APPENDIX N

WMA Alternative Compliance Program Overview

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APPENDIX N. WMA ALTERNATIVE COMPLIANCE PROGRAM OVERVIEW

The 2013 San Diego National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater (MS4) Permit (R9-2013-0001) allows for implementation of offsite alternative compliance methods in lieu of meeting structural best management practice (BMP) design standards and/or hydromodification management criteria on the project site.

To implement an offsite alternative compliance program, a jurisdiction must first complete an optional Watershed Management Area Analysis (WMAA), as detailed in Permit Section B.3.b.(4). The San Diego County Responsible Agencies have collectively funded and provided guidance for development of a regional WMAA. Findings of the regional WMAA, specific to the Los Peñasquitos Watershed Management Area (WMA), are summarized in this appendix. The full WMAA will be attached as an appendix to the forthcoming *BMP Design Manual*, currently in development under direction from the Responsible Agencies.

In development of the Offsite Alternative Compliance Program framework, Responsible Agencies began with research of potential benefits and barriers to program implementation, as summarized in Sections N.1 and N.2. The sections following that discussion outline the selection of candidate sites and the program implementation schedule.

N.1 Alternative Compliance Program Benefits

The 2013 MS4 Permit (Permit) requirements will result in more priority development projects (PDPs), stricter criteria for onsite storm water retention, and larger hydromodification management facilities as compared to the 2007 Permit. The Responsible Agencies identified these factors as driving the need for offsite alternative compliance program implementation in the Los Peñasquitos WMA.

Alternative compliance methods can be implemented at the subwatershed scale (such as regional detention BMPs) or as green infrastructure BMPs (such as green streets). Regardless of scale, the Responsible Agencies acknowledged that offsite alternative compliance BMPs provide the opportunity to mitigate for pollutants not reliably retained on the project site or hydromodification impacts not reliably mitigated onsite per requirements detailed in Permit Sections E.3.c.(1) and E.3.c.(2). Note that onsite treatment control BMPs will still be required, though such BMPs would not be required to meet the onsite retention requirements.

Offsite alternative compliance methods can provide enhanced benefits for the watershed. For instance, facilities can be designed and customized to maximize targeted pollutant load reductions. If the facilities are located offsite and capable of filtering pollutants from larger contributing watershed areas, the pollutant removal

effectiveness can be enhanced. Thus, such facilities could be used as part of total maximum daily load (TMDL) reduction strategies implemented at the watershed level.

N.2 Alternative Compliance Program Implementation Barriers

Implementation of an offsite alternative compliance program will require updates to jurisdictional ordinances and development of funding mechanisms, water quality credit systems, and payment structures. Funding options, which are outlined in Table N-1, should be developed to minimize jurisdictional financial risk and to guarantee funding of long-term maintenance activities at the offsite alternative compliance facility. The options should include provisions of jurisdictional responsibility in the event that planned projects do not move forward or projects do not meet funding responsibility after occupancy.

Table N-1
Funding Methods for Offsite Alternative Compliance Candidate Projects

Funding Option	Comment
In-lieu funding of candidate projects	Project applicant must follow the BMP construction and long-term maintenance payment structure to be developed by the jurisdiction.
Funding and construction of BMP water quality credits	Project applicant must follow the water quality credit structure and BMP construction and long-term maintenance payment structure to be developed by the jurisdiction. This could include a process for water quality credit banking and trading.
Funding to offset temporal mitigation of pollutant loads prior to construction of alternative compliance project	Project applicant must follow the temporal loading payment structure to be developed by the jurisdiction.

For Responsible Agencies to move forward with offering offsite alternative compliance options to land development applicants, it will be necessary to reduce sources of financial risk, public liability risk, and compliance risk through legal agreements and other mechanisms.

The Permit specifies a timing element regarding the amount of time that may lapse between the completion of development project construction and completion of construction for the offsite mitigation. Programs will need to establish some assurance that the development applicant will meet that timeline and that the Responsible Agency will not be subject to enforcement actions caused by the development applicant's failure to meet the timeline. A program must be established with sufficient staffing to prevent delays in approvals, funding releases, or contract procurement required by the Responsible Agency to facilitate implementation of the offsite compliance.

For private development, the Responsible Agency review process provides some assurance that the permanent BMPs are properly designed and constructed to comply

with the performance requirements of the Permit. However, the developer and subsequent owner can be held responsible for corrective work if the BMPs are subsequently determined to be out of compliance with performance requirements of the Permit. It will be necessary to give Responsible Agencies the same level of protection for any offsite BMPs used as compliance credit for the development project.

Bonding mechanisms can protect the Responsible Agencies from abandoned projects or other issues that could affect the private development. Similar mechanisms would need to be established for offsite BMPs if the Responsible Agency is relying on the development applicant to supply funds or provide construction.

There are public liability risks associated with any public improvements including the offsite BMPs as well as any associated improvements, such as sidewalks and traffic lanes for the alternative compliance site. Responsible Agencies will need to establish measures that prevent additional risk associated with the introduction of Green Infrastructure into public spaces and having a private entity design and construct non-standard designs within public lands and right-of-ways. One measure could the development of new design standards and standard drawings specific to Green Infrastructure in public spaces.

The obligation to maintain any offsite BMPs is essentially “into perpetuity.” Therefore, it will be necessary for Responsible Agencies to have durable mechanisms in place that can assure private development financing of maintenance well into the future. Historically, some mechanisms such as homeowner associations and maintenance assessment districts, have not always proven to be durable over long periods of time including the possibility of severe downturns in the economy. Proper maintenance of BMP facilities is essential to provide for the intended BMP function and to prevent health concerns resulting from potential vector issues.

Possible alternative compliance arrangements could include public-to-public (where a public agency is both the project owner and the owner of the land with the offsite BMP), private-to-private, and private-to-public. The mechanisms needed for a public-to-public arrangement, particularly if both sites are within the same agency, are much less than what might be required for private-to-public. Therefore, some Responsible Agencies might be able to exercise alternative compliance in a public-to-public arrangement before all of the assurance mechanisms necessary for private-to-public arrangements are in place.

Per Permit requirements, offsite alternative compliance facilities must be constructed within the Los Peñasquitos WMA and provide for a greater water quality benefit, as compared to implementation of structural BMPs at the project site. To assess the water quality benefit metric, the jurisdiction must either develop or adopt water quality equivalency standards. Development of these equivalency standards, which represents another barrier to program implementation, has begun at the regional level between representatives of the City of San Diego, the County of San Diego, Orange County, and Riverside County. Equivalency calculations will provide the metric by which watershed improvement is demonstrated.

N.3 Selection of Candidate Projects

Per Permit Section B.3.b.(4)(a), the WMAA must include geographic information system (GIS) mapping layers to characterize the watershed functions detailed in Table N-2. The Responsible Agencies have compiled these layers for potential use in selecting candidate project sites. Such detailed information provides for initial project planning guidance, but should be field verified since much of the information was generated using desktop methods.

Table N-2
WMAA GIS Mapping Layers

GIS Mapping Layer	Potential Use
Dominant hydrologic processes	Identify areas prone to overland flow or infiltration.
Existing stream condition	Identify stream bed material, geomorphic processes, flow regime.
Coarse sediment yield areas	Identify buffer areas to minimize reduction in sediment supply and subsequent hydromodification impacts.
Current and future land uses	Determine the developable footprint.
Existing channel structures	Identify flood control channels, grade control structures, and detention facilities that can significantly affect watershed response.

Within the Los Peñasquitos watershed, detailed stream assessments were prepared for Los Peñasquitos Creek, Poway Creek, Rattlesnake Creek, and Carroll Canyon Creek.

In addition to allowing for offsite alternative compliance program development, the WMAA findings can also help determine the feasibility of candidate projects for offsite alternative compliance implementation (Permit Section B.3.b.(4)(b)). Responsible Agencies are currently compiling a list of candidate projects that will include projects previously identified in Comprehensive Load Reduction Plans (CLRPs), Jurisdictional Runoff Management Plans (JRMPs), and other regulatory documents. The numeric goals of the Los Peñasquitos WMA are also being considered in candidate project selection. Consistent with the Permit, project types being considered are detailed in Table N-3.

Table N-3
Candidate Project Types

Project Type	Potential Mitigation Provided
Infrastructure retrofits	Best management practice (BMP) pollutant mitigation Hydromodification management
Green streets	BMP pollutant mitigation Hydromodification management

Project Type	Potential Mitigation Provided
Regional BMPs	BMP pollutant mitigation Hydromodification management Floodplain management
Stream rehabilitation or restoration	Hydromodification management Floodplain management Natural water quality filtering
Riparian habitat rehabilitation or restoration	Biological resources
Groundwater recharge and water supply augmentation	Water resources BMP Pollutant mitigation Hydromodification management
Floodplain buffer land acquisition	Floodplain management Open space preservation Natural water quality filtering

This appendix and the Water Quality Improvement Plan will be updated to include the final candidate project list for future drafts, as that list is made available.

Responsible Agencies will use the results of the WMAA to develop the formal Offsite Alternative Compliance Program. As part of program development, Responsible Agencies will need to identify funding mechanisms, develop payment and credits structures, formulate water quality equivalency standards, and implement required ordinance updates. Consideration will also focus on the potential roles of regulatory agencies, such as the U.S. Army Corps of Engineers and the State Department of Fish and Wildlife, in helping to implement offsite alternative compliance facilities.

N.4 Alternative Compliance Implementation Schedule

Table N-4 summarizes milestones regarding the WMAA and potential Offsite Alternative Compliance Program initiation.

Table N-4 WMAA and Alternative Compliance Program Implementation

Milestone	Date
WMAA public outreach effort	July 2014 to September 2014
Watershed-specific WMAA GIS layers provided to Water Quality Improvement Plan groups	September 2014
Watershed specific WMAAs provided to Water Quality Improvement Plan groups	October 2014
Draft Water Quality Improvement Plan candidate project list	October 2014
BMP Design Manual submittal (with WMAA as attachment)	June 2015
Final Water Quality Improvement Plan submittal with watershed-specific WMAA attached	June 2015

Milestone	Date
Water quality equivalency standards—final document	December 2015
First potential approval of Offsite Alternative Compliance Program	To be determined

N.5 Los Peñasquitos WMAA Report and Attachments

The Los Peñasquitos WMAA report and attachments are included as Attachments N-1 and N-2. These documents were developed as part of a regional Copermittee effort and included a call for data for information to be included in the analysis. The WMAA documents were developed following criteria set forth in the MS4 Permit. Data included in the documents are intended for guidance purposes. Where more site specific data is available, then the more detailed information should be used.

The WMAA also provides an assessment of applicable exemptions to hydromodification management requirements, in addition to the Permit's allowed exemptions regarding direct discharges to exempt receiving waters including the Pacific Ocean, lakes, or reservoirs (or direct discharges to underground storm drains or concrete-lined channels directly discharging to the Pacific Ocean). For the Los Peñasquitos watershed, no additional potential exemptions are recommended with regard to exempt river reaches, stabilized conveyances, highly impervious watersheds, or tidally-influenced lagoons.

Draft candidate project lists currently available are provided in Attachment N-3. The Water Quality Improvement Plan will be updated to include the final candidate project list, as that list is made available.

