WDID NO.:_____XXXXXXX_________________

STORMWATER POLLUTION PREVENTION PLAN

for

EAST CAT CANYON FIELD REDEVELOPMENT PROJECT PHASE I

RISK LEVEL _2_

Legally Responsible Person [LRP):

Aera Energy LLC
Address
To Be Determined
Phone Number

Prepared for:

Aera Energy LLC
10000 Ming Avenue
Bakersfield, CA 93311-1302
661-665-5000

Project Address:

Sections 19, 20, 29, 30 T9N R32W
East Cat Canyon Field, Santa Barbara County, California

Contractor:

To Be Determined
Address
Phone Number

SWPPP Prepared by:

200 New Stine Road
Bakersfield, CA 93309
Robin S. Dickerson, PE QSD # 24986
661-831-8782 Ext. 217

SWPPP Preparation Date

September 25, 2014

Estimated Project Dates:

Start of Construction	Completion of Construction
January 2, 2017	**December 31, 2020**

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Qualified SWPPP Developer

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: EAST CAT CANYON FIELD REDEVELOPMENT PROJECT

Project Number/ID: *WDID # XXXXXXXXXXX*

"This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD Signature	*Date*
Robin S. Dickerson	*24986*
QSD Name	*QSD Certificate Number*
Project Specialist, TJ Cross Engineers Inc.	(661) 831-8782 Ext. 217
Title and Affiliation	*Telephone Number*
rdickerson@tjcross.com	
Email	

Legally Responsible Person

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name:	EAST CAT CANYON FIELD REDEVELOPMENT PROJECT
Project Number/ID:	*WDID # XXXXXXXXXXX*

"I certify under penalty of law that this document and all Attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Aera Energy LLC

Legally Responsible Person

Signature of Legally Responsible Person or Approved Signatory	Date
Name of Legally Responsible Person or Approved Signatory	Telephone Number

Amendment Log

Project Name: EAST CAT CANYON FIELD REDEVELOPMENT PROJECT

Project Number/ID: *WDID # XXXXXXXXXXX*

Amendment No.	**Date**	**Brief Description of Amendment, include section and page number**	**Prepared and Approved By**
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

Section 1 SWPPP Requirements

1.1 INTRODUCTION

The East Cat Canyon Field Redevelopment Project comprises approximately 2,100 acres located within the Solomon Hills northeast of the Gato Ridge mountain ranges within East Cat Canyon, approximately 10 miles southeast of the communities of Santa Maria and Orcutt located in northern Santa Barbara County, California in Sections 19, 20, 29, 30 T9N R32W, Santa Barbara County, California. The property is comprised of eight leases, which are owned and operated by Aera Energy LLC. The projects location is shown on the Location Map in Appendix B.

The main property entrance is located at 6516 Cat Canyon Road, approximately 4 miles south of Sisquoc, California. The development project activity will be focused predominantly on the west portion of the property, where the greater density of existing roads, well pads and previous facility footprints already exist. Approximately 287 acres will be disturbed.

Seventy two well pads along with supporting facilities and infrastructure are being proposed for this project.

This Stormwater Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ and 2012-0006 DWQ (NPDES No. CAS000002) and issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association Stormwater *Best Management Practice Handbook Portal: Construction* (CASQA, 2010). In accordance with the General Permit, Section XIV, this SWPPP is designed to address the following:

- All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;

Calculations can be found in Appendix A and design details as well as BMP controls can be found in Appendix B.

Rain Event Action Plans (REAP) will be prepared by the QSP when there is a forecasted storm event. REAP forms can be found in Appendix J.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Stormwater Multi Application and Report Tracking System (SMARTS) by the Legally

Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Map;
4. Post –construction water balance calculation
5. Annual Fee;
6. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
7. SWPPP.

Site Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP AMENDMENTS

The SWPPP shall be ammended or revised when:

- There is a General Permit violation. (i.e. NAL and NEL exceedances). (General Permit Section I Part H No. 57 and 59).
- There is a reduction or increase in total disturbed acreage (General Permit Section II Part C).
- BMPs do not meet the objectives of reducing or eliminating pollutants during qualifying rain events. (General Permit, Attachment C, D, or E Part I.3.G).

Additionally, the SWPPP shall be amended when:

- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- When there is a change in the project duration that changes the project's risk level; or
- When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP proposed, if any; and
- The new BMP proposed.

Amendment shall be logged into the SWPPP amendment log at the front of this SWPPP and certification kept in Appendix D. The SWPPP text shall be revised replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP(1)	**Check changes that can be field located or field determined by QSP**
Increase quantity of an Erosion or Sediment Control Measure	**X**
Relocate/Add stockpiles or stored materials	**X**
Relocate or add toilets	**X**
Relocate vehicle storage and/or fueling locations	**X**
Relocate areas for waste storage	**X**
Relocate water storage and/or water transfer location	**X**
Changes to access points (entrance/exits)	**X**
Change type of Erosion or Sediment Control Measure	**X**
Changes to location of erosion or sediment control	**X**
Minor changes to schedule or phases	**X**
Changes in construction materials	**X**
(1) Any field changes not identified for field location or field determination by QSP must be approved by QSD	

1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- SWPPP

- Amendments
- Training Reports
- Weather Reports
- Field Inspection Reports
- Subcontractor and Material Suppliers
- Notice of discharge reports

These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

1.6 REQUIRED NON-COMPLIANCE REPORTING

If a discharge violation occurs the QSP shall immediately notify the LRP and the LRP shall file a violation report electronically to the Regional Water Board within 30 days of identification of non-compliance using SMARTS.

The report to the LRP and to the Regional Water Board will contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

Corrective measures will be implemented immediately following the discharge or written notice of non-compliance from the Regional Water Board. Discharges and corrective actions will be documented on the NAL/NEL Exceedance Site Evaluation Report Form in CSMP Attachment 3 "Example Forms."

Reporting requirements for Numeric Action Levels (NALs) exceedances are discussed in Section 7.7.2.7.

1.7 ANNUAL REPORT

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms. The annual report will cover the construction period from July 1 thru June 30.

1.8 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and cetrification of SWPPP amendments are to be kept in Appendix D. Updated PRDs submitted electronically via SMARTS can be found in Appendix E.

1.9 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. For purposes of “final stabilization” the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

Section 2 Project Information

2.1 PROJECT AND SITE DESCRIPTION

2.1.1 Site Description

The Aera Energy LLC East Cat Canyon Field comprises approximately 2,100 acres and is located within the Solomon Hills northeast of the Gato Ridge mountain ranges within East Cat Canyon, approximately 10 miles southeast of the communities of Santa Maria and Orcutt located in northern Santa Barbara County, California. The property is owned and developed by Aera Energy LLC. The project consists of eight leases located within Sections 19, 20, 28, 29, 31 and 32 of Township 9N/Range 32W, SBBM and is identified on the Location Map in Appendix B.

The main property entrance is located at 6516 Cat Canyon Road, approximately 4 miles south of Sisquoc, California. The development project activity will be focused predominantly on the west portion of the property, where the greater density of existing roads, well pads and previous facility footprints already exist. Approximately 287 acres will be disturbed.

Seventy three well pads along with supporting facilities and infrastructure are being proposed for this project.

The topography of the area consists of a series of north-south aligned subdued hills with elevations ranging from about +500 to +1,000 feet above mean sea level (MSL). Cat Canyon, which is the principal stream in the area, is intermittent and flows to the north toward the community of Sisquoc. That creek, as well as those in Long Canyon and Olivera Canyon, are well entrenched along most of its course.

The East Area of the Cat Canyon Oil Field (East Cat Canyon) is situated in the southeast section of the Santa Maria basin located in the Solomon Hills of the Southern California Coast Ranges. Surface elevations range from approximately 500 ft to 1025 ft above mean sea level (msl). The assessment area includes the southwestern portion of East Cat Canyon, and constitutes several tributaries of the Sisquoc River, including Cat Canyon, Long Canyon, Olivera Canyon and 3 unnamed blue lines. The site topography is steep and rugged, generally sloping southwest toward Cat Canyon from a northwest trending central ridge. The hills are dissected by arroyos, forming canyons separated by prominent ridges.

The Site is in the East Cat Canyon Oil Field. Oil is produced from oil traps formed within the Brooks Sands of the lower Sisquoc Formation on the shallow dipping northeastern flank of the Gato Ridge anticline at depths of about 2,800 feet below ground surface (bgs) to 4,850 feet bgs. Very low gravity, heavy oil (0° to 10° API) has been produced from this area.

2.1.2 Existing Conditions

The East Cat Canyon Oil Field is located in the Santa Maria Basin, where oil operations have been conducted since 1888. In 1984, the Project Site was transferred to Shell Oil Company. In 1997 Shell and Mobil Oil Company formed a partnership of their oil production activities in California, known first as CalResources and later Aera Energy LLC. Intermittent production activities at the East Cat Canyon Field were conducted until 1989, when the oilfield was shut down due to economic reasons. Aera implemented an oil well decommissioning program from the late 1980’s to 2003. The field’s wells were abandoned and nearly all of the facilities were removed by 2002.

The Project Site currently supports an office/warehouse building, 131 abandoned oil wells, four non-producing test wells, a system of graded access roads and wells pads, former facility footprints, a permitted beneficial reuse site, and leased grazing. At this time there are no active producing oil wells on the site. Most of the existing development occurred in the southern half of Section 19, all of Section 30, and the western half of Section 29.

A considerable portion of East Cat Canyon has asphalt-like material visible at the surface on the hillsides and in the arroyos. Most of this material was deposited as part of early oil production methods dating back to 1909. There are large accumulations at previous sumps or storage tank sites, and thinner asphaltic layers occur from small accumulations or flows between areas. Some of the larger accumulations are hardened, and some are in the form of a highly viscous fluid that occasionally seeps to the surface from sump remains in the arroyos.

The area contains chaparral-type vegetation that includes live oak, scrub bush, willows and grasses. Surrounding properties in Cat Canyon are used for livestock grazing, vineyard cultivation, and oil production. In the East Cat Canyon field, the discovery well, Brooks Oil Co. No.1 (now Fullerton Oil Co. No. 1) was drilled in 1909 and had an initial daily yield of 150 barrels. At some point prior to the acquisition of the property by Shell/Aera the production practice was to produce the wells into open canyons taking off the lighter ends while leaving the sand and heavier asphaltic ends, filling canyons and “flowing” oil down channels or between areas.

The Project Site is designated Agriculture (Ag-II-100) and Agricultural Commercial (AC) under the County Land Use and Zoning Ordinances. Oil and gas exploration and production are approved uses in this zoning.

2.1.3 Existing Drainage

The existing topography of the project site area consists of a series of north-south aligned subdued hills with elevations ranging from about +500 to +1,025 feet above mean sea level (MSL). Cat Canyon Creek, which is the principal stream in the area, is intermittent and flows to the north toward the community of Sisquoc. That creek, as well as those in Long Canyon and Olivera Canyon and the 3 unnamed blue lines, are well entrenched along most of their courses. Six water sheds are contained within the 2100 acres. They are Cat Canyon, Long Canyon, Olivera Canyon and 3 unnamed blue lines. All water sheds drain to the north and are tributaries of the Sisquoc River.

Stormwater from the site primarily flows to the north from one of six existing natural blue line channels. All six blue line channels directly discharge into the Sisquoc River, which discharges into the Santa Maria River which ultimately discharges into the Pacific Ocean. Stormwater discharges, from the site, are considered direct discharges into the Sisquoc River, as defined by the State Water Board. Existing site topography, drainage patterns, and stormwater conveyance systems are shown on Hydrology Map – Post Construction Watershed Drawing Nos. 072-13-024A-C in Appendix B.

The project discharges to Sisquoc River that is not listed for water quality impairment on the most recent 303(d) list but is identified as having beneficial uses as cold, spawn or migratory and ultimately discharges into the Santa Maria River which is listed for water quality impairment on the most recent 303(d)-list.

The Sisquoc River, north of the site, is the major surface water feature in the site vicinity. The Sisquoc River is a tributary to the Santa Maria River that drains west eventually emptying into the Pacific Ocean. During periods of low to moderate flow, all or most of the water entering the area is absorbed by river channel deposits and recharges the groundwater supply.

Cat Canyon Creek, south of the site, is an intermittent creek that flows to the northwest down Cat Canyon. It joins other intermittent creeks near the intersection of Cat Canyon Road and Palmer Road then flows north to the Sisquoc River. The canyons within the Cat Canyon Water shed which are part of the project generally drain to the south into Cat Canyon Creek. In Cat Canyon, surface water from moderate precipitation infiltrates through the Careaga sand and gravelly sand that comprise the sediments. During heavy rainfall, surface runoff accumulates in the streambeds and flows into the six existing blue line channels.

2.1.4 Geology and Groundwater

The site is in the southeast portion of Santa Maria Basin in the Solomon Hills. The Santa Maria Basin is a wedge shaped region between two structural provinces: the Southern California Coast Ranges (San Raphael Mountains) on the northeast and the Transverse Ranges (Santa Ynez Mountains) on the south.

The Casmalia Hills and Solomon Hills form a continuous series of anticlinal uplifts between the Santa Maria Valley syncline and the San Antonio and Los Alamos synclines. One of these anticlinal uplifts, the northwest trending Flores/Cat Canyon anticline, forms the major structure in Cat Canyon, southwest of the East Cat Canyon Oil Field. The uplift and subsequent erosion of overlying formations has exposed the Careaga sands throughout much of Cat Canyon. The Gato Ridge anticline is located beneath the assessment area. The northeast limb of the Gato Ridge anticline forms the structural trap from which oil is produced in the East Area of the Cat Canyon Oil Field. It is a northwest plunging structure with a narrow well-defined crest south of Cat Canyon that flares out near the Site entrance gate along Cat Canyon Road. No faults of record were found to be located on site. However, the surface trace of the Foxen Canyon fault is located about 3 miles to the north and the axial trace of the Flores/Cat Canyon anticline and related fault is located about 2 miles to the southwest.

The geologic conditions in the project area consist of predominantly flat lying to slightly folded sequence of Pliocene and Pleistocene formations consisting of the Carreaga and Paso Robles Formations. Older alluvial deposits are present on the tops of ridges and hills and deposits of recent colluvium and alluvium are also present in the project area in the tributary canyons and valley floors. Groundwater occurs beneath the site at greater than 100 to 200 feet below ground surface. The groundwater gradient is towards the north. Although the depth to groundwater is anticipated to be relatively deep, there is a possibility for areas or zones of perched groundwater to be present at shallow depths (that is less than 30 feet deep) on at least a seasonal basis. Perched groundwater can occur in drainage channels or where changes in soil type or permeability occur within soil or rock materials. Groundwater seepage can occur where water daylights perched in cuts or at the ground surface.

The site is located in California's seismically active central coast region and there are a number of active faults in the region that have the potential to produce strong ground motion at the site. Although no active faults exist on the site, two inactive concealed faults have been identified. The one concealed northeast-dipping, normal fault mapped through the northeastern portion of the project area is referred to as the Garey fault. The second concealed northeast-dipping, normal fault mapped through the southwestern portion of the area is unnamed on published maps, but locally referred to as the Fuglar fault. Both faults are considered inactive. Consequently, neither of those two onsite faults are considered likely to pose a ground-surface fault-rupture hazard.

In the Cat Canyon area, groundwater is found mainly in the Careaga sands. The general groundwater gradient is toward the north, toward the Sisquoc River. Groundwater levels in the site area vary with climatic changes, lower levels in years following drought and higher levels (recharge) following wetter years. The static water table for the regional aquifer is currently about 50 to 90 feet beneath the Cat Canyon Creek bed. Assuming this depth, groundwater elevations beneath the site probably range from approximately 630 to 590 feet above msl (about 200 to 300 feet bgs).

The regional aquifer in the Santa Maria Basin is contained within the alluvium, Orcutt Sand, Paso Robles Formation, the Careaga sand, and the alluvial terrace and channels deposits of the Cat Canyon area. The bottom of the aquifer is considered to be at the base of the Careaga sand.

2.1.5 Project Description

The East Cat Canyon Oil Field Redevelopment Project will re-establish oil production in an existing oil field by implementing a thermal enhanced oil recovery process that is technically, economically, and environmentally feasible for oil recovery. Project plans include construction and restoration of approximately 72 well pads, construction and restoration of over nine miles of field access roads, and drilling of up to 296 wells. Planned wells include oil/gas production wells, steam injection wells, observation wells, water production wells, water injection wells, and fresh groundwater wells.

New processing facilities and field systems will be constructed. Processing facilities will include: 1) a production group station for bulk separation of produced gas and liquids, 2) a central processing facility for oil cleaning, water cleaning, water softening, oil storage, and oil sales, and 3) a steam generation site (up to six once through steam generators rated at 85 million BTU/hour each) for production of saturated steam to be used for thermal enhanced oil recovery. An additional 62.5 MMBTU/hr steam generator will be used to generate steam from the project's produced gas. No fresh water will be used to generate steam; only non-potable water will be used.

Field systems will include 1) a production gathering network, 2) a steam distribution network and 3) electrical power distribution and supervisory control and data acquisition (SCADA) networks. Project infrastructure will also include an office building, a multipurpose building, a warehouse and maintenance building, and a facility control building. A fresh water system with a 3,000 barrel tank and water distribution pipelines is also planned for utility purposes including fire protection, lavatories, showers, equipment cleaning, dust control, and minor landscape irrigation.

The Project has been designed to minimize grading and land disturbance by maximizing the use of existing roads, well pads, cleared areas, and contours wherever possible. Out of the approximate total 2,108-acre Project site, approximately 300 acres, or 14 percent will be graded. Earthwork volumes will be balanced across the Project site in order to minimize the need for import or export of significant amounts of soil.

The primary Project site entrance is located at 6516 Cat Canyon Road. Vehicles and equipment entering the Project site travel across Cat Canyon Creek via an existing culvert crossing located just outside of the Aera Energy LLC property boundary. As proposed, the Project would utilize the existing crossing during the initial Project construction, while concurrently constructing a new Project site entrance located approximately 300 feet north (upstream) of the existing entrance. The Project will also include construction of a secondary access located along Long Canyon Road, on the eastern boundary of the Project site along with two smaller east side entrances from Long Canyon Road, which will be constructed to provide adequate access to the new well pads. Project site entrances will be connected via a primary site access road, which will be graded and paved concurrently with site entrance construction activities.

The Project will be implemented in phases to maximize efficiency and help moderate construction peak activity levels. Phase I will include the construction of the production group station, central processing facility, steam generation site , fresh water distribution system, office building, main roadways and a beneficial reuse facility for soil and sand. Four of the seven steam generators will be installed. Some of the project's well pads and wells will be restored/developed during Phase I, along with the associated roadways, electrical distribution lines, and gathering and distribution pipelines to support those wells. Phase I activities will last approximately four years.

During Phase II, the remaining well pads will be restored/developed; the remaining wells will be drilled, along with associated roadways, electrical distribution lines, and gathering and distribution pipelines. Phase II will also expand the processing facility capacities, and add three additional steam generators. Phase II facility expansion will start approximately three years after Phase I completion and is expected to take up to two years. Phase II well drilling, along with the construction of roadways, electrical distribution lines, and gathering and distribution pipelines to support those wells, is planned to take place over a period of up to ten years. Production from the project is expected to continue for more than 30 years.

2.1.6 Developed Condition

This SWPPP will only address the construction in Phase I. Post construction surface drainage will follow the existing drainage patterns and be primarily directed to the north as surface flow through stormwater conveyance systems and/or sheet flow towards one of the 6 main natural blue line channels and will discharge at points located at the project boundary and further discussed in section 7.

Post construction drainage patterns and conveyance systems are presented on Drawing No. 072-13-024 A- C in Appendix B.

Hydrology for the project can be found in Appendix A. Hydrology was run for the 10 year pre and post construction events. Areas, runoff coefficients and flows at the various junctions were calculated and can be found in Appendix A.

2.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account while preparing this SWPPP

- Grading Permit for Central Processing Site (Pending county submittal and approval)
- Grading Permit for Steam Generator Site (Pending county submittal and approval)
- Grading Permit for Office Site (Pending county submittal and approval)
- Grading Permit for Production Group Station (Pending county submittal and approval)
- Structural Permits (Pending county submittal and approval)
- Regional Water Board requirements
- Basin Plan requirements
- Contract Documents
- Air Quality Regulations and Permits
- Federal Endangered Species Act
- National Historic Preservation Act/Requirements of the State Historic Preservation Office
- State of California Endangered Species Act
- Clean Water Act Section 401 Water Quality Certifications and 404 Permits
- CA Department of Fish and Game 1602 Streambed Alteration Agreement

2.3 STORMWATER RUN-ON FROM OFFSITE AREAS

There is no anticipated offsite run-on to the proposed construction sites because the construction activities occur at the start of initial sub watersheds. Offsite run-on however will occur within the major creek beds of Cat Canyon, Long Canyon and Olivera Canyon, but will not impact the construction sites themselves. Therefore sampling of the run-on prior to entering the lease boundary will be tested to verify no pollutants are coming from up stream.

2.4 FINDINGS OF THE CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 2.

The risk level was determined though the use of the K and LS provided in SMARTS. The R value was calculated based on the EPA Stormwater Phase II Final Rule as allowed by the California Regional Water Control Board. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

Table 2.2 and Table 2.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

Table 2.2 Summary of Sediment Risk

RUSLE Factor	**Value**	**Method for establishing value**	
R	80	EPA Stormwater Phase II Final Rule	
K	0.15	From SMARTS	
LS	4.74	From SMARTS	
Total Predicted Sediment Loss (tons/acre)			**56.88**
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre			☐ **Low** ☒ **Medium** ☐ **High**

Runoff from the project site discharges into existing canyons which discharge into Long Canyon Cat Canyon and 2 unnamed blue lines which discharge into the Sisquoc River, which discharges into the Santa Maria River and eventually into the Pacific Ocean.

Table 2.3 Summary of Receiving Water Risk

Receiving Water Name	**303(d) Listed for Sediment Related Pollutant(1)**	**TMDL for Sediment Related Pollutant(1)**	**Beneficial Uses of COLD, SPAWN, and MIGRATORY(1)**
Santa Maria River	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No
Sisquoc	☐ Yes ☒ No	☐ Yes ☒ No	☒ Yes ☐ No
Overall Receiving Water Risk			☐ **Low** ☒ **High**
(1) If yes is selected for any option the Receiving Water Risk is High			

Risk Level 2 sites are subject to both the narrative effluent limitations and numeric effluent standards. The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures and best management practices. Discharges from Risk Level 2 site are subject to NALs for pH and turbidity shown in Table 2-4. This SWPPP has been prepared to address Risk Level 2 requirements (General Permit Attachment D).

Table 2.4 Numeric Action Levels

Parameter	Unit	Numeric Action Level Daily Average
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	NTU	250 NTU

2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on Phase I construction taking place between January 2, 2017 and December 31, 2020. Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP. The estimated schedule for planned work can be found in Appendix F. At this time a schedule has not been prepared for this project.

2.6 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Appendix G includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to stormwater runoff.

The anticipated activities and associated pollutants were used in Section 3 to select the Best Management Practices for the project. Location of anticipated pollutants and associated BMPs are show on the Site Map in Appendix B.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 7.7.1. For a full and complete list of onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer.

2.7 IDENTIFICATION OF NON-STORMWATER DISCHARGES

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants.

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Non-stormwater discharges that are authorized from this project site include the following:

- Vehicle and Equipment fueling – gasoline
- Vehicle and Equipment maintenance – vehicle fluids, including oil, grease, petroleum and coolants
- Cement materials
- Solvents, thinners, and acids

- Mortar Mix
- BMP materials
- Solid Waste Management (litter, trash and debris)
- Concrete
- Liquid waste management (wash water)
- Sanitary Septic Waste Management (portable toilets)
- Concrete Wash Out

These authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3 of this SWPPP and will be minimized by the QSP.

Construction activities at this site that may result in unauthorized non-stormwater discharges include:

- Clearing and grubbing operations
- Grading and excavation operations
- Installing Riprap
- Utility and foundation excavations
- Mortar Mixing
- Stockpiling and removal of excavated soils
- Paving
- Pouring of concrete
- Painting

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

Discharges of construction materials and wastes, such as fuel, concrete washout or paint, resulting from dumping, spills, or direct contact with rainwater or storm water runoff, are also prohibited.

2.8 REQUIRED SITE MAP INFORMATION

The construction project’s Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter and general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 2.6 identifies Map or Sheet Nos. where required elements are illustrated.

Table 2.6 Required Map Information

Included on Map/Plan Sheet No. [1]	Required Element
072-13-026A	The project’s surrounding area (vicinity)
072-13-004A	Site layout
072-13-025A	Construction site boundaries
072-13-024A-C	Drainage areas
072-13-027 A-C	Discharge locations
072-13-027 A-C	Sampling locations
072-13-025A	Areas of soil disturbance (temporary or permanent)
072-13-004A	Active areas of soil disturbance (cut or fill)
072-13-009A-F	Locations of runoff BMPs
072-13-009A-F	Locations of erosion control BMPs
072-13-009A-F	Locations of sediment control BMPs
N/A	ATS location (if applicable)
072-13-009A-F	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
072-13-009A-F	Locations of all post construction BMPs
072-13-009A	Waste storage areas
072-13-009A	Vehicle storage areas
072-13-009A	Material storage areas
072-13-009A	Entrance and Exits
072-13-009A	Fueling Locations

Notes: (1) Indicate maps or drawings that information is included on (e.g., Vicinity Map, Site Map, Drainage Plans, Grading Plans, Progress Maps, etc.)

Section 3 Best Management Practices

3.1 SCHEDULE FOR BMP IMPLEMENTATION

Site-specific BMPs were selected to reduce or eliminate pollutants in storm water and non-storm water discharges associated with construction activities. The following erosion control (EC), non-storm waste management (NS), sediment control (SE), tracking control (TC), wind erosion control (WE), and waste management (WM) BMP tables indicate which BMPs are prescribed for specific phases of construction for this project include:

- Grading and Land Development (GLD);
- Streets and Utilities (SU);
- Final Landscaping and Site Stabilization (FLS);
- Vertical Construction (V).

Structural or physical BMP locations are shown on the Erosion Control Plans in Appendix B (non-structural BMPs are to be implemented site-wide) and described in this section. The BMP specification details can be found in Appendix H of the SWPPP.

Table 3.1 BMP Implementation Schedule

	BMP	Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to Construction	Entirety of Project
	EC-2, Preservation of Existing Vegetation	Start of Construction	Entirety of Project
	EC-4, Hydroseeding	Prior to Completion of Construction	Areas of existing vegetation
	EC-7, Geotextiles and Mats	Prior to Completion of Construction	On Slopes of 2:1
	EC-9, Earth Dike and Drainage Swales	Start of Construction	Entirety of Project
	EC-10, Velocity Dissipation Device	As needed during Construction	Locations of construction discharge
	EC-11, Slope Drains	Prior to Completion of Construction	Bench Drains
	EC-12, Stream Bank Stabilization	As needed during Construction	Natural Drainage Channels
	EC-14 Compost Blankets	Prior to Completion of Construction	On Slopes of 2:1
	EC-15 Soil Preparation Roughening	Prior to Completion of Construction	On Slopes of 2:1

Table 3.1 BMP Implementation Schedule

	BMP	Implementation	Duration
	EC-16 Non-Vegetative Stabilization	Prior to Completion of Construction	Natural Drainage Channels and areas of channelized flow
Sediment Control	SE-1, Silt Fence	Start of Construction	Entirety of Project
	SE-2, Sediment Basins	As needed during Construction	Drainage Locations
	SE-3, Sediment Traps	As needed during Construction	Drainage Locations
	SE-4, Check Dam	Start of Construction	Natural Drainage Channel
	SE-5, Fiber Rolls	Start of Construction	Upon completion of slope grading
	SE-7, Street Sweeping and Vacuuming	As needed during Construction	Entirety of Project
	SE-9, Straw Bale Barrier	Start of Construction	Entirety of Project
	SE-10, Storm Drain Inlet Protection	As needed during Construction	Entirety of Project
	SE-13, Compost Sock and berm	Start of Construction	Upon completion of slope grading
	SE-14, Biofilter Bags	Start of Construction	Upon completion of slope grading
Tracking Control	TC-1, Stabilized Construction Entrance/Exit	Start of Construction	Entirety of Project
	TC-2, Stabilized Construction Roadway	Start of Construction	Entirety of Project
Wind Erosion	WE-1, Wind Erosion Control	Start of Construction	Entirety of Project
Waste Management	WM-1 Material Delivery Storage	Start of Construction	Entirety of Project
	WM-2 Material Use	Start of Construction	Entirety of Project
	WM-3 Stockpile Management	Start of Construction	Entirety of Project
	WM-4 Spill Prevention and Control	Start of Construction	Entirety of Project

Table 3.1 BMP Implementation Schedule			
	BMP	**Implementation**	**Duration**
	WM-5 Solid Waste Management	Start of Construction	Entirety of Project
	WM-6 Hazardous Waste Management	Start of Construction	Entirety of Project
	WM-7 Contaminated Soil Management	Start of Construction	Entirety of Project
	WM-8 Concrete Waste Management	Start of Construction	Entirety of Project
	WM-9 Sanitary/Septic Waste Management	Start of Construction	Entirety of Project
	WM-10 Liquid Waste Management	Start of Construction	Entirety of Project

3.2 EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where required and when feasible.
2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

Table 3.1a indicates the BMPs that are specified for the site. Structural or physical BMP locations are shown on the Erosion Control Plans in Attachment B (non-structural BMPs are to be implemented site-wide) and described in this section. The General Permit specifies that effective soil cover must be provided for inactive (14 days or longer areas and all finished slopes, backfill, and stockpiles, as well as prior to rain events. Additional BMP specifications can be found in Appendix H of the SWPPP.

Table 3.1a BMP Implementation Schedule

	BMP No.	BMP Name	Phases of Construction	Note Site –Specific Implementation Requirements
Erosion Control	EC-1	Scheduling	GLD, FLS,SU, V	Avoid grading during wet weather when possible; limit area of disturbance, stabilize the pad and slopes as soon as possible after final grading.
	EC-2	Preservation of Existing Vegetation	GLD, FLS,SU, V	Preserve vegetation surrounding the pad as much as possible. Retain and chip cleared vegetation for use as wood mulch cover on fill slopes.
	EC-4	Hydroseeding	GLD,FLS	Apply hydroseeding to pad perimeter slopes if needed to achieve final stabilization; utilize in conjunction with jute netting.
	EC-7	Geotextiles and Mats	GLD, FLS	Install jute netting on earthen berms along perimeter of pad. Stabilize fill slopes along roadway with jute netting.
	EC-9	Earth Dike and Drainage Swales	GLD, SU	Install swales and run on diversion infrastructure. Utilize around vessels, piping, and related appurtenances being purged of liquids. May be necessary along roads to control run-on.
	EC-10	Velocity Dissipation Device	GLD, SU	Utilize as needed to reduce velocity in run-on diversion structures, i.e. end of culverts, slope drains.
	EC-11	Slope Drains	GLD, SU	Install on slopes where runoff concentrates.
	EC-12	Stream bank Stabilization	GLD, SU	Install in natural drainage channels where there is construction or severe erosion
	EC-14	Compost Blankets	FLS	Can be used for Geotextiles and Mats
	EC-15	Soil Preparation-Roughening	GLD	Should be used prior to hydroseeding.
	EC-16	Non-Vegetative Stabilization	GLD, SU	Apply Class II road base to well pad after grading is performed.
	WE-1	Wind Erosion Control	GLD, SU, FLS, V	Utilize water truck to control dust on graded pad prior to road base and mulch application.

The following temporary erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on the construction site. Fact Sheets for temporary erosion control BMPs are provided in Appendix H.

Table 3.2 Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		
EC-3	Hydraulic Mulch	✓(2)		✓	Geotextiles and Mats shall be used.
EC-4	Hydroseed	✓(2)	✓		
EC-5	Soil Binders	✓(2)		✓	Geotextiles and Mats shall be used.
EC-6	Straw Mulch	✓(2)		✓	Geotextiles and Mats shall be used.
EC-7	Geotextiles and Mats	✓(2)	✓		
EC-8	Wood Mulching	✓(2)		✓	Geotextiles and Mats shall be used.
EC-9	Earth Dike and Drainage Swales	✓(3)	✓		
EC-10	Velocity Dissipation Devices		✓		
EC-11	Slope Drains		✓		
EC-12	Stream Bank Stabilization		✓		
EC-14	Compost Blankets	✓(2)	✓		
EC-15	Soil Preparation-Roughening		✓		
EC-16	Non-Vegetated Stabilization	✓(2)	✓		
WE-1	Wind Erosion Control	✓	✓		
Alternate BMPs Used:					**If used, state reason:**

(1) Applicability to a specific project shall be determined by the QSD.
(2) The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
(3) Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Scheduling

Sequencing of construction activities and the implementation of the BMPs shall be scheduled to take in to account the local climate conditions and reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Preservation of Existing Vegetation

Prior to construction, limits for preservation of existing vegetation shall be visually identifiable and marked as outlined in the Erosion Control Plan provided in Appendix B and the BMP Fact Sheet provided in Appendix H. Contractor shall schedule construction activities in such a way as to preserve as much of the existing vegetation as possible.

Hydroseed

Hydroseeding shall be applied to soil disturbed areas requiring temporary protection until permanent stabilization are established. This protects the soils from erosion by water and wind. BMPs are shown on the Erosion Control Plan provided in Appendix B and the BMP fact sheet in Appendix H.

Geotextiles and Mats

Geotextiles and Mats shall be applied to steep slopes and any slopes adjacent to water bodies to cover and hold soil surface in place. Channels with flows exceeding 3.3 ft./s, slopes where erosion potential is high and where plants are slow to develop. This protects the soils from erosion by water and wind. BMPs as shown on the Erosion Control Plan provided in Appendix B and the BMP fact sheet in Appendix H.

Earth Dike and Drainage Swales

Earth Dike and Drainage Swales are used to divert off site runoff around the construction site, divert runoff from stabilized and disturbed areas, and direct runoff in sediment basins or traps as shown on the Erosion Control Plan provided in Appendix B and the BMP fact sheet in Appendix H.

Velocity Dissipation Devices

Outlet protection shall be placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flow. The Fact Sheet for Velocity Dissipation Devices can be found in Appendix H.

Slope Drains

Slope drains to be used to intercept and direct surface runoff and/or groundwater into a stabilized watercourse, trapping device, or stabilized area. Earth dikes and drainage ditches are used with slope drains when intercepting and directing surface flow away from slope areas to protect cut or fill slopes. This protects the soils from erosion by water. BMPs as shown on the Erosion Control Plan provided in Appendix B and the BMP fact sheet in Appendix H.

Stream bank Stabilization

The stream banks shall be stabilized on the south end of the project, where construction may have disturbed the existing natural drainage channel banks. Contractor to use rip/rap to act as a velocity dissipater and to provide erosion control and shall be installed at the completion of construction, as required by the QSP

Composite Blankets

Composite Blankets shall be installed in conjunction with the hydroseeding to help stabilize the slopes after grading has been completed as part of the permanent BMP's to be installed.   The Erosion Control Plan provided in Appendix B shows the location of the Composite blankets. The fact sheet for the composite blanket can be found in Appendix H.

Soil Preparation-Roughening

Soil Preparation / Roughening to be used prior to installing BMPs for surface soils. Soil testing and roughening surface soil can be included to prepare soil for additional BMPs and/or to break up sheet flow. The fact sheet for the non-vegetated stabilization can be found in Appendix H.

Non-Vegetated Stabilization

Non-vegetated stabilization to be used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible. The fact sheet for the soil preparation / roughening can be found in Appendix H.

Wind Erosion Control

A water truck shall apply water as needed to reduce the dust generated on project site roads, areas of disturbed soil, and stockpiles. Speed limits on the unpaved roads shall not exceed 15 miles per hour. Contractor is responsible for notifying all employees and subcontractors of the speed limits within the project area.

3.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

Sediment Control

Table 3.1c indicates the BMPs that are to be implemented to control and retain sediment on-site. Structural or physical BMP locations are shown on the WPCDs in Attachment B (non-structural BMPs are to be implemented site-wide) and described in this section. The BMP specification can be found in AppendixG of the SWPPP. The General Permit specifies that effective perimeter controls must be established and maintained and all construction entrances and exits sufficiently to control erosion and sediment discharges from the site. Additionally, construction activity traffic must be restricted to and from the Site to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

Table 3.1c BMP Implementation Schedule

	BMP No.	BMP Name	Phases of Construction	Note Site –Specific Implemention Requiremnt
Sediment Control	SE-1	Silt Fence	GLD, SU	Install at edge of road to protect adjacent waterway. Install at toe of pad fill slope to contain pad perimeter.Utilize at the base of all streambanks.
	SE-2	Sediment Basin	GLD, FLS	Basin will assist with sediment collection. Samples should be collected downstream of basin.
	SE-3	Sediment Trap	GLD, SU, FLS & V	Traps will assist with sediment collection. Samples should be collected downstream of traps.
	SE-4	Check Dams	GLD, SU	To help remove sediments in natural and reduce velocity in natural drainage channels that are not designated as blue lines
	SE-5	Fiber Rolls	GLD, SU	Install at break line of rock and fill soil and at toe of slope. Install on fill slope to minimize sheet flow length and around temporary stockpiles.
	SE-6	Gravel Berm Bag	GLD, SU	Can be used in place of fiber rolls. Aids in reducing velocity of water and settling of sediment.
	SE-7	Street Sweeping and Vacuuming	GLD, SU, FLS & V	Perform as necessary on paved entrance roads at both Cat Canyon and Long Canyon.
	SE-10	Storm Drain Inlet Protection	GLD,/ SU, FLS & V	Install fiber rolls or gravel bags around storm drain. Utilize road base to stabilized soils near drain and protect with fiber rolls.
	SE-13	Compost Socks and Berms	GLD, FLS	Biodegradable compost socks and berms may be utilized in place of fiber rolls.
	SE-14	Biofilter Bags	GLD, FLS, FLS & V	May be utilized in place of fiber rolls or gravel bag berms.

Fully biodegradable fiber rolls may be left in place at the conclusion of construction activities. Fiber rolls containing plastic netting or similar non-degradable components must be removed from the site to achieve final stabilization. Fiber roll installation on slopes must comply with the specifications for construction sites, as specified in Table 3.1c.1

Table 3.1c.1
Critical Slope and Sheet Flow Length Specifications for Fiber Roll Installation

Slope Gradient Percentage	Fiber Roll Spacing Specification *(Sheet flow distance not to exceed these distances)*
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

Tracking Controls

Table 5 indicates the BMPs that are to be implemented to reduce sediment tracking from the Site onto roads. The General Permit requires daily inspections of all immediate access roads. At a minimum daily (when necessary) and prior to any rain event, any sediment or other construction activity-related materials that are deposited on the roads must be removed by vacuuming or sweeping. Structural or physical BMP locations are shown on the WPCDs in Attachment B (non-structural BMPs are to be implemented site-wide) and described in this section. The BMP specifications can be found in Appendix G of the SWPPP.

Table 3.1d BMP Implementation Schedule

	BMP No.	BMP Name	Phases of Construction	Note Site –Specific Implementation Requirements
	TC-1	Stabilized Construction Entrance/Exit	GLD, SU	If tracking is observed, shaker bars will be installed at the entrance/exit.
	TC-2	Stabilized Construction Roadway	GLD, SU	Stabilize construction roadway with road base if erosion becomes apparent.

The following sediment control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H.

Table 3.3 Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used YES	BMP used NO	If not used, state reason
SE-1	Silt Fence	✓[2] [3]	✓		
SE-2	Sediment Basin		✓		
SE-3	Sediment Trap		✓		
SE-4	Check Dams		✓		
SE-5	Fiber Rolls	✓[2][3]	✓		
SE-6	Gravel Bag Berm	✓[3]		✓	Fiber Rolls used instead
SE-7	Street Sweeping	✓	✓		
SE-8	Sandbag Barrier			✓	Fiber Rolls used instead
SE-9	Straw Bale Barrier			✓	Fiber Rolls used instead
SE-10	Storm Drain Inlet Protection	✓	✓		
SE-11	ATS			✓	N/A
SE-12	Temporary Silt Dike			✓	Fiber Rolls used instead
SE-13	Compost Sock and Berm	✓[3]	✓		
SE-14	Biofilter Bags	✓[3]	✓		
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-2	Stabilized Construction Roadway		✓		
TC-3	Entrance Outlet Tire Wash			✓	N/A
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements
[3]Risk Level 2 &3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope

These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Silt Fence

To be installed along base of slopes and around waste management and materials pollution areas. Locations of where silt fence is in use are shown on the Erosion Control Plan in Appendix B. The fact sheet for the silt fence can be found in Appendix H.

Sediment Basin

Sediment basin shall be used to reduce sediment from stromwater runoff discharge. Locations of sediment basins can be found on the erosion control plans in Appendix B. The fact sheet for the sediment basins can be found in Appendix H.

Sediment Trap

Sediment traps shall be constructed at the end of the bench drains located throughout the project and the drainage pipe outlets within the project to help reduce the amount of sediment in site run off. Locations of the sediment traps are shown on the Erosion Control Plan in Appendix B. The fact sheet for the sediment traps can be found in Appendix H.

Check Dams

Check Dams shall be installed in areas of the natural drainage channel that is being altered during construction to help reduce the sediment being transported downstream. The fact sheet for the check dams can be found in Appendix H.

Fiber Rolls

Fiber rolls shall be used as part of the slope protection during construction to help stabilize freshly graded slopes prior to permanent stabilization. Fiber rolls shall be placed in accordance with the Fact Sheet and Table 3.1.d below. Location of the fiber rolls is shown on the Erosion Control Plan in Appendix B. The fact sheet for the fiber rolls can be found in Appendix H.

Fully biodegradable fiber rolls may be left in place at the conclusion of construction activities. Fiber rolls containing plastic netting or similar non-degradable components must be removed from the site to achieve final stabilization. Fiber roll installation on slopes must comply with the specifications for construction sites, as specified in Table 3.1c.1

Table 3.1c.1
Critical Slope and Sheet Flow Length Specifications for Fiber Roll Installation

Slope Gradient Percentage	Fiber Roll Spacing Specification *(Sheet flow distance not to exceed these distances)*
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

Street Sweeping and Vacuuming

Sweeping and vacuuming shall be in use anywhere sediment is tracked from the project site onto public or private paved streets and roads. Also shall be applicable during preparation of paved surfaces for final paving. The fact sheet for street sweeping and vacuuming can be found in Appendix H.

Storm Drain Inlet Protection

Fiber rolls, or biofilter bags shall be used as storm drain inlet protection around storm drain inlets. Utilize road base to stabilized soils near drain and protect with fiber rolls. Refer to the Erosion Control Plan in Appendix B for the location of storm drains. The fact sheet for storm drain protection can be found in Appendix H.

Compost Sock and Berm

Compost socks and berms shall be used to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on slope areas. These bio-degradable filters shall be placed perpendicular to the flow of runoff allowing filtered runoff to pass through the compost and retaining sediment.. The fact sheet for this BMP is provided in Appendix H.

Biofilter Bags

Biofilter bags can be used as an alternate for inlet protection. The fact sheet for this BMP is provided in Appendix H.

Stabilized Construction Entrance and Exit

Stabilized Construction Entrances and Exits shall be installed along points of entry and egress to the construction site. Location of the stabilized construction entrances and exits are shown on the Erosion Control Plan in Appendix B. The fact sheet for this BMP is provided in Appendix H.

Stabilized Construction Roadway

Stabilized Construction Roadway shall be installed along points of entry and egress to the construction site. Locations of the stabilized construction roadway are shown on the Erosion Control Plan in Appendix B. The fact sheet for this BMP is provided in Appendix H.

3.3 NON-STORMWATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

3.3.1 Non-Stormwater Controls

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.7 of this SWPPP.

Non-Storm Water Management

Table 3.1b indicates the BMPs that have been selected to control non-storm water on-site. Structural or physical BMP locations are shown on the WPCDs in Attachment B (non-structural BMPs are to be implemented site-wide) and described in this section. The BMP specifications can be found in Appendix G of the SWPPP.

Table 3.1b BMP Implementation Schedule

	BMP No.	BMP Name	Phases of Construction	Note Site –Specific Implementation Requirements
Non-Storm Water Management	NS-1	Water Conservation Practices	GLD, SU, FLS	Shall be implemented for all construction activities that require water usage when practical
	NS-3	Paving and Grinding Operations	GLD, SU, FLS	If possible avoid paving and grinding operations during wet weather.
	NS-4	Temporary Stream Crossing	GLD, SU, FLS	May be necessary depending on the construction schedule
	NS-5	Clear Water Diversion	GLD, SU, FLS	May be necessary depending on the amount of rain received and where construction is occurring during the rainy season
	NS-6	Illicit Connection / Discharge	GLD, SU, FLS	Contractors to recognize and report all incidents of illegal discharge.
	NS-7	Potable Water / Irrigation	GLD, SU, FLS	This will mainly affect the CPP and Office/Warehouse area where irrigation is proposed.
	NS-8	Vehicle and Equipment Cleaning	GLD, SU, FLS	Area has been designated on the Erosion Control Plan for this.
	NS-9	Vehicle and Equipment Fueling	GLD, SU, FLS	Area has been designated on the Erosion Control Plan for this.
	NS-10	Vehicle and Equipment Maintenance	GLD, SU, FLS	Area has been designated on the Erosion Control Plan for this.

BMP No.	BMP Name	Phases of Construction	Note Site –Specific Implementation Requirements
NS-12	Concrete Curing	GLD, SU, & V	Care should be exercised for all concrete work to contain all run off from concrete work areas. Due to limit of PH on discharge requirements.
NS-13	Concrete Finishing	GLD, SU, & V	Care should be exercised for all concrete work to contain all run off from concrete work areas. Due to limit of PH on discharge requirements.
NS-14	Material and Equipment over Water	GLD, SU	This may or may not be required. Contractor to exercise care should this occur. There are many canyons throughout the project area which may contain water intermittently.

The following non-stormwater control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-stormwater control BMPs are provided in Appendix H.

Table 3.4 Temporary Non-Stormwater BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-2	Dewatering Operation			✓	N/A
NS-3	Paving and Grinding Operation		✓		
NS-4	Temporary Stream Crossing		✓		
NS-5	Clear Water Diversion		✓		
NS-6	Illicit Connection- Illegal Discharge Connection	✓	✓		
NS-7	Potable Water Irrigation Discharge Detection		✓		
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-10	Vehicle and Equipment Maintenance	✓	✓		
NS-11	Pile Driving Operation			✓	N/A
NS-12	Concrete Curing		✓		
NS-13	Concrete Finishing		✓		
NS-14	Material and Equipment Use Over Water		✓		
NS-15	Demolition Removal Adjacent to Water			✓	N/A
NS-16	Temporary Batch Plants			✓	N/A
Alternate BMPs Used:			**If used, state reason:**		

(1) Applicability to a specific project shall be determined by the QSD

Non-stormwater BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Water Conservation Practices

Contractor shall implement water conservation practices as listed on the fact sheet for water usage where practical. The fact sheet can be found in Appendix H.

Paving and Grinding Operation

Paving and grinding operation procedures shall be implemented where paving, surfacing, resurfacing, or sawcutting may pollute stormwater runoff or discharge to the storm drain system or watercourses. These procedures will prevent and reduce the discharge of pollutants from paving operations. The fact sheet for paving and grinding operation is found in Appendix H.

Temporary Stream Crossing

During rainy weather temporary stream crossings may need to be constructed. Most streams are intermittent. The fact sheet for temporary stream crossing is found in Appendix H.

Clear Water Diversion

Contractor shall implement clear water diversion as listed on the fact sheet for streams that provide direct discharge ontto construction areas. The fact sheet for clear water diversion is found in Appendix H.

Illicit Connection- Illegal Discharge Connection

Contractor is to report illicit connections or illegal dumping or discharge of materials on a construction site. The fact sheet for the illicit connection/illegal discharge is found in Appendix H.

Potable Water Irrigation Discharge Detection

Potable water irrigation discharge detection practices and procedures shall be used to manage discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing. The fact sheet for Potable water irrigation discharge detection is found in Appendix H.

Vehicle and Equipment Cleaning

Contractor shall implement vehicle and equipment cleaning procedures and practices to eliminate or reduce the discharge pollutants to stormwater from vehicle and equipment cleaning operation. The contractor is responsible for training his employees and subcontractors on the vehicle and equipment fueling procedures. The fact sheet for the vehicle and equipment fueling is found in Appendix H.

Vehicle and Equipment Fueling

Contractor shall provide equipment fueling procedures that are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of storm water. The contractor is responsible for training his employees and subcontractors on the vehicle and equipment fueling procedures. The fact sheet for the vehicle and equipment fueling is found in Appendix H.

Vehicle and Equipment Maintenance

A location for maintenance of vehicles and equipment will be established by the contractor. The maintenance area shall be constructed as provided in the fact sheet found in Appendix H. The contractor is responsible for training his employees and subcontractors on the vehicle and equipment maintenance procedures.

Concrete Curing

Concrete curing is used in the construction of structures such as bridges, retaining wall, slabs, and structured foundations. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals and fines. The Contractor shall implement proper procedures to reduce or eliminate the contamination of stormwater runoff during concrete curing. The fact sheet for concrete curing is found in Appendix H.

Concrete Finishing

Contractor shall provide procedures to minimize the impact that concrete finishing methods may have on runoff as listed on the fact sheet for concrete finishing in Appendix H.

Material and Equipment Use Over Water

This may or may not be required. Contractor shall exercise care should equipment need to be placed over water. There are many canyons throughout the project area which may contain water intermittently. The fact sheet for concrete curing is found in Appendix H.

3.3.2 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges.

Preparation of the Project site will include removal of the existing office/warehouse building and any debris from former operations. Debris and demolition wastes will be reused or recycled to the extent feasible, or disposed of at the Santa Maria Regional Landfill. Project construction activities may encounter areas that contain petroleum hydrocarbon-containing soils. Aera Energy LLC plans to excavate the petroleum hydrocarbon-containing soils within the Project disturbance areas for beneficial re-use either on-site, at other Aera Energy LLC locations, or at the Santa Maria Regional Landfill, in accordance with the Soil Beneficial Re-Use Plan developed for the Project (Attached for reference in Appendix O). The Project has been designed to balance cut and fill across the Project site (to the greatest extent feasible); any excess cut material will be managed onsite.

Hazardous Waste Materials Management/Transportation Plan will be developed by Aera Energy LLC to comply with state and federal regulations. Any waste scheduled to be transported offsite will be placed in U.S. Department of Transportation-approved containers, loaded into the appropriate vehicle (i.e., tanker truck, dry bulk carrier, bin carrier, etc.), manifested, and shipped to an appropriate waste facility.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged off-site. The primary mechanisms for stormwater contact that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into stormwater.

Waste Management and Materials Pollution Control

Table 3.1f indicates that BMPs that have been selected to control construction site wastes and materials. Structural or physical BMP locations are shown on the WPCDs in Attachment B (non-structural BMPs are to be implemented site-wide) and described in this section. The BMP specification can be found in Appendix H of the SWPPP.

Table 3.1f BMP Implementation Schedule

BMP No.	BMP Name	Phases of Construction	Note Site –Specific Implementation Requirement
WM-1	Material Delivery Storage	GLD, SU, FLS & V	As necessary.
WM-2	Material Use	GLD, SU, FLS & V	As necessary.
WM-3	Stockpile Management	GLD, SU	Apply water to stockpiles and exposed soil as needed to prevent wind erosion.
WM-4	Spill Prevention and Control	GLD, SU, FLS & V	As necessary.
WM-5	Solid Waste Management	GLD, SU, FLS & V	As necessary.
WM-6	Hazardous Waste Management	GLD, SU, FLS & V	As necessary.
WM-7	Contaminated Soil Management	GLD, SU	As necessary.

	WM-8	Concrete Waste Management	GLD, SU, & V	As necessary.
	WM-9	Sanitary / Septic Waste Management	GLD, SU, FLS & V	As necessary.
	WM-10	Liquid Waste Management	GLD, SU, FLS & V	As necessary.

A list of construction activities is provided in Section 2.6. The following Materials and Waste Management BMP selection table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

Table 3.5 Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	✓		
WM-02	Material Use	✓	✓		
WM-03	Stockpile Management	✓	✓		
WM-04	Spill Prevention and Control	✓	✓		
WM-05	Solid Waste Management	✓	✓		
WM-06	Hazardous Waste Management	✓	✓		
WM-07	Contaminated Soil Management		✓		
WM-08	Concrete Waste Management	✓	✓		
WM-09	Sanitary-Septic Waste Management	✓	✓		
WM-10	Liquid Waste Management		✓		
Alternate BMPs Used:				**If used, state reason:**	

(1) Applicability to a specific project shall be determined by the QSD.

Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Material Delivery and Storage

Material delivery and storage shall be in a designed area where a secondary containment will be be installed. Designate area will help prevent, reduce, or eliminate the discharge of pollutants from intruding the storm water system or water courses. Regular inspections of the material delivery and storage area will be done daily. Refer to Erosion Control Plan for the locations of the material delivery and storage area. The fact sheet for material delivery and storage is found in Appendix H.

Material Use

This BMP prevents or reduces the discharges of pollutants to the storm drain system or water course. The fact sheet for material use is found in Appendix H.

Stockpile Management

Stockpiles will be provided in a few locations on the construction site refer to the Erosion Control Plan for locations. The stockpiles will be sprayed with water to control dust. The toes of the stockpiles will be surrounded by fiber rolls. The fact sheet for stockpile management is found in Appendix H.

Spill Prevention and Control

Spill prevention and control practices and procedures prevent or reduce the discharge of pollutants to drainage system or watercourse from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, proper disposal of spill materials. Spill control procedures shall be implemented anytime chemicals or hazardous substances are stored on the construction site including materials list on the fact sheet. The fact sheet for spill prevention and control is found in Appendix H.

Solid Waste Management

Trash receptacles will be located onsite. Trash, debris and litter will be removed from the site weekly by a licensed trash hauler. The fact sheet for solid waste management is found in Appendix H.

Hazardous Waste Management

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal and training. The fact sheet for hazardous waste management is found in Appendix H.

Contaminated Soil Management

If contaminated soil is encountered during the excavation work. It will be removed and hauled to the Soil Reclamation Site. Refer to fact sheet for contaminated soil management found in Appendix H.

Concrete Waste Management

Concrete washout will be provided and maintained throughout the construction period. Contractor will notify all employees and subcontractors of concrete washout locations. Refer to fact sheet for concrete waste management found in Appendix H.

Sanitary-Septic Waste Management

Restroom facilities will be provided and maintained for the use of the contractor and subcontractors. They will be inspected weekly to make sure they are not leaking and will be emptied and maintained as needed. Contractor will notify all employees and subcontractors of restroom facility locations.

Liquid Waste Management

Liquid waste management procedures and practices shall be implemented at the construction site to prevent discharge of pollutants to the storm drain systems or watercourses as a result of the creation, collection, and disposal of non-hazardous liquid waste.

3.4 POST CONSTRUCTION STORMWATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan. ☐ Yes ☒ No

The following source control post construction BMPs to comply with General Permit Section XIII.B and local requirements have been identified for the site:

- Hydroseeding of slopes with geotextile or mats.
- Planting of 12,000 oak trees.
- Planting and Landscaping areas.
- Using pervious surfacing methods such as aggregate base and decomposed granite.
- Stream Bed Stabilization for distrubances that have occurred inside existing natural drainage channels.
- Detention Basins
- Secondary Containment Basins

The Post Construction Water Balance Calculator can be found in Appendix A.

A plan for the post construction funding and maintenance of these BMPs will be developed to address at minimum five years following construction. The post construction BMPs that are described above shall be funded and maintained by the Aera Energy LLP. If required, post construction funding and maintenance will be submitted with the NOT.

Section 4 BMP Inspection, Maintenance, and Rain Event Action Plans

4.1 BMP INSPECTION AND MAINTENANCE

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix I. Completed checklists shall be kept in CSMP Attachment 2 "Monitoring Records.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

4.2 RAIN EVENT ACTION PLANS

The Rain Event Action Plan (REAP) is a written document designed to be used as a planning tool by the QSP to protect exposed portions of project sites and to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures. These measures are intended to reduce the amount of sediment and other pollutants that could be generated during the rain event. It is the responsibility of the QSP to be aware of precipitation forecast and to obtain and print copies of forecasted precipitation from NOAA's National Weather Service Forecast Office.

The SWPPP includes REAP templates but the QSP will need to customize them for each rain event. Site-specific REAP templates for each applicable project phase can be found in Appendix J. The QSP shall maintain a paper copy of completed REAPs in compliance with the record retention requirements Section 1.5 of this SWPPP. Completed REAPs shall be maintained in Appendix J.

The QSP will develop an event specific REAP 48 hours in advance of a precipitation event forecast to have a 50% or greater chance of producing precipitation in the project area. The REAP will be onsite and be implemented 24 hours in advance of any the predicted precipitation event.

At minimum the REAP will include the following site and phase-specific information:

1. Site Address;
2. Calculated Risk Level 2;
3. Site Stormwater Manager Information including the name, company and 24-hour emergency telephone number;
4. Erosion and Sediment Control Provider information including the name, company and 24-hour emergency telephone number;

5. Stormwater Sampling Agent information including the name, company, and 24-hour emergency telephone number;
6. Activities associated with each construction phase;
7. Trades active on the construction site during each construction phase;
8. Trade contractor information; and
9. Recommended actions for each project phase.

Section 5 Training

Appendix L identifies the QSPs for the project. To promote stormwater management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix K, which identifies the site-specific stormwater topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix K.

Section 6 Responsible Parties and Operators

6.1 RESPONSIBLE PARTIES

Approved Signatories who are responsible for SWPPP implementation and have authority to sign permit-related documents are listed below. Written authorizations from the LRP for these individuals are provided in Appendix L. The Approved Signatories assigned to this project are:

Name	Title	Phone Number

QSPs identified for the project are identified in Appendix L. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-stormwater and stormwater visual observations and inspections;
  - Performing non-stormwater and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.
- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events.

6.2 CONTRACTOR LIST

Contractor

Name: TO BE DETERMINED

Title:

Company:

Address:

Phone Number:

Number (24/7):

Section 7 Construction Site Monitoring Program

7.1 Purpose

This Construction Site Monitoring Program was developed to address the following objectives:

1. To demonstrate that the site is in compliance with the Discharge Prohibitions and Numeric Action Level (NALs) of the Construction General Permit;
2. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
3. To determine whether immediate corrective actions, additional Best Management Practices (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges;
4. To determine whether BMPs included in the SWPPP and REAP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

7.2 Applicability of Permit Requirements

This project has been determined to be a Risk Level 2 project. The General Permit identifies the following types of monitoring as being applicable for a Risk Level 2 project.

Risk Level 2

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff for pH and turbidity;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable;
- Sampling and analysis of non-stormwater discharges when applicable.

7.3. Weather and Rain Event Tracking

Visual monitoring, inspections, and sampling requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces ½ inch of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

7.3.1 Weather Tracking

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at http://www.srh.noaa.gov/. Weather reports should be printed and maintained with the SWPPP in CSMP Attachment 1 "Weather Reports".

7.3.2 Rain Gauges

The QSP shall install one rain gauge on the project site RG #1 as shown on Drawing # 072-13-027C located in Appendix B. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 “Weather Records”. Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied and the gauge reset.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) is located at http://www.cnrfc.noaa.gov/google_precip.php .

7.4 Monitoring Locations

Monitoring locations are shown on the Drawing no. 072-13-027 A-C in Appendix B. Monitoring locations are described in Sections 7.6 and 7.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 Safety and Monitoring Exemptions

Safety practices for sample collection will be in accordance with Aera Energy LLC and the contractor safety practices. A summary of the safety requirements that apply to sampling personnel is provided below.

- To be determined

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours are: Monday thru Friday from 6:00am to 6:00pm.

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 “Monitoring Records”.

7.6 Visual Monitoring

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

Table 7.1 Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency
Routine Inspections	
BMP Inspections	Weekly[1]
BMP Inspections – Tracking Control	Daily by contractor
BMP Inspections – Clear Water Control	Daily by contractor
Non-Stormwater Discharge Observations	Quarterly during daylight hours
Rain Event Triggered Inspections	
Site Inspections Prior to a Qualifying Event	Within 48 hours of a qualifying event [2]
BMP Inspections During an Extended Storm Event	Every 24-hour period of a rainevent[2]
Site Inspections Following a Qualifying Event	Within 48 hours of a qualifying event[2]

[1] Most BMPs must be inspected weekly; those identified below must be inspected more frequently.

[2] Inspections are only required during scheduled site operating hours. Note however, these inspections are required daily regardless of the amount of precipitation.

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 Non-Stormwater Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event; following a qualifying rain event, and every 24-hour period during a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event

Within 48-hours prior to a qualifying event a stormwater visual monitoring site inspection will include observations of the following locations:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

BMP inspections and visual monitoring will be triggered by a NOAA quantitative predicted forecast (QPF) that indicates ½-inch or more of rain will occur in the project area.

7.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

7.6.2.2 Visual Observations Following a Qualifying Rain Event

Within 48 hours following a qualifying rain event (0.5 inches of rain) a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel are listed below and their training qualifications are provided in Appendix K.

Assigned inspector: To Be Determined Contact phone: To Be Determined

Alternate inspector: To Be Determined Contact phone: To Be Determined

Stormwater observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 “Example Forms”). BMP inspections shall be documented on the site specific BMP inspection checklist. Any photographs used to document observations will be referenced on stormwater site inspection report and maintained with the Monitoring Records in Attachment 2.

The QSP shall within seven days of the inspection submit copies of the completed inspection report to Susan Perell, Environmental Advisor, Aera Energy LLC and the QSD.

The completed reports will be kept in CSMP Attachment 2 “Monitoring Records”.

7.6.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 “Monitoring Records”.

The QSP shall within seven days of the inspection submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to Susan Perell, Environmental Advisor, Aera Energy LLC and the QSD.

Results of visual monitoring must be summarized and reported in the Annual Report.

7.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section.

BMP locations are shown on the Erosion Control Plans Drawing Nos. 072-13-009A-F in SWPPP Appendix B.

There are thirty one drainage areas on the project site and the contractor’s yard, staging areas, and storage areas. Seventeen areas are in Phase 1. Drainage areas are shown on the Drawing # 072-13-024A-C in Appendix B and Table 7.2 identifies each drainage area by location.

Table 7.2 Site Drainage Areas

Location No.	Location
NNBL 1-1	Phase 2 See Post construction Watershed Drawing No. 072-13-024A

Table 7.2 Site Drainage Areas

Location No.	Location
NNBL 2-1	See Post construction Watershed Drawing No. 072-13-024A
NNBL 2-2	See Post construction Watershed Drawing No. 072-13-024A
NNBL 2-3	See Post construction Watershed Drawing No. 072-13-024A
NNBL 2-4	See Post construction Watershed Drawing No. 072-13-024A
NNBL 2-5	Phase 2 See Post construction Watershed Drawing No. 072-13-024A
NNBL2-11	Phase 2 See Post construction Watershed Drawing No. 072-13-024A
NNBL2-13	Phase 2 See Post construction Watershed Drawing No. 072-13-024A
LNG CYN 4	Phase 2 See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 5	See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 6	See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 7	See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 9	See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 13	Phase 1 & 2 See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 14	Phase 2 See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 15	Phase 2 See Post construction Watershed Drawing No. 072-13-024B
LNG CYN 17	Phase 2 See Post construction Watershed Drawing No. 072-13-024B
CAT CYN 31	Phase 2 See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 33	Phase 2 See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 36A	Phase 2 See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 36	Phase 2 See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 40A1-A	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 40A1	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 40A2	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 40B1	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 40B2	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 44A	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 45A	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 46	See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 49A	Phase 2 See Post construction Watershed Drawing No. 072-13-024C
CAT CYN 49B1	Phase 2 See Post construction Watershed Drawing No. 072-13-024C

There are sixteen stormwater storage or containment areas are on the project site. Eight of the sixteen are in Phase 1. Stormwater storage or containment area(s) are shown on the Grading Plan for the Field Redevelopment Project Drawing Nos 072-13-004A in Appendix B and Table 7.3 identifies each stormwater storage or containment area by location.

Table 7.3 Stormwater Storage and Containment Areas

Location No.	Location
Basin A	Phase 2
Basin B	West of Soil Reclamation site
Basin C	East of Office/Multipurpose area
Basin D	North of Office/Multipurpose area
Basin E	South west of steam plant
Basin F	Located between pads 20 and 26
Basin G	Northwest end of the CPP
Basin H	East of CPP
Basin J	Northeast of CPP
Basin K	Phase 2
Basin L	Phase 2
Basin M	Phase 2
Basin N	Phase 2
Basin P	Phase 2
Basin Q	Phase 2
Basin R	Phase 2

There are fifteen discharge locations on the project site.   Site stormwater discharge locations are shown on Water Sampling Location Drawing Nos 072-13-027A-C in Appendix B and Table 7.4 identifies each stormwater discharge location.

Table 7.4 Site Stormwater Discharge Locations

Location No.	Location
D1	Located at the intersection of the Property Boundary with Unnamed BL #2

Table 7.4 Site Stormwater Discharge Locations

Location No.	Location
D2	Phase 2
D3	Phase 2
D4	Phase 2
D5	Phase 2
D6	Phase 2
D7	Phase 2
D8	Property Boundary west of Soil Reclamation Site and NW of Basin A - No Construction within this area.
D9	Outlet for Basin B & C
D10	West of Office/Multipurpose Building Outlet of Basin D
D11	Outlet of Basin G
D12	North of CPP
D13	Phase 2
D14	Directly west of the CPP Outlet for Basin H
D15	Located at the intersection of the Property Boundary with Long Canyon

7.7 Water Quality Sampling and Analysis

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges

This Sampling and Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the project site.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B.

- Vehicle and Equipment fueling - gasoline
- Vehicle and Equipment maintenance – vehicle fluids, including oil, grease, petroleum and coolants, batteries

- Cement materials
- Solvents, thinners and acids
- Mortar Mix
- BMP materials
- Solid Waste Management (litter, trash and debris)
- Concrete
- Liquid Waste Management (wash water)
- Sanitary Septic Waste Management (portable toilets)
- Construction of buildings (drywall, painting etc)

Construction activities that have the potential to contribute sediment to storm water discharges include the following:

- Clearing and grubbing operations
- Grading and excavation operations
- Rip rap operations
- Utility and foundation excavations
- Mortar Mix
- Stockpiling of excavated soils

The following existing site features, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Field Redevelopment Project Drawing No. 072-13-004A in Appendix B.

- Exclusion areas

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Erosion Control Plans Drawing No. 072-13-009A in Appendix B

- Unknown at this time
- To Be Determined

The project has the potential to receive stormwater run-on from the following locations with the potential to contribute non-visible pollutants to stormwater discharges from the project.

Locations of such run-on to the project site are shown on the Water Sampling Locations Drawing No. 072-13- 027C in Appendix B.

- S14
- S16

7.7.1.1 Sampling Schedule

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents stormwater contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity, including but not limited to those in Section 2.6, with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

7.7.1.2 Sampling Locations

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the Water Sampling Locations Drawing No. 072-13-027 A – C in Appendix B and include the locations identified in Table 7.5 through 7.10.

Seven sampling location only three of the locations are in Phase 1 on the project site and the contractor’s yard have been identified for the collection of samples of runoff from planned material and waste storage areas and areas where non-visible pollutant producing construction activities are planned.

Table 7.6 Non-Visible Pollutant Sample Locations – Contractors’ Yard

Sample Location Number	Sample Location Description	Sample Location Latitude and Longitude (Deg/Min/Sec)
S3	Phase2	N 34°50’34” W 120°17’28”
S4	Phase 2	N 34°50’05” W 120°17’42”
S6	Outlet of Basin G	N 34°49’23” W 120°17’26”
S8	Located at the intersection of the Property Boundary with Long Canyon	N 34°50’35” W 120°16’35”
S9	Junction 14 on Long Canyon	N 34°49’33” W 120°16’02”
S12	Phase 2	N 34°48’48” W 120°16’32”
S13	Phase 2	N 34°49’03” W 120°16’16”

One sampling locations have been identified for the collection of samples of runoff from drainage areas where soil amendments will be applied that have the potential to affect water quality.

Table 7.7 Non-Visible Pollutant Sample Locations – Soil Amendment Areas

Sample Location Number	Sample Location	Sample Location Latitude and Longitude (Deg/Min/Sec)
S6	Outlet of Basin G	N 34°49’23” W 120°17’26”

Six sampling locations have been identified for the collection of samples of runoff from drainage areas contaminated by historical usage of the site.

Table 7.8 Non-Visible Pollutant Sample Locations – Areas of Historical Contamination

Sample Location Number	Sample Location	Sample Location Latitude and Longitude (Deg/Min/Sec)
S1	Intersection of the property boundary with UN BL 2	N 34°50'34" W 120°17'01"
S2	Phase 2	N 34°50'34" W 120°17'16"
S5	North of CPP	N 34°49'31" W 120°17'26"
S7	West of Office/Multipurpose Building Outlet of Basin D	N 34°49'16" W 120°17'05"
S10	Outlet for Basin B & C	N 34°49'16" W 120°17'006"
S11	Phase 2	N 34°49'03" W 120°16'40"

Two sampling location(s) has been identified for the collection of an uncontaminated sample of runoff as a background sample for comparison with the samples being analyzed for non-visible pollutants. This location(s) was selected such that the sample will not have come in contact with the operations, activities, or areas identified in Section 7.7.1 or with disturbed soils areas.

Table 7.9 Non-Visible Pollutant Sample Locations – Background (Unaffected Sample)

Sample Location Number	Sample Location	Sample Location Latitude and Longitude (Deg/Min/Sec)
S15	Directly west of the CPP Outlet for Basin H	N 34°49'21" W 120°17'22"
S17	Property Boundary west of Soil Reclamation Site and NW of Basin A - No Construction within this area.	N 34°49'05" W 120°16'55"

Two sampling locations have been identified for the collection of samples of run-on to the project site. Run-on from these locations has the potential to combine with discharges from the site being sampled for non-visible pollutants. These samples are intended to identify potential sources of non-visible pollutants that originate off the project site.

Table 7.10 Non-Visible Pollutant Sample Locations – Site Run-On

Sample Location Number	Sample Location	Sample Location Latitude and Longitude (Deg/Min/Sec)
S14	Junction 15	N 34°18’39” W 120°16’12”
S16	South of Long Canyon Road Crossing	N 34°49’16” W 120°15’56”

If a stormwater visual monitoring site inspection conducted prior to or during a storm event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm drain system that is at a location not listed above and has not been identified on the Site Maps, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form and or Rain Event Action Plan prior to a forecasted qualifying rain event.

7.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

Contractor	☐ Yes	☒ No
Consultant	☒ Yes	☐ No
Laboratory	☒ Yes	☐ No

Samples on the project site will be collected by the following Oilfield Environmental and Compliance Inc.:

Company Name:	Oilfield Environmental and Compliance Inc.
Street Address:	307 Roemer Way, Suite 300
City, State Zip:	Santa Maria, CA 93454
Telephone Number:	(805) 922-4772
Point of Contact:	Gracie Venegas
Name of Sampler(s):	TBD
Name of Alternate(s):	TBD

The QSP or his/her designee will contact Oilfield Environmental and Compliance Inc. 24 hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins if one of the triggering conditions is identified during an inspection to ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.1.4 Analytical Constituents

Table 7.11 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

General Work Activity/Potential Pollutants	**Water Quality Indicators of Potential Constituents** (Review product literature and Material Safety Data Sheets to confirm potential constituents)
Adhesives	COD, Phenols, SVOCs
Asphalt Work	VOCs
Cleaning	
Acids	pH
Bleaches	Residual chlorine
TSP	Phosphate
Solvents	VOCs, SVOCs
Detergents	MBAS
Concrete / Masonry Work	
Sealant (Methyl methacrylate)	SVOC
Curing compounds	VOCs, SVOCs, pH
Ash, slag, sand	pH, Al, Ca, Va, Zn
Drywall	Cu, Al, General Minerals
Framing / Carpentry	
Treated Wood	Cu, Cr, As, Zn
Particle board	Formaldehyde
Untreated wood	BOD
Grading / Earthworks	
Gypsum / Lime amendments	pH
Contaminated Soil	Constituents specific to known contaminants, check with Laboratory
Heating, Ventilation, Air Conditioning	Freon
Insulation	Al, Zn
Landscaping	
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Fertilizers	TKN, NO_3, BOD, COD, DOC, Sulfate, NH_3,

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

General Work Activity/Potential Pollutants	Water Quality Indicators of Potential Constituents (Review product literature and Material Safety Data Sheets to confirm potential constituents)
	Phosphate, Potassium
Aluminum sulfate	Al, TDS, Sulfate
Liquid Waste	Constituents specific to materials, check with Laboratory
Painting	
Resins	COD, SVOCs
Thinners	COD, VOCs
Paint strippers	VOCs, SVOCs, metals
Lacquers, varnishes, enamels	COD, VOCs, SVOCs
Sealants	COD
Adhesives	Phenols, SVOCs
Planting / Vegetation Management	
Vegetation stockpiles	BOD
Fertilizers	TKN, NO_3, BOD, COD, DOC, sulfate, NH_3, Phosphate, Potassium
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Plumbing	
Solder, flux, pipe fitting	Cu, Pb, Sn, Zn
Removal of existing structures	Zn, VOCs, PCBs (see also other applicable activity categories, e.g., grading, painting)
Roofing	Cu, Pb, VOCs
Sanitary Waste Sewer line breaks and Portable Toilets (using clear fluid – blue fluid is visible if discharged)	BOD, Total/Fecal coliform
Soil Preparation / Amendments/Dust Control	
Polymer/Co-polymers	TKN, NO_3, BOD, COD, DOC, Sulfate, Ni
Lignin sulfate	TDS, alkalinity
Psyllium	COD, TOC

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

General Work Activity/Potential Pollutants	Water Quality Indicators of Potential Constituents (Review product literature and Material Safety Data Sheets to confirm potential constituents)
Guar/Plant Gums	COD, TOC, Ni
Solid Waste (leakage)	BOD
Utility Line Testing and Flushing	Residual chlorine, chloramines
Vehicle and Equipment Use	
Batteries	Sulfuric acid; Pb, pH
Fuel	VOC, SVOC
Oil and Grease	VOC, SVOC

7.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Water Sampling Location Drawings Nos. 072-13-027A-C or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in the Table 7.12.

Samples will be analyzed by:

Laboratory Name:	Oilfield Environmental and Compliance Inc.
Street Address:	307 Roemer Way, Suite 300
City, State Zip:	Santa Maria, CA 93454
Telephone Number:	(805) 922-4772
Point of Contact:	Gracie Venegas
ELAP Certification Number:	2438

Samples will be delivered to the laboratory by:

Driven by Contractor	☐	Yes	☒	No
Picked up by Laboratory Courier	☒	Yes	☐	No
Shipped	☐	Yes	☒	No

Table 7.12 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
VOCs	EPA 8260B	3 x 40 mL	VOA - glass	Store At 4°C HCL to pH<2	1 ug/L	14 days
SVOCs	EPA 8270C	1 x 1 L	Glass - Amber	Store At 4°C	10 ug/L	7 days
BOD	EPA 405.1	1 x 1 L	Polypropylene	Store At 4°C	0.1 ug/L	7 days
pH	Field test w/calibrated portable instrument	1x 100mL	Polypropylene	none	Unit less	15 minutes
Metals (Pb)	EPA 6010B/7470A	1x250mL	Polypropylene	Store At 4°C HNO_3 to pH<2	0.1 mg/L	6 months
Total/Fecal Coliform	Membrane filter procedure (EPA Method 1103.1)	1 x 1 L	Factory sealed, presterilized whirl-pak bag	Store At 4°C		30 hours

Notes: °C – Degrees Celsius, BOD – biochemical oxygen demand, EPA – Environmental Protection Agency, HCL – hydrochloric acid, HNO_3 - nitric acid, L – liter, mg/L – milligrams per liter, ug/L - microgram per liter, SVOCs – semivolatile organic compound, VOC - volatile organic compound

7.7.1.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is required for this project. This Sampling and Analysis Plan describes the strategy for monitoring turbidity and pH levels of stormwater runoff discharges from the project site and run-on that may contribute to an exceedance of a Numeric Action Level (NAL).

Samples for turbidity will be collected from all drainage areas with disturbed soil areas and samples for pH will be collected from all drainage areas with a high risk of pH discharge.

7.7.2.1 Sampling Schedule

Stormwater runoff samples shall be collected for turbidity from all qualifying rain events that result in a discharge from the project site. At minimum, turbidity samples will be collected from each site discharge location draining a disturbed area. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the project each day of discharge during the qualifying event. Typically representative samples will be spaced in time throughout the daily discharge event.

Stormwater runoff samples shall be collected for pH from all qualifying rain events that result in a discharge from the project site. At minimum, pH samples will be collected from each site discharge location during project phases and drainage areas with a high risk of pH discharge. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the location each day of discharge during the qualifying event. Typically representative samples will be spaced in time throughout the daily discharge event.

Stored or collected water from a qualifying storm event when discharged shall be tested for turbidity and pH (when applicable). Stored or collected water from a qualifying event may be sampled at the point it is released from the storage or containment area or at the site discharge location.

Run-on samples shall be collected whenever the QSP identifies that run-on has the potential to contribute to an exceedance of a NAL.

7.7.2.2 Sampling Locations

Sampling locations are based on the site runoff discharge locations and locations where run-on enters the site; accessibility for sampling; and personnel safety. Planned pH and turbidity sampling locations are shown on the Water Sampling Locations Drawing No. 072-13-027 A - C in Appendix B and include the locations identified in Table 7.13 and Table 7-14.

Fifteen sampling locations on the project site and the contractor's yard have been identified for the collection of runoff samples. Table 7.13 also provides an estimate of the site's area that drains to each location.

Table 7.13 Turbidity and pH Runoff Sample Locations

Sample Location Number	Sample Location	Estimate of Site Drainage (%)
S1	Intersection of the property boundary with UN BL 2	N 34°50'34" W 120°17'01"
S2	Phase 2	N 34°50'34" W 120°17'16"
S3	Phase2	N 34°50'34" W 120°17'28"
S4	Phase 2	N 34°50'05" W 120°17'42"
S5	North of CPP	N 34°49'31" W 120°17'26"
S6	Outlet of Basin G	N 34°49'23" W 120°17'26"
S7	West of Office/Multipurpose Building Outlet of Basin D	N 34°49'16" W 120°17'05"
S8	Located at the intersection of the Property Boundary with Long Canyon	N 34°50'35" W 120°16'35"
S9	Junction 14 on Long Canyon	N 34°49'33" W 120°16'02"
S10	Outlet for Basin B & C	N 34°49'16" W 120°17'006"

Table 7.13 Turbidity and pH Runoff Sample Locations

Sample Location Number	Sample Location	Estimate of Site Drainage (%)
S11	Phase 2	N 34°49’03” W 120°16’40”
S12	Phase 2	N 34°48’48” W 120°16’32”
S13	Phase 2	N 34°49’03” W 120°16’16”
S15	Directly west of the CPP Outlet for Basin H	N 34°49’21” W 120°17’22”
S17	Property Boundary west of Soil Reclamation Site and NW of Basin A - No Construction within this area.	N 34°49’05” W 120°16’55”

Two sampling locations have been identified for the collection of run-on samples where the run-on has the potential to contribute to an exceedance of a NAL or NEL.

Table 7.14 Turbidity and pH Run-On Sample Locations

Sample Location Number	Sample Location	Sample Location Latitude and Longitude (Deg/Min/Sec)
S14	Junction 15	N 34°18’39” W 120°16’12”
S16	South of Long Canyon Road Crossing	N 34°49’16” W 120°15’56”

7.7.2.3 Monitoring Preparation

Turbidity and pH samples will be collected and analyzed by:

Contractor	☐ Yes	☒ No
Consultant	☒ Yes	☐ No
Laboratory	☒ Yes	☐ No

Samples on the project site will be collected by the following Oilfield Environmental and Compliance Inc.:

Company Name: Oilfield Environmental and Compliance Inc.

Street Address:	307 Roemer Way, Suite 300
City, State, Zip:	Santa Maria, CA 93454
Telephone Number:	(805) 922-4772
Point of Contact:	Gracie Venegas
Name of Sampler(s):	TBD
Name of Alternate(s):	TBD

The QSP or his/her designee will contact Oilfield Environmental and Compliance Inc.: 24 hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins to ensure that adequate sample collection personnel, supplies for monitoring pH and turbidity are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.2.4 Field Parameters

Samples shall be analyzed for the constituents indicated in the table below "Sample Collection, and Analysis for Monitoring Turbidity and pH."

Table 7.15 Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume(1)	Sample Collection Container Type	Detection Limit (minimum)
Turbidity	Field meter/probe with calibrated portable instrument	500 mL	Polypropylene or Glass (Do not collect in meter sample cells)	1 NTU
pH	Field meter/probe with calibrated portable instrument or calibrated pH test kit	100 mL	Polypropylene	0.2 pH units

Notes: [1] Minimum sample volume recommended. Specific volume requirements will vary by instrument; check instrument manufacturer instructions.

L – Liter
mL – Milliliter
NTU – Nephelometric Turbidity Unit

7.7.2.5 Sample Collection

Samples of discharge shall be collected at the designated runoff and run-on sampling locations shown on the Water Sampling Locations Drawing No. 072-13-027 A - C in Appendix B. Run-on samples shall be collected within close proximity of the point of run-on to the project.

Only personnel trained in water quality sampling and field measurements working under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.2.6 *Field Measurements*

Samples collected for field analysis, collection, analysis and equipment calibration shall be in accordance with the field instrument manufacturer's specifications.

Immediately following collection, samples for field analysis shall be tested in accordance with the field instrument manufacturer's instructions and results recorded on the *Effluent Sampling Field Log Sheet*.

The field instrument(s) listed in Table 7.16 will be used to analyze the following constituents:

Table 7.16 Field Instruments

Field Instrument (Manufacturer and Model)	Constituent
pH Meter	pH
Turbidity Meter	Turbidity

The manufacturers' instructions are included in CSMP Attachment 4 "Field Meter Instructions". Field sampling staff shall review the instructions prior to each sampling event and follow the instructions in completing measurement of the samples.

- The instrument(s) shall be maintained in accordance with manufacturer's instructions.
- The instrument(s) shall be calibrated before each sampling and analysis event.
- Maintenance and calibration records shall be maintained with the SWPPP.

The QSP may authorize alternate equipment provided that the equipment meets the Construction General Permit's requirements and the manufacturers' instructions for calibration and use are added to CSMP Attachment 4 "Field Meter Instructions".

7.7.2.7 *Data Evaluation and Reporting*

Immediately upon completing the measurements for the sampling event, provide the *Effluent Sampling Field Log Sheets* to the QSP for evaluation.

Numeric Action Levels

This project is subject to NALs for pH and turbidity (Table 7.17). Compliance with the NAL for pH and turbidity is based on a weighted daily average. Upon receiving the field log sheets, the QSP shall immediately calculate the weighted arithmetic average of the pH and turbidity samples to determine if the NALs, shown in the table below, have been exceeded.

Table 7.17 Numeric Action Levels

Parameter	Unit	Daily Average
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	NTU	250 NTU

The QSP shall within 7 days of the sample collection submit copies of the completed *Effluent Sampling Field Log Sheets* to Susan Perell with Aera Energy LLC and the QSD.

In the event that the pH or turbidity NAL is exceeded, the QSP shall immediately notify Susan Perell with Aera Energy LLC and the QSD and investigate the cause of the exceedance and identify corrective actions.

Exceedances of NALs shall be electronically reported to the State Water Board by Susan Perell with Aera Energy LLC through the SMARTs system within 10 days of the conclusion of the storm event. If requested by the Regional Board, a NAL Exceedance report will be submitted. The NAL Exceedance Report must contain the following information:

- Analytical method(s), method reporting unit(s), and MDL(s) of each parameter;
- Date, place, time of sampling, visual observation, and/or measurements, including precipitation; and
- Description of the current BMPs associated with the sample that exceeded the NAL and the proposed corrective actions taken.

7.7.3 Additional Monitoring Following an NEL Exceedance

This project is not subject to NELs.

7.7.4 Sampling and Analysis Plan for Non-Stormwater Discharges

This Sampling and Analysis Plan for non-storm water discharges describes the sampling and analysis strategy and schedule for monitoring pollutants in authorized and unauthorized non-storm water discharges from the project site in accordance with the requirements of the Construction General Permit.

Sampling of non-storm water discharges will be conducted when an authorized or unauthorized non-storm water discharge is observed discharging from the project site. In the event that non-storm water discharges run-on to the project site from offsite locations, and this run-on has the potential to contribute to a violation of a NAL or NEL, the run-on will also be sampled.

The following authorized non-storm water discharges identified in Section 2.7, have the potential to be discharged from the project site.

- Vehicle and equipment cleaning, fueling and maintenance operations;
- Vehicle and equipment wash water, including concrete washout water;
- Slurries from concrete cutting and coring operations, PCC grinding or AC grinding operations;
- Slurries from concrete or mortar mixing operations;
- Slurries from drilling or boring operations;
- Blast residue from high-pressure washing of structures or surfaces;
- Wash water from cleaning painting equipment;
- Runoff from dust control applications of water or dust palliatives;

- Sanitary and septic wastes;
- Chemical leaks and/or spills of any kind including but not limited to petroleum, paints, cure compounds, etc.

In addition to the above authorized stormwater discharges, some construction activities have the potential to result in an unplanned (unauthorized) non-stormwater discharge if BMPs fail. These activities include:

- None

7.7.4.1 Sampling Schedule

Samples of authorized or unauthorized non-stormwater discharges shall be collected when they are observed.

7.7.4.2 Sampling Locations

Samples shall be collected from the discharge point of the construction site where the non-stormwater discharge is running off the project site. Site discharge locations are shown on the Water Sampling Locations Drawing No. 072-13-027 A - C in Appendix B and include the locations identified below.

Fifteen sampling locations on the project site and the contractor's yard have been identified where non-stormwater discharges may runoff from the project site.

Sample Location Number	**Sample Location**	**Sample Location Latitude and Longitude** (Deg/Min/Sec)
S1	Intersection of the property boundary with UN BL 2	N 34°50'34" W 120°17'01"
S2	Phase 2	N 34°50'34" W 120°17'16"
S3	Phase2	N 34°50'34" W 120°17'28"
S4	Phase 2	N 34°50'05" W 120°17'42"
S5	North of CPP	N 34°49'31" W 120°17'26"
S6	Outlet of Basin G	N 34°49'23" W 120°17'26"
S7	West of Office/Multipurpose Building Outlet of Basin D	N 34°49'16" W 120°17'05"

S8	Located at the intersection of the Property Boundary with Long Canyon	N 34°50’35” W 120°16’35”
S9	Junction 14 on Long Canyon	N 34°49’33” W 120°16’02”
S10	Outlet for Basin B & C	N 34°49’16” W 120°17’006”
S11	Phase 2	N 34°49’03” W 120°16’40”
S12	Phase 2	N 34°48’48” W 120°16’32”
S13	Phase 2	N 34°49’03” W 120°16’16”
S15	Directly west of the CPP Outlet for Basin H	N 34°49’21” W 120°17’22”
S17	Property Boundary west of Soil Reclamation Site and NW of Basin A - No Construction within this area.	N 34°49’05” W 120°16’55”

Two sampling locations have been identified for the collection of non-stormwater discharges that run-on to the project site.

Sample Location Number	**Sample Location**	**Sample Location Latitude and Longitude** (Deg/Min/Sec)
S14	Junction 15	N 34°18’39” W 120°16’12”
S16	South of Long Canyon Road Crossing	N 34°49’16” W 120°15’56”

7.7.4.3 Monitoring Preparation

Non-stormwater discharge samples will be collected by:

Contractor	☐ Yes	☒ No
Consultant	☒ Yes	☐ No
Laboratory	☒ Yes	☐ No

Samples on the project site will be collected by the following Oilfield Environmental and Compliance Inc.:

Company Name:	Oilfield Environmental and Compliance Inc.
Street Address:	307 Roemer Way, Suite 300
City, State Zip:	Santa Maria, CA 93454
Telephone Number:	(805) 922-4772
Point of Contact:	Gracie Venegas
Name of Sampler(s):	TBD
Name of Alternate(s):	TBD

The QSP or his/her designee will contact Oilfield Environmental and Compliance Inc., 24 hours prior to a planned non-storm water discharge or as soon as an unplanned non-storm water discharge is observed to ensure that adequate sample collection personnel, supplies for non-storm water discharge monitoring are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.4.4 Analytical Constituents

All non-storm water discharges that flow through a disturbed area shall, at minimum, be monitored for turbidity.

All non-storm water discharges that flow through an area where they are exposed to pH altering materials shall be monitored for pH.

The QSP shall identify additional pollutants to be monitored for each non-storm water discharge incident based on the source of the non-storm water discharge. If the source of an unauthorized non-storm water discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Non-storm water discharge run-on shall be monitored, at minimum, for pH and turbidity. The QSP shall identify additional pollutants to be monitored for each non-storm water discharge incident based on the source of the non-storm water discharge. If the source of an unauthorized non-storm water discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Table 7.21 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7.21 Potential Non-Stormwater Discharge Pollutants and Water Quality Indicator Constituents

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Disturbed Areas	Sediment	Turbidity
Concrete Work	pH	pH

7.7.4.5 Sample Collection

Samples shall be collected at the discharge locations where the non-stormwater discharge is leaving the project site. Potential discharge locations are shown on the Water Sample Location Drawing Nos. 072-13-027 A-C in Appendix B and identified in Section 7.7.4.2.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7.22. Only personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.4.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in Table 7.22.

7.7.4.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Turbidity and pH results shall be evaluated for compliance with NALs and NELs as identified in Section 7.7.2.7.

Runoff results shall also be evaluated for the constituents suspected in the non-stormwater discharge. Should the runoff sample indicate the discharge of a pollutant which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

Non-storm water discharge results shall be submitted with the Annual Report.

The General Permit prohibits the non-storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board.

Table 7.22 Sample Collection, Preservation and Analysis for Monitoring Pollutants in Non-Stormwater Discharges

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
VOCs	EPA 8260B	3 x 40 mL	VOA - glass	Store At 4°C HCL to pH<2	1 ug/L	14 days
SVOCs	EPA 8270C	1 x 1 L	Glass - Amber	Store At 4°C	10 ug/L	7 days
BOD	EPA 405.1	1 x 1 L	Polypropylene	Store At 4°C	0.1 ug/L	7 days
pH	Field test w/calibrated portable instrument	1x 100mL	Polypropylene	none	Unit less	15 minutes
Metals (Pb)	EPA 6010B/7470A	1x250mL	Polypropylene	Store At 4°C HNO_3 to pH<2	0.1 mg/L	6 months
Total/Fecal Coliform	Membrane filter procedure (EPA Method 1103.1)	1 x 1 L	Factory sealed, presterilized whirl-pak bag	Store At 4°C		30 hours
Notes:						

7.7.5 Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board

The Regional Water Board has not specified monitoring for additional pollutants.

7.7.6 Training of Sampling Personnel

Sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP). Training records of designated contractor sampling personnel are provided in Appendix K.

The stormwater sampler(s) and alternate(s) have received the following stormwater sampling training:

Name	Training
To Be Determined	To Be Determined

The stormwater sampler(s) and alternates have the following stormwater sampling experience:

Name	Experience
To Be Determined	To Be Determined

7.7.7 Sample Collection and Handling

7.7.7.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP).

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;

- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.
ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
iv. Avoid collecting samples from ponded, sluggish or stagnant water.
v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

SSC samples should be taken as a normal grab sample, where the bottle is submerged facing upstream and filled. SSC samples need to be collected in a separate bottle because the analysis requires the entire volume of the bottle. Do not collect in a larger container and partition into the laboratory sample container.

7.7.7.2 Sample Handling

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

Laboratory Name:	Oilfield Environmental and Compliance Inc
Address:	307 Roemer Way, Suite 300
City, State Zip:	Santa Maria, CA 93454
Telephone Number:	(805) 722-4772
Point of Contact:	Gracie Venegas

7.7.7.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the Effluent Sampling Field Log Sheet.

Sample documentation procedures include the following:

<u>Sample Bottle Identification Labels:</u> Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

<u>Field Log Sheets:</u> Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

<u>Chain of Custody:</u> Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

7.8 Active Treatment System Monitoring

An Active Treatment System (ATS) will be deployed on the site?

☐ Yes ☒ No

This project does not require a project specific Sampling and Analysis Plan for an ATS because deployment of an ATS is not planned.

7.9 Bioassessment Monitoring

This project will disturb 30 acres or more	☒ Yes	☐ No
This project directly discharges runoff to a freshwater wadeable stream (or streams).	☒ Yes	☐ No

This project is not subject to bioassessment monitoring, although it meets both of the above permit specified trigger requirements, it is not a Risk Level 3 project.

7.10 Watershed Monitoring Option

This project is not participating in a watershed monitoring option.

7.11 Quality Assurance and Quality Control

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log, an Effluent Sampling Field Log Sheet, and an Effluent Sampling Field Log Sheet are included in CSMP Attachment 3 “Example Forms”.

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in CSMP Attachment 3 “Example Forms”.

7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

☒ Field Duplicates at a frequency of 1 duplicate per sampling event.
(Required for all sampling plans with field measurements or laboratory analysis)

☒ Travel Blanks at a frequency of one travel blank per sampling event.
(Required for sampling plans that include VOC laboratory analysis)

7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

7.11.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ioninzed water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

7.11.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ioninzed water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

7.11.5 Data Verification

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
  EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
  Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent;
  Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and
- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.12 Records Retention

All records of stormwater monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections.

CSMP Attachment 1: Weather Reports

INSTRUCTIONS

Place printed NOAA weather forecasts in this Attachment.

CSMP Attachment 2: Monitoring Records

INSTRUCTIONS

Place completed BMP Inspection Forms, Visual Monitoring, Effluent Sampling and Receiving Water Field Logs, Monitoring Exceptions, and NAL/NEL Exceedance Reports in this Attachment.

INSTRUCTIONS

Place example forms and check lists, e.g., Rain Gauge Logs, Field Logs, NAL/NEL Exceedance Reports, CoCs, in this Attachment.

Rain Gauge Log Sheet				
Construction Site Name:				
WDID #:				
Date (mm/dd/yy)	Time (24-hr)	Initials	Rainfall Depth (Inches)	Notes:

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***						
Date and Time of Inspection:					Report Date:	
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater
Site Information						
Construction Site Name:						
Construction stage and completed activities:					Approximate area of exposed site:	
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: ____________ (date and time)		Estimate storm duration:________ (hours)		Estimate time since last storm: ________ (days or hours)	Rain gauge reading:_______ (inches)	
Observations: If yes identify location						
Odors	Yes ☐ No ☐					
Floating material	Yes ☐ No ☐					
Suspended Material	Yes ☐ No ☐					
Sheen	Yes ☐ No ☐					
Discolorations	Yes ☐ No ☐					
Turbidity	Yes ☐ No ☐					
Site Inspections						
Outfalls or BMPs Evaluated			**Deficiencies Noted**			
(add additional sheets or attached detailed BMP Inspection Checklists)						
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:			
Corrective Actions Identified (note if SWPPP/REAP change is needed)						
Inspector Information						
Inspector Name:				Inspector Title:		
Signature:					Date:	

Risk Level 3 ***Effluent Sampling Field Log Sheets***				
Construction Site Name:		Date:		Time Start:
Sampler:				
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant	☐ Post NEL Exceedance

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements

Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected

Discharge Location Description	SSC	Other (specify)	Time

Additional Sampling Notes:

Time End:

Risk Level 3 ***Receiving Water Sampling Field Log Sheets***		
Construction Site Name:	Date:	Time Start:
Sampler:		

Receiving Water Description and Observations	
Receiving Water Name/ID:	
Observations:	
Odors	Yes ☐ No ☐
Floating material	Yes ☐ No ☐
Suspended Material	Yes ☐ No ☐
Sheen	Yes ☐ No ☐
Discolorations	Yes ☐ No ☐
Turbidity	Yes ☐ No ☐

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements and SSC Grab Sample			
Upstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		
Downstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		

Additional Sampling Notes:
Time End:

NAL or NEL Exceedance Evaluation Summary Report	Page __ of __
Project Name	
Project WDID	
Project Location	
Date of Exceedance	
Type of Exceedance	NAL Daily Average ☐ pH ☐ Turbidity NEL Daily Average ☐ pH ☐ Turbidity ☐ Other (specify) ________________
Measurement or Analytical Method	☐ Field meter (Sensitivity: _________) ☐ Lab method (specify) __________ (Reporting Limit: _____) (MDL: ______________)
Calculated Daily Average	☐ pH _ pH units ☐ Turbidity __ NTU
Rain Gauge Measurement	_______ inches
Compliance Storm Event	_______ inches (5-year, 24-hour event)
Visual Observations on Day of Exceedance	

NAL or NEL Exceedance Evaluation Summary Report	Page __ of __
Description of BMPs in Place at Time of Event	
Initial Assessment of Cause	
Corrective Actions Taken (deployed after exceedance)	
Additional Corrective Actions Proposed	
Report Completed By	____ **(Print Name, Title)**
Signature	____

CHAIN-OF-CUSTODY **DATE:** **Lab ID:**

DESTINATION LAB:

ATTN:

ADDRESS:

Office Phone:

Cell Phone:

SAMPLED BY:

Contact:

Project Name

REQUESTED ANALYSIS

Notes:

Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container #	Container Type	Container Pres.				

SENDER COMMENTS:

RELINQUISHED BY

Signature:	
Print:	
Company:	
Date:	TIME:

LABORATORY COMMENTS:

RECEIVED BY

Signature:	
Print:	
Company:	
Date:	TIME:

CSMP Attachment 4: Field Meter Instructions

INSTRUCTIONS

Place instructions for field meters that will be used by contractor personnel in this Attachment.

CSMP Attachment 5: Supplemental Information

INSTRUCTIONS

Place documents related to Regional Board required monitoring, watershed monitoring option approval, and bioassessment exception approval in this Attachment.

Section 8 References

Project Plans and Specifications, prepared by TJ Cross Engineers, Inc. include the following:

- Civil Grading Plan Package Rev 1 dated 8/26/14.
- Civil Field Entrances Rev 1 dated 9/17/14
- Preliminary Hydrology Report Rev 0 dated 9/17/14

Soil Beneficial Reuse Plan prepared by Padre Associates dated July 2014

General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ and 2012-0006 DWQ (NPDES No. CAS000002) and issued by the State Water Resources Control Board (State Water Board). Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

CASQA 2009, *Stormwater BMP Handbook Portal: Construction*, November 2009, www.casqa.org

Appendix A: Calculations

INSTRUCTIONS

- *Include calculations here*

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
10 Year Flow - PRE CONSTRUCTION																	
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	230	2558	9.0%		8.5	8.5	2.25	0.44	47.71	47.71	47.2				
NNBL2-2	2B, J1	Initial Area	230	1927	11.9%		7.0	7.0	2.47	0.48	23.71	23.71	27.8				
NNBL2-3	2C, J1	Initial Area	240	1874	12.8%		7.0	7.0	2.47	0.48	28.5	28.50	33.4				
Junction 1								8.5	2.25	0.46		99.92	103.1				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	3.82	11.0	19.5	1.51	0.40	51.72	151.64	92.6	0.04	0.37		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	1.99	0.40	78.76	78.76	61.9				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	2.77	0.52	19.95	19.95	28.8				
Junction 2	J2							19.5	1.51	0.41		250.35	155.2				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	7.14	4.8	24.4	1.36	0.39	54.73	305.08	159.3	0.04	1.07		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	3.05	0.56	15.65	15.65	26.7				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	2.77	0.52	21.99	21.99	31.7				
Junction 3	J3							24.4	1.36	0.40		342.72	186.7				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	6.89	3.5	27.8	1.27	0.39	22.03	364.75	182.0	0.04	1.16		
NNBL1-1	1A, J4	Initial Area	410	5501	7.4%		17.2	17.2	1.60	0.32	112.2	112.20	57.7				
Junction 4	J4							27.8	1.27	0.38		476.95	227.9				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	2.47	0.48	35.8	35.80	42.0				
NNBL2-12	2J,J5	Initial Area	192	1139	16.8%		4.0	4.0	3.23	0.58	16.24	16.24	30.5				
Junction 5	J5							7.0	2.47	0.51		52.04	65.3				
NNBL2-13	J5,J6	J3-J4	83	1700	4.9%	6.96	4.1	11.1	1.98	0.46	40.03	92.07	83.7	0.04	0.77		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	2.25	0.44	50.68	50.68	50.2				
Junction 6								11.1	1.98	0.45		142.75	127.9				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	5.30	3.1	14.2	1.76	0.44	13.41	156.16	121.7	0.04	1.26		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	4.85	2.9	30.8	1.21	0.37	15.71	492.66	221.6	0.04	1.32		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	2.77	0.52	23.12	23.12	33.3				
Junction 7	J7							30.8	1.21	0.39		671.94	320.2				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	8.43	4.5	35.2	1.14	0.38	45.45	717.39	310.9	0.04	1.72		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	2.66	0.50	27.27	27.27	36.5				
Junction 8	J8							35.2	1.14	0.39		744.66	326.5				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	7.32	7.3	42.5	1.04	0.37	55.98	800.64	309.0	0.04	1.87		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	2.77	0.52	12.58	12.58	18.1				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	3.71	0.64	6.13	6.13	14.5				
Junction 10								5.5	2.77	0.56		18.71	29.0				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.07	9.3	14.8	1.72	0.44	25.07	43.78	33.0	0.04	0.68		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	3.71	0.64	6.78	6.78	16.1				
Junction 11	J11							14.8	1.72	0.46		50.56	40.5				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	6.41	5.0	19.8	1.50	0.39	42.5	93.06	54.2	0.04	0.75		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	3.71	0.64	12.04	12.04	28.5				
Junction 12	J12							19.8	1.50	0.42		105.10	65.7				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	8.50	2.3	22.1	1.42	0.40	16.97	122.07	69.2	0.04	0.94		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	2.45	0.47	23.35	23.35	27.1				
Junction 13	J13							22.1	1.42	0.41		145.42	84.9				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	6.60	1.5	23.6	1.38	0.40	8.43	153.85	85.3	0.04	1.22		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	2.77	0.52	16.27	16.27	23.5				
Junction 14	J14							23.6	1.38	0.41		170.12	97.0				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	7.63	1.8	25.4	1.33	0.40	15.07	185.19	98.9	0.04	0.97		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	2.56	0.49	18.70	18.70	23.4				
Junction 15	J15							25.4	1.33	0.41		203.89	111.0				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	7.24	1.8	27.2	1.29	0.40	14.11	218.00	111.9	0.04	0.86		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	3.23	0.58	9.9	9.90	18.6				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.19	0.43	39.82	39.82	37.5				
Junction 1								9.0	2.19	0.46		49.72	50.1				

Rational Method
Pre Construction
Q= 10 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	5.24	7.5	16.5	1.64	0.38	81.59	131.31	81.3	0.04	0.68		
LGN CYN 4	C,J2	Initial Area	287	1723	16.7%		6.0	6.0	2.66	0.50	23.03	23.03	30.8				
Junction 2	J2							16.5	1.64	0.40		154.34	100.3				
LGN CYN 5	J2,J3	J2-J3	8	510	1.7%	4.93	1.7	18.2	1.56	0.39	9.18	163.52	100.0	0.04	1.04		
LGN CYN 6	D,J3	Initial Area	285	2578	11.0%		8.0	8.0	2.31	0.45	33.34	33.34	34.8				
Junction 3	J3							18.2	1.56	0.40		196.86	123.5				
LGN CYN 7	J3,J4	J3-J4	33	587	5.6%	7.17	1.4	19.6	1.51	0.40	5.32	202.18	121.7	0.04	0.73		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	2.45	0.47	18.54	18.54	21.5				
LGN CYN 9	F, J4	Initial Area	321	3298	9.7%		10.1	10.1	2.07	0.41	64.82	64.82	55.0				
Junction 4	J4							19.6	1.51	0.41		285.54	175.0				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.22	3.4	22.9	1.40	0.40	18.52	304.06	169.2	0.04	1.73		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	2.47	0.48	40.46	40.46	47.5				
Junction 5	J5							22.9	1.40	0.41		344.52	196.1				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	7.61	4.7	27.7	1.28	0.38	64.42	408.94	199.5	0.04	1.14		
LGN CYN 13	G,J6	Initial Area	320	1808	17.7%		5.2	5.2	2.85	0.53	72.61	72.61	109.7				
Junction 6	J6							27.7	1.28	0.40		481.55	248.6				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	5.44	4.3	32.0	1.19	0.39	52.08	533.63	245.8	0.04	1.55		
LGN CYN 15	H,J7	Initial Area	267	2128	12.5%		6.5	6.5	2.56	0.49	40.85	40.85	51.1				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	8.66	8.66	12.5				
Junction 7	J7							32.0	1.19	0.40		583.14	274.9				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	6.97	3.1	35.1	1.14	0.39	37.96	621.10	272.0	0.04	1.67		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	2.56	0.49	22.38	22.38	28.0				
Junction 8	J8							35.1	1.14	0.39		643.48	284.5				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	7.87	2.8	38.0	1.10	0.38	46.44	689.92	284.3	0.04	1.35		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	2.58	0.49	21.61	21.61	27.4				
Junction 9	J9							38.0	1.10	0.38		711.53	295.9				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	7.55	1.5	39.5	1.08	0.37	20.72	732.25	294.7	0.04	1.59		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	2.77	0.52	23.15	23.15	33.4				
Junction 10	J10							39.5	1.08	0.38		755.40	307.6				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	8.65	1.6	41.1	1.05	0.37	20.28	775.68	305.7	0.04	1.59		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	2.93	0.54	16.4	16.40	26.0				
Junction 11	J11							41.1	1.05	0.38		792.08	315.1				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	9.99	3.5	44.6	1.01	0.36	52.63	844.71	312.5	0.04	1.77		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	2.62	0.50	21.56	21.56	28.1				
Junction 12	J12							44.6	1.01	0.37		866.27	323.4				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	9.01	2.3	46.9	0.99	0.36	26.06	892.33	320.1	0.04	1.95		

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	2.31	0.45	33.14	33.14	34.6				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	2.70	0.51	19.71	19.71	27.2				
Junction 1								8.0	2.31	0.47		52.85	57.9				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	6.65	5.1	13.1	1.83	0.42	46.79	99.64	77.0	0.04	0.83		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	2.90	0.54	31.97	31.97	49.9				
Junction 2	J2							13.1	1.83	0.45		131.61	108.4				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	7.02	4.2	17.3	1.60	0.42	44.86	176.47	117.9	0.04	1.02		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.07	0.41	63.01	63.01	53.5				
Junction 3	J3							17.3	1.60	0.42		239.48	159.2				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	9.05	1.7	18.9	1.53	0.41	8.79	248.27	156.5	0.04	1.24		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	1.83	0.37	72.00	72.00	48.5				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.07	0.41	53.94	53.94	45.8				
Junction 4	J4							18.9	1.53	0.40		374.21	230.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	6.48	2.4	21.3	1.45	0.40	18.75	392.96	225.9	0.04	1.76		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	1.91	0.38	57.52	57.52	41.7				
Junction 5	J5							21.3	1.45	0.40		450.48	257.6				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	10.05	0.7	22.0	1.43	0.39	23.30	473.78	263.2	0.04	1.50		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.13	0.42	79.32	79.32	71.1				
Junction 6	J6							22.0	1.43	0.39		553.10	310.8				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	6.46	4.1	26.1	1.31	0.38	57.77	610.87	305.5	0.04	1.83		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	2.47	0.48	34.70	34.70	40.7				
Junction 7	J7							26.1	1.31	0.39		645.57	327.2				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	9.60	3.2	29.3	1.24	0.37	64.56	710.13	328.5	0.04	1.74		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	19.74	19.74	28.5				
Junction 8	J8							29.3	1.24	0.38		729.87	341.3				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	1.77	0.35	117.13	117.13	73.5				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	3.08	0.56	12.59	12.59	21.9				
Junction 12								14.0	1.77	0.37		129.72	86.1				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	7.20	4.9	18.9	1.53	0.36	48.49	178.21	97.3	0.04	0.99		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.19	0.43	53.73	53.73	50.6				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	3.05	0.56	11.00	11.00	18.8				
Junction 13	J13							18.9	1.53	0.38		242.94	142.2				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	3.71	4.4	23.3	1.39	0.38	8.92	251.86	132.0	0.04	1.65		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	2.77	0.52	21.83	21.83	31.5				
Junction 14	J14							23.3	1.39	0.39		273.69	147.7				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	7.20	4.0	27.3	1.28	0.37	42.44	316.13	150.4	0.04	1.31		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	2.24	0.44	43.38	43.38	42.5				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	2.50	0.48	16.5	16.50	19.9				
Junction 15	J15							27.3	1.28	0.38		376.01	185.1				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	9.48	1.1	28.4	1.26	0.38	9.39	385.40	184.3	0.04	1.29		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	2.47	0.48	29.51	29.51	34.6				
Junction 16	J16							28.4	1.26	0.39		414.91	202.0				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	7.26	4.4	32.8	1.18	0.38	28.82	443.73	196.1	0.04	1.56		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	2.47	0.48	24.93	24.93	29.3				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	8.68	3.1	32.4	1.18	0.22	39.08	768.95	203.0	0.04	1.81		
Junction 9	J9							32.8	1.18	0.28		1237.61	411.9				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	11.21	1.4	34.2	1.15	0.28	14.42	1252.03	407.3	0.04	1.76		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	2.70	0.51	14.88	14.88	20.5				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	1.66	0.33	45.78	45.78	25.3				
Junction 10	J10							34.2	1.15	0.29		1312.69	433.6				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.06	0.41	33.42	33.42	28.1				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	2.30	0.45	24.49	24.49	25.3				
Junction 18	J18							10.2	2.06	0.43		57.91	50.8				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	7.87	1.7	11.9	1.92	0.42	14.51	72.42	57.9	0.04	0.73		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	3.02	0.55	10.78	10.78	18.0				
Junction 19	J19							11.9	1.92	0.43		83.20	69.3				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	10.17	2.4	14.3	1.75	0.29	15.63	1328.32	669.4	0.04	1.90		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	8.40	1.0	29.4	1.24	0.43	2.49	85.69	45.5	0.04	0.83		
Junction 11	J11							29.4	1.24	0.30		1414.01	518.2				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	1.77	0.35	164.76	164.76	103.4				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	1.99	0.40	82.64	82.64	64.9				
Junction 1								14.0	1.77	0.37		247.40	161.2				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	7.57	2.3	34.8	1.14	0.35	37.57	284.97	113.4	0.04	1.31		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	1.77	0.35	177.26	177.26	111.3				
Junction 2	J2							34.8	1.14	0.35		462.23	185.3				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	6.08	6.9	41.7	1.05	0.33	68.72	530.95	183.3	0.04	1.48		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	1.66	0.33	106.30	106.30	58.7				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	1.99	0.40	93.88	93.88	73.7				
Junction 3	J3							41.7	1.05	0.34		731.13	259.3				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	5.96	7.1	48.8	0.97	0.32	86.11	817.24	254.2	0.04	1.79		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.39	0.28	209.62	209.62	80.4				
Junction 4	J4							48.8	0.97	0.31		1026.86	310.3				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	6.03	5.2	53.9	0.93	0.30	90.94	1117.80	308.4	0.04	1.96		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.34	0.26	238.85	238.85	83.9				
Junction 5	J5							53.9	0.93	0.29		1356.65	366.4				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	7.22	1.5	55.4	0.91	0.29	21.49	1378.14	364.5	0.04	1.96		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	1.83	0.37	130.52	130.52	87.9				
Junction 6	J6							55.4	0.91	0.30		1508.66	408.3				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	5.76	4.0	59.4	0.88	0.29	77.69	1586.35	404.3	0.04	2.44		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	1.61	0.32	383.83	383.83	199.8				
Junction 7	J7							59.4	0.88	0.30		1970.18	513.9				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	8.05	3.9	63.3	0.86	0.29	114.13	2084.31	511.0	0.04	2.31		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	1.66	0.33	134.68	134.68	74.4				
Junction 8	J8							63.3	0.86	0.29		2218.99	549.4				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	1.94	0.39	173.73	173.73	131.0				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.08	0.41	165.79	165.79	142.0				
Junction J9A								11.5	1.94	0.40		339.52	263.8				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	9.78	2.3	13.8	1.78	0.40	21.14	360.66	255.1	0.04	1.39		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	6.22	4.1	67.4	0.83	0.29	50.58	2269.57	538.4	0.04	2.73		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	1.94	0.39	112.02	112.02	84.5				
Junction 9	J9A,J9							67.4	0.83	0.30		2742.25	693.7				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	4.90	3.5	70.9	0.81	0.30	57.78	2800.03	682.6	0.04	3.43		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	1.99	0.40	70.08	70.08	55.1				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	2.39	0.46	43.22	43.22	47.8				
Junction 10	J10							70.9	0.81	0.30		2913.33	721.3				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	6.15	8.3	79.1	0.77	0.29	190.84	3104.17	698.7	0.04	3.30		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	1.83	0.37	265.58	265.58	178.8				
Junction 11	J11							79.1	0.77	0.30		3369.75	773.8				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	1.99	0.40	93.86	93.86	73.7				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.00	0.40	116.31	116.31	92.9				
Junction 13								11.0	1.99	0.40		210.17	165.8				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	Total	I	C	Area Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	8.50	4.3	15.3	1.69	0.39	54.66	264.83	172.8	0.04	1.27		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	10.08	1.6	80.7	0.76	0.29	69.68	3439.43	771.7	0.04	2.68		
Junction 12	J12							80.7	0.76	0.30		3704.26	849.6				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	7.73	2.7	83.4	0.75	0.30	87.79	3792.05	842.5	0.04	3.26		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	1.66	0.33	234.44	234.44	129.5				
Junction 14	J14							83.4	0.75	0.30		4026.49	901.2				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	7.78	7.4	90.8	0.72	0.28	351.98	4378.47	886.0	0.04	3.35		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.10	0.42	48.77	48.77	42.5				
Junction 15	J15							90.8	0.72	0.28		4427.24	900.6				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	1.77	0.35	197.82	197.82	124.2				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.08	0.41	162.07	162.07	138.8				
Junction 24	J24							14.0	1.77	0.38		359.89	242.3				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	11.20	1.7	15.7	1.67	0.38	32.03	391.92	247.3	0.04	1.34		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	2.47	0.48	68.33	68.33	80.2				
Junction 25	J25							15.7	1.67	0.39		460.25	301.7				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	8.00	3.7	94.5	0.71	0.28	49.63	4476.87	886.0	0.04	3.28		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	10.12	3.6	19.3	1.52	0.38	44.65	504.90	293.9	0.04	1.58		
CAT CYN 33	Z, J16	Initial Area	417	2959	14.1%		7.5	7.5	2.39	0.46	49.02	49.02	54.2				
Junction 16	J16							94.5	0.71	0.29		5030.79	1039.1				
CAT CYN 36A	AA, BA	Initial Area	296	1711	17.3%		5.0	5.0	2.90	0.54	30.36	30.36	47.4				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	8.73	3.1	8.1	2.31	0.50	23.84	54.20	62.5	0.04	0.66		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	8.57	2.4	96.9	0.70	0.29	51.89	5082.68	1029.2	0.04	3.39		
Junction 17	J17							96.9	0.70	0.30		5136.88	1059.5				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	2.31	0.45	46.04	46.04	48.1				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	1.99	0.40	173.56	173.56	136.3				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.03	0.40	137.55	137.55	112.7				
Junction 26	J26							11.0	1.99	0.41		357.15	287.9				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	7.92	5.2	102.1	0.68	0.29	129.3	5266.18	1039.4	0.04	3.61		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	9.67	4.6	15.6	1.68	0.40	50.69	407.84	272.1	0.04	1.54		
Junction 18	J18							102.1	0.68	0.30		5674.02	1149.8				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	3.44	0.61	14.93	14.93	31.3				
CAT CYN 40A1	BB, J28	BB-J28	109	1038	10.5%	8.12	2.1	5.6	2.74	0.57	9.83	24.76	38.8	0.04	0.55		
CAT CYN 40A2	AA,J28	Initial Area	379	3110	12.2%		9.5	9.5	2.13	0.42	82.62	82.62	74.1				
Junction 28	J28							9.5	2.13	0.54		107.38	123.6				
CAT CYN 40B1	AD, BC	Initial Area	288	2356	12.2%		7.5	7.5	2.39	0.46	40.60	40.60	44.9				
CAT CYN 40B	BC, J27	BC-J27	72	884	8.1%	8.19	1.8	9.3	2.15	0.46	8.4	49.00	48.2	0.04	0.68		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	9.93	1.2	10.7	2.01	0.53	12.06	119.44	126.5	0.04	1.00		
Junction 27	J27							10.7	2.01	0.62		168.44	209.3				
CAT CYN 40	J27,J19	J27-J19	40	2450	1.6%	5.54	7.4	18.1	1.57	0.60	8.17	176.61	166.8	0.04	1.26		
CAT CYN 39	J18,J19	J18-J19	101	2671	3.8%	18.53	2.4	104.5	0.67	0.30	7.45	5681.47	1137.4	0.04	4.09		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	1.91	0.38	123.12	123.12	89.3				
Junction 19	J19							104.5	0.67	0.31		5981.20	1240.8				
CAT CYN 43A	AG, BD	Initial Area	269	1114	24.2%		3.2	3.2	3.59	0.63	8.20	8.20	18.5				
CAT CYN 43	BD, J20	BD-J20	101	1290	7.8%	6.35	3.4	6.6	2.54	0.53	19.88	28.08	37.6	0.04	0.48		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	10.56	2.0	106.5	0.67	0.31	44.86	6026.06	1231.5	0.04	3.38		
Junction 20	J20							106.5	0.67	0.31		6054.14	1244.8				

Rational Method
Pre Construction
Q= 10 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 45A	AE, BE	Initial Area	282	1507	18.7%		4.3	4.3	3.12	0.57	18.48	18.48	32.7				
CAT CYN 45	BE, J21	BE-J21	108	1389	7.8%	7.37	3.1	7.4	2.40	0.53	10.43	28.91	36.7	0.04	0.60		
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	8.83	1.9	108.4	0.66	0.30	108.43	6162.57	1238.6	0.04	3.65		
Junction 21	J21							108.4	0.66	0.30		6191.48	1248.7				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	2.29	0.45	48.73	48.73	49.8				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	7.77	3.0	111.4	0.65	0.30	125.08	6316.56	1236.9	0.04	3.90		
Junction 22	J22							111.4	0.65	0.30		6365.29	1251.1				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	3.65	0.63	13.36	13.36	30.9				
CAT CYN 49B	AL, J29		35	417	8.4%	7.44	0.9	4.0	3.22	0.62	5.53	18.89	37.5	0.04	0.57		
CAT CYN 49A	AJ, J29	Initial Area	330	2263	14.6%		6.1	6.1	2.64	0.50	43.14	43.14	57.0				
Junction 29	J29							6.1	2.64	0.54		62.03	87.7				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	8.34	4.2	10.3	2.05	0.49	37.43	99.46	99.3	0.04	0.91		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	9.44	7.6	119.0	0.63	0.29	286.36	6651.65	1220.8	0.04	3.60		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	1.91	0.38	243.99	243.99	176.9				
Junction 23	J23							119.0	0.63	0.30		6995.10	1310.3				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
10 Year Flow - POST CONSTRUCTION																	
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	229	2372	9.7%		8.0	8.0	2.31	0.71	41.66	41.66	68.8				
NNBL2-2	2B, J1	Initial Area	218	2353	9.3%		7.5	7.5	2.39	1.07	23.82	23.82	60.8				
NNBL2-3	2C, J1	Initial Area	240	2253	10.7%		8.0	8.0	2.31	1.14	30.78	30.78	80.9				
Junction 1								8.0	2.31	0.94		96.26	208.6				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	4.44	9.5	17.5	1.59	0.63	46.6	142.86	144.0	0.04	0.46		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	1.99	0.68	80.33	80.33	108.5				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	2.77	0.52	19.95	19.95	28.8				
Junction 2	J2							17.5	1.59	0.64		243.14	247.4				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	7.61	4.6	22.0	1.42	0.57	54.73	297.87	243.4	0.04	1.18		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	3.05	0.56	15.65	15.65	26.7				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	2.77	0.52	21.99	21.99	31.7				
Junction 3	J3							22.0	1.42	0.57		335.51	272.1				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	7.11	3.4	25.4	1.33	0.55	22.03	357.54	261.8	0.04	1.22		
NNBL1-1	1A, J4	Initial Area	410	5898	7.0%		17.2	17.2	1.60	0.48	114.71	114.71	89.0				
Junction 4	J4							25.4	1.33	0.53		472.25	335.6				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	2.47	0.83	52.24	52.24	107.4				
NNBL2-13	J5,J6	J5-J6	83	1700	4.9%	7.38	3.8	10.8	2.00	0.77	40.71	92.95	142.5	0.04	0.85		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	2.25	0.44	50.68	50.68	50.2				
Junction 6								10.8	2.00	0.65		143.63	187.2				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	5.52	3.0	13.9	1.78	0.63	13.41	157.04	174.8	0.04	1.34		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.02	2.8	28.2	1.26	0.53	15.71	487.96	323.9	0.04	1.38		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	2.77	0.52	23.12	23.12	33.3				
Junction 7	J7							28.2	1.26	0.55		668.12	463.4				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	8.70	4.3	32.6	1.18	0.53	45.45	713.57	444.6	0.04	1.80		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	2.66	0.50	27.27	27.27	36.5				
Junction 8	J8							32.6	1.18	0.53		740.84	460.8				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	7.54	7.1	39.6	1.07	0.50	55.98	796.82	430.9	0.04	1.96		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	2.77	0.52	12.58	12.58	18.1				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	3.71	0.64	6.13	6.13	14.5				
Junction 10								5.5	2.77	0.56		18.71	29.0				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.07	9.3	14.8	1.72	0.44	25.07	43.78	33.0	0.04	0.68		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	3.71	0.64	6.78	6.78	16.1				
Junction 11	J11							14.8	1.72	0.46		50.56	40.5				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	6.41	5.0	19.8	1.50	0.39	42.5	93.06	54.2	0.04	0.75		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	3.71	0.64	12.04	12.04	28.5				
Junction 12	J12							19.8	1.50	0.42		105.10	65.7				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	8.50	2.3	22.1	1.42	0.40	16.97	122.07	69.2	0.04	0.94		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	2.45	0.47	23.35	23.35	27.1				
Junction 13	J13							22.1	1.42	0.41		145.42	84.9				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	6.60	1.5	23.6	1.38	0.40	8.43	153.85	85.3	0.04	1.22		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	2.77	0.52	16.27	16.27	23.5				
Junction 14	J14							23.6	1.38	0.41		170.12	97.0				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	7.63	1.8	25.4	1.33	0.40	15.07	185.19	98.9	0.04	0.97		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	2.56	0.49	18.70	18.70	23.4				
Junction 15	J15							25.4	1.33	0.41		203.89	111.0				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	7.24	1.8	27.2	1.29	0.40	14.11	218.00	111.9	0.04	0.86		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	3.23	0.58	9.9	9.90	18.6				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.19	0.43	39.82	39.82	37.5				
Junction 1								9.0	2.19	0.46		49.72	50.1				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	5.24	7.5	16.5	1.64	0.38	81.59	131.31	81.3	0.04	0.68		
LGN CYN 4	C,J2	Initial Area	287	1809	15.9%		6.0	6.0	2.66	0.73	19	19.00	36.7				
Junction 2	J2							16.5	1.64	0.42		150.31	103.8				
LGN CYN 5	J2,J3	J2-J3	8	501	1.7%	4.97	1.7	18.2	1.56	0.43	6.8	157.11	104.6	0.04	1.04		
LGN CYN 6	D,J3	Initial Area	286	2301	12.4%		8.0	8.0	2.31	0.70	36.15	36.15	58.9				
Junction 3	J3							18.2	1.56	0.48		193.26	144.3				
LGN CYN 7	J3,J4	J3-J4	33	585	5.6%	7.22	1.4	19.5	1.51	0.47	5.78	199.04	142.1	0.04	0.74		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	2.45	0.47	18.54	18.54	21.5				
LGN CYN 9	F, J4	Initial Area	239	3803	6.3%		10.1	10.1	2.07	0.73	68.07	68.07	102.9				
Junction 4	J4							19.5	1.51	0.53		285.65	230.3				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.33	3.3	22.8	1.40	0.52	18.52	304.17	220.9	0.04	1.79		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	2.47	0.48	40.46	40.46	47.5				
Junction 5	J5							22.8	1.40	0.51		344.63	247.8				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	7.79	4.6	27.4	1.28	0.47	64.42	409.05	247.2	0.04	1.18		
LGN CYN 13	G,J6	Initial Area	296	2838	10.4%		5.2	5.2	2.85	1.00	74.09	74.09	211.8				
Junction 6	J6							27.4	1.28	0.55		483.14	342.5				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	5.63	4.2	31.6	1.20	0.52	52.08	535.22	334.1	0.04	1.63		
LGN CYN 15	H,J7	Initial Area	257	2259	11.4%		6.5	6.5	2.56	0.85	41.34	41.34	89.6				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	8.66	8.66	12.5				
Junction 7	J7							31.6	1.20	0.54		585.22	381.4				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	7.22	3.0	34.6	1.15	0.53	37.32	622.54	380.8	0.04	1.76		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	2.56	0.49	22.38	22.38	28.0				
Junction 8	J8							34.6	1.15	0.53		644.92	393.3				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	8.15	2.7	37.4	1.10	0.51	46.44	691.36	389.6	0.04	1.43		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	2.58	0.49	21.61	21.61	27.4				
Junction 9	J9							37.4	1.10	0.51		712.97	401.4				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	7.76	1.5	38.9	1.08	0.50	20.72	733.69	398.3	0.04	1.66		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	2.77	0.52	23.15	23.15	33.4				
Junction 10	J10							38.9	1.08	0.50		756.84	411.4				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	8.91	1.6	40.5	1.06	0.49	20.28	777.12	407.7	0.04	1.66		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	2.93	0.54	16.4	16.40	26.0				
Junction 11	J11							40.5	1.06	0.49		793.52	417.1				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	10.29	3.4	43.8	1.02	0.47	52.63	846.15	411.0	0.04	1.85		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	2.62	0.50	21.56	21.56	28.1				
Junction 12	J12							43.8	1.02	0.48		867.71	422.0				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	9.26	2.2	46.1	1.00	0.47	26.06	893.77	416.5	0.04	2.03		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	2.31	0.45	33.14	33.14	34.6				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	2.70	0.51	19.71	19.71	27.2				
Junction 1								8.0	2.31	0.47		52.85	57.9				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	6.65	5.1	13.1	1.83	0.42	46.79	99.64	77.0	0.04	0.83		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	2.90	0.54	31.97	31.97	49.9				
Junction 2	J2							13.1	1.83	0.45		131.61	108.4				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	7.02	4.2	17.3	1.60	0.42	44.86	176.47	117.9	0.04	1.02		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.07	0.41	63.01	63.01	53.5				
Junction 3	J3							17.3	1.60	0.42		239.48	159.2				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	9.05	1.7	18.9	1.53	0.41	8.79	248.27	156.5	0.04	1.24		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	1.83	0.37	72.00	72.00	48.5				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.07	0.41	53.94	53.94	45.8				
Junction 4	J4							18.9	1.53	0.40		374.21	230.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	6.48	2.4	21.3	1.45	0.40	18.75	392.96	225.9	0.04	1.76		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	1.91	0.38	57.52	57.52	41.7				
Junction 5	J5							21.3	1.45	0.40		450.48	257.6				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	10.05	0.7	22.0	1.43	0.39	23.30	473.78	263.2	0.04	1.50		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.13	0.42	79.32	79.32	71.1				
Junction 6	J6							22.0	1.43	0.39		553.10	310.8				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	6.46	4.1	26.1	1.31	0.38	57.77	610.87	305.5	0.04	1.83		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	2.47	0.48	34.70	34.70	40.7				
Junction 7	J7							26.1	1.31	0.39		645.57	327.2				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	9.60	3.2	29.3	1.24	0.37	64.56	710.13	328.5	0.04	1.74		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	19.74	19.74	28.5				
Junction 8	J8							29.3	1.24	0.38		729.87	341.3				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	1.77	0.35	117.13	117.13	73.5				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	3.08	0.56	12.59	12.59	21.9				
Junction 12								14.0	1.77	0.37		129.72	86.1				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	7.20	4.9	18.9	1.53	0.36	48.49	178.21	97.3	0.04	0.99		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.19	0.43	53.73	53.73	50.6				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	3.05	0.56	11.00	11.00	18.8				
Junction 13	J13							18.9	1.53	0.38		242.94	142.2				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	3.71	4.4	23.3	1.39	0.38	8.92	251.86	132.0	0.04	1.65		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	2.77	0.52	21.83	21.83	31.5				
Junction 14	J14							23.3	1.39	0.39		273.69	147.7				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	7.20	4.0	27.3	1.28	0.37	42.44	316.13	150.4	0.04	1.31		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	2.24	0.44	43.38	43.38	42.5				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	2.50	0.48	16.5	16.50	19.9				
Junction 15	J15							27.3	1.28	0.38		376.01	185.1				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	9.48	1.1	28.4	1.26	0.38	9.39	385.40	184.3	0.04	1.29		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	2.47	0.48	29.51	29.51	34.6				
Junction 16	J16							28.4		0.39		414.91	0.0				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	7.26	4.4	32.8	1.18	0.38	28.82	443.73	196.1	0.04	1.56		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	2.47	0.48	24.93	24.93	29.3				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	8.68	3.1	32.4	1.18	0.22	39.08	768.95	203.0	0.04	1.81		
Junction 9	J9							32.8	1.18	0.28		1237.61	411.9				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	11.21	1.4	34.2	1.15	0.28	14.42	1252.03	407.3	0.04	1.76		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	2.70	0.51	14.88	14.88	20.5				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	1.66	0.33	45.78	45.78	25.3				
Junction 10	J10							34.2	1.15	0.29		1312.69	433.6				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.06	0.41	33.42	33.42	28.1				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	2.30	0.45	24.49	24.49	25.3				
Junction 18	J18							10.2	2.06	0.43		57.91	50.8				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	7.87	1.7	11.9	1.92	0.42	14.51	72.42	57.9	0.04	0.73		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	3.02	0.55	10.78	10.78	18.0				
Junction 19	J19							11.9	1.92	0.43		83.20	69.3				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	10.17	2.4	14.3	1.75	0.29	15.63	1328.32	669.4	0.04	1.90		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	8.40	1.0	29.4	1.24	0.43	2.49	85.69	45.5	0.04	0.83		
Junction 11	J11							29.4	1.24	0.30		1414.01	518.2				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	1.77	0.35	164.76	164.76	103.4				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	1.99	0.40	82.64	82.64	64.9				
Junction 1								14.0	1.77	0.37		247.40	161.2				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	7.57	2.3	34.8	1.14	0.35	37.57	284.97	113.4	0.04	1.31		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	1.77	0.35	177.26	177.26	111.3				
Junction 2	J2							34.8	1.14	0.35		462.23	185.3				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	6.08	6.9	41.7	1.05	0.33	68.72	530.95	183.3	0.04	1.48		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	1.66	0.33	106.30	106.30	58.7				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	1.99	0.40	93.88	93.88	73.7				
Junction 3	J3							41.7	1.05	0.34		731.13	259.3				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	5.96	7.1	48.8	0.97	0.32	86.11	817.24	254.2	0.04	1.79		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.39	0.28	209.62	209.62	80.4				
Junction 4	J4							48.8	0.97	0.31		1026.86	310.3				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	6.03	5.2	53.9	0.93	0.30	90.94	1117.80	308.4	0.04	1.96		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.34	0.26	238.85	238.85	83.9				
Junction 5	J5							53.9	0.93	0.29		1356.65	366.4				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	7.22	1.5	55.4	0.91	0.29	21.49	1378.14	364.5	0.04	1.96		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	1.83	0.37	130.52	130.52	87.9				
Junction 6	J6							55.4	0.91	0.30		1508.66	408.3				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	5.76	4.0	59.4	0.88	0.29	77.69	1586.35	404.3	0.04	2.44		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	1.61	0.32	383.83	383.83	199.8				
Junction 7	J7							59.4	0.88	0.30		1970.18	513.9				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	8.05	3.9	63.3	0.86	0.29	114.13	2084.31	511.0	0.04	2.31		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	1.66	0.33	134.68	134.68	74.4				
Junction 8	J8							63.3	0.86	0.29		2218.99	549.4				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	1.94	0.39	173.73	173.73	131.0				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.08	0.41	165.79	165.79	142.0				
Junction J9A								11.5	1.94	0.40		339.52	263.8				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	9.78	2.3	13.8	1.78	0.40	21.14	360.66	255.1	0.04	1.39		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	6.22	4.1	67.4	0.83	0.29	50.58	2269.57	538.4	0.04	2.73		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	1.94	0.39	112.02	112.02	84.5				
Junction 9	J9A,J9							67.4	0.83	0.30		2742.25	693.7				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	4.90	3.5	70.9	0.81	0.30	57.78	2800.03	682.6	0.04	3.43		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	1.99	0.40	70.08	70.08	55.1				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	2.39	0.46	43.22	43.22	47.8				
Junction 10	J10							70.9	0.81	0.30		2913.33	721.4				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	6.15	8.3	79.1	0.77	0.29	190.84	3104.17	698.7	0.04	3.30		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	1.83	0.37	265.58	265.58	178.8				
Junction 11	J11							79.1	0.77	0.30		3369.75	773.8				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	1.99	0.40	93.86	93.86	73.7				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.00	0.40	116.31	116.31	92.9				
Junction 13								11.0	1.99	0.40		210.17	165.8				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	8.50	4.3	15.3	1.69	0.39	54.66	264.83	172.8	0.04	1.27		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	10.08	1.6	80.7	0.76	0.29	69.68	3439.43	771.7	0.04	2.68		
Junction 12	J12							80.7	0.76	0.30		3704.26	849.6				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	7.73	2.7	83.4	0.75	0.30	87.79	3792.05	842.5	0.04	3.26		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	1.66	0.33	234.44	234.44	129.5				
Junction 14	J14							83.4	0.75	0.30		4026.49	901.2				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	7.78	7.4	90.8	0.72	0.28	351.98	4378.47	886.0	0.04	3.35		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.10	0.42	48.77	48.77	42.5				
Junction 15	J15							90.8	0.72	0.28		4427.24	900.6				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	1.77	0.35	197.82	197.82	124.2				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.08	0.41	162.07	162.07	138.8				
Junction 24	J24							14.0	1.77	0.38		359.89	242.3				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	11.20	1.7	15.7	1.67	0.38	32.03	391.92	247.3	0.04	1.34		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	2.47	0.48	68.33	68.33	80.2				
Junction 25	J25							15.7	1.67	0.39		460.25	301.7				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	8.00	3.7	94.5	0.71	0.28	49.63	4476.87	886.0	0.04	3.28		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	10.12	3.6	19.3	1.52	0.38	44.65	504.90	293.9	0.04	1.58		
CAT CYN 33	Z, J16	Initial Area	417	2957	14.1%		7.5	7.5	2.39	0.83	48.65	48.65	95.8				
Junction 16	J16							94.5	0.71	0.30		5030.42	1051.4				
CAT CYN 36A	AA, BA	Initial Area	296	1727	17.1%		5.0	5.0	2.90	1.67	33.86	33.86	163.9				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	10.99	2.4	7.4	2.40	0.68	23.6	57.46	94.1	0.04	0.93		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	8.58	2.4	96.9	0.70	0.29	50.35	5080.77	1041.3	0.04	3.40		
Junction 17	J17							96.9	0.70	0.31		5138.23	1108.2				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	2.31	0.45	46.04	46.04	48.1				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	1.99	0.40	173.56	173.56	136.3				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.03	0.40	137.55	137.55	112.7				
Junction 26	J26							11.0	1.99	0.41		357.15	287.9				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	7.96	5.1	102.1	0.68	0.30	129.21	5267.44	1087.0	0.04	3.64		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	9.67	4.6	15.6	1.68	0.40	50.69	407.84	272.1	0.04	1.54		
Junction 18	J18							102.1	0.68	0.31		5675.28	1197.5				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	3.44	2.19	17.20	17.20	129.7				
CAT CYN 40A1	BB, J28	BB-J28	121	1038	11.6%	11.30	1.5	5.0	2.89	1.78	8.62	25.82	132.9	0.04	0.84		
CAT CYN 40A2	AA,J28	Initial Area	357	2963	12.0%		8.0	8.0	2.31	0.89	82.79	82.79	171.0				
Junction 28	J28							8.0	2.31	1.10		108.61	277.4				
CAT CYN 40B1	AD, BC	Initial Area	279	2472	11.3%		7.1	7.1	2.45	1.38	45.65	45.65	154.1				
CAT CYN 40B2	BC, BC1	BC-BC1	136	846	16.0%	14.39	1.0	8.1	2.30	1.36	9.39	55.04	172.0	0.04	0.95		
CAT CYN 40B	BC1, J27	BC-J27	19	377	4.9%	7.97	0.8	8.9	2.20	1.33	1.86	56.90	166.2	0.04	0.95		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	11.31	1.1	9.1	2.18	1.04	11.19	119.80	271.8	0.04	1.22		
Junction 27	J27							9.1	2.18	1.13		176.70	436.4				
CAT CYN 40	J27,J19	J27-J19	40	688	5.8%	11.70	1.0	10.0	2.08	1.10	7.91	184.61	422.2	0.04	1.49		
CAT CYN 39	J18,J19	J18-J19	2	407	0.5%	6.71	1.0	103.1	0.68	0.31	7.45	5682.73	1192.2	0.04	4.12		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	1.91	0.38	123.12	123.12	89.3				
Junction 19	J19							103.1	0.68	0.33		5990.46	1362.0				
CAT CYN 43	BF, J20	Initial Area	51	686	7.4%		3.9	3.9	3.27	1.05	4.26	4.26	14.6	0.04	0.69		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	10.67	2.0	105.0	0.67	0.33	42.06	6032.52	1355.2	0.04	3.43		
Junction 20	J20							105.0	0.67	0.33		6036.78	1358.2				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 43A	AG, BD	Initial Area	283	1052	26.9%		2.8	2.8	3.83	1.43	11.65	11.65	63.9				
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	7.48	2.2	107.3	0.67	0.33	105.65	6142.43	1358.7	0.04	2.85		
CAT CYN 44A	BJ,BH	Initial Area	77	1919	4.0%		10.0	10.0	2.08	0.76	23.74	23.74	37.6				
CAT CYN 45	BH,J21	BH-J21	59	713	8.3%	7.25	1.6	11.6	1.93	0.75	3.16	26.90	38.8	0.04	0.56		
Junction 21	J21							107.3	0.67	0.34		6180.98	1383.2				
CAT CYN 45A	AE, BE	Initial Area	298	1467	20.3%		4.3	4.3	3.12	0.80	18.85	18.85	47.0				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	2.29	0.45	47.36	47.36	48.4				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	7.84	3.0	110.3	0.66	0.33	122.7	6303.68	1369.6	0.04	3.95		
Junction 22	J22							110.3	0.66	0.33		6369.89	1393.4				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	3.65	2.68	15.32	15.32	149.6				
CAT CYN 49B	AL, J29		35	417	8.4%	10.29	0.7	5.0	2.91	2.25	4.68	20.00	130.8	0.04	0.93		
CAT CYN 49A	AJ, J29	Initial Area	330	2190	15.1%		6.1	6.1	2.64	0.71	41.14	41.14	77.0				
Junction 29	J29							6.1	2.64	1.21		61.14	195.7				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	9.50	3.7	9.8	2.10	0.91	37.43	98.57	188.3	0.04	1.11		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	9.54	7.5	117.8	0.64	0.32	286.32	6656.21	1358.9	0.04	3.66		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	1.91	0.38	243.99	243.99	176.9				
Junction 23	J23							117.8	0.64	0.33		6998.77	1475.1				

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		80
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.15
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		4.74
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**	56.88	
16	**Site Sediment Risk Factor**	**Medium**	
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment**? For help with impaired waterbodies please check the attached worksheet or visit the link below: 2006 Approved Sediment-impared WBs Worksheet http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp	**yes**	**High**

Combined Risk Level Matrix

<table>
<tr><td rowspan="2" colspan="2"></td><td colspan="3">Sediment Risk</td></tr>
<tr><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td rowspan="2">Receiving Water Risk</td><td>Low</td><td>Level 1</td><td colspan="2">Level 2</td></tr>
<tr><td>High</td><td colspan="2">Level 2</td><td>Level 3</td></tr>
</table>

Project Sediment Risk:	**Medium**
Project RW Risk:	**High**
Project Combined Risk:	**Level 2**

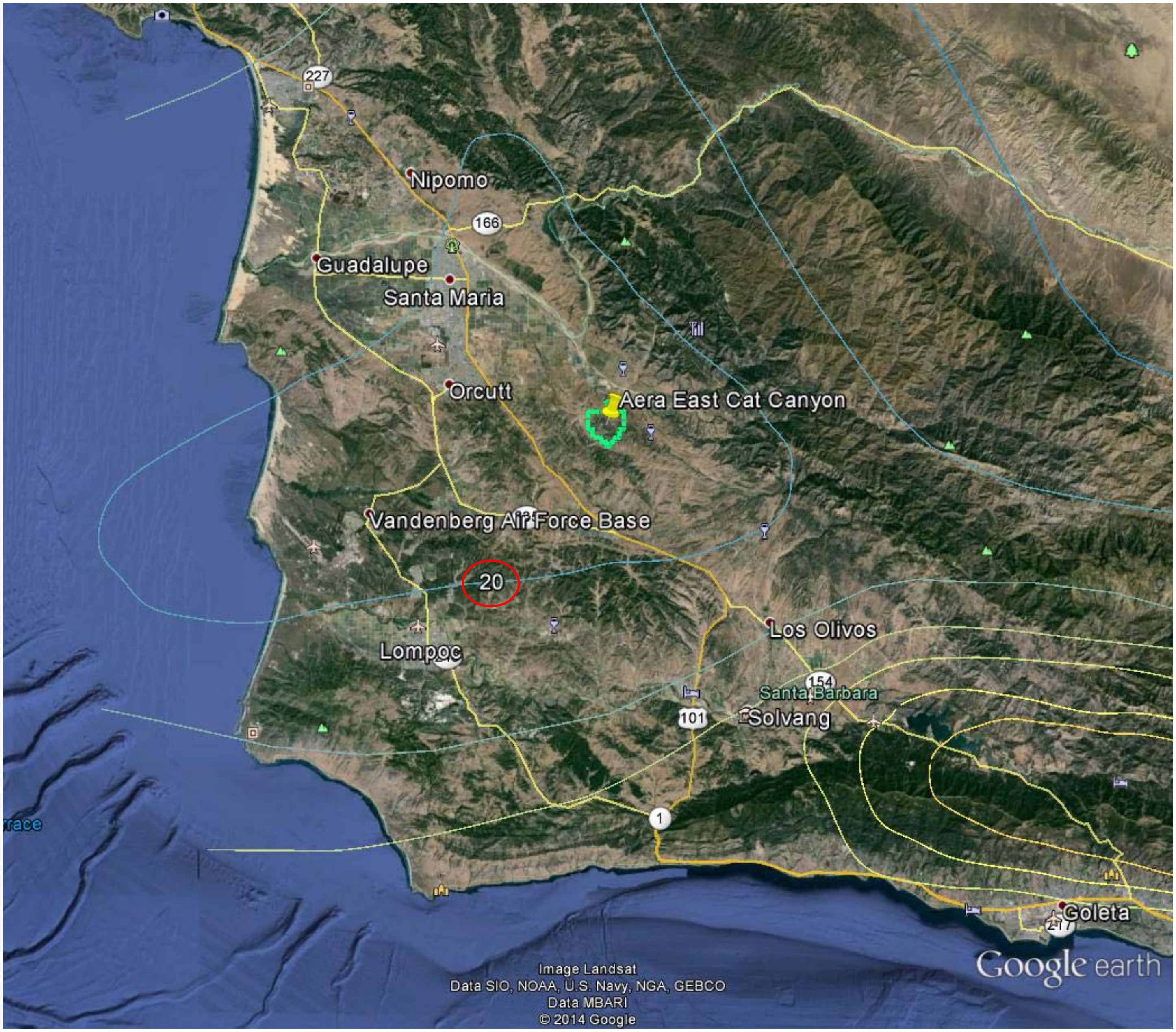
Project: AERA East Cat Canyon Field Redevelopment Project - Phase 1 TJC # 13186

Location: East Cat Canyon, Santa Barbara County, California 25-Aug-14

Subject: R - Factor Calculation

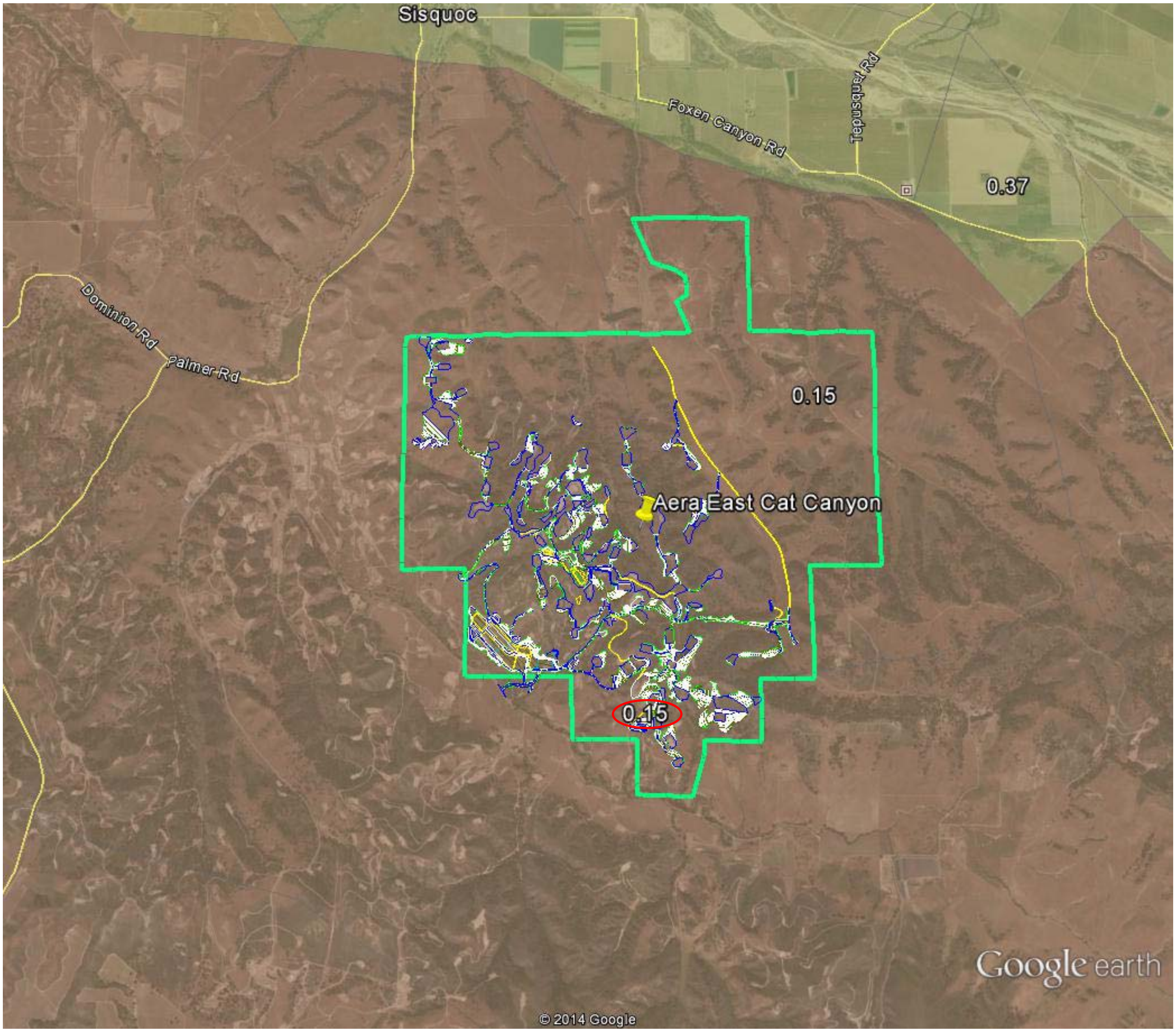
Item No.	Particulars					
	Phase 1	Years	4			
	Construction Schedule	***Start***	***End***			
	Site activities	1/2/2017	12/31/2020			
	Erosivity Index Zone Map (Figure 1)	**25**				
	Erosivity Index Value(%EI) (Table 1)	**%**	**%**	**%**		
	from January 2 to December 31	0	100	100		
	01/02/2017 - 12/31/2020 - 4 years			***400***		
	Total (Mulitiple by Number of Years of Site Activities)					
	Isoerodent Map of California (Figure 4)	**20**				
	R Value (Sumation of EI * Isoerodent Map Value)	**80**				
	Does the site qualify for an Erosivity Wavier?	**NO**	**80**	**>**	**5**	

08/25/2014 RSD

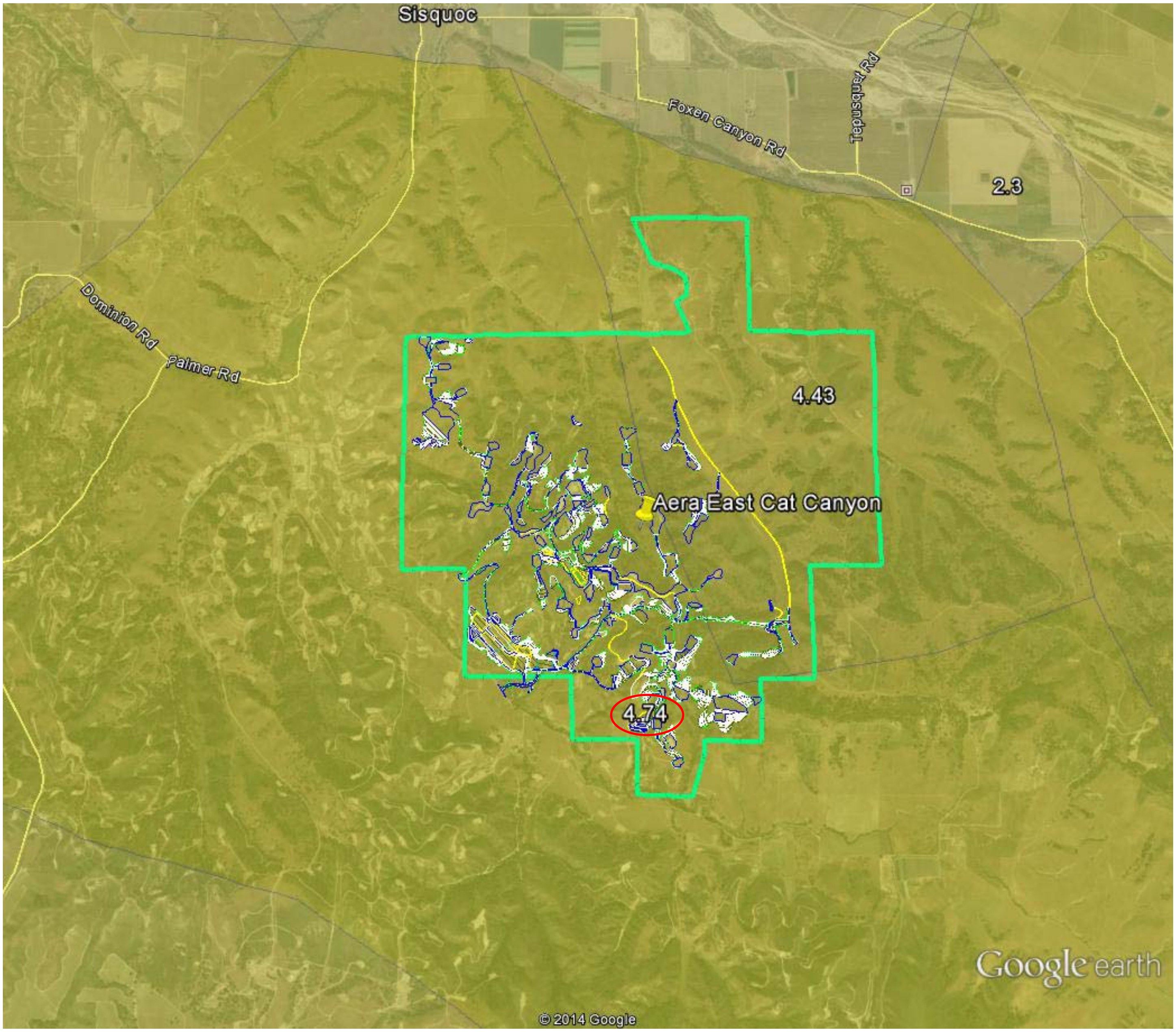


TJC # 13186 AERA
East Cat Canyon Field Redevelopment Project
SWPPP
Isoerodent R-Value = 20
Data Source: Natural Resources Conservation Services,
U.S. Dept. of Agriculture and State Water Resources Control Board
Last Modified / Up-dated 02/24/2012

08/25/2014 RSD



TJC # 13186 AERA
East Cat Canyon Field Redevelopment Project
SWPPP
RUSLE K-factor 0.15
Data Source: Natural Resources Conservation Services,
U.S. Dept. of Agriculture and State Water Resources Control Board
Last Modified / Up-dated 02/24/2012



TJC # 13186 AERA
East Cat Canyon Field Redevelopment Project
SWPPP 8/25/14
RUSLE LS Value: 4.74
Data Source: State Water Resources Control Board
Last Modified / Up-dated 02/24/2012

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.		(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below	(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.	*SANTA_BARBARA*
			(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.	SANTA MARIA WSO ARPT

Project Information

Project Name:	***ECC Field Redevelopment Project***
Waste Discharge Identification (WDID):	***Optional***
Date:	***25-Aug-14***
Sub Drainage Area Name (from map):	***Optional***

Runoff Calculations

(Step 2) Indicate the Soil Type (dropdown menu to right):	***Group C Soils***	**Low infiltration. Sandy clay loam. Infiltration rate 0.05 to 0.15 inch/hr when wet.**
(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	***Brush: <50% ground cover***	
(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	***Brush or chaparral covering less than 50% of the open space***	

	Complete Either		
	Sq Ft	**Acres**	**Acres**
(Step 5) Total Project Site Area:		**2100.00**	**2100.00**
(Step 6) Sub-watershed Area:		**287.00**	**287.00**
Percent of total project :			**20%**

Runoff Curve Numbers

Existing Runoff Curve Number	**84**
Proposed Development Runoff Curve Number	**85**

Design Storm

Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	**0.58**	**in**
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	**0.38**	**In**
P used for calculations (in) (the greater of the above two criteria)	**0.58**	**In**
^Available at www.cabmphandbooks.com		

(Step 7) Sub-watershed Conditions	**Complete Either**		**Calculated Acres**
	Sq Ft	**Acres**	
Sub-watershed Area (acres)			**287.00**
Existing Rooftop Impervious Coverage	**4000**		**0.09**
Existing Non-Rooftop Impervious Coverage		**30**	**30.00**
Proposed Rooftop Impervious Coverage	**30000**		**0.69**
Proposed Non-Rooftop Impervious Coverage		**60**	**60.00**

Credits	**Acres**	**Square Feet**
Porous Pavement	**9.86**	**429,502**
Tree Planting	**30.13**	**1,312,463**
Downspout Disconnection	**0.00**	**0**
Impervious Area Disconnection	**0.00**	**0**
Green Roof	**0.00**	**0**
Stream Buffer	**34.59**	**1,506,740**
Vegetated Swales	**1.50**	**65,340**
Subtotal	**76.08**	**3,314,045**
Subtotal Runoff Volume Reduction Credit	**7180 Cu. Ft.**	

Pre-Project Runoff Volume (cu ft)	**19,844**	**Cu.Ft.**
Project-Related Runoff Volume Increase w/o credits (cu ft)	**7,243**	**Cu.Ft.**
Project-Related Volume Increase with Credits (cu ft)	**0**	**Cu.Ft.**

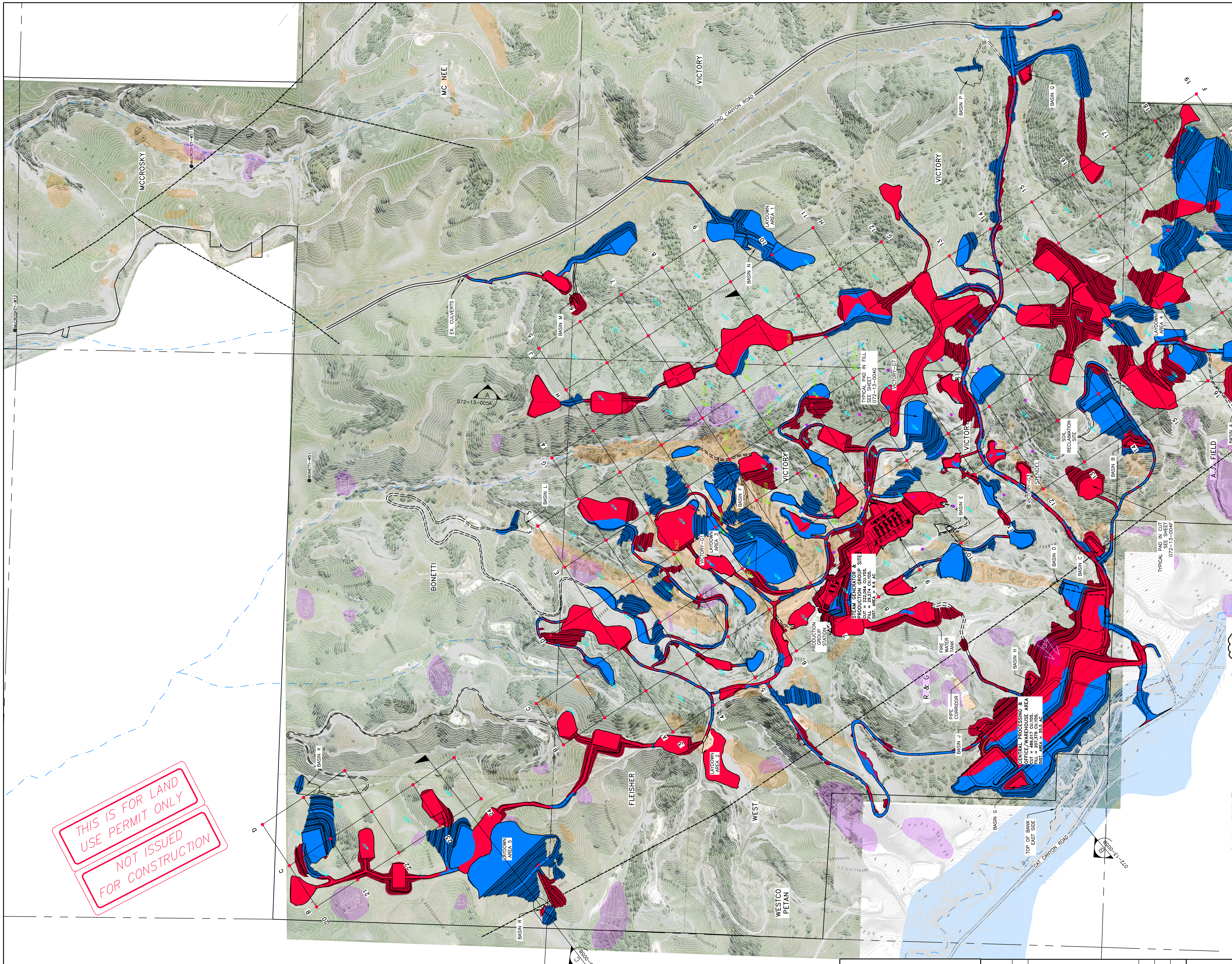
(Step 9) Impervious Volume Reduction Credits	**Volume (cubic feet)**
Rain Barrels/Cisterns	**93 Cu. Ft.**
Soil Quality	**0 Cu. Ft.**
Subtotal Runoff Volume Reduction	**93 Cu. Ft.**
Total Runoff Volume Reduction Credit	**7,273 Cu. Ft.**

You have achieved your minimum requirements

Appendix B: Site Maps

INSTRUCTIONS

- *Include maps here*



TOTAL QUANTITIES

FINISHED GRADE QUANTITIES:
CUT = 3,148,273 CU.YDS.
FILL = 3,108,167 CU.YDS.*
* INCLUDES 30% SHRINKAGE

REV 1

DISTURBED AREA = 287.00 AC

NOTES:
1. QUANTITIES INCLUDE (73) WELLPADS, ADJOINING ROADS, STEAM GENERATOR SITE, CENTRAL PROCESSING AREA, WAREHOUSE SITE, OFFICE SITE, BASINS, (1) PIPE CORRIDOR, (2) ROAD MIX PAD, (5) CONSTRUCTION LAYDOWN AREAS AND FILL SLOPE KEY AREAS.
2. MINIMUM WELLPAD SIZE AND ROADWAY WIDTHS PER EMAIL: "WELL PAD AND ROADWAY GRADING GUIDELINES", RECEIVED 02/18/14.
3. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
4. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-002A UNDER "EARTHWORK NOTES".
5. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
6. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS.

EXISTING GRADE CONTOUR INTERVAL = 2'–0"
DESIGN GRADE CONTOUR INTERVAL = 2'–0"

LEGEND

AREA OF CUT
AREA OF ENGINEERED FILL
EXCLUSION AREA
LAND SLIDE AREA
FAULT LINE
KEY BENCH LIMIT
EXISTING DELINEATION WELL
EXISTING INJECTION WELL
ABANDONED WELL (APPROX. LOCATION)

N

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=300' FILE: 13186/072-13-004A
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 10/21/13 LAST CHANGED: 08/26/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/26/14	1	ISSUED FOR PERMIT (ADDED SLOPE KEY VOL.)	IDU	RSD	EP
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING PLAN
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/26/14	SCALE: 1" = 300'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-004A	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-004A	

:FUNCTIONAL LOCATION NO.

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

EC-4 AND EC-7

LANDSCAPE BY OTHERS

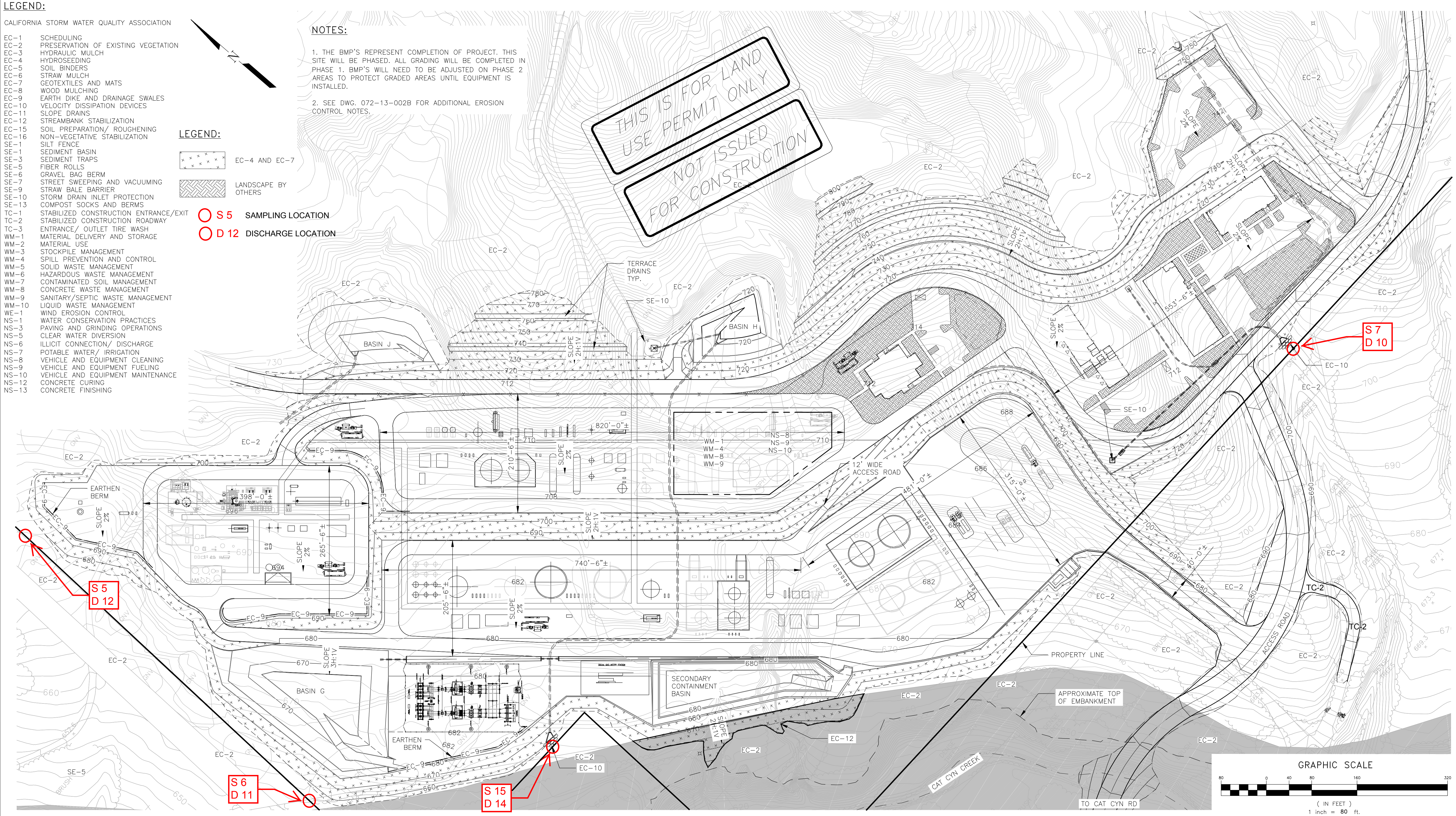
S 5 SAMPLING LOCATION

D 12 DISCHARGE LOCATION

NOTES:

1. THE BMP'S REPRESENT COMPLETION OF PROJECT. THIS SITE WILL BE PHASED. ALL GRADING WILL BE COMPLETED IN PHASE 1. BMP'S WILL NEED TO BE ADJUSTED ON PHASE 2 AREAS TO PROTECT GRADED AREAS UNTIL EQUIPMENT IS INSTALLED.

2. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.



EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 2'-0"

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=80' FILE: 13186/072-13-009A
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 05/30/14 LAST CHANGED: 08/20/14

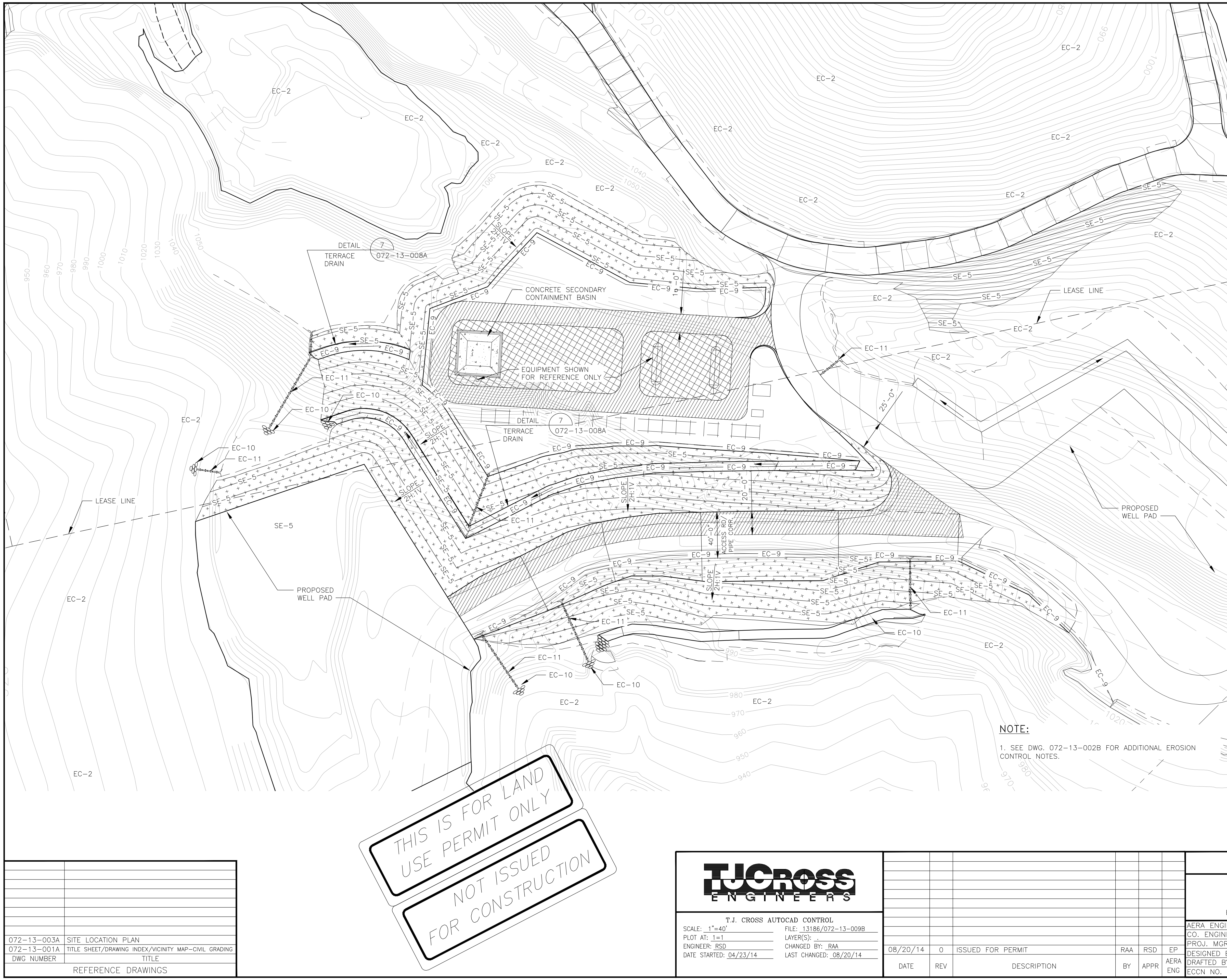
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN – CENTRAL PROCESSING PLANT/OFFICE/MULTIPURPOSE BUILDING
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 80'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ		
DESIGNED BY:	ROBIN DICKERSON	NO. 072-13-009A	REV. 0
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009A	

:FUNCTIONAL LOCATION NO.



NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=40'	FILE: 13186/072-13-009B
PLOT AT: 1=1	LAYER(S): _
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 04/23/14	LAST CHANGED: 08/20/14

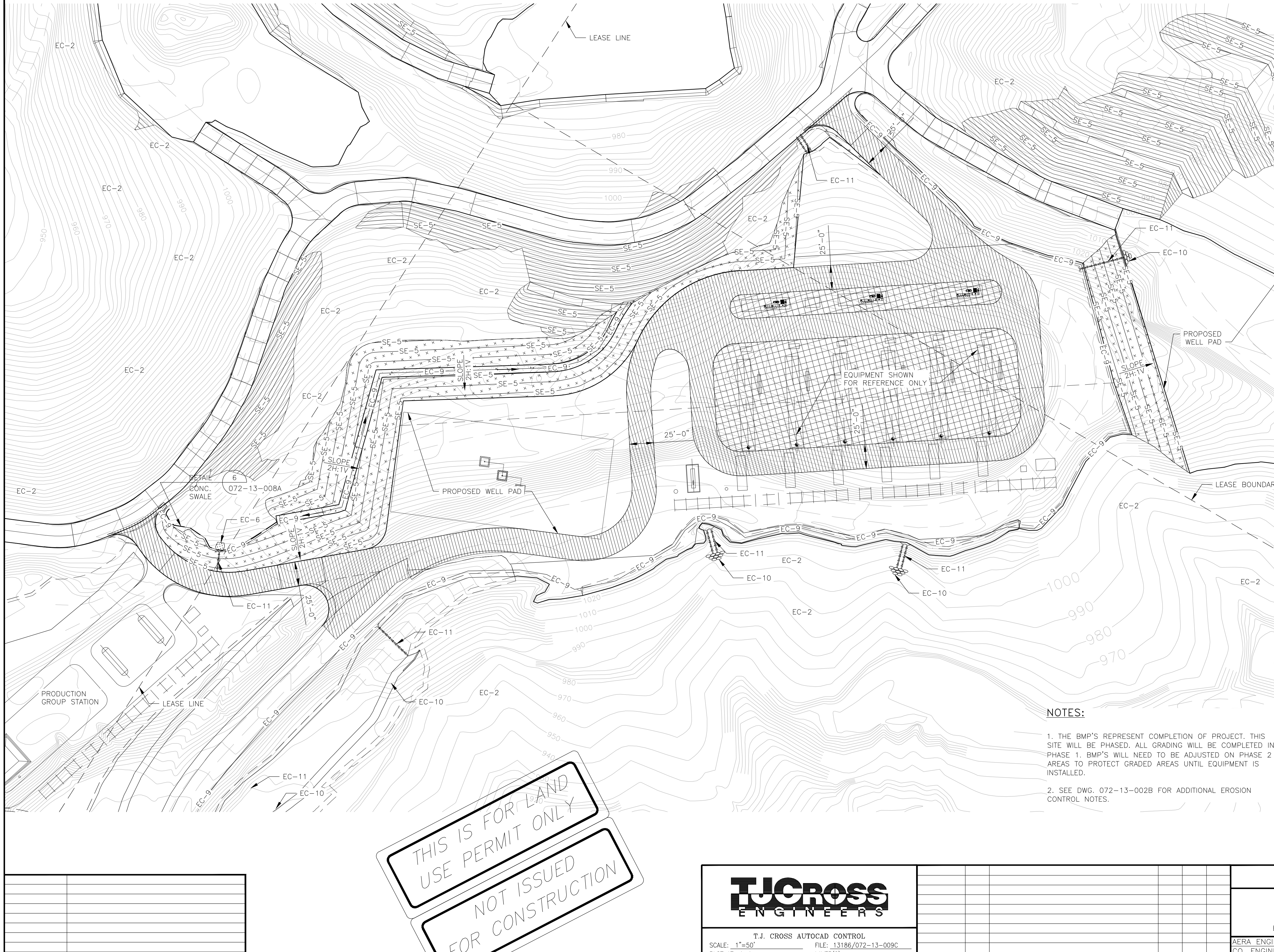
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN - PRODUCTION GROUP STATION
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 40'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009B	

:FUNCTIONAL LOCATION NO.



LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THE BMP'S REPRESENT COMPLETION OF PROJECT. THIS SITE WILL BE PHASED. ALL GRADING WILL BE COMPLETED IN PHASE 1. BMP'S WILL NEED TO BE ADJUSTED ON PHASE 2 AREAS TO PROTECT GRADED AREAS UNTIL EQUIPMENT IS INSTALLED.

2. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=50'	FILE: 13186/072-13-009C
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 10/24/13	LAST CHANGED: 08/20/14

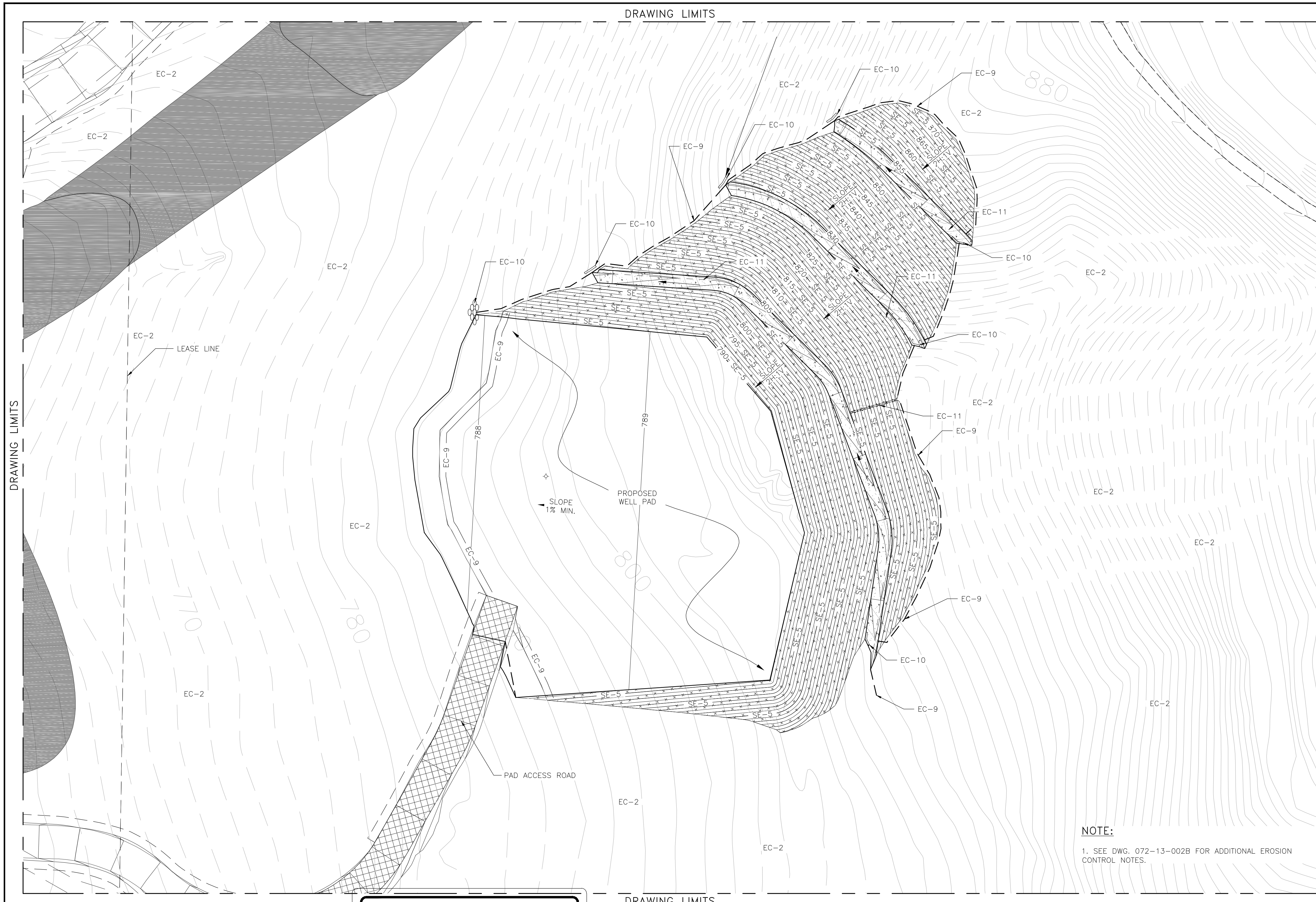
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN – STEAM PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 50'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009C	

:FUNCTIONAL LOCATION NO.



NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

N

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=30'	FILE: 13186/072-13-009D
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 08/07/14	LAST CHANGED: 08/20/14

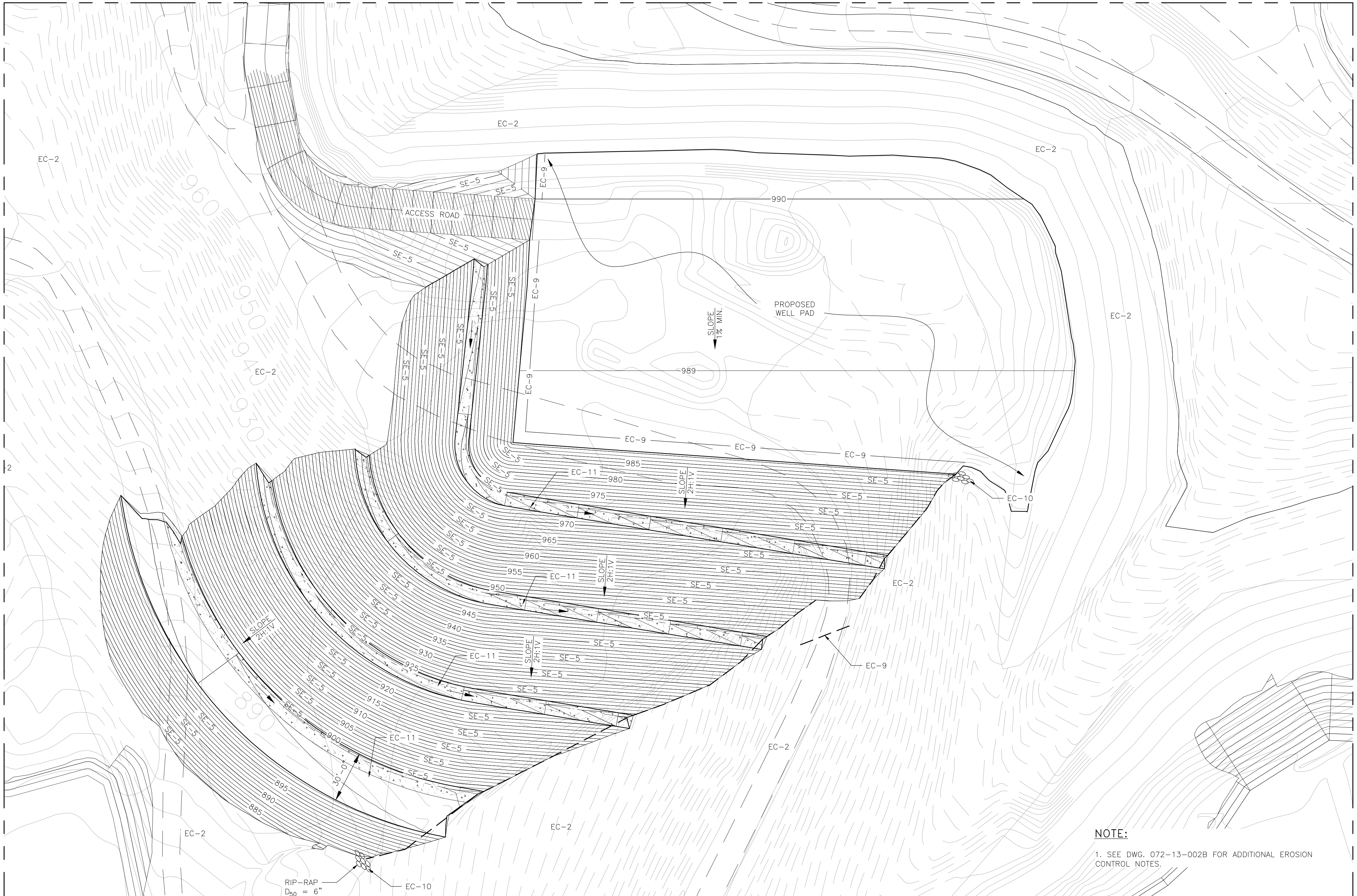
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN – PAD IN CUT (TYP.)
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 30'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009D	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009D	

:FUNCTIONAL LOCATION NO.



LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING
DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=30'	FILE: 13186/072-13-009E
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 08/07/14	LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN – PAD IN FILL (TYP.)
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 30'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009E	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009E	

:FUNCTIONAL LOCATION NO.

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

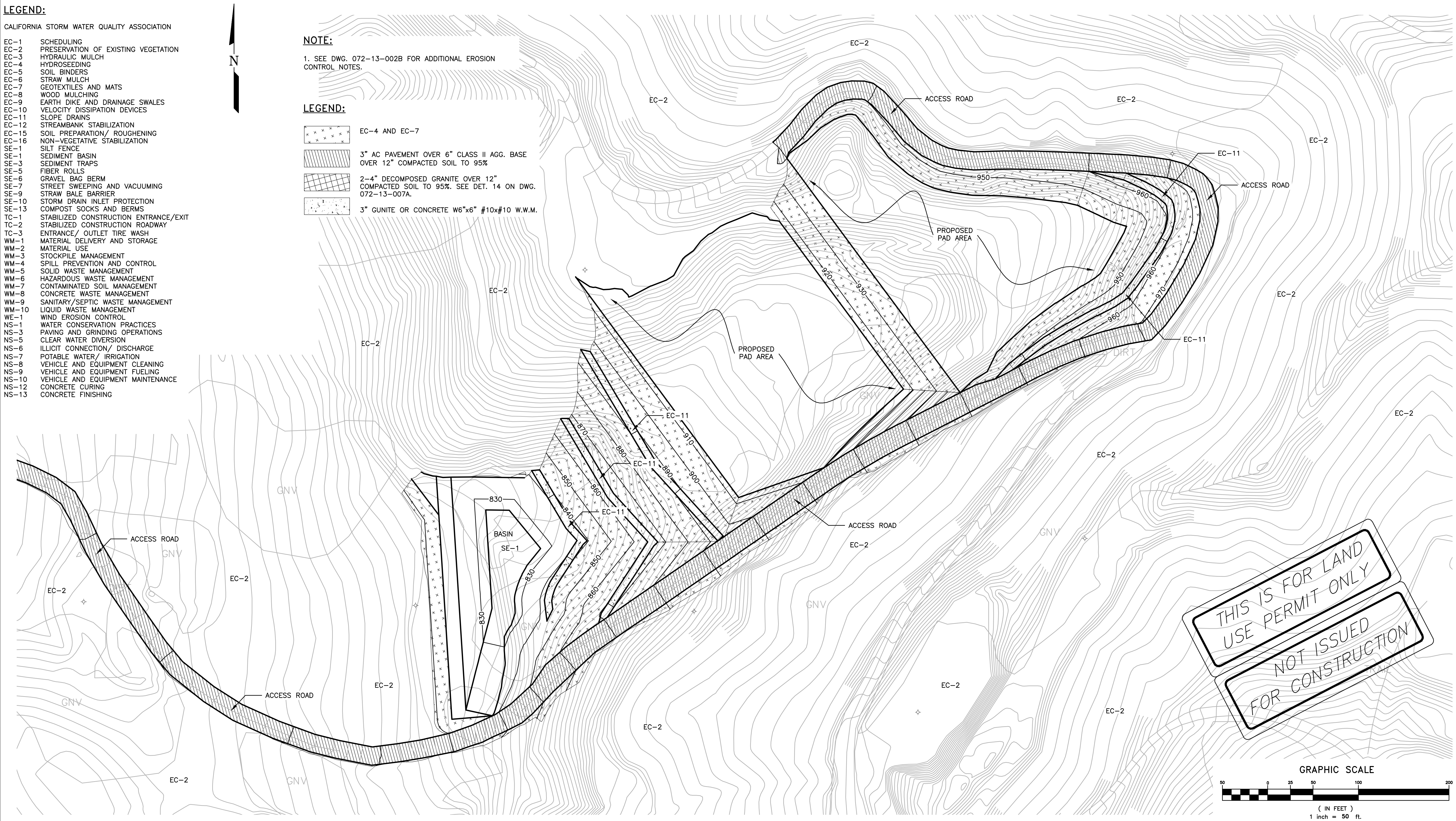
EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.



EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 2'-0"

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=50'	FILE: 13186/072-13-009F
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 08/22/14	LAST CHANGED: 08/22/14

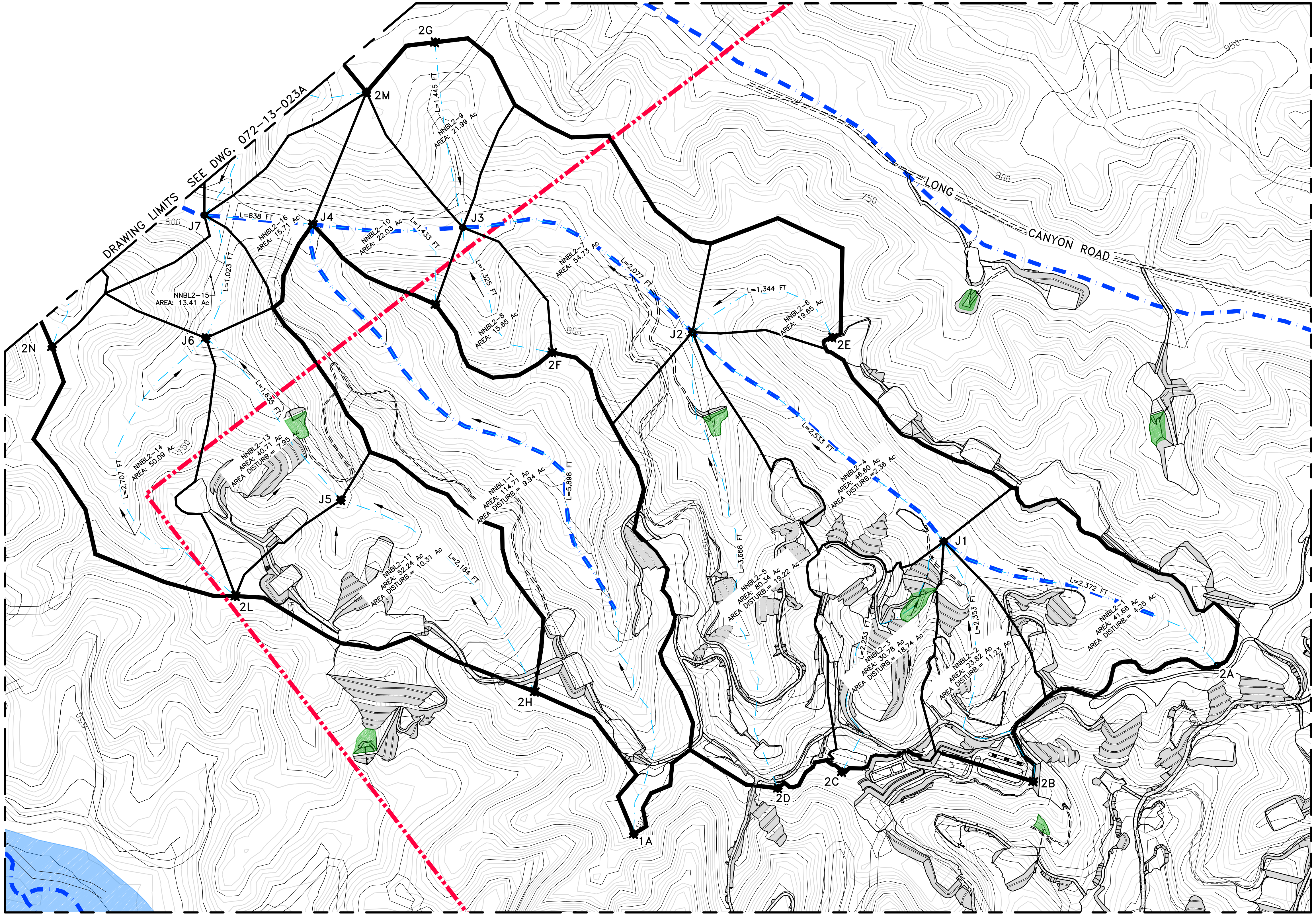
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/22/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN – SOIL RECLAMATION SITE
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/22/14	SCALE: 1" = 50'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009F	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009F	

:FUNCTIONAL LOCATION NO.



PROGRESS PRINT
NOT READY FOR ISSUE

UNNAMED BLUE LINE 1 & 2

SCALE: 1" = 400'

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- PROP. DETENTION BASIN LOCATION (FINAL DESIGN TO BE DETERMINED)

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=400' FILE: 13186/072-13-024MS
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 12/16/13 LAST CHANGED: 09/17/14

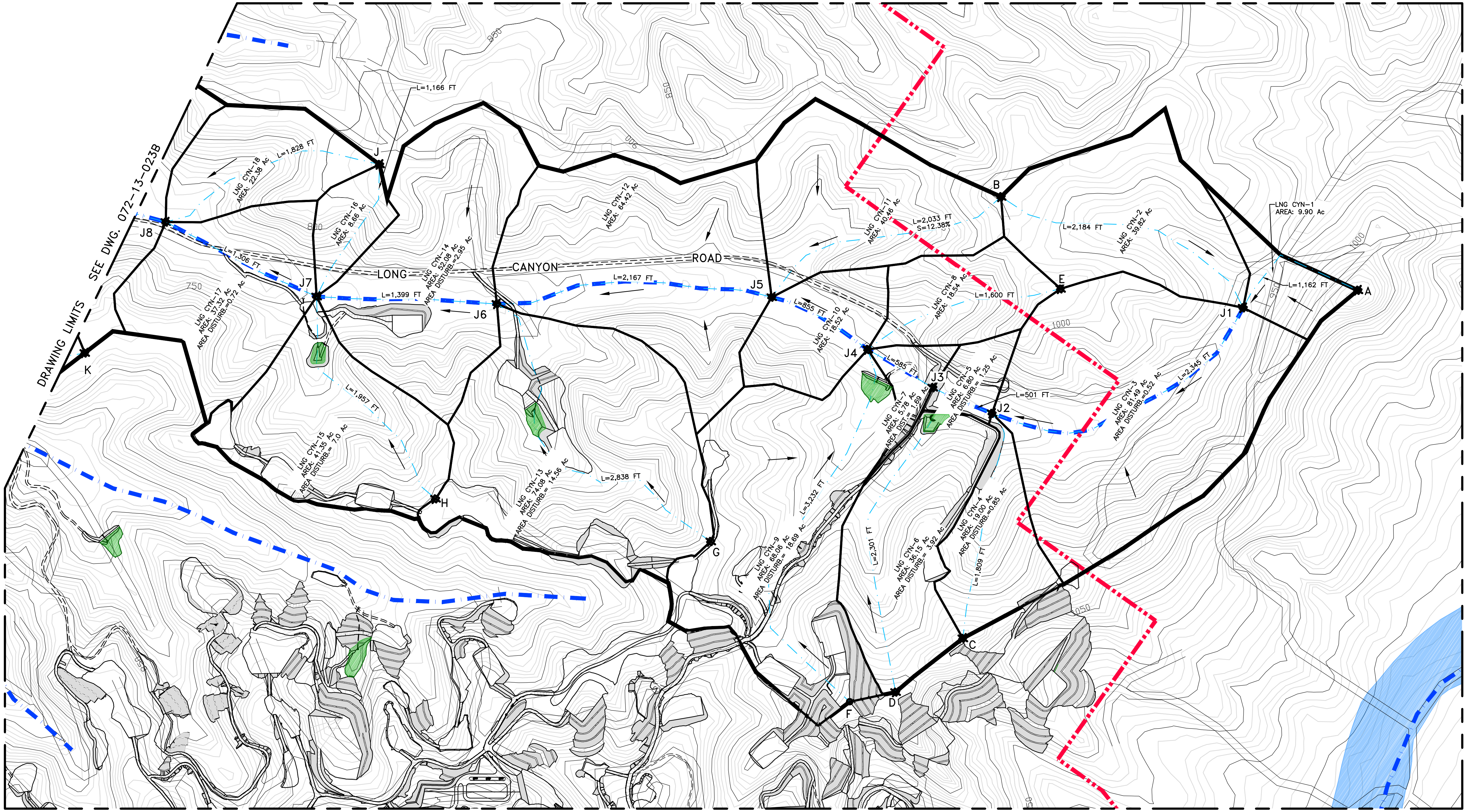
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – POST-CONSTRUCTION WATERSHED – UNNAMED BLUE LINE 1 & 2
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 400'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-024A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-024MS	

:FUNCTIONAL LOCATION NO.



PRELIMINARY NOT FOR CONSTRUCTION

LONG CANYON
SCALE: 1" = 400'

GRAPHIC SCALE
400 0 200 400 800 1600
(IN FEET)
1 inch = 400 ft.

LEGEND
- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- PROP. DETENTION BASIN LOCATION (FINAL DESIGN TO BE DETERMINED)

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=400' FILE: 13186/072-13-024MS
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 12/16/13 LAST CHANGED: 09/17/14

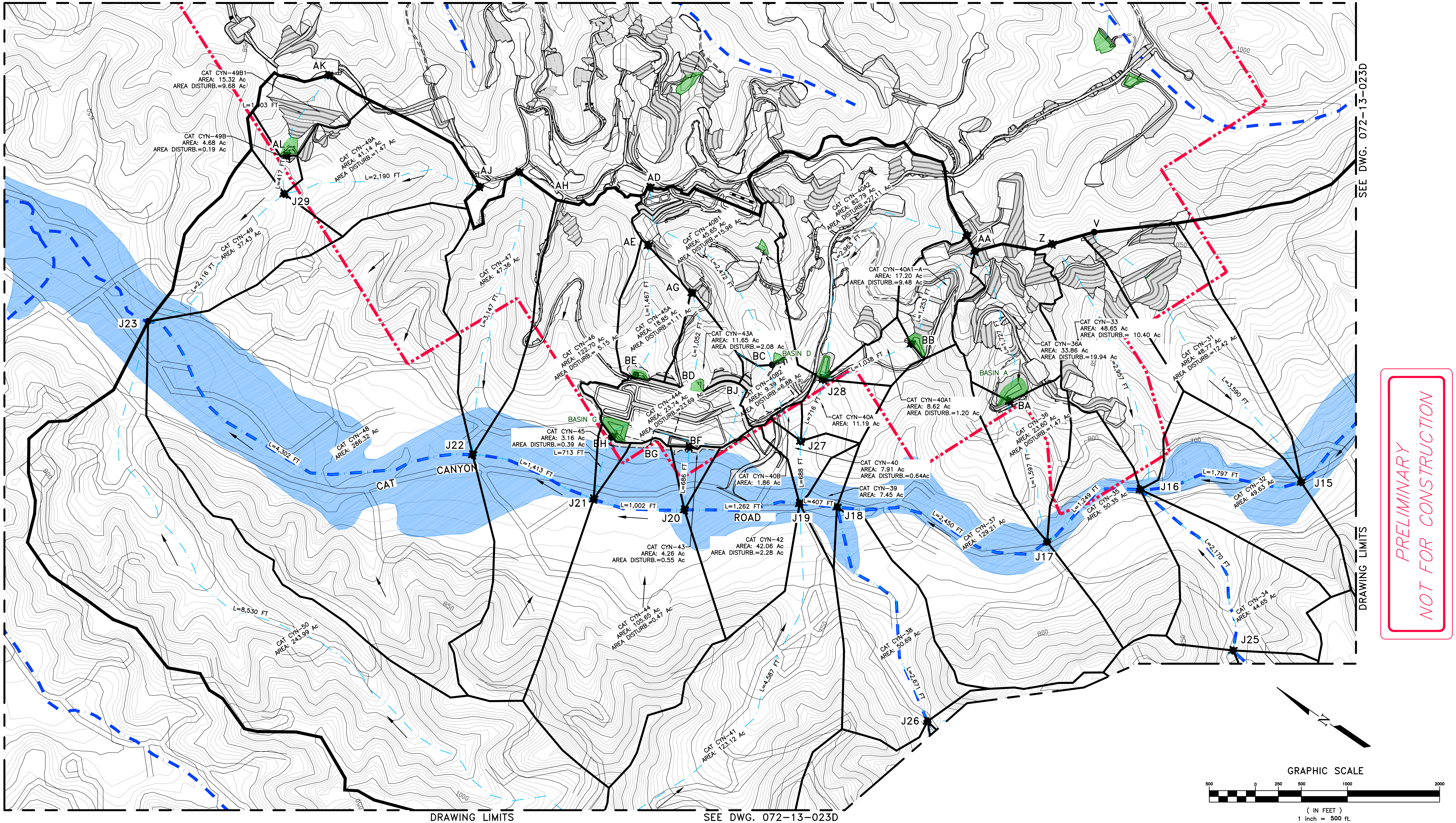
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – POST-CONSTRUCTION WATERSHED – LONG CANYON
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 400'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-024B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-024MS	

:FUNCTIONAL LOCATION NO.



DRAWING LIMITS

SEE DWG. 072-13-023D

CAT CANYON
SCALE: 1" = 500'

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- PROP. DETENTION BASIN LOCATION (FINAL DESIGN TO BE DETERMINED)

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=500'	FILE: 13186/072-13-024MS
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 12/16/13	LAST CHANGED: 09/17/14

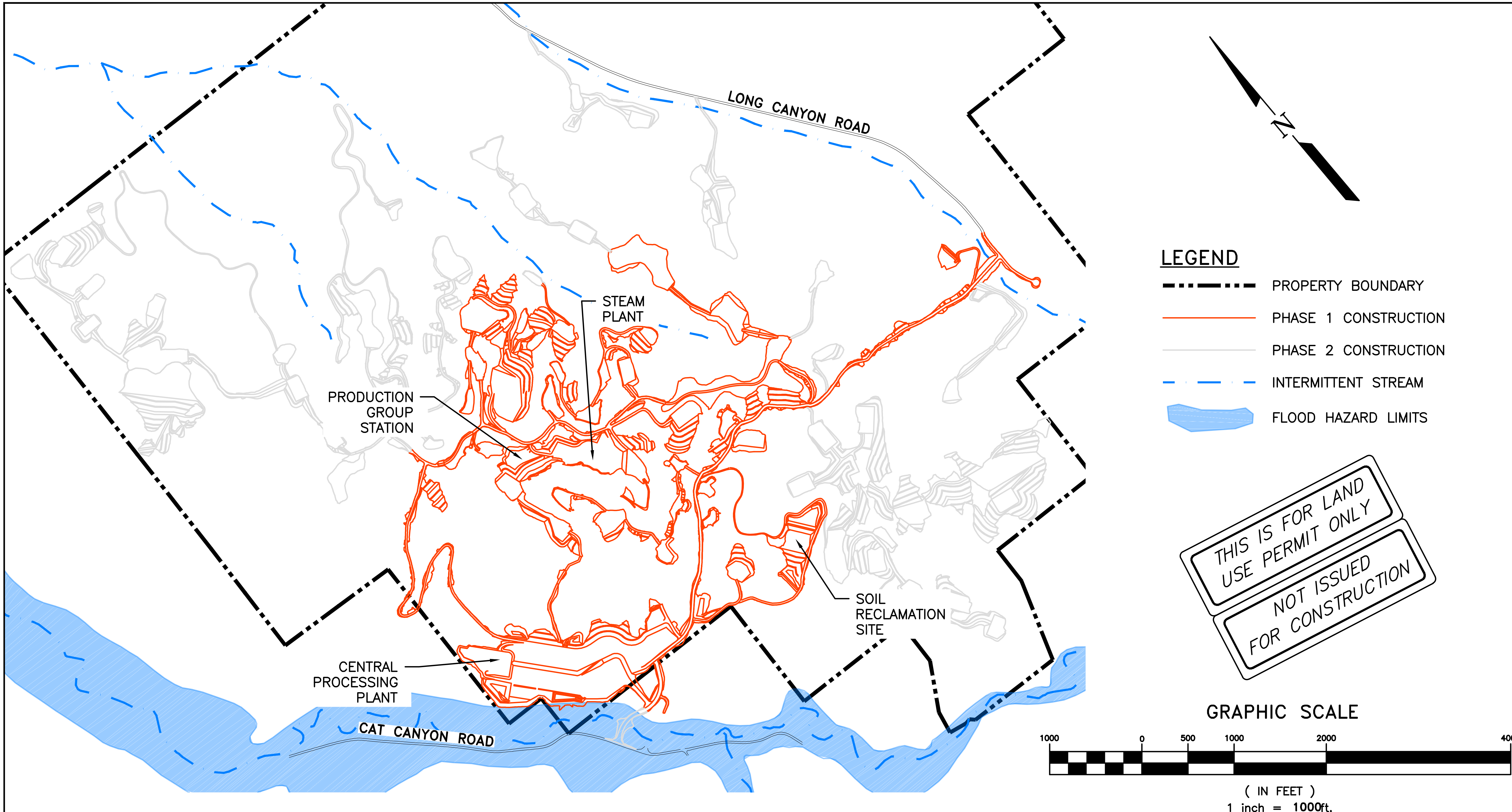
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – POST-CONSTRUCTION WATERSHED – CAT CANYON (NORTH)
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 500'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-024C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-024MS	

:FUNCTIONAL LOCATION NO.



DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=1000' FILE: 072-13-025A
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 06/17/14 LAST CHANGED: 08/28/14

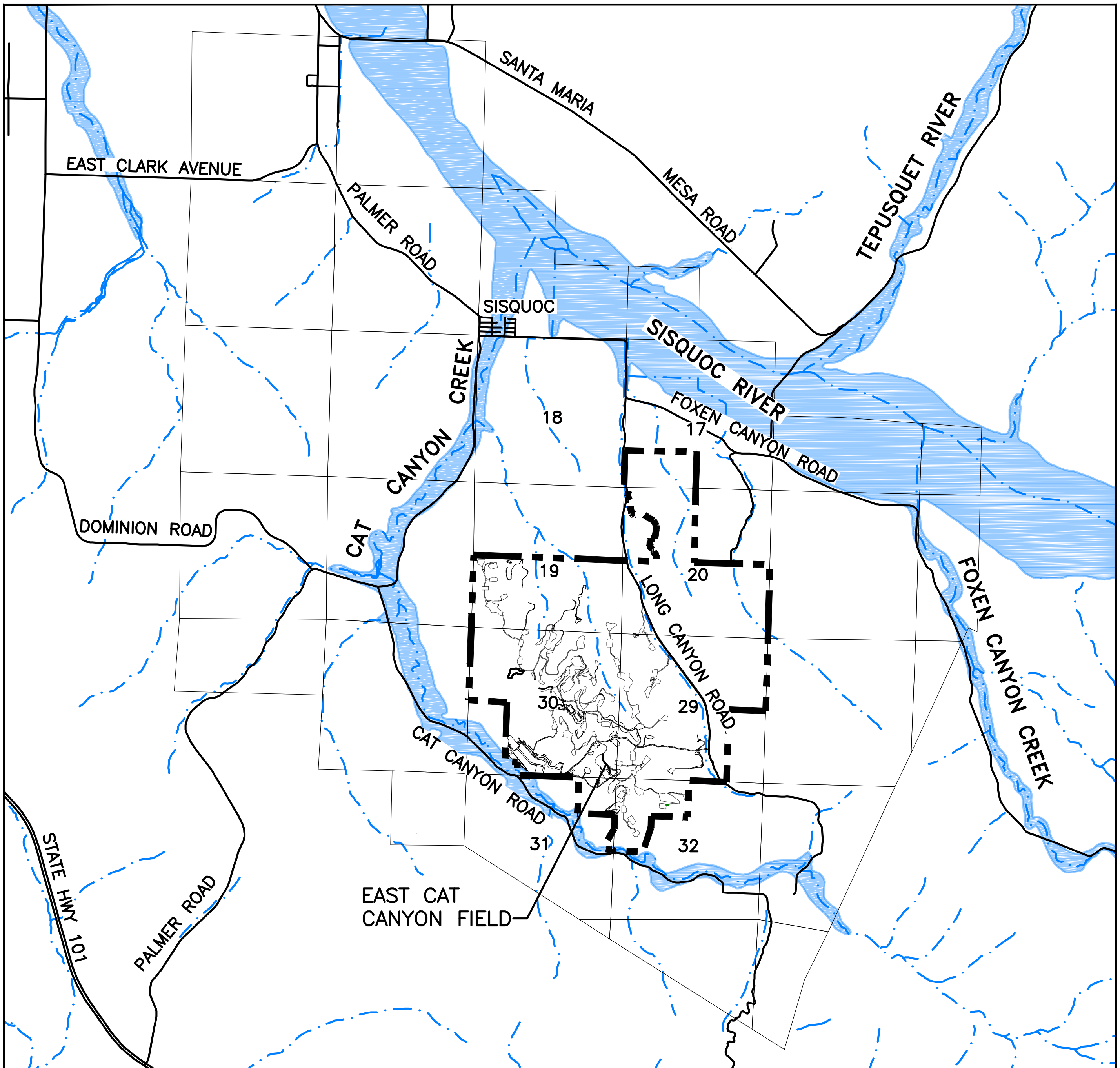
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/28/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

SITE PLAN – PHASE 1 CONSTRUCTION
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON	DATE: 08/28/14	SCALE: 1"=1000'	
CO. ENGINEER: TJCROSS ENGINEERS, INC.	ORIGINAL DWG NO.		
PROJ. MGR: ALI GOKGOZ	NO. 072-13-025A		REV. 0
DESIGNED BY: ROBIN DICKERSON			
DRAFTED BY: ROBERT AMARO			
ECCN NO. EAR99	CAD FILE NO. 072-13-025A		

:FUNCTIONAL LOCATION NO.



LEGEND

AERA PROPERTY BOUNDARY
SECTION LINES
INTERMITTENT STREAM
FLOOD HAZARD LIMITS

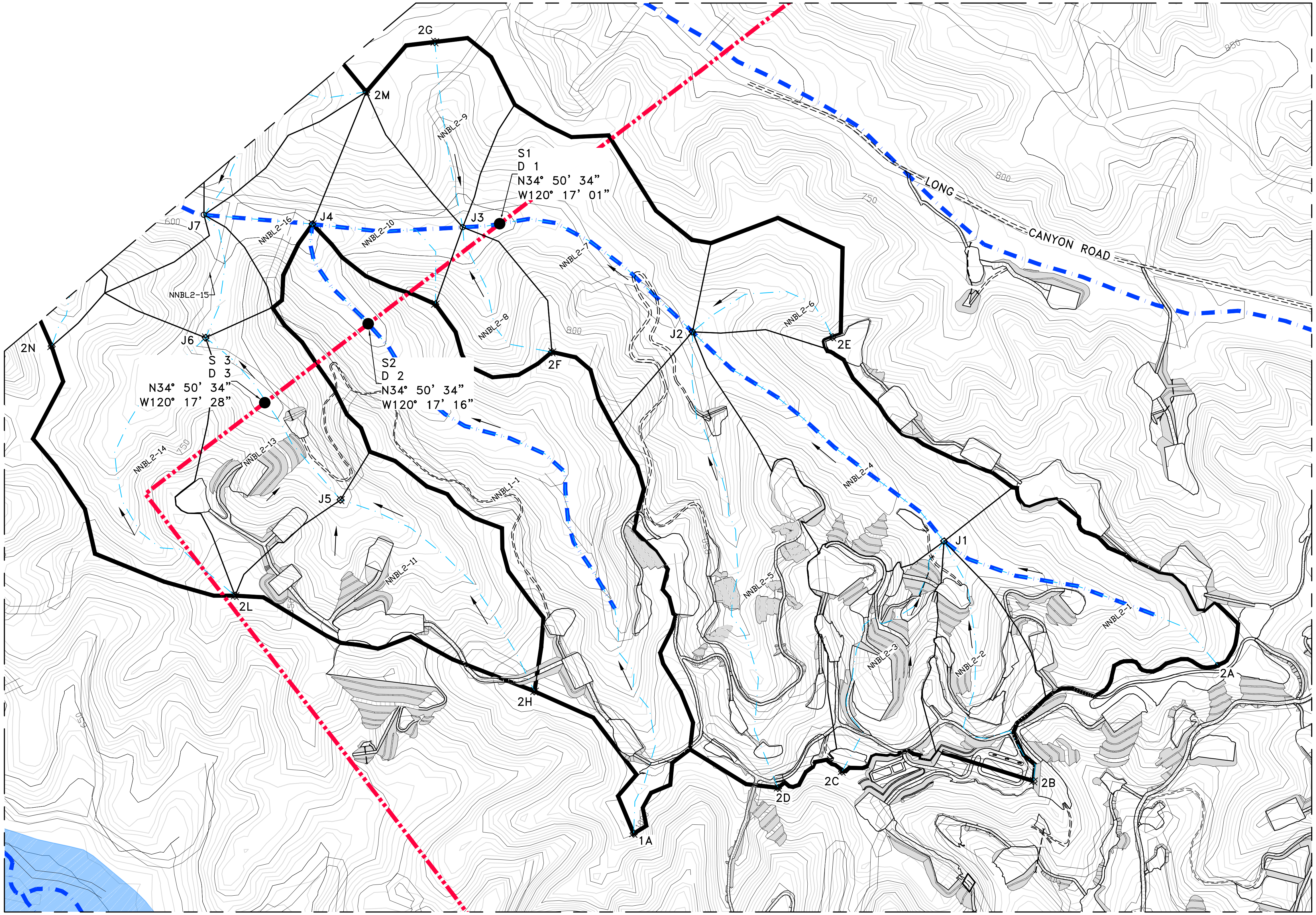
08/20/14	A	ISSUED FOR REVIEW	RAA	RSD	EP	
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG	

AERA

VICINITY MAP – HYDROLOGY
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 5000'
CO. ENGINEER:	TJCROSS ENGINEERS, INC.	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072–13–026A	REV. A
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072–13–026A	

:FUNCTIONAL LOCATION NO.



UNNAMED BLUE LINE 1 & 2

SCALE: 1" = 400'

N

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- S 1 SAMPLING LOCATION
- D 1 DISCHARGE LOCATION

PROGRESS PRINT
NOT READY FOR ISSUE

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=400'	FILE: 13186/072-13-027MS
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ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 12/16/13	LAST CHANGED: 08/28/14

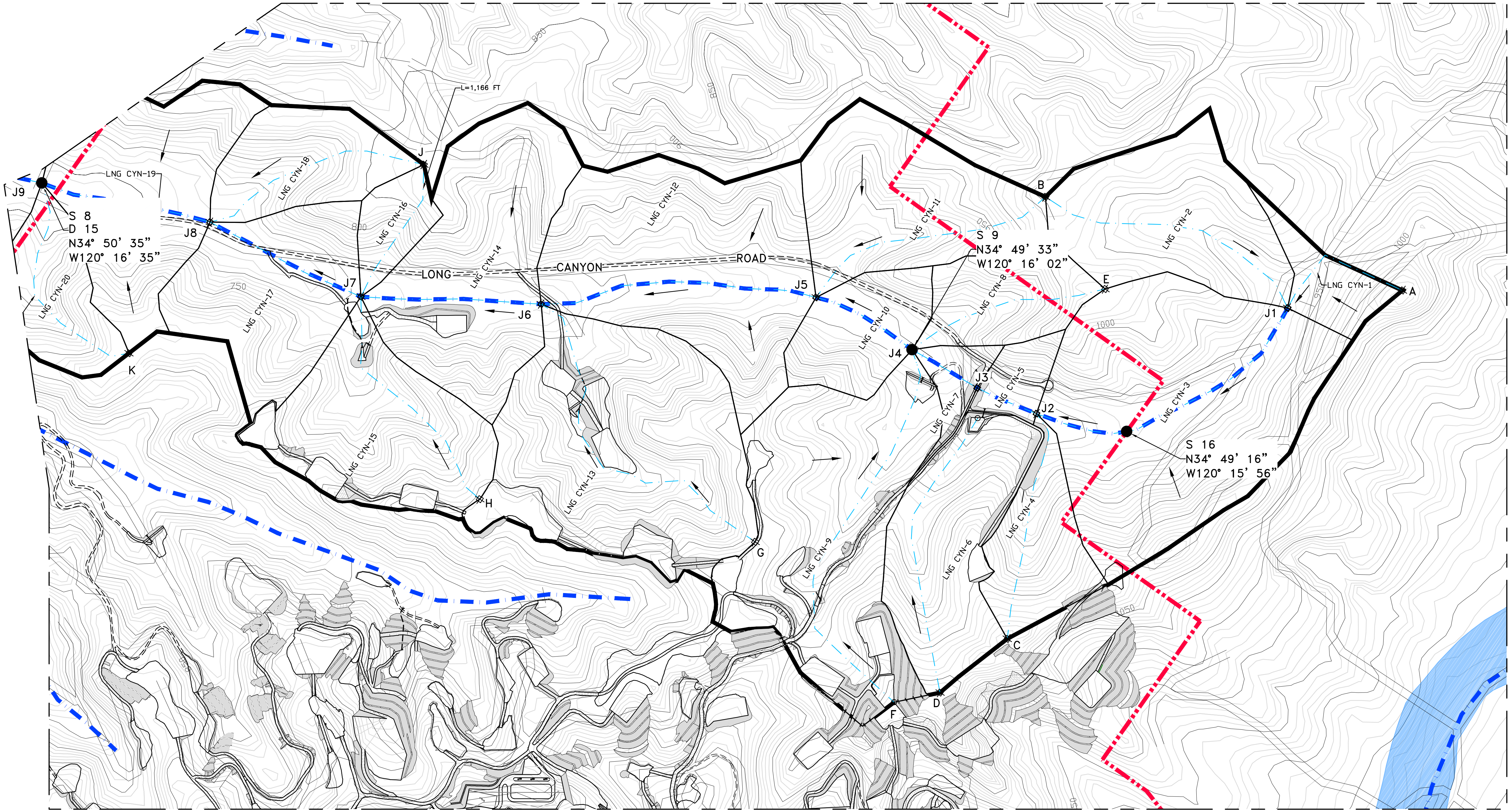
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/28/14	A	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

HYDROLOGY MAP – WATER SAMPLING LOCATIONS – UNNAMED BLUE LINE 1 & 2
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/28/14	SCALE: 1" = 400'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-027A	REV. A
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-027MS	

:FUNCTIONAL LOCATION NO.



LONG CANYON

SCALE: 1" = 400'

PRELIMINARY
NOT FOR CONSTRUCTION

N

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- ● S 8 SAMPLING LOCATION
- ● D 14 DISCHARGE LOCATION

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=400' FILE: 13186/072-13-027MS
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 12/16/13 LAST CHANGED: 08/28/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/28/14	A	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

HYDROLOGY MAP – WATER SAMPLING LOCATIONS – LONG CANYON
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/28/14	SCALE: 1" = 400'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-027B	REV. A
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-027MS	

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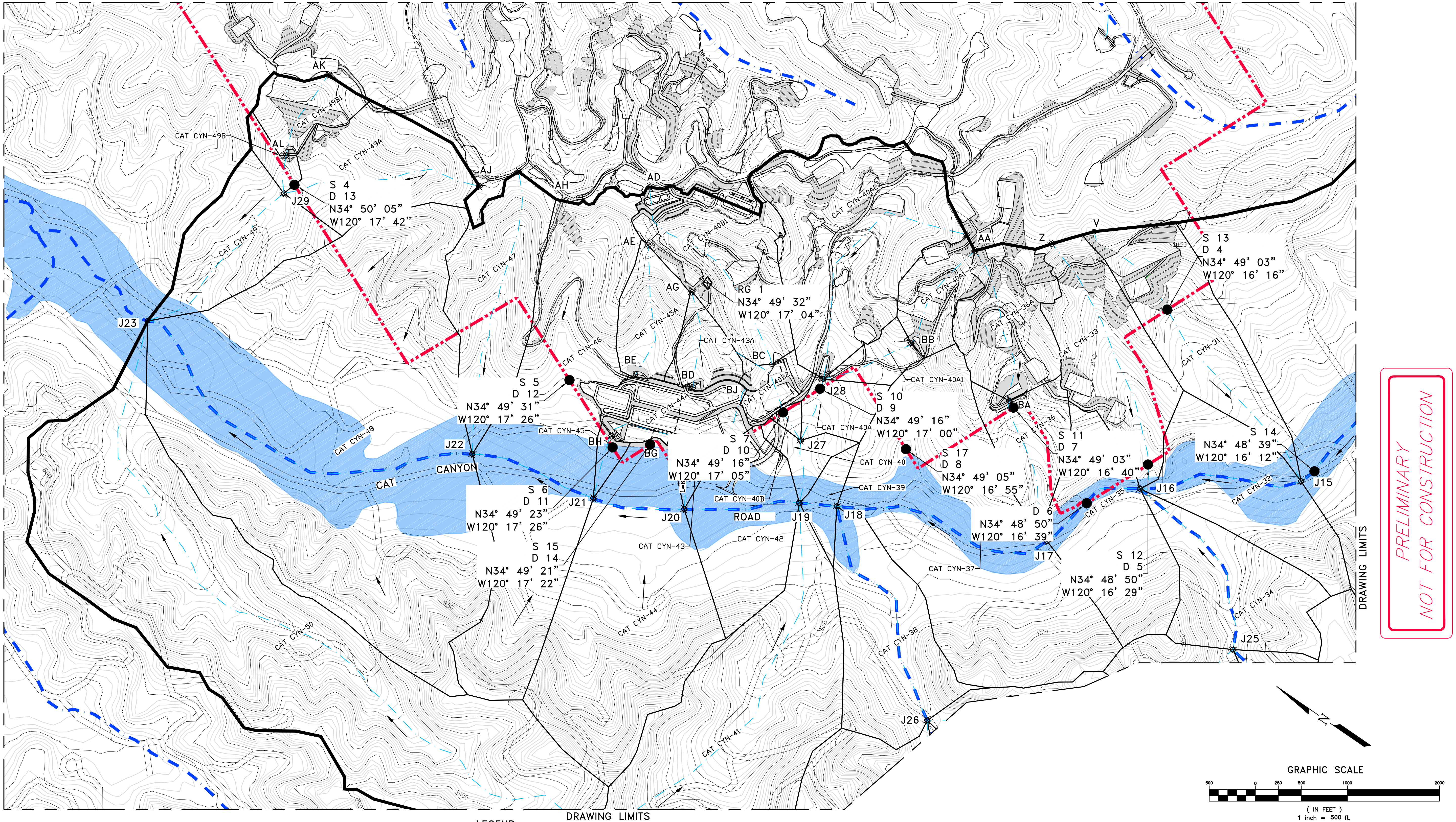

PRELIMINARY
NOT FOR CONSTRUCTION

CAT CANYON
SCALE: 1" = 500'

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- ● S 6 SAMPLING LOCATION
- ● D 11 DISCHARGE LOCATION
- ◇ RG 1 RAIN GAUGE #

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=500'	FILE: 13186/072-13-027MS
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DATE STARTED: 12/16/13	LAST CHANGED: 08/28/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/28/14	A	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

HYDROLOGY MAP – WATER SAMPLING LOCATIONS – CAT CANYON (NORTH)
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/28/14	SCALE: 1" = 500'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-027C	REV. A
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-027MS	

:FUNCTIONAL LOCATION NO.

Appendix C: Permit Registration Documents

Permit Registration Documents included in this Appendix

Y/N	Permit Registration Document
	Notice of Intent
	Risk Assessment
	Certification
	Post Construction Water Balance
	Copy of Annual Fee Receipt
	ATS Design Documents
	Site Map, see Appendix B

Appendix D: SWPPP Amendment Certifications

INSTRUCTIONS

- *Include certification statements for each SWPPP amendment.*

SWPPP Amendment No. ____________

Project Name: ____

Project Number: ____

Qualified SWPPP Developer's Certification of the Stormwater Pollution Prevention Plan Amendment

"This Stormwater Pollution Prevention Plan and attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Order No. 2009-009-DWQ as amended by 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD's Signature	Date
QSD Name	QSD Certificate Number
Title and Affiliation	Telephone
Address	Email

Appendix E: Submitted Changes to PRDs

Log of Updated PRDs

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, with revisions and amendments recorded in Appendix C. Updated PRDs submitted electronically via SMARTS can be found in this Appendix.

This appendix includes all of the following updated PRDs (check all that apply):

☐ Revised Notice of Intent (NOI);

☐ Revised Site Map;

☐ Revised Risk Assessment;

☐ New landowner's information (name, address, phone number, email address); and

☐ New signed certification statement.

____
Legally Responsible Person [if organization]

Signature of [Authorized Representative of] Legally Responsible Person or Approved Signatory	Date
Name of [Authorized Representative of] Legally Responsible Person or Approved Signatory	Telephone Number

Appendix F: Construction Schedule

INSTRUCTIONS

- *Include a copy of construction schedule*

Appendix G: Construction Activities, Materials Used, and Associated Pollutants

Table G.1 Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants	Pollutant Category[(1)]
Grading and Land Development	Liquid waste	• Wash waters	Metals, Synthetic Organics
	Removal of existing structures	• Demolition of asphalt, concrete, masonry, framing, roofing, metal structures.	Metals, Oil and Grease, Synthetic Organics
	Sanitary waste	• Portable toilets	Nutrients
	Solid waste	• Litter, trash and debris • Vegetation	Gross Pollutants
	Vehicle and equipment use	• Equipment operation • Equipment maintenance • Equipment washing • Equipment fueling	Oil and Grease
Streets and Utilities Phase	Asphalt paving/curbs	• Hot and cold mix asphalt	Oil and Grease
	Liquid waste	• Wash waters • Pipeline testing/flushing	Metals, Synthetic Organics
	Plumbing	• Solder (lead, tin), flux (zinc chloride), pipe fitting • Galvanized metal in nails, fences, and electric wiring	Metals, Synthetic Organics
	Sanitary waste	• Portable toilets	Nutrients
	Solid waste	• Litter, trash and debris • Vegetation	Gross Pollutants
	Utility line testing and flushing	• Hydrostatic test water • Pipe flushing	Synthetic Organics
	Vehicle and equipment use	• Equipment operation • Equipment maintenance • Equipment washing • Equipment fueling	Oil and Grease
Vertical Construction Phase	Adhesives	• Adhesives, glues, resins, epoxy synthetics, PVC cement • Caulks, sealers, putty, sealing agents and • Coal tars (naphtha, pitch)	Oil and Grease, Synthetic Organics[1]
	Cleaners	• Polishes (metal, ceramic, tile) • Etching agents • Cleaners, ammonia, lye, caustic sodas, bleaching agents and chromate salts	Metals, Synthetic Organics

Table G.1 Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants	Pollutant Category(1)
Vertical Construction Phase	Concrete / Masonry	• Cement and brick dust • Colored chalks • Concrete curing compounds • Glazing compounds • Surfaces cleaners • Saw cut slurries • Tile cutting	Metals, Synthetic Organics
	Drywall	• Saw-cutting drywall	Metals
	Framing/Carpentry	• Sawdust, particle board dust, and treated woods • Saw cut slurries	Metals, Synthetic Organics
	Heating, Ventilation, Air Conditioning	• Demolition or construction of air condition and heating systems	Metals, Synthetic Organics
	Insulation	• Demolition or construction involving insulation, venting systems	Metals, Synthetic Organics
	Liquid waste	• Wash waters	Metals, Synthetic Organics
	Painting	• Paint thinners, acetone, methyl ethyl ketone, stripper paints, lacquers, varnish, enamels, turpentine, gum spirit, solvents, dyes, stripping pigments and sanding	Metals, Synthetic Organics
	Plumbing	• Solder (lead, tin), flux (zinc chloride), pipe fitting • Galvanized metal in nails, fences, and electric wiring	Metals, Synthetic Organics
	Roofing	• Flashing • Saw cut slurries (tile cutting) • Shingle scrap and debris	Metals, Oil and Grease, Synthetic Organics
	Sanitary waste	• Portable toilets	Nutrients
	Solid waste	• Litter, trash and debris	Gross Pollutants
	Vehicle and equipment use	• Equipment operation • Equipment maintenance • Equipment washing • Equipment fueling	Oil and Grease

Table G.1 Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants	Pollutant Category[1]
Landscaping and Site Stabilization Phase	Liquid waste	• Wash waters • Irrigation line testing/flushing	Metals, Synthetic Organics
	Planting / Vegetation Management	• Vegetation control (pesticides/herbicides) • Planting • Plant maintenance • Vegetation removal	Nutrients, Metals, Synthetic Organics
	Sanitary waste	• Portable toilets	Nutrients
	Soil preparation/amendments	• Use of soil additives/amendments	Nutrients
	Solid waste	• Litter, trash and debris • Vegetation	Gross Pollutants
	Vehicle and equipment use	• Equipment operation • Equipment maintenance • Equipment washing • Equipment fueling	Oil and Grease

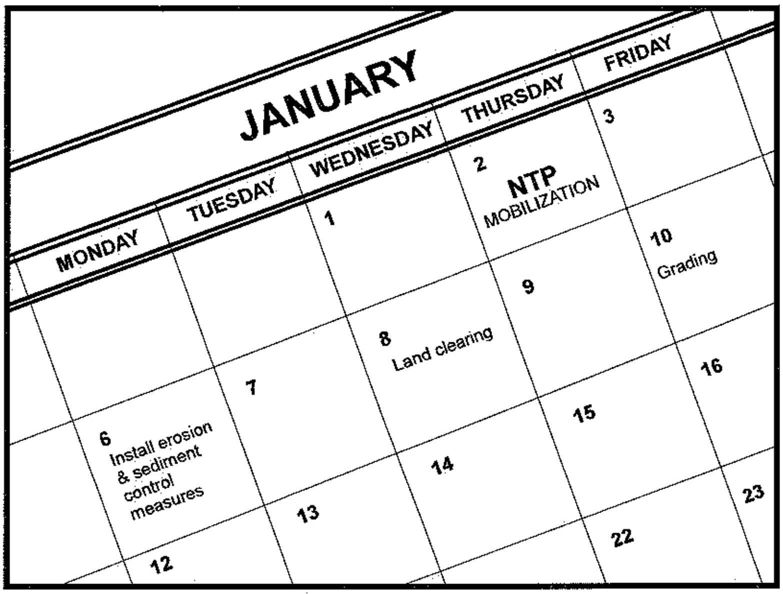
[1] Categories per CASQA BMP Handbook (i.e., Sediment, Nutrients, Bacteria and Viruses, Oil and Grease, Metals, Synthetic Organics, Pesticides, Gross Pollutants, and Vector Production)

Appendix H: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets

INSTRUCTIONS

- *Include Fact Sheets for BMPs identified in Section 3 of this SWPPP*

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.

- Plan the project and develop a schedule showing each phase

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

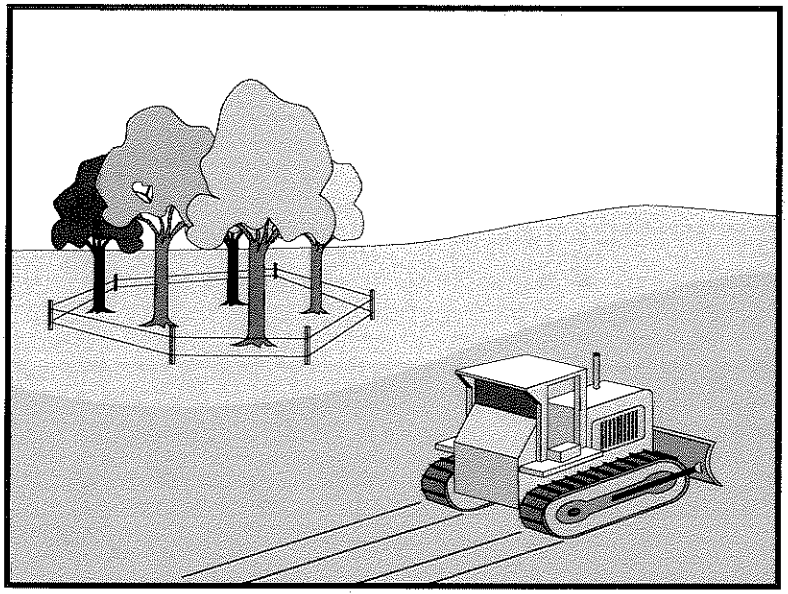
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Limitations

- Requires forward planning by the owner/developer,

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contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.

- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.

  - Orange colored plastic mesh fencing works well.

  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.

- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.

- Consider the impact of grade changes to existing vegetation and the root zone.

- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.

- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

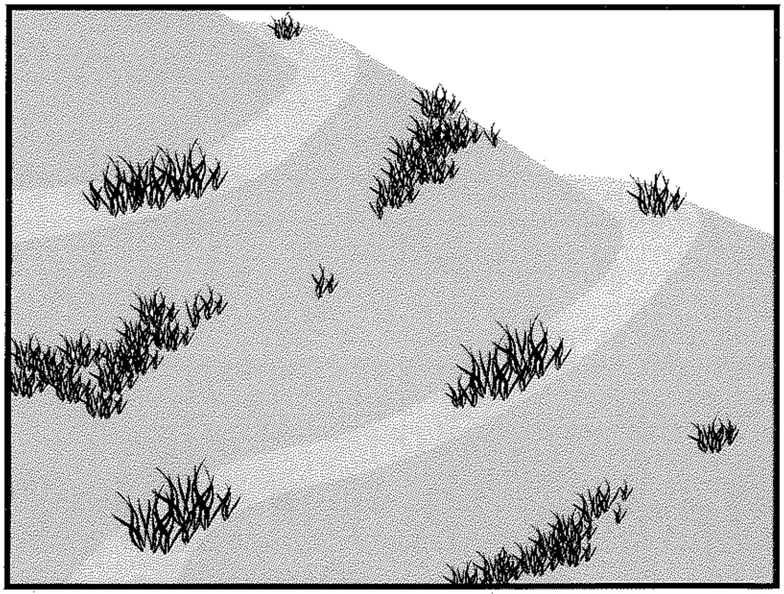
References

County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

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Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:

  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.

- Hydraulic seed without mulch does not provide immediate erosion control.

- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).

- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.

- Temporary vegetation may have to be removed before permanent vegetation is applied.

- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

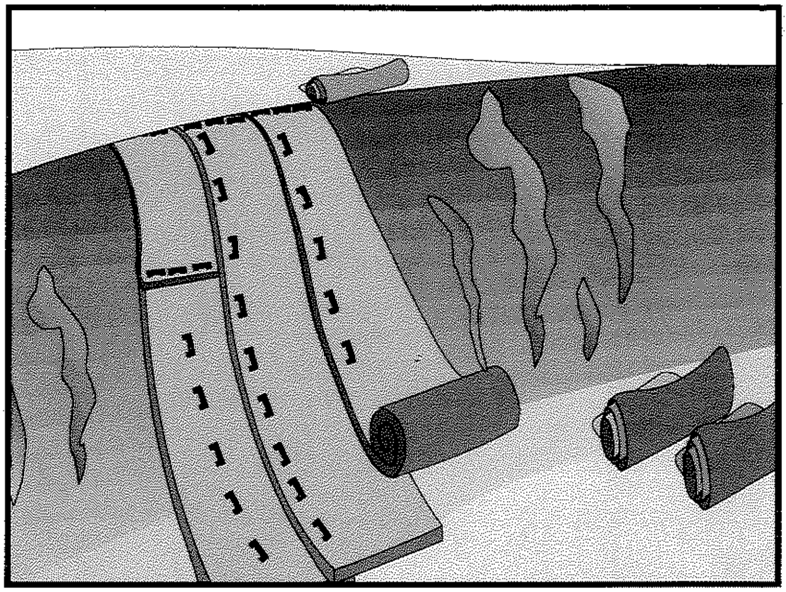
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.



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Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

Description and Purpose

Mattings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

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- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
    - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
    - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation
Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

  - **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))
Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Biodegradable	Jute Mesh	$6,000-$7,000	$6,600-$7,700
	Curled Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Straw	$8,000-$10,500	$8,800-$11,050
	Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Coconut Fiber	$13,000-$14,000	$14,300-$15,400
	Coconut Fiber Mesh	$30,000-$33,000	$33,000-$36,300
	Straw Coconut Fiber	$10,000-$12,000	$11,000-$13,200
Non-Biodegradable	Plastic Netting	$2,000-$2,200	$2,200-$2,220
	Plastic Mesh	$3,000-$3,500	$3,300-$3,850
	Synthetic Fiber with Netting	$34,000-$40,000	$37,400-$44,000
	Bonded Synthetic Fibers	$45,000-$55,000	$49,500-$60,500
	Combination with Biodegradable	$30,000-$36,000	$33,000-$39,600

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.

- Make sure matting is uniformly in contact with the soil.

- Check that all the lap joints are secure.

- Check that staples are flush with the ground.

References

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service, January 1991.

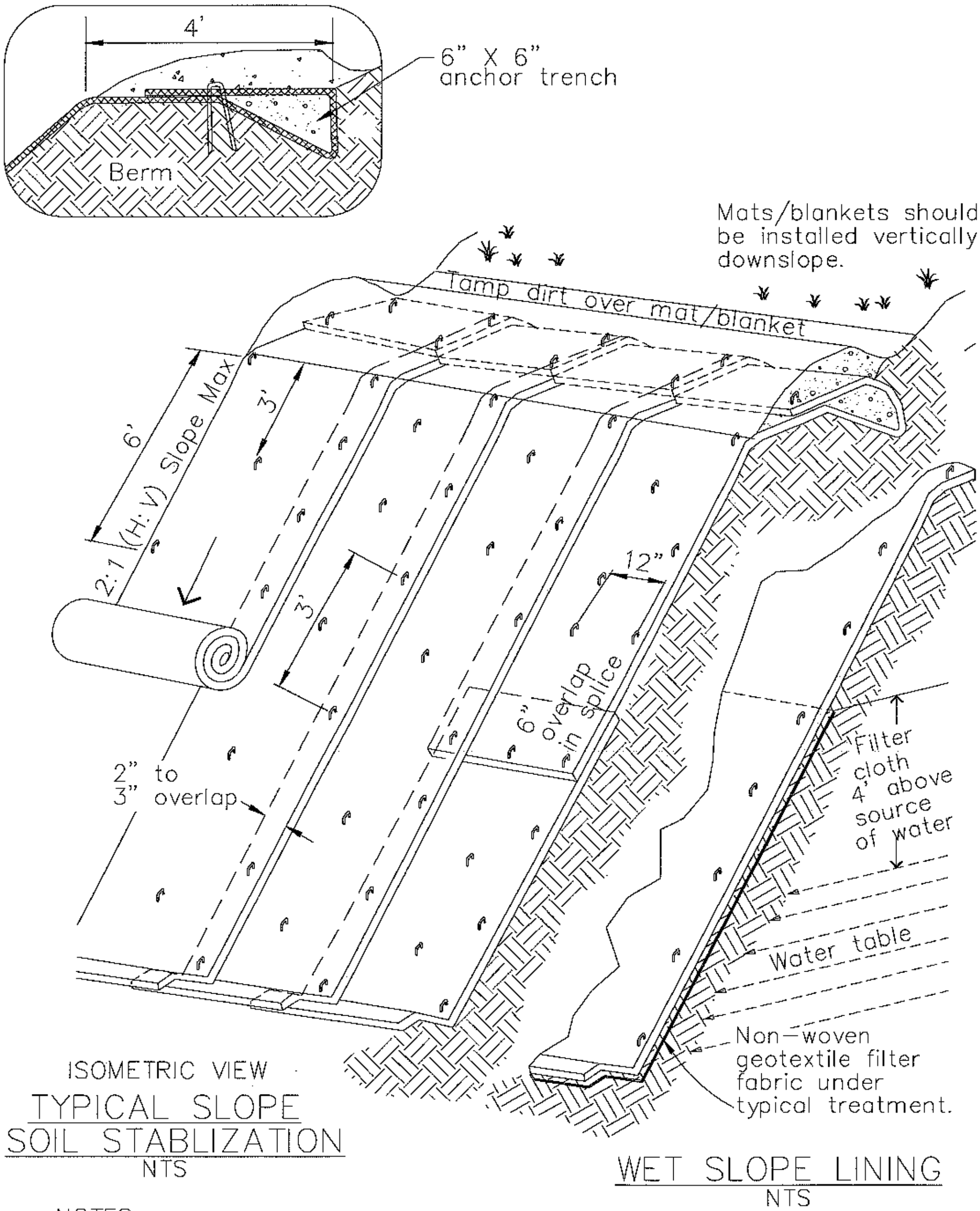
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

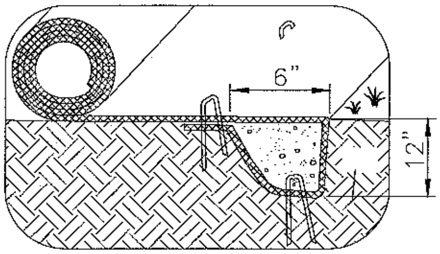
Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



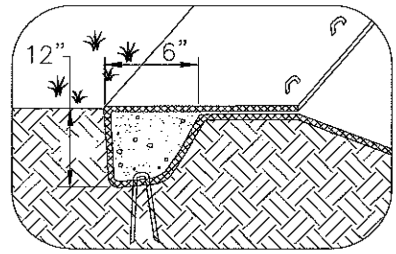
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

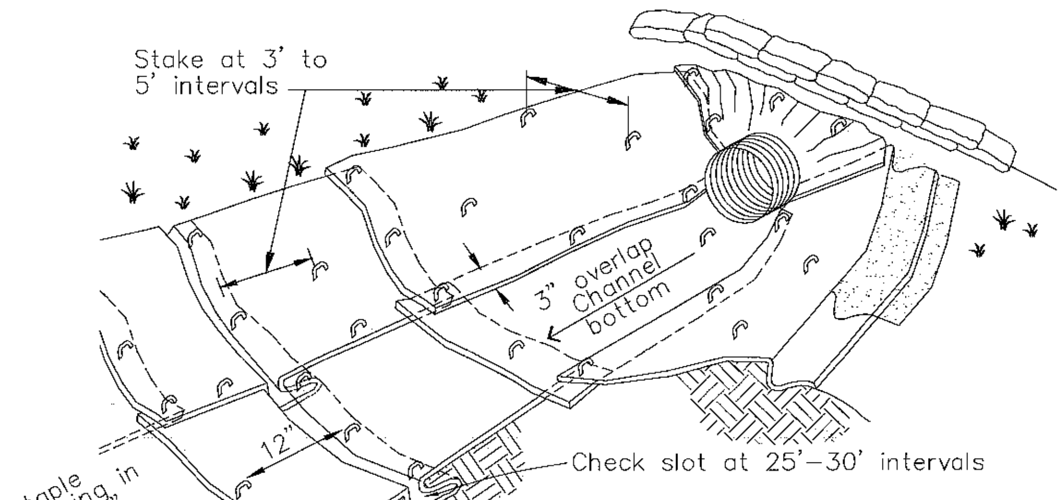
TYPICAL INSTALLATION DETAIL



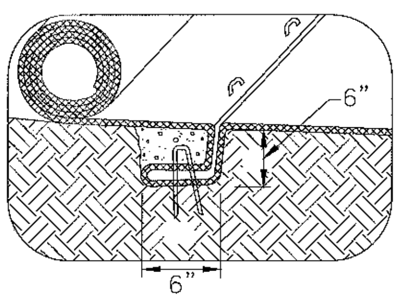
INITIAL CHANNEL ANCHOR TRENCH
NTS



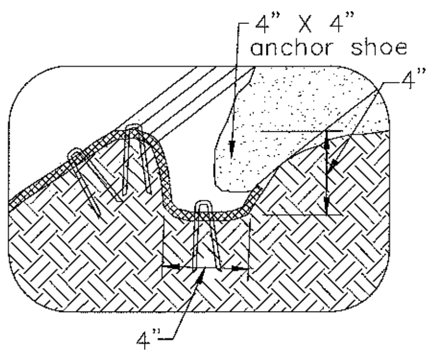
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
NTS



ISOMETRIC VIEW
NTS



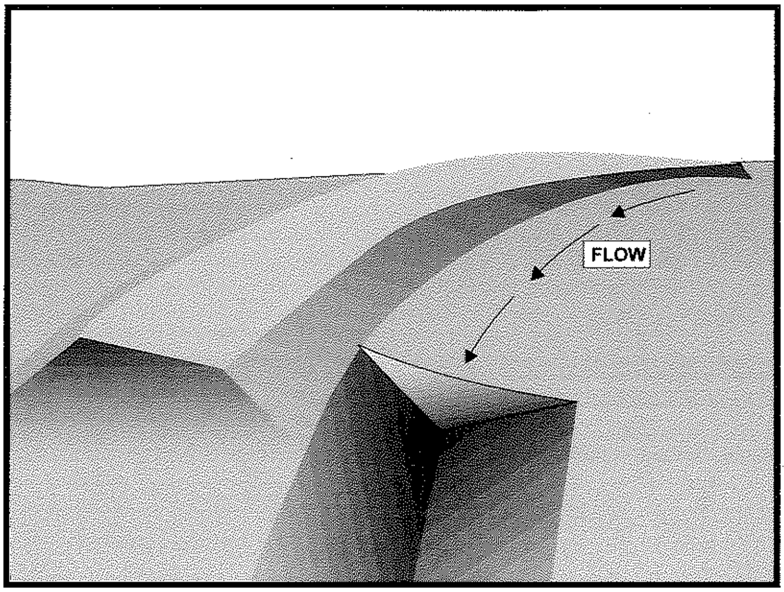
INTERMITTENT CHECK SLOT
NTS



LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:
1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

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- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

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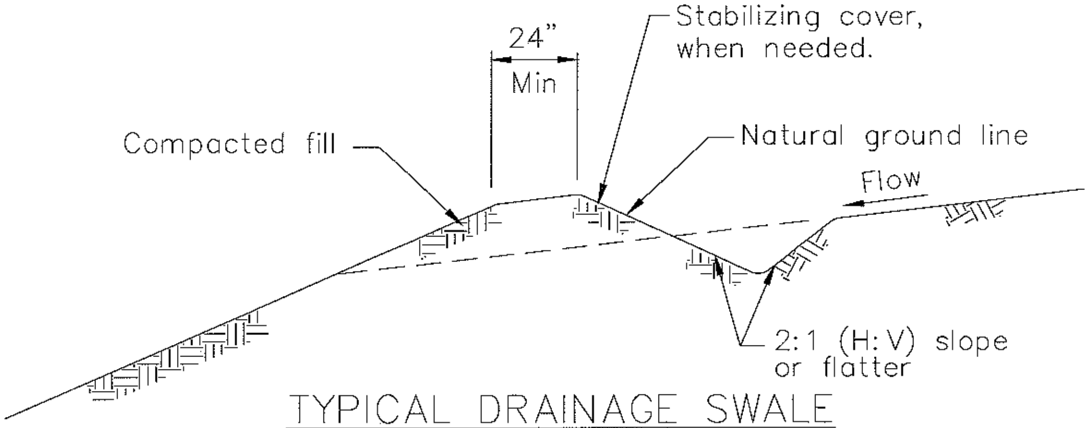
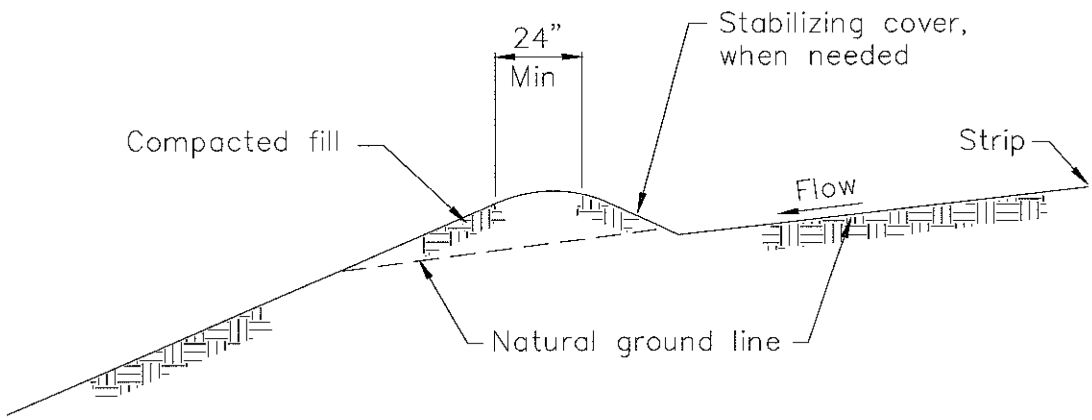


TYPICAL DRAINAGE SWALE
NOT TO SCALE

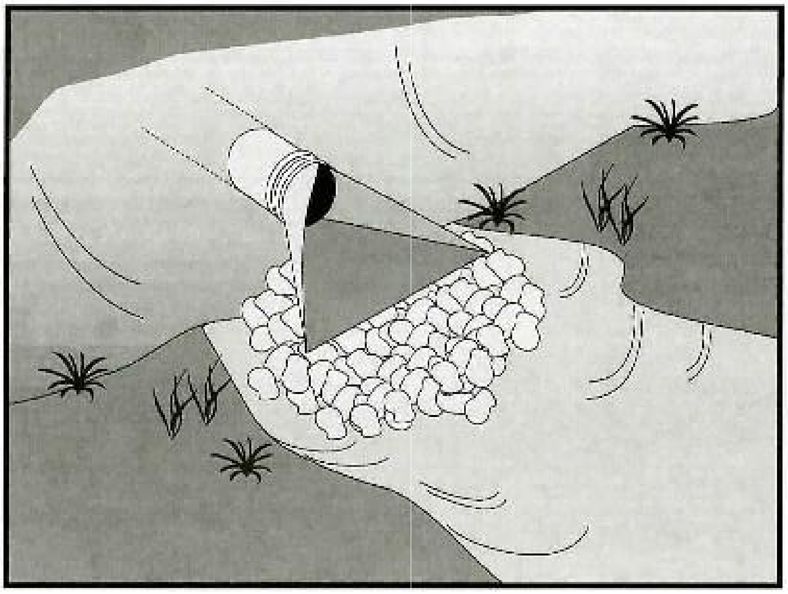
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.
- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

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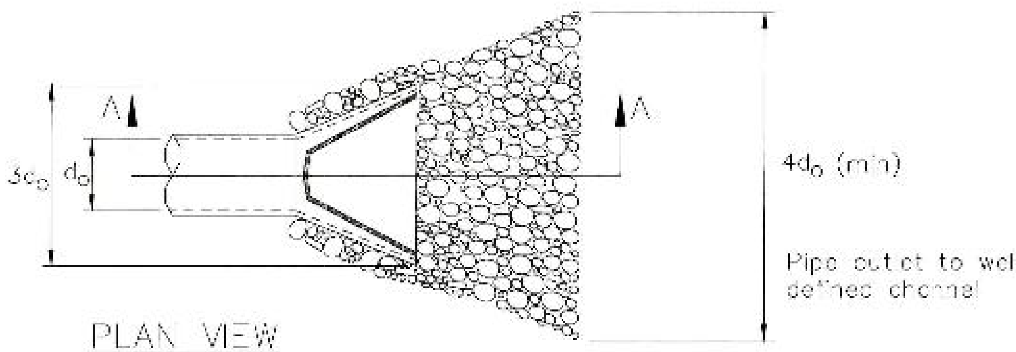
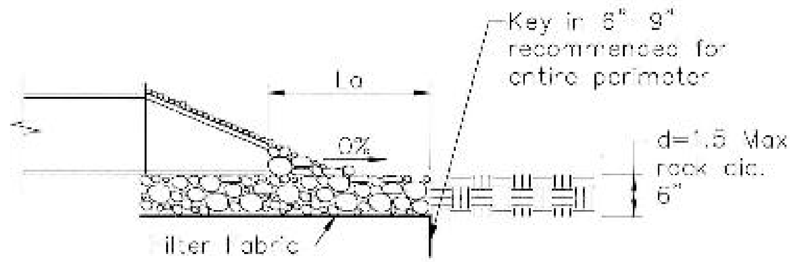


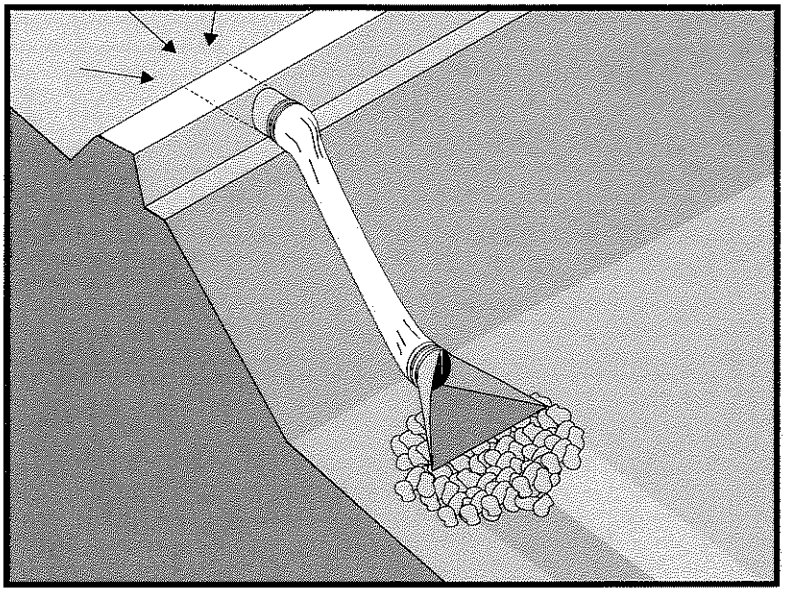
PLAN VIEW



SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS



Categories

EC	Erosion Control	☑
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-9 Earth Dike, Drainage Swales

Description and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Suitable Applications

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut and fill slopes where water can accumulate.
- Emergency spillway for a sediment basin.

Limitations

Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion.

- Maximum drainage area per slope drain is 10 acres. (For large areas use a paved chute, rock lined channel, or additional pipes.)
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.
  - During large storms, pipe slope drains may become clogged or over charged, forcing water around the pipe

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and causing extreme slope erosion.

- If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion and potential failure of the structure.

- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.

- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in energy dissipaters associated with slope drain outlets.

Implementation

General

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent stormwater collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion.

Installation

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope and the outlet at the bottom of the slope. This BMP typically is used in combination with a diversion control, such as an earth dike or drainage swale at the top of the slope.

The following criteria must be considered when siting slope drains.

- Permanent structures included in the project plans can often serve as construction BMPs if implemented early. However, the permanent structure must meet or exceed the criteria for the temporary structure.

- Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.

- Slope drains must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.

- Outlets must be stabilized with riprap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin. See EC-10, Velocity Dissipation Devices.

- Debris racks are recommended at the inlet. Debris racks located several feet upstream of the inlet can usually be larger than racks at the inlet, and thus provide enhanced debris protection and less plugging.

- Safety racks are also recommended at the inlet and outlet of pipes where children or animals could become entrapped.

- Secure inlet and surround with dikes to prevent gully erosion and anchor pipe to slope.

- When using slope drains, limit drainage area to 10 acres per pipe. For larger areas, use a rock lined channel or a series of pipes.
- Size to convey at least the peak flow of a 10-year storm. The design storm is conservative due to the potential impact of system failures.
- Maximum slope generally limited to 2:1 (H:V) as energy dissipation below steeper slopes is difficult.
- Direct surface runoff to slope drains with interceptor dikes. See BMP EC-9, Earth Dikes and Drainage Swales. Top of interceptor dikes should be 12 in. higher than the top of the slope drain.
- Slope drains can be placed on or buried underneath the slope surface.
- Recommended materials include both metal and plastic pipe, either corrugated or smooth wall. Concrete pipe can also be used.
- When installing slope drains:
  - Install slope drains perpendicular to slope contours.
  - Compact soil around and under entrance, outlet, and along length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - Check to ensure that pipe connections are watertight.
  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
  - Protect outlet of slope drains using a flared end section when outlet discharges to a flexible energy dissipation device.
  - A flared end section installed at the inlet will improve flow into the slope drain and prevent erosion at the pipe entrance. Use a flared end section with a 6 in. minimum toe plate to help prevent undercutting. The flared section should slope towards the pipe inlet.

Design and Layout

The capacity for temporary drains should be sufficient to convey at least the peak runoff from a 10-year rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow and any erosion of the slope. The design storm is purposely conservative due to the potential impacts associated with system failures.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

Minimum Pipe Diameter (Inches)	Maximum Drainage Area (Acres)
12	1.0
18	3.0
21	5.0
24	7.0
30	10.0

Larger drainage areas can be treated if the area can be subdivided into areas of 10 acres or less and each area is treated as a separate drainage. Drainage areas exceeding 10 acres must be designed by a Registered Civil Engineer and approved by the agency that issued the grading permit.

Materials:

Soil type, rainfall patterns, construction schedule, local requirements, and available supply are some of the factors to be considered when selecting materials. The following types of slope drains are commonly used:

- **Rigid Pipe:** This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured onto the slope surface or buried in a trench. Concrete thrust blocks must be used when warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.

- **Flexible Pipe**: The flexible pipe slope drain consists of a flexible tube of heavy duty plastic, rubber, or composite material. The tube material is securely anchored onto the slope surface. The tube should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or watertight collars.

- **Section Downdrains**: The section downdrain consists of pre-fabricated, section conduit of half round or third round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.

- **Concrete-lined Terrace Drain:** This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are typically specified as permanent structures and if installed early, can serve as slope drains during construction, which should be designed according to local drainage design criteria.

Costs

- Cost varies based on pipe selection and selected outlet protection.

Corrugated Steel Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12"	$19.60 per LF
15"	$22.00
18"	$26.00
24"	$32.00
30"	$50.00
PVC Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12"	$24.50
14"	$49.00
16"	$51.00
18"	$54.00
20"	$66.00
24"	$93.00
30"	$130.00

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.

- Insert inlet for clogging or undercutting. Remove debris from inlet to maintain flows. Repair undercutting at inlet and if needed, install flared section or rip rap around the inlet to prevent further undercutting.

- Inspect pipes for leakage. Repair leaks and restore damaged slopes.

- Inspect slope drainage for accumulations of debris and sediment.

- Remove built up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.
- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).
- Pipe anchors must be checked to ensure that the pipe remains anchored to the slope. Install additional anchors if pipe movement is detected.

References

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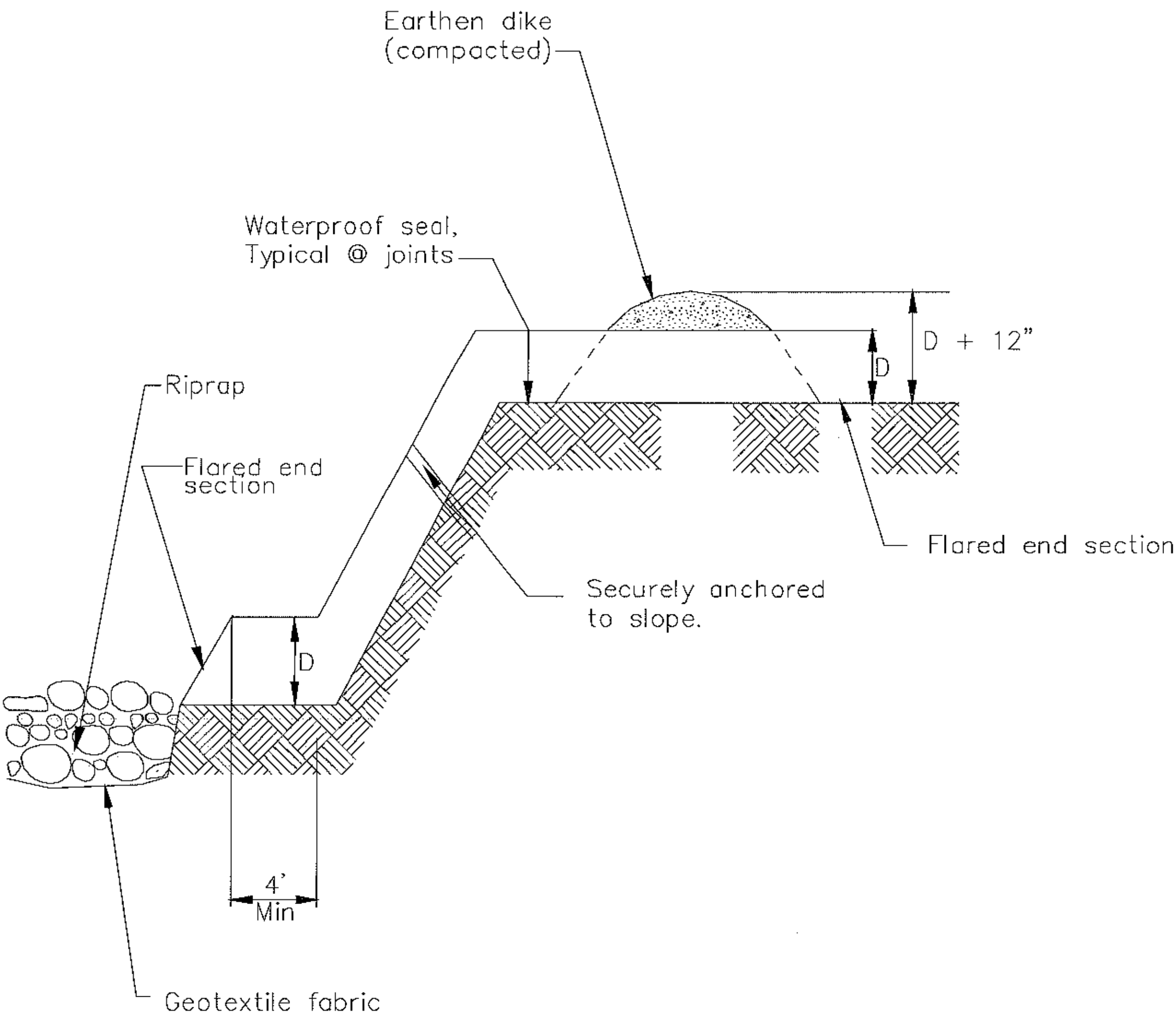
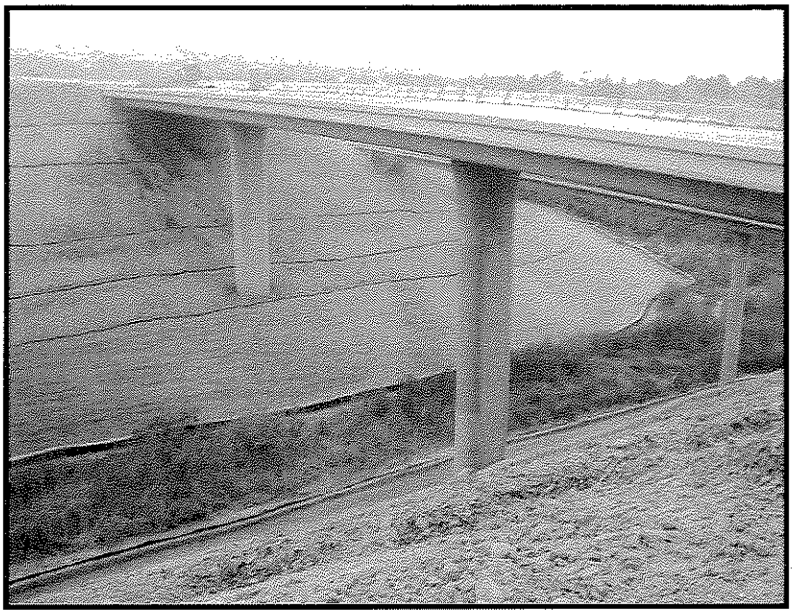


TYPICAL SLOPE DRAIN
NOT TO SCALE



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.

Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to

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conduct sampling to verify that there is no net increase in sediment load due to construction activities.

Implementation

Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.

- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).

- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.

- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

Selection of Project Site

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

Equipment Selection

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in^2, where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

Streambank Stabilization

Preservation of Existing Vegetation

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

Water Quality Protection

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

Streambank Stabilization

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

Riparian Habitat

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

Limitations

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

Streambank Stabilization Specific Installation

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

Hydraulic Mulch

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

Limitations

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

Hydroseeding

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

Limitations

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

Soil Binders

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

Limitations

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

Straw Mulch

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

Limitations

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

Geotextiles and Mats

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

Earth Dikes, Drainage Swales, and Lined Ditches

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.
- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Velocity Dissipation Devices

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

Slope Drains

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

Limitations

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Streambank Sediment Control

Silt Fences

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

Fiber Rolls

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

Gravel Bag Berm

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

Limitations

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence, on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

Applications

- Near the toe of slopes that may be subject to flow and rill erosion.

Limitations

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

Specifications

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

K-rail

Description and Purpose

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

- This technique is useful at the toe of embankments, cuts or fills slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Implementation

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

Instream Construction Sediment Control

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable "worst time" to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to "pull" in-stream structures may be during the rising limb of a storm hydrograph.

Techniques to minimize Total Suspended Solids (TSS)

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.

- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.

- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.

- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

Washing Fines

Definition and Purpose

- Washing fines is an "in-channel" sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.

- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.

- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

Appropriate Applications

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed "in the dry", and which subsequently become re-watered.

Limitations

- The stream must have sufficient gravel and cobble substrate composition.

- The use of this technique requires consideration of time of year and timing of expected stream flows.

- The optimum time for the use of this technique is in the fall, prior to winter flows.

- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

Implementation

- Apply sufficient water to wash fines, but not cause further erosion or runoff.

- Apply water slowly and evenly to prevent runoff and erosion.

- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events until final stabilization is achieved.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

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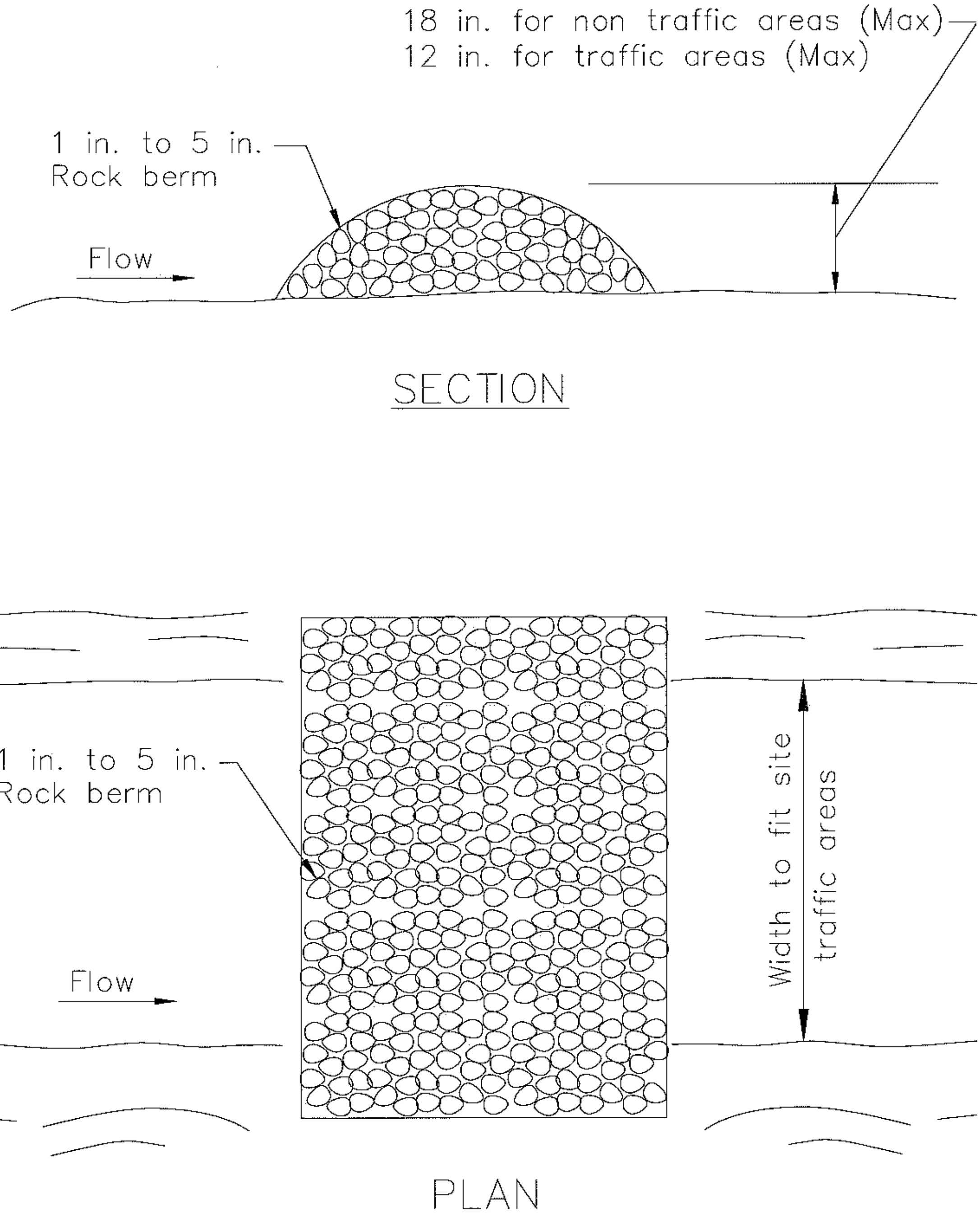

TYPICAL ROCK FILTER
NOT TO SCALE

Compost Blanket EC-14

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

A compost blanket is applied to slopes and earth disturbed areas to prevent erosion, and in some cases, increase infiltration and/or establish vegetation. The compost blanket can be applied by hand, conveyor system, compost spreader, or pneumatic delivery (blower) system. The blanket thickness is determined from the slope steepness and anticipated precipitation. A compost blanket protects the soil surface from raindrop erosion, particularly rills and gullies that may form under other methods of erosion control.

A compost blanket, if properly installed, can be very successful at vegetation establishment, weed suppression and erosion control. The compost blanket comes into direct contact with the underlying soil, reducing rill formation. Furthermore, compost provides organic matter and nutrients important for vegetation growth. The compost blanket provides soil structure that allows water to infiltrate the soil surface and retain moisture, which also promotes seed germination and vegetation growth, in addition to reducing runoff.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly, compost selection is an important design consideration in the application of this type of erosion control.

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Suitable Applications

A compost blanket is appropriate for slopes and earth disturbed areas requiring protection until permanent stabilization is established. A compost blanket can also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment. Examples include:

- Rough-graded areas that will remain inactive for longer than 14 days
- Soil stockpiles
- Slopes with exposed soil between existing vegetation such as trees or shrubs
- Slopes planted with live, container-grown vegetation
- Disturbed areas where plants are slow to develop

A compost blanket is typically used on slopes of 2:1 (H:V) or gentler. However, a compost blanket can be effective when applied to slopes as steep as 1:1 (H:V) with appropriate design considerations including slope length, blanket thickness, adding components such as a tackifier, or using compost blankets in conjunction with other techniques, such as compost socks and berms or fiber rolls.

Compost can be pre-seeded prior to application to the soil (recommended by the EPA for construction site stormwater runoff control) or seeded after the blanket has been installed. The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons (USEPA, 1998).

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Carefully consider the qualifications and experience of any compost producer/supplier.
- A compost blanket applied by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of application.
- When blowers are used, the treatment areas should be within 300 ft of a road or surface capable of supporting trucks.
- Wind may limit application of compost and result in application to undesired locations.
- Compost blankets should not be applied in areas of concentrated flows.
- Steeper slopes may require additional blanket thickness and other stability measures such as using tackifiers or slope interruption devices (compost socks and berms, or fiber rolls). The same applies for sites with high precipitation totals or during the rainy season.

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1 below, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).

- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.

- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.

- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should be high-quality mature compost. Immature compost can potentially leach nutrients.

- Compost should not be derived from mixed municipal solid waste and should be free of visible contaminants.

- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

- Compost should not possess objectionable odors.

- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to compost application, prepare the slope by removing loose rocks, roots, stumps, and other debris greater than 2" in diameter. Prepare the slope area surface by scarifying or track walking/roughening if necessary.

- Select method to apply the compost blanket. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.

- A compost blanket thickness of 1" to 4" should be applied to slopes of 2:1 (H:V) or gentler, based on site-specific conditions. Increase blanket thickness with increased slope steepness and/or during installation during the rainy season (for example, 2" to 3" should be used for a

3:1 slope, while 1" to 2" can be used for a 4:1 slope). Erosion control using a compost blanket is not recommended for slopes greater than 1:1 (H:V).

- For steeper slopes, tackifiers should be utilized and/or other stabilization techniques employed. For example, compost socks or berms can be installed at intervals over the compost blanket (in a similar manner as Fiber Rolls, SE-5).

- Compost socks or berms (or equivalent linear sediment control BMP) should be placed at the top and/or bottom of the slope for additional erosion control performance.

- For optimum vegetation establishment, a blanket thickness of 1" to 2" is recommended. If vegetation establishment is not the primary function of the compost blanket, a thicker blanket may be recommended based on slope or rainfall conditions.

- Evenly distribute compost on the soil surface to the desired blanket thickness (1/2" to 4" as calculated prior based on site conditions and objectives). Even distribution is an important factor in preventing future rill and gully erosion.

- The compost blanket should extend 3 to 6 feet over the top of the shoulder of the slope. A compost sock or compost berm can be used at the top of the slope as an auxiliary technique to prevent runoff from flowing underneath the compost blanket.

- Use additional anchoring and erosion control BMPs in conjunction of the compost blanket as needed.

Costs

The cost associated with a compost blanket is similar to that of a straw mat and generally less expensive than a geotextile blanket (USEPA, 2009). Caltrans has provided a recent estimate for $5,000 to $8,000 per acre for application of an unseeded 1 inch compost blanket (Caltrans Compost Specifications, 2009). Recently obtained vendor costs indicate that proprietary blends of compost that are seeded and contain a nutrient rich "tackifier" can cost approximately $0.35 per square foot, or approximately $15,000 per acre for a 2 inch blanket. Application by hand is more time intensive and likely more costly.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident, another layer of compost should be reapplied as soon as possible. It may be necessary to install an additional type of stormwater BMP at the top of slope or as a slope interrupter to control flow, such as a fiber roll (SE-5) or compost sock (SE-11).

- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- Limit or prohibit foot traffic to minimize damage to BMP or impede vegetation establishment.

References

An Analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, pubs.caes.uga.edu/caespubs/pubcd/B1200.htm, Faucette, B. and Risse, M., 2009.

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Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, 2005.

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Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

Filter Sock Presentation provided at Erosion, Sediment Control and Stormwater Management with Compost BMPs Workshop, U.S. Composting Council 13th Annual Conference and Trade Show, McCoy, S., 2005.

National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118, 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing Designation M10-03, Compost for Erosion/Sediment Control (Compost Blankets), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-7 Geotextiles and Mats

Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.

- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.

- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.

- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a "bridging" effect, which suspends the blanket above the seed bed.

- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.

- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Categories

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WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured

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from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.

- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd^2 in flat areas and \$11 - \$23/yd^2 on side slopes.

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.
- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

Design Standards for Urban Infrastructure - Soft Landscape Design, Department of Territory and Municipal Services - Australian Capital Territory http://www.tams.act.gov.au/work/standards_and_procedures/design_standards_for_urban_infrastructure

Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

Gravel Mulch, Landscape Architecture Non-Standard Specification 10-2, California Department of Transportation (Caltrans), http://www.dot.ca.gov/hq/LandArch/roadside/detail-gm.htm

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National Menu of Best Management Practices, US Environmental Protection Agency, 2006.

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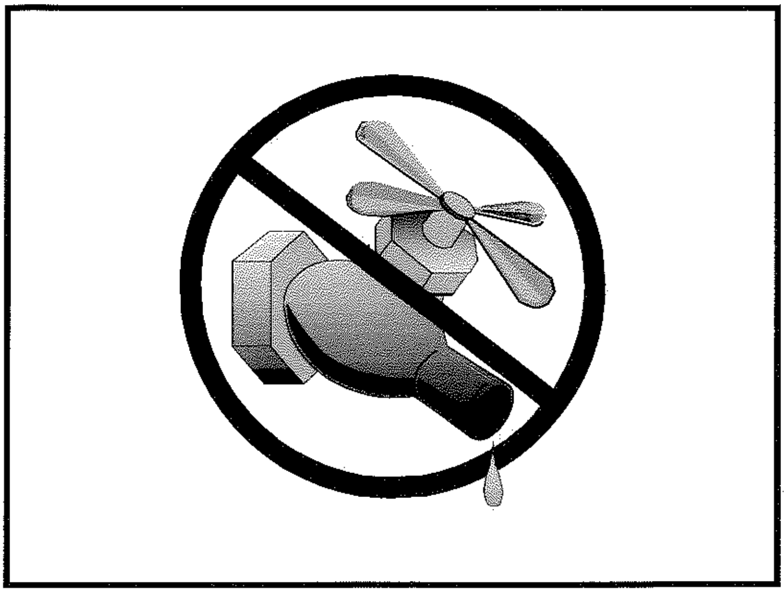

Categories

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Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

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into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.

- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.

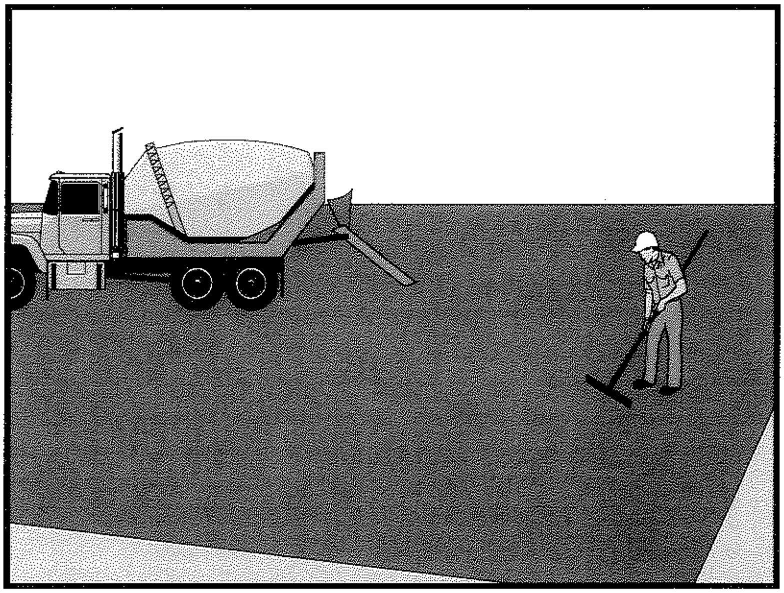
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.

- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



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Legend:

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☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

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Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

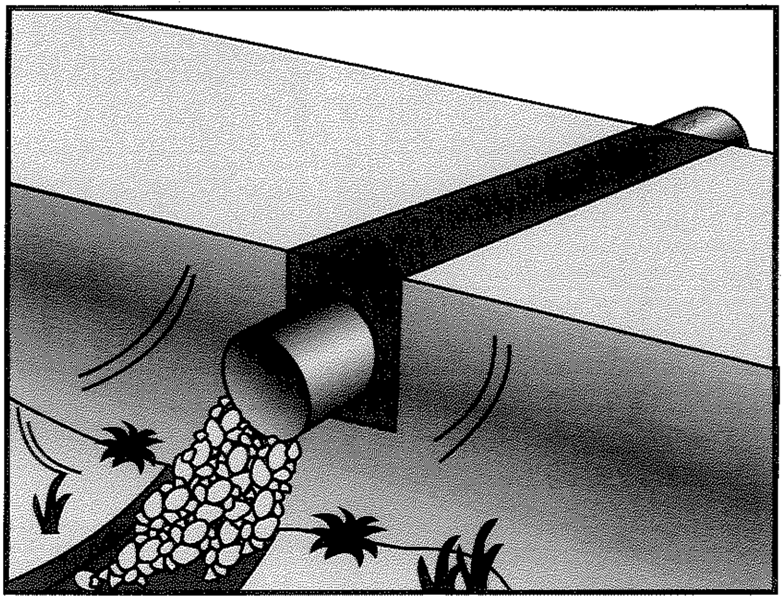
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Temporary Stream Crossing NS-4



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

A temporary stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to maintain traffic for the public. The temporary access will eliminate erosion and downstream sedimentation caused by vehicles.

Suitable Applications

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels that may be significantly eroded by construction traffic.

Temporary streams crossings are installed at sites:

- Where appropriate permits have been secured (404 Permits, and 401 Certifications)
- Where construction equipment or vehicles need to frequently cross a waterway
- When alternate access routes impose significant constraints
- When crossing perennial streams or waterways causes significant erosion
- Where construction activities will not last longer than one year
- Where appropriate permits have been obtained for the

stream crossing

Limitations

The following limitations may apply:

- Installation and removal will usually disturb the waterway.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Installation may require dewatering or temporary diversion of the stream. See NS-2, Dewatering Operations and NS-5, Clear Water Diversion.
- Installation may cause a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.
- Use of natural or other gravel in the stream for construction of Cellular Confinement System (CCS) ford crossing will be contingent upon approval by fisheries agencies.
- Ford crossings may degrade water quality due to contact with vehicles and equipment.
- May be expensive for a temporary improvement.
- Requires other BMPs to minimize soil disturbance during installation and removal.
- Fords should only be used in dry weather.

Implementation

General

The purpose of this BMP is to provide a safe, erosion-free access across a stream for construction equipment. Minimum standards and specifications for the design, construction, maintenance, and removal of the structure should be established by an engineer registered in California. Temporary stream crossings may be necessary to prevent construction equipment from causing erosion of the stream and tracking sediment and other pollutants into the stream.

Temporary stream crossings are used as access points to construction sites when other detour routes may be too long or burdensome for the construction equipment. Often heavy construction equipment must cross streams or creeks, and detour routes may impose too many constraints such as being too narrow or poor soil strength for the equipment loadings. Additionally, the contractor may find a temporary stream crossing more economical for light–duty vehicles to use for frequent crossings, and may have less environmental impact than construction of a temporary access road.

Location of the temporary stream crossing should address:

- Site selection where erosion potential is low.

- Areas where the side slopes from site runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings should be considered:

- **Culverts** – A temporary culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert can be easily constructed and allows for heavy equipment loads.

- **Fords** - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams, and low-flow perennial streams. CCS, a type of ford crossing, is also appropriate for use in streams that would benefit from an influx of gravels. A temporary ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford is the least expensive stream crossing and allows for maximum load limits. It also offers very low maintenance. Fords are more appropriate during the dry ice season and in arid areas of California.

- **Bridges** - Appropriate for streams with high flow velocities, steep gradients and where temporary restrictions in the channel are not allowed.

Design

During the long summer construction season in much of California, rainfall is infrequent and many streams are dry. Under these conditions, a temporary ford may be sufficient. A ford is not appropriate if construction will continue through the winter rainy season, if summer thunderstorms are likely, or if the stream flows during most of the year. Temporary culverts and bridges should then be considered and, if used, should be sized to pass a significant design storm (i.e., at least a 10-year storm). The temporary stream crossing should be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.

Design and installation requires knowledge of stream flows and soil strength. Designs should be prepared under direction of, and approved by, a registered civil engineer and for bridges, a registered structural engineer. Both hydraulic and construction loading requirements should be considered with the following:

- Comply with any special requirements for culvert and bridge crossings, particularly if the temporary stream crossing will remain through the rainy season.

- Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor should be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.

- Install sediment traps immediately downstream of crossings to capture sediments. See SE-3, Sediment Trap.

- Avoid oil or other potentially hazardous materials for surface treatment.

- Culverts are relatively easy to construct and able to support heavy equipment loads.

- Fords are the least expensive of the crossings, with maximum load limits.

- CCS crossing structures consist of clean, washed gravel and cellular confinement system blocks. CCS are appropriate for streams that would benefit from an influx of gravel; for example, salmonid streams, streams or rivers below reservoirs, and urban, channelized streams. Many urban stream systems are gravel-deprived due to human influences, such as dams, gravel mines, and concrete channels.

- CCS allow designers to use either angular or naturally occurring rounded gravel, because the cells provide the necessary structure and stability. In fact, natural gravel is optimal for this technique, because of the habitat improvement it will provide after removal of the CCS.

- A gravel depth of 6 to 12 in. for a CCS structure is sufficient to support most construction equipment.

- An advantage of a CCS crossing structure is that relatively little rock or gravel is needed, because the CCS provides the stability.

- Bridges are generally more expensive to design and construct, but provide the least disturbance of the streambed and constriction of the waterway flows.

Construction and Use

- Stabilize construction roadways, adjacent work area, and stream bottom against erosion.

- Construct during dry periods to minimize stream disturbance and reduce costs.

- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.

- Install temporary erosion control BMPs in accordance with erosion control BMP fact sheets to minimize erosion of embankment into flow lines.

- Any temporary artificial obstruction placed within flowing water should only be built from material, such as clean gravel or sandbags, that will not introduce sediment or silt into the watercourse.

- Temporary water body crossings and encroachments should be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments should be clean, rounded river cobble.

- Vehicles and equipment should not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed.

- The exterior of vehicles and equipment that will encroach on the water body within the project should be maintained free of grease, oil, fuel, and residues.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate soil stabilization measures.

- Riparian vegetation, when removed pursuant to the provisions of the work, should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble must be removed upon completion of project activities.

- Conceptual temporary stream crossings are shown in the attached figures.

Costs

Caltrans Construction Cost index for temporary bridge crossings is \$45-\$95/ft^2.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Check for blockage in the channel, sediment buildup or trapped debris in culverts, blockage behind fords or under bridges.

- Check for erosion of abutments, channel scour, riprap displacement, or piping in the soil.

- Check for structural weakening of the temporary crossings, such as cracks, and undermining of foundations and abutments.

- Remove sediment that collects behind fords, in culverts, and under bridges periodically.

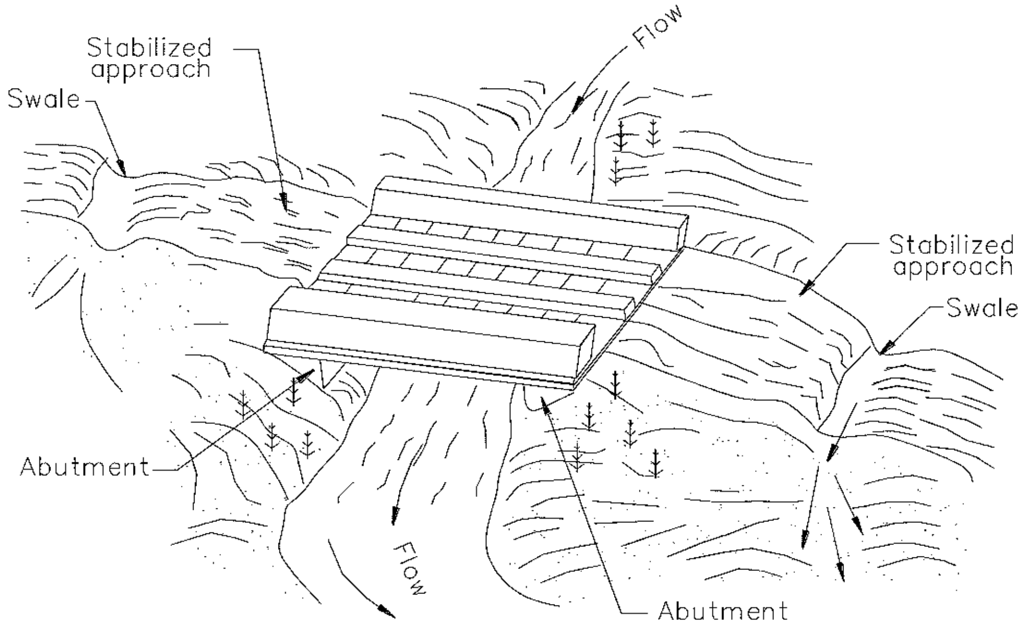
- Replace lost or displaced aggregate from inlets and outlets of culverts and cellular confinement systems.

- Remove temporary crossing promptly when it is no longer needed.

References

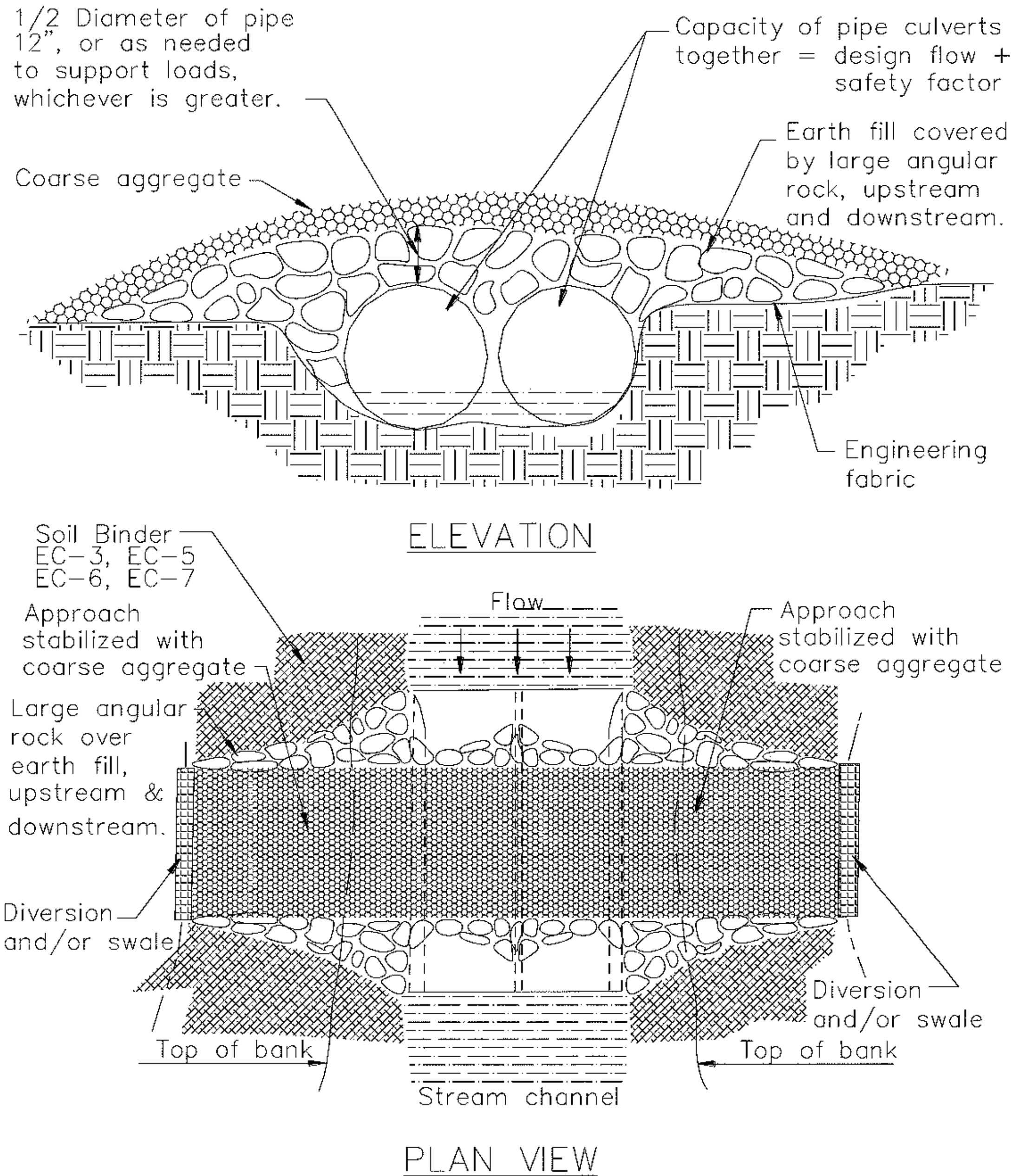
California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

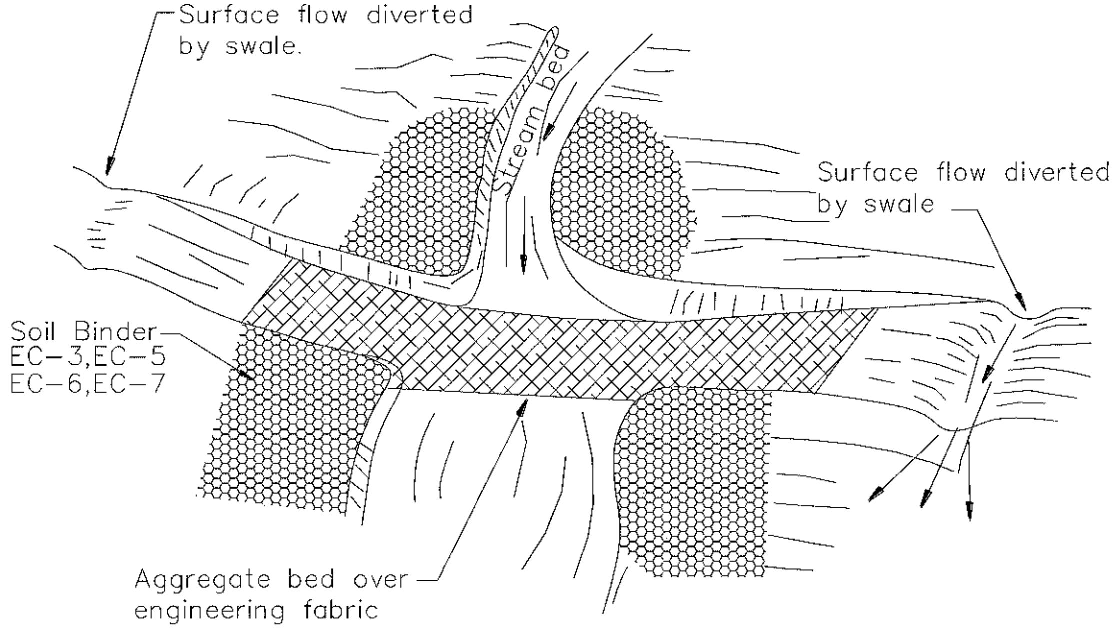


NOTE:
Surface flow of road diverted by swale and/or dike.

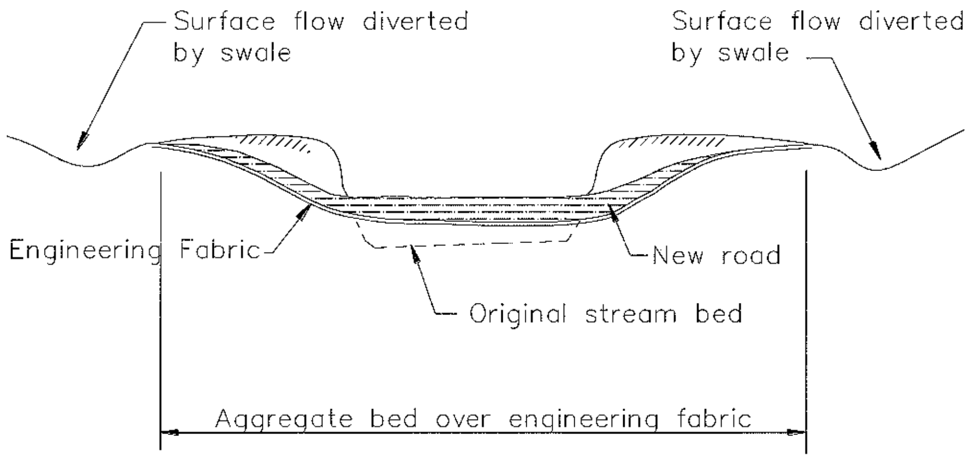
TYPICAL BRIDGE CROSSING
NOT TO SCALE



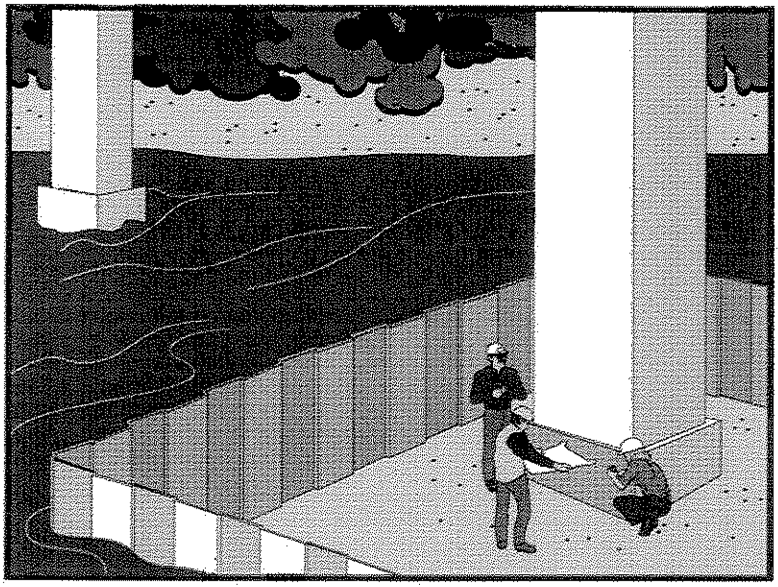
TYPICAL CULVERT CROSSING
NOT TO SCALE



Aggregate approch
1:5 (V:H) Maximum slope on road



TYPICAL FORD CROSSING
NOT TO SCALE



Categories

EC	Erosion Control	
SE	Sediment Control	
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NS	Non-Stormwater Management Control	☑
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.
- Pumped diversions are suitable for intermittent and low flow streams.
- Excavation of a temporary bypass channel, or passing the

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flow through a heavy pipe (called a "flume") with a trench excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in EC-12, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.

- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.

- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.

- Equipment should not be parked below the high water mark unless allowed by a permit.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.

- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.

- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.

- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.

- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.

- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.

- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.

- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.

- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.

- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.

- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.

- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.

- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.

- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.

- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.

- Manufactured diversion structures should be installed following manufacturer's specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.

- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.

- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.

- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.

- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.

- Filter fabrics are not appropriate for projects where dewatering is necessary.

- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.

- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.

- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.

- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.

- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.

- Remove and properly dispose of sediment buildup.

- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.

- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.

- Turbidity curtains should not be placed across the width of a channel.

- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.

- The curtain should extend the entire depth of the watercourse in calm-water situations.

- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.
- The curtain should be held in place by anchors placed at least every 100 ft.
- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.
- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.
- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.
- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.
- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.

- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.

- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.

- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.

- Dewatering of the work area is possible.

- Pipes can be moved around to allow construction operations.

- The dams can serve as temporary access to the site.

- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.

- A pumped diversion requires 24 hour monitoring of pumps.

- Sudden rain could overtop dams.

- Erosion at the outlet.

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

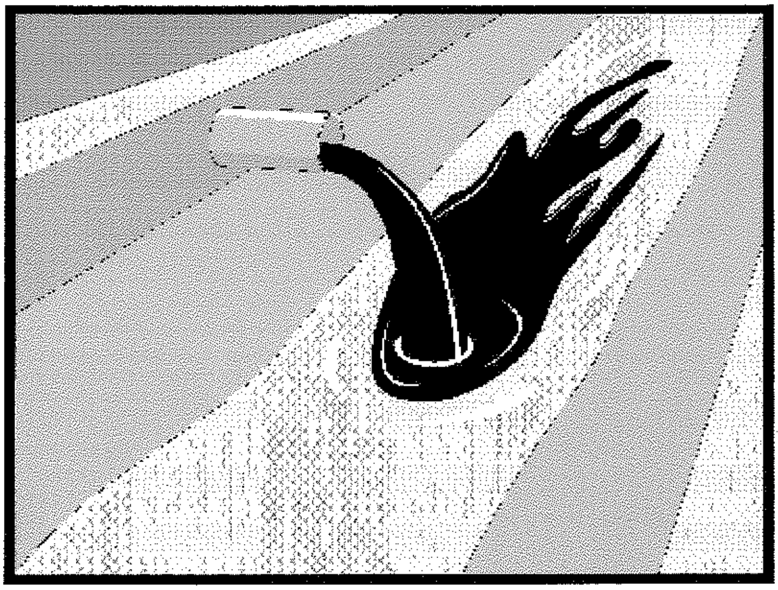
Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.
- Inspect site regularly during project execution for evidence

of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect the site regularly to check for any illegal dumping or discharge.

- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.

- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

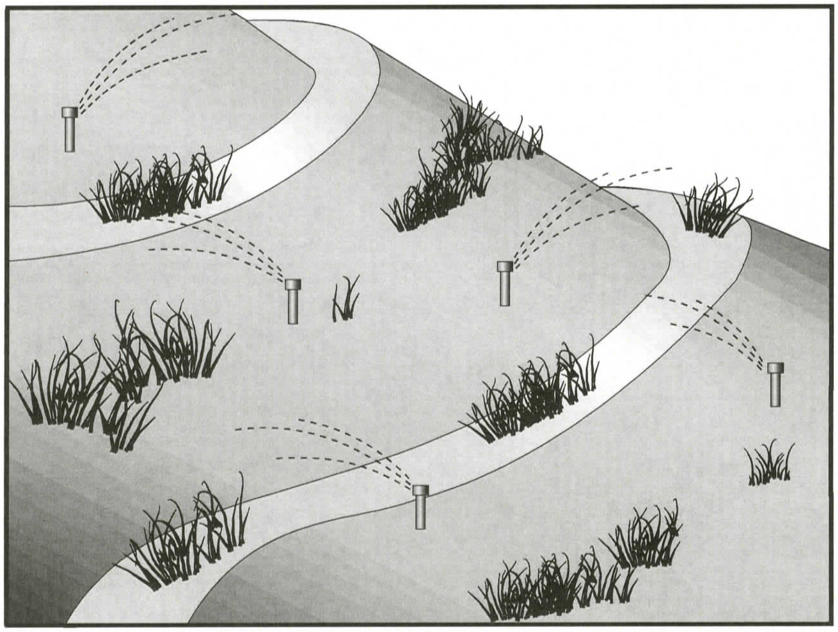
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water/Irrigation



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.
- Inspect irrigated areas within the construction limits for

excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

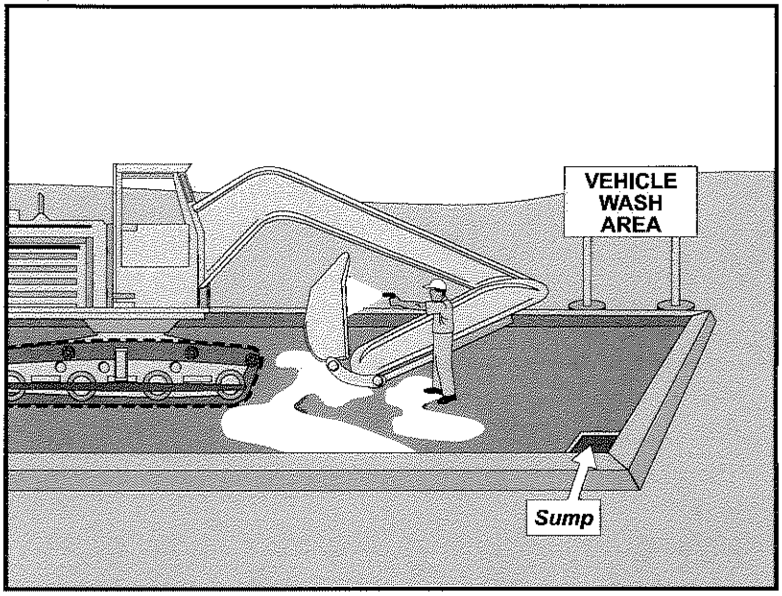
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

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- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspection and maintenance is minimal, although some berm repair may be necessary.

- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

- Inspect sump regularly and remove liquids and sediment as needed.

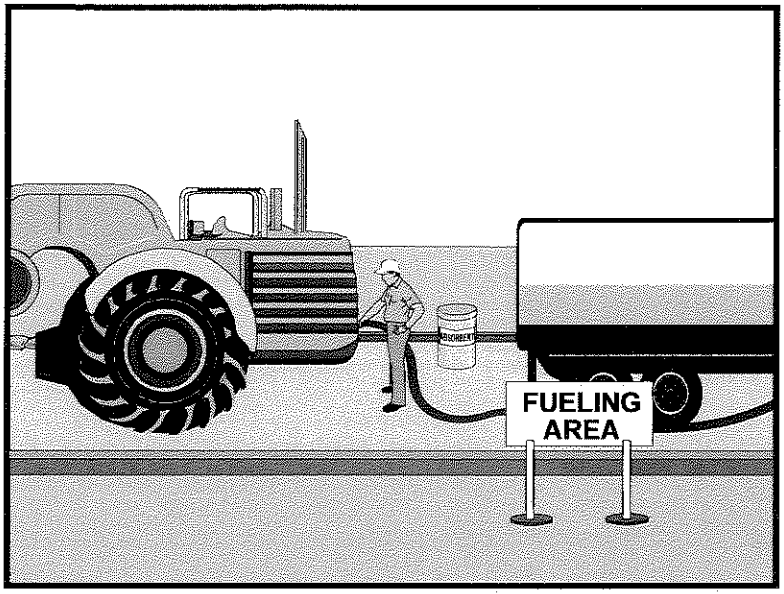
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories

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Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

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be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

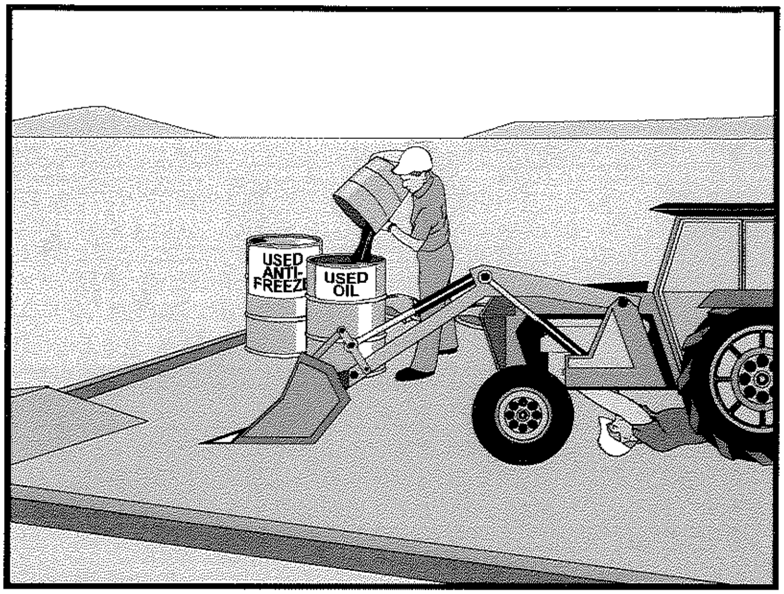
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

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Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.

- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.

- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,- trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Keep ample supplies of spill cleanup materials onsite.

- Maintain waste fluid containers in leak proof condition.

- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.

- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

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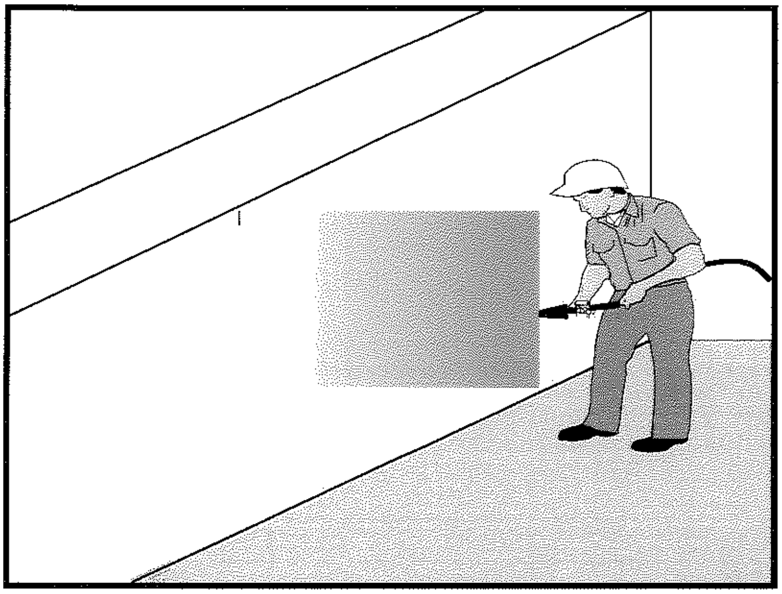

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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

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Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

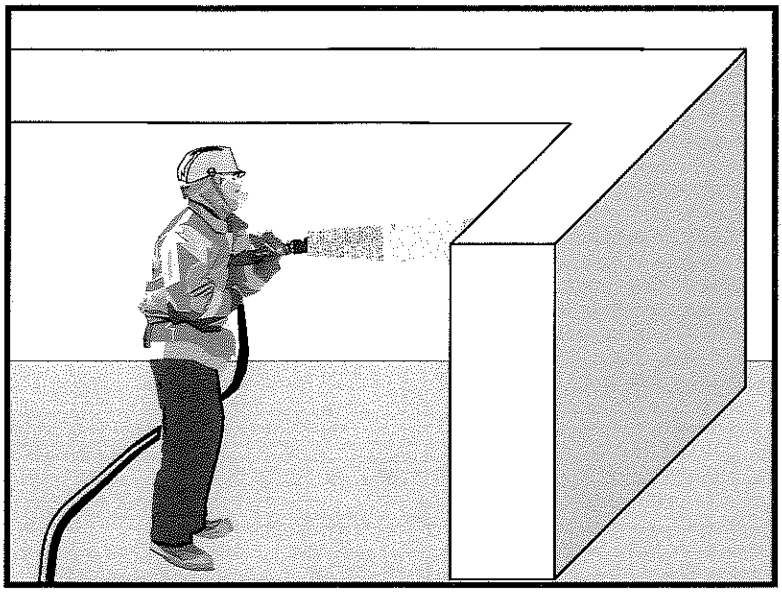
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

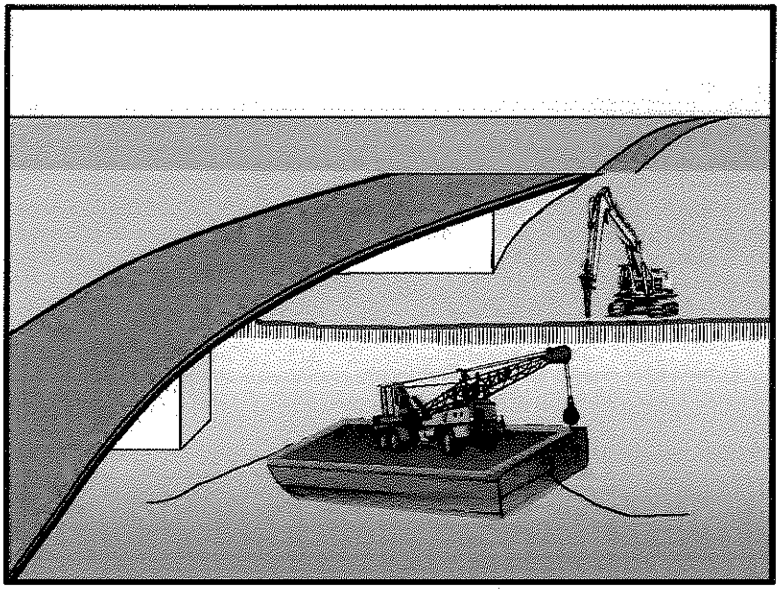
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Material Over Water



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse.

Suitable Applications

Applies where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse including waters of the United States. These procedures should be implemented for construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to exceedances of water quality standards.

Limitations

Dredge and fill activities are regulated by the US Army Corps of Engineers and Regional Boards under Section 404/401 of the Clean Water Act.

Implementation

- Refer to WM-1, Material Delivery and Storage and WM-4, Spill Prevention and Control.
- Use drip pans and absorbent materials for equipment and vehicles and ensure that an adequate supply of spill clean up materials is available.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over

water bodies when the vehicle or equipment is expected to be idle for more than 1 hour.

- Maintain equipment in accordance with NS-10, Vehicle and Equipment Maintenance. If a leaking line cannot be repaired, remove equipment from over the water.
- Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge, platform, dock, etc.
- Secure all materials to prevent discharges to receiving waters via wind.
- Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff is trained regarding the use of the materials, deployment and access of control measures, and reporting measures.
- In case of spills, contact the local Regional Board as soon as possible but within 48 hours.
- Refer to WM-5, Solid Waste Management (non-hazardous) and WM-6, Hazardous Waste Management. Ensure the timely and proper removal of accumulated wastes
- Comply with all necessary permits required for construction within or near the watercourse, such as Regional Water Quality Control Board, U.S. Army Corps of Engineers, Department of Fish and Game or and other local permitting.
- Discharges to waterways should be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures contained in SWPPP.

Costs

These measures are generally of low to moderate cost. Exceptions are areas for temporary storage of materials, engine fluids, or wastewater pump out.

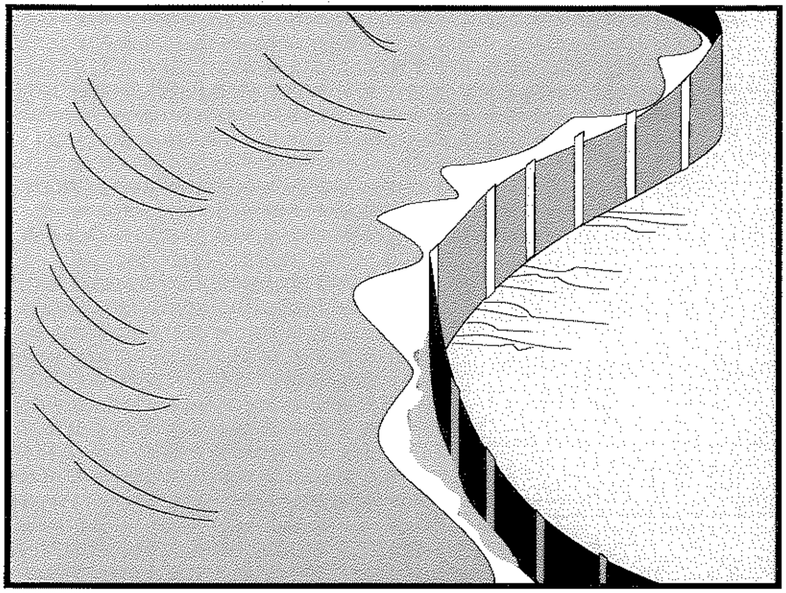
Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Ensure that employees and subcontractors implement the appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the water courses, including waters of the United States.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

<u>Standard Silt Fence</u>

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.

- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.

- This method will not work with pre-fabricated, wire backed silt fence.

- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.

- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

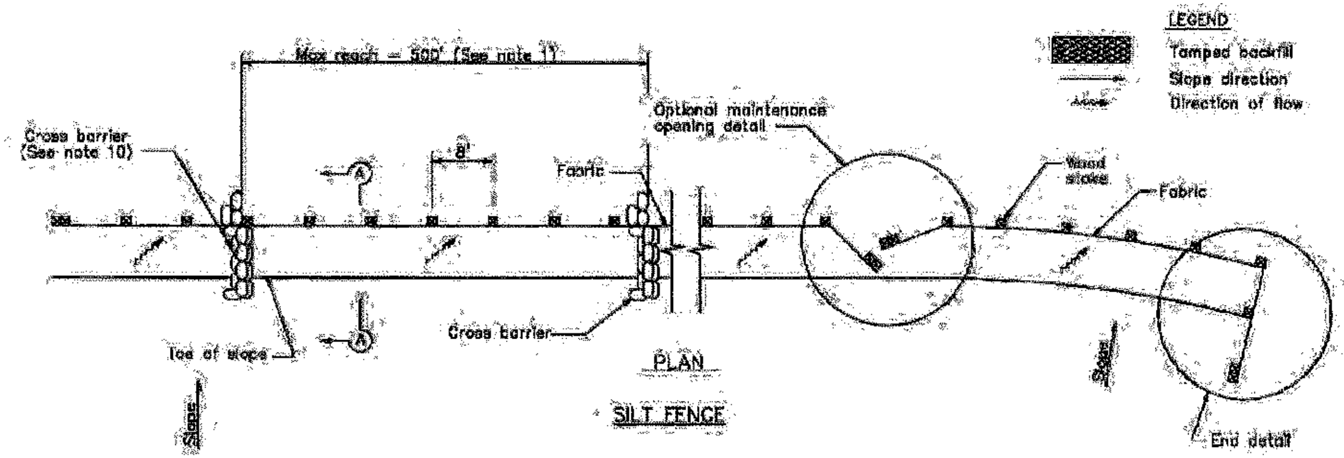
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

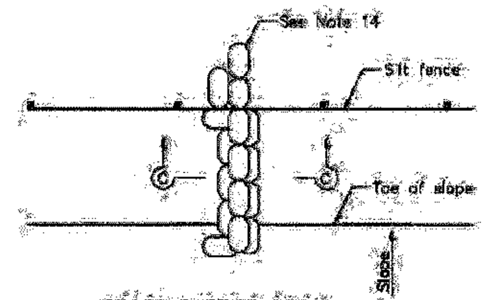
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

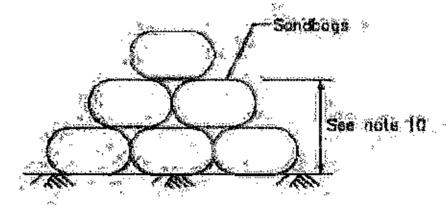


NOTES

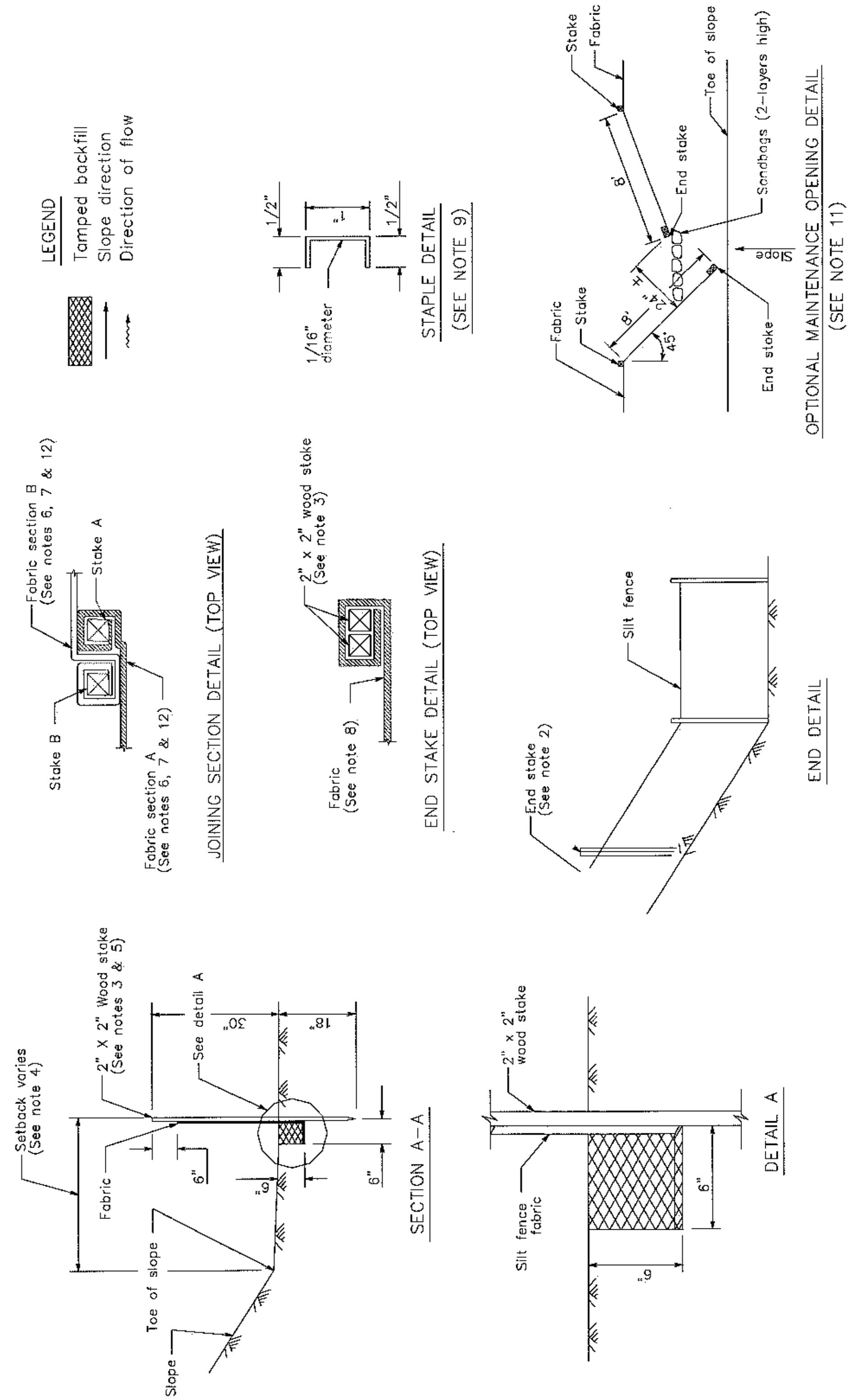
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3-4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.

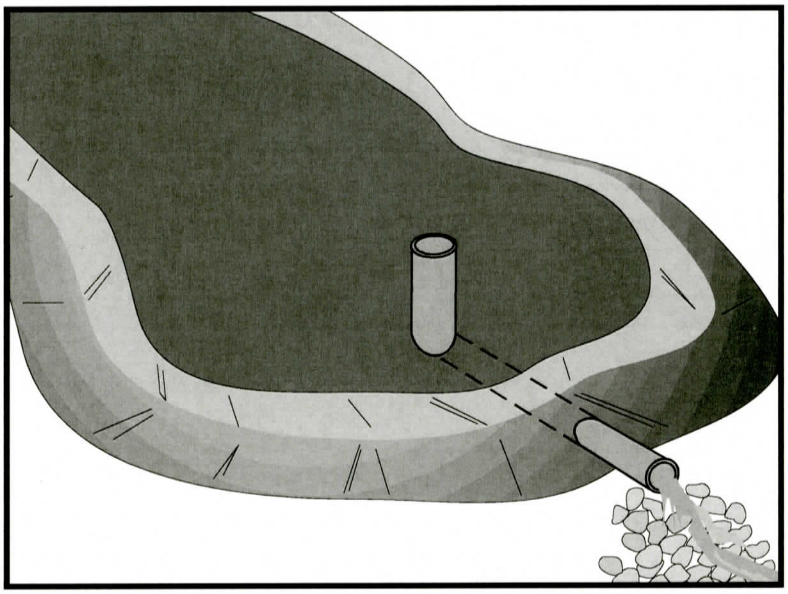


CROSS BARRIER DETAIL



SECTION C-C


LEGEND
Tamped backfill
Slope direction
Direction of flow
STAPLE DETAIL
(SEE NOTE 9)
1/2"
1"
1/16" diameter
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Stake
Fabric
Toe of slope
Sandbags (2-layers high)
End stake
Slope
8'
4'
45°
JOINING SECTION DETAIL (TOP VIEW)
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
END STAKE DETAIL (TOP VIEW)
2" x 2" wood stake (See note 3)
Fabric (See note 8)
END DETAIL
Silt fence
End stake (See note 2)
SECTION A-A
Setback varies (See note 4)
2" X 2" Wood stake (See notes 3 & 5)
See detail A
Fabric
Toe of slope
Slope
30"
18"
6"
DETAIL A
2" x 2" wood stake
Silt fence fabric
6"



Categories

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SE	Sediment Control	☑
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site
  and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional (aka "physical") enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These "physical" enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres and evaluated on a site by site basis
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (http://www.water.ca.gov/damsafety/).

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.

- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure expected to be used during active construction in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to convey runoff to the basin inlet.

Many development projects in California are required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). . The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.

- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.

- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.

- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See *"Step 3. Evaluate the Capacity of the Sediment Basin"),* and should incorporate approaches identified in "*Step 4. Other Design Considerations*" to enhance basin performance.

A) Basin Design Options:

Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \qquad \text{(Eq. 1)}$$

Where:

A_s = Minimum surface area for trapping soil particles of a certain size

V_s = Settling velocity of the design particle size chosen (V_s = 0.00028 ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

$Q = CIA$ (Eq.2)

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

The design particle size should be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the Vs used should be 100 percent of the calculated settling velocity.

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

B) Typical Sediment/Detention Basin Design Methodology:

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

Step 1. Hydrologic Design

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.
- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate discharge. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from http://www.wrcc.dri.edu/pcpnfreq.html).

Step 2. Hydraulic Design

- Calculate the surface area required for the sediment basin using Equation 1. In which discharge is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and Vs is estimated using Stokes Law presented in Equation 3.

$$V_s = 2.81d^2 \qquad \text{(Eq.3)}$$

Where

V_s = Settling velocity in feet per second at 68°F

d = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt (0.01 mm [or 0.0004 in.])

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation verses discharge (stage-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:
  - An outlet should have more than one orifice.
  - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).
  - Orifices can vary in shape.
  - Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.

- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.
- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.
- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.
- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.
- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC' A(2gH)^{0.5} \qquad \text{(Eq.4)}$$

Where
Q = Discharge in ft^3/s
C′ = Orifice coefficient (unitless)
A = Area of the orifice (ft^2)
g = acceleration due to gravity (ft^3/s)
H = Head above the orifice (ft)
B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

  - Care must be taken in the selection of orifice coefficient ("C′"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:
    - C′ = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or
    - C′ = 0.80 when the material is thicker than the orifice diameter

- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event) and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

- Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

- Floating Outlet Skimmer: The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from http://www.fairclothskimmer.com/.

- Hold and Release Valve: An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be discharged at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

Step 3. Evaluate the Capacity of the Sediment Basin

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.

- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

  $$A = R \times K \times LS \times C \times P \qquad \text{(Eq.5)}$$

  $$Y = 95\left(Q \times q_p\right)^{0.56} \times K \times LS \times C \times P \qquad \text{(Eq.6)}$$

  Where:

  A = annual soil loss, tons/acre-year

  R = rainfall erosion index, in 100 ft.tons/acre.in/hr

  K = soil erodibility factor, tons/acre per unit of R

  LS = slope length and steepness factor (unitless)

C = vegetative cover factor (unitless)

P = erosion control practice factor (unitless)

Y = single storm sediment yield in tons

Q = runoff volume in acre-feet

q_p = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).
- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.
- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.
- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

Step 4. Other Design Considerations

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
  - The basin depth must be no less than 3 ft (not including freeboard).
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred

to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.

- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).

- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.

  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.

  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.

- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.

- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.

- The length to settling depth ratio (L/SD) should be less than 200.

- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.

- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.

- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.

- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).

- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.

- Sediment basins are best used in conjunction with erosion controls.

- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.

- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.

- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.

- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.

- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.

- Cleanout level should be clearly marked on the riser pipe.

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).

- Areas under embankments must be cleared and stripped of vegetation.

- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Examine basin banks for seepage and structural soundness.

- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.

- Check inlet and outlet area for erosion and stabilize if required.

- Check fencing for damage and repair as needed.

- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).

- Remove standing water from basin within 96 hours after accumulation.

- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.

- To minimize vector production:

  - Remove accumulation of live and dead floating vegetation in basins during every inspection.

  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

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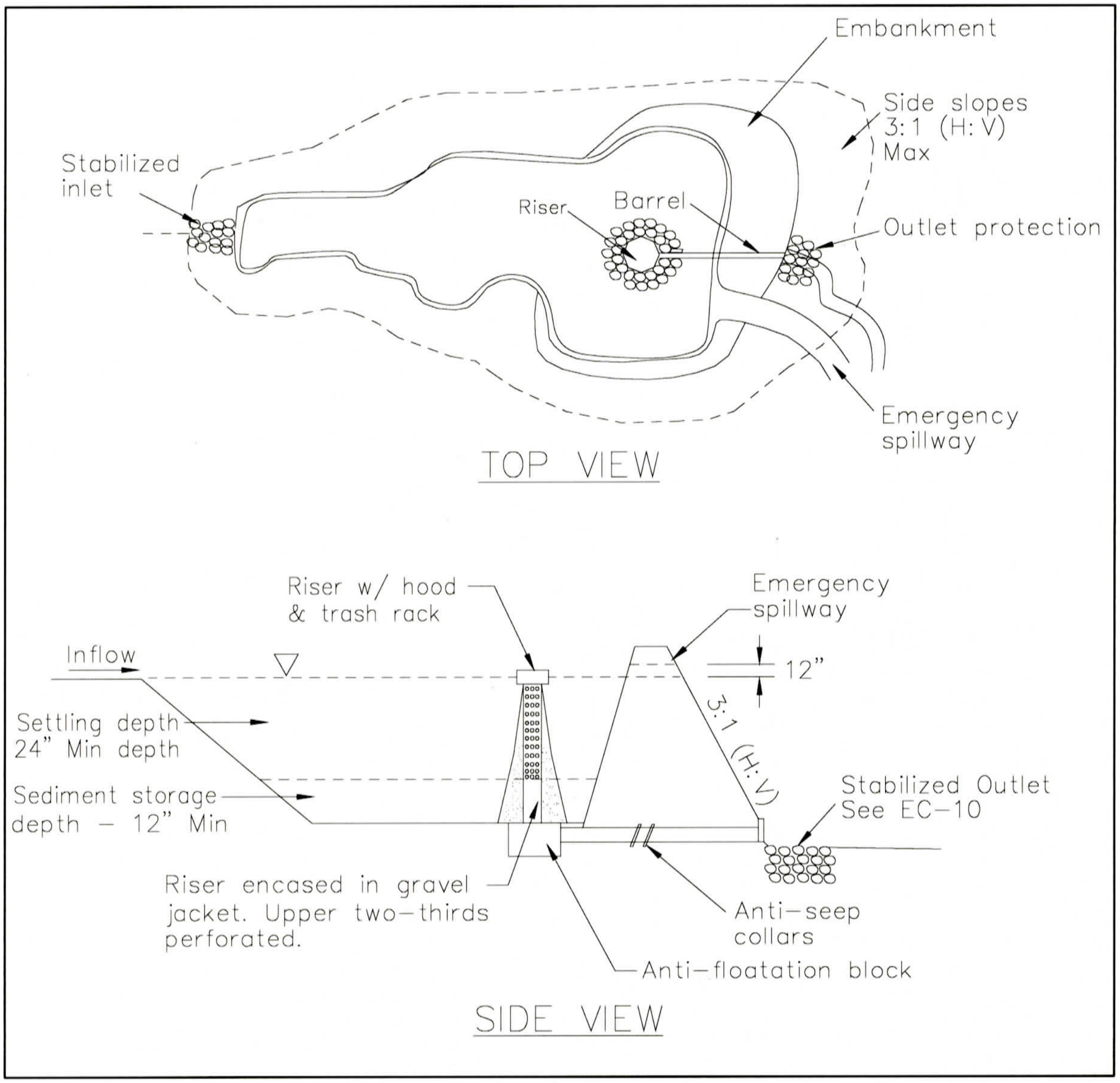


FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE

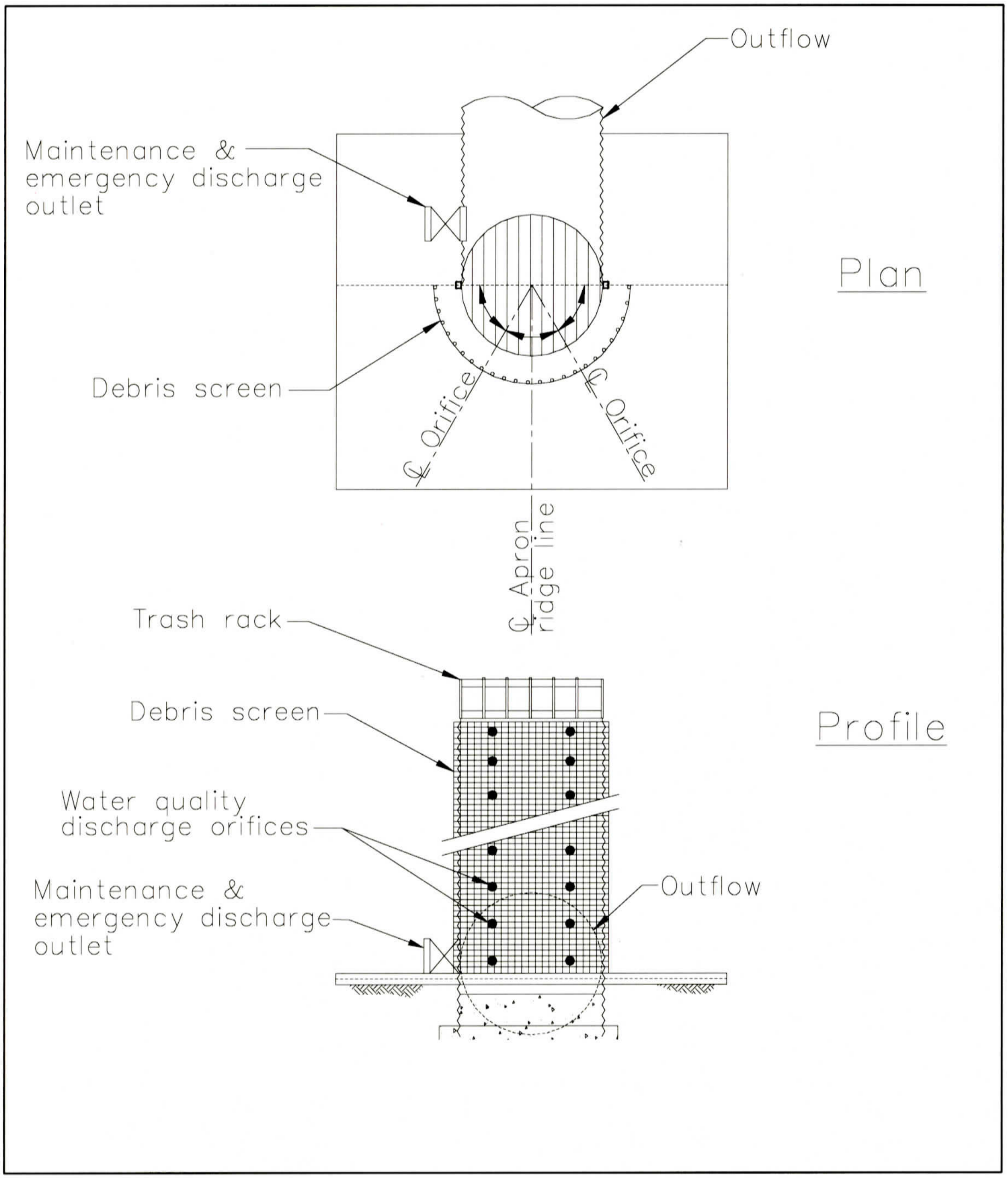


FIGURE 2: MULTIPLE ORIFICE OUTLET RISER
NOT TO SCALE

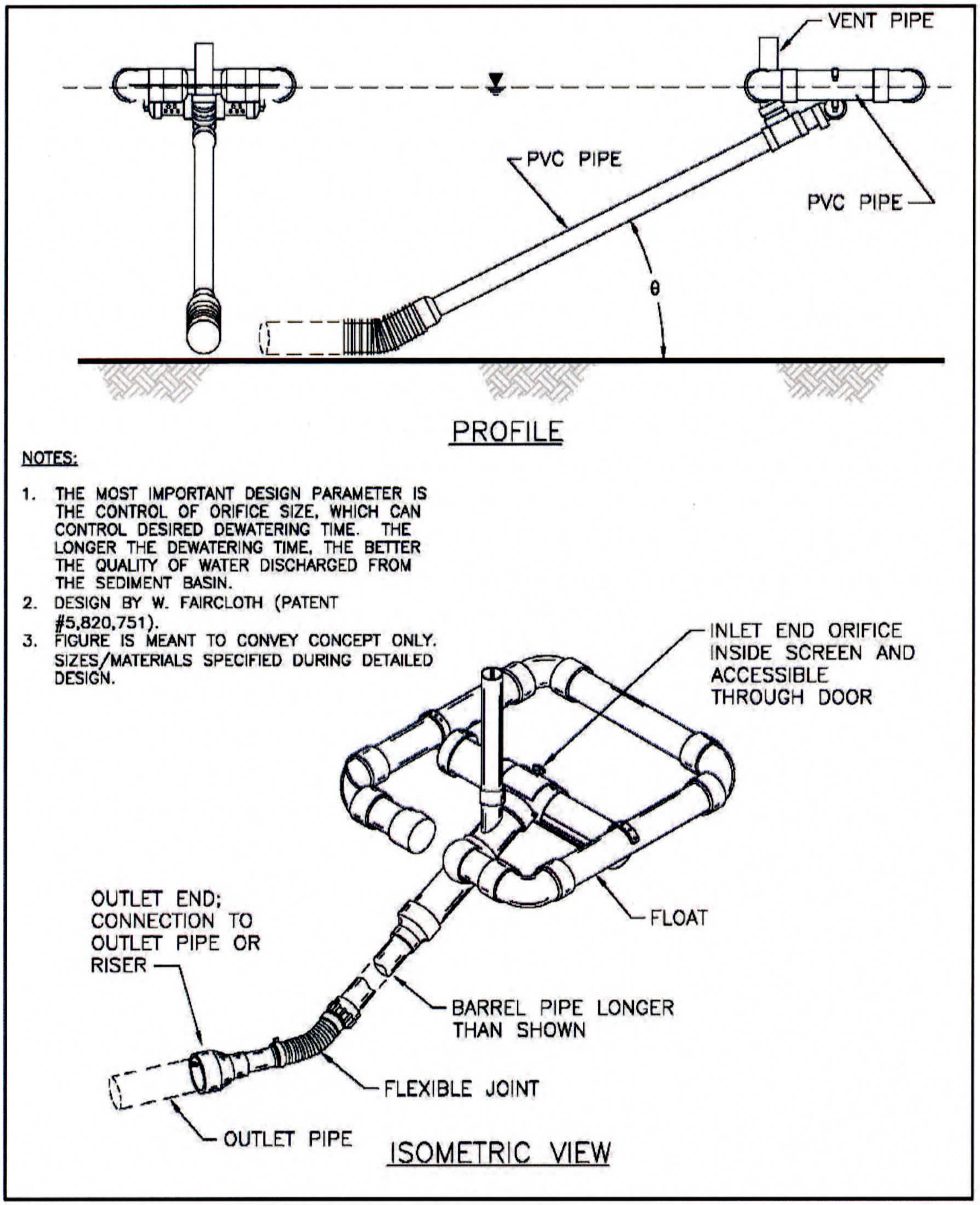


FIGURE 3: TYPICAL SKIMMER

NOT TO SCALE

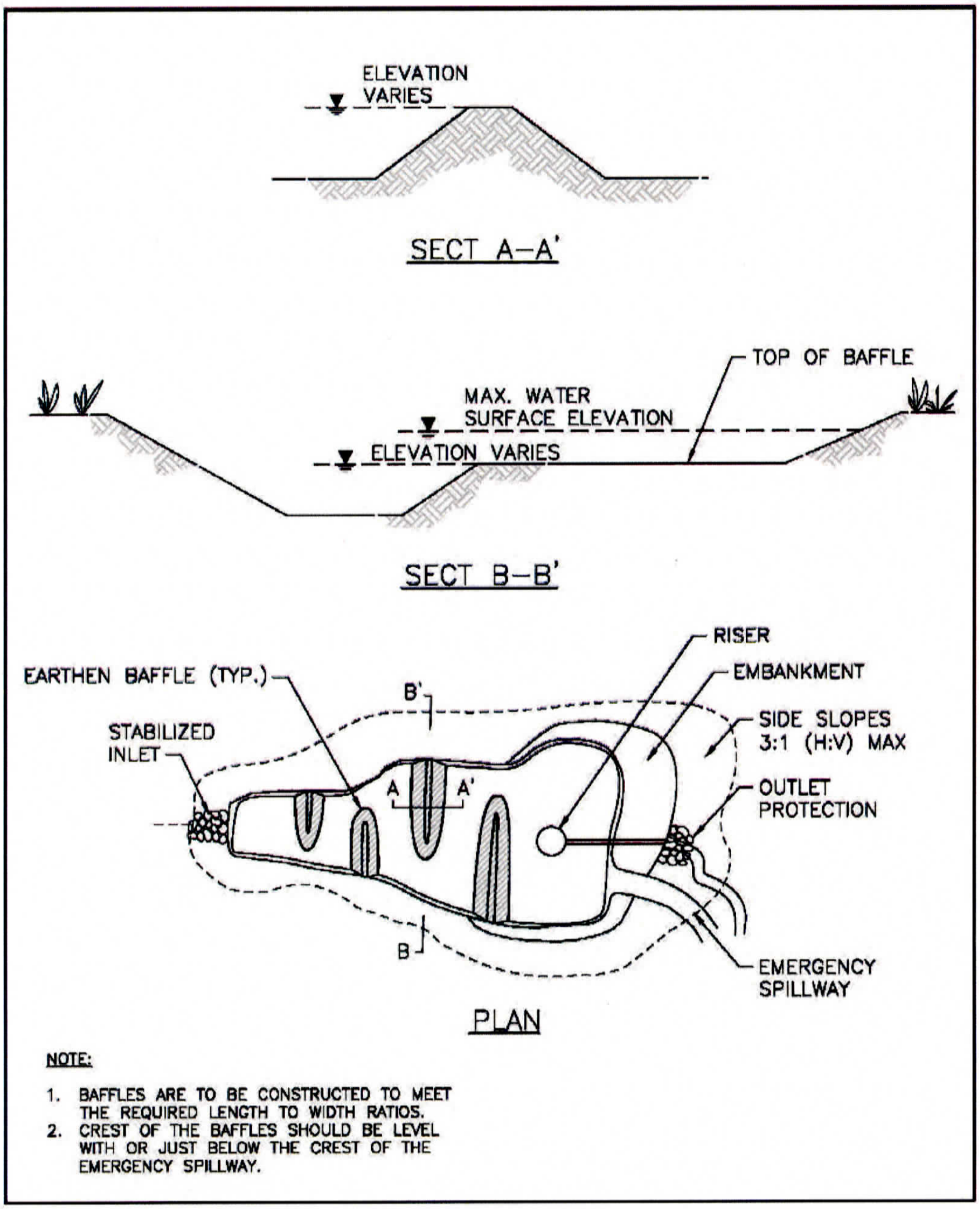
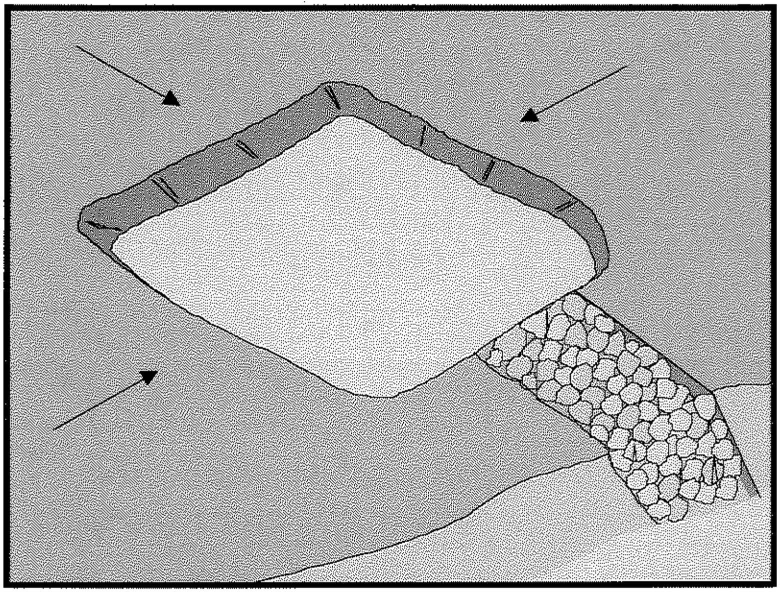


FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN WITH BAFFLES

NOT TO SCALE

Sediment Trap

SE-3



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged by gravity flow. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Trap design guidance provided in this fact sheet is not intended to guarantee compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment traps should be used in conjunction with a comprehensive system of BMPs.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be

placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.

- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.

- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.

- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect outlet area for erosion and stabilize if required.

- Inspect trap banks for seepage and structural soundness, repair as needed.

- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.

- Inspect fencing for damage and repair as needed.

- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 96 hours or less to prevent vector production.

- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.

- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.

- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs per NS-2 shall be implemented at all times during dewatering activities.

References

Brown, W., and T. Schueler. The Economics of Stormwater BMPs in the Mid-Atlantic Region. Prepared for Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD, 1997.

Draft – Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

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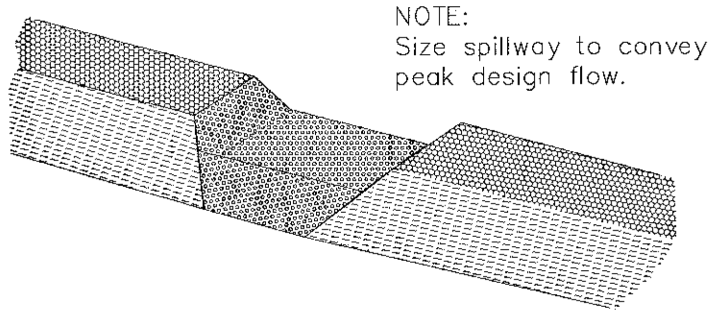
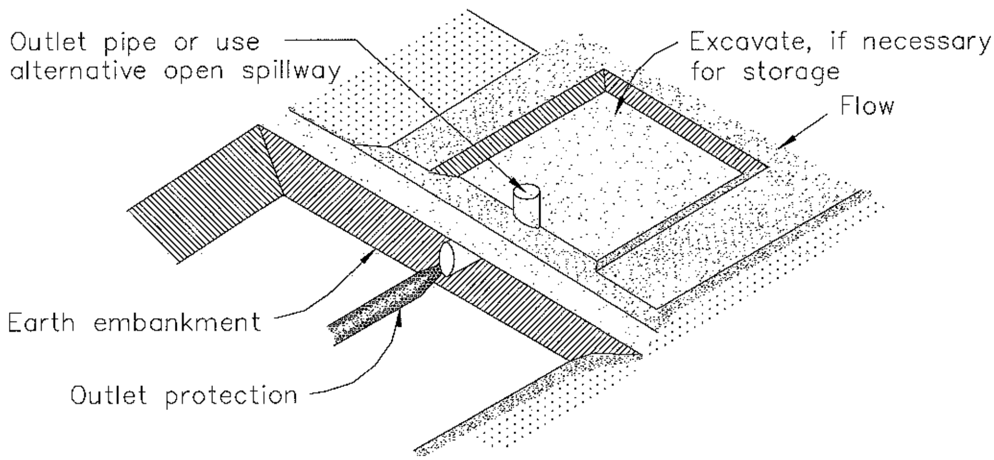
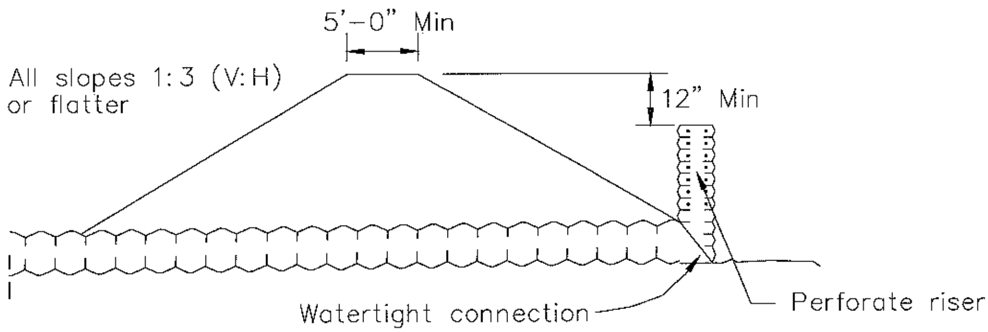
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



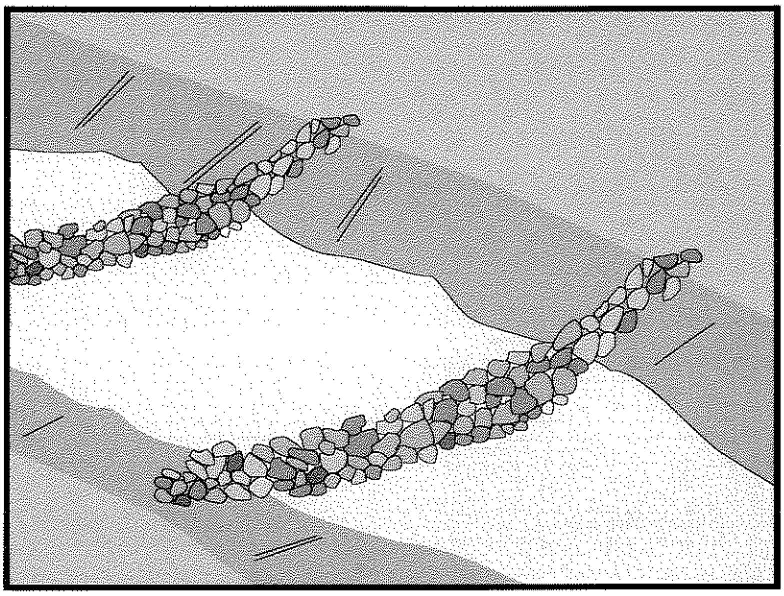
TYPICAL OPEN SPILLWAY





EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

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Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don't use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see "Spacing Between Check Dams" detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of the ditch or swale (see "Typical Rock Check Dam" detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see "Gravel Bag Check Dam" detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer's instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.

- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.

- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.

- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.

- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.

- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.

- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.

- Upper rows or gravel and sand bags shall overlap joints in lower rows.

- Fiber rolls should be trenched in, backfilled, and firmly staked in place.

- Install along a level contour.

- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

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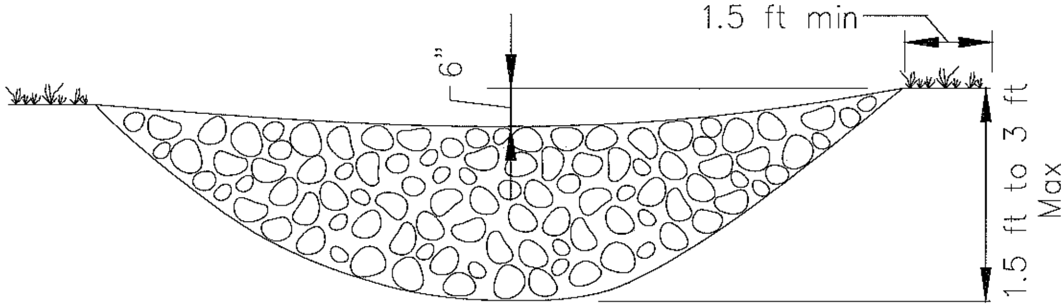
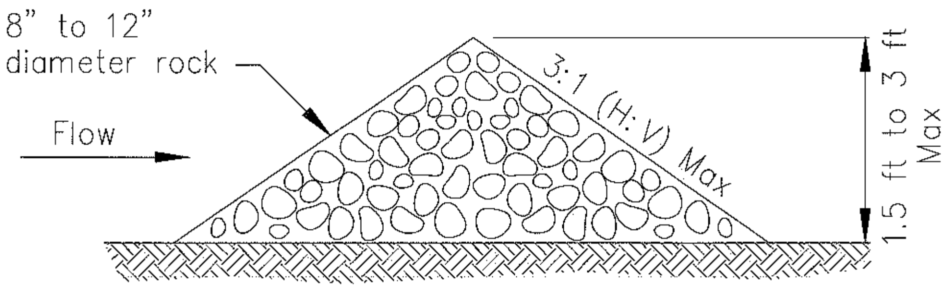
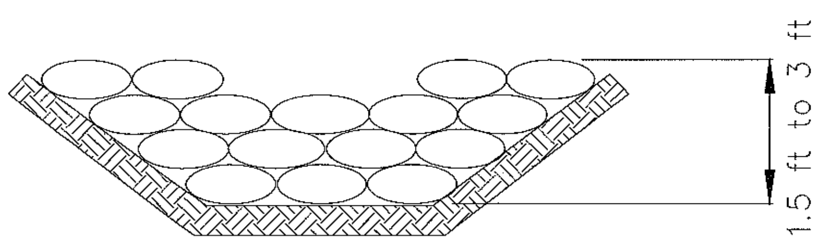


ELEVATION

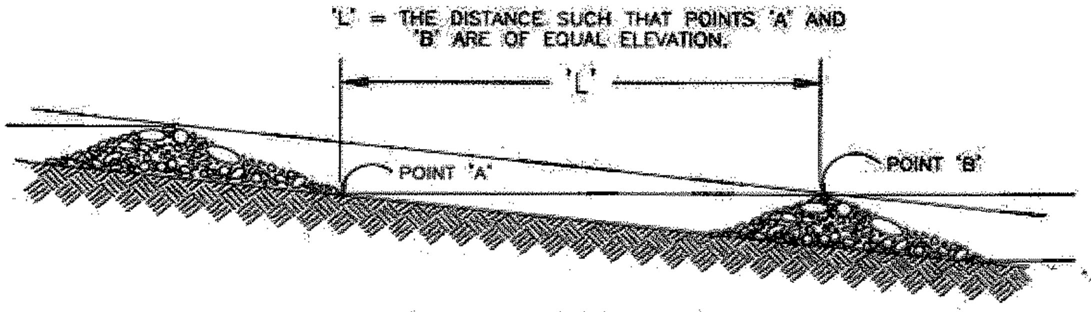


TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE

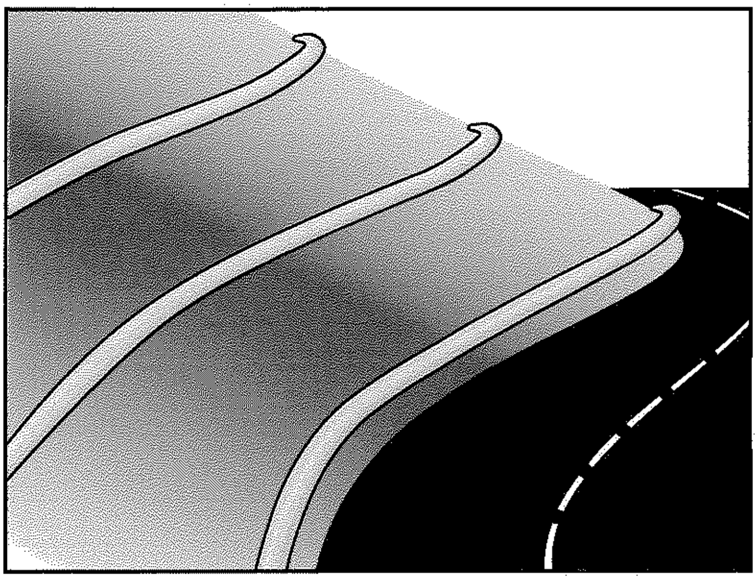


GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE



SPACING BETWEEN CHECK DAMS

Fiber Rolls SE-5



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

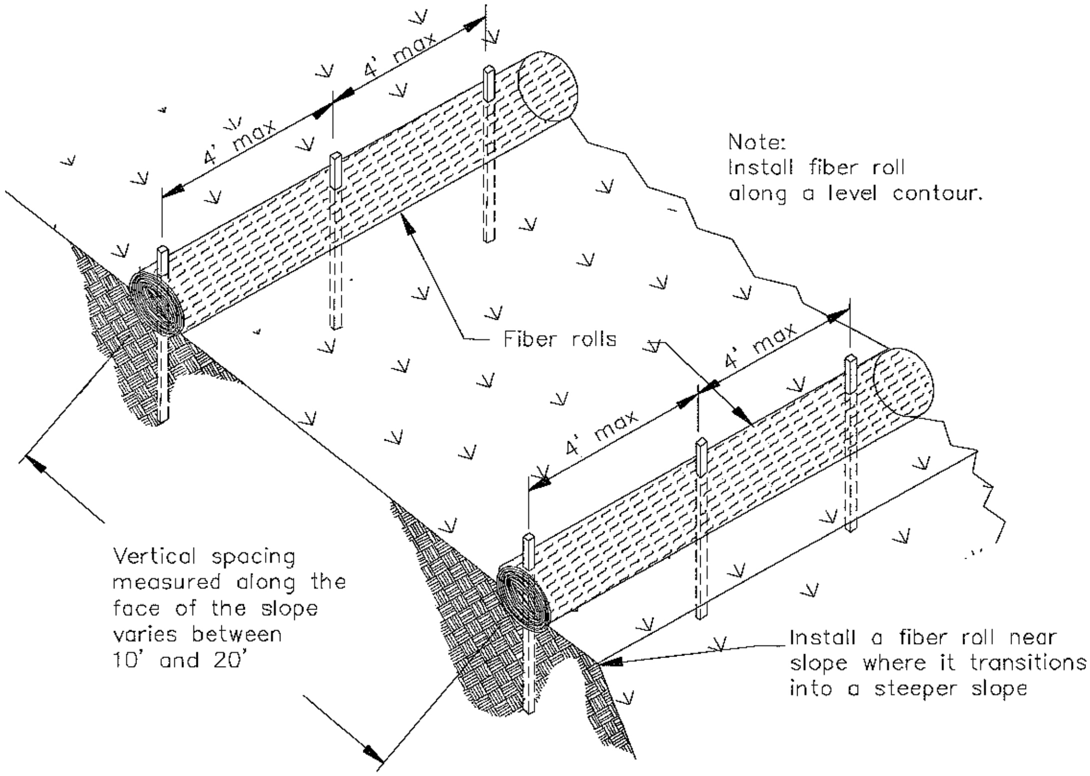
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

- Repair any rills or gullies promptly.

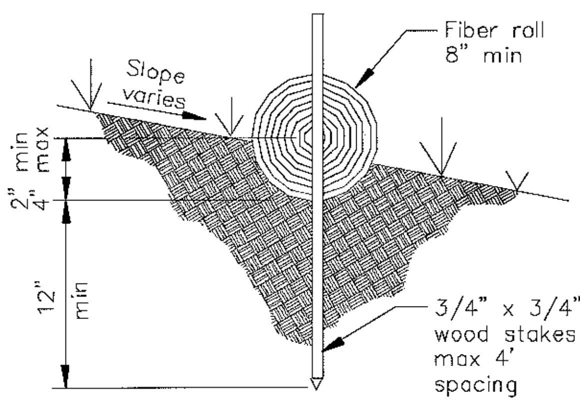
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

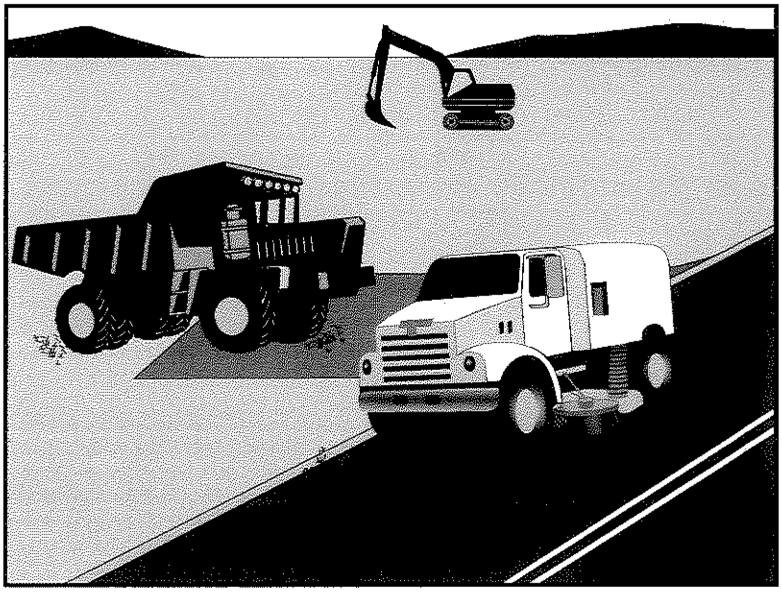


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Street Sweeping and Vacuuming SE-7



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

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- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

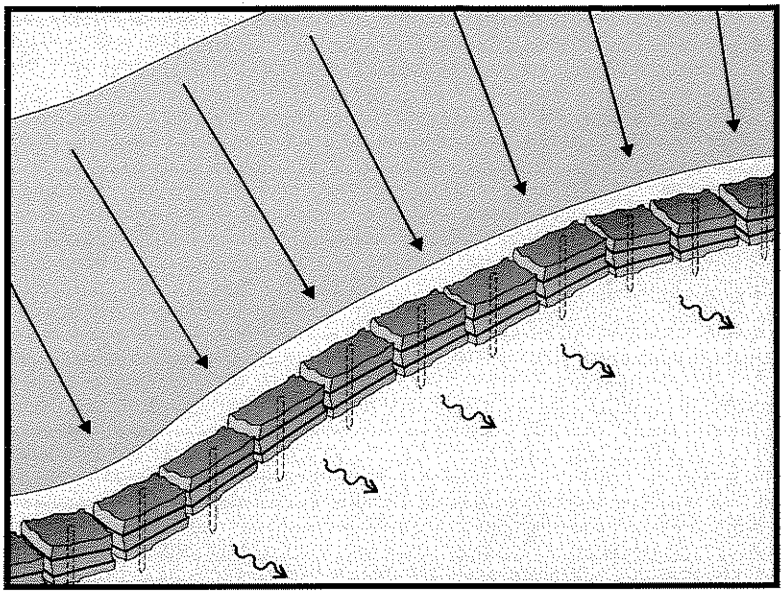
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Straw Bale Barrier



Categories

EC	Erosion Control	☒
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet- flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

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- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

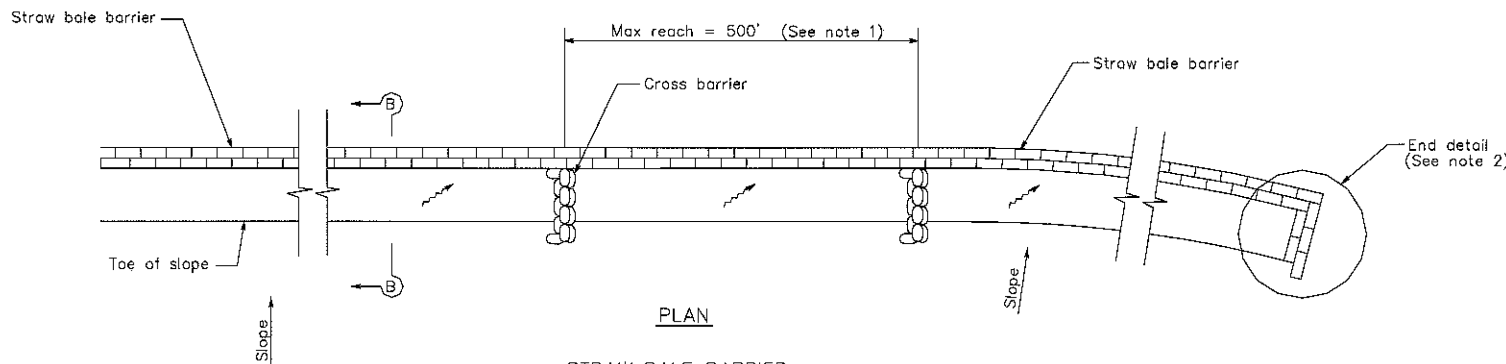
Inspection and Maintenance

Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



PLAN

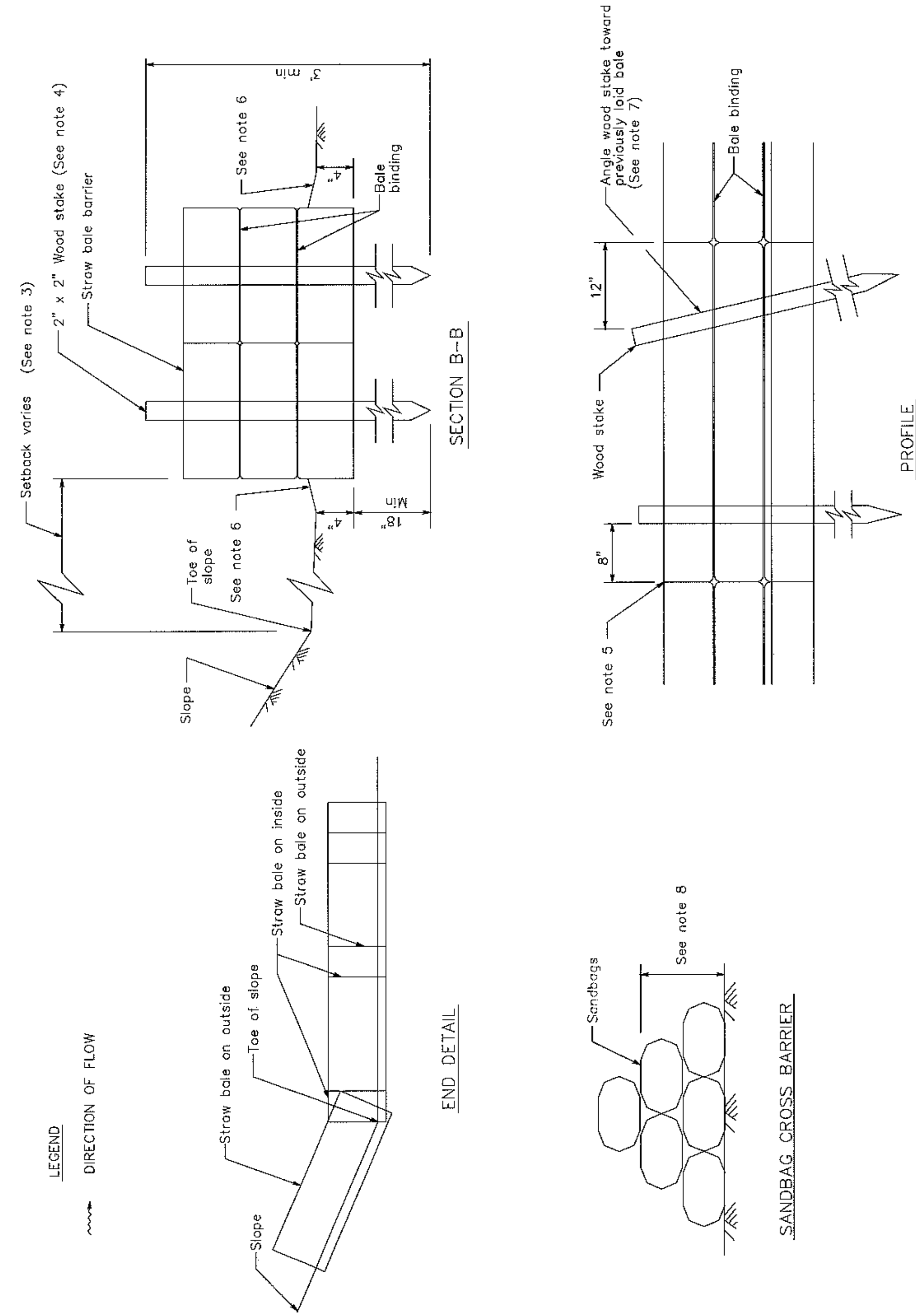
STRAW BALE BARRIER

NOTES

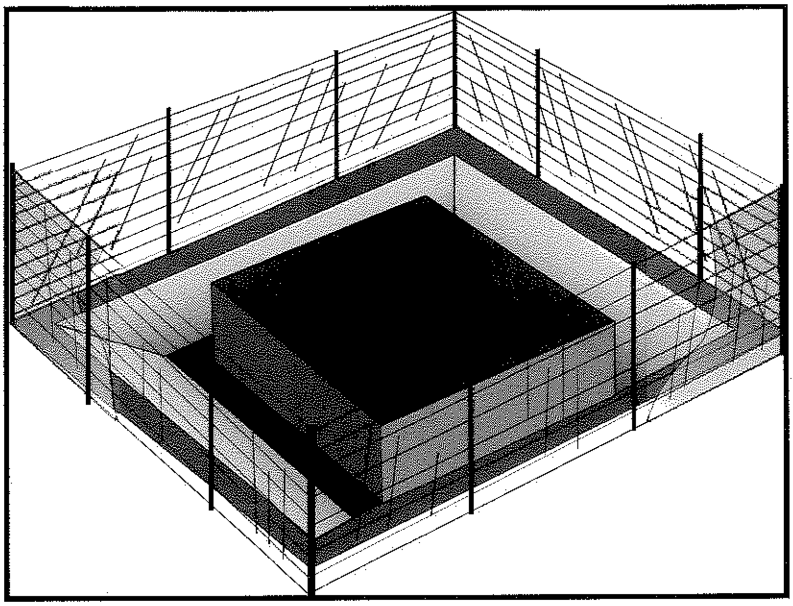
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max. of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

LEGEND

DIRECTION OF FLOW



Setback varies (See note 3)
2" x 2" Wood stake (See note 4)
Straw bale barrier
3' min
See note 6
4"
Bale binding
18" Min
Toe of slope
See note 6
Slope
SECTION B-B
Angle wood stake toward previously laid bale (See note 7)
Bale binding
12"
Wood stake
8"
See note 5
PROFILE
LEGEND
DIRECTION OF FLOW
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
Sandbags
See note 8
SANDBAG CROSS BARRIER



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.

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- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.
- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Six types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
  - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
  - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag*** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.
  2. Leave room upstream of barrier for water to pond and sediment to settle.
  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.
  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary)*** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

    1. Construct in a gently sloping area.

    2. Biofilter bags should be placed around inlets to intercept runoff flows.

    3. All bag joints should overlap by 6 in.

    4. Leave room upstream for water to pond and for sediment to settle out.

    5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.

- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.

- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.

- Remove storm drain inlet protection once the drainage area is stabilized.

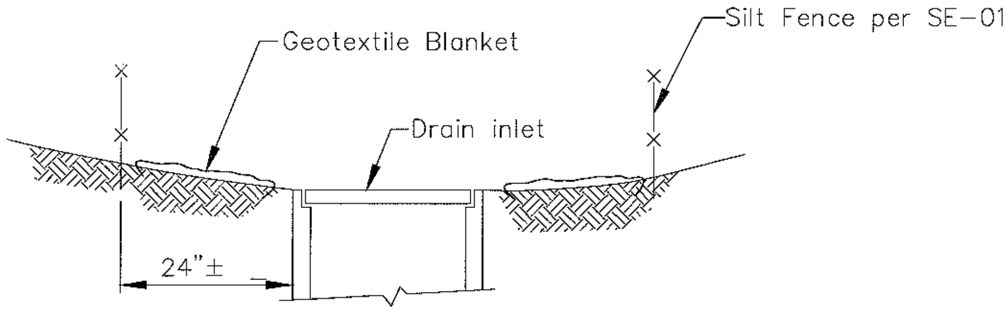
- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

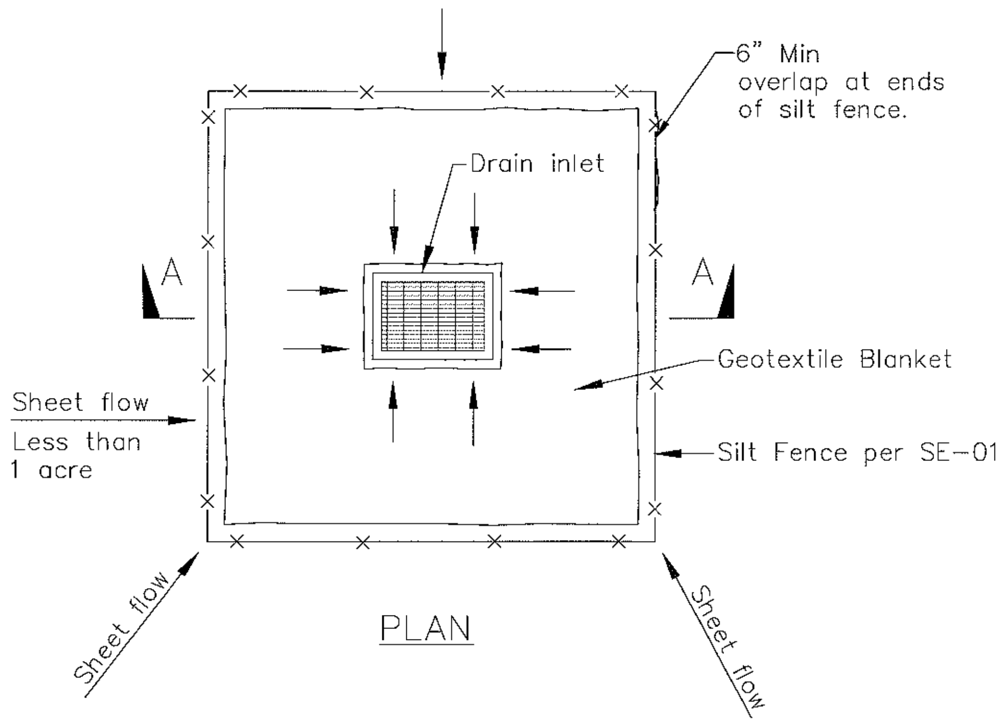
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



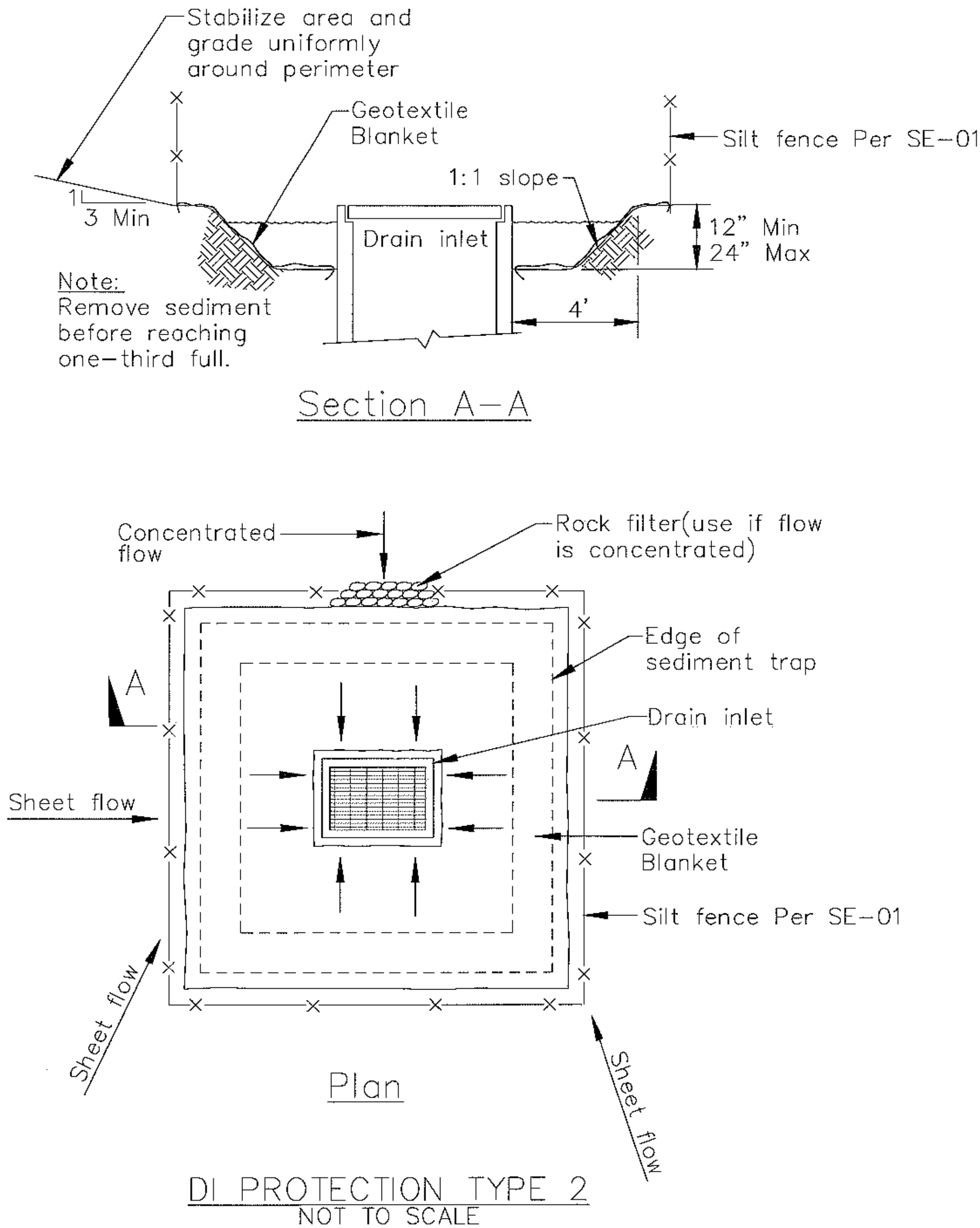
SECTION A-A



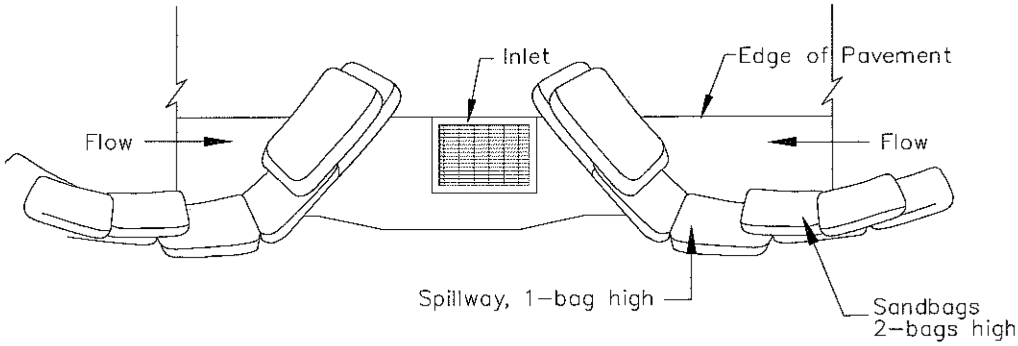
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

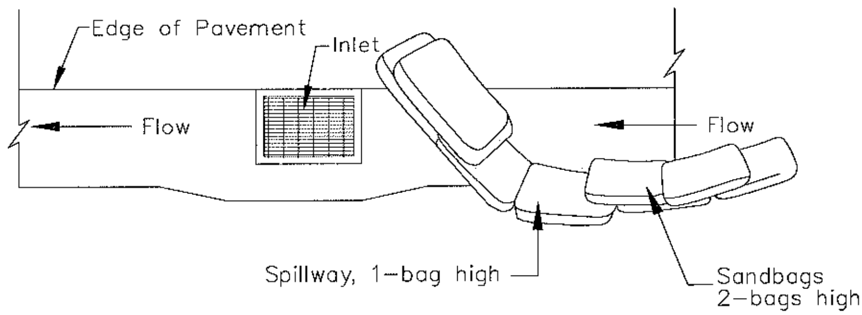
1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP



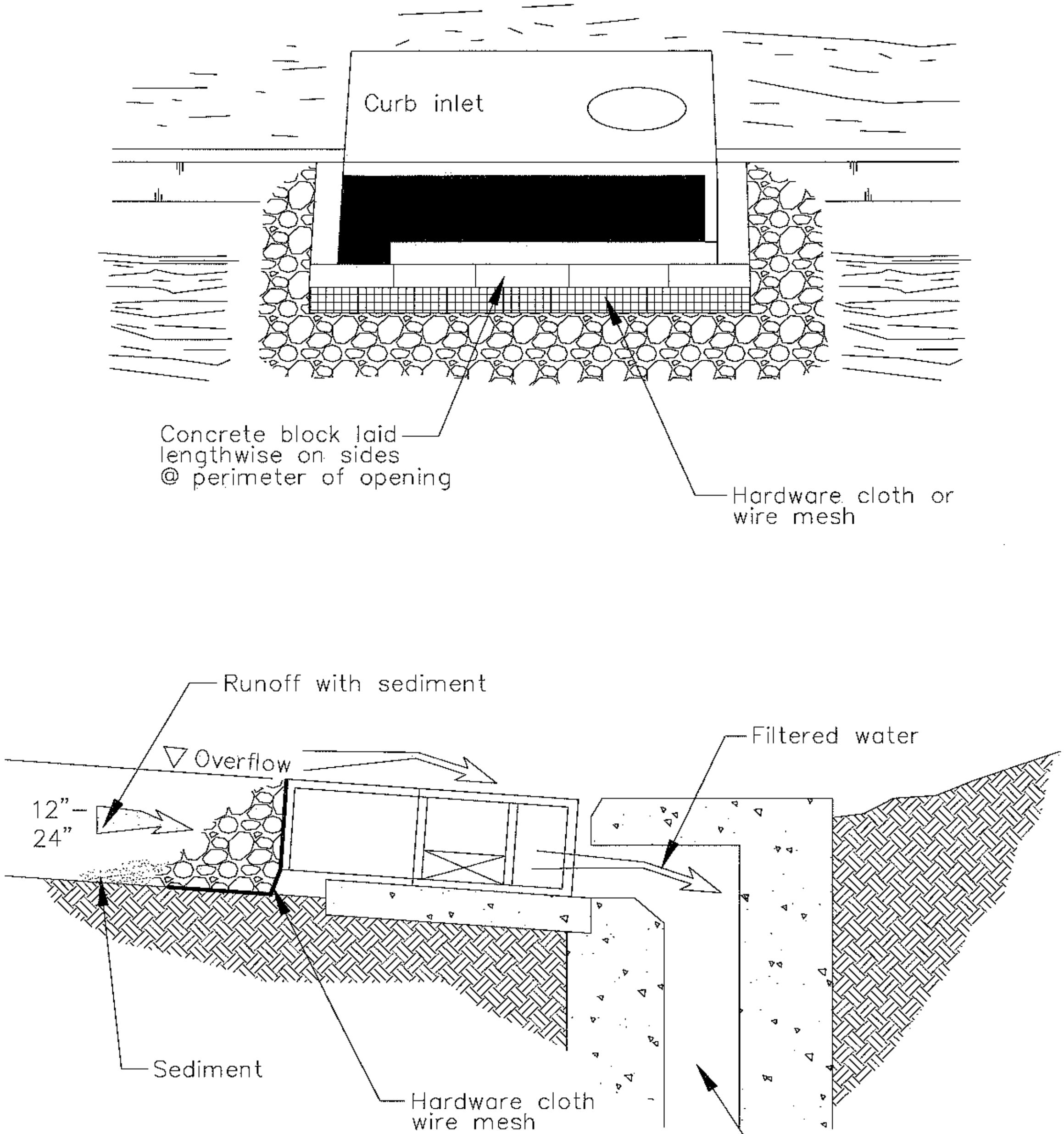
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short–term use.
2. Use to inhibit non–storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3

NOT TO SCALE



DI PROTECTION – TYPE 4
NOT TO SCALE

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Compost socks and berms act as three-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of runoff, allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants). A compost sock can be assembled on site by filling a mesh sock (e.g. with a pneumatic blower). The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in establishing vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps prevent rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity, as well as erosion and sediment control. The compost of the compost sock or berm can be selected that targets site specific objectives in capturing sediment and other pollutants, supporting vegetation, or additional erosion control.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

Suitable Applications

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or flatter, all other slope applications should use compost socks)
- Along the perimeter of a project
- As check dams in unlined ditches (compost socks only)
- Down-slope of exposed soil areas
- At operational storm drains as a form of inlet protection (compost socks only)
- Around temporary stockpiles

Compost socks and berms do not require special trenching or BMP removal compared to other sediment control methods (e.g. silt fence or fiber rolls). Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.

Compost can be pre-seeded prior to application (recommended by the EPA for construction site stormwater runoff control and required for compost socks) or seeded after installation (for compost berms only). The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons.

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Compost should be obtained from a supplier certified by the California Integrated Waste Management Board or compost should otherwise meet the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7. Carefully consider the qualifications and experience of any compost producer/supplier.
- Application by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of assembly.
- Compost socks and berms should not be employed at the base of slopes greater than 2:1 (H:V). They can be employed with other erosion control methods for steeper slopes.

- Difficult to move once saturated.
- Compost berms should not be applied in areas of concentrated flows.
- Compost socks and berms are easy to fix; however, they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance.

Implementation

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost medium parameter specifications for compost socks and berms have been developed to assist in compost selection, such as those provided by the American Association of State Highway Transportation Officials (AASHTO).
- Particle size is important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. small and large pieces) perform better for filtration objectives, while finer grades better support vegetation. Particle size of the compost should be selected based on site conditions, such as expected precipitation, and filtration goals and / or long term plant nutrients.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.
- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual. Vegetation has different nutrient and moisture needs.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should not be derived from mixed municipal solid waste and should be reasonably free of visible contaminates.

- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

- Compost should not possess objectionable odors.

- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to application, prepare locations for socks and berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface.

- Select method to apply the compost sock or berm. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.

- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal in cross section. Berm design is generally consists of a base two times the height. AASHTO specification MP 9-03 provides compost berm dimensions based on anticipated site precipitation (AASHTO, 2003 and USEPA, 2009). State agencies, such as Oregon

Department of Environmental Quality (ODEQ) have developed berm dimension based on slope steepness and length (ODEQ, 2004).

- Compost socks can be assembled on site by filling mesh socks with the selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. The sock diameter is a function of slope steepness and length. Again, ASSHTO provides specifications for various parameters. Compost socks range from 8" to 18", but are typically 12" to 18" in diameter.

- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks need to be anchored, typically stakes, through the center of the sock. To prevent water flowing around them, the ends of compost socks should be placed upslope.

- Locate compost socks and berms on level contours spaced as follows:

  - Slope inclination of 4:1 (H:V) or flatter: Socks and/or berms should be placed at a maximum interval of 20 ft.

  - Slope inclination between 4:1 and 2:1 (H:V): Socks should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).

  - Slope inclination 2:1 (H:V) or greater: Socks should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).

- Place perimeter socks and berms using a j-hook installation. Use of vegetation will also provide additional anchoring.

- Compost socks and berms can be placed around the perimeter of an affected area, like a silt fence, if the area is flat or on a contour. Do not place these socks and berms where ponded water could become an issue.

- If used at the toe of slopes, the compost sock or berm should at a minimum of 5 to 10 feet away.

- Use additional anchoring and erosion control BMPS in conjunction of the compost socks and berms as needed.

- Consider using compost berms or socks as necessary at the top and/or bottom of the slope for additional erosion control performance.

- Compost socks and berms can also be effective over rocky and frozen ground if installed properly.

- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic foot per second.

Costs

Recently obtained vendor costs indicated $3.50 per linear foot for compost berm application and $2.00 per linear foot for 8" socks and $2.50 per linear foot for 12"socks. Costs do not include final compost sock or berm functions at the end of construction activities, including spreading or removal, if required. ODEQ estimates that compost berms cost 30 percent less than silt fences to install.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Once damage is identified, mend or reapply the sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed. It may be necessary to apply an additional type of stormwater BMP, such as a compost blanket.

- Sediment contained by the sock or berm should be removed prior reaching 1/3 of the exposed height of the BMP. The sediment can be stabilized with the compost sock or berm with vegetation at the end of construction activities.

- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

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Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Categories

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-4 Check Dams

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

Description and Purpose

Biofilter bags, or bio-bags, are a multi-purpose sediment control BMP consisting of a plastic mesh bag filled with 100% recycled wood product waste. Biofilter bags come in a variety of sizes (30" X 18" and 30" X 9" being common) and generally have between 1-2 cubic yards of recycled wood waste (or wood chips). Biofilter bags work by detaining flow and allowing a slow rate of discharge through the wood media. This action removes suspended sediment through gravity settling of the detained water and filtration within the bag.

Suitable Applications

Biofilter bags are a short-term BMP that can be rapidly deployed, maintained, and replaced. Biofilter bags can be an effective short-term solution to place in developed rills to prevent further erosion until permanent measures can be established. Suitable short-term applications include:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - Below other small cleared areas
  - Along the perimeter of a site (with low-expected flow)
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas

- Along streams and channels

- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
  - At the top of slopes to divert runoff away from disturbed slopes
  - As check dams across mildly sloped construction roads
- Inlet Protection (See SE-10)
- Supplement to silt fences or other sediment control devices

Limitations

- Short life-span (2-3 months); regular maintenance and replacement required to ensure effectiveness. Bags will rapidly fill with sediment and reduce permeability.
- Easily damaged by construction vehicles.
- If not properly staked, will fail on slope applications.
- If improperly installed can allow undercutting or side-cutting flow.
- Not effective where water velocities or volumes are high.
- Potentially buoyant and easily displaced if not properly installed.

Implementation

General

Biofilter bags are a relatively low cost temporary BMP that are easily deployed and have a simple installation that can be performed by hand. Without proper installation, however, biofilter bags can fail due to their light weight, potential displacement, and multiple joint locations. One of the benefits of utilizing biofilter bags is that the media (wood-product) can be recycled or used onsite when no longer needed (where acceptable).

Design and Layout – Linear control

- Locate biofilter bags on level contours.
  - Slopes between 20:1 and 4:1 (H:V): Biofilter bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slopes between 4:1 and 2:1 (H:V): Biofilter bags should be placed at a maximum interval of 15 ft, with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Biofilter bags should be placed at a maximum interval of 10 ft., with the first row placed the slope toe.

- Turn the ends of the biofilter bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the biofilter bag berm to allow ponding, and to provide room for sediment storage.
- Stake biofilter bags into a 1 to 2 in. deep trench with a width equal to the bag.
  - Drive one stake at each end of the bag.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- Biofilter bags should be overlapped (6 in.), not abutted.

Costs

Pre-filled biofilter bags cost approximately $2.50-$3.50 per bag, dependent upon size.

Inspection and Maintenance

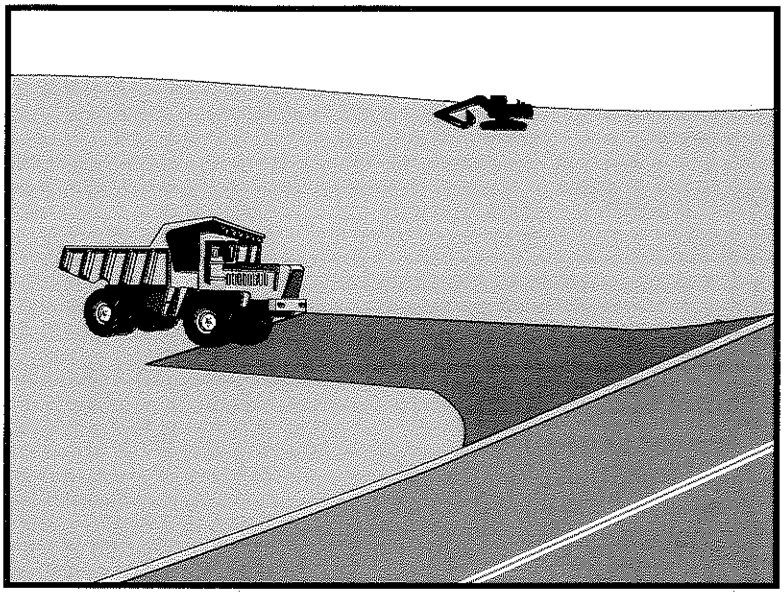
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Biofilter bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace biofilter bags as needed.
- Repair washouts or other damage as needed.
- Sediment that is retained by the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove biofilter bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Biofilter media may be used on-site, if allowed.

References

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2, Section 7, BMP 34 – Biofilter Bags, Idaho Department of Environmental Quality, 2005.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

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Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

- Designate combination or single purpose entrances and exits to the construction site.

- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.

- Implement SE-7, Street Sweeping and Vacuuming, as needed.

- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.

- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.

- Keep all temporary roadway ditches clear.

- Check for damage and repair as needed.

- Replace gravel material when surface voids are visible.

- Remove all sediment deposited on paved roadways within 24 hours.

- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

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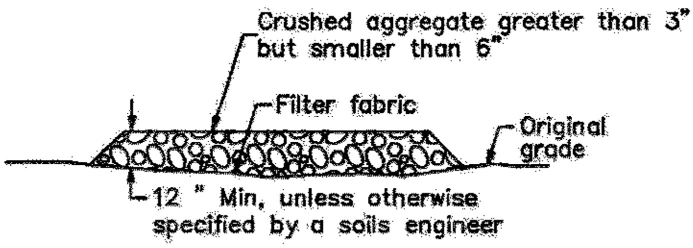
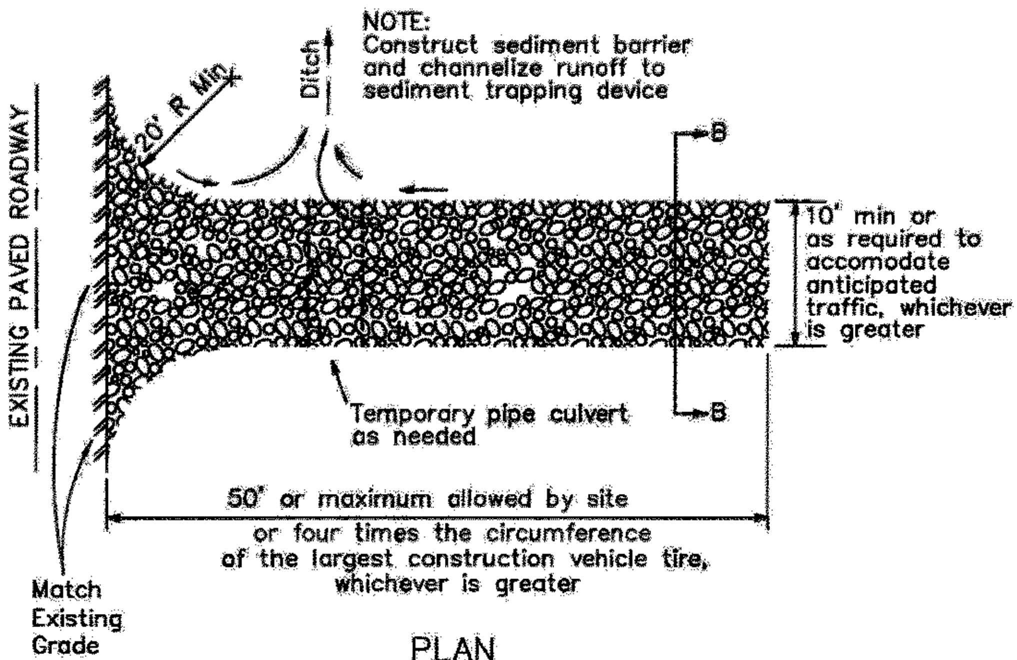
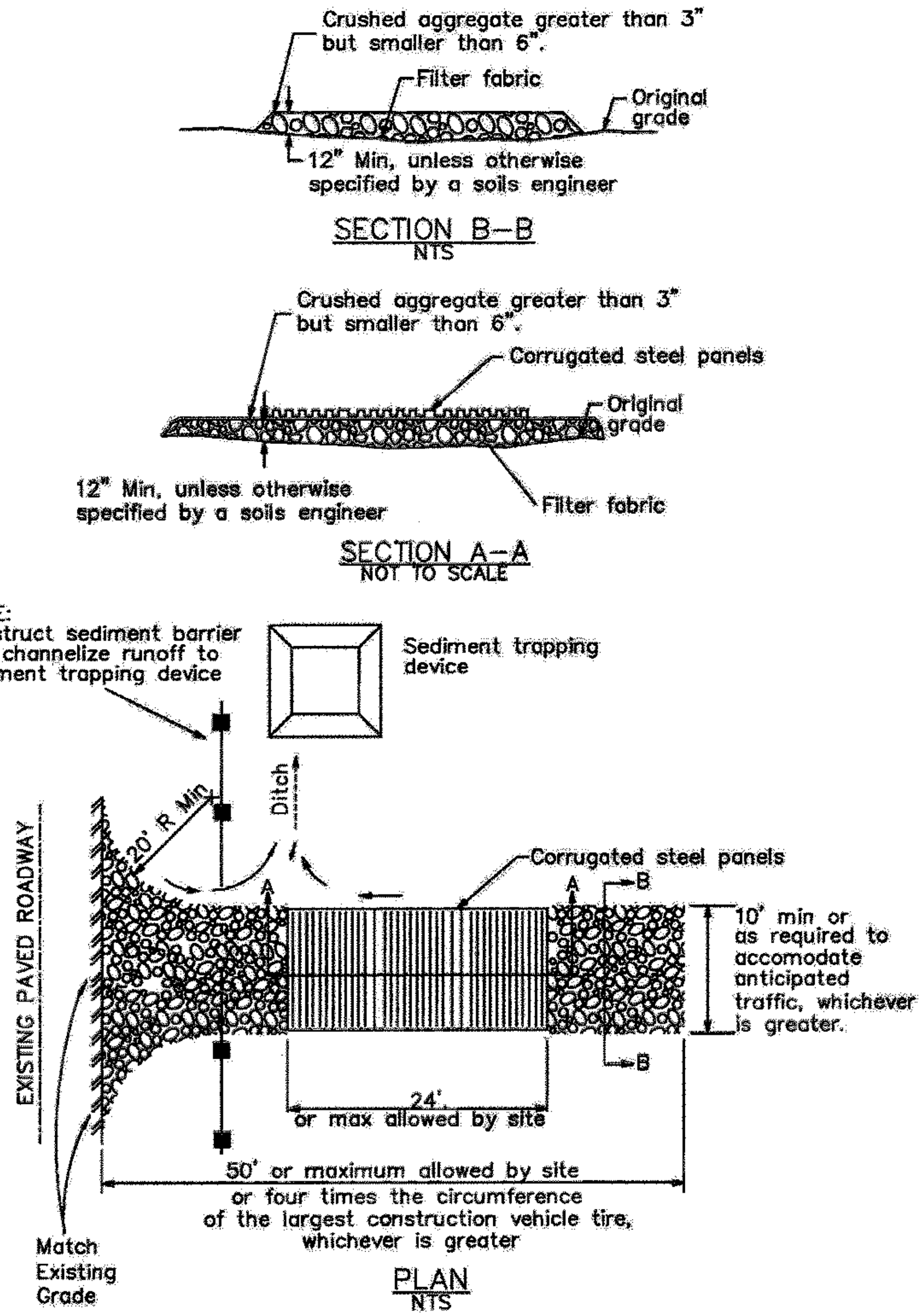
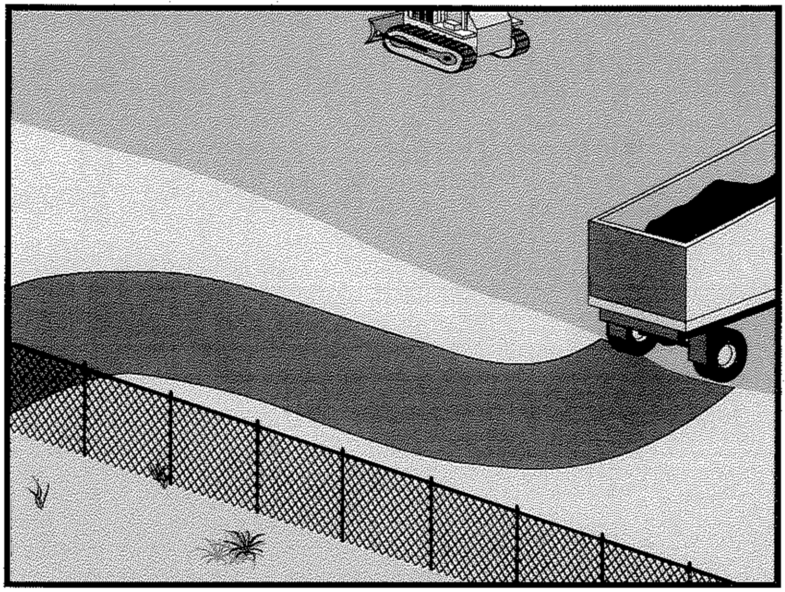


SECTION B–B
NTS



PLAN
NTS


Crushed aggregate greater than 3" but smaller than 6".
Filter fabric
Original grade
12" Min, unless otherwise specified by a soils engineer
SECTION B-B
NTS
Crushed aggregate greater than 3" but smaller than 6".
Corrugated steel panels
Original grade
12" Min, unless otherwise specified by a soils engineer
Filter fabric
SECTION A-A
NOT TO SCALE
NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
Corrugated steel panels
A
A
B
B
10' min or as required to accomodate anticipated traffic, whichever is greater.
24' or max allowed by site
50' or maximum allowed by site or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.
- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.

- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

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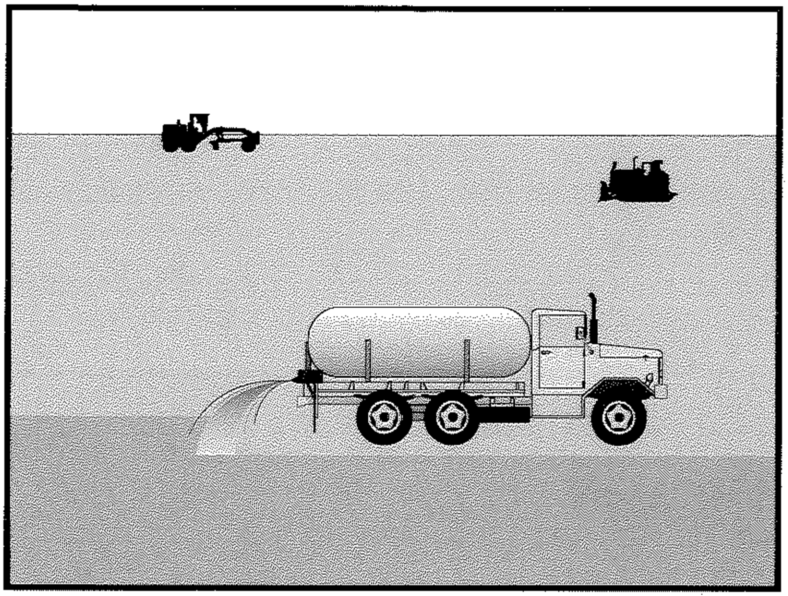
Wind Erosion Control WE-1



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit. .

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

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- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

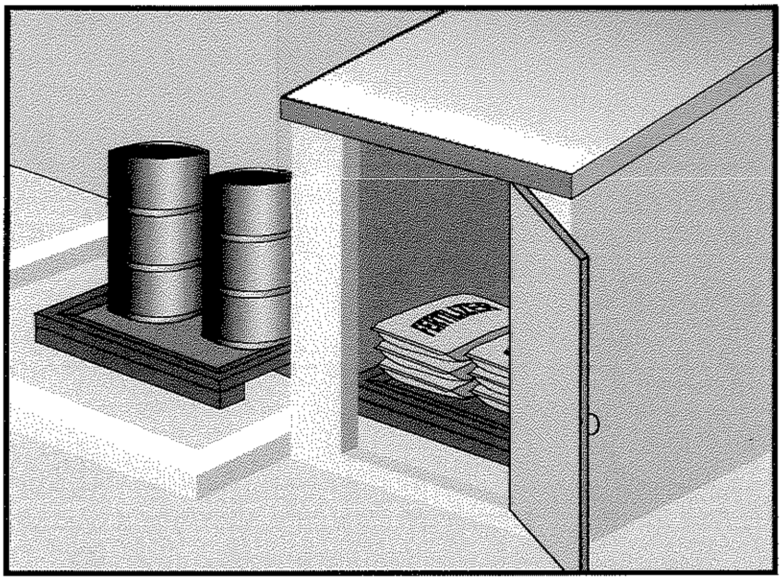
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Material Delivery and Storage WM-1



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

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- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.

- Stockpiles should be protected in accordance with WM-3, Stockpile Management.

- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.

- Proper storage instructions should be posted at all times in an open and conspicuous location.

- An ample supply of appropriate spill clean up material should be kept near storage areas.

- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.

- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.

- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.

- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Keep storage areas clean and well organized, including a current list of all materials onsite.

- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

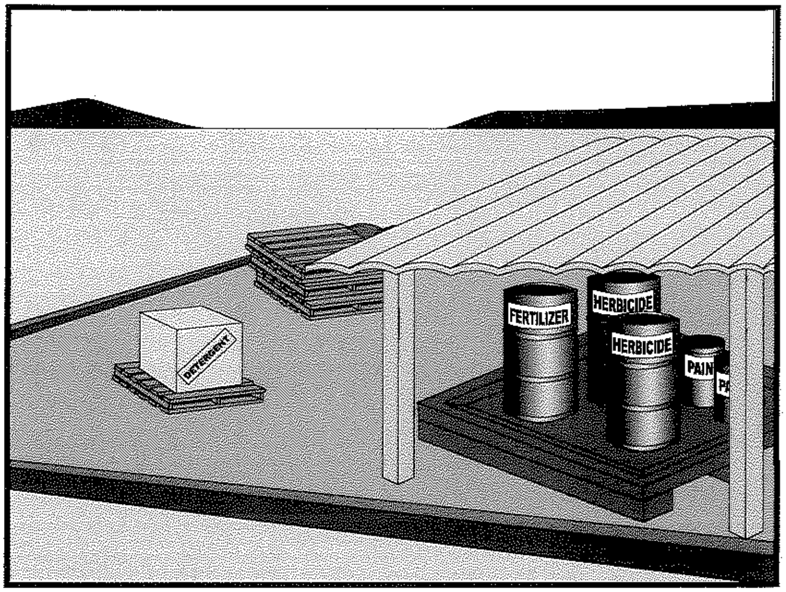
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

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Limitations
Safer alternative building and construction products may not be available or suitable in every instance.

Implementation
The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.

- Train employees and subcontractors in proper material use.

- Supply Material Safety Data Sheets (MSDS) for all materials.

- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.

- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.

- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.

- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.

- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.

- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

- Document the location, time, chemicals applied, and applicator's name and qualifications.

- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.

- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

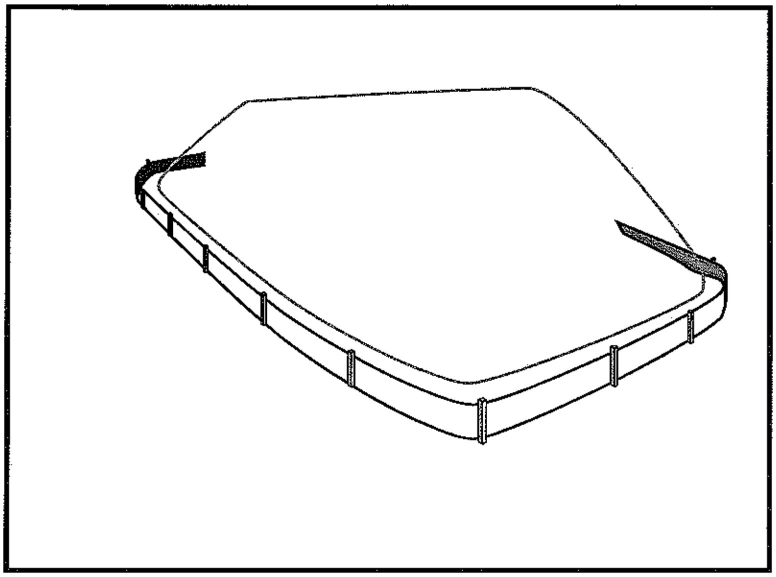
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of plastic materials should be avoided when feasible and photodegradable plastics should not be used.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.

- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.

- Protect all stockpiles from stormwater run-on using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.

- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.

- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.

- Place bagged materials on pallets and under cover.

- Ensure that stockpile coverings are installed securely to protect from wind and rain.

- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Cover and project soil stockpiles with soil stabilization measures and a temporary perimeter sediment barrier at all times.

- Consider temporary vegetation for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Provide covers and protect these stockpiles with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cover cold mix stockpiles and place them on plastic sheeting (or comparable material) and surround the stockpiles with a berm all times.

Stockpiles of fly ash, stucco, hydrated lime

- Cover stockpiles of materials that may raise the pH of runoff (i.e., basic materials) with plastic and surround the stockpiles with a berm at all times.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)

- Cover treated wood with plastic sheeting (or comparable material) and surround with a berm at all times.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.

- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.

- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).

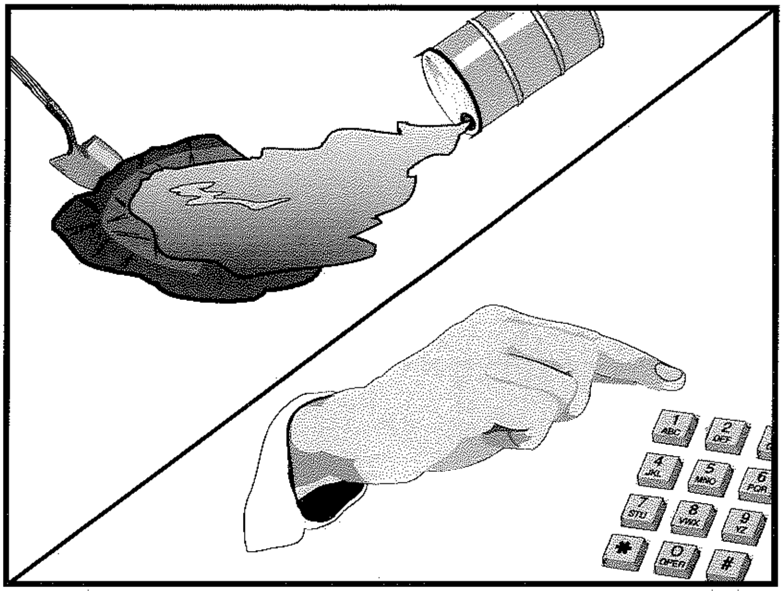
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Description and Purpose
Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications
This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives
None

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

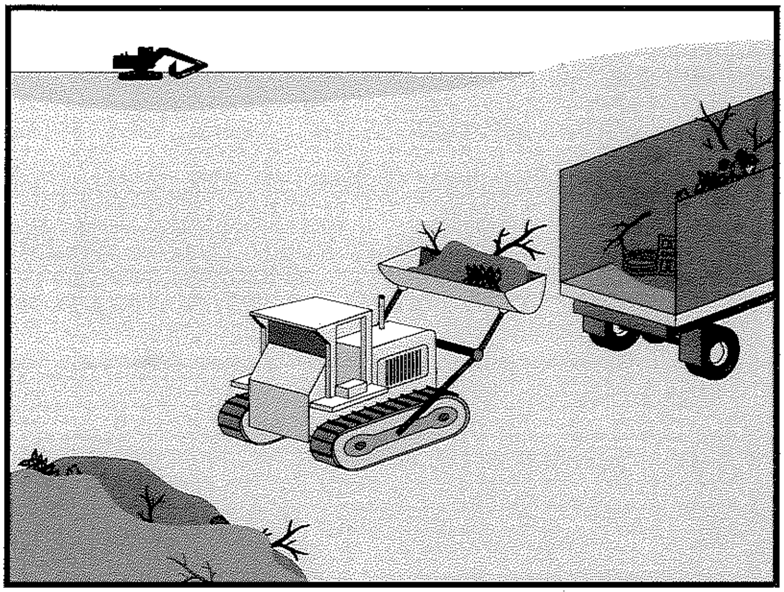
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs
All of the above are low cost measures.

Inspection and Maintenance
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur

- Inspect construction waste area regularly.

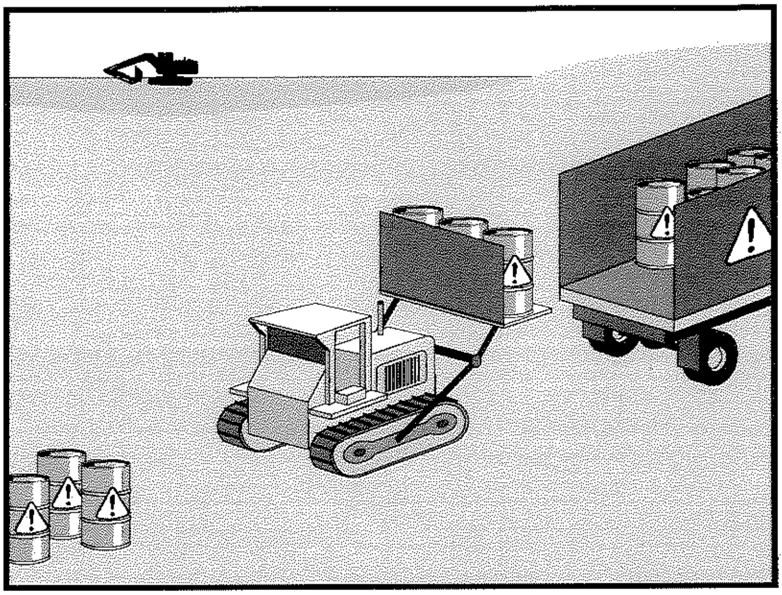
- Arrange for regular waste collection.

References
Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management



Description and Purpose
Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications
This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives
None

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

■ Drums should not be overfilled and wastes should not be mixed.

■ Unless watertight, containers of dry waste should be stored on pallets.

■ Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

■ Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

■ Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

■ The following actions should be taken with respect to temporary contaminant:

  - Ensure that adequate hazardous waste storage volume is available.

  - Ensure that hazardous waste collection containers are conveniently located.

  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

  - Minimize production or generation of hazardous materials and hazardous waste on the job site.

  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.

  - Segregate potentially hazardous waste from non-hazardous construction site debris.

  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.

- A copy of the hazardous waste manifests should be provided.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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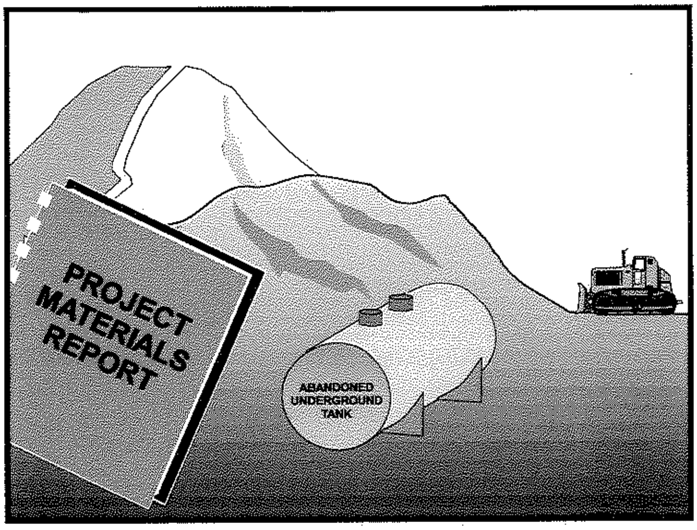

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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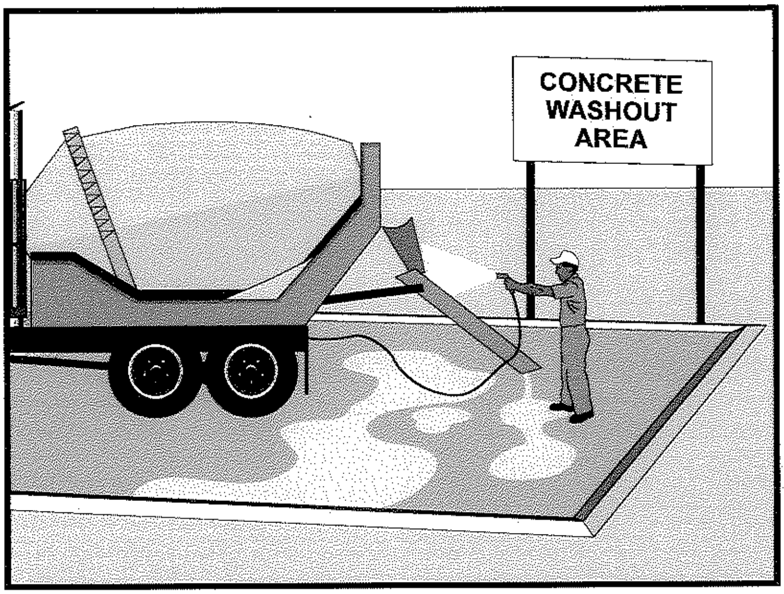


Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
    - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
    - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
    - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.

- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.

- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a "roll-off"; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

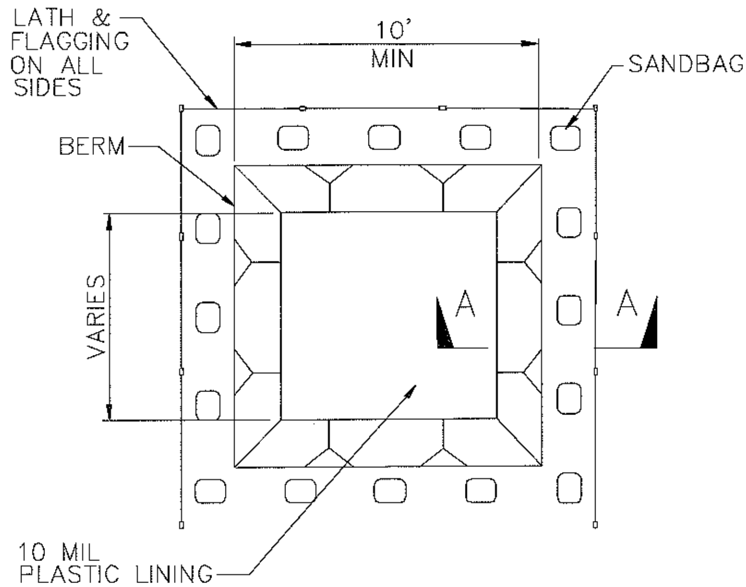
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

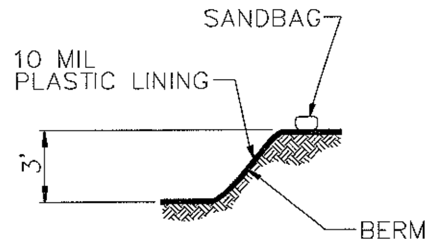
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

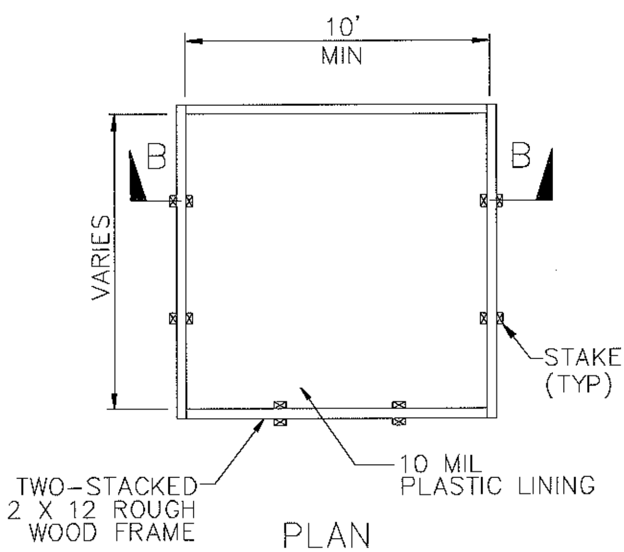
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



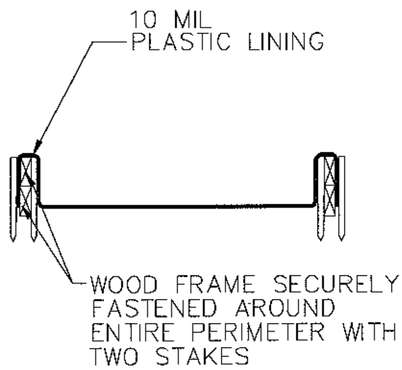
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



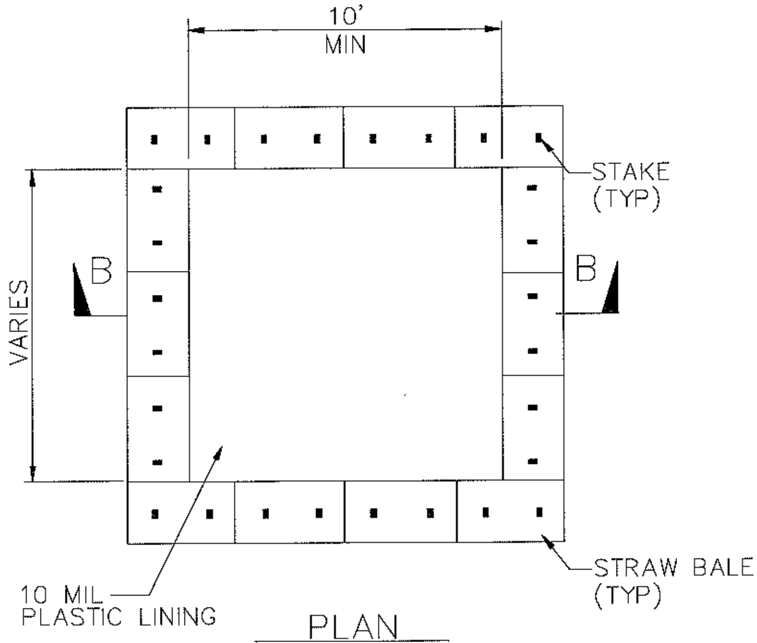
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



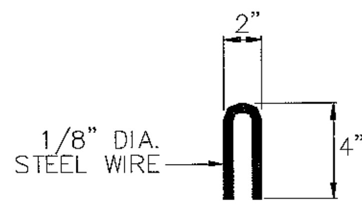
SECTION B–B
NOT TO SCALE

NOTES

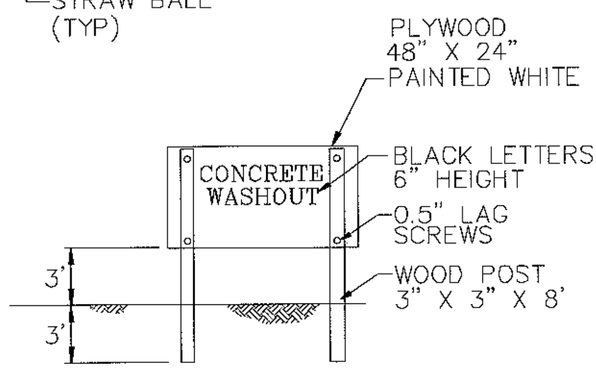
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



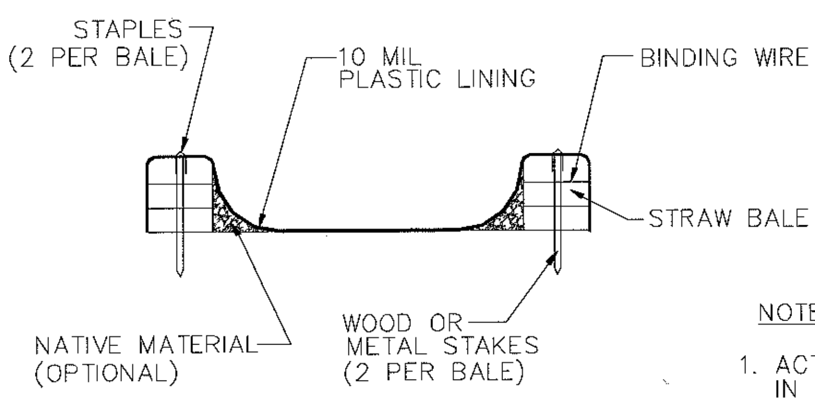
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



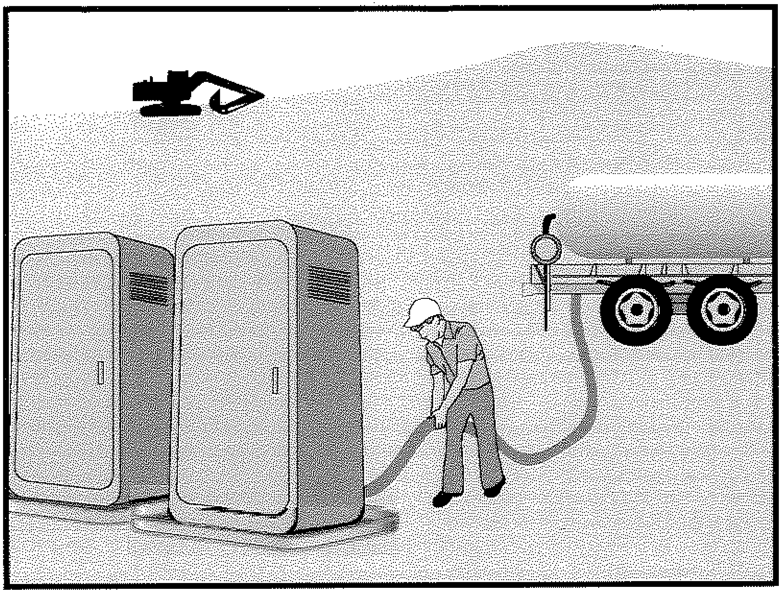
CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)



SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Arrange for regular waste collection.

- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.

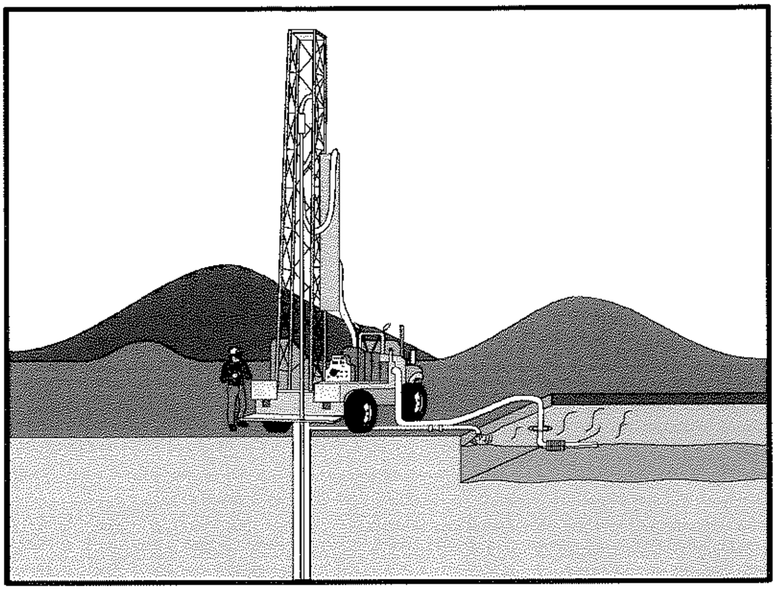
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Liquid Waste Management WM-10



Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.

- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Appendix I: BMP Inspection Form

INSTRUCTIONS

- *Identify Risk Level, for Risk Level 2 or 3 include highlighted text*

BMP INSPECTION REPORT

Date and Time of Inspection:		Date Report Written:		
Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Storm *Complete Parts I,II,III,IV and VII*	During Rain Event *Complete Parts I, II, III, V, and VII*	Post-Storm *Complete Parts I,II,III,VI and VII*
Part I. General Information				
Site Information				
Construction Site Name:				
Construction stage and completed activities:			Approximate area of site that is exposed:	
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:	
Weather				
Estimate storm beginning: (date and time)		Estimate storm duration: (hours)		
Estimate time since last storm: (days or hours)		Rain gauge reading and location: (in)		
Is a “Qualifying Event” predicted or did one occur (i.e., 0.5” rain with 48-hrs or greater between events)? (Y/N) If yes, summarize forecast:				
Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.				
Inspector Information				
Inspector Name:			Inspector Title:	
Signature:				Date:

Part II. BMP Observations. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Failures or other short comings (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Linear sediment control along toe of slope, face of slope an at grade breaks (Risk Level 2 & 3 Only)			
Limit construction activity to and from site to entrances and exits that employ effective controls to prevent offsite tracking (Risk Level 2 & 3 Only)			

Ensure all storm, drain inlets and perimeter controls, runoff control BMPs and pollutants controls at entrances and exits are maintained and protected from activities the reduce their effectiveness (Risk Level 2 & 3 Only)			
Inspect all immediate access roads daily (Risk Level 2 & 3 Only)			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

Part III. Descriptions of BMP Deficiencies		
Deficiency	**Repairs Implemented:** **Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.**	
	Start Date	**Action**
1.		
2.		
3.		
4.		

Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).	
	Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	

Notes:	

Part V. Additional During Storm Observations. If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.	
Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

Part VI. Additional Post-Storm Observations. **Visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.**	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. **Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.**	
Required Actions	**Implementation Date**

Appendix J: Project Specific Rain Event Action Plan Template

INSTRUCTIONS

- *QSD should modify the CASQA REAP template for use by the QSP*
- *The QSP will modify the project specific template for each phase/rain event*
- *File REAPs completed by the QSP in this Appendix*

Rain Event Action Plan (REAP)

Date of REAP		**WDID Number:**	
Date Rain Predicted to Occur:		**Predicted % chance of rain:**	

Predicted Rain Event Triggered Actions

Below is a list of suggested actions and items to review for this project. Each active Trade should check all material storage areas, stockpiles, waste management areas, vehicle and equipment storage and maintenance, areas of active soil disturbance, and areas of active work to ensure the proper implementation of BMPs. Project-wide BMPs should be checked and cross-referenced to the BMP progress map.

Trade or Activity	Suggested action(s) to perform / item(s) to review prior to rain event
❑ Information & Scheduling	❑ Inform trade supervisors of predicted rain ❑ Check scheduled activities and reschedule as needed ❑ Alert erosion/sediment control provider ❑ Alert sample collection contractor (if applicable) ❑ Schedule staff for extended rain inspections (including weekends & holidays) ❑ Check Erosion and Sediment Control (ESC) material stock ❑ Review BMP progress map ❑ Other:_______________________________________ ❑ ____ ❑ ____
❑ Material storage areas	❑ Material under cover or in sheds (ex: treated woods and metals) ❑ Perimeter control around stockpiles ❑ Other:_______________________________________ ❑ ____ ❑ ____________________________________
❑ Waste management areas	❑ Dumpsters closed ❑ Drain holes plugged ❑ Recycling bins covered ❑ Sanitary stations bermed and protected from tipping ❑ Other:_______________________________________ ❑ ____ ❑ ____
❑ Trade operations	❑ Exterior operations shut down for event (e.g., no concrete pours or paving) ❑ Soil treatments (e.g.,: fertilizer) ceased within 24 hours of event ❑ Materials and equipment (ex: tools) properly stored and covered ❑ Waste and debris disposed in covered dumpsters or removed from site ❑ Trenches and excavations protected ❑ Perimeter controls around disturbed areas ❑ Fueling and repair areas covered and bermed ❑ Other:_______________________________________ ❑ ____ ❑ ____________________________________
❑ Site ESC BMPs	❑ Adequate capacity in sediment basins and traps ❑ Site perimeter controls in place ❑ Catch basin and drop inlet protection in place and cleaned ❑ Temporary erosion controls deployed ❑ Temporary perimeter controls deployed around disturbed areas and stockpiles ❑ Roads swept; site ingress and egress points stabilized ❑ Other:_______________________________________ ❑ ____ ❑ ____________________________________
❑ Concrete rinse out area	❑ Adequate capacity for rain ❑ Wash-out bins covered ❑ Other:_______________________________________ ❑ ____ ❑ ____________________________________
❑ Spill and drips	❑ All incident spills and drips, including paint, stucco, fuel, and oil cleaned ❑ Drip pans emptied ❑ Other:_______________________________________ ❑ ____ ❑ ____________________________________

Continued on next page.

❑ Other / Discussion / Diagrams	❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____ ❑ ____

Attach a printout of the weather forecast from the NOAA website to the REAP.

I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

____Date: __________________________
Qualified SWPPP Practitioner (Use ink please)

Appendix K: Training Reporting Form

Trained Contractor Personnel Log

Stormwater Management Training Log and Documentation

Project Name: ____

WDID #: _______________________________

Stormwater Management Topic: (check as appropriate)

☐ Erosion Control ☐ Sediment Control

☐ Wind Erosion Control ☐ Tracking Control

☐ Non-Stormwater Management ☐ Waste Management and Materials Pollution Control

☐ Stormwater Sampling

Specific Training Objective: ____

Location: ____________________ Date: _______________________

Instructor:____________________ Telephone: ___________________

Course Length (hours): __________

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As needed, add proof of external training (e.g., course completion certificates, credentials for QSP, QSD).

Appendix L: Responsible Parties

Authorization of Approved Signatories

Project Name: ____

WDID #: _______________________________

Name of Personnel	Project Role	Company	Signature	Date

_________________________ _________________________

LRP's Signature Date

_________________________ _________________________

LRP Name and Title Telephone Number

Identification of QSP

Project Name: ____

WDID #: __________________________________

The following are QSPs associated with this project

Name of Personnel(1)	Company	Date

(1) If additional QSPs are required on the job site add additional lines and include information here

OPTIONAL

Authorization of Data Submitters

Project Name: ____

WDID #: _________________________________

Name of Personnel	Project Role	Company	Signature	Date

__________________________ __________________________

Approved Signatory's Signature Date

__________________________ __________________________

Approved Signatory Telephone Number

Name and Title

Appendix M:Contractors and Subcontractors

Appendix N: Construction General Permit

INSTRUCTIONS

- *Include a copy of the General Permit, or reference permanent location of General Permit that is kept on the construction site.*

State Water Resources Control Board
Division of Water Quality
1001 I Street • Sacramento, California 95814 • (916) 341-5455
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100
Fax (916) 341-5463 • http://www.waterboards.ca.gov

Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

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I. BACKGROUND

A. History

In 1972, the Federal Water Pollution Control Act (also referred to as the Clean Water Act [CWA]) was amended to provide that the discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 amendments to the CWA added Section 402(p), which establishes a framework for regulating municipal and industrial storm water discharges under the NPDES Program. On November 16, 1990, the U.S. Environmental Protection Agency (USEPA) published final regulations that established storm water permit application requirements for specified categories of industries. The regulations provide that discharges of storm water to waters of the United States from construction projects that encompass five or more acres of soil disturbance are effectively prohibited unless the discharge is in compliance with an NPDES Permit. Regulations (Phase II Rule) that became final on December 8, 1999 lowered the permitting threshold from five acres to one acre.

While federal regulations allow two permitting options for storm water discharges (Individual Permits and General Permits), the State Water Board has elected to adopt only one statewide General Permit at this time that will apply to most storm water discharges associated with construction activity.

On August 19, 1999, the State Water Board reissued the General Construction Storm Water Permit (Water Quality Order 99-08-DWQ). On December 8, 1999 the State Water Board amended Order 99-08-DWQ to apply to sites as small as one acre.

The General Permit accompanying this fact sheet regulates storm water runoff from construction sites. Regulating many storm water discharges under one permit will greatly reduce the administrative burden associated with permitting individual storm water discharges. To obtain coverage under this General Permit, dischargers shall electronically file the Permit Registration Documents (PRDs), which includes a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other compliance related documents required by this General Permit and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Quality Control Boards (Regional Water Boards) may issue General Permits or Individual Permits containing more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers.

B. Legal Challenges and Court Decisions

1. Early Court Decisions

Shortly after the passage of the CWA, the USEPA promulgated regulations exempting most storm water discharges from the NPDES permit requirements. (See 40 C.F.R. § 125.4 (1975); see also *Natural Resources Defense Council v. Costle* (D.C. Cir. 1977) 568 F.2d 1369, 1372 (*Costle*); *Defenders of Wildlife v. Browner* (9th Cir. 1999) 191 F.3d 1159, 1163 (*Defenders of Wildlife*).) When environmental groups challenged this exemption in federal court, the District of Columbia Court of Appeals invalidated the regulation, holding that the USEPA "does not have authority to exempt categories of point sources from the permit requirements of [CWA] § 402." (*Costle*, 568 F.2d at 1377.) The *Costle* court rejected the USEPA's argument that effluent-based storm sewer regulation was administratively infeasible because of the variable nature of storm water pollution and the number of affected storm sewers throughout the country. (*Id.* at 1377-82.) Although the court acknowledged the practical problems relating to storm sewer regulation, the court found the USEPA had the flexibility under the CWA to design regulations that would overcome these problems. (*Id.* at 1379-83.) In particular, the court pointed to general permits and permits based on requiring best management practices (BMPs).

During the next 15 years, the USEPA made numerous attempts to reconcile the statutory requirement of point source regulation with the practical problem of regulating possibly millions of diverse point source discharges of storm water. (See *Defenders of Wildlife*, 191 F.3d at 1163; see also Gallagher, Clean Water Act in Environmental Law Handbook (Sullivan, edit., 2003)
p. 300 (Environmental Law Handbook); Eisen, *Toward a Sustainable Urbanism: Lessons from Federal Regulation of Urban Storm Water Runoff* (1995) 48 Wash. U.J. Urb. & Contemp. L.1, 40-41 [Regulation of Urban Storm Water Runoff].)

In 1987, Congress amended the CWA to require NPDES permits for storm water discharges. (See CWA § 402(p), 33 U.S.C. § 1342(p); *Defenders of Wildlife,* 191 F.3d at 1163; *Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1296.) In these amendments, enacted as part of the Water Quality Act of 1987, Congress distinguished between industrial and municipal storm water discharges. With respect to industrial storm water discharges, Congress provided that NPDES permits "shall meet all applicable provisions of this section and section 1311 [requiring the USEPA to establish effluent limitations under specific timetables]." (CWA § 402(p)(3)(A), 33 U.S.C. § 1342(p)(3)(A); see also *Defenders of Wildlife,* 191 F.3d at 1163-64.)

In 1990, USEPA adopted regulations specifying what activities were considered “industrial” and thus required discharges of storm water associated with those activities to obtain coverage under NPDES permits. (55 Fed. Reg. 47,990 (1990); 40 C.F.R. § 122.26(b)(14).) Construction activities, deemed a subset of the industrial activities category, must also be regulated by an NPDES permit. (40 C.F.R. § 122.26(b)(14)(x)). In 1999, USEPA issued regulations for “Phase II” of storm water regulation, which required most small construction sites (1-5 acres) to be regulated under the NPDES program. (64 Fed. Reg. 68,722; 40 C.F.R. § 122.26(b)(15)(i).)

2. Court Decisions on Public Participation

Two recent federal court opinions have vacated USEPA rules that denied meaningful public review of NPDES permit conditions. On January 14, 2003, the Ninth Circuit Court of Appeals held that certain aspects of USEPA’s Phase II regulations governing MS4s were invalid primarily because the general permit did not contain express requirements for public participation. (*Environmental Defense Center v. USEPA* (9th Cir. 2003) 344 F.3d 832.) Specifically, the court determined that applications for general permit coverage (including the Notice of Intent (NOI) and Storm Water Management Program (SWMP)) must be made available to the public, the applications must be reviewed and determined to meet the applicable standard by the permitting authority before coverage commences, and there must be a process to accommodate public hearings. (*Id.* at 852-54.) Similarly, on February 28, 2005, the Second Circuit Court of Appeals held that the USEPA's confined animal feeding operation (CAFO) rule violated the CWA because it allowed dischargers to write their own nutrient management plans without public review. (*Waterkeeper Alliance v. USEPA* (2d Cir. 2005) 399 F.3d 486.) Although neither decision involved the issuance of construction storm water permits, the State Water Board’s Office of Chief Counsel has recommended that the new General Permit address the courts’ rulings where feasible[1].

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[1] In *Texas Independent Producers and Royalty Owners Assn. v. USEPA* (7th Cir. 2005) 410 F.3d 964, the Seventh Circuit Court of Appeals held that the USEPA’s construction general permit was not required to provide the public with the opportunity for a public hearing on the Notice of Intent or Storm Water Pollution Prevention Plan. The Seventh Circuit briefly discussed why it agreed with the Ninth Circuit’s dissent in *Environmental Defense Center*, but

The CWA and the USEPA's regulations provide states with the discretion to formulate permit terms, including specifying best management practices (BMPs), to achieve strict compliance with federal technology-based and water quality-based standards. (*Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1308.) Accordingly, this General Permit has developed specific BMPs as well as numeric action levels (NALs) in order to achieve these minimum federal standards. In addition, the General Permit requires a SWPPP and REAP (another dynamic, site-specific plan) to be developed but has removed all language requiring the discharger to implement these plans – instead, the discharger is required to comply with specific requirements. By requiring the dischargers to implement these specific BMPs and NALs, this General Permit ensures that the dischargers do not "write their own permits." As a result this General Permit does not require each discharger's SWPPP and REAP to be reviewed and approved by the Regional Water Boards.

This General Permit also requires dischargers to electronically file all permit-related compliance documents. These documents include, but are not limited to, NOIs, SWPPPs, annual reports, Notice of Terminations (NOTs), and numeric action level (NAL) exceedance reports. Electronically submitted compliance information is immediately available to the public, as well as the Regional Water Quality Control Board (Regional Water Board) offices, via the Internet. In addition, this General Permit enables public review and hearings on permit applications when appropriate. Under this General Permit, the public clearly has a meaningful opportunity to participate in the permitting process.

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generally did not discuss the substantive holdings in *Environmental Defense Center* and *Waterkeeper Alliance*, because neither court addressed the initial question of whether the plaintiffs had standing to challenge the permits at issue. However, notwithstanding the Seventh Circuit's decision, it is not binding or controlling on the State Water Board because California is located within the Ninth Circuit.

C. Blue Ribbon Panel of Experts and Feasibility of Numeric Effluent Limitations

In 2005 and 2006, the State Water Board convened an expert panel (panel) to address the feasibility of numeric effluent limitations (NELs) in California's storm water permits. Specifically, the panel was asked to address:

"Is it technically feasible to establish numeric effluent limitations, or some other quantifiable limit, for inclusion in storm water permits? How would such limitations or criteria be established, and what information and data would be required?"

"The answers should address industrial general permits, construction general permits, and area-wide municipal permits. The answers should also address both technology-based limitations or criteria and water quality-based limitations or criteria. In evaluating establishment of any objective criteria, the panel should address all of the following:

The ability of the State Water Board to establish appropriate objective limitations or criteria;

How compliance determinations would be made;

The ability of dischargers and inspectors to monitor for compliance; and

The technical and financial ability of dischargers to comply with the limitations or criteria."

Through a series of public participation processes (State Water Board meetings, State Water Board workshops, and the solicitation of written comments), a number of water quality, public process and overall program effectiveness problems were identified. Some of these problems are addressed through this General Permit.

D. Summary of Panel Findings on Construction Activities

The panel's final report can be downloaded and viewed through links at www.waterboards.ca.gov or by clicking here[2].

The panel made the following observations:

"Limited field studies indicate that traditional erosion and sediment controls are highly variable in performance, resulting in highly variable turbidity levels in the site discharge."

"Site-to-site variability in runoff turbidity from undeveloped sites can also be quite large in many areas of California, particularly in more arid regions with less natural vegetative cover and steep slopes."

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[2] http://www.waterboards.ca.gov/stormwtr/docs/numeric/swpanel_final_report.pdf

“Active treatment technologies involving the use of polymers with relatively large storage systems now exist that can provide much more consistent and very low discharge turbidity. However, these technologies have as yet only been applied to larger construction sites, generally five acres or greater. Furthermore, toxicity has been observed at some locations, although at the vast majority of sites, toxicity has not occurred. There is also the potential for an accidental large release of such chemicals with their use.”

“To date most of the construction permits have focused on TSS and turbidity, but have not addressed other, potentially significant pollutants such as phosphorus and an assortment of chemicals used at construction sites.”

“Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors.”

“The quality of storm water discharges from construction sites that effectively employ BMPs likely varies due to site conditions such as climate, soil, and topography.”

“The States of Oregon and Washington have recently adopted similar concepts to the Action Levels described earlier.”

In addition, the panel made the following conclusions:

“It is the consensus of the Panel that active treatment technologies make Numeric Limits technically feasible for pollutants commonly associated with storm water discharges from construction sites (e.g. TSS and turbidity) for larger construction sites. Technical practicalities and cost-effectiveness may make these technologies less feasible for smaller sites, including small drainages within a larger site, as these technologies have seen limited use at small construction sites. If chemical addition is not permitted, then Numeric Limits are not likely feasible.”

“The Board should consider Numeric Limits or Action Levels for other pollutants of relevance to construction sites, but in particular pH. It is of particular concern where fresh concrete or wash water from cement mixers/equipment is exposed to storm water.”

“The Board should consider the phased implementation of Numeric Limits and Action Levels, commensurate with the capacity of the dischargers and support industry to respond.”

E. How the Panel’s Findings are Used in this General Permit

The State Water Board carefully considered the findings of the panel and related public comments. The State Water Board also reviewed and considered the comments regarding statewide storm water policy and the reissuance of the Industrial General Permit. From the input received the State Water Board identified some permit and program performance gaps that are addressed in this General Permit. The Summary of Significant Changes (below) in this General Permit are a direct result of this process.

F. Summary of Significant Changes in This General Permit

The State Water Board has significant changes to Order 99-08-DWQ. This General Permit differs from Order 99-08-DWQ in the following significant ways:

Rainfall Erosivity Waiver: this General Permit includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their site's given location and time frame compute to be less than or equal to 5.

Technology-Based Numeric Action Levels: this General Permit includes NALs for pH and turbidity.

Risk-Based Permitting Approach: this General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk.

Minimum Requirements Specified: this General Permit imposes more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.

Project Site Soil Characteristics Monitoring and Reporting: this General Permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.

Effluent Monitoring and Reporting: this General Permit requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to evaluate whether NALs and NELs for Active Treatment Systems included in this General Permit are exceeded.

Receiving Water Monitoring and Reporting: this General Permit requires some Risk Level 3 and LUP Type 3 dischargers to monitor receiving waters and conduct bioassessments.

Post-Construction Storm Water Performance Standards: this General Permit specifies runoff reduction requirements for all sites not covered by a Phase I or Phase II MS4 NPDES permit, to avoid, minimize and/or mitigate post-construction storm water runoff impacts.

Rain Event Action Plan: this General Permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.

Annual Reporting: this General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information.

Certification/Training Requirements for Key Project Personnel: this General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.

Linear Underground/Overhead Projects: this General Permit includes requirements for all Linear Underground/Overhead Projects (LUPs).

II. RATIONALE

A. General Permit Approach

A general permit for construction activities is an appropriate permitting approach for the following reasons:

1. A general permit is an efficient method to establish the essential regulatory requirements for a broad range of construction activities under differing site conditions;

2. A general permit is the most efficient method to handle the large number of construction storm water permit applications;

3. The application process for coverage under a general permit is far less onerous than that for individual permit and hence more cost effective;

4. A general permit is consistent with USEPA's four-tier permitting strategy, the purpose of which is to use the flexibility provided by the CWA in designing a workable and efficient permitting system; and

5. A general permit is designed to provide coverage for a group of related facilities or operations of a specific industry type or group of industries. It is appropriate when the discharge characteristics are sufficiently similar, and a standard set of permit requirements can effectively provide environmental protection and comply with water quality standards for discharges. In most cases, the general permit will provide sufficient and appropriate management requirements to protect the quality of receiving waters from discharges of storm water from construction sites.

There may be instances where a general permit is not appropriate for a specific construction project. A Regional Water Board may require any discharger otherwise covered under the General Permit to apply for and obtain an Individual Permit or apply for coverage under a more specific General Permit. The Regional Water Board must determine that this General Permit does not provide adequate assurance that water quality will be protected, or that there is a site-specific reason why an individual permit should be required.

B. Construction Activities Covered

1. **Construction activity subject to this General Permit:**

Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or sale of one or more acres of disturbed land surface.

Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to USEPA regulations, such as dairy barns or food processing facilities.

Construction activity associated with LUPs including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[3]

Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction[4] (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction projects that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the project.

2. Linear Underground/Overhead Projects (LUPs) subject to this General Permit:

Underground/overhead facilities typically constructed as LUPs include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Water Quality Order 2003-0007-DWQ regulated construction activities associated with small LUPs that resulted in land disturbances greater than one acre, but less than five acres. These projects were considered non-traditional construction projects. Attachment A of this Order now regulates all construction activities from LUPs resulting in land disturbances greater than one acre.

3. Common Plan of Development or Sale

USEPA regulations include the term “common plan of development or sale” to ensure that acreage within a common project does not artificially escape the permit requirements because construction activities are phased, split among smaller parcels, or completed by different owners/developers. In the absence of an

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[3] Pursuant to the Ninth Circuit Court of Appeals’ decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the USEPA’s petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

[4] A construction site that includes a dredge and/or fill discharge to any water of the United States (e.g., wetland, channel, pond, or marine water) requires a CWA Section 404 permit from the U.S. Army Corps of Engineers and a CWA Section 401 Water Quality Certification from the Regional Water Board or State Water Board.

exact definition of “common plan of development or sale,” the State Water Board is required to exercise its regulatory discretion in providing a common sense interpretation of the term as it applies to construction projects and permit coverage. An overbroad interpretation of the term would render meaningless the clear “one acre” federal permitting threshold and would potentially trigger permitting of almost any construction activity that occurs within an area that had previously received area-wide utility or road improvements.

Construction projects generally receive grading and/or building permits (Local Permits) from local authorities prior to initiating construction activity. These Local Permits spell out the scope of the project, the parcels involved, the type of construction approved, etc. Referring to the Local Permit helps define “common plan of development or sale.” In cases such as tract home development, a Local Permit will include all phases of the construction project including rough grading, utility and road installation, and vertical construction. All construction activities approved in the Local Permit are part of the common plan and must remain under the General Permit until construction is completed. For custom home construction, Local Permits typically only approve vertical construction as the rough grading, utilities, and road improvements were already independently completed under the a previous Local Permit. In the case of a custom home site, the homeowner must submit plans and obtain a distinct and separate Local Permit from the local authority in order to proceed. It is not the intent of the State Water Board to require permitting for an individual homeowner building a custom home on a private lot of less than one acre if it is subject to a separate Local Permit. Similarly, the installation of a swimming pool, deck, or landscaping that disturbs less than one acre that was not part of any previous Local Permit are not required to be permitted.

The following are several examples of construction activity of less than one acre that would require permit coverage:

a. A landowner receives a building permit(s) to build tract homes on a 100-acre site split into 200 one-third acre parcels, (the remaining acreage consists of streets and parkways) which are sold to individual homeowners as they are completed. The landowner completes and sells all the parcels except for two. Although the remaining two parcels combined are less than one acre, the landowner must continue permit coverage for the two parcels.

b. One of the parcels discussed above is sold to another owner who intends to complete the construction as already approved in the Local Permit. The new landowner must file Permit Registration Documents (PRDs) to complete the construction even if the new landowner is required to obtain a separate Local Permit.

c. Landowner in (1) above purchases 50 additional one half-acre parcels adjacent to the original 200-acre project. The landowner seeks a Local Permit (or amendment to existing Local permit) to build on 20 parcels while leaving the remaining 30 parcels for future development. The landowner must amend PRDs to include the 20 parcels 14 days prior to commencement of construction activity on those parcels.

C. Construction Activities Not Covered

1. Traditional Construction Projects Not Covered

This General Permit does not apply to the following construction activity:

a. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

b. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

c. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

d. Discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction projects in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit. Construction projects within the Lahontan region must also comply with the Lahontan Region Project Guideline for Erosion Control (R6T-2005-0007 Section), which can be found at **http://www.waterboards.ca.gov/lahontan/Adopted_Orders/2005/r6t_2005_0007.pdf**

e. Construction activity that disturbs less than one acre of land surface, unless part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

f. Construction activity covered by an individual NPDES Permit for storm water discharges.

g. Landfill construction activity that is subject to the Industrial General Permit.

h. Construction activity that discharges to Combined Sewer Systems.

i. Conveyances that discharge storm water runoff combined with municipal sewage.

j. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

2. **Linear Projects Not Covered**

a. LUP construction activity does not include linear routine maintenance projects. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements, or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:

i. Maintain the original purpose of the facility or hydraulic capacity.

ii. Update existing lines[5] and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.

iii. Repairing leaks.

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[5]Update existing lines includes replacing existing lines with new materials or pipes.

Routine maintenance does not include construction of new[6] lines or facilities resulting from compliance with applicable codes, standards, and regulations.

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must secure new areas, those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement, or agreement.

b. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).

c. Tie-ins conducted immediately adjacent to “energized” or “pressurized” facilities by the discharger are not considered construction activities where all other LUP construction activities associated with the tie-in are covered by an NOI and SWPPP of a third party or municipal agency.

3. **EPA’s Small Construction Rainfall Erosivity Waiver**

EPA’s Storm Water Phase II Final Rule provides the option for a Small Construction Rainfall Erosivity Waiver. This waiver applies to small construction sites between 1 and 5 acres, and allows permitting authorities to waive those sites that do not have adverse water quality impacts.

Dischargers eligible for this waiver are exempt from Construction General Permit Coverage. In order to obtain the waiver, the discharger must certify to the State Water Board that small construction activity will occur only when the rainfall erosivity factor is less than 5 (“R” in the Revised Universal Soil Loss Equation). The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a practice that provides interim non-vegetative stabilization can be used for the end of the construction period. The operator must agree (as a condition waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the General Permit have been met. If use of this interim stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with a certification statement constitutes acceptance of and commitment to complete the final stabilization process. The discharger must submit a waiver certification to the State Board prior to commencing construction activities.

USEPA funded a cooperative agreement with Texas A&M University to develop an online rainfall erosivity calculator. Dischargers can access the calculator from EPA’s website at: www.epa.gov/npdes/stormwater/cgp. Use of the calculator allows the discharger to determine potential eligibility for the rainfall erosivity waiver. It may also be useful in determining the time periods during which construction activity could be waived from permit coverage.

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[6]New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

D. Obtaining and Terminating Permit Coverage

The appropriate Legally Responsible Person (LRP) must obtain coverage under this General Permit. To obtain coverage, the LRP or the LRP's Approved Signatory must file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

To obtain coverage under this General Permit, LRPs must electronically file the PRDs, which include a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other documents required by this General Permit, and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Boards may issue General Permits or Individual Permits that contain more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers that obtain coverage under Individual Permits.

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

The application requirements of the General Permit establish a mechanism to clearly identify the responsible parties, locations, and scope of operations of dischargers covered by the General Permit and to document the discharger's knowledge of the General Permit's requirements.

This General Permit provides a grandfathering exception to existing dischargers subject to Water Quality Order No. 99-08-DWQ. Construction projects covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at Risk Level 1. LUP projects covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage at LUP Type 1. The Regional Water Boards have the authority to require Risk Determination to be performed on projects currently covered under Water Quality Order No. 99-08-DWQ and 2003-0007-DWQ where they deem necessary.

LRPs must file a Notice of Termination (NOT) with the Regional Water Board when construction is complete and final stabilization has been reached or ownership has been transferred. The discharger must certify that all State and local requirements have been met in accordance with this General Permit. In order for construction to be found complete, the discharger must install post-construction storm water management measures and establish a long-term maintenance plan. This requirement is intended to ensure that the post-construction conditions at the project site do not cause or contribute to direct or indirect water quality impacts (i.e., pollution and/or hydromodification) upstream and downstream. Specifically, the discharger must demonstrate compliance with the post-construction standards set forth in this General Permit (Section XIII). The discharger is responsible for all compliance issues including all annual fees until the NOT has been filed and approved by the local Regional Water Board.

E. Discharge Prohibitions

This General Permit authorizes the discharge of storm water to surface waters from construction activities that result in the disturbance of one or more acres of land, provided that the discharger satisfies all permit conditions set forth in the Order. This General Permit prohibits the discharge of pollutants other than storm water and non-storm water discharges authorized by this General Permit or another NPDES permit. This General Permit also prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges. In addition, this General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the nine Regional Water Boards. Discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural BMPs. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction projects. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water dewatering, and other discharges not subject to a separate general NPDES permit adopted by a region. Therefore this General Permit authorizes such discharges provided they meet the following conditions.

These authorized non-storm water discharges must:

1. be infeasible to eliminate;

2. comply with BMPs as described in the SWPPP;

3. filter or treat, using appropriate technology, all dewatering discharges from sedimentation basins;

4. meet the NALs for pH and turbidity; and

5. not cause or contribute to a violation of water quality standards.

Additionally, authorized non-storm water discharges must not be used to clean up failed or inadequate construction or post-construction BMPs designed to keep materials onsite. Authorized non-storm water dewatering discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges.

This General Permit prohibits the discharge of storm water that causes or threatens to cause pollution, contamination, or nuisance.

F. Effluent Standards for All Types of Discharges

1. Technology-Based Effluent Limitations

Permits for storm water discharges associated with construction activity must meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize best available technology economically achievable (BAT) for toxic pollutants and non conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants. Additionally, these provisions require controls of pollutant discharges to reduce pollutants and any more stringent controls necessary to meet water quality standards. The USEPA has already established such limitations, known as effluent limitation guidelines (ELGs), for some industrial categories. This is not the case with construction discharges. In instances where there are no ELGs the permit writer is to use best professional judgment (BPJ) to establish requirements that the discharger must meet using BAT/BCT technology. This General Permit contains only narrative effluent limitations and does not contain numeric effluent limitations, except for Active Treatment Systems (ATS).

Order No. 2009-0009-DWQ, as originally adopted by the State Water Board on September 2, 2009, contained numeric effluent limitations for pH (within the range of 6.0 and 9.0 pH units) and turbidity (500 NTU) that applied only to Risk Level 3 and LUP Type 3 construction sites. The State Water Board adopted the numeric effluent limitations as technology-based effluent limitations based upon its best professional judgment. The California Building Industry Association, the Building Industry Legal Defense

Foundation, and the California Business Properties Association (petitioners) challenged Order No. 2009-0009-DWQ in *California Building Industry Association et al. v. State Water Resources Control Board*. On December 27, 2011, the Superior Court issued a judgment and writ of mandamus. The Superior Court ruled in favor of the State Water Board on almost all of the issues the petitioners raised, but the Superior Court invalidated the numeric effluent limitations for pH and turbidity for Risk Level 3 and LUP Type 3 sites because it determined that the State Water Board did not have sufficient BMP performance data to support those numeric effluent limitations. Therefore, the Superior Court concluded that the State Water Board did not comply with the federal regulations that apply to the use of best professional judgment. In invalidating the numeric effluent limitations, the Superior Court also suspended two ancillary requirements (a compliance storm event provision and receiving water monitoring at Risk Level 3 and LUP Type 3 sites that violated the numeric effluent limitations) that related solely to the invalidated numeric effluent limitations.

As a result of the Superior Court's writ of mandamus, this Order no longer contains numeric effluent limitations for pH and turbidity, except for ATS. In addition, as a result of the Superior Court's writ of mandamus, the receiving water monitoring requirements for Risk Level 3 and LUP Type 3 sites were suspended until the State Water Board amended this Order to restore the receiving water monitoring requirements. As amended, this Order now requires Risk Level 3 and LUP Type 3 Dischargers with direct discharges to surface waters to conduct receiving water monitoring whenever their effluent exceeds specified receiving water monitoring triggers. The receiving water monitoring triggers were established at the same levels as the previous numeric effluent limitations (effluent pH outside the range of 6.0 and 9.0 pH units or turbidity exceeding 500 NTU). In restoring the receiving water monitoring requirements, the State Water Board determined that it was appropriate to require receiving water monitoring for these types of sites with direct discharges to surface waters that exceeded the receiving water monitoring triggers under any storm event scenarios, because these sites represent the highest threat to receiving water quality. An exceedance of a receiving water monitoring trigger does not constitute a violation of this General Permit. These receiving water monitoring requirements take effect on the effective date of the amendment to this Order.

BAT/BCT technologies not only include passive systems such as conventional runoff and sediment control, but also treatment systems such as coagulation/flocculation using sand filtration, when appropriate. Such technologies allow for effective treatment of soil particles less 0.02 mm (medium silt) in diameter. The discharger must install structural controls, as necessary, such as erosion and sediment controls that meet BAT and BCT to achieve compliance with water quality standards. The narrative effluent limitations constitute compliance with the requirements of the CWA.

Because the permit is an NPDES permit, there is no legal requirement to address the factors set forth in Water Code sections 13241 and 13263, unless the permit is more stringent than what federal law requires. (See *City of Burbank v. State Water Resources Control Bd.* (2005) 35 Cal.4th 613, 618, 627.) None of the requirements in this permit are more stringent than the minimum federal requirements, which include technology-based requirements achieving BAT/BCT and strict compliance with water quality standards. The inclusion of numeric effluent limitations (NELs) in the permit for Active Treatment Systems does not cause the permit to be more stringent than current federal law. NELs and best management practices are simply two different methods of achieving the same federal requirement: strict compliance with state water quality standards. Federal law authorizes both narrative and numeric effluent limitations to meet state water quality standards. The use of NELs to achieve compliance with water quality standards is not a more stringent requirement than the use of BMPs. (State Water Board Order No. WQ 2006-0012 (*Boeing*).) Accordingly, the State Water Board does not need to take into account the factors in Water Code sections 13241 and 13263.

The State Water Board has concluded that the establishment of BAT/BCT will not create or aggravate other environmental problems through increases in air pollution, solid waste generation, or energy consumption. While there may be a slight increase in non-water quality impacts due to the implementation of additional monitoring or the construction of additional BMPs, these impacts will be negligible in comparison with the construction activities taking place on site and would be justified by the water quality benefits associated with compliance.

pH Receiving Water Monitoring Trigger

Given the potential contaminants, the minimum standard method for control of pH in runoff requires the use of preventive measures such as avoiding concrete pours during rainy weather, covering concrete and directing flow away from fresh concrete if a pour occurs during rain, covering scrap drywall and stucco materials when stored outside and potentially exposed to rain, and other housekeeping measures. If necessary, pH-impaired storm water from construction sites can be treated in a filter or settling pond or basin, with additional natural or chemical treatment required to meet pH limits set forth in this permit. The basin or pond acts as a collection point and holds storm water for a sufficient period for the contaminants to be settled out, either naturally or artificially, and allows any additional treatment to take place. The State Water Board considers these techniques to be equivalent to BCT. In determining the pH concentration trigger for discharges, the State Water Board used BPJ to set these limitations.

The chosen trigger was established by calculating three standard deviations above and below the mean pH of runoff from highway construction sites[7] in California. Proper implementation of BMPs should result in discharges that are within the range of 6.0 to 9.0 pH Units.

Turbidity Receiving Water Monitoring Trigger

The Turbidity receiving water monitoring trigger of 500 NTU is a technology-based trigger and was developed using three different analyses aimed at finding the appropriate threshold to set the technology-based limit to ensure environmental protection, effluent quality and cost-effectiveness. The analyses fell into three, main types: (1) an ecoregion-specific dataset developed by Simon et. al. (2004) [8]; (2) Statewide Regional Water Quality Control Board enforcement data; and (3) published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites.

A 1:3 relationship between turbidity (expressed as NTU) and suspended sediment concentration (expressed as mg/L) is assumed based on a review of suspended sediment and turbidity data from three gages used in the USGS National Water Quality Assessment Program:

USGS 11074000 SANTA ANA R BL PRADO DAM CA
USGS 11447650 SACRAMENTO R A FREEPORT CA
USGS 11303500 SAN JOAQUIN R NR VERNALIS CA

The receiving water monitoring trigger represents staff determination that the trigger value is the most practicable based on available data. The turbidity receiving water monitoring trigger represents a bridge between the narrative effluent limitations and receiving water limitations. To support this receiving water monitoring trigger, State Water Board staff analyzed construction site discharge information (monitoring data, estimates) and receiving water monitoring information.

Since the turbidity receiving water monitoring trigger represents an appropriate threshold level expected at a site, compliance with this value does not necessarily represent compliance with either the narrative effluent limitations (as enforced through the BAT/BCT standard) or the receiving water limitations. In the San Diego region, some inland surface waters have a receiving water objective for turbidity equal to 20 NTU. Obviously a discharge up to, but not exceeding, the turbidity receiving water monitoring trigger of

[7] Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf.

500 NTU may still cause or contribute to the exceedance of the 20 NTU standard. Most of the waters of the State are protected by turbidity objectives based on background conditions**.**

Table 1 - Regional Water Board Basin Plans, Water Quality Objectives for Turbidity

REGIONAL WATER BOARD	WQ Objective	Background/Natural Turbidity	Maximum Increase
1	Based on background	All levels	20%
2	Based on background	> 50 NTU	10%
3	Based on background	0-50 JTU 50-100 JTU > 100 JTU	20% 10 NTU 10%
4	Based on background	0-50 NTU > 50 NTU	20% 10%
5	Based on background	0-5 NTU 5-50 NTU 50-100 NTU >100 NTU	1 NTU 20% 10 NTU 10%
6	Based on background	All levels	10%
7	Based on background	N/A	N/A
8	Based on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%
9	Inland Surface Waters, 20 NTU All others, based on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%

Table 2 shows the suspended sediment concentrations at the 1.5 year flow recurrence interval for the 12 ecoregions in California from Simon et. al (2004).

Table 2 - Results of Ecoregion Analysis

Ecoregion	Percent of California Land Area	Median Suspended Sediment Concentration (mg/L)
1	9.1	874
4	0.2	120
5	8.8	35.6
6	20.7	1530
7	7.7	122
8	3.0	47.4
9	9.4	284
13	5.2	143
14	21.7	5150
78	8.1	581
80	2.4	199
81	3.7	503
Area-weighted average		1633

If a 1:3 relationship between turbidity and suspended sediment is assumed, the median turbidity is 544 NTU.

The following table is composed of turbidity readings measured in NTUs from administrative civil liability (ACL) actions for construction sites from 2003 - 2009. This data was derived from the complete listing of construction-related ACLs for the six year period. All ACLs were reviewed and those that included turbidimeter readings at the point of storm water discharge were selected for this dataset.

Table 3 – ACL Sampling Data taken by Regional Water Board Staff

WDID#	Region	Discharger	Turbidity (NTU)
5S34C331884	5S	Bradshaw Interceptor Section 6B	1800
5S05C325110	5S	Bridalwood Subdivision	1670
5S48C336297	5S	Cheyenne at Browns Valley	1629
5R32C314271	5R	Grizzly Ranch Construction	1400
6A090406008	6T	El Dorado County Department of Transportation, Angora Creek	97.4
5S03C346861	5S	TML Development, LLC	1600
6A31C325917	6T	Northstar Village	See Subdata Set

Subdata Set - Turbidity for point of storm water runoff discharge at Northstar Village

Date	Turbidity (NTU)	Location
10/5/2006	900	Middle Martis Creek
11/2/2006	190	Middle Martis Creek
01/04/2007	36	West Fork, West Martis Creek
02/08/2007	180	Middle Martis Creek
02/09/2007	130	Middle Martis Creek
02/09/2007	290	Middle Martis Creek
02/09/2007	100	West Fork, West Martis Creek
02/10/2007	28	Middle Martis Creek
02/10/2007	23	Middle Martis Creek
02/10/2007	32	Middle Martis Creek
02/10/2007	12	Middle Martis Creek
02/10/2007	60	West Fork, West Martis Creek
02/10/2007	34	West Fork, West Martis Creek

A 95% confidence interval for mean turbidity in an ACL order was constructed. The data set used was a small sample size, so the 500 NTU (the value derived as the receiving water monitoring trigger for this General Permit) needed to be verified as a possible population mean. In this case, the population refers to a hypothetical population of turbidity measurements of which our sample of 20 represents. A t-distribution was assumed due to the small sample size:

Mean: 512.23 NTU Standard Deviation: 686.85 **Margin of** Error: 321.45 Confidence Interval: 190.78 NTU (Low) 833.68 NTU (High)

Based on a constructed 95% confidence interval, an ACL order turbidity measurement will be between 190.78 – 833.68 NTU. 500 NTU falls within this range. Using the same data set, a small-sample hypothesis test was also performed to test if the ACL turbidity data set contains enough information to cast doubt on choosing a 500 NTU as a mean. 500 NTU was again chosen due to its proposed use as an acceptable value. The test was carried out using a 95% confidence interval. Results indicated that the ACL turbidity data set *does not* contain significant sample evidence to reject the claim of 500 NTU as an acceptable mean for the ACL turbidity population.

There are not many published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites. The most often cited study is a report titled, "Improving the Cost Effectiveness of Highway Construction Site Erosion and Pollution Control" (Horner, Guedry, and Kortenhof 1990, http://www.wsdot.wa.gov/Research/Reports/200/200.1.htm). In a comment letter summarizing this report sent to the State Water Board, the primary author, Dr. Horner, states:

"The most effective erosion control product was wood fiber mulch applied at two different rates along with a bonding agent and grass seed in sufficient time before the tests to achieve germination. Plots treated in this way reduced influent turbidity by more than 97 percent and discharged effluent exhibiting mean and maximum turbidity values of 21 and 73 NTU, respectively. Some other mulch and blanket materials performed nearly as well. These tests demonstrated the control ability of widely available BMPs over a very broad range of erosion potential."

Other technologies studied in this report produced effluent quality at or near 100 NTU. It is the BPJ of the State Water Board staff that erosion control, while preferred, is not always an option on construction sites and that technology performance in a controlled study showing effluent quality directly leaving a BMP is always easier and cheaper to control than effluent being discharged from the project (edge of property, etc.). As a result, it is the BPJ of the State Water Board staff that it is not cost effective or feasible, at this time, for all risk level and type 3 sites in California to achieve effluent discharges with turbidity values that are less than 100 NTU.

To summarize, the analysis showed that: (1) results of the Simon et. al dataset reveals turbidity values in background receiving water in California's ecoregions range from 16 NTU to 1716 NTU (with a mean of 544 NTU); (2) based on a constructed 95% confidence interval, construction sites will be subject to administrative civil liability (ACL) when their turbidity measurement falls between 190.78 – 833.68 NTU; and (3) sites with highly controlled discharges employing and maintaining good erosion control practices can discharge effluent from the BMP with turbidity values less than 100 NTU. State Water Board staff has determined, using its BPJ, that it is most cost effective to set the receiving water monitoring trigger for turbidity at 500 NTU.

i. *Compliance Storm Event*

While this General Permit no longer contains "compliance storm event" exceptions from technology-based NELs, the "compliance storm event" exception from the ATS NELs remain in effect. See Section K of this Fact Sheet, and Attachment F of this General Permit for more information.

a. TMDLs and Waste Load Allocations

Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL for sediment has been adopted by the Regional Water Board or USEPA, must comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of sediment. If it does, the

TMDL should include a specific waste load allocation for this activity/source. The discharger, in this case, may be required by a separate Regional Water Board order to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. If a specific waste load allocation has been established that would apply to a specific discharge, the Regional Water Board may adopt an order requiring specific implementation actions necessary to meet that allocation. In the instance where an approved TMDL has specified a general waste load allocation to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, dischargers must consult with the state TMDL authority[9] to confirm that adherence to a SWPPP that meets the requirements of the General Permit will be consistent with the approved TMDL.

2. Determining Compliance with Effluent Standards

a. Technology-Based Numeric Action Levels (NALs)

This General Permit contains technology-based NALs for pH and turbidity, and requirements for effluent monitoring at all Risk level 2 & 3, and LUP Type 2 & 3 sites. Numeric action levels are essentially numeric benchmark values for certain parameters that, if exceeded in effluent sampling, trigger the discharger to take actions. Exceedance of an NAL does not itself constitute a violation of the General Permit. If the discharger fails to take the corrective action required by the General Permit, though, that may consititute a violation.

The primary purpose of NALs is to assist dischargers in evaluating the effectiveness of their on-site measures. Construction sites need to employ many different systems that must work together to achieve compliance with the permit's requirements. The NALs chosen should indicate whether the systems are working as intended.

Another purpose of NALs is to provide information regarding construction activities and water quality impacts. This data will provide the State and Regional Water Boards and the rest of the storm water community with more information about levels and types of pollutants present in runoff and how effective the dischargers BMPs are at reducing pollutants in effluent. The State Water Board also hopes to learn more about the linkage between effluent and receiving water quality. In addition, these requirements will provide information on the mechanics needed to establish compliance monitoring programs at construction sites in future permit deliberations.

i. ***pH***

The chosen limits were established by calculating one standard deviation above and below the mean pH of runoff from highway construction sites[10] in California. Proper implementation of BMPs should result in discharges that are within the range of 6.5 to 8.5 pH Units.

[9] http://www.waterboards.ca.gov/tmdl/tmdl.html.
[10] Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf.

The Caltrans study included 33 highway construction sites throughout California over a period of four years, which included 120 storm events. All of these sites had BMPs in place that would be generally implemented at all types of construction sites in California.

ii. ***Turbidity***

BPJ was used to develop an NAL that can be used as a learning tool to help dischargers improve their site controls, and to provide meaningful information on the effectiveness of storm water controls. A statewide turbidity NAL has been set at 250 NTU.

G. Receiving Water Limitations

Construction-related activities that cause or contribute to an exceedance of water quality standards must be addressed. The dynamic nature of construction activity gives the discharger the ability to quickly identify and monitor the source of the exceedances. This is because when storm water mobilizes sediment, it provides visual cues as to where corrective actions should take place and how effective they are once implemented.

This General Permit requires that storm water discharges and authorized non-storm water discharges must not contain pollutants that cause or contribute to an exceedance of any applicable water quality objective or water quality standards. The monitoring requirements in this General Permit for sampling and analysis procedures will help determine whether BMPs installed and maintained are preventing pollutants in discharges from the construction site that may cause or contribute to an exceedance of water quality standards.

Water quality standards consist of designated beneficial uses of surface waters and the adoption of ambient criteria necessary to protect those uses. When adopted by the State Water Board or a Regional Water Board, the ambient criteria are termed “water quality objectives.” If storm water runoff from construction sites contains pollutants, there is a risk that those pollutants could enter surface waters and cause or contribute to an exceedance of water quality standards. For that reason, dischargers should be aware of the applicable water quality standards in their receiving waters. (The best method to ensure compliance with receiving water limitations is to implement BMPs that prevent pollutants from contact with storm water or from leaving the construction site in runoff.)

In California, water quality standards are published in the Basin Plans adopted by each Regional Water Board, the California Toxics Rule (CTR), the National Toxics Rule (NTR), and the Ocean Plan.

Dischargers can determine the applicable water quality standards by contacting Regional Water Board staff or by consulting one of the following sources. The actual Basin Plans that contain the water quality standards can be viewed at the website of the appropriate Regional Water Board. (http://www.waterboards.ca.gov/regions.html), the State Water Board site for statewide plans (http://www.waterboards.ca.gov/plnspols/index.html), or the USEPA regulations for the NTR and CTR (40 C.F.R. §§ 131.36-38). Basin Plans and statewide plans are also available by mail from the appropriate Regional Water Board or the State Water Board. The USEPA regulations are available at http://www.epa.gov/. Additional information concerning water quality standards can be accessed through http://www.waterboards.ca.gov/stormwtr/gen_const.html.

H. Training Qualifications and Requirements

The Blue Ribbon Panel (BRP) made the following observation about the lack of industry-specific training requirements:

“Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors.”

Order 99-08-DWQ required that all dischargers train their employees on how to comply with the permit, but it did not specificy a curriculum or certification program. This has resulted in inconsistent implementation by all affected parties - the dischargers, the local governments where the construction activity occurs, and the regulators required to enforce 99-08-DWQ. This General Permit requires Qualified SWPPP Developers and practitioners to obtain appropriate training, and makes this curriculum mandatory two years after adoption, to allow time for course completion. The State and Regional Water Board are working with many stakeholders to develop the curriculum and mechanisms needed to develop and deliver the courses.

To ensure that the preparation, implementation, and oversight of the SWPPP is sufficient for effective pollution prevention, the Qualified SWPPP Developer and Qualified SWPPP Practitioners responsible for creating, revising, overseeing, and implementing the SWPPP must attend a State Water Board-sponsored or approved Qualified SWPPP Developer and Qualified SWPPP Practitioner training course.

I. Sampling, Monitoring, Reporting and Record Keeping

1. Traditional Construction Monitoring Requirements

This General Permit requires visual monitoring at all sites, and effluent water quality at all Risk Level 2 & 3 sites. It requires receiving water monitoring at some Risk Level 3 sites. All sites are required to submit annual reports, which contain various types of information, depending on the site characteristics and events. A summary of the monitoring and reporting requirements is found in Table 4.

Table 4 - Required Monitoring Elements for Risk Levels

	Visual	Non-visible Pollutant	Effluent	Receiving Water
Risk Level 1	three types required for all Risk Levels: non-storm water, pre-rain and post-rain	As needed for all Risk Levels (see below)	where applicable	not required
Risk Level 2			pH, turbidity	not required
Risk Level 3			pH, turbidity	(if Receiving Water Monitoring Trigger exceeded) pH, turbidity and SSC. Bioassessment for sites 30 acres or larger.

a. Visual

All dischargers are required to conduct quarterly, non-storm water visual inspections. For these inspections, the discharger must visually observe each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources. For storm-related inspections, dischargers must visually observe storm water discharges at all discharge locations within two business days after a qualifying event. For this requirement, a qualifying rain event is one producing precipitation of ½ inch or more of discharge. Dischargers must conduct a post-storm event inspection to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify any additional BMPs necessary and revise the SWPPP accordingly. Dischargers must maintain on-site records of all visual observations, personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

b. **Non-Visible Pollutant Monitoring**

This General Permit requires that all dischargers develop a sampling and analysis strategy for monitoring pollutants that are not visually detectable in storm water. Monitoring for non-visible pollutants must be required at any construction site when the exposure of construction materials occurs and where a discharge can cause or contribute to an exceedance of a water quality objective.

Of significant concern for construction discharges are the pollutants found in materials used in large quantities at construction sites throughout California and exposed throughout the rainy season, such as cement, flyash, and other recycled materials or by-products of combustion. The water quality standards that apply to these materials will depend on their composition. Some of the more common storm water pollutants from construction activity are not CTR pollutants. Examples of non-visible pollutants include glyphosate (herbicides), diazinon and chlorpyrifos (pesticides), nutrients (fertilizers), and molybdenum (lubricants). The use of diazinon and chlorpyrifos is a common practice among landscaping professionals and may trigger sampling and analysis requirements if these materials come into contact with storm water. High pH values from cement and gypsum, high pH and SSC from wash waters, and chemical/fecal contamination from portable toilets, also are not CTR pollutants. Although some of these constituents do have numeric water quality objectives in individual Basin Plans, many do not and are subject only to narrative water quality standards (i.e. not causing toxicity). Dischargers are encouraged to discuss these issues with Regional Water Board staff and other storm water quality professionals.

The most effective way to avoid the sampling and analysis requirements, and to ensure permit compliance, is to avoid the exposure of construction materials to precipitation and storm water runoff. Materials that are not exposed do not have the potential to enter storm water runoff, and therefore receiving waters sampling is not required. Preventing contact between storm water and construction materials is one of the most important BMPs at any construction site.

Preventing or eliminating the exposure of pollutants at construction sites is not always possible. Some materials, such as soil amendments, are designed to be used in a manner that will result in exposure to storm water. In these cases, it is important to make sure that these materials are applied according to the manufacturer's instructions and at a time when they are unlikely to be washed away. Other construction materials can be exposed when storage, waste disposal or the application of the material is done in a manner not protective of water quality. For these situations, sampling is required unless there is capture and containment of all storm water that has been exposed. In cases where construction materials may be exposed to storm water, but the storm water is contained and is not allowed to run off the site, sampling will only be required when inspections show that the containment failed or is breached, resulting in potential exposure or discharge to receiving waters.

The discharger must develop a list of potential pollutants based on a review of potential sources, which will include construction materials soil amendments, soil treatments, and historic contamination at the site. The discharger must review existing environmental and real estate documentation to determine the potential for pollutants that could be present on the construction site as a result of past land use activities.

Good sources of information on previously existing pollution and past land uses include:

i. Environmental Assessments;

ii. Initial Studies;

iii. Phase 1 Assessments prepared for property transfers; and

iv. Environmental Impact Reports or Environmental Impact Statements prepared under the requirements of the National Environmental Policy Act or the California Environmental Quality Act.

In some instances, the results of soil chemical analyses may be available and can provide additional information on potential contamination.

The potential pollutant list must include all non-visible pollutants that are known or should be known to occur on the construction site including, but not limited to, materials that:

i. are being used in construction activities;

ii. are stored on the construction site;

iii. were spilled during construction operations and not cleaned up;

iv. were stored (or used) in a manner that created the potential for a release of the materials during past land use activities;

v. were spilled during previous land use activities and not cleaned up; or

vi. were applied to the soil as part of past land use activities.

C. Effluent Monitoring

Federal regulations[11] require effluent monitoring for discharges subject to NALs. Subsequently, all Risk Level 2 and 3 dischargers must perform sampling and analysis of effluent discharges to characterize discharges associated with construction activity from the entire area disturbed by the project. Dischargers must collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

Table 5 - Storm Water Effluent Monitoring Requirements by Risk Level

	Frequency	Effluent Monitoring (Section E, below)
Risk Level 1	when applicable	non-visible pollutant parameters (if applicable)
Risk Level 2	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	pH, turbidity, and non-visible pollutant parameters (if applicable)
Risk Level 3	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	pH, turbidity, and non-visible pollutant parameters if applicable

Risk Level 1 dischargers must analyze samples for:

i. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment C contained in the General Permit.

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[11] 40 C.F.R. § 122.44.

Risk Level 2 dischargers must analyze samples for:

i. pH and turbidity;

ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment D contained in the General Permit, and

iii. any additional parameters for which monitoring is required by the Regional Water Board.

Risk Level 3 dischargers must analyze samples for:

i. pH, turbidity;

ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment E contained in the General Permit, and

iii. any additional parameters for which monitoring is required by the Regional Water Board.

2. **Linear Monitoring and Sampling Requirements**

Attachment A, establishes minimum monitoring and reporting requirements for all LUPs. It establishes different monitoring requirements depending on project complexity and risk to water quality. The monitoring requirements for Type 1 LUPs are less than Type 2 & 3 projects because Type 1 projects have a lower potential to impact water quality.

A discharger shall prepare a monitoring program prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project.

a. **Type 1 LUP Monitoring Requirements**

A discharger must conduct daily visual inspections of Type 1 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be conducted in conjunction with other daily activities. Inspections will be conducted to ensure the BMPs are adequate, maintained, and in place at the end of the construction day. The discharger will revise the SWPPP, as appropriate, based on the results of the daily inspections. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures have been installed, and successful final vegetative cover or other stabilization criteria have been met).

A discharger shall implement the monitoring program for inspecting Type 1 LUPs. This program requires temporary and permanent stabilization BMPs after active construction is completed. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where re-vegetation is chosen until minimum vegetative coverage has been established. Photographs shall be taken during site inspections and submitted to the State Water Board.

b. **Type 2 & 3 LUP Monitoring Requirements**

A discharger must conduct daily visual inspections of Type 2 & 3 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be in conjunction with other daily activities.

All dischargers of Type 2 & 3 LUPs are required to conduct inspections by qualified personnel of the construction site during normal working hours prior to all anticipated storm events and after actual storm events. During extended storm events, the discharger shall conduct inspections during normal working hours for each 24-hour period. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures installed, and successful vegetative cover or other stabilization criteria have been met).

The goals of these inspections are (1) to identify areas contributing to a storm water discharge; (2) to evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly installed and functioning in accordance with the terms of the General Permit; and (3) to determine whether additional control practices or corrective maintenance activities are needed. Equipment, materials, and workers must be available for rapid response to failures and emergencies. All corrective maintenance to BMPs shall be performed as soon as possible, depending upon worker safety.

All dischargers shall develop and implement a monitoring program for inspecting Type 2 & 3 LUPs that require temporary and permanent stabilization BMPs after active construction is completed. Inspections will be conducted to ensure the BMPs are adequate and maintained. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where revegetation is chosen until minimum vegetative coverage has been established.

A log of inspections conducted before, during, and after the storm events must be maintained in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection. Photographs must be taken during site inspections and submitted to the State Water Board.

C. Sampling Requirements for all LUP Project Types

LUPs are also subject to sampling and analysis requirements for visible pollutants (i.e., sedimentation/siltation, turbidity) and for non-visible pollutants.

Sampling for visible pollutants is required for Type 2 & 3 LUPs.

Non-visible pollutant monitoring is required for pollutants associated with construction sites and activities that (1) are not visually detectable in storm water discharges, and (2) are known or should be known to occur on the construction site, and (3) could cause or contribute to an exceedance of water quality objectives in the receiving waters. Sample collection for non-visible pollutants must only be required (1) during a storm event when pollutants associated with construction activities may be discharged with storm water runoff due to a spill, or in the event there was a breach, malfunction, failure, and/or leak of any BMP, and (2) when the discharger has failed to adequately clean the area of material and pollutants. Failure to implement appropriate BMPs will trigger the same sampling requirements as those required for a breach, malfunction and/or leak, or when the discharger has failed to implement appropriate BMPs prior to the next storm event.

Additional monitoring parameters may be required by the Regional Water Boards.

It is not anticipated that many LUPs will be required to collect samples for pollutants not visually detected in runoff due to the nature and character of the construction site and activities as previously described in this fact sheet. Most LUPs are constructed in urban areas with public access (e.g., existing roadways, road shoulders, parking areas, etc.). This raises a concern regarding the potential contribution of pollutants from vehicle use and/or from normal activities of the public (e.g., vehicle washing, landscape fertilization, pest spraying, etc.) in runoff from the project site. Since the dischargers are not the land owners of the project area and are not able to control the presence of these pollutants in the storm water that runs through their projects, it is not the intent of this General Permit to require dischargers to sample for these pollutants. This General Permit does not require the discharger to sample for these types of pollutants except where the discharger has brought materials onsite that contain these pollutants and when a condition (e.g., breach, failure, etc.) described above occurs.

3. Receiving Water Monitoring

In order to ensure that receiving water limitations are met, discharges subject to receiving water monitoring triggers (i.e., Risk Level 3 and LUP Type 3 sites) or numeric effluent limitations (i.e., Risk Level 3 and LUP Type 3 sites utilizing ATS with direct discharges into receiving waters) must also monitor the downstream receiving water(s) for turbidity, SSC, and pH (if applicable) when a receiving water monitoring trigger or NEL is exceeded.

a. Bioassessment Monitoring

This General Permit requires a bioassessment of receiving waters for dischargers of Risk Level 3 or LUP Type 3 construction projects equal to or larger than 30 acres with direct discharges into receiving waters. Benthic macroinvertebrate samples will be taken upstream and downstream of the site's discharge point in the receiving water. Bioassessments measure the quality of the stream by analyzing the aquatic life present. Higher levels of appropriate aquatic species tend to indicate a healthy stream; whereas low levels of organisms can indicate stream degradation. Active construction sites have the potential to discharge large amounts of sediment and pollutants into receiving waters. Requiring a bioassessment for large project sites, with the most potential to impact water quality, provides a snapshot of the health of the receiving water prior to initiation of construction activities. This snapshot can be used in comparison to the health of the receiving water after construction has commenced.

Each ecoregion (biologically and geographically related area) in the State has a specific yearly peak time where stream biota is in a stable and abundant state. This time of year is called an Index Period. The bioassessment requirements in this General Permit, requires benthic macroinvertebrate sampling within a sites index period. The State Water Board has developed a map designating index periods for the ecoregions in the State (see State Water Board Website).

This General Permit requires the bioassessment methods to be in accordance with the Surface Water Ambient Monitoring Program (SWAMP) in order to provide data consistency within the state as well as generate useable biological stream data.

Table 6 - Receiving Water Monitoring Requirements

	Receiving Water Monitoring Parameters
Risk Level 1 /LUP Type 1	not required
Risk Level 2 / LUP Type 2	not required
Risk Level 3 / LUP Type 3	If Receiving Water Monitoring Trigger exceeded: pH (if applicable), turbidity, and SSC. Bioassessment for sites 30 acres or larger.

4. Reporting Requirements

a. NAL Exceedance Report

All Risk Level 3 and LUP Type 3 dischargers must electronically submit all storm event sampling results to the State And Regional Boards, via the electronic data system, no later than 10 days after the conclusion of the storm event.

b. Annual Report

All dischargers must prepare and electronically submit an annual report no later than September 1 of each year using the Storm water Multi-Application Reporting and Tracking System (SMARTS). The

Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, chain of custody forms, a summary of all corrective actions taken during the compliance year, and identification of any compliance activities or corrective actions that were not implemented.

5. Record Keeping

According to 40 C.F.R. Parts 122.21(p) and 122.41(j), the discharger is required to retain paper or electronic copies of all records required by this General Permit for a period of at least three years from the date generated or the date submitted to the State Water Board or Regional Water Boards. A discharger must retain records for a period beyond three years as directed by Regional Water Board.

J. Risk Determination

1. Traditional Projects

a. Overall Risk Determination

There are two major requirements related to site planning and risk determination in this General Permit. The project's overall risk is broken up into two elements – (1) project sediment risk (the relative amount of sediment that can be discharged, given the project and location details) and (2) receiving water risk (the risk sediment discharges pose to the receiving waters).

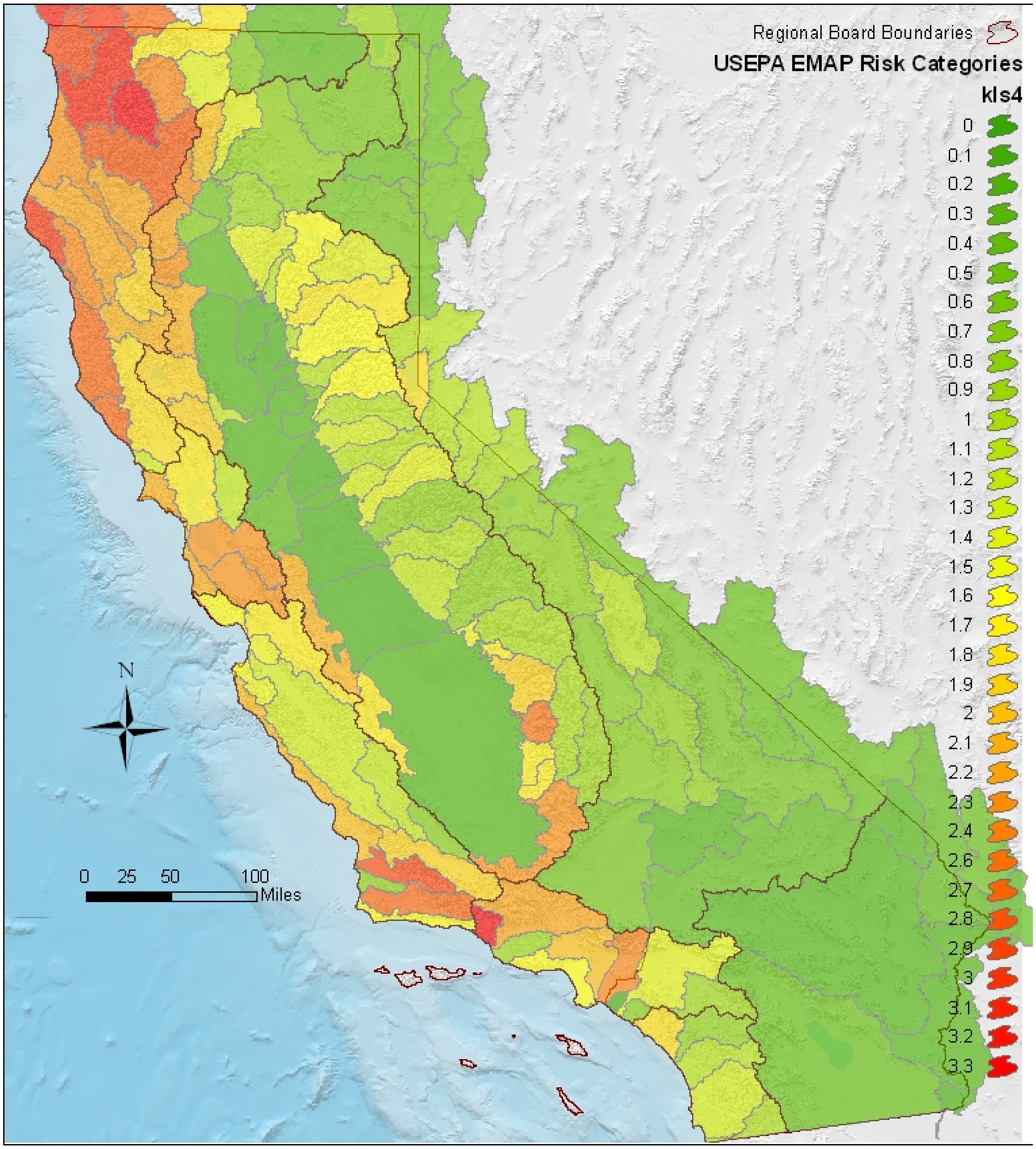
Project Sediment Risk:
Project Sediment Risk is determined by multiplying the R, K, and LS factors from the Revised Universal Soil Loss Equation (RUSLE) to obtain an estimate of project-related bare ground soil loss expressed in tons/acre. The RUSLE equation is as follows:

A = (R)(K)(LS)(C)(P)

Where: A = the rate of sheet and rill erosion
R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = length-slope factor
C = cover factor (erosion controls)
P = management operations and support practices (sediment controls)

The C and P factors are given values of 1.0 to simulate bare ground conditions.

There is a map option and a manual calculation option for determining soil loss. For the map option, the R factor for the project is calculated using the online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm. The product of K and LS are shown on Figure 1. To determine soil loss in tons per acre, the discharger multiplies the R factor times the value for K times LS from the map.



State Water Resources Control Board, January 15, 2008

Figure 1 -Statewide Map of K * LS

For the manual calculation option, the R factor for the project is calculated using the online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm. The K and LS factors are determined using Appendix 1.

Soil loss of less than 15 tons/acre is considered **low** sediment risk.
Soil loss between 15 and 75 tons/acre is **medium** sediment risk.
Soil loss over 75 tons/acre is considered **high** sediment risk.

The soil loss values and risk categories were obtained from mean and standard deviation RKLS values from the USEPA EMAP program. High risk is the mean RKLS value plus two standard deviations. Low risk is the mean RKLS value minus two standard deviations.

Receiving Water Risk:
Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody. A sediment-sensitive waterbody is either

on the most recent 303d list for waterbodies impaired for sediment;
has a USEPA-approved Total Maximum Daily Load implementation plan for sediment; **or**
has the beneficial uses of COLD, SPAWN, and MIGRATORY.

A project that meets at least one of the three criteria has a high receiving water risk. A list of sediment-sensitive waterbodies will be posted on the State Water Board's website. It is anticipated that an interactive map of sediment sensitive water bodies in California will be available in the future.

The Risk Levels have been altered by eliminating the possibility of a Risk Level 4, and expanding the constraints for Risk Levels 1, 2, and 3. Therefore, projects with high receiving water risk and high sediment risk will be considered a Risk Level 3 risk to water quality.

In response to public comments, the Risk Level requirements have also been changed such that Risk Level 1 projects will be subject to minimum BMP and visual monitoring requirements, Risk Level 2 projects will be subject to NALs and some additional monitoring requirements, and Risk Level 3 projects will be subject to NALs, and more rigorous monitoring requirements such as receiving water monitoring and in some cases bioassessment.

Table 7 - Combined Risk Level Matrix

<table>
<tr><td colspan="5">Combined Risk Level Matrix</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="4">Receiving Water Risk</td><td rowspan="2"></td><td colspan="3">Sediment Risk</td></tr>
<tr><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td>Low</td><td>Level 1</td><td colspan="2">Level 2</td></tr>
<tr><td>High</td><td colspan="2">Level 2</td><td>Level 3</td></tr>
</table>

b. Effluent Standards

All dischargers are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require storm water discharges associated with construction activity to meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize BAT and BCT to reduce pollutants and any more stringent controls necessary to meet water quality standards.

Risk Level 2 dischargers that pose a medium risk to water quality are subject to technology-based NALs for pH and turbidity. Risk Level 3 dischargers that pose a high risk to water quality are also subject to technology-based NALs for pH and turbidity.

c. **Good Housekeeping**

Proper handling and managing of construction materials can help minimize threats to water quality. The discharger must consider good housekeeping measures for: construction materials, waste management, vehicle storage & maintenance, landscape materials, and potential pollutant sources. Examples include; conducting an inventory of products used, implementing proper storage & containment, and properly cleaning all leaks from equipment and vehicles.

d. **Non-Storm Water Management**

Non-storm water discharges directly connected to receiving waters or the storm drain system have the potential to negatively impact water quality. The discharger must implement measures to control all non-storm water discharges during construction, and from dewatering activities associated with construction. Examples include; properly washing vehicles in contained areas, cleaning streets, and minimizing irrigation runoff.

e. **Erosion Control**

The best way to minimize the risk of creating erosion and sedimentation problems during construction is to disturb as little of the land surface as possible by fitting the development to the terrain. When development is tailored to the natural contours of the land, little grading is necessary and, consequently, erosion potential is lower.[14] Other effective erosion control measures include: preserving existing vegetation where feasible, limiting disturbance, and stabilizing and re-vegetating disturbed areas as soon as possible after grading or construction activities. Particular attention must be paid to large, mass-graded sites where the potential for soil exposure to the erosive effects of rainfall and wind is great and where there is potential for significant sediment discharge from the site to surface waters. Until permanent vegetation is established, soil cover is the most cost-effective and expeditious method to protect soil particles from detachment and transport by rainfall. Temporary soil stabilization can be the single most important factor in reducing erosion at construction sites. The discharger is required to consider measures such as: covering disturbed areas with mulch, temporary seeding, soil stabilizers, binders, fiber rolls or blankets, temporary vegetation, and permanent seeding. These erosion control measures are only examples of what should be considered and should not preclude new or innovative approaches currently available or being developed. Erosion control BMPs should be the primary means of preventing storm water contamination, and sediment control techniques should be used to capture any soil that becomes eroded.[12]

Risk Level 3 dischargers pose a higher risk to water quality and are therefore additionally required to ensure that post-construction soil loss is equivalent to or less than the pre-construction levels.

f. **Sediment Control**

Sediment control BMPs should be the secondary means of preventing storm water contamination. When erosion control techniques are ineffective, sediment control techniques should be used to capture any soil that becomes eroded. The discharger is required to consider perimeter control measures such as: installing silt fences or placing straw wattles below slopes. These sediment control measures are only

[12] U.S. Environmental Protection Agency. 2007. Developing Your Storm Water Pollution Prevention Plan: A Guide for Construction Sites.

examples of what should be considered and should not preclude new or innovative approaches currently available or being developed.

Because Risk Level 2 and 3 dischargers pose a higher risk to water quality, additional requirements for the application of sediment controls are imposed on these projects. This General Permit also authorizes the Regional Water Boards to require Risk Level 3 dischargers to implement additional site-specific sediment control requirements if the implementation of other erosion or sediment controls are not adequately protecting the receiving waters.

g. **Run-on and Runoff Control**

Inappropriate management of run-on and runoff can result in excessive physical impacts to receiving waters from sediment and increased flows. The discharger is required to manage all run-on and runoff from a project site. Examples include: installing berms and other temporary run-on and runoff diversions.

Risk Level 1 dischargers with lower risks to impact water quality are not subject to the run-on and runoff control requirements unless an evaluation deems them necessary or visual inspections show that such controls are required.

h. **Inspection, Maintenance and Repair**

All measures must be periodically inspected, maintained and repaired to ensure that receiving water quality is protected. Frequent inspections coupled with thorough documentation and timely repair is necessary to ensure that all measures are functioning as intended.

i. **Rain Event Action Plan (REAP)**

A Rain Event Action Plan (REAP) is a written document, specific for each rain event. A REAP should be designed that when implemented it protects all exposed portions of the site within 48 hours of any likely precipitation event forecast of 50% or greater probability.

This General Permit requires Risk Level 2 and 3 dischargers to develop and implement a REAP designed to protect all exposed portions of their sites within 48 hours prior to any likely precipitation event. The REAP requirement is designed to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures that are intended to reduce the amount of sediment and other pollutants generated from the active site. A REAP must be developed when there is likely a forecast of 50% or greater probability of precipitation in the project area. (The National Oceanic and Atmospheric Administration (NOAA) defines a chance of precipitation as a probability of precipitation of 30% to 50% chance of producing precipitation in the project area.[13] NOAA defines the probability of precipitation (PoP) as the likelihood of occurrence (expressed as a percent) of a measurable amount (0.01 inch or more) of liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time at any given point in the forecast area.) Forecasts are normally issued for 12-hour time periods. Descriptive terms for uncertainty and aerial coverage are used as follows:

Table 8 -National Oceanic and Atmospheric Administration (NOAA) Definition of Probability of Precipitation (PoP)

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[13] http://www.crh.noaa.gov/lot/severe/wxterms.php.

PoP	Expressions of Uncertainty	Aerial Coverage
0%	none used	none used
10%	none used	isolated
20%	slight chance	isolated
30-50%	chance	scattered
60-70%	likely	numerous
80-100%	none used	none used

The discharger must obtain the precipitation forecast information from the National Weather Service Forecast Office (http://www.srh.noaa.gov/).

2. Linear Projects

a. Linear Risk Determination

LUPs vary in complexity and water quality concerns based on the type of project. This General Permit has varying application requirements based on the project's risk to water quality. Factors that lead to the characterization of the project include location, sediment risk, and receiving water risk.

Based on the location and complexity of a project area or project section area, LUPs are separated into project types. As described below, LUPs have been categorized into three project types.

i. *Type 1 LUPs*

Type 1 LUPs are those construction projects where:

(1) 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day, or

(2) greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

Areas disturbed during construction will be returned to pre-construction conditions or equivalent protection established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization Best Management Practices (BMPs) will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

Type 1 LUPs typically do not have a high potential to impact storm water quality because (1) these construction activities are not typically conducted during a rain event, (2) these projects are normally constructed over a short period of time[14], minimizing the duration that pollutants could potentially be exposed to rainfall; and (3) disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.