Attachment N-1

Los Peñasquitos WMAA Report

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Los Peñasquitos Watershed Management Area Analysis

Lake Henshaw

October 3, 2014

Prepared for:
San Diego County Copermittees

Prepared by:

Geosyntec consultants
engineers | scientists | innovators

RICK ENGINEERING COMPANY

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ACRONYMS AND ABBREVIATIONS

%	percent
>	greater than
<	less than
BMP	Best Management Practice
CB	Coarse Bedrock
CEG	Certified Engineering Geologist
CIP	Capital Improvement Project
CLRP	Comprehensive Load Reduction Plan
CSI	Coarse Sedimentary Impermeable
CSP	Coarse Sedimentary Permeable
E_P	Erosion Potential
ET	Evapotranspiration
FB	Fine Bedrock
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FSI	Fine Sedimentary Impermeable
FSP	Fine Sedimentary Permeable
GIS	Geographic Information System
GLU	Geomorphic Landscape Unit
HA	Hydrologic Area
HCP	Hydromodification Control Plan
HMP	Hydromodification Management Plan
HRU	Hydrologic Response Unit
HSA	Hydrologic Sub Area
HSG	Hydrologic Soil Group
IRWM	Integrated Regional Water Management
JURMP	Jurisdictional Urban Runoff Management Plan
LDW	Land Development Workgroup
LID	Low Impact Development
MAP	Mean Annual Precipitation

ACRONYMS AND ABBREVIATIONS continued

MHPA	Multiple Habitat Planning Area
MS4	Municipal Separate Storm Sewer System
MSCP	Multiple Species Conservation Program
NED	National Elevation Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
PDP	Priority Development Project
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
SCAMP	Southern California Aerial Mapping Project
SCCWRP	Southern California Coastal Water Research Project
SD	San Diego
SDRWQCB	San Diego Regional Water Quality Control Board
S_P	Sediment Supply Potential
SSURGO	Soil Survey Geographic Database
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan
WURMP	Watershed Urban Runoff Management Plan

1. Introduction

1.1. Background

On May 8, 2013 the California Regional Water Quality Control Board, San Diego Region adopted Order No. R9-2013-0001; NPDES No. CAS 0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region (Regional MS4 Permit). The Regional MS4 Permit, which became effective on June 27, 2013, replaces the previous MS4 Permits that covered portions of the Counties of San Diego, Orange, and Riverside within the San Diego Region. There were two main goals for the Regional MS4 Permit:

1. To have more consistent implementation, as well as improve inter-agency communication (particularly in the case of watersheds that cross jurisdictional boundaries), and minimize resources spent on the permit renewal process.
2. To establish requirements that focused on the achievement of water quality improvement goals and outcomes rather than completing specific actions, thereby giving the Copermittees more control over how their water quality programs are implemented.

To achieve the second goal, the Regional MS4 Permit requires that Water Quality Improvement Plans (WQIPs) be developed for each Watershed Management Area (WMA) within the San Diego Region. As part of the development of WQIPs, the Regional MS4 Permit provides Copermittees an option to perform a Watershed Management Area Analysis (WMAA) through which watershed-specific requirements for structural BMP implementation for Priority Development Projects can be developed for each WMA. This report presents the Copermittees' approach and results for the regional elements of the WMAA developed for the San Diego County area.

1.2. Watershed Management Area Analysis (WMAA)

The Regional MS4 Permit, through inclusion of the WMAA, provides an optional pathway for Copermittees to develop an integrated approach for their land development programs by promoting evaluation of multiple strategies for water quality improvement and development of watershed-scale solutions for improving overall water quality in the watershed. The WMAA comprises the following three components as indicated in the Regional MS4 Permit:

1. Perform analysis and develop Geographic Information System (GIS) layers (maps) by gathering information pertaining to the physical characteristics of the WMA (referred to herein as WMA Characterization). This includes, for example, identifying potential areas of coarse sediment supply, present and anticipated future land uses, and locations of physical structures within receiving streams and upland areas that affect the watershed hydrology (such as bridges, culverts, and flood management basins).
2. Using the WMA Characterization results, compile a list of candidate projects that could potentially be used as alternative compliance options for Priority Development Projects. Such projects may include, for example, opportunities for stream or riparian area

rehabilitation, opportunities for retrofitting existing infrastructure to incorporate storm water retention or treatment, or opportunities for regional BMPs, among others. Prior to implementing these candidate projects the Copermittees must demonstrate that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of the onsite structural BMPs. Note, compilation or evaluation of potential projects was not performed as part of this regional effort. Identification and listing of candidate projects will be performed for each WMA through the WQIP process for WMAs that elect to submit the optional WMAA as part of the WQIP.

3. Additionally, using the WMA Characterization maps, identify areas within the watershed management area where it is appropriate to allow for exemptions from hydromodification management requirements that are in addition to those already allowed by the Regional MS4 Permit for Priority Development Projects. The Copermittees shall identify such cases on a watershed basis and include them in the WMAA with supporting rationale to support claims for exemptions.

1.3.Scope of Work for Regional WMAA

In July 2013, the Copermittees elected to fund a regional effort to develop elements of the regional WMAA for the 9 San Diego-area WMAs within the County of San Diego that are currently subject to the Regional MS4 Permit, which include:

- Santa Margarita River (for portion in San Diego County)
- San Luis Rey River
- Carlsbad
- San Dieguito River
- Los Peñasquitos
- Mission Bay & La Jolla Watershed
- San Diego River
- San Diego Bay
- Tijuana River (for portion in San Diego County)

The regional-level information developed through this effort is intended to provide consistency across WMAs and serve as the foundation for developing watershed-specific information for each WMA to be developed through the WQIP process. The regional effort scope of work included:

1. Development of GIS map layers that characterize the WMAs using data previously collected, readily available, and provided by the Copermittees, including:
    a. Description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;
    b. Description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;

c. Current and anticipated future land uses;

d. Potential coarse sediment yield areas; and

e. Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

2. Development of a Microsoft® Excel (Excel) template for use by Copermittees to compile lists of candidate projects for an optional alternative compliance program.

3. Development of additional criteria and analyses to support reinstating the following proposed exemptions that were originally developed in the approved 2011 Final Hydromodification Management Plan but not included in the Regional MS4 Permit unless provided by the Copermittees in the WMAA. In addition, development of the associated Hydromodification Applicability/Exemption Mapping.

    a. Exempt River Reaches including:

        i. San Diego River;

        ii. Otay River;

        iii. San Dieguito River;

        iv. San Luis Rey River; and

        v. Sweetwater River

    b. Stabilized Conveyance Systems Draining to Exempt Water Bodies

    c. Highly Impervious/Highly Urbanized Watersheds and Urban Infill, and

    d. Tidally Influenced Lagoons (where data/study provided)

The scope of work for the regional effort excluded performing analysis within the following areas unless data was readily available, as Copermittees do not have jurisdiction over these areas:

1. State Lands;
2. U.S. Departments of Defense land;
3. U.S. National Forest land;
4. U.S. Department of Interior land and
5. Tribal land

Additional description of excluded areas, for the purposes of the Regional WMAA, is indicated in Section 2.3 Land Uses.

1.4.Project Process

The process for developing the Regional WMAA included close coordination with the Land Development Workgroup (LDW) at key points during the project. The LDW is composed of the 21 San Diego-area Copermittees and serves to develop and implement regional land development plans and programs necessary to support the requirements of the Regional MS4 Permit. The consultant team (Geosyntec Consultants and Rick Engineering Company) presented

preliminary project assumptions and methodologies proposed to be used to develop the Regional WMAA to meet the requirements of the Regional MS4 Permit in December 2013. The consultant team incorporated workgroup feedback from this meeting and subsequently presented the preliminary Regional WMAA project results to the LDW in March 2014, again to receive direction and incorporate input on the preliminary results. Subsequently, the draft report was released to the public in July 2014, by a public workshop that included Consultation Panel members from each of the WMAs on July 29, 2014. This version of the report including all of the input described above is being issued for optional inclusion into the respective WQIP Provision B.3 submittals to the SDRWQCB in December 2014.

1.5. Report Organization

This report is organized as follows:

- Chapter 1 provides the project background and purpose;
- Chapter 2 describes the technical basis for characterizing the WMA;
- Chapter 3 describes the template that can be used by Copermittees to compile the list of candidate projects;
- Chapter 4 summarizes the analyses performed to support reinstating select exemptions from hydromodification control requirements for PDPs;
- Chapter 5 presents the WMAA conclusions;
- Chapter 6 presents the references used for the WMAA;
- Attachment A presents the exhibits and additional supporting information for watershed management area characterization;
- Attachment B presents the exhibits and additional supporting information for hydromodification management applicability/exemptions;
- Attachment C expands on the structure of the geodatabase that hosts the GIS data developed by the WMAA; and
- Attachment D provides a crosswalk between the Regional MS4 Permit requirements for WMAA and this report.

1.6.Terms of Reference

The work described in this report was conducted by Geosyntec Consultants (Geosyntec) and Rick Engineering Company (RICK) on behalf of the County of San Diego and the regional Copermittees.

2. Watershed Management Area Characterization

Watershed health and function are strongly influenced by hydrological and geomorphological processes occurring in the watershed. Both hydrological response and geomorphological response of the watershed are dependent on a variety of physical characteristics of the watershed. To this end, the Regional MS4 Permit specifies a set of data that is required to adequately characterize overall watershed processes as a foundation to enhancing integration and effectiveness of watershed management and water quality programs. The following GIS map layers were developed to characterize the hydrological and geomorphological processes within the Los Peñasquitos WMA:

- Dominant Hydrologic Processes: A description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;
- Stream Characterization: A description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;
- Land Uses: Current and anticipated future land uses;
- Potential Coarse Sediment Yield Areas; and
- Physical Structures: Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

These GIS layers can be used to:

- Identify the nature and distribution of key macro-scale watershed processes;
- Identify potential opportunities and constraints for regional and sub-regional storm water management facilities that can play a critical role in meeting water quality, hydromodification, water supply, and/or habitat goals within the watershed;
- Assist with determining the most appropriate management actions for specific portions of the watershed; and
- Suggest where further study is appropriate.

2.1. Dominant Hydrologic Processes

The Regional MS4 Permit identifies in the provisions related to the WMAA that a description of dominant hydrologic processes within the watershed must be developed, with GIS layers (maps) as output. The Permit specifically calls for processes "*such as areas where infiltration or overland flow likely dominates*." These particular aspects of the hydrological mechanics of watersheds are particularly important when attempting to understand the macro-scale opportunities for locating projects that take advantage of either capturing overland flow for treatment or for infiltration.

Investigation of the dominant hydrologic processes in the San Diego-area watersheds indicates that evapotranspiration (ET) is the most dominant hydrologic process for the region based on review of a published study (Sanford and Selnick, 2013). ET is the sum of evaporation and plant transpiration in the hydrologic cycle that transports water from land surfaces to the atmosphere. This is conclusion is supported by comparing the 30-year average annual rainfall for the study area (San Diego County east of the peninsular divide) of between 15 and 18 inches per year (San Diego County, 2005) to the average annual ET rates. According to the California Irrigation Management Information System (CIMIS) Reference Evapotranspiration Map (CIMIS, 1999), the study area (within Zones 4, 6, and 9) experiences annual reference ET of 46.6, 49.7 and 59.9 inches, respectively. Therefore, theoretically, if all of the annual precipitation for the San Diego-area watersheds remained stationary where it fell and did not either infiltrate or runoff to local waterbodies where it would be conveyed downstream ultimately to the ocean, it all would be consumed by ET. As such, the effect of ET on the overall hydrologic processes within the San Diego watersheds is a function of the temporal scale over which it acts. Precipitation events often produce runoff in these watersheds, particularly in the urbanized portions, based on the topography and land cover that tend to accelerate the conveyance of runoff downstream rather than collecting, storing, or spreading out that then would maximize the effect of ET.