Type 1 LUPs are determined during the risk assessment found in Attachment A.1 to be 1) low sediment risk and low receiving water risk; 2) low sediment risk and medium receiving water risk; and 3) medium sediment risk and low receiving water risk.

This General Permit requires the discharger to ensure a SWPPP is developed for these construction activities that is specific to project type, location and characteristics.

ii. ***Type 2 LUPs:***

Type 2 projects are determined to have a combination of High, Medium, and Low project sediment risk along with High, Medium, and Low receiving water risk. Like Type 1 projects, Type 2 projects are typically constructed over a short period of time. However, these projects have a higher potential to impact water quality because they:

(1) typically occur outside the more urban/developed areas;

(2) have larger areas of soil disturbance that are not closed or restored at the end of the day;

(3) may have onsite stockpiles of soil, spoil and other materials;

(4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and

(5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location and characteristics.

iii. ***Type 3 LUPs:***

[14] Short period of time refers to a project duration of weeks to months, but typically less than one year in duration.

Type 3 projects are determined to have a combination of High and Medium project sediment risk along with High and Medium receiving water risk. Similar to Type 2 projects, Type 3 projects have a higher potential to impact water quality because they:

(1) typically occur outside of the more urban/developed areas;

(2) have larger areas of soil disturbance that are not closed or restored at the end of the day;

(3) may have onsite stockpiles of soil, spoil and other materials;

(4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and

(5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location, and characteristics.

b. Linear Effluent Standards

All LUPs are subject to the narrative effluent limitations specified in the General Permit.

Type 2 and Type 3 projects are subject to technology-based NALs for pH and turbidity.

c. Linear Good Housekeeping

Improper use and handling of construction materials could potentially cause a threat to water quality. In order to ensure proper site management of these construction materials, all LUP dischargers must comply with a minimum set of Good Housekeeping measures specified in Attachment A of this General Permit.

d. Linear Non-Storm Water Management

In order to ensure control of all non-storm water discharges during construction, all LUP dischargers must comply with the Non-Storm Water Management measures specified in Attachment A of this General Permit.

e. Linear Erosion Control

This General Permit requires all LUP dischargers to implement effective wind erosion control measures, and soil cover for inactive areas. Type 3 LUPs posing a higher risk to water quality are additionally required to ensure the post-construction soil loss is equivalent to or less than the pre-construction levels.

f. Linear Sediment Control

In order to ensure control and containment of all sediment discharges, all LUP dischargers must comply with the general Sediment Control measures specified in Attachment A or this General Permit. Additional requirements for sediment controls are imposed on Type 2 & 3 LUPs due to their higher risk to water quality.

g. **Linear Run-on and Runoff Control**

Discharges originating outside of a project's perimeter and flowing onto the property can adversely affect the quantity and quality of discharges originating from a project site. In order to ensure proper management of run-on and runoff, all LUPs must comply with the run-on and runoff control measures specified in Attachment A of this General Permit. Due to the lower risk of impacting water quality, Type 1 LUPs are not required to implement run-on and runoff controls unless deemed necessary by the discharger.

h. **Linear Inspection, Maintenance and Repair**

Proper inspection, maintenance, and repair activities are important to ensure the effectiveness of on-site measures to control water quality. In order to ensure that inspection, maintenance, and repair activities are adequately performed, the all LUP dischargers a re required to comply with the Inspection, Maintenance, and Repair requirements specified in Attachment A of this General Permit.

K. ATS[15] Requirements

There are instances on construction sites where traditional erosion and sediment controls do not effectively control accelerated erosion. Under such circumstances, or under circumstances where storm water discharges leaving the site may cause or contribute to an exceedance of a water quality standard, the use of an Active Treatment System (ATS) may be necessary. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.[16]

Although treatment systems have been in use in some form since the mid-1990s, the ATS industry in California is relatively young, and detailed regulatory standards have not yet been developed. Many developers are using these systems to treat storm water discharges from their construction sites. The new ATS requirements set forth in this General Permit are based on those in place for small wastewater treatment systems, ATS regulations from the Central Valley Regional Water Quality Control Board (September 2005 memorandum "2005/2006 Rainy Season – Monitoring Requirements for Storm Water Treatment Systems that Utilize Chemical Additives to Enhance Sedimentation"), the Construction Storm Water Program at the State of Washington's Department of Ecology, as well as recent advances in technology and knowledge of coagulant performance and aquatic safety.

The effective design of an ATS requires a detailed survey and analysis of site conditions. With proper planning, ATS performance can provide exceptional water quality discharge and prevent significant impacts to surface water quality, even under extreme environmental conditions.

These systems can be very effective in reducing the sediment in storm water runoff, but the systems that use additives/polymers to enhance sedimentation also pose a potential risk to water quality (e.g., operational failure, equipment failure, additive/polymer release, etc.). The State Water Board is concerned about the potential acute and chronic impacts that the polymers and other chemical additives may have on fish and aquatic organisms if released in sufficient quantities or concentrations. In addition

[15] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation in order to reduce turbidity caused by fine suspended sediment.
[16] Pitt, R., S. Clark, and D. Lake. 2006. Construction Site Erosion and Sediment Controls: Planning, Design, and Performance. DEStech Publications. Lancaster, PA. 370pp.

to anecdotal evidence of polymer releases causing aquatic toxicity in California, the literature supports this concern.[17] For example, cationic polymers have been shown to bind with the negatively charged gills of fish, resulting in mechanical suffocation.[18] Due to the potential toxicity impacts, which may be caused by the release of additives/polymers into receiving waters, this General Permit establishes residual polymer monitoring and toxicity testing requirements have been established in this General Permit for discharges from construction sites that utilize an ATS in order to protect receiving water quality and beneficial uses.

The primary treatment process in an ATS is coagulation/flocculation. ATS's operate on the principle that the added coagulant is bound to suspended sediment, forming floc, which is gravitationally settled in tanks or a basin, or removed by sand filters. A typical installation utilizes an injection pump upstream from the clarifier tank, basin, or sand filters, which is electronically metered to both flow rate and suspended solids level of the influent, assuring a constant dose. The coagulant mixes and reacts with the influent, forming a dense floc. The floc may be removed by gravitational setting in a clarifier tank or basin, or by filtration. Water from the clarifier tank, basin, or sand filters may be routed through cartridge(s) and/or bag filters for final polishing. Vendor-specific systems use various methods of dose control, sediment/floc removal, filtration, etc., that are detailed in project-specific documentation. The particular coagulant/flocculant to be used for a given project is determined based on the water chemistry of the site because the coagulants are specific in their reactions with various types of sediments. Appropriate selection of dosage must be carefully matched to the characteristics of each site.

ATS's are operated in two differing modes, either Batch or Flow-Through. Batch treatment can be defined as Pump-Treat-Hold-Test-Release. In Batch treatment, water is held in a basin or tank, and is not discharged until treatment is complete. Batch treatment involves holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full. In Flow-Through treatment, water is pumped into the ATS directly from the runoff collection system or storm water holding pond, where it is treated and filtered as it flows through the system, and is then directly discharged. "Flow-Through Treatment" is also referred to as "Continuous Treatment."

1. Effluent Standards

This General Permit establishes NELs for discharges from construction sites that utilize an ATS. These systems lend themselves to NELs for turbidity and pH because of their known reliable treatment. Advanced systems have been in use in some form since the mid-1990s. An ATS is considered reliable, can consistently produce a discharge of less than 10 NTU, and has been used successfully at many sites in several states since 1995 to reduce turbidity to very low levels.[19]

This General Permit contains "compliance storm event" exceptions from the technology-based NELs for ATS discharges. The rationale is that technology-based requirements are developed assuming a certain design storm. In the case of ATS the industry-standard design storm is 10-year, 24-hour (as stated in

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[17] RomØen, K., B. Thu, and Ø. Evensen. 2002. Immersion delivery of plasmid DNA II. A study of the potentials of a chitosan based delivery system in rainbow trout (*Oncorhynchus mykiss*) fry. *Journal of Controlled Release* **85**: 215-225.
[18] Bullock, G., V. Blazer, S. Tsukuda, and S. Summerfelt. 2000. Toxicity of acidified chitosan for cultured rainbow trout (*Oncorhynchus mykiss*). *Aquaculture* **185**:273-280.
[19] Currier, B., G. Minton, R. Pitt, L. Roesner, K. Schiff, M. Stenstrom, E. Strassler, and E. Strecker. 2006. The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities.

Attachment F of this General Permit), so the compliance storm event has been established as the 10-year 24-hour event as well to provide consistency.

2. **Training**

Operator training is critical to the safe and efficient operation and maintenance of the ATS, and to ensure that all State Water Board monitoring and sampling requirements are met. The General Permit requires that all ATS operators have training specific to using ATS's liquid coagulants.

L. Post-Construction Requirements

Under past practices, new and redevelopment construction activities have resulted in modified natural watershed and stream processes. This is caused by altering the terrain, modifying the vegetation and soil characteristics, introducing impervious surfaces such as pavement and buildings, increasing drainage density through pipes and channels, and altering the condition of stream channels through straightening, deepening, and armoring. These changes result in a drainage system where sediment transport capacity is increased and sediment supply is decreased. A receiving channel's response is dependent on dominant channel materials and its stage of adjustment.

Construction activity can lead to impairment of beneficial uses in two main ways. First, during the actual construction process, storm water discharges can negatively affect the chemical, biological, and physical properties of downstream receiving waters. Due to the disturbance of the landscape, the most likely pollutant is sediment, however pH and other non-visible pollutants are also of great concern. Second, after most construction activities are completed at a construction site, the finished project may result in significant modification of the site's response to precipitation. New development and redevelopment projects have almost always resulted in permanent post-construction water quality impacts because more precipitation ends up as runoff and less precipitation is intercepted, evapotranspired, and infiltrated.

General Permit 99-08-DWQ required the SWPPP to include a description of all post-construction BMPs on a site and a maintenance schedule. An effective storm water management strategy must address the full suite of storm events (water quality, channel protection, overbank flood protection, extreme flood protection) (Figure 2).

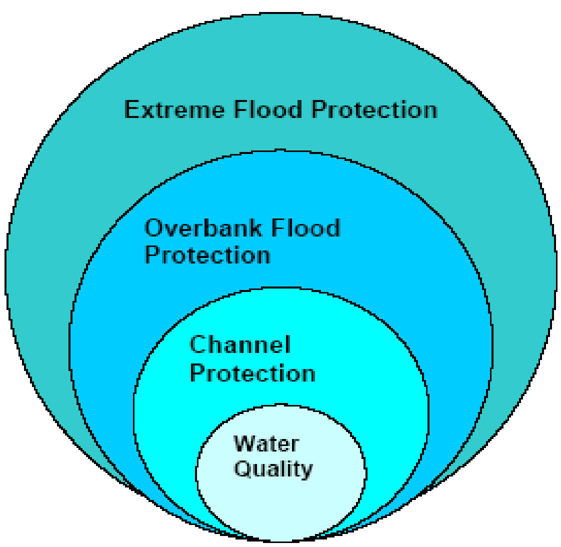

Figure 2 - Suite of Storm Events

The post-construction storm water performance standards in this General Permit specifically address water quality and channel protection events. Overbank flood protection and extreme flood protection events are traditionally dealt with in local drainage and flood protection ordinances. However, measures in this General Permit to address water quality and channel protection also reduce overbank and extreme flooding impacts. This General Permit aims to match post-construction runoff to pre-construction runoff for the 85th percentile storm event, which not only reduces the risk of impact to the receiving water's channel morphology but also provides some protection of water quality.

This General Permit clarifies that its runoff reduction requirements only apply to projects that lie outside of jurisdictions covered by a Standard Urban Storm water Management Plan (SUSMP) (or other more protective) post-construction requirements in either Phase I or Phase II permits.

Figures 3 and 4, below, show the General Permit enrollees (to Order 99-08-DWQ, as of March 10, 2008) overlaid upon a map with SUSMP (or more protective) areas in blue and purple. Areas without blue or purple indicate where the General Permit's runoff reduction requirements would actually apply.

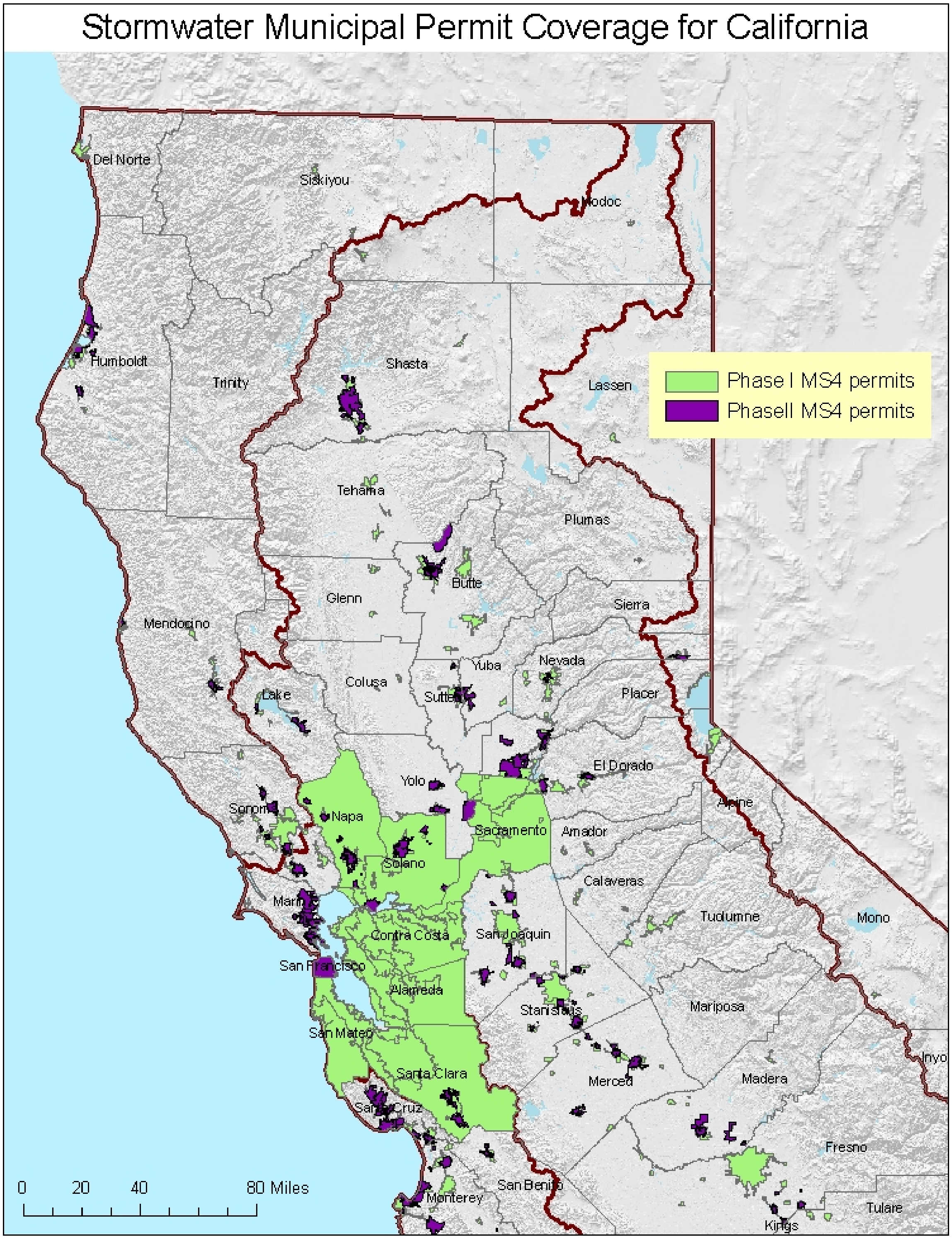

Figure 3 - Northern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Figure 4 - Southern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Water Quality:
This General Permit requires dischargers to replicate the pre-project runoff water balance (defined as the amount of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event, or the smallest storm event that generates runoff, whichever is larger. Contemporary storm water management generally routes these flows directly to the drainage system, increasing pollutant loads and potentially causing adverse effects on receiving waters. These smaller water quality events happen much more frequently than larger events and generate much higher pollutant loads on an annual basis. There are other adverse hydrological impacts that result from not designing according to the site's pre-construction water balance. In Maryland, Klein[20] noted that baseflow decreases as the extent of urbanization increases. Ferguson and Suckling[21] noted a similar relation in watersheds in Georgia. On Long Island, Spinello and Simmons[22] noted substantial decreases in base flow in intensely urbanized watersheds.

The permit emphasizes runoff reduction through on-site storm water reuse, interception, evapo-transpiration and infiltration through non-structural controls and conservation design measures (e.g., downspout disconnection, soil quality preservation/enhancement, interceptor trees). Employing these measures close to the source of runoff generation is the easiest and most cost-effective way to comply with the pre-construction water balance standard. Using low-tech runoff reduction techniques close to the source is consistent with a number of recommendations in the literature.[23] In many cases, BMPs implemented close to the source of runoff generation cost less than end-of the pipe measures.[24] Dischargers are given the option of using Appendix 2 to calculate the required runoff volume or a watershed process-based, continuous simulation model such as the EPA's Storm Water Management Model (SWMMM) or Hydrologic Simulation Program Fortran (HSPF). Such methods used by the discharger will be reviewed by the Regional Water Board upon NOT application.

Channel Protection:
In order to address channel protection, a basic understanding of fluvial geomorphic concepts is necessary. A dominant paradigm in fluvial geomorphology holds that streams adjust their channel dimensions (width and depth) in response to long-term changes in sediment supply and bankfull discharge (1.5 to 2 year recurrence interval). The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which the moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.[25] Lane (1955 as cited in Rosgen 1996[26]) showed the generalized relationship between sediment load, sediment size, stream discharge and stream slope in

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[20] Klein 1979 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[21] Ferguson and Suckling 1990 as cited Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[22] Center for Watershed Protection (CWP). 2000. The Practice of Watershed Protection: Techniques for protecting our nation's streams, lakes, rivers, and estuaries. Ellicott City, MD. 741 pp.
[23] Bay Area Storm Water Management Agencies Association (BASMAA). 1997. Start at the Source: Residential Site Planning and Design Guidance Manual for Storm Water Quality Protection. Palo Alto, CA;
McCuen, R.H. 2003 Smart Growth: hydrologic perspective. Journal of Professional Issues in Engineering Education and Practice. Vol (129), pp.151-154;
Moglen, G.E. and S. Kim. 2007. Impervious imperviousness-are threshold based policies a good idea? Journal of the American Planning Association, Vol 73 No. 2. pp 161-171.
[24] Delaware Department of natural Resources (DDNR). 2004. Green technology: The Delaware urban Runoff Management Approcah. Dover, DE. 117 pp.
[25] Dunne, T and L.B. Leopold. 1978. Water in Environmental Planning. San Francisco W.H. Freeman and Company
[26] Rosgen. D.L. 1996. Applied River Morphology. Pagosa Springs. Wildland Hydrology

Figure 5. A change in any one of these variables sets up a series of mutual adjustments in the companion variables with a resulting direct change in the physical characteristics of the stream channel.

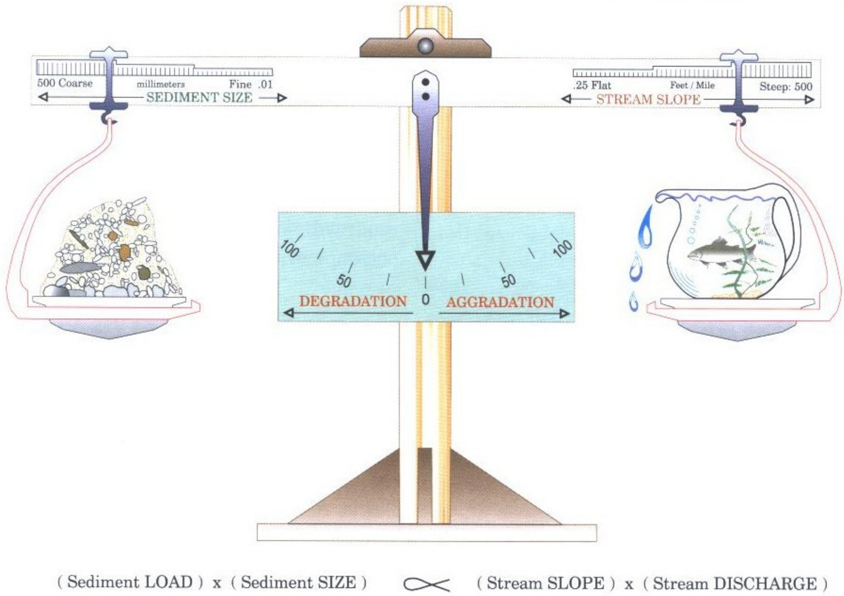

Figure 5 - Schematic of the Lane Relationship

After Lane (1955) as cited in Rosgen (1996)

Stream slope multiplied by stream discharge (the right side of the scale) is essentially an approximation of stream power, a unifying concept in fluvial geomorphology (Bledsoe 1999). Urbanization generally increases stream power and affects the resisting forces in a channel (sediment load and sediment size represented on the left side of the scale).

During construction, sediment loads can increase from 2 to 40,000 times over pre-construction levels.[27] Most of this sediment is delivered to stream channels during large, episodic rain events.[28] This increased sediment load leads to an initial aggradation phase where stream depths may decrease as sediment fills the channel, leading to a decrease in channel capacity and increase in flooding and overbank deposition. A degradation phase initiates after construction is completed.

Schumm et. al (1984) developed a channel evolution model that describes the series of adjustments from initial downcutting, to widening, to establishing new floodplains at lower elevations (Figure 6).

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[27] Goldman S.J., K. Jackson, and T.A. Bursztynsky. 1986. Erosion and Sediment Control Handbook. McGraw Hill. San Francisco.
[28] Wolman 1967 as cited in Paul, M.P. and J.L. Meyer. 2001. Streams in the Urban Landscape. *Annu. Rev.Ecol. Syst.* 32: 333-365.

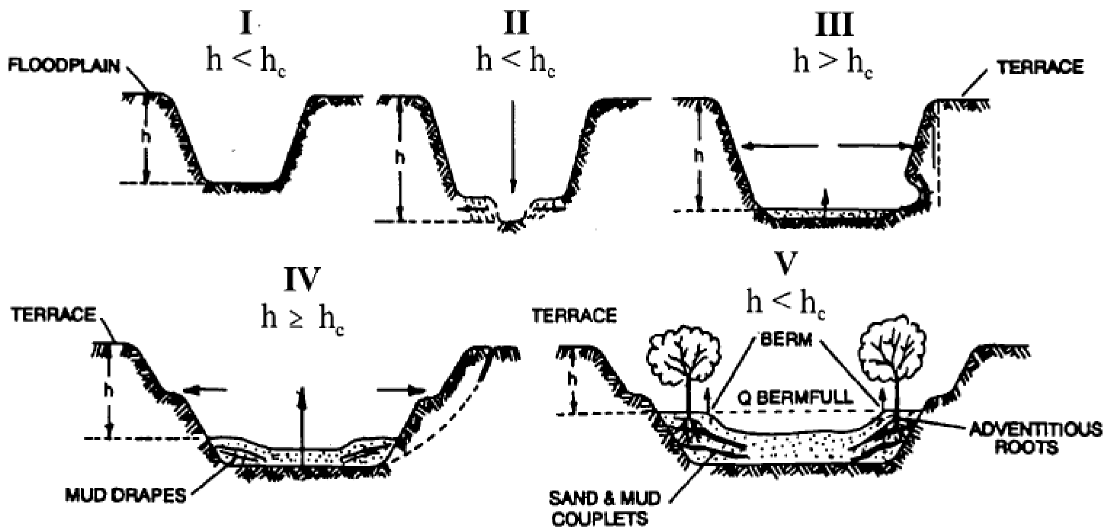

Figure 6 - Channel Changes Associated with Urbanization

After Incised Channel Evolution Sequence in Schumm et. al 1984

Channel incision (Stage II) and widening (Stages III and to a lesser degree, Stage IV) are due to a number of fundamental changes on the landscape. Connected impervious area and compaction of pervious surfaces increase the frequency and volume of bankfull discharges.[29] Increased drainage density (miles of stream length per square mile of watershed) also negatively impacts receiving stream channels.[30] Increased drainage density and hydraulic efficiency leads to an increase in the frequency and volume of bankfull discharges because the time of concentration is shortened. Flows from engineered pipes and channels are also often "sediment starved" and seek to replenish their sediment supply from the channel.

Encroachment of stream channels can also lead to an increase in stream slope, which leads to an increase in stream power. In addition, watershed sediment loads and sediment size (with size generally represented as the median bed and bank particle size, or d_{50}) decrease during urbanization.[31] This means

[29] Booth, D. B. and C. R. Jackson. 1997. Urbanization of Aquatic Systems: Degradation Thresholds, Storm Water Detection, and the Limits of Mitigation. Journal of the American Water Resources Association Vol. 33, No.5, pp. 1077-1089.
[30] May, C.W. 1998. Cumulative effects of urbanization on small streams in the Puget Sound Lowland ecoregion. Conference proceedings from Puget Sound Research '98 held March 12, 13 1998 in Seattle, WA;
Santa Clara Valley Urban Runoff Pollution Prevention Program. 2002. Hydromodification Management Plan Literature Review. 80 pp.
[31] Finkenbine, J.K., D.S. Atwater, and D.S. Mavinic. 2000. Stream health after urbanization. *J. Am. Water Resour. Assoc.* 36:1149-60;

that even if pre- and post-development stream power are the same, more erosion will occur in the post-development stage because the smaller particles are less resistant (provided they are non-cohesive).

As shown in Stages II and III, the channel deepens and widens to accommodate the increased stream power [32]and decrease in sediment load and sediment size. Channels may actually narrow as entrained sediment from incision is deposited laterally in the channel. After incised channels begin to migrate laterally (Stage III), bank erosion begins, which leads to general channel widening.[33] At this point, a majority of the sediment that leaves a drainage area comes from within the channel, as opposed to the background and construction related hillslope contribution. Stage IV is characterized by more aggradation and localized bank instability. Stage V represents a new quasi-equilibrium channel morphology in balance with the new flow and sediment supply regime. In other words, stream power is in balance with sediment load and sediment size.

The magnitude of the channel morphology changes discussed above varies along a stream network as well as with the age of development, slope, geology (sand-bedded channels may cycle through the evolution sequence in a matter of decades whereas clay-dominated channels may take much longer), watershed sediment load and size, type of urbanization, and land use history. It is also dependent on a channel's stage in the channel evolution sequence when urbanization occurs. Management strategies

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Pizzuto, J.E. W.S. Hession, and M. McBride. 2000. Comparing gravel-bed rivers in paired urban and rural catchments of southeastern Pennsylvania. *Geology* 28:79-82.

[32] Hammer 1973 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp;
Booth, D.B. 1990. Stream Channel Incision Following Drainage Basin Urbanization. *Water Resour. Bull.* 26:407-417.

[33] Trimble, S.W. 1997. Contribution of Stream Channel Erosion to Sediment Yield from an Urbanizing Watershed. *Science*: Vol. 278 (21), pp. 1442-1444.

must take into account a channel's stage of adjustment and account for future changes in the evolution of channel form (Stein and Zaleski 2005).[34]

Traditional structural water quality BMPs (e.g. detention basins and other devices used to store volumes of runoff) unless they are highly engineered to provide adequate flow duration control, do not adequately protect receiving waters from accelerated channel bed and bank erosion, do not address post-development increases in runoff volume, and do not mitigate the decline in benthic macroinvertebrate communities in the receiving waters[35] suggest that structural BMPs are not as effective in protecting aquatic communities as a continuous riparian buffer of native vegetation. This is supported by the findings of Zucker and White[36], where instream biological metrics were correlated with the extent of forested buffers.

This General Permit requires dischargers to maintain pre-development drainage densities and times of concentration in order to protect channels and encourages dischargers to implement setbacks to reduce channel slope and velocity changes that can lead to aquatic habitat degradation.

There are a number of other approaches for modeling fluvial systems, including statistical and physical models and simpler stream power models.[37] The use of these models in California is described in Stein and Zaleski (2005).[38] Rather than prescribe a specific one-size-fits-all modeling method in this permit, the State Water Board intends to develop a stream power and channel evolution model-based framework to assess channels and develop a hierarchy of suitable analysis methods and management strategies. In time, this framework may become a State Water Board water quality control policy.

Permit Linkage to Overbank and Extreme Flood Protection

Site design BMPs (e.g. rooftop and impervious disconnection, vegetated swales, setbacks and buffers) filter and settle out pollutants and provide for more infiltration than is possible for traditional centralized structural BMPs placed at the lowest point in a site. They provide source control for runoff and lead to a reduction in pollutant loads. When implemented, they also help reduce the magnitude and volume of larger, less frequent storm events (e.g., 10-yr, 24-hour storm and larger), thereby reducing the need for expensive flood control infrastructure. Nonstructural BMPs can also be a landscape amenity, instead of a large isolated structure requiring substantial area for ancillary access, buffering, screening and maintenance facilities.[25] The multiple benefits of using non-structural benefits will be critically important as the state's population increases and imposes strains upon our existing water resources.

Maintaining predevelopment drainage densities and times of concentration will help reduce post-development peak flows and volumes in areas not covered under a municipal permit. The most effective way to preserve drainage areas and maximize time of concentration is to implement landform grading,

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[34] Stein, E.S. and S. Zaleski. 2005.Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.

[35] Horner, R.R. 2006. Investigation of the Feasibility and Benefits of Low-Impact Site Design Practices (LID) for the San Diego Region. Available at: http://www.projectcleanwater.org/pdf/permit/case-study_lid.pdf.

[36] Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.

[37] Finlayson, D.P. and D.R. Montgomery. 2003. Modeling large-scale fluvial erosion in geographic information systems. Geomorphology (53), pp. 147-164).

[38] Stein, E.S. and S. Zaleski. 2005.Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.

incorporate site design BMPs and implement distributed structural BMPs (e.g., bioretention cells, rain gardens, rain cisterns).

M. Storm Water Pollution Prevention Plans

USEPA's Construction General Permit requires that qualified personnel conduct inspections. USEPA defines qualified personnel as "a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity."[39] USEPA also suggests that qualified personnel prepare SWPPPs and points to numerous states that require certified professionals to be on construction sites at all times. States that currently have certification programs are Washington, Georgia, Florida, Delaware, Maryland, and New Jersey. The Permit 99-08-DWQ did not require that qualified personnel prepare SWPPPs or conduct inspections. However, to ensure that water quality is being protected, this General Permit requires that all SWPPPs be written, amended, and certified by a Qualified SWPPP Developer. A Qualified SWPPP Developer must possess one of the eight certifications and or registrations specified in this General Permit and effective two years after the adoption date of this General Permit, must have attended a State Water Board-sponsored or approved Qualified SWPPP Developer training course. Table 9 provides an overview of the criteria used in determining qualified certification titles for a QSD and QSP.

39 US Environmental Protection Agency. Stormwater Pollution Prevention Plans for Construction Activities. <http://cfpub.epa.gov/npdes/stormwater/swppp.cfm> and <http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf>.

Table 9 - Qualified SWPPP Developer/ Qualified SWPPP Practitioner Certification Criteria

Certification/ Title	Registered By	QSD/QSP	Certification Criteria
Professional Civil Engineer	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Geologist or Engineering Geologist	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Landscape Architect	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Hydrologist	American Institute of Hydrology	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Certified Professional in Erosion and Sediment Control™ (CPESC)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Inspector of Sediment and Erosion Control™ (CISEC)	Certified Inspector of Sediment and Erosion Control, Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Erosion, Sediment and Storm Water Inspector™ (CESSWI)	Enviro Cert International Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Professional in Storm Water Quality™ (CPSWQ)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education

The previous versions of the General Permit required development and implementation of a SWPPP as the primary compliance mechanism. The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of storm water discharges; and (2) to describe and ensure the implementation of BMPs to reduce or eliminate sediment and other pollutants in storm water and non-storm water discharges. The SWPPP must include BMPs that address source control, BMPs that address pollutant control, and BMPs that address treatment control.

This General Permit shifts some of the measures that were covered by this general requirement to specific permit requirements, each individually enforceable as a permit term. This General Permit emphasizes the use of appropriately selected, correctly installed and maintained pollution reduction BMPs. This approach provides the flexibility necessary to establish BMPs that can effectively address source control of pollutants during changing construction activities. These specific requirements also improve both the clarity and the enforceability of the General Permit so that the dischargers understand, and the public can determine whether the discharges are in compliance with, permit requirements.

The SWPPP must be implemented at the appropriate level to protect water quality at all times throughout the life of the project.   The SWPPP must remain on the site during construction activities, commencing with the initial mobilization and ending with the termination of coverage under the General Permit. For LUPs the discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio or telephone. Once construction activities are complete, until stabilization is achieved, the SWPPP shall be available from the SWPPP contact listed in the PRDs

A SWPPP must be appropriate for the type and complexity of a project and will be developed and implemented to address project specific conditions. Some projects may have similarities or complexities, yet each project is unique in its progressive state that requires specific description and selection of BMPs needed to address all possible generated pollutants

N. Regional Water Board Authorities

Because this General Permit will be issued to thousands of construction sites across the State, the Regional Water Boards retain discretionary authority over certain issues that may arise from the discharges in their respective regions. This General Permit does not grant the Regional Water Boards any authority they do not otherwise have; rather, it merely emphasizes that the Regional Water Boards can take specific actions related to this General Permit. For example, the Regional Water Boards will be enforcing this General Permit and may need to adjust some requirements for a discharger based on the discharger’s compliance history.

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

Arnold Schwarzenegger
Governor

Division of Water Quality

1001 I Street • Sacramento, California 95814 • (916) 341-5455
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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO**. CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ [as amended by Order No. 2010-0014-DWQ] except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

Arnold Schwarzenegger
Governor

Division of Water Quality
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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

ORDER NO. 2010-0014-DWQ
NPDES NO. CAS000002

Order No. 2009-0009-DWQ was adopted by the State Water Resources Control Board on:	**September 2, 2009**
Order No. 2009-0009-DWQ became effective on:	**July 1, 2010**
Order No. 2009-0009-DWQ shall expire on:	**September 2, 2014**
This Order, which amends Order No. 2009-0009-DWQ, was adopted by the State Water Resources Control Board on:	**November 16, 2010**
This Order shall become effective on:	**February 14, 2011**

IT IS HEREBY ORDERED that this Order amends Order No. 2009-0009-DWQ. Additions to Order No. 2009-0009-DWQ are reflected in blue-underline text and deletions are reflected in red-strikeout text.

IT IS FURTHER ORDERED that staff are directed to prepare and post a conformed copy of Order No. 2009-0009-DWQ incorporating the revisions made by this Order.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on **November 16, 2010.**

AYE:	Chairman Charles R. Hoppin Vice Chair Frances Spivy-Weber Board Member Arthur G. Baggett, Jr. Board Member Tam M. Doduc
NAY:	None
ABSENT:	None
ABSTAIN:	None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

ORDER NO. 2012-0006-DWQ
NPDES NO**. CAS000002**

Order No. 2009-0009-DWQ was adopted by the State Water Resources Control Board on:	**September 2, 2009**
Order No. 2009-0009-DWQ became effective on:	**July 1, 2010**
Order No. 2010-0014-DWQ became effective on:	**February 14, 2011**
Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ shall expire on:	**September 2, 2014**
This Order, which amends Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ, was adopted by the State Water Resources Control Board on:	**July 17, 2012**
This Order No. 2012-0006-DWQ shall become effective on:	**July 17, 2012**

IT IS HEREBY ORDERED that this Order amends Order No. 2009-0009-DWQ. Additions to Order No. 2009-0009-DWQ are reflected in blue-underline text and deletions are reflected in red-strikeout text.

IT IS FURTHER ORDERED that staff are directed to prepare and post a conformed copy of Order No. 2009-000-DWQ incorporating the revisions made by this Order.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on July 17, 2012.

AYE:	Chairman Charles R. Hoppin Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Steven Moore Board Member Felicia Marcus
NAY:	None
ABSENT:	None
ABSTAIN:	None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

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LIST OF ATTACHMENTS

LIST OF APPENDICES

STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
[AS AMENDED BY ORDER NO. 2010-0014-DWQ]
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002

WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.

2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear

Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.

5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.

6. Pursuant to 40 C.F.R. § 131.12 and State Water Board Resolution No. 68-16,[1] which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.

7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.

8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.

9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

[1] Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.

11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.

12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.

13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.

14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.

15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.

16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.

17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.

21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[2]

23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of

[2] Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.

28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

29. Construction activity covered by an individual NPDES Permit for storm water discharges.

30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 (“R” in the Revised Universal Soil Loss Equation).

31. Landfill construction activity that is subject to the Industrial General Permit.

32. Construction activity that discharges to Combined Sewer Systems.

33. Conveyances that discharge storm water runoff combined with municipal sewage.

34. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.

37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and No. 2003-0007-DWQ. For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)[3]. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.

42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

43. This General Permit prohibits the discharge of any debris[4] from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.

45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

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[3] BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

[4] Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.

47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.

48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.

49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.

50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS[5]) can prevent or reduce the release of fine particles from construction sites.

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[5] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, “The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities,” dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel’s suggestions into this General Permit, which includes numeric action levels (NALs) for pH and turbidity, and special numeric limits for ATS discharges.

Determining Compliance with Numeric Limitations

53. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. An exceedance of a NAL does not constitute a violation of this General Permit.

54. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is

required to provide an NAL Exceedance Report when requested by a Regional Water Board.

I. Receiving Water Limitations

55. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

56. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

57. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.

58. For all Risk Level 3/LUP Type 3 and Risk Level 2/LUP Type 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.

59. Risk Level 3 and LUP Type 3 sites with effluent that exceeds the Receiving Water Monitoring Triggers contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring. An exceedance of a Receiving Water Monitoring Trigger does not constitute a violation of this General Permit.

60. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) as an exemptions to the receiving water monitoring requirements for Risk Level 3 and LUP Type 3 dischargers.

61. If run-on is caused by a forest fire or any other natural disaster, then receiving water monitoring triggers do not apply.

62. For Risk Level 3 and LUP Type 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.

63. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.

64. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.

65. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.

66. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

67. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.

68. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.

69. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.

70. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.

71. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

72. This General Permit includes performance standards for post-construction that are consistent with State Water Board Resolution No. 2005-0006, "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and 2008-0030, "Requiring Sustainable Water Resources Management." The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This "runoff reduction" approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

73. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

74. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.

75. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

76. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this

General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)[6]:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. The Legally Responsible Person is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.

3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

[6] These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

B. Obtaining Permit Coverage Traditional Construction Sites

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.

2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

3. PRDs shall consist of:

   a. Notice of Intent (NOI)
   b. Risk Assessment (Section VIII)
   c. Site Map
   d. Storm Water Pollution Prevention Plan (Section XIV)
   e. Annual Fee
   f. Signed Certification Statement

   Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

   Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.

   a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.

   b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated.

Existing dischargers shall electronically file their PRDs no later than July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.

6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOT prior to July 1, 2010, are not required to obtain coverage under this General Permit.

7. Small Construction Rainfall Erosivity Waiver

   EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

   Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

   If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.

2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:

   a. A revised NOI indicating the new project size;

   b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.

   c. SWPPP revisions, as appropriate; and

   d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.

   e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved "Final Stabilization" as defined in Section II.D.

4. When an LRP with active General Permit coverage transfers its LRP status to another person or entity that qualifies as an LRP, the existing LRP shall inform the new LRP of the General Permit's requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP's approved signatory, must submit PRDs in accordance with this General Permit's requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:

    a. For purposes of "final stabilization," the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;

    b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;

    c. Final stabilization has been reached;

    d. Construction materials and wastes have been disposed of properly;

    e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;

    f. Post-construction storm water management measures have been installed and a long-term maintenance plan[7] has been established; and

    g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.

[7] For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.

3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:

    a. “70% final cover method,” no computational proof required

        OR:

    b. “RUSLE or RUSLE2 method,” computational proof required

        OR:

    c. “Custom method”, the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the “final stabilization” requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

A. Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

B. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.

C. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:

1. The discharge does not cause or contribute to a violation of any water quality standard;

2. The discharge does not violate any other provision of this General Permit;

3. The discharge is not prohibited by the applicable Basin Plan;

4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.

5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

6. The discharge is monitored and meets the applicable NALs; and

7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

D. Debris resulting from construction activities are prohibited from being discharged from construction sites.

E. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.

2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger’s premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notices of Termination (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP), as defined in Appendix 5 – Glossary, or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory, as defined in Appendix 5 - Glossary) must submit all information electronically via SMARTS.

2. Changes to Authorization. If an Approved Signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an Approved Signatory.

3. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's Approved Signatory.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass[8] is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;[9]

2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;

3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or

4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset[10] in an action brought for noncompliance shall demonstrate,

[8] The intentional diversion of waste streams from any portion of a treatment facility

[9] Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

[10] An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the discharger can identify the cause(s) of the upset

b. The treatment facility was being properly operated by the time of the upset

c. The discharger submitted notice of the upset as required; and

d. The discharger complied with any remedial measures required

2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.

3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[11] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

[11] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

V. EFFLUENT STANDARDS & RECEIVING WATER MONITORING

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

Table 1- Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU
		Risk Level 3			250 NTU

B. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for

pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.

3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

    a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

    AND/OR:

    b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

C. Receiving Water Monitoring Triggers

1. The receiving water monitoring triggers for Risk Level 3 dischargers with direct discharges to surface waters are triggered when the daily average effluent pH values during any site phase when there is a high risk of pH discharge[12] fall outside of the range of 6.0 and 9.0 pH units, or when the daily average effluent turbidity exceeds 500 NTU.

2. Risk Level 3 dischargers with with direct discharges to surface waters shall conduct receiving water monitoring whenever their effluent monitoring results exceed the receiving water monitoring triggers. If the pH trigger is exceeded, the receiving water shall be monitored for pH for the duration of coverage under this General Permit. If the turbidity trigger is exceeded, the receiving water shall be monitored for turbidity and SSC for the duration of coverage under this general permit.

3. Risk Level 3 dischargers with direct discharges to surfaces waters shall initiate receiving water monitoring when the triggers are exceeded unless the storm event causing the exceedance is determined after the fact to equal to or greater than the 5-year 24-hour storm (expressed in inches of rainfall) as determined by using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

   Verification of the 5-year 24-hour storm event shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. If run-on is caused by a forest fire or any other natural disaster, then receiving water monitoring triggers do not apply.

[12] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

VI. RECEIVING WATER LIMITATIONS

A. The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

B. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

C. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

D. Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

   a. A California registered professional civil engineer;

   b. A California registered professional geologist or engineering geologist;

   c. A California registered landscape architect;

   d. A professional hydrologist registered through the American Institute of Hydrology;

   e. A Certified Professional in Erosion and Sediment Control (CPESC) ™ registered through Enviro Cert International, Inc.;

   f. A Certified Professional in Storm Water Quality (CPSWQ) ™ registered through Enviro Cert International, Inc.; or

   g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or

   b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.

5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,[13] the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

[13] Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres http://cain.ice.ucdavis.edu/calwater/calwfaq.html, http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175 .

XIII. POST-CONSTRUCTION STANDARDS

A. All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.

1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.

2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.

3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.

4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream[14] or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

[14] A first order stream is defined as a stream with no tributaries.

B. All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

A. The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;

2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;

3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;

4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and

5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.

B. To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.

C. The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

A. In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.

B. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

C. Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

D. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

E. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

A. All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.

B. The discharger shall certify each Annual Report in accordance with the Special Provisions.

C. The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.

D. The discharger shall include storm water monitoring information in the Annual Report consisting of:

1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;

2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

3. a summary of all corrective actions taken during the compliance year;

4. identification of any compliance activities or corrective actions that were not implemented;

5. a summary of all violations of the General Permit;

6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;

7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and

8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.

E. The discharger shall provide training information in the Annual Report consisting of:

1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and

3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

ATTACHMENT A
Linear Underground/ Overhead Requirements

All Linear Underground/Overhead project dischargers who submit permit registration documents (PRDs) indicating their intention to be regulated under the provisions of this General Permit shall comply with the following:

A. DEFINITION OF LINEAR UNDERGROUND/OVERHEAD PROJECTS

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquiescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. LUP evaluation shall consist of two tasks:

a. Confirm that the project or project section(s) qualifies as an LUP. The State Water Board website contains a project determination guidance flowchart. http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

b. Identify which Type(s) (1, 2 or 3 described in Section I below) are applicable to the project or project sections based on project sediment and receiving water risk. (See Attachment A.1)

3. A Legally Responsible Person (LRP) for a Linear Underground/Overhead project is required to obtain CGP coverage under one or more permit registration document (PRD) electronic submittals to the State Water Board's Storm Water Multi-Application and Report Tracking (SMARTs) system. Attachment A.1 contains a flow chart to be used when determining if a linear project qualifies for coverage and to determine LUP Types. Since a LUP may be constructed within both developed and undeveloped locations and portions of LUPs may be constructed by different contractors, LUPs may be broken into logical permit sections. Sections may be determined based on portions of a project conducted by one contractor. Other situations may also occur, such as the time period in which the sections of a project will be constructed (e.g. project phases), for which separate permit coverage is possible. For projects that are broken into separate sections, a description of how each section relates to the overall project and the definition of the boundaries between sections shall be clearly stated.

4. Where construction activities transverse or enter into different Regional Water Board jurisdictions, LRPs shall obtain permit coverage for each Regional Water Board area involved prior to the commencement of construction activities.

5. Small Construction Rainfall Erosivity Waiver

EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

If a small linear construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

B. LINEAR PROJECT PERMIT REGISTRATION DOCUMENTS (PRDs)

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted. PRDs shall consist of the following:

1. Notice of Intent (NOI)

Prior to construction activities, the LRP of a proposed linear underground/overhead project shall utilize the processes and methods provided in Attachment A.2, Permit Registration Documents (PRDs) – General Instructions for Linear Underground/Overhead Projects to comply with the Construction General Permit.

2. Site Maps

LRPs submitting PRDs shall include at least 3 maps. The first map will be a zoomed[1] 1000-1500 ft vicinity map that shows the starting point of the project. The second will be a zoomed map of 1000-1500 ft showing the ending location of the project. The third will be a larger view vicinity map, 1000 ft to 2000 ft, displaying the entire project location depending on the project size, and indicating the LUP type (1, 2 or 3) areas within the total project footprint.

3. Drawings

LRPs submitting PRDs shall include a construction drawing(s) or other appropriate drawing(s) or map(s) that shows the locations of storm drain

[1] An image with a close-up/enhanced detailed view of site features that show minute details such as streets and neighboring structures.
Or: An image with a close-up/enhanced detailed view of the site's surrounding infrastructure.
Or: An image with a close up detailed view of the project and its surroundings.

inlets and waterbodies[2] that may receive discharges from the construction activities and that shows the locations of BMPs to be installed for all those BMPs that can be illustrated on the revisable drawing(s) or map(s). If storm drain inlets, waterbodies, and/or BMPs cannot be adequately shown on the drawing(s) or map(s) they should be described in detail within the SWPPP.

4. Storm Water Pollution Prevention Plan (SWPPP)

LUP dischargers shall comply with the SWPPP Preparation, Implementation, and Oversight requirements in Section K of this Attachment.

5. Contact information

LUP dischargers shall include contact information for all contractors (or subcontractors) responsible for each area of an LUP project. This should include the names, telephone numbers, and addresses of contact personnel. Specific areas of responsibility of each contact, and emergency contact numbers should also be included.

6. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. LINEAR PROJECT TERMINATION OF COVERAGE REQUIREMENTS

The LRP may terminate coverage of an LUP when construction activities are completed by submitting an electronic notice of termination (NOT) through the State Water Board's SMARTS system. Termination requirements are different depending on the complexity of the LUP. An LUP is considered complete when: (a) there is no potential for construction-related storm water pollution; (b) all elements of the SWPPP have been completed; (c) construction materials and waste have been disposed of properly; (d) the site is in compliance with all local storm water management requirements; and (e) the LRP submits a notice of termination (NOT) and has received approval for termination from the appropriate Regional Water Board office.

1. LUP Stabilization Requirements

The LUP discharger shall ensure that all disturbed areas of the construction site are stabilized prior to termination of coverage under this General Permit. Final stabilization for the purposes of submitting an NOT

[2] Includes basin(s) that the MS4 storm sewer systems may drain to for Hydromodification or Hydrological Conditional of Concerns under the MS4 permits.

is satisfied when all soil disturbing activities are completed and one of the following criteria is met:

a. In disturbed areas that were vegetated prior to construction activities of the LUP, the area disturbed must be re-established to a uniform vegetative cover equivalent to 70 percent coverage of the preconstruction vegetative conditions. Where preconstruction vegetation covers less than 100 percent of the surface, such as in arid areas, the 70 percent coverage criteria is adjusted as follows: if the preconstruction vegetation covers 50 percent of the ground surface, 70 percent of 50 percent (.70 X .50=.35) would require 35 percent total uniform surface coverage; or

b. Where no vegetation is present prior to construction, the site is returned to its original line and grade and/or compacted to achieve stabilization; or

c. Equivalent stabilization measures have been employed. These measures include, but are not limited to, the use of such BMPs as blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, or other erosion resistant soil coverings or treatments.

2. LUP Termination of Coverage Requirements

The LRP shall file an NOT through the State Water Board's SMARTS system. By submitting an NOT, the LRP is certifying that construction activities for an LUP are complete and that the project is in full compliance with requirements of this General Permit and that it is now compliant with soil stabilization requirements where appropriate. Upon approval by the appropriate Regional Water Board office, permit coverage will be terminated.

3. Revising Coverage for Change of Acreage

When the LRP of a portion of an LUP construction project changes, or when a phase within a multi-phase project is completed, the LRP may reduce the total acreage covered by this General Permit. In reducing the acreage covered by this General Permit, the LRP shall electronically file revisions to the PRDs that include:

a. a revised NOI indicating the new project size;

b. a revised site map showing the acreage of the project completed, acreage currently under construction, acreage sold, transferred or added, and acreage currently stabilized.

c. SWPPP revisions, as appropriate; and

d. certification that any new LRPs have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address (if known) of the new LRP.

If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

D. DISCHARGE PROHIBITIONS

1. LUP dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

2. LUP dischargers are prohibited from discharging non-storm water that is not otherwise authorized by this General Permit. Non-storm water discharges authorized by this General Permit[3] may include, fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, street cleaning, dewatering,[4] uncontaminated groundwater from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. Such discharges are allowed by this General Permit provided they are not relied upon to clean up failed or inadequate construction or post-construction BMPs designed to keep materials on site. These authorized non-storm water discharges:

[3] Dischargers must identify all authorized non-storm water discharges in the LUP's SWPPP and identify BMPs that will be implemented to either eliminate or reduce pollutants in non-storm water discharges. Regional Water Boards may direct the discharger to discontinue discharging such non-storm water discharges if determined that such discharges discharge significant pollutants or threaten water quality.
[4] Dewatering activities may be prohibited or need coverage under a separate permit issued by the Regional Water Boards. Dischargers shall check with the appropriate Regional Water Boards for any required permit or basin plan conditions prior to initial dewatering activities to land, storm drains, or waterbodies.

a. Shall not cause or contribute to a violation of any water quality standard;

b. Shall not violate any other provision of this General Permit;

c. Shall not violate any applicable Basin Plan;

d. Shall comply with BMPs as described in the SWPPP;

e. Shall not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

f. Shall be monitored and meets the applicable NALs; and

g. Shall be reported by the discharger in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not authorized by this General Permit to determine the need for a separate NPDES permit.

Additionally, some LUP dischargers may be required to obtain a separate permit if the applicable Regional Water Board has adopted a General Permit for dewatering discharges. Wherever feasible, alternatives, that do not result in the discharge of non-storm water, shall be implemented in accordance with this Attachment's Section K.2 - SWPPP Implementation Schedule.

3. LUP dischargers shall ensure that trench spoils or any other soils disturbed during construction activities that are contaminated[5] are not discharged with storm water or non-storm water discharges into any storm drain or water body except pursuant to an NPDES permit.

When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the LUP discharger shall have those soils sampled and tested to ensure that proper handling and public safety measures are

[5] Contaminated soil contains pollutants in concentrations that exceed the appropriate thresholds that various regulatory agencies set for those substances. Preliminary testing of potentially contaminated soils will be based on odor, soil discoloration, or prior history of the site's chemical use and storage and other similar factors. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The legally responsible person will notify the appropriate local, State, or federal agency(ies) when contaminated soil is found at a construction site, and will notify the Regional Water Board by submitting an NOT at the completion of the project.

implemented. The LUP discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

4. Discharging any pollutant-laden water that will cause or contribute to an exceedance of the applicable Regional Water Board's Basin Plan from a dewatering site or sediment basin into any receiving water or storm drain is prohibited.

5. Debris[6] resulting from construction activities are prohibited from being discharged from construction project sites.

E. SPECIAL PROVISIONS

1. Duty to Comply

a. The LUP discharger must comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

b. The LUP discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

2. General Permit Actions

a. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

[6] Litter, rubble, discarded refuse, and remains of something destroyed.

b. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an LUP discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

4. Duty to Mitigate

The LUP discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

5. Proper Operation and Maintenance

The LUP discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit and with the requirements of the Storm Water Pollution Prevention Plan (SWPPP). Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

6. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

7. Duty to Maintain Records and Provide Information

a. The LUP discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be kept at the construction site or in a crew member's vehicle until construction is completed, and shall be made available upon request.

b. The LUP discharger shall furnish the Regional Water Board, State Water Board, or USEPA, within a reasonable time, any requested information to determine compliance with this General Permit. The LUP discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

8. Inspection and Entry

The LUP discharger shall allow the Regional Water Board, State Water Board, USEPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

b. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

c. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

d. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

9. Electronic Signature and Certification Requirements

a. All Permit Registration Documents (PRDs) and Notices of Termination (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP), as defined in Appendix 5 – Glossary, or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory, as defined in Appendix 5 - Glossary) must submit all information electronically via SMARTS.

b. Changes to Authorization. If an Approved Signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an Approved Signatory.

c. All SWPPP revisions, annual reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, USEPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's Approved Signatory.

10. Certification

Any person signing documents under Section E.9 above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

11. Anticipated Noncompliance

The LUP discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

12. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

13. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the LUP discharger is or may be subject to under Section 311 of the CWA.

14. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

15. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of USEPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

16. Penalties for Violations of Permit Conditions

a. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[7] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

b. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

17. Transfers

This General Permit is not transferable. A new LRP of an ongoing construction activity must submit PRDs in accordance with the requirements of this General Permit to be authorized to discharge under this General Permit. An LRP who is a property owner with active General Permit coverage who sells a fraction or all the land shall inform the new property owner(s) of the requirements of this General Permit.

18. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those

[7] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act

dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

F. EFFLUENT STANDARDS & RECEIVING WATER MONITORING

1. Narrative Effluent Limitations

a. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges regulated by this General Permit do not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

b. LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of structural or non-structural controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

Table 1. Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level
pH	Field test with calibrated portable instrument	LUP Type 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5
		LUP Type 3			lower NAL = 6.5 upper NAL = 8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	LUP Type 2	1	NTU	250 NTU
		LUP Type 3			250 NTU

2. Numeric Action Levels (NALs)

a. For LUP Type 2 and 3 dischargers, the lower storm event daily average NAL for pH is 6.5 pH units and the upper storm event daily average NAL for pH is 8.5 pH units. The LUP discharger shall take actions as described below if the storm event daily average discharge is outside of this range of pH values.

b. For LUP Type 2 and 3 dischargers, the storm event daily average NAL for turbidity is 250 NTU. The discharger shall take actions as described below if the storm event daily average discharge is outside of this range of turbidity values.

c. Whenever daily average analytical effluent monitoring results indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the LUP discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

d. The site evaluation will be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

   i Are related to the construction activities and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

   AND/OR:

   ii Are related to the run-on associated with the construction site location and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) decide what corrective action(s) were taken or will be taken, including a description of the schedule for completion.

3. Receiving Water Monitoring Triggers

a. The receiving water monitoring triggers for LUP Type 3 dischargers with direct discharges to surface waters are triggered when the daily average effluent pH values during any site phase when there is a high risk of pH discharge[8] fall outside of the range of 6.0 and 9.0 pH units, or when the daily average effluent turbidity exceeds 500 NTU.

b. LUP Type 3 dischargers with direct discharges to surface waters shall conduct receiving water monitoring whenever their effluent monitoring results exceed the receiving water monitoring triggers. If the pH trigger is exceeded, the receiving water shall be monitored for pH for the duration of coverage under this General Permit. If the turbidity trigger is exceeded, the receiving water shall be monitored for turbidity and SSC for the duration of coverage under this General Permit.

c. LUP Type 3 dischargers with direct discharges to surfaces waters shall initiate receiving water monitoring when the triggers are exceeded unless the storm event causing the exceedance is determined after the fact to equal to or greater than the 5-year 24-hour storm (expressed in inches of rainfall) as determined by using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

   Verification of the 5-year 24-hour storm event shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

d. If run-on is caused by a forest fire or any other natural disaster, then receiving water monitoring triggers do not apply.

G. RECEIVING WATER LIMITATIONS

1. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

2. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

3. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or

[8] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

H. TRAINING QUALIFICATIONS

1. General

All persons responsible for implementing requirements of this General Permit shall be appropriately trained. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Persons responsible for preparing, amending and certifying SWPPPs shall comply with the requirements in this Section H.

2. SWPPP Certification Requirements

a. **Qualified SWPPP Developer:** The LUP discharger shall ensure that all SWPPPs be written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

i A California registered professional civil engineer;

ii A California registered professional geologist or engineering geologist;

iii A California registered landscape architect;

iv A professional hydrologist registered through the American Institute of Hydrology;

v A certified professional in erosion and sediment control (CPESC) ™ registered through Enviro Cert International, Inc;

vi A certified professional in storm water quality (CPSWQ)™ registered through Enviro Cert International, Inc.; or

vii A certified professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

b. The LUP discharger shall ensure that the SWPPP is written and amended, as needed, to address the specific circumstances for each construction site covered by this General Permit prior to commencement of construction activity for any stage.

c. The LUP discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

d. **Qualified SWPPP Practitioner:** The LUP discharger shall ensure that all elements of any SWPPP for each project will be implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis, and for ensuring full compliance with the permit and implementation of all elements of the SWPPP. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

    i A certified erosion, sediment and storm water inspector registered through Certified Professional in Erosion and Sediment Control, Inc.; or

    ii A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

    Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

e. The LUP discharger shall ensure that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner, and who is ultimately responsible for implementation of the SWPPP. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

f. The LUP discharger shall ensure that the SWPPP and each amendment be signed by the Qualified SWPPP Developer. The LUP discharger shall include a listing of the date of initial preparation and the dates of each amendment in the SWPPP.

I. TYPES OF LINEAR PROJECTS

This attachment establishes three types (Type 1, 2 & 3) of complexity for areas within an LUP or project section based on threat to water quality. Project area Types are determined through Attachment A.1.

The Type 1 requirements below establish the baseline requirements for all LUPs subject to this General Permit. Additional requirements for Type 2 and Type 3 LUPs are labeled.

1. Type 1 LUPs*:*

LUP dischargers with areas of a LUP designated as Type 1 shall comply with the requirements in this Attachment. Type 1 LUPs are:

a. Those construction areas where 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day; or

b. Where greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

    i Areas disturbed during construction will be returned to preconstruction conditions or equivalent protection is established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

    ii Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization BMPs will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

c. Where the risk determination is as follows:

    i Low sediment risk, low receiving water risk, or

    ii Low sediment risk, medium receiving water risk, or

    iii Medium sediment risk, low receiving water risk

2. **Type 2 LUPs**:

Type 2 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 2 LUPs have the specified combination of risk:

d. High sediment risk, low receiving water risk, or

e. Medium sediment risk, medium receiving water risk, or

f. Low sediment risk, high receiving water risk

Receiving water risk is either considered “Low” for those areas of the project that are not in close proximity to a sensitive receiving watershed, “Medium” for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, and “High” where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C of this General Permit.

3. **Type 3 LUPs:**

Type 3 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 3 LUPs have the specified combination of risk:

a. High sediment risk, high receiving water risk, or

b. High sediment risk, medium receiving water risk, or

c. Medium sediment risk, high receiving water risk

Receiving water risk is either considered “Medium” for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, or “High” where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C.

J. LUP TYPE-SPECIFIC REQUIREMENTS

1. Effluent Standards

a. Narrative – LUP dischargers shall comply with the narrative effluent standards below.

i Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

ii LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

b. Numeric – LUP Type 1 dischargers are not subject to a numeric effluent standard

c. Numeric –LUP Type 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

d. Numeric – LUP Type 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

2. Good Site Management "Housekeeping"

a. LUP dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, the good housekeeping measures shall consist of the following:

i Identify the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

ii Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

iii Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

iv Minimize exposure of construction materials to precipitation (not applicable to materials designed to be outdoors and exposed to the environment).

v Implement BMPs to control the off-site tracking of loose construction and landscape materials.

b. LUP dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

i Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

ii Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

iii Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

iv Cover waste disposal containers at the end of every business day and during a rain event.

v Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

vi Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

vii Implement procedures that effectively address hazardous and non-hazardous spills.

viii Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

(1) Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

(2) Appropriate spill response personnel are assigned and trained.

ix Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

c. LUP dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   i Prevent oil, grease, or fuel from leaking into the ground, storm drains or surface waters.

   ii Implement appropriate BMPs whenever equipment or vehicles are fueled, maintained or stored.

   iii Clean leaks immediately and disposing of leaked materials properly.

d. LUP dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   i Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   ii Contain fertilizers and other landscape materials when they are not actively being used.

   iii Discontinue the application of any erodible landscape material at least 2 days before a forecasted rain event[9] or during periods of precipitation.

   iv Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   v Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.

e. LUP dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, LUP dischargers shall do the following:

[9] 50% or greater chance of producing precipitation.

i Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

ii Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

iii Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

iv Ensure retention of sampling, visual observation, and inspection records.

v Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

f. LUP dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations.

3. Non-Storm Water Management

a. LUP dischargers shall implement measures to control all non-storm water discharges during construction.

b. LUP dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

c. LUP dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

4. Erosion Control

a. LUP dischargers shall implement effective wind erosion control.

b. LUP dischargers shall provide effective soil cover for inactive[10] areas and all finished slopes, and utility backfill.

[10] Areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days

c. LUP dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

5. Sediment Controls

a. LUP dischargers shall establish and maintain effective perimeter controls as needed, and implement effective BMPs for all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

b. On sites where sediment basins are to be used, LUP dischargers shall, at minimum, design sediment basins according to the guidance provided in CASQA's Construction BMP Handbook.

c. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[11] in accordance with Table 2 below.

Table 2 – Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

d. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent off-site tracking of sediment.

e. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

f. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall inspect all immediate access roads. At a minimum daily and prior to any rain event, the discharger shall remove any

[11] Sheet flow length is the length that shallow, low velocity flow travels across a site.

sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

g. **Additional LUP Type 3 Requirement:** The Regional Water Board may require LUP Type 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

6. Run-on and Run-off Controls

a. LUP dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site-shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this Attachment.

b. Run-on and runoff controls are not required for Type 1 LUPs unless the evaluation of quantity and quality of run-on and runoff deems them necessary or visual inspections show that the site requires such controls.

7. Inspection, Maintenance and Repair

a. All inspection, maintenance repair and sampling activities at the discharger's LUP location shall be performed or supervised by a QSP representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

b. LUP dischargers shall conduct visual inspections and observations daily during working hours (not recorded). At least once each 24-hour period during extended storm events, **LUP Type 2 & 3 dischargers** shall conduct visual inspections to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

c. Upon identifying failures or other shortcomings, as directed by the QSP, LUP dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

d. For each pre- and post-rain event inspection required, LUP dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format that includes the information described below.

e. The LUP discharger shall ensure that the checklist remains on-site or with the SWPPP. At a minimum, an inspection checklist should include:

   i Inspection date and date the inspection report was written.

   ii Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   iii Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   iv A description of any BMPs evaluated and any deficiencies noted.

   v If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   vi Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   vii Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   viii Photographs taken during the inspection, if any.

   ix Inspector's name, title, and signature.

K. STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

1. Objectives

SWPPPs for all LUPs shall be developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

a. All pollutants and their sources, including sources of sediment, associated with construction activities associated with LUP activity are controlled;

b. All non-storm water discharges are identified and either eliminated, controlled, or treated;

c. BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from LUPs during construction; and

d. Stabilization BMPs installed to reduce or eliminate pollutants after construction is completed are effective and maintained.

2. SWPPP Implementation Schedule

a. LUPs for which PRDs have been submitted to the State Water Board shall develop a site/project location SWPPP prior to the start of land-disturbing activity in accordance with this Section and shall implement the SWPPP concurrently with commencement of soil-disturbing activities.

b. For an ongoing LUP involving a change in the LRP, the new LRP shall review the existing SWPPP and amend it, if necessary, or develop a new SWPPP within 15 calendar days to conform to the requirements set forth in this General Permit.

3. Availability

The SWPPP shall be available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

L. REGIONAL WATER BOARD AUTHORITIES

1. Regional Water Boards shall administer the provisions of this General Permit. Administration of this General Permit may include, but is not limited to, requesting the submittal of SWPPPs, reviewing SWPPPs, reviewing monitoring and sampling and analysis reports, conducting compliance inspections, gathering site information by any medium including sampling, photo and video documentation, and taking enforcement actions.

2. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

3. Regional Water Boards may issue separate permits for discharges of storm water associated with construction activity to individual dischargers, categories of dischargers, or dischargers in a geographic area. Upon issuance of such permits by a Regional Water Board, dischargers subject to those permits shall no longer be regulated by this General Permit.

4. Regional Water Boards may direct the discharger to reevaluate the LUP Type(s) for the project (or elements/areas of the project) and impose the appropriate level of requirements.

5. Regional Water Boards may terminate coverage under this General Permit for dischargers who negligently or with willful intent incorrectly determine or report their LUP Type (e.g., they determine themselves to be a LUP Type 1 when they are actually a Type 2).

6. Regional Water Boards may review PRDs and reject or accept applications for permit coverage or may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

7. Regional Water Boards may impose additional requirements on dischargers to satisfy TMDL implementation requirements or to satisfy provisions in their Basin Plans.

8. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

9. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

10. Based on an LUP's threat to water quality and complexity, the Regional Water Board may determine on a case-by-case basis that an LUP, or a portion of an LUP, is not eligible for the linear project requirements contained in this Attachment, and require that the discharger comply with all standard requirements in this General Permit.

11. The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

M. MONITORING AND REPORTING REQUIREMENTS

Table 3. LUP Summary of Monitoring Requirements

LUP Type	Visual Inspections				Sample Collection		
	Daily Site BMP	Pre-storm Event Baseline	Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water	Non-Visible (when applicable)
1	X						x
2	X	X	X	X	X		x
3	X	X	X	X	X	X	x

1. Objectives

LUP dischargers shall prepare a monitoring and reporting program (M&RP) prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The M&RP must be a part of the SWPPP, included as an appendix or separate SWPPP chapter.

2. M&RP Implementation Schedule

a. LUP dischargers shall implement the requirements of this Section at the time of commencement of construction activity. LUP dischargers are responsible for implementing these requirements until construction activity is complete and the site is stabilized.

b. LUP dischargers shall revise the M&RP when:

i Site conditions or construction activities change such that a change in monitoring is required to comply with the requirements and intent of this General Permit.

ii The Regional Water Board requires the discharger to revise its M&RP based on its review of the document. Revisions may include, but not be limited to, conducting additional site inspections, submitting reports, and certifications. Revisions shall be submitted via postal mail or electronic e-mail.

iii The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

3. LUP Type 1 Monitoring and Reporting Requirements

a. <u>LUP Type 1 Inspection Requirements</u>

i LUP Type 1 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.

ii LUP Type 1 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.

iii LUP Type 1 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.

iv LUP Type 1 dischargers shall conduct daily visual inspections to verify that:

(1) Appropriate BMPs for storm water and non-storm water are being implemented in areas where active construction is occurring (including staging areas);

(2) Project excavations are closed, with properly protected spoils, and that road surfaces are cleaned of excavated material and construction materials such as chemicals by either removing or storing the material in protective storage containers at the end of every construction day;

(3) Land areas disturbed during construction are returned to pre-construction conditions or an equivalent protection is used at the end of each workday to eliminate or minimize erosion and the possible discharge of sediment or other pollutants during a rain event.

v Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

vi Inspection programs are required for LUP Type 1 projects where temporary and permanent stabilization BMPs are installed and are to be monitored after active construction is completed. Inspection activities shall continue until adequate permanent stabilization is established and, in areas where re-vegetation is chosen, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

b. LUP Type 1 Monitoring Requirements for Non-Visible Pollutants

LUP Type 1 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

i Sampling and analysis for non-visible pollutants is only required where the LUP Type 1 discharger believes pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

(1) Visual observations made during the monitoring program described above will help the LUP Type 1 discharger determine when to collect samples.

(2) The LUP Type 1 discharger is not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.

ii LUP Type 1 dischargers shall collect samples down-gradient from all discharge locations where the visual observations were made triggering the monitoring, and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.

iii If sampling for non-visible pollutant parameters is required, LUP Type 1 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

iv LUP Type 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

v LUP Type 1 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample[12]) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.

vi LUP Type 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).

vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 1 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed. Portable meters shall be calibrated according to manufacturer's specification.

viii LUP Type 1 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

c. <u>LUP Type 1 Visual Observation Exceptions</u>

i LUP Type 1 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. The Type 1 LUP discharger is not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

[12] Sample collected at a location unaffected by contruction activities.

ii If the LUP Type 1 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

d. Particle Size Analysis for Risk Justification

LUP Type 1 dischargers utilizing justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

4. LUP Type 2 & 3 Monitoring and Reporting Requirements

a. LUP Type 2 & 3 Inspection Requirements

i LUP Type 2 & 3 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.

ii LUP Type 2 & 3 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.

iii LUP Type 2 & 3 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.

iv LUP Type 2 & 3 dischargers shall conduct daily visual inspections to verify that appropriate BMPs for storm water and non-storm water are being implemented and in place in areas where active construction is occurring (including staging areas).

v LUP Type 2 & 3 dischargers shall conduct inspections of the construction site prior to anticipated storm events, during extended storm events, and after actual storm events to identify areas contributing to a discharge of storm water associated with construction activity. Pre-storm inspections are to ensure that BMPs are properly installed and maintained; post-storm inspections are to assure that BMPs have functioned adequately. During extended storm events, inspections shall be required during normal working hours for each 24-hour period.

vi Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

vii LUP Type 2 & 3 dischargers shall implement a monitoring program for inspecting projects that require temporary and permanent stabilization BMPs after active construction is complete. Inspections shall ensure that the BMPs are adequate and maintained. Inspection activities shall continue until adequate permanent stabilization is established and, in vegetated areas, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

viii If possible, LUP Type 2 & 3 dischargers shall install a rain gauge on-site at an accessible and secure location with readings made during all storm event inspections. When readings are unavailable, data from the closest rain gauge with publically available data may be used.

ix LUP Type 2 & 3 dischargers shall Include and maintain a log of the inspections conducted in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection.

b. LUP Type 2 & 3 Storm Water Effluent Monitoring Requirements

Table 4. LUP Type 2 & 3 Effluent Monitoring Requirements

LUP Type	Frequency	Effluent Monitoring
2	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	Turbidity, pH, and non-visible pollutant parameters (if applicable)
3	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	turbidity, pH, and non-visible pollutant parameters (if applicable)

i LUP Type 2 & 3 dischargers shall collect storm water grab samples from sampling locations characterizing discharges associated with activity from the LUP active areas of construction. At a minimum, 3 samples shall be collected per day of discharge.

ii LUP Type 2 & 3 dischargers shall collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

iii LUP Type 2 & 3 dischargers shall ensure that storm water grab sample(s) obtained be representative of the flow and characteristics of the discharge.

iv LUP Type 2 & 3 dischargers shall analyze their effluent samples for:

(1) pH and turbidity
(2) Any additional parameter for which monitoring is required by the Regional Water Board.

c. LUP Type 2 & 3 Storm Water Effluent Sampling Locations

i LUP Type 2 & 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire disturbed project or area.

ii LUP Type 2 & 3 dischargers may monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to exceedance of NALs.

iii LUP Type 2 & 3 dischargers shall select analytical test methods from the list provided in Table 5 below.

iv LUP Type 2 & 3 dischargers shall ensure that all storm water sample collection preservation and handling shall be conducted in accordance with the “Storm Water Sample Collection and Handling Instructions” below.

d. LUP Type 3 Receiving Water Monitoring Requirements

i In the event that an LUP Type 3 discharger’s effluent exceeds the receiving water monitoring triggers of 500 NTU turbidity or pH range of 6.0-9.0, contained in this General Permit and has a direct discharge to receiving waters, the LUP discharger shall subsequently sample Receiving Waters (RWs) for turbidity, pH (if applicable) and SSC for the duration of coverage under this General Permit. In the event that an LUP Tupe 3 discharger utilizing ATS with direct discharges into receiving waters discharges effluent that exceeds the NELs in this permit, the discharger shall subsequently sample RWs for turbidity, pH (if applicable), and SSC for the duration of coverage under this General Permit.

ii LUP Type 3 dischargers that meet the project criteria in Appendix 3 of this General Permit and have more than 30 acres of soil disturbance in the project area or project section area designated as Type 3, shall comply with the Bioassessment requirements prior to commencement of construction activity.

iii LUP Type 3 dischargers shall obtain RW samples in accordance with the requirements of the Receiving Water Sampling Locations section (Section M.4.c. of this Attachment).

e. <u>LUP Type 3 Receiving Water Sampling Locations</u>

i **Upstream/up-gradient RW samples**: LUP Type 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible to and upstream from the effluent discharge point.

ii **Downstream/down-gradient RW samples**: LUP Type 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible to and downstream from the effluent discharge point.

iii If two or more discharge locations discharge to the same receiving water, LUP Type 3 dischargers may sample the receiving water at a single upstream and downstream location.

f. <u>LUP Type 2 & 3 Monitoring Requirements for Non-Visible Pollutants</u>

LUP Type 2 & 3 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

i Sampling and analysis for non-visible pollutants is only required where LUP Type 2 & 3 dischargers believe pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

(1) Visual observations made during the monitoring program described above will help LUP Type 2 & 3 dischargers determine when to collect samples.

(2) LUP Type 2 & 3 dischargers are not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.

ii LUP Type 2 & 3 dischargers shall collect samples down-gradient from the discharge locations where the visual observations were made triggering the monitoring and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.

iii If sampling for non-visible pollutant parameters is required, LUP Type 2 & 3 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

iv LUP Type 2 & 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

v LUP Type 2 & 3 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample[13]) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.

vi LUP Type 2 & 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).

vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 2 & 3 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed.

[13] Sample collected at a location unaffected by construction activities

Portable meters shall be calibrated according to manufacturer's specification.

viii LUP Type 2 & 3 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

g. LUP Type 2 & 3 Visual Observation and Sample Collection Exceptions

i LUP Type 2 & 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. Type 2 & 3 LUP dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

ii If the LUP Type 2 or 3 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

h. LUP Type 2 & 3 Storm Water Sample Collection and Handling Instructions

LUP Type 2 & 3 dischargers shall refer to Table 5 below for test Methods, detection Limits, and reporting Units. During storm water sample collection and handling, the LUP Type 2 & 3 discharger shall:

i Identify the parameters required for testing and the number of storm water discharge points that will be sampled. Request the laboratory to provide the appropriate number of sample containers, types of containers, sample container labels, blank chain of custody forms, and sample preservation instructions.

ii Determine how to ship the samples to the laboratory. The testing laboratory should receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory). The options are to either deliver the samples to the laboratory, arrange to have the laboratory pick them up, or ship them overnight to the laboratory.

iii Use only the sample containers provided by the laboratory to collect and store samples. Use of any other type of containers could contaminate your samples.

iv Prevent sample contamination, by not touching, or putting anything into the sample containers before collecting storm water samples.

v Not overfilling sample containers. Overfilling can change the analytical results.

vi Tightly screw the cap of each sample container without stripping the threads of the cap.

vii Complete and attach a label to each sample container. The label shall identify the date and time of sample collection, the person taking the sample, and the sample collection location or discharge point. The label should also identify any sample containers that have been preserved.

viii Carefully pack sample containers into an ice chest or refrigerator to prevent breakage and maintain temperature during shipment. Remember to place frozen ice packs into the shipping container. Samples should be kept as close to 4° C (39° F) as possible until arriving at the laboratory. Do not freeze samples.

ix Complete a Chain of Custody form for each set of samples. The Chain of Custody form shall include the discharger's name, address, and phone number, identification of each sample container and sample collection point, person collecting the samples, the date and time each sample container was filled, and the analysis that is required for each sample container.

x Upon shipping/delivering the sample containers, obtain both the signatures of the persons relinquishing and receiving the sample containers.

xi Designate and train personnel to collect, maintain, and ship samples in accordance with the above sample protocols and good laboratory practices.

xii Refer to the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP) for more information on sampling collection and analysis. See http://www.waterboards.ca.gov/water_issues/programs/swamp/[14]

Table 5. Test Methods, Detection Limits, Reporting Units and Applicable NALs

Parameter	Test Method	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Levels	(LUP Type 3) Receiving Water Monitoring Trigger
pH	Field test with calibrated portable instrument	Type 2 & 3	0.2	pH units	Lower = 6.5 upper = 8.5	Lower = 6.0 upper = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Type 2 & 3	1	NTU	250 NTU	500 NTU
SSC	ASTM Method D 3977-97[15]	Type 3 if Receiving Water Monitoring Trigger is exceeded	5	Mg/L	N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[16] fixed-count of 600 org/sample	Type 3 LUPs > 30 acres	N/A	N/A	N/A	N/A

i. <u>LUP Type 2 & 3 Monitoring Methods</u>

i The LUP Type 2 or 3 discharger's project M&RP shall include a description of the following items:

(1) Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

[14] Additional information regarding SWAMP's QAPrP can be found at: http://www.waterboards.ca.gov/water_issues/programs/swamp/.

[15] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394

[16] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

(2) Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program a copy of the Chain of Custody form used when handling and shipping samples.

(3) Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section M.4.f above.

ii LUP Type 2 & 3 dischargers shall ensure that all sampling and sample preservation be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) shall be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. All laboratory analyses shall be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses shall be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). The LUP discharger shall conduct its own field analysis of pH and may conduct its own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

j. <u>LUP Type 2 & 3 Analytical Methods</u>

LUP Type 2 & 3 dischargers shall refer to Table 5 above for test Methods, detection Limits, and reporting Units.

i **pH**: LUP Type 2 & 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or pH test kit. The LUP discharger shall record pH monitoring results on paper and retain these records in accordance with Section M.4.o, below.

ii **Turbidity**: LUP Type 2 & 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results shall be recorded in the site log book in Nephelometric Turbidity Units (NTU).

iii **Suspended sediment concentration (SSC)**: LUP Type 3 dischargers exceeding the turbidity Receiving Water Monitoring Trigger, shall perform SSC analysis using ASTM Method D3977-97.

iv **Bioassessment**: LUP Type 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

k. Watershed Monitoring Option

If an LUP Type 2 or 3 discharger is part of a qualified regional watershed-based monitoring program the LUP Type 2 or 3 discharger may be eligible for relief from the monitoring requirements in this Attachment. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program if it determines that the watershed-based monitoring program will provide information to determine each discharger's compliance with the requirements of this General Permit.

l. Particle Size Analysis for Risk Justification

LUP Type 2 & 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

m. NAL Exceedance Report

i In the event that any effluent sample exceeds an applicable NAL, the Regional Water Boards may require LUP Type 2 & 3 dischargers to submit NAL Exceedance Reports.

ii LUP Type 2 & 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

iii LUP Type 2 & 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the exceedance report is filed.

iv LUP Type 2 & 3 dischargers shall include in the NAL Exceedance Report:

(1) the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit"); and
(2) the date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
(3) Description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

n. Monitoring Records

LUP Type 2 & 3 dischargers shall ensure that records of all storm water monitoring information and copies of all reports (including Annual Reports) required by this General Permit be retained for a period of at least three years. LUP Type 2 & 3 dischargers may retain records off-site and make them available upon request. These records shall include:

i The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge);

ii The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements;

iii The date and approximate time of analyses;

iv The individual(s) who performed the analyses;

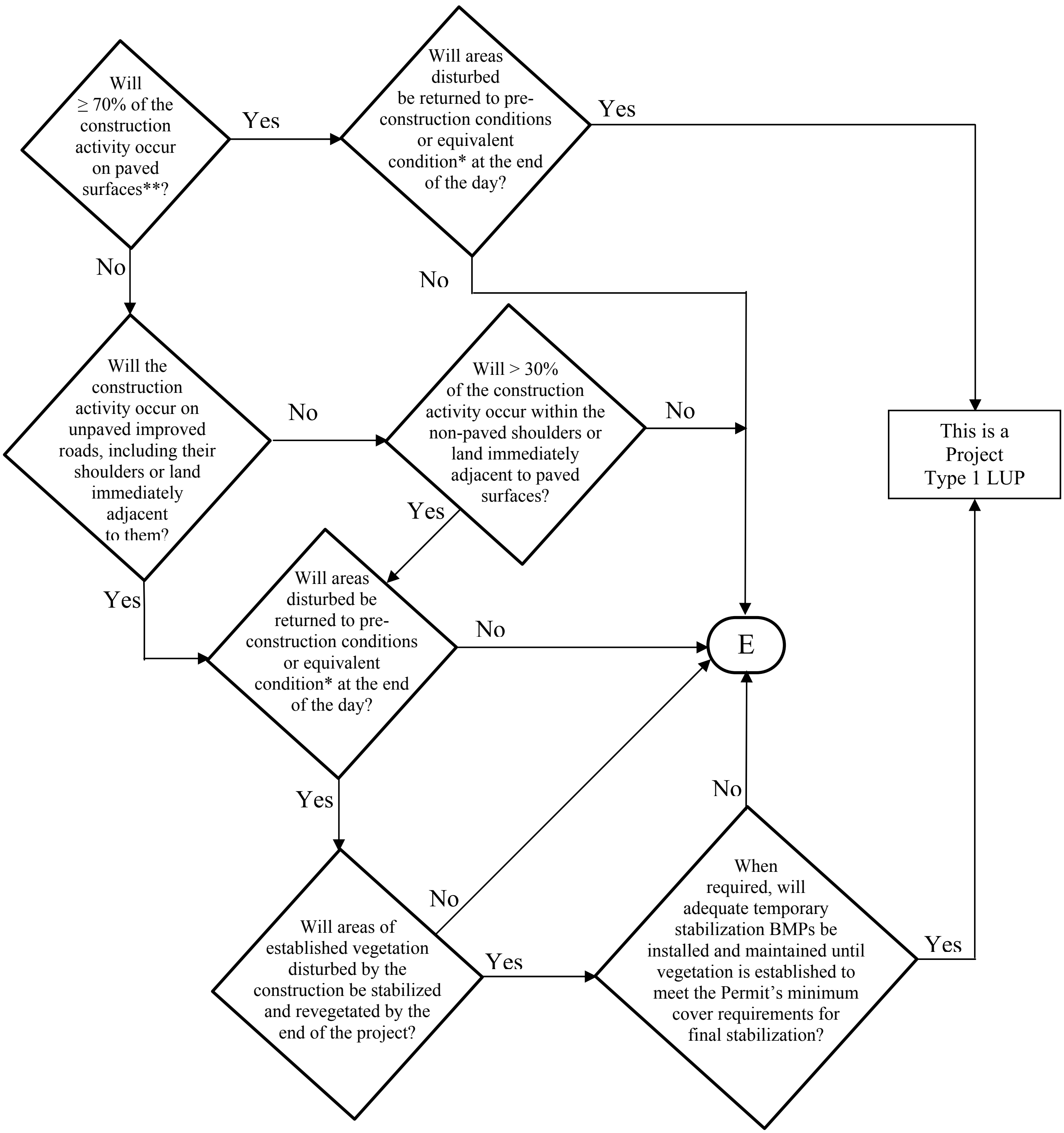
v A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and all chain of custody forms;

vi Quality assurance/quality control records and results;

vii Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Section M.4.a above);

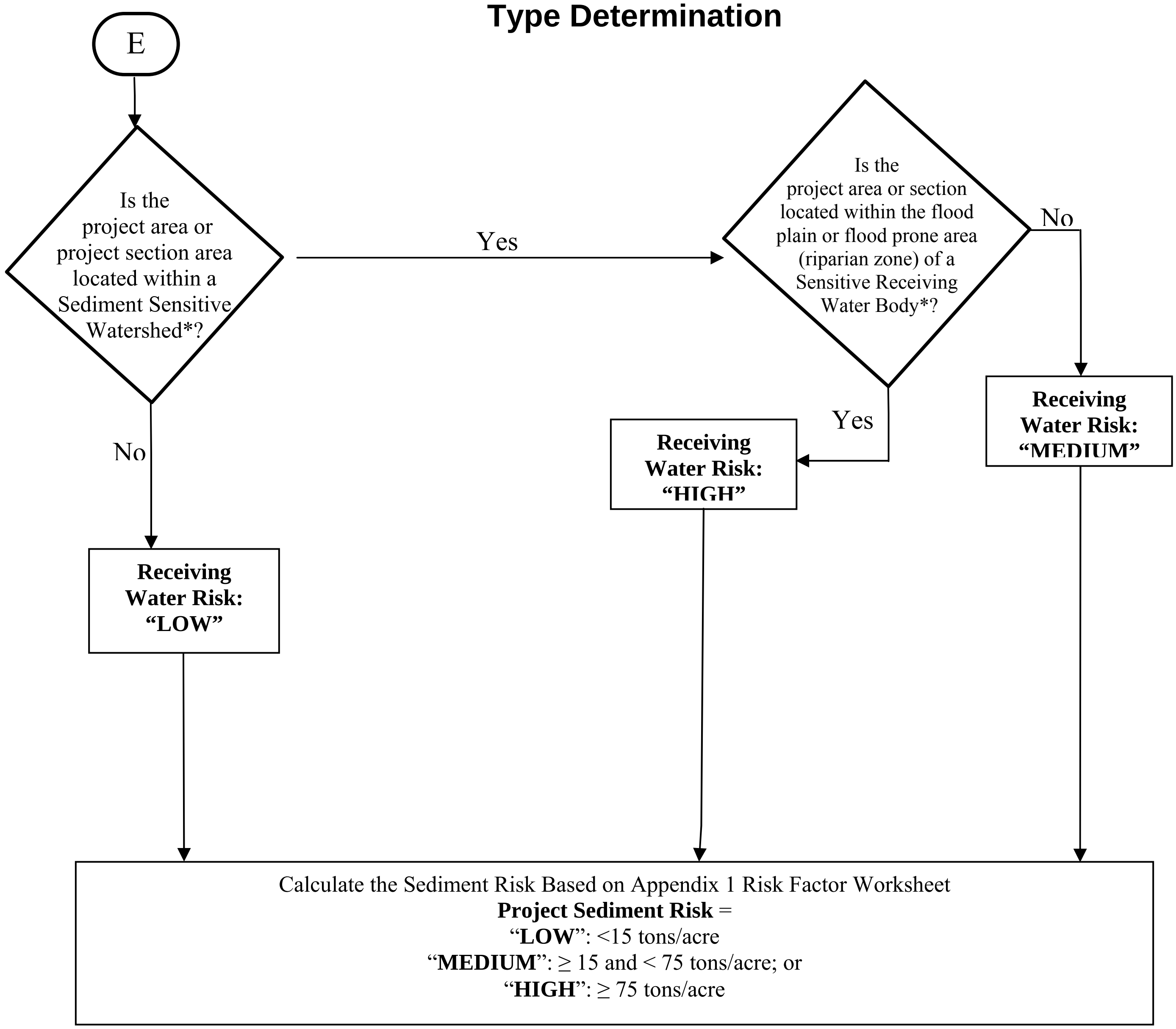
viii Visual observation and sample collection exception records (see Section M.4.g above); and ix The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT A.1
LUP Project Area or Project Section Area Type Determination



*See Definition of Terms
** Or: "Will < 30% of the soil disturbance occur on <u>unpaved</u> surfaces?

ATTACHMENT A.1
LUP Project Area or Project Section Area Type Determination



* See Definition of Terms

RECEIVING WATER RISK / **PROJECT SEDIMENT RISK**

	LOW	MEDIUM	HIGH
LOW	Type 1	Type 1	Type 2
MEDIUM	Type 1	Type 2	Type 3
HIGH	Type 2	Type 3	Type 3

ATTACHMENT A.1
Definition of Terms

1. **Equivalent Condition** – Means disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.
2. **Linear Construction Activity** – Linear construction activity consists of underground/ overhead facilities that typically include, but are not limited to, any conveyance, pipe or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/ tower pad and cable/ wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/ borrow locations.
3. **Sediment Sensitive Receiving Water Body –** Defined as a water body segment that is listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or is designated with beneficial uses of SPAWN, MIGRATORY, and COLD.
4. **Sediment Sensitive Watershed –** Defined as a watershed draining into a receiving water body listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or a water body designated with beneficial uses of SPAWN, MIGRATORY, and COLD.

ATTACHMENT A.2
PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS FOR LINEAR UNDERGROUND/OVERHEAD PROJECTS TO COMPLY WITH THE CONSTRUCTION GENERAL PERMIT

GENERAL INSTRUCTIONS

Who Must Submit

This permit is effective on July 1, 2010.

The Legally Responsible Person (LRP) for construction activities associated with linear underground/overhead project (LUP) must electronically apply for coverage under this General Permit on or after July 1, 2010. If it is determined that the LUP construction activities require an NPDES permit, the Legally Responsible Person[1] (LRP) shall submit PRDs for this General Permit in accordance with the following:

LUPs associated with Private or Municipal Development Projects

1. For LUPs associated with pre-development and pre-redevelopment construction activities:

   The LRP must obtain coverage[2] under this General Permit for its pre-development and pre-redevelopment construction activities where the total disturbed land area of these construction activities is greater than 1 acre.

2. For LUPs associated with new development and redevelopment construction projects:

   The LRP must obtain coverage under this General Permit for LUP construction activities associated with new development and redevelopment projects where the total disturbed land area of the LUP is greater than 1 acre. Coverage under this permit is not required where the same LUP construction activities are covered by another NPDES permit.

LUPs not associated with private or municipal new development or redevelopment projects:

The LRP must obtain coverage under this General Permit on or after July 1, 2010 for its LUP construction activities where the total disturbed land area is greater than 1 acre.

PRD Submittal Requirements

Prior to the start of construction activities a LRP must submit PRDs and fees to the State Water Board for each LUP.

New and Ongoing LUPs

Dischargers of new LUPs that commence construction activities after the adoption date of this General Permit shall file PRDs prior to the commencement of construction and implement the SWPPP upon the start of construction.

[1] person possessing the title of the land on which the construction activities will occur for the regulated site
[2] obtain coverage means filing PRDs for the project.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

Dischargers of ongoing LUPs that are currently covered under State Water Board Order No. 2003-0007 (Small LUP General Permit) shall electronically file Permit Registration Documents no later than July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 2003-0007-DWQ will be terminated. All existing dischargers shall be exempt from the risk determination requirements in Attachment A. All existing dischargers are therefore subject to LUP Type 1 requirements regardless of their project's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the risk determination requirements in Attachment A.

Where to Apply

The Permit Registration Documents (PRDs) can be found at www.waterboards.ca.gov/water_issues/programs/stormwater/

Fees

The annual fee for storm water permits are established through the State of California Code of Regulations.

When Permit Coverage Commences

To obtain coverage under the General Permit, the LRP must include the complete PRDs and the annual fee. All PRDs deemed incomplete will be rejected with an explanation as to what is required to complete submittal. Upon receipt of complete PRDs and associated fee, each discharger will be sent a waste discharger's identification (WDID) number.

Projects and Activities Not Defined As Construction Activity

1. LUP construction activity does not include routine maintenance projects to maintain original line and grade, hydraulic capacity, or original purpose of the facility. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:

   - Maintain the original purpose of the facility, or hydraulic capacity.
   - Update existing lines[3] and facilities to comply with applicable codes, standards and regulations regardless if such projects result in increased capacity.
   - Repairing leaks.

   Routine maintenance does not include construction of new[4] lines or facilities resulting from compliance with applicable codes, standards and regulations.

[3] Update existing lines includes replacing existing lines with new materials or pipes.
[4] New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must acquire new areas, those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement, or agreement.

2. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).

3. Tie-ins conducted immediately adjacent to “energized” or “pressurized” facilities by the discharger are not considered small construction activities where all other LUP construction activities associated with the tie-in are covered by a NOI and SWPPP of a third party or municipal agency.

Calculating Land Disturbance Areas of LUPs

The total land area disturbed for LUPs is the sum of the:

- Surface areas of trenches, laterals and ancillary facilities, plus
- Area of the base of stockpiles on unpaved surfaces, plus
- Surface area of the borrow area, plus
- Areas of paved surfaces constructed for the project, plus
- Areas of new roads constructed or areas of major reconstruction to existing roads (e.g. improvements to two-track surfaces or road widening) for the sole purpose of accessing construction activities or as part of the final project, plus
- Equipment and material storage, staging, and preparation areas (laydown areas) not on paved surfaces, plus
- Soil areas outside the surface area of trenches, laterals and ancillary facilities that will be graded, and/or disturbed by the use of construction equipment, vehicles and machinery during construction activities.

Stockpiling Areas

Stockpiling areas, borrow areas and the removal of soils from a construction site may or may not be included when calculating the area of disturbed soil for a site depending on the following conditions:

- For stockpiling of soils onsite or immediately adjacent to a LUP site and the stockpile is not on a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation.

- The surface area of borrow areas that are onsite or immediately adjacent to a project site are to be included in the disturbed area calculation.

- For soil that is hauled offsite to a location owned or operated by the discharger that is not a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

- For soil that is brought to the project from an off-site location owned or operated by the discharger the surface area of the borrow pit is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

- Trench spoils on a paved surface that are either returned to the trench or excavation or hauled away from the project daily for disposal or reuse will not be included in the disturbed area calculation.

If you have any questions concerning submittal of PRDs, please call the State Water Board at (866) 563-3107.

ATTACHMENT B
PERMIT REGISTRATION DOCUMENTS (PRDs) TO COMPLY WITH THE TERMS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

GENERAL INSTRUCTIONS

A. All Linear Construction Projects shall comply with the PRD requirements in Attachment A.2 of this Order.

B. Who Must Submit

Discharges of storm water associated with construction that results in the disturbance of one acre or more of land must apply for coverage under the General Construction Storm Water Permit (General Permit). Any construction activity that is a part of a larger common plan of development or sale must also be permitted, regardless of size. (For example, if 0.5 acre of a 20-acre subdivision is disturbed by the construction activities of discharger A and the remaining 19.5 acres is to be developed by discharger B, discharger A must obtain a General Storm Water Permit for the 0.5 acre project).

Other discharges from construction activities that are covered under this General Permit can be found in the General Permit Section II.B.

It is the LRP's responsibility to obtain coverage under this General Permit by electronically submitting complete PRDs (Permit Registration Documents).

In all cases, the proper procedures for submitting the PRDs must be completed before construction can commence.

C. Construction Activity Not Covered By This General Permit

Discharges from construction that are not covered under this General Permit can be found in the General Permit Sections II.A &B..

D. Annual Fees and Fee Calculation

Annual fees are calculated based upon the total area of land to be disturbed not the total size of the acreage owned. However, the calculation includes all acres to be disturbed during the duration of the project. For example, if 10 acres are scheduled to be disturbed the first year and 10 in each subsequent year for 5 years, the annual fees would be based upon 50 acres of disturbance. The State Water Board will evaluate adding acreage to an existing Permit Waste Discharge Identification (WDID) number on a case-by-case basis. In general, any acreage to be considered must be contiguous to the permitted land area and the existing

SWPPP must be appropriate for the construction activity and topography of the acreage under consideration. As acreage is built out and stabilized or sold, the Change of Information (COI) form enables the applicant to remove those acres from inclusion in the annual fee calculation. Checks should be made payable to: State Water Board.

The Annual fees are established through regulations adopted by the State Water Board. The total annual fee is the current base fee plus applicable surcharges for all construction sites submitting an NOI, based on the total acreage to be disturbed during the life of the project. Annual fees are subject to change by regulation.

Dischargers that apply for and satisfy the Small Construction Erosivity Wavier requirements shall pay a fee of $200.00 plus an applicable surcharge, see the General Permit Section II.B.7.

E. When to Apply

LRP's proposing to conduct construction activities subject to this General Permit must submit their PRDs prior to the commencement of construction activity.

F. Requirements for Completing Permit Registration Documents (PRDs)

All dischargers required to comply with this General Permit shall electronically submit the required PRDs for their type of construction as defined below.

G. Standard PRD Requirements (All Dischargers)

1. Notice of Intent
2. Risk Assessment (Standard or Site-Specific)
3. Site Map
4. SWPPP
5. Annual Fee
6. Certification

H. Additional PRD Requirements Related to Construction Type

1. Discharger in unincorporated areas of the State (not covered under an adopted Phase I or II SUSMP requirements) and that are not a linear project shall also submit a completed:
   a. Post-Construction Water Balance Calculator (Appendix 2).

2. Dischargers who are proposing to implement ATS shall submit:
   a. Complete ATS Plan in accordance with Attachment F at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation.

   b. Certification proof that design done by a professional in accordance with Attachment F.

3. Dischargers who are proposing an alternate Risk Justification:
   a. Particle Size Analysis.

I. Exceptions to Standard PRD Requirements

Construction sites with an R value less than 5 as determined in the Risk Assessment are not required to submit a SWPPP.

J. Description of PRDs

1. Notice of Intent (NOI)

2. Site Map(s) Includes:
   a. The project's surrounding area (vicinity)
   b. Site layout
   c. Construction site boundaries
   d. Drainage areas
   e. Discharge locations
   f. Sampling locations
   g. Areas of soil disturbance (temporary or permanent)
   h. Active areas of soil disturbance (cut or fill)
   i. Locations of all runoff BMPs
   j. Locations of all erosion control BMPs
   k. Locations of all sediment control BMPs
   l. ATS location (if applicable)
   m. Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
   n. Locations of all post-construction BMPs
   o. Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices

3. **SWPPPs**
   A site-specific SWPPP shall be developed by each discharger and shall be submitted with the PRDs.

4. **Risk Assessment**
   All dischargers shall use the Risk Assessment procedure as describe in the General Permit Appendix 1.

   a. The Standard Risk Assessment includes utilization of the following:
      i. Receiving water Risk Assessment interactive map

ii. EPA Rainfall Erosivity Factor Calculator Website
iii. Sediment Risk interactive map
iv. Sediment sensitive water bodies list

b. The Site-Specific Risk Assessment includes the completion of the hand calculated R value Risk Calculator

5. **Post-Construction Water Balance Calculator**
   All dischargers subject to this requirement shall complete the Water Balance Calculator (in Appendix 2) in accordance with the instructions.

6. **ATS Design Document and Certification**
   All dischargers using ATS must submit electronically their system design (as well as any supporting documentation) and proof that the system was designed by a qualified ATS design professional (See Attachment F).

To obtain coverage under the General Permit PRDs must be included and completed. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected. Upon receipt of a complete PRD submittal, the State Water Board will process the application package in the order received and assign a (WDID) number.

Questions?

If you have any questions on completing the PRDs please email stormwater@waterboards.ca.gov or call (866) 563-3107.

ATTACHMENT C
RISK LEVEL 1 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 1 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk Level 1 dischargers are not subject to a numeric effluent standard.

B. Good Site Management "Housekeeping"

1. Risk Level 1 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 1 dischargers shall implement good housekeeping measures for <u>waste management</u>, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 1 dischargers shall implement good housekeeping for <u>vehicle storage and maintenance</u>, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 1 dischargers shall implement good housekeeping for <u>landscape materials</u>, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 1 dischargers shall conduct an assessment and create a list of <u>potential pollutant sources</u> and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 1 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

C. Non-Storm Water Management

1. Risk Level 1 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 1 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 1 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 1 dischargers shall implement effective wind erosion control.

2. Risk Level 1 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 1 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 1 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 1 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

F. Run-on and Runoff Controls

Risk Level 1 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 1 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

2. Risk Level 1 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 1 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 1 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector's name, title, and signature.

H. Rain Event Action Plan
Not required for Risk Level 1 dischargers.

I. Risk Level 1 Monitoring and Reporting Requirements

Table 1- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

1. **Construction Site Monitoring Program Requirements**

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Programs to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with the Discharge Prohibitions;

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and

d. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 1 - Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 1 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 1 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 1 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 1 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 1 dischargers shall visually observe (inspect):

i. All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP. If needed, the discharger shall implement appropriate corrective actions.

iii. Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in e.i and e.iii above, Risk Level 1 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 1 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 1 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 1 – Visual Observation Exemptions**

a. Risk Level 1 dischargers shall be prepared to conduct visual observation (inspections) until the minimum requirements of Section I.3 above are completed. Risk Level 1 dischargers are not required to conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required visual observations (inspections) are collected due to these exceptions, Risk Level 1 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the visual observations (inspections) were not conducted.

5. **Risk Level 1 – Monitoring Methods**

Risk Level 1 dischargers shall include a description of the visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures in the CSMP.

6. **Risk Level 1 – Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

   i. Risk Level 1 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

   ii. Risk Level 1 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

   iii. Risk Level 1 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 1 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

7. **Risk Level 1 – Non-Visible Pollutant Monitoring Requirements**

   a. Risk Level 1 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

   b. Risk Level 1 dischargers shall ensure that water samples are large enough to characterize the site conditions.

   c. Risk Level 1 dischargers shall collect samples at all discharge locations that can be safely accessed.

   d. Risk Level 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

   e. Risk Level 1 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 1 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 1 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[2]

h. Risk Level 1 dischargers shall keep all field /or analytical data in the SWPPP document.

8. **Risk Level 1 – Particle Size Analysis for Project Risk Justification**

Risk Level 1 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

9. **Risk Level 1 – Records**

Risk Level 1 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 1 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

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[2] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.6 above).

i. Visual observation and sample collection exception records (see Section I.4 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT D
RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 2 dischargers shall implement good housekeeping measures for <u>waste management</u>, which, at a minimum, shall consist of the following:

   a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

   b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

   c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

   d. Cover waste disposal containers at the end of every business day and during a rain event.

   e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

   f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

   g. Implement procedures that effectively address hazardous and non-hazardous spills.

   h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

      i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 2 dischargers shall implement good housekeeping for <u>vehicle storage and maintenance</u>, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 2 dischargers shall implement good housekeeping for <u>landscape materials</u>, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain all fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 2 dischargers shall conduct an assessment and create a list of <u>potential pollutant sources</u> and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.

2. Risk Level 2 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector’s name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any

likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase
   b. Trades active on the construction site during each construction phase
   c. Trade contractor information
   d. Suggested actions for each project phase

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number

d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number
f. Trades active on site during Inactive Construction
g. Trade contractor information
h. Suggested actions for inactive construction sites

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	**X**	**X**	**X**	**X**	**X**	**X**	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs).

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 2 – Water Quality Sampling and Analysis**

a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 2 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. **Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent[4] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. **Risk Level 2 – Visual Observation and Sample Collection Exemptions**

a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

[4] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 2 – Storm Water Sample Collection and Handling Instructions**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[5]

8. **Risk Level 2 – Monitoring Methods**

a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:

i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program

[5] Additional information regarding SWAMP's QAPrP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.

an example Chain of Custody form used when handling and shipping samples.

iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 2 – Analytical Methods**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. **Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

   i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

   ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

   iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

   i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

   ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

   iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. **Risk Level 2 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[6]

h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 2 – Watershed Monitoring Option**

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

[6] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

13. **Risk Level 2 – Particle Size Analysis for Project Risk Justification**

Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 2 – Records**

Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

f. Rain gauge readings from site inspections;

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 2 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:

   i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).

   ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

   iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1	NTU	250 NTU
		For ATS discharges	1	NTU	N/A

ATTACHMENT E
RISK LEVEL 3 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 3 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric –Risk Level 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 3 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 3 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 3 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

   a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

   b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

   c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

   d. Cover waste disposal containers at the end of every business day and during a rain event.

   e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

   f. Contain and securely protecting stockpiled waste material from wind and rain at all times unless actively being used.

   g. Implement procedures that effectively address hazardous and non-hazardous spills.

   h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

      i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 3 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 3 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinuing the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 3 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 3 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 3 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 3 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 3 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 3 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 3 dischargers shall implement effective wind erosion control.

2. Risk Level 3 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 3 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 3 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

5. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

8. **Additional Risk Level 3 Requirement:** The Regional Water Board may require Risk Level 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

F. Run-on and Run-off Controls

Risk Level 3 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 3 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 3 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 3 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 3 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 3 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

    a. Inspection date and date the inspection report was written.

    b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

    c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

    d. A description of any BMPs evaluated and any deficiencies noted.

    e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

    f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

    g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

    h. Photographs taken during the inspection, if any.

i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The QSP shall obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address.
   b. Calculated Risk Level (2 or 3).
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.

4. **Additional Risk Level 3 Requirement:** The QSP shall include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase.
   b. Trades active on the construction site during each construction phase.
   c. Trade contractor information.
   d. Suggested actions for each project phase.

5. **Additional Risk Level 3 Requirement:** The QSP shall develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

a. Site Address.
b. Calculated Risk Level (2 or 3).
c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.
f. Trades active on site during Inactive Construction.
g. Trade contractor information.
h. Suggested actions for inactive construction sites.

6. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 3 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
3	**X**	**X**	**X**	**X**	**X**	**X**	**X**[4]

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Program in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

[4] When receiving water monitoring trigger is exceeded

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 3 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 3 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 3 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 3 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 3 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 3 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i. and c.iii above, Risk Level 3 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 3 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 3 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 3 – Water Quality Sampling and Analysis**

a. Risk Level 3 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 3 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 3 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 3 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

e. Risk 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event.

Receiving Water Monitoring Requirements

f. In the event that a Risk Level 3 discharger's effluent exceeds the daily average receiving water monitoring trigger of 500 NTU turbidity or the daily average pH range 6.0-9.0 contained in this General Permit and has a direct discharge into receiving waters, the Risk Level 3 discharger shall subsequently sample receiving waters (RWs) for turbidity, pH (if applicable), and SSC for the duration of coverage under this General Permit. If a Risk Level 3 discharger utilizing ATS with direct discharges into receiving waters discharges effluent that exceeds the NELs in this permit, the discharger shall subsequently sample RWs for turbidity, pH (if applicable), and SSC for the duration of coverage under this General Permit.

g. Risk Level 3 dischargers disturbing 30 acres or more of the landscape and with direct discharges into receiving waters shall conduct or participate in benthic macroinvertebrate bioassessment of RWs prior to commencement of construction activity (See Appendix 3).

h. Risk Level 3 dischargers shall obtain RW samples in accordance with the Receiving Water sampling location section (Section I.5), below.

5. **Risk Level 3 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 3 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 3 dischargers shall ensure that storm water discharge collected and observed represent[5] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 3 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

e. Risk Level 3 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 3 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

Receiving Water Sampling Locations

h. **Upstream/up-gradient RW samples**: Risk Level 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible and upstream from the effluent discharge point.

i. **Downstream/down-gradient RW samples**: Risk Level 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible and downstream from the effluent discharge point.

j. If two or more discharge locations discharge to the same receiving water, Risk Level 3 dischargers may sample the receiving water at a single upstream and downstream location.

[5] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment-laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment laden water even if most water flowing through the fence is clear.

6. **Risk Level 3 – Visual Observation and Sample Collection Exemptions**

   a. Risk Level 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk Level 3 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

      i. During dangerous weather conditions such as flooding and electrical storms.

      ii. Outside of scheduled site business hours.

   b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 3 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 3 – Storm Water Sample Collection and Handling Instructions**

   a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

   b. Risk Level 3 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

   c. Risk Level 3 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[6]

[6] Additional information regarding SWAMP's QAPrP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf

8. **Risk Level 3 – Monitoring Methods**

   a. Risk Level 3 dischargers shall include a description of the following items in the CSMP:

      i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

      ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

      iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

   b. Risk Level 3 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 3 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). Risk Level 3 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 3 – Analytical Methods**

   a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 3 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

d. **Suspended sediment concentration (SSC)**: Risk Level 3 dischargers that exceed the turbidity Receiving Water Monitoring Trigger shall perform SSC analysis using ASTM Method D3977-97.

e. **Bioassessment**: Risk Level 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

10. **Risk Level 3 - Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

i. Risk Level 3 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

ii. Risk Level 3 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

iii. Risk Level 3 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 3 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

   i. Risk Level 3 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

   ii. Risk Level 3 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

   iii. Risk Level 3 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. **Risk Level 3 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 3 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 3 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 3 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 3 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 3 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 3 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[7]

h. Risk Level 3 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 3 – Watershed Monitoring Option**

Risk Level 3 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 3 – Particle Size Analysis for Project Risk Justification**

Risk Level 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 3 – Records**

Risk Level 3 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 3 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

[7] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

d. The individual(s) who performed the analyses.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 3 – NAL Exceedance Report**

a. Risk Level 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity In this General Permit.

c. Risk Level 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 3 dischargers shall include in the NAL Exceedance Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit").

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

16. **Risk Level 3 – Bioassessment**

a. Risk Level 3 dischargers with a total project-related ground disturbance exceeding 30 acres shall:

i. Conduct bioassessment monitoring, as described in Appendix 3.

ii. Include the collection and reporting of specified in stream biological data and physical habitat.

iii. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).[8]

b. Risk Level 3 dischargers qualifying for bioassessment, where construction commences out of an index period for the site location shall:

i. Receive Regional Board approval for the sampling exception.

ii. Conduct bioassessment monitoring, as described in Appendix 3.

iii. Include the collection and reporting of specified instream biological data and physical habitat.

iv. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).

OR

v. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.

[8] http://www.waterboards.ca.gov/water_issues/programs/swamp/.

vi. Send a copy of the check to the Regional Water Board office for the site's region.

vii. Invest $**7,500.00 X The number of samples required** into the SWAMP program as compensation (upon regional board approval).

Table 3 – Risk Level 3 Test Methods, Detection Limits, Reporting Units and Applicable NALs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level	Numeric Effluent Limitation	Receiving Water Monitoring Trigger
pH	Field test with calibrated portable instrument	Risk Level 3 Discharges	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A	lower limit = 6.0 upper limit = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 3 Discharges other than ATS	1	NTU	250 NTU	N/A	500 NTU
		For ATS discharges	1	NTU	N/A	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample
SSC	ASTM Method D 3977-97[9]	Risk Level 3 (if Receiving Water Monitoring Trigger exceeded)	5	mg/L	N/A	N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[10] fixed-count of 600 org/sample	Risk Level 3 projects> 30 acres	N/A	N/A	N/A	N/A	N/A

[9] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394.

[10] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

ATTACHMENT F:
Active Treatment System (ATS) Requirements

Table 1 – Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
Turbidity	EPA 0180.1 and/or field test with a calibrated portable instrument	For ATS discharges	1	NTU	N/A	10 NTU for Daily Flow-Weighted Average & 20 NTU for Any Single Sample

A. Dischargers choosing to implement an Active Treatment System (ATS) on their site shall comply with all of the requirements in this Attachment.

B. The discharger shall maintain a paper copy of each ATS specification onsite in compliance with the record retention requirements in the Special Provisions of this General Permit.

C. ATS Design, Operation and Submittals

1. The ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

2. The discharger shall ensure that the ATS is designed in a manner to preclude the accidental discharge of settled floc[1] during floc pumping or related operations.

3. The discharger shall design outlets to dissipate energy from concentrated flows.

4. The discharger shall install and operate an ATS by assigning a lead person (or project manager) who has either a minimum of five years construction storm

[1] Floc is defined as a clump of solids formed by the chemical action in ATS systems.

water experience or who is a licensed contractors specifically holding a California Class A Contractors license.[2]

5. The discharger shall prepare an ATS Plan that combines the site-specific data and treatment system information required to safely and efficiently operate an ATS. The ATS Plan shall be electronically submitted to the State Water Board at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation. At a minimum, the ATS Plan shall include:

    a. ATS Operation and Maintenance Manual for All Equipment.

    b. ATS Monitoring, Sampling & Reporting Plan, including Quality Assurance/Quality Control (QA/QC).

    c. ATS Health and Safety Plan.

    d. ATS Spill Prevention Plan.

6. The ATS shall be designed to capture and treat (within a 72-hour period) a volume equivalent to the runoff from a 10-year, 24-hour storm event using a watershed runoff coefficient of 1.0.

D. Treatment – Chemical Coagulation/Flocculation

1. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003).

2. The discharger shall conduct, at minimum, six site-specific jar tests (per polymer with one test serving as a control) for each project to determine the proper polymer and dosage levels for their ATS.

3. Single field jar tests may also be conducted during a project if conditions warrant, for example if construction activities disturb changing types of soils, which consequently cause change in storm water and runoff characteristics.

E. Residual Chemical and Toxicity Requirements

1. The discharger shall utilize a residual chemical test method that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold

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[2] Business and Professions Code Division 3, Chapter 9, Article 4, Class A Contractor: A general engineering contractor is a contractor whose principal contracting business is in connection with fixed works requiring specialized engineering knowledge and skill. [http://www.cslb.ca.gov/General-Information/library/licensing-classifications.asp].

concentration[3] (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used.

2. The discharger shall utilize a residual chemical test method that produces a result within one hour of sampling.

3. The discharger shall have a California State certified laboratory validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

4. If the discharger cannot utilize a residual chemical test method that meets the requirements above, the discharger shall operate the ATS in Batch Treatment[4] mode.

5. A discharger planning to operate in Batch Treatment mode shall perform toxicity testing in accordance with the following:

    a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge[5]. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.[6]

    b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in “Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012” for Fathead minnow, *Pimephales promelas* (fathead minnow). Acute toxicity for *Oncorhynchus mykiss* (Rainbow Trout) may be used as a substitute for testing fathead minnows.

    c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

    d. The discharger shall electronically report all acute toxicity testing.

[3] The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. A typical MATC would be:
The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.
[4] Batch Treatment mode is defined as holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full.
[5] This requirement only requires that the test be initiated prior to discharge.
[6] http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

F. Filtration

1. The ATS shall include a filtration step between the coagulant treatment train and the effluent discharge. This is commonly provided by sand, bag, or cartridge filters, which are sized to capture suspended material that might pass through the clarifier tanks.

2. Differential pressure measurements shall be taken to monitor filter loading and confirm that the final filter stage is functioning properly.

G. Residuals Management

1. Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.

2. Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.

H. ATS Instrumentation

1. The ATS shall be equipped with instrumentation that automatically measures and records effluent water quality data and flow rate.

2. The minimum data recorded shall be consistent with the Monitoring and Reporting requirements below, and shall include:

    a. Influent Turbidity

    b. Effluent Turbidity

    c. Influent pH

    d. Effluent pH

    e. Residual Chemical

    f. Effluent Flow rate

    g. Effluent Flow volume

3. Systems shall be equipped with a data recording system, such as data loggers or webserver-based systems, which records each measurement on a frequency no longer than once every 15 minutes.

4. Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days continuous data.

5. Instrumentation systems shall be interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.

6. The system shall also assure that upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.

7. Instrumentation (flow meters, probes, valves, streaming current detectors, controlling computers, etc.) shall be installed and maintained per manufacturer's recommendations, which shall be included in the QA/QC plan.

8. The QA/QC plan shall also specify calibration procedures and frequencies, instrument method detection limit or sensitivity verification, laboratory duplicate procedures, and other pertinent procedures.

9. The instrumentation system shall include a method for controlling coagulant dose, to prevent potential overdosing. Available technologies include flow/turbidity proportional metering, periodic jar testing and metering pump adjustment, and ionic charge measurement controlling the metering pump.

I. ATS Effluent Discharge

1. ATS effluent shall comply with all provisions and prohibitions in this General Permit, specifically the NELs.

2. NELs for discharges from an ATS:

    a. Turbidity of all ATS discharges shall be less than 10 NTU for daily flow-weighted average of all samples and 20 NTU for any single sample.

    b. Residual Chemical shall be < 10% of MATC[7] for the most sensitive species of the chemical used.

[7] The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

3. If an analytical effluent sampling result exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file the results in violation within 24-hours of obtaining the results.

4. If ATS effluent is authorized to discharge into a sanitary sewer system, the discharger shall comply with any pre-treatment requirements applicable for that system. The discharger shall include any specific criteria required by the municipality in the ATS Plan.

5. Compliance Storm Event:

   Discharges of storm water from ATS shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for ATS discharges is the 10 year, 24 hour storm, as determined using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca10y24.gif

   This exemption is dependent on the submission of rain gauge data verifying the storm event is equal to or larger than the Compliance Storm.

J. Operation and Maintenance Plan

1. Each Project shall have a site-specific Operation and Maintenance (O&M) Manual covering the procedures required to install, operate and maintain the ATS.[8]

2. The O&M Manual shall only be used in conjunction with appropriate project-specific design specifications that describe the system configuration and operating parameters.

3. The O&M Manual shall have operating manuals for specific pumps, generators, control systems,and other equipment.

K. Sampling and Reporting Quality Assurance/ Quality Check (QA/QC) Plan

4. A project-specific QA/QC Plan shall be developed for each project. The QA/QC Plan shall include at a minimum:

   a. Calibration – Calibration methods and frequencies for all system and field instruments shall be specified.

[8] The manual is typically in a modular format covering generalized procedures for each component that is utilized in a particular system.

b. Method Detection Limits (MDLs) – The methods for determining MDLs shall be specified for each residual coagulant measurement method. Acceptable minimum MDLs for each method, specific to individual coagulants, shall be specified.

c. Laboratory Duplicates – Requirements for monthly laboratory duplicates for residual coagulant analysis shall be specified.

L. Personnel Training

1. Operators shall have training specific to using an ATS and liquid coagulants for storm water discharges in California.

2. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal.

3. Training shall include a minimum of eight hours classroom and 32 hours field training. The course shall cover the following topics:

   a. Coagulation Basics –Chemistry and physical processes

   b. ATS System Design and Operating Principles

   c. ATS Control Systems

   d. Coagulant Selection – Jar testing, dose determination, etc.

   e. Aquatic Safety/Toxicity of Coagulants, proper handling and safety

   f. Monitoring, Sampling, and Analysis

   g. Reporting and Recordkeeping

   h. Emergency Response

M. Active Treatment System (ATS) Monitoring Requirements

Any discharger who deploys an ATS on their site shall conduct the following:

1. Visual Monitoring

   a. A designated responsible person shall be on site daily at all times during treatment operations.

b. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log.

   i. The log shall include the name and phone number of the person responsible for system operation and monitoring.

   ii. The log shall include documentation of the responsible person's training.

2. Operational and Compliance Monitoring

   a. Flow shall be continuously monitored and recorded at not greater than 15-minute intervals for total volume treated and discharged.

   b. Influent and effluent pH must be continuously monitored and recorded at not greater than 15-minute intervals.

   c. Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at not greater than 15-minute intervals.

   d. The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.

   e. Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.

   f. Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.

   g. Effluent shall be monitored and recorded for residual chemical/additive levels.

   h. If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

3. Toxicity Monitoring

   A discharger operating in batch treatment mode shall perform toxicity testing in accordance with the following:

   a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge.[9] All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS)

[9] This requirement only requires that the test be initiated prior to discharge.

Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.[10]

b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in “Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012” for Fathead minnow, *Pimephales promelas or* Rainbow trout *Oncorhynchus mykiss* may be used as a substitute for fathead minnow.

c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.[11]

4. Reporting and Recordkeeping

At a minimum, every 30 days a LRP representing the discharger shall access the State Water Boards Storm Water Mulit-Application and Report Tracking system (SMARTS) and electronically upload field data from the ATS. Records must be kept for three years after the project is completed .

5. Non-compliance Reporting

a. Any indications of toxicity or other violations of water quality objectives shall be reported to the appropriate regulatory agency as required by this General Permit.

b. Upon any measurements that exceed water quality standards, the system operator shall immediately notify his supervisor or other responsible parties, who shall notify the Regional Water Board.

c. If any monitoring data exceeds any applicable NEL in this General Permit, the discharger shall electronically submit a NEL Violation Report to the State Water Board within 24 hours after the NEL exceedance has been identified.

i. ATS dischargers shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity in this General Permit.

ii. ATS dischargers shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the annual report is filed.

iii. ATS dischargers shall include in the NEL Violation Report:

[10] http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.
[11] http://www.epa.gov/waterscience/methods/wet/.

(1) The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”);

(2) The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and

(3) A description of the current onsite BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

iv. Compliance Storm Exemption - In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, ATS dischargers shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Version 8/17/2011												
2		**Risk Determination Worksheet**											
3													
4			**Step 1**	Determine Sediment Risk via one of the options listed:									
5				1. GIS Map Method - EPA Rainfall Erosivity Calculator & GIS map									
6				2. Individual Method - EPA Rainfall Erosivity Calculator & Individual Data									
7			**Step 2**	Determine Receiving Water Risk via one of the options listed:									
8				1. GIS map of Sediment Sensitive Watersheds provided									
9				2. Site Specific Analysis (support documentation required)									
10			**Step 3**	Determine Combined Risk Level									
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		0
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**	0	
16	**Site Sediment Risk Factor**	**Low**	
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			
21			
22			
23	**GIS Map Method:**		
24	**1.** The R factor for the project is calculated using the online calculator at:		
25	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
26			
27	**2**. The K and LS factors may be obtained by accessing the GIS maps located on the State Water Board FTP website at:		
28	ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/		
29			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	yes/no	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml	no	Low
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan		

Combined Risk Level Matrix

		Sediment Risk		
		Low	Medium	High
Receiving Water Risk	Low	Level 1	Level 2	
	High	Level 2		Level 3

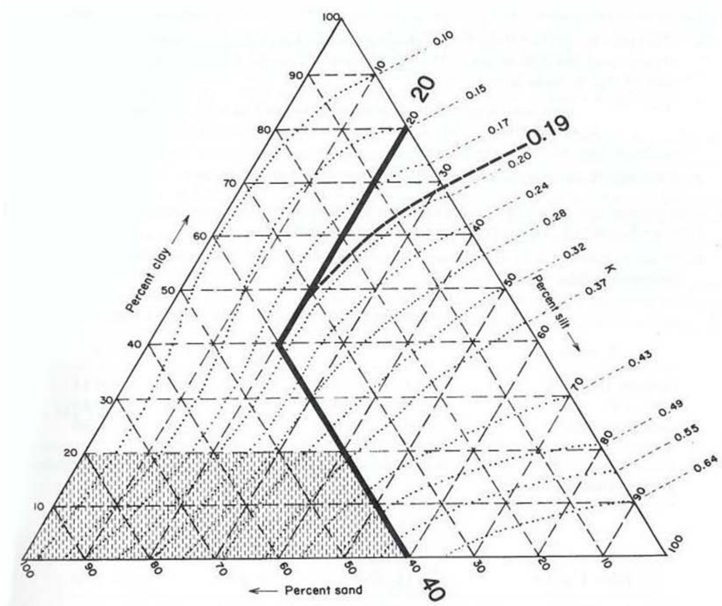
Project Sediment Risk: Low

Project RW Risk: Low

Project Combined Risk: Level 1

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Erickson triangular nomograph used to estimate soil erodibility (K) factor.
The figure above is the USDA nomograph used to determine the K factor for a soil, based on its texture (% silt plus very fine sand, % sand, % organic matter, soil structure, and permeability). *Nomograph from Erickson 1977 as referenced in Goldman et. al., 1986.*

Sheet Flow Length (ft)	Average Watershed Slope (%)																		
	0.2	**0.5**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**20.0**	**25.0**	**30.0**	**40.0**	**50.0**	**60.0**
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35	0.36	0.38	0.39	0.41	0.45	0.48	0.53	0.58	0.63
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37	0.41	0.45	0.49	0.56	0.64	0.72	0.85	0.97	1.07
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38	0.45	0.51	0.56	0.67	0.80	0.91	1.13	1.31	1.47
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39	0.47	0.55	0.62	0.76	0.93	1.08	1.37	1.62	1.84
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40	0.49	0.58	0.67	0.84	1.04	1.24	1.59	1.91	2.19
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57	0.71	0.85	0.98	1.24	1.56	1.86	2.41	2.91	3.36
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91	1.15	1.40	1.64	2.10	2.67	3.22	4.24	5.16	5.97
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20	1.54	1.87	2.21	2.86	3.67	4.44	5.89	7.20	8.37
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46	1.88	2.31	2.73	3.57	4.59	5.58	7.44	9.13	10.63
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.92	2.51	3.09	3.68	4.85	6.30	7.70	10.35	12.75	14.89
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34	3.07	3.81	4.56	6.04	7.88	9.67	13.07	16.16	18.92
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72	3.60	4.48	5.37	7.16	9.38	11.55	15.67	19.42	22.78
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09	4.09	5.11	6.15	8.23	10.81	13.35	18.17	22.57	26.51
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75	5.01	6.30	7.60	10.24	13.53	16.77	22.95	28.60	33.67
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95	6.67	8.45	10.26	13.94	18.57	23.14	31.89	39.95	47.18
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03	8.17	10.40	12.69	17.35	23.24	29.07	40.29	50.63	59.93
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02	9.57	12.23	14.96	20.57	27.66	34.71	48.29	60.84	72.15

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

APPENDIX 2:
Post-Construction Water Balance Performance Standard Spreadsheet

The discharger shall submit with their Notice of Intent (NOI) the following information to demonstrate compliance with the New and Re-Development Water Balance Performance Standard.

Map Instructions

The discharger must submit a small-scale topographic map of the site to show the existing contour elevations, pre- and post-construction drainage divides, and the total length of stream in each watershed area. Recommended scales include 1 in. = 20 ft., 1 in. = 30 ft., 1 in. = 40 ft., or 1 in = 50 ft. The suggested contour interval is usually 1 to 5 feet, depending upon the slope of the terrain. The contour interval may be increased on steep slopes. Other contour intervals and scales may be appropriate given the magnitude of land disturbance.

Spreadsheet Instructions

The intent of the spreadsheet is to help dischargers calculate the project-related increase in runoff volume and select impervious area and runoff reduction credits to reduce the project-related increase in runoff volume to pre-project levels.

The discharger has the option of using the spreadsheet (**Appendix 2.1)** or a more sophisticated, watershed process-based model (e.g. Storm Water Management Model, Hydrological Simulation Program Fortran) to determine the project-related increase in runoff volume.

In* Appendix 4.1**, ***you must complete the worksheet for each land use/soil type combination for each project sub-watershed.

Steps 1 through 9 pertain specifically to the Runoff Volume Calculator:

Step 1: Enter the county where the project is located in cell H3.

Step 2: Enter the soil type in cell H6.

Step 3: Enter the existing pervious (dominant) land use type in cell H7.

Step 4: Enter the proposed pervious (dominant) land use type in cell H8.

Step 5: Enter the total project site area in cell H11 or J11.

Step 6: Enter the sub-watershed area in cell H12 or J12.

Step 7: Enter the existing rooftop area in cell H17 or J17, the existing non-rooftop impervious area in cell H18 or J18, the proposed rooftop area in cell H19 or J19, and the proposed non-rooftop impervious area in cell H20 or J20

Step 8: Work through each of the impervious area reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Step 9: Work through each of the impervious volume reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Non-structural Practices Available for Crediting

- ***Porous Pavement***
- ***Tree Planting***
- ***Downspout Disconnection***
- ***Impervious Area Disconnection***
- ***Green Roof***
- ***Stream Buffer***
- ***Vegetated Swales***
- ***Rain Barrels and Cisterns***
- ***Landscaping Soil Quality***

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.

(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below	
(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.	*SACRAMENTO*
(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.	**SACRAMENTO FAA ARPT**

Project Information	
Project Name:	***Optional***
Waste Discharge Identification (WDID):	***Optional***
Date:	***Optional***
Sub Drainage Area Name (from map):	***Optional***

Runoff Calculations		
(Step 2) Indicate the Soil Type (dropdown menu to right):	***Group C Soils***	**Low infiltration. Sandy clay loam. Infiltration rate 0.05 to 0.15 inch/hr when wet.**
(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	***Wood & Grass: <50% ground cover***	
(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	***Lawn, Grass, or Pasture covering more than 75% of the open space***	

Runoff Curve Numbers	
Existing Pervious Runoff Curve Number	**82**
Proposed Development Pervious Runoff Curve Number	**74**

	Complete Either		
	Sq Ft	**Acres**	**Acres**
(Step 5) Total Project Site Area:		**5.00**	**5.00**
(Step 6) Sub-watershed Area:		**5.00**	**5.00**
Percent of total project :			**100%**

Design Storm		
Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	**0.62**	**in**
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	**0.44**	**In**
P used for calculations (in) (the greater of the above two criteria)	**0.62**	**In**
^Available at www.cabmphandbooks.com		

(Step 7) Sub-watershed Conditions	**Complete Either**		**Calculated Acres**
Sub-watershed Area (acres)	**Sq Ft**	**Acres**	**5.00**
Existing Rooftop Impervious Coverage		**0**	**0.00**
Existing Non-Rooftop Impervious Coverage		**0**	**0.00**
Proposed Rooftop Impervious Coverage		**0**	**0.00**
Proposed Non-Rooftop Impervious Coverage		**0**	**0.00**

Credits	**Acres**	**Square Feet**
Porous Pavement	**0.00**	**0**
Tree Planting	**0.00**	**0**
Downspout Disconnection	**0.00**	**0**
Impervious Area Disconnection	**0.00**	**0**
Green Roof	**0.00**	**0**
Stream Buffer	**0.00**	**0**
Vegetated Swales	**0.00**	**0**
Subtotal	**0.00**	**0**
Subtotal Runoff Volume Reduction Credit	**0 Cu. Ft.**	

Pre-Project Runoff Volume (cu ft)	**247**	**Cu.Ft.**
Project-Related Runoff Volume Increase w/o credits (cu ft)	**0**	**Cu.Ft.**
Project-Related Volume Increase with Credits (cu ft)	**0**	**Cu.Ft.**

(Step 9) Impervious Volume Reduction Credits	**Volume (cubic feet)**
Rain Barrels/Cisterns	**0 Cu. Ft.**
Soil Quality	**0 Cu. Ft.**
Subtotal Runoff Volume Reduction	**0 Cu. Ft.**
Total Runoff Volume Reduction Credit	**0 Cu. Ft.**

You have achieved your minimum requirements

Porous Pavement Credit Worksheet

Please fill out a porous pavement credit worksheet for each project sub-watershed.

For the PROPOSED Development:

Proposed Porous Pavement	Runoff Reduction*	Fill in either Acres or SqFt In SqFt.	In Acres	Equivalent Acres
Area of **Brick without Grout** on less than 12 inches of base with at least 20% void space over soil	0.45			0.00
Area of **Brick without Grout** on more than 12 inches of base with at least 20% void space over soil	0.90			0.00
Area of **Cobbles** less than 12 inches deep and over soil	0.30			0.00
Area of **Cobbles** less than 12 inches deep and over soil	0.60			0.00
Area of **Reinforced Grass Pavement** on less than 12 inches of base with at least 20% void space over soil	0.45			0.00
Area of **Reinforced Grass Pavement** on at least 12 inches of base with at least 20% void space over soil	0.90			0.00
Area of **Porous Gravel Pavement** on less than 12 inches of base with at least 20% void space over soil	0.38			0.00
Area of **Porous Gravel Pavement** on at least 12 inches of base with at least 20% void space over soil	0.75			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with less than 4 inches of gravel base (washed stone)	0.40			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 4 to 8 inches of gravel base (washed stone)	0.60			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 8 to 12 inches of gravel base (washed stone)	0.80			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 12 or more inches of gravel base (washed stone)	1.00			0.00

*=1-Rv** Return to Calculator

**Using Site Design Techniques to meet Development Standards for Stormwater Quality (BASMAA 2003)

**NCDENR Stormwater BMP Manual (2007)

Tree Planting Credit Worksheet
Please fill out a tree canopy credit worksheet for each project sub-watershed.

Tree Canopy Credit Criteria	Number of Trees Planted	Credit (acres)
Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*	0	0.00
Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*		0.00
	Square feet Under Canopy	
Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.		0.00
Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.		0.00
Please describe below how the project will ensure that these trees will be maintained.		

0

Return to Calculator

* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions

Downspout Disconnection Credit Worksheet

Please fill out a downspout disconnection credit worksheet for each project subwatershed. If you answer yes to all questions, all rooftop area draining to each downspout will be subtracted from your proposed rooftop impervious coverage.

Downspout Disconnection Credit Criteria					
Do downspouts and any extensions extend at least six feet from a basement and two feet from a crawl space or concrete slab?				○ Yes	◉ No
Is the area of rooftop connecting to each disconnected downspout 600 square feet or less?				○ Yes	◉ No
Is the roof runoff from the design storm event fully contained in a raised bed or planter box or does it drain as sheet flow to a landscaped area large enough to contain the roof runoff from the design storm event?				○ Yes	◉ No
The Stream Buffer and/or Vegetated Swale credits **will not** be taken in this sub-watershed area?				○ Yes	◉ No
Percentage of existing	0.00	Acres	of rooftop surface has disconnected downspouts		
Percentage of the proposed	0.00	Acres	of rooftop surface has disconnected downspouts	50	
				Return to Calculator	

Impervious Area Disconnection Credit Worksheet

Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.

Non-Rooftop Disconnection Credit Criteria	Response
Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?	◉ Yes ○ No
Is the impervious area to any one discharge location less than 5,000 square feet?	◉ Yes ○ No
The Stream Buffer credit **will not** be taken in this sub-watershed area?	◉ Yes ○ No

Percentage of existing	0.00	Acres	non-rooftop surface area disconnected	
Percentage of the proposed	0.00	Acres	non-rooftop surface area disconnected	70

Return to Calculator

Green Roof Credit Worksheet

Please fill out a greenroof credit worksheet for each project sub-watershed. If you answer yes to all questions, 70% of the greenroof area will be subtracted from your proposed rooftop impervious coverage.

Green Roof Credit Criteria	Response
Is the roof slope less than 15% or does it have a grid to hold the substrate in place until it forms a thick vegetation mat?	(●) Yes ( ) No
Has a professional engineer assessed the necessary load reserves and designed a roof structure to meet state and local codes?	(●) Yes ( ) No
Is the irrigation needed for plant establishment and/or to sustain the green roof during extended dry periods, is the source from stored, recycled, reclaimed, or reused water?	(●) Yes ( ) No
Percentage of existing 0.00 Acres rooftop surface area in greenroof	
Percentage of the proposed 0.00 Acres rooftop surface area in greenroof	

Return to Calculator

Stream Buffer Credit Worksheet

Please fill out a stream buffer credit worksheet for each project sub-watershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout and/or Impervious Area Disconnection credits.

Stream Buffer Credit Criteria				Response
Does runoff enter the floodprone width* or within 500 feet (whichever is larger) of a stream channel as sheet flow**?				○ Yes ◉ No
Is the contributing overland slope 5% or less, or if greater than 5%, is a level spreader used?				○ Yes ◉ No
Is the buffer area protected from vehicle or other traffic barriers to reduce compaction?				○ Yes ◉ No
Will the stream buffer be maintained in an ungraded and uncompacted condition and will the vegetation be maintained in a natural condition?				○ Yes ◉ No
Percentage of existing	0.00	Acres	impervious surface area draining into a stream buffer:	
Percentage of the proposed	0.00	Acres	impervious surface area that will drain into a stream buffer:	
Please describe below how the project will ensure that the buffer areas will remain in ungraded and uncompacted condition and that the vegetation will be maintained in a natural condition.				

Return to Calculator

* floodprone width is the width at twice the bankfull depth.
** the maximum contributing length shall be 75 feet for impervious area

Vegetated Swale Credit Worksheet

Please fill out a vegetated swale worksheet for each project subwatershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout Disconnection credit.

Vegetated Swale Credit Criteria

Have all vegetated swales been designed in accordance with Treatment Control BMP 30 (TC-30 - Vegetated Swale) from the California Stormwater BMP Handbook, New Development and Redevelopment (available at www.cabmphandbooks.com)?	○ Yes ◉ No
Is the maximum flow velocity for runoff from the design storm event less than or equal to 1.0 foot per second?	○ Yes ◉ No

Percentage of existing	0.00	Acres of impervious area draining to a vegetated swale	
Percentage of the proposed	0.00	Acres of impervious area draining to a vegetated swale	

Return to Calculator

Rain Barrel/Cistern Credit Worksheet

Please fill out a rain barrel/cistern worksheet for each project sub-watershed.

Rain Barrel/Cistern Credit Criteria	Response
Total number of rain barrel(s)/cisterns	
Average capacity of rain barrel(s)/cistern(s) (in gallons)	
Total capacity rain barrel(s)/cistern(s) (in cu ft) [1]	0

[1] accounts for 10% loss

Return to Calculator

Please fill out a soil quality worksheet for each project sub-watershed.

	Response
Will the landscaped area be lined with an impervious membrane?	
Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below? [1]	○ Yes ◉ No
If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm^3)* , fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.	1.3
If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm^3).	Sandy loams, loams
What is the average depth of your landscaped soil media meeting the above criteria (inches)?	12
What is the total area of the landscaped areas meeting the above criteria (in acres)?	2.97

Return to Calculator

Table 1

Sands, loamy sands	<1.6
Sandy loams, loams	<1.4
Sandy clay loams, loams, clay loams	<1.4
Silts, silt loams	<1.3
Silt loams, silty clay loams	<1.1
Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1
Clays (>45% clay)	<1.1

[1] USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000.
http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf

* To determine how to calculate density see:
http://www.globe.gov/tctg/bulkden.pdf?sectionID=94

Porosity (%) 50.94%

Mineral grains in many soils are mainly quartz and feldspar, so 2.65 a good average for particle density. To determine percent porosity, use the formula: Porosity (%) = (1-Bulk Density/2.65) X 100

APPENDIX 3
Bioassessment Monitoring Guidelines

Bioassessment monitoring is required for projects that meet all of the following criteria:

1. The project is rated Risk Level 3 or LUP Type 3
2. The project directly discharges runoff to a freshwater wadeable stream (or streams) that is either: (a) listed by the State Water Board or USEPA as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or have the beneficial use SPAWN & COLD & MIGRATORY
3. Total project-related ground disturbance exceeds 30 acres.

For all such projects, the discharger shall conduct bioassessment monitoring, as described in this section, to assess the effect of the project on the biological integrity of receiving waters.
Bioassessment shall include:

1. The collection and reporting of specified instream biological data
2. The collection and reporting of specified instream physical habitat data

<u>Bioassessment Exception</u>
If a site qualifies for bioassessment, but construction commences out of an index period for the site location, the discharger shall:

1. Receive Regional Water Board approval for the sampling exception
2. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.
3. Send a copy of the check to the Regional Water Board office for the site's region
4. Invest **7,500.00 X The number of samples required** into the SWAMP program as compensation (upon Regional Water Board approval).
5. Conduct bioassessment monitoring, as described in Appendix 4
6. Include the collection and reporting of specified instream biological data and physical habitat
7. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP)

<u>Site Locations and Frequency</u>
Macroinvertebrate samples shall be collected both before ground disturbance is initiated and after the project is completed. The "after" sample(s) shall be collected after at least one winter season resulting in surface runoff has transpired after project-related ground disturbance has ceased. "Before" and "after" samples shall be collected both upstream and downstream of the project's

discharge. Upstream samples should be taken immediately before the sites outfall and downstream samples should be taken immediately after the outfall (when safe to collect the samples). Samples should be collected for each freshwater wadeable stream that is listed as impaired due to sediment, or tributary to a water body that is listed for sediment. Habitat assessment data shall be collected concurrently with all required macroinvertebrate samples.

Index Period (Timing of Sample Collection)

Macroinvertebrate sampling shall be conducted during the time of year (i.e., the "index period") most appropriate for bioassessment sampling, depending on ecoregion. This map is posted on the State Water Board's Website: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Field Methods for Macroinvertebrate Collections

In collecting macroinvertebrate samples, the discharger shall use the "Reachwide Benthos (Multi-habitat) Procedure" specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007).[1]

Physical - Habitat Assessment Methods

The discharger shall conduct, concurrently with all required macroinvertebrate collections, the "Full" suite of physical habitat characterization measurements as specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007), and as summarized in the Surface Water Ambient Monitoring Program's *Stream Habitat Characterization Form — Full Version*.

Laboratory Methods

Macroinvertebrates shall be identified and classified according to the Standard Taxonomic Effort (STE) Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists (SAFIT),[2] and using a fixed-count of 600 organisms per sample.

Quality Assurance

The discharger or its consultant(s) shall have and follow a quality assurance (QA) plan that covers the required bioassessment monitoring. The QA plan shall include, or be supplemented to include, a specific requirement for external QA checks (i.e., verification of taxonomic identifications and correction of data where

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[1] This document is available on the Internet at: ~~http://www.swrcb.ca.gov/swamp/docs/phab_sopr6.pdf~~. http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf.

[2] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: ~~http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf~~ http://www.safit.org/Docs/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

errors are identified). External QA checks shall be performed on one of the discharger's macroinvertebrate samples collected per calendar year, or ten percent of the samples per year (whichever is greater). QA samples shall be randomly selected. The external QA checks shall be paid for by the discharger, and performed by the California Department of Fish and Game's Aquatic Bioassessment Laboratory. An alternate laboratory with equivalent or better expertise and performance may be used if approved in writing by State Water Board staff.

Sample Preservation and Archiving
The original sample material shall be stored in 70 percent ethanol and retained by the discharger until: 1) all QA analyses specified herein and in the relevant QA plan are completed; and 2) any data corrections and/or re-analyses recommended by the external QA laboratory have been implemented. The remaining subsampled material shall be stored in 70 percent ethanol and retained until completeness checks have been performed according to the relevant QA plan. The identified organisms shall be stored in 70 percent ethanol, in separate glass vials for each final ID taxon. (For example, a sample with 45 identified taxa would be archived in a minimum of 45 vials, each containing all individuals of the identified taxon.) Each of the vials containing identified organisms shall be labeled with taxonomic information (i.e., taxon name, organism count) and collection information (i.e., site name/site code, waterbody name, date collected, method of collection). The identified organisms shall be archived (i.e., retained) by the discharger for a period of not less than three years from the date that all QA steps are completed, and shall be checked at least once per year and "topped off" with ethanol to prevent desiccation. The identified organisms shall be relinquished to the State Water Board upon request by any State Water Board staff.

Data Submittal
The macroinvertebrate results (i.e., taxonomic identifications consistent with the specified SAFIT STEs, and number of organisms within each taxa) shall be submitted to the State Water Board in electronic format. The State Water Board's Surface Water Ambient Monitoring Program (SWAMP) is currently developing standardized formats for reporting bioassessment data. All bioassessment data collected after those formats become available shall be submitted using the SWAMP formats. Until those formats are available, the biological data shall be submitted in MS-Excel (or equivalent) format.[3]

The physical/habitat data shall be reported using the standard format titled *SWAMP Stream Habitat Characterization Form — Full Version*.[4]

[3] Any version of Excel, 2000 or later, may be used.
[4] Available at:
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/fieldforms_fullversion052908.pdf

Invasive Species Prevention

In conducting the required bioassessment monitoring, the discharger and its consultants shall take precautions to prevent the introduction or spread of aquatic invasive species. At minimum, the discharger and its consultants shall follow the recommendations of the California Department of Fish and Game to minimize the introduction or spread of the New Zealand mudsnail.[5]

[5] Instructions for controlling the spread of NZ mudsnails, including decontamination methods, can be found at: http://www.dfg.ca.gov/invasives/mudsnail/
More information on AIS More information on AIS
http://www.waterboards.ca.gov/water_issues/programs/swamp/ais/

Appendix 4 Non Sediment TMDLs

Region 1 Lost River-DIN and CBOD

Region 1 Source: Cal Trans Construction TMDL Completion Date: 12 30 2008 TMDL Type: River, Lake Watershed Area= 2996 mi^2	**Pollutant Stressors/WLA**	
	Dissolved inorganic nitrogen (DIN) (metric tons/yr)	**Carbonaceous biochemical oxygen demand (CBOD) (metric tons/yr)**
Lost River from the Oregon border to Tule Lake	.1	.2
Tule Lake Refuge	.1	.2
Lower Klamath Refuge	.1	.2

Region 2 San Francisco Bay-Mercury

Region 2 Source:Non-Urban Stormwater Runoff TMDL Type: Bay	**Name**	**Pollutant Stressor/WLA**	**TMDL Completion Date**
	San Francisco Bay	Mercury 25 kg/year	08 09 2006

Region 4 Ballona Creek-Metals and Selenium

Region 4 Source: NPDES General Construction TMDL Completion Date: 12 22 2005 TMDL Type: Creek	**Pollutant Stressors/WLA**							
	Copper (Cu)		**Lead (Pb)**		**Selenium (Se)**		**Zinc (Zn)**	
	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre
Ballona Creek	4.94E-07 x Daily storm volume (L)	2.20E-10 x Daily storm volume (L)	1.62E-06 x Daily storm volume (L)	7.20E-10 x Daily storm volume (L)	1.37E-07 x Daily storm volume (L)	6.10E-11 x Daily storm volume (L)	3.27E-06 x Daily storm volume (L)	1.45E-09 x Daily storm volume (L)

General Construction Storm Water Permits:
Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board.

- Dry-weather Implementation Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be:
  (1) infeasible to eliminate
  (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and
  (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order.
  Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.
- Wet-weather Implementation Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees.
- Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL.
- General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Region 4 Calleaguas Creek-OC Pesticides, PCBs, and Siltation

Interim Requirements

Region 4 Calleaguas Creek Source: Minor NPDES point sources/WDRs TMDL Completion Date: 3 14 2006 TMDL Type:Creek	**Pollutant Stressor**	**WLA Daily Max (µg/L)**	**WLA Monthly Ave (µg/L)**
	Chlordane	1.2	0.59
	4,4-DDD	1.7	0.84
	4,4-DDE	1.2	0.59
	4,4-DDT	1.2	0.59
	Dieldrin	0.28	0.14
	PCB's	0.34	0.17
	Toxaphene	0.33	0.16

Final WLA (ng/g)							
Region 4 Calleaguas Creek Source: Stormwater Permittees TMDL Completion Date: 3 14 2006 TMDL Type:Creek	Chlordane	4,4-DDD	4,4-DDE	4,4-DDT	Dieldrin	PCB's	Toxaphene
Mugu Lagoon*	3.3	2.0	2.2	0.3	4.3	180.0	360.0
Callegaus Creek	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Revolon Slough (SW)*	0.9	2.0	1.4	0.3	0.1	130.0	1.0
Arroyo Las posas(SW)*	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Arroyo Simi	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Conejo Creek	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Interim Requirements (ng/g)							
Mugu Lagoon*	25.0	69.0	300.0	39.0	19.0	180.	22900.0
Callegaus Creek	17.0	66.0	470.0	110.0	3.0	3800.0	260.0
Revolon Slough (SW)*	48.0	400.0	1600.0	690.0	5.7	7600.0	790.0
Arroyo Las posas(SW)*	3.3	290.0	950.0	670.0	1.1	25700.0	230.0
Arroyo Simi	3.3	14.0	170.0	25.0	1.1	25700.0	230.0
Conejo Creek	3.4	5.3	20.0	2.0	3.0	3800.0	260.0

*(SW)=Subwatershed

*Mugu Lagoon includes Duck pond/Agricultural Drain/Mugu/Oxnard Drain #2

Compliance with sediment based WLAs is measured as an instream annual average at the base of each subwatershed where the discharges are located.

<u>Region 4 Calleguas Creek-Salts</u>

Final Dry Weather Pollutant WLA (mg/L)					
Region 4 Calleaguas Creek Source Permitted Stormwater Dischargers TMDL Completion Date: 12 2 2008 TMDL Type:Creek	**Critical Condition Flow Rate (mgd)**	**Chloride (lb/day)**	**TDS (lb/day)**	**Sulfate (lb/day)**	**Boron (lb/day)**
Simi	1.39	1738.0	9849.0	2897.0	12.0
Las Posas	0.13	157.0	887.0	261.0	N/A
Conejo	1.26	1576.0	8931.0	2627.0	N/A

Camarillo	0.06	72.0	406.0	119.0	N/A
Pleasant Valley (Calleguas)	0.12	150.0	850.0	250.0	N/A
Pleasant Valley (Revolon)	0.25	314.0	1778.0	523.0	2.0

Dry Weather Interim Pollutant WLA (mg/L)				
	Chloride (mg/L)	**TDS (mg/L)**	**Sulfate (mg/L)**	**Boron (mg/L)**
Simi	230.0	1720.0	1289.0	1.3
Las Posas	230.0	1720.0	1289.0	1.3
Conejo	230.0	1720.0	1289.0	1.3
Camarillo	230.0	1720.0	1289.0	1.3
Pleasant Valley (Calleguas)	230.0	1720.0	1289.0	1.3
Pleasant Valley (Revolon)	230.0	1720.0	1289.0	1.3

- General Construction permittees are assigned a dry weather wasteload allocation equal to the average dry weather critical condition flow rate multiplied by the numeric target for each constituent. Waste load allocations apply in the receiving water at the base of each subwatershed. Dry weather allocations apply when instream flow rates are below the 86th percentile flow and there has been no measurable precipitation in the previous 24 hours.
- Because wet weather flows transport a large mass of salts at low concentrations, these dischargers meet water quality objectives during wet weather.
- Interim limits are assigned for dry weather discharges from areas covered by NPDES stormwater permits to allow time to implement appropriate actions. The interim limits are assigned as concentration based receiving water limits set to the 95th percentile of the discharger data as a monthly average limit except for chloride. The 95th percentile for chloride was 267 mg/L which is higher than the recommended criteria set forth in the Basin Plan for protection of sensitive beneficial uses including aquatic life. Therefore, the interim limit for chloride for Permitted Stormwater Dischargers is set equal to 230 mg/L to ensure protection of sensitive beneficial uses in the Calleguas Creek watershed.

Region 4 San Gabriel River and Tributaries-Metals and Selenium

Region 4 San Gabriel River and Tributaries Source: Construction Stormwater Dischargers TMDL Completion Date: 3 2007 TMDL Type: Creek	**Pollutant Stressor**	**Wet weather Allocations**	**Dry Weather Allocations**	**% of Watershed**

San Gabriel Reach 2	Lead (Pb)	0.7% * 166 µg/l * Daily Storm Vol	N/A	0.7%
San Gabriel Reach 2	Lead (Pb) Mass based	0.8 kg/d	N/A	0.7%
Coyote Creek	Copper (Cu)	0.285 kg/d	0	5.0%
Coyote Creek	Lead (Pb)	1.70 kg/d	N/A	5.0%
Coyote Creek	Zinc (Zn)	2.4 kg/d	N/A	5.0%
San Jose Creek Reach 1 and 2	Selenium	5 µg/L	5 µg/L	5.0%

Wet-weather allocations for lead in San Gabriel River Reach 2. Concentration-based allocations apply to non-stormwater NPDES discharges. Stormwater allocations are expressed as a percent of load duration curve. Mass-based values presented in table are based on a flow of 260 cfs (daily storm volume = 6.4 x10^8 liters).

There are 1555 acres of water in the entire watershed, 37.4 acres of water in the Reach 1 subwatershed (2.4%), and 269 acres in the Coyote Creek subwatershed (17%).

General Construction Storm Water Permits

Waste load allocations for the general construction storm water permits may be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. An estimate of direct atmospheric deposition is developed based on the percent area of surface water in the watershed. Approximately 0.4% of the watershed area draining to San Gabriel River Reach 2 is comprised of water and approximately 0.2% of the watershed area draining to Coyote Creek is comprised of water.

Region 4 The Harbor Beaches of Ventura County-Bacteria

The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. Bacteriological objectives are set forth in Chapter 3 of the Basin Plan. The objectives are based on four bacteria indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are:

The General NPDES Construction permit is seen as a minor contributor and is given no allocation

General NPDES permits, individual NPDES permits, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, and WDR permittees in the Channel Islands Harbor subwatershed are assigned WLAs of zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, individual NPDES permit, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, and WDR will also be subject to a WLA of zero (0) days of allowable exceedances.

Region 4 Resolution No. 03-009 Los Angeles River and Tributaries-Nutrients

Minor Point Sources

Waste loads are allocated to minor point sources enrolled under NPDES or WDR permits including but not limited to Tapia WRP, Whittier Narrows WRP, Los Angeles Zoo WRP, industrial and construction stormwater, and municipal storm water and urban runoff from municipal separate storm sewer systems (MS4s)

Region 4 Minor Point Sources for NPDES/WDR Permits TMDL Completion Date: 7 10 2003 TMDL Type: River	Pollutant Stressor/WLA				
	Total Ammonia (NH_3)		**Nitrate-nitrogen (NO_3-N)**	**Nitrite-nitrogen (NO_2-N)**	**NO_3-N + NO_3-N**
	1 Hr Ave mg/l	30 Day Ave mg/l	30 Day Ave mg/l		30 Day Ave mg/l
LA River Above Los Angeles-Glendale WRP (LAG)	4.7	1.6	8.0	1.0	8.0
LA River Below LAG	8.7	2.4	8.0	1.0	8.0
Los Angeles Tributaries	10.1	2.3	8.0	1.0	8.0

Malibu Creek Attachment A to Resolution No. 2004-019R-Bacteria

12 13 2004 The WLAs for permittees under the NPDES General Stormwater Construction Permit are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean.

Region 4 Marina del Rey Harbor, Mothers' Beach and Back Basins

Attachment A to Resolution No. 2003-012-Bacteria

8 7 2003 As discussed in "Source Analysis", discharges from general NPDES permits, general industrial storm water permits and general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, general industrial storm water permit or general construction storm water permit within the MdR Watershed will also be subject to a WLA of zero days of allowable exceedances.

Region 4 San Gabriel River and Tributaries-Metals and Selenium

Dry Weather Selenium WLA
A zero WLA is assigned to the industrial and construction stormwater permits during dry weather. Non-storm water discharges are already prohibited or restricted by existing general permits.

Region 4 General Construction Permittees TMDL Completion Date: 7 13 2006 TMDL Type: River	**Total Recoverable Metals (kg/day)**		
	Copper (Cu) Kg/day	**Lead (Pb) Kg/day**	**Zinc (Zn) Kg/day**
San Gabriel River Reach 2 and upstream reaches/tributaries	**XXXX**	Daily storm volume x 1.24 µg/L	**XXXX**
Coyote Creek and Tributaries	Daily storm volume x 0.7 µg/L	Daily storm volume x 4.3 µg/L	Daily storm volume x 6.2 µg/L

Each enrollee under the general construction stormwater permit receives a WLA on a per acre basis

Region 4 General Construction Permittees TMDL Completion Date: 7 13 2006 TMDL Type: River	**Total Recoverable Metals (kg/day/acre)**		
	Copper (Cu) Kg/acre/day	**Lead (Pb) Kg/acre/day**	**Zinc (Zn) Kg/acre/day**
San Gabriel River Reach 2 and upstream reaches/tributaries	**XXXX**	Daily storm volume x 0.56 µg/L	**XXXX**

Coyote Creek and Tributaries	Daily storm volume x 0.12 µg/L	Daily storm volume x 0.70 µg/L	Daily storm volume x 1.01 µg/L

For the general industrial and construction storm water permits, the daily storm volume is measured at USGS station 11085000 for discharges to Reach 2 and above and at LACDPW flow gauge station F354-R for discharges to Coyote Creek.

General construction storm water permits
WLAs will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board.
Dry-weather implementation
Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (NPDES Permit No. CAS000002), or any successor permit, are exempt from the dry-weather WLA equal to zero as long as they comply with the provisions of sections C.3.and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by Permit No. CAS000002.

Upon permit issuance, renewal, or re-opener
Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather WLAs. WLAs shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.

Six years from the effective date of the TMDL
The construction industry will submit the results of wet-weather BMP effectiveness studies to the Los Angeles Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.

Seven years from the effective date of the TMDL
The Los Angeles Regional Board will consider results of the wet weather BMP effectiveness studies and consider approval of BMPs.

Eight years from the effective date of the TMDL
All general construction storm water permittees shall implement Regional Board-approved BMPs.

Total Maximum Daily Loads (TMDLs) for San Diego Creek,
Upper and Lower Newport Bay, Orange County, California

Region 8 NPDES Construction Permit TMDL Completion Date: 1 24 1995	Organochlorine Compounds							
	Total DDT		**Chlordane**		**Total PCBs**		**Toxaphene**	
TMDL Type: River. Cr, Bay	g/day	g/yr	g/day	g/yr	g/day	g/yr	g/day	g/yr
San Diego Creek	.27	99.8	**.18***	**64.3***	**.09***	**31.5***	.004	1.5
Upper Newport Bay	.11	40.3	.06	23.4	.06	23.2	**X**	**X**
Lower Newport Bay	.04	14.9	.02	8.6	.17	60.7	**X**	**X**

*Red= Informational WLA only, not for enforcement purposes

Organochlorine Compounds TMDLs Implementation Tasks and Schedule

Regional Board staff shall develop a SWPPP Improvement Program that identifies the Regional Board's expectations with respect to the content of SWPPPs, including documentation regarding the selection and implementation of BMPs, and a sampling and analysis plan. The Improvement Program shall include specific guidance regarding the development and implementation of monitoring plans, including the constituents to be monitored, sampling frequency and analytical protocols. The SWPPP Improvement Program shall be completed by (*the date of OAL approval of this BPA*). ***No later than two months*** from completion of the Improvement Program, Board staff shall assure that the requirements of the Program are communicated to interested parties, including dischargers with existing authorizations under the General Construction Permit. Existing, authorized dischargers shall revise their project SWPPPs as needed to address the Program requirements as soon as possible but ***no later than (three months of completion of the SWPPP Improvement Program)***. Applicable SWPPPs that do not adequately address the Program requirements shall be considered inadequate and enforcement by the Regional Board shall proceed accordingly. The Caltrans and Orange County MS4 permits shall be revised as needed to assure that the permittees communicate the Regional Board's SWPPP expectations, based on the SWPPP Improvement Program, with the Standard Conditions of Approval.

Appendix 4 Sediment TMDLs

Implemented Sediment TMDLs in California. Construction was listed as a source in all fo these TMDLs in relation to road construction. Although construction was mentioned as a source, it was not given a specific allocation amount. The closest allocation amount would be for the road activity management WLA. **Implementation Phase** – Adoption process by the Regional Board, the State Water Resources Control Board, the Office of Administrative Law, and the US Environmental Protection Agency completed and TMDL being implemented.

A. Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.albionfinaltmdl	R	Albion River	Sedimentation	Road Construction	2001	43 acres	See A (table 6)

B Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelR-middle.mainSed.temp	R	Middle Main Eel River and Tributaries (from Dos Rios to the South Fork)	Sedimentation	Road Construction	2005-2006	521 mi^2	100

C Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelRsouth.sed.temp	R	South Fork Eel River	Sedimentation	Road Construction	12 1999	See chart	473

D Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.bigfinaltmdl	R	Big River	Sedimentation	Road Construction	12 2001	181 mi^2 watershed drainage	TMDL = loading capacity = nonpoint sources + background =

							393 t mi2 yr

E Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.EelR-lower.Sed.temp-121807-signed	R	Lower Eel River	Sedimentation	Road Construction	12 2007	300 square-mile watershed	898

F Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.EelR-middle.Sed.temp-	R	Middle Fork Eel River	Sedimentation	Road Construction	12 2003	753 mi^2 (approx. 482,000 acres)	82

G Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres Mi^2	WLA tons mi^2 yr
1 R1.epa.EelRnorth-Sed.temp.final-121807-signed	R	North Fork Eel River	Sedimentation	Road Construction	12 30 2002	289 (180,020 acres)	20

H Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres Mi^2	WLA tons mi^2 yr
1 R1.epa.EelR-upper.mainSed.temp-	R	Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury)	Sedimentation	Road Construction	12 29 2004	688 (approx. 440,384 acres)	14

I Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.gualalafinaltmdl	R	Gualala River	Sedimentation	Road Construction	Not sure	300 (191,145 acres)	7

J Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.Mad-sed.turbidity	R	Mad River	Sedimentation	Road Construction	12 21 2007	480	174

K Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.mattole.sediment	R	Mattole River	Sedimentation	Road Construction	12 30 2003	296	27 or 520+27 = 547

L Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.navarro.sed.temp	R	Navarro River	Sedimentation	Road Construction	Not sure	315 (201,600 acres).	50

M Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.noyo.sediment	R	Noyo River	Sedimentation	Road Construction	12 16 1999	113 (72,323 acres)	68 (three areas measured) Table 16 in the TMDL

N Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.RedwoodCk.sed	Cr	Redwood Creek	Sedimentation	Road Construction	12 30 1998	278	1900 Total allocation

O Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA – Roads tons mi^2 yr
1 R1.epa.tenmile.sed	R	Ten Mile River	Sedimentation	Road Construction	2000	120	9

P Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA management tons mi^2 yr
1 R1.epa.trinity.sed	R	Trinity River	Sedimentation	Road Construction	12 20 2001	2000 of 3000 covered in this TMDL	See rows below
1	Cr	Horse Linto Creek	Sedimentation	Road Construction	12 20 2001	64	528
1	Cr	Mill creek and Tish Tang	Sedimentation	Road Construction	12 20 2001	39	210
1	Cr	Willow Creek	Sedimentation	Road Construction	12 20 2001	43	94
1	Cr	Campbell Creek and Supply Creek	Sedimentation	Road Construction	12 20 2001	11	1961
1	Cr	Lower Mainstem and Coon Creek	Sedimentation	Road Construction	12 20 2001	32	63
1	R	Reference	Sedimentation	Road	12 20 2001	434	24

		Subwatershed [1]		Construction			
1	Cr	Canyon Creek	Sedimentation	Road Construction	12 20 2001	64	326
1	R	Upper Tributaries[2]	Sedimentation	Road Construction	12 20 2001	72	67
1	R	Middle Tributaries[3]	Sedimentation	Road Construction	12 20 2001	54	53
1	R	Lower Tributaries[4]	Sedimentation	Road Construction	12 20 2001	96	55
1	Cr	Weaver and Rush Creeks	Sedimentation	Road Construction	12 20 2001	72	169
1	Cr	Deadwood Creek Hoadley Gulch Poker Bar	Sedimentation	Road Construction	12 20 2001	47	68
1	L	Lewiston Lake	Sedimentation	Road Construction	12 20 2001	25	49
1	Cr	Grassvalley Creek	Sedimentation	Road Construction	12 20 2001	37	44
1	Cr	Indian Creek	Sedimentation	Road Construction	12 20 2001	34	81
1	Cr	Reading and Browns Creek	Sedimentation	Road Construction	12 20 2001	104	66
1	Cr	Reference Subwatersheds[5]	Sedimentation	Road Construction	12 20 2001	235	281
1	L, Cr	Westside tributaries[6]	Sedimentation	Road Construction	12 20 2001	93	105
1	R, Cr, G	Upper trinity[7]	Sedimentation	Road Construction	12 20 2001	161	690
1	R, Cr, G	East Fork Tributaries[8]	Sedimentation	Road Construction	12 20 2001	115	65

1
2
3
4
5
6
7
8

1	R, L	Eastside Tributaries[9]	Sedimentation	Road Construction	12 20 2001	89	60

1 New River, Big French, Manzanita, North Fork, East Fork, North Fork
2 Dutch, Soldier, Oregon gulch, Conner Creek
3 Big Bar, Prairie Creek, Little French Creek
4 Swede, Italian, Canadian, Cedar Flat, Mill, McDonald, Hennessy, Quimby, Hawkins, Sharber
5 Stuarts Fork, Swift Creek, Coffee Creek
6 Stuart Arm, Stoney Creek, Mule Creek, East Fork, Stuart Fork, West Side Trinity Lake, Hatchet Creek, Buckeye Creek,
7 Upper Trinity River, Tangle Blue, Sunflower, Graves, Bear Upper Trinity Mainstream, Ramshorn Creek, Ripple Creek, Minnehaha Creek, Snowslide Gulch, Scorpion Creek
8 East Fork Trinity, Cedar Creek, Squirrel Gulch
9 East Side Tributaries, Trinity Lake

Q Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
1 R1.epa.trinity.so.sed	R, Cr	South Fork Trinity River and Hayfork Creek	Sedimentation	Road Construction	12 1998	Not given, 19 miles long	33 (road total)

R Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
1 R1.epa.vanduzen.sed	R, Cr	Van Duzen River and Yager Creek	Sedimentation	Various	12 16 1999	429	1353 total allocation
1		Upper Basin	Sedimentation	Road Construction			7
1		Middle Basin	Sedimentation	Road Construction			22
1		Lower Basin	Sedimentation	Road Construction			20

S Region	**Type**	**Name**	**Pollutant Stressor**	**Potential**	**TMDL**	**Watershed**	**WLA** tons mi^2

9

				Sources	**Completion Date**	**Acres** mi^2	yr
6 R6.blackwood.sed	Cr	Blackwood Creek (Placer County)	Bedded Sediment	Various	9 2007	11	17272 total

T Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
6 R6.SquawCk.sed	R	Squaw Creek (Placer County)	Sedimentation /controllable sources	Various – basin plan amendment	4 13 2006	8.2	10,900

Adopted TMDLs for Construction Sediment Sources

Region	Type	Name	Pollutant Stressor	Potential Sources	**TMDL Completion Date**	**Watershed Area** mi^2	Waste load Allocation tons mi^2 yr
8	R	Newport Bay San Diego Creek Watershed	Sedimentation	Construction Land Development	1999	2.24 (1432 acres)	125,000 tons per Year (no more than 13,000 tons per year from construction sites)

APPENDIX 5:
Glossary

Active Areas of Construction
All areas subject to land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas. All previously active areas are still considered active areas until final stabilization is complete. [The construction activity Phases used in this General Permit are the Preliminary Phase, Grading and Land Development Phase, Streets and Utilities Phase, and the Vertical Construction Phase.]

Active Treatment System (ATS)
A treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to aid in the reduction of turbidity caused by fine suspended sediment.

Acute Toxicity Test
A chemical stimulus severe enough to rapidly induce a negative effect; in aquatic toxicity tests, an effect observed within 96 hours or less is considered acute.

Air Deposition
Airborne particulates from construction activities.

Approved Signatory
A person who has been authorized by the Legally Responsible Person to sign, certify, and electronically submit Permit Registration Documents, Notices of Termination, and any other documents, reports, or information required by the General Permit, the State or Regional Water Board, or U.S. EPA. The Approved Signatory must be one of the following:

1. For a corporation or limited liability company: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation or limited liability company; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;

3. For a municipality, State, Federal, or other public agency: a principal executive officer, ranking elected official, city manager, council president, or any other authorized public employee with managerial responsibility over the

construction or land disturbance project (including, but not limited to, project manager, project superintendent, or resident engineer);

4. For the military: any military officer or Department of Defense civilian, acting in an equivalent capacity to a military officer, who has been designated;
5. For a public university: an authorized university official;
6. For an individual: the individual, because the individual acts as both the Legally Responsible Person and the Approved Signatory; or
7. For any type of entity not listed above (e.g. trusts, estates, receivers): an authorized person with managerial authority over the construction or land disturbance project.

Beneficial Uses
As defined in the California Water Code, beneficial uses of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

Best Available Technology Economically Achievable (BAT)
As defined by USEPA, BAT is a technology-based standard established by the Clean Water Act (CWA) as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. The BAT effluent limitations guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.

Best Conventional Pollutant Control Technology (BCT)
As defined by USEPA, BCT is a technology-based standard for the discharge from existing industrial point sources of conventional pollutants including biochemical oxygen demand (BOD), total suspended sediment (TSS), fecal coliform, pH, oil and grease.

Best Professional Judgment (BPJ)
The method used by permit writers to develop technology-based NPDES permit conditions on a case-by-case basis using all reasonably available and relevant data.

Best Management Practices (BMPs)
BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures,

and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Chain of Custody (COC)
Form used to track sample handling as samples progress from sample collection to the analytical laboratory. The COC is then used to track the resulting analytical data from the laboratory to the client. COC forms can be obtained from an analytical laboratory upon request.

Coagulation
The clumping of particles in a discharge to settle out impurities, often induced by chemicals such as lime, alum, and iron salts.

Common Plan of Development
Generally a contiguous area where multiple, distinct construction activities may be taking place at different times under one plan. A plan is generally defined as any piece of documentation or physical demarcation that indicates that construction activities may occur on a common plot. Such documentation could consist of a tract map, parcel map, demolition plans, grading plans or contract documents. Any of these documents could delineate the boundaries of a common plan area. However, broad planning documents, such as land use master plans, conceptual master plans, or broad-based CEQA or NEPA documents that identify potential projects for an agency or facility are not considered common plans of development.

Daily Average Discharge
The discharge of a pollutant measured during any 24-hour period that reasonably represents a calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged during the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration) the daily discharge is calculated as the average measurement of the pollutant throughout the day (40 CFR 122.2). In the case of pH, the pH must first be converted from a log scale.

Debris
Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

Direct Discharge
A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal storm sewer system), or through surface runoff.

Discharger
The Legally Responsible Person (see definition) or entity subject to this General Permit.

Dose Rate (for ATS)
In exposure assessment, dose (e.g. of a chemical) per time unit (e.g. mg/day), sometimes also called dosage.

Drainage Area
The area of land that drains water, sediment, pollutants, and dissolved materials to a common outlet.

Effluent
Any discharge of water by a discharger either to the receiving water or beyond the property boundary controlled by the discharger.

Effluent Limitation
Any numeric or narrative restriction imposed on quantities, discharge rates, and concentrations of pollutants which are discharged from point sources into waters of the United States, the waters of the contiguous zone, or the ocean.

Erosion
The process, by which soil particles are detached and transported by the actions of wind, water, or gravity.

Erosion Control BMPs
Vegetation, such as grasses and wildflowers, and other materials, such as straw, fiber, stabilizing emulsion, protective blankets, etc., placed to stabilize areas of disturbed soils, reduce loss of soil due to the action of water or wind, and prevent water pollution.

Field Measurements
Testing procedures performed in the field with portable field-testing kits or meters.

Final Stabilization
All soil disturbing activities at each individual parcel within the site have been completed in a manner consistent with the requirements in this General Permit.

First Order Stream
Stream with no tributaries.

Flocculants
Substances that interact with suspended particles and bind them together to form flocs.

Good Housekeeping BMPs
BMPs designed to reduce or eliminate the addition of pollutants to construction site runoff through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Grading Phase (part of the Grading and Land Development Phase)
Includes reconfiguring the topography and slope including; alluvium removals; canyon cleanouts; rock undercuts; keyway excavations; land form grading; and stockpiling of select material for capping operations.

Hydromodification
Hydromodification is the alteration of the hydrologic characteristics of coastal and non-coastal waters, which in turn could cause degradation of water resources. Hydromodification can cause excessive erosion and/or sedimentation rates, causing excessive turbidity, channel aggradation and/or degradation.

Identified Organisms
Organisms within a sub-sample that is specifically identified and counted.

Inactive Areas of Construction
Areas of construction activity that are not active and those that have been active and are not scheduled to be re-disturbed for at least 14 days.

Index Period
The period of time during which bioassessment samples must be collected to produce results suitable for assessing the biological integrity of streams and rivers. Instream communities naturally vary over the course of a year,and sampling during the index period ensures that samples are collected during a time frame when communities are stable so that year-to-year consistency is obtained. The index period approach provides a cost-effective alternative to year-round sampling. Furthermore, sampling within the appropriate index period will yield results that are comparable to the assessment thresholds or criteria for a given region, which are established for the same index period. Because index periods differ for different parts of the state, it is essential to know the index period for your area.

K Factor
The soil erodibility factor used in the Revised Universal Soil Loss Equation (RUSLE). It represents the combination of detachability of the soil, runoff potential of the soil, and the transportability of the sediment eroded from the soil.

Legally Responsible Person
The Legally Responsible Person (LRP) will typically be the project proponent. The categories of persons or entities that are eligible to serve as the LRP are set forth below. For any construction or land disturbance project where multiple persons or entities are eligible to serve as the LRP, those persons or entities

shall select a single LRP. In exceptional circumstances, a person or entity that qualifies as the LRP may provide written authorization to another person or entity to serve as the LRP. In such a circumstance, the person or entity that provides the authorization retains all responsibility for compliance with the General Permit. Except as provided in category 2(d), a contractor who does not satisfy the requirements of any of the categories below is not qualified to be an LRP.

The following persons or entities may serve as an LRP:

1. A person, company, agency, or other entity that possesses a real property interest (including, but not limited to, fee simple ownership, easement, leasehold, or other rights of way) in the land upon which the construction or land disturbance activities will occur for the regulated site.

2. In addition to the above, the following persons or entities may also serve as an LRP:

   a. For linear underground/overhead projects, the utility company, municipality, or other public or private company or agency that owns or operates the LUP;

   b. For land controlled by an estate or similar entity, the person who has day-to-day control over the land (including, but not limited to, a bankruptcy trustee, receiver, or conservator);

   c. For pollution investigation and remediation projects, any potentially responsible party that has received permission to conduct the project from the holder of a real property interest in the land; or

   d. For U.S. Army Corp of Engineers projects, the U.S. Army Corps of Engineers may provide written authorization to its bonded contractor to serve as the LRP, provided, however, that the U.S. Army Corps of Engineers is also responsible for compliance with the general permit, as authorized by the Clean Water Act or the Federal Facilities Compliance Act.

Likely Precipitation Event
Any weather pattern that is forecasted to have a 50% or greater chance of producing precipitation in the project area. The discharger shall obtain likely precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

Maximum Allowable Threshold Concentration (MATC)
The allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity

testing conducted by an independent, third-party laboratory. A typical MATC would be:

The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

Natural Channel Evolution
The physical trend in channel adjustments following a disturbance that causes the river to have more energy and degrade or aggrade more sediment. Channels have been observed to pass through 5 to 9 evolution types. Once they pass though the suite of evolution stages, they will rest in a new state of equilibrium.

Non-Storm Water Discharges
Discharges are discharges that do not originate from precipitation events. They can include, but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.

Non-Visible Pollutants
Pollutants associated with a specific site or activity that can have a negative impact on water quality, but cannot be seen though observation (ex: chlorine). Such pollutants being discharged are not authorized.

Numeric Action Level (NAL)
Level is used as a warning to evaluate if best management practices are effective and take necessary corrective actions. Not an effluent limit.

Original Sample Material
The material (i.e., macroinvertebrates, organic material, gravel, etc.) remaining after the subsample has been removed for identification.

pH
Unit universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems.

Post-Construction BMPs
Structural and non-structural controls which detain, retain, or filter the release of pollutants to receiving waters after final stabilization is attained.

Preliminary Phase (Pre-Construction Phase - Part of the Grading and Land Development Phase)
Construction stage including rough grading and/or disking, clearing and grubbing operations, or any soil disturbance prior to mass grading.

Project

Qualified SWPPP Developer
Individual who is authorized to develop and revise SWPPPs.

Qualified SWPPP Practitioner
Individual assigned responsibility for non-storm water and storm water visual observations, sampling and analysis, and responsibility to ensure full compliance with the permit and implementation of all elements of the SWPPP, including the preparation of the annual compliance evaluation and the elimination of all unauthorized discharges.

Qualifying Rain Event
Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events.

R Factor
Erosivity factor used in the Revised Universal Soil Loss Equation (RUSLE). The R factor represents the erosivity of the climate at a particular location. An average annual value of R is determined from historical weather records using erosivity values determined for individual storms. The erosivity of an individual storm is computed as the product of the storm's total energy, which is closely related to storm amount, and the storm's maximum 30-minute intensity.

Rain Event Action Plan (REAP)
Written document, specific for each rain event, that when implemented is designed to protect all exposed portions of the site within 48 hours of any likely precipitation event.

Remaining Sub sampled Material
The material (e.g., organic material, gravel, etc.) that remains after the organisms to be identified have been removed from the subsample for identification. (Generally, no macroinvertebrates are present in the remaining subsampled material, but the sample needs to be checked and verified using a complete Quality Assurance (QA) plan)

Routine Maintenance
Activities intended to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Runoff Control BMPs
Measures used to divert runon from offsite and runoff within the site.

Run-on
Discharges that originate offsite and flow onto the property of a separate project site.

Revised Universal Soil Loss Equation (RUSLE)
Empirical model that calculates average annual soil loss as a function of rainfall and runoff erosivity, soil erodibility, topography, erosion controls, and sediment controls.

Sampling and Analysis Plan
Document that describes how the samples will be collected, under what conditions, where and when the samples will be collected, what the sample will be tested for, what test methods and detection limits will be used, and what methods/procedures will be maintained to ensure the integrity of the sample during collection, storage, shipping and testing (i.e., quality assurance/quality control protocols).

Sediment
Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation
Process of deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.

Sediment Control BMPs
Practices that trap soil particles after they have been eroded by rain, flowing water, or wind. They include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped (e.g., silt fence, sediment basin, fiber rolls, etc.).

Settleable Solids (SS)
Solid material that can be settled within a water column during a specified time frame. It is typically tested by placing a water sample into an Imhoff settling cone and then allowing the solids to settle by gravity for a given length of time. Results are reported either as a volume (mL/L) or a mass (mg/L) concentration.

Sheet Flow
Flow of water that occurs overland in areas where there are no defined channels where the water spreads out over a large area at a uniform depth.

Site

Soil Amendment
Any material that is added to the soil to change its chemical properties, engineering properties, or erosion resistance that could become mobilized by storm water.

Streets and Utilities Phase
Construction stage including excavation and street paving, lot grading, curbs, gutters and sidewalks, public utilities, public water facilities including fire hydrants, public sanitary sewer systems, storm sewer system and/or other drainage improvements.

Structural Controls
Any structural facility designed and constructed to mitigate the adverse impacts of storm water and urban runoff pollution

Suspended Sediment Concentration (SSC)
The measure of the concentration of suspended solid material in a water sample by measuring the dry weight of all of the solid material from a known volume of a collected water sample. Results are reported in mg/L.

Total Suspended Solids (TSS)
The measure of the suspended solids in a water sample includes inorganic substances, such as soil particles and organic substances, such as algae, aquatic plant/animal waste, particles related to industrial/sewage waste, etc. The TSS test measures the concentration of suspended solids in water by measuring the dry weight of a solid material contained in a known volume of a sub-sample of a collected water sample. Results are reported in mg/L.

Toxicity
The adverse response(s) of organisms to chemicals or physical agents ranging from mortality to physiological responses such as impaired reproduction or growth anomalies.

Turbidity
The cloudiness of water quantified by the degree to which light traveling through a water column is scattered by the suspended organic and inorganic particles it contains. The turbidity test is reported in Nephelometric Turbidity Units (NTU) or Jackson Turbidity Units (JTU).

Vertical Construction Phase
The Build out of structures from foundations to roofing, including rough landscaping.

Waters of the United States
Generally refers to surface waters, as defined by the federal Environmental Protection Agency in 40 C.F.R. § 122.2.[1]

Water Quality Objectives (WQO)
Water quality objectives are defined in the California Water Code as limits or levels of water quality constituents or characteristics, which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

[1] The application of the definition of “waters of the United States” may be difficult to determine; there are currently several judicial decisions that create some confusion. If a landowner is unsure whether the discharge must be covered by this General Permit, the landowner may wish to seek legal advice.

APPENDIX 6:
Acronym List

ASBS	Areas of Special Biological Significance
ASTM	American Society of Testing and Materials; Standard Test Method for Particle-Size Analysis of Soils
ATS	Active Treatment System
BASMAA	Bay Area Storm water Management Agencies Association
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
CAFO	Confined Animal Feeding Operation
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities
CIWQS	California Integrated Water Quality System
CKD	Cement Kiln Dust
COC	Chain of Custody
CPESC	Certified Professional in Erosion and Sediment Control
CPSWQ	Certified Professional in Storm Water Quality
CSMP	Construction Site Monitoring Program
CTB	Cement Treated Base
CTR	California Toxics Rule
CWA	Clean Water Act
CWC	California Water Code
CWP	Center for Watershed Protection
DADMAC	Diallyldimethyl-ammonium chloride
DDNR	Delaware Department of Natural Resources
DFG	Department of Fish and Game
DHS	Department of Health Services
DWQ	Division of Water Quality
EC	Electrical Conductivity
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
ESC	Erosion and Sediment Control
HSPF	Hydrologic Simulation Program Fortran
JTU	Jackson Turbidity Units
LID	Low Impact Development
LOEC	Lowest Observed Effect Concentration
LRP	Legally Responsible Person
LUP	Linear Underground/Overhead Projects

MATC	Maximum Allowable Threshold Concentration
MDL	Method Detection Limits
MRR	Monitoring and Reporting Requirements
MS4	Municipal Separate Storm Sewer System
MUSLE	Modified Universal Soil Loss Equation
NAL	Numeric Action Level
NEL	Numeric Effluent Limitation
NICET	National Institute for Certification in Engineering Technologies
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTR	National Toxics Rule
NTU	Nephelometric Turbidity Units
O&M	Operation and Maintenance
PAC	Polyaluminum chloride
PAM	Polyacrylamide
PASS	Polyaluminum chloride Silica/sulfate
POC	Pollutants of Concern
PoP	Probability of Precipitation
POTW	Publicly Owned Treatment Works
PRDs	Permit Registration Documents
PWS	Planning Watershed
QAMP	Quality Assurance Management Plan
QA/QC	Quality Assurance/Quality Control
REAP	Rain Event Action Plan
Regional Board	Regional Water Quality Control Board
ROWD	Report of Waste Discharge
RUSLE	Revised Universal Soil Loss Equation
RW	Receiving Water
SMARTS	Storm water Multi Application Reporting and Tracking System
SS	Settleable Solids
SSC	Suspended Sediment Concentration
SUSMP	Standard Urban Storm Water Mitigation Plan
SW	Storm Water
SWARM	Storm Water Annual Report Module
SWAMP	Surface Water Ambient Monitoring Program
SWMM	Storm Water Management Model
SWMP	Storm Water Management Program
SWPPP	Storm Water Pollution Prevention Plan
TC	Treatment Control
TDS	Total Dissolved Solids

TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USACOE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WDID	Waste Discharge Identification Number
WDR	Waste Discharge Requirements
WLA	Waste Load Allocation
WET	Whole Effluent Toxicity
WRCC	Western Regional Climate Center
WQBEL	Water Quality Based Effluent Limitation
WQO	Water Quality Objective
WQS	Water Quality Standard

APPENDIX 7:
State and Regional Water Resources Control Board Contacts

NORTH COAST REGION (1)
5550 Skylane Blvd, Ste. A
Santa Rose, CA 95403
(707) 576-2220 FAX: (707)523-0135

SAN FRANCISCO BAY REGION (2)
1515 Clay Street, Ste. 1400
Oakland, CA 94612
(510) 622-2300 FAX: (510) 622-2640

CENTRAL COAST REGION (3)
895 Aerovista Place, Ste 101
San Luis Obispo, CA 93401
(805) 549-3147 FAX: (805) 543-0397

LOS ANGELES REGION (4)
320 W. 4th Street, Ste. 200
Los Angeles, CA 90013
(213) 576-6600 FAX: (213) 576-6640

CENTRAL VALLEY REGION (5S)
11020 Sun Center Dr., #200
Rancho Cordova, CA 95670-6114
(916) 464-3291 FAX: (916) 464-4645

FRESNO BRANCH OFFICE (5F)
1685 E St.
Fresno, CA 93706
(559) 445-5116 FAX: (559) 445-5910

REDDING BRANCH OFFICE (5R)
364 Knollcrest Drive, Ste. 205
Redding, CA 96002
(530) 224-4845 FAX: (530) 224-4857

LAHONTAN REGION (6 SLT)
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
(530) 542-5400 FAX: (530) 544-2271

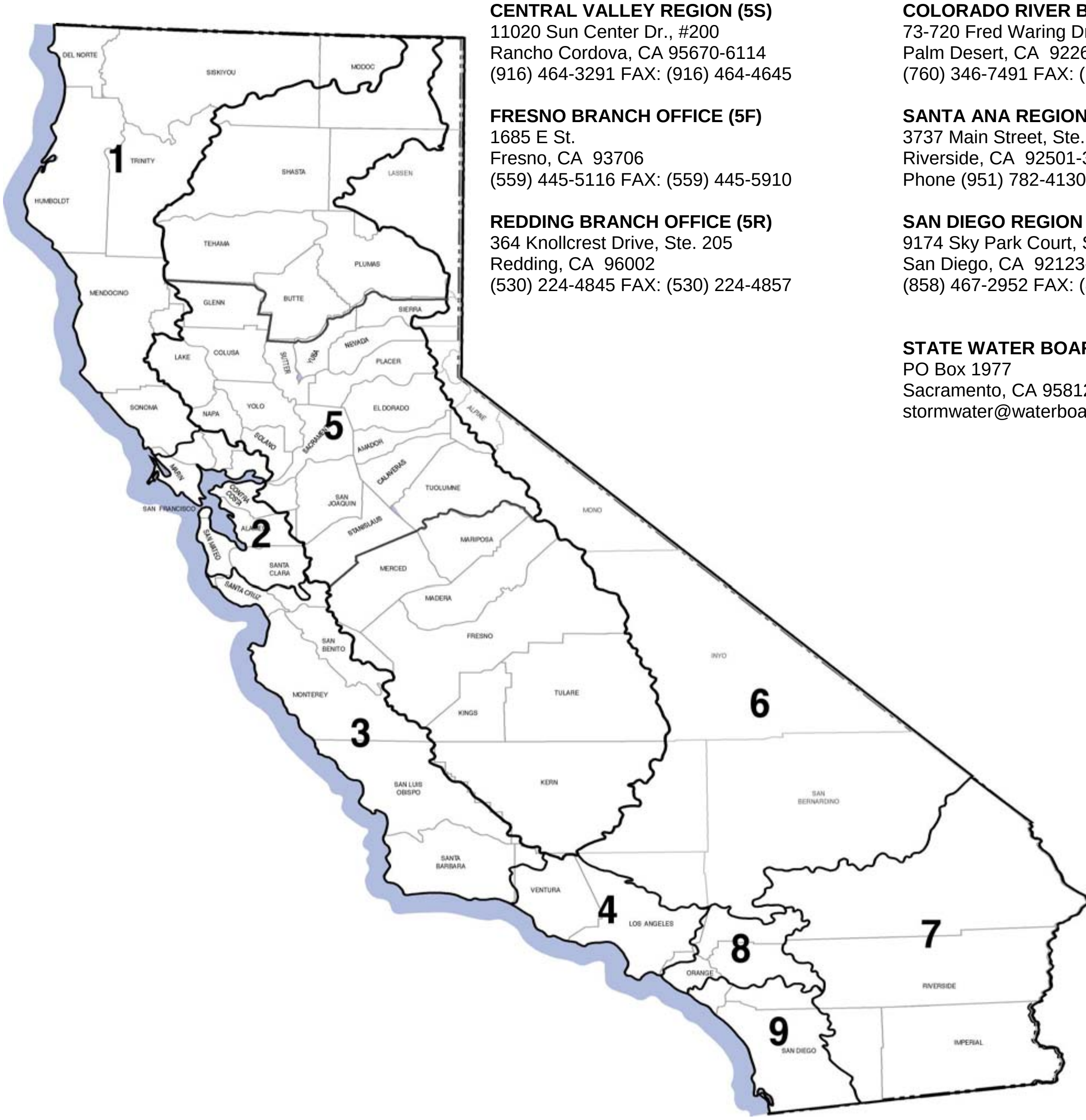
VICTORVILLE OFFICE (6V)
14440 Civic Drive, Ste. 200
Victorville, CA 92392-2383
(760) 241-6583 FAX: (760) 241-7308

COLORADO RIVER BASIN REGION (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491 FAX: (760) 341-6820

SANTA ANA REGION (8)
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
Phone (951) 782-4130 FAX: (951) 781-6288

SAN DIEGO REGION (9)
9174 Sky Park Court, Ste. 100
San Diego, CA 92123-4340
(858) 467-2952 FAX: (858) 571-6972

STATE WATER BOARD
PO Box 1977
Sacramento, CA 95812-1977
stormwater@waterboards.ca.gov

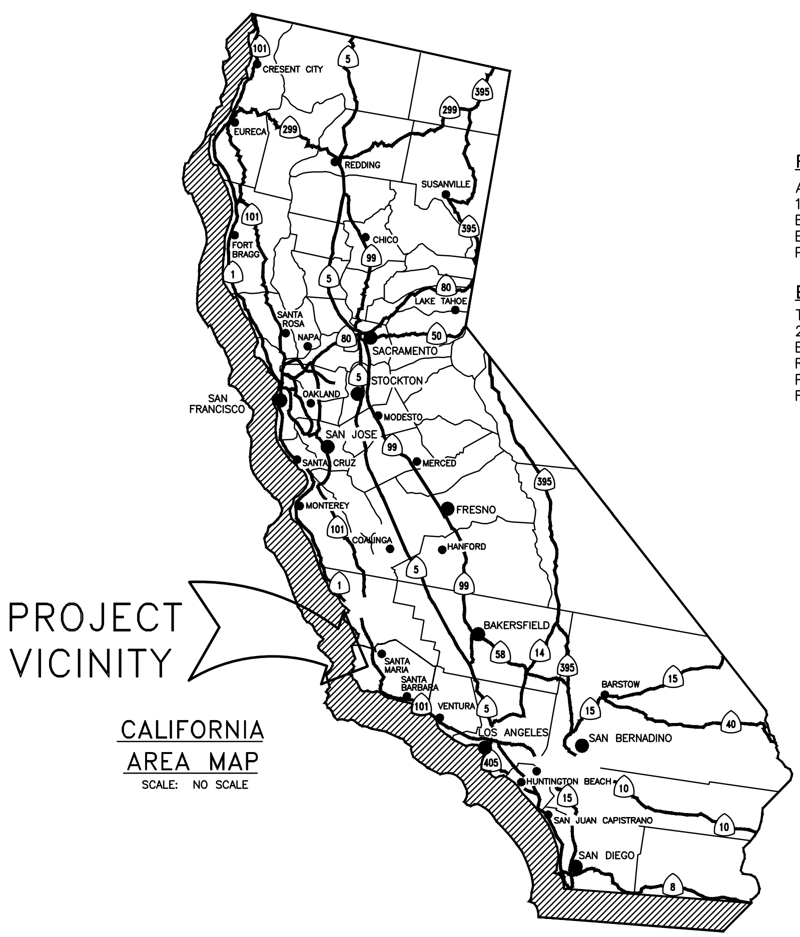


Appendix O: REFERENCED PLANS

List of Referenced Plans included in this appendix

- Civil Grading Plan Package Rev 1 prepared by TJ Cross Engineers dated 8/26/14.
- Civil Field Entrances Rev 1 prepared by TJ Cross Engineers dated 9/17/14
- Preliminary Hydrology Report Rev 0 prepared by TJ Cross Engineers dated 9/17/14
- Soil Beneficial Reuse Plan prepared by Padre Associated dated July 2014

TITLE SHEET/VICINITY MAP-CIVIL GRADING
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA



CALIFORNIA AREA MAP
SCALE: NO SCALE

PROJECT OWNER
AERA ENERGY LLC
10000 MING AVENUE
BAKERSFIELD, CA 93311
ENGINEER: ERIC PAULSON
PH.: 661-665-5359

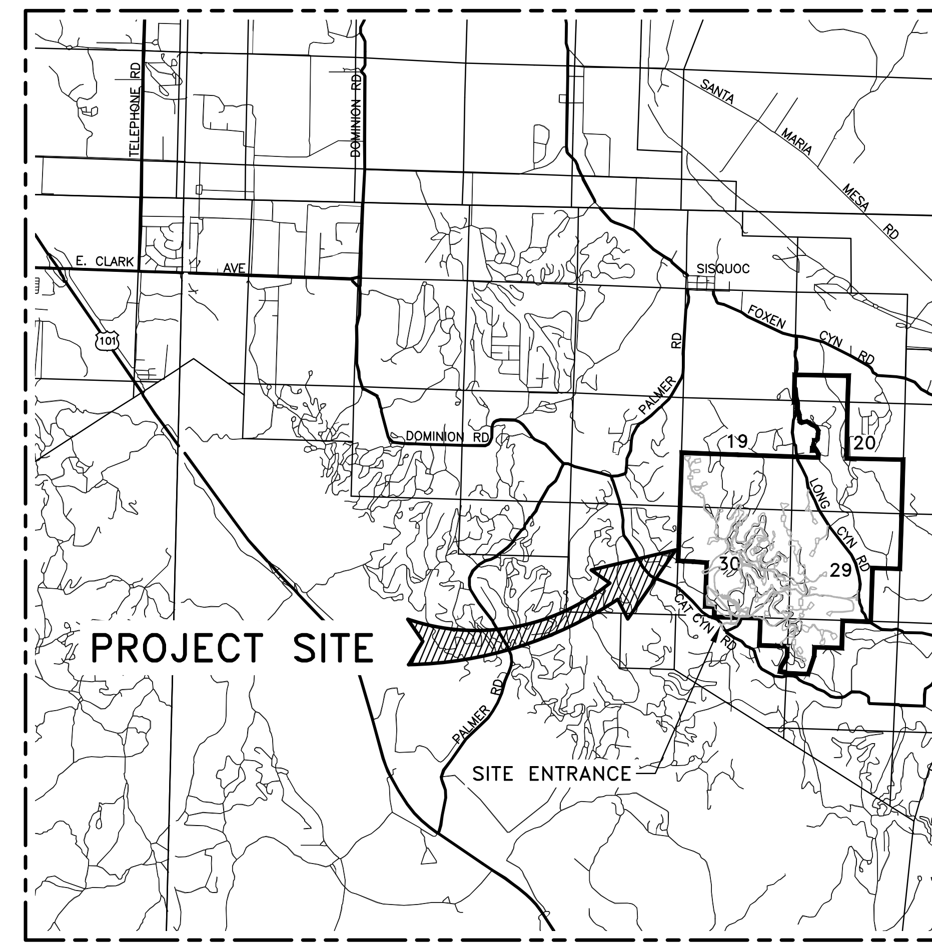
GEOTECH
FUGRO CONSULTANTS, INC.
4820 McGRATH STREET, SUITE 100
BAKERSFIELD, CALIFORNIA 93003
PH.: 805-650-7000
FAX: 805-650-7010

ENGINEER
T.J. CROSS ENGINEERS, INC.
200 NEW STINE ROAD, SUITE 270
BAKERSFIELD, CALIFORNIA 93309
ROBIN DICKERSON, P.E.
PH.: 661-831-8782 x217
FAX: 661-831-5019

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

NOTE:
PROJECT SITE IS LOCATED WITHIN AREA OF POTENTIAL H_2S GAS CONCENTRATIONS. ALL PERSONNEL, CONTRACTORS AND VISITORS MUST BE EQUIPPED WITH AN APPROPRIATE MONITORING DEVICE OR ACCOMPANIED BY AERA PERSONNEL.



VICINITY MAP
SCALE: NO SCALE

PROPERTY / PROJECT INFORMATION

PROJECT PURPOSE:	**GRADING FOR FIELD REDEVELOPMENT**
ADDRESS:	6516 CAT CANYON ROAD
APN:	129-210-017, 101-040-005, 101-040-006, 101-050-042, 101-040-011, 101-040-012, 101-040-013, 101-040-014, 101-050-013, 101-040-019, 101-040-020, 101-050-014, 101-070-007, 101-050-002
GRADING DESIGNATION:	ENGINEERED GRADING
EXCAVATION QUANTITY:	3,148,273 (CU. YDS.)
FILL QUANTITY:	3,108,167 (CU. YDS.)
DISTURBED AREA:	287.00 ACRES
DESIGN CODE:	CURRENT ISSUE OF SANTA BARBARA COUNTY GRADING & BUILDING CODE
ZONING:	ZONE "Ag-II-100 & AC" / AGRICULTURE & AGRICULTURAL COMMERCIAL
LAND USE DESIGNATION:	OIL AND GAS EXPLORATION AND PRODUCTION

REV 1

PROJECT LOCATION DESCRIPTION

FROM HIGHWAY 101, TAKE PALMER RD. NORTH APPROX. 4.5 MILES TO CAT CANYON RD. TURN RIGHT ON CAT CANYON RD. AND GO SOUTH APPROX. 1.8 MILES. TURN LEFT ONTO OIL FIELD ROAD AND GO PAST GATE AND TURN LEFT. GO NORTH APPROX. 0.25 MILES TO AREA FIELD OFFICE.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: NONE	FILE: 13186/072-13-001A
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/17/14	LAST CHANGED: 08/26/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/26/14	1	ISSUED FOR PERMIT (ADDED SLOPE KEY VOL.)	IDU	RSD	EP
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

TITLE SHEET/DRAWING INDEX/VICINITY MAP - CIVIL GRADING
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER: ERIC PAULSON	DATE: 08/26/14	SCALE: NONE
CO. ENGINEER: TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR: ALI GOKGOZ	NO. 072-13-001A	REV. 1
DESIGNED BY: ROBIN DICKERSON		
DRAFTED BY: ROBERT AMARO		
ECCN NO. EAR99	CAD FILE NO. 072-13-001A	

:FUNCTIONAL LOCATION NO.

DRAWING INDEX

FILE NO.	REV.	DESCRIPTION
072-13-001A	1	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING
072-13-001B	1	TITLE SHEET/DRAWING INDEX – CIVIL
072-13-002A	1	CONSTRUCTION NOTES
072-13-002B	1	CONSTRUCTION NOTES – SANTA BARBARA
072-13-003A	0	SITE LOCATION PLAN
072-13-004A	1	GRADING PLAN – FIELD DEVELOPMENT
072-13-004B	0	GRADING PLAN – CENTRAL PROCESSING PLANT
072-13-004C	0	GRADING PLAN – PRODUCTION GROUP STATION
072-13-004D	0	GRADING PLAN – STEAM PLANT
072-13-004E	0	GRADING PLAN – OFFICE/WAREHOUSE SITE
072-13-004F	0	GRADING PLAN – TYPICAL PAD IN-CUT
072-13-004G	0	GRADING PLAN – TYPICAL PAD IN-FILL
072-13-005A	0	GRADING SECTIONS – FIELD DEVELOPMENT
072-13-005B	0	GRADING SECTIONS – FIELD DEVELOPMENT
072-13-005C	0	GRADING SECTIONS – CENTRAL PROCESSING PLANT
072-13-005D	0	GRADING SECTIONS – PRODUCTION GROUP STATION
072-13-005E	0	GRADING SECTIONS – STEAM PLANT
072-13-005F	0	GRADING SECTIONS – OFFICE/WAREHOUSE SITE
072-13-005G	0	GRADING SECTIONS – TYPICAL PAD IN CUT & FILL
072-13-006A	0	PAVING PLAN – CENTRAL PROCESSING PLANT/OFFICE/MULTIPURPOSE BUILDING
072-13-006B	0	PAVING PLAN – PRODUCTION GROUP STATION
072-13-006C	0	PAVING PLAN – STEAM PLANT
072-13-006D	0	PAVING PLAN – FIELD DEVELOPMENT
072-13-006E	0	PAVING PLAN – FIELD DEVELOPMENT
072-13-006F	0	PAVING PLAN – FIELD DEVELOPMENT
072-13-006G	0	PAVING PLAN – FIELD DEVELOPMENT
072-13-007A	0	PAVING DETAILS
072-13-008A	0	GRADING DETAILS
072-13-008B	0	GRADING DETAILS
072-13-009A	0	EROSION CONTROL PLAN – CENTRAL PROCESSING PLANT/OFFICE/MULTIPURPOSE BUILDING
072-13-009B	0	EROSION CONTROL PLAN – PRODUCTION GROUP STATION
072-13-009C	0	EROSION CONTROL PLAN – STEAM PLANT
072-13-009D	0	EROSION CONTROL PLAN – PAD IN CUT (TYP.)
072-13-009E	0	EROSION CONTROL PLAN – PAD IN FILL (TYP.)

REV 1

REV 1

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: NONE
FILE: 13186/072-13-001B
PLOT AT: 1=1
LAYER(S):
ENGINEER: RSD
CHANGED BY: IDU
DATE STARTED: 05/09/14
LAST CHANGED: 08/26/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
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08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

TITLE SHEET/DRAWING INDEX – CIVIL
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ROBERT AMARO
ECCN NO. EAR99
ORIGINAL DWG NO.
DATE: 08/26/14 SCALE: NONE
NO. 072-13-001B REV. 1
CAD FILE NO. 072-13-001B

:FUNCTIONAL LOCATION NO.

CONSTRUCTION NOTES

SITE PREPARATION AND GRADING PLAN

ESTIMATED CONSTRUCTION QUANTITIES:
AREA DISTURBED – 287.0 ACRES
EXCAVATION – 3,148,273 CUBIC YARDS
FILL – 3,108,167 CUBIC YARDS REV 1
* INCLUDES 30% SHRINKAGE

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. CONTRACTOR SHALL CALCULATE THE EARTHWORK QUANTITIES TO THEIR SATISFACTION PRIOR TO START OF CONSTRUCTION OR BIDDING. CONSOLIDATION, LOSSES DUE TO CLEARING OPERATIONS, UTILITY TRENCHES, SUBGRADE STABILIZATION, OR FACTORS FOR GRADING MEANS AND METHODS ARE NOT INCLUDED AND EARTHWORK QUANTITIES MAY VARY ACCORDING TO THESE FACTORS.
C. EARTHWORK VOLUMES DO NOT INCLUDE OVEREXCAVATION OR SCARIFICATION.

1. EQUIPMENT, SERVICES AND MATERIALS BY CONTRACTOR

CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND SUPERVISION NECESSARY TO PERFORM THE WORK SHOWN ON THE PLANS WHICH INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:

A. EXCAVATION, BACKFILL AND COMPACTION.
B. WATER FOR MOISTURE CONDITIONING AND DUST CONTROL.
C. MEASURES NECESSARY TO PREVENT EROSION AND PONDING.
D. ALL SURVEYING ASSOCIATED WITH THIS WORK.

2. EQUIPMENT, SERVICES AND MATERIAL PROVIDED BY AERA APPROVED CONTRACTOR.

A. MATERIAL FOR USE AS ENGINEERED FILL.
B. ALL SOILS TESTING.

3. CODES AND STANDARDS

CONTRACTOR SHALL PERFORM AND COMPLETE CONSTRUCTION IN COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL CODES, LAWS, ORDINANCES AND REGULATIONS.

A. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

- D–1556 DENSITY OF SOIL IN PLACE BY SAND–CONE METHOD.
- D–1557 MOISTURE–DENSITY RELATIONSHIP OF SOIL AND SOIL–AGGREGATE MIXTURES USING A 10–LB. HAMMER AND 18–INCH DROP.
- D–2937 DENSITY OF SOIL IN PLACE BY THE DRIVE CYLINDER METHOD.
- D–3017 MOISTURE CONTENT OF SOIL AND SOIL–AGGREGATE MIXTURES IN PLACE BY NUCLEAR METHOD.
- D–6938 DENSITY OF SOIL AND SOIL–AGGREGATE MIXTURES IN PLACE BY NUCLEAR METHOD.

B. SANTA BARBARA COUNTY CODE.

- CHAPTER 10 BUILDING CODE (ORDINANCE # 4766).
- CHAPTER 14 GRADING CODE (ORDINANCE # 4776).
- CHAPTER 25 PETROLEUM CODE (ORDINANCE # 9794).
- CHAPTER 35 ZONING SECTION 35–1 COUNTY LAND USE & DEVELOPMENT CODE.

C. 2013 CALIFORNIA BUILDING CODE.

D. IN ADDITION TO THE REQUIREMENTS SPECIFIED IN THESE DRAWINGS, THE CONTRACTOR SHALL REFER TO THE "GEOTECHNICAL ENGINEERING INVESTIGATION" REPORT PROVIDED BY FUGRO COONSULTANTS, INC. PROJECT NO. 04.62130155, DATED JANUARY 10, 2014.

4. GENERAL PROVISIONS REQUIRED OF CONTRACTOR

A. PROTECTION OF EXISTING FACILITIES

- EXISTING COMPANY FACILITIES SHALL BE PROTECTED.IF DAMAGED BY CONTRACTOR, FACILITIES SHALL BE REPAIRED AND/OR RESTORED AT CONTRACTOR'S EXPENSE.
- COMPANY RESERVES THE RIGHT TO ENTER THE SITE TO MAKE ANY REPAIRS OR ALTERATIONS TO EXISTING EQUIPMENT.
- EXTREME CARE SHALL BE EXERCISED WHEN EXCAVATING AT THIS SITE. UNDERGROUND UTILITIES ENCOUNTERED DURING EXCAVATION SHALL BE BROUGHT TO THE ATTENTION OF COMPANY REPRESENTATIVE. THESE FACILITIES SHALL NOT BE DISTURBED UNTIL INSTRUCTION IS RECEIVED FROM COMPANY REPRESENTATIVE.

B. SAFETY

- CONTRACTOR SHALL PROVIDE PROTECTIVE EQUIPMENT AND ENSURE THAT THIS EQUIPMENT IS PROPERLY USED WHEN REQUIRED.AT A MINIMUM, HARD HATS, SAFETY SHOES, AND SAFETY GLASSES WITH SIDE SHIELDS SHALL BE WORN AT ALL TIMES ON THE CONSTRUCTION SITE.
- WORK SHALL BE PERFORMED ACCORDING TO THE TERMS AND CONDITIONS OF THE CONTRACT AND APPLICABLE STATE AND FEDERAL REGULATIONS.
- EXTREME CARE MUST BE EXERCISED WHEN OPERATING ANY EQUIPMENT NEAR OVERHEAD POWER LINES.CONTRACTOR MUST NOT ALLOW ANY EQUIPMENT OR PERSONNEL TO OPERATE NEAR ANY OVERHEAD POWER LINE.
- EXCAVATING MUST BE ACCOMPLISHED SO AS TO AVOID ALL UNDERGROUND UTILITIES AND LINES.
- THE SIZE, NUMBER, LOCATION AND DEPTH OF ANY BURIED UTILITIES SHOWN ON THE DRAWINGS ARE BASED ON THE BEST INFORMATION AVAILABLE, EXTREME CARE SHALL BE TAKEN DURING EXCAVATION AS LOCATION AND DEPTH ALLOWANCES MAY NOT BE SHOWN ON THE SOURCE PLANS FOR THIS DRAWING.
- NO PERSON SHALL ENTER ANY EXCAVATION UNLESS PROTECTED FROM CAVE–INS IN ACCORDANCE WITH THE REQUIREMENTS OF "CFR 29 (OSHA), PART 1926.652 (REQUIREMENTS FOR PROTECTIVE SYSTEMS)" AND "OCR TITLE 8 (Aloha) SECTION 1541.1 (REQUIREMENTS FOR PROTECTIVE SYSTEMS)". DESIGN OF THE PROTECTIVE SYSTEM SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- IN EXCAVATION AREAS IMMEDIATELY ADJACENT TO EXISTING FOUNDATIONS WHERE VERTICAL CUT SIDE SLOPES ARE REQUIRED, EXCAVATION WIDTH SHALL NOT EXCEED 7'. THESE AREAS SHALL BE BACKFILLED AS SOON AS POSSIBLE TO MINIMIZE EXPOSURE OF THE EXISTING FOUNDATION(S). IF THESE AREAS ARE LEFT UNATTENDED AT ANY POINT DURING THE EXCAVATION OR BACKFILL, THE AREA SHALL BE CORDONED OFF WITH CAUTION TAPE AND BARRICADES TO PREVENT UNAUTHORIZED ACCESS.

C. INJURIES

- CONTRACTOR SHALL IMMEDIATELY NOTIFY COMPANY REPRESENTATIVES OF ANY INJURY OCCURRING ON COMPANY PROPERTY. A WRITTEN REPORT CONCERNING THE INJURY SHALL BE PROVIDED TO COMPANY WITHIN 24 HOURS OF OCCURRENCE OF INJURY.
- CONTRACTOR SHALL PROVIDE ALL FIRST AID AND EMERGENCY TREATMENT, AMBULANCE, HOSPITAL SERVICES, ETC. FOR ANY INJURY OCCURRING TO HIS EMPLOYEES ON COMPANY PROPERTY.

D. PERSONNEL FACILITIES

- CONTRACTOR SHALL PROVIDE ALL FACILITIES REQUIRED FOR HIS PERSONNEL.THESE FACILITIES INCLUDE PORTABLE TOILETS, DRINKING WATER,CLEAN–UP FACILITIES, ETC.

E. GRADES, LINES, LEVELS AND BENCHMARKS REFERENCES

- SITE BENCHMARKS ARE PROVIDED TO THE CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING PROPER ELEVATIONS AND HORIZONTAL OFFSETS AS REFERENCED TO THE BENCHMARKS.
- CONTRACTOR SHALL LAYOUT ALL WORK, ESTABLISH MARKERS, STAKES, ETC. AND BE RESPONSIBLE FOR THEIR ACCURACY. COMPANY MAY CHOOSE TO USE AN INDEPENDENT SURVEYOR TO CHECK CONTRACTOR'S WORK.

F. COMPANY OPERATION OF EXISTING FACILITIES

- COMPANY INTENDS TO OPERATE EXISTING EQUIPMENT AND FACILITIES IN THE VICINITY OF THE SITE DURING CONSTRUCTION.CONTRACTOR SHALL COORDINATE HIS WORK WITH COMPANY FIELD OPERATIONS THROUGH COMPANY REPRESENTATIVE.
- CONTRACTOR SHALL COORDINATE AND FULLY COOPERATE WITH ANY TESTING AGENCY TO ENSURE ALL TESTS ARE COMPLETED AND DOCUMENTED IN A TIMELY AND EFFICIENT MANNER.

5. GRADING AND EXCAVATION – CIVIL

A. GENERAL GRADING

- ELEVATIONS PRESENTED ON THE DRAWINGS INDICATE FINAL GRADE ELEVATIONS. FINAL GRADED SURFACE SHALL BE SLOPED UNIFORMLY BETWEEN SUCH POINTS AND NATURAL GRADE.
- TOLERANCES FROM FINAL GRADE SHALL BE +–0.1 FOOT. IN NO CASE HOWEVER SHOULD FINAL GRADE ALLOW PONDING OR DRAINAGE IF NOT INDICATED ON THE PLANS.
- ALL DEBRIS, VEGETATION, ROCK AND LUMPS GREATER THAN 3 INCHES IN ITS LARGEST DIMENSION AND OTHER OBJECTIONABLE MATERIAL SHALL BE COLLECTED, PILED AND DISPOSED OF BY THE CONTRACTOR SO AS TO LEAVE THE AREAS THAT HAVE BEEN CLEARED WITH A NEAT AND FINISHED APPEARANCE. SITE STRIPPING SHALL EXTEND TO A MIN. DEPTH OF 4–INCHES, OR UNTIL ALL ORGANICS IN EXCESS OF 3% BY VOLUME HAS BEEN REMOVED.

B. GRADING INSPECTION

- PROFESSIONAL INSPECTION OF GRADING OPERATIONS AS REQUIRED IN THESE SPECIFICATIONS SHALL BE PROVIDED BY A CALIFORNIA REGISTERED CIVIL ENGINEER AND REGISTERED SOILS ENGINEER.
- A REGISTERED CIVIL ENGINEER SHALL INSPECT SITE AT COMPLETION OF ALL GRADING ACTIVITIES.
- GRADING OPERATIONS FOR WHICH A PERMIT IS REQUIRED SHALL BE SUBJECT TO INSPECTION BY A GRADING OFFICIAL.
- BUILDING PADS SHALL HAVE A DRAINAGE GRADIENT OF 2 PERCENT TOWARD APPROVED DRAINAGE FACILITIES, UNLESS WAIVED BY A GRADING OFFICIAL.

C. EXCAVATIONS

- EXCAVATIONS SHALL BE PERFORMED IN A MANNER TO ASSURE DRAINAGE DURING THE COURSE OF THE WORK. FLOODED EXCAVATIONS SHALL BE DEWATERED AND ALL MUCK REMOVED BEFORE PROCEEDING WITH WORK.
- AFTER EXCAVATION, SCARIFY THE ENTIRE AREA EXPOSED TO A 6–INCH DEPTH, MOISTURE CONDITION OF 0–3% ABOVE OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D–1557 AND RECOMPACT TO A MINIMUM OF 95% PRIOR TO PLACEMENT OF ENGINEERED FILL.
- OVER–EXCAVATE EXISTING SOIL IN LOCATIONS WHERE UNSUITABLE MATERIAL EXISTS AS DIRECTED BY THE COMPANY REPRESENTATIVE AND SOILS ENGINEER. MOISTURE CONDITION OF 0–3% ABOVE OPTIMUM MOISTURE CONTENT AND BACKFILL WITH ENGINEERED FILL COMPACTED TO A MINIMUM 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D–1557.
- SOILS ENGINEER SHALL INSPECT THE BOTTOM OF EXCAVATION PRIOR TO PLACEMENT OF BACKFILL. FINAL DEPTH OF EXCAVATION TO BE DETERMINED BY SOILS ENGINEER. CIVIL ENGINEER AND SOILS ENGINEER SHALL INSPECT SITE AT COMPLETION OF ALL GRADING ACTIVITIES.

6. FILLS

A. PREPARATION OF GROUND

- FILL SLOPES SHALL NOT BE CONSTRUCTED ON NATURAL SLOPES STEEPER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50% SLOPE).THE GROUND SURFACE SHALL BE PREPARED TO RECEIVE FILL BY REMOVING VEGETATION, NON–COMPLYING FILL, TOPSOIL AND OTHER UNSUITABLE MATERIALS SCARIFYING TO PROVIDE A BOND WITH NEW FILL AND, WHERE SLOPES ARE STEEPER THAN 1 UNIT VERTICAL IN 5 UNITS HORIZONTAL (20% SLOPE) AND THE HEIGHT IS GREATER THAN 5 FEET, BY BENCHING INTO SOUND BEDROCK OR OTHER COMPETENT MATERIAL AS DETERMINED BY THE SOILS ENGINEER. THE BENCH UNDER THE TOE OF A FILL ON A SLOPE STEEPER THAN 1 UNIT VERTICAL IN 5 UNITS HORIZONTAL (20% SLOPE) SHALL BE AT LEAST 10 FEET WIDE. FIVE FEET OF THE LOWERMOST BENCH SHALL BE EXPOSED BEYOND THE TOE OF HILLSIDE FILLS. THE AREA BEYOND THE TOE OF FILL SHALL BE SLOPED FOR SHEET OVERFLOW OR A PAVED DRAIN SHALL BE PROVIDED. WHEN FILL IS TO BE PLACED OVER A CUT, THE BENCH UNDER THE TOE OF FILL SHALL BE AT LEAST 10 FEET WIDE. THE CUT SHALL BE MADE BEFORE PLACING THE FILL AND THE CUT SHALL BE APPROVED BY THE SOILS ENGINEER OR ENGINEERING GEOLOGIST OR BOTH AS A SUITABLE FOUNDATION FOR FILL.

B. FILL MATERIAL & PLACEMENT

- ALL IMPORTED FILL MATERIAL SHALL BE APPROVED BY THE SOIL ENGINEER PRIOR TO PLACEMENT AT THE SITE.
- DETRIMENTAL AMOUNTS OF ORGANIC MATERIAL SHALL NOT BE PERMITTED IN FILLS. EXCEPT AS PERMITTED BY THE GRADING OFFICIAL, NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL WITH A MAXIMUM DIMENSION GREATER THAN 3 INCHES SHALL BE BURIED OR PLACED IN FILLS.
- PLACE FILL SOIL IN CONTINUOUS HORIZONTAL LOOSE LIFTS APPROXIMATELY 6 INCHES THICK. DO NOT PLACE FILL UNTIL REMOVAL OF UNSUITABLE MATERIAL HAS BEEN INSPECTED AND APPROVED BY THE SOIL ENGINEER.

C. COMPACTION

- FILL SHALL BE MOISTURE–CONDITIONED 0–3% ABOVE OPTIMUM MOISTURE CONTENT, AND COMPACTED TO AT LEAST 90% MAXIMUM, DENSITY BASED ON ASTM D–1557.

D. SLOPES

- THE SLOPE OF FILL SURFACES SHALL BE NO STEEPER THAN IS SAFE FOR THE INTENDED USE. FILL SLOPES SHALL BE NO STEEPER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50% SLOPE).
- WHERE EXISTING SLOPES ARE STEEPER THAN 5 HORIZONTAL:1 VERTICAL AND THE HEIGHT IS GREATER THAN 5 FEET, THE SURFACE SHALL BE PREPARED FOR FILL BY BENCHING INTO COMPETENT MATERIAL AS DETERMINED BY THE SOILS ENGINEER.

7. DRAINAGE AND TERRACING

- UNLESS OTHERWISE INDICATED ON THE APPROVED GRADING PLAN, DRAINAGE FACILITIES AND TERRACING SHALL CONFORM TO THE PROVISIONS OF CHAPTER 14 (SANTA BARBARA COUNTY GRADING CODE)FOR CUT OR FILL SLOPES STEEPER THAN 1 UNIT VERTICAL IN 3 UNITS HORIZONTAL (33.3% SLOPE).
- TERRACES AT LEAST 8 FEET IN WIDTH SHALL BE ESTABLISHED AT NOT MORE THAN 25–FOOT VERTICAL INTERVALS ON ALL CUT OR FILL SLOPES TO CONTROL SURFACE DRAINAGE AND DEBRIS EXCEPT THAT WHERE ONLY ONE TERRACE IS REQUIRED, IT SHALL BE AT MID–HEIGHT. NO FILL SLOPE SHALL EXCEED A VERTICAL HEIGHT OF ONE HUNDRED FEET UNLESS HORIZONTAL BENCHES WITH A MINIMUM WIDTH OF THIRTY FEET ARE INSTALLED AT EACH ONE HUNDRED FEET VERTICAL HEIGHT.

8. EROSION, DUST, AND RUNOFF CONTROL

A. EROSION CONTROL MEASURES

- THE FACES OF CUT AND FILL SLOPES SHALL BE PREPARED AND MAINTAINED TO CONTROL AGAINST EROSION. SLOPE PROTECTION SHALL BE INSTALLED AS SOON AS PRACTICABLE AND PRIOR TO CALLING FOR FINAL APPROVAL.
- WHERE REQUIRED, CONTRACTOR SHALL PROVIDE SUFFICIENT EROSION CONTROL MEASURES INCLUDING, BUT NOT LIMITED TO, INSTALLATION OF ENERGY DISSIPATING RIP–RAP, SILT FENCING AND/OR HAY BALES.
- A STORM WATER POLLUTION PREVENTION PLAN HAS BEEN PREPARED FOR PHASE 1 OF THIS PROJECT. THE WDID # (WILL BE OBTAINED). THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN THE SWPPP.
- CONSTRUCTION WITHIN BLUE LINE CHANNELS SHALL NOT BE PERMITTED DURING THE RAINY SEASON (OCT. 15 TO APRIL 15).

B. DUST CONTROL MEASURES

- CONTRACTOR SHALL IMPLEMENT DUST CONTROL MEASURES, WHICH CONSIST OF WATER SPRAYING ALL GRADED AREAS AND ROADWAYS TO ALLEVIATE OR PREVENT DUST NUISANCE.

C. RUNOFF CONTROL MEASURES

- ALL STORMWATER TO BE RETAINED ON SITE DURING CONSTRUCTION. IMPLEMENT RUNOFF CONTROL AS INDICATED ON PLANS AND IN ACCORDANCE WITH SANTA BARBARA COUNTY GRADING ORDINANCE.

9. PAVEMENTS

A. ASPHALTIC CONCRETE (AC)

- 1/2" OR 3/4" MAXIMUM, PG64–10 OR PG70–10 TYPE A OR B PER SECTION 39 "ASPHALT CONCRETE" STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATION, MAY 2010.
- MIX DESIGN SHALL BE SUBMITTED TO ENGINEER OF RECORD FOR APPROVAL.

B. AGGREGATE BASE

- CLASS 2 AGGREGATE BASE SHALL BE PER SECTION 26 "AGGREGATE BASE", STATE OF CALIFORNIA, STANDARD SPECIFICATION, MAY 2010.
- USE EITHER 1 1/2" OR 3/4" AGGREGATE GRADING.

C. CLASS 2 RIP–RAP

- NO MORE THAN 10% OF THE STONE WILL HAVE A DIAMETER GREATER THAN SIXTEEN (16) INCHES; NO MORE THAN 50% OF THE STONE WILL HAVE A DIAMETER LESS THAN TWELVE (12) INCHES; AND NO MORE THAN 10% OF THE STONE WILL HAVE A DIAMETER OF LESS THAN SIX (6) INCHES. THE THICKNESS OF THE RIP–RAP LINER WILL BE NO LESS THAN EIGHTEEN (18) INCHES.

NOT ISSUED FOR CONSTRUCTION

THIS IS FOR LAND USE PERMIT ONLY

DWG NUMBER	TITLE
072–013–003A	SITE LOCATION PLAN
072–013–001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
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AERA

CONSTRUCTION NOTES
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/26/14	SCALE: NONE
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072–13–002A	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072–13–002A	

:FUNCTIONAL LOCATION NO.

GRADING NOTES

SANTA BARBARA COUNTY
STANDARD GRADING NOTES

1. ALL GRADING SHALL CONFORM WITH SANTA BARBARA COUNTY CODE CHAPTER 14 AND STANDARDS AND REQUIREMENTS PERTAINING THERETO, THESE CONSTRUCTION DRAWINGS AND THE RECOMMENDATIONS OF THE SOILS ENGINEER AND ENGINEERING GEOLOGIST.

2. CONTRACTOR TO NOTIFY THE COUNTY GRADING INSPECTOR AND SOILS LABORATORY AT LEAST 48 HOURS BEFORE START OF GRADING WORK OR ANY PRE-CONSTRUCTION MEETING.

3. CONTRACTOR SHALL EMPLOY ALL LABOR, EQUIPMENT AND METHODS REQUIRED TO PREVENT HIS OPERATIONS FROM PRODUCING DUST IN AMOUNTS DAMAGING TO ADJACENT PROPERTY, CULTIVATED VEGETATION AND DOMESTIC ANIMALS OR CAUSING A NUISANCE TO PERSONS OCCUPYING BUILDINGS IN THE VICINITY OF THE JOB SITE. CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE CAUSED BY DUST FROM HIS GRADING OPERATION.

4. BEFORE BEGINNING WORK REQUIRING EXPORTING OR IMPORTING OF MATERIALS, THE CONTRACTOR SHALL OBTAIN APPROVAL FROM PUBLIC WORKS ROAD DIVISION FOR HAUL ROUTES USED AND METHODS PROVIDED TO MINIMIZE THE DEPOSIT OF SOILS ON COUNTY ROADS. GRADING/ROAD INSPECTORS SHALL MONITOR THIS REQUIREMENT WITH THE CONTRACTOR.

5. THE GEOTECHNICAL ENGINEER SHALL PROVIDE OBSERVATION AND TESTING DURING GRADING OPERATIONS IN THE FIELD AND SHALL SUBMIT A FINAL REPORT STATING THAT ALL EARTHWORK WAS PROPERLY COMPLETED AND IS IN SUBSTANTIAL CONFORMANCE WITH THE REQUIREMENTS OF THE GRADING ORDINANCE.

6. AREAS TO BE GRADED SHALL BE CLEARED OF ALL VEGETATION INCLUDING ROOTS AND OTHER UNSUITABLE MATERIAL FOR A STRUCTURAL FILL, THEN SCARIFIED TO A DEPTH OF 6" PRIOR TO PLACING OF ANY FILL. CALL GRADING INSPECTOR FOR INITIAL INSPECTION.

7. A THOROUGH SEARCH SHALL BE MADE FOR ALL ABANDONED MAN-MADE FACILITIES SUCH AS SEPTIC TANK SYSTEMS, FUEL OR WATER STORAGE TANKS, AND PIPELINES OR CONDUITS. ANY SUCH FACILITIES ENCOUNTERED SHALL BE REMOVED AND THE DEPRESSION PROPERLY FILLED AND COMPACTED UNDER OBSERVATION OF THE GEOTECHNICAL ENGINEER.

8. AREAS WITH EXISTING SLOPES WHICH ARE TO RECEIVE FILL MATERIAL SHALL BE KEYED AND BENCHED. THE DESIGN AND INSTALLATION OF THE KEYWAY SHALL BE PER THE GEOTECHNICAL ENGINEER'S RECOMMENDATION OR PER COUNTY STANDARD DETAIL NO. G-13.

9. FILL MATERIAL SHALL BE SPREAD IN LIFTS NOT EXCEEDING 6" IN COMPACTED THICKNESS, MOISTENED OR DRIED AS NECESSARY TO NEAR OPTIMUM MOISTURE CONTENT AND COMPACTED BY AN APPROVED METHOD. FILL MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 90% MAXIMUM DENSITY AS DETERMINED BY 1957 ASTM D-1557-91 MODIFIED PROCTOR (AASHO) TEST OR SIMILAR APPROVED METHODS. SOME FILL AREAS MAY REQUIRE COMPACTION TO A GREATER DENSITY IF CALLED FOR IN THE CONSTRUCTION DOCUMENTS. SOIL TESTS SHALL BE CONDUCTED AT NOT LESS THAN ONE TEST FOR EACH 18" OF FILL AND/OR FOR EACH 500 CUBIC YARDS OF FILL PLACED.

10. CUT SLOPES SHALL NOT EXCEED A GRADE OF 1 1/2 HORIZONTAL TO 1 VERTICAL. FILL AND COMBINATION FILL AND CUT SLOPES SHALL NOT EXCEED 2 HORIZONTAL TO 1 VERTICAL. SLOPES OVER THREE FEET IN VERTICAL HEIGHT SHALL BE PLANTED WITH APPROVED PERENNIAL OR TREATED WITH EQUALLY APPROVED EROSION CONTROL MEASURES PRIOR TO FINAL INSPECTION.

11. SURFACE DRAINAGE SHALL BE PROVIDED AT A MINIMUM OF 2% FOR 5 FEET AWAY FROM THE FOUNDATION LINE OR ANY STRUCTURE.

12. ALL TREES THAT ARE TO REMAIN ON SITE SHALL BE TEMPORARILY FENCED AND PROTECTED AROUND THE DRIP LINE DURING GRADING OPERATION.

13. AN EROSION AND SEDIMENT CONTROL PLAN SHALL BE REQUIRED AS PART OF THE GRADING PLAN AND PERMIT REQUIREMENTS.

14. "BEST MANAGEMENT PRACTICES FOR CONSTRUCTION ACTIVITIES: ERODED SEDIMENTS AND OTHER POLLUTANTS MUST BE RETAINED ONSITE AND MAY NOT BE TRANSPORTED FROM SITE VIA SHEET FLOW, SWALES, AREA DRAINS, NATURAL DRAINAGE COURSES, OR WIND. STOCKPILES OF EARTH AND OTHER CONSTRUCTION RELATED MATERIALS MUST BE PROTECTED FROM BEING TRANSPORTED FROM THE SITE BY THE FORCES OF WIND OR WATER. FUELS, OILS, SOLVENTS, AND OTHER TOXIC MATERIALS MUST BE STORED IN ACCORDANCE WITH THEIR LISTING AND ARE NOT TO CONTAMINATE THE SOIL AND SURFACE WATERS. ALL APPROVED STORAGE CONTAINERS ARE TO BE PROTECTED FROM WEATHER. SPILLS MAY NOT BE WASHED INTO THE DRAINAGE SYSTEM. EXCESS OR WASTE CONCRETE MAY NOT BE WASHED INTO PUBLIC WAY OR NAY OTHER DRAINAGE SYSTEM. PROVISIONS MUST BE MADE TO RETAIN CONCRETE WASTE ON SITE UNTIL THEY CAN BE DISPOSED AS SOLID WASTE. TRASH AND CONSTRUCTION RELATED SOLID WASTE MUST BE DEPOSITED INTO A COVERED WASTE RECEPTACLE TO PREVENT CONTAMINATION OF RAINWATER AND DISPERSAL BY WIND. SEDIMENTS AND OTHER MATERIAL MAY NOT BE TRACKED FROM TO THE SITE BY VEHICLE TRAFFIC. THE CONSTRUCTION ENTRANCE ROADWAY MUST BE STABILIZED AS TO INHIBIT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC WAY. ACCIDENTAL DEPOSITION MUST BE SWEPT UP IMMEDIATELY AND MAY NOT BE WASHED DOWN BY RAIN OR THER MEANS. ANY SLOPES WITH DISTURBED SOILS OR DENUDED OF VEGETATION MUST BE STABILIZED SO AS TO MINIMIZE EROSION BY WIND AND WATER."

15. IF GRADING OCCURS DURING NOV 1 THROUGH APRIL 15, NO GRADING SHALL OCCUR UNLESS APPROVED EROSION AND SEDIMENT CONTROL MEASURES ARE IN PLACE. DISCHARGES OF SEDIMENT FROM THE PROJECT SITE MAY RESULT IN A "STOP WORK ORDER."

16. ALL EARTHWORK ON HILLSIDES, SLOPING OR MOUNTAINOUS TERRAIN SHALL BE STABILIZED TO PROTECT AND PREVENT LOSS OF SOILS, AS NECESSARY, YEAR-ROUND.

EARTHWORK ESTIMATES:

EXCAVATION:	3,148,273 CUBIC YARDS
IMPORT:	0 CUBIC YARDS
EXPORT:	40,106 CUBIC YARDS
FILL:	3,108,167 CUBIC YARDS

REV 1

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. CONTRACTOR SHALL CALCULATE THE EARTHWORK QUANTITIES TO THEIR SATISFACTION PRIOR TO START OF CONSTRUCTION OR BIDDING. CONSOLIDATION, LOSSES DUE TO CLEARING OPERATIONS, UTILITY TRENCHES, SUBGRADE STABILIZATION, OR FACTORS FOR GRADING MEANS AND METHODS ARE NOT INCLUDED AND EARTHWORK QUATITITES MAY VARY ACCORDING TO THESE FACTORS.
C. EARTHWORK VOLUMES DO NOT INCLUDE OVEREXCAVATION OR SCARIFICATION.

AIR POLLUTION CONTROL NOTES

1. DURING CONSTRUCTION, THE CONTRACTOR SHALL IMPLEMENT THE FOLLOWING PARTICULATE (DUST) CONTROL MEASURES:

   A. REDUCE THE AMOUNT OF DISTURBED AREA WHERE POSSIBLE;

   B. USE WATER TRUCKS OR SPRINKLER SYSTEMS IN SUFFICIENT QUANTITIES TO PREVENT AIRBORNE DUST LEAVING THE SITE. INCREASED WATERING FREQUENCY WILL BE REQUIRED WHENEVER WIND SPEEDS EXCEED 15 MPH.

   C. EXPOSED GROUND AREAS THAT ARE PLANNED TO BE REWORKED AT DATES GREATER THAN ONE MONTH AFTER INITIAL GRADING SHOULD BE SOWN WITH A FAST-GERMINATING NATIVE GRASS SEED UNTIL VEGETATION IS ESTABLISHED;

   D. ALL DISTURBED SOIL AREAS SHOULD BE STABILIZED PER EROSION CONTROL NOTE 3.

   E. VEHICLE SPEED FOR ALL CONSTRUCTION VEHICLES SHALL NOT EXCEED 15 MPH ON ANY UNPAVED SURFACE AT THE CONSTRUCTION SITE.

EROSION CONTROL NOTES

1. PROJECT: THE CONTRACTOR WILL DISTURB AREAS SUBJECT TO EROSION DURING THE SITE PREPARATION, EXCAVATION, AND FILL PLACEMENT. IF FILL PLACEMENT IS NOT COMPLETED AND GROUND COVER IS NOT ESTABLISHED BY OCTOBER 15, THE CONTRACTOR SHALL CONSTRUCT, MONITOR, AND MAINTAIN THE NECESSARY EROSION AND SEDIMENTATION MITIGATION MEASURES ON ALL SUCH AREAS.

2. EROSION AND SEDIMENTATION CONTROL PROGRAM: THE LOCATION OF EROSION AND SEDIMENTATION CONTROL MEASURES SHOWN ON THESE PLANS MAY VARY ACCORDING TO THE SEASON AND PHASE OF CONSTRUCTION. THE OBJECTIVE OF THESE MEASURES IS TO MITIGATE THE EROSION AND SEDIMENTATION IMPACTS. THIS PROGRAM CONSISTS OF THE INSTALLATION AND MAINTENANCE OF GROUND COVER, EROSION CONTROL MAT, STRAW WATTLES AND SILT FENCES. THE CONTRACTOR SHALL ONLY DISTURB THE AREAS NECESSARY TO COMPLETE THE WORK SHOWN IN THESE PLANS.

3. INSTALLATION

   A. ALL DISTURBED SOIL AREAS, INCLUDING ROADS, SHALL RECEIVE LANDSCAPE/EROSION CONTROL COVER IN ACCORDANCE WITH THE FOLLOWING:

   STEP 1: SEED AND SLURRY

SEED MIX	PURE LIVE SEED LBS/ACRE	HYDROSEED SLURRY ADDITIVES	LBS/ACRE
ARTEMISIA CALIFORNICA	0.2	CONWED 100% WOOD FIBER	2000
BROMUS CARINATUS	8.0	AM-120 MYCORRHIZAL INOCULUM	60
ELYMUS GLAUCUS	6.0	ECOLOGY CONTROLS M-BINDER	150
ESCHSCHOLZIA CALIFORNICA	1.5	15-15-15 FERTILIZER	200
HORDEUM INTERCEDENS	4.0		
ISOCOMA MENZIESII	1.0		
LOTUS SCOPARIUS	4.0		
LUPINUS NANUS	2.0		
MIMULUS AURANTIACUS			
AURANTIACUS	0.1		
NASSELLA PULCHRA	6.0		
SALVIA MELLIFERA	2.0		
VULPIA MICROSTACHYS	6.0		
	40.8		

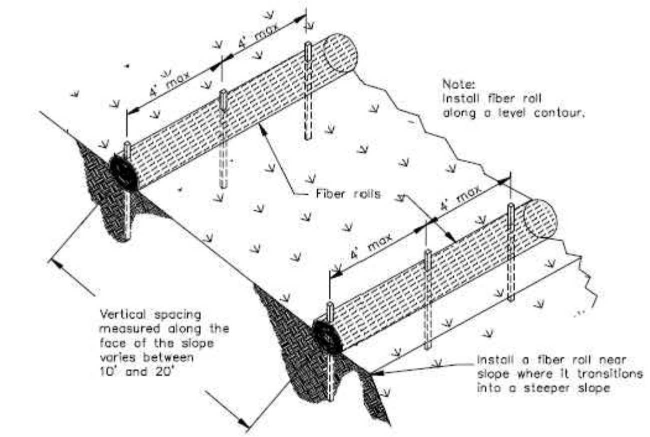
   STEP 2: APPLY STRAW MULCH AT 4000 LBS/ACRE

   STEP 3: TACK STRAW
   FIBER 500
   BINDER 100

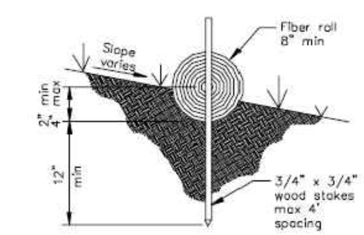
   B. ALL LANDSCAPE/HYDROSEED/EROSION CONTROL SHALL BE INSTALLED PER COUNTY REQUIREMENTS AND INDUSTRIAL STANDARDS. STRAW MULCH SHALL BE PLACED OVER ALL SEEDED AREAS AND SHALL BE CRIMPED INTO SOIL OR HELD IN PLACE BY A LIQUID TACKIFIER.
   C. SILT FENCE TO BE INSTALLED ON DOWNHILL SIDE OF ALL DISTURBED AREAS, TO REMAIN IN PLACE UNTIL TOTAL REVEGETATION IS ACHIEVED.
   D. ALL DISTURBED AREAS SHALL BE REVEGETATED. TEMPORARY SILTATION MITIGATION DEVICES SHALL BE IN PLACE OCTOBER 15 TO APRIL 15.

4. MAINTENANCE PROGRAM: THE CONTRACTOR SHALL INSPECT AND MAINTAIN THE EROSION AND SEDIMENTATION MITIGATION MEASURES ON ALL DISTURBED AREAS BEFORE, DURING AND AFTER STORM. THE CONTRACTOR SHALL ENSURE THAT THE EROSION AND SEDIMENTATION MEASURES ARE INSTALLED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE PLANS PRIOR TO EACH STORM. ALSO, THE CONTRACTOR SHALL REMOVE THE SEDIMENTS COLLECTED IN STRAW WATTLES AND DEPOSIT THESE SEDIMENTS ON AREAS WHERE THEY WILL NOT RE-ENTER THE DISTURBED AREAS.

SE-5 **Fiber Rolls**



TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

072-013-003A	SITE LOCATION PLAN
072-013-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING
DWG NUMBER	TITLE

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: NONE	FILE: 13186/072-13-002B
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/17/14	LAST CHANGED: 08/26/14

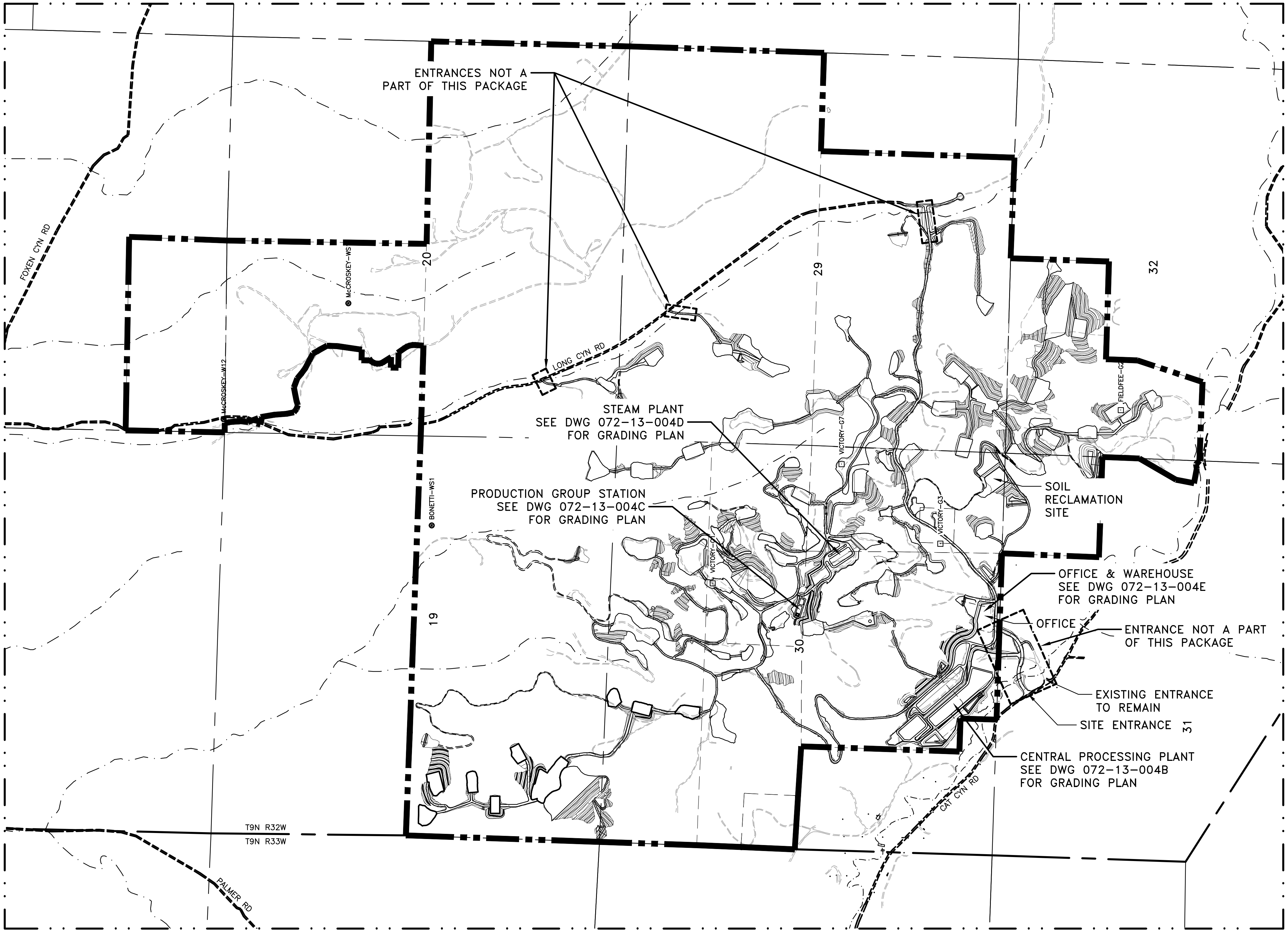
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/26/14	1	ISSUED FOR PERMIT (ADDED SLOPE KEY VOL.)	IDU	RSD	EP
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

CONSTRUCTION NOTES – SANTA BARBARA
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/26/14	SCALE: NONE
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-002B	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-002B	

:FUNCTIONAL LOCATION NO.



N

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND:

- INTERMITTENT CREEKS
- TOWNSHIP LINES
- SECTION LINES
- LEASE LINES
- PROPERTY LINE

APN:
129-210-017, 101-040-005,
101-040-006, 101-050-042,
101-040-011, 101-040-012,
101-040-013, 101-040-014,
101-050-013, 101-040-019,
101-040-020, 101-050-014,
101-070-007, 101-050-002

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

GRAPHIC SCALE

700' 0 350' 700' 1400' 2800'

(IN FEET)
1"=700'-0"

DWG NUMBER	TITLE
072-013-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1" = 700'	FILE: 13186/072-13-003A
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 04/17/14	LAST CHANGED: 08/20/14

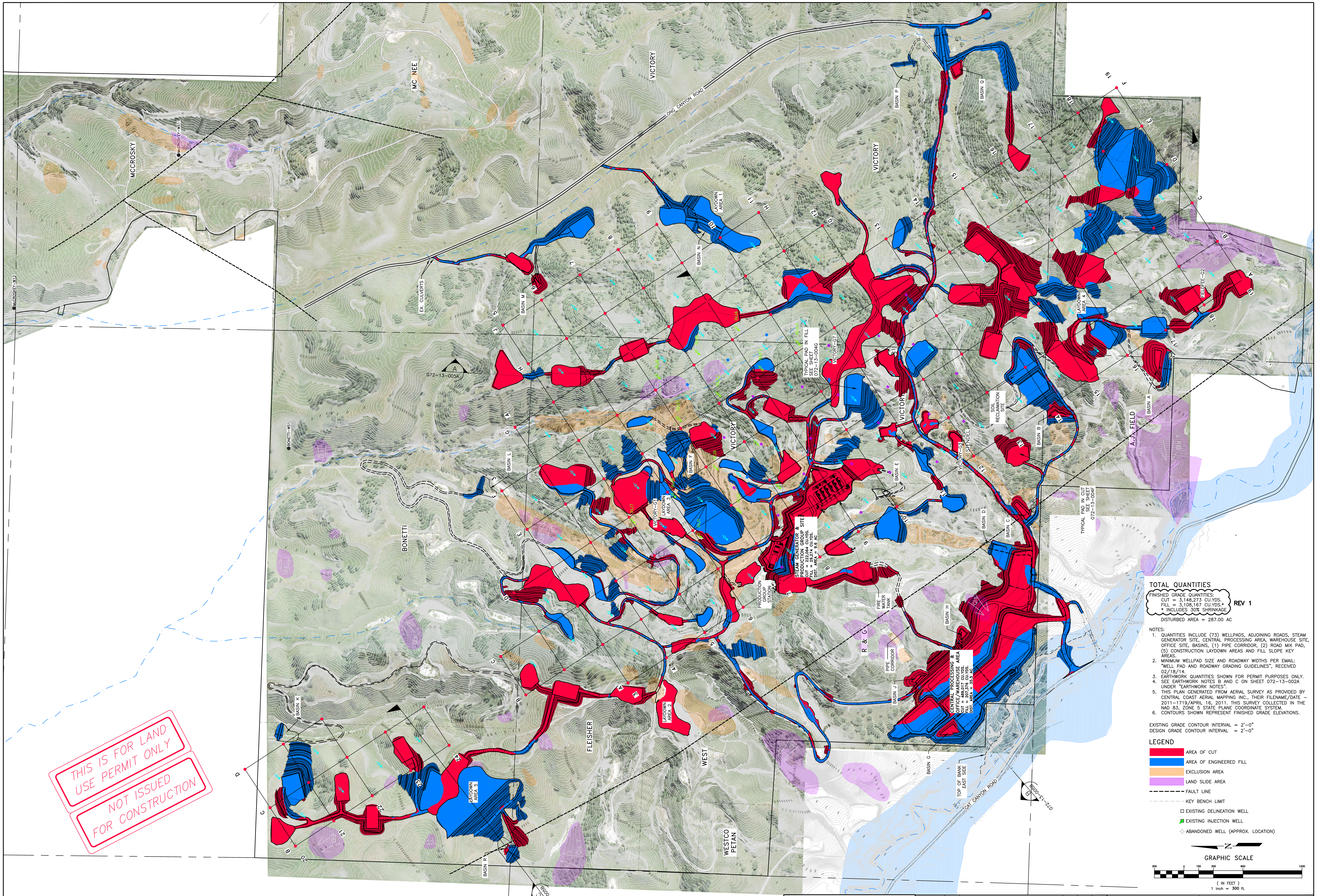
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

SITE LOCATION PLAN
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14 SCALE: 1" = 700'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-003A REV. 0
DESIGNED BY:	ROBIN DICKERSON	
DRAFTED BY:	ROBERT AMARO	
ECCN NO.	EAR99	CAD FILE NO. 072-13-003A

:FUNCTIONAL LOCATION NO.



TOTAL QUANTITIES

FINISHED GRADE QUANTITIES:
CUT = 3,148,273 CU.YDS.
FILL = 3,108,167 CU.YDS.*
* INCLUDES 30% SHRINKAGE

REV 1

DISTURBED AREA = 287.00 AC

NOTES:

1. QUANTITIES INCLUDE (73) WELLPADS, ADJOINING ROADS, STEAM GENERATOR SITE, CENTRAL PROCESSING AREA, WAREHOUSE SITE, OFFICE SITE, BASINS, (1) PIPE CORRIDOR, (2) ROAD MIX PAD, (5) CONSTRUCTION LAYDOWN AREAS AND FILL SLOPE KEY AREAS.
2. MINIMUM WELLPAD SIZE AND ROADWAY WIDTHS PER EMAIL: "WELL PAD AND ROADWAY GRADING GUIDELINES", RECEIVED 02/18/14.
3. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
4. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-002A UNDER "EARTHWORK NOTES".
5. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
6. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 2'-0"

LEGEND

AREA OF CUT
AREA OF ENGINEERED FILL
EXCLUSION AREA
LAND SLIDE AREA
FAULT LINE
KEY BENCH LIMIT
EXISTING DELINEATION WELL
EXISTING INJECTION WELL
ABANDONED WELL (APPROX. LOCATION)

GRAPHIC SCALE
300 0 150 300 600 1200
(IN FEET)
1 inch = 300 ft.

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=300'
FILE: 13186/072-13-004A
PLOT AT: 1=1
LAYER(S): .
ENGINEER: RSD
CHANGED BY: IDU
DATE STARTED: 10/21/13
LAST CHANGED: 08/26/14

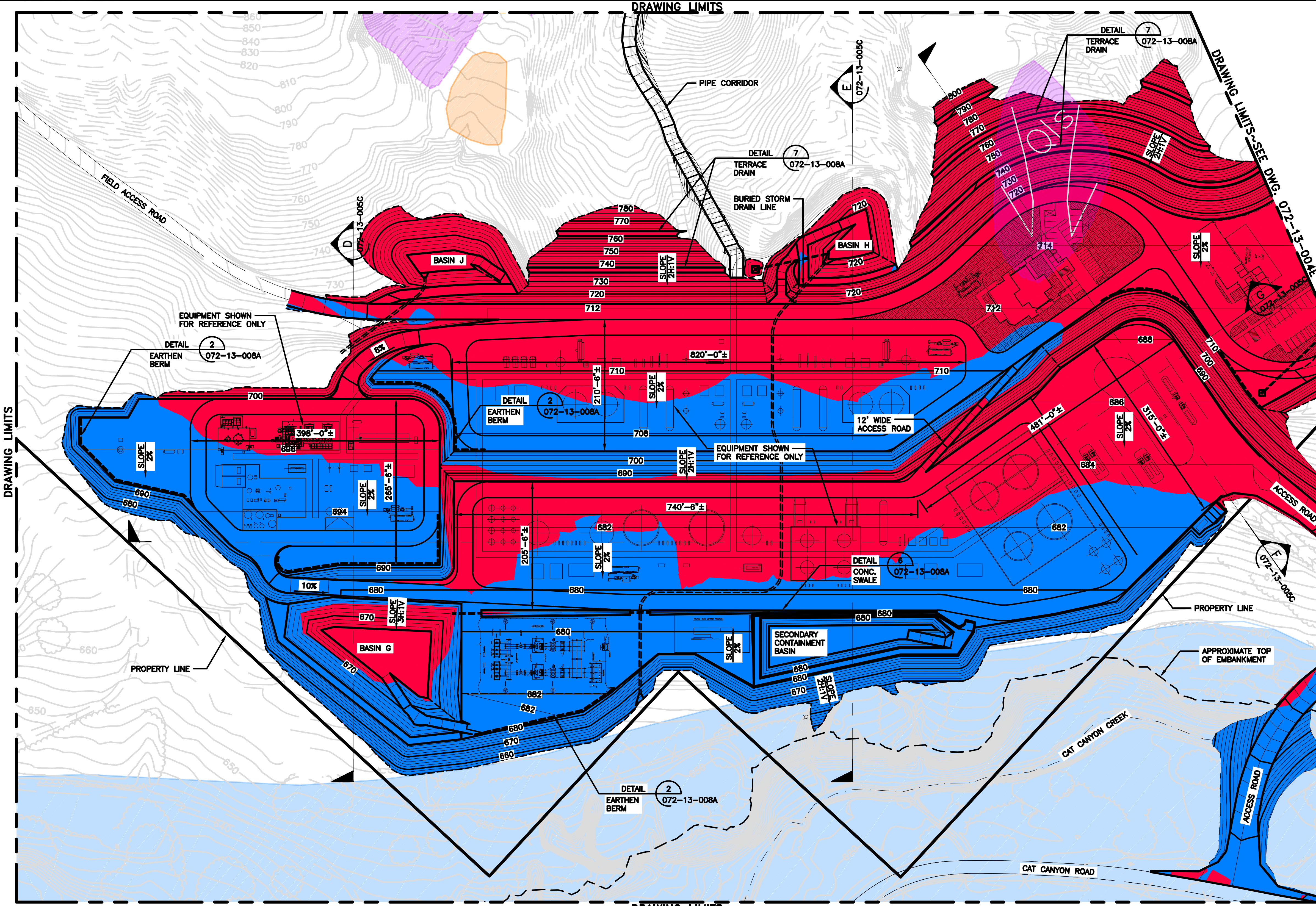
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/26/14	1	ISSUED FOR PERMIT (ADDED SLOPE KEY VOL.)	IDU	RSD	EP
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING PLAN
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/26/14	SCALE: 1" = 300'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-004A	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-004A	

:FUNCTIONAL LOCATION NO.



EARTHWORK VOLUMES:

ROUGH GRADE QUANTITIES:

CUT (CU. YDS.)	+489,017
FILL* (CU. YDS.)	−207,376
TOTAL CUT (CU. YDS.)	+489,017
TOTAL FILL* (CU. YDS.)	−207,376
NET (CU. YDS.)	+281,641

(SEE NOTE 3.)
* INCLUDES 30% SHRINKAGE

DISTURBED AREA = 35.50 AC
(SEE NOTE 4.)

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-002A UNDER "EARTHWORK NOTES".

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS.
3. EARTHWORK QUANTITIES INCLUDE CENTRAL PROCESSING PLANT, OFFICE & WAREHOUSE AREAS.
4. DISTURBANCE AREA INCLUDES CENTRAL PROCESSING PLANT, OFFICE & WAREHOUSE AREAS.

EXISTING GRADE CONTOUR INTERVAL = 2'–0"
DESIGN GRADE CONTOUR INTERVAL = 2'–0"

LEGEND

- AREA OF CUT
- AREA OF ENGINEERED FILL
- EXCLUSION AREA
- LANDSLIDE
- FEMA FLOOD BOUNDARY PER SANTA BARBARA COUNTY
- ABANDONDED WELL (APPROX. LOCATION)

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

GRAPHIC SCALE
(IN FEET)
1 inch = 80 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=80' FILE: 13186/072-13-004B
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 05/30/14 LAST CHANGED: 08/20/14

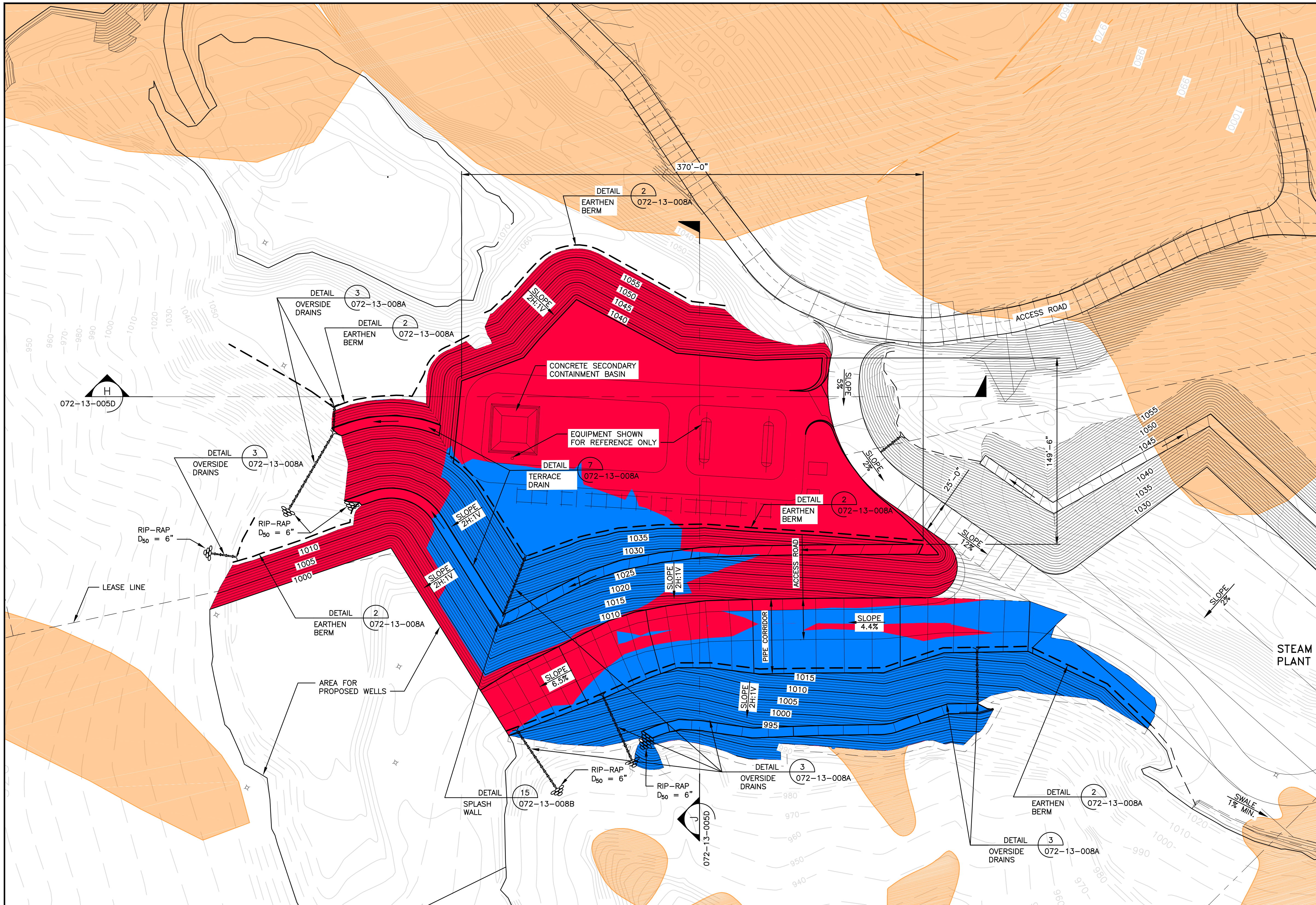
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING PLAN – CENTRAL PROCESSING PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 80'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-004B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-004B	

:FUNCTIONAL LOCATION NO.



EARTHWORK VOLUMES:

ROUGH GRADE QUANTITIES:	
CUT (CU. YDS.)	+23,216
FILL* (CU. YDS.)	-29,271
TOTAL CUT (CU. YDS.)	+23,216
TOTAL FILL* (CU. YDS.)	-29,271
NET (CU. YDS.)	-6,055

* INCLUDES 30% SHRINKAGE

DISTURBED AREA = 3.48 AC

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-002A UNDER "EARTHWORK NOTES".

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- AREA OF CUT
- AREA OF ENGINEERED FILL
- EXCLUSION AREA
- ABANDONED WELL (APPROX. LOCATION)

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=40'	FILE: 13186/072-13-004C
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 04/23/14	LAST CHANGED: 08/18/14

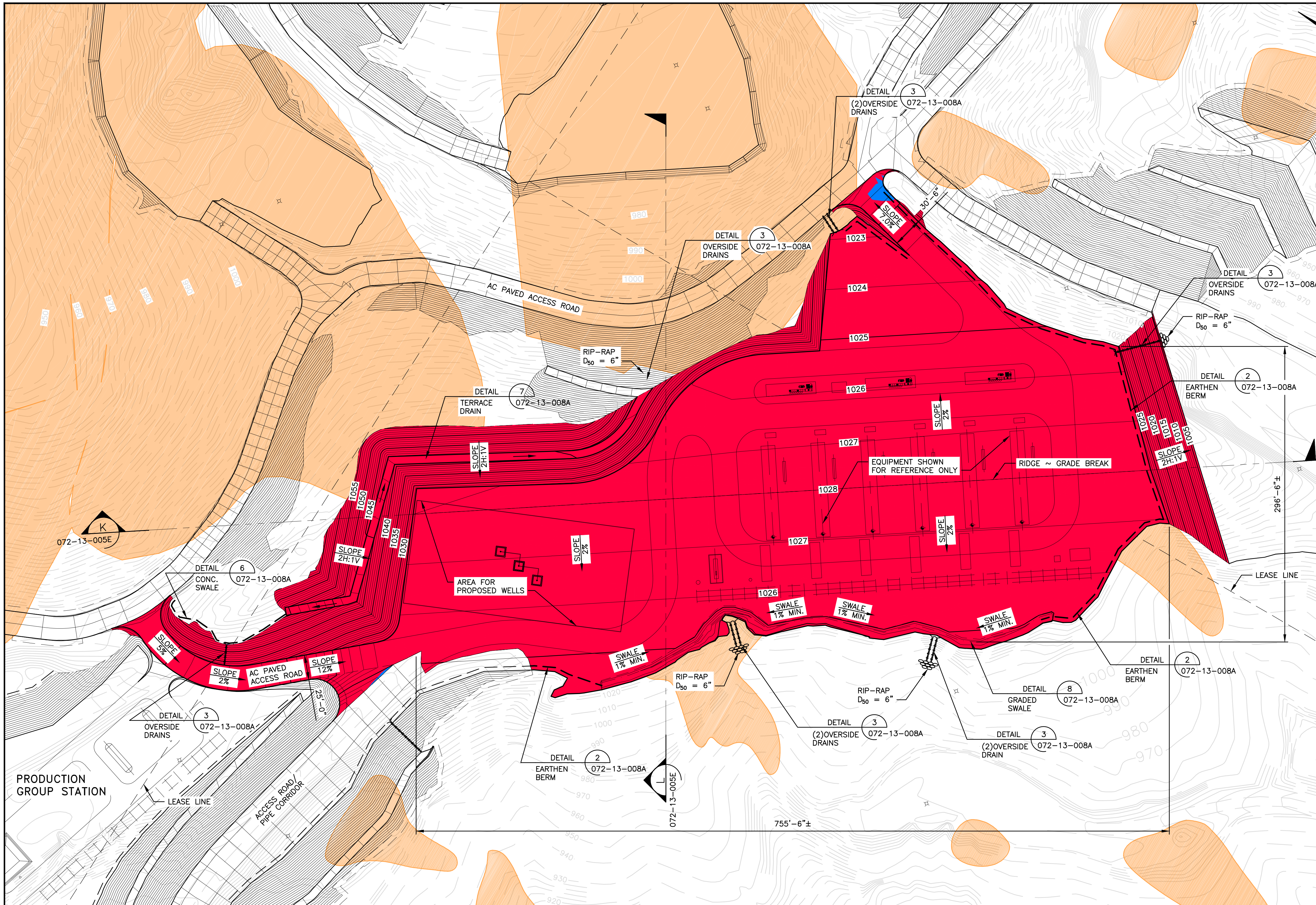
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING PLAN – PRODUCTION GROUP STATION
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 40'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-004C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-004C	

:FUNCTIONAL LOCATION NO.



EARTHWORK VOLUMES:

ROUGH GRADE QUANTITIES:

CUT (CU. YDS.)	+198,848
FILL* (CU. YDS.)	−3
TOTAL CUT (CU. YDS.)	+198,848
TOTAL FILL* (CU. YDS.)	−3
NET (CU. YDS.)	+198,845

* INCLUDES 30% SHRINKAGE

DISTURBED AREA = 6.09 AC

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072–13–002A UNDER "EARTHWORK NOTES".

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- AREA OF CUT
- AREA OF ENGINEERED FILL
- EXCLUSION AREA
- ABANDONED WELL (APPROX. LOCATION)

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011–1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

EXISTING GRADE CONTOUR INTERVAL = 2'–0"
DESIGN GRADE CONTOUR INTERVAL = 1'–0"

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

DWG NUMBER	TITLE
072–13–003A	SITE LOCATION PLAN
072–13–001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=50'
PLOT AT: 1=1
ENGINEER: RSD
DATE STARTED: 10/24/13
FILE: 13186/072–13–004D
LAYER(S):
CHANGED BY: RAA
LAST CHANGED: 08/18/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

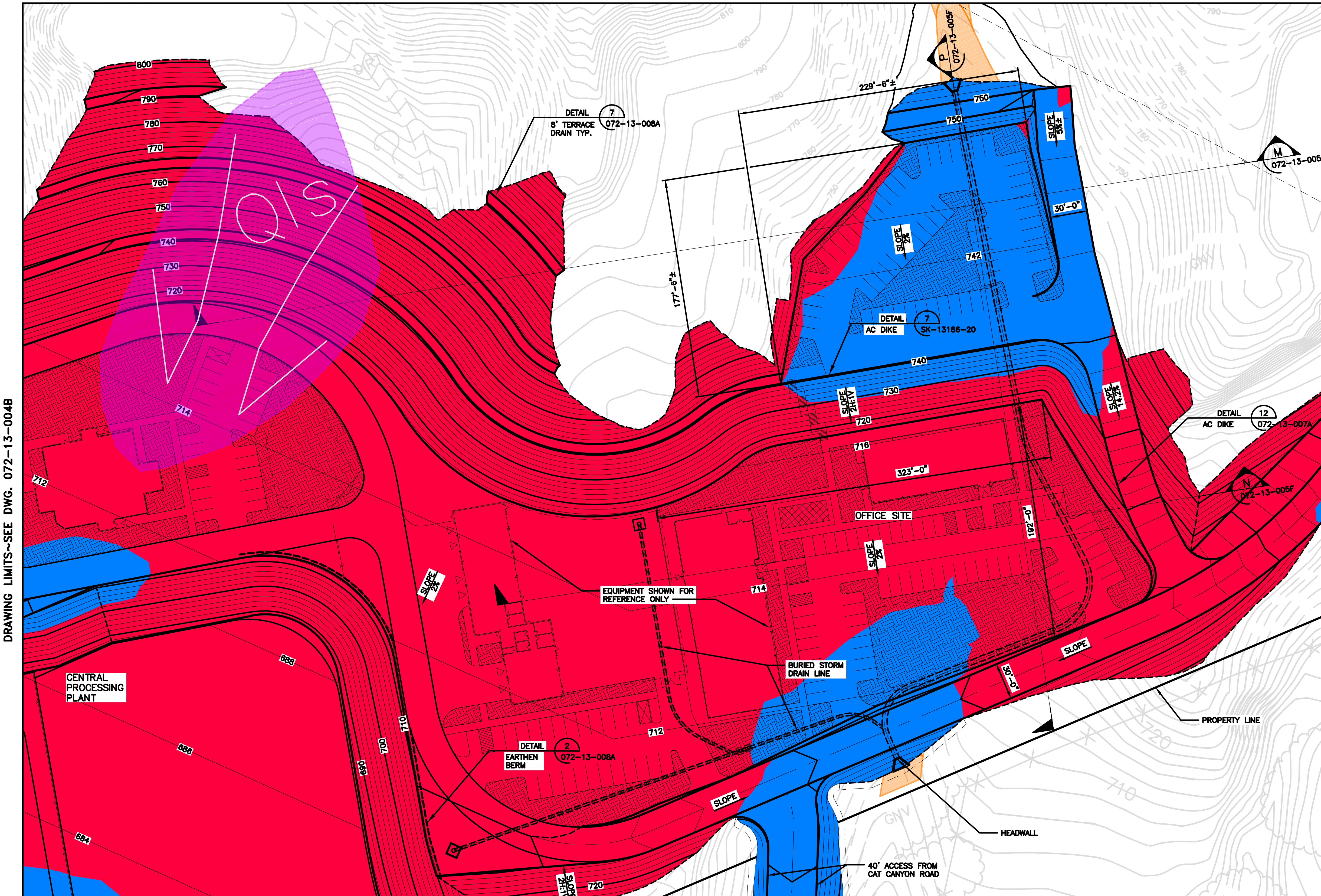
AERA

GRADING PLAN – STEAM PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ROBERT AMARO
ECCN NO. EAR99

DATE: 08/18/14
SCALE: 1" = 50'
ORIGINAL DWG NO.
NO. 072–13–004D
REV. 0
CAD FILE NO. 072–13–004D

:FUNCTIONAL LOCATION NO.



EARTHWORK VOLUMES:

SEE SHEET 072-13-004B FOR EARTHWORK VOLUMES.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- AREA OF CUT
- AREA OF ENGINEERED FILL
- EXCLUSION AREA
- LANDSLIDE

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=40' FILE: 13186/072-13-004E
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 11/18/13 LAST CHANGED: 08/18/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

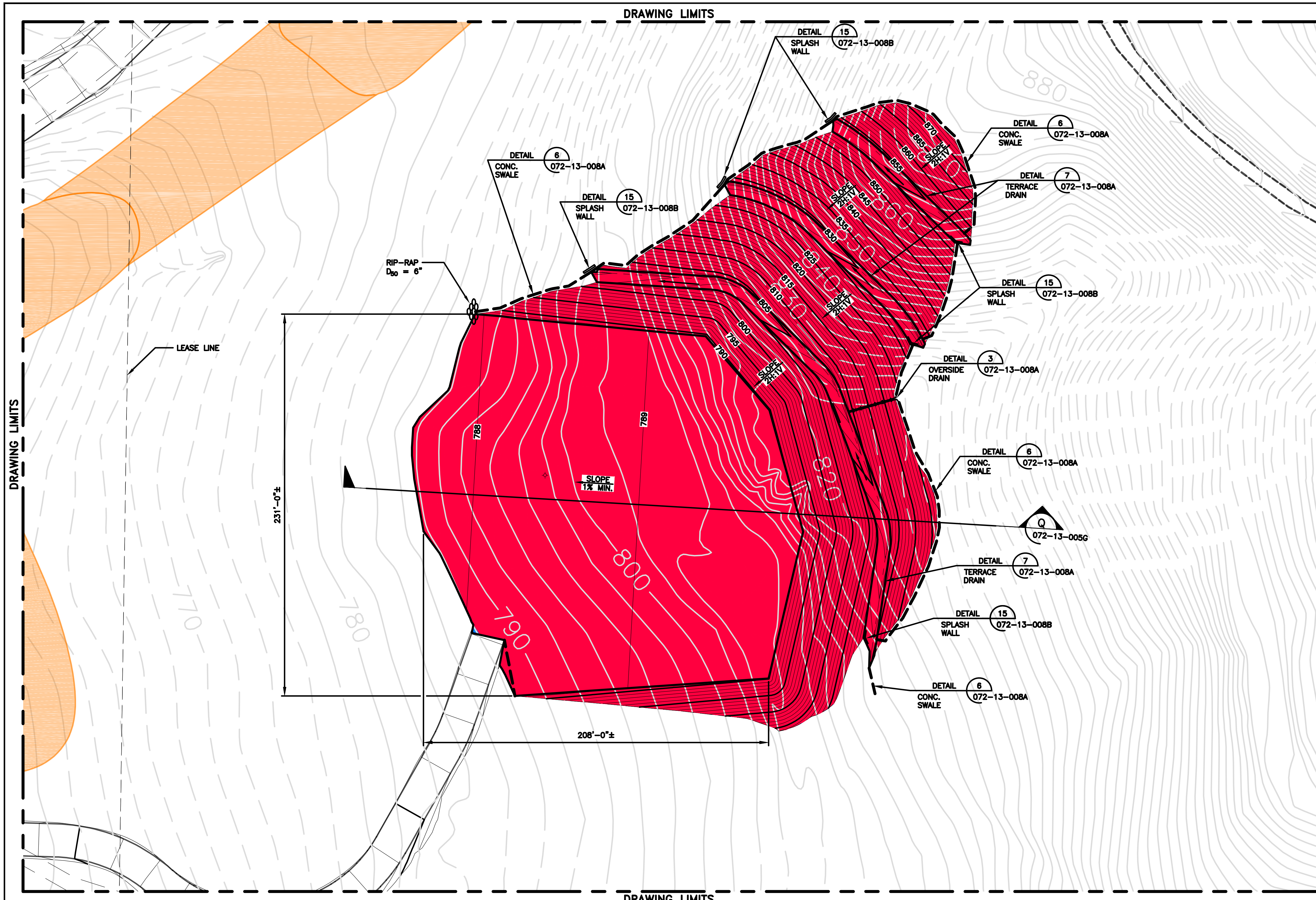
AERA

GRADING PLAN – OFFICE/WAREHOUSE SITE
FIELD REDEVELOPMENT PLAN
SECTIONS 19,20,29,30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON
CO. ENGINEER:	TJCROSS ENGINEERS, INC
PROJ. MGR:	ALI GOKGOZ
DESIGNED BY:	ROBIN DICKERSON
DRAFTED BY:	ROBERT AMARO
ECCN NO.	EAR99

DATE: 08/18/14 SCALE: 1" = 40'
ORIGINAL DWG NO.
NO. 072-13-004E REV. 0
CAD FILE NO. 072-13-004E

:FUNCTIONAL LOCATION NO.



EARTHWORK VOLUMES:

ROUGH GRADE QUANTITIES:

CUT (CU. YDS.)	+33,135
FILL* (CU. YDS.)	-0

* INCLUDES 30% SHRINKAGE

DISTURBED AREA = 1.95 AC

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-002A UNDER "EARTHWORK NOTES".

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- AREA OF CUT
- AREA OF ENGINEERED FILL
- EXCLUSION AREA
- ABANDONED WELL (APPROX. LOCATION)

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

DWG NUMBER	TITLE
072-13-005G	GRADING SECTIONS-TYPICAL PAD IN CUT & FILL
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=30' FILE: 13186/072-13-004F
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 11/18/13 LAST CHANGED: 08/18/14

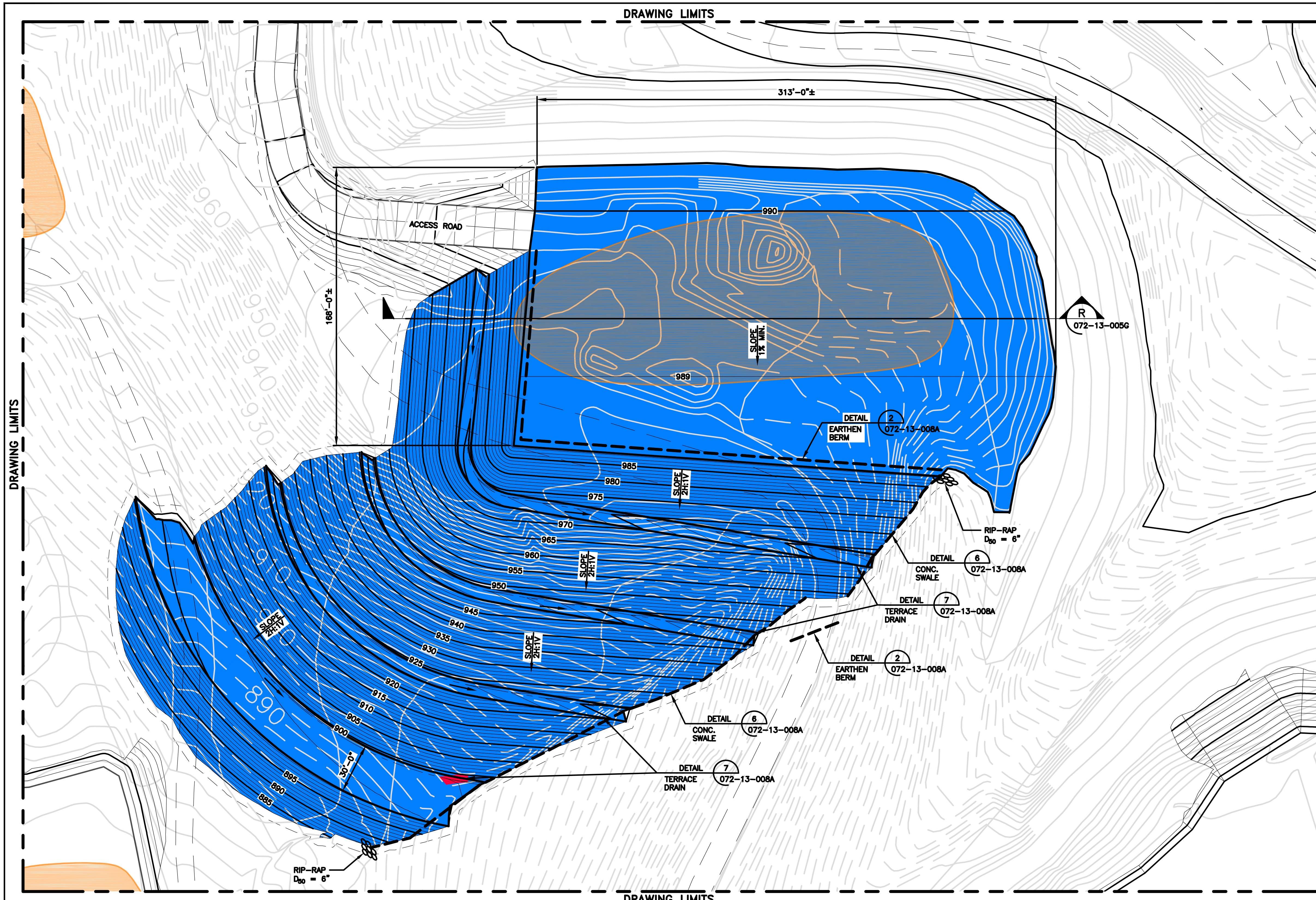
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING PLAN – TYPICAL PAD IN-CUT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 30'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-004F	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERTAMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-004F	

:FUNCTIONAL LOCATION NO.



EARTHWORK VOLUMES:

ROUGH GRADE QUANTITIES:

CUT (CU. YDS.)	+112,110
FILL* (CU. YDS.)	-0

* INCLUDES 30% SHRINKAGE

DISTURBED AREA = 3.15 AC

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-002A UNDER "EARTHWORK NOTES".

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- AREA OF CUT
- AREA OF ENGINEERED FILL
- EXCLUSION AREA
- ABANDONED WELL (APPROX. LOCATION)

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

DWG NUMBER	TITLE
072-13-005G	GRADING SECTIONS-TYPICAL PAD IN CUT & FILL
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=30' FILE: 13186/072-13-004G
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 11/18/13 LAST CHANGED: 08/18/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

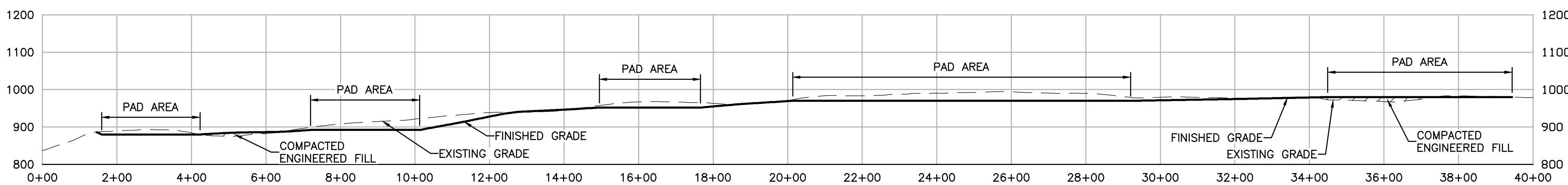
AERA

GRADING PLAN – TYPICAL PAD IN-FILL
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

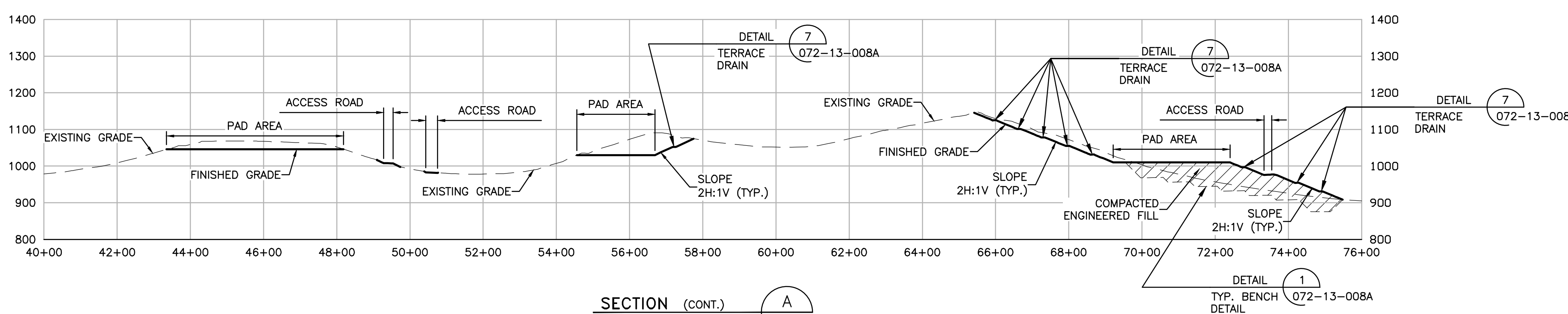
AERA ENGINEER:	ERIC PAULSON
CO. ENGINEER:	TJCROSS ENGINEERS, INC
PROJ. MGR:	ALI GOKGOZ
DESIGNED BY:	ROBIN DICKERSON
DRAFTED BY:	ROBERT AMARO
ECCN NO.	EAR99

DATE: 08/18/14 SCALE: 1" = 30'
ORIGINAL DWG NO.
NO. 072-13-004G REV. 0
CAD FILE NO. 072-13-004G

:FUNCTIONAL LOCATION NO.



SECTION A
VIEW LOOKING NORTHEASTERLY
SCALE: VERT.& HORIZ.(1"=200')
072-13-004A



SECTION (CONT.) A
VIEW LOOKING NORTHEASTERLY
SCALE: VERT.& HORIZ.(1"=200')
072-13-004A

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-004A	GRADING PLAN – FIELD DEVELOPMENT
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=200'
PLOT AT: 1=1
ENGINEER: RSD
DATE STARTED: 08/04/14
FILE: 13186/072-13-005A
LAYER(S): _
CHANGED BY: RAA
LAST CHANGED: 08/18/14

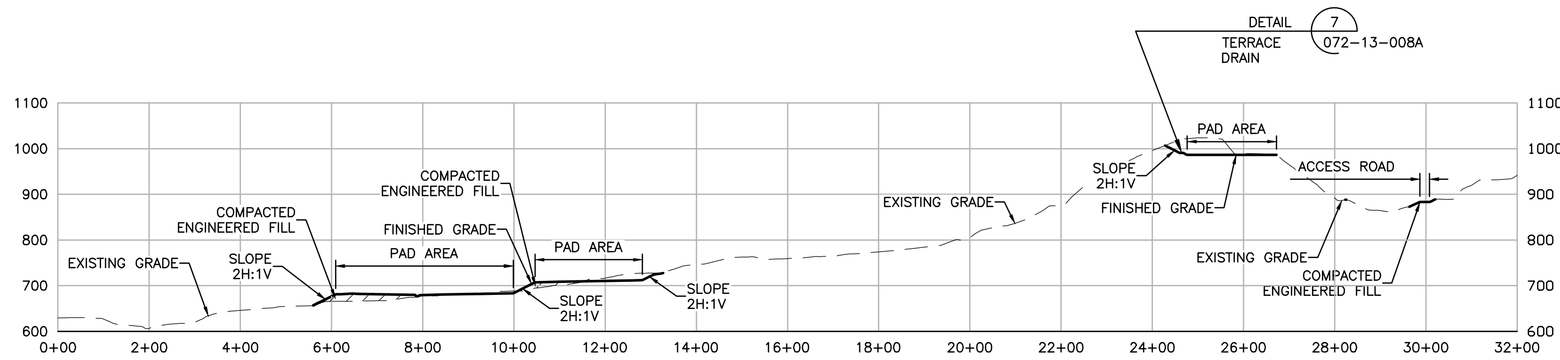
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

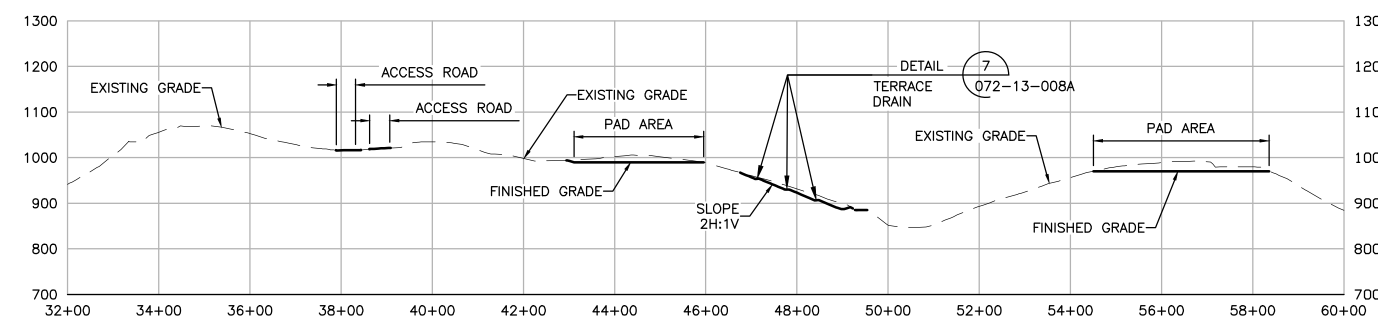
GRADING SECTIONS – FIELD DEVELOPMENT
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 200'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-005A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-005A	

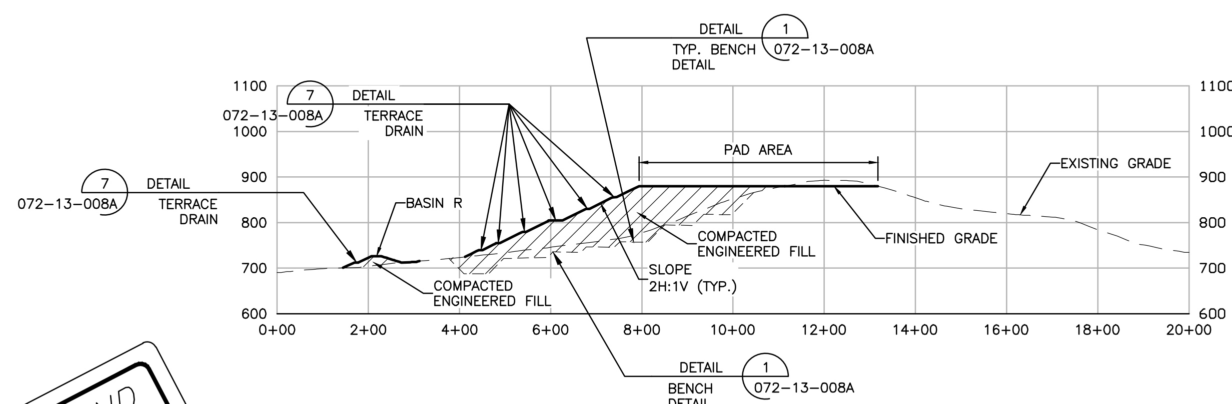
:FUNCTIONAL LOCATION NO.



SECTION B
VIEW LOOKING NORTHWESTERLY
SCALE: VERT.& HORIZ.(1"=200')
072-13-004A



SECTION (CONT.) B
VIEW LOOKING NORTHWESTERLY
SCALE: VERT.& HORIZ.(1"=200')
072-13-004A



SECTION C
VIEW LOOKING NORTHWESTERLY
SCALE: VERT.& HORIZ.(1"=200')
072-13-004A

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-004A	GRADING PLAN – FIELD DEVELOPMENT
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=200' FILE: 13186/072-13-005B
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 08/04/14 LAST CHANGED: 08/18/14

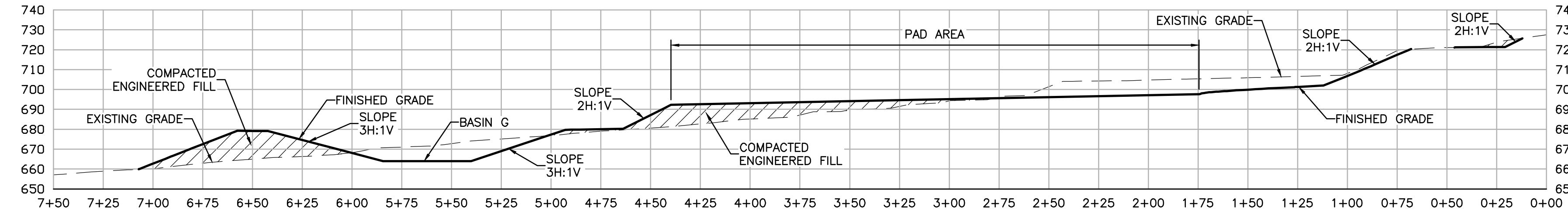
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

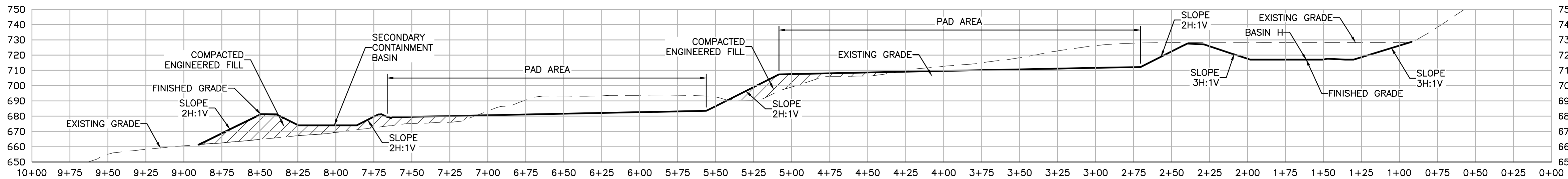
GRADING SECTIONS – FIELD DEVELOPMENT
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 200'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-005B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-005B	

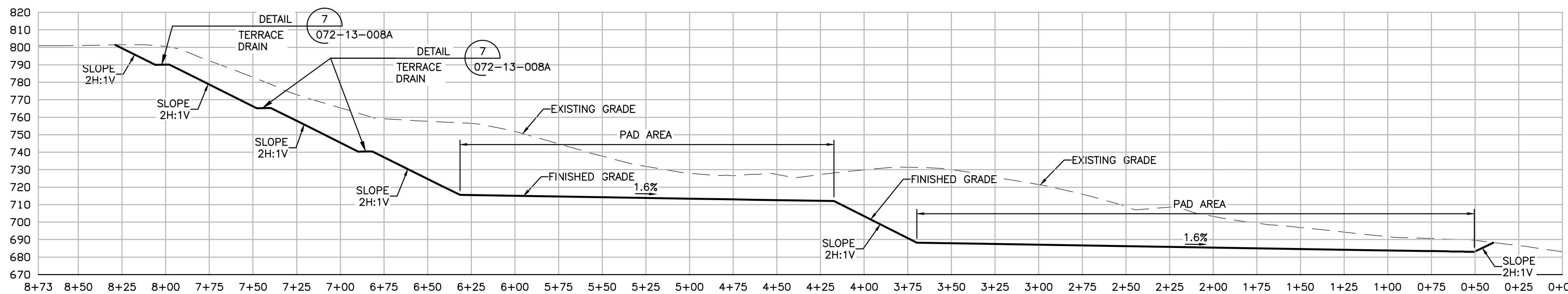
:FUNCTIONAL LOCATION NO.



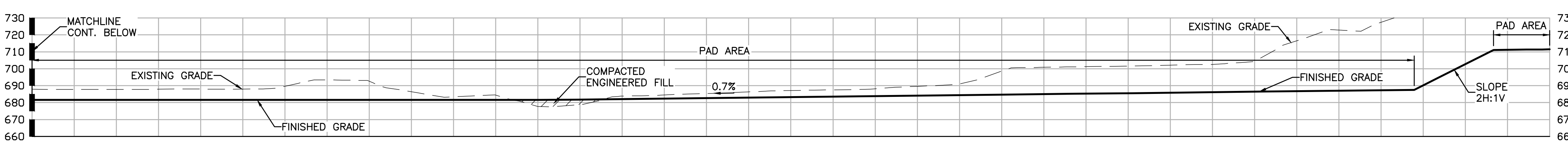
SECTION D
VIEW LOOKING NORTHWESTERLY
SCALE: VERT.& HORIZ.(1"=40')
072-13-004B



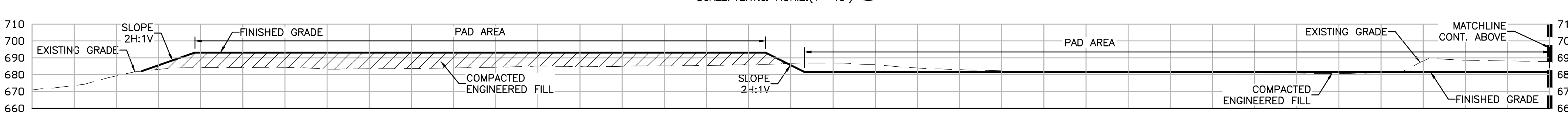
SECTION E
VIEW LOOKING NORTHWESTERLY
SCALE: VERT.& HORIZ.(1"=40')
072-13-004B



SECTION F
VIEW LOOKING WESTERLY
SCALE: VERT.& HORIZ.(1"=40')
072-13-004B



SECTION G
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=40')
072-13-004B



SECTION (CONT.) G
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=40')
072-13-004B

DWG NUMBER	TITLE
072-13-004B	GRADING PLAN – CENTRAL PROCESSING PLANT
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=40' FILE: 13186/072-13-005C
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 08/04/14 LAST CHANGED: 08/18/14

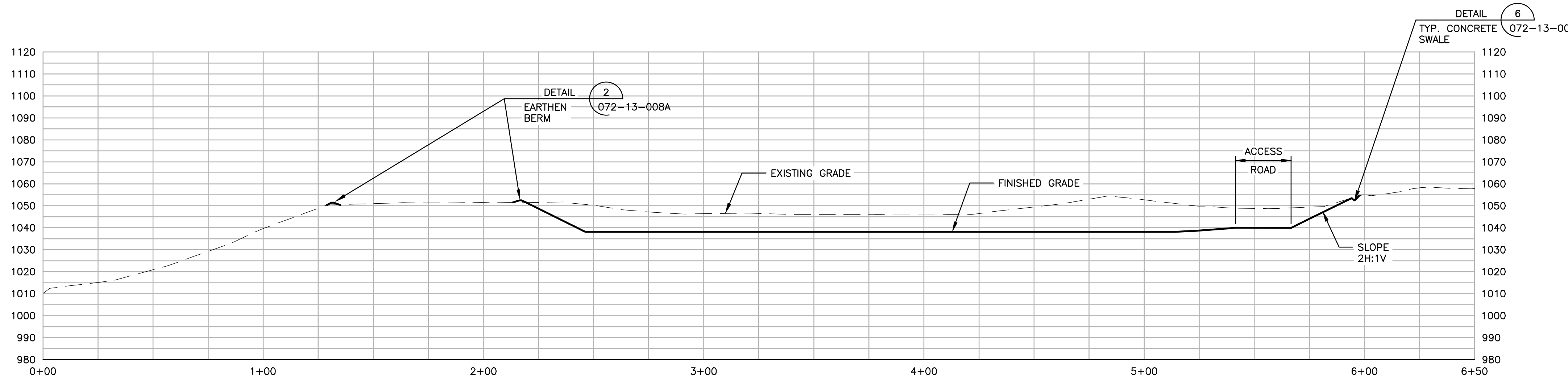
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

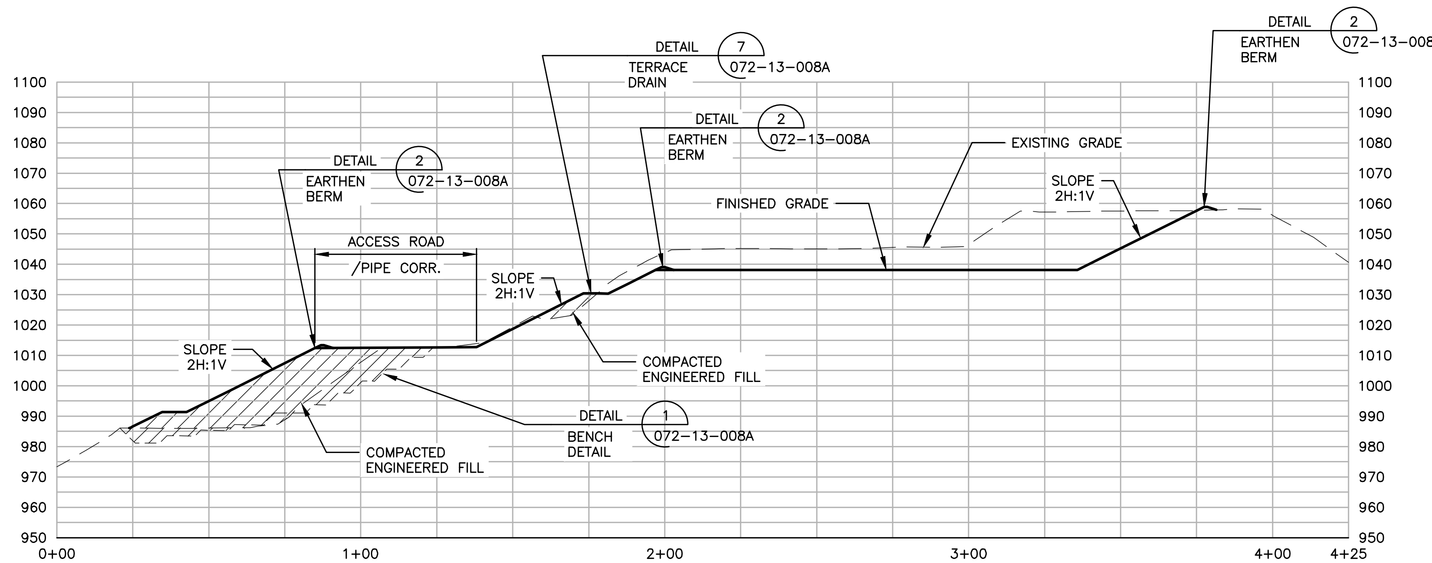
GRADING SECTIONS – CENTRAL PROCESSING PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 40'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-005C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-005C	

:FUNCTIONAL LOCATION NO.



SECTION H 072-13-004C
VIEW LOOKING NORTHEAST
SCALE: VERT.& HORIZ.(1"=30')



SECTION J 072-13-004C
VIEW LOOKING NORTHWEST
SCALE: VERT.& HORIZ.(1"=30')

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=30' FILE: 13186/072-13-005D
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 10/24/13 LAST CHANGED: 08/18/14

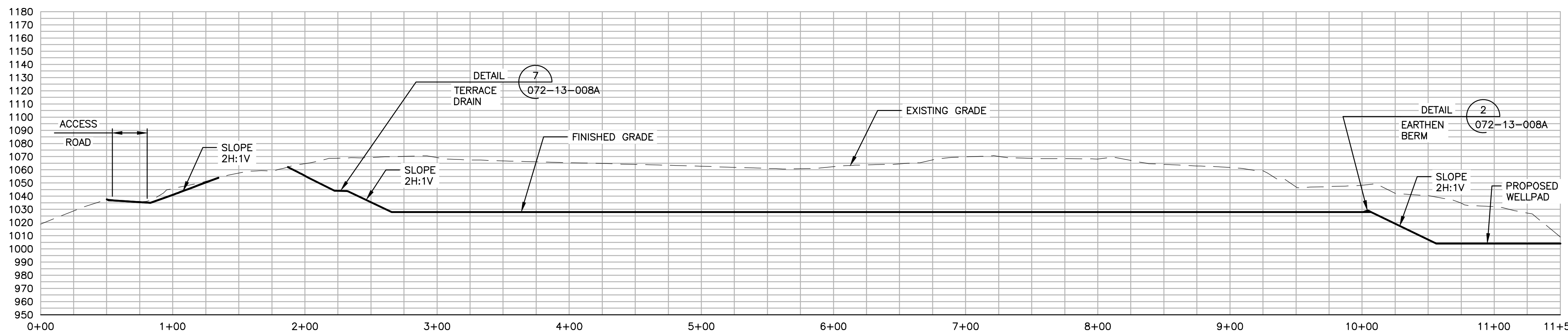
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

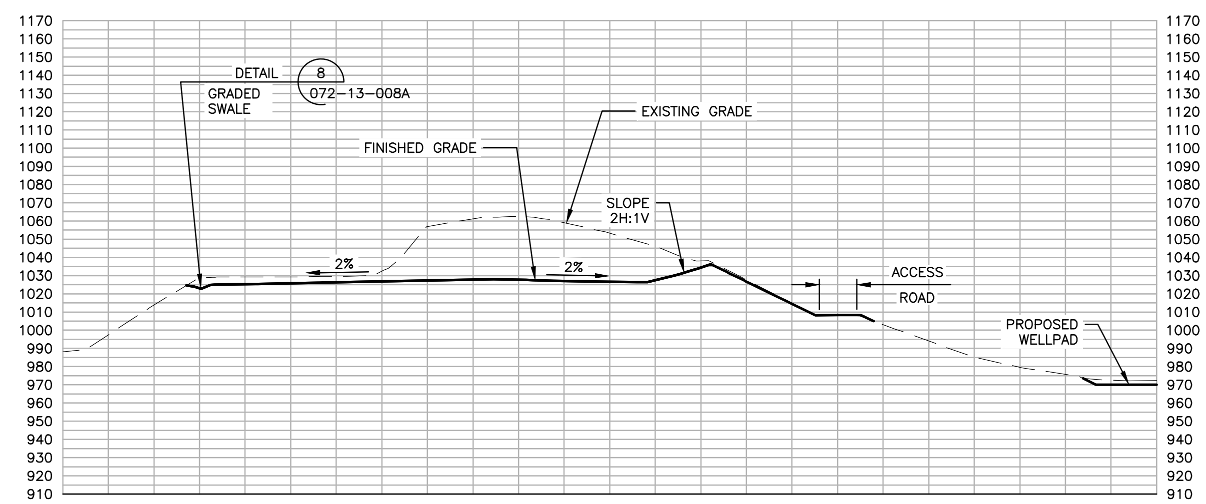
GRADING SECTIONS – PRODUCTION GROUP STATION
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 30'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-005D	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-005D	

:FUNCTIONAL LOCATION NO.



SECTION K 072-13-004D
VIEW LOOKING NORTHEAST
SCALE: VERT.& HORIZ.(1"=50')



SECTION L 072-13-004D
VIEW LOOKING NORTHWEST
SCALE: VERT.& HORIZ.(1"=50')

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=50' FILE: 13186/072-13-005E
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 10/24/13 LAST CHANGED: 08/18/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

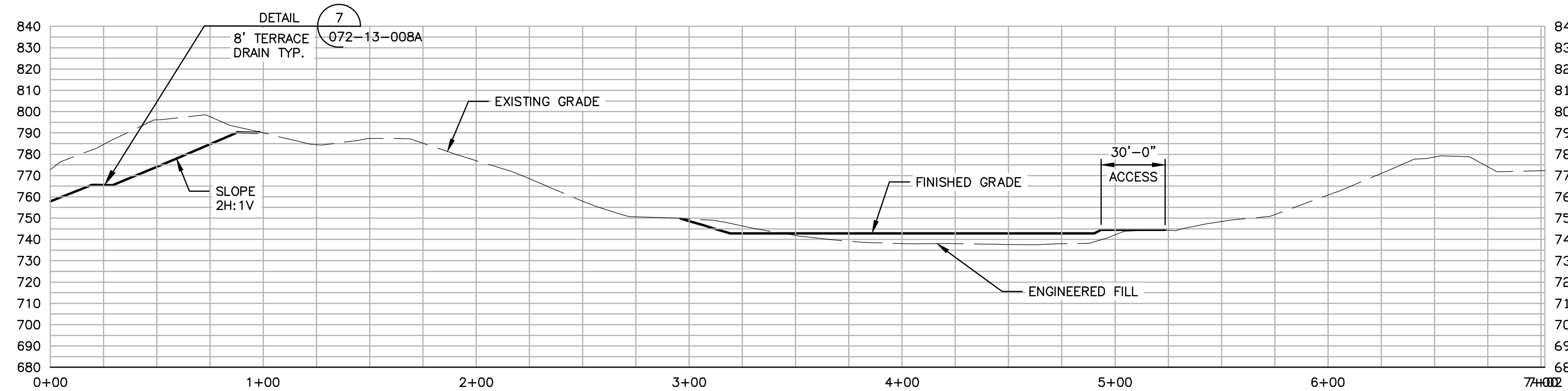
AERA

GRADING SECTIONS – STEAM PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

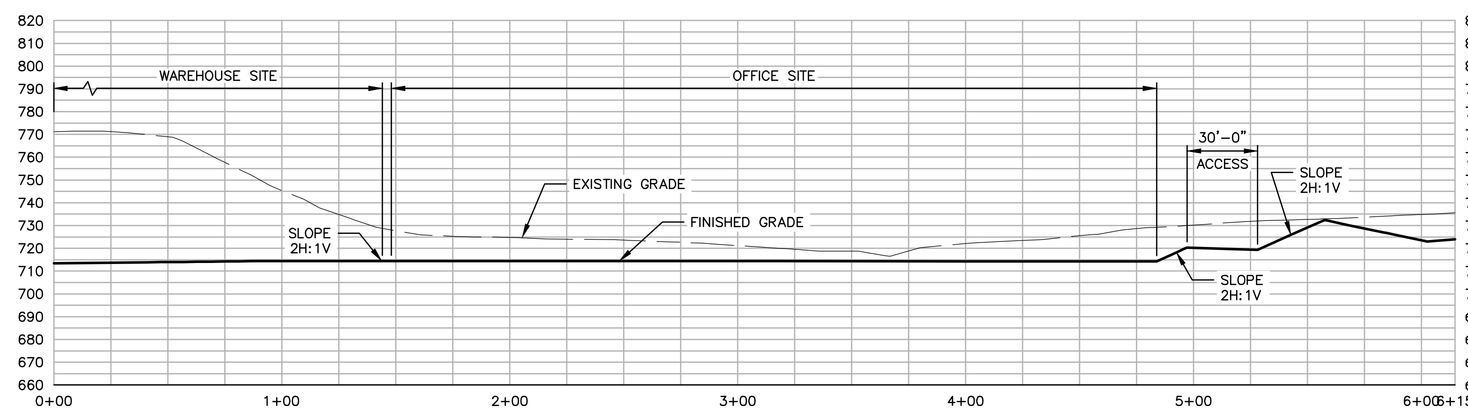
AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ROBERT AMARO
ECCN NO. EAR99

DATE: 08/18/14 SCALE: 1" = 50'
ORIGINAL DWG NO.
NO. 072-13-005E REV. 0
CAD FILE NO. 072-13-005E

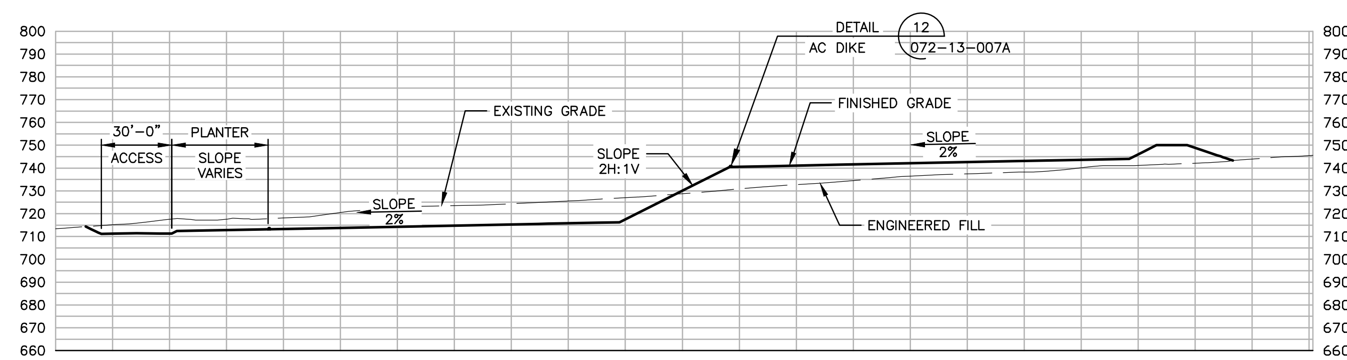
:FUNCTIONAL LOCATION NO.



SECTION M
VIEW LOOKING NORTHEAST
SCALE: VERT.& HORIZ.(1"=40')
072-13-004E



SECTION N
VIEW LOOKING NORTHEAST
SCALE: VERT.& HORIZ.(1"=40')
072-13-004E



SECTION P
VIEW LOOKING NORTHWEST
SCALE: VERT.& HORIZ.(1"=40')
072-13-004E

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=40' FILE: 13186/072-13-005F
PLOT AT: 1=1 LAYER(S):
ENGINEER: MSO CHANGED BY: RAA
DATE STARTED: 11/18/13 LAST CHANGED: 08/18/14

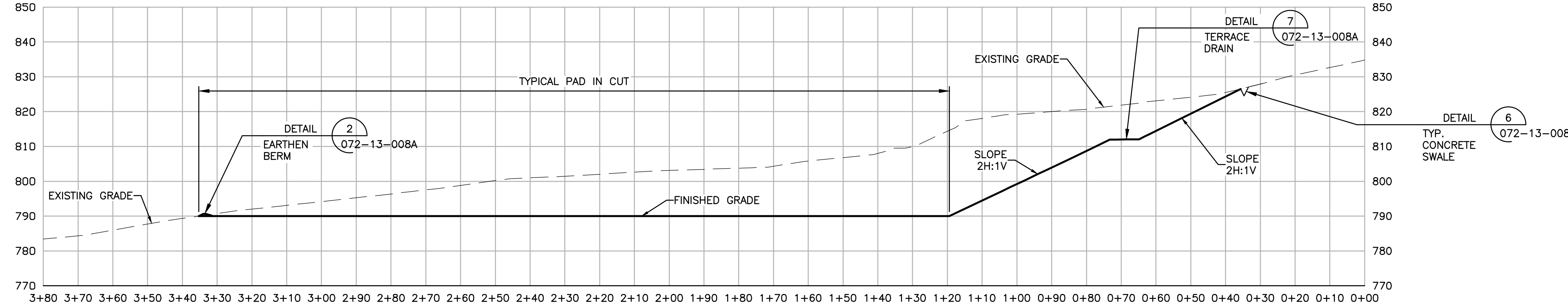
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

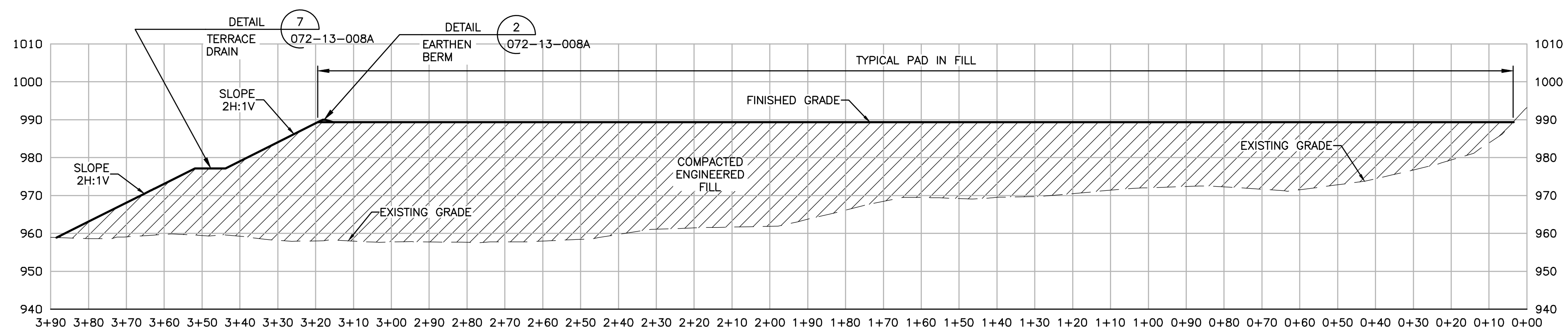
GRADING SECTIONS – OFFICE/WAREHOUSE SITE
FIELD REDEVELOPEMENT PLAN
SECTIONS 19,20,29,30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 40'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-005F	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-005F	

:FUNCTIONAL LOCATION NO.



SECTION Q
VIEW LOOKING NORTH
SCALE: VERT.& HORIZ.(1"=20')
072-13-004F



SECTION R
VIEW LOOKING NORTH
SCALE: VERT.& HORIZ.(1"=20')
072-13-004G

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-004G	GRADING PLAN – TYPICAL PAD IN FILL
072-13-004F	GRADING PLAN – TYPICAL PAD IN CUT
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20'
FILE: 13186/072-13-005G
PLOT AT: 1=1
LAYER(S): _
ENGINEER: RSD
CHANGED BY: RAA
DATE STARTED: 08/04/14
LAST CHANGED: 08/18/14

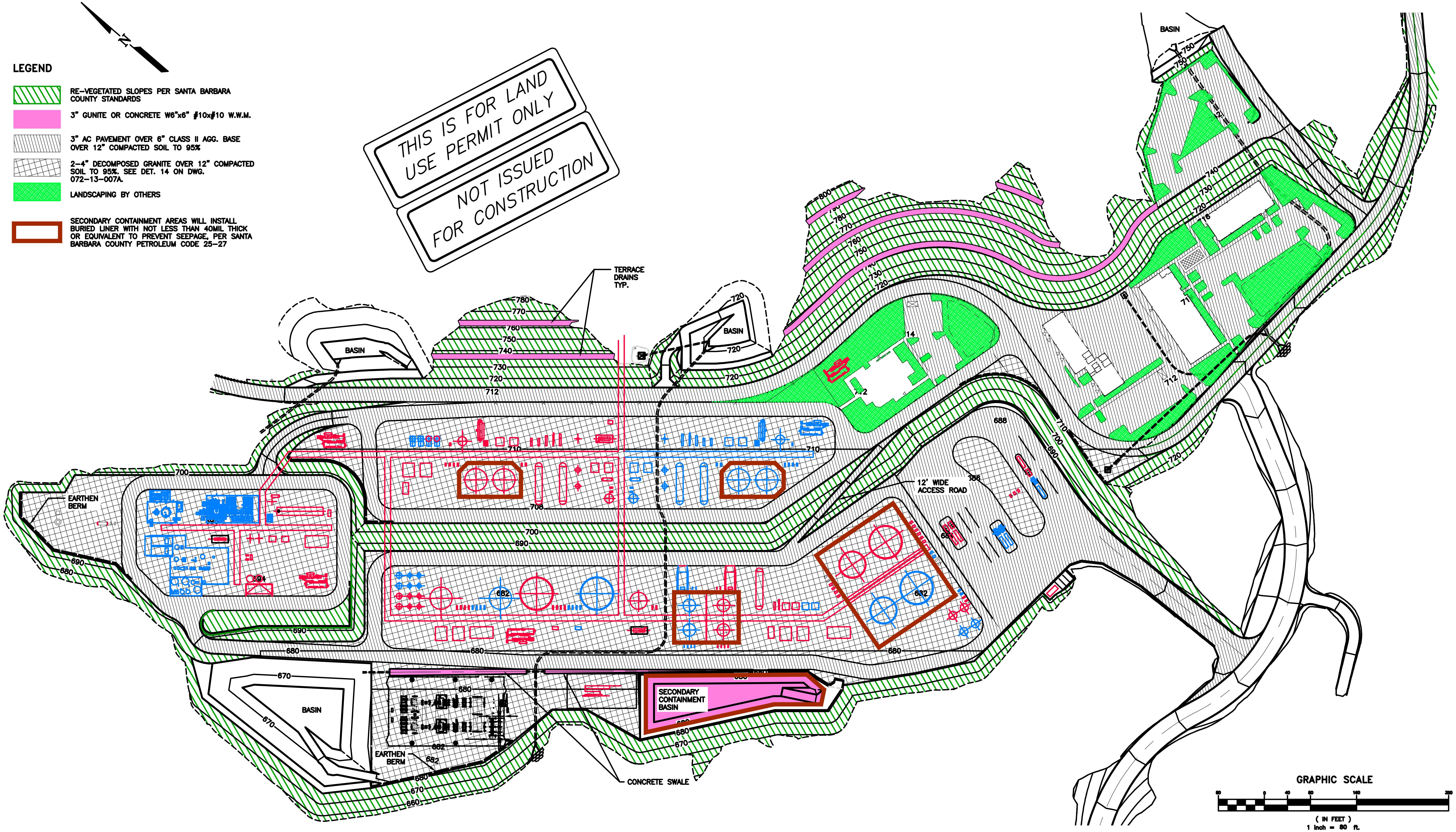
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING SECTIONS – TYPICAL PAD IN CUT & FILL
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/18/14	SCALE: 1" = 20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-005G	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-005G	

:FUNCTIONAL LOCATION NO.



EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 2'-0"

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=80' FILE: 13186/072-13-006A
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 05/30/14 LAST CHANGED: 08/20/14

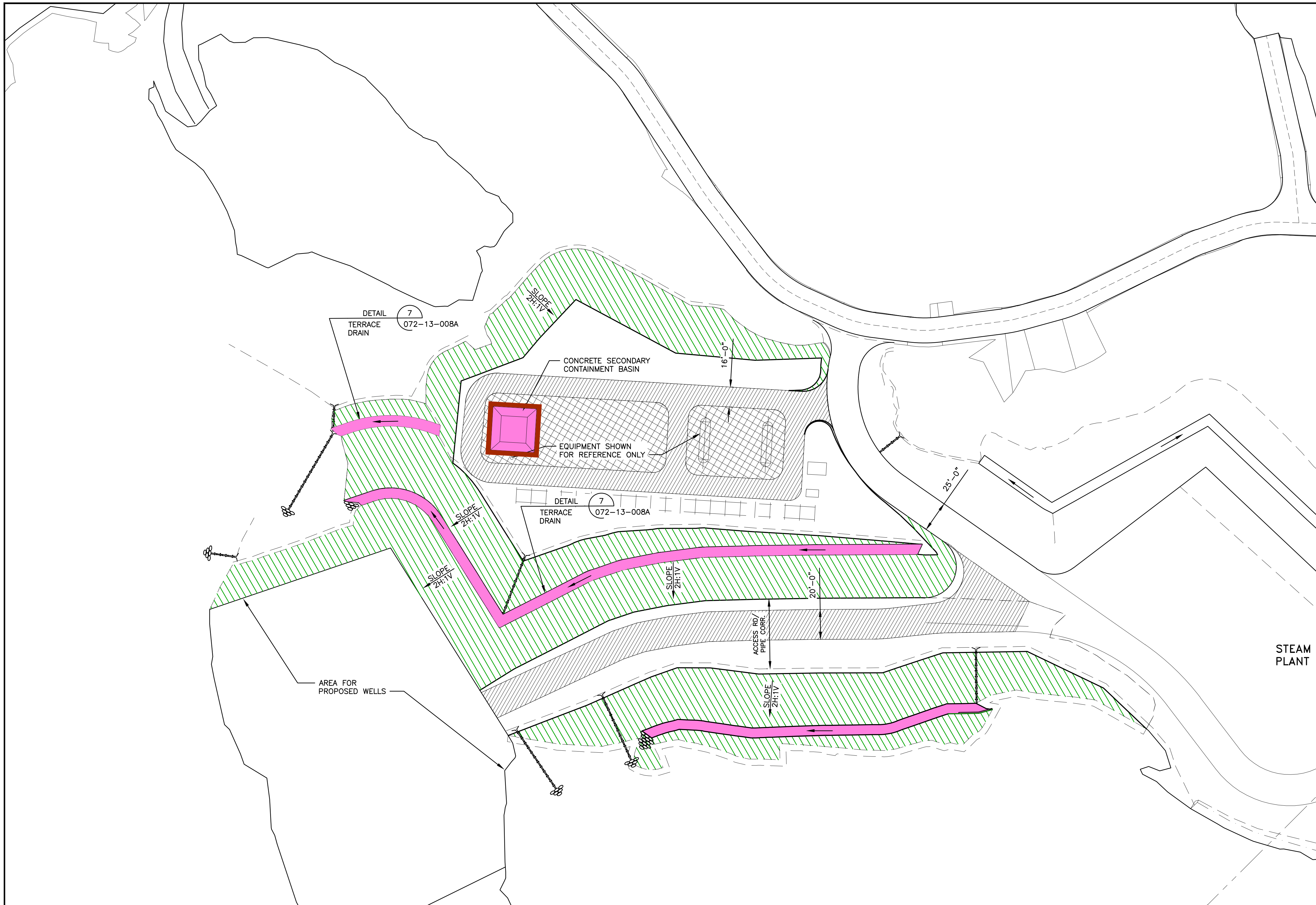
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

PAVING PLAN – CENTRAL PROCESSING PLANT/OFFICE/MULTIPURPOSE BUILDING
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 80'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-006A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-006A	

:FUNCTIONAL LOCATION NO.



THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- RE-VEGETATED SLOPES PER SANTA BARBARA COUNTY STANDARDS
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- LANDSCAPING BY OTHERS
- SECONDARY CONTAINMENT AREAS WILL INSTALL BURIED LINER WITH NOT LESS THAN 40MIL THICK OR EQUIVALENT TO PREVENT SEEPAGE, PER SANTA BARBARA COUNTY PETROLEUM CODE 25-27

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING
DWG NUMBER	TITLE

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=40' FILE: 13186/072-13-006B
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 04/23/14 LAST CHANGED: 08/20/14

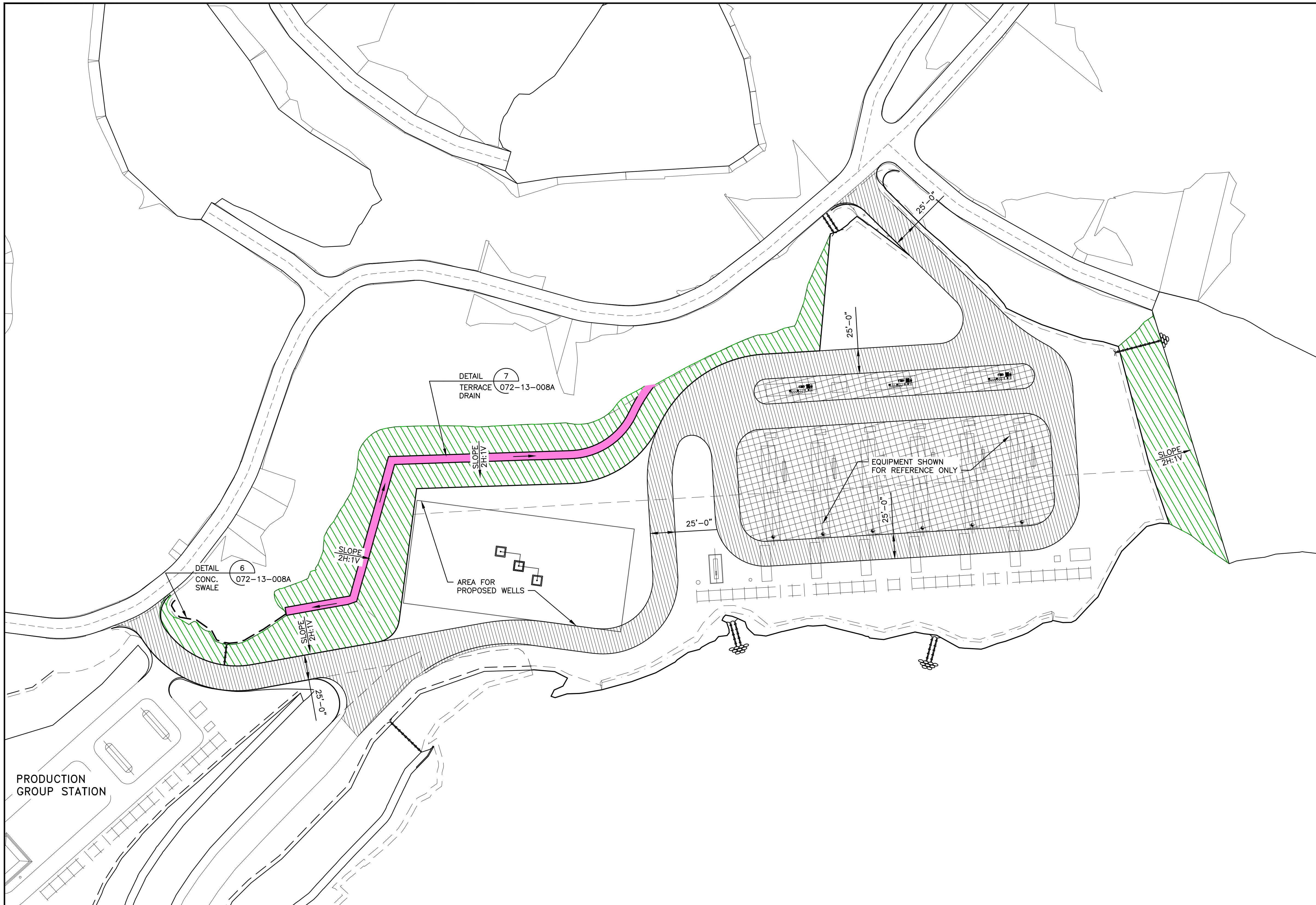
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

PAVING PLAN – PRODUCTION GROUP STATION
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 40'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-006B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-006B	

:FUNCTIONAL LOCATION NO.



THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND

- RE-VEGETATED SLOPES PER SANTA BARBARA COUNTY STANDARDS
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- LANDSCAPING BY OTHERS

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

072-13-003A	SITER LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING
DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=50'
FILE: 13186/072-13-006C
PLOT AT: 1=1
LAYER(S): .
ENGINEER: RSD
CHANGED BY: RAA
DATE STARTED: 10/24/13
LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

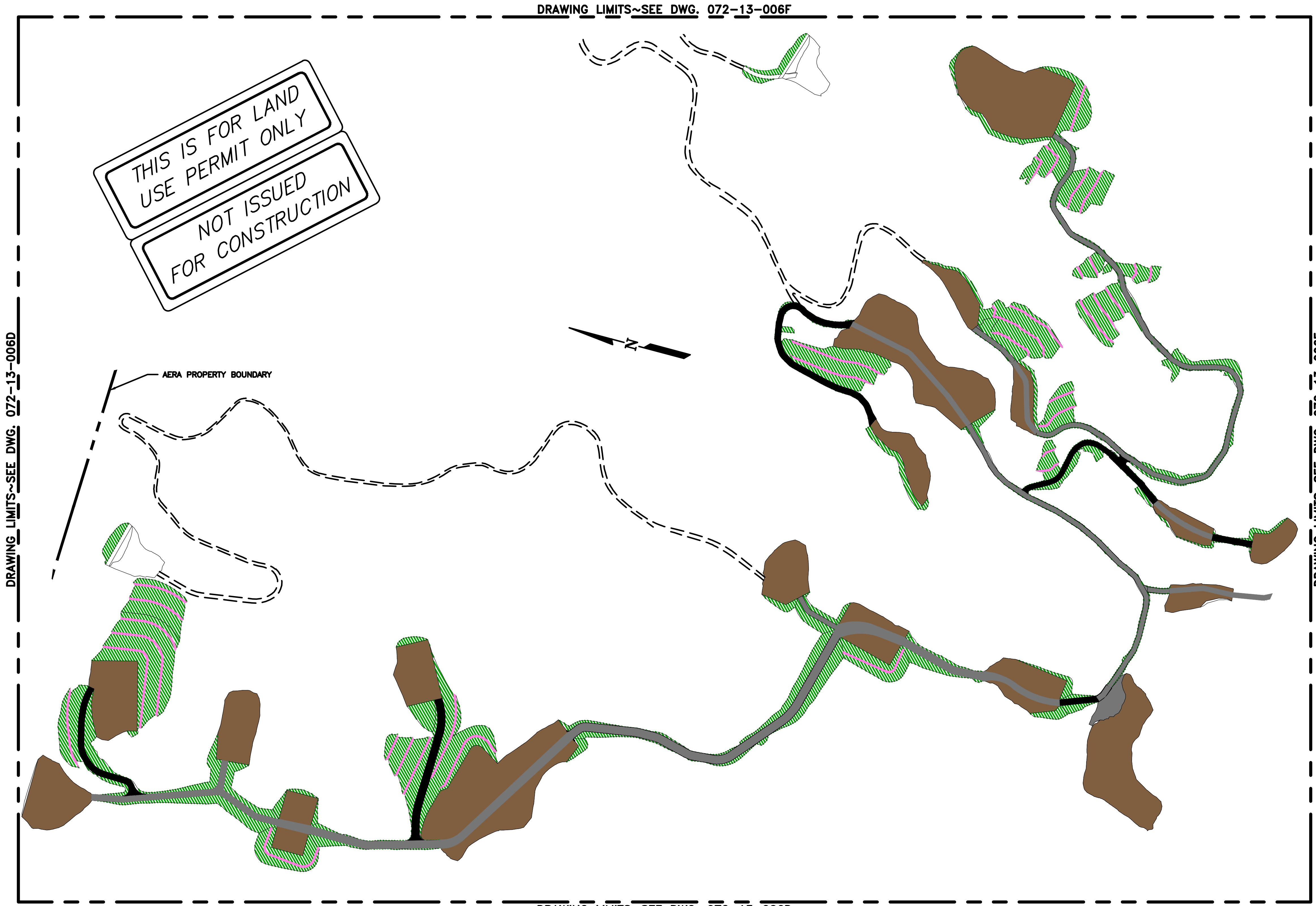
PAVING PLAN - STEAM PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER:	ERIC PAULSON
CO. ENGINEER:	TJCROSS ENGINEERS, INC
PROJ. MGR:	ALI GOKGOZ
DESIGNED BY:	ROBIN DICKERSON
DRAFTED BY:	ROBERT AMARO
ECCN NO.	EAR99

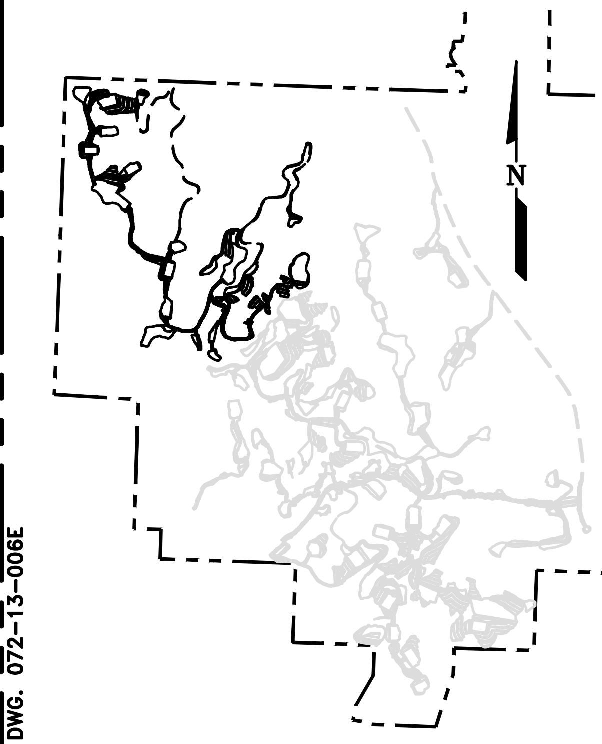
DATE: 08/20/14 SCALE: 1" = 50'
ORIGINAL DWG NO.
NO. 072-13-006C REV. 0
CAD FILE NO. 072-13-006C

:FUNCTIONAL LOCATION NO.

DRAWING LIMITS~SEE DWG. 072-13-006F



DRAWING LIMITS~SEE DWG. 072-13-006D



KEY MAP

LEGEND

- RE-VEGETATED SLOPES PER SANTA BARBARA COUNTY STANDARDS
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 9" CLASS 2 AGG. BASE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 11 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.
- DEVELOPED PADS COMPACTED TO 95%

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

N

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=200'	FILE: 13186/072-13-006D
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 04/23/14	LAST CHANGED: 08/20/14

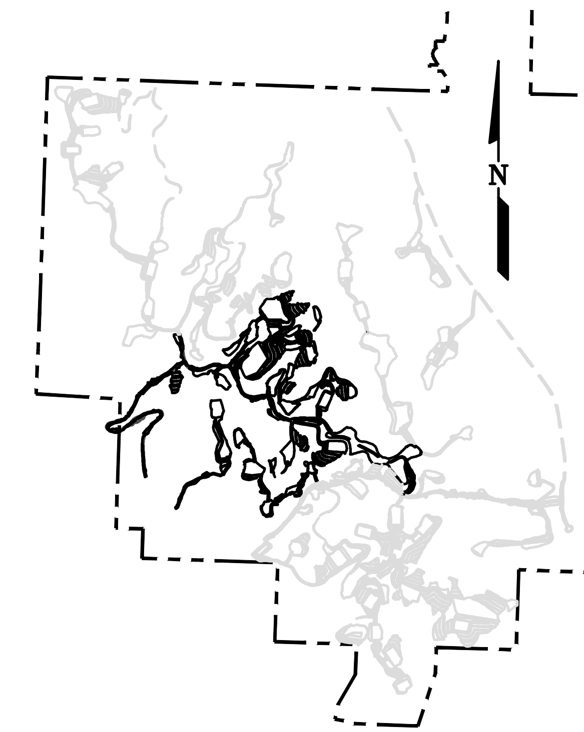
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

PAVING PLAN – FIELD DEVELOPMENT
FIELD REDEVELOPMENT PROJECT
SECTIONS 19 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 200'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-006D	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-006D	

:FUNCTIONAL LOCATION NO.