Because this study is focused on developing information and mapping for the portion of the hydrologic process that informs watershed management decisions, i.e., locating beneficial projects in areas of greatest opportunity, the next tier of dominant hydrologic processes are studied and mapped by this project. As such, the study area was characterized, based on the methodology described in the following section, according to the predicted fate of runoff within the watersheds being either overland flow or infiltration after considering the effects of ET (as well as an intermediate category of interflow). Areas that were mapped as overland flow do not necessarily preclude infiltration but rather indicate the dominant expected process that runoff would experience if not intercepted for the express purpose of infiltrating storm water runoff. The Model BMP Design Manual will provide more detailed guidance and procedures for determining the potential for infiltrating captured storm water at the project level irrespective of the mapping produced in the WMAA. To reiterate, the WMAA mapping is to provide macro-scale processes for high-level analysis and to inform decisions affecting regional scales. Furthermore, the Model BMP Design Manual will indicate the degree to which site-scale BMPs can expect to benefit from ET or how ET is considered in the sizing of BMPs. In brief, typical storm water BMPs only store water for a few days and therefore are not really capable of significant volume disposal through ET. However, pervious area dispersion (i.e., directing storm water runoff to flat areas for spreading and infiltration) has appreciable benefits with regard to ET and is a practice promoted in the BMP Design Manual.

The processes of interest are further defined as follows:

Overland flow: This process can be thought of as the inverse of infiltration; precipitation reaching the ground surface that does not immediately soak in must run over the land surface (thus, "overland" flow). It reflects the relative rates of rainfall intensity and the soil's infiltration capacity: wherever and whenever the rainfall intensity exceeds the soil's infiltration capacity, some overland flow will occur. Most uncompacted, vegetated soils have infiltration capacities of one to several inches per hour at the ground surface, which exceeds the rainfall intensity of even unusually intense storms. In contrast, pavement and hard surfaces reduce the effective infiltration capacity of the ground surface to zero, ensuring overland flow regardless of the meteorological attributes of a storm, together with a much faster rate of runoff relative to vegetated surfaces.

Infiltration and groundwater recharge: These closely linked hydrologic processes are most apparent near ephemeral and perennial conveyances in the San Diego region. Their widespread occurrence is expressed by the common absence of surface-water channels on even steep (undisturbed) hillslopes. Thus, on virtually any geologic material on all but the steepest slopes (or bare rock), infiltration of rainfall into the soil is inferred to be widespread, if not ubiquitous. With urbanization, changes to the process of infiltration are also quite simple to characterize: some (typically large) fraction of that once infiltrating water is now converted to overland flow.

Interflow: Interflow takes place following storm events as shallow subsurface flow (usually within 3 to 6 feet of the surface) occurring in a more permeable soil layer above a less permeable substrate. In the storm response of a stream, interflow provides a transition between the rapid response from surface runoff and much slower stream discharge from deeper groundwater. In some geologic settings, the distinction between "interflow" and "deep groundwater" is artificial and largely meaningless; in others, however, there is a strong physical discrimination between "shallow" and "deep" groundwater movement. Development reduces infiltration and thus interflow as discussed previously, as well as reducing the footprint of the area supporting interflow volume.

The datasets used, methodology for creating the dominant hydrologic processes maps, and the results are described in the sections below.

2.1.1. Datasets Used for identifying dominant hydrologic processes

The following datasets were used in the analysis:

Dataset	Source	Year	Description
Elevation	USGS	2013	1/3rd Arc Second (~10 meter cells) digital elevation model for San Diego County
Soils Data	SanGIS	2013	NRCS (SSURGO) Database for San Diego County downloaded from SanGIS
Land Cover	SanGIS	2013	Ecology-Vegetation layer for San Diego County downloaded from SanGIS

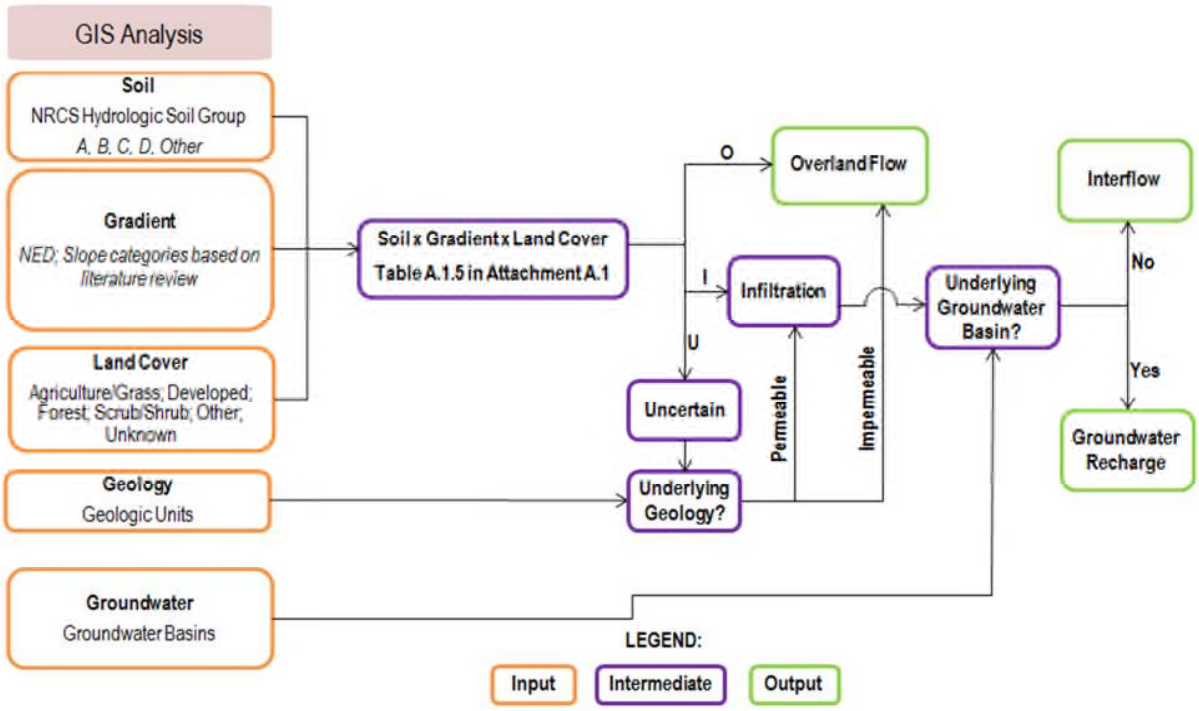
Dataset	Source	Year	Description
Geology	Kennedy, M.P., and Tan, S.S.	2002	Geologic Map of the Oceanside 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 2, 1:100,000 scale.
	Kennedy, M.P., and Tan, S.S.	2008	Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, 1:100,000 scale.
	Todd, V.R.	2004	Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, Southern California, United States Geological Survey, Southern California Aerial Mapping Project (SCAMP), Open File Report 2004-1361, 1:100,000 scale.
	Jennings et al.	2010	"Geologic Map of California," California Geological Survey, Map No. 2 – Geologic Map of California, 1:750,000 scale
Groundwater Basins	SanGIS	2013	Groundwater Basins in San Diego County downloaded from SanGIS

2.1.2. Methodology/Assumptions/Criteria for identifying dominant hydrologic processes

The methodology used to describe dominant hydrologic processes is based on recommendations included in the Southern California Coastal Water Research Project's (SCCWRP) Technical Report 605 titled "Hydromodification Screening Tools: GIS-Based Catchment Analyses of Potential Changes in Runoff and Sediment Discharge" (SCCWRP, 2010). The foundation for this analysis was to incorporate the Report's concept of grouping common hydrologic attributes into Hydrologic Response Units (HRUs). The report states the following:

> *"Grouping common hydrologic attributes across a watershed into a tractable number of Hydrologic Response Units (HRUs: a term first used by England and Holtan 1969) has become a well-established approach for condensing the near-infinite variability of a natural watershed into a tractable number of different elements. The normal procedure for developing HRUs is to identify presumptively similar rainfall–runoff characteristics across a watershed by combining spatially distributed climate, geology, soils, land use, and topographic data into areas that are approximately homogeneous in their hydrologic properties (Green and Cruise 1995, Becker and Braun 1999, Beven 2001, Haverkamp et al. 2005). As noted by Beighley et al (2005), this process of merging the landscape into discrete HRUs is a common and effective method for reducing model complexity and data requirements. Using watershed characteristics to predict runoff is the explicit task of hydrologic models, and there is a host of such models available for application to hydromodification evaluation. For purposes of "screening," however, the goal is simplicity and ease of application even if the precision of the resulting analysis is crude."*

The following process describes the methodology used to define Hydrologic Response Units (HRUs) and then relate the HRUs to the dominant hydrologic processes (i.e., overland flow, interflow, and groundwater recharge) in the Los Peñasquitos WMA.



The first step is to define the HRUs. Once these are defined, the remaining steps determine the dominant hydrologic process.

1. **Integrate data sets used to determine HRU**: Categories for soil type, gradient, and land cover were defined based on readily available GIS datasets for the region and classifications found in relevant literature, as indicated below. The different combinations of these three categories comprise the distinct HRUs.

    - **Soil Categories**: based on National Resource Conservation Service (NRCS) Hydrologic Soil Group (HSG) classifications, which are commonly used to describe runoff/infiltration potential of soils on a regional scale. These categories include: A, B, C, and D. HSG A soils have the lowest runoff potential, while HSG D soils have the highest runoff potential.

    - **Gradient Categories**: based on slope ranges found in a review of relevant literature identified in Chapter 6. The spatial processing of the slope categories utilized the United States Geologic Survey (USGS) National Elevation Dataset (NED). Slopes were grouped (bins) into the following ranges: 0% to 2%; 2% to 6%; 6% to 10%; and greater than 10%. The 2% and 6% slope thresholds were based on slope ranges included in Table A.1.1 (McCuen, 2005) presented in Attachment A.1. This table provides runoff coefficients as a function of slope, soil group, land cover, and return period and was used for subsequent steps in the mapping effort. The 10% slope threshold was used in SCCWRP's Technical

Report 605 (SCCWRP, 2010) and is a logical cutoff since slopes steeper than 10% are assumed to be dominated by overland flow.

- **Land Cover Categories**: were defined using the Ecology Vegetation GIS map layer developed by the City of San Diego, the County of San Diego and SANDAG and downloaded from SanGIS (2013). The vegetation categories in the GIS layer were grouped (Table A.1.2 in Attachment A.1) to match the following categories used in SCCWRP's Technical Report 605 (SCCWRP, 2010): Agriculture/Grass; Developed; Forest; Scrub/Shrub, Other (Water), and Unknown.

2. **Evaluate Land Cover**: Land cover categories for Agriculture/Grass, Forest, Scrub/Shrub and Other were related to land use categories defined in Table A.1.1 as shown in Table A.1.3 in Attachment A.1. Relating a land use category for the Developed land cover category was not necessary because all Developed cover was assumed to have overland flow as its dominant hydrologic process.
3. **Determine Hydrology Characteristics for Land Covers**: For each of the land cover/land use categories listed in Table A.1.3, the ratio of precipitation lost to evapotranspiration (i.e. an evapotranspiration coefficient) was estimated using Table A.1.1 using the process described below. Since precipitation is considered to be the sum of the resulting runoff, infiltration, and evapotranspiration, the coefficients for these three hydrologic pathways sum to one, as indicated below.