KEY MAP

LEGEND

- RE-VEGETATED SLOPES PER SANTA BARBARA COUNTY STANDARDS
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 9" CLASS 2 AGG. BASE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 11 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.
- DEVELOPED PADS COMPACTED TO 95%

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

N

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=200'
FILE: 13186/072-13-006E
PLOT AT: 1=1
LAYER(S): .
ENGINEER: RSD
CHANGED BY: RAA
DATE STARTED: 04/23/14
LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

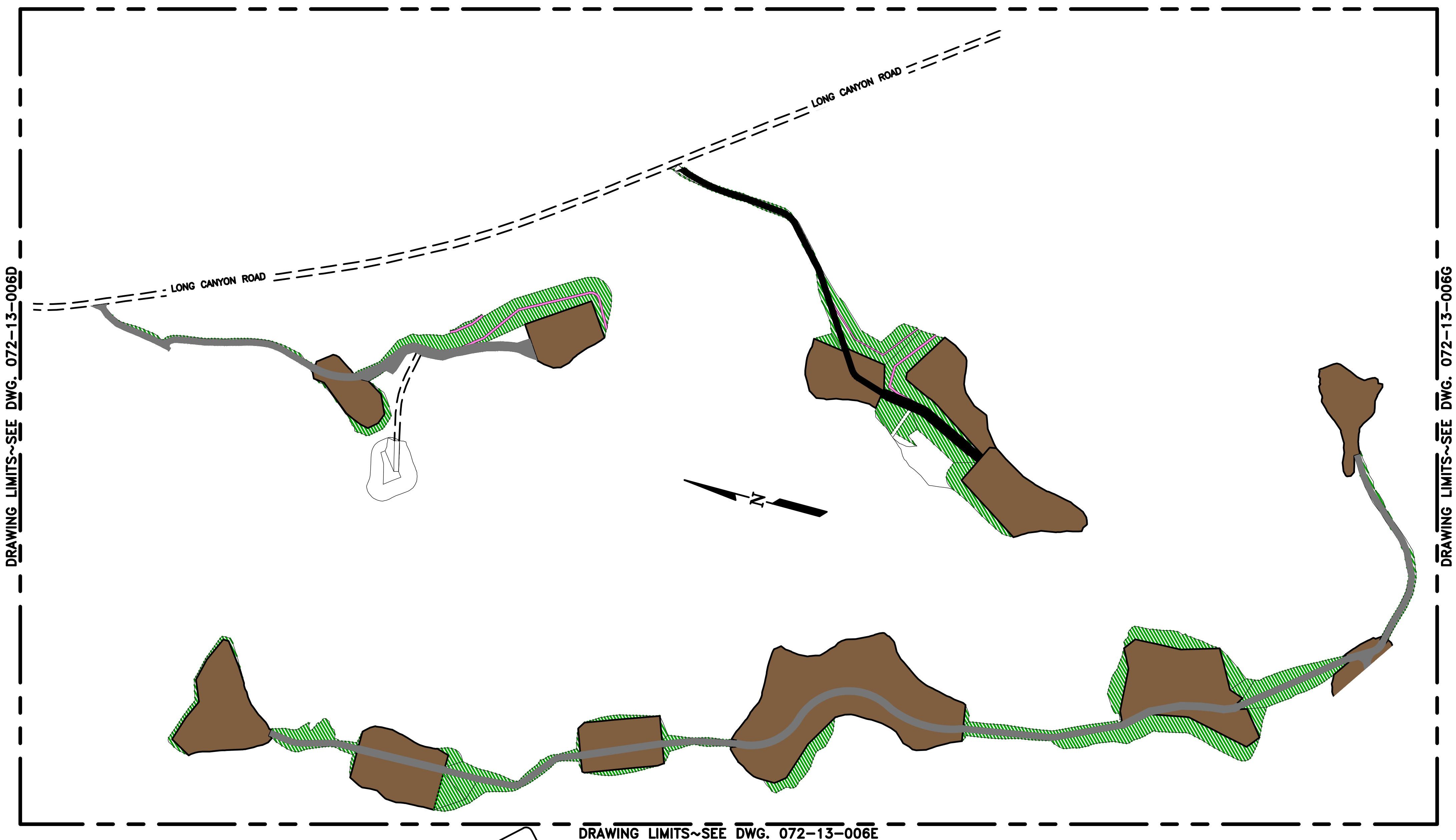
AERA

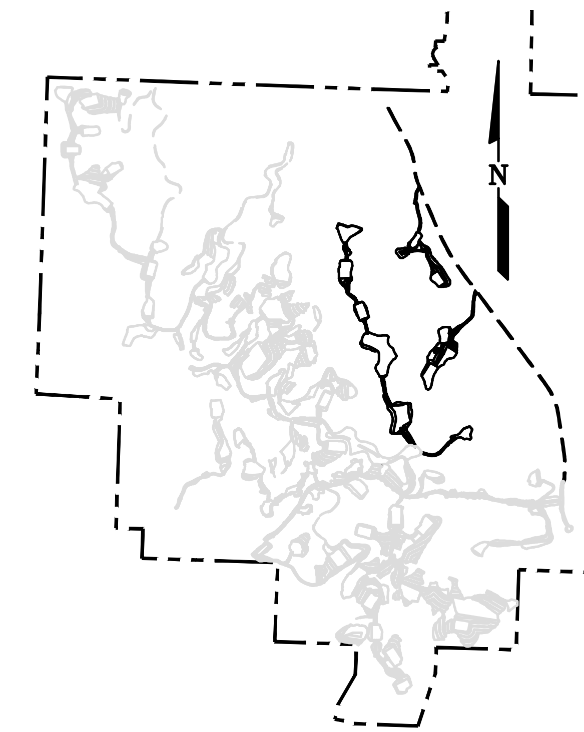
PAVING PLAN – FIELD DEVELOPMENT
FIELD REDEVELOPMENT PROJECT
SECTIONS 30 & 31 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ROBERT AMARO
ECCN NO. EAR99

DATE: 08/20/14
SCALE: 1" = 200'
ORIGINAL DWG NO.
NO. 072-13-006E
REV. 0
CAD FILE NO. 072-13-006E

:FUNCTIONAL LOCATION NO.





LEGEND

- RE-VEGETATED SLOPES PER SANTA BARBARA COUNTY STANDARDS
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 9" CLASS 2 AGG. BASE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 11 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.
- DEVELOPED PADS COMPACTED TO 95%

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

N

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=200' FILE: 13186/072-13-006F
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 04/23/14 LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

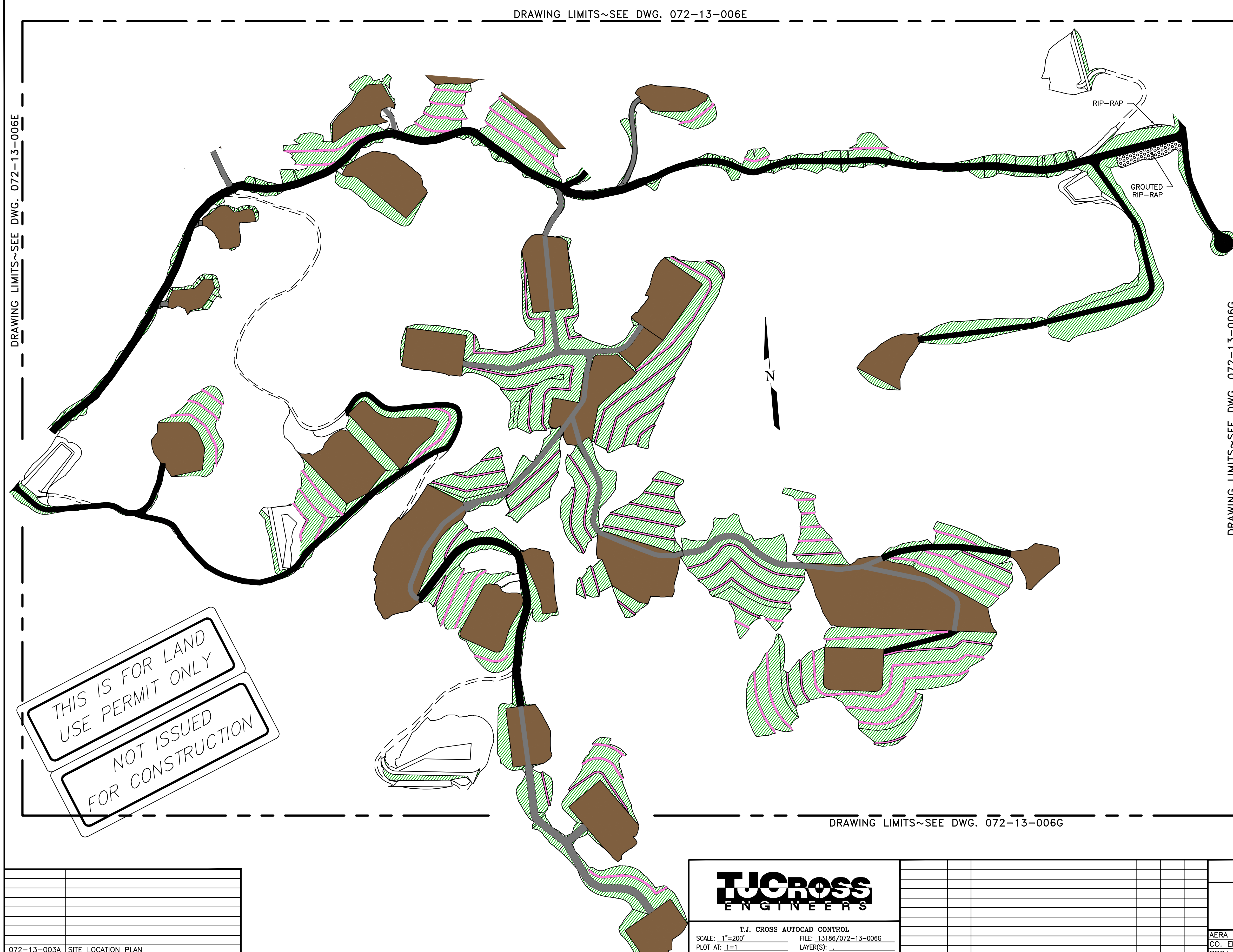
AERA

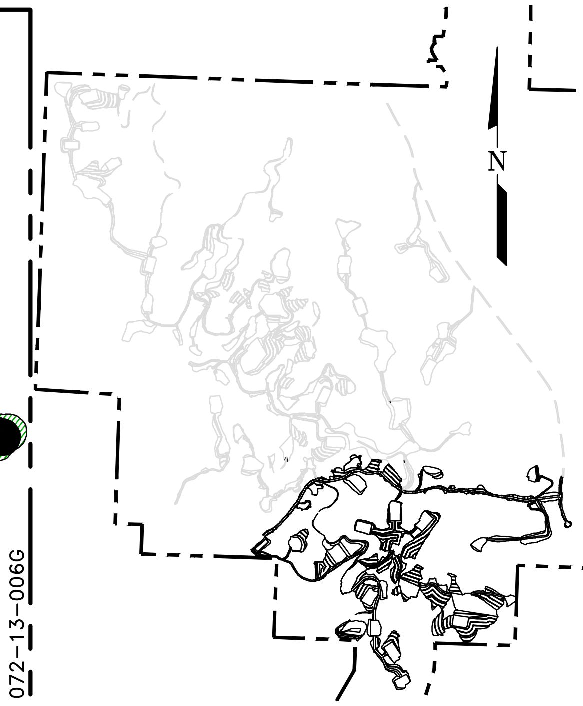
PAVING PLAN – FIELD DEVELOPMENT
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ROBERT AMARO
ECCN NO. EAR99

DATE: 08/20/14 SCALE: 1" = 200'
ORIGINAL DWG NO.
NO. 072-13-006F REV. 0
CAD FILE NO. 072-13-006F

:FUNCTIONAL LOCATION NO.





KEY MAP

LEGEND

- RE-VEGETATED SLOPES PER SANTA BARBARA COUNTY STANDARDS
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 9" CLASS 2 AGG. BASE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 11 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.
- DEVELOPED PADS COMPACTED TO 95%

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

N

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=200'
PLOT AT: 1=1
ENGINEER: RSD
DATE STARTED: 04/23/14
FILE: 13186/072-13-006G
LAYER(S): _
CHANGED BY: RAA
LAST CHANGED: 08/20/14

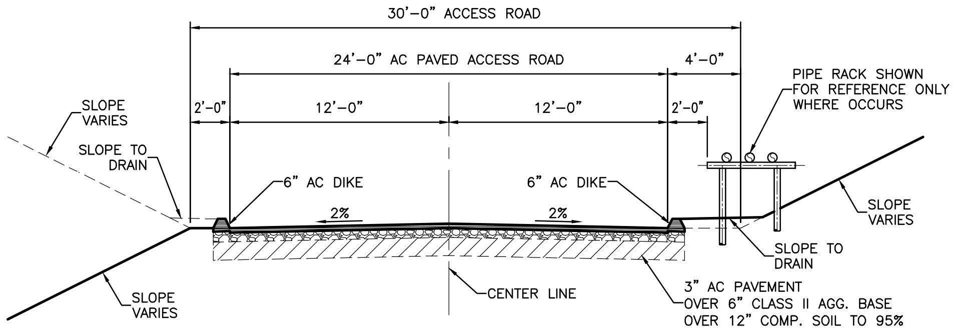
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

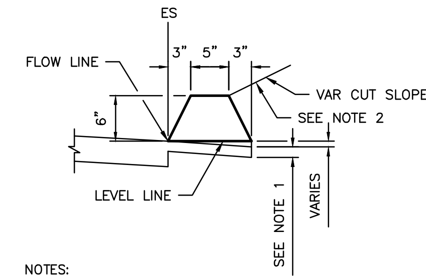
PAVING PLAN – FIELD DEVELOPMENT
FIELD REDEVELOPMENT PROJECT
SECTIONS 29/30/ & 31 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 200'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-006G	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-006G	

:FUNCTIONAL LOCATION NO.



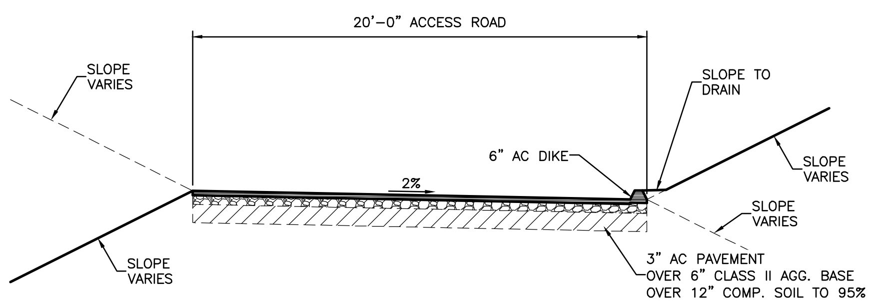
DETAIL 9
TYP. AC PVM'T ROAD SEC.
SCALE: 1"=5'
072-13-004A



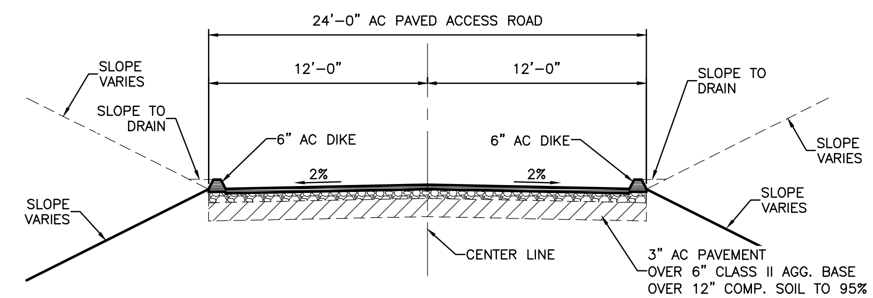
NOTES:

1. FOR AC SHOULDERS ONLY, EXTEND TOP LAYER OF AC PLACED ON THE SHOULDER UNDER DIKE WITH NO JOINT AT THE ES.
2. FILL AND COMPACT WITH EXCAVATED MATERIAL TO TOP OF DIKE.

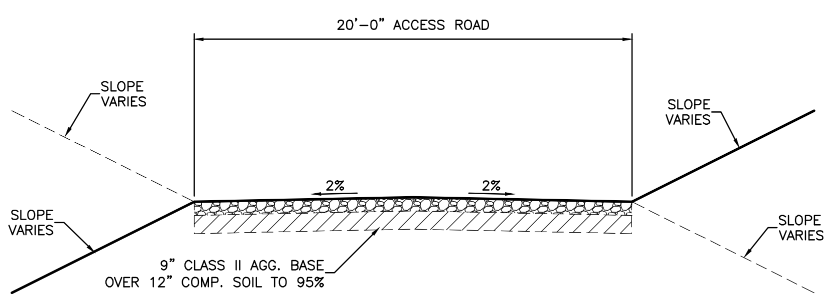
DETAIL 12
TYP. AC DIKE
SCALE: 1"=1'
072-13-004A



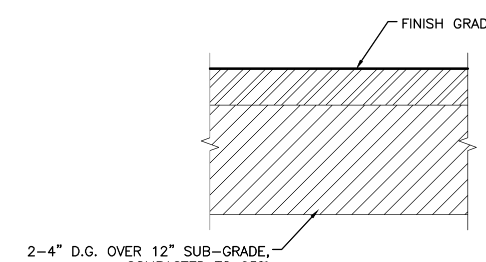
DETAIL 10
TYP. AGG. BASE ROAD SEC.
SCALE: 1"=5'
072-13-004A



DETAIL 13
TYP. AC PVM'T ROAD SEC.
SCALE: 1"=5'
072-13-004A



DETAIL 11
TYP. AGG. BASE ROAD SEC.
SCALE: 1"=5'
072-13-004A



DETAIL 14
D.G. SURFACING
SCALE: 1"=5'
072-13-006B
072-13-006C
072-13-006D

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: AS SHOWN	FILE: 13186/072-13-007A
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 11/19/13	LAST CHANGED: 08/20/14

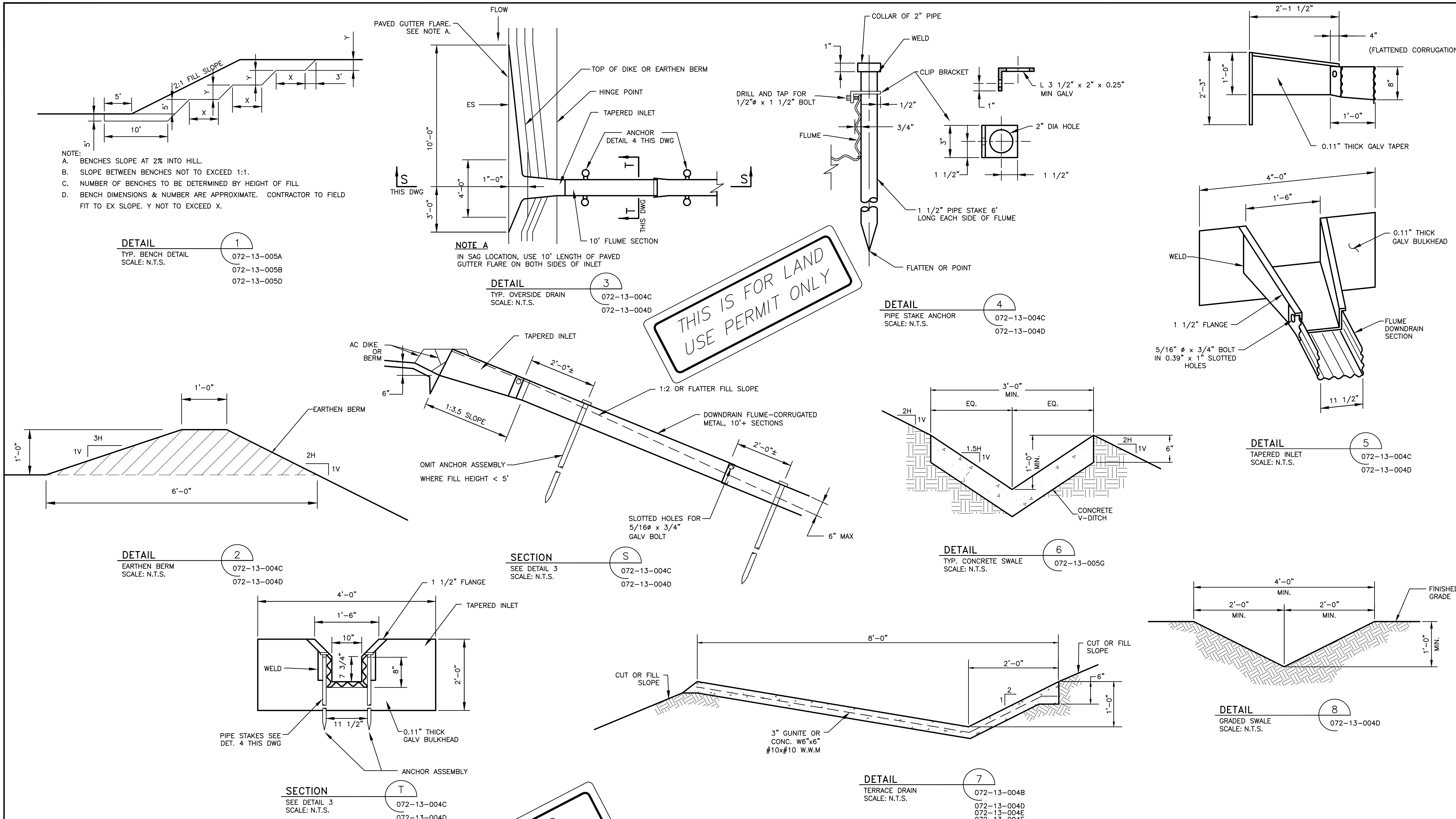
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

PAVING DETAILS
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: AS SHOWN
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-007A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-007A	

:FUNCTIONAL LOCATION NO.



NOT ISSUED FOR CONSTRUCTION

072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING
DWG NUMBER	TITLE

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: AS SHOWN — FILE: 13186/072-13-008A
PLOT AT: 1=1 — LAYER(S): _
ENGINEER: RSD — CHANGED BY: RAA
DATE STARTED: 01/21/14 — LAST CHANGED: 08/20/14

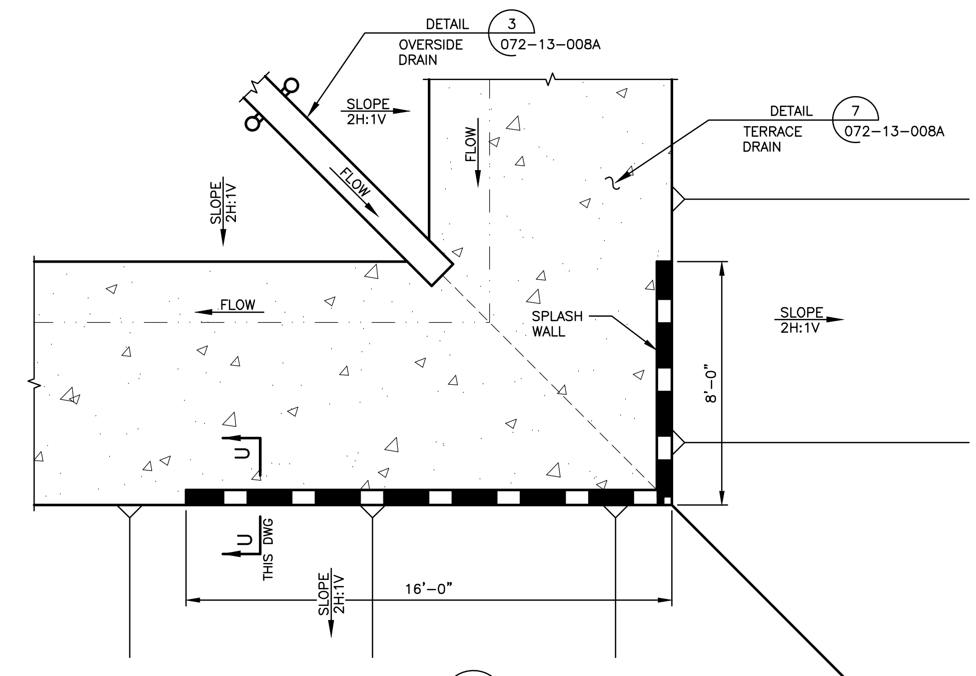
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

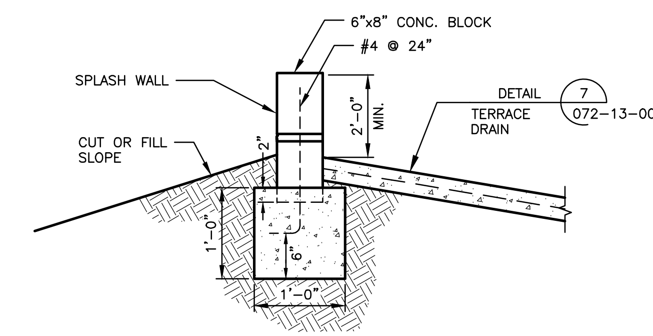
GRADING DETAILS
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: AS SHOWN
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-008A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-008A	

:FUNCTIONAL LOCATION NO.



DETAIL 15
SPLASH WALL
SCALE: N.T.S.
072-13-004C



SECTION U
SEE DETAIL 15
SCALE: N.T.S.
072-13-008B

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP–CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: AS SHOWN
PLOT AT: 1=1
ENGINEER: RSD
DATE STARTED: 01/21/14
FILE: 13186/072-13-008B
LAYER(S): _
CHANGED BY: RAA
LAST CHANGED: 08/18/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

GRADING DETAILS
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON
CO. ENGINEER:	TJCROSS ENGINEERS, INC
PROJ. MGR:	ALI GOKGOZ
DESIGNED BY:	ROBIN DICKERSON
DRAFTED BY:	ROBERT AMARO
ECCN NO.	EAR99

DATE: 08/18/14 SCALE: AS SHOWN
ORIGINAL DWG NO.
NO. 072-13-008B REV. 0
CAD FILE NO. 072-13-008B

:FUNCTIONAL LOCATION NO.

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

EC-4 AND EC-7

LANDSCAPE BY OTHERS

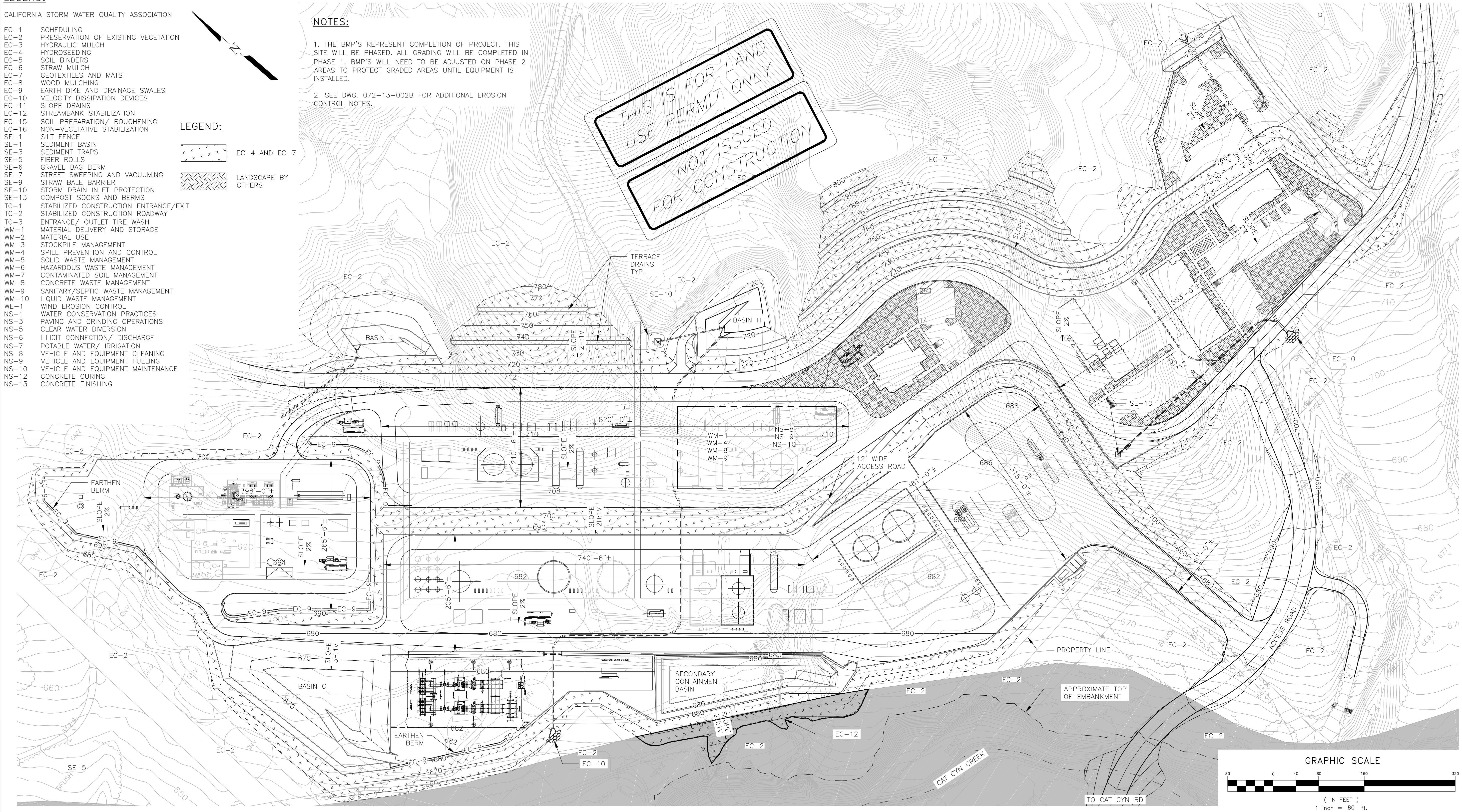
NOTES:

1. THE BMP'S REPRESENT COMPLETION OF PROJECT. THIS SITE WILL BE PHASED. ALL GRADING WILL BE COMPLETED IN PHASE 1. BMP'S WILL NEED TO BE ADJUSTED ON PHASE 2 AREAS TO PROTECT GRADED AREAS UNTIL EQUIPMENT IS INSTALLED.

2. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION



EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 2'-0"

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.
2. CONTOURS SHOWN REPRESENT FINISHED GRADE ELEVATIONS

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=80'	FILE: 13186/072-13-009A
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 05/30/14	LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN – CENTRAL PROCESSING PLANT/OFFICE/MULTIPURPOSE BUILDING
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 80'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009A	

:FUNCTIONAL LOCATION NO.

NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=40'	FILE: 13186/072-13-009B
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 04/23/14	LAST CHANGED: 08/20/14

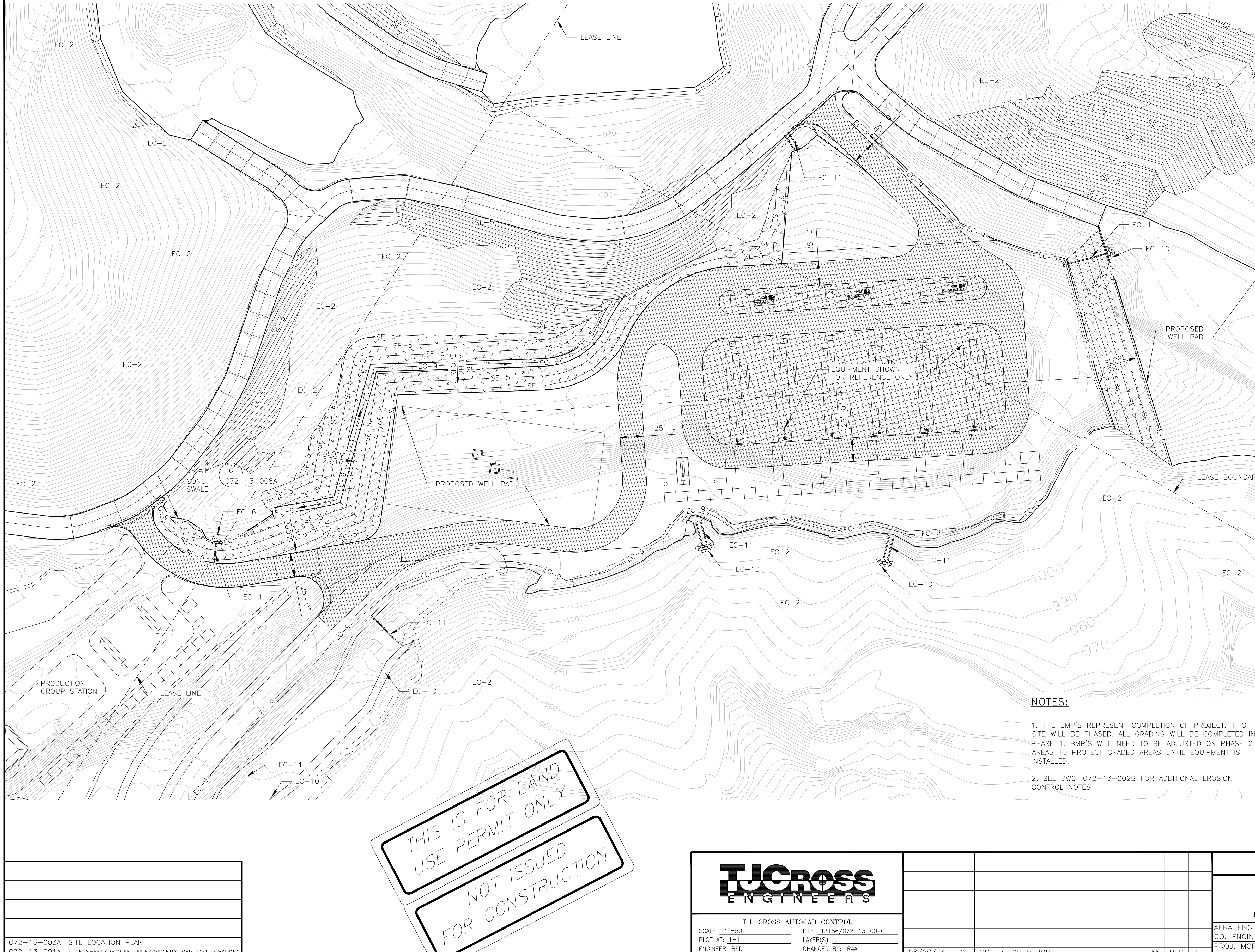
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN - PRODUCTION GROUP STATION
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 40'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009B	

:FUNCTIONAL LOCATION NO.



LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THE BMP'S REPRESENT COMPLETION OF PROJECT. THIS SITE WILL BE PHASED. ALL GRADING WILL BE COMPLETED IN PHASE 1. BMP'S WILL NEED TO BE ADJUSTED ON PHASE 2 AREAS TO PROTECT GRADED AREAS UNTIL EQUIPMENT IS INSTALLED.

2. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=50'	FILE: 13186/072-13-009C
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 10/24/13	LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN - STEAM PLANT
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 50'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009C	

:FUNCTIONAL LOCATION NO.

N

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=30' FILE: 13186/072-13-009D
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: RAA
DATE STARTED: 08/07/14 LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

AERA

EROSION CONTROL PLAN - PAD IN CUT (TYP.)
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 30'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009D	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009D	

:FUNCTIONAL LOCATION NO.

LEGEND:

CALIFORNIA STORM WATER QUALITY ASSOCIATION

EC-1	SCHEDULING
EC-2	PRESERVATION OF EXISTING VEGETATION
EC-3	HYDRAULIC MULCH
EC-4	HYDROSEEDING
EC-5	SOIL BINDERS
EC-6	STRAW MULCH
EC-7	GEOTEXTILES AND MATS
EC-8	WOOD MULCHING
EC-9	EARTH DIKE AND DRAINAGE SWALES
EC-10	VELOCITY DISSIPATION DEVICES
EC-11	SLOPE DRAINS
EC-12	STREAMBANK STABILIZATION
EC-15	SOIL PREPARATION/ ROUGHENING
EC-16	NON-VEGETATIVE STABILIZATION
SE-1	SILT FENCE
SE-1	SEDIMENT BASIN
SE-3	SEDIMENT TRAPS
SE-5	FIBER ROLLS
SE-6	GRAVEL BAG BERM
SE-7	STREET SWEEPING AND VACUUMING
SE-9	STRAW BALE BARRIER
SE-10	STORM DRAIN INLET PROTECTION
SE-13	COMPOST SOCKS AND BERMS
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT
TC-2	STABILIZED CONSTRUCTION ROADWAY
TC-3	ENTRANCE/ OUTLET TIRE WASH
WM-1	MATERIAL DELIVERY AND STORAGE
WM-2	MATERIAL USE
WM-3	STOCKPILE MANAGEMENT
WM-4	SPILL PREVENTION AND CONTROL
WM-5	SOLID WASTE MANAGEMENT
WM-6	HAZARDOUS WASTE MANAGEMENT
WM-7	CONTAMINATED SOIL MANAGEMENT
WM-8	CONCRETE WASTE MANAGEMENT
WM-9	SANITARY/SEPTIC WASTE MANAGEMENT
WM-10	LIQUID WASTE MANAGEMENT
WE-1	WIND EROSION CONTROL
NS-1	WATER CONSERVATION PRACTICES
NS-3	PAVING AND GRINDING OPERATIONS
NS-5	CLEAR WATER DIVERSION
NS-6	ILLICIT CONNECTION/ DISCHARGE
NS-7	POTABLE WATER/ IRRIGATION
NS-8	VEHICLE AND EQUIPMENT CLEANING
NS-9	VEHICLE AND EQUIPMENT FUELING
NS-10	VEHICLE AND EQUIPMENT MAINTENANCE
NS-12	CONCRETE CURING
NS-13	CONCRETE FINISHING

LEGEND:

- EC-4 AND EC-7
- 3" AC PAVEMENT OVER 6" CLASS II AGG. BASE OVER 12" COMPACTED SOIL TO 95%
- 2-4" DECOMPOSED GRANITE OVER 12" COMPACTED SOIL TO 95%. SEE DET. 14 ON DWG. 072-13-007A.
- 3" GUNITE OR CONCRETE W6"x6" #10x#10 W.W.M.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

NOTE:

1. SEE DWG. 072-13-002B FOR ADDITIONAL EROSION CONTROL NOTES.

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-003A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/DRAWING INDEX/VICINITY MAP-CIVIL GRADING

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=30'	FILE: 13186/072-13-009E
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: RAA
DATE STARTED: 08/07/14	LAST CHANGED: 08/20/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/20/14	0	ISSUED FOR PERMIT	RAA	RSD	EP

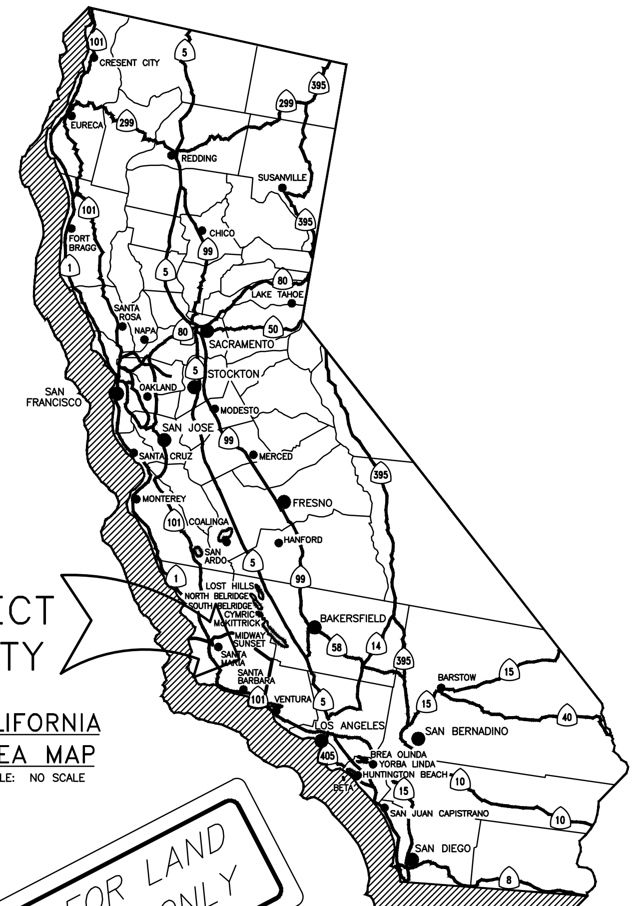
AERA

EROSION CONTROL PLAN – PAD IN FILL (TYP.)
FIELD REDEVELOPMENT PROJECT
SECTION 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 30'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-009E	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072-13-009E	

:FUNCTIONAL LOCATION NO.

TITLE SHEET/VICINITY MAP/DRAWING INDEX – CIVIL FIELD ENTRANCES
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA



PROJECT VICINITY

CALIFORNIA AREA MAP
SCALE: NO SCALE

THIS IS FOR LAND USE PERMIT ONLY

DRAWING INDEX

	FILE NO.	REV.	DESCRIPTION
REV 1	072-13-013A	1	TITLE SHEET/DRAWING INDEX/VICINITY MAP – CIVIL FIELD ENTRANCES
	072-13-014A	0	CONSTRUCTION NOTES
	072-13-014B	0	CONSTRUCTION NOTES – SANTA BARBARA
	072-13-015A	0	SITE LOCATION PLAN
REV 1	072-13-016A	1	PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 1
	072-13-016B	0	PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 2
	072-13-016C	0	PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 3
	072-13-016D	0	PLAN & PROFILE – CAT CANYON ENTRANCE
	072-13-016E	0	PLAN & PROFILE – CAT CANYON ENTRANCE
	072-13-016F	0	PLAN & PROFILE – CAT CANYON ENTRANCE
	072-13-016G	0	PLAN & PROFILE – CENTRAL PROCESSING AREA ACCESS ROAD
	072-13-017A	0	PAVING PLAN – LONG CANYON ROAD ENTRANCE 1
	072-13-017B	0	PAVING PLAN – LONG CANYON ROAD ENTRANCE 2
	072-13-017C	0	PAVING PLAN – LONG CANYON ROAD ENTRANCE 3
	072-13-017D	0	PAVING PLAN – CAT CANYON ENTRANCE
	072-13-018A	0	GRADING DETAILS
	072-13-019A	0	PAVING DETAILS

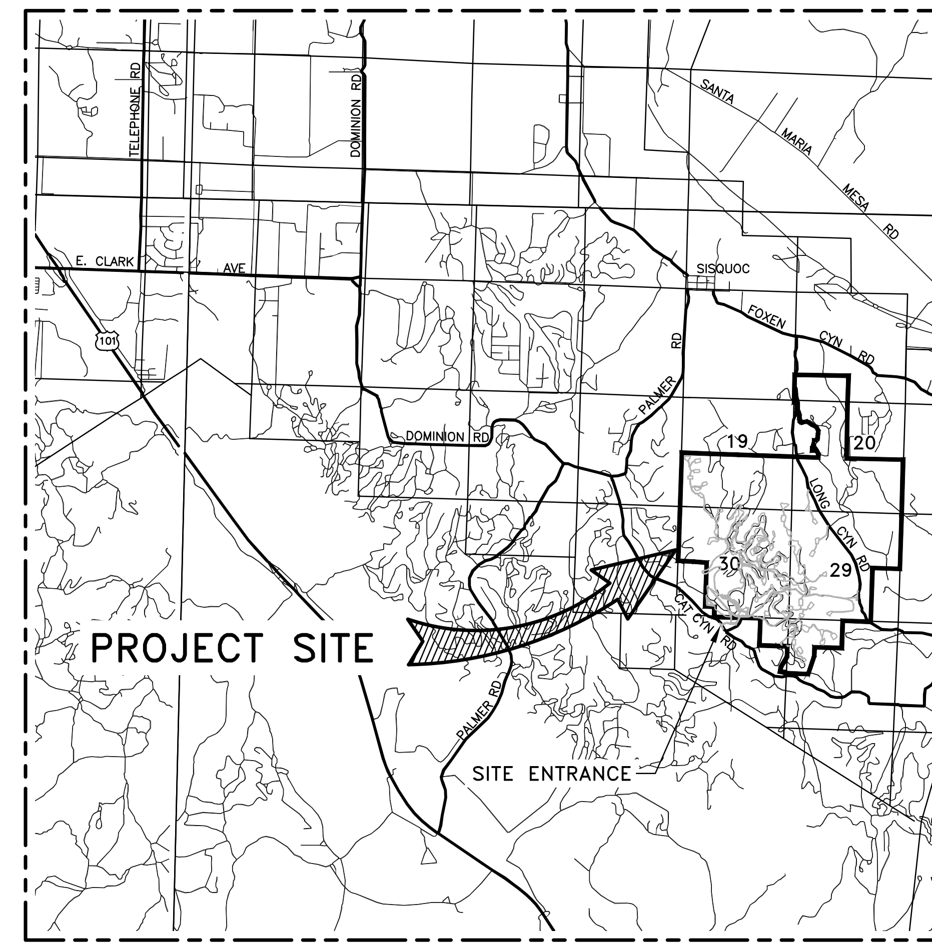
PROJECT OWNER
AERA ENERGY LLC
10000 MING AVENUE
BAKERSFIELD, CA 93311
ENGINEER: ERIC PAULSON
PH.: 661-665-5359

GEOTECH
FUGRO CONSULTANTS, INC.
4820 McGRATH STREET, SUITE 100
BAKERSFIELD, CALIFORNIA 93003
PH.: 805-650-7000
FAX: 805-650-7010

ENGINEER
T.J. CROSS ENGINEERS, INC.
200 NEW STINE ROAD, SUITE 270
BAKERSFIELD, CALIFORNIA 93309
ROBIN DICKERSON, P.E.
PH.: 661-831-8782 x217
FAX: 661-831-5019

NOT ISSUED FOR CONSTRUCTION

NOTE:
PROJECT SITE IS LOCATED WITHIN AREA OF POTENTIAL H_2S GAS CONCENTRATIONS. ALL PERSONNEL, CONTRACTORS AND VISITORS MUST BE EQUIPPED WITH AN APPROPRIATE MONITORING DEVICE OR ACCOMPANIED BY AERA PERSONNEL.



VICINITY MAP
SCALE: NO SCALE

PROJECT LOCATION DESCRIPTION

FROM HIGHWAY 101, TAKE PALMER RD. NORTH APPROX. 4.5 MILES TO CAT CANYON RD. TURN RIGHT ON CAT CANYON RD. AND GO SOUTH APPROX. 1.8 MILES. TURN LEFT ONTO OIL FIELD ROAD AND GO PAST GATE AND TURN LEFT. GO NORTH APPROX. 0.25 MILES TO AREA FIELD OFFICE.

PROPERTY / PROJECT INFORMATION

PROJECT PURPOSE:	**GRADING FOR FIELD REDEVELOPMENT**
ADDRESS:	6516 CAT CANYON ROAD
APN:	129-210-017, 101-040-005, 101-040-006, 101-050-042, 101-040-011, 101-040-012, 101-040-013, 101-040-014, 101-050-013, 101-040-019, 101-040-020, 101-050-014, 101-070-007, 101-050-002
GRADING DESIGNATION:	ENGINEERED GRADING
EXCAVATION QUANTITY:	7,749 (CU. YDS.)
FILL QUANTITY:	40,548 (CU. YDS.)
DISTURBED AREA:	4.1 ACRES
DESIGN CODE:	CURRENT ISSUE OF SANTA BARBARA COUNTY GRADING & BUILDING CODE
ZONING:	ZONE "Ag-II-100 & AC" / AGRICULTURE & AGRICULTURAL COMMERCIAL
LAND USE DESIGNATION:	OIL AND GAS EXPLORATION AND PRODUCTION

REFERENCE DRAWINGS

DWG NUMBER	TITLE
072-013-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: NONE	FILE: 13186/072-13-013A
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/17/14	LAST CHANGED: 09/17/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	1	RE-ISSUED FOR PERMIT (LNG CYN CULVERT SIZE)	IDU	RSD	EP
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

TITLE SHEET/DRAWING INDEX/VICINITY MAP – CIVIL FIELD ENTRANCES
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: NO SCALE
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-013A	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-013A	

:FUNCTIONAL LOCATION NO.

CONSTRUCTION NOTES

SITE PREPARATION AND GRADING PLAN

ESTIMATED CONSTRUCTION QUANTITIES:
AREA DISTURBED – ~4.1 ACRES
EXCAVATION – 7,749 CUBIC YARDS
FILL – 40,548 CUBIC YARDS

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. CONTRACTOR SHALL CALCULATE THE EARTHWORK QUANTITIES TO THEIR SATISFACTION PRIOR TO START OF CONSTRUCTION OR BIDDING. CONSOLIDATION, LOSSES DUE TO CLEARING OPERATIONS, UTILITY TRENCHES, SUBGRADE STABILIZATION, OR FACTORS FOR GRADING MEANS AND METHODS ARE NOT INCLUDED AND EARTHWORK QUANTITIES MAY VARY ACCORDING TO THESE FACTORS.
C. EARTHWORK VOLUMES DO NOT INCLUDE OVEREXCAVATION OR SCARIFICATION.

1. EQUIPMENT, SERVICES AND MATERIALS BY CONTRACTOR

CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND SUPERVISION NECESSARY TO PERFORM THE WORK SHOWN ON THE PLANS WHICH INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:

A. EXCAVATION, BACKFILL AND COMPACTION.
B. WATER FOR MOISTURE CONDITIONING AND DUST CONTROL.
C. MEASURES NECESSARY TO PREVENT EROSION AND PONDING.
D. ALL SURVEYING ASSOCIATED WITH THIS WORK.

2. EQUIPMENT, SERVICES AND MATERIAL PROVIDED BY AERA APPROVED CONTRACTOR.

A. MATERIAL FOR USE AS ENGINEERED FILL.
B. ALL SOILS TESTING.

3. CODES AND STANDARDS

CONTRACTOR SHALL PERFORM AND COMPLETE CONSTRUCTION IN COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL CODES, LAWS, ORDINANCES AND REGULATIONS.

A. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

- D–1556 DENSITY OF SOIL IN PLACE BY SAND–CONE METHOD.
- D–1557 MOISTURE–DENSITY RELATIONSHIP OF SOIL AND SOIL–AGGREGATE MIXTURES USING A 10–LB. HAMMER AND 18–INCH DROP.
- D–2937 DENSITY OF SOIL IN PLACE BY THE DRIVE CYLINDER METHOD.
- D–3017 MOISTURE CONTENT OF SOIL AND SOIL–AGGREGATE MIXTURES IN PLACE BY NUCLEAR METHOD.
- D–6938 DENSITY OF SOIL AND SOIL–AGGREGATE MIXTURES IN PLACE BY NUCLEAR METHOD.

B. SANTA BARBARA COUNTY CODE.

- CHAPTER 10 BUILDING CODE (ORDINANCE # 4766).
- CHAPTER 14 GRADING CODE (ORDINANCE # 4776).
- CHAPTER 25 PETROLEUM CODE (ORDINANCE # 9794).
- CHAPTER 35 ZONING SECTION 35–1 COUNTY LAND USE & DEVELOPMENT CODE.

C. 2013 CALIFORNIA BUILDING CODE.

D. IN ADDITION TO THE REQUIREMENTS SPECIFIED IN THESE DRAWINGS, THE CONTRACTOR SHALL REFER TO THE "GEOTECHNICAL ENGINEERING INVESTIGATION" REPORT PROVIDED BY FUGRO COONSULTANTS, INC. PROJECT NO. 04.62130155, DATED JANUARY 10, 2014.

4. GENERAL PROVISIONS REQUIRED OF CONTRACTOR

A. PROTECTION OF EXISTING FACILITIES

- EXISTING COMPANY FACILITIES SHALL BE PROTECTED.IF DAMAGED BY CONTRACTOR, FACILITIES SHALL BE REPAIRED AND/OR RESTORED AT CONTRACTOR'S EXPENSE.
- COMPANY RESERVES THE RIGHT TO ENTER THE SITE TO MAKE ANY REPAIRS OR ALTERATIONS TO EXISTING EQUIPMENT.
- EXTREME CARE SHALL BE EXERCISED WHEN EXCAVATING AT THIS SITE. UNDERGROUND UTILITIES ENCOUNTERED DURING EXCAVATION SHALL BE BROUGHT TO THE ATTENTION OF COMPANY REPRESENTATIVE. THESE FACILITIES SHALL NOT BE DISTURBED UNTIL INSTRUCTION IS RECEIVED FROM COMPANY REPRESENTATIVE.

B. SAFETY

- CONTRACTOR SHALL PROVIDE PROTECTIVE EQUIPMENT AND ENSURE THAT THIS EQUIPMENT IS PROPERLY USED WHEN REQUIRED.AT A MINIMUM, HARD HATS, SAFETY SHOES, AND SAFETY GLASSES WITH SIDE SHIELDS SHALL BE WORN AT ALL TIMES ON THE CONSTRUCTION SITE.
- WORK SHALL BE PERFORMED ACCORDING TO THE TERMS AND CONDITIONS OF THE CONTRACT AND APPLICABLE STATE AND FEDERAL REGULATIONS.
- EXTREME CARE MUST BE EXERCISED WHEN OPERATING ANY EQUIPMENT NEAR OVERHEAD POWER LINES.CONTRACTOR MUST NOT ALLOW ANY EQUIPMENT OR PERSONNEL TO OPERATE NEAR ANY OVERHEAD POWER LINE.
- EXCAVATING MUST BE ACCOMPLISHED SO AS TO AVOID ALL UNDERGROUND UTILITIES AND LINES.
- THE SIZE, NUMBER, LOCATION AND DEPTH OF ANY BURIED UTILITIES SHOWN ON THE DRAWINGS ARE BASED ON THE BEST INFORMATION AVAILABLE, EXTREME CARE SHALL BE TAKEN DURING EXCAVATION AS LOCATION AND DEPTH ALLOWANCES MAY NOT BE SHOWN ON THE SOURCE PLANS FOR THIS DRAWING.
- NO PERSON SHALL ENTER ANY EXCAVATION UNLESS PROTECTED FROM CAVE–INS IN ACCORDANCE WITH THE REQUIREMENTS OF "CFR 29 (OSHA), PART 1926.652 (REQUIREMENTS FOR PROTECTIVE SYSTEMS)" AND "OCR TITLE 8 (Aloha) SECTION 1541.1 (REQUIREMENTS FOR PROTECTIVE SYSTEMS)". DESIGN OF THE PROTECTIVE SYSTEM SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- IN EXCAVATION AREAS IMMEDIATELY ADJACENT TO EXISTING FOUNDATIONS WHERE VERTICAL CUT SIDE SLOPES ARE REQUIRED, EXCAVATION WIDTH SHALL NOT EXCEED 7'. THESE AREAS SHALL BE BACKFILLED AS SOON AS POSSIBLE TO MINIMIZE EXPOSURE OF THE EXISTING FOUNDATION(S). IF THESE AREAS ARE LEFT UNATTENDED AT ANY POINT DURING THE EXCAVATION OR BACKFILL, THE AREA SHALL BE CORDONED OFF WITH CAUTION TAPE AND BARRICADES TO PREVENT UNAUTHORIZED ACCESS.

C. INJURIES

- CONTRACTOR SHALL IMMEDIATELY NOTIFY COMPANY REPRESENTATIVES OF ANY INJURY OCCURRING ON COMPANY PROPERTY. A WRITTEN REPORT CONCERNING THE INJURY SHALL BE PROVIDED TO COMPANY WITHIN 24 HOURS OF OCCURRENCE OF INJURY.
- CONTRACTOR SHALL PROVIDE ALL FIRST AID AND EMERGENCY TREATMENT, AMBULANCE, HOSPITAL SERVICES, ETC. FOR ANY INJURY OCCURRING TO HIS EMPLOYEES ON COMPANY PROPERTY.

D. PERSONNEL FACILITIES

- CONTRACTOR SHALL PROVIDE ALL FACILITIES REQUIRED FOR HIS PERSONNEL.THESE FACILITIES INCLUDE PORTABLE TOILETS, DRINKING WATER,CLEAN–UP FACILITIES, ETC.

E. GRADES, LINES, LEVELS AND BENCHMARKS REFERENCES

- SITE BENCHMARKS ARE PROVIDED TO THE CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING PROPER ELEVATIONS AND HORIZONTAL OFFSETS AS REFERENCED TO THE BENCHMARKS.
- CONTRACTOR SHALL LAYOUT ALL WORK, ESTABLISH MARKERS, STAKES, ETC. AND BE RESPONSIBLE FOR THEIR ACCURACY. COMPANY MAY CHOOSE TO USE AN INDEPENDENT SURVEYOR TO CHECK CONTRACTOR'S WORK.

F. COMPANY OPERATION OF EXISTING FACILITIES

- COMPANY INTENDS TO OPERATE EXISTING EQUIPMENT AND FACILITIES IN THE VICINITY OF THE SITE DURING CONSTRUCTION.CONTRACTOR SHALL COORDINATE HIS WORK WITH COMPANY FIELD OPERATIONS THROUGH COMPANY REPRESENTATIVE.
- CONTRACTOR SHALL COORDINATE AND FULLY COOPERATE WITH ANY TESTING AGENCY TO ENSURE ALL TESTS ARE COMPLETED AND DOCUMENTED IN A TIMELY AND EFFICIENT MANNER.

5. GRADING AND EXCAVATION – CIVIL

A. GENERAL GRADING

- ELEVATIONS PRESENTED ON THE DRAWINGS INDICATE FINAL GRADE ELEVATIONS. FINAL GRADED SURFACE SHALL BE SLOPED UNIFORMLY BETWEEN SUCH POINTS AND NATURAL GRADE.
- TOLERANCES FROM FINAL GRADE SHALL BE +–0.1 FOOT. IN NO CASE HOWEVER SHOULD FINAL GRADE ALLOW PONDING OR DRAINAGE IF NOT INDICATED ON THE PLANS.
- ALL DEBRIS, VEGETATION, ROCK AND LUMPS GREATER THAN 3 INCHES IN ITS LARGEST DIMENSION AND OTHER OBJECTIONABLE MATERIAL SHALL BE COLLECTED, PILED AND DISPOSED OF BY THE CONTRACTOR SO AS TO LEAVE THE AREAS THAT HAVE BEEN CLEARED WITH A NEAT AND FINISHED APPEARANCE. SITE STRIPPING SHALL EXTEND TO A MIN. DEPTH OF 4–INCHES, OR UNTIL ALL ORGANICS IN EXCESS OF 3% BY VOLUME HAS BEEN REMOVED.

B. GRADING INSPECTION

- PROFESSIONAL INSPECTION OF GRADING OPERATIONS AS REQUIRED IN THESE SPECIFICATIONS SHALL BE PROVIDED BY A CALIFORNIA REGISTERED CIVIL ENGINEER AND REGISTERED SOILS ENGINEER.
- A REGISTERED CIVIL ENGINEER SHALL INSPECT SITE AT COMPLETION OF ALL GRADING ACTIVITIES.
- GRADING OPERATIONS FOR WHICH A PERMIT IS REQUIRED SHALL BE SUBJECT TO INSPECTION BY A GRADING OFFICIAL.
- BUILDING PADS SHALL HAVE A DRAINAGE GRADIENT OF 2 PERCENT TOWARD APPROVED DRAINAGE FACILITIES, UNLESS WAIVED BY A GRADING OFFICIAL.

C. EXCAVATIONS

- EXCAVATIONS SHALL BE PERFORMED IN A MANNER TO ASSURE DRAINAGE DURING THE COURSE OF THE WORK. FLOODED EXCAVATIONS SHALL BE DEWATERED AND ALL MUCK REMOVED BEFORE PROCEEDING WITH WORK.
- AFTER EXCAVATION, SCARIFY THE ENTIRE AREA EXPOSED TO A 6–INCH DEPTH, MOISTURE CONDITION OF 0–3% ABOVE OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D–1557 AND RECOMPACT TO A MINIMUM OF 95% PRIOR TO PLACEMENT OF ENGINEERED FILL.
- OVER–EXCAVATE EXISTING SOIL IN LOCATIONS WHERE UNSUITABLE MATERIAL EXISTS AS DIRECTED BY THE COMPANY REPRESENTATIVE AND SOILS ENGINEER. MOISTURE CONDITION OF 0–3% ABOVE OPTIMUM MOISTURE CONTENT AND BACKFILL WITH ENGINEERED FILL COMPACTED TO A MINIMUM 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D–1557.
- SOILS ENGINEER SHALL INSPECT THE BOTTOM OF EXCAVATION PRIOR TO PLACEMENT OF BACKFILL. FINAL DEPTH OF EXCAVATION TO BE DETERMINED BY SOILS ENGINEER. CIVIL ENGINEER AND SOILS ENGINEER SHALL INSPECT SITE AT COMPLETION OF ALL GRADING ACTIVITIES.

6. FILLS

A. PREPARATION OF GROUND

- FILL SLOPES SHALL NOT BE CONSTRUCTED ON NATURAL SLOPES STEEPER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50% SLOPE).THE GROUND SURFACE SHALL BE PREPARED TO RECEIVE FILL BY REMOVING VEGETATION, NON–COMPLYING FILL, TOPSOIL AND OTHER UNSUITABLE MATERIALS SCARIFYING TO PROVIDE A BOND WITH NEW FILL AND, WHERE SLOPES ARE STEEPER THAN 1 UNIT VERTICAL IN 5 UNITS HORIZONTAL (20% SLOPE) AND THE HEIGHT IS GREATER THAN 5 FEET, BY BENCHING INTO SOUND BEDROCK OR OTHER COMPETENT MATERIAL AS DETERMINED BY THE SOILS ENGINEER. THE BENCH UNDER THE TOE OF A FILL ON A SLOPE STEEPER THAN 1 UNIT VERTICAL IN 5 UNITS HORIZONTAL (20% SLOPE) SHALL BE AT LEAST 10 FEET WIDE. FIVE FEET OF THE LOWERMOST BENCH SHALL BE EXPOSED BEYOND THE TOE OF HILLSIDE FILLS. THE AREA BEYOND THE TOE OF FILL SHALL BE SLOPED FOR SHEET OVERFLOW OR A PAVED DRAIN SHALL BE PROVIDED. WHEN FILL IS TO BE PLACED OVER A CUT, THE BENCH UNDER THE TOE OF FILL SHALL BE AT LEAST 10 FEET WIDE. THE CUT SHALL BE MADE BEFORE PLACING THE FILL AND THE CUT SHALL BE APPROVED BY THE SOILS ENGINEER OR ENGINEERING GEOLOGIST OR BOTH AS A SUITABLE FOUNDATION FOR FILL.

B. FILL MATERIAL & PLACEMENT

- ALL IMPORTED FILL MATERIAL SHALL BE APPROVED BY THE SOIL ENGINEER PRIOR TO PLACEMENT AT THE SITE.
- DETRIMENTAL AMOUNTS OF ORGANIC MATERIAL SHALL NOT BE PERMITTED IN FILLS. EXCEPT AS PERMITTED BY THE GRADING OFFICIAL, NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL WITH A MAXIMUM DIMENSION GREATER THAN 3 INCHES SHALL BE BURIED OR PLACED IN FILLS.
- PLACE FILL SOIL IN CONTINUOUS HORIZONTAL LOOSE LIFTS APPROXIMATELY 6 INCHES THICK. DO NOT PLACE FILL UNTIL REMOVAL OF UNSUITABLE MATERIAL HAS BEEN INSPECTED AND APPROVED BY THE SOIL ENGINEER.

C. COMPACTION

- FILL SHALL BE MOISTURE–CONDITIONED 0–3% ABOVE OPTIMUM MOISTURE CONTENT, AND COMPACTED TO AT LEAST 90% MAXIMUM, DENSITY BASED ON ASTM D–1557.

D. SLOPES

- THE SLOPE OF FILL SURFACES SHALL BE NO STEEPER THAN IS SAFE FOR THE INTENDED USE. FILL SLOPES SHALL BE NO STEEPER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50% SLOPE).
- WHERE EXISTING SLOPES ARE STEEPER THAN 5 HORIZONTAL:1 VERTICAL AND THE HEIGHT IS GREATER THAN 5 FEET, THE SURFACE SHALL BE PREPARED FOR FILL BY BENCHING INTO COMPETENT MATERIAL AS DETERMINED BY THE SOILS ENGINEER.

7. DRAINAGE AND TERRACING

- UNLESS OTHERWISE INDICATED ON THE APPROVED GRADING PLAN, DRAINAGE FACILITIES AND TERRACING SHALL CONFORM TO THE PROVISIONS OF CHAPTER 14 (SANTA BARBARA COUNTY GRADING CODE)FOR CUT OR FILL SLOPES STEEPER THAN 1 UNIT VERTICAL IN 3 UNITS HORIZONTAL (33.3% SLOPE).
- TERRACES AT LEAST 8 FEET IN WIDTH SHALL BE ESTABLISHED AT NOT MORE THAN 25–FOOT VERTICAL INTERVALS ON ALL CUT OR FILL SLOPES TO CONTROL SURFACE DRAINAGE AND DEBRIS EXCEPT THAT WHERE ONLY ONE TERRACE IS REQUIRED, IT SHALL BE AT MID–HEIGHT. NO FILL SLOPE SHALL EXCEED A VERTICAL HEIGHT OF ONE HUNDRED FEET UNLESS HORIZONTAL BENCHES WITH A MINIMUM WIDTH OF THIRTY FEET ARE INSTALLED AT EACH ONE HUNDRED FEET VERTICAL HEIGHT.

8. EROSION, DUST, AND RUNOFF CONTROL

A. EROSION CONTROL MEASURES

- THE FACES OF CUT AND FILL SLOPES SHALL BE PREPARED AND MAINTAINED TO CONTROL AGAINST EROSION. SLOPE PROTECTION SHALL BE INSTALLED AS SOON AS PRACTICABLE AND PRIOR TO CALLING FOR FINAL APPROVAL.
- WHERE REQUIRED, CONTRACTOR SHALL PROVIDE SUFFICIENT EROSION CONTROL MEASURES INCLUDING, BUT NOT LIMITED TO, INSTALLATION OF ENERGY DISSIPATING RIP–RAP, SILT FENCING AND/OR HAY BALES.
- A STORM WATER POLLUTION PREVENTION PLAN HAS BEEN PREPARED FOR PHASE 1 OF THIS PROJECT. THE WDID # (WILL BE OBTAINED). THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN THE SWPPP.
- CONSTRUCTION WITHIN BLUE LINE CHANNELS SHALL NOT BE PERMITTED DURING THE RAINY SEASON (OCT. 15 TO APRIL 15).

B. DUST CONTROL MEASURES

- CONTRACTOR SHALL IMPLEMENT DUST CONTROL MEASURES, WHICH CONSIST OF WATER SPRAYING ALL GRADED AREAS AND ROADWAYS TO ALLEVIATE OR PREVENT DUST NUISANCE.

C. RUNOFF CONTROL MEASURES

- ALL STORMWATER TO BE RETAINED ON SITE DURING CONSTRUCTION. IMPLEMENT RUNOFF CONTROL AS INDICATED ON PLANS AND IN ACCORDANCE WITH SANTA BARBARA COUNTY GRADING ORDINANCE.

9. PAVEMENTS

A. ASPHALTIC CONCRETE (AC)

- 1/2" OR 3/4" MAXIMUM, PG64–10 OR PG70–10 TYPE A OR B PER SECTION 39 "ASPHALT CONCRETE" STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATION, MAY 2010.
- MIX DESIGN SHALL BE SUBMITTED TO TJ CROSS ENGINEERS, INC. FOR APPROVAL.

B. AGGREGATE BASE

- CLASS 2 AGGREGATE BASE SHALL BE PER SECTION 26 "AGGREGATE BASE", STATE OF CALIFORNIA, STANDARD SPECIFICATION, MAY 2010.
- USE EITHER 1 1/2" OR 3/4" AGGREGATE GRADING.

C. CLASS 2 RIP–RAP

- NO MORE THAN 10% OF THE STONE WILL HAVE A DIAMETER GREATER THAN SIXTEEN (16) INCHES; NO MORE THAN 50% OF THE STONE WILL HAVE A DIAMETER LESS THAN TWELVE (12) INCHES; AND NO MORE THAN 10% OF THE STONE WILL HAVE A DIAMETER OF LESS THAN SIX (6) INCHES. THE THICKNESS OF THE RIP–RAP LINER WILL BE NO LESS THAN EIGHTEEN (18) INCHES.

NOT ISSUED FOR CONSTRUCTION

THIS IS FOR LAND USE PERMIT ONLY

DWG NUMBER	TITLE
072–013–015A	SITE LOCATION PLAN
072–013–013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: NONE — FILE: 13186/072–13–014A
PLOT AT: 1=1 — LAYER(S): .
ENGINEER: RSD — CHANGED BY: IDU
DATE STARTED: 04/17/14 — LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

CONSTRUCTION NOTES
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: AS SHOWN
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072–13–014A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072–13–014A	

:FUNCTIONAL LOCATION NO.

GRADING NOTES

SANTA BARBARA COUNTY
STANDARD GRADING NOTES

1. ALL GRADING SHALL CONFORM WITH SANTA BARBARA COUNTY CODE CHAPTER 14 AND STANDARDS AND REQUIREMENTS PERTAINING THERETO, THESE CONSTRUCTION DRAWINGS AND THE RECOMMENDATIONS OF THE SOILS ENGINEER AND ENGINEERING GEOLOGIST.

2. CONTRACTOR TO NOTIFY THE COUNTY GRADING INSPECTOR AND SOILS LABORATORY AT LEAST 48 HOURS BEFORE START OF GRADING WORK OR ANY PRE-CONSTRUCTION MEETING.

3. CONTRACTOR SHALL EMPLOY ALL LABOR, EQUIPMENT AND METHODS REQUIRED TO PREVENT HIS OPERATIONS FROM PRODUCING DUST IN AMOUNTS DAMAGING TO ADJACENT PROPERTY, CULTIVATED VEGETATION AND DOMESTIC ANIMALS OR CAUSING A NUISANCE TO PERSONS OCCUPYING BUILDINGS IN THE VICINITY OF THE JOB SITE. CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE CAUSED BY DUST FROM HIS GRADING OPERATION.

4. BEFORE BEGINNING WORK REQUIRING EXPORTING OR IMPORTING OF MATERIALS, THE CONTRACTOR SHALL OBTAIN APPROVAL FROM PUBLIC WORKS ROAD DIVISION FOR HAUL ROUTES USED AND METHODS PROVIDED TO MINIMIZE THE DEPOSIT OF SOILS ON COUNTY ROADS. GRADING/ROAD INSPECTORS SHALL MONITOR THIS REQUIREMENT WITH THE CONTRACTOR.

5. THE GEOTECHNICAL ENGINEER SHALL PROVIDE OBSERVATION AND TESTING DURING GRADING OPERATIONS IN THE FIELD AND SHALL SUBMIT A FINAL REPORT STATING THAT ALL EARTHWORK WAS PROPERLY COMPLETED AND IS IN SUBSTANTIAL CONFORMANCE WITH THE REQUIREMENTS OF THE GRADING ORDINANCE.

6. AREAS TO BE GRADED SHALL BE CLEARED OF ALL VEGETATION INCLUDING ROOTS AND OTHER UNSUITABLE MATERIAL FOR A STRUCTURAL FILL, THEN SCARIFIED TO A DEPTH OF 6" PRIOR TO PLACING OF ANY FILL. CALL GRADING INSPECTOR FOR INITIAL INSPECTION.

7. A THOROUGH SEARCH SHALL BE MADE FOR ALL ABANDONED MAN-MADE FACILITIES SUCH AS SEPTIC TANK SYSTEMS, FUEL OR WATER STORAGE TANKS, AND PIPELINES OR CONDUITS. ANY SUCH FACILITIES ENCOUNTERED SHALL BE REMOVED AND THE DEPRESSION PROPERLY FILLED AND COMPACTED UNDER OBSERVATION OF THE GEOTECHNICAL ENGINEER.

8. AREAS WITH EXISTING SLOPES WHICH ARE TO RECEIVE FILL MATERIAL SHALL BE KEYED AND BENCHED. THE DESIGN AND INSTALLATION OF THE KEYWAY SHALL BE PER THE GEOTECHNICAL ENGINEER'S RECOMMENDATION OR PER COUNTY STANDARD DETAIL NO. G-13.

9. FILL MATERIAL SHALL BE SPREAD IN LIFTS NOT EXCEEDING 6" IN COMPACTED THICKNESS, MOISTENED OR DRIED AS NECESSARY TO NEAR OPTIMUM MOISTURE CONTENT AND COMPACTED BY AN APPROVED METHOD. FILL MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 90% MAXIMUM DENSITY AS DETERMINED BY 1957 ASTM D-1557-91 MODIFIED PROCTOR (AASHO) TEST OR SIMILAR APPROVED METHODS. SOME FILL AREAS MAY REQUIRE COMPACTION TO A GREATER DENSITY IF CALLED FOR IN THE CONSTRUCTION DOCUMENTS. SOIL TESTS SHALL BE CONDUCTED AT NOT LESS THAN ONE TEST FOR EACH 18" OF FILL AND/OR FOR EACH 500 CUBIC YARDS OF FILL PLACED.

10. CUT SLOPES SHALL NOT EXCEED A GRADE OF 1 1/2 HORIZONTAL TO 1 VERTICAL. FILL AND COMBINATION FILL AND CUT SLOPES SHALL NOT EXCEED 2 HORIZONTAL TO 1 VERTICAL. SLOPES OVER THREE FEET IN VERTICAL HEIGHT SHALL BE PLANTED WITH APPROVED PERENNIAL OR TREATED WITH EQUALLY APPROVED EROSION CONTROL MEASURES PRIOR TO FINAL INSPECTION.

11. SURFACE DRAINAGE SHALL BE PROVIDED AT A MINIMUM OF 2% FOR 5 FEET AWAY FROM THE FOUNDATION LINE OR ANY STRUCTURE.

12. ALL TREES THAT ARE TO REMAIN ON SITE SHALL BE TEMPORARILY FENCED AND PROTECTED AROUND THE DRIP LINE DURING GRADING OPERATION.

13. AN EROSION AND SEDIMENT CONTROL PLAN SHALL BE REQUIRED AS PART OF THE GRADING PLAN AND PERMIT REQUIREMENTS.

14. "BEST MANAGEMENT PRACTICES FOR CONSTRUCTION ACTIVITIES: ERODED SEDIMENTS AND OTHER POLLUTANTS MUST BE RETAINED ONSITE AND MAY NOT BE TRANSPORTED FROM SITE VIA SHEET FLOW, SWALES, AREA DRAINS, NATURAL DRAINAGE COURSES, OR WIND. STOCKPILES OF EARTH AND OTHER CONSTRUCTION RELATED MATERIALS MUST BE PROTECTED FROM BEING TRANSPORTED FROM THE SITE BY THE FORCES OF WIND OR WATER. FUELS, OILS, SOLVENTS, AND OTHER TOXIC MATERIALS MUST BE STORED IN ACCORDANCE WITH THEIR LISTING AND ARE NOT TO CONTAMINATE THE SOIL AND SURFACE WATERS. ALL APPROVED STORAGE CONTAINERS ARE TO BE PROTECTED FROM WEATHER. SPILLS MAY NOT BE WASHED INTO THE DRAINAGE SYSTEM. EXCESS OR WASTE CONCRETE MAY NOT BE WASHED INTO PUBLIC WAY OR NAY OTHER DRAINAGE SYSTEM. PROVISIONS MUST BE MADE TO RETAIN CONCRETE WASTE ON SITE UNTIL THEY CAN BE DISPOSED AS SOLID WASTE. TRASH AND CONSTRUCTION RELATED SOLID WASTE MUST BE DEPOSITED INTO A COVERED WASTE RECEPTACLE TO PREVENT CONTAMINATION OF RAINWATER AND DISPERSAL BY WIND. SEDIMENTS AND OTHER MATERIAL MAY NOT BE TRACKED FROM TO THE SITE BY VEHICLE TRAFFIC. THE CONSTRUCTION ENTRANCE ROADWAY MUST BE STABILIZED AS TO INHIBIT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC WAY. ACCIDENTAL DEPOSITION MUST BE SWEPT UP IMMEDIATELY AND MAY NOT BE WASHED DOWN BY RAIN OR THER MEANS. ANY SLOPES WITH DISTURBED SOILS OR DENUDED OF VEGETATION MUST BE STABILIZED SO AS TO MINIMIZE EROSION BY WIND AND WATER."

15. IF GRADING OCCURS DURING NOV 1 THROUGH APRIL 15, NO GRADING SHALL OCCUR UNLESS APPROVED EROSION AND SEDIMENT CONTROL MEASURES ARE IN PLACE. DISCHARGES OF SEDIMENT FROM THE PROJECT SITE MAY RESULT IN A "STOP WORK ORDER."

16. ALL EARTHWORK ON HILLSIDES, SLOPING OR MOUNTAINOUS TERRAIN SHALL BE STABILIZED TO PROTECT AND PREVENT LOSS OF SOILS, AS NECESSARY, YEAR-ROUND.

EARTHWORK ESTIMATES:

EXCAVATION:	7,749 CUBIC YARDS
IMPORT:	32,799 CUBIC YARDS
EXPORT:	0 CUBIC YARDS
FILL:	40,548 CUBIC YARDS

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. CONTRACTOR SHALL CALCULATE THE EARTHWORK QUANTITIES TO THEIR SATISFACTION PRIOR TO START OF CONSTRUCTION OR BIDDING. CONSOLIDATION, LOSSES DUE TO CLEARING OPERATIONS, UTILITY TRENCHES, SUBGRADE STABILIZATION, OR FACTORS FOR GRADING MEANS AND METHODS ARE NOT INCLUDED AND EARTHWORK QUATITITES MAY VARY ACCORDING TO THESE FACTORS.
C. EARTHWORK VOLUMES DO NOT INCLUDE OVEREXCAVATION OR SCARIFICATION.

AIR POLLUTION CONTROL NOTES

1. DURING CONSTRUCTION, THE CONTRACTOR SHALL IMPLEMENT THE FOLLOWING PARTICULATE (DUST) CONTROL MEASURES:

   A. REDUCE THE AMOUNT OF DISTURBED AREA WHERE POSSIBLE;
   B. USE WATER TRUCKS OR SPRINKLER SYSTEMS IN SUFFICIENT QUANTITIES TO PREVENT AIRBORNE DUST LEAVING THE SITE. INCREASED WATERING FREQUENCY WILL BE REQUIRED WHENEVER WIND SPEEDS EXCEED 15 MPH.
   C. EXPOSED GROUND AREAS THAT ARE PLANNED TO BE REWORKED AT DATES GREATER THAN ONE MONTH AFTER INITIAL GRADING SHOULD BE SOWN WITH A FAST-GERMINATING NATIVE GRASS SEED UNTIL VEGETATION IS ESTABLISHED;
   D. ALL DISTURBED SOIL AREAS SHOULD BE STABILIZED PER EROSION CONTROL NOTE #3.
   E. VEHICLE SPEED FOR ALL CONSTRUCTION VEHICLES SHALL NOT EXCEED 15 MPH ON ANY UNPAVED SURFACE AT THE CONSTRUCTION SITE.

EROSION CONTROL NOTES

1. PROJECT: THE CONTRACTOR WILL DISTURB AREAS SUBJECT TO EROSION DURING THE SITE PREPARATION, EXCAVATION, AND FILL PLACEMENT. IF FILL PLACEMENT IS NOT COMPLETED AND GROUND COVER IS NOT ESTABLISHED BY OCTOBER 15, THE CONTRACTOR SHALL CONSTRUCT, MONITOR, AND MAINTAIN THE NECESSARY EROSION AND SEDIMENTATION MITIGATION MEASURES ON ALL SUCH AREAS.

2. EROSION AND SEDIMENTATION CONTROL PROGRAM: THE LOCATION OF EROSION AND SEDIMENTATION CONTROL MEASURES SHOWN ON THESE PLANS MAY VARY ACCORDING TO THE SEASON AND PHASE OF CONSTRUCTION. THE OBJECTIVE OF THESE MEASURES IS TO MITIGATE THE EROSION AND SEDIMENTATION IMPACTS. THIS PROGRAM CONSISTS OF THE INSTALLATION AND MAINTENANCE OF GROUND COVER, EROSION CONTROL MAT, STRAW WATTLES AND SILT FENCES. THE CONTRACTOR SHALL ONLY DISTURB THE AREAS NECESSARY TO COMPLETE THE WORK SHOWN IN THESE PLANS.

3. INSTALLATION

   A. ALL DISTURBED SOIL AREAS, INCLUDING ROADs, SHALL RECEIVE LANDSCAPE/EROSION CONTROL COVER IN ACCORDANCE WITH THE FOLLOWING:

   STEP 1: SEED AND SLURRY

SEED MIX	PURE LIVE SEED LBS/ACRE	HYDROSEED SLURRY ADDITIVES	LBS/ACRE
ARTEMISIA CALIFORNICA	0.2	CONWED 100% WOOD FIBER	2000
BROMUS CARINATUS	8.0	AM-120 MYCORRHIZAL INOCULUM	60
ELYMUS GLAUCUS	6.0	ECOLOGY CONTROLS M-BINDER	150
ESCHSCHOLZIA CALIFORNICA	1.5	15-15-15 FERTILIZER	200
HORDEUM INTERCEDENS	4.0		
ISOCOMA MENZIESII	1.0		
LOTUS SCOPARIUS	4.0		
LUPINUS NANUS	2.0		
MIMULUS AURANTIACUS AURANTIACUS	0.1		
NASSELLA PULCHRA	6.0		
SALVIA MELLIFERA	2.0		
VULPIA MICROSTACHYS	6.0		
	40.8		

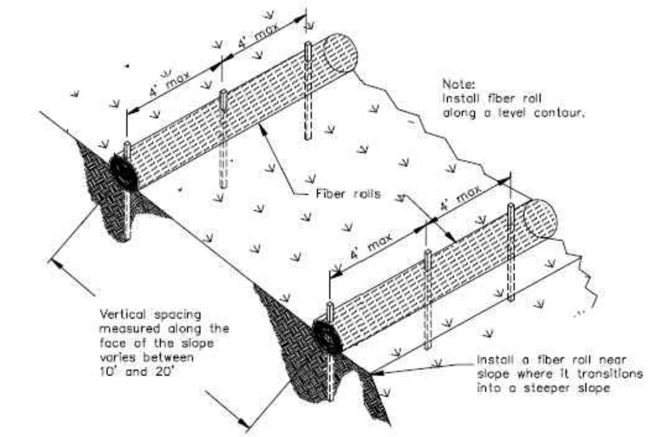
   STEP 2: APPLY STRAW MULCH AT 4000 LBS/ACRE

   STEP 3: TACK STRAW
   FIBER 500
   BINDER 100

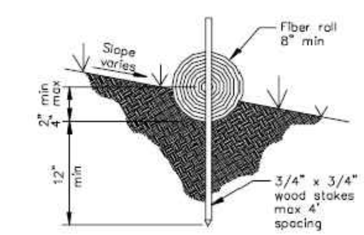
   B. ALL LANDSCAPE/HYDROSEED/EROSION CONTROL SHALL BE INSTALLED PER COUNTY REQUIREMENTS AND INDUSTRIAL STANDARDS. STRAW MULCH SHALL BE PLACED OVER ALL SEEDED AREAS AND SHALL BE CRIMPED INTO SOIL OR HELD IN PLACE BY A LIQUID TACKIFIER.
   C. SILT FENCE TO BE INSTALLED ON DOWNHILL SIDE OF ALL DISTURBED AREAS, TO REMAIN IN PLACE UNTIL TOTAL REVEGETATION IS ACHIEVED.
   D. ALL DISTURBED AREAS SHALL BE REVEGETATED. TEMPORARY SILTATION MITIGATION DEVICES SHALL BE IN PLACE OCTOBER 15 TO APRIL 15.

4. MAINTENANCE PROGRAM: THE CONTRACTOR SHALL INSPECT AND MAINTAIN THE EROSION AND SEDIMENTATION MITIGATION MEASURES ON ALL DISTURBED AREAS BEFORE, DURING AND AFTER STORM. THE CONTRACTOR SHALL ENSURE THAT THE EROSION AND SEDIMENTATION MEASURES ARE INSTALLED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE PLANS PRIOR TO EACH STORM. ALSO, THE CONTRACTOR SHALL REMOVE THE SEDIMENTS COLLECTED IN STRAW WATTLES AND DEPOSIT THESE SEDIMENTS ON AREAS WHERE THEY WILL NOT RE-ENTER THE DISTURBED AREAS.

SE-5 **Fiber Rolls**



TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

072-013-015A	SITE LOCATION PLAN
072-013-013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP
DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: NONE	FILE: 13186/072-13-014B
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/17/14	LAST CHANGED: 08/01/14

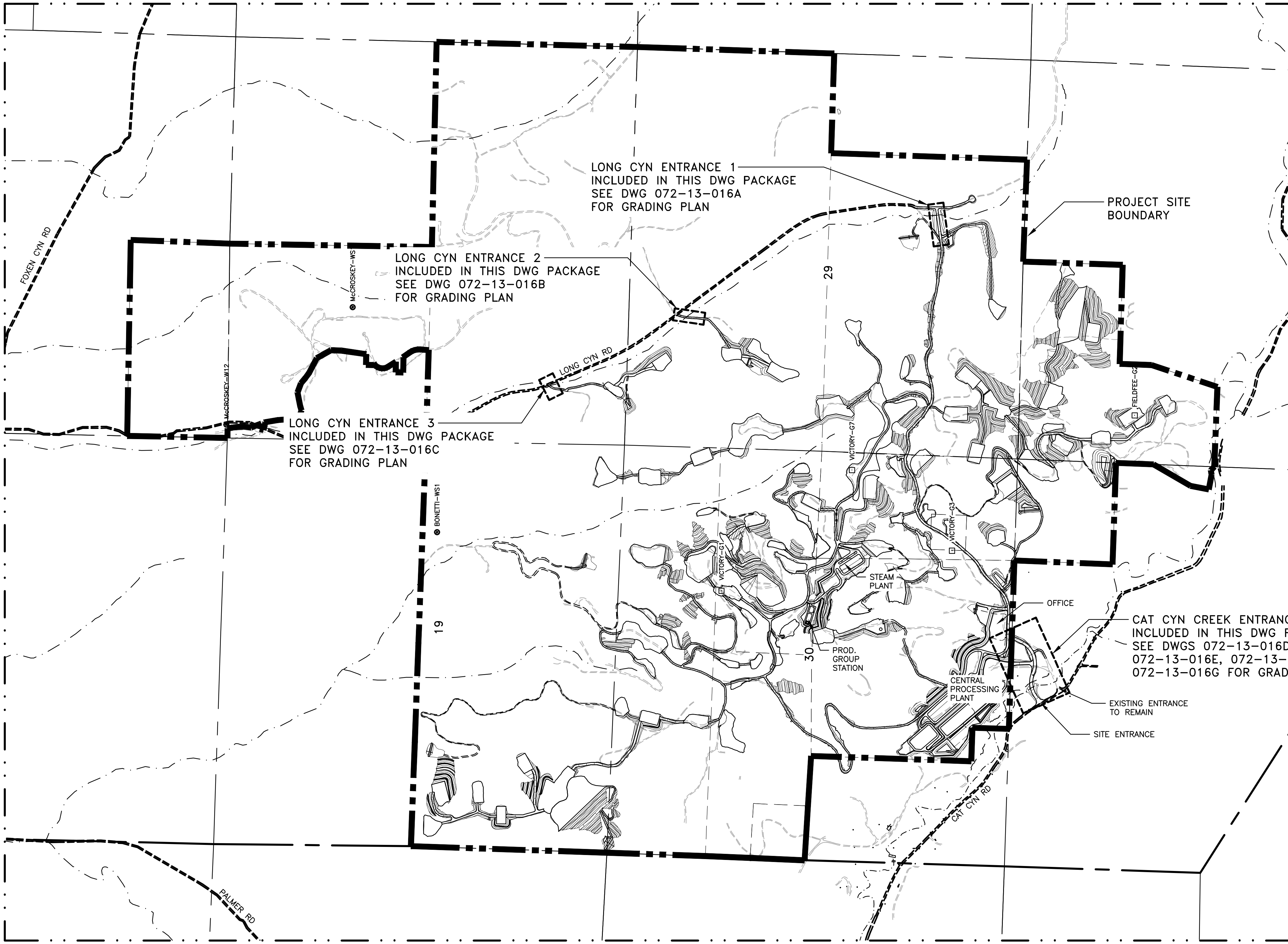
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

CONSTRUCTION NOTES – SANTA BARBARA
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON	DATE: 08/01/14	SCALE: AS SHOWN
CO. ENGINEER: TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR: ALI GOKGOZ	NO. 072-13-014B	REV. 0
DESIGNED BY: ROBIN DICKERSON		
DRAFTED BY: ISAC URBINA		
ECCN NO. EAR99	CAD FILE NO. 072-13-014B	

:FUNCTIONAL LOCATION NO.



N

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

LEGEND:

- INTERMITTENT CREEKS
- TOWNSHIP LINES
- SECTION LINES
- LEASE LINES
- PROPERTY LINE

APN:
129-210-017, 101-040-005,
101-040-006, 101-050-042,
101-040-011, 101-040-012,
101-040-013, 101-040-014,
101-050-013, 101-040-019,
101-040-020, 101-050-014,
101-070-007, 101-050-002

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

GRAPHIC SCALE

700' 0 350' 700' 1400' 2800'

(IN FEET)
1"=700'-0"

DWG NUMBER	TITLE
072-013-015A	SITE LOCATION PLAN
072-013-013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1" = 700' FILE: 13186/072-13-015A
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/17/14 LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

SITE LOCATION PLAN
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ISAC URBINA
ECCN NO. EAR99

DATE: 08/01/14 SCALE: 1" = 700'
ORIGINAL DWG NO.
NO. 072-13-015A REV. 0
CAD FILE NO. 072-13-015A

:FUNCTIONAL LOCATION NO.

QUANTITIES:

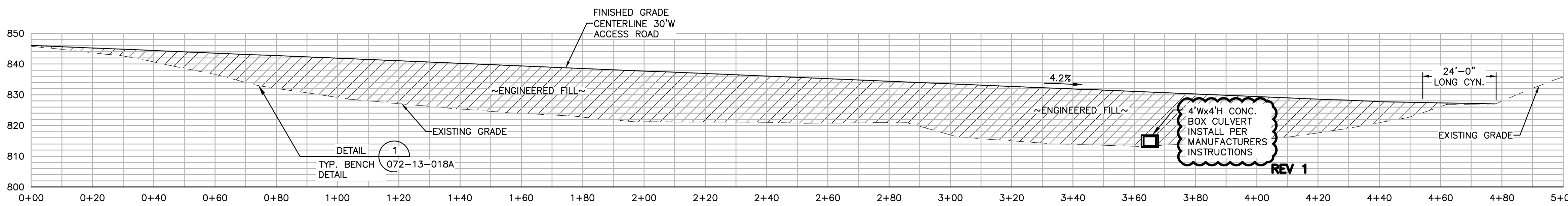
ROUGH GRADE QUANTITIES:

CUT (CU. YDS.)	+1.00
FILL* (CU. YDS.)	−21,626
TOTAL CUT (CU. YDS.)	+1.00
TOTAL FILL* (CU. YDS.)	−21,626
NET (CU. YDS.)	−21,625

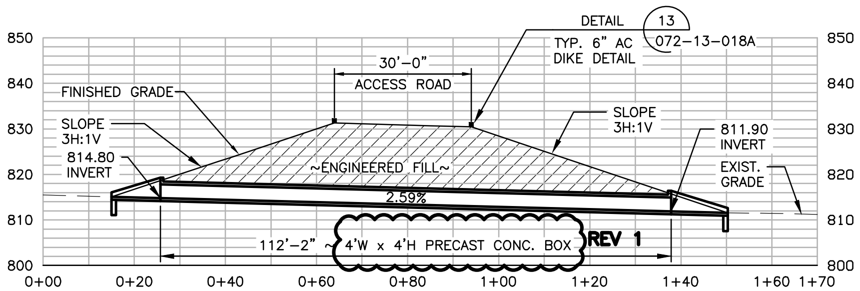
* INCLUDES 30% SHRINKAGE

REV 1

4'W x 4'H CONC. PRECAST BOX CULVERT	112'-2" L.F.
WING WALLS	2 REQ'D



SECTION C
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=20') 072-13-016A



SECTION D
VIEW LOOKING WESTERLY
SCALE: VERT.& HORIZ.(1"=20') 072-13-016A

EARTHWORK NOTES:

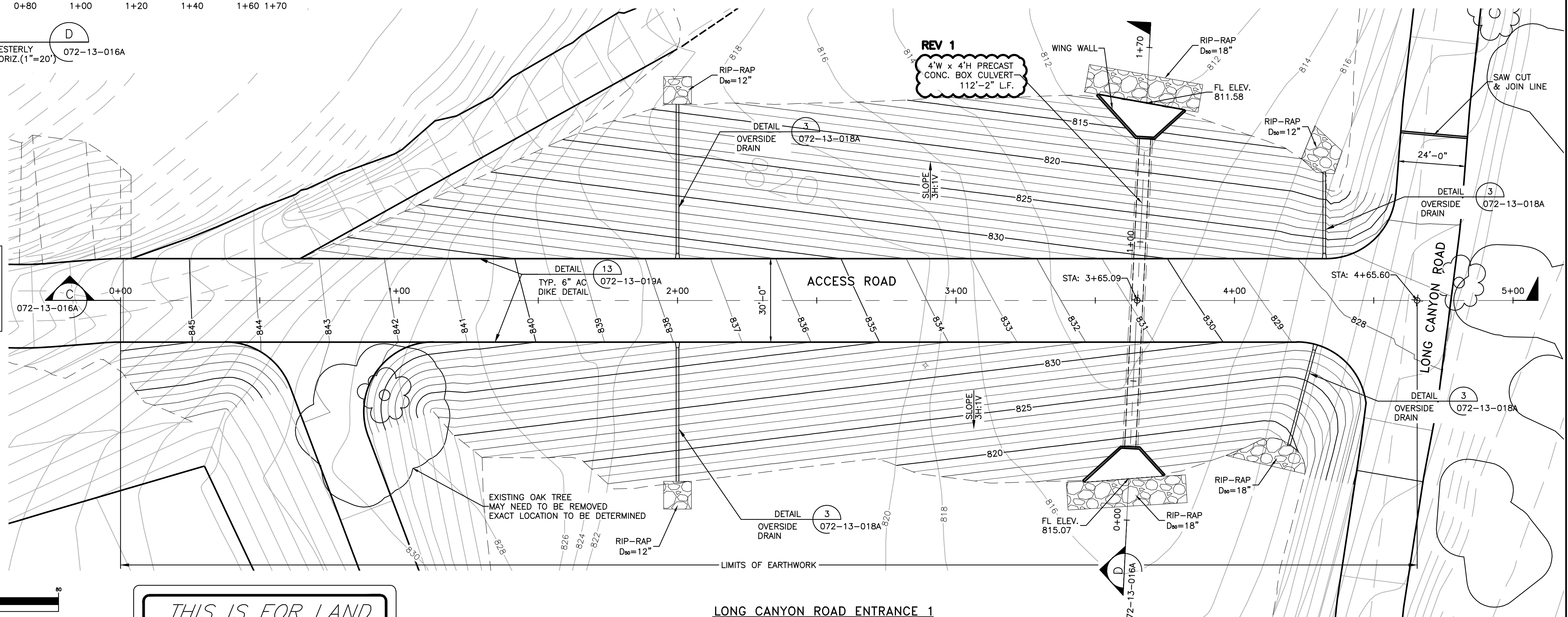
A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-014A UNDER EARTHWORK NOTES.

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"



GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

LONG CANYON ROAD ENTRANCE 1
SCALE:1"=20'

THIS IS FOR LAND USE PERMIT ONLY

PRELIMINARY NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=20'	FILE: 13186/072-13-016A
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/07/14	LAST CHANGED: 09/17/14

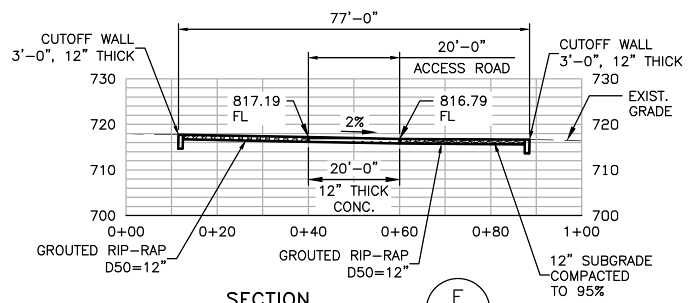
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	1	RE-ISSUED FOR PERMIT (LNG CYN CULVERT SIZE)	IDU	RSD	EP
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

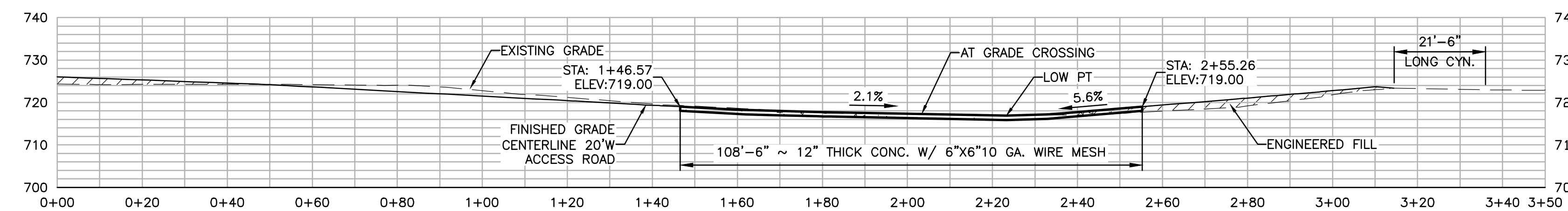
PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 1
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1"=20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016A	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016A	

:FUNCTIONAL LOCATION NO.



SECTION F
VIEW LOOKING SOUTHERLY
SCALE: VERT.& HORIZ.(1"=20') 072-13-016B



SECTION E
VIEW LOOKING WESTERLY
SCALE: VERT.& HORIZ.(1"=20') 072-13-016B

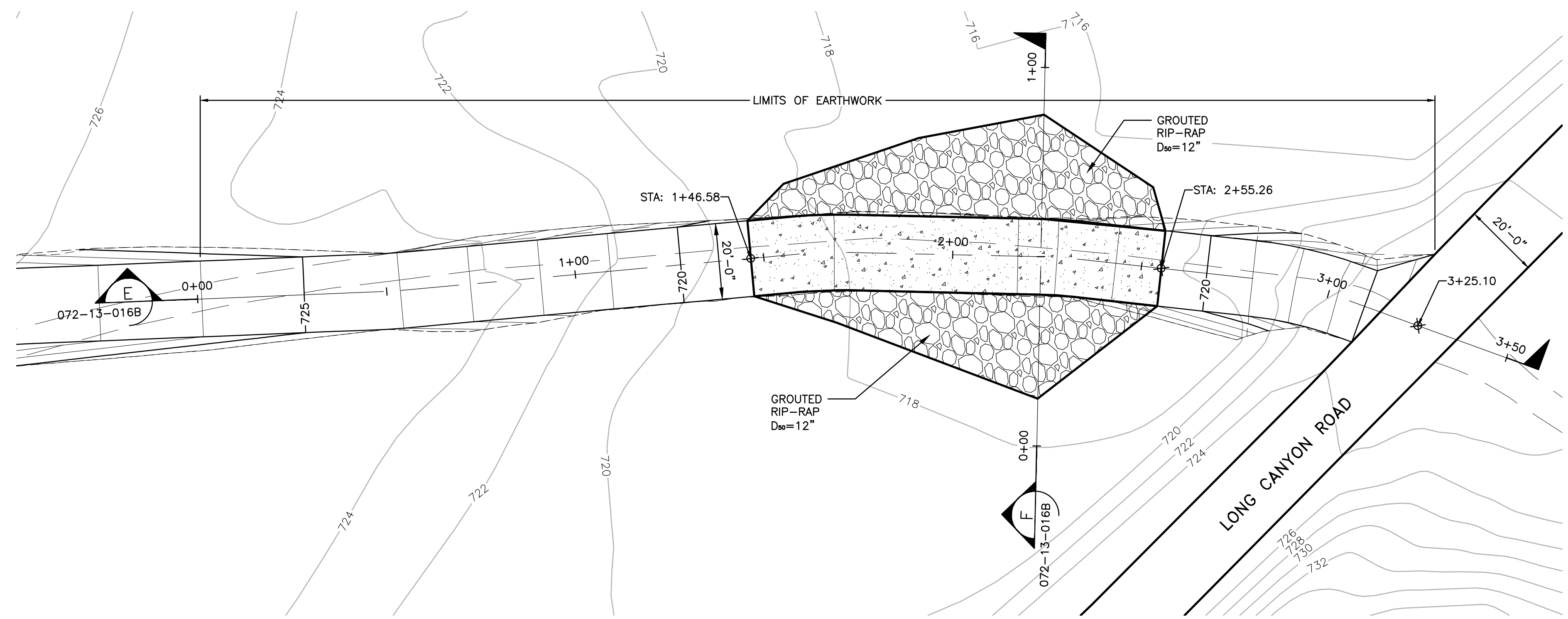
QUANTITIES:

CROSSING (CONCRETE)	81 CU. YDS.
GROUTED RIP-RAP	127 CU. YDS.
CUTOFF WALL (CONCRETE)	28 CU. YDS.
ROAD	CUT-60 CU. YDS. FILL-155 CU. YDS.
CUT (EARTHWORK) FILL (EARTHWORK)	296 CU. YDS. 155 CU. YDS.

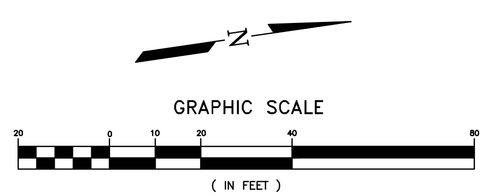
* CONCRETE TO BE 4000 PSI @ 28 DAYS

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-014A UNDER EARTHWORK NOTES.



LONG CANYON ROAD ENTRANCE 2
SCALE:1"=20'



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NOTES:
1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

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PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION MAP
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-016B
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

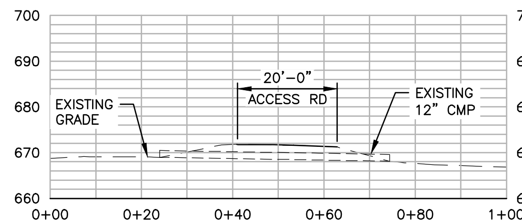
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

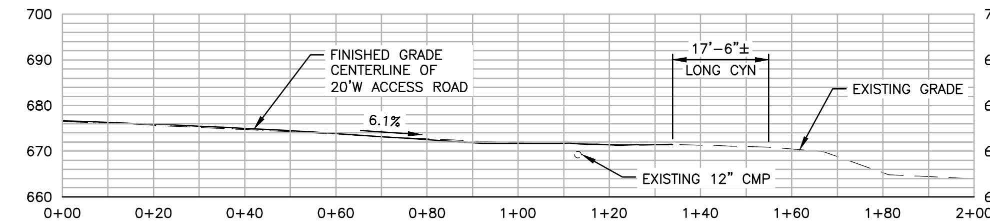
PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 2
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON	DATE: 08/01/14 SCALE: 1"=20'
CO. ENGINEER: TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.
PROJ. MGR: ALI GOKGOZ	NO. 072-13-016B REV. 0
DESIGNED BY: ROBIN DICKERSON	
DRAFTED BY: ISAC URBINA	
ECCN NO. EAR99	CAD FILE NO. 072-13-016B

:FUNCTIONAL LOCATION NO.

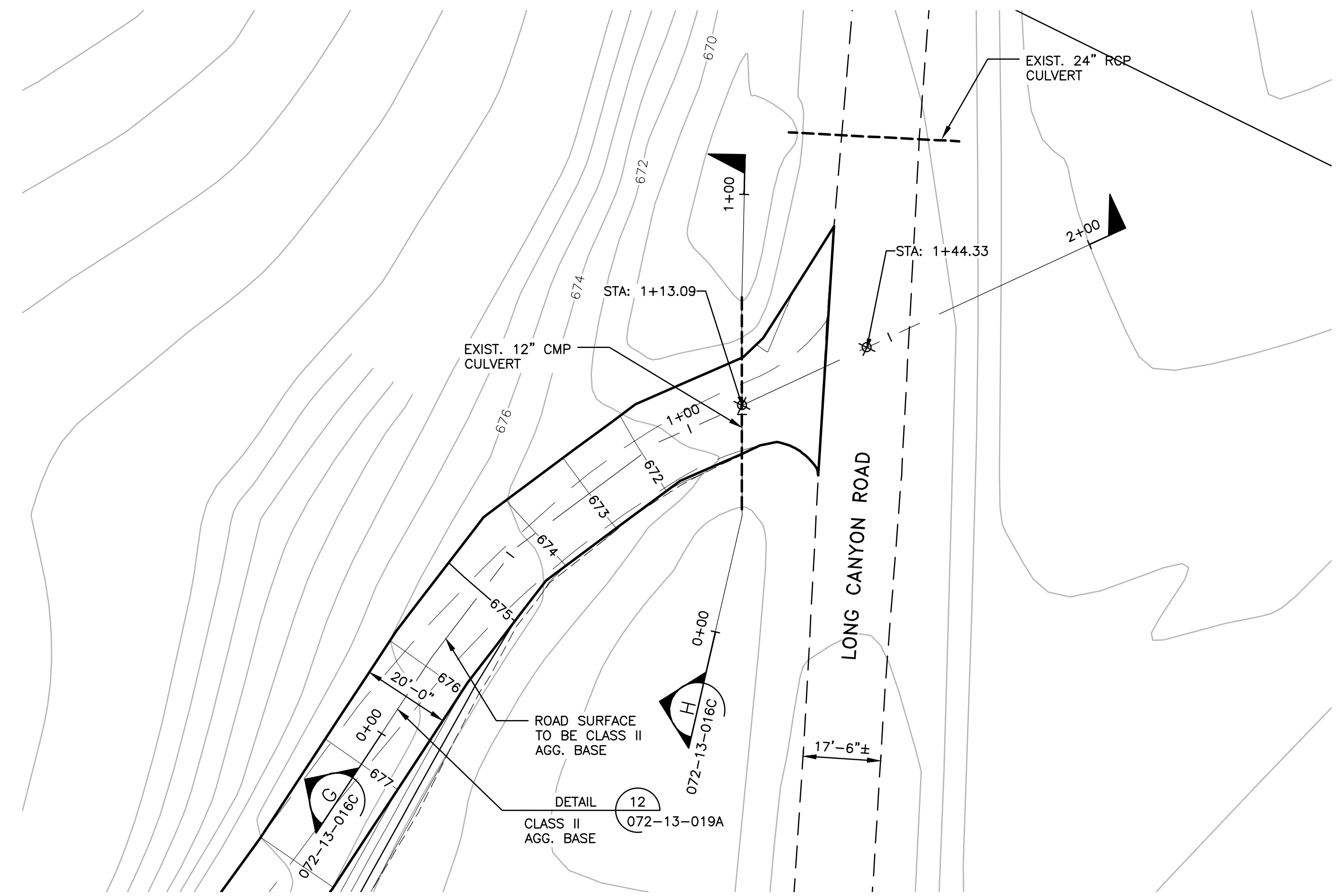


SECTION H 072-13-016C
VIEW LOOKING SOUTHWEST
SCALE: VERT.& HORIZ.(1"=20')

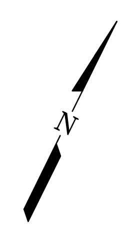


SECTION G 072-13-16C
VIEW LOOKING WESTERLY
SCALE: VERT.& HORIZ.(1"=20')

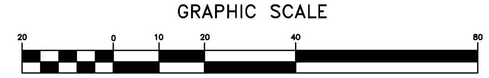
NOTE:
NO CUT OR FILL. USING EXISTING ROADWAY



LONG CANYON ROAD ENTRANCE 3
SCALE:1"=20'



GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

NOTE TO SURVEYOR:
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NOTES:
1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

THIS IS FOR LAND USE PERMIT ONLY

PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-016C
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

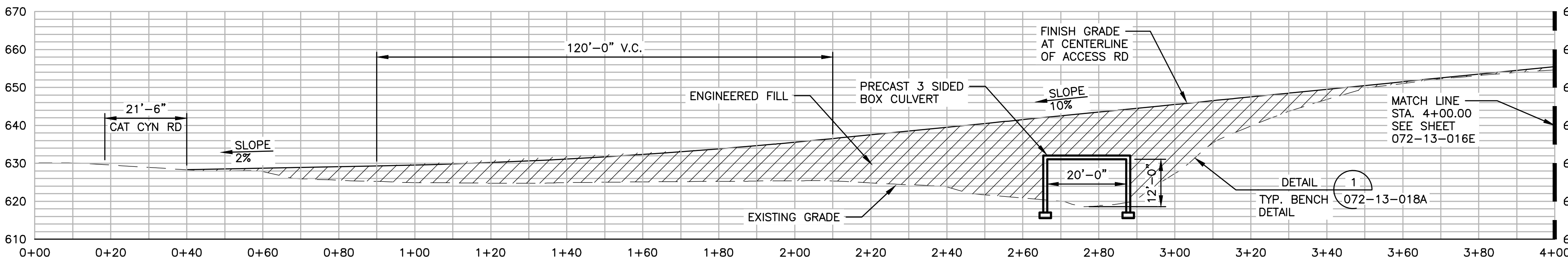
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

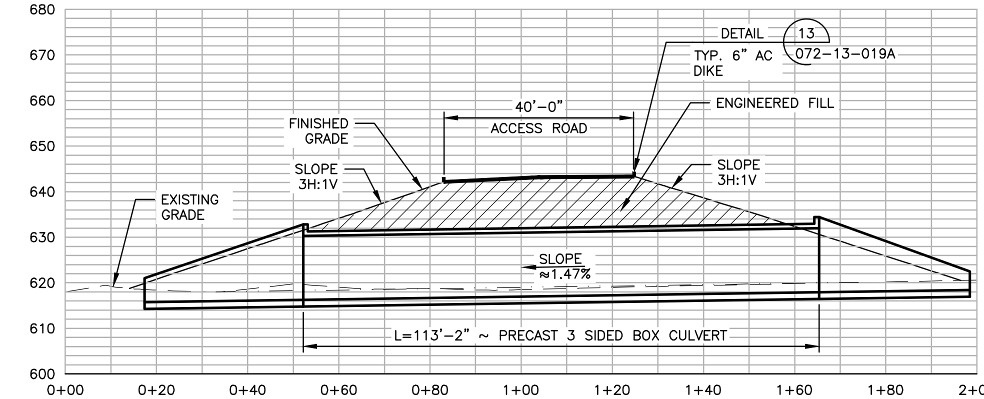
PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 3
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: 1"=20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016C	

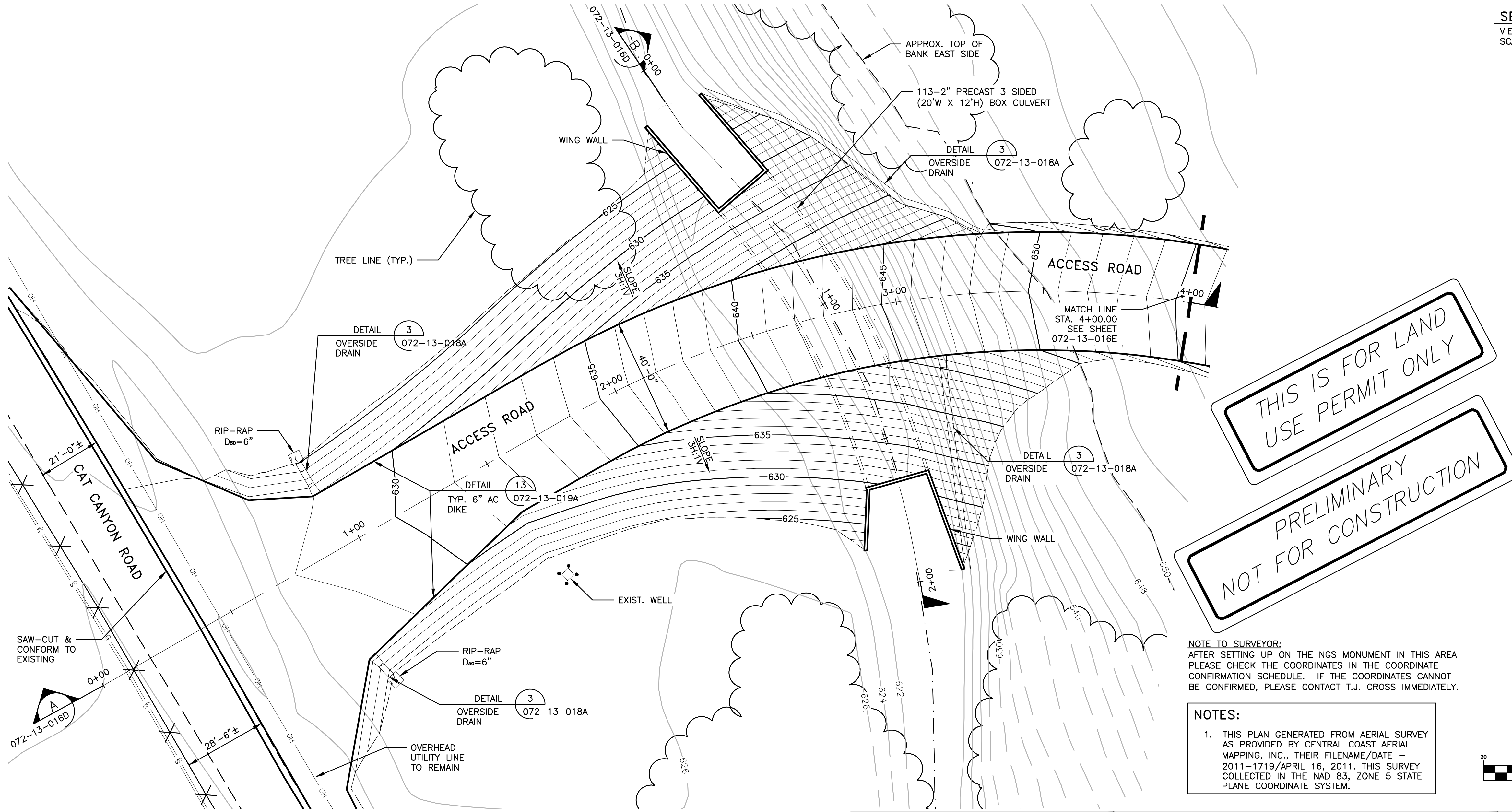
:FUNCTIONAL LOCATION NO.



SECTION A 072-13-016D
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=20')



SECTION B 072-13-016D
VIEW LOOKING EASTERLY
SCALE: VERT.& HORIZ.(1"=20')



CAT CANYON ENTRANCE
SCALE:1"=20'

QUANTITIES:

ROUGH GRADE QUANTITIES (FOR SHEETS -016D THRU -016G):

CUT (CU. YDS.)	+7,452
FILL* (CU. YDS.)	-18,767
TOTAL CUT (CU. YDS.)	+7,452
TOTAL FILL* (CU. YDS.)	-18,767
NET (CU. YDS.)	-11,315

* INCLUDES 30% SHRINKAGE

PRECAST 3 SIDED (20'Wx12'H) BOX CULVERT 113'-2" L.F.

WING WALLS 2 REQ'D

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-014A UNDER EARTHWORK NOTES.

NOTE:

USING A 3 SIDED PRECAST BOX CULVERT WITH A CLEAR SPAN OF 20 FT. WIDE, 12 FT. HIGH.

THE CULVERT WILL BE CENTERED ALONG THE BLUE LINE CHANNEL.

FOOTINGS WILL BE CONSTRUCTED ON BOTH SIDES OF THE BOX CULVERT FOR PLACEMENT OF THE PRECAST 3 SIDED CULVERT.

BOTTOM WILL REMAIN NATURAL.

DESIGN AND INSTALLATION PER MANUFACTURER

THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

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N

GRAPHIC SCALE
20 0 10 20 40 100
(IN FEET)
1 inch = 20 ft.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-016D
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

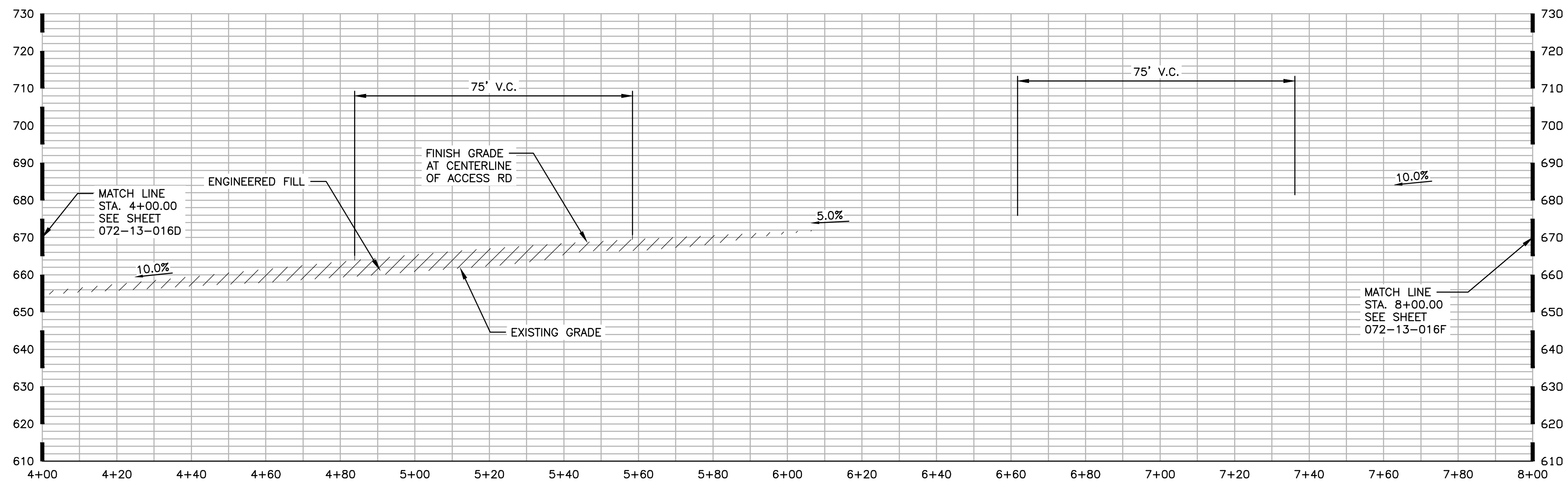
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PLAN & PROFILE – CAT CANYON ENTRANCE
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: 1"=20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016D	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016D	

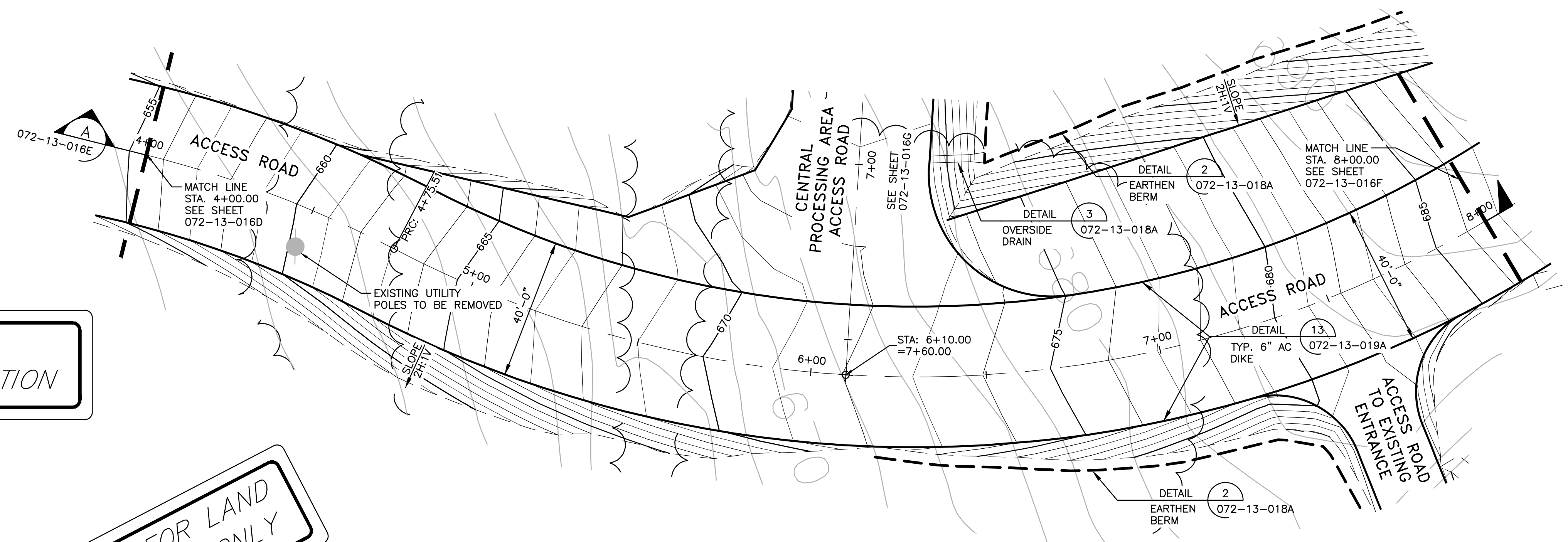
:FUNCTIONAL LOCATION NO.



SECTION (CONT.) A 072-13-016E

VIEW LOOKING NORTHERLY

SCALE: VERT.& HORIZ.(1"=20')



PRELIMINARY
NOT FOR CONSTRUCTION

CAT CANYON ENTRANCE

SCALE:1"=20'

NOTE TO SURVEYOR:
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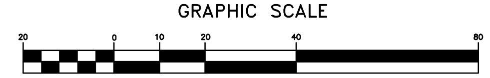
THIS IS FOR LAND USE PERMIT ONLY

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP

REFERENCE DRAWINGS

GRAPHIC SCALE



(IN FEET)
1 inch = **20** ft.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=20'	FILE: 13186/072-13-016E
PLOT AT: 1=1	LAYER(S): _
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/07/14	LAST CHANGED: 08/01/14

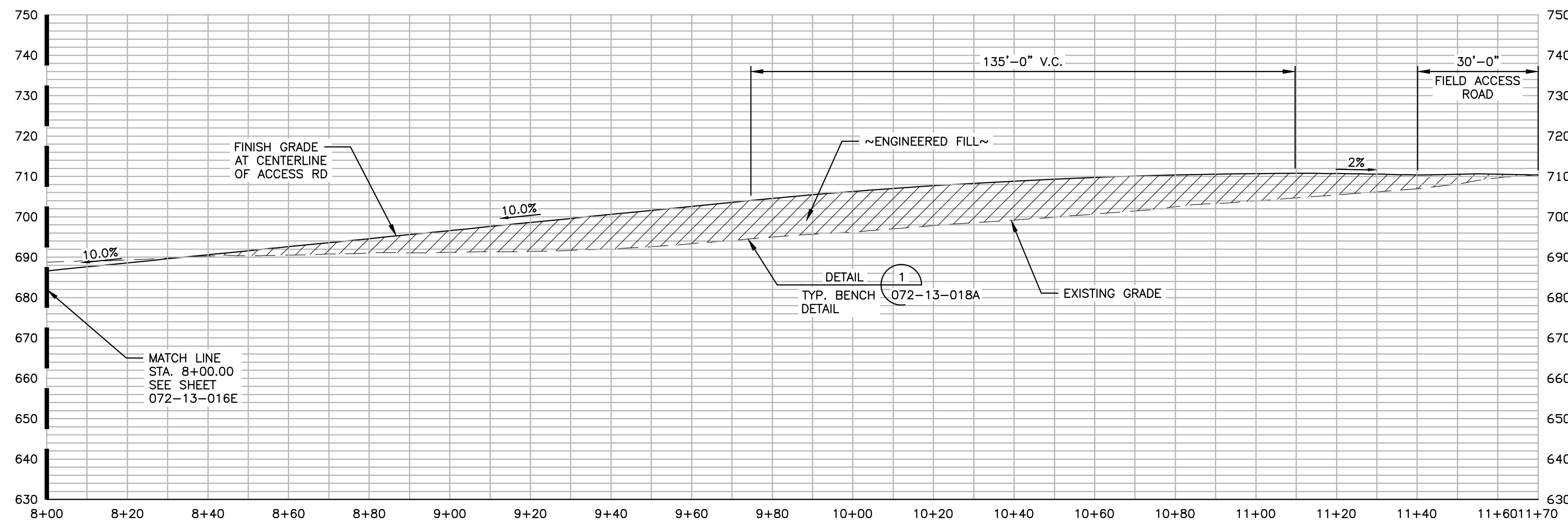
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PLAN & PROFILE – CAT CANYON ENTRANCE
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

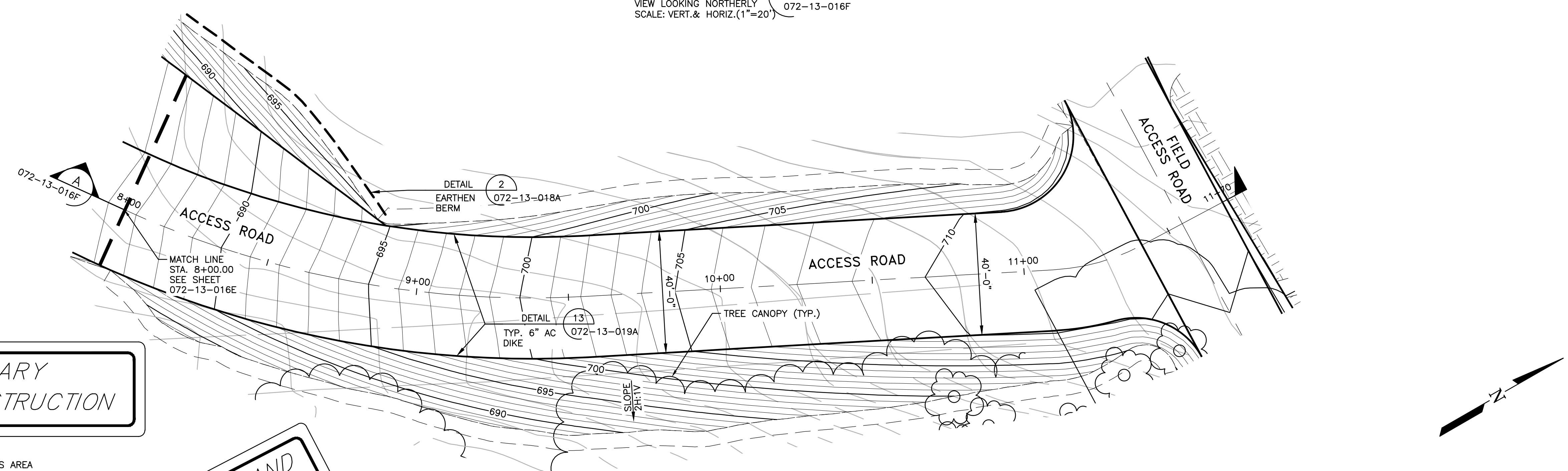
AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: AS SHOWN
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016E	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016E	

:FUNCTIONAL LOCATION NO.



SECTION (CONT.) A 072-13-016F

VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=20')



PRELIMINARY
NOT FOR CONSTRUCTION

THIS IS FOR LAND
USE PERMIT ONLY

CAT CANYON ENTRANCE
SCALE:1"=20'

NOTE TO SURVEYOR:
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NOTES:

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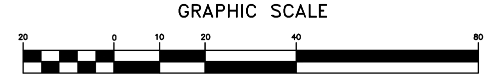
GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION MAP
072-13-013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=20'	FILE: 13186/072-13-016F
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/07/14	LAST CHANGED: 08/01/14

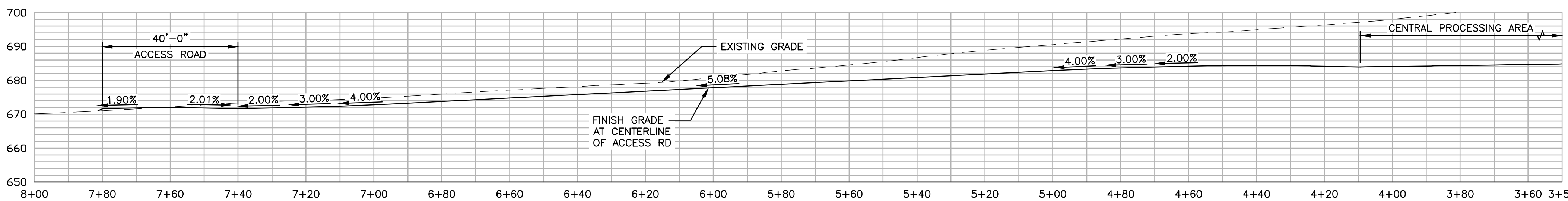
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

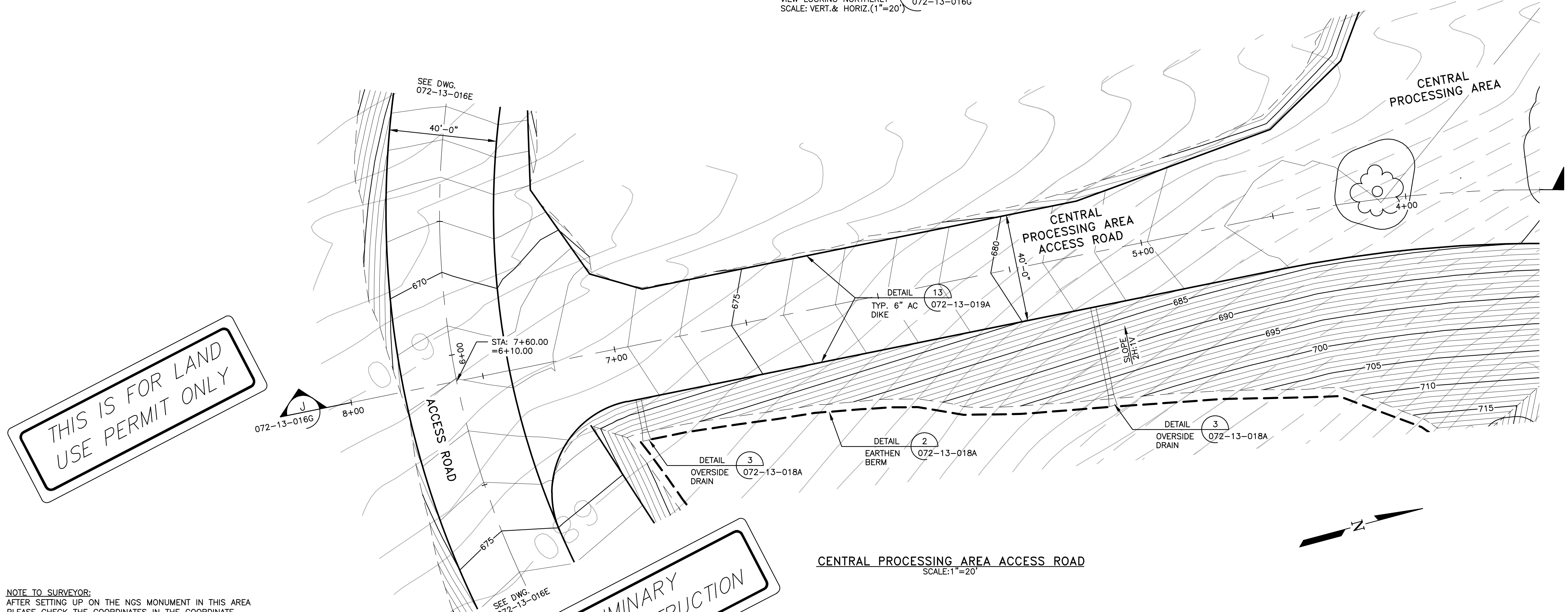
PLAN & PROFILE – CAT CANYON ENTRANCE
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: AS SHOWN
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016F	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016F	

:FUNCTIONAL LOCATION NO.



SECTION J 072-13-016G
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=20')



CENTRAL PROCESSING AREA ACCESS ROAD
SCALE:1"=20'

NOTE TO SURVEYOR:
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NOTES:

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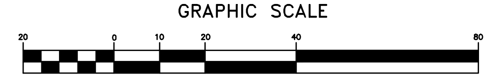
GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION MAP
072-13-013A	TITLE SHEET/DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-016G
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

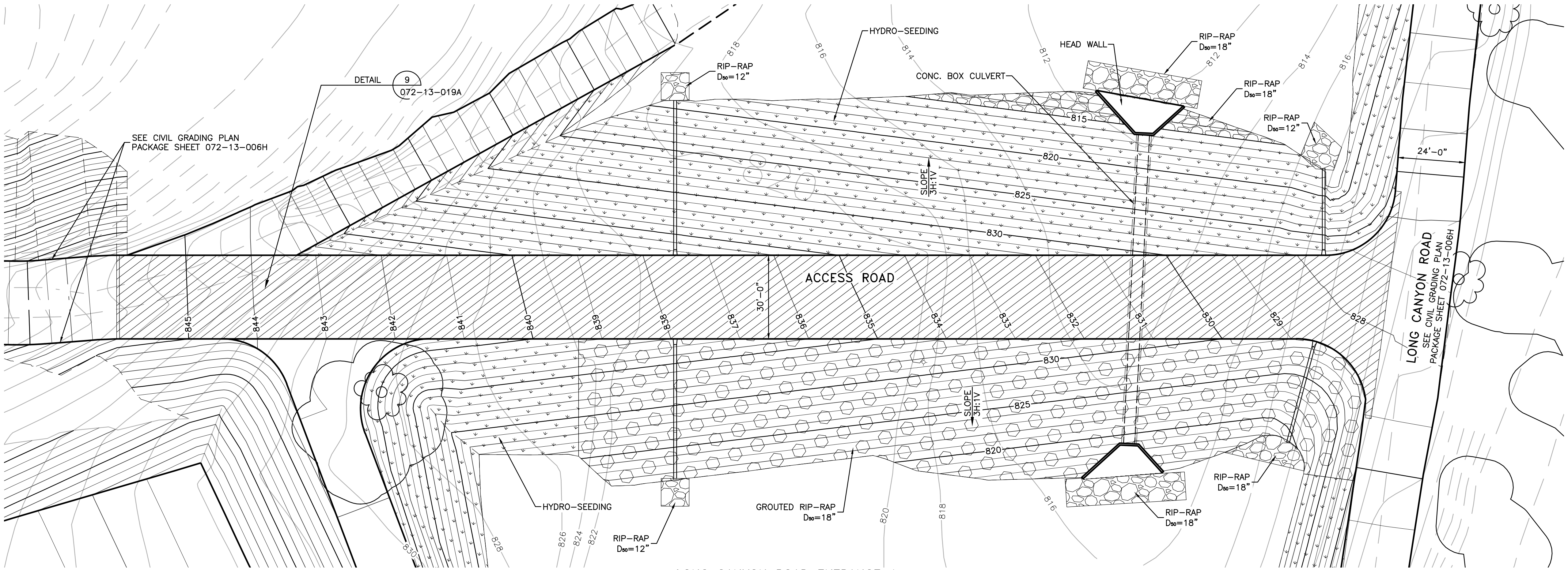
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PLAN & PROFILE – CENTRAL PROCESSING AREA ACCESS ROAD
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: 1"=20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016G	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016G	

:FUNCTIONAL LOCATION NO.



LONG CANYON ROAD ENTRANCE 1
SCALE:1"=20'

LEGEND

- ASPHALT/ CONCRETE
- CLASS II AGGREGATE BASE
- RIP-RAP
- GROUTED RIP-RAP
- HYDRO-SEEDING

N

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

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PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=20'	FILE: 13186/072-13-017A
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/07/14	LAST CHANGED: 08/01/14

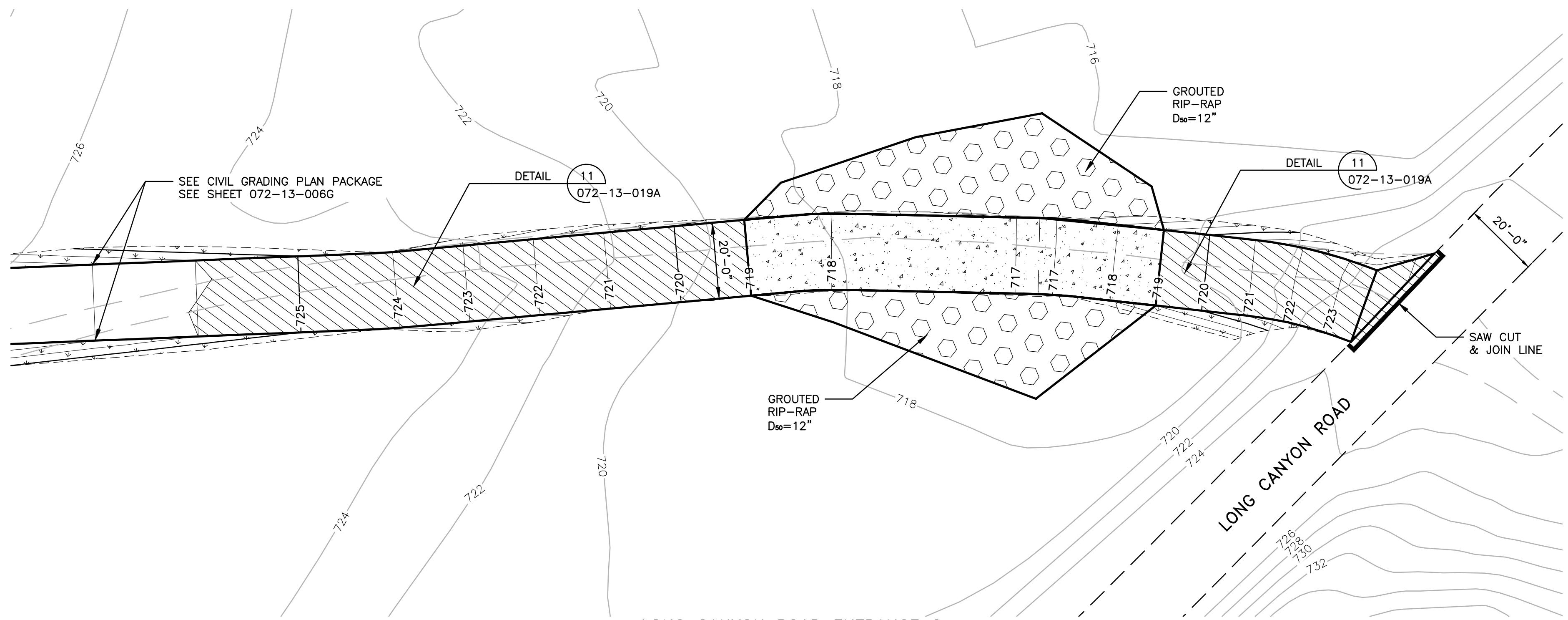
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PAVING PLAN – LONG CANYON ROAD ENTRANCE 1
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: 1"=20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-017A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-017A	

:FUNCTIONAL LOCATION NO.



LONG CANYON ROAD ENTRANCE 2
SCALE:1"=20'

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

LEGEND

- ASPHALT/ CONCRETE
- CLASS II AGGREGATE BASE
- RIP-RAP
- GROUTED RIP-RAP
- HYDRO-SEEDING

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = **20** ft.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

THIS IS FOR LAND USE PERMIT ONLY

PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION MAP
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-017B
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

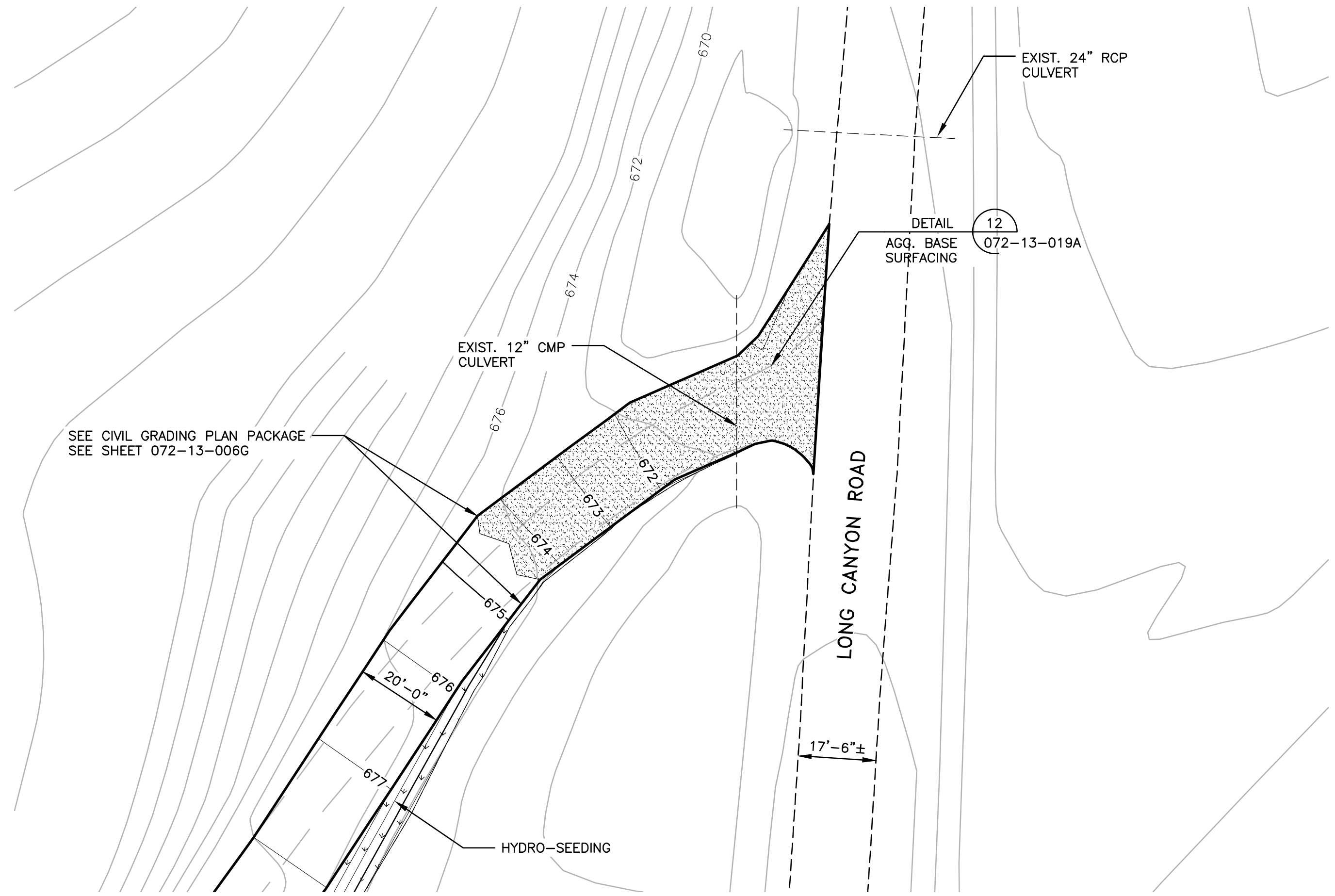
AERA

PAVING PLAN – LONG CANYON ROAD ENTRANCE 2
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON
CO. ENGINEER:	TJCROSS ENGINEERS, INC
PROJ. MGR:	ALI GOKGOZ
DESIGNED BY:	ROBIN DICKERSON
DRAFTED BY:	ISAC URBINA
ECCN NO.	EAR99

DATE: 08/01/14 SCALE: 1"=20'
ORIGINAL DWG NO.
NO. 072-13-017B REV. 0
CAD FILE NO. 072-13-017B

:FUNCTIONAL LOCATION NO.



LONG CANYON ROAD ENTRANCE 3
SCALE:1"=20'

LEGEND

- ASPHALT/ CONCRETE
- CLASS II AGGREGATE BASE
- RIP-RAP
- GROUTED RIP-RAP
- HYDRO-SEEDING

N

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

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PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-017C
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR PROGRESS PRINT	IDU	RSD	EP

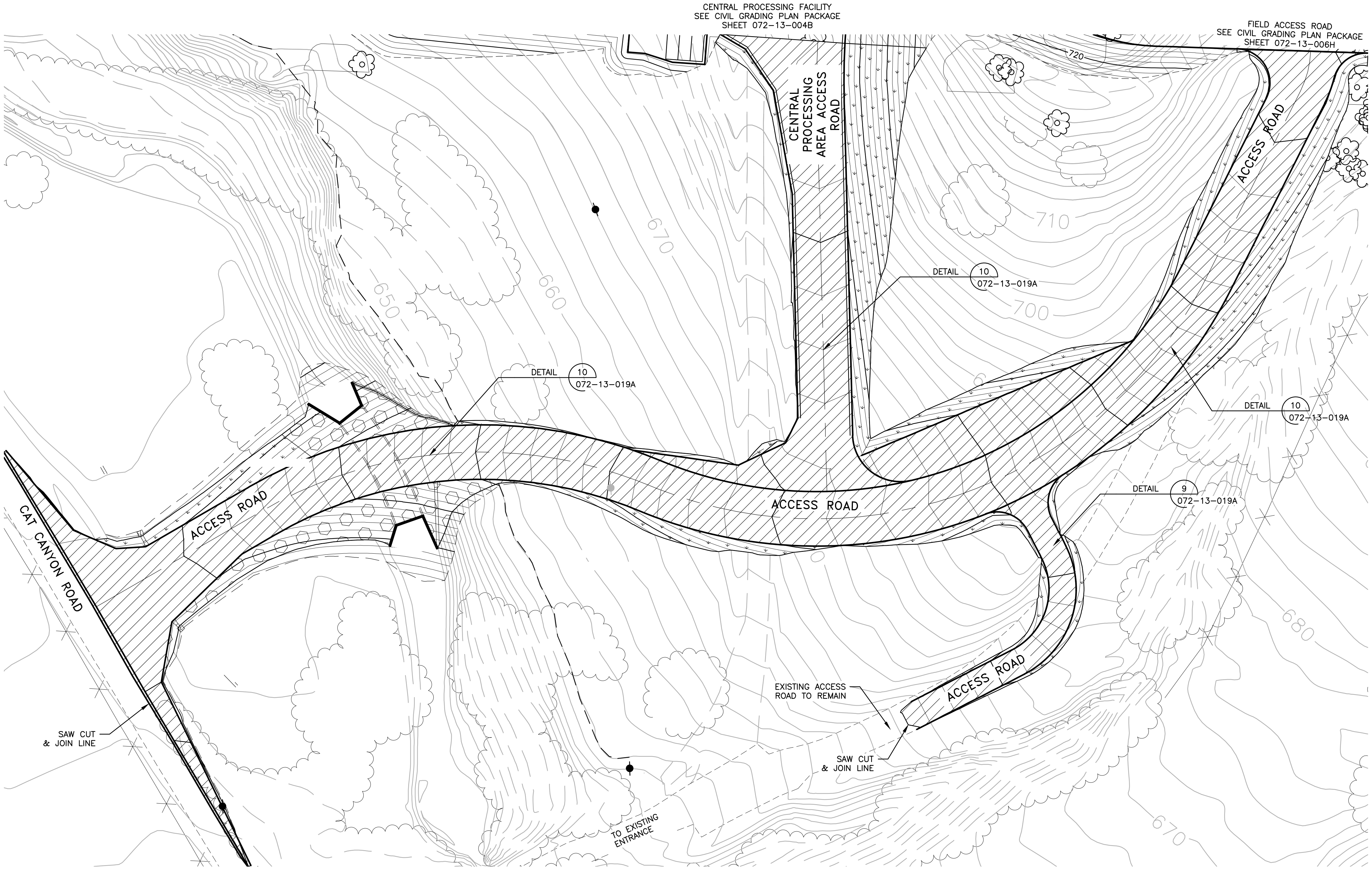
AERA

PAVING PLAN – LONG CANYON ROAD ENTRANCE 3
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ISAC URBINA
ECCN NO. EAR99

DATE: 08/01/14 SCALE: 1"=20'
ORIGINAL DWG NO.
NO. 072-13-017C REV. 0
CAD FILE NO. 072-13-017C

:FUNCTIONAL LOCATION NO.



CAT CANYON ENTRANCE
SCALE:1"=40'

PRELIMINARY
NOT FOR CONSTRUCTION

THIS IS FOR LAND USE PERMIT ONLY

LEGEND

- ASPHALT/ CONCRETE
- CLASS II AGGREGATE BASE
- RIP-RAP
- GROUTED RIP-RAP
- HYDRO-SEEDING

N

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/DRAWING INDEX/VICINITY MAP

REFERENCE DRAWINGS

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=40' FILE: 13186/072-13-017D
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

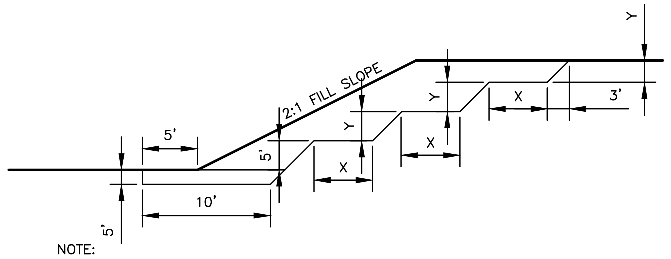
AERA

PAVING PLAN – CAT CANYON ENTRANCE
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER: ERIC PAULSON
CO. ENGINEER: TJCROSS ENGINEERS, INC
PROJ. MGR: ALI GOKGOZ
DESIGNED BY: ROBIN DICKERSON
DRAFTED BY: ISAC URBINA
ECCN NO. EAR99

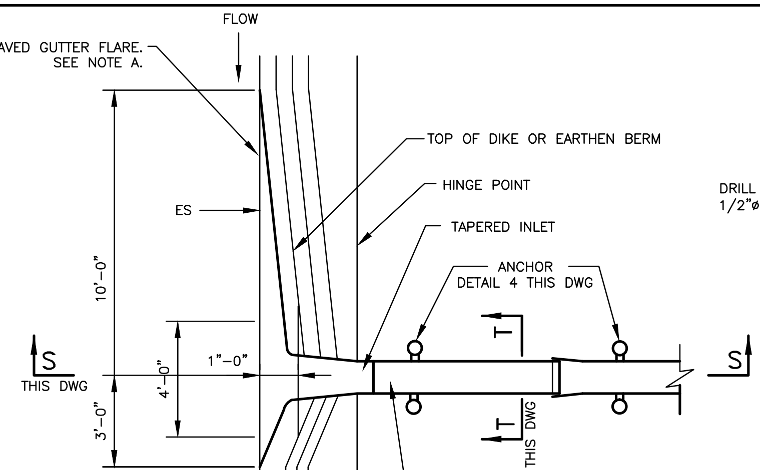
DATE: 08/01/14 SCALE: 1"=40'
ORIGINAL DWG NO.
NO. 072-13-017D REV. 0
CAD FILE NO. 072-13-017D

:FUNCTIONAL LOCATION NO.



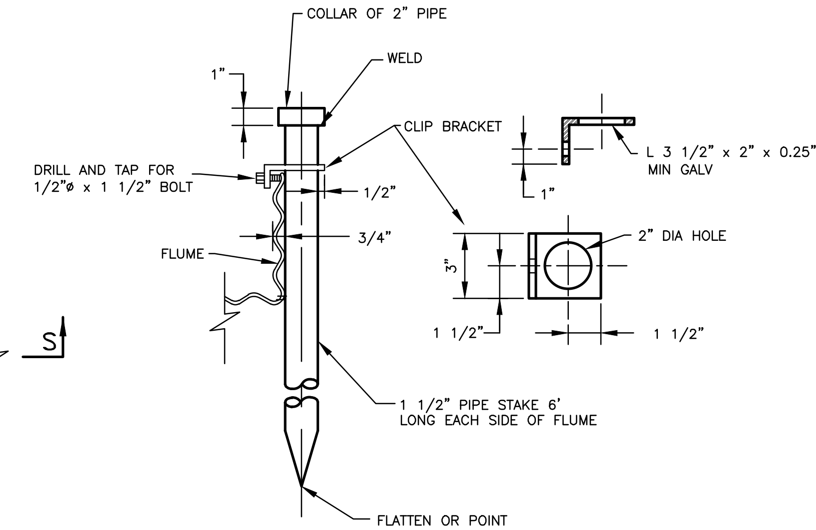
NOTE:
A. BENCHES SLOPE AT 2% INTO HILL.
B. SLOPE BETWEEN BENCHES NOT TO EXCEED 1:1.
C. NUMBER OF BENCHES TO BE DETERMINED BY HEIGHT OF FILL
D. BENCH DIMENSIONS & NUMBER ARE APPROXIMATE. CONTRACTOR TO FIELD FIT TO EX SLOPE. Y NOT TO EXCEED X.

DETAIL 1
TYP. BENCH DETAIL
SCALE: N.T.S.
072-13-016A
072-13-016D

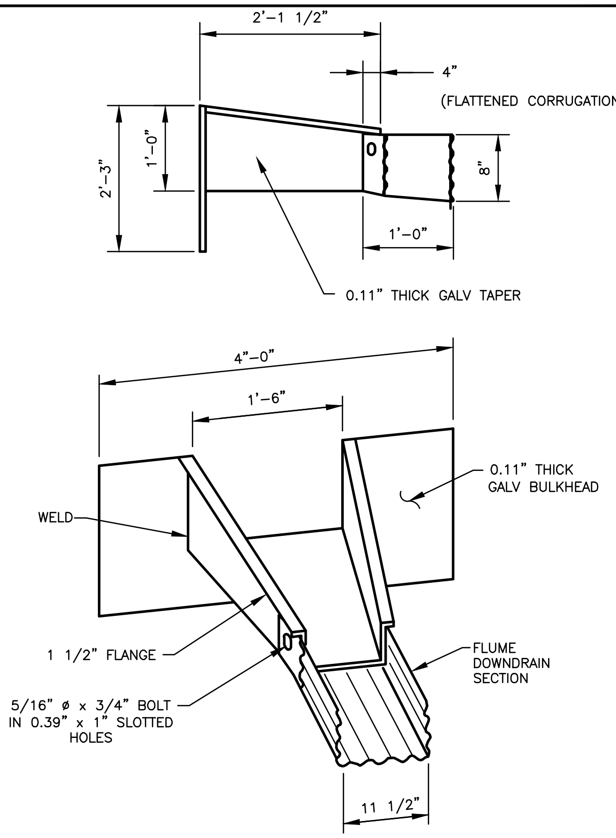


NOTE A
IN SAG LOCATION, USE 10' LENGTH OF PAVED GUTTER FLARE ON BOTH SIDES OF INLET

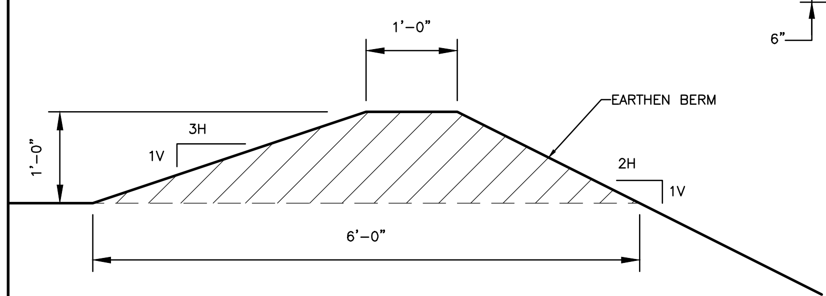
DETAIL 3
TYP. OVERSIDE DRAIN
SCALE: N.T.S.
072-13-016A
072-13-016D



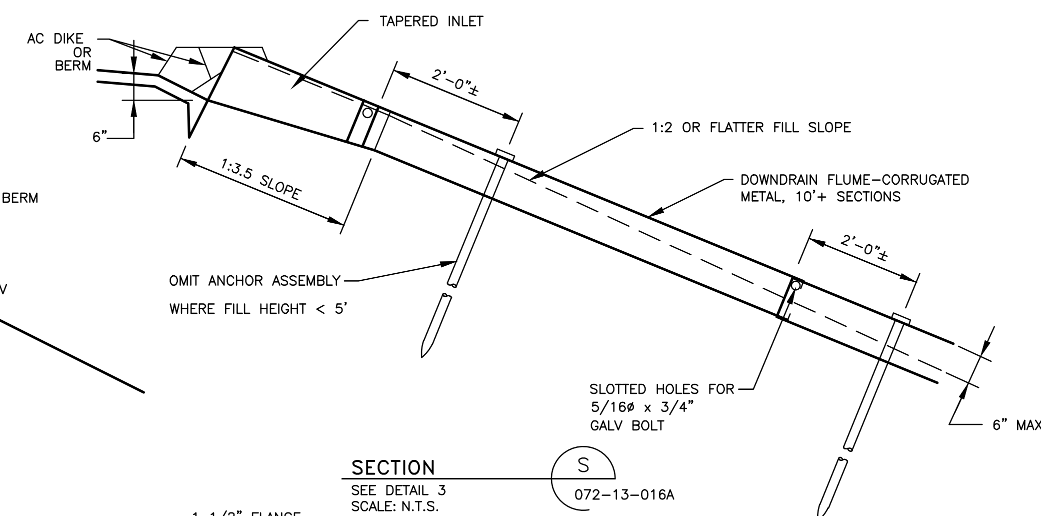
DETAIL 4
PIPE STAKE ANCHOR
SCALE: N.T.S.
072-13-016A
072-13-016D



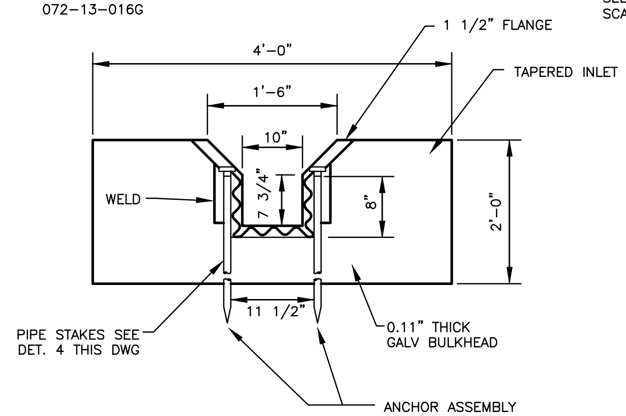
DETAIL 5
TAPERED INLET
SCALE: N.T.S.
072-13-016A
072-13-016D



DETAIL 2
EARTHEN BERM
SCALE: N.T.S.
072-13-016E
072-13-016F
072-13-016G



SECTION S
SEE DETAIL 3
SCALE: N.T.S.
072-13-016A
072-13-016D



SECTION T
SEE DETAIL 3
SCALE: N.T.S.
072-13-016A
072-13-016D

THIS IS FOR LAND USE PERMIT ONLY

NOT ISSUED FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-001A	TITLE SHEET/VICINITY MAP/DRAWING INDEX

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: AS SHOWN
PLOT AT: 1=1
ENGINEER: RSD
DATE STARTED: 01/21/14
FILE: 13186/072-13-008A
LAYER(S): _
CHANGED BY: IDU
LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

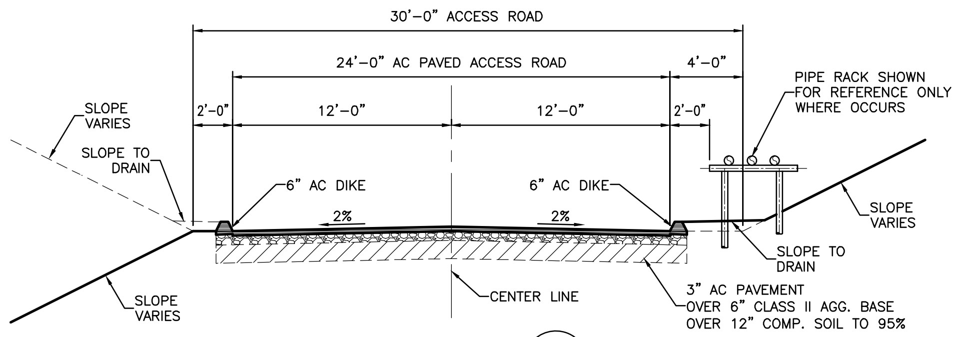
AERA

GRADING DETAILS
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

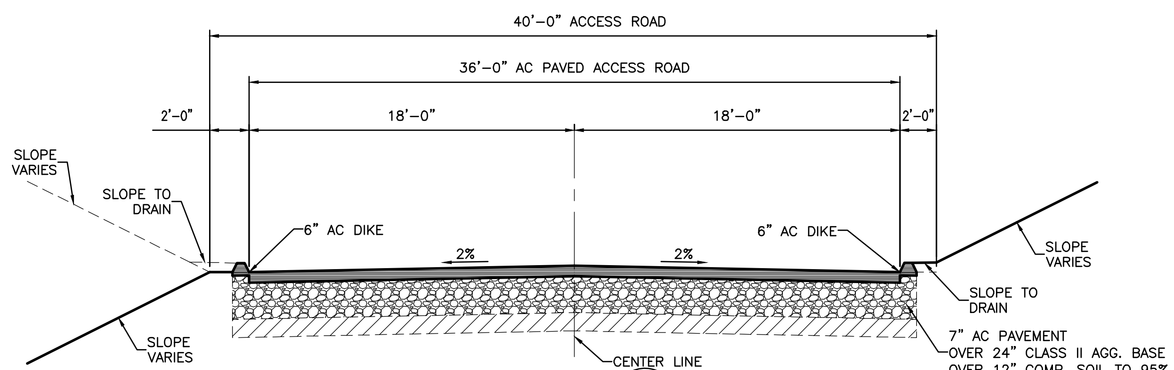
AERA ENGINEER:	ERIC PAULSON
CO. ENGINEER:	TJCROSS ENGINEERS, INC
PROJ. MGR:	ALI GOKGOZ
DESIGNED BY:	ROBIN DICKERSON
DRAFTED BY:	ISAC URBINA
ECCN NO.	EAR99

DATE: 08/01/14 SCALE: AS SHOWN
ORIGINAL DWG NO.
NO. 072-13-018A REV. 0
CAD FILE NO. 072-13-018A

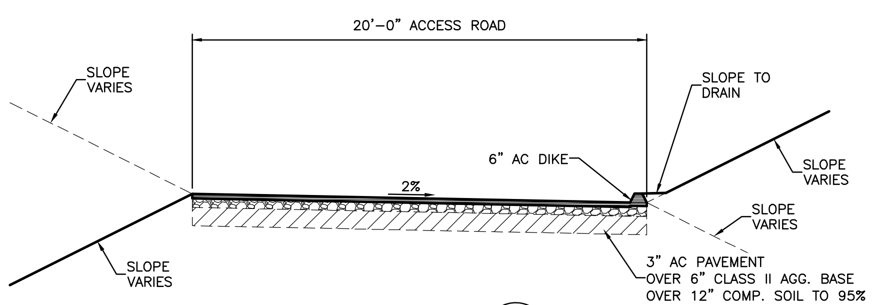
:FUNCTIONAL LOCATION NO.



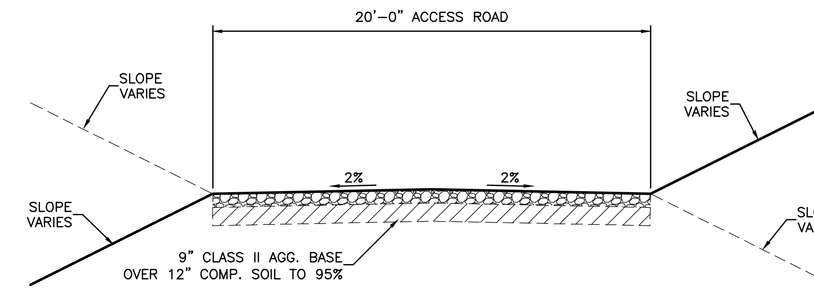
DETAIL 9
TYP. AC PVM'T ROAD SEC.
SCALE: 1"=5'
072-13-017A
072-13-017D



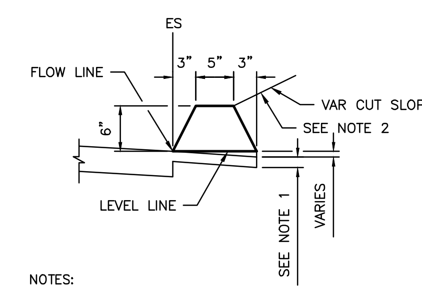
DETAIL 10
TYP. AC PVM'T ROAD SEC.
SCALE: 1"=5'
072-13-017D



DETAIL 11
TYP. AGG. BASE ROAD SEC.
SCALE: 1"=5'
072-13-17B



DETAIL 12
TYP. AGG. BASE ROAD SEC.
SCALE: 1"=5'
072-13-016C
072-13-017C



NOTES:

1. FOR AC SHOULDERS ONLY, EXTEND TOP LAYER OF AC PLACED ON THE SHOULDER UNDER DIKE WITH NO JOINT AT THE ES.
2. FILL AND COMPACT WITH EXCAVATED MATERIAL TO TOP OF DIKE.

DETAIL 13
TYP. 6" AC DIKE
SCALE: 1"=1'
072-13-016A
072-13-016D
072-13-016E
072-13-016F
072-13-016G

THIS IS FOR LAND USE PERMIT ONLY

PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: AS SHOWN — FILE: 13186/072-13-018A
PLOT AT: 1=1 — LAYER(S):
ENGINEER: RSD — CHANGED BY: IDU
DATE STARTED: 11/19/13 — LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PAVING DETAILS
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/01/14	SCALE: AS SHOWN
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-019A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URIBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-019A	

:FUNCTIONAL LOCATION NO.

DS-13186-117

Preliminary Hydrology Report

For

EAST CAT CANYON FIELD REDEVELOPMENT PROJECT

Prepared for:

Aera Energy LLC
10000 Ming Avenue
Bakersfield, CA 93311-1302
661-665-5000

Project Address:

Sections 19, 20, 29, 30 T9N R32W
East Cat Canyon Field, Santa Barbara County, California

Prepared by:

200 New Stine Road
Bakersfield, CA 93309
Robin S. Dickerson, PE
661-831-8782 Ext. 217

Revision Date

September 17, 2014

Project Description

The East Cat Canyon Field Redevelopment project comprises approximately 2,100 acres of which 290 acres is proposed for disturbance and is located within the Solomon Hills northeast of the Gato Ridge mountain ranges within East Cat Canyon, approximately 10 miles southeast of the communities of Santa Maria and Orcutt located in northern Santa Barbara County, California. The property is owned and developed by Aera Energy LLC. The property consists of eight leases located within Sections 19, 20, 28, 29, 31 and 32 of Township 9N/Range 32W, SBBM and is outline on the attached location map. (See Attached Drawing 072-13-026A).

The proposed development will re-establish oil production in an existing oil field. Prior wells have been abandoned and prior facilities have been removed. There is no active production in the proposed project area. The proposed project will use steam injection to develop an ultra-heavy bituminous resource. Project plans include construction and restoration of approximately 73 well pads, construction and restoration of over nine miles of field access roads and drilling of up to 315 wells. Planned wells include oil/gas production wells, steam injection wells, observation wells, water injection wells, and fresh water wells. The project's well pads and roadways have been designed to use existing well pads and roadways when possible.

New process facilities and field systems will be constructed. Process facilities will include: 1) a production group station for bulk separation of produced gas and liquids, 2) a central processing plant for cleaning and sales of produced oil, for cleaning and softening of produced water and for treatment of produced gas, and 3) a steam generation site (six once through steam generators rated at 85 million BTU/hour each) for production of saturated steam to be used for thermal enhanced oil recovery (TEOR). All project steam will be generated by the recycle of produced water. Field systems will include 1) a production gathering network, 2) a steam distribution network and 3) electrical power distribution and SCADA networks. Project infrastructure will also include an office building, a multipurpose building, a warehouse and maintenance building and a facility control building. A water system with a 3,000 barrel tank and fire water distribution is also planned.