   Runoff Coefficient + Infiltration Coefficient + Evapotranspiration Coefficient = 1

   i) **Estimate Evapotranspiration**: To estimate the evapotranspiration (ET) coefficient for each land cover, first the runoff coefficient was identified in Table A.1.1 for the highest runoff potential (i.e., Group D soil and 6%+ slope) and most common storm conditions (i.e., storm recurrence intervals less than 25 years). The infiltration for these high runoff conditions was assumed to be negligible, resulting in an infiltration coefficient of zero. Since the sum of the three coefficients should sum to one, the ET coefficient was assumed to be the remaining difference (i.e., ET Coefficient = 1 – Runoff Coefficient). The ET coefficient calculated for the highest runoff potential was then applied to all soil types and slopes within that land use category. The calculated ET coefficient for each applicable HRU is provided in Table A.1.4 in Attachment A.1. The ET coefficient for HRUs that have a Developed land cover or a gradient greater than 10% were not calculated since these HRUs were assumed to have overland flow as the dominant hydrologic process.

   ii) **Estimate Infiltration**: The infiltration coefficient for each applicable HRU (i.e., combination of soil, gradient, and land cover) was estimated by subtracting both the runoff coefficient, provided in Table A.1.1, and the ET coefficient, calculated in step 3(i), from one (i.e., Infiltration Coefficient = 1 – Runoff Coefficient – ET Coefficient). The calculated infiltration coefficient for each applicable HRU is provided in Table A.1.4 in Attachment A.1.

   iii) **Estimate Runoff**: For each applicable HRU, the runoff coefficient was divided by

the infiltration coefficient to obtain a ratio representing the potential for runoff or infiltration. The higher the ratio, the greater the potential for runoff to be a more dominant hydrologic process than infiltration. Similarly, the lower the ratio, the greater the potential for infiltration to be a more dominant hydrologic process than runoff. The calculated runoff to infiltration ratios are provided in Table A.1.4 in Attachment A.1.

4. **Associate Runoff and Infiltration to HRUs**: The following designations were assigned to each applicable HRU based on the runoff to infiltration ratio (i.e., runoff coefficient/infiltration coefficient). These designations were based on best engineering judgment with the underlying assumption that if a runoff or infiltration coefficient is more than 50% greater than its counterpart, then the prevailing process is considered dominant.

    - HRUs with runoff to infiltration ratios greater than 1.5 (3:2 ratio) were assumed to have relatively high runoff and overland flow was considered its dominant hydrologic process. These HRUs are designated by the letter "O" (Overland flow is dominant process) in Tables A.1.4 and A.1.5 in Attachment A.1.
    - HRUs with runoff to infiltration ratios less than 0.67 (2:3 ratio) were assumed to have relatively high infiltration and its dominant hydrologic process was either interflow or groundwater recharge, based on analysis described in subsequent steps. These HRUs are designated by the letter "I" (Interflow is dominant process) in Tables A.1.4 and A.1.5.
    - For HRUs with runoff to infiltration ratios between, and including, 1.5 and 0.67 it was uncertain whether it was dominated by overland flow or infiltration. These HRUs are designated by the letter "U" (Dominant process is uncertain) in Tables A.1.4 and A.1.5.
    - For HRUs that have a Developed land cover or a gradient greater than 10%, the runoff to infiltration ratios were not calculated because these HRUs were assumed to have overland flow as the dominant hydrologic process. These HRUs are designated by the letter "O" (Overland flow is dominant process) in Table A.1.5.

5. **Uncertain HRUs Assignment**: For HRUs with an uncertain designation ("U") in Table A.1.5 in Attachment A.1, the underlying regional geology (Kennedy and Tan, 2002 & 2008; Todd, 2004 and Jennings et al., 2010) was used to evaluate whether overland flow or infiltration were dominant. If the underlying geology was considered impermeable, then these uncertain areas were considered to have overland flow as its dominant hydrologic process. If the underlying geology was considered permeable, then these uncertain areas were considered to be dominated by infiltration. The determination of whether a geologic unit is impermeable or permeable was based on desktop evaluation and the best professional judgment of a Certified Engineering Geologist (CEG). This analysis was performed in GIS and is illustrated in the flowchart above.

6. **Associate Infiltration HRUs with Known Groundwater Basins**: For HRUs with relatively high infiltration and have a designation of "I" in Table A.1.5 in Attachment A.1, the presence or absence of a regional groundwater basin (SanGIS, 2013) underlying these areas determined whether the dominant hydrologic process was designated as interflow or groundwater recharge. The groundwater recharge hydrologic process was assigned as dominant for those applicable areas which had an underlying groundwater basin. The interflow hydrologic process was assigned as dominant for those applicable areas which did not have an underlying groundwater basin directly below it. This analysis was performed in GIS and is illustrated in the flowchart above.
7. **Resulting HRU Data:** The resulting GIS map of dominant hydrologic processes was reviewed by engineering professionals familiar with the hydrology in the County of San Diego to confirm that the mapping is consistent with their experience working in the region.

2.1.3. Results for identifying dominant hydrologic processes

The resulting GIS map showing the spatial distribution of dominant hydrologic processes (i.e., overland flow, interflow, and groundwater recharge) within the Los Peñasquitos WMAs is provided in Attachment A.1. An ArcMap document file which presents the results from each step of the methodology is included in Attachment C, as well as a Google Earth KMZ file. Based on this analysis, overland flow is the predominant hydrologic process in all this WMA, which is consistent with the experience of engineering professionals familiar with the hydrology of the County of San Diego.

Summary of Deliverables for Dominant Hydrologic Processes

Format	Item	Description	Location
Report	Figure	"Dominant Hydrologic Processes"	Attachment A.1
GIS	Map Group Title	Hydrologic Processes	Attachment C.1
	Map Layer Title	Soil Land Cover Slope Hydrologic Response Unit Initial Rating Permeability Groundwater Basin Dominant Hydrologic Processes	
	Geodatabase Feature Dataset	HydrologicProcesses	
	Geodatabase Feature Class	HRUAnalysis	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Dominant Hydrologic Processes	Attachment C.2

[1] To enhance the utilization of this data, the Dominant Hydrological Processes map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.1.4. Limitations for identifying dominant hydrologic processes

The resulting GIS map layer only lists the dominant hydrological process (i.e., an HRU assigned a dominant process of overland flow can also experience small amounts of infiltration) and provides a useful, rapid framework to perform screening-level analysis that is appropriate for watershed-scale planning studies. When more precise estimates are required for a particular site and subarea it is recommended that this analysis be augmented with site-specific analysis.

2.2.Stream Characterization

For the purpose of WMAA, the Regional MS4 Permit requires a description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral. Under the Regional WMAA, this analysis was prepared for 27 streams throughout the San Diego Region agreed upon by the consultant team and Copermittees. Within the Los Peñasquitos WMA, stream characterization and detailed mapping is provided for Los Peñasquitos / Poway Creek, Rattlesnake Creek, and Carroll Canyon Creek as shown on the exhibit titled "Watershed Management Area Streams" located in Attachment A.2.

2.2.1. Datasets Used for stream characterization

The following data were referenced for the purpose of stream characterization:

- USGS National Hydrography Dataset, downloaded from USGS November 2013
- USGS 7.5-minute quadrangles, compiled image of quadrangles covering San Diego County, various dates
- Floodplains: "National Flood Hazard Layer," provided by Federal Emergency Management Agency October 2012
- Various datasets provided by Copermittees depicting existing storm water conveyance infrastructure within their jurisdictions.
- Aerial photography by Digital Globe dated 2012

2.2.2. Methodology/Assumptions/Criteria for stream characterization

The analysis was prepared by digitizing each of the 27 streams based on review of data listed above. Within the pre-existing datasets depicting streams, floodplains, or infrastructure, no single dataset included a complete, accurate alignment of each stream. Digitizing the streams based on review of all of the data listed above allowed creation of GIS linework with a continuous corrected alignment for each stream. The following data were recorded as GIS attributes for each stream as the stream was digitized:

- River name
- Reach type (engineered or natural, constrained or un-constrained)
- Bed material
- Bank material
- Hydrographic category (perennial or intermittent)

The attributes listed above were collected manually based on interpretation of the reference data. Assumptions used in making the interpretations are listed below. The ***Hydrographic Category*** section below will provide the rationale as to why perennial and intermittent were the hydrographic categories chosen for this WMAA and not perennial and ephemeral.

Note that stream classification was not prepared within areas of Federal/State/Indian lands unless data was readily available. Stream lines were prepared within these areas for continuity, but some data fields were not populated within these areas.

Reach Type

Streams were classified as either engineered or natural, and either constrained or un-constrained. See the exhibit titled, "Watershed Management Area Streams by Reach Type" in Attachment A.2. The purpose of this exercise was to identify whether the stream has been modified by human activity within the stream itself, which may include addition of crossing structures, stabilization of banks, dredging, or any other human activity. This aids the identification of physical structures including stream armoring, constrictions, grade control, and other modifications as required by the Regional MS4 Permit.

Classification of the streams as either "**engineered"** or **"natural"** was based on the following criteria:

Engineered

- A classification of "engineered" was assigned where the stream itself has been modified by human activity.
- All culvert/bridge/pipe crossings either provided in the Copermittes' storm water conveyance system data or clearly visible on the aerial photo have been assigned as engineered within the limits of the crossing.
- If the Copermittees did not provide storm water conveyance system data for the dirt road crossings/dip sections the streams have been assigned as engineered within the limits of the crossing. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, they were assigned as engineered.
- Golf courses have been assigned as engineered.
- If aerial photography showed large water bodies (lake, pond, irrigation pond, etc.) they were assigned as engineered.
- If the storm water conveyance system data provided by the Copermittees has identified the stream as "rockbs", the assumption has been made that these streams have rocks on their bottom and the sides ("bs"), and have been assigned as engineered.
- Sand mining operations have been assigned as engineered. Sand mining is an operation that is in continuous flux and does not typically result in a discrete, engineered geometry in any given channel cross section until restoration is implemented at the conclusion of the sand mining operation. It is assigned as engineered to acknowledge human alteration of the stream.

Natural

- Streams that have no apparent alteration within the stream itself by human activity have been assigned as natural.

Classification of the streams as either **"constrained"** or **"un-constrained"** was based on the following criteria:

Constrained

- All culvers/bridge/pipe crossings either provided in the Copermittes' storm water conveyance system data or clearly visible on the aerial photo have been assigned as constrained.
- If the Copermittees did not provide storm water conveyance system data for the dirt road crossings/dip sections the streams have been assigned as constrained. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, they were assigned as constrained.
- Golf courses have been assigned as constrained if located within the Federal Emergency Management Agency (FEMA) floodway based on the "National Flood Hazard Layer" data.
- The USGS National Hydrographic Dataset in their hydrographic category had assigned some reaches as artificial paths. In these situations and if the aerial photography shows large water bodies (lake, pond, irrigation pond, etc.) these streams have been assigned as constrained.
- Sand mining operations located within the FEMA floodway based on the "National Flood Hazard Layer" have been assigned as constrained.

Un-constrained

- Golf courses have been assigned as un-constrained if not located within the FEMA floodway based on the "National Flood Hazard Layer" data.
- Sand mining operations not located within the FEMA floodway based on the "National Flood Hazard Layer" data have been assigned un-constrained.
- If the stream is located within the FEMA floodway based on the "National Flood Hazard Layer" and there is available land in the floodway fringe (the area between the floodway and the 100-yeaer floodplain) the area has been assigned un-constrained. Note that there may be only one side or both sides of the stream with available land in the floodway fringe therefore a note was added as to which side of the stream is constrained and un-constrained.
- If the stream is located within a FEMA 100-year floodplain based on the "National Flood Hazard Layer" data with no floodway and the FEMA floodplain width is not within an existing development or bordered by roads have been assigned as un-constrained.

Bed Material and Bank Material

The following bed and bank materials were identified:

- Concrete
- Riprap
- Pipe / culvert
- Earth

The assumptions made to identify the streams bed and bank materials were based on the following criteria:

- If the data provided by the Copermittees provided information about the stream bed and bank material, the provided data was used for the bed and bank material.
- Generally the data provided by the Copermittees did not identify the crossing type (pipe, box culvert, bridge with or without piers, etc.) or the material (RCP, RCB, earth, riprap, concrete, etc.). In that case, all culvert/bridge/pipe crossings were assigned as pipe/culvert for the bed and bank material.
- If the Copermittees did not provide data for the dirt road crossings/dip sections the bed and bank material have been assigned as pipe/culvert. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, the bed and bank material have been assigned as earth.
- If aerial photography showed large water bodies (lake, pond, irrigation pond, etc.) they were assigned as earth bed and bank material. The USGS National Hydrographic Dataset in their hydrographic category had assigned some of these types of reaches as artificial paths.
- Sand mining operations within the stream have been assigned as earth for bed and bank material.
- If the Copermittees did not provide data for the stream material the bed and bank material have been assigned based on the aerial photography.

See exhibits titled, "Watershed Management Area Streams by Bed Material" in Attachment A.2.

After stream bed and bank material was classified, earthen reaches were further classified by geologic group. This was accomplished by intersecting the streams with the geologic group layer that had been prepared for use in the dominant hydrologic process and potential coarse sediment yield analyses. The result is displayed in exhibits titled, "Watershed Management Area Streams by Geologic Group" in Attachment A.2.

Hydrographic Category

Streams were classified as "perennial" or "intermittent." See exhibits titled, "Watershed Management Area Streams by Hydrographic Category" in Attachment A.2. Classification was obtained from the USGS National Hydrography Dataset (NHD). The definitions of these categories in the USGS National Hydrography Dataset are:

- **Perennial**: Contains water throughout the year, except for infrequent periods of severe drought.
- **Intermittent**: Contains water for only part of the year, but more than just after rainstorms and at snowmelt.

While the specific Regional MS4 Permit language requested classification of perennial or ephemeral, rather than perennial or intermittent, the data that was referenced in order to classify streams did not include "ephemeral" streams. For reference, the USGS National Hydrography Dataset definition of "ephemeral" is: "contains water only during or after a local rainstorm or heavy snowmelt." None of the stream reaches in the study were classified as ephemeral in the NHD dataset, therefore none are classified as ephemeral in the WMAA product. The City of San Diego provided a map titled “City of San Diego Stream Survey” dated April 3, 2013 prepared by AMEC that shows streams that are “dry” and streams that are “flowing”. This information in conjunction with the other parameters listed in this section was used to determine if a stream was perennial or intermittent.

USGS NHD includes hydrographic category classification for many of the streams. However data was not available for all reaches of all streams. In order to classify reaches of streams that did not already contain this data in NHD, these assumptions were made:

- The USGS NHD information for the stream hydrographic category has been used when available.
- When USGS NHD has “artificial paths” for portions of the stream, the hydrographic category of the upstream portion of the stream have been assigned to the stream unless other assumptions took precedence.
- If aerial photography shows large waterbody (lake, pond, irrigation pond, etc.) perennial has been assumed for the hydrographic category.
- For ponded areas shown on the aerial photography and if the USGS 7.5-minute quadrangles shows cross hatching for the area, intermittent has been assigned unless the upstream portion of the stream was assigned as perennial pursuant to the USGS National Hydrography Dataset then assigned perennial for the ponded area.
- USGS has a dashed line for intermittent streams. USGS has a solid line for perennial streams. In some situations this information was used to assist in the determination of assigning perennial or intermittent to a stream.

2.2.3. Results for stream characterization

The 27 streams and data are contained in a GIS file titled "SD_Regional_WMAA_Streams" located in Attachment C. The streams are shown in watershed maps included in Attachment A.2.

Summary of Deliverables for Stream Characterization

Format	Item	Description	Location
Report	Title of Figures	• "Watershed Management Area Streams" • "Watershed Management Area Streams by Hydrographic Category" • "Watershed Management Area Streams by Bed Material" • "Watershed Management Area Streams by Geologic Group" • "Watershed Management Area Streams by Reach	Attachment A.2

Format	Item	Description	Location
		Type"	
GIS	Map Group Title	Not Grouped	Attachment C.1
	Map Layer Title	SD_Regional_WMAA_Streams	
	Geodatabase Feature Dataset	Streams	
	Geodatabase Feature Class	SD_Regional_WMAA_Streams	
	Geodatabase Geometry Type	Line	
KMZ [1]	KMZ File Name	SD_Regional_WMAA_Streams	Attachment C.2

[1] To enhance the utilization of this data, the Stream Characterization map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

In addition to the 27 streams that were subject of detailed analysis, NHD streams have been included on maps and within the geodatabase for reference. The NHD stream alignments have not been corrected and in some cases may be inconsistent with the existing infrastructure. The NHD streams are contained in a GIS file titled, "SD_NHD_Streams."

2.2.4. Limitations for stream characterization

- Only a desktop analysis was performed and no field verification was conducted.
- Infrastructure is only based on storm water conveyance system data provided by Copermittees or clearly visible on aerial photography. If the Copermittee used a numbering or lettering system for describing bed and bank material for example, since the metadata was not provided the bed and bank material could not be verified.
- In some instances concrete channels cannot be identified on aerial photography if it is filled with sediment and/ or vegetation.

2.3.Land Uses

For the purpose of the WMAA, the Regional MS4 Permit requires a description of current and anticipated future land uses. This is presented in the final GIS deliverable as "Land Use Planning" and includes the following representations of land uses in the watersheds: existing land uses, planned land uses, developable lands, redevelopment and infill areas, floodplains, Multiple Species Conservation Program (MSCP) designated areas, and areas not within the Copermittees' jurisdictions (tribal lands, state lands, and federal lands).

2.3.1. Datasets Used for land uses

The following existing regional datasets were referenced to meet this requirement:

- Municipal boundaries: "Municipal_Boundaries" dated August 2012, available from SanGIS/SANDAG
- Ownership: "Parcels" dated December 2013, available from SanGIS/SANDAG
- Existing land use: "SANGIS.LANDUSE_CURRENT" dated December 2012, available from SanGIS/SANDAG (existing land use)
- Planned land use: "PLANLU" (Planned Land Use for the Series 12 Regional Growth Forecast (2050)), dated December 2010, available from SanGIS/SANDAG
- Developable land: "DEVABLE" (Land available for potential development for the Series 12 Regional Growth Forecast), dated December 2010, available from SanGIS/SANDAG
- Redevelopment and infill areas: "REDEVINF" (Redevelopment and infill areas for the Series 12 Regional Growth Forecast), dated December 2010, available from SanGIS/SANDAG
- Floodplains: "National Flood Hazard Layer" provided by Federal Emergency Management Agency October 2012
- Multiple Species Conservation Program (MSCP), total of four datasets available from SanGIS/SANDAG: "MHPA_SD," dated 2012, (Multiple Habitat Planning Areas for City of San Diego); "MSCP_CN," dated 2009 (designations of the County of San Diego's Multiple Species Conservation Program South County Subregional Plan); "MSCP_EAST_DRAFT_CN," dated 2009 (draft East County MSCP Plan); and "Draft_North_County_MSCP_Version_8.0_Categories," dated 2008 (draft North County MSCP Plan)

2.3.2. Methodology/Assumptions/Criteria for land uses

The existing regional datasets for existing land use, planned land use, developable land, redevelopment and infill areas, floodplains, and MSCP designated areas were referenced with no modifications. Areas not within the Copermittees' jurisdictions (tribal lands, state lands, and federal lands) were compiled from SanGIS parcel data (December 2013) based on the "ownership" value. The owners listed below were excluded from the Copermittees jurisdictions and represent the "Federal/State/Indian" layer, which is displayed on various maps included in Attachment A.2.

- Bureau of Land Management
- California Department of Fish and Game
- Indian Reservations
- Military Reservations

- Other Federal
- State
- State of California Land Commission
- State Parks
- U.S. Fish and Wildlife Service
- U.S. Forest Service

When available, relevant data from these areas was included in analyses (e.g., developable land areas within Federal/State/Indian areas). Stream lines were prepared within these areas for continuity. However, stream classification (e.g., bed and bank material) was not prepared within these areas unless data was readily available (e.g., hydrographic category data available from NHD)

2.3.3. Results for land uses

The existing regional datasets are compiled into the Geodatabase in a group titled, "Land Use Planning." Current and anticipated future land uses are depicted in watershed maps included in Attachment C. Federal/State/Indian Lands are also referenced on all other map exhibits included in Attachment A.2.

Summary of Deliverables for Land Uses

Format	Item	Description	Location
Report	Title of Figures	• "Existing Land Use" • "Planned Land Use" • "Developable Land" • "Redevelopment and Infill Areas"	Attachment A.3
GIS	Map Group Title	Land Use Planning	Attachment C.1
	Map Layer Title	Municipal Boundaries Federal/State/Indian Lands SanGIS_ExistingLandUse SanGIS_PlannedLandUse SanGIS_DevelopableLand SanGIS_RedevelopmentandInfill FEMA Floodplain MHPA_SD MSCP_CN MSCP_EAST_DRAFT_CN Draft_North_County_MSCP_Version_8_Categories	
	Geodatabase Feature Dataset	LandUsePlanning	
	Geodatabase Feature Class	SanGIS_MunicipalBoundaries Federal_State_Indian_Lands SanGIS_ExistingLandUse SanGIS_PlannedLandUse	

Format	Item	Description	Location
		SanGIS_DevelopableLand SanGIS_RedevelopmentandInfill FEMA_NFHL SanGIS_MHPA_SD SanGIS_MSCP_CN SanGIS_MSCP_EAST_DRAFT_CN SanGIS_Draft_North_County_MSCP_Version_8_Categories	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Municipal Boundaries Federal/State/Indian Lands Floodplains Due to file size limitations, SanGIS land use datasets were not converted to KMZ.	Attachment C.2

[1] To enhance the utilization of this data, the Land Uses map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.3.4. Limitations

Some jurisdictions may have compiled GIS land use layers that include more detailed or more current information than the regional datasets available from SanGIS. SanGIS layers were selected for the Regional WMAA to provide consistent land use characterization region-wide, and to provide for repeatability of GIS analyses when a land use layer is required for input data. The definition of non-Copermittee areas identified in this document as "Federal/State/Indian Lands" is for the Regional WMAA. Some WQIPs may define non-Copermittee areas differently.

2.4.Potential Critical Coarse Sediment Yield Areas

The Regional MS4 Permit identifies in the provisions related to the WMAA that potential coarse sediment yield areas within the watershed be identified, with GIS layers (maps) as output. With regard to the function and importance of coarse sediment, SCCWRP Technical Report 667 titled "Hydromodification Assessment and Management in California" states the following:

"Coarse sediment functions to naturally armor the stream bed and reduce the erosive forces associated with high flows. Absence of coarse sediment often results in erosion of in-channel substrate during high flows. In addition, coarse sediment contributes to formation of in-channel habitats necessary to support native flora and fauna."