Main access to the project site will be from Cat Canyon Road. Secondary access will be provided from Long Canyon Road. The proposed project will disturb approximately 290 acres. Earthwork volumes are expected to be balanced onsite by project completion. Legacy fill material and excess material will be managed at a new Soil Reclamation Site.

Project construction and well drilling will be phased. Phase I activities will include the development of approximately 25% of the project. In addition to field systems to support well production and injection, Phase I construction will include the initial capacities at a new Group Station, new Central Processing Facility and new Steam Generation Site. The project's water system, primary offices, main roadways and the Soil Reclamation Site will also be part of Phase I. Activities for Phase I are expected to last approximately four years. Phase II will develop the remaining resource and expand capacities at the Group Station, Central Processing Facility and Steam Generation Site. Phase II construction and well drilling will start about three years after Phase I completion. Phase II capacity additions to processing facilities are expected to take up to two years. Phase II well drilling and construction of field systems are planned to take place over a period of up to ten years. Production from the project is expected to continue for more than 30 years.

Project Site

The topography of the area consists of a series of north-south aligned subdued hills with elevations ranging from about +500 to +1,000 feet above mean sea level (MSL). The project is contained within 6 watersheds which ultimately discharge into the Sisquoc River to the north. (See attached watershed map). The watersheds consist of Cat Canyon (7000 acres), Long Canyon (893 acres), Olivera Canyon (1414 acres), and 3 unnamed blue lines (Unnamed 1&2 800 acres Unnamed #3 218 acres). Cat Canyon is the principal stream in the area. All watersheds are intermittent and flow to the north toward the community of Sisquoc. All 6 creeks are well entrenched along most of their courses. (See Attached drawing 072-13-022A). Watersheds were defined using the available topographical contours from Topo Depot. Each watershed was further divided into both pre and post construction sub-watersheds. (See Attached Drawing 072-13-023A thru 023E for Pre Construction and 072-13-024A thru 024C for Post Construction).

The Hydrological Soils Groups for areas within the project site were obtained from the United States Department of Agriculture, National Resource Conservation Services, Web Soil Survey site. The Hydrological Soils Group appears to be predominantly Group C with some Group A and D dispersed within the watersheds. Group C Soils have a slow infiltration rate when thoroughly wet. These soils also have a slow rate of water transmission. Group A soils have a high infiltration rate and low runoff potential when thoroughly wet. They also have a high rate of water transmission. Group D soils have a very slow infiltration rate and high potential for water runoff. These soils have a very slow rate of water transmission.

Unnamed Blue line #1 is predominantly Group C with Group A located within the channel. A small patch of Group D is located along the southern edge of the watershed. (See Appendix A). Unnamed Blue line #2 is predominantly Group C with Group A located within the channels and along the southern edge of the watershed. A small patch of Group D is located along the southern edge of the watershed. (See Appendix A). Unnamed Blue line #3 is predominantly Group C. A small patch of Group D is located along the eastern edge of the watershed. (See Appendix A). Long Canyon is predominantly Group C with Group A located within the channels and along the southern end of the watershed. A small patch of Group D is located along the northeastern edge of the watershed. (See Appendix A). Olivera Canyon is predominantly Group C with Group A located within the channels. A patch of Group D is dispersed throughout the northern portion of the watershed. (See Appendix A). Cat Canyon is predominantly Group C to the southeast and predominantly Group D to the northwest with Group A located within the northwest portion of the channels. (See Appendix A). These soils groups will be used in determining weighted CN values needed for the final hydrology when design phase plans have been developed.

Methodology

Runoff shall be conveyed safely, to prevent erosion from slopes and channels. Basins have been provided where practical, but have been kept outside of the 6 defined blue line channels. Disturbed slopes shall be revegetated with appropriate native or drought tolerant vegetation. Permanent Channel crossings will be stabilized and energy dissipaters such as rip rap will be used at the outlet of storm drains, culverts or channels that enter unlined channels to minimize erosion potential. There are 2 structures being proposed for creek crossing for this project. Both culverts are sufficiently sized to handle the 100 year post construction flow.(See Figure 1). One is at the entrance of the project site off of Cat Canyon Road crossing over Cat Canyon, which is a proposed 20' x 12' high U-shaped structure with a natural bottom. (See Attached Drawing 072-13-016D). The other structure is on Long Canyon where the new tie-in road is proposed. The box culvert will be a 4' x 4' Concrete Box Culvert. (See Attached Drawing 072-13-016A).

The hydrology was calculated for each watershed using the rational method Q=CIA as required by the Santa Barbara Flood Control District. The runoff coefficients were calculated from the Santa Barbara County Flood Control District Rainfall Intensity/Runoff Coefficient equations Dated August 2003. (See Appendix A) The Pre construction Runoff Coefficients were calculated using the equation for Curve #4 - North County Agriculture, since most of the watershed is in a natural state and the current and proposed zoning is agriculture. For the post construction runoff coefficients an interpolation between Curve #3 and Curve #4 was used for the disturbed area. For facilities a higher C value was used and for the Central Processing Plant the equation for commercial was used, since most of the area will be paved. As reaches were added to the discharge, the runoff coefficients were weighted based on area.

Intensities were calculated using Rainfall Intensity equations from the Santa Barbara County Flood Control District Curve Construction for Sisquoc dated August 2003. Times of Concentration Values were obtained from the nomograph provided by the Santa Barbara County Flood Control District. (See Appendix B).

The flows for the 100, 50, 25, and 10 year pre and post construction events were calculated and provided in Tables 1 - 5 below for each junction of the watershed. Complete spreadsheets for each model run can be found in Appendix C. Where practical and as shown on the field redevelopment plans detention basins will be provided to reduce the peak flows. These basins will be sized to handle the incremental flows. Currently the basins are sized at a minimum of 0.1 acre feet per acre as required by Santa Barbara County Flood Control and Water Conservation District – Standard Conditions of Project Plan Approval. The Santa Barbara Urban Hydrograph will be utilized in designing the final basin sizes based on the flows provided below and the project design documents.

Findings and Conclusions

For Unnamed Blue Line #1 & #2 the project will increase the 100 year property boundary discharge by 88.10 cubic feet/sec. For Unnamed Blue Line #3 and Olivera Canyon there will be no increase, since no development is planned within either watershed. For Long Canyon the 100 year property boundary discharge will increase by 84.6 cubic feet per second and for Cat Canyon the 100 year property boundary discharge will increase by 150.8 cubic feet per second. See Tables 1 though 5 below for pre and post flows for the 100 year, 50 year, 25 year and 10 year at various junction points throughout the project area. A complete copy of the Rational Method calculations can be found in Appendix D and pre and post watershed maps can be found on attached drawings 072-13-022A thru 072-13-024C.

Based on the hydrologic soils group information the project area is predominantly group C and will have a slow infiltration rate and moderate runoff potential. They will also have a slow rate of water transmission. Areas within the existing natural drainage channels are shown as Group A and will have a high infiltration rate and low runoff potential. These soils also have a high rate of water transmission. See Appendix A for Hydrological Soils Maps for each watershed.

Detention Basins have been strategically placed outside of existing blue line channels to reduce the increase in peak flow discharge caused by the development of the project site. Specific design and outflow discharge for post construction have not been determined, however the proposed detention basins are currently sized for a minimum 0.1 acre feet per acre and gravity bleeder lines will be designed for the 100 year 24 hour storm event developed condition to 0.07 cubic feet per second per acre as required by the Santa Barbara County Flood Control and Water Conservation District. The terrain, proximity to existing blue lines and the preservation of existing oak trees had significantly limited size and location of detention basins. Sixteen detention basins are proposed for the project area. Basins typically vary in size from 2100 cubic yards to 7500 cubic yards averaging 3750 cubic yards, except for 3 basins. Two basins exceed this range they are Basin A which is 18250 cubic yards and Basin G which is 14250 cubic yards. The smallest basin is Basin D and it has 725 cubic yard capacity. These basins will be more than sufficiently sized at the time of project development. See drawing 072-13-024A thru C for proposed basin locations.

There are 2 major creek crossings proposed for the project. The main entrance off of Cat Canyon Road will cross Cat Canyon Creek. A 20’ x 12’ U-shaped culvert is proposed for this entrance. The second crossing is proposed where the main road through the project site ties into Long Canyon Road crossing Long Canyon Creek. A 4’ x 4’ box culvert is proposed for this crossing. Both crossings were sized for over a 100 year storm event for the developed condition. Calculations can be found in Figure 1 below and on the attached drawings 072-13-016D and 072-13-016A.

TABLE 1

Unnamed Blue Line #1 & #2								
Junction #		Area (acres)	C	TOC (min)	Q_{100} (cft/sec)	Q_{50} (cft/sec)	Q_{25} (cft/sec)	Q_{10} (cft/sec)
1	Pre	99.92	0.62	8.5	207.2	174.9	138.4	103.1
	Post	96.26	0.82	8.0	311.2	281.7	246.0	208.6
2	Pre	250.35	0.57	17.6	337.0	277.4	214.7	155.2
	Post	243.14	0.61	16.4	396.4	352.1	301.9	247.4
3	Pre	342.72	0.56	21.6	412.4	338.4	261.0	186.7
	Post	335.51	0.59	20.3	463.9	411.1	343.8	272.1
4	Pre	476.95	0.53	24.4	511.9	418.7	321.9	227.9
	Post	472.25	0.56	23.1	580.3	505.6	423.7	335.6
5	Pre	52.04	0.67	7.0	129.1	109.4	86.8	65.3
	Post	52.24	0.83	7.0	160.2	145.0	126.6	107.4
6	Pre	142.75	0.61	10.4	268.0	224.1	175.1	127.9
	Post	143.63	0.71	10.1	312.9	275.2	231.8	187.2
7	Pre	671.94	0.55	26.8	715.2	586.0	451.6	320.2
	Post	668.12	0.59	25.5	817.1	708.4	590.2	463.4
8	Pre	744.66	0.54	30.5	735.9	601.9	463.1	326.5
	Post	740.84	0.58	29.1	832.9	717.8	593.7	460.8
9	Pre	800.64	0.53	36.4	**706.7**	**576.4**	**442.2**	**309.0**
	Post	796.82	0.56	35.0	**794.8**	**681.5**	**560.9**	**430.9**

TABLE 2

Unnamed Blue Line #3 – No Development Pre Q's = Post Q's								
Junction #		Area (acres)	C	TOC (min)	Q_{100} (cft/sec)	Q_{50} (cft/sec)	Q_{25} (cft/sec)	Q_{10} (cft/sec)
10	Pre=Post	18.71	0.73	5.5	56.5	48.1	38.2	29.0
11	Pre=Post	50.56	0.64	13.1	87.6	72.7	56.3	40.5
12	Pre=Post	105.10	0.59	17.2	147.6	121.4	93.2	65.7
13	Pre=Post	145.42	0.58	19.1	191.4	157.3	120.6	84.9
14	Pre=Post	170.12	0.58	20.4	218.4	179.5	137.8	97.0
15	Pre=Post	203.89	0.58	21.8	250.9	206.0	158.1	111.0
End	Pre=Post	218.00	0.57	23.3	**255.0**	**208.9**	**160.0**	**111.9**

TABLE 3

Long Canyon								
Junction #		Area (acres)	C	TOC (min)	Q_{100} (cft/sec)	Q_{50} (cft/sec)	Q_{25} (cft/sec)	Q_{10} (cft/sec)
1	Pre	49.72	0.62	9.0	100.6	85.0	67.3	50.1
	Post	49.72	0.62	9.0	100.6	85.0	67.3	50.1
2	Pre	154.34	0.56	15.1	218.9	181.3	140.5	100.3
	Post	150.31	0.56	15.1	214.8	179.9	141.9	103.8
3	Pre	196.86	0.56	16.5	269.8	223.4	173.2	123.5
	Post	193.26	0.59	16.5	276.7	235.6	190.4	144.3
4	Pre	285.54	0.57	17.7	381.4	315.9	245.1	175.0
	Post	285.65	0.62	17.6	420.0	361.6	297.3	230.3
5	Pre	344.52	0.57	20.4	430.2	355.7	275.6	196.1
	Post	344.63	0.61	20.3	467.0	399.0	324.7	247.8
6	Pre	481.55	0.56	24.3	551.2	454.6	351.5	248.6
	Post	483.14	0.65	24.1	634.6	544.1	446.0	342.5
7	Pre	583.14	0.56	27.9	615.8	506.6	390.9	274.9
	Post	585.22	0.64	27.5	711.6	609.0	498.6	381.4
8	Pre	643.48	0.55	30.4	642.2	527.4	406.2	284.5
	Post	644.92	0.62	30.0	734.8	628.6	514.6	393.3
9	Pre	711.53	0.54	32.8	673.6	552.1	424.5	295.9
	Post	712.97	0.61	32.3	764.1	650.7	529.8	401.3
10	Pre	755.40	0.54	34.0	701.4	574.7	441.7	307.6
	Post	756.84	0.60	33.5	790.9	672.0	545.5	411.4
11	Pre	792.08	0.54	35.3	720.1	589.6	453.0	315.1
	Post	793.52	0.60	34.8	808.4	685.6	555.3	417.1
12	Pre	866.27	0.53	38.2	745.2	609.1	467.2	323.4
	Post	867.71	0.58	37.6	831.4	702.3	566.3	422.0
End	Pre	892.33	0.52	40.1	**741.5**	**605.3**	**463.7**	**320.1**
	Post	893.77	0.57	39.4	**826.1**	**696.7**	**560.8**	**416.5**

TABLE 4

Olivera Canyon – No Development Pre Q's = Post Q's								
Junction #		Area (acres)	C	TOC (min)	Q_{100} (cft/sec)	Q_{50} (cft/sec)	Q_{25} (cft/sec)	Q_{10} (cft/sec)
1	Pre=Post	52.85	0.63	8.0	115.8	97.9	77.5	57.9
2	Pre=Post	131.61	0.61	12.2	228.3	190.6	149.0	108.4
3	Pre=Post	239.48	0.58	15.6	345.9	286.8	222.4	159.2
4	Pre=Post	374.21	0.56	17.0	504.8	417.8	323.7	230.8
5	Pre=Post	450.48	0.55	18.9	568.4	469.4	363.0	257.6
6	Pre=Post	553.10	0.55	19.4	686.9	567.1	438.4	310.8
7	Pre=Post	645.57	0.54	22.8	732.3	602.7	464.7	327.2
8	Pre=Post	729.87	0.53	25.5	772.5	634.1	487.7	341.3
12	Pre=Post	129.72	0.52	14.0	179.6	150.4	118.4	86.1
13	Pre=Post	242.94	0.53	18.0	303.7	252.9	197.8	142.2
14	Pre=Post	273.69	0.54	21.6	318.5	264.5	206.4	147.7
15	Pre=Post	376.01	0.54	24.9	404.5	334.9	260.5	185.1
16	Pre=Post	414.91	0.54	25.8	441.7	365.6	284.3	202.0
9	Pre=Post	1237.61	0.44	29.4	1003.1	812.1	613.8	411.9
10	Pre=Post	1312.69	0.44	30.6	1052.4	852.5	645.0	433.6
18	Pre=Post	57.91	0.58	10.2	103.4	87.1	68.8	50.8
19	Pre=Post	83.20	0.59	11.6	142.7	119.8	94.4	69.3
11	Pre=Post	1414.01	0.45	26.7	**1236.3**	**1005.3**	**763.7**	**518.2**

TABLE 5

Cat Canyon								
Junction #		Area (acres)	C	TOC (min)	Q_{100} (cft/sec)	Q_{50} (cft/sec)	Q_{25} (cft/sec)	Q_{10} (cft/sec)
1	Pre	247.4	0.52	14.0	337.7	282.6	222.2	161.2
	Post	247.4	0.52	14.0	337.7	282.6	222.2	161.2
2	Pre	462.23	0.50	29.9	423.2	346.7	266.5	185.3
	Post	462.23	0.50	29.9	423.2	346.7	266.5	185.3
3	Pre	731.13	0.49	36.1	601.2	490.7	376.1	259.3
	Post	731.13	0.49	35.6	601.2	490.7	376.1	259.3
4	Pre	1026.86	0.46	42.5	737.6	598.8	456.4	310.3
	Post	1026.86	0.46	41.4	737.6	598.8	456.4	310.3
5	Pre	1356.65	0.44	47.2	887.3	717.6	544.7	366.4
	Post	1356.65	0.44	45.6	887.3	717.6	544.7	366.4
6	Pre	1508.66	0.44	48.6	985.0	797.2	605.8	408.3
	Post	1508.66	0.44	46.9	985.0	797.2	605.8	408.3
7	Pre	1970.18	0.44	52.2	1241.8	1004.6	763.4	513.9
	Post	1970.18	0.44	50.1	1241.8	1004.6	763.4	513.9
8	Pre	2218.99	0.43	55.9	1338.4	1080.9	819.9	549.4
	Post	2218.99	0.43	53.4	1338.4	1080.9	819.9	549.4
9A	Pre	339.52	0.55	11.5	543.8	456.6	359.9	263.8
	Post	339.52	0.55	11.5	543.8	456.6	359.9	263.8
9	Pre	2742.25	0.45	60.0	1667.7	1352.1	1028.0	693.7
	Post	2742.25	0.45	56.7	1667.7	1352.1	1028.0	693.7
10	Pre	2913.33	0.45	63.3	1735.0	1406.3	1069.4	721.3
	Post	2913.33	0.45	59.5	1735.0	1406.3	1069.5	721.4
11	Pre	3369.76	0.44	71.3	1877.0	1518.5	1153.0	773.8
	Post	3369.75	0.44	66.3	1877.0	1518.5	1153.0	773.8
13	Pre	210.17	0.55	11.0	342.2	287.2	226.3	165.8
	Post	210.17	0.55	11.0	342.2	287.2	226.3	165.8
12	Pre	3704.27	0.45	72.8	2057.4	1664.9	1264.8	849.6
	Post	3704.26	0.45	67.6	2057.4	1664.9	1264.9	849.6
14	Pre	4026.50	0.44	75.4	2188.2	1769.7	1343.8	901.2
	Post	4026.49	0.44	69.8	2188.2	1769.7	1343.8	901.2

Cat Canyon (con't)								
Junction #		Area (acres)	C	TOC (min)	Q_{100} (cft/sec)	Q_{50} (cft/sec)	Q_{25} (cft/sec)	Q_{10} (cft/sec)
15	Pre	4427.25	0.43	82.7	2227.2	1794.5	1356.8	900.6
	Post	4427.24	0.43	75.8	2227.2	1794.5	1356.8	900.6
24	Pre	359.89	0.53	14.0	504.2	422.4	332.7	242.3
	Post	359.89	0.53	14.0	504.2	422.4	332.7	242.3
25	Pre	460.25	0.54	15.4	630.7	527.5	415.1	301.7
	Post	460.25	0.54	15.4	630.7	527.5	415.1	301.7
16	Pre	5030.80	0.44	86.4	2544.5	2053.9	1557.3	1039.1
	Post	5030.42	0.44	78.9	2555.7	2063.5	1570.0	1051.4
17	Pre	5136.89	0.44	88.8	2592.8	2093.0	1587.5	1059.5
	Post	5138.23	0.45	80.9	2646.7	2144.2	1640.3	1108.2
26	Pre	357.15	0.56	11.0	591.6	497.0	392.0	287.9
	Post	357.15	0.56	11.0	591.6	497.0	392.0	287.9
18	Pre	5674.03	0.44	94.1	2809.5	2268.4	1721.8	1149.8
	Post	5675.28	0.45	85.1	2862.5	2318.5	1773.6	1197.5
28	Pre	107.38	0.73	9.5	247.7	209.3	165.8	123.6
	Post	108.61	1.10	8	413.8	374.5	327.1	277.4
27	Pre	168.44	0.83	10.5	425.0	357.9	282.7	209.3
	Post	176.70	1.14	8.9	664.7	598.5	519.6	436.4
19	Pre	5981.21	0.45	95.4	3030.5	2434.2	1851.2	1240.8
	Post	5990.46	0.48	85.9	3152.3	2569.5	1984.8	1362.0
20	Pre	6045.15	0.46	97.5	3042.4	2443.4	1858.0	1244.8
	Post	6036.78	0.47	87.5	3138.3	2559.0	1977.9	1358.2
21	Pre	6191.49	0.45	99.5	3062.4	2457.8	1867.5	1248.7
	Post	6180.98	0.47	89.4	3170.3	2589.2	2006.4	1383.2
22	Pre	6365.30	0.45	102.7	3080.1	2470.2	1875.3	1251.1
	Post	6369.89	0.47	91.8	3201.7	2613.4	2024.2	1393.4
29	Pre	62.03	0.70	6.1	172.2	147.1	116.0	87.7
	Post	61.14	1.24	6.1	291.8	264.2	230.3	195.7
23	Pre	6995.11	0.44	110.7	**3242.3**	**2598.1**	**1970.3**	**1308.2**
	Post	6998.77	0.47	98.0	**3393.1**	**3066.9**	**2692.7**	**1475.1**

FIGURE 1

Creek Crossing Calculations

Using Manning's Equation

Q = 1.486/n * A * R^2/3 * S^1/2

Q = Discharge
n = Manning's roughness coefficient
A = Cross Sectional Area
R = Hydraulic Radius
S = Slope of Culvert

For Cat Canyon Creek Crossing at Junction 20

Using a 20 x 12 U-Shape Concrete Culvert
Q_{100} = 3138.3 cubic feet per second per Post Construction 100 year Rational method
n = 0.02075
A = 240
R = 3.75
S = .0147

Solve for Q

Q = 5.029.9 cubic feet per second (calc)

Culvert is sufficiently sized for 100 year post construction flow.

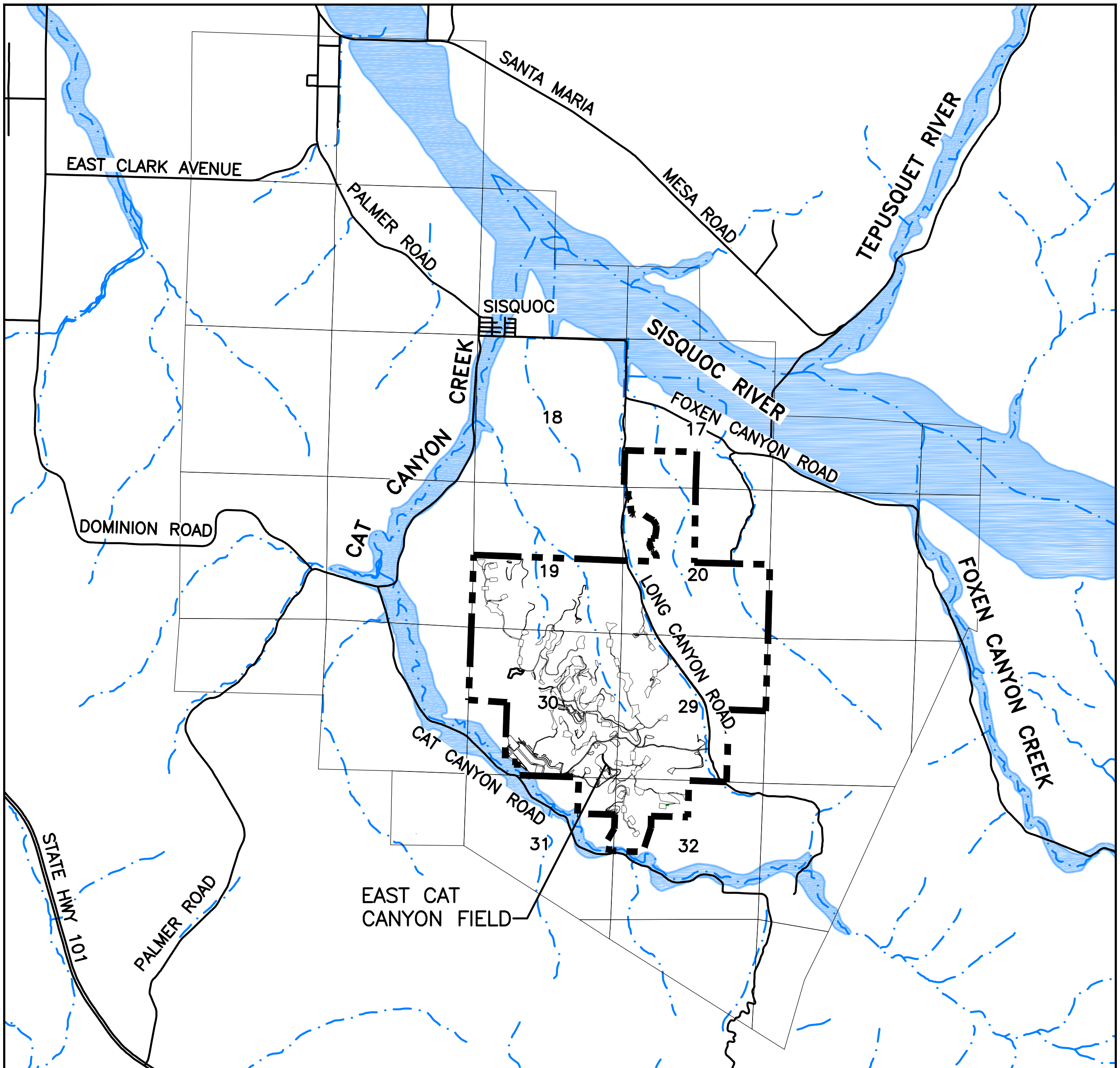
For Long Canyon Creek Crossing at Junction 3

Using a 4 x 4 Concrete Box Culvert
Q_{100} = 276.7 cubic feet per second per Post Construction 100 year Rational method
n = 0.012
A = 15.65
R = 1.04
S = .0259

Solve for Q

Q = 320.2 cubic feet per second (calc)

Culvert is sufficiently sized for 100 year post construction flow.



LEGEND

AERA PROPERTY BOUNDARY

SECTION LINES

INTERMITTENT STREAM

FLOOD HAZARD LIMITS

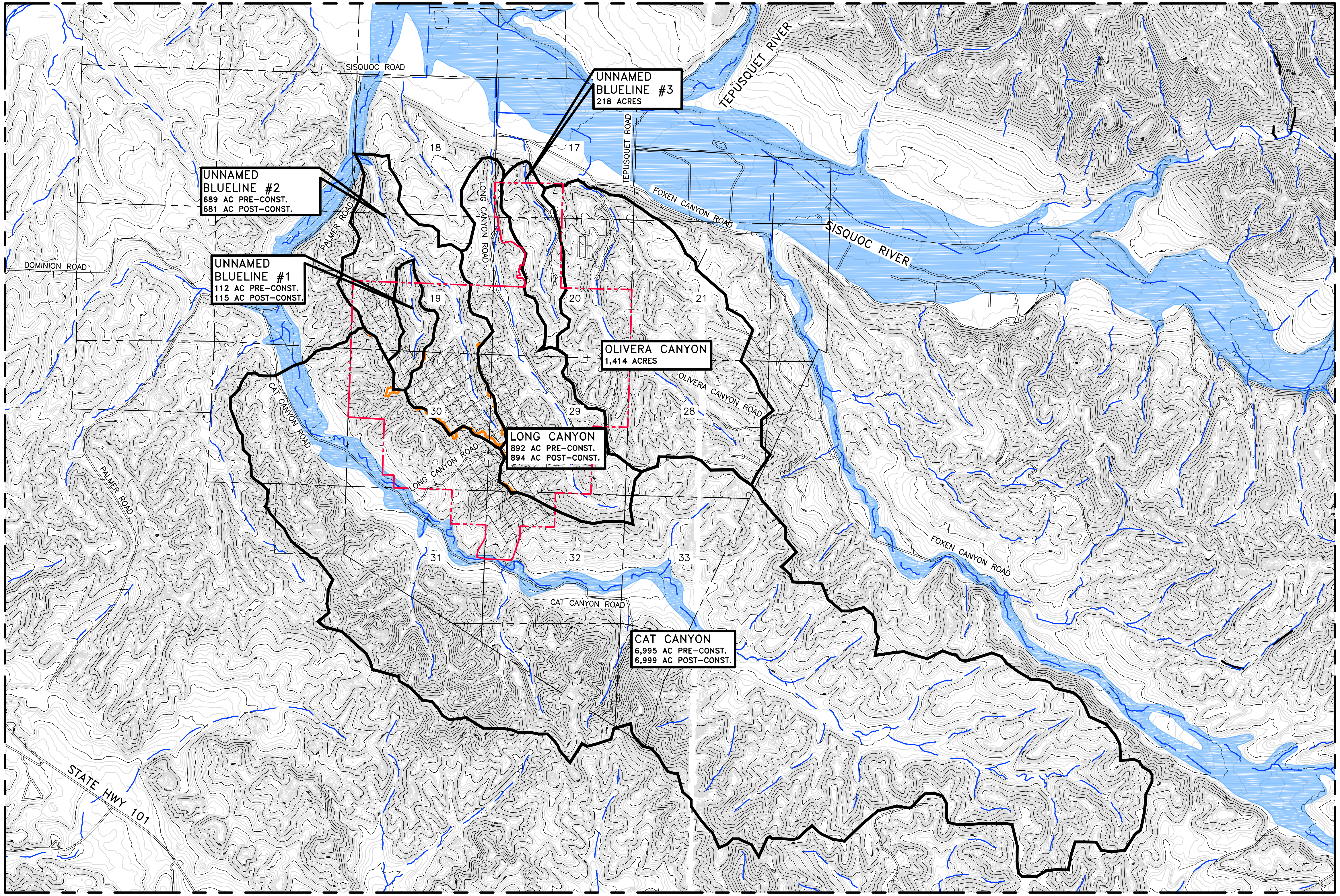
08/20/14	A	ISSUED FOR REVIEW	RAA	RSD	EP
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG

AERA

VICINITY MAP – HYDROLOGY
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 08/20/14	SCALE: 1" = 5000'
CO. ENGINEER:	TJCROSS ENGINEERS, INC.	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072–13–026A	REV. A
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ROBERT AMARO		
ECCN NO.	EAR99	CAD FILE NO. 072–13–026A	

:FUNCTIONAL LOCATION NO.



N

PRELIMINARY
NOT FOR CONSTRUCTION

LEGEND

- PROPERTY BOUNDARY AND LEASE BOUNDARY
- INTERMITTENT STEAM
- SECTION LINES
- FLOOD HAZARD LIMITS
- PRE-CONSTRUCTION WATERSHED BOUNDARY
- POST-CONSTRUCTION WATERSHED BOUNDARY

GRAPHIC SCALE

2000 0 1000 2000 4000 8000

(IN FEET)
1 inch = 2000ft.

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=2000' FILE: 13186/072-13-022A
PLOT AT: 1=1 LAYER(S): .
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 12/16/13 LAST CHANGED: 09/17/14

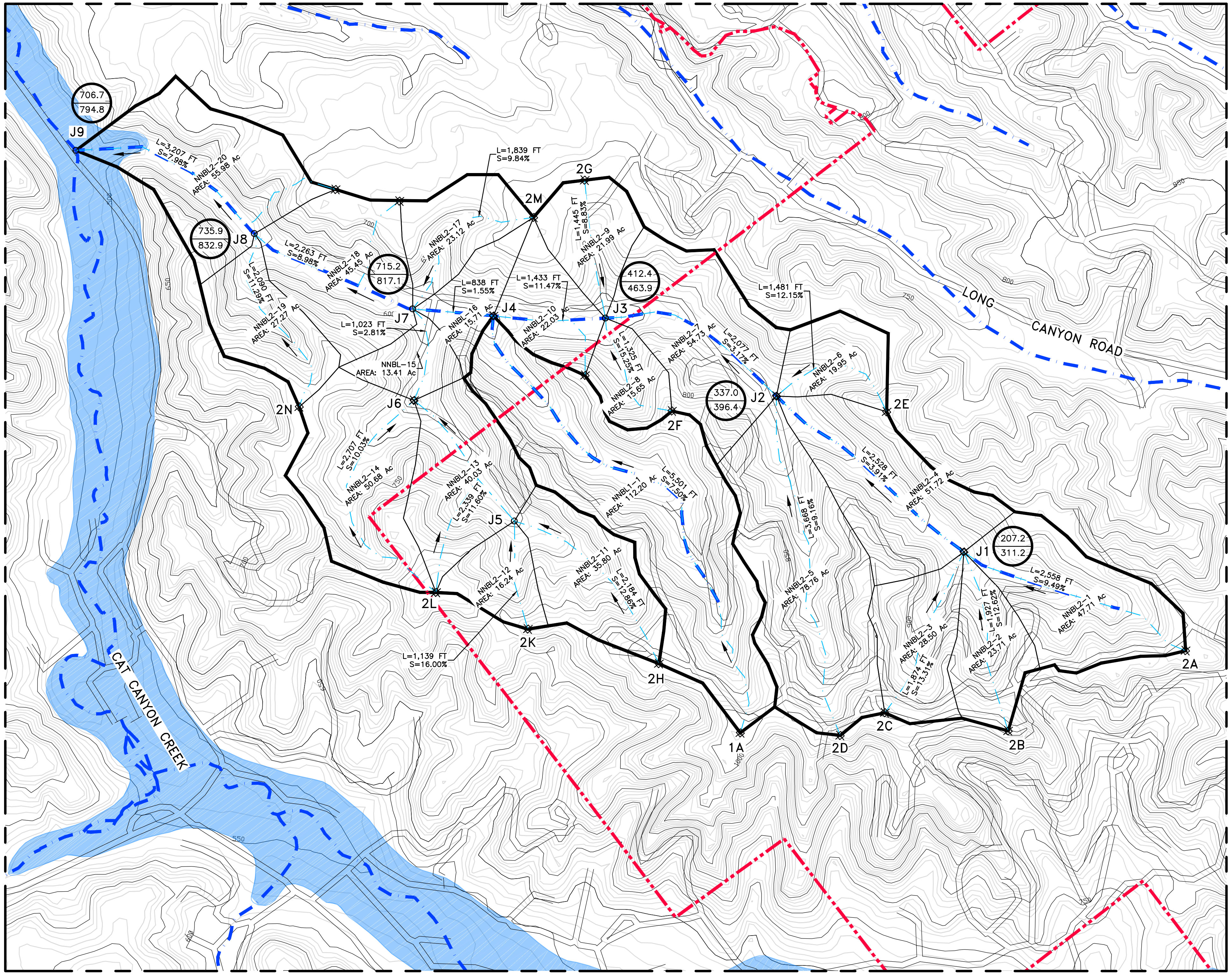
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY – WATERSHED MAP
FIELD REDEVELOPMENT PROJECT
SECTIONS 19/20/29/30/31 & 32 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 2000'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	SK-13186-25
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-022A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-022A	

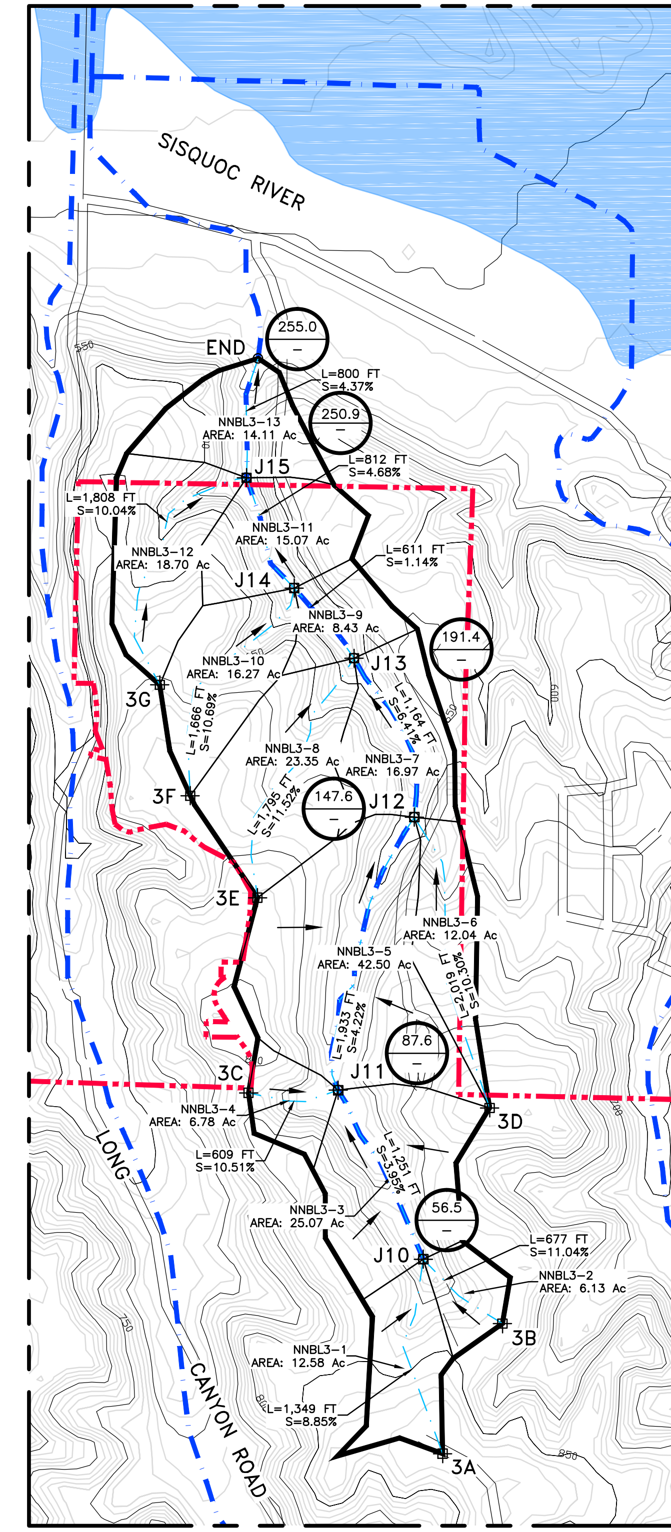
:FUNCTIONAL LOCATION NO.



UNNAMED BLUE LINE 1 & 2

SCALE: 1" = 600'

PRELIMINARY
NOT FOR CONSTRUCTION



UNNAMED BLUE LINE 3

SCALE: 1" = 600'

N

N

GRAPHIC SCALE

600 0 300 600 1200 2400

(IN FEET)
1 inch = 600 ft.

LEGEND

207.2	PRE-CONSTRUCTION Q_{100} IN CFS
311.2	POST-CONSTRUCTION Q_{100} IN CFS
	INTERMITTENT STREAM
	FLOOD HAZARD LIMITS
	PROPERTY BOUNDARY
	FLOW PATH
	DRAINAGE FLOW

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=600'	FILE: 13186/072-13-023MS
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 12/16/13	LAST CHANGED: 09/17/14

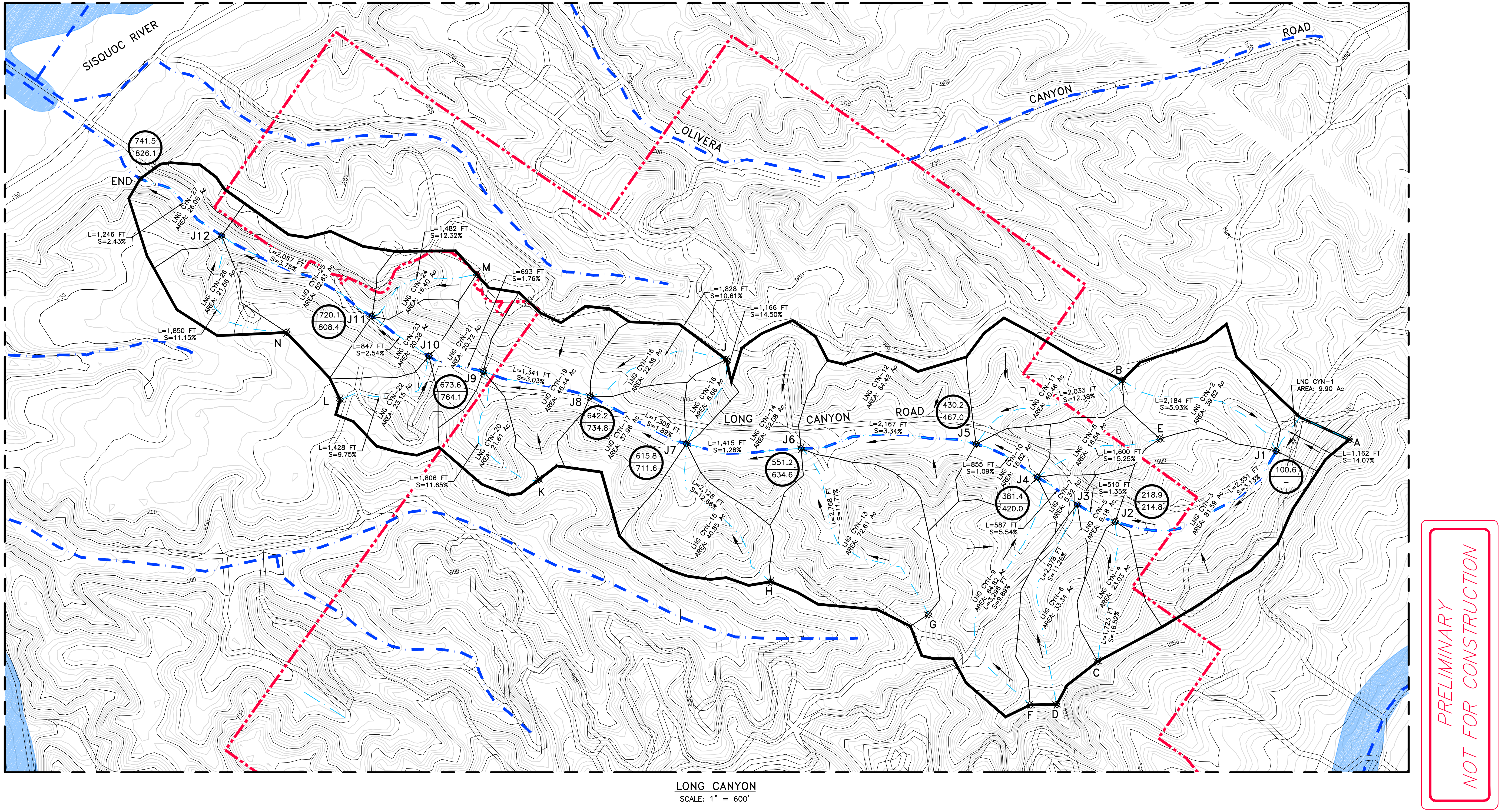
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

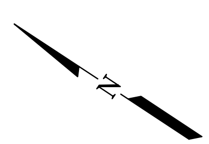
HYDROLOGY MAP – PRE-CONSTRUCTION WATERSHED – UNNAMED BLUE LINE 1 & 2 & 3
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 600'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-023A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-023MS	

:FUNCTIONAL LOCATION NO.



LONG CANYON
SCALE: 1" = 600'



GRAPHIC SCALE

600 0 300 600 1200 2400
(IN FEET)
1 inch = 600 ft.

LEGEND

207.2	PRE-CONSTRUCTION Q_{100} IN CFS
311.2	POST-CONSTRUCTION Q_{100} IN CFS
	INTERMITTENT STREAM
	FLOOD HAZARD LIMITS
	PROPERTY BOUNDARY
	FLOW PATH
	DRAINAGE FLOW

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=600'	FILE: 13186/072-13-023MS
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 12/16/13	LAST CHANGED: 09/17/14

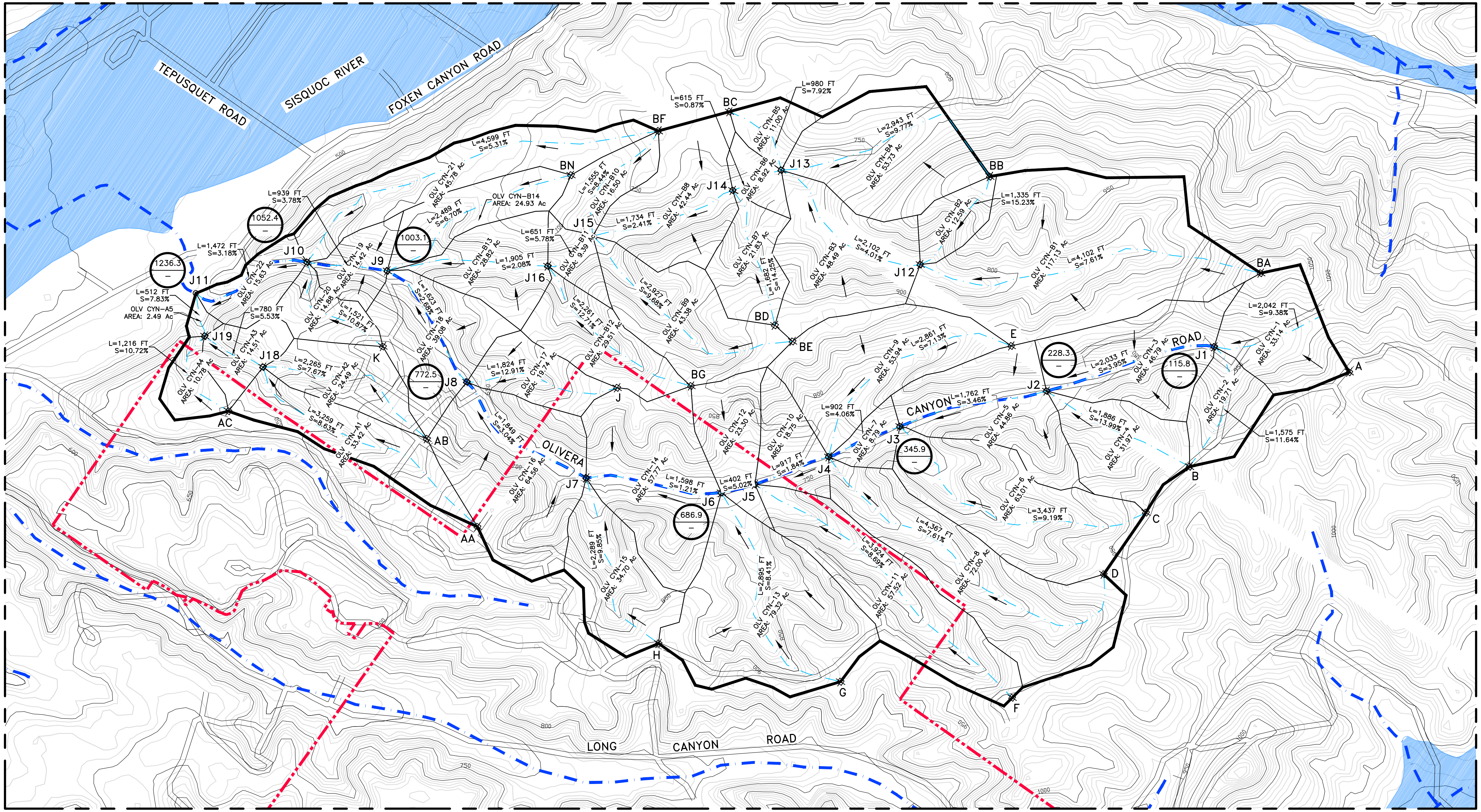
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – PRE-CONSTRUCTION WATERSHED – LONG CANYON
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 600'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-023B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-023MS	

:FUNCTIONAL LOCATION NO.



OLIVERA CANYON

SCALE: 1" = 600'

GRAPHIC SCALE

600 0 300 600 1200 2400

(IN FEET)
1 inch = 600 ft.

LEGEND

207.2 / 311.2 — PRE-CONSTRUCTION Q_{100} IN CFS / POST-CONSTRUCTION Q_{100} IN CFS

INTERMITTENT STREAM

FLOOD HAZARD LIMITS

PROPERTY BOUNDARY

FLOW PATH

DRAINAGE FLOW

PRELIMINARY
NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=600'
PLOT AT: 1=1
ENGINEER: RSD
DATE STARTED: 12/16/13
FILE: 13186/072-13-023MS
LAYER(S): _
CHANGED BY: IDU
LAST CHANGED: 09/17/14

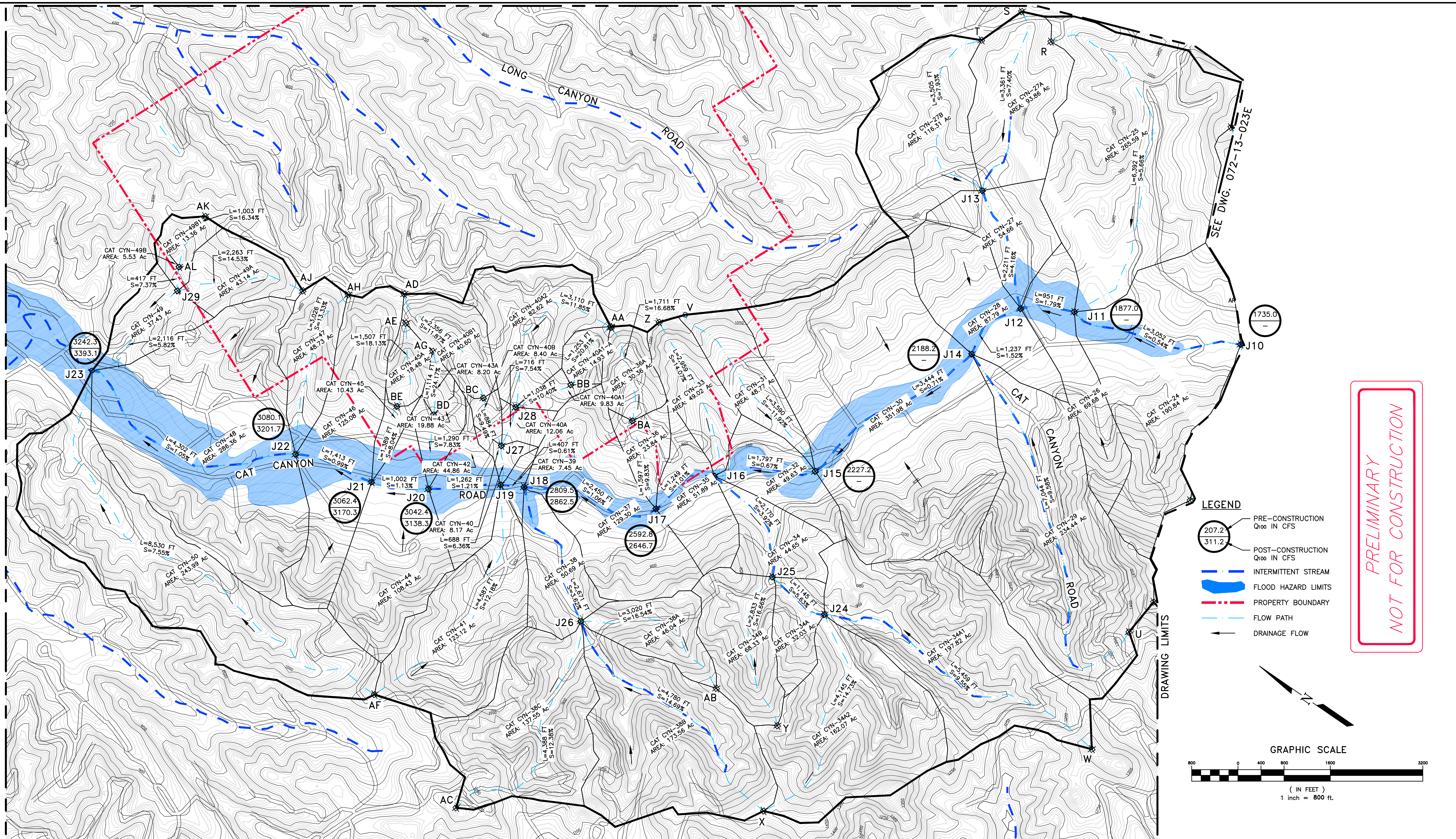
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – PRE-CONSTRUCTION WATERSHED – OLIVERA CANYON
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 600'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-023C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-023MS	

:FUNCTIONAL LOCATION NO.



CAT CANYON

SCALE: 1" = 800'

DWG NUMBER	TITLE
	REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=800' FILE: 13186/072-13-023MS
PLOT AT: 1=1 LAYER(S): _
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 12/16/13 LAST CHANGED: 09/17/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – PRE-CONSTRUCTION WATERSHED – CAT CANYON (NORTH)
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 800'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-023D	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-023MS	

:FUNCTIONAL LOCATION NO.

SEE DWG. 072-13-023D

N

GRAPHIC SCALE

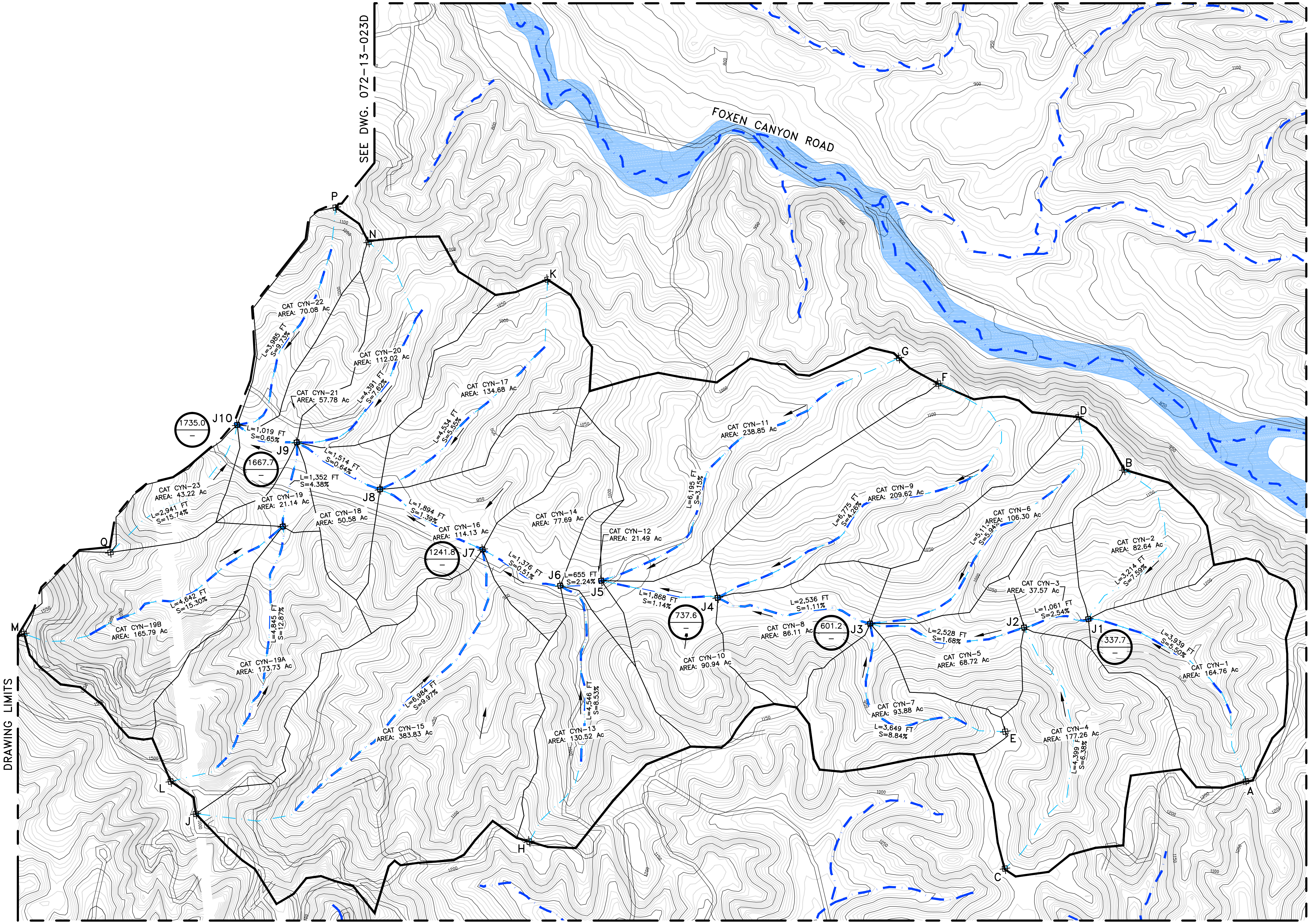
800 0 400 800 1600 3200

(IN FEET)
1 inch = 800 ft.

LEGEND

207.2 — PRE-CONSTRUCTION Q_{100} IN CFS
311.2 — POST-CONSTRUCTION Q_{100} IN CFS
INTERMITTENT STREAM
FLOOD HAZARD LIMITS
PROPERTY BOUNDARY
FLOW PATH
DRAINAGE FLOW

PRELIMINARY
NOT FOR CONSTRUCTION



CAT CANYON
SCALE: 1" = 800'

DWG NUMBER	TITLE
	REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=800'	FILE: 13186/072-13-023MS
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 12/16/13	LAST CHANGED: 09/17/14

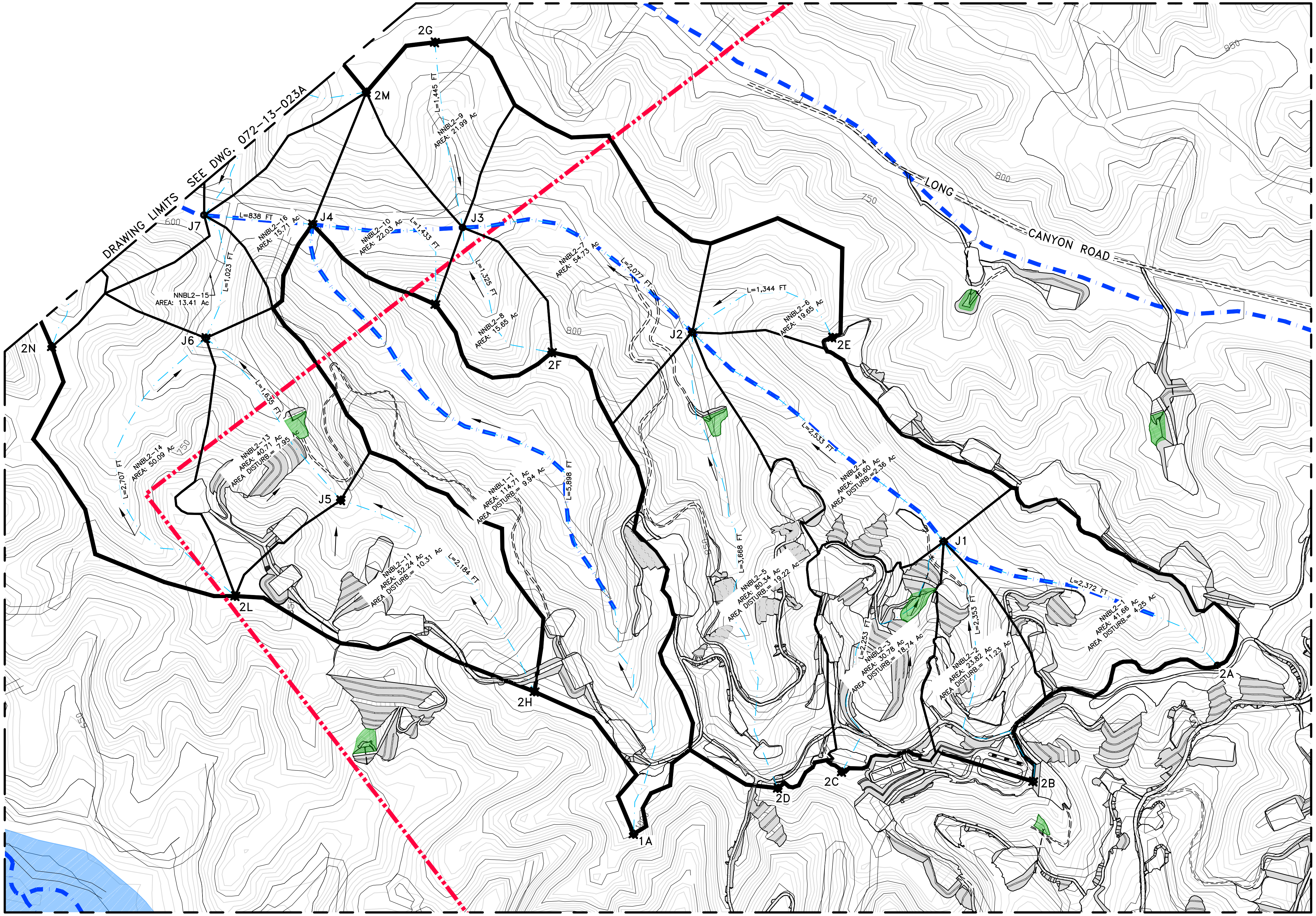
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – PRE-CONSTRUCTION WATERSHED – CAT CANYON (SOUTH)
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 800'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-023E	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-023MS	

:FUNCTIONAL LOCATION NO.



N

PROGRESS PRINT
NOT READY FOR ISSUE

UNNAMED BLUE LINE 1 & 2

SCALE: 1" = 400'

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- PROP. DETENTION BASIN LOCATION (FINAL DESIGN TO BE DETERMINED)

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=400'	FILE: 13186/072-13-024MS
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 12/16/13	LAST CHANGED: 09/17/14

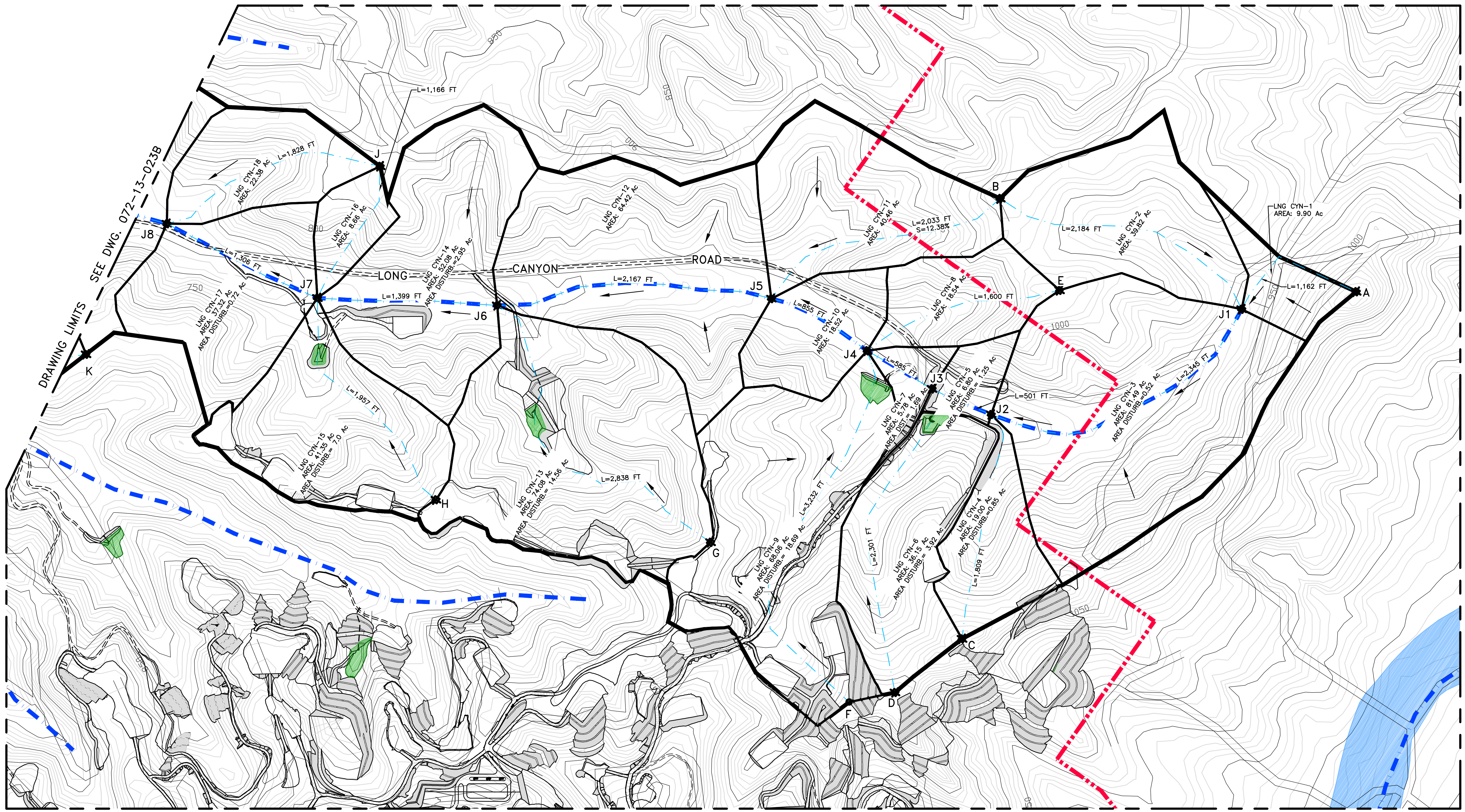
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA.

HYDROLOGY MAP – POST-CONSTRUCTION WATERSHED – UNNAMED BLUE LINE 1 & 2
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 400'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-024A	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-024MS	

:FUNCTIONAL LOCATION NO.



LONG CANYON

SCALE: 1" = 400'

PRELIMINARY
NOT FOR CONSTRUCTION

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

LEGEND

- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- PROP. DETENTION BASIN LOCATION (FINAL DESIGN TO BE DETERMINED)

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=400'	FILE: 13186/072-13-024MS
PLOT AT: 1=1	LAYER(S): .
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 12/16/13	LAST CHANGED: 09/17/14

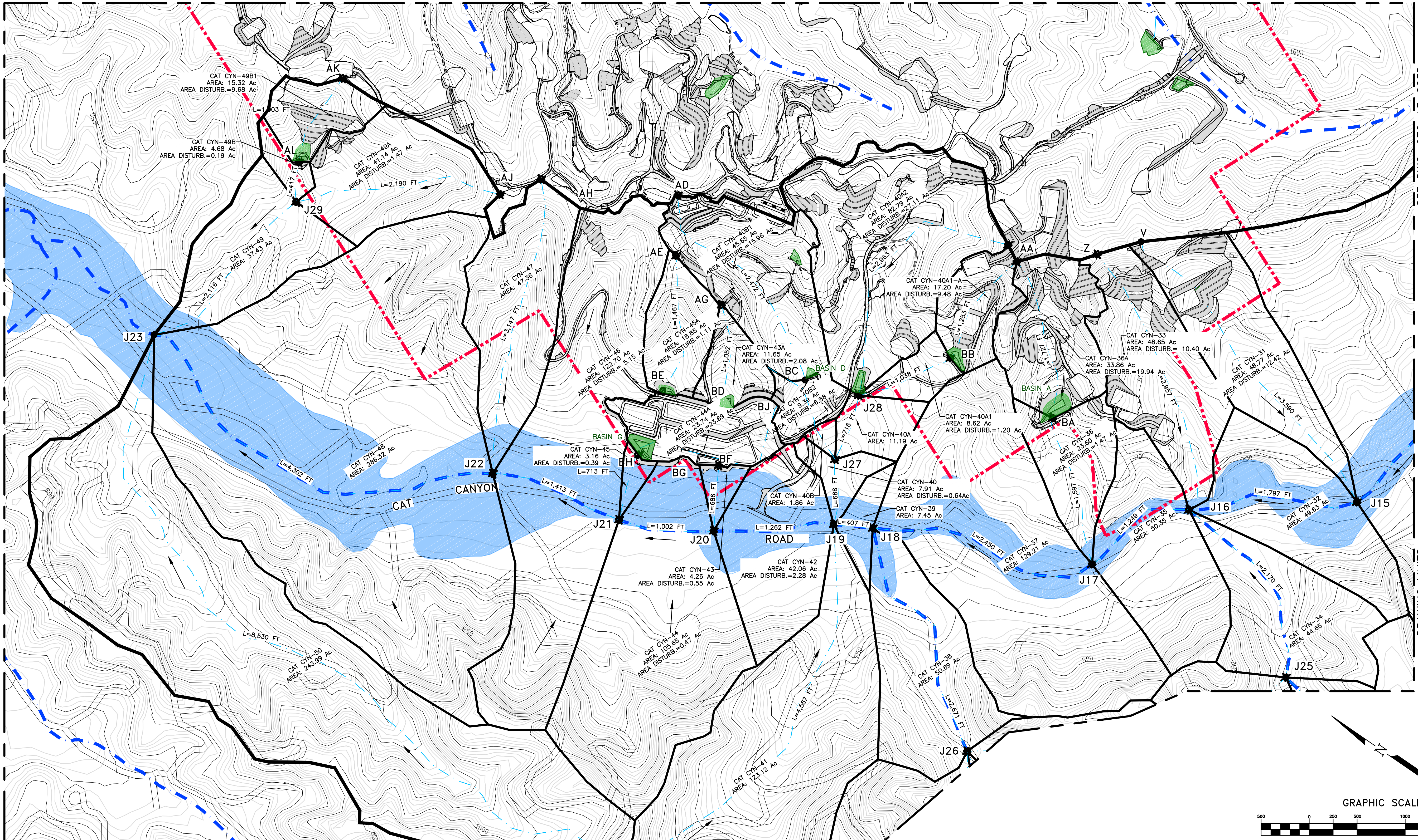
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

HYDROLOGY MAP – POST-CONSTRUCTION WATERSHED – LONG CANYON
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 400'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-024B	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-024MS	

:FUNCTIONAL LOCATION NO.



DRAWING LIMITS

SEE DWG. 072-13-023D

PRELIMINARY
NOT FOR CONSTRUCTION

CAT CANYON
SCALE: 1" = 500'

LEGEND
- INTERMITTENT STREAM
- FLOOD HAZARD LIMITS
- PROPERTY BOUNDARY
- FLOW PATH
- DRAINAGE FLOW
- PROP. DETENTION BASIN LOCATION (FINAL DESIGN TO BE DETERMINED)

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=500' FILE: 13186/072-13-024MS
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 12/16/13 LAST CHANGED: 09/17/14

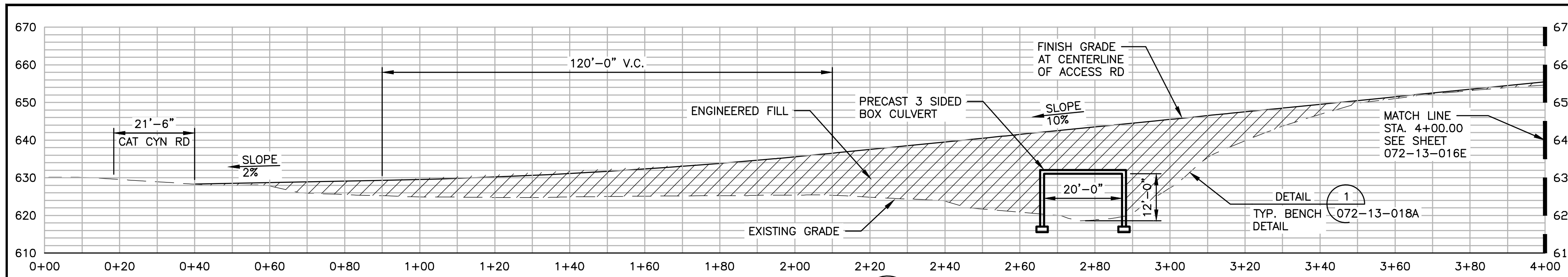
DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
08/20/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

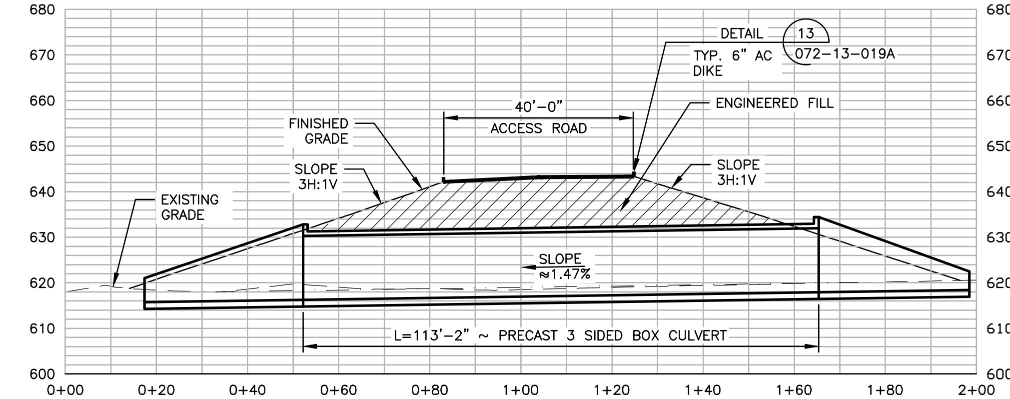
HYDROLOGY MAP – POST-CONSTRUCTION WATERSHED – CAT CANYON (NORTH)
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1" = 500'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-024C	REV. 0
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-024MS	

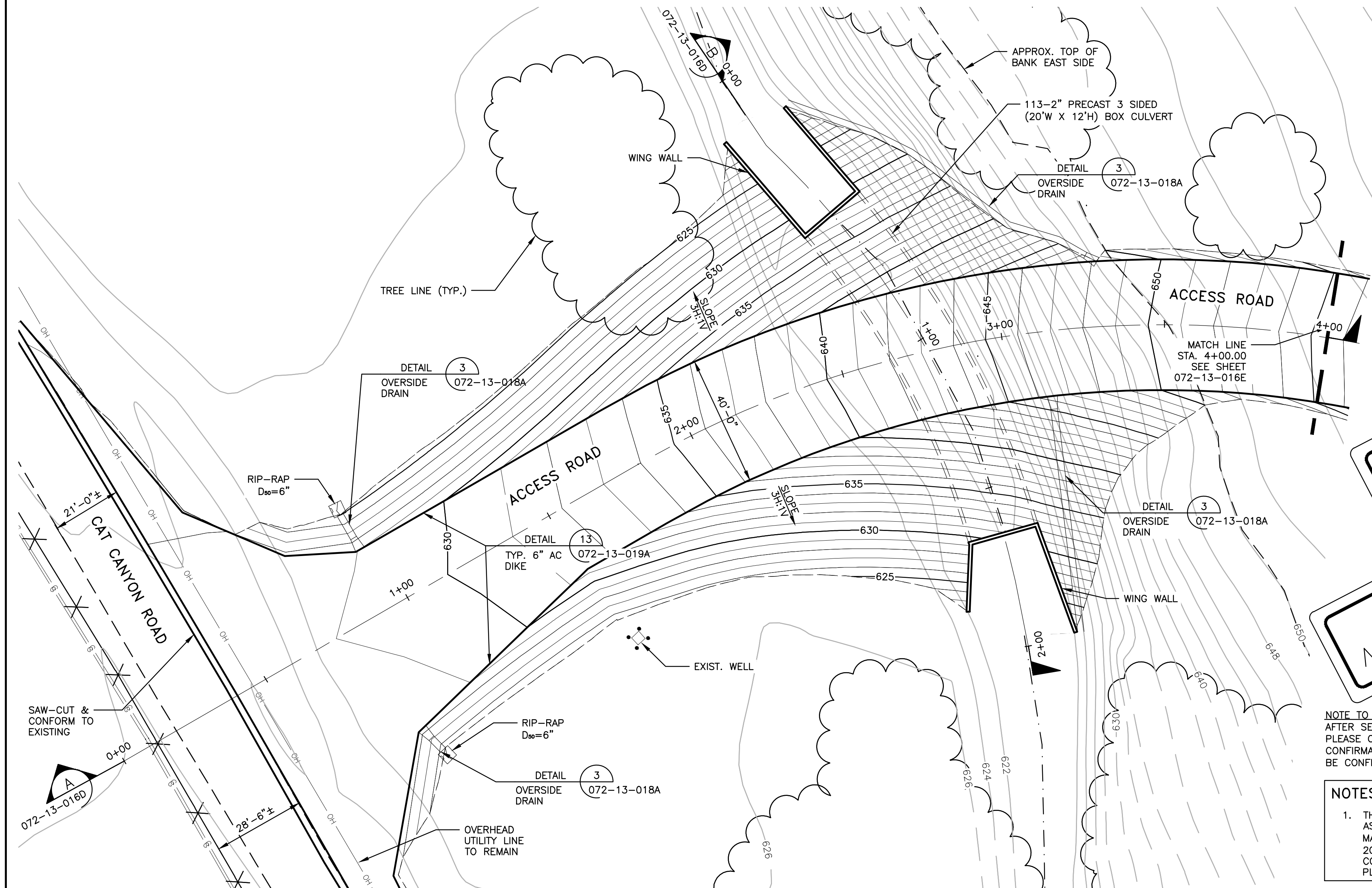
:FUNCTIONAL LOCATION NO.



SECTION A 072-13-016D
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=20')



SECTION B 072-13-016D
VIEW LOOKING EASTERLY
SCALE: VERT.& HORIZ.(1"=20')



CAT CANYON ENTRANCE
SCALE:1"=20'

THIS IS FOR LAND USE PERMIT ONLY

PRELIMINARY NOT FOR CONSTRUCTION

QUANTITIES:

ROUGH GRADE QUANTITIES (FOR SHEETS -016D THRU -016G):

CUT (CU. YDS.)	+7,452
FILL* (CU. YDS.)	-18,767
TOTAL CUT (CU. YDS.)	+7,452
TOTAL FILL* (CU. YDS.)	-18,767
NET (CU. YDS.)	-11,315

* INCLUDES 30% SHRINKAGE

PRECAST 3 SIDED (20'Wx12'H) BOX CULVERT 113'-2" L.F.

WING WALLS 2 REQ'D

EARTHWORK NOTES:

A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-014A UNDER EARTHWORK NOTES.

NOTE:

USING A 3 SIDED PRECAST BOX CULVERT WITH A CLEAR SPAN OF 20 FT. WIDE, 12 FT. HIGH.

THE CULVERT WILL BE CENTERED ALONG THE BLUE LINE CHANNEL.

FOOTINGS WILL BE CONSTRUCTED ON BOTH SIDES OF THE BOX CULVERT FOR PLACEMENT OF THE PRECAST 3 SIDED CULVERT.

BOTTOM WILL REMAIN NATURAL.

DESIGN AND INSTALLATION PER MANUFACTURER

THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE - 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

N

GRAPHIC SCALE
20 0 10 20 40 100
(IN FEET)
1 inch = 20 ft.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"

DWG NUMBER	TITLE
REFERENCE DRAWINGS	

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL
SCALE: 1"=20' FILE: 13186/072-13-016D
PLOT AT: 1=1 LAYER(S):
ENGINEER: RSD CHANGED BY: IDU
DATE STARTED: 04/07/14 LAST CHANGED: 08/01/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PLAN & PROFILE - CAT CANYON ENTRANCE
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD - SANTA BARBARA COUNTY - CALIFORNIA

AERA ENGINEER: ERIC PAULSON	DATE: 08/01/14 SCALE: 1"=20'
CO. ENGINEER: TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.
PROJ. MGR: ALI GOKGOZ	NO. 072-13-016D REV. 0
DESIGNED BY: ROBIN DICKERSON	
DRAFTED BY: ISAC URBINA	
ECCN NO. EAR99	CAD FILE NO. 072-13-016D

:FUNCTIONAL LOCATION NO.

QUANTITIES:

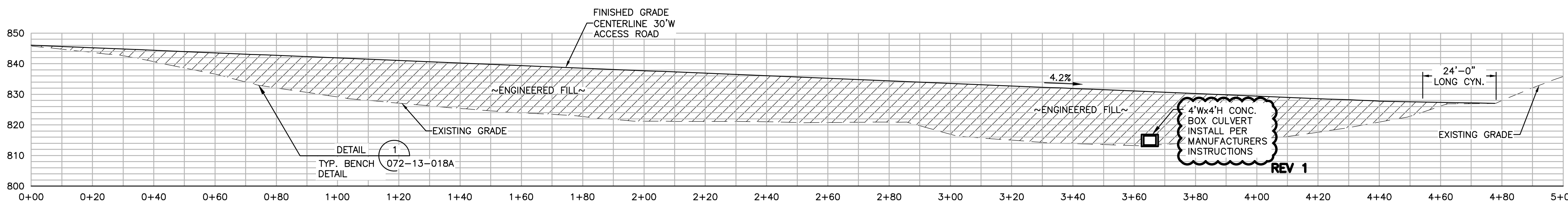
ROUGH GRADE QUANTITIES:

CUT (CU. YDS.)	+1.00
FILL* (CU. YDS.)	-21,626
TOTAL CUT (CU. YDS.)	+1.00
TOTAL FILL* (CU. YDS.)	-21,626
NET (CU. YDS.)	-21,625

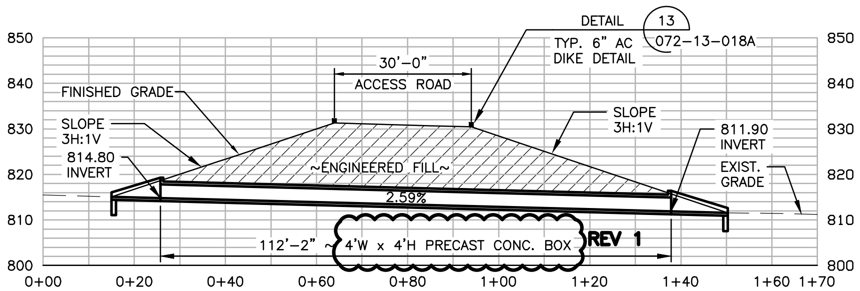
* INCLUDES 30% SHRINKAGE

REV 1

4'W x 4'H CONC. PRECAST BOX CULVERT	112'-2" L.F.
WING WALLS	2 REQ'D



SECTION C
VIEW LOOKING NORTHERLY
SCALE: VERT.& HORIZ.(1"=20') 072-13-016A



SECTION D
VIEW LOOKING WESTERLY
SCALE: VERT.& HORIZ.(1"=20') 072-13-016A

EARTHWORK NOTES:

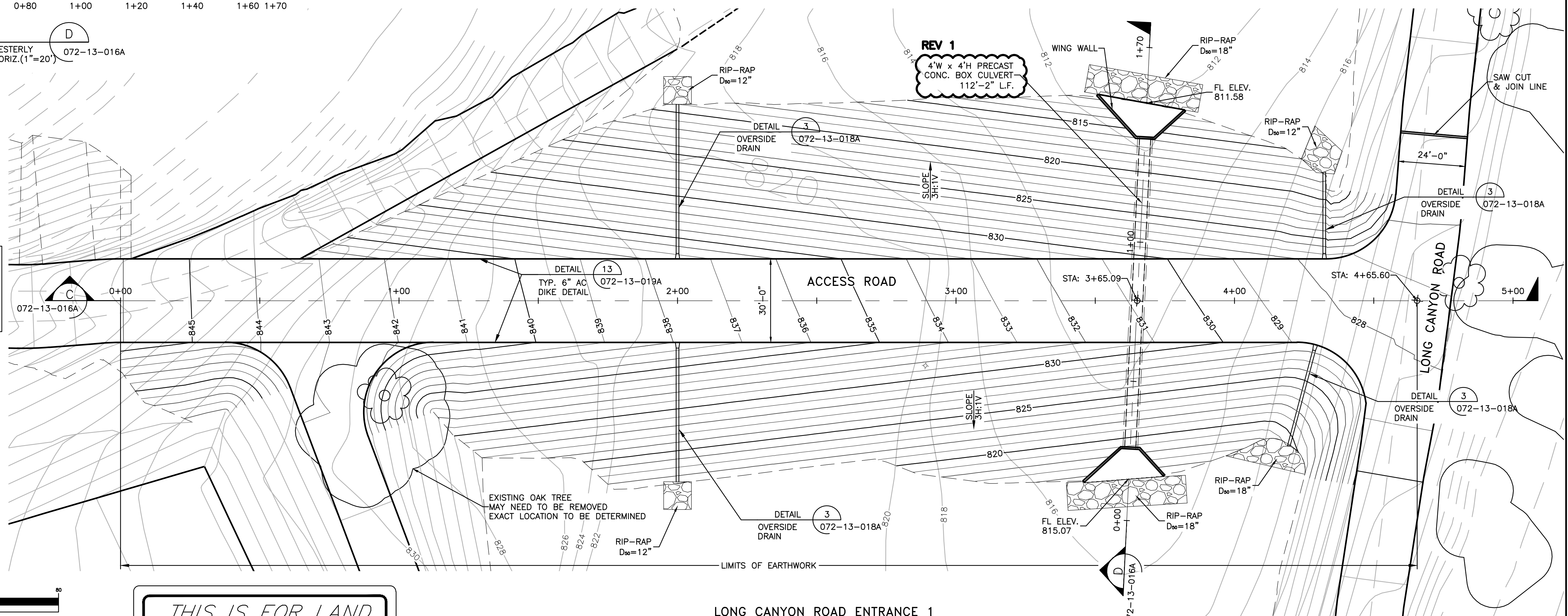
A. EARTHWORK QUANTITIES SHOWN FOR PERMIT PURPOSES ONLY.
B. SEE EARTHWORK NOTES B AND C ON SHEET 072-13-014A UNDER EARTHWORK NOTES.

NOTE TO SURVEYOR:
AFTER SETTING UP ON THE NGS MONUMENT IN THIS AREA PLEASE CHECK THE COORDINATES IN THE COORDINATE CONFIRMATION SCHEDULE. IF THE COORDINATES CANNOT BE CONFIRMED, PLEASE CONTACT T.J. CROSS IMMEDIATELY.

NOTES:

1. THIS PLAN GENERATED FROM AERIAL SURVEY AS PROVIDED BY CENTRAL COAST AERIAL MAPPING, INC., THEIR FILENAME/DATE – 2011-1719/APRIL 16, 2011. THIS SURVEY COLLECTED IN THE NAD 83, ZONE 5 STATE PLANE COORDINATE SYSTEM.

EXISTING GRADE CONTOUR INTERVAL = 2'-0"
DESIGN GRADE CONTOUR INTERVAL = 1'-0"



GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

LONG CANYON ROAD ENTRANCE 1
SCALE:1"=20'

THIS IS FOR LAND USE PERMIT ONLY

PRELIMINARY NOT FOR CONSTRUCTION

DWG NUMBER	TITLE
072-13-015A	SITE LOCATION PLAN
072-13-013A	TITLE SHEET/ DRAWING INDEX/ VICINITY MAP

REFERENCE DRAWINGS

TJCROSS ENGINEERS

T.J. CROSS AUTOCAD CONTROL

SCALE: 1"=20'	FILE: 13186/072-13-016A
PLOT AT: 1=1	LAYER(S):
ENGINEER: RSD	CHANGED BY: IDU
DATE STARTED: 04/07/14	LAST CHANGED: 09/17/14

DATE	REV	DESCRIPTION	BY	APPR	AERA ENG
09/17/14	1	RE-ISSUED FOR PERMIT (LNG CYN CULVERT SIZE)	IDU	RSD	EP
08/01/14	0	ISSUED FOR PERMIT	IDU	RSD	EP
06/03/14	A	ISSUED FOR REVIEW	IDU	RSD	EP

AERA

PLAN & PROFILE – LONG CANYON ROAD ENTRANCE 1
FIELD REDEVELOPMENT PROJECT
SECTIONS 20/29 & 30 T9N R32W
EAST CAT CANYON FIELD – SANTA BARBARA COUNTY – CALIFORNIA

AERA ENGINEER:	ERIC PAULSON	DATE: 09/17/14	SCALE: 1"=20'
CO. ENGINEER:	TJCROSS ENGINEERS, INC	ORIGINAL DWG NO.	
PROJ. MGR:	ALI GOKGOZ	NO. 072-13-016A	REV. 1
DESIGNED BY:	ROBIN DICKERSON		
DRAFTED BY:	ISAC URBINA		
ECCN NO.	EAR99	CAD FILE NO. 072-13-016A	

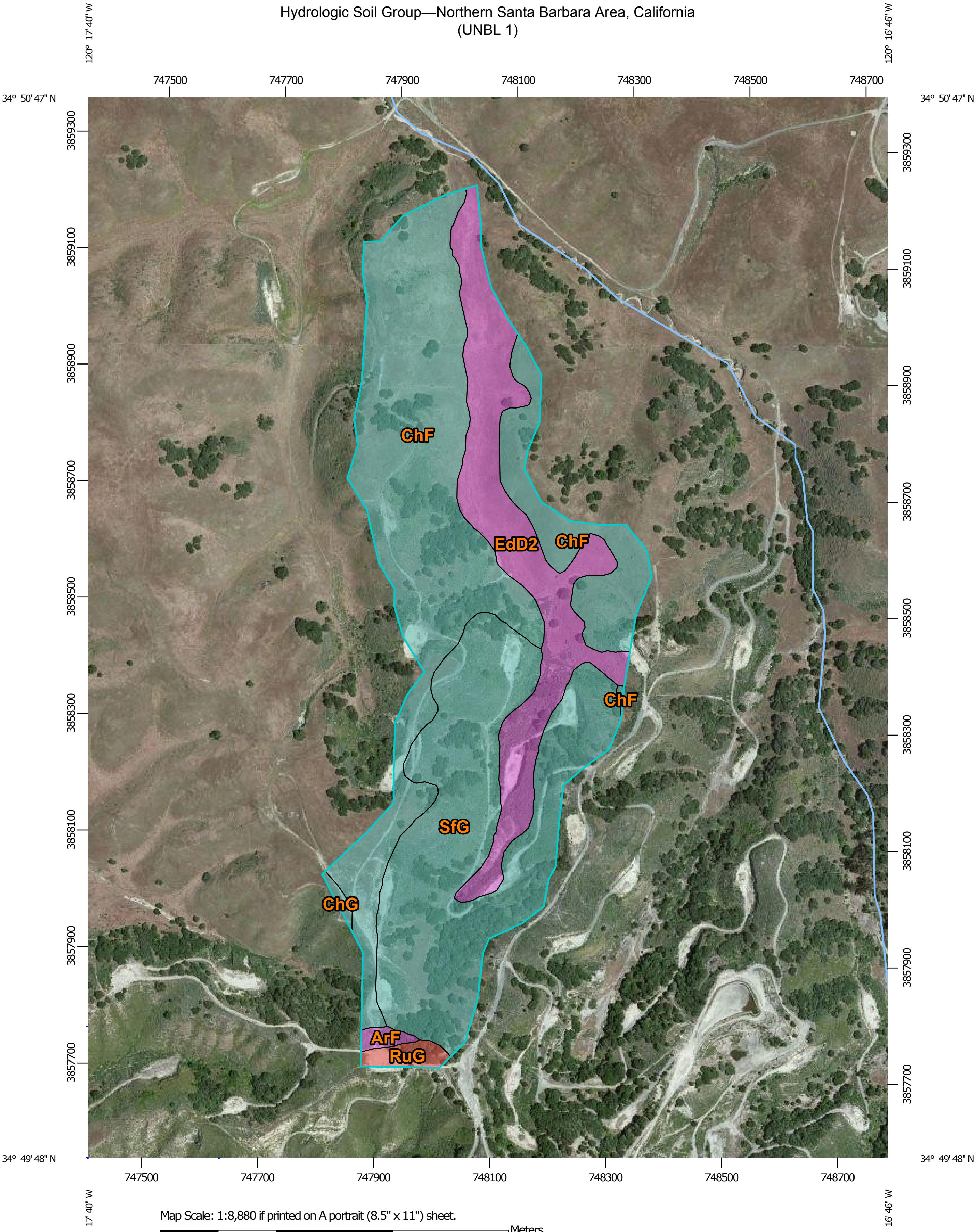
:FUNCTIONAL LOCATION NO.

APPENDIX

Appendix A

Hydrologic Soils Groups

Hydrologic Soil Group—Northern Santa Barbara Area, California
(UNBL 1)



Map Scale: 1:8,880 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 400, 800, 1600, 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Northern Santa Barbara Area, California
Survey Area Data: Version 8, Dec 7, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2010—Jun 10, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
ArF	Arnold sand, 15 to 45 percent slopes	A	0.7	0.6%
ChF	Chamise shaly loam, 15 to 45 percent slopes	C	50.8	45.2%
ChG	Chamise shaly loam, 45 to 75 percent slopes	C	0.4	0.3%
EdD2	Elder sandy loam, 9 to 15 percent slopes, eroded	A	21.9	19.4%
RuG	Rough broken land	D	1.4	1.2%
SfG	San Andreas-Tierra complex, 30 to 75 percent slopes	C	37.4	33.2%
Totals for Area of Interest			**112.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

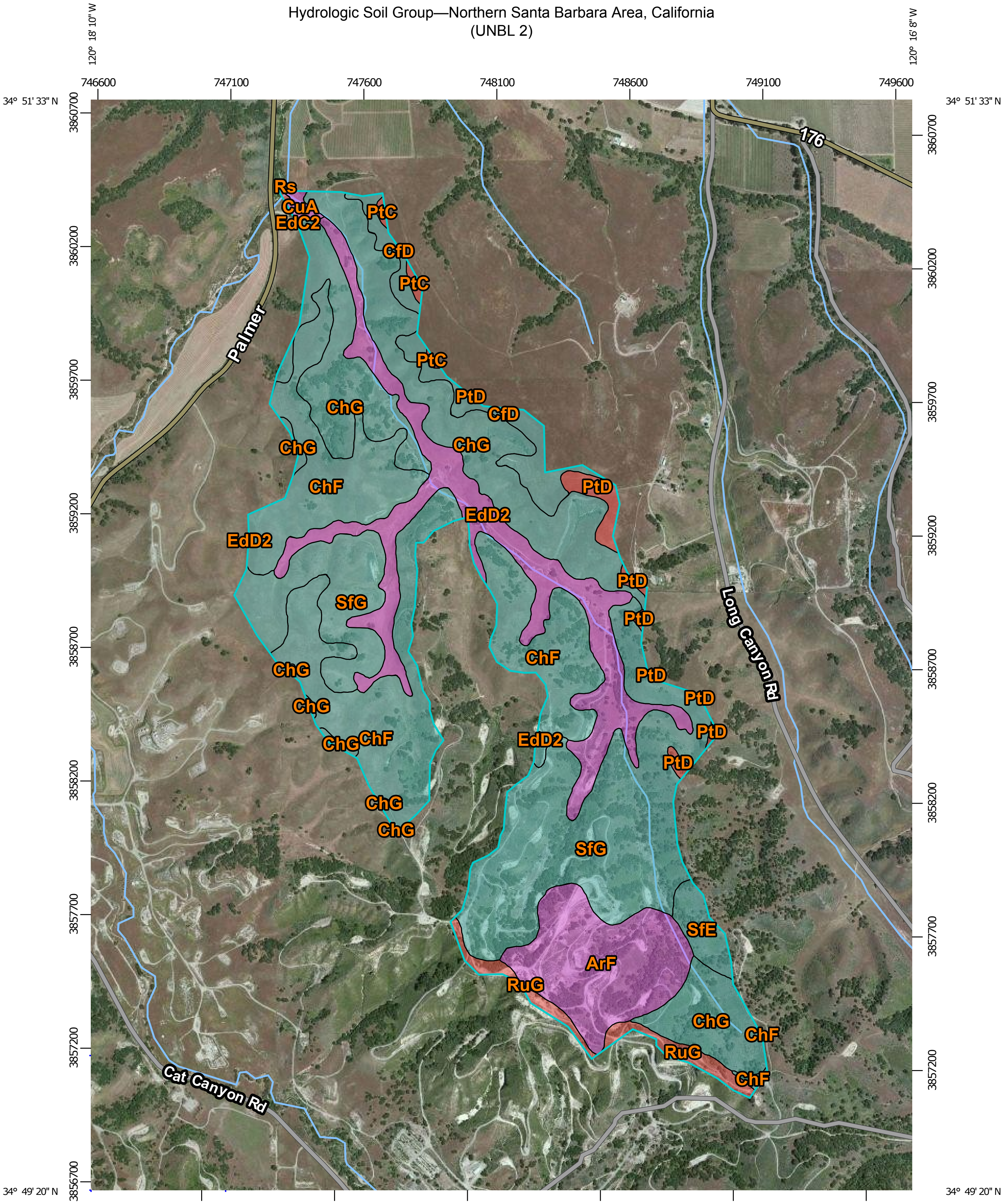
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Northern Santa Barbara Area, California
(UNBL 2)



Map Scale: 1:19,900 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 250, 500, 1000, 1500

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
Area of Interest (AOI)

Soils

Soil Rating Polygons
A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines
A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points
A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features
Streams and Canals

Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background
Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Northern Santa Barbara Area, California
Survey Area Data: Version 8, Dec 7, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2010—Jun 10, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ArF	Arnold sand, 15 to 45 percent slopes	A	61.6	8.9%
CfD	Chamise shaly sandy loam, 9 to 15 percent slopes	C	24.1	3.5%
ChF	Chamise shaly loam, 15 to 45 percent slopes	C	166.1	24.1%
ChG	Chamise shaly loam, 45 to 75 percent slopes	C	144.8	21.0%
CuA	Corralitos loamy sand, 0 to 2 percent slopes	A	2.3	0.3%
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	A	0.0	0.0%
EdD2	Elder sandy loam, 9 to 15 percent slopes, eroded	A	84.0	12.2%
PtC	Positas fine sandy loam, 2 to 9 percent slopes	D	2.2	0.3%
PtD	Positas fine sandy loam, 9 to 15 percent slopes	D	9.7	1.4%
Rs	Riverwash	D	0.2	0.0%
RuG	Rough broken land	D	13.6	2.0%
SfE	San Andreas-Tierra complex, 15 to 30 percent slopes	C	10.4	1.5%
SfG	San Andreas-Tierra complex, 30 to 75 percent slopes	C	169.6	24.6%
Totals for Area of Interest			**688.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

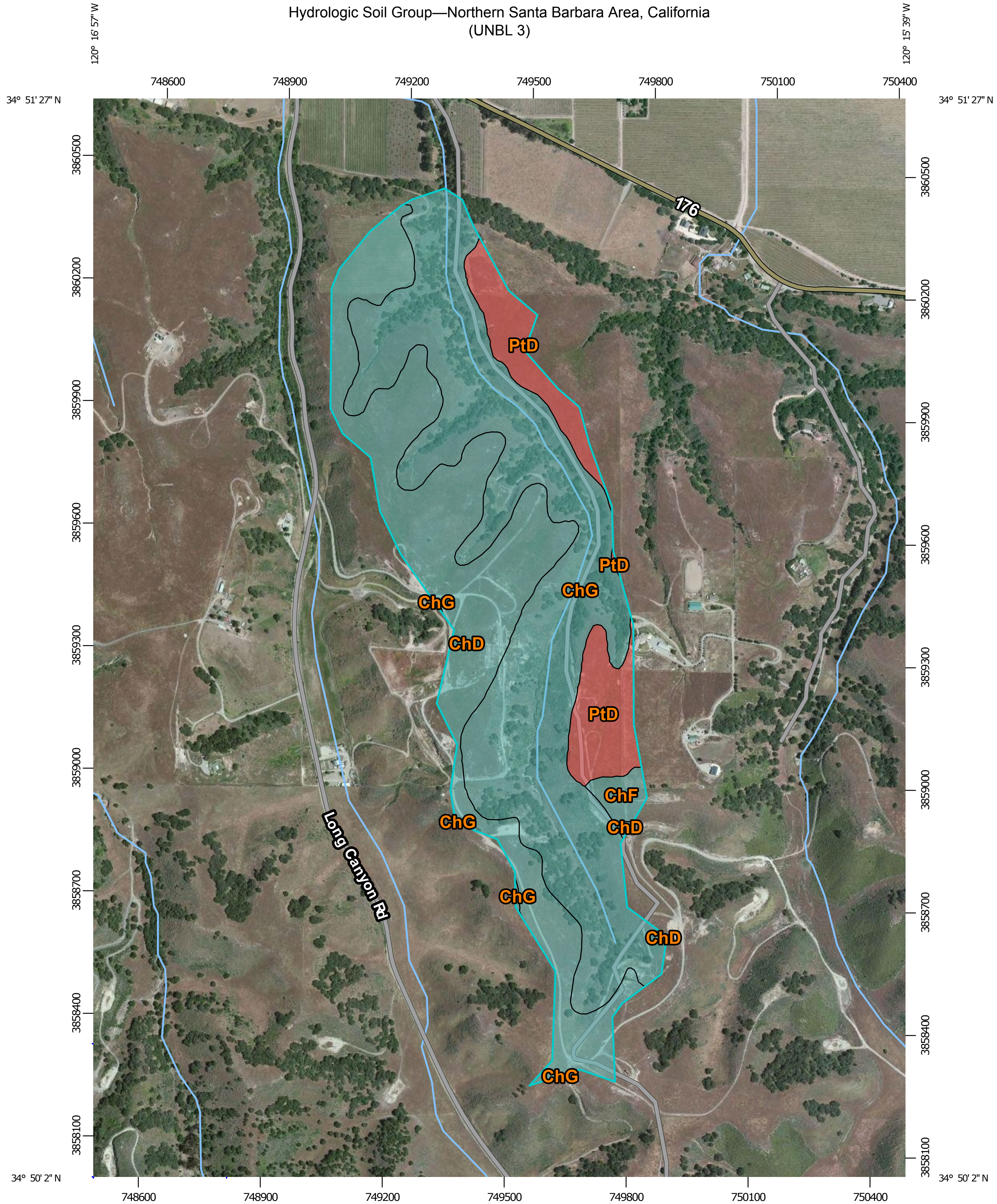
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Northern Santa Barbara Area, California
(UNBL 3)



Map Scale: 1:12,900 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Northern Santa Barbara Area, California
Survey Area Data: Version 8, Dec 7, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2010—Jun 10, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
ChD	Chamise shaly loam, 9 to 15 percent slopes	C	76.6	35.1%
ChF	Chamise shaly loam, 15 to 45 percent slopes	C	3.2	1.4%
ChG	Chamise shaly loam, 45 to 75 percent slopes	C	114.9	52.7%
PtD	Positas fine sandy loam, 9 to 15 percent slopes	D	23.3	10.7%
Totals for Area of Interest			**218.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

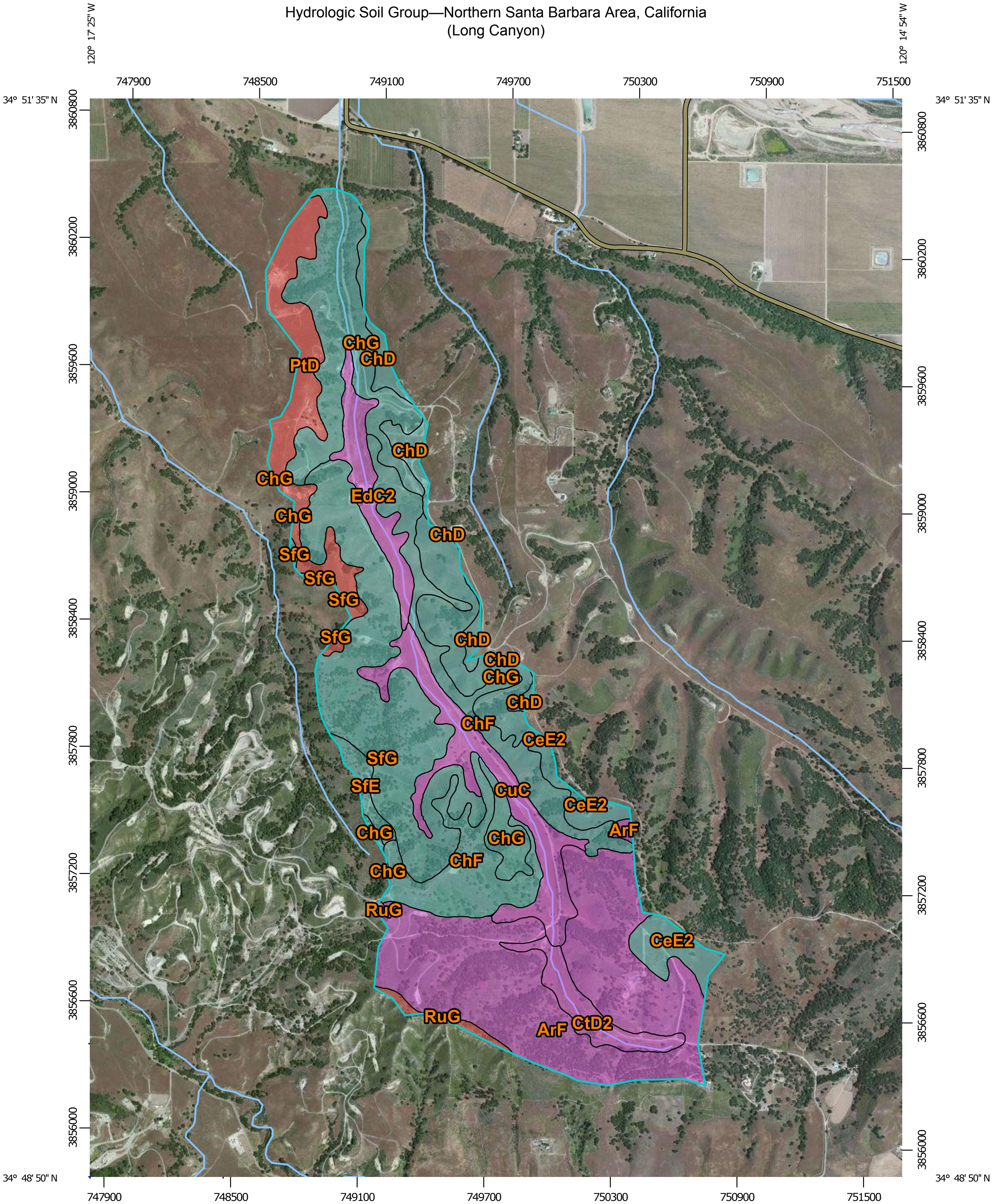
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Northern Santa Barbara Area, California
(Long Canyon)



Map Scale: 1:24,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Northern Santa Barbara Area, California
Survey Area Data: Version 8, Dec 7, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2010—Jun 10, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
ArF	Arnold sand, 15 to 45 percent slopes	A	223.7	25.1%
CeE2	Chamise sandy loam, 5 to 30 percent slopes, eroded	C	19.8	2.2%
ChD	Chamise shaly loam, 9 to 15 percent slopes	C	25.5	2.9%
ChF	Chamise shaly loam, 15 to 45 percent slopes	C	109.5	12.3%
ChG	Chamise shaly loam, 45 to 75 percent slopes	C	165.2	18.5%
CtD2	Corralitos sand, 2 to 15 percent slopes, eroded	A	24.5	2.7%
CuC	Corralitos loamy sand, 2 to 9 percent slopes	A	61.8	6.9%
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	A	30.6	3.4%
PtD	Positas fine sandy loam, 9 to 15 percent slopes	D	63.9	7.2%
RuG	Rough broken land	D	5.7	0.6%
SfE	San Andreas-Tierra complex, 15 to 30 percent slopes	C	9.5	1.1%
SfG	San Andreas-Tierra complex, 30 to 75 percent slopes	C	152.9	17.1%
Totals for Area of Interest			**892.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

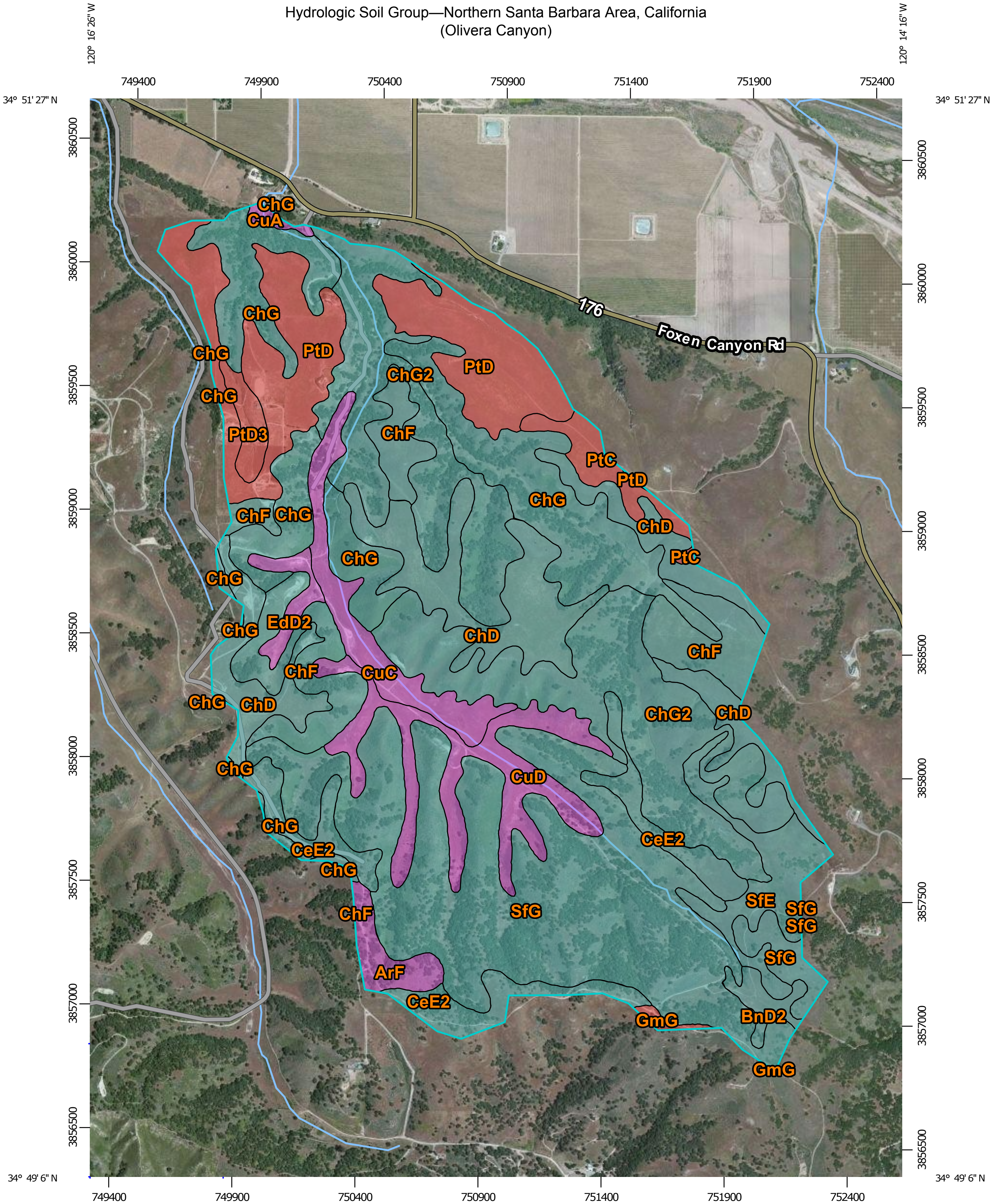
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Northern Santa Barbara Area, California
(Olivera Canyon)



Map Scale: 1:21,300 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 300 600 1200 1800

N

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

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Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
ArF	Arnold sand, 15 to 45 percent slopes	A	16.9	1.2%
BnD2	Betteravia loamy sand, dark variant, 5 to 15 percent slopes, eroded	C	10.3	0.7%
CeE2	Chamise sandy loam, 5 to 30 percent slopes, eroded	C	62.9	4.4%
ChD	Chamise shaly loam, 9 to 15 percent slopes	C	139.4	9.9%
ChF	Chamise shaly loam, 15 to 45 percent slopes	C	96.8	6.8%
ChG	Chamise shaly loam, 45 to 75 percent slopes	C	174.4	12.3%
ChG2	Chamise shaly loam, 30 to 75 percent slopes, eroded	C	257.1	18.2%
CuA	Corralitos loamy sand, 0 to 2 percent slopes	A	3.1	0.2%
CuC	Corralitos loamy sand, 2 to 9 percent slopes	A	41.1	2.9%
CuD	Corralitos loamy sand, 9 to 15 percent slopes	A	69.7	4.9%
EdD2	Elder sandy loam, 9 to 15 percent slopes, eroded	A	10.5	0.7%
GmG	Gaviota sandy loam, 30 to 75 percent slopes, MLRA 15	D	2.6	0.2%
PtC	Positas fine sandy loam, 2 to 9 percent slopes	D	19.3	1.4%
PtD	Positas fine sandy loam, 9 to 15 percent slopes	D	137.3	9.7%
PtD3	Positas fine sandy loam, 9 to 15 percent slopes, severely eroded	D	11.4	0.8%
SfE	San Andreas-Tierra complex, 15 to 30 percent slopes	C	40.5	2.9%
SfG	San Andreas-Tierra complex, 30 to 75 percent slopes	C	320.9	22.7%
Totals for Area of Interest			**1,414.2**	**100.0%**

Description

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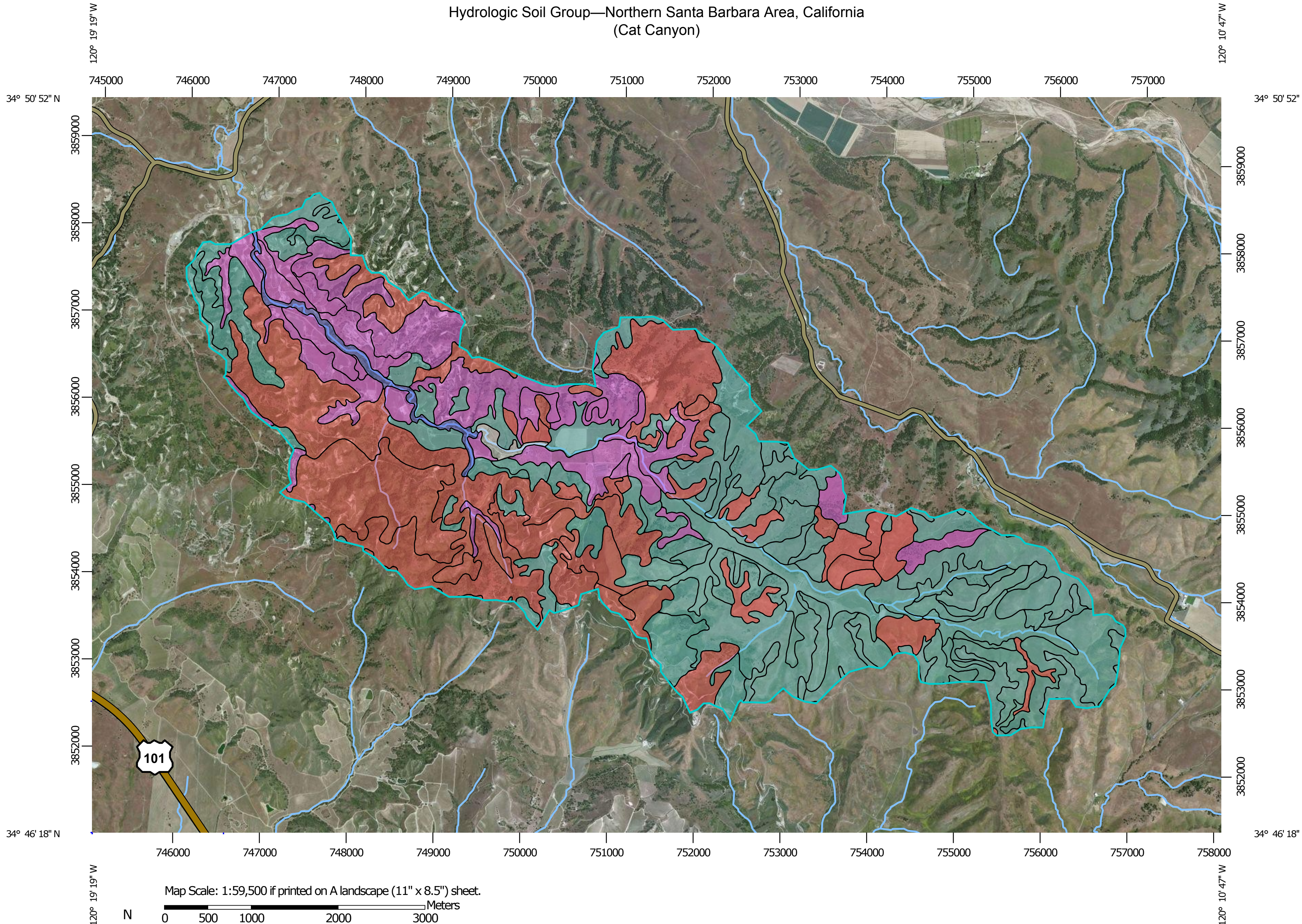
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Northern Santa Barbara Area, California
(Cat Canyon)



Map Scale: 1:59,500 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2500, 5000, 10000, 15000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

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Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ArD	Arnold sand, 5 to 15 percent slopes	A	113.8	1.6%
ArF	Arnold sand, 15 to 45 percent slopes	A	498.1	7.1%
BnD2	Betteravia loamy sand, dark variant, 5 to 15 percent slopes, eroded	C	97.0	1.4%
BoD2	Botella loam, 2 to 15 percent slopes, eroded	C	264.5	3.8%
CeE2	Chamise sandy loam, 5 to 30 percent slopes, eroded	C	35.6	0.5%
CfD	Chamise shaly sandy loam, 9 to 15 percent slopes	C	197.6	2.8%
ChF	Chamise shaly loam, 15 to 45 percent slopes	C	106.9	1.5%
ChG	Chamise shaly loam, 45 to 75 percent slopes	C	219.8	3.1%
ChG2	Chamise shaly loam, 30 to 75 percent slopes, eroded	C	70.3	1.0%
CkF	Chamise clay loam, 30 to 45 percent slopes	C	91.2	1.3%
CtA	Corralitos sand, 0 to 2 percent slopes	A	28.0	0.4%
CtD	Corralitos sand, 2 to 15 percent slopes	A	170.3	2.4%
CuC	Corralitos loamy sand, 2 to 9 percent slopes	A	116.7	1.7%
CuD	Corralitos loamy sand, 9 to 15 percent slopes	A	4.8	0.1%
CwE	Crow Hill loam, 15 to 30 percent slopes	C	65.2	0.9%
CwF	Crow Hill loam, 30 to 45 percent slopes	C	385.2	5.5%
CwG	Crow Hill loam, 45 to 75 percent slopes	C	158.3	2.3%
DaF3	Diablo silty clay, 15 to 45 percent slopes, severely eroded	D	1.0	0.0%

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EdA2	Elder sandy loam, 0 to 2 percent slopes, eroded	A	55.0	0.8%
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	A	86.7	1.2%
EmC	Elder loam, 2 to 9 percent slopes	A	115.5	1.7%
EnD2	Elder shaly loam, 9 to 15 percent slopes, eroded	A	18.1	0.3%
GmG	Gaviota sandy loam, 30 to 75 percent slopes, MLRA 15	D	1,298.3	18.6%
GsD	Gazos clay loam, 9 to 15 percent slopes	C	33.0	0.5%
GsE	Gazos clay loam, 15 to 30 percent slopes	C	50.3	0.7%
GsF	Gazos clay loam, 30 to 45 percent slopes	C	435.0	6.2%
GsG	Gazos clay loam, 45 to 75 percent slopes	C	17.9	0.3%
LmG	Lopez shaly clay loam, 15 to 75 percent slopes	D	142.6	2.0%
RuG	Rough broken land	D	690.2	9.9%
SfD	San Andreas-Tierra complex, 5 to 15 percent slopes	C	83.0	1.2%
SfE	San Andreas-Tierra complex, 15 to 30 percent slopes	C	426.6	6.1%
SfF3	San Andreas-Tierra complex, 9 to 45 percent slopes, severely eroded	C	140.7	2.0%
SfG	San Andreas-Tierra complex, 30 to 75 percent slopes	C	349.1	5.0%
Sh	Sandy alluvial land	B	76.7	1.1%
SpG	Sedimentary rock land	D	69.6	1.0%
SrG	Shedd silty clay loam, 45 to 75 percent slopes	C	2.3	0.0%
TdF	Terrace escarpments, loamy		26.0	0.4%
TnE2	Tierra sandy loam, 15 to 30 percent slopes, eroded	D	89.8	1.3%

Hydrologic Soil Group— Summary by Map Unit — Northern Santa Barbara Area, California (CA672)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
TrD	Tierra loam, 9 to 15 percent slopes	D	36.7	0.5%
TrE2	Tierra loam, 15 to 30 percent slopes, eroded	D	5.7	0.1%
TrE3	Tierra loam, 5 to 30 percent slopes, severely eroded	D	123.4	1.8%
Totals for Area of Interest			**6,996.4**	**100.0%**

Description

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Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

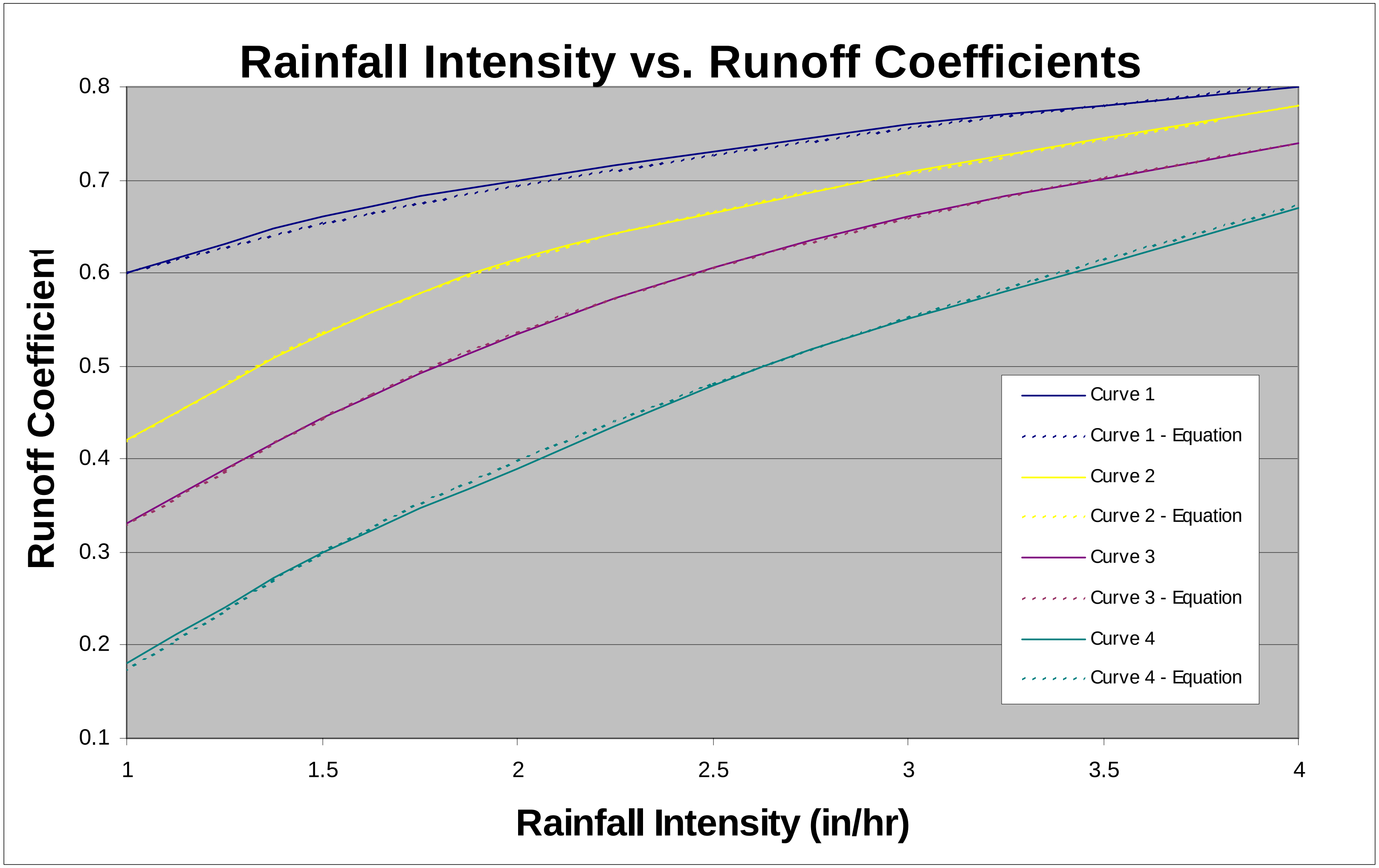
Appendix B

Runoff Coefficient Equations and Curves

Rainfall Intensity/Runoff Coefficient Equations

SBCFCD August, 2003

Curve #1 - Commercial			
Equation:	C = .60*(RI)^.21		
Rainfall Intensity (in/hr)	Runoff Coefficient	Synthetic Value	Variation
1	0.6	0.6	0
1.5	0.66	0.653326711	0.006673289
2	0.7	0.69401291	0.00598709
2.5	0.73	0.727308482	0.002691518
3	0.76	0.755695287	0.004304713
3.5	0.78	0.780558648	-0.000558648
4	0.8	0.802756533	-0.002756533
Curve #2 - South Coast Single Family			
Equation:	C = -.01643+.6228(RI)-.225(RI)^2+.04115(RI)^3-.002848(RI)^4		
Rainfall Intensity (in/hr)	Runoff Coefficient	Synthetic Value	Variation
1	0.42	0.419672	0.000328
1.5	0.535	0.53598325	-0.00098325
2	0.615	0.612802	0.002198
2.5	0.665	0.66603875	-0.00103875
3	0.708	0.707332	0.000668
3.5	0.745	0.74404825	0.00095175
4	0.78	0.779282	0.000718
Curve #3 - North County Single Family, South Coast Agriculture			
Equation:	C = .004071+.3989(RI)-.07952(RI)^2+.006444(RI)^3		
Rainfall Intensity (in/hr)	Runoff Coefficient	Synthetic Value	Variation
1	0.33	0.329895	0.000105
1.5	0.445	0.4452495	-0.0002495
2	0.535	0.535343	-0.000343
2.5	0.605	0.6050085	-8.5E-06
3	0.66	0.659079	0.000921
3.5	0.701	0.7023875	-0.0013875
4	0.74	0.739767	0.000233
Curve #4 - North County Agriculture			
Equation:	C = 1.01*(RI)^.29-.837		
Rainfall Intensity (in/hr)	Runoff Coefficient	Synthetic Value	Variation
1	0.18	0.173	0.007
1.5	0.3	0.299024869	0.000975131
2	0.39	0.39786668	-0.00786668
2.5	0.48	0.480419163	-0.000419163
3	0.55	0.551949762	-0.001949762
3.5	0.61	0.615449718	-0.005449718
4	0.67	0.672797741	-0.002797741



Rainfall Intensity vs. Runoff Coefficients
Runoff Coefficient
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
1
1.5
2
2.5
3
3.5
4
Rainfall Intensity (in/hr)
Curve 1
Curve 1 - Equation
Curve 2
Curve 2 - Equation
Curve 3
Curve 3 - Equation
Curve 4
Curve 4 - Equation

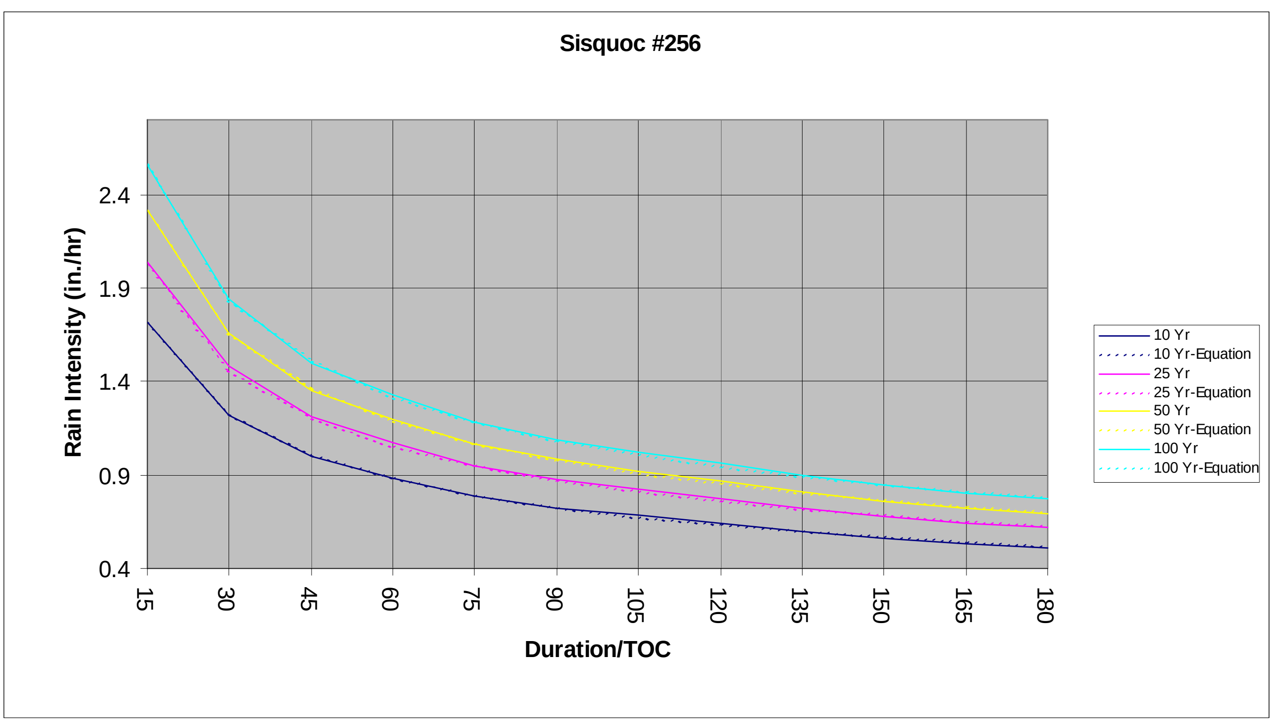
Appendix C

Rainfall intensity Equations and Curves

For Siquoc

Curve Construction for Sisquoc												
SBCFCD	August, 2003											
Area:	Sisquoc											
Gage #:	256											
Elevation:	420											
Years of Record:	33											
Depth/Duration (mins)												
Duration (mins.):	15	30	45	60	75	90	105	120	135	150	165	180
Frequency (yrs):												
10	0.43	0.61	0.750188	0.88	0.98625	1.086	1.19875	1.28	1.338383	1.399428	1.463259	1.53
25	0.51	0.74	0.908477	1.07	1.18875	1.311	1.4385	1.55	1.6201	1.693369	1.769953	1.85
50	0.58	0.83	1.015754	1.2	1.335	1.476	1.60825	1.74	1.819398	1.90242	1.989229	2.08
100	0.64	0.92	1.125281	1.33	1.48125	1.632	1.79025	1.93	2.018696	2.111469	2.208505	2.31
Intensity/Duration												
Duration (mins.):	15	30	45	60	75	90	105	120	135	150	165	180
Frequency (yrs):												
10	1.72	1.22	1	0.88	0.789	0.724	0.685	0.64	0.594837	0.559771	0.532094	0.51
25	2.04	1.48	1.211	1.07	0.951	0.874	0.822	0.775	0.720044	0.677348	0.643619	0.616667
50	2.32	1.66	1.354	1.2	1.068	0.984	0.919	0.87	0.808621	0.760968	0.723356	0.693333
100	2.56	1.84	1.5	1.33	1.185	1.088	1.023	0.965	0.897198	0.844587	0.803093	0.77
Synthetic Curve Values:												
Duration (mins.):	15	30	45	60	75	90	105	120	135	150	165	180
Frequency (yrs):												
10	1.711732	1.227274	1.010224	0.87992781	0.790552	0.724308	0.672649	0.630889	0.59621	0.566808	0.541461	0.519313
25	2.027831	1.460981	1.206017	1.052585344	0.94715	0.868893	0.807793	0.758351	0.717257	0.682388	0.652308	0.626007
50	2.311384	1.65721	1.364124	1.188182775	1.067496	0.978046	0.908291	0.8519	0.805074	0.765371	0.731145	0.701237
100	2.555429	1.833456	1.509812	1.315458531	1.182108	1.083252	1.006148	0.943808	0.892035	0.848133	0.810283	0.777206
Curve Equations:												
Frequency (yrs):												
10		RI = 6.28*(TOC)^-0.48				RI = Rainfall Intensity						
25		RI = 7.3*(TOC)^-0.473				TOC = Time of Concentration/Storm Duration						
50		RI = 8.48*(TOC)^-0.48										
100		RI = 9.35*(TOC)^-0.479										
Variation (in.):												
Duration (mins.):	15	30	45	60	75	90	105	120	135	150	165	180
Frequency (yrs):												
10	-0.008268	0.007274	0.010224	-7.21904E-05	0.001552	0.000308	-0.012351	-0.009111	0.001373	0.007036	0.009367	0.009313
25	-0.012169	-0.019019	-0.004983	-0.017414656	-0.00385	-0.005107	-0.014207	-0.016649	-0.002787	0.005041	0.008689	0.00934
50	-0.008616	-0.00279	0.010124	-0.011817225	-0.000504	-0.005954	-0.010709	-0.0181	-0.003548	0.004403	0.007789	0.007904
100	-0.004571	-0.006544	0.009812	-0.014541469	-0.002892	-0.004748	-0.016852	-0.021192	-0.005164	0.003545	0.007191	0.007206

Note: "Actual" Curves taken from Santa Barbara County Flood Control District Recording Data. Data available for 15, 30, 60, 120 and 180 minutes.
Intermediate values were determined visually and by using Excel "Series" extrapolation.



Appendix D

Rational Method Calculations

Rational Method
Pre Construction
Q= 100 YEAR FLOW

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
100 Year Flow - PRE CONSTRUCTION																	
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	230	2558	9.0%		8.5	8.5	3.35	0.60	47.71	47.71	95.7				
NNBL2-2	2B, J1	Initial Area	230	1927	11.9%		7.0	7.0	3.68	0.64	23.71	23.71	55.6				
NNBL2-3	2C, J1	Initial Area	240	1874	12.8%		7.0	7.0	3.68	0.64	28.5	28.50	66.8				
Junction 1								8.5	3.35	0.62		99.92	207.2				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	4.63	9.1	17.6	2.37	0.56	51.72	151.64	202.5	0.04	0.49		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	2.96	0.55	78.76	78.76	127.8				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	4.13	0.69	19.95	19.95	56.6				
Junction 2	J2							17.6	2.37	0.57		250.35	337.0				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	8.71	4.0	21.6	2.15	0.54	54.73	305.08	355.4	0.04	1.44		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	4.55	0.73	15.65	15.65	52.0				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	4.13	0.69	21.99	21.99	62.4				
Junction 3	J3							21.6	2.15	0.56		342.72	412.4				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	8.40	2.8	24.4	2.02	0.55	22.03	364.75	406.6	0.04	1.57		
NNBL1-1	1A, J4	Initial Area	410	5501	7.4%		17.2	17.2	2.39	0.46	112.2	112.20	124.6				
Junction 4	J4							24.4	2.02	0.53		476.95	511.9				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	3.68	0.64	35.8	35.80	83.9				
NNBL2-12	2J,J5	Initial Area	192	1139	16.8%		4.0	4.0	4.81	0.76	16.24	16.24	59.1				
Junction 5	J5							7.0	3.68	0.67		52.04	129.1				
NNBL2-13	J5,J6	J5-J6	83	1700	4.9%	8.49	3.3	10.3	3.05	0.62	40.03	92.07	175.5	0.04	1.04		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	3.35	0.60	50.68	50.68	101.6				
Junction 6								10.3	3.05	0.61		142.75	268.0				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	6.47	2.6	12.9	2.75	0.61	13.41	156.16	260.0	0.04	1.70		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.93	2.4	26.8	1.94	0.53	15.71	492.66	501.3	0.04	1.78		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	4.13	0.69	23.12	23.12	65.6				
Junction 7	J7							26.8	1.94	0.55		671.94	715.2				

Rational Method
Pre Construction
Q= 100 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	10.28	3.7	30.5	1.82	0.54	45.45	717.39	702.7	0.04	2.32		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	3.96	0.67	27.27	27.27	72.3				
Junction 8	J8							30.5	1.82	0.54		744.66	735.9				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	8.93	6.0	36.5	1.67	0.53	55.98	800.64	706.7	0.04	2.52		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	4.13	0.69	12.58	12.58	35.7				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	5.52	0.82	6.13	6.13	27.8				
Junction 10								5.5	4.13	0.73		18.71	56.5				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.96	7.6	13.1	2.73	0.61	25.07	43.78	72.4	0.04	0.91		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	5.52	0.82	6.78	6.78	30.7				
Junction 11	J11							13.1	2.73	0.64		50.56	87.6				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	7.82	4.1	17.2	2.39	0.56	42.5	93.06	124.0	0.04	1.01		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	5.52	0.82	12.04	12.04	54.6				
Junction 12	J12							17.2	2.39	0.59		105.10	147.6				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	10.37	1.9	19.1	2.28	0.57	16.97	122.07	157.7	0.04	1.27		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	3.66	0.63	23.35	23.35	54.1				
Junction 13	J13							19.1	2.28	0.58		145.42	191.4				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	8.06	1.3	20.4	2.21	0.57	8.43	153.85	193.7	0.04	1.64		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	4.13	0.69	16.27	16.27	46.2				
Junction 14	J14							20.4	2.21	0.58		170.12	218.4				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	9.31	1.5	21.8	2.14	0.57	15.07	185.19	224.9	0.04	1.30		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	3.81	0.65	18.70	18.70	46.5				
Junction 15	J15							21.8	2.14	0.58		203.89	250.9				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	8.84	1.5	23.3	2.07	0.57	14.11	218.00	255.0	0.04	1.16		

Rational Method
Pre Construction
Q= 100 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	4.81	0.76	9.9	9.90	36.0				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	3.26	0.59	39.82	39.82	76.2				
Junction 1								9.0	3.26	0.62		49.72	100.6				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	6.40	6.1	15.1	2.55	0.54	81.59	131.31	179.7	0.04	0.92		
LGN CYN 4	C,J2	Initial Area	287	1723	16.7%		6.0	6.0	3.96	0.67	23.03	23.03	61.0				
Junction 2	J2							15.1	2.55	0.56		154.34	218.9				
LGN CYN 5	J2,J3	J2-J3	8	510	1.7%	6.01	1.4	16.5	2.44	0.55	9.18	163.52	220.2	0.04	1.40		
LGN CYN 6	D,J3	Initial Area	285	2578	11.0%		8.0	8.0	3.45	0.61	33.34	33.34	70.2				
Junction 3	J3							16.5	2.44	0.56		196.86	269.8				
LGN CYN 7	J3,J4	J3-J4	33	587	5.6%	8.75	1.1	17.7	2.36	0.56	5.32	202.18	267.3	0.04	0.99		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	3.66	0.63	18.54	18.54	43.0				
LGN CYN 9	F, J4	Initial Area	321	3298	9.7%		10.1	10.1	3.09	0.56	64.82	64.82	112.9				
Junction 4	J4							17.7	2.36	0.57		285.54	381.4				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	5.15	2.8	20.4	2.20	0.56	18.52	304.06	373.4	0.04	2.33		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	3.68	0.64	40.46	40.46	94.9				
Junction 5	J5							20.4	2.20	0.57		344.52	430.2				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	9.29	3.9	24.3	2.03	0.54	64.42	408.94	448.3	0.04	1.53		
LGN CYN 13	G,J6	Initial Area	320	1808	17.7%		5.2	5.2	4.24	0.70	72.61	72.61	215.4				
Junction 6	J6							24.3	2.03	0.56		481.55	551.2				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	6.64	3.6	27.9	1.90	0.55	52.08	533.63	553.9	0.04	2.09		
LGN CYN 15	H,J7	Initial Area	267	2128	12.5%		6.5	6.5	3.81	0.65	40.85	40.85	101.6				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	4.13	0.69	8.66	8.66	24.6				
Junction 7	J7							27.9	1.90	0.56		583.14	615.8				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	8.51	2.6	30.4	1.82	0.54	37.96	621.10	615.6	0.04	2.25		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	3.81	0.65	22.38	22.38	55.7				
Junction 8	J8							30.4	1.82	0.55		643.48	642.2				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	9.61	2.3	32.8	1.76	0.53	46.44	689.92	648.7	0.04	1.82		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	3.84	0.66	21.61	21.61	54.4				
Junction 9	J9							32.8	1.76	0.54		711.53	673.6				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	9.21	1.3	34.0	1.73	0.53	20.72	732.25	674.0	0.04	2.15		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	4.13	0.69	23.15	23.15	65.7				
Junction 10	J10							34.0	1.73	0.54		755.40	701.4				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	10.56	1.3	35.3	1.69	0.53	20.28	775.68	700.3	0.04	2.14		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	4.37	0.71	16.4	16.40	51.0				
Junction 11	J11							35.3	1.69	0.54		792.08	720.1				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	12.19	2.9	38.2	1.63	0.52	52.63	844.71	721.9	0.04	2.39		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	3.90	0.66	21.56	21.56	55.7				
Junction 12	J12							38.2	1.63	0.53		866.27	745.2				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	10.99	1.9	40.1	1.60	0.52	26.06	892.33	741.5	0.04	2.62		

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	3.45	0.61	33.14	33.14	69.8				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	4.03	0.68	19.71	19.71	53.7				
Junction 1								8.0	3.45	0.63		52.85	115.8				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	8.11	4.2	12.2	2.82	0.58	46.79	99.64	164.4	0.04	1.11		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	4.33	0.71	31.97	31.97	97.8				
Junction 2	J2							12.2	2.82	0.61		131.61	228.3				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	8.56	3.4	15.6	2.51	0.58	44.86	176.47	256.9	0.04	1.37		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	3.09	0.56	63.01	63.01	109.7				
Junction 3	J3							15.6	2.51	0.58		239.48	345.9				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	11.04	1.4	17.0	2.41	0.57	8.79	248.27	342.2	0.04	1.67		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	2.74	0.52	72.00	72.00	101.6				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	3.09	0.56	53.94	53.94	93.9				
Junction 4	J4							17.0	2.41	0.56		374.21	504.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	7.90	1.9	18.9	2.29	0.55	18.75	392.96	498.6	0.04	2.37		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	2.84	0.53	57.52	57.52	86.8				
Junction 5	J5							18.9	2.29	0.55		450.48	568.4				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	12.26	0.5	19.4	2.26	0.55	23.30	473.78	583.9	0.04	2.03		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	3.18	0.58	79.32	79.32	145.2				
Junction 6	J6							19.4	2.26	0.55		553.10	686.9				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	7.88	3.4	22.8	2.09	0.54	57.77	610.87	686.1	0.04	2.47		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	3.68	0.64	34.70	34.70	81.4				
Junction 7	J7							22.8	2.09	0.54		645.57	732.3				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	11.71	2.6	25.5	1.98	0.53	64.56	710.13	745.6	0.04	2.35		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	4.13	0.69	19.74	19.74	56.0				
Junction 8	J8							25.5	1.98	0.53		729.87	772.5				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	2.64	0.50	117.13	117.13	155.2				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	4.60	0.74	12.59	12.59	42.6				
Junction 12								14.0	2.64	0.52		129.72	179.6				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	8.78	4.0	18.0	2.34	0.51	48.49	178.21	211.1	0.04	1.33		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	3.26	0.59	53.73	53.73	102.8				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	4.55	0.73	11.00	11.00	36.5				
Junction 13	J13							18.0	2.34	0.53		242.94	303.7				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	4.53	3.6	21.6	2.15	0.53	8.92	251.86	286.3	0.04	2.22		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	4.13	0.69	21.83	21.83	62.0				
Junction 14	J14							21.6	2.15	0.54		273.69	318.5				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	8.78	3.3	24.9	2.00	0.52	42.44	316.13	331.5	0.04	1.77		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	3.34	0.60	43.38	43.38	86.1				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	3.73	0.64	16.5	16.50	39.6				
Junction 15	J15							24.9	2.00	0.54		376.01	404.5				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	11.56	0.9	25.8	1.97	0.53	9.39	385.40	404.7	0.04	1.74		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	3.68	0.64	29.51	29.51	69.2				
Junction 16	J16							25.8	1.97	0.54		414.91	441.7				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	8.86	3.6	29.4	1.85	0.53	28.82	443.73	434.8	0.04	2.10		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	3.68	0.64	24.93	24.93	58.5				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	10.59	2.6	28.0	1.89	0.38	39.08	768.95	551.6	0.04	2.44		
Junction 9	J9							29.4	1.85	0.44		1237.61	1003.1				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	13.68	1.1	30.6	1.82	0.44	14.42	1252.03	994.5	0.04	2.37		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	4.03	0.68	14.88	14.88	40.5				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	2.48	0.48	45.78	45.78	54.1				
Junction 10	J10							30.6	1.82	0.44		1312.69	1052.4				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	3.07	0.56	33.42	33.42	57.7				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	3.43	0.61	24.49	24.49	51.1				
Junction 18	J18							10.2	3.07	0.58		57.91	103.4				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	9.60	1.4	11.6	2.90	0.57	14.51	72.42	120.0	0.04	0.98		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	4.50	0.73	10.78	10.78	35.2				
Junction 19	J19							11.6	2.90	0.59		83.20	142.7				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	12.41	2.0	13.5	2.68	0.44	15.63	1328.32	1576.0	0.04	2.56		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	10.25	0.8	26.7	1.94	0.59	2.49	85.69	97.5	0.04	1.11		
Junction 11	J11							26.7	1.94	0.45		1414.01	1236.3				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	2.64	0.50	164.76	164.76	218.3				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	2.96	0.55	82.64	82.64	134.1				
Junction 1								14.0	2.64	0.52		247.40	337.7				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	9.24	1.9	29.9	1.84	0.50	37.57	284.97	260.0	0.04	1.77		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	2.64	0.50	177.26	177.26	234.8				
Junction 2	J2							29.9	1.84	0.50		462.23	423.2				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	7.42	5.7	35.6	1.69	0.48	68.72	530.95	428.8	0.04	1.99		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	2.48	0.48	106.30	106.30	125.6				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	2.96	0.55	93.88	93.88	152.3				
Junction 3	J3							35.6	1.69	0.49		731.13	601.2				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	7.28	5.8	41.4	1.57	0.47	86.11	817.24	601.8	0.04	2.41		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	2.08	0.41	209.62	209.62	180.0				
Junction 4	J4							41.4	1.57	0.46		1026.86	737.6				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	7.36	4.2	45.6	1.50	0.44	90.94	1117.80	744.8	0.04	2.64		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	2.00	0.40	238.85	238.85	190.2				
Junction 5	J5							45.6	1.50	0.44		1356.65	887.3				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	8.81	1.2	46.9	1.48	0.43	21.49	1378.14	885.4	0.04	2.65		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	2.74	0.52	130.52	130.52	184.1				
Junction 6	J6							46.9	1.48	0.44		1508.66	985.0				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	7.02	3.3	50.1	1.43	0.43	77.69	1586.35	985.4	0.04	3.29		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	2.41	0.47	383.83	383.83	430.5				
Junction 7	J7							50.1	1.43	0.44		1970.18	1241.8				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	9.82	3.2	53.4	1.39	0.43	114.13	2084.31	1249.0	0.04	3.12		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	2.48	0.48	134.68	134.68	159.2				
Junction 8	J8							53.4	1.39	0.43		2218.99	1338.4				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	2.90	0.54	173.73	173.73	271.6				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	3.10	0.57	165.79	165.79	291.0				
Junction J9A								11.5	2.90	0.55		339.52	543.8				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	11.93	1.9	13.4	2.70	0.55	21.14	360.66	534.7	0.04	1.88		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	7.59	3.3	56.7	1.35	0.43	50.58	2269.57	1318.3	0.04	3.68		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	2.90	0.54	112.02	112.02	175.1				
Junction 9	J9A,J9							56.7	1.35	0.45		2742.25	1667.7				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	5.98	2.8	59.5	1.32	0.45	57.78	2800.03	1648.8	0.04	4.62		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	2.96	0.55	70.08	70.08	113.7				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	3.56	0.62	43.22	43.22	95.9				
Junction 10	J10							59.5	1.32	0.45		2913.33	1735.0				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	7.50	6.8	66.3	1.25	0.44	190.84	3104.17	1705.4	0.04	4.45		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	2.74	0.52	265.59	265.59	374.6				
Junction 11	J11							66.3	1.25	0.44		3369.76	1877.0				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	2.96	0.55	93.86	93.86	152.3				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.99	0.55	116.31	116.31	191.6				
Junction 13								11.0	2.96	0.55		210.17	342.2				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	10.38	3.6	14.6	2.59	0.54	54.66	264.83	369.3	0.04	1.71		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	12.30	1.3	67.6	1.24	0.44	69.68	3439.44	1880.5	0.04	3.62		
Junction 12	J12							67.6	1.24	0.45		3704.27	2057.4				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	9.43	2.2	69.8	1.22	0.44	87.79	3792.06	2051.4	0.04	4.39		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	2.48	0.48	234.44	234.44	277.1				
Junction 14	J14							69.8	1.22	0.44		4026.50	2188.3				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	9.49	6.0	75.8	1.18	0.43	351.98	4378.48	2194.5	0.04	4.51		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	3.13	0.57	48.77	48.77	87.0				
Junction 15	J15							75.8	1.18	0.43		4427.25	2227.2				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	2.64	0.50	197.82	197.82	262.1				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	3.10	0.57	162.07	162.07	284.5				
Junction 24	J24							14.0	2.64	0.53		359.89	504.2				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	13.67	1.4	15.4	2.52	0.53	32.03	391.92	520.9	0.04	1.81		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	3.68	0.64	68.33	68.33	160.2				
Junction 25	J25							15.4	2.52	0.54		460.25	630.7				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	9.77	3.1	78.9	1.15	0.43	49.63	4476.88	2197.7	0.04	4.42		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	12.34	2.9	18.3	2.32	0.54	44.65	504.90	627.1	0.04	2.13		
CAT CYN 33	Z, J16	Initial Area	417	2959	14.1%		7.5	7.5	3.56	0.62	49.02	49.02	108.7				
Junction 16	J16							78.9	1.15	0.44		5030.80	2544.5				
CAT CYN 36A	AA, BA	Initial Area	296	1711	17.3%		5.0	5.0	4.33	0.71	30.36	30.36	92.9				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	10.65	2.5	7.5	3.56	0.67	23.84	54.20	129.4	0.04	0.89		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	10.46	2.0	80.9	1.14	0.44	51.89	5082.69	2526.9	0.04	4.57		
Junction 17	J17							80.9	1.14	0.44		5136.89	2592.8				

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Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	3.45	0.61	46.04	46.04	97.0				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	2.96	0.55	173.56	173.56	281.6				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	3.03	0.56	137.55	137.55	231.9				
Junction 26	J26							11.0	2.96	0.56		357.15	591.6				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	9.67	4.2	85.1	1.11	0.44	129.3	5266.19	2559.8	0.04	4.87		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	11.80	3.8	14.8	2.57	0.55	50.69	407.84	577.8	0.04	2.08		
Junction 18	J18							85.1	1.11	0.45		5674.03	2809.6				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	5.13	0.79	14.93	14.93	60.2				
CAT CYN 40A1	BB, J28	BB-J28	109	1038	10.5%	9.91	1.7	5.2	4.23	0.75	9.83	24.76	78.6	0.04	0.75		
CAT CYN 40A2	AA,J28	Initial Area	379	3110	12.2%		9.5	9.5	3.18	0.58	82.62	82.62	151.3				
Junction 28	J28							9.5	3.18	0.73		107.38	247.7				
CAT CYN 40B1	AD, BC	Initial Area	288	2356	12.2%		7.5	7.5	3.56	0.62	40.60	40.60	90.1				
CAT CYN 40B	BC, J27	BC-J27	72	884	8.1%	9.99	1.5	9.0	3.27	0.62	8.4	49.00	98.8	0.04	0.91		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	12.12	1.0	10.5	3.03	0.71	12.06	119.44	256.6	0.04	1.35		
Junction 27	J27							10.5	3.03	0.83		168.44	425.0				
CAT CYN 40	J27,J19	J27-J19	40	688	5.8%	12.77	0.9	11.4	2.92	0.82	8.17	176.61	421.5	0.04	1.69		
CAT CYN 39	J18,J19	J18-J19	2	407	0.5%	8.15	0.8	85.9	1.11	0.44	7.45	5681.48	2798.2	0.04	5.52		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	2.84	0.53	123.12	123.12	185.8				
Junction 19	J19							85.9	1.11	0.46		5981.21	3030.5				
CAT CYN 43A	AG, BD	Initial Area	269	1114	24.2%		3.2	3.2	5.36	0.81	8.20	8.20	35.4				
CAT CYN 43	BD, J20	BD-J20	101	1290	7.8%	7.75	2.8	6.0	3.97	0.71	19.88	28.08	79.1	0.04	0.64		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	12.88	1.6	87.6	1.10	0.46	44.86	6026.07	3013.2	0.04	4.55		
Junction 20	J20							87.6	1.10	0.46		6054.15	3042.4				

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Cat Canyon (con't)																	
CAT CYN 45A	AE, BE	Initial Area	282	1507	18.7%		4.3	4.3	4.65	0.74	18.48	18.48	63.6				
CAT CYN 45	BE, J21	BE-J21	108	1389	7.8%	8.99	2.6	6.9	3.71	0.70	10.43	28.91	75.6	0.04	0.81		
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	10.77	1.6	89.1	1.09	0.45	108.43	6162.58	3040.3	0.04	4.93		
Junction 21	J21							89.1	1.09	0.45		6191.49	3062.4				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	3.41	0.60	48.73	48.73	100.6				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	9.48	2.5	91.6	1.07	0.45	125.08	6316.57	3048.4	0.04	5.26		
Junction 22	J22							91.6	1.07	0.45		6365.30	3080.1				
CAT CYN 49B1	AK, J29	Initial Area	165	1003	16.5%		3.1	3.1	5.44	0.81	13.36	13.36	59.1				
CAT CYN 49B	AL, J29		35	417	8.4%	9.08	0.8	3.9	4.89	0.80	5.53	18.89	73.8	0.04	0.77		
CAT CYN 49A	AJ, J29	Initial Area	330	2263	14.6%		6.1	6.1	3.93	0.67	43.14	43.14	112.9				
Junction 29	J29							6.1	3.93	0.71		62.03	172.2				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	10.17	3.5	9.6	3.17	0.66	37.43	99.46	207.0	0.04	1.23		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	11.52	6.2	97.8	1.04	0.44	286.36	6651.66	3039.7	0.04	4.86		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	2.84	0.53	243.99	243.99	368.1				
Junction 23	J23							97.8	1.04	0.45		6995.11	3242.3				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
					50 Year Flow - PRE CONSTRUCTION												
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	230	2558	9.0%		8.5	8.5	3.04	0.56	47.71	47.71	80.6				
NNBL2-2	2B, J1	Initial Area	230	1927	11.9%		7.0	7.0	3.33	0.59	23.71	23.71	47.0				
NNBL2-3	2C, J1	Initial Area	240	1874	12.8%		7.0	7.0	3.33	0.59	28.5	28.50	56.5				
Junction 1								8.5	3.04	0.58		99.92	174.9				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	4.31	9.8	18.3	2.10	0.52	51.72	151.64	166.4	0.04	0.44		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	2.68	0.51	78.76	78.76	107.2				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	3.74	0.64	19.95	19.95	48.1				
Junction 2	J2							18.3	2.10	0.53		250.35	277.4				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	8.29	4.2	22.5	1.90	0.50	54.73	305.08	291.0	0.04	1.34		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	4.12	0.69	15.65	15.65	44.2				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	3.74	0.64	21.99	21.99	53.0				
Junction 3	J3							22.5	1.90	0.52		342.72	338.4				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	7.99	3.0	25.4	1.79	0.51	22.03	364.75	332.9	0.04	1.46		
NNBL1-1	1A, J4	Initial Area	410	5501	7.4%		17.2	17.2	2.16	0.43	112.2	112.20	103.6				
Junction 4	J4							25.4	1.79	0.49		476.95	418.7				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	3.33	0.59	35.8	35.80	71.0				
NNBL2-12	2J,J5	Initial Area	192	1139	16.8%		4.0	4.0	4.36	0.71	16.24	16.24	50.3				
Junction 5	J5							7.0	3.33	0.63		52.04	109.4				
NNBL2-13	J5,J6	J3-J4	83	1700	4.9%	8.08	3.5	10.5	2.74	0.58	40.03	92.07	146.7	0.04	0.97		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	3.04	0.56	50.68	50.68	85.7				
Junction 6								10.5	2.74	0.57		142.75	224.1				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	6.16	2.7	13.2	2.46	0.56	13.41	156.16	216.3	0.04	1.58		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.65	2.5	27.9	1.71	0.48	15.71	492.66	409.5	0.04	1.65		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	3.74	0.64	23.12	23.12	55.7				
Junction 7	J7							27.9	1.71	0.51		671.94	586.0				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	9.78	3.9	31.8	1.61	0.50	45.45	717.39	574.4	0.04	2.15		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	3.59	0.63	27.27	27.27	61.3				
Junction 8	J8							31.8	1.61	0.50		744.66	601.9				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	8.51	6.3	38.1	1.48	0.49	55.98	800.64	576.4	0.04	2.34		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	3.74	0.64	12.58	12.58	30.3				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	5.00	0.77	6.13	6.13	23.8				
Junction 10								5.5	3.74	0.69		18.71	48.1				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.72	8.0	13.5	2.43	0.56	25.07	43.78	59.9	0.04	0.85		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	5.00	0.77	6.78	6.78	26.3				
Junction 11	J11							13.5	2.43	0.59		50.56	72.7				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	7.44	4.3	17.8	2.13	0.51	42.5	93.06	101.6	0.04	0.93		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	5.00	0.77	12.04	12.04	46.6				
Junction 12	J12							17.8	2.13	0.54		105.10	121.4				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	9.86	2.0	19.8	2.02	0.52	16.97	122.07	129.3	0.04	1.18		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	3.31	0.59	23.35	23.35	45.8				
Junction 13	J13							19.8	2.02	0.53		145.42	157.3				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	7.66	1.3	21.1	1.96	0.53	8.43	153.85	158.9	0.04	1.52		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	3.74	0.64	16.27	16.27	39.2				
Junction 14	J14							21.1	1.96	0.54		170.12	179.5				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	8.86	1.5	22.6	1.90	0.52	15.07	185.19	184.4	0.04	1.21		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	3.45	0.61	18.70	18.70	39.4				
Junction 15	J15							22.6	1.90	0.53		203.89	206.0				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	8.41	1.6	24.2	1.84	0.52	14.11	218.00	208.9	0.04	1.07		

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	4.36	0.71	9.9	9.90	30.7				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.95	0.55	39.82	39.82	64.2				
Junction 1								9.0	2.95	0.58		49.72	85.0				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	6.08	6.4	15.4	2.28	0.50	81.59	131.31	148.5	0.04	0.86		
LGN CYN 4	C,J2	Initial Area	287	1723	16.7%		6.0	6.0	3.59	0.63	23.03	23.03	51.7				
Junction 2	J2							15.4	2.28	0.52		154.34	181.3				
LGN CYN 5	J2,J3	J2-J3	8	510	1.7%	5.72	1.5	16.9	2.18	0.51	9.18	163.52	182.1	0.04	1.30		
LGN CYN 6	D,J3	Initial Area	285	2578	11.0%		8.0	8.0	3.13	0.57	33.34	33.34	59.2				
Junction 3	J3							16.9	2.18	0.52		196.86	223.4				
LGN CYN 7	J3,J4	J3-J4	33	587	5.6%	8.33	1.2	18.1	2.11	0.52	5.32	202.18	221.0	0.04	0.92		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	3.31	0.59	18.54	18.54	36.3				
LGN CYN 9	F, J4	Initial Area	321	3298	9.7%		10.1	10.1	2.79	0.52	64.82	64.82	94.9				
Junction 4	J4							18.1	2.11	0.52		285.54	315.9				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.90	2.9	21.0	1.97	0.52	18.52	304.06	308.4	0.04	2.16		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	3.33	0.59	40.46	40.46	80.2				
Junction 5	J5							21.0	1.97	0.53		344.52	355.7				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	8.84	4.1	25.1	1.81	0.50	64.42	408.94	368.7	0.04	1.42		
LGN CYN 13	G,J6	Initial Area	320	1808	17.7%		5.2	5.2	3.84	0.66	72.61	72.61	182.9				
Junction 6	J6							25.1	1.81	0.52		481.55	454.6				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	6.31	3.7	28.8	1.69	0.50	52.08	533.63	455.1	0.04	1.94		
LGN CYN 15	H,J7	Initial Area	267	2128	12.5%		6.5	6.5	3.45	0.61	40.85	40.85	86.0				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	3.74	0.64	8.66	8.66	20.9				
Junction 7	J7							28.8	1.69	0.51		583.14	506.6				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	8.09	2.7	31.5	1.62	0.50	37.96	621.10	505.3	0.04	2.08		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	3.45	0.61	22.38	22.38	47.1				
Junction 8	J8							31.5	1.62	0.51		643.48	527.4				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	9.14	2.4	34.0	1.56	0.49	46.44	689.92	531.4	0.04	1.69		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	3.48	0.61	21.61	21.61	46.1				
Junction 9	J9							34.0	1.56	0.50		711.53	552.1				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	8.76	1.3	35.3	1.53	0.49	20.72	732.25	551.8	0.04	1.99		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	3.74	0.64	23.15	23.15	55.8				
Junction 10	J10							35.3	1.53	0.50		755.40	574.7				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	10.04	1.4	36.7	1.50	0.49	20.28	775.68	573.2	0.04	1.98		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	3.95	0.67	16.4	16.40	43.3				
Junction 11	J11							36.7	1.50	0.49		792.08	589.6				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	11.60	3.0	39.7	1.45	0.48	52.63	844.71	589.7	0.04	2.22		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	3.53	0.62	21.56	21.56	47.2				
Junction 12	J12							39.7	1.45	0.49		866.27	609.1				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	10.46	2.0	41.7	1.42	0.48	26.06	892.33	605.3	0.04	2.43		

Rational Method
Pre Construction
Q= 50 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	3.13	0.57	33.14	33.14	58.9				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	3.65	0.63	19.71	19.71	45.5				
Junction 1								8.0	3.13	0.59		52.85	97.9				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	7.72	4.4	12.4	2.53	0.54	46.79	99.64	136.9	0.04	1.03		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	3.92	0.66	31.97	31.97	83.1				
Junction 2	J2							12.4	2.53	0.57		131.61	190.6				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	8.15	3.6	16.0	2.24	0.54	44.86	176.47	212.8	0.04	1.27		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.79	0.52	63.01	63.01	92.2				
Junction 3	J3							16.0	2.24	0.53		239.48	286.8				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	10.50	1.4	17.4	2.15	0.53	8.79	248.27	283.2	0.04	1.55		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	2.48	0.48	72.00	72.00	85.0				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.79	0.52	53.94	53.94	78.9				
Junction 4	J4							17.4	2.15	0.52		374.21	417.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	7.52	2.0	19.5	2.04	0.51	18.75	392.96	411.7	0.04	2.20		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	2.57	0.49	57.52	57.52	72.7				
Junction 5	J5							19.5	2.04	0.51		450.48	469.4				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	11.67	0.6	20.0	2.01	0.51	23.30	473.78	481.6	0.04	1.88		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.88	0.54	79.32	79.32	122.2				
Junction 6	J6							20.0	2.01	0.51		553.10	567.1				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	7.50	3.6	23.6	1.86	0.50	57.77	610.87	564.3	0.04	2.29		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	3.33	0.59	34.70	34.70	68.8				
Junction 7	J7							23.6	1.86	0.50		645.57	602.7				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	11.14	2.8	26.4	1.76	0.49	64.56	710.13	611.7	0.04	2.18		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	3.74	0.64	19.74	19.74	47.5				
Junction 8	J8							26.4	1.76	0.49		729.87	634.1				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	2.39	0.46	117.13	117.13	129.6				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	4.16	0.69	12.59	12.59	36.2				
Junction 12								14.0	2.39	0.49		129.72	150.4				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	8.35	4.2	18.2	2.11	0.47	48.49	178.21	175.2	0.04	1.23		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.95	0.55	53.73	53.73	86.6				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	4.12	0.69	11.00	11.00	31.1				
Junction 13	J13							18.2	2.11	0.49		242.94	252.9				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	4.31	3.8	22.0	1.92	0.49	8.92	251.86	237.5	0.04	2.06		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	3.74	0.64	21.83	21.83	52.6				
Junction 14	J14							22.0	1.92	0.50		273.69	264.5				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	8.35	3.5	25.4	1.79	0.48	42.44	316.13	274.0	0.04	1.64		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	3.02	0.55	43.38	43.38	72.6				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	3.38	0.60	16.5	16.50	33.5				
Junction 15	J15							25.4	1.79	0.50		376.01	334.9				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	11.00	1.0	26.4	1.76	0.49	9.39	385.40	334.6	0.04	1.61		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	3.33	0.59	29.51	29.51	58.5				
Junction 16	J16							26.4	1.76	0.50		414.91	365.6				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	8.43	3.8	30.2	1.65	0.49	28.82	443.73	358.7	0.04	1.95		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	3.33	0.59	24.93	24.93	49.4				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	10.08	2.7	29.0	1.68	0.34	39.08	768.95	437.1	0.04	2.26		
Junction 9	J9							30.2	1.65	0.40		1237.61	812.1				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	13.02	1.2	31.4	1.62	0.40	14.42	1252.03	804.6	0.04	2.20		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	3.65	0.63	14.88	14.88	34.3				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	2.24	0.44	45.78	45.78	45.1				
Junction 10	J10							31.4	1.62	0.40		1312.69	852.5				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.78	0.52	33.42	33.42	48.5				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	3.11	0.57	24.49	24.49	43.1				
Junction 18	J18							10.2	2.78	0.54		57.91	87.1				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	9.14	1.4	11.6	2.61	0.53	14.51	72.42	100.6	0.04	0.91		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	4.08	0.68	10.78	10.78	29.9				
Junction 19	J19							11.6	2.61	0.55		83.20	119.8				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	11.80	2.1	13.7	2.41	0.40	15.63	1328.32	1287.0	0.04	2.38		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	9.75	0.9	27.3	1.73	0.55	2.49	85.69	81.0	0.04	1.03		
Junction 11	J11							27.3	1.73	0.41		1414.01	1005.3				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	2.39	0.46	164.76	164.76	182.3				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	2.68	0.51	82.64	82.64	112.5				
Junction 1								14.0	2.39	0.48		247.40	282.6				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	8.79	2.0	31.0	1.63	0.46	37.57	284.97	212.8	0.04	1.64		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	2.39	0.46	177.26	177.26	196.2				
Junction 2	J2							31.0	1.63	0.46		462.23	346.7				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	7.06	6.0	37.0	1.50	0.44	68.72	530.95	349.4	0.04	1.85		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	2.24	0.44	106.30	106.30	104.6				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	2.68	0.51	93.88	93.88	127.8				
Junction 3	J3							37.0	1.50	0.45		731.13	490.7				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	6.92	6.1	43.1	1.39	0.43	86.11	817.24	489.0	0.04	2.23		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.88	0.38	209.62	209.62	148.5				
Junction 4	J4							43.1	1.39	0.42		1026.86	598.8				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	7.00	4.4	47.6	1.33	0.41	90.94	1117.80	602.7	0.04	2.45		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.81	0.36	238.85	238.85	156.6				
Junction 5	J5							47.6	1.33	0.40		1356.65	717.6				