This report identifies the potential critical coarse sediment yield areas for the Los Peñasquitos WMAs in compliance with this permit provision. The applied datasets and methodologies for identifying the coarse sediment yield areas, along with their respective results, are described in the sections below.

2.4.1. Datasets Used for identifying potential critical coarse sediment yield areas

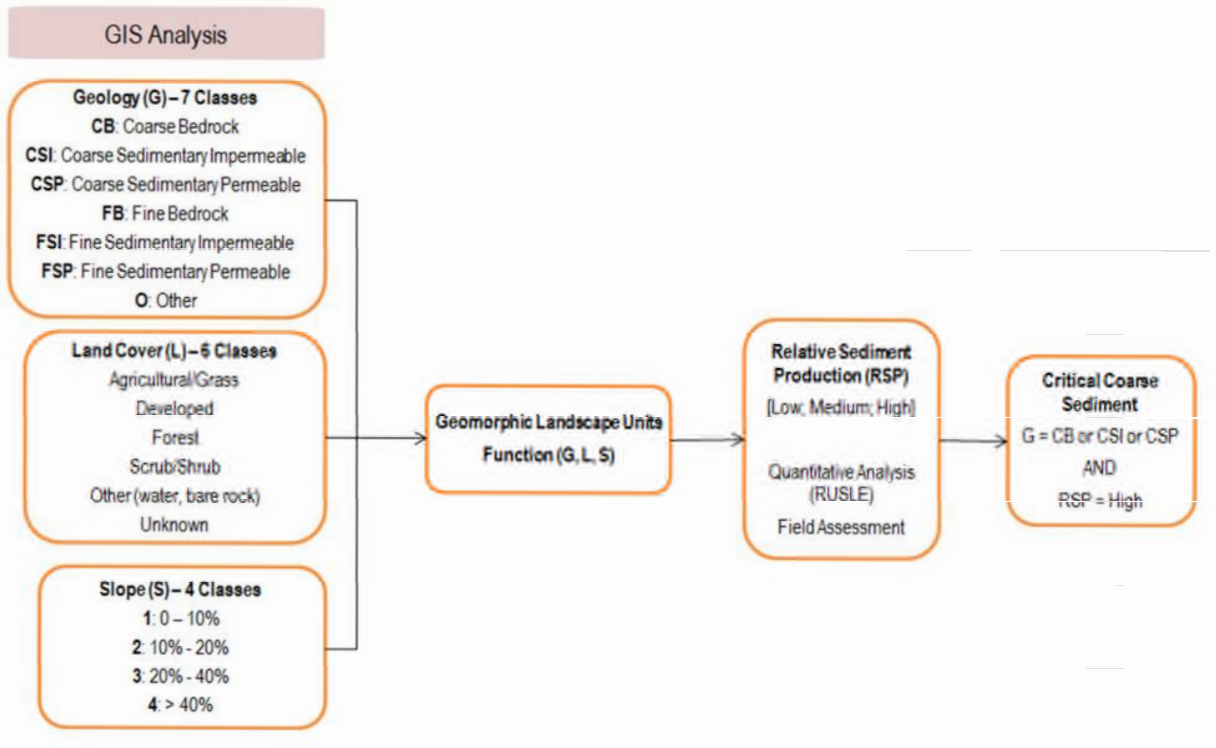
The following datasets were used in the analysis

Dataset	Source	Year	Description
Elevation	USGS	2013	1/3rd Arc Second (~10 meter cells) digital elevation model for San Diego County
Land Cover	SanGIS	2013	Ecology-Vegetation layer for San Diego County downloaded from SanGIS
Geology	Kennedy, M.P., and Tan, S.S.	2002	Geologic Map of the Oceanside 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 2, 1:100,000 scale.
	Kennedy, M.P., and Tan, S.S.	2008	Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, 1:100,000 scale.
	Todd, V.R.	2004	Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, Southern California, United States Geological Survey, Southern California Areal Mapping Project (SCAMP), Open File Report 2004-1361, 1:100,000 scale.
	Jennings et al.	2010	"Geologic Map of California," California Geological Survey, Map No. 2 – Geologic Map of California, 1:750,000 scale

2.4.2. Methodology/Assumptions/Criteria for identifying potential critical coarse sediment yield areas

The methodology used to identify coarse sediment yield areas is based on Geomorphic

Landscape Unit (GLU) methodology presented in the SCCWRP Technical Report 605 titled "Hydromodification Screening Tools: GIS-Based Catchment Analyses of Potential Changes in Runoff and Sediment Discharge" (SCCWRP, 2010). Geomorphic Landscape Units characterize the magnitude of sediment production from areas through three factors judged to exert the greatest influence on the variability on sediment-production rates: geology types, hillslope gradient, and land cover. The GLU approach provides a useful, rapid framework to identify sediment-delivery attributes of the watershed. The process to integrate these factors into GLUs is indicated in the flow chart below.



The following steps were used to define Geomorphic Landscape Units (GLUs), which were then related to the coarse sediment and critical coarse sediment yield areas in the Los Peñasquitos WMA.

1. **Integrate data sets used to determine GLU:** Categories for geology, gradient, and land cover were defined based on readily available GIS datasets for the region and classifications found in relevant literature listed in Chapter 6. The different combinations of these categories make up distinct GLUs.

    - **Geologic Categories**: based on methodology listed in Attachment A.4.1 of Attachment A.4. Resulting geologic categories from this analysis are: Coarse Bedrock (CB), Coarse Sedimentary Impermeable (CSI), Coarse Sedimentary Permeable (CSP), Fine Bedrock (FB), Fine Sedimentary Impermeable (FSI), Fine Sedimentary Permeable (FSP), and Other (O). An exhibit showing the regional geology groupings is presented in Attachment A.4.

- **Land cover categories**: defined using the Ecology Vegetation GIS map layer developed by the City of San Diego, the County of San Diego and SANDAG which were downloaded from SanGIS (2013). The vegetation categories in the GIS layer were grouped (Table A.1.2 in Attachment A.1) to match the following categories used in SCCWRP's Technical Report 605 (SCCWRP, 2010): Agriculture/Grass; Developed; Forest; Scrub/Shrub, Other (Water) and Unknown.
- **Gradient Categories**: based on slope ranges found in a review of relevant literature (GLU methodology applied in California) listed in Chapter 6. The spatial processing of the slope categories utilized the USGS National Elevation Dataset (NED). Slope ranges used include: 0% to 10%, 10% to 20%, 20% to 40%, and greater than 40%.

2. **GLU Union Results**: GIS mapping exercise for the study area resulted in 166 GLUs within the 9 WMAs in San Diego County. Table A.4.2 in Attachment A.4 provides the list of the 166 GLUs.

For implementing hydromodification management performance standards in the Regional MS4 Permit, the Copermittees need to identify Critical Coarse Sediment Yield areas in the study region. To provide information on the identification of Critical Coarse Sediment yield, the study assumed that critical coarse sediment would be generated from GLUs that are composed of geologic units likely to generate coarse sediment (based on the methodology listed in Step 3) and have the potential for high relative sediment production (as estimated using the methodology listed in Step 4).

3. **Define Pertinent Geologic groups**: the geologic groups (Attachment A.4.1) considered in this study to have the potential to generate coarse sediment are Coarse Bedrock (CB), Coarse Sedimentary Impermeable (CSI), and Coarse Sedimentary Permeable (CSP). An exhibit showing the regional geologic grouping is presented in Attachment A.4.
4. **Relate GLU to Sediment Production**: For assigning GLUs with a relative sediment production, the following methodology was utilized:
    - Conducted quantitative analysis to assign relative sediment production. Analysis was performed based on the assumption that sediment production from an area is proportional to the soil loss from the area, as evaluated using standard soil loss equation. Detailed analysis steps are documented in Attachment A.4.2;
    - To validate the quantitative assignment above, a qualitative field assessment was conducted for 40 sites. Site selection and findings from the field assessment is documented in Attachment A.4.3.
    - The result of the field assessment indicated a 65% match between field conditions and the quantitative assignments. The mismatches are attributed to differences in percent land cover as assumed for the quantitative analysis and those observed in the field. As such, the quantitative assignments were considered to be valid for the purposes of assigning relative sediment production.

2.4.3. Results for identifying potential critical coarse sediment yield areas

The resulting GIS maps showing the spatial distribution of geologic grouping and critical coarse sediment yield areas within the Los Peñasquitos WMA are provided in Attachment A.4. An ArcMap document which presents the results from each step of the methodology is included in Attachment C. Based on this analysis it was estimated that 5.1% of the study area is a potential critical coarse sediment yield area.

As a result of the regional-scale datasets, and commensurate data resolution, used to map the potential critical coarse sediment yield areas, some areas may were mapped that in reality do not produce critical coarse sediment as they are existing developed areas. As such, an opportunity for jurisdictions to incorporate more refined data into the preliminary WMAA GIS dataset based on local knowledge and review of current aerial images was provided. The City of Poway and the County of San Diego provided augmented data in the Los Peñasquitos WMA in their respective jurisdictional areas.

Summary of Deliverables for Potential Critical Coarse Sediment Yield Areas

Format	Item	Description	Location
Report	Figures	"Geologic Grouping" "Potential Critical Coarse Sediment Yield Areas"	Attachment A.4
GIS	Map Group Layer Name	Potential Coarse Sediment Yield	Attachment C.1
	Map Layer Title	Geologic Grouping Land Cover Slope Category Geomorphic Landscape Unit Potential Coarse Sediment Yield Area Relative Sediment Production Potential Critical Coarse Sediment Yield Area	
	Geodatabase Feature Dataset	PotentialCoarseSedimentYield	
	Geodatabase Feature Class	GLUAnalysis PotentialCoarseSedimentYieldAreas PotentialCriticalCoarseSedimentYieldAreas	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Potential Critical Coarse Sediment Yield Areas	Attachment C.2

[1] To enhance the utilization of this data, the Geomorphic Landscape Unit Analysis is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.4.4. Limitations for identifying potential critical coarse sediment yield areas

The resulting GIS layers were developed using regional datasets and provide a useful, rapid framework to perform screening-level analysis that is appropriate for watershed-scale planning studies. The methodology used to identify potential coarse sediment yield areas does not account for instream sediment supply and sediment production from mass failures like landslides which

are difficult to estimate on a regional scale without performing extensive field investigation. This data set also does not account for potential existing impediments that may hinder delivery of coarse sediment to receiving waters or downstream locations within the watershed as this was beyond the scope of a regional study. Where more precise estimates are required for a particular site or subarea it is recommended that this analysis be augmented with site-specific analysis. It is also recognized that this regional data set is a function of the inherent data resolution and therefore may not conform to all site conditions, or does not reflect changes to particular areas that have occurred since the underlying data was developed. As such, the WMAA data for the potential critical coarse sediment yield areas should be verified in the field according to the procedures outlined in the Model BMP Design Manual and/or jurisdiction specific BMP Design Manual.

2.5.Physical Structures

The Regional MS4 Permit requires the Copermittees to identify information regarding locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins with GIS layers (maps) as output, for each WMA being analyzed for the purpose of developing watershed-specific requirements for structural BMP implementation. This study identified the physical structures using a desktop-level analysis for the stream(s) identified in Section 2.2 in compliance with this permit provision.

2.5.1. Approach for identifying physical structures

The intent of this portion of the WMAA project was to provide an initial assessment of the structures of interest for the stream(s) identified in Section 2.2. This desktop-level analysis was conducted primarily as a visual survey of aerial imagery and FEMA flood insurance study (FIS) profiles where available. The collected information was entered into a GIS layer for inclusion into the overall WMAA geodatabase containing the characterization layers required by the Regional MS4 Permit. To support overall WMA characterization, the information derived in this task provides insight into water and sediment movement through the watershed (SCCWRP, 2012), the opportunities and limitations for infrastructure retrofits and also informs efforts to identify appropriate locations for habitat or riparian area rehabilitation in relation to proximate infrastructure. Specific information regarding how the survey was performed and the attributes of the generated data is presented in Attachment A.5. Note that concrete channels, pipes/culverts, riprap or other artificial stream armoring, and basins have also been identified in the linework generated for the streams (see Section 2.2).

2.5.2. Results for identifying physical structures

The resulting GIS mapping provided in Attachment A.5 shows the spatial locations of the physical structures within the mapped stream(s).

Summary of Deliverables for Physical Structures

Format	Item	Description	Location
Report	Figure	Watershed Management Area Streams by Reach Type with Channel Structures	Attachment A.5
GIS	Map Group Layer Name	Channel Structures	Attachment C.1
	Map Layer Title	Channel Structures	
	Geodatabase Feature Dataset	ChannelStructures	
	Geodatabase Feature Class	ChannelStructures	
	Geodatabase Geometry Type	Point	
KMZ [1]	Kmz File Name	ChannelStructures	Attachment C.2

[1] To enhance the utilization of this data, the Physical Structures map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

3. Template for Candidate Project List

The Regional MS4 Permit requires each WMA to use the results from the WMA characterization to compile a list of candidate projects that could potentially be used as alternative compliance options for Priority Development Projects should an agency or jurisdiction opt to develop an alternative compliance program. Copermittees must first conclude that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of structural BMPs onsite prior to implementing these candidate projects as alternative compliance projects.

The Copermittees elected to identify potential candidate projects as a separate effort from this regional project, and therefore the process for identifying candidate projects is not documented in this report. Instead, this project only developed a template, in a spreadsheet format, for use by the Copermittees to compile lists of potential candidate projects. The template is intended to enhance regional consistency of the information that is gathered for candidate projects. The template spreadsheet file was distributed to the Copermittees on January 28, 2014. A table of the template components is indicated below:

Column	Primary Heading	Secondary Heading	Guidance for Completing the Project List
A	Project Identifier	-	Unique identifier for the project.
B	Watershed Management Area	-	Dropdown menu to select the watershed management area the project is located in
C	Hydrologic Area (HA)	-	Dropdown menu to select the hydrologic area the project is located in Select a WMA in column B for HA (Column C) dropdown menu to activate.
D	Hydrologic Subarea (HSA)	-	Dropdown menu to select the hydrologic subarea the project is located in. Select a HA in column C for HSA (Column D) dropdown menu to activate.
E	Jurisdiction	-	Dropdown menu to select the jurisdiction the project is located in. Select a HSA in column D for Jurisdiction (Column E) dropdown menu to activate.
F	Project Name	-	Indicate the name of the project.
G	Ownership	Type	Dropdown menu to select if the project is a public project, private project, or public-private partnership.
H	Ownership	Ownership Information	List the details for the owner.
I	Project Location	Address	List the address of the project site.
J	Project Location	APN	List the APN of the parcel.
K	Project Location	Latitude	List the latitude of the project site.
L	Project Location	Longitude	List the longitude of the project site.

Column	Primary Heading	Secondary Heading	Guidance for Completing the Project List
M	Project Origination/ Originator	Name	List the name of the report/organization/individual that provided the idea for the project. Potential origination sources: WQIP, WMAA, JURMPs, WURMPs, CLRPs, IRWM, MSCP, MHPA, Other.
N	Project Origination/ Originator	Contact Information	Link or report title if the proposed project is from a report [or] contact information if from an organization/individual.
O	Project Category	-	Drop Down menu to select the project category; In addition to the 6 project categories explicitly listed in the Regional MS4 Permit, the drop down menu also has a category "Other project types allowed by the MS4 Permit". Example for “Other” project types are agency CIP programs such as Green Streets, LID conversions (medians, parks), agency filter installation, etc.
P	Specific Project Type	-	List the subcategory of the project; for example, list Regional BMP type (i.e. infiltration basin, wetland, etc.).
Q	Potential Pollutant	-	Identify the potential pollutant(s) that can be treated by the proposed project.
R	Project Size & Parameters	Contributing Drainage Area (acres)	List the contributing drainage area to the project.
S	Project Size & Parameters	Parcel Size (acres)	List the size of the parcel the project is located on.
T	Project Size & Parameters	Project Footprint (acres)	List the size of the project footprint.
U	Project Size & Parameters	Parameters (with units as necessary)	Parameters needed to quantify benefits from the project; i.e. for an infiltration basin, list the water quality volume, long-term infiltration rate, depth of the basin, etc.
V	Regulatory Requirement	-	Indicate if the project is proposed to meet particular regulatory requirement such as TMDL, etc.
W	Project Timeline	-	Indicate if a project must be implemented by certain date to meet a grant deadline or other time commitment.
X	Other Notes	-	List any other relevant notes; for example, when retrofitting existing infrastructure project category is selected, input parameters needed to quantify benefits from existing infrastructure into this column as these will be needed to estimate additional benefits that can be used for alternative compliance. If N/A is selected in any dropdown menus, add additional explanation in here

4. Hydromodification Management Applicability/Exemptions

Hydromodification, which is caused by both altered storm water flow and altered sediment flow regimes, is largely responsible for degradation of creeks, streams, and associated habitats in the San Diego Region. The purpose of the hydromodification management requirements in the Regional MS4 Permit is to maintain or restore more natural hydrologic flow regimes to prevent accelerated, unnatural erosion in downstream receiving waters.

In some cases, priority development projects may be exempt from hydromodification management requirements if the project site discharges runoff to receiving waters that are not susceptible to erosion (e.g., a lake, bay, or the Pacific Ocean) either directly or via hardened systems including concrete-lined channels or existing underground storm drain systems.

The March 2011 Final Hydromodification Management Plan (HMP)P identified certain exemptions from hydromodification management requirements by presenting "HMP applicability criteria." The Regional MS4 Permit maintains some of these HMP applicability criteria. However, some of the applicability criteria are not included under the Regional MS4 Permit unless the area or receiving water is mapped in the WMAA. The intent of this Section is to provide mapping of areas exempt from hydromodification management requirements, and provide supporting technical analyses for exemptions that are recommended by the WMAA.

4.1. Additional Analysis for Hydromodification Management Exemptions

This section documents additional analysis performed to further evaluate the following exemptions that were already approved by the San Diego Regional Board with the 2011 Final HMP. This study only provides additional analysis, data, and rationale for supporting or eliminating the following existing exemptions and does not propose or study any new exemptions:

- Exempt River Reaches
- Stabilized Conveyance Systems Draining to Exempt Water Bodies
- Highly Impervious Watersheds and Urban Infill and
- Tidally Influenced Lagoons

4.1.1. Exempt River Reaches

There are no river reaches currently recommended for exemption from hydromodification management requirements in the Los Peñasquitos WMA. Potential river reach exemptions may be studied using the recommended approach documented in the Regional WMAA. Refer to the Regional WMAA for the criteria and an example exemption studies that were prepared for the five river reaches included in the San Diego County Final HMP dated March 2011. However, any future proposed HMP exemptions would need to be approved through the WQIP Annual Update process (Regional MS4 Permit Section F.1.2.c.).

4.1.2. Stabilized Conveyance Systems Draining to Exempt Water Bodies

There are no stabilized conveyance systems currently recommended for exemption from hydromodification management requirements in the Los Peñasquitos WMA. If engineered conveyance systems that are stabilized with materials other than concrete, such as riprap, turf reinforcement mat, or vegetation, including rehabilitated stream systems, are identified as potential candidates for exemption, they may be studied and may be recommended exempt if they meet specific criteria presented in the Regional WMAA for this exemption. Refer to the Regional WMAA for the criteria and an example study that was prepared for Forester Creek in the San Diego River WMA. However, any future proposed HMP exemptions would need to be approved through the WQIP Annual Update process (Regional MS4 Permit Section F.1.2.c.).

4.1.3. Highly Impervious/Highly Urbanized Watersheds and Urban Infill

Based on evaluation of the highly impervious/highly urbanized watershed and urban infill exemptions presented in the March 2011 Final HMP, and comparison with more recent research prepared for the Ventura County Hydromodification Control Plan (Ventura County HCP) (Final Draft dated September 2013), resurrection of these exemptions from the March 2011 Final HMP was not recommended by the Regional WMAA. The research prepared in support of the Ventura County HCP determined lower thresholds of additional impervious area (ranging from 0.44% to 1.65%) than the limit presented in the San Diego County Final HMP dated March 2011 (3%). No areas within the Los Peñasquitos WMA are currently recommended for highly impervious/highly urbanized watershed or urban infill exemption.

4.1.4. Tidally Influenced Lagoons

There are no areas recommended for exemption from hydromodification management requirements under the tidally influenced lagoons category in the Los Peñasquitos WMA. Refer to the Regional WMAA for further information regarding this exemption.

5. Conclusions

5.1. Watershed Management Area Characterization

The WMA Characterization data was developed using available regional data to further understand the macro-scale watershed characteristics and processes in the Los Peñasquitos WMA. The Regional MS4 Permit allows for flexibility in complying with land development requirements when using the information developed in the WMAA to improve water quality planning and implementation associated with land development. This dataset will assist with identifying the opportunities and constraints for projects and management decisions based on a watershed scale (rather than piecemeal project identification without context within the watershed) and provides Copermittees the ability to exercise the option to create an alternative compliance program that offers the opportunity to develop watershed-specific alternatives to universal onsite structural BMP implementation. The characterization data includes:

Characterization Data	Utilization Potential
Dominant Hydrologic Process: • Overland flow • Infiltration • Interflow	• Identify areas for enhanced infiltration or collection of storm water for treatment • Implement management measures that correspond to pre-development conditions – promotes long-term channel stability and health • Increases understanding of the natural functioning of the watershed and what has been (or is at risk of being) altered by urbanization.
Stream Characterization: • Reach type • Bed material • Bank material • Hydrographic category • Channel Structures	• Preliminary dataset that can be used to conduct stream power evaluations • Identify channel systems for preservation or restoration • Identification of appropriate space for channel processes to occur (e.g., flood plain connectivity) • Insight to sensitivity of receiving stream reach • Indicates the features within channels that affect water and sediment movement through the watershed

Characterization Data	Utilization Potential
Land Use: • Existing • Future	• Foresight (identifies relative risks, opportunities, or constraints) in comparing future to existing land uses, i.e., areas that may be more/less vulnerable to adverse impacts to changes in storm water runoff associated with development • Encourage infill development
Potential Critical Coarse Sediment Yield Areas	• Preservation of areas or function that contributes critical sediment within the watershed to stream armoring/stability • Assist with identifying potentially susceptible stream reaches that require uninterrupted coarse sediment supplies to remain stable • Dual goal of open space conservation

Regarding the identification of the potential critical coarse sediment yield areas in the WMAA using readily available regional datasets, it is anticipated that when more precise estimates for potential critical coarse sediment yield areas are required for a particular site or subarea that this regional study will be augmented with site-specific analysis. Development projects must avoid critical sediment yield areas or implement measures that allow critical coarse sediment to be discharged to receiving waters, such that there is no net impact to the receiving water to meet the requirements of the Regional MS4 permit. As such, projects should consult the Model BMP Design Manual and/or jurisdiction specific BMP Design manual for options to meet the Regional MS4 Permit requirements. It is anticipated that the data will not be static but will be enhanced over time through future studies or field assessments that will refine what is currently a macro-level data set.

5.2.Template for Candidate Project List

It is anticipated the Copermittees that elect to develop alternative compliance programs will conduct a separate exercise to nominate potential candidate projects for inclusion into the WQIPs using the template developed for this project.

5.3.Hydromodification Management Exemptions

Attachment B.2 presents hydromodification management applicability/exemption mapping for the Los Peñasquitos WMA. The mapping includes receiving waters that are exempt based on the Regional MS4 Permit or recommended exempt based on studies.

Receiving waters that are **exempt** based on the Regional MS4 Permit include:

- The Pacific Ocean
- Lakes and Reservoirs
- Existing underground storm drains or concrete-lined channels draining directly to the ocean

There are no additional exemptions recommended based on studies in the Los Peñasquitos WMA.

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Attachment N-2

Los Peñasquitos WMAA Report Attachments

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Los Peñasquitos Watershed Management Area Analysis ATTACHMENTS

Lake Henshaw

September 8, 2014

Prepared for:
San Diego County Copermittees

Prepared by:

Geosyntec consultants
engineers | scientists | innovators

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ATTACHMENT A

WATERSHED MANAGEMENT AREA CHARACTERIZATION

ATTACHMENT A.1

DOMINANT HYDROLOGICAL PROCESS

A.1 Dominant Hydrological Process

Table A.1.1: Runoff Coefficients versus Land Use, Hydrologic Soil Group (A, B, C, D), and Slope Range

	A			B			C			D		
Land Use	0–2%	2–6%	6%+	0–2%	2–6%	6%+	0–2%	2–6%	6%+	0–2%	2–6%	6%+
Cultivated land	0.08[a]	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14[b]	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential lot size 1/8 acre	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
	0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Residential lot size 1/4 acre	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
Residential lot size 1/3 acre	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
Residential lot size 1/2 acre	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
	0.25	0.29	0.32	0.28	0.32	0.36	0.31	0.35	0.42	0.34	0.38	0.48
Residential lot size 1 acre	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
Streets	0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
Open space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.15	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

[a] Runoff coefficients for storm recurrence intervals less than 25 years.

[b] Runoff coefficients for storm recurrence intervals of 25 years or longer.

Source: Table 7-9 in *Hydrologic Analysis and Design* (McCuen, 2005)

Table A.1.2: Land Cover Grouping

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
1	42000 Valley and Foothill Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
2	42100 Native Grassland		Agricultural/Grass
3	42110 Valley Needlegrass Grassland		Agricultural/Grass
4	42120 Valley Sacaton Grassland		Agricultural/Grass

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
5	42200 Non-Native Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
6	42300 Wildflower Field		Agriculture/Grass
7	42400 Foothill/Mountain Perennial Grassland		Agriculture/Grass
8	42470 Transmontane Dropseed Grassland		Agriculture/Grass
9	45000 Meadow and Seep		Agriculture/Grass
10	45100 Montane Meadow		Agriculture/Grass
11	45110 Wet Montane Meadow		Agriculture/Grass
12	45120 Dry Montane Meadows		Agriculture/Grass
13	45300 Alkali Meadows and Seeps		Agriculture/Grass
14	45320 Alkali Seep		Agriculture/Grass
15	45400 Freshwater Seep		Agriculture/Grass
16	46000 Alkali Playa Community		Agriculture/Grass
17	46100 Badlands/Mudhill Forbs		Agriculture/Grass
18	Non-Native Grassland		Agriculture/Grass
19	18000 General Agriculture	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Agriculture/Grass
20	18100 Orchards and Vineyards		Agriculture/Grass
21	18200 Intensive Agriculture		Agriculture/Grass
22	18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches		Agriculture/Grass
23	18300 Extensive Agriculture - Field/Pasture, Row Crops		Agriculture/Grass
24	18310 Field/Pasture		Agriculture/Grass
25	18310 Pasture		Agriculture/Grass
26	18320 Row Crops		Agriculture/Grass
27	12000 Urban/Developed		Developed
28	12000 Urban/Develpoed		Developed
29	81100 Mixed Evergreen Forest	Forest	Forest
30	81300 Oak Forest		Forest
31	81310 Coast Live Oak Forest		Forest
32	81320 Canyon Live Oak Forest		Forest
33	81340 Black Oak Forest		Forest
34	83140 Torrey Pine Forest		Forest
35	83230 Southern Interior Cypress Forest		Forest
36	84000 Lower Montane Coniferous Forest		Forest
37	84100 Coast Range, Klamath and Peninsular Coniferous Forest		Forest

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
38	84140 Coulter Pine Forest	Forest	Forest
39	84150 Bigcone Spruce (Bigcone Douglas Fir)-Canyon Oak Forest		Forest
40	84230 Sierran Mixed Coniferous Forest		Forest
41	84500 Mixed Oak/Coniferous/Bigcone/Coulter		Forest
42	85100 Jeffrey Pine Forest		Forest
43	11100 Eucalyptus Woodland	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Forest
44	60000 RIPARIAN AND BOTTOMLAND HABITAT	Riparian and Bottomland Habitat	Forest
45	61000 Riparian Forests		Forest
46	61300 Southern Riparian Forest		Forest
47	61310 Southern Coast Live Oak Riparian Forest		Forest
48	61320 Southern Arroyo Willow Riparian Forest		Forest
49	61330 Southern Cottonwood-willow Riparian Forest		Forest
50	61510 White Alder Riparian Forest		Forest
51	61810 Sonoran Cottonwood-willow Riparian Forest		Forest
52	61820 Mesquite Bosque		Forest
53	62000 Riparian Woodlands		Forest
54	62200 Desert Dry Wash Woodland		Forest
55	62300 Desert Fan Palm Oasis Woodland		Forest
56	62400 Southern Sycamore-alder Riparian Woodland		Forest
57	70000 WOODLAND	Woodland	Forest
58	71000 Cismontane Woodland		Forest
59	71100 Oak Woodland		Forest
60	71120 Black Oak Woodland		Forest
61	71160 Coast Live Oak Woodland		Forest
62	71161 Open Coast Live Oak Woodland		Forest
63	71162 Dense Coast Live Oak Woodland		Forest
64	71162 Dense Coast Love Oak Woodland		Forest

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
65	71180 Engelmann Oak Woodland	Woodland	Forest
66	71181 Open Engelmann Oak Woodland		Forest
67	71182 Dense Engelmann Oak Woodland		Forest
68	72300 Peninsular Pinon and Juniper Woodlands		Forest
69	72310 Peninsular Pinon Woodland		Forest
70	72320 Peninsular Juniper Woodland and Scrub		Forest
71	75100 Elephant Tree Woodland		Forest
72	77000 Mixed Oak Woodland		Forest
73	78000 Undifferentiated Open Woodland		Forest
74	79000 Undifferentiated Dense Woodland		Forest
75	Engelmann Oak Woodland		Forest
76	52120 Southern Coastal Salt Marsh	Bog and Marsh	Other
77	52300 Alkali Marsh		Other
78	52310 Cismontane Alkali Marsh		Other
79	52400 Freshwater Marsh		Other
80	52410 Coastal and Valley Freshwater Marsh		Other
81	52420 Transmontane Freshwater Marsh		Other
82	52440 Emergent Wetland		Other
83	44000 Vernal Pool	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Other
84	44320 San Diego Mesa Vernal Pool		Other
85	44322 San Diego Mesa Claypan Vernal Pool (southern mesas)		Other
86	13100 Open Water	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
87	13110 Marine		Other
88	13111 Subtidal		Other
89	13112 Intertidal		Other
90	13121 Deep Bay		Other
91	13122 Intermediate Bay		Other
92	13123 Shallow Bay		Other
93	13130 Estuarine		Other
94	13131 Subtidal		Other
95	13133 Brackishwater		Other

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
96	13140 Freshwater	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
97	13200 Non-Vegetated Channel, Floodway, Lakeshore Fringe		Other
98	13300 Saltpan/Mudflats		Other
99	13400 Beach		Other
100	21230 Southern Foredunes	Dune Community	Scrub/Shrub
101	22100 Active Desert Dunes		Scrub/Shrub
102	22300 Stabilized and Partially-Stabilized Desert Sand Field		Scrub/Shrub
103	24000 Stabilized Alkaline Dunes		Scrub/Shrub
104	29000 ACACIA SCRUB		Scrub/Shrub
105	63000 Riparian Scrubs	Riparian and Bottomland Habitat	Scrub/Shrub
106	63300 Southern Riparian Scrub		Scrub/Shrub
107	63310 Mule Fat Scrub		Scrub/Shrub
108	63310 Mulefat Scrub		Scrub/Shrub
109	63320 Southern Willow Scrub		Scrub/Shrub
110	63321 Arundo donnax Dominant/Southern Willow Scrub		Scrub/Shrub
111	63330 Southern Riparian Scrub		Scrub/Shrub
112	63400 Great Valley Scrub		Scrub/Shrub
113	63410 Great Valley Willow Scrub		Scrub/Shrub
114	63800 Colorado Riparian Scrub		Scrub/Shrub
115	63810 Tamarisk Scrub		Scrub/Shrub
116	63820 Arrowweed Scrub		Scrub/Shrub
117	31200 Southern Coastal Bluff Scrub	Scrub and Chaparral	Scrub/Shrub
118	32000 Coastal Scrub		Scrub/Shrub
119	32400 Maritime Succulent Scrub		Scrub/Shrub
120	32500 Diegan Coastal Sage Scrub		Scrub/Shrub
121	32510 Coastal form		Scrub/Shrub
122	32520 Inland form (> 1,000 ft. elevation)		Scrub/Shrub
123	32700 Riversidian Sage Scrub		Scrub/Shrub
124	32710 Riversidian Upland Sage Scrub		Scrub/Shrub
125	32720 Alluvial Fan Scrub		Scrub/Shrub
126	33000 Sonoran Desert Scrub		Scrub/Shrub
127	33100 Sonoran Creosote Bush Scrub		Scrub/Shrub
128	33200 Sonoran Desert Mixed Scrub		Scrub/Shrub
129	33210 Sonoran Mixed Woody Scrub		Scrub/Shrub

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
130	33220 Sonoran Mixed Woody and Succulent Scrub	Scrub and Chaparral	Scrub/Shrub
131	33230 Sonoran Wash Scrub		Scrub/Shrub
132	33300 Colorado Desert Wash Scrub		Scrub/Shrub
133	33600 Encelia Scrub		Scrub/Shrub
134	34000 Mojavean Desert Scrub		Scrub/Shrub
135	34300 Blackbush Scrub		Scrub/Shrub
136	35000 Great Basin Scrub		Scrub/Shrub
137	35200 Sagebrush Scrub		Scrub/Shrub
138	35210 Big Sagebrush Scrub		Scrub/Shrub
139	35210 Sagebrush Scrub		Scrub/Shrub
140	36110 Desert Saltbush Scrub		Scrub/Shrub