Rational Method
Pre Construction
Q= 50 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	8.38	1.3	48.9	1.31	0.40	21.49	1378.14	715.6	0.04	2.46		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	2.48	0.48	130.52	130.52	154.0				
Junction 6	J6							48.9	1.31	0.40		1508.66	797.2				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	6.68	3.4	52.3	1.27	0.40	77.69	1586.35	795.8	0.04	3.05		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	2.18	0.43	383.83	383.83	358.0				
Junction 7	J7							52.3	1.27	0.40		1970.18	1004.6				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	9.35	3.4	55.7	1.23	0.39	114.13	2084.31	1008.0	0.04	2.89		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	2.24	0.44	134.68	134.68	132.6				
Junction 8	J8							55.7	1.23	0.40		2218.99	1080.9				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	2.63	0.50	173.73	173.73	227.8				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.81	0.53	165.79	165.79	244.7				
Junction J9A								11.5	2.63	0.51		339.52	456.6				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	11.35	2.0	13.5	2.43	0.51	21.14	360.66	447.1	0.04	1.74		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	7.59	3.3	59.0	1.20	0.39	50.58	2269.57	1065.0	0.04	3.68		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	2.63	0.50	112.02	112.02	146.9				
Junction 9	J9A,J9							59.0	1.20	0.41		2742.25	1352.1				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	5.69	3.0	62.0	1.17	0.41	57.78	2800.03	1335.3	0.04	4.29		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	2.68	0.51	70.08	70.08	95.4				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	3.22	0.58	43.22	43.22	81.0				
Junction 10	J10							62.0	1.17	0.41		2913.33	1406.3				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	7.13	7.1	69.1	1.11	0.40	190.84	3104.17	1378.0	0.04	4.13		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	2.48	0.48	265.58	265.58	313.4				
Junction 11	J11							69.1	1.11	0.41		3369.75	1518.5				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	2.68	0.51	93.86	93.86	127.8				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.71	0.51	116.31	116.31	160.9				
Junction 13								11.0	2.68	0.51		210.17	287.2				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	9.87	3.7	14.7	2.33	0.50	54.66	264.83	307.5	0.04	1.58		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	11.70	1.4	70.5	1.10	0.40	69.68	3439.43	1519.9	0.04	3.36		
Junction 12	J12							70.5	1.10	0.41		3704.26	1664.9				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	8.97	2.3	72.8	1.08	0.40	87.79	3792.05	1658.2	0.04	4.07		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	2.24	0.44	234.44	234.44	230.8				
Junction 14	J14							72.8	1.08	0.41		4026.49	1769.7				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	9.03	6.4	79.1	1.04	0.39	351.98	4378.47	1767.6	0.04	4.18		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.84	0.53	48.77	48.77	73.2				
Junction 15	J15							79.1	1.04	0.39		4427.24	1794.5				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	2.39	0.46	197.82	197.82	218.9				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.81	0.53	162.07	162.07	239.2				
Junction 24	J24							14.0	2.39	0.49		359.89	422.4				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	13.00	1.5	15.5	2.28	0.49	32.03	391.92	435.2	0.04	1.68		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	3.33	0.59	68.33	68.33	135.5				
Junction 25	J25							15.5	2.28	0.50		460.25	527.8				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	9.29	3.2	82.3	1.02	0.39	49.63	4476.87	1769.5	0.04	4.10		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	11.74	3.1	18.5	2.09	0.50	44.65	504.90	522.2	0.04	1.98		
CAT CYN 33	Z, J16	Initial Area	417	2959	14.1%		7.5	7.5	3.22	0.58	49.02	49.02	91.9				
Junction 16	J16							82.3	1.02	0.40		5030.79	2053.9				
CAT CYN 36A	AA, BA	Initial Area	296	1711	17.3%		5.0	5.0	3.92	0.66	30.36	30.36	78.9				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	10.13	2.6	7.6	3.20	0.63	23.84	54.20	108.5	0.04	0.82		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	9.95	2.1	84.4	1.01	0.40	51.89	5082.68	2038.5	0.04	4.24		
Junction 17	J17							84.4	1.01	0.40		5136.88	2093.0				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	3.13	0.57	46.04	46.04	81.8				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	2.68	0.51	173.56	173.56	236.3				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.74	0.52	137.55	137.55	194.8				
Junction 26	J26							11.0	2.68	0.52		357.15	497.0				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	9.20	4.4	88.9	0.98	0.40	129.3	5266.18	2063.6	0.04	4.52		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	11.23	4.0	15.0	2.31	0.51	50.69	407.84	481.7	0.04	1.93		
Junction 18	J18							88.9	0.98	0.41		5674.02	2268.4				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	4.65	0.74	14.93	14.93	51.3				
CAT CYN 40A1	BB, J28	BB-J28	109	1038	10.5%	9.43	1.8	5.3	3.80	0.70	9.83	24.76	66.2	0.04	0.69		
CAT CYN 40A2	AA,J28	Initial Area	379	3110	12.2%		9.5	9.5	2.88	0.54	82.62	82.62	127.3				
Junction 28	J28							9.5	2.88	0.68		107.38	209.3				
CAT CYN 40B1	AD, BC	Initial Area	288	2356	12.2%		7.5	7.5	3.22	0.58	40.60	40.60	76.1				
CAT CYN 40B	BC, J27	BC-J27	72	884	8.1%	9.51	1.5	9.0	2.95	0.57	8.4	49.00	83.0	0.04	0.85		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	11.53	1.0	10.5	2.74	0.66	12.06	119.44	216.2	0.04	1.25		
Junction 27	J27							10.5	2.74	0.78		168.44	357.9				
CAT CYN 40	J27,J19	J27-J19	40	2450	1.6%	6.44	6.3	16.9	2.18	0.76	8.17	176.61	293.1	0.04	1.57		
CAT CYN 39	J18,J19	J18-J19	101	2671	3.8%	21.51	2.1	91.0	0.97	0.41	7.45	5681.47	2244.7	0.04	5.12		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	2.57	0.49	123.12	123.12	155.7				
Junction 19	J19							91.0	0.97	0.42		5981.20	2434.2				
CAT CYN 43A	AG, BD	Initial Area	269	1114	24.2%		3.2	3.2	4.85	0.76	8.20	8.20	30.2				
CAT CYN 43	BD, J20	BD-J20	101	1290	7.8%	7.37	2.9	6.1	3.56	0.66	19.88	28.08	66.1	0.04	0.60		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	12.26	1.7	92.7	0.96	0.42	44.86	6026.06	2419.4	0.04	4.23		
Junction 20	J20							92.7	0.96	0.42		6054.14	2443.4				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 45A	AE, BE	Initial Area	282	1507	18.7%		4.3	4.3	4.21	0.70	18.48	18.48	54.1				
CAT CYN 45	BE, J21	BE-J21	108	1389	7.8%	8.55	2.7	7.0	3.33	0.66	10.43	28.91	63.5	0.04	0.75		
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	10.25	1.6	94.3	0.96	0.41	108.43	6162.57	2439.6	0.04	4.57		
Junction 21	J21							94.3	0.96	0.42		6191.48	2457.8				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	3.09	0.56	48.73	48.73	84.8				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	9.02	2.6	96.9	0.94	0.41	125.08	6316.56	2444.3	0.04	4.88		
Junction 22	J22							96.9	0.94	0.41		6365.29	2470.2				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	4.93	0.77	13.36	13.36	50.5				
CAT CYN 49B	AL, J29		35	417	8.4%	8.64	0.8	3.9	4.87	0.77	5.53	18.89	70.4	0.04	0.72		
CAT CYN 49A	AJ, J29	Initial Area	330	2263	14.6%		6.1	6.1	3.56	0.62	43.14	43.14	95.6				
Junction 29	J29							6.1	3.56	0.67		62.03	147.1				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	9.68	3.6	9.7	2.84	0.62	37.43	99.46	173.9	0.04	1.14		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	10.96	6.5	103.5	0.91	0.40	286.36	6651.65	2432.5	0.04	4.51		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	2.57	0.49	243.99	243.99	308.5				
Junction 23	J23							103.5	0.91	0.41		6995.10	2598.1				

Rational Method
Pre Construction
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DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
				25 Year Flow - PRE CONSTRUCTION													
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	230	2558	9.0%		8.5	8.5	2.65	0.50	47.71	47.71	63.7				
NNBL2-2	2B, J1	Initial Area	230	1927	11.9%		7.0	7.0	2.91	0.54	23.71	23.71	37.2				
NNBL2-3	2C, J1	Initial Area	240	1874	12.8%		7.0	7.0	2.91	0.54	28.5	28.50	44.7				
Junction 1								8.5	2.65	0.52		99.92	138.4				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	3.99	10.6	19.1	1.81	0.47	51.72	151.64	128.4	0.04	0.39		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	2.35	0.46	78.76	78.76	84.5				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	3.26	0.59	19.95	19.95	38.1				
Junction 2	J2							19.1	1.81	0.47		250.35	214.7				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	7.74	4.5	23.5	1.64	0.45	54.73	305.08	223.8	0.04	1.21		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	3.58	0.63	15.65	15.65	35.1				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	3.26	0.59	21.99	21.99	42.0				
Junction 3	J3							23.5	1.64	0.46		342.72	261.0				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	7.46	3.2	26.7	1.54	0.46	22.03	364.75	256.2	0.04	1.31		
NNBL1-1	1A, J4	Initial Area	410	5501	7.4%		17.2	17.2	1.90	0.38	112.2	112.20	81.0				
Junction 4	J4							26.7	1.54	0.44		476.95	321.9				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	2.91	0.54	35.8	35.80	56.2				
NNBL2-12	2J,J5	Initial Area	192	1139	16.8%		4.0	4.0	3.79	0.65	16.24	16.24	40.0				
Junction 5	J5							7.0	2.91	0.57		52.04	86.8				
NNBL2-13	J5,J6	J3-J4	83	1700	4.9%	7.54	3.8	10.8	2.37	0.52	40.03	92.07	114.6	0.04	0.87		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	2.65	0.50	50.68	50.68	67.7				
Junction 6								10.8	2.37	0.52		142.75	175.1				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	5.75	2.9	13.7	2.12	0.51	13.41	156.16	168.4	0.04	1.42		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.28	2.7	29.4	1.47	0.43	15.71	492.66	314.5	0.04	1.49		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	3.26	0.59	23.12	23.12	44.1				
Junction 7	J7							29.4	1.47	0.46		671.94	451.6				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	9.13	4.1	33.5	1.39	0.44	45.45	717.39	441.6	0.04	1.94		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	3.13	0.57	27.27	27.27	48.5				
Junction 8	J8							33.5	1.39	0.45		744.66	463.1				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	7.94	6.7	40.3	1.27	0.43	55.98	800.64	442.2	0.04	2.11		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	3.26	0.59	12.58	12.58	24.0				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	4.34	0.71	6.13	6.13	18.9				
Junction 10								5.5	3.26	0.63		18.71	38.2				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.41	8.6	14.1	2.09	0.50	25.07	43.78	46.2	0.04	0.76		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	4.34	0.71	6.78	6.78	20.9				
Junction 11	J11							14.1	2.09	0.53		50.56	56.3				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	6.94	4.6	18.7	1.83	0.46	42.5	93.06	77.6	0.04	0.84		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	4.34	0.71	12.04	12.04	37.1				
Junction 12	J12							18.7	1.83	0.49		105.10	93.2				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	9.21	2.1	20.8	1.74	0.47	16.97	122.07	98.9	0.04	1.06		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	2.89	0.54	23.35	23.35	36.2				
Junction 13	J13							20.8	1.74	0.48		145.42	120.6				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	7.15	1.4	22.2	1.68	0.47	8.43	153.85	121.7	0.04	1.37		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	3.26	0.59	16.27	16.27	31.1				
Junction 14	J14							22.2	1.68	0.48		170.12	137.8				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	8.27	1.6	23.9	1.63	0.47	15.07	185.19	141.2	0.04	1.09		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	3.01	0.55	18.70	18.70	31.2				
Junction 15	J15							23.9	1.63	0.48		203.89	158.1				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	7.85	1.7	25.6	1.58	0.47	14.11	218.00	160.0	0.04	0.97		

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	3.79	0.65	9.9	9.90	24.4				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.58	0.49	39.82	39.82	50.7				
Junction 1								9.0	2.58	0.52		49.72	67.3				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	5.68	6.9	15.9	1.97	0.44	81.59	131.31	114.6	0.04	0.77		
LGN CYN 4	C,J2	Initial Area	287	1723	16.7%		6.0	6.0	3.13	0.57	23.03	23.03	41.0				
Junction 2	J2							15.9	1.97	0.46		154.34	140.5				
LGN CYN 5	J2,J3	J2-J3	8	510	1.7%	5.34	1.6	17.5	1.89	0.46	9.18	163.52	140.8	0.04	1.17		
LGN CYN 6	D,J3	Initial Area	285	2578	11.0%		8.0	8.0	2.73	0.51	33.34	33.34	46.8				
Junction 3	J3							17.5	1.89	0.47		196.86	173.2				
LGN CYN 7	J3,J4	J3-J4	33	587	5.6%	7.77	1.3	18.7	1.82	0.46	5.32	202.18	171.1	0.04	0.83		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	2.89	0.54	18.54	18.54	28.7				
LGN CYN 9	F, J4	Initial Area	321	3298	9.7%		10.1	10.1	2.44	0.47	64.82	64.82	74.8				
Junction 4	J4							18.7	1.82	0.47		285.54	245.1				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.57	3.1	21.9	1.70	0.46	18.52	304.06	238.6	0.04	1.95		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	2.91	0.54	40.46	40.46	63.5				
Junction 5	J5							21.9	1.70	0.47		344.52	275.6				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	8.25	4.4	26.2	1.56	0.45	64.42	408.94	284.0	0.04	1.28		
LGN CYN 13	G,J6	Initial Area	320	1808	17.7%		5.2	5.2	3.35	0.60	72.61	72.61	145.0				
Junction 6	J6							26.2	1.56	0.47		481.55	351.5				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	5.89	4.0	30.2	1.46	0.45	52.08	533.63	350.6	0.04	1.75		
LGN CYN 15	H,J7	Initial Area	267	2128	12.5%		6.5	6.5	3.01	0.55	40.85	40.85	68.1				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	3.26	0.59	8.66	8.66	16.5				
Junction 7	J7							30.2	1.46	0.46		583.14	390.9				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	7.56	2.9	33.1	1.39	0.45	37.96	621.10	388.9	0.04	1.88		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	3.01	0.55	22.38	22.38	37.3				
Junction 8	J8							33.1	1.39	0.45		643.48	406.2				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	8.53	2.6	35.8	1.34	0.44	46.44	689.92	408.3	0.04	1.53		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	3.03	0.56	21.61	21.61	36.5				
Junction 9	J9							35.8	1.34	0.44		711.53	424.5				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	8.18	1.4	37.2	1.32	0.44	20.72	732.25	423.8	0.04	1.80		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	3.26	0.59	23.15	23.15	44.2				
Junction 10	J10							37.2	1.32	0.44		755.40	441.7				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	9.38	1.5	38.7	1.30	0.44	20.28	775.68	440.1	0.04	1.79		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	3.44	0.61	16.4	16.40	34.4				
Junction 11	J11							38.7	1.30	0.44		792.08	453.0				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	10.83	3.2	41.9	1.25	0.43	52.63	844.71	452.0	0.04	2.00		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	3.08	0.56	21.56	21.56	37.4				
Junction 12	J12							41.9	1.25	0.43		866.27	467.2				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	9.77	2.1	44.0	1.22	0.43	26.06	892.33	463.7	0.04	2.20		

Rational Method
Pre Construction
Q= 25 YEAR FLOW

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	2.73	0.51	33.14	33.14	46.5				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	3.18	0.58	19.71	19.71	36.0				
Junction 1								8.0	2.73	0.54		52.85	77.5				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	7.20	4.7	12.7	2.19	0.49	46.79	99.64	106.6	0.04	0.93		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	3.41	0.60	31.97	31.97	65.9				
Junction 2	J2							12.7	2.19	0.52		131.61	149.0				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	7.61	3.9	16.6	1.93	0.48	44.86	176.47	164.9	0.04	1.15		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.44	0.47	63.01	63.01	72.7				
Junction 3	J3							16.6	1.93	0.48		239.48	222.4				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	9.80	1.5	18.1	1.86	0.48	8.79	248.27	219.4	0.04	1.40		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	2.17	0.43	72.00	72.00	66.8				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.44	0.47	53.94	53.94	62.2				
Junction 4	J4							18.1	1.86	0.47		374.21	323.7				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	7.02	2.2	20.3	1.76	0.46	18.75	392.96	318.4	0.04	1.99		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	2.25	0.44	57.52	57.52	57.2				
Junction 5	J5							20.3	1.76	0.46		450.48	363.0				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	10.89	0.6	20.9	1.73	0.45	23.30	473.78	372.0	0.04	1.70		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.52	0.48	79.32	79.32	96.4				
Junction 6	J6							20.9	1.73	0.46		553.10	438.4				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	7.00	3.8	24.7	1.60	0.44	57.77	610.87	434.7	0.04	2.06		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	2.91	0.54	34.70	34.70	54.4				
Junction 7	J7							24.7	1.60	0.45		645.57	464.7				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	10.40	3.0	27.7	1.52	0.44	64.56	710.13	470.2	0.04	1.97		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	3.26	0.59	19.74	19.74	37.7				
Junction 8	J8							27.7	1.52	0.44		729.87	487.7				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	Total	I	C	Area Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	2.10	0.41	117.13	117.13	101.7				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	3.62	0.63	12.59	12.59	28.7				
Junction 12								14.0	2.10	0.44		129.72	118.4				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	7.80	4.5	18.5	1.84	0.42	48.49	178.21	136.5	0.04	1.11		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.58	0.49	53.73	53.73	68.4				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	3.58	0.63	11.00	11.00	24.7				
Junction 13	J13							18.5	1.84	0.44		242.94	197.8				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	4.02	4.1	22.6	1.67	0.44	8.92	251.86	185.0	0.04	1.86		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	3.26	0.59	21.83	21.83	41.7				
Junction 14	J14							22.6	1.67	0.45		273.69	206.4				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	7.80	3.7	26.3	1.56	0.43	42.44	316.13	212.6	0.04	1.48		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	2.64	0.50	43.38	43.38	57.4				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	2.95	0.54	16.5	16.50	26.5				
Junction 15	J15							26.3	1.56	0.45		376.01	260.5				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	10.27	1.1	27.3	1.53	0.44	9.39	385.40	260.0	0.04	1.46		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	2.91	0.54	29.51	29.51	46.3				
Junction 16	J16							27.3	1.53	0.45		414.91	284.3				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	7.87	4.0	31.4	1.43	0.44	28.82	443.73	278.1	0.04	1.76		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	2.91	0.54	24.93	24.93	39.1				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	9.41	2.9	30.5	1.45	0.29	39.08	768.95	320.5	0.04	2.04		
Junction 9	J9							31.4	1.43	0.35		1237.61	613.8				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	12.15	1.3	32.6	1.40	0.35	14.42	1252.03	607.8	0.04	1.99		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	3.18	0.58	14.88	14.88	27.2				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	1.97	0.39	45.78	45.78	35.3				
Junction 10	J10							32.6	1.40	0.35		1312.69	645.0				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.43	0.47	33.42	33.42	38.2				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	2.71	0.51	24.49	24.49	34.0				
Junction 18	J18							10.2	2.43	0.49		57.91	68.8				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	8.53	1.5	11.7	2.28	0.48	14.51	72.42	79.1	0.04	0.82		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	3.55	0.62	10.78	10.78	23.7				
Junction 19	J19							11.7	2.28	0.50		83.20	94.4				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	11.02	2.2	14.0	2.10	0.35	15.63	1328.32	977.9	0.04	2.14		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	9.11	0.9	28.3	1.50	0.49	2.49	85.69	63.4	0.04	0.93		
Junction 11	J11							28.3	1.50	0.36		1414.01	763.7				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	2.10	0.41	164.76	164.76	143.1				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	2.35	0.46	82.64	82.64	88.6				
Junction 1								14.0	2.10	0.43		247.40	222.2				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	8.21	2.2	32.7	1.40	0.41	37.57	284.97	163.4	0.04	1.48		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	2.10	0.41	177.26	177.26	154.0				
Junction 2	J2							32.7	1.40	0.41		462.23	266.5				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	6.59	6.4	39.1	1.29	0.39	68.72	530.95	267.1	0.04	1.67		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	1.97	0.39	106.30	106.30	81.9				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	2.35	0.46	93.88	93.88	100.7				
Junction 3	J3							39.1	1.29	0.40		731.13	376.1				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	6.46	6.5	45.6	1.20	0.38	86.11	817.24	373.0	0.04	2.02		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.66	0.33	209.62	209.62	115.4				
Junction 4	J4							45.6	1.20	0.37		1026.86	456.4				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	6.54	4.8	50.4	1.14	0.36	90.94	1117.80	457.6	0.04	2.21		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.59	0.32	238.85	238.85	121.3				
Junction 5	J5							50.4	1.14	0.35		1356.65	544.7				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	7.82	1.4	51.8	1.13	0.35	21.49	1378.14	542.8	0.04	2.21		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	2.17	0.43	130.52	130.52	121.0				
Junction 6	J6							51.8	1.13	0.36		1508.66	605.8				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	6.24	3.7	55.5	1.09	0.35	77.69	1586.35	603.3	0.04	2.75		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	1.91	0.38	383.83	383.83	280.0				
Junction 7	J7							55.5	1.09	0.35		1970.18	763.4				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	8.72	3.6	59.1	1.06	0.35	114.13	2084.31	764.0	0.04	2.61		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	1.97	0.39	134.68	134.68	103.8				
Junction 8	J8							59.1	1.06	0.35		2218.99	819.9				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	2.30	0.45	173.73	173.73	179.3				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.46	0.47	165.79	165.79	192.9				
Junction J9A								11.5	2.30	0.46		339.52	359.9				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	10.60	2.1	13.6	2.12	0.46	21.14	360.66	351.0	0.04	1.57		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	6.74	3.7	62.8	1.03	0.34	50.58	2269.57	805.9	0.04	3.08		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	2.30	0.45	112.02	112.02	115.6				
Junction 9	J9A,J9							62.8	1.03	0.36		2742.25	1028.0				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	5.31	3.2	66.0	1.01	0.36	57.78	2800.03	1014.3	0.04	3.87		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	2.35	0.46	70.08	70.08	75.2				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	2.81	0.53	43.22	43.22	64.0				
Junction 10	J10							66.0	1.01	0.36		2913.33	1069.4				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	6.66	7.6	73.7	0.96	0.35	190.84	3104.17	1044.6	0.04	3.73		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	2.17	0.43	265.58	265.58	246.3				
Junction 11	J11							73.7	0.96	0.36		3369.75	1153.0				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	2.35	0.46	93.86	93.86	100.7				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.37	0.46	116.31	116.31	126.7				
Junction 13								11.0	2.35	0.46		210.17	226.3				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	9.22	4.0	15.0	2.03	0.45	54.66	264.83	240.1	0.04	1.43		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	10.92	1.5	75.1	0.95	0.35	69.68	3439.43	1152.8	0.04	3.03		
Junction 12	J12							75.1	0.95	0.36		3704.26	1264.8				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	8.37	2.5	77.6	0.93	0.36	87.79	3792.05	1258.2	0.04	3.67		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	1.97	0.39	234.44	234.44	180.7				
Junction 14	J14							77.6	0.93	0.36		4026.49	1343.8				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	8.43	6.8	84.4	0.90	0.34	351.98	4378.47	1335.9	0.04	3.77		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.48	0.48	48.77	48.77	57.7				
Junction 15	J15							84.4	0.90	0.34		4427.24	1356.8				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	2.10	0.41	197.82	197.82	171.8				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.46	0.47	162.07	162.07	188.6				
Junction 24	J24							14.0	2.10	0.44		359.89	332.7				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	12.14	1.6	15.6	1.99	0.44	32.03	391.92	341.7	0.04	1.51		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	2.91	0.54	68.33	68.33	107.2				
Junction 25	J25							15.6	1.99	0.45		460.25	415.1				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	8.67	3.5	87.8	0.88	0.34	49.63	4476.87	1337.2	0.04	3.70		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	10.96	3.3	18.9	1.82	0.44	44.65	504.90	408.6	0.04	1.78		
CAT CYN 33	Z, J16	Initial Area	417	2959	14.1%		7.5	7.5	2.81	0.53	49.02	49.02	72.6				
Junction 16	J16							87.8	0.88	0.35		5030.79	1557.3				
CAT CYN 36A	AA, BA	Initial Area	296	1711	17.3%		5.0	5.0	3.41	0.60	30.36	30.36	62.6				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	9.46	2.8	7.8	2.76	0.57	23.84	54.20	84.8	0.04	0.74		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	9.29	2.2	90.1	0.87	0.35	51.89	5082.68	1544.9	0.04	3.83		
Junction 17	J17							90.1	0.87	0.36		5136.88	1587.5				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	2.73	0.51	46.04	46.04	64.7				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	2.35	0.46	173.56	173.56	186.1				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.40	0.46	137.55	137.55	153.5				
Junction 26	J26							11.0	2.35	0.47		357.15	392.0				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	8.59	4.8	94.8	0.85	0.35	129.3	5266.18	1563.1	0.04	4.07		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	10.48	4.2	15.2	2.01	0.46	50.69	407.84	376.7	0.04	1.74		
Junction 18	J18							94.8	0.85	0.36		5674.02	1721.8				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	4.04	0.68	14.93	14.93	40.8				
CAT CYN 40A1	BB, J28	BB-J28	109	1038	10.5%	8.80	2.0	5.5	3.27	0.64	9.83	24.76	51.9	0.04	0.62		
CAT CYN 40A2	AA,J28	Initial Area	379	3110	12.2%		9.5	9.5	2.52	0.48	82.62	82.62	100.4				
Junction 28	J28							9.5	2.52	0.61		107.38	165.8				
CAT CYN 40B1	AD, BC	Initial Area	288	2356	12.2%		7.5	7.5	2.81	0.53	40.60	40.60	60.2				
CAT CYN 40B	BC, J27	BC-J27	72	884	8.1%	8.88	1.7	9.2	2.56	0.52	8.4	49.00	65.3	0.04	0.76		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	10.76	1.1	10.6	2.39	0.60	12.06	119.44	170.7	0.04	1.13		
Junction 27	J27							10.6	2.39	0.70		168.44	282.7				
CAT CYN 40	J27,J19	J27-J19	40	2450	1.6%	6.01	6.8	17.4	1.89	0.69	8.17	176.61	229.5	0.04	1.42		
CAT CYN 39	J18,J19	J18-J19	101	2671	3.8%	20.08	2.2	97.0	0.84	0.36	7.45	5681.47	1703.8	0.04	4.62		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	2.25	0.44	123.12	123.12	122.5				
Junction 19	J19							97.0	0.84	0.37		5981.20	1851.2				
CAT CYN 43A	AG, BD	Initial Area	269	1114	24.2%		3.2	3.2	4.21	0.70	8.20	8.20	24.0				
CAT CYN 43	BD, J20	BD-J20	101	1290	7.8%	6.88	3.1	6.3	3.05	0.60	19.88	28.08	51.3	0.04	0.54		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	11.44	1.8	98.9	0.83	0.37	44.86	6026.06	1839.3	0.04	3.81		
Junction 20	J20							98.9	0.83	0.37		6054.14	1858.0				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 45A	AE, BE	Initial Area	282	1507	18.7%		4.3	4.3	3.66	0.63	18.48	18.48	42.9				
CAT CYN 45	BE, J21	BE-J21	108	1389	7.8%	7.98	2.9	7.2	2.87	0.60	10.43	28.91	49.6	0.04	0.67		
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	9.57	1.7	100.6	0.82	0.36	108.43	6162.57	1853.3	0.04	4.12		
Junction 21	J21							100.6	0.82	0.37		6191.48	1867.5				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	2.70	0.51	48.73	48.73	67.0				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	8.42	2.8	103.4	0.81	0.36	125.08	6316.56	1855.1	0.04	4.40		
Junction 22	J22							103.4	0.81	0.36		6365.29	1875.3				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	4.27	0.70	13.36	13.36	40.1				
CAT CYN 49B	AL, J29		35	417	8.4%	8.06	0.9	4.0	3.81	0.69	5.53	18.89	49.4	0.04	0.65		
CAT CYN 49A	AJ, J29	Initial Area	330	2263	14.6%		6.1	6.1	3.10	0.57	43.14	43.14	75.7				
Junction 29	J29							6.1	3.10	0.60		62.03	116.0				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	9.04	3.9	10.0	2.46	0.55	37.43	99.46	135.4	0.04	1.03		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	10.23	7.0	110.4	0.79	0.35	286.36	6651.65	1841.9	0.04	4.06		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	2.25	0.44	243.99	243.99	242.7				
Junction 23	J23							110.4	0.79	0.36		6995.10	1970.3				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
10 Year Flow - PRE CONSTRUCTION																	
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	230	2558	9.0%		8.5	8.5	2.25	0.44	47.71	47.71	47.2				
NNBL2-2	2B, J1	Initial Area	230	1927	11.9%		7.0	7.0	2.47	0.48	23.71	23.71	27.8				
NNBL2-3	2C, J1	Initial Area	240	1874	12.8%		7.0	7.0	2.47	0.48	28.5	28.50	33.4				
Junction 1								8.5	2.25	0.46		99.92	103.1				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	3.82	11.0	19.5	1.51	0.40	51.72	151.64	92.6	0.04	0.37		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	1.99	0.40	78.76	78.76	61.9				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	2.77	0.52	19.95	19.95	28.8				
Junction 2	J2							19.5	1.51	0.41		250.35	155.2				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	7.14	4.8	24.4	1.36	0.39	54.73	305.08	159.3	0.04	1.07		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	3.05	0.56	15.65	15.65	26.7				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	2.77	0.52	21.99	21.99	31.7				
Junction 3	J3							24.4	1.36	0.40		342.72	186.7				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	6.89	3.5	27.8	1.27	0.39	22.03	364.75	182.0	0.04	1.16		
NNBL1-1	1A, J4	Initial Area	410	5501	7.4%		17.2	17.2	1.60	0.32	112.2	112.20	57.7				
Junction 4	J4							27.8	1.27	0.38		476.95	227.9				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	2.47	0.48	35.8	35.80	42.0				
NNBL2-12	2J,J5	Initial Area	192	1139	16.8%		4.0	4.0	3.23	0.58	16.24	16.24	30.5				
Junction 5	J5							7.0	2.47	0.51		52.04	65.3				
NNBL2-13	J5,J6	J3-J4	83	1700	4.9%	6.96	4.1	11.1	1.98	0.46	40.03	92.07	83.7	0.04	0.77		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	2.25	0.44	50.68	50.68	50.2				
Junction 6								11.1	1.98	0.45		142.75	127.9				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	5.30	3.1	14.2	1.76	0.44	13.41	156.16	121.7	0.04	1.26		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	4.85	2.9	30.8	1.21	0.37	15.71	492.66	221.6	0.04	1.32		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	2.77	0.52	23.12	23.12	33.3				
Junction 7	J7							30.8	1.21	0.39		671.94	320.2				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	8.43	4.5	35.2	1.14	0.38	45.45	717.39	310.9	0.04	1.72		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	2.66	0.50	27.27	27.27	36.5				
Junction 8	J8							35.2	1.14	0.39		744.66	326.5				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	7.32	7.3	42.5	1.04	0.37	55.98	800.64	309.0	0.04	1.87		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	2.77	0.52	12.58	12.58	18.1				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	3.71	0.64	6.13	6.13	14.5				
Junction 10								5.5	2.77	0.56		18.71	29.0				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.07	9.3	14.8	1.72	0.44	25.07	43.78	33.0	0.04	0.68		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	3.71	0.64	6.78	6.78	16.1				
Junction 11	J11							14.8	1.72	0.46		50.56	40.5				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	6.41	5.0	19.8	1.50	0.39	42.5	93.06	54.2	0.04	0.75		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	3.71	0.64	12.04	12.04	28.5				
Junction 12	J12							19.8	1.50	0.42		105.10	65.7				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	8.50	2.3	22.1	1.42	0.40	16.97	122.07	69.2	0.04	0.94		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	2.45	0.47	23.35	23.35	27.1				
Junction 13	J13							22.1	1.42	0.41		145.42	84.9				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	6.60	1.5	23.6	1.38	0.40	8.43	153.85	85.3	0.04	1.22		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	2.77	0.52	16.27	16.27	23.5				
Junction 14	J14							23.6	1.38	0.41		170.12	97.0				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	7.63	1.8	25.4	1.33	0.40	15.07	185.19	98.9	0.04	0.97		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	2.56	0.49	18.70	18.70	23.4				
Junction 15	J15							25.4	1.33	0.41		203.89	111.0				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	7.24	1.8	27.2	1.29	0.40	14.11	218.00	111.9	0.04	0.86		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	3.23	0.58	9.9	9.90	18.6				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.19	0.43	39.82	39.82	37.5				
Junction 1								9.0	2.19	0.46		49.72	50.1				

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LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	5.24	7.5	16.5	1.64	0.38	81.59	131.31	81.3	0.04	0.68		
LGN CYN 4	C,J2	Initial Area	287	1723	16.7%		6.0	6.0	2.66	0.50	23.03	23.03	30.8				
Junction 2	J2							16.5	1.64	0.40		154.34	100.3				
LGN CYN 5	J2,J3	J2-J3	8	510	1.7%	4.93	1.7	18.2	1.56	0.39	9.18	163.52	100.0	0.04	1.04		
LGN CYN 6	D,J3	Initial Area	285	2578	11.0%		8.0	8.0	2.31	0.45	33.34	33.34	34.8				
Junction 3	J3							18.2	1.56	0.40		196.86	123.5				
LGN CYN 7	J3,J4	J3-J4	33	587	5.6%	7.17	1.4	19.6	1.51	0.40	5.32	202.18	121.7	0.04	0.73		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	2.45	0.47	18.54	18.54	21.5				
LGN CYN 9	F, J4	Initial Area	321	3298	9.7%		10.1	10.1	2.07	0.41	64.82	64.82	55.0				
Junction 4	J4							19.6	1.51	0.41		285.54	175.0				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.22	3.4	22.9	1.40	0.40	18.52	304.06	169.2	0.04	1.73		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	2.47	0.48	40.46	40.46	47.5				
Junction 5	J5							22.9	1.40	0.41		344.52	196.1				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	7.61	4.7	27.7	1.28	0.38	64.42	408.94	199.5	0.04	1.14		
LGN CYN 13	G,J6	Initial Area	320	1808	17.7%		5.2	5.2	2.85	0.53	72.61	72.61	109.7				
Junction 6	J6							27.7	1.28	0.40		481.55	248.6				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	5.44	4.3	32.0	1.19	0.39	52.08	533.63	245.8	0.04	1.55		
LGN CYN 15	H,J7	Initial Area	267	2128	12.5%		6.5	6.5	2.56	0.49	40.85	40.85	51.1				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	8.66	8.66	12.5				
Junction 7	J7							32.0	1.19	0.40		583.14	274.9				

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Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	6.97	3.1	35.1	1.14	0.39	37.96	621.10	272.0	0.04	1.67		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	2.56	0.49	22.38	22.38	28.0				
Junction 8	J8							35.1	1.14	0.39		643.48	284.5				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	7.87	2.8	38.0	1.10	0.38	46.44	689.92	284.3	0.04	1.35		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	2.58	0.49	21.61	21.61	27.4				
Junction 9	J9							38.0	1.10	0.38		711.53	295.9				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	7.55	1.5	39.5	1.08	0.37	20.72	732.25	294.7	0.04	1.59		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	2.77	0.52	23.15	23.15	33.4				
Junction 10	J10							39.5	1.08	0.38		755.40	307.6				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	8.65	1.6	41.1	1.05	0.37	20.28	775.68	305.7	0.04	1.59		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	2.93	0.54	16.4	16.40	26.0				
Junction 11	J11							41.1	1.05	0.38		792.08	315.1				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	9.99	3.5	44.6	1.01	0.36	52.63	844.71	312.5	0.04	1.77		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	2.62	0.50	21.56	21.56	28.1				
Junction 12	J12							44.6	1.01	0.37		866.27	323.4				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	9.01	2.3	46.9	0.99	0.36	26.06	892.33	320.1	0.04	1.95		

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	2.31	0.45	33.14	33.14	34.6				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	2.70	0.51	19.71	19.71	27.2				
Junction 1								8.0	2.31	0.47		52.85	57.9				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	6.65	5.1	13.1	1.83	0.42	46.79	99.64	77.0	0.04	0.83		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	2.90	0.54	31.97	31.97	49.9				
Junction 2	J2							13.1	1.83	0.45		131.61	108.4				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	7.02	4.2	17.3	1.60	0.42	44.86	176.47	117.9	0.04	1.02		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.07	0.41	63.01	63.01	53.5				
Junction 3	J3							17.3	1.60	0.42		239.48	159.2				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	9.05	1.7	18.9	1.53	0.41	8.79	248.27	156.5	0.04	1.24		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	1.83	0.37	72.00	72.00	48.5				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.07	0.41	53.94	53.94	45.8				
Junction 4	J4							18.9	1.53	0.40		374.21	230.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	6.48	2.4	21.3	1.45	0.40	18.75	392.96	225.9	0.04	1.76		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	1.91	0.38	57.52	57.52	41.7				
Junction 5	J5							21.3	1.45	0.40		450.48	257.6				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	10.05	0.7	22.0	1.43	0.39	23.30	473.78	263.2	0.04	1.50		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.13	0.42	79.32	79.32	71.1				
Junction 6	J6							22.0	1.43	0.39		553.10	310.8				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	6.46	4.1	26.1	1.31	0.38	57.77	610.87	305.5	0.04	1.83		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	2.47	0.48	34.70	34.70	40.7				
Junction 7	J7							26.1	1.31	0.39		645.57	327.2				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	9.60	3.2	29.3	1.24	0.37	64.56	710.13	328.5	0.04	1.74		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	19.74	19.74	28.5				
Junction 8	J8							29.3	1.24	0.38		729.87	341.3				

Rational Method
Pre Construction
Q= 10 YEAR FLOW

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	1.77	0.35	117.13	117.13	73.5				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	3.08	0.56	12.59	12.59	21.9				
Junction 12								14.0	1.77	0.37		129.72	86.1				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	7.20	4.9	18.9	1.53	0.36	48.49	178.21	97.3	0.04	0.99		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.19	0.43	53.73	53.73	50.6				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	3.05	0.56	11.00	11.00	18.8				
Junction 13	J13							18.9	1.53	0.38		242.94	142.2				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	3.71	4.4	23.3	1.39	0.38	8.92	251.86	132.0	0.04	1.65		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	2.77	0.52	21.83	21.83	31.5				
Junction 14	J14							23.3	1.39	0.39		273.69	147.7				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	7.20	4.0	27.3	1.28	0.37	42.44	316.13	150.4	0.04	1.31		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	2.24	0.44	43.38	43.38	42.5				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	2.50	0.48	16.5	16.50	19.9				
Junction 15	J15							27.3	1.28	0.38		376.01	185.1				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	9.48	1.1	28.4	1.26	0.38	9.39	385.40	184.3	0.04	1.29		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	2.47	0.48	29.51	29.51	34.6				
Junction 16	J16							28.4	1.26	0.39		414.91	202.0				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	7.26	4.4	32.8	1.18	0.38	28.82	443.73	196.1	0.04	1.56		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	2.47	0.48	24.93	24.93	29.3				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	8.68	3.1	32.4	1.18	0.22	39.08	768.95	203.0	0.04	1.81		
Junction 9	J9							32.8	1.18	0.28		1237.61	411.9				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	11.21	1.4	34.2	1.15	0.28	14.42	1252.03	407.3	0.04	1.76		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	2.70	0.51	14.88	14.88	20.5				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	1.66	0.33	45.78	45.78	25.3				
Junction 10	J10							34.2	1.15	0.29		1312.69	433.6				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.06	0.41	33.42	33.42	28.1				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	2.30	0.45	24.49	24.49	25.3				
Junction 18	J18							10.2	2.06	0.43		57.91	50.8				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	7.87	1.7	11.9	1.92	0.42	14.51	72.42	57.9	0.04	0.73		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	3.02	0.55	10.78	10.78	18.0				
Junction 19	J19							11.9	1.92	0.43		83.20	69.3				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	10.17	2.4	14.3	1.75	0.29	15.63	1328.32	669.4	0.04	1.90		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	8.40	1.0	29.4	1.24	0.43	2.49	85.69	45.5	0.04	0.83		
Junction 11	J11							29.4	1.24	0.30		1414.01	518.2				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	1.77	0.35	164.76	164.76	103.4				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	1.99	0.40	82.64	82.64	64.9				
Junction 1								14.0	1.77	0.37		247.40	161.2				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	7.57	2.3	34.8	1.14	0.35	37.57	284.97	113.4	0.04	1.31		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	1.77	0.35	177.26	177.26	111.3				
Junction 2	J2							34.8	1.14	0.35		462.23	185.3				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	6.08	6.9	41.7	1.05	0.33	68.72	530.95	183.3	0.04	1.48		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	1.66	0.33	106.30	106.30	58.7				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	1.99	0.40	93.88	93.88	73.7				
Junction 3	J3							41.7	1.05	0.34		731.13	259.3				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	5.96	7.1	48.8	0.97	0.32	86.11	817.24	254.2	0.04	1.79		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.39	0.28	209.62	209.62	80.4				
Junction 4	J4							48.8	0.97	0.31		1026.86	310.3				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	6.03	5.2	53.9	0.93	0.30	90.94	1117.80	308.4	0.04	1.96		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.34	0.26	238.85	238.85	83.9				
Junction 5	J5							53.9	0.93	0.29		1356.65	366.4				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	7.22	1.5	55.4	0.91	0.29	21.49	1378.14	364.5	0.04	1.96		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	1.83	0.37	130.52	130.52	87.9				
Junction 6	J6							55.4	0.91	0.30		1508.66	408.3				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	5.76	4.0	59.4	0.88	0.29	77.69	1586.35	404.3	0.04	2.44		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	1.61	0.32	383.83	383.83	199.8				
Junction 7	J7							59.4	0.88	0.30		1970.18	513.9				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	8.05	3.9	63.3	0.86	0.29	114.13	2084.31	511.0	0.04	2.31		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	1.66	0.33	134.68	134.68	74.4				
Junction 8	J8							63.3	0.86	0.29		2218.99	549.4				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	1.94	0.39	173.73	173.73	131.0				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.08	0.41	165.79	165.79	142.0				
Junction J9A								11.5	1.94	0.40		339.52	263.8				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	9.78	2.3	13.8	1.78	0.40	21.14	360.66	255.1	0.04	1.39		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	6.22	4.1	67.4	0.83	0.29	50.58	2269.57	538.4	0.04	2.73		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	1.94	0.39	112.02	112.02	84.5				
Junction 9	J9A,J9							67.4	0.83	0.30		2742.25	693.7				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	4.90	3.5	70.9	0.81	0.30	57.78	2800.03	682.6	0.04	3.43		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	1.99	0.40	70.08	70.08	55.1				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	2.39	0.46	43.22	43.22	47.8				
Junction 10	J10							70.9	0.81	0.30		2913.33	721.3				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	6.15	8.3	79.1	0.77	0.29	190.84	3104.17	698.7	0.04	3.30		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	1.83	0.37	265.58	265.58	178.8				
Junction 11	J11							79.1	0.77	0.30		3369.75	773.8				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	1.99	0.40	93.86	93.86	73.7				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.00	0.40	116.31	116.31	92.9				
Junction 13								11.0	1.99	0.40		210.17	165.8				

DS-13186-114 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R
Cat Canyon (con't)															
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	8.50	4.3	15.3	1.69	0.39	54.66	264.83	172.8	0.04	1.27
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	10.08	1.6	80.7	0.76	0.29	69.68	3439.43	771.7	0.04	2.68
Junction 12	J12							80.7	0.76	0.30		3704.26	849.6		
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	7.73	2.7	83.4	0.75	0.30	87.79	3792.05	842.5	0.04	3.26
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	1.66	0.33	234.44	234.44	129.5		
Junction 14	J14							83.4	0.75	0.30		4026.49	901.2		
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	7.78	7.4	90.8	0.72	0.28	351.98	4378.47	886.0	0.04	3.35
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.10	0.42	48.77	48.77	42.5		
Junction 15	J15							90.8	0.72	0.28		4427.24	900.6		
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	1.77	0.35	197.82	197.82	124.2		
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.08	0.41	162.07	162.07	138.8		
Junction 24	J24							14.0	1.77	0.38		359.89	242.3		
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	11.20	1.7	15.7	1.67	0.38	32.03	391.92	247.3	0.04	1.34
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	2.47	0.48	68.33	68.33	80.2		
Junction 25	J25							15.7	1.67	0.39		460.25	301.7		
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	8.00	3.7	94.5	0.71	0.28	49.63	4476.87	886.0	0.04	3.28
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	10.12	3.6	19.3	1.52	0.38	44.65	504.90	293.9	0.04	1.58
CAT CYN 33	Z, J16	Initial Area	417	2959	14.1%		7.5	7.5	2.39	0.46	49.02	49.02	54.2		
Junction 16	J16							94.5	0.71	0.29		5030.79	1039.1		
CAT CYN 36A	AA, BA	Initial Area	296	1711	17.3%		5.0	5.0	2.90	0.54	30.36	30.36	47.4		
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	8.73	3.1	8.1	2.31	0.50	23.84	54.20	62.5	0.04	0.66
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	8.57	2.4	96.9	0.70	0.29	51.89	5082.68	1029.2	0.04	3.39
Junction 17	J17							96.9	0.70	0.30		5136.88	1059.5		

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	2.31	0.45	46.04	46.04	48.1				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	1.99	0.40	173.56	173.56	136.3				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.03	0.40	137.55	137.55	112.7				
Junction 26	J26							11.0	1.99	0.41		357.15	287.9				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	7.92	5.2	102.1	0.68	0.29	129.3	5266.18	1039.4	0.04	3.61		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	9.67	4.6	15.6	1.68	0.40	50.69	407.84	272.1	0.04	1.54		
Junction 18	J18							102.1	0.68	0.30		5674.02	1149.8				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	3.44	0.61	14.93	14.93	31.3				
CAT CYN 40A1	BB, J28	BB-J28	109	1038	10.5%	8.12	2.1	5.6	2.74	0.57	9.83	24.76	38.8	0.04	0.55		
CAT CYN 40A2	AA,J28	Initial Area	379	3110	12.2%		9.5	9.5	2.13	0.42	82.62	82.62	74.1				
Junction 28	J28							9.5	2.13	0.54		107.38	123.6				
CAT CYN 40B1	AD, BC	Initial Area	288	2356	12.2%		7.5	7.5	2.39	0.46	40.60	40.60	44.9				
CAT CYN 40B	BC, J27	BC-J27	72	884	8.1%	8.19	1.8	9.3	2.15	0.46	8.4	49.00	48.2	0.04	0.68		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	9.93	1.2	10.7	2.01	0.53	12.06	119.44	126.5	0.04	1.00		
Junction 27	J27							10.7	2.01	0.62		168.44	209.3				
CAT CYN 40	J27,J19	J27-J19	40	2450	1.6%	5.54	7.4	18.1	1.57	0.60	8.17	176.61	166.8	0.04	1.26		
CAT CYN 39	J18,J19	J18-J19	101	2671	3.8%	18.53	2.4	104.5	0.67	0.30	7.45	5681.47	1137.4	0.04	4.09		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	1.91	0.38	123.12	123.12	89.3				
Junction 19	J19							104.5	0.67	0.31		5981.20	1240.8				
CAT CYN 43A	AG, BD	Initial Area	269	1114	24.2%		3.2	3.2	3.59	0.63	8.20	8.20	18.5				
CAT CYN 43	BD, J20	BD-J20	101	1290	7.8%	6.35	3.4	6.6	2.54	0.53	19.88	28.08	37.6	0.04	0.48		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	10.56	2.0	106.5	0.67	0.31	44.86	6026.06	1231.5	0.04	3.38		
Junction 20	J20							106.5	0.67	0.31		6054.14	1244.8				

DS-13186-114							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 45A	AE, BE	Initial Area	282	1507	18.7%		4.3	4.3	3.12	0.57	18.48	18.48	32.7				
CAT CYN 45	BE, J21	BE-J21	108	1389	7.8%	7.37	3.1	7.4	2.40	0.53	10.43	28.91	36.7	0.04	0.60		
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	8.83	1.9	108.4	0.66	0.30	108.43	6162.57	1238.6	0.04	3.65		
Junction 21	J21							108.4	0.66	0.30		6191.48	1248.7				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	2.29	0.45	48.73	48.73	49.8				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	7.77	3.0	111.4	0.65	0.30	125.08	6316.56	1236.9	0.04	3.90		
Junction 22	J22							111.4	0.65	0.30		6365.29	1251.1				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	3.65	0.63	13.36	13.36	30.9				
CAT CYN 49B	AL, J29		35	417	8.4%	7.44	0.9	4.0	3.22	0.62	5.53	18.89	37.5	0.04	0.57		
CAT CYN 49A	AJ, J29	Initial Area	330	2263	14.6%		6.1	6.1	2.64	0.50	43.14	43.14	57.0				
Junction 29	J29							6.1	2.64	0.54		62.03	87.7				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	8.34	4.2	10.3	2.05	0.49	37.43	99.46	99.3	0.04	0.91		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	9.44	7.6	119.0	0.63	0.29	286.36	6651.65	1220.8	0.04	3.60		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	1.91	0.38	243.99	243.99	176.9				
Junction 23	J23							119.0	0.63	0.30		6995.10	1310.3				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
		100 Year Flow - POST CONSTRUCTION															
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	229	2372	9.7%		8.0	8.0	3.45	0.71	41.66	41.66	102.6				
NNBL2-2	2B, J1	Initial Area	218	2353	9.3%		7.5	7.5	3.56	1.07	23.82	23.82	90.7				
NNBL2-3	2C, J1	Initial Area	240	2253	10.7%		8.0	8.0	3.45	1.14	30.78	30.78	120.6				
Junction 1								8.0	3.45	0.94		96.26	311.2				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	5.41	7.8	15.8	2.49	0.63	46.6	142.86	226.0	0.04	0.62		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	2.96	0.68	80.33	80.33	162.0				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	4.13	0.69	19.95	19.95	56.6				
Junction 2	J2							15.8	2.49	0.65		243.14	396.4				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	9.28	3.7	19.5	2.25	0.61	54.73	297.87	412.5	0.04	1.59		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	4.55	0.73	15.65	15.65	52.0				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	4.13	0.69	21.99	21.99	62.4				
Junction 3	J3							19.5	2.25	0.62		335.51	472.3				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	8.68	2.8	22.3	2.11	0.61	22.03	357.54	462.9	0.04	1.65		
NNBL1-1	1A, J4	Initial Area	410	5898	7.0%		17.2	17.2	2.39	0.48	114.71	114.71	132.9				
Junction 4	J4							22.3	2.11	0.58		472.25	580.3				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	3.68	0.83	52.24	52.24	160.2				
NNBL2-13	J5,J6	J5-J6	83	1700	4.9%	9.01	3.1	10.1	3.08	0.77	40.71	92.95	219.5	0.04	1.14		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	3.35	0.60	50.68	50.68	101.6				
Junction 6								10.1	3.08	0.71		143.63	312.9				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	6.73	2.5	12.6	2.78	0.69	13.41	157.04	301.2	0.04	1.80		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	6.12	2.3	24.6	2.02	0.58	15.71	487.96	566.1	0.04	1.86		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	4.13	0.69	23.12	23.12	65.6				
Junction 7	J7							24.6	2.02	0.61		668.12	817.1				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	10.62	3.6	28.1	1.89	0.59	45.45	713.57	798.4	0.04	2.43		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	3.96	0.67	27.27	27.27	72.3				
Junction 8	J8							28.1	1.89	0.59		740.84	832.9				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	9.21	5.8	33.9	1.73	0.58	55.98	796.82	794.8	0.04	2.64		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	4.13	0.69	12.58	12.58	35.7				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	5.52	0.82	6.13	6.13	27.8				
Junction 10								5.5	4.13	0.73		18.71	56.5				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.96	7.6	13.1	2.73	0.61	25.07	43.78	72.4	0.04	0.91		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	5.52	0.82	6.78	6.78	30.7				
Junction 11	J11							13.1	2.73	0.64		50.56	87.6				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	7.82	4.1	17.2	2.39	0.56	42.5	93.06	124.0	0.04	1.01		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	5.52	0.82	12.04	12.04	54.6				
Junction 12	J12							17.2	2.39	0.59		105.10	147.6				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	10.37	1.9	19.1	2.28	0.57	16.97	122.07	157.7	0.04	1.27		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	3.66	0.63	23.35	23.35	54.1				
Junction 13	J13							19.1	2.28	0.58		145.42	191.4				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	8.06	1.3	20.4	2.21	0.57	8.43	153.85	193.7	0.04	1.64		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	4.13	0.69	16.27	16.27	46.2				
Junction 14	J14							20.4	2.21	0.58		170.12	218.4				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	9.31	1.5	21.8	2.14	0.57	15.07	185.19	224.9	0.04	1.30		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	3.81	0.65	18.70	18.70	46.5				
Junction 15	J15							21.8	2.14	0.58		203.89	250.9				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	8.84	1.5	23.3	2.07	0.57	14.11	218.00	255.0	0.04	1.16		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	4.81	0.76	9.9	9.90	36.0				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	3.26	0.59	39.82	39.82	76.2				
Junction 1								9.0	3.26	0.62		49.72	100.6				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	6.40	6.1	15.1	2.55	0.54	81.59	131.31	179.7	0.04	0.92		
LGN CYN 4	C,J2	Initial Area	287	1809	15.9%		6.0	6.0	3.96	0.73	19	19.00	54.7				
Junction 2	J2							15.1	2.55	0.56		150.31	214.8				
LGN CYN 5	J2,J3	J2-J3	8	501	1.7%	6.06	1.4	16.5	2.44	0.56	6.8	157.11	214.6	0.04	1.40		
LGN CYN 6	D,J3	Initial Area	286	2301	12.4%		8.0	8.0	3.45	0.70	36.15	36.15	87.8				
Junction 3	J3							16.5	2.44	0.59		193.26	276.7				
LGN CYN 7	J3,J4	J3-J4	33	585	5.6%	8.81	1.1	17.6	2.37	0.58	5.78	199.04	274.5	0.04	0.99		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	3.66	0.63	18.54	18.54	43.0				
LGN CYN 9	F, J4	Initial Area	239	3803	6.3%		10.1	10.1	3.09	0.73	68.07	68.07	153.6				
Junction 4	J4							17.6	2.37	0.62		285.65	420.0				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	5.28	2.7	20.3	2.21	0.61	18.52	304.17	410.0	0.04	2.42		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	3.68	0.64	40.46	40.46	94.9				
Junction 5	J5							20.3	2.21	0.61		344.63	467.0				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	9.50	3.8	24.1	2.04	0.58	64.42	409.05	483.1	0.04	1.59		
LGN CYN 13	G,J6	Initial Area	296	2838	10.4%		5.2	5.2	4.24	1.00	74.09	74.09	315.8				
Junction 6	J6							24.1	2.04	0.65		483.14	634.6				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	6.87	3.4	27.5	1.91	0.62	52.08	535.22	633.3	0.04	2.20		
LGN CYN 15	H,J7	Initial Area	257	2259	11.4%		6.5	6.5	3.81	0.85	41.34	41.34	133.7				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	4.13	0.69	8.66	8.66	24.6				
Junction 7	J7							27.5	1.91	0.64		585.22	711.6				

Rational Method
Post Construction
Q= 100 YEAR FLOW

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	8.81	2.5	30.0	1.83	0.62	37.32	622.54	708.1	0.04	2.37		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	3.81	0.65	22.38	22.38	55.7				
Junction 8	J8							30.0	1.83	0.62		644.92	734.8				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	9.95	2.2	32.3	1.77	0.60	46.44	691.36	739.0	0.04	1.92		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	3.84	0.66	21.61	21.61	54.4				
Junction 9	J9							32.3	1.77	0.61		712.97	764.1				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	9.47	1.2	33.5	1.74	0.60	20.72	733.69	763.2	0.04	2.24		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	4.13	0.69	23.15	23.15	65.7				
Junction 10	J10							33.5	1.74	0.60		756.84	790.9				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	10.87	1.3	34.8	1.71	0.59	20.28	777.12	788.5	0.04	2.24		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	4.37	0.71	16.4	16.40	51.0				
Junction 11	J11							34.8	1.71	0.60		793.52	808.4				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	12.55	2.8	37.6	1.65	0.58	52.63	846.15	807.9	0.04	2.50		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	3.90	0.66	21.56	21.56	55.7				
Junction 12	J12							37.6	1.65	0.58		867.71	831.4				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	11.30	1.8	39.4	1.61	0.57	26.06	893.77	826.1	0.04	2.73		

Rational Method
Post Construction
Q= 100 YEAR FLOW

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	3.45	0.61	33.14	33.14	69.8				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	4.03	0.68	19.71	19.71	53.7				
Junction 1								8.0	3.45	0.63		52.85	115.8				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	8.11	4.2	12.2	2.82	0.58	46.79	99.64	164.4	0.04	1.11		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	4.33	0.71	31.97	31.97	97.8				
Junction 2	J2							12.2	2.82	0.61		131.61	228.3				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	8.56	3.4	15.6	2.51	0.58	44.86	176.47	256.9	0.04	1.37		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	3.09	0.56	63.01	63.01	109.7				
Junction 3	J3							15.6	2.51	0.58		239.48	345.9				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	11.04	1.4	17.0	2.41	0.57	8.79	248.27	342.2	0.04	1.67		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	2.74	0.52	72.00	72.00	101.6				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	3.09	0.56	53.94	53.94	93.9				
Junction 4	J4							17.0	2.41	0.56		374.21	504.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	7.90	1.9	18.9	2.29	0.55	18.75	392.96	498.6	0.04	2.37		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	2.84	0.53	57.52	57.52	86.8				
Junction 5	J5							18.9	2.29	0.55		450.48	568.4				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	12.26	0.5	19.4	2.26	0.55	23.30	473.78	583.9	0.04	2.03		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	3.18	0.58	79.32	79.32	145.2				
Junction 6	J6							19.4	2.26	0.55		553.10	686.9				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	7.88	3.4	22.8	2.09	0.54	57.77	610.87	686.1	0.04	2.47		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	3.68	0.64	34.70	34.70	81.4				
Junction 7	J7							22.8	2.09	0.54		645.57	732.3				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	11.71	2.6	25.5	1.98	0.53	64.56	710.13	745.6	0.04	2.35		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	4.13	0.69	19.74	19.74	56.0				
Junction 8	J8							25.5	1.98	0.53		729.87	772.5				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	2.64	0.50	117.13	117.13	155.2				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	4.60	0.74	12.59	12.59	42.6				
Junction 12								14.0	2.64	0.52		129.72	179.6				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	8.78	4.0	18.0	2.34	0.51	48.49	178.21	211.1	0.04	1.33		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	3.26	0.59	53.73	53.73	102.8				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	4.55	0.73	11.00	11.00	36.5				
Junction 13	J13							18.0	2.34	0.53		242.94	303.7				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	4.53	3.6	21.6	2.15	0.53	8.92	251.86	286.3	0.04	2.22		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	4.13	0.69	21.83	21.83	62.0				
Junction 14	J14							21.6	2.15	0.54		273.69	318.5				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	8.78	3.3	24.9	2.00	0.52	42.44	316.13	331.5	0.04	1.77		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	3.34	0.60	43.38	43.38	86.1				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	3.73	0.64	16.5	16.50	39.6				
Junction 15	J15							24.9	2.00	0.54		376.01	404.5				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	11.56	0.9	25.8	1.97	0.53	9.39	385.40	404.7	0.04	1.74		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	3.68	0.64	29.51	29.51	69.2				
Junction 16	J16							25.8	1.97	0.54		414.91	441.7				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	8.86	3.6	29.4	1.85	0.53	28.82	443.73	434.8	0.04	2.10		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	3.68	0.64	24.93	24.93	58.5				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	10.59	2.6	28.0	1.89	0.38	39.08	768.95	551.6	0.04	2.44		
Junction 9	J9							29.4	1.85	0.44		1237.61	1003.1				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	13.68	1.1	30.6	1.82	0.44	14.42	1252.03	994.5	0.04	2.37		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	4.03	0.68	14.88	14.88	40.5				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	2.48	0.48	45.78	45.78	54.1				
Junction 10	J10							30.6	1.82	0.44		1312.69	1052.4				

Rational Method
Post Construction
Q= 100 YEAR FLOW

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	3.07	0.56	33.42	33.42	57.7				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	3.43	0.61	24.49	24.49	51.1				
Junction 18	J18							10.2	3.07	0.58		57.91	103.4				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	9.60	1.4	11.6	2.90	0.57	14.51	72.42	120.0	0.04	0.98		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	4.50	0.73	10.78	10.78	35.2				
Junction 19	J19							11.6	2.90	0.59		83.20	142.7				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	12.41	2.0	13.5	2.68	0.44	15.63	1328.32	1576.0	0.04	2.56		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	10.25	0.8	26.7	1.94	0.59	2.49	85.69	97.5	0.04	1.11		
Junction 11	J11							26.7	1.94	0.45		1414.01	1236.3				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	2.64	0.50	164.76	164.76	218.3				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	2.96	0.55	82.64	82.64	134.1				
Junction 1								14.0	2.64	0.52		247.40	337.7				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	9.24	1.9	29.9	1.84	0.50	37.57	284.97	260.0	0.04	1.77		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	2.64	0.50	177.26	177.26	234.8				
Junction 2	J2							29.9	1.84	0.50		462.23	423.2				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	7.42	5.7	35.6	1.69	0.48	68.72	530.95	428.8	0.04	1.99		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	2.48	0.48	106.30	106.30	125.6				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	2.96	0.55	93.88	93.88	152.3				
Junction 3	J3							35.6	1.69	0.49		731.13	601.2				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	7.28	5.8	41.4	1.57	0.47	86.11	817.24	601.8	0.04	2.41		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	2.08	0.41	209.62	209.62	180.0				
Junction 4	J4							41.4	1.57	0.46		1026.86	737.6				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	7.36	4.2	45.6	1.50	0.44	90.94	1117.80	744.8	0.04	2.64		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	2.00	0.40	238.85	238.85	190.2				
Junction 5	J5							45.6	1.50	0.44		1356.65	887.3				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	8.81	1.2	46.9	1.48	0.43	21.49	1378.14	885.4	0.04	2.65		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	2.74	0.52	130.52	130.52	184.1				
Junction 6	J6							46.9	1.48	0.44		1508.66	985.0				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	7.02	3.3	50.1	1.43	0.43	77.69	1586.35	985.4	0.04	3.29		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	2.41	0.47	383.83	383.83	430.5				
Junction 7	J7							50.1	1.43	0.44		1970.18	1241.8				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	9.82	3.2	53.4	1.39	0.43	114.13	2084.31	1249.0	0.04	3.12		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	2.48	0.48	134.68	134.68	159.2				
Junction 8	J8							53.4	1.39	0.43		2218.99	1338.4				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	2.90	0.54	173.73	173.73	271.6				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	3.10	0.57	165.79	165.79	291.0				
Junction J9A								11.5	2.90	0.55		339.52	543.8				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	11.93	1.9	13.4	2.70	0.55	21.14	360.66	534.7	0.04	1.88		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	7.59	3.3	56.7	1.35	0.43	50.58	2269.57	1318.3	0.04	3.68		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	2.90	0.54	112.02	112.02	175.1				
Junction 9	J9A,J9							56.7	1.35	0.45		2742.25	1667.7				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	5.98	2.8	59.5	1.32	0.45	57.78	2800.03	1648.8	0.04	4.63		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	2.96	0.55	70.08	70.08	113.7				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	3.56	0.62	43.22	43.22	95.9				
Junction 10	J10							59.5	1.32	0.45		2913.33	1735.0				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	7.50	6.8	66.3	1.25	0.44	190.84	3104.17	1705.4	0.04	4.45		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	2.74	0.52	265.58	265.58	374.6				
Junction 11	J11							66.3	1.25	0.44		3369.75	1877.1				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	2.96	0.55	93.86	93.86	152.3				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.99	0.55	116.31	116.31	191.6				
Junction 13								11.0	2.96	0.55		210.17	342.2				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	10.38	3.6	14.6	2.59	0.54	54.66	264.83	369.3	0.04	1.71		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	12.30	1.3	67.6	1.24	0.44	69.68	3439.43	1880.5	0.04	3.62		
Junction 12	J12							67.6	1.24	0.45		3704.26	2057.5				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	9.43	2.2	69.8	1.22	0.44	87.79	3792.05	2051.4	0.04	4.39		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	2.48	0.48	234.44	234.44	277.1				
Junction 14	J14							69.8	1.22	0.44		4026.49	2188.3				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	9.49	6.0	75.8	1.18	0.43	351.98	4378.47	2194.6	0.04	4.51		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	3.13	0.57	48.77	48.77	87.0				
Junction 15	J15							75.8	1.18	0.43		4427.24	2227.2				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	2.64	0.50	197.82	197.82	262.1				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	3.10	0.57	162.07	162.07	284.5				
Junction 24	J24							14.0	2.64	0.53		359.89	504.2				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	13.67	1.4	15.4	2.52	0.53	32.03	391.92	520.9	0.04	1.81		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	3.68	0.64	68.33	68.33	160.2				
Junction 25	J25							15.4	2.52	0.54		460.25	630.7				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	9.77	3.1	78.9	1.15	0.43	49.63	4476.87	2197.7	0.04	4.42		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	12.34	2.9	18.3	2.32	0.54	44.65	504.90	627.1	0.04	2.13		
CAT CYN 33	Z, J16	Initial Area	417	2957	14.1%		7.5	7.5	3.56	0.83	48.65	48.65	143.0				
Junction 16	J16							78.9	1.15	0.44		5030.42	2555.7				
CAT CYN 36A	AA, BA	Initial Area	296	1727	17.1%		5.0	5.0	4.33	1.67	33.86	33.86	244.5				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	13.41	2.0	7.0	3.69	0.68	23.6	57.46	144.5	0.04	1.25		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	10.46	2.0	80.9	1.14	0.44	50.35	5080.77	2537.6	0.04	4.58		
Junction 17	J17							80.9	1.14	0.45		5138.23	2646.7				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	3.45	0.61	46.04	46.04	97.0				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	2.96	0.55	173.56	173.56	281.6				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	3.03	0.56	137.55	137.55	231.9				
Junction 26	J26							11.0	2.96	0.56		357.15	591.6				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	9.72	4.2	85.1	1.11	0.45	129.21	5267.44	2612.7	0.04	4.91		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	11.80	3.8	14.8	2.57	0.55	50.69	407.84	577.8	0.04	2.08		
Junction 18	J18							85.1	1.11	0.45		5675.28	2862.5				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	5.13	2.19	17.20	17.20	193.3				
CAT CYN 40A1	BB, J28	BB-J28	121	1038	11.6%	13.78	1.3	4.8	4.43	1.78	8.62	25.82	203.6	0.04	1.13		
CAT CYN 40A2	AA,J28	Initial Area	357	2963	12.0%		8.0	8.0	3.45	0.89	82.79	82.79	255.1				
Junction 28	J28							8.0	3.45	1.10		108.61	413.8				
CAT CYN 40B1	AD, BC	Initial Area	279	2472	11.3%		7.1	7.1	3.66	1.38	45.65	45.65	229.9				
CAT CYN 40B2	BC, BC1	BC-BC1	136	846	16.0%	17.56	0.8	7.9	3.47	1.36	9.39	55.04	259.3	0.04	1.28		
CAT CYN 40B	BC1, J27	BC-J27	19	377	4.9%	9.72	0.6	8.5	3.35	1.33	1.86	56.90	253.5	0.04	1.28		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	13.80	0.9	8.9	3.29	1.06	11.19	119.80	415.6	0.04	1.64		
Junction 27	J27							8.9	3.29	1.14		176.70	664.7				
CAT CYN 40	J27,J19	J27-J19	40	688	5.8%	14.28	0.8	9.7	3.15	1.12	7.91	184.61	652.0	0.04	2.00		
CAT CYN 39	J18,J19	J18-J19	2	407	0.5%	8.19	0.8	85.9	1.11	0.45	7.45	5682.73	2850.9	0.04	5.55		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	2.84	0.53	123.12	123.12	185.8				
Junction 19	J19							85.9	1.11	0.48		5990.46	3152.2				
CAT CYN 43	BF, J20	Initial Area	51	686	7.4%		3.9	3.9	4.87	1.05	4.26	4.26	21.8	0.04	0.93		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	13.01	1.6	87.5	1.10	0.47	42.06	6032.52	3133.3	0.04	4.62		
Junction 20	J20							87.5	1.10	0.47		6036.78	3138.3				

DS-13186-115							TOC (min)				Area						
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Cat Canyon (con't)																	
CAT CYN 43A	AG, BD	Initial Area	283	1052	26.9%		2.8	2.8	5.71	1.43	11.65	11.65	95.2				
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	9.13	1.8	89.4	1.09	0.47	105.65	6142.43	3130.3	0.04	3.84		
CAT CYN 44A	BJ,BH	Initial Area	77	1919	4.0%		10.0	10.0	3.10	0.76	23.74	23.74	56.1				
CAT CYN 45	BH,J21	BH-J21	59	713	8.3%	8.84	1.3	11.3	3.08	0.75	3.16	26.90	61.9	0.04	0.75		
Junction 21	J21							89.4	1.09	0.47		6180.98	3170.3				
CAT CYN 45A	AE, BE	Initial Area	298	1467	20.3%		4.3	4.3	4.65	0.80	18.85	18.85	70.1				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	3.41	0.60	47.36	47.36	97.8				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	9.56	2.5	91.8	1.07	0.47	122.7	6303.68	3154.8	0.04	5.33		
Junction 22	J22							91.8	1.07	0.47		6369.89	3201.7				
CAT CYN 49B1	AK,AL	Initial Area	165	1003	16.5%		3.1	3.1	5.44	2.68	15.32	15.32	223.1				
CAT CYN 49B	AL, J29		35	417	8.4%	12.56	0.6	4.9	4.39	2.25	4.68	20.00	197.4	0.04	1.26		
CAT CYN 49A	AJ, J29	Initial Area	330	2190	15.1%		6.1	6.1	3.93	0.71	41.14	41.14	114.9				
Junction 29	J29							6.1	3.93	1.21		61.14	291.8				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	11.59	3.0	9.1	3.24	0.97	37.43	98.57	311.1	0.04	1.49		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	11.63	6.2	98.0	1.04	0.46	286.32	6656.21	3158.6	0.04	4.93		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	2.84	0.53	243.99	243.99	368.1				
Junction 23	J23							98.0	1.04	0.47		6998.77	3393.1				

Rational Method
Post Construction
Q= 50 YEAR FLOW

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
50 Year Flow - POST CONSTRUCTION																	
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	229	2372	9.7%		8.0	8.0	3.13	0.71	41.66	41.66	92.9				
NNBL2-2	2B, J1	Initial Area	218	2353	9.3%		7.5	7.5	3.22	1.07	23.82	23.82	82.1				
NNBL2-3	2C, J1	Initial Area	240	2253	10.7%		8.0	8.0	3.13	1.14	30.78	30.78	109.2				
Junction 1								8.0	3.13	0.94		96.26	281.7				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	5.14	8.2	16.2	2.23	0.63	46.6	142.86	201.8	0.04	0.58		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	2.68	0.68	80.33	80.33	146.5				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	3.74	0.64	19.95	19.95	48.1				
Junction 2	J2							16.2	2.23	0.65		243.14	352.1				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	8.83	3.9	20.1	2.01	0.60	54.73	297.87	361.2	0.04	1.47		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	4.12	0.69	15.65	15.65	44.2				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	3.74	0.64	21.99	21.99	53.0				
Junction 3	J3							20.1	2.01	0.61		335.51	411.1				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	8.26	2.9	23.0	1.88	0.60	22.03	357.54	401.1	0.04	1.53		
NNBL1-1	1A, J4	Initial Area	410	5898	7.0%		17.2	17.2	2.16	0.48	114.71	114.71	120.2				
Junction 4	J4							23.0	1.88	0.57		472.25	505.6				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	3.33	0.83	52.24	52.24	145.0				
NNBL2-13	J5,J6	J5-J6	83	1700	4.9%	8.57	3.3	10.3	2.77	0.77	40.71	92.95	197.1	0.04	1.06		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	3.04	0.56	50.68	50.68	85.7				
Junction 6								10.3	2.77	0.69		143.63	275.2				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	6.41	2.6	12.9	2.48	0.67	13.41	157.04	263.0	0.04	1.67		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.82	2.4	25.4	1.79	0.56	15.71	487.96	491.9	0.04	1.73		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	3.74	0.64	23.12	23.12	55.7				
Junction 7	J7							25.4	1.79	0.59		668.12	708.4				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	10.10	3.7	29.2	1.68	0.58	45.45	713.57	689.1	0.04	2.26		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	3.59	0.63	27.27	27.27	61.3				
Junction 8	J8							29.2	1.68	0.58		740.84	717.8				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	8.76	6.1	35.3	1.53	0.56	55.98	796.82	681.5	0.04	2.45		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	3.74	0.64	12.58	12.58	30.3				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	5.00	0.77	6.13	6.13	23.8				
Junction 10								5.5	3.74	0.69		18.71	48.1				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.72	8.0	13.5	2.43	0.56	25.07	43.78	59.9	0.04	0.85		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	5.00	0.77	6.78	6.78	26.3				
Junction 11	J11							13.5	2.43	0.59		50.56	72.7				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	7.44	4.3	17.8	2.13	0.51	42.5	93.06	101.6	0.04	0.93		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	5.00	0.77	12.04	12.04	46.6				
Junction 12	J12							17.8	2.13	0.54		105.10	121.4				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	9.86	2.0	19.8	2.02	0.52	16.97	122.07	129.3	0.04	1.18		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	3.31	0.59	23.35	23.35	45.8				
Junction 13	J13							19.8	2.02	0.53		145.42	157.3				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	7.66	1.3	21.1	1.96	0.53	8.43	153.85	158.9	0.04	1.52		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	3.74	0.64	16.27	16.27	39.2				
Junction 14	J14							21.1	1.96	0.54		170.12	179.5				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	8.86	1.5	22.6	1.90	0.52	15.07	185.19	184.4	0.04	1.21		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	3.45	0.61	18.70	18.70	39.4				
Junction 15	J15							22.6	1.90	0.53		203.89	206.0				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	8.41	1.6	24.2	1.84	0.52	14.11	218.00	208.9	0.04	1.07		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	4.36	0.71	9.9	9.90	30.7				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.95	0.55	39.82	39.82	64.2				
Junction 1								9.0	2.95	0.58		49.72	85.0				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	6.08	6.4	15.4	2.28	0.50	81.59	131.31	148.5	0.04	0.86		
LGN CYN 4	C,J2	Initial Area	287	1809	15.9%		6.0	6.0	3.59	0.73	19	19.00	49.5				
Junction 2	J2							15.4	2.28	0.53		150.31	179.9				
LGN CYN 5	J2,J3	J2-J3	8	501	1.7%	5.77	1.4	16.9	2.18	0.52	6.8	157.11	180.0	0.04	1.30		
LGN CYN 6	D,J3	Initial Area	286	2301	12.4%		8.0	8.0	3.13	0.70	36.15	36.15	79.5				
Junction 3	J3							16.9	2.18	0.56		193.26	235.6				
LGN CYN 7	J3,J4	J3-J4	33	585	5.6%	8.38	1.2	18.1	2.11	0.55	5.78	199.04	233.2	0.04	0.92		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	3.31	0.59	18.54	18.54	36.3				
LGN CYN 9	F, J4	Initial Area	239	3803	6.3%		10.1	10.1	2.79	0.73	68.07	68.07	139.0				
Junction 4	J4							18.1	2.11	0.60		285.65	361.6				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	5.02	2.8	20.9	1.97	0.59	18.52	304.17	351.5	0.04	2.24		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	3.33	0.59	40.46	40.46	80.2				
Junction 5	J5							20.9	1.97	0.59		344.63	399.0				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	9.04	4.0	24.9	1.81	0.55	64.42	409.05	409.2	0.04	1.47		
LGN CYN 13	G,J6	Initial Area	296	2838	10.4%		5.2	5.2	3.84	1.00	74.09	74.09	285.9				
Junction 6	J6							24.9	1.81	0.62		483.14	544.1				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	6.54	3.6	28.5	1.70	0.59	52.08	535.22	540.0	0.04	2.04		
LGN CYN 15	H,J7	Initial Area	257	2259	11.4%		6.5	6.5	3.45	0.85	41.34	41.34	121.0				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	3.74	0.64	8.66	8.66	20.9				
Junction 7	J7							28.5	1.70	0.61		585.22	609.0				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	8.39	2.6	31.1	1.63	0.60	37.32	622.54	606.4	0.04	2.20		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	3.45	0.61	22.38	22.38	47.1				
Junction 8	J8							31.1	1.63	0.60		644.92	628.6				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	9.47	2.4	33.5	1.57	0.58	46.44	691.36	629.9	0.04	1.78		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	3.48	0.61	21.61	21.61	46.1				
Junction 9	J9							33.5	1.57	0.58		712.97	650.7				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	9.01	1.3	34.7	1.54	0.57	20.72	733.69	648.9	0.04	2.08		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	3.74	0.64	23.15	23.15	55.8				
Junction 10	J10							34.7	1.54	0.57		756.84	672.0				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	10.34	1.4	36.1	1.52	0.57	20.28	777.12	669.0	0.04	2.07		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	3.95	0.67	16.4	16.40	43.3				
Junction 11	J11							36.1	1.52	0.57		793.52	685.6				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	11.94	2.9	39.0	1.46	0.55	52.63	846.15	682.8	0.04	2.32		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	3.53	0.62	21.56	21.56	47.2				
Junction 12	J12							39.0	1.46	0.55		867.71	702.3				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	10.75	1.9	40.9	1.43	0.55	26.06	893.77	696.7	0.04	2.54		

Rational Method
Post Construction
Q= 50 YEAR FLOW

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	3.13	0.57	33.14	33.14	58.9				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	3.65	0.63	19.71	19.71	45.5				
Junction 1								8.0	3.13	0.59		52.85	97.9				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	7.72	4.4	12.4	2.53	0.54	46.79	99.64	136.9	0.04	1.03		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	3.92	0.66	31.97	31.97	83.1				
Junction 2	J2							12.4	2.53	0.57		131.61	190.6				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	8.15	3.6	16.0	2.24	0.54	44.86	176.47	212.8	0.04	1.27		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.79	0.52	63.01	63.01	92.2				
Junction 3	J3							16.0	2.24	0.53		239.48	286.8				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	10.50	1.4	17.4	2.15	0.53	8.79	248.27	283.2	0.04	1.55		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	2.48	0.48	72.00	72.00	85.0				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.79	0.52	53.94	53.94	78.9				
Junction 4	J4							17.4	2.15	0.52		374.21	417.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	7.52	2.0	19.5	2.04	0.51	18.75	392.96	411.7	0.04	2.20		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	2.57	0.49	57.52	57.52	72.7				
Junction 5	J5							19.5	2.04	0.51		450.48	469.4				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	11.67	0.6	20.0	2.01	0.51	23.30	473.78	481.6	0.04	1.88		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.88	0.54	79.32	79.32	122.2				
Junction 6	J6							20.0	2.01	0.51		553.10	567.1				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	7.50	3.6	23.6	1.86	0.50	57.77	610.87	564.3	0.04	2.29		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	3.33	0.59	34.70	34.70	68.8				
Junction 7	J7							23.6	1.86	0.50		645.57	602.7				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	11.14	2.8	26.4	1.76	0.49	64.56	710.13	611.7	0.04	2.18		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	3.74	0.64	19.74	19.74	47.5				
Junction 8	J8							26.4	1.76	0.49		729.87	634.1				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	2.39	0.46	117.13	117.13	129.6				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	4.16	0.69	12.59	12.59	36.2				
Junction 12								14.0	2.39	0.49		129.72	150.4				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	8.35	4.2	18.2	2.11	0.47	48.49	178.21	175.2	0.04	1.23		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.95	0.55	53.73	53.73	86.6				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	4.12	0.69	11.00	11.00	31.1				
Junction 13	J13							18.2	2.11	0.49		242.94	252.9				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	4.31	3.8	22.0	1.92	0.49	8.92	251.86	237.5	0.04	2.06		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	3.74	0.64	21.83	21.83	52.6				
Junction 14	J14							22.0	1.92	0.50		273.69	264.5				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	8.35	3.5	25.4	1.79	0.48	42.44	316.13	274.0	0.04	1.64		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	3.02	0.55	43.38	43.38	72.6				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	3.38	0.60	16.5	16.50	33.5				
Junction 15	J15							25.4	1.79	0.50		376.01	334.9				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	11.00	1.0	26.4	1.76	0.49	9.39	385.40	334.6	0.04	1.61		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	3.33	0.59	29.51	29.51	58.5				
Junction 16	J16							26.4	1.76	0.50		414.91	365.6				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	8.43	3.8	30.2	1.65	0.49	28.82	443.73	358.7	0.04	1.95		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	3.33	0.59	24.93	24.93	49.4				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	10.08	2.7	29.0	1.68	0.34	39.08	768.95	437.1	0.04	2.26		
Junction 9	J9							30.2	1.65	0.40		1237.61	812.1				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	13.02	1.2	31.4	1.62	0.40	14.42	1252.03	804.6	0.04	2.20		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	3.65	0.63	14.88	14.88	34.3				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	2.24	0.44	45.78	45.78	45.1				
Junction 10	J10							31.4	1.62	0.40		1312.69	852.5				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.78	0.52	33.42	33.42	48.5				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	3.11	0.57	24.49	24.49	43.1				
Junction 18	J18							10.2	2.78	0.54		57.91	87.1				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	9.14	1.4	11.6	2.61	0.53	14.51	72.42	100.6	0.04	0.91		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	4.08	0.68	10.78	10.78	29.9				
Junction 19	J19							11.6	2.61	0.55		83.20	119.8				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	11.80	2.1	13.7	2.41	0.40	15.63	1328.32	1287.0	0.04	2.38		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	9.75	0.9	27.3	1.73	0.55	2.49	85.69	81.0	0.04	1.03		
Junction 11	J11							27.3	1.73	0.41		1414.01	1005.3				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	2.39	0.46	164.76	164.76	182.3				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	2.68	0.51	82.64	82.64	112.5				
Junction 1								14.0	2.39	0.48		247.40	282.6				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	8.79	2.0	31.0	1.63	0.46	37.57	284.97	212.8	0.04	1.64		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	2.39	0.46	177.26	177.26	196.2				
Junction 2	J2							31.0	1.63	0.46		462.23	346.7				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	7.06	6.0	37.0	1.50	0.44	68.72	530.95	349.4	0.04	1.85		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	2.24	0.44	106.30	106.30	104.6				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	2.68	0.51	93.88	93.88	127.8				
Junction 3	J3							37.0	1.50	0.45		731.13	490.7				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	6.92	6.1	43.1	1.39	0.43	86.11	817.24	489.0	0.04	2.23		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.88	0.38	209.62	209.62	148.5				
Junction 4	J4							43.1	1.39	0.42		1026.86	598.8				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	7.00	4.4	47.6	1.33	0.41	90.94	1117.80	602.7	0.04	2.45		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.81	0.36	238.85	238.85	156.6				
Junction 5	J5							47.6	1.33	0.40		1356.65	717.6				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	8.38	1.3	48.9	1.31	0.40	21.49	1378.14	715.6	0.04	2.46		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	2.48	0.48	130.52	130.52	154.0				
Junction 6	J6							48.9	1.31	0.40		1508.66	797.2				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	6.68	3.4	52.3	1.27	0.40	77.69	1586.35	795.8	0.04	3.05		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	2.18	0.43	383.83	383.83	358.0				
Junction 7	J7							52.3	1.27	0.40		1970.18	1004.6				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	9.35	3.4	55.7	1.23	0.39	114.13	2084.31	1008.0	0.04	2.89		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	2.24	0.44	134.68	134.68	132.6				
Junction 8	J8							55.7	1.23	0.40		2218.99	1080.9				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	2.63	0.50	173.73	173.73	227.8				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.81	0.53	165.79	165.79	244.7				
Junction J9A								11.5	2.63	0.51		339.52	456.6				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	11.35	2.0	13.5	2.43	0.51	21.14	360.66	447.1	0.04	1.74		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	7.22	3.5	59.2	1.20	0.39	50.58	2269.57	1063.5	0.04	3.42		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	2.63	0.50	112.02	112.02	146.9				
Junction 9	J9A,J9							59.2	1.20	0.41		2742.25	1350.3				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	5.69	3.0	62.2	1.17	0.41	57.78	2800.03	1333.6	0.04	4.29		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	2.68	0.51	70.08	70.08	95.4				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	3.22	0.58	43.22	43.22	81.0				
Junction 10	J10							62.2	1.17	0.41		2913.33	1404.5				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	7.13	7.1	69.3	1.11	0.40	190.84	3104.17	1376.3	0.04	4.13		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	2.48	0.48	265.58	265.58	313.4				
Junction 11	J11							69.3	1.11	0.41		3369.75	1516.6				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	2.68	0.51	93.86	93.86	127.8				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.71	0.51	116.31	116.31	160.9				
Junction 13								11.0	2.68	0.51		210.17	287.2				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	9.87	3.7	14.7	2.33	0.50	54.66	264.83	307.5	0.04	1.58		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	11.70	1.4	70.6	1.10	0.40	69.68	3439.43	1518.0	0.04	3.36		
Junction 12	J12							70.6	1.10	0.41		3704.26	1662.9				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	8.97	2.3	72.9	1.08	0.40	87.79	3792.05	1656.2	0.04	4.07		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	2.24	0.44	234.44	234.44	230.8				
Junction 14	J14							72.9	1.08	0.41		4026.49	1767.6				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	9.03	6.4	79.3	1.04	0.39	351.98	4378.47	1765.5	0.04	4.18		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.84	0.53	48.77	48.77	73.2				
Junction 15	J15							79.3	1.04	0.39		4427.24	1792.4				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	2.39	0.46	197.82	197.82	218.9				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.81	0.53	162.07	162.07	239.2				
Junction 24	J24							14.0	2.39	0.49		359.89	422.4				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	13.00	1.5	15.5	2.28	0.49	32.03	391.92	435.2	0.04	1.68		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	3.33	0.59	68.33	68.33	135.5				
Junction 25	J25							15.5	2.28	0.50		460.25	527.8				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	9.29	3.2	82.5	1.02	0.39	49.63	4476.87	1767.5	0.04	4.10		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	11.74	3.1	18.5	2.09	0.50	44.65	504.90	522.2	0.04	1.98		
CAT CYN 33	Z, J16	Initial Area	417	2957	14.1%		7.5	7.5	3.22	0.83	48.65	48.65	129.4				
Junction 16	J16							82.5	1.02	0.40		5030.42	2063.5				
CAT CYN 36A	AA, BA	Initial Area	296	1727	17.1%		5.0	5.0	3.92	1.67	33.86	33.86	221.4				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	12.76	2.1	7.1	3.31	0.68	23.6	57.46	129.9	0.04	1.16		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	9.96	2.1	84.6	1.01	0.40	50.35	5080.77	2047.7	0.04	4.25		
Junction 17	J17							84.6	1.01	0.41		5138.23	2144.2				

Rational Method
Post Construction
Q= 50 YEAR FLOW

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	3.13	0.57	46.04	46.04	81.8				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	2.68	0.51	173.56	173.56	236.3				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.74	0.52	137.55	137.55	194.8				
Junction 26	J26							11.0	2.68	0.52		357.15	497.0				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	9.25	4.4	89.0	0.98	0.41	129.21	5267.44	2113.8	0.04	4.55		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	11.23	4.0	15.0	2.31	0.51	50.69	407.84	481.7	0.04	1.93		
Junction 18	J18							89.0	0.98	0.42		5675.28	2318.5				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	4.65	2.19	17.20	17.20	175.1				
CAT CYN 40A1	BB, J28	BB-J28	121	1038	11.6%	13.11	1.3	4.8	3.99	1.78	8.62	25.82	183.2	0.04	1.05		
CAT CYN 40A2	AA,J28	Initial Area	357	2963	12.0%		8.0	8.0	3.13	0.89	82.79	82.79	230.9				
Junction 28	J28							8.0	3.13	1.10		108.61	374.5				
CAT CYN 40B1	AD, BC	Initial Area	279	2472	11.3%		7.1	7.1	3.31	1.38	45.65	45.65	208.1				
CAT CYN 40B2	BC, BC1	BC-BC1	136	846	16.0%	16.71	0.8	7.9	3.14	1.36	9.39	55.04	234.1	0.04	1.19		
CAT CYN 40B	BC1, J27	BC-J27	19	377	4.9%	9.25	0.7	8.6	3.01	1.33	1.86	56.90	228.2	0.04	1.19		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	13.12	0.9	8.9	2.97	1.05	11.19	119.80	373.9	0.04	1.52		
Junction 27	J27							8.9	2.97	1.14		176.70	598.5				
CAT CYN 40	J27,J19	J27-J19	40	688	5.8%	13.58	0.8	9.8	2.84	1.12	7.91	184.61	585.0	0.04	1.86		
CAT CYN 39	J18,J19	J18-J19	2	407	0.5%	7.79	0.9	89.9	0.98	0.42	7.45	5682.73	2308.9	0.04	5.15		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	2.57	0.49	123.12	123.12	155.7				
Junction 19	J19							89.9	0.98	0.44		5990.46	2569.5				
CAT CYN 43	BF, J20	Initial Area	51	686	7.4%		3.9	3.9	4.41	1.05	4.26	4.26	19.7	0.04	0.86		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	12.38	1.7	91.6	0.97	0.44	42.06	6032.52	2554.6	0.04	4.29		
Junction 20	J20							91.6	0.97	0.44		6036.78	2558.9				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 43A	AG, BD	Initial Area	283	1052	26.9%		2.8	2.8	5.17	1.43	11.65	11.65	86.3				
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	8.69	1.9	93.5	0.96	0.43	105.65	6142.43	2553.9	0.04	3.57		
CAT CYN 44A	BJ,BH	Initial Area	77	1919	4.0%		10.0	10.0	2.81	0.76	23.74	23.74	50.7				
CAT CYN 45	BH,J21	BH-J21	59	713	8.3%	8.41	1.4	11.4	2.64	0.75	3.16	26.90	52.9	0.04	0.70		
Junction 21	J21							93.5	0.96	0.44		6180.98	2589.2				
CAT CYN 45A	AE, BE	Initial Area	298	1467	20.3%		4.3	4.3	4.21	0.80	18.85	18.85	63.5				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	3.09	0.56	47.36	47.36	82.5				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	9.10	2.6	96.1	0.95	0.43	122.7	6303.68	2573.8	0.04	4.95		
Junction 22	J22							96.1	0.95	0.43		6369.89	2613.4				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	4.93	2.68	15.32	15.32	202.1				
CAT CYN 49B	AL, J29		35	417	8.4%	11.95	0.6	4.9	3.96	2.25	4.68	20.00	178.2	0.04	1.17		
CAT CYN 49A	AJ, J29	Initial Area	330	2190	15.1%		6.1	6.1	3.56	0.71	41.14	41.14	104.0				
Junction 29	J29							6.1	3.56	1.21		61.14	264.2				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	11.02	3.2	9.3	2.91	0.96	37.43	98.57	274.5	0.04	1.39		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	11.07	6.5	102.6	0.92	0.42	286.32	6656.21	2571.8	0.04	4.58		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	2.57	0.49	243.99	243.99	308.5				
Junction 23	J23							102.6	1.02	0.43		6998.77	3066.9				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
					25 Year Flow - POST CONSTRUCTION												
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	229	2372	9.7%		8.0	8.0	2.73	0.71	41.66	41.66	81.1				
NNBL2-2	2B, J1	Initial Area	218	2353	9.3%		7.5	7.5	2.81	1.07	23.82	23.82	71.7				
NNBL2-3	2C, J1	Initial Area	240	2253	10.7%		8.0	8.0	2.73	1.14	30.78	30.78	95.4				
Junction 1								8.0	2.73	0.94		96.26	246.0				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	4.81	8.8	16.8	1.92	0.63	46.6	142.86	174.3	0.04	0.52		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	2.35	0.68	80.33	80.33	128.3				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	3.26	0.59	19.95	19.95	38.1				
Junction 2	J2							16.8	1.92	0.65		243.14	301.9				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	8.24	4.2	21.0	1.73	0.59	54.73	297.87	304.5	0.04	1.33		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	3.58	0.63	15.65	15.65	35.1				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	3.26	0.59	21.99	21.99	42.0				
Junction 3	J3							21.0	1.73	0.59		335.51	343.8				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	7.71	3.1	24.1	1.62	0.58	22.03	357.54	333.7	0.04	1.38		
NNBL1-1	1A, J4	Initial Area	410	5898	7.0%		17.2	17.2	1.90	0.48	114.71	114.71	105.5				
Junction 4	J4							24.1	1.62	0.55		472.25	423.7				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	2.91	0.83	52.24	52.24	126.6				
NNBL2-13	J5,J6	J5-J6	83	1700	4.9%	8.00	3.5	10.5	2.40	0.77	40.71	92.95	170.7	0.04	0.95		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	2.65	0.50	50.68	50.68	67.7				
Junction 6								10.5	2.40	0.67		143.63	231.8				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	5.98	2.8	13.3	2.14	0.65	13.41	157.04	219.6	0.04	1.51		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.44	2.6	26.7	1.54	0.55	15.71	487.96	411.1	0.04	1.56		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	3.26	0.59	23.12	23.12	44.1				
Junction 7	J7							26.7	1.54	0.57		668.12	590.2				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	9.43	4.0	30.7	1.45	0.55	45.45	713.57	571.3	0.04	2.04		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	3.13	0.57	27.27	27.27	48.5				
Junction 8	J8							30.7	1.45	0.55		740.84	593.7				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	8.18	6.5	37.2	1.32	0.53	55.98	796.82	560.9	0.04	2.21		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	3.26	0.59	12.58	12.58	24.0				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	4.34	0.71	6.13	6.13	18.9				
Junction 10								5.5	3.26	0.63		18.71	38.2				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.41	8.6	14.1	2.09	0.50	25.07	43.78	46.2	0.04	0.76		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	4.34	0.71	6.78	6.78	20.9				
Junction 11	J11							14.1	2.09	0.53		50.56	56.3				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	6.94	4.6	18.7	1.83	0.46	42.5	93.06	77.6	0.04	0.84		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	4.34	0.71	12.04	12.04	37.1				
Junction 12	J12							18.7	1.83	0.49		105.10	93.2				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	9.21	2.1	20.8	1.74	0.47	16.97	122.07	98.9	0.04	1.06		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	2.89	0.54	23.35	23.35	36.2				
Junction 13	J13							20.8	1.74	0.48		145.42	120.6				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	7.15	1.4	22.2	1.68	0.47	8.43	153.85	121.7	0.04	1.37		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	3.26	0.59	16.27	16.27	31.1				
Junction 14	J14							22.2	1.68	0.48		170.12	137.8				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	8.27	1.6	23.9	1.63	0.47	15.07	185.19	141.2	0.04	1.09		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	3.01	0.55	18.70	18.70	31.2				
Junction 15	J15							23.9	1.63	0.48		203.89	158.1				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	7.85	1.7	25.6	1.58	0.47	14.11	218.00	160.0	0.04	0.97		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	3.79	0.65	9.9	9.90	24.4				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.58	0.49	39.82	39.82	50.7				
Junction 1								9.0	2.58	0.52		49.72	67.3				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	5.68	6.9	15.9	1.97	0.44	81.59	131.31	114.6	0.04	0.77		
LGN CYN 4	C,J2	Initial Area	287	1809	15.9%		6.0	6.0	3.13	0.73	19	19.00	43.2				
Junction 2	J2							15.9	1.97	0.48		150.31	141.9				
LGN CYN 5	J2,J3	J2-J3	8	501	1.7%	5.39	1.6	17.4	1.89	0.48	6.8	157.11	142.4	0.04	1.17		
LGN CYN 6	D,J3	Initial Area	286	2301	12.4%		8.0	8.0	2.73	0.70	36.15	36.15	69.4				
Junction 3	J3							17.4	1.89	0.52		193.26	190.4				
LGN CYN 7	J3,J4	J3-J4	33	585	5.6%	7.82	1.2	18.7	1.83	0.52	5.78	199.04	188.2	0.04	0.83		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	2.89	0.54	18.54	18.54	28.7				
LGN CYN 9	F, J4	Initial Area	239	3803	6.3%		10.1	10.1	2.44	0.73	68.07	68.07	121.6				
Junction 4	J4							18.7	1.83	0.57		285.65	297.2				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.69	3.0	21.7	1.70	0.56	18.52	304.17	287.5	0.04	2.02		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	2.91	0.54	40.46	40.46	63.5				
Junction 5	J5							21.7	1.70	0.55		344.63	324.7				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	8.44	4.3	26.0	1.56	0.52	64.42	409.05	329.7	0.04	1.33		
LGN CYN 13	G,J6	Initial Area	296	2838	10.4%		5.2	5.2	3.35	1.00	74.09	74.09	249.0				
Junction 6	J6							26.0	1.56	0.59		483.14	446.0				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	6.10	3.9	29.9	1.46	0.56	52.08	535.22	439.9	0.04	1.84		
LGN CYN 15	H,J7	Initial Area	257	2259	11.4%		6.5	6.5	3.01	0.85	41.34	41.34	105.5				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	3.26	0.59	8.66	8.66	16.5				
Junction 7	J7							29.9	1.46	0.58		585.22	498.6				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	7.83	2.8	32.7	1.40	0.57	37.32	622.54	497.3	0.04	1.98		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	3.01	0.55	22.38	22.38	37.3				
Junction 8	J8							32.7	1.40	0.57		644.92	514.6				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	8.84	2.5	35.2	1.35	0.55	46.44	691.36	513.5	0.04	1.61		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	3.03	0.56	21.61	21.61	36.5				
Junction 9	J9							35.2	1.35	0.55		712.97	529.8				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	8.41	1.4	36.6	1.33	0.54	20.72	733.69	527.5	0.04	1.87		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	3.26	0.59	23.15	23.15	44.2				
Junction 10	J10							36.6	1.33	0.54		756.84	545.5				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	9.66	1.5	38.0	1.31	0.53	20.28	777.12	542.2	0.04	1.87		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	3.44	0.61	16.4	16.40	34.4				
Junction 11	J11							38.0	1.31	0.54		793.52	555.3				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	11.15	3.1	41.2	1.26	0.52	52.63	846.15	551.0	0.04	2.09		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	3.08	0.56	21.56	21.56	37.4				
Junction 12	J12							41.2	1.26	0.52		867.71	566.3				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	10.04	2.1	43.2	1.23	0.51	26.06	893.77	560.8	0.04	2.29		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	2.73	0.51	33.14	33.14	46.5				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	3.18	0.58	19.71	19.71	36.0				
Junction 1								8.0	2.73	0.54		52.85	77.5				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	7.20	4.7	12.7	2.19	0.49	46.79	99.64	106.6	0.04	0.93		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	3.41	0.60	31.97	31.97	65.9				
Junction 2	J2							12.7	2.19	0.52		131.61	149.0				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	7.61	3.9	16.6	1.93	0.48	44.86	176.47	164.9	0.04	1.15		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.44	0.47	63.01	63.01	72.7				
Junction 3	J3							16.6	1.93	0.48		239.48	222.4				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	9.80	1.5	18.1	1.86	0.48	8.79	248.27	219.4	0.04	1.40		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	2.17	0.43	72.00	72.00	66.8				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.44	0.47	53.94	53.94	62.2				
Junction 4	J4							18.1	1.86	0.47		374.21	323.7				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	7.02	2.2	20.3	1.76	0.46	18.75	392.96	318.4	0.04	1.99		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	2.25	0.44	57.52	57.52	57.2				
Junction 5	J5							20.3	1.76	0.46		450.48	363.0				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	10.89	0.6	20.9	1.73	0.45	23.30	473.78	372.0	0.04	1.70		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.52	0.48	79.32	79.32	96.4				
Junction 6	J6							20.9	1.73	0.46		553.10	438.4				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	7.00	3.8	24.7	1.60	0.44	57.77	610.87	434.7	0.04	2.06		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	2.91	0.54	34.70	34.70	54.4				
Junction 7	J7							24.7	1.60	0.45		645.57	464.7				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	10.40	3.0	27.7	1.52	0.44	64.56	710.13	470.2	0.04	1.97		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	3.26	0.59	19.74	19.74	37.7				
Junction 8	J8							27.7	1.52	0.44		729.87	487.7				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	2.10	0.41	117.13	117.13	101.7				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	3.62	0.63	12.59	12.59	28.7				
Junction 12								14.0	2.10	0.44		129.72	118.4				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	7.80	4.5	18.5	1.84	0.42	48.49	178.21	136.5	0.04	1.11		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.58	0.49	53.73	53.73	68.4				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	3.58	0.63	11.00	11.00	24.7				
Junction 13	J13							18.5	1.84	0.44		242.94	197.8				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	4.02	4.1	22.6	1.67	0.44	8.92	251.86	185.0	0.04	1.86		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	3.26	0.59	21.83	21.83	41.7				
Junction 14	J14							22.6	1.67	0.45		273.69	206.4				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	7.80	3.7	26.3	1.56	0.43	42.44	316.13	212.6	0.04	1.48		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	2.64	0.50	43.38	43.38	57.4				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	2.95	0.54	16.5	16.50	26.5				
Junction 15	J15							26.3	1.56	0.45		376.01	260.5				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	10.27	1.1	27.3	1.53	0.44	9.39	385.40	260.0	0.04	1.46		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	2.91	0.54	29.51	29.51	46.3				
Junction 16	J16							27.3	1.53	0.45		414.91	284.3				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	7.87	4.0	31.4	1.43	0.44	28.82	443.73	278.1	0.04	1.76		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	2.91	0.54	24.93	24.93	39.1				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	9.41	2.9	30.5	1.45	0.29	39.08	768.95	320.5	0.04	2.04		
Junction 9	J9							31.4	1.43	0.35		1237.61	613.8				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	12.15	1.3	32.6	1.40	0.35	14.42	1252.03	607.8	0.04	1.99		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	3.18	0.58	14.88	14.88	27.2				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	1.97	0.39	45.78	45.78	35.3				
Junction 10	J10							32.6	1.40	0.35		1312.69	645.0				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.43	0.47	33.42	33.42	38.2				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	2.71	0.51	24.49	24.49	34.0				
Junction 18	J18							10.2	2.43	0.49		57.91	68.8				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	8.53	1.5	11.7	2.28	0.48	14.51	72.42	79.1	0.04	0.82		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	3.55	0.62	10.78	10.78	23.7				
Junction 19	J19							11.7	2.28	0.50		83.20	94.4				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	11.02	2.2	14.0	2.10	0.35	15.63	1328.32	977.9	0.04	2.14		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	9.11	0.9	28.3	1.50	0.49	2.49	85.69	63.4	0.04	0.93		
Junction 11	J11							28.3	1.50	0.36		1414.01	763.7				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	2.10	0.41	164.76	164.76	143.1				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	2.35	0.46	82.64	82.64	88.6				
Junction 1								14.0	2.10	0.43		247.40	222.2				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	8.21	2.2	32.7	1.40	0.41	37.57	284.97	163.4	0.04	1.48		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	2.10	0.41	177.26	177.26	154.0				
Junction 2	J2							32.7	1.40	0.41		462.23	266.5				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	6.59	6.4	39.1	1.29	0.39	68.72	530.95	267.1	0.04	1.67		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	1.97	0.39	106.30	106.30	81.9				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	2.35	0.46	93.88	93.88	100.7				
Junction 3	J3							39.1	1.29	0.40		731.13	376.1				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	6.46	6.5	45.6	1.20	0.38	86.11	817.24	373.0	0.04	2.02		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.66	0.33	209.62	209.62	115.4				
Junction 4	J4							45.6	1.20	0.37		1026.86	456.4				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	6.54	4.8	50.4	1.14	0.36	90.94	1117.80	457.6	0.04	2.21		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.59	0.32	238.85	238.85	121.3				
Junction 5	J5							50.4	1.14	0.35		1356.65	544.7				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	7.82	1.4	51.8	1.13	0.35	21.49	1378.14	542.8	0.04	2.21		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	2.17	0.43	130.52	130.52	121.0				
Junction 6	J6							51.8	1.13	0.36		1508.66	605.8				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	6.24	3.7	55.5	1.09	0.35	77.69	1586.35	603.3	0.04	2.75		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	1.91	0.38	383.83	383.83	280.0				
Junction 7	J7							55.5	1.09	0.35		1970.18	763.4				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	8.72	3.6	59.1	1.06	0.35	114.13	2084.31	764.0	0.04	2.61		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	1.97	0.39	134.68	134.68	103.8				
Junction 8	J8							59.1	1.06	0.35		2218.99	819.9				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	2.30	0.45	173.73	173.73	179.3				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.46	0.47	165.79	165.79	192.9				
Junction J9A								11.5	2.30	0.46		339.52	359.9				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	10.60	2.1	13.6	2.12	0.46	21.14	360.66	351.0	0.04	1.57		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	6.74	3.7	62.8	1.03	0.34	50.58	2269.57	805.9	0.04	3.08		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	2.30	0.45	112.02	112.02	115.6				
Junction 9	J9A,J9							62.8	1.03	0.36		2742.25	1028.0				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	5.31	3.2	66.0	1.01	0.36	57.78	2800.03	1014.4	0.04	3.87		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	2.35	0.46	70.08	70.08	75.2				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	2.81	0.53	43.22	43.22	64.0				
Junction 10	J10							66.0	1.01	0.36		2913.33	1069.5				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	6.66	7.6	73.6	0.96	0.35	190.84	3104.17	1044.6	0.04	3.73		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	2.17	0.43	265.58	265.58	246.3				
Junction 11	J11							73.6	0.96	0.36		3369.75	1153.0				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	2.35	0.46	93.86	93.86	100.7				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.37	0.46	116.31	116.31	126.7				
Junction 13								11.0	2.35	0.46		210.17	226.3				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	9.22	4.0	15.0	2.03	0.45	54.66	264.83	240.1	0.04	1.43		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	10.92	1.5	75.1	0.95	0.35	69.68	3439.43	1152.8	0.04	3.03		
Junction 12	J12							75.1	0.95	0.36		3704.26	1264.9				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	8.37	2.5	77.6	0.93	0.36	87.79	3792.05	1258.2	0.04	3.67		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	1.97	0.39	234.44	234.44	180.7				
Junction 14	J14							77.6	0.93	0.36		4026.49	1343.8				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	8.43	6.8	84.4	0.90	0.34	351.98	4378.47	1335.9	0.04	3.77		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.48	0.48	48.77	48.77	57.7				
Junction 15	J15							84.4	0.90	0.34		4427.24	1356.8				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	2.10	0.41	197.82	197.82	171.8				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.46	0.47	162.07	162.07	188.6				
Junction 24	J24							14.0	2.10	0.44		359.89	332.7				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	12.14	1.6	15.6	1.99	0.44	32.03	391.92	341.7	0.04	1.51		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	2.91	0.54	68.33	68.33	107.2				
Junction 25	J25							15.6	1.99	0.45		460.25	415.1				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	8.67	3.5	87.8	0.88	0.34	49.63	4476.87	1337.2	0.04	3.70		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	10.96	3.3	18.9	1.82	0.44	44.65	504.90	408.6	0.04	1.78		
CAT CYN 33	Z, J16	Initial Area	417	2957	14.1%		7.5	7.5	2.81	0.83	48.65	48.65	113.0				
Junction 16	J16							87.8	0.88	0.36		5030.42	1570.0				
CAT CYN 36A	AA, BA	Initial Area	296	1727	17.1%		5.0	5.0	3.41	1.67	33.86	33.86	192.7				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	11.91	2.2	7.2	2.86	0.68	23.6	57.46	112.2	0.04	1.05		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	9.29	2.2	90.1	0.87	0.35	50.35	5080.77	1557.2	0.04	3.83		
Junction 17	J17							90.1	0.87	0.37		5138.23	1640.3				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	2.73	0.51	46.04	46.04	64.7				
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	2.35	0.46	173.56	173.56	186.1				
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.40	0.46	137.55	137.55	153.5				
Junction 26	J26							11.0	2.35	0.47		357.15	392.0				
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	8.63	4.7	94.8	0.85	0.36	129.21	5267.44	1614.9	0.04	4.11		
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	10.48	4.2	15.2	2.01	0.46	50.69	407.84	376.7	0.04	1.74		
Junction 18	J18							94.8	0.85	0.37		5675.28	1773.6				
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	4.04	2.19	17.20	17.20	152.1				
CAT CYN 40A1	BB, J28	BB-J28	121	1038	11.6%	12.24	1.4	4.9	3.44	1.78	8.62	25.82	158.0	0.04	0.95		
CAT CYN 40A2	AA,J28	Initial Area	357	2963	12.0%		8.0	8.0	2.73	0.89	82.79	82.79	201.7				
Junction 28	J28							8.0	2.73	1.10		108.61	327.1				
CAT CYN 40B1	AD, BC	Initial Area	279	2472	11.3%		7.1	7.1	2.89	1.38	45.65	45.65	181.6				
CAT CYN 40B2	BC, BC1	BC-BC1	136	846	16.0%	15.60	0.9	8.0	2.73	1.36	9.39	55.04	203.8	0.04	1.07		
CAT CYN 40B	BC1, J27	BC-J27	19	377	4.9%	8.63	0.7	8.7	2.62	1.33	1.86	56.90	198.0	0.04	1.07		
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	12.25	1.0	9.0	2.59	1.05	11.19	119.80	324.1	0.04	1.37		
Junction 27	J27							9.0	2.59	1.14		176.70	519.6				
CAT CYN 40	J27,J19	J27-J19	40	688	5.8%	12.68	0.9	9.9	2.47	1.11	7.91	184.61	505.8	0.04	1.68		
CAT CYN 39	J18,J19	J18-J19	2	407	0.5%	7.27	0.9	95.7	0.84	0.37	7.45	5682.73	1766.1	0.04	4.65		
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	2.25	0.44	123.12	123.12	122.5				
Junction 19	J19							95.7	0.84	0.39		5990.46	1984.8				
CAT CYN 43	BF, J20	Initial Area	51	686	7.4%		3.9	3.9	3.83	1.05	4.26	4.26	17.2	0.04	0.77		
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	11.56	1.8	97.5	0.84	0.39	42.06	6032.52	1974.1	0.04	3.87		
Junction 20	J20							97.5	0.84	0.39		6036.78	1977.9				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 43A	AG, BD	Initial Area	283	1052	26.9%		2.8	2.8	4.49	1.43	11.65	11.65	74.8				
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	8.11	2.1	99.6	0.83	0.39	105.65	6142.43	1975.9	0.04	3.22		
CAT CYN 44A	BJ,BH	Initial Area	77	1919	4.0%		10.0	10.0	2.46	0.76	23.74	23.74	44.4				
CAT CYN 45	BH,J21	BH-J21	59	713	8.3%	7.85	1.5	11.5	2.30	0.75	3.16	26.90	46.2	0.04	0.63		
Junction 21	J21							99.6	0.83	0.39		6180.98	2006.4				
CAT CYN 45A	AE, BE	Initial Area	298	1467	20.3%		4.3	4.3	3.66	0.80	18.85	18.85	55.2				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	2.70	0.51	47.36	47.36	65.2				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	8.49	2.8	102.4	0.82	0.39	122.7	6303.68	1992.1	0.04	4.46		
Junction 22	J22							102.4	0.82	0.39		6369.89	2024.2				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	4.27	2.68	15.32	15.32	175.3				
CAT CYN 49B	AL, J29		35	417	8.4%	11.15	0.6	4.9	3.43	2.25	4.68	20.00	154.5	0.04	1.05		
CAT CYN 49A	AJ, J29	Initial Area	330	2190	15.1%		6.1	6.1	3.10	0.71	41.14	41.14	90.7				
Junction 29	J29							6.1	3.10	1.21		61.14	230.3				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	10.29	3.4	9.5	2.51	0.94	37.43	98.57	231.9	0.04	1.25		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	10.33	6.9	109.3	0.79	0.38	286.32	6656.21	1986.7	0.04	4.13		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	2.84	0.53	243.99	243.99	368.1				
Junction 23	J23							109.3	0.99	0.39		6998.77	2692.7				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
10 Year Flow - POST CONSTRUCTION																	
Unnamed Blueline #1 & #2																	
NNBL2-1	2A, J1	Initial Area	229	2372	9.7%		8.0	8.0	2.31	0.71	41.66	41.66	68.8				
NNBL2-2	2B, J1	Initial Area	218	2353	9.3%		7.5	7.5	2.39	1.07	23.82	23.82	60.8				
NNBL2-3	2C, J1	Initial Area	240	2253	10.7%		8.0	8.0	2.31	1.14	30.78	30.78	80.9				
Junction 1								8.0	2.31	0.94		96.26	208.6				
NNBL2-4	J1, J2	J1-J2	100	2528	4.0%	4.44	9.5	17.5	1.59	0.63	46.6	142.86	144.0	0.04	0.46		
NNBL2-5	2D, J2	Initial Area	334	3668	9.1%		11.0	11.0	1.99	0.68	80.33	80.33	108.5				
NNBL2-6	2E, J2	Initial Area	170	1481	11.5%		5.5	5.5	2.77	0.52	19.95	19.95	28.8				
Junction 2	J2							17.5	1.59	0.64		243.14	247.4				
NNBL2-7	J2,J3	J2-J3	70	2077	3.4%	7.61	4.6	22.0	1.42	0.57	54.73	297.87	243.4	0.04	1.18		
NNBL2-8	2F, J3	Initial Area	194	1325	14.7%		4.5	4.5	3.05	0.56	15.65	15.65	26.7				
NNBL2-9	2G, J3	Initial Area	120	1445	8.3%		5.5	5.5	2.77	0.52	21.99	21.99	31.7				
Junction 3	J3							22.0	1.42	0.57		335.51	272.1				
NNBL2-10	J3,J4	J3-J4	40	1433	2.8%	7.11	3.4	25.4	1.33	0.55	22.03	357.54	261.8	0.04	1.22		
NNBL1-1	1A, J4	Initial Area	410	5898	7.0%		17.2	17.2	1.60	0.48	114.71	114.71	89.0				
Junction 4	J4							25.4	1.33	0.53		472.25	335.6				
NNBL2-11	2H,J5	Initial Area	272	2184	12.4%		7.0	7.0	2.47	0.83	52.24	52.24	107.4				
NNBL2-13	J5,J6	J5-J6	83	1700	4.9%	7.38	3.8	10.8	2.00	0.77	40.71	92.95	142.5	0.04	0.85		
NNBL2-14	2L, J6	Initial Area	275	2707	10.2%		8.5	8.5	2.25	0.44	50.68	50.68	50.2				
Junction 6								10.8	2.00	0.65		143.63	187.2				
NNBL2-15	J6,J7	J6-J7	15	1000	1.5%	5.52	3.0	13.9	1.78	0.63	13.41	157.04	174.8	0.04	1.34		
NNBL2-16	J4,J7	J4-J7	10	850	1.2%	5.02	2.8	28.2	1.26	0.53	15.71	487.96	323.9	0.04	1.38		
NNBL2-17	2M,J7	Initial Area	179	1839	9.7%		5.5	5.5	2.77	0.52	23.12	23.12	33.3				
Junction 7	J7							28.2	1.26	0.55		668.12	463.4				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	Total	I	C	Area Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Unnamed Blueline #1 & #2 (con't)																	
NNBL2-18	J7,J8	J7-J8	56	2263	2.5%	8.70	4.3	32.6	1.18	0.53	45.45	713.57	444.6	0.04	1.80		
NNBL2-19	2N,J8	Initial Area	226	2090	10.8%		6.0	6.0	2.66	0.50	27.27	27.27	36.5				
Junction 8	J8							32.6	1.18	0.53		740.84	460.8				
NNBL2-20	J8,J9	J8 to J9	54	3207	1.7%	7.54	7.1	39.6	1.07	0.50	55.98	796.82	430.9	0.04	1.96		
Unnamed Blueline #3																	
NNBL3-1	3A, J10	Initial Area	110	1349	8.2%		5.5	5.5	2.77	0.52	12.58	12.58	18.1				
NNBL3-2	3B, J10	Initial Area	70	677	10.3%		3.0	3.0	3.71	0.64	6.13	6.13	14.5				
Junction 10								5.5	2.77	0.56		18.71	29.0				
NNBL3-3	J10,J11	J10-J11	45	2263	2.0%	4.07	9.3	14.8	1.72	0.44	25.07	43.78	33.0	0.04	0.68		
NNBL3-4	3C,J11	Initial Area	55	609	9.1%		3.0	3.0	3.71	0.64	6.78	6.78	16.1				
Junction 11	J11							14.8	1.72	0.46		50.56	40.5				
NNBL3-5	J11,J12	J11-J12	84	1933	4.4%	6.41	5.0	19.8	1.50	0.39	42.5	93.06	54.2	0.04	0.75		
NNBL3-6	3D,J12	Initial Area	199	2019	9.9%		3.0	3.0	3.71	0.64	12.04	12.04	28.5				
Junction 12	J12							19.8	1.50	0.42		105.10	65.7				
NNBL3-7	J12,J13	J12-J13	66	1164	5.6%	8.50	2.3	22.1	1.42	0.40	16.97	122.07	69.2	0.04	0.94		
NNBL3-8	3E,J13	Initial Area	196	2019	9.7%		7.1	7.1	2.45	0.47	23.35	23.35	27.1				
Junction 13	J13							22.1	1.42	0.41		145.42	84.9				
NNBL3-9	J13,J14	J13-J14	15	611	2.4%	6.60	1.5	23.6	1.38	0.40	8.43	153.85	85.3	0.04	1.22		
NNBL3-10	3F,J14	Initial Area	199	1666	12.0%		5.5	5.5	2.77	0.52	16.27	16.27	23.5				
Junction 14	J14							23.6	1.38	0.41		170.12	97.0				
NNBL3-11	J14,J15	J14-J15	36	812	4.4%	7.63	1.8	25.4	1.33	0.40	15.07	185.19	98.9	0.04	0.97		
NNBL3-12	3G,J15	Initial Area	184	1808	10.2%		6.5	6.5	2.56	0.49	18.70	18.70	23.4				
Junction 15	J15							25.4	1.33	0.41		203.89	111.0				
NNBL3-13	J15, end	J15 - end	37	800	4.6%	7.24	1.8	27.2	1.29	0.40	14.11	218.00	111.9	0.04	0.86		

Rational Method
Post Construction
Q= 10 YEAR FLOW

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon																	
LNG CYN 1	A, J1	Initial Area	160	1162	13.8%		4.0	4.0	3.23	0.58	9.9	9.90	18.6				
LNG CYN 2	B, J1	Initial Area	120	2184	5.5%		9.0	9.0	2.19	0.43	39.82	39.82	37.5				
Junction 1								9.0	2.19	0.46		49.72	50.1				
LNG CYN 3	J1,J2	J1-J2	77	2351	3.3%	5.24	7.5	16.5	1.64	0.38	81.59	131.31	81.3	0.04	0.68		
LGN CYN 4	C,J2	Initial Area	287	1809	15.9%		6.0	6.0	2.66	0.73	19	19.00	36.7				
Junction 2	J2							16.5	1.64	0.42		150.31	103.8				
LGN CYN 5	J2,J3	J2-J3	8	501	1.7%	4.97	1.7	18.2	1.56	0.43	6.8	157.11	104.6	0.04	1.04		
LGN CYN 6	D,J3	Initial Area	286	2301	12.4%		8.0	8.0	2.31	0.70	36.15	36.15	58.9				
Junction 3	J3							18.2	1.56	0.48		193.26	144.3				
LGN CYN 7	J3,J4	J3-J4	33	585	5.6%	7.22	1.4	19.5	1.51	0.47	5.78	199.04	142.1	0.04	0.74		
LGN CYN 8	E,J4	Initial Area	239	1600	14.9%		7.1	7.1	2.45	0.47	18.54	18.54	21.5				
LGN CYN 9	F, J4	Initial Area	239	3803	6.3%		10.1	10.1	2.07	0.73	68.07	68.07	102.9				
Junction 4	J4							19.5	1.51	0.53		285.65	230.3				
LGN CYN 10	J4,J5	J4-J5	5	855	0.6%	4.33	3.3	22.8	1.40	0.52	18.52	304.17	220.9	0.04	1.79		
LGN CYN 11	B,J5	Initial Area	244	2033	12.0%		7.0	7.0	2.47	0.48	40.46	40.46	47.5				
Junction 5	J5							22.8	1.40	0.51		344.63	247.8				
LGN CYN 12	J5,J6	J5-J6	76	2167	3.5%	7.79	4.6	27.4	1.28	0.47	64.42	409.05	247.2	0.04	1.18		
LGN CYN 13	G,J6	Initial Area	296	2838	10.4%		5.2	5.2	2.85	1.00	74.09	74.09	211.8				
Junction 6	J6							27.4	1.28	0.55		483.14	342.5				
LGN CYN 14	J6,J7	J6-J7	17	1415	1.2%	5.63	4.2	31.6	1.20	0.52	52.08	535.22	334.1	0.04	1.63		
LGN CYN 15	H,J7	Initial Area	257	2259	11.4%		6.5	6.5	2.56	0.85	41.34	41.34	89.6				
LGN CYN 16	J, J7	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	8.66	8.66	12.5				
Junction 7	J7							31.6	1.20	0.54		585.22	381.4				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	TOC (min) Total	I	C	Area Delta	Area Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Long Canyon (con't)																	
LGN CYN 17	J7,J8	J7-J8	23	1308	1.8%	7.22	3.0	34.6	1.15	0.53	37.32	622.54	380.8	0.04	1.76		
LGN CYN 18	J,J8	Initial Area	191	1828	10.5%		6.5	6.5	2.56	0.49	22.38	22.38	28.0				
Junction 8	J8							34.6	1.15	0.53		644.92	393.3				
LGN CYN 19	J8,J9	J8-J9	40	1341	3.0%	8.15	2.7	37.4	1.10	0.51	46.44	691.36	389.6	0.04	1.43		
LGN CYN 20	K,J9	Initial Area	200	1806	11.1%		6.4	6.4	2.58	0.49	21.61	21.61	27.4				
Junction 9	J9							37.4	1.10	0.51		712.97	401.4				
LGN CYN 21	J9,J10	J9-J10	15	693	2.2%	7.76	1.5	38.9	1.08	0.50	20.72	733.69	398.3	0.04	1.66		
LGN CYN 22	L,J10	Initial Area	135	1428	9.5%		5.5	5.5	2.77	0.52	23.15	23.15	33.4				
Junction 10	J10							38.9	1.08	0.50		756.84	411.4				
LGN CYN 23	J10,J11	J10-J11	25	847	2.9%	8.91	1.6	40.5	1.06	0.49	20.28	777.12	407.7	0.04	1.66		
LGN CYN 24	M,J11	Initial Area	187	1482	12.6%		4.9	4.9	2.93	0.54	16.4	16.40	26.0				
Junction 11	J11							40.5	1.06	0.49		793.52	417.1				
LGN CYN 25	J11,J12	J11-J12	70	2087	3.4%	10.29	3.4	43.8	1.02	0.47	52.63	846.15	411.0	0.04	1.85		
LGN CYN 26	N,J12	Initial Area	200	1850	10.8%		6.2	6.2	2.62	0.50	21.56	21.56	28.1				
Junction 12	J12							43.8	1.02	0.48		867.71	422.0				
LGN CYN 27	J12, END	J12-END	30	1246	2.4%	9.26	2.2	46.1	1.00	0.47	26.06	893.77	416.5	0.04	2.03		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon																	
OLV CYN 1	A, J1	Initial Area	185	2042	9.1%		8.0	8.0	2.31	0.45	33.14	33.14	34.6				
OLV CYN 2	B, J1	Initial Area	161	1575	10.2%		5.8	5.8	2.70	0.51	19.71	19.71	27.2				
Junction 1								8.0	2.31	0.47		52.85	57.9				
OLV CYN 3	J1,J2	J1-J2	84	2033	4.1%	6.65	5.1	13.1	1.83	0.42	46.79	99.64	77.0	0.04	0.83		
OLV CYN 4	B,J2	Initial Area	244	1723	14.2%		5.0	5.0	2.90	0.54	31.97	31.97	49.9				
Junction 2	J2							13.1	1.83	0.45		131.61	108.4				
OLV CYN 5	J2,J3	J2-J3	61	1762	3.5%	7.02	4.2	17.3	1.60	0.42	44.86	176.47	117.9	0.04	1.02		
OLV CYN 6	C,J3	Initial Area	313	3437	9.1%		10.1	10.1	2.07	0.41	63.01	63.01	53.5				
Junction 3	J3							17.3	1.60	0.42		239.48	159.2				
OLV CYN 7	J3,J4	J3-J4	40	902	4.4%	9.05	1.7	18.9	1.53	0.41	8.79	248.27	156.5	0.04	1.24		
OLV CYN 8	D,J4	Initial Area	330	4367	7.6%		13.0	13.0	1.83	0.37	72.00	72.00	48.5				
OLV CYN 9	E, J4	Initial Area	197	2861	6.9%		10.1	10.1	2.07	0.41	53.94	53.94	45.8				
Junction 4	J4							18.9	1.53	0.40		374.21	230.8				
OLV CYN 10	J4,J5	J4-J5	13	917	1.4%	6.48	2.4	21.3	1.45	0.40	18.75	392.96	225.9	0.04	1.76		
OLV CYN 11	F,J5	Initial Area	333	3924	8.5%		12.0	12.0	1.91	0.38	57.52	57.52	41.7				
Junction 5	J5							21.3	1.45	0.40		450.48	257.6				
OLV CYN 12	J5,J6	J5-J6	17	402	4.2%	10.05	0.7	22.0	1.43	0.39	23.30	473.78	263.2	0.04	1.50		
OLV CYN 13	G,J6	Initial Area	239	2895	8.3%		9.5	9.5	2.13	0.42	79.32	79.32	71.1				
Junction 6	J6							22.0	1.43	0.39		553.10	310.8				
OLV CYN 14	J6,J7	J6-J7	21	1598	1.3%	6.46	4.1	26.1	1.31	0.38	57.77	610.87	305.5	0.04	1.83		
OLV CYN 15	H,J7	Initial Area	221	2289	9.7%		7.0	7.0	2.47	0.48	34.70	34.70	40.7				
Junction 7	J7							26.1	1.31	0.39		645.57	327.2				
OLV CYN 16	J7,J8	J7-J8	59	1849	3.2%	9.60	3.2	29.3	1.24	0.37	64.56	710.13	328.5	0.04	1.74		
OLV CYN 17	J, J8	Initial Area	168	1166	14.4%		5.5	5.5	2.77	0.52	19.74	19.74	28.5				
Junction 8	J8							29.3	1.24	0.38		729.87	341.3				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN B1	BA, J12	Initial Area	319	4102	7.8%		14.0	14.0	1.77	0.35	117.13	117.13	73.5				
OLV CYN B2	BB, J12	Initial Area	200	1335	15.0%		4.4	4.4	3.08	0.56	12.59	12.59	21.9				
Junction 12								14.0	1.77	0.37		129.72	86.1				
OLV CYN B3	J12,J13	J12-J13	80	2102	3.8%	7.20	4.9	18.9	1.53	0.36	48.49	178.21	97.3	0.04	0.99		
OLV CYN B4	BB, J13	Initial Area	280	2943	9.5%		9.0	9.0	2.19	0.43	53.73	53.73	50.6				
OLV CYN B5	BC, J13	Initial Area	70	980	7.1%		4.5	4.5	3.05	0.56	11.00	11.00	18.8				
Junction 13	J13							18.9	1.53	0.38		242.94	142.2				
OLV CYN B6	J13,J14	J13-J14	5	980	0.5%	3.71	4.4	23.3	1.39	0.38	8.92	251.86	132.0	0.04	1.65		
OLV CYN B7	BD, J14	Initial Area	235	1682	14.0%		5.5	5.5	2.77	0.52	21.83	21.83	31.5				
Junction 14	J14							23.3	1.39	0.39		273.69	147.7				
OLV CYN B8	J14,J15	J14-J15	45	1734	2.6%	7.20	4.0	27.3	1.28	0.37	42.44	316.13	150.4	0.04	1.31		
OLV CYN B9	BE, J15	Initial Area	288	2927	9.8%		8.6	8.6	2.24	0.44	43.38	43.38	42.5				
OLV CYN B10	BF, J15	Initial Area	130	1555	8.4%		6.8	6.8	2.50	0.48	16.5	16.50	19.9				
Junction 15	J15							27.3	1.28	0.38		376.01	185.1				
OLV CYN B11	J15,J16	J15-J16	30	651	4.6%	9.48	1.1	28.4	1.26	0.38	9.39	385.40	184.3	0.04	1.29		
OLV CYN B12	BG, J16	Initial Area	280	2261	12.4%		7.0	7.0	2.47	0.48	29.51	29.51	34.6				
Junction 16	J16							28.4		0.39		414.91	0.0				
OLV CYN B13	J16,J9	J16-J9	40	1905	2.1%	7.26	4.4	32.8	1.18	0.38	28.82	443.73	196.1	0.04	1.56		
OLV CYN B14	BH, J9	Initial Area	158	2489	6.3%		7.0	7.0	2.47	0.48	24.93	24.93	29.3				
OLV CYN 18	J8,J9	J8-J9	40	1623	2.5%	8.68	3.1	32.4	1.18	0.22	39.08	768.95	203.0	0.04	1.81		
Junction 9	J9							32.8	1.18	0.28		1237.61	411.9				
OLV CYN 19	J9,J10	J9-J10	40	939	4.3%	11.21	1.4	34.2	1.15	0.28	14.42	1252.03	407.3	0.04	1.76		
OLV CYN 20	K, J10	Initial Area	160	1521	10.5%		5.8	5.8	2.70	0.51	14.88	14.88	20.5				
OLV CYN 21	BF, J10	Initial Area	240	4599	5.2%		16.0	16.0	1.66	0.33	45.78	45.78	25.3				
Junction 10	J10							34.2	1.15	0.29		1312.69	433.6				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Olivera Canyon (con't)																	
OLV CYN A1	AA, J18	Initial Area	270	3259	8.3%		10.2	10.2	2.06	0.41	33.42	33.42	28.1				
OLV CYN A2	AB, J18	Initial Area	170	2265	7.5%		8.1	8.1	2.30	0.45	24.49	24.49	25.3				
Junction 18	J18							10.2	2.06	0.43		57.91	50.8				
OLV CYN A3	J18,J19	J18-J19	53	780	6.8%	7.87	1.7	11.9	1.92	0.42	14.51	72.42	57.9	0.04	0.73		
OLV CYN A4	AC, J19	Initial Area	133	1216	10.9%		4.6	4.6	3.02	0.55	10.78	10.78	18.0				
Junction 19	J19							11.9	1.92	0.43		83.20	69.3				
OLV CYN 22	J10,J11	J10-J11	47	1472	3.2%	10.17	2.4	14.3	1.75	0.29	15.63	1328.32	669.4	0.04	1.90		
OLV CYN A5	J19,J11	J19-J11	34	512	6.6%	8.40	1.0	29.4	1.24	0.43	2.49	85.69	45.5	0.04	0.83		
Junction 11	J11							29.4	1.24	0.30		1414.01	518.2				
Cat Canyon																	
CAT CYN 1	A, J1	Initial Area	220	3939	5.6%		14.0	14.0	1.77	0.35	164.76	164.76	103.4				
CAT CYN 2	B, J1	Initial Area	240	3214	7.5%		11.0	11.0	1.99	0.40	82.64	82.64	64.9				
Junction 1								14.0	1.77	0.37		247.40	161.2				
CAT CYN 3	J1,J2	J1-J2	30	1061	2.9%	7.57	2.3	34.8	1.14	0.35	37.57	284.97	113.4	0.04	1.31		
CAT CYN 4	C,J2	Initial Area	273	4399	6.2%		14.0	14.0	1.77	0.35	177.26	177.26	111.3				
Junction 2	J2							34.8	1.14	0.35		462.23	185.3				
CAT CYN 5	J2,J3	J2-J3	40	2528	1.6%	6.08	6.9	41.7	1.05	0.33	68.72	530.95	183.3	0.04	1.48		
CAT CYN 6	D,J3	Initial Area	300	5119	5.9%		16.0	16.0	1.66	0.33	106.30	106.30	58.7				
CAT CYN 7	E, J3	Initial Area	318	3649	8.7%		11.0	11.0	1.99	0.40	93.88	93.88	73.7				
Junction 3	J3							41.7	1.05	0.34		731.13	259.3				
CAT CYN 8	J3,J4	J3-J4	30	2536	1.2%	5.96	7.1	48.8	0.97	0.32	86.11	817.24	254.2	0.04	1.79		
CAT CYN 9	F,J4	Initial Area	300	6775	4.4%		23.0	23.0	1.39	0.28	209.62	209.62	80.4				
Junction 4	J4							48.8	0.97	0.31		1026.86	310.3				
CAT CYN 10	J4,J5	J4-J5	20	1868	1.1%	6.03	5.2	53.9	0.93	0.30	90.94	1117.80	308.4	0.04	1.96		
CAT CYN 11	G,J5	Initial Area	190	6195	3.1%		25.0	25.0	1.34	0.26	238.85	238.85	83.9				
Junction 5	J5							53.9	0.93	0.29		1356.65	366.4				

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 12	J5,J6	J5-J6	10	655	1.5%	7.22	1.5	55.4	0.91	0.29	21.49	1378.14	364.5	0.04	1.96		
CAT CYN 13	H,J6	Initial Area	380	4546	8.4%		13.0	13.0	1.83	0.37	130.52	130.52	87.9				
Junction 6	J6							55.4	0.91	0.30		1508.66	408.3				
CAT CYN 14	J6,J7	J6-J7	10	1376	0.7%	5.76	4.0	59.4	0.88	0.29	77.69	1586.35	404.3	0.04	2.44		
CAT CYN 15	J,J7	Initial Area	670	6984	9.6%		17.0	17.0	1.61	0.32	383.83	383.83	199.8				
Junction 7	J7							59.4	0.88	0.30		1970.18	513.9				
CAT CYN 16	J7,J8	J7-J8	29	1894	1.5%	8.05	3.9	63.3	0.86	0.29	114.13	2084.31	511.0	0.04	2.31		
CAT CYN 17	K, J8	Initial Area	249	4534	5.5%		16.0	16.0	1.66	0.33	134.68	134.68	74.4				
Junction 8	J8							63.3	0.86	0.29		2218.99	549.4				
CAT CYN 19A	L, J9A	Initial Area	620	4845	12.8%		11.5	11.5	1.94	0.39	173.73	173.73	131.0				
CAT CYN 19B	M, J9A	Initial Area	730	4642	15.7%		10.0	10.0	2.08	0.41	165.79	165.79	142.0				
Junction J9A								11.5	1.94	0.40		339.52	263.8				
CAT CYN 19	J9A,J9	J9A-J9	60	1352	4.4%	9.78	2.3	13.8	1.78	0.40	21.14	360.66	255.1	0.04	1.39		
CAT CYN 18	J8,J9	J8-J9	11	1514	0.7%	6.22	4.1	67.4	0.83	0.29	50.58	2269.57	538.4	0.04	2.73		
CAT CYN 20	N, J9	Initial Area	340	3649	9.3%		11.5	11.5	1.94	0.39	112.02	112.02	84.5				
Junction 9	J9A,J9							67.4	0.83	0.30		2742.25	693.7				
CAT CYN 21	J9,J10	J9-J10	3	1019	0.3%	4.90	3.5	70.9	0.81	0.30	57.78	2800.03	682.6	0.04	3.43		
CAT CYN 22	P,J10	Initial Area	383	3985	9.6%		11.0	11.0	1.99	0.40	70.08	70.08	55.1				
CAT CYN 23	Q, J10	Initial Area	463	2941	15.8%		7.5	7.5	2.39	0.46	43.22	43.22	47.8				
Junction 10	J10							70.9	0.81	0.30		2913.33	721.4				
CAT CYN 24	J10,J11	J10-J11	17	3052	0.6%	6.15	8.3	79.1	0.77	0.29	190.84	3104.17	698.7	0.04	3.30		
CAT CYN 25	R, J11	Initial Area	360	4534	7.9%		13.0	13.0	1.83	0.37	265.58	265.58	178.8				
Junction 11	J11							79.1	0.77	0.30		3369.75	773.8				
CAT CYN 27A	S, J13	Initial Area	255	3361	7.6%		11.0	11.0	1.99	0.40	93.86	93.86	73.7				
CAT CYN 27B	T, J13	Initial Area	285	3505	8.1%		10.8	10.8	2.00	0.40	116.31	116.31	92.9				
Junction 13								11.0	1.99	0.40		210.17	165.8				

DS-13186-115 Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	TOC (min) Δ	Total	I	C	Area Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 27	J13,J12	J13-J12	84	2211	3.8%	8.50	4.3	15.3	1.69	0.39	54.66	264.83	172.8	0.04	1.27		
CAT CYN 26	J11,J12	J11-J12	19	951	2.0%	10.08	1.6	80.7	0.76	0.29	69.68	3439.43	771.7	0.04	2.68		
Junction 12	J12							80.7	0.76	0.30		3704.26	849.6				
CAT CYN 28	J12,J14	J12-J14	11	1237	0.9%	7.73	2.7	83.4	0.75	0.30	87.79	3792.05	842.5	0.04	3.26		
CAT CYN 29	U, J14	Initial Area	670	7044	9.5%		16.0	16.0	1.66	0.33	234.44	234.44	129.5				
Junction 14	J14							83.4	0.75	0.30		4026.49	901.2				
CAT CYN 30	J14,J15	J14-J15	30	3444	0.9%	7.78	7.4	90.8	0.72	0.28	351.98	4378.47	886.0	0.04	3.35		
CAT CYN 31	V, J15	Initial Area	430	3590	12.0%		9.8	9.8	2.10	0.42	48.77	48.77	42.5				
Junction 15	J15							90.8	0.72	0.28		4427.24	900.6				
CAT CYN 34A1	W, J24	Initial Area	510	5459	9.3%		14.0	14.0	1.77	0.35	197.82	197.82	124.2				
CAT CYN 34A2	X, J24	Initial Area	600	4145	14.5%		10.0	10.0	2.08	0.41	162.07	162.07	138.8				
Junction 24	J24							14.0	1.77	0.38		359.89	242.3				
CAT CYN 34A	J24,J25	J24-J25	70	1145	6.1%	11.20	1.7	15.7	1.67	0.38	32.03	391.92	247.3	0.04	1.34		
CAT CYN 34B	Y, J25	Initial Area	470	2833	16.6%		7.0	7.0	2.47	0.48	68.33	68.33	80.2				
Junction 25	J25							15.7	1.67	0.39		460.25	301.7				
CAT CYN 32	J15,J16	J15-J16	17	1797	0.9%	8.00	3.7	94.5	0.71	0.28	49.63	4476.87	886.0	0.04	3.28		
CAT CYN 34	J25,J16	J25-J16	87	2170	4.0%	10.12	3.6	19.3	1.52	0.38	44.65	504.90	293.9	0.04	1.58		
CAT CYN 33	Z, J16	Initial Area	417	2957	14.1%		7.5	7.5	2.39	0.83	48.65	48.65	95.8				
Junction 16	J16							94.5	0.71	0.30		5030.42	1051.4				
CAT CYN 36A	AA, BA	Initial Area	296	1727	17.1%		5.0	5.0	2.90	1.67	33.86	33.86	163.9				
CAT CYN 36	BA, J17	BA-J17	154	1597	9.6%	10.99	2.4	7.4	2.40	0.68	23.6	57.46	94.1	0.04	0.93		
CAT CYN 35	J16,J17	J16-J17	13	1249	1.0%	8.58	2.4	96.9	0.70	0.29	50.35	5080.77	1041.3	0.04	3.40		
Junction 17	J17							96.9	0.70	0.31		5138.23	1108.2				

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Cat Canyon (con't)															
CAT CYN 38A	AB, J26	Initial Area	489	3020	16.2%		8.0	8.0	2.31	0.45	46.04	46.04	48.1		
CAT CYN 38B	X, J26	Initial Area	689	4780	14.4%		11.0	11.0	1.99	0.40	173.56	173.56	136.3		
CAT CYN 38C	AC, J26	Initial Area	536	4388	12.2%		10.5	10.5	2.03	0.40	137.55	137.55	112.7		
Junction 26	J26							11.0	1.99	0.41		357.15	287.9		
CAT CYN 37	J17,J18	J17-J18	20	2450	0.8%	7.96	5.1	102.1	0.68	0.30	129.21	5267.44	1087.0	0.04	3.64
CAT CYN 38	J26,J18	J26-J18	101	2671	3.8%	9.67	4.6	15.6	1.68	0.40	50.69	407.84	272.1	0.04	1.54
Junction 18	J18							102.1	0.68	0.31		5675.28	1197.5		
CAT CYN 40A1-	AA, BB	Initial Area	270	1253	21.5%		3.5	3.5	3.44	2.19	17.20	17.20	129.7		
CAT CYN 40A1	BB, J28	BB-J28	121	1038	11.6%	11.30	1.5	5.0	2.89	1.78	8.62	25.82	132.9	0.04	0.84
CAT CYN 40A2	AA,J28	Initial Area	357	2963	12.0%		8.0	8.0	2.31	0.89	82.79	82.79	171.0		
Junction 28	J28							8.0	2.31	1.10		108.61	277.4		
CAT CYN 40B1	AD, BC	Initial Area	279	2472	11.3%		7.1	7.1	2.45	1.38	45.65	45.65	154.1		
CAT CYN 40B2	BC, BC1	BC-BC1	136	846	16.0%	14.39	1.0	8.1	2.30	1.36	9.39	55.04	172.0	0.04	0.95
CAT CYN 40B	BC1, J27	BC-J27	19	377	4.9%	7.97	0.8	8.9	2.20	1.33	1.86	56.90	166.2	0.04	0.95
CAT CYN 40A	J28,J27	J28-J27	51	716	7.1%	11.31	1.1	9.1	2.18	1.04	11.19	119.80	271.8	0.04	1.22
Junction 27	J27							9.1	2.18	1.13		176.70	436.4		
CAT CYN 40	J27,J19	J27-J19	40	688	5.8%	11.70	1.0	10.0	2.08	1.10	7.91	184.61	422.2	0.04	1.49
CAT CYN 39	J18,J19	J18-J19	2	407	0.5%	6.71	1.0	103.1	0.68	0.31	7.45	5682.73	1192.2	0.04	4.12
CAT CYN 41	AF, J19	Initial Area	550	4587	12.0%		12.0	12.0	1.91	0.38	123.12	123.12	89.3		
Junction 19	J19							103.1	0.68	0.33		5990.46	1362.0		
CAT CYN 43	BF, J20	Initial Area	51	686	7.4%		3.9	3.9	3.27	1.05	4.26	4.26	14.6	0.04	0.69
CAT CYN 42	J19,J20	J19-J20	20	1262	1.6%	10.67	2.0	105.0	0.67	0.33	42.06	6032.52	1355.2	0.04	3.43
Junction 20	J20							105.0	0.67	0.33		6036.78	1358.2		

DS-13186-115							TOC (min)				Area						
Point of Concentration		Area Description	Delta H (ft)	L (ft)	S (%)	V (fps)	Δ	Total	I	C	Delta	Total	Q (cfs)	Mannings n	Hydraulic Radius R		
Cat Canyon (con't)																	
CAT CYN 43A	AG, BD	Initial Area	283	1052	26.9%		2.8	2.8	3.83	1.43	11.65	11.65	63.9				
CAT CYN 44	J20,J21	J20-J21	10	1002	1.0%	7.48	2.2	107.3	0.67	0.33	105.65	6142.43	1358.7	0.04	2.85		
CAT CYN 44A	BJ,BH	Initial Area	77	1919	4.0%		10.0	10.0	2.08	0.76	23.74	23.74	37.6				
CAT CYN 45	BH,J21	BH-J21	59	713	8.3%	7.25	1.6	11.6	1.93	0.75	3.16	26.90	38.8	0.04	0.56		
Junction 21	J21							107.3	0.67	0.34		6180.98	1383.2				
CAT CYN 45A	AE, BE	Initial Area	298	1467	20.3%		4.3	4.3	3.12	0.80	18.85	18.85	47.0				
CAT CYN 47	AH, J22	Initial Area	403	3026	13.3%		8.2	8.2	2.29	0.45	47.36	47.36	48.4				
CAT CYN 46	J21,J22	J21-J22	10	1413	0.7%	7.84	3.0	110.3	0.66	0.33	122.7	6303.68	1369.6	0.04	3.95		
Junction 22	J22							110.3	0.66	0.33		6369.89	1393.4				
CAT CYN 49B1	AK, J29	Initial Area	200	1003	19.9%		3.1	3.1	3.65	2.68	15.32	15.32	149.6				
CAT CYN 49B	AL, J29		35	417	8.4%	10.29	0.7	5.0	2.91	2.25	4.68	20.00	130.8	0.04	0.93		
CAT CYN 49A	AJ, J29	Initial Area	330	2190	15.1%		6.1	6.1	2.64	0.71	41.14	41.14	77.0				
Junction 29	J29							6.1	2.64	1.21		61.14	195.7				
CAT CYN 49	J29,J23	J29-J23	120	2116	5.7%	9.50	3.7	9.8	2.10	0.91	37.43	98.57	188.3	0.04	1.11		
CAT CYN 48	J22,J23	J22-J23	50	4302	1.2%	9.54	7.5	117.8	0.64	0.32	286.32	6656.21	1358.9	0.04	3.66		
CAT CYN 50	AF, J23	Initial Area	640	8530	7.5%		12.0	12.0	1.91	0.38	243.99	243.99	176.9				
Junction 23	J23							117.8	0.64	0.33		6998.77	1475.1				

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

SOIL BENEFICIAL RE-USE PLAN

AERA ENERGY LLC
EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT
6516 CAT CANYON ROAD
SANTA BARBARA COUNTY, CALIFORNIA

Prepared for:
Aera Energy LLC

August 2014

369 Pacific Street ■ San Luis Obispo, California 93401 ■ (805) 786-2650 ■ FAX (805) 786-2651

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PLATES

ATTACHMENTS

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1.0 GENERAL OVERVIEW

On behalf of Aera Energy LLC (Aera), Padre Associates, Inc. (Padre) has prepared this Soil Beneficial Re-Use Plan for submittal to the California Regional Water Quality Control Board – Central Coast Region (RWQCB). Aera is planning to relocate and operate an existing soil beneficial re-use facility in compliance with the RWQCB's General Conditional Waiver of Waste Discharge Requirements for the Re-Use of Non-Hazardous Crude Oil Impacted Soil and Non-Hazardous Spent Sandblasting Aggregate on Active Oil Lease and Fee Properties in the Central Coast, Order No. R3-2010-0037 (Beneficial Re-use Waiver) for the on-site and off-site re-use of petroleum hydrocarbon-containing soil at Aera's East Cat Canyon Oil Field property, located in Santa Barbara County, California (Project Site). Attached are two plates: Plate 1 is a Site Location Map, and Plate 2 showing the location of the proposed stockpiling and mixing area. As part of the Waiver enrollment requirements, a Compliance Plan and a Management Practices Plan have been prepared, which are included as Attachments A and B, respectively.

The Project Site is located approximately six miles east of the Town of Orcutt (refer to Plate 1- Site Location Map) and encompasses approximately 2,100 acres. The Project Site is further located within the Solomon Hills, and includes portions of the Olivera Canyon Area and the East Area of the Cat Canyon Oil Field (refer to Plate 2 – Site Map). Access to the Project Site is via Cat Canyon Road.

The Project Site was historically used for crude oil exploration and production, and portions of the Project Site are still currently active. Aera is intending to redevelop the Project Site using existing and new roads and well pads, new oil production and steam injection wells, steam generators, a central processing facility, and pipelines. As part of the Project, Aera proposes to utilize areas that are known to contain pre-existing petroleum hydrocarbon-containing soils. Construction activities will disturb the petroleum hydrocarbon-containing soils; therefore Aera plans to excavate the petroleum hydrocarbon-containing soils for beneficial re-use either on-site or at other Aera locations.

Implementation of the Project would result in the excavation of petroleum hydrocarbon-containing soil (the Re-Use Material), processing the Re-Use Material, and placement of processed Re-Use Material throughout the Project Site as road sub-base, road base, and/or final road surfaces associated with the planned oil field re-development activities. The source of the Re-Use Material originates from multiple on-site petroleum hydrocarbon-containing soil sites and oily sand produced during petroleum production activities.

2.0 PROJECT SITE PERMIT HISTORY

Aera is currently enrolled with the RWQCB for the stockpiling of petroleum-containing soil at the Project Site, per the requirements of the General Conditional Waiver of Waste Discharge Requirements for the Management of Petroleum-Impacted Soils at Authorized Waste Pile Management Facilities at Active Oil Leases and Fee Properties in the Central Coast Region, (Waste Pile Order) (Order No. R3-2010-0036); however, no active soil waste piles currently exist at the Project Site.

3.0 SUMMARY OF RE-USE FEATURES

At each Re-Use Source Site, soil with total petroleum hydrocarbon (TPH) concentrations in excess of concentrations specified by the Santa Barbara County Environmental Health Services (SBCEHS) Lease Restoration Program, will be either transported and processed on-site at the Re-Use Site for preparation for use as on-site road material, transported to Aera's Belridge road-mix facility for re-use, or disposed off-site at the Santa Maria Regional Landfill under the Non-Hazardous Impacted Soil program.

Aera proposes to use the following procedures during the course of the excavation and processing of Re-Use Material:

- Erosion control measures would be installed and maintained throughout the course of the excavation and material processing activities.
- Existing vegetation would be cleared from the proposed excavation areas and disposed off-site or shredded and used for erosion control.
- Dust control and air monitoring would be conducted during all excavation activities in accordance with the Santa Barbara County Grading Ordinance and Santa Barbara County Air Pollution Control District (APCD) regulations.
- Soil samples from the bottom, and any exposed excavation sidewalls would be collected and chemically analyzed for petroleum constituents to document the remaining petroleum hydrocarbon-containing soil located outside of the planned disturbance area. Analytical results would be submitted to SBCEHS to document the remaining TPH-containing soil adjacent to and under the Re-Use Source Area.

4.0 RE-USE MATERIAL PROCESSING AND PLACEMENT AS ROAD MATERIAL

Based on the results of previous soil testing conducted for geotechnical properties, the dense asphaltic material typically found at and near the surface can be processed and used as reclaimed asphalt pavement; sandy oily-containing material can be processed and used in asphalt concrete; and other on-site TPH-containing soils can be processed to be used as either road sub-base or base material (Tetra Tech, 2001).

The various TPH-containing soils can be excavated using conventional excavation equipment and segregated for further processing depending on the final use. Processing of these soils may include the addition of asphalt, aggregate material, clean sand, soil binders, and water (for proper compaction during placement). The material will be transferred to the proposed soil management area shown on Plate 2. There it will be stockpiled on-site for either re-use on-site for road base material or transported off-site to another Aera facility for beneficial re-use. The material will be monitored for compliance with the Waste Pile Order and the Beneficial Re-Use Order, as shown in Attachment A. The material will be handled in accordance with Attachment B – Management Practices Plan.

5.0 SCHEDULE

The proposed Project activities will be completed over an approximate 10-year period following receipt of all necessary permits and approvals. Project activities would occur throughout the year; unless restricted by the requirements of permits issued to the Project.

6.0 PERMIT REQUIREMENT SUMMARY

Other permits that would be required for the proposed soil beneficial re-use project include, but not limited to, the following:

- Storm Water Pollution Prevention Plan and Notice of Intent – State Water Resources Control Board General Permit for Storm Water Discharges Associated with Construction or Land Disturbance Activities.
- Land Use and Grading Permits issued by the Santa Barbara County Planning and Development Department.
- An Authority to Construct/Permit to Operate will be required by the Santa Barbara APCD for contaminated soil excavation projects. As part of the APCD permit, Aera will be required to prepare and implement an Air Quality Monitoring Plan that includes air monitoring requirements during soil excavation activities for volatile organic compounds and dust emissions. The Air Quality Monitoring Plan will include reporting requirements in the event of non-compliance and contingency measures to ensure that the action levels are not exceeded.

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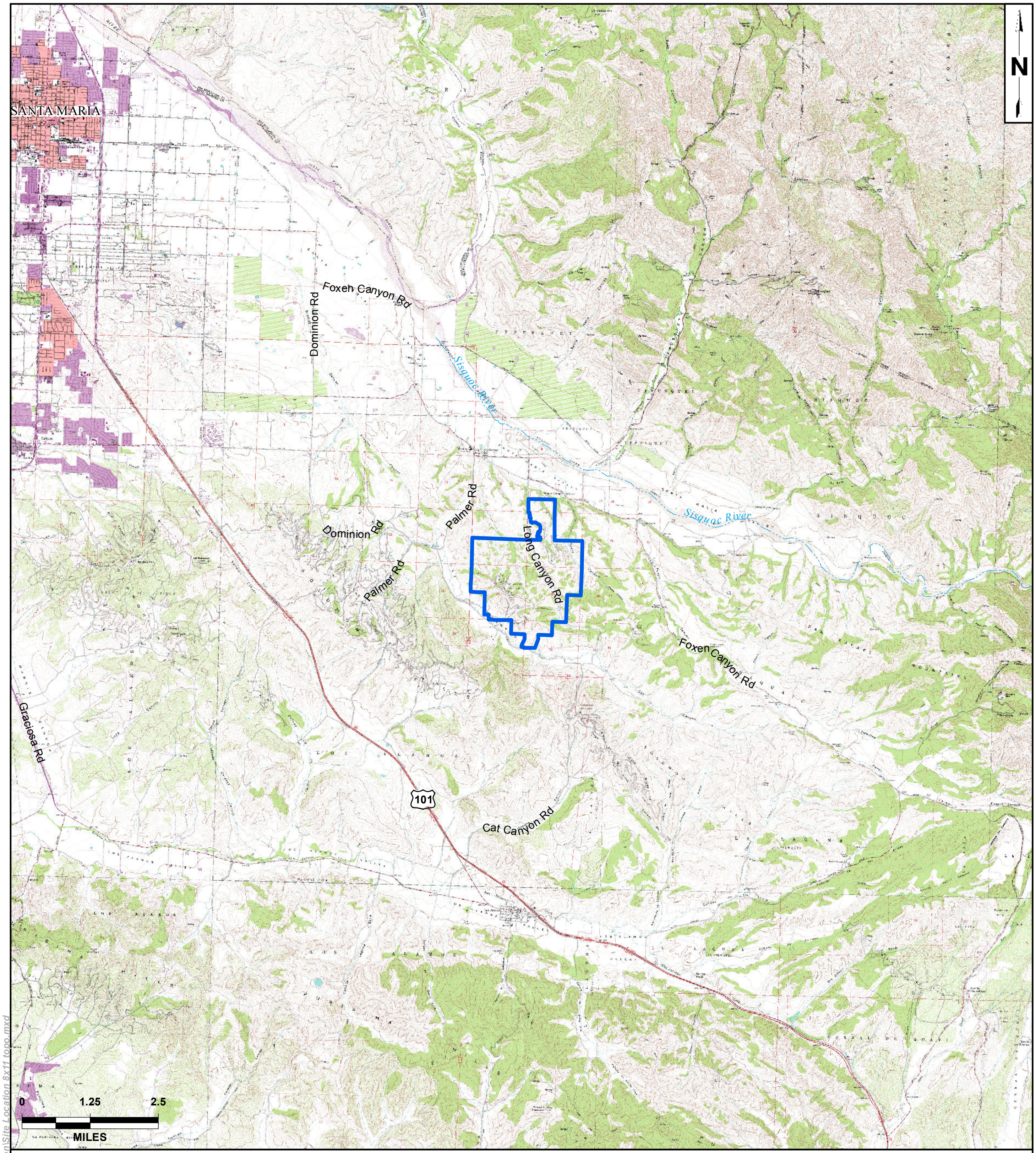
PLATES



LEGEND:

Aera Energy LLC Property

Source: USGS Topo Quad, DPSI 2013 Survey, Santa Barbara County, TIGER
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposed only

Z:\Kristin\GIS Maps\Map Project\East Cat Canyon\Site Location 8x11 topo.mxd

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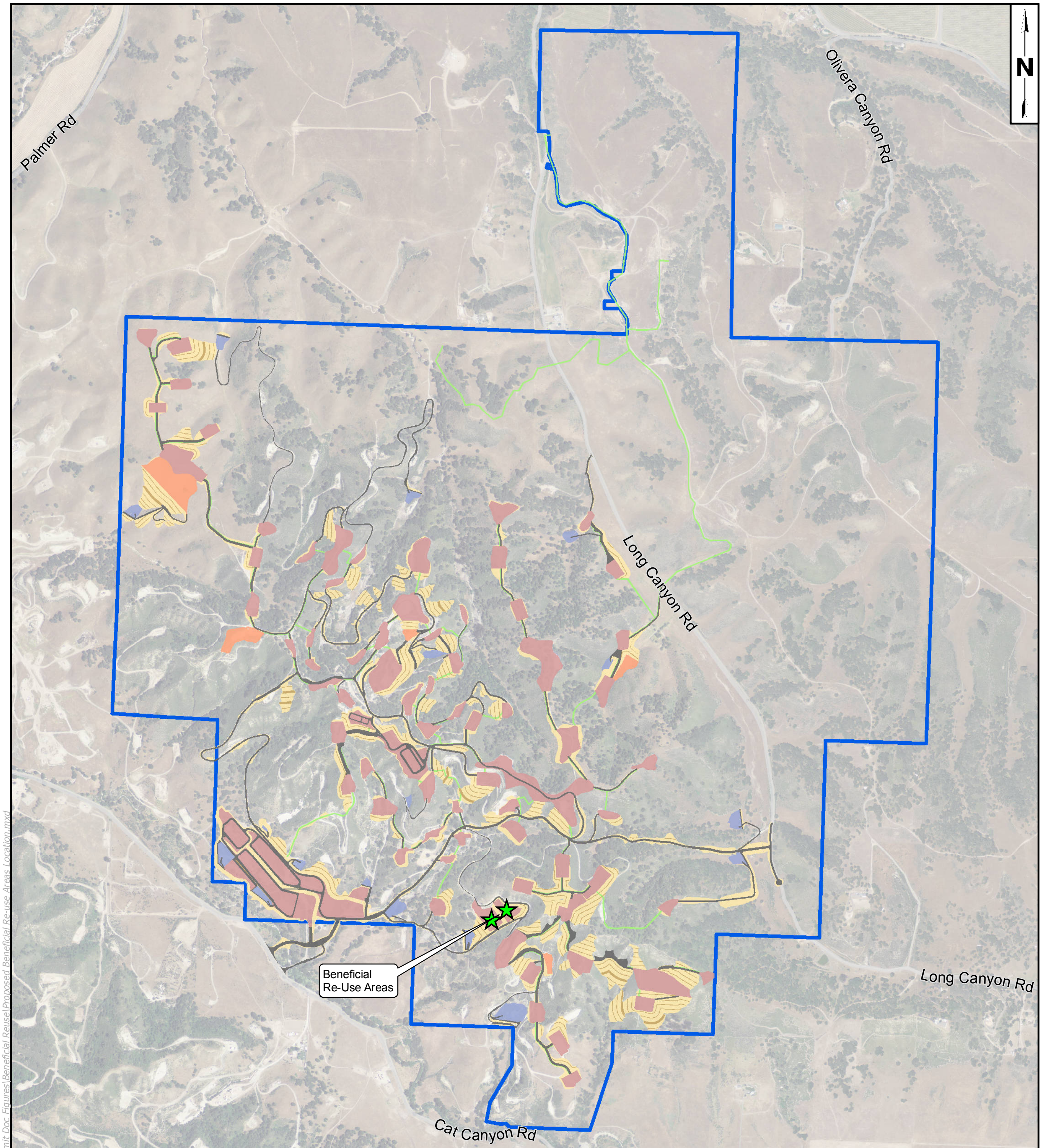
PROJECT NAME:		TOPOGRAPHIC LOCATION MAP	FIGURE
EAST CAT CANYON SANTA BARBARA COUNTY, CA			1
PROJECT NUMBER: 1002-0455	DATE: August 2014		



Aera Energy LLC Property
Well or Other Facility Pad
Laydown Area
Road
Cut / Fill Slope
Slope Benching
Pipeline Corridor
Storm Water Basin

0 600 1,200
FEET

Source: County of Santa Barbara, TJCross 8-20-14, DPSI 2013 Land Survey
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only.

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PROJECT NAME: EAST CAT CANYON SANTA BARBARA COUNTY, CA		PROPOSED BENEFICIAL RE-USE AREAS LOCATION	PLATE 2
PROJECT NUMBER: 1002-0455	DATE: February 2015		

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ATTACHMENT A

COMPLIANCE PLAN

COMPLIANCE PLAN

A. **Site Inspections and Observations** – Aera shall inspect all re-use project areas according to the following schedule, recording the following Standard Observations.
   a. **Site Inspection Schedule**:
      i. Aera shall perform one inspection prior to, during, and after the rainy season (October 1 through April 1), or at any time a failed management measure and/or discharge is reported or observed.
         1. **Standard Observations** – standard observations shall be performed along the perimeter of all authorized re-use projects to inspect for evidence of erosion or washout after severe rain events, and integrity during wet seasons. Aera shall select a sufficient number and location for each "observation point" as necessary to achieve compliance with the conditions of the waiver.

B. **Data Logging and Reporting**
   a. Logbooks – Aera shall maintain logbooks for recording all visual and water analysis data.
   b. If at any time offsite erosion or washout is observed, Aera shall determine and identify the failed management measures and source of discharge. Management measure failure is defined as:
      i. Whenever an implemented management measure creates a condition of pollution, contamination, or condition of nuisance
      ii. When lack of implementation of a necessary management measure creates a condition of pollution, contamination, or condition of nuisance
   c. If management measures fail, Aera shall photo document them and shall implement management practices immediately to prevent discharge and impacts to water quality.
   d. Annual Report – Aera shall submit an annual report to the Water Board by October 1st summarizing all preparedness measures performed to ensure discharges to surface and groundwater do not occur during the impending rainy season. The annual report shall include the following:
      i. Status of re-use projects including:
         1. The source of all materials
         2. Approximate volume of materials used
         3. Results of all soil chemical characterization performed
      ii. Summary of all Management Practices implemented in preparation of the upcoming rainy season.
      iii. An evaluation of the previous year's Management Practices implemented and their respective effectiveness.
      iv. Visual storm water observations and their observation dates
      v. Stabilization and erosion control measures implemented

   vi. Summary of violations
   vii. Summary of standard observations performed
   viii. Summary of actions implemented for the protection of water quality
   ix. Documentation of rainfall measurement procedures and locations
   x. A summary of water quality monitoring performed during the previous year (if any)
   xi. Recommendations for improving the monitoring and reporting program
   xii. **Maps**
      1. Map or aerial photo that show the locations of physical features and monitoring locations if applicable
      2. Map showing areas in which re-use materials have been placed and locations of re-use material projects completed during the previous year.
   xiii. **Lab Results**
      1. All monitoring and analytical data obtained during the previous year
      2. The evaluation and interpretation of all available data
   xiv. **Electronic Submittals** – the annual report will be submitted electronically
   xv. Aera shall maintain records of all monitoring information and results for a minimum of 3 years
   xvi. Photo-point monitoring points – All photo-point monitoring points will be documented in logbooks and photos will be of sufficient quality to record the effectiveness of the management practice

e. Aera shall notify the Executive Officer within 48 hours by telephone or email and within 14 days in writing of:
   i. Any noncompliance potentially or actually endangering health or the environment
   ii. Any flooding equipment failure, or other change in site conditions which could impair the integrity of the site
   iii. Any time Aera observes a discharge from the re-use areas
   iv. Any violations of the waiver conditions

ATTACHMENT B

MANAGEMENT PRACTICES PLAN

MANAGEMENT PRACTICES PLAN

A. **Non-structural Management Practices**
   a. **Good housekeeping** – Aera will operate the re-use project area in accordance with good housekeeping principals which are summarized by the following:
      i. Keep work site clean
      ii. Keep work site orderly
      iii. Handling materials and wastes in a manner that minimizes risk and potential runoff
   b. **Preventative Maintenance** – all equipment used in and around the re-use project area will be routinely inspected for wear and repaired if necessary.
   c. **Oil Spill Response** – an emergency contact list (located in Aera's Oil Spill Contingency Plan) includes contact information for Aera personnel, spill contractors, emergency numbers, and government agencies that must be notified in case of a release. The responsibilities of the response personnel include identifying the size, position, and content of the spill, and also the direction and speed and the likelihood of a spill entering a vulnerable area. No member of the response party shall do anything that would put anyone at risk. It is important that the spilled material be contained as soon as possible to prevent damage to health or to the environment.
   d. **Material handling and storage** – all materials will be handled in accordance with the waiver conditions.
   e. **Employee training** – all Aera field personnel are given annual training on the Management Practices Plan. The major emphasis of the training is in spill preventions and response, good housekeeping, and material management practices and an understanding of applicable pollution control laws and discharge procedure protocols.
   f. **Record keeping** – all plan related activities will be recorded and available for inspection.
   g. **Inspections** – site inspections will occur regularly according to the Site Inspection Schedule in the compliance plan.

B. **Structural Management Practices** – The main structural management practice that will be utilized will be earthen berms constructed around the re-use project location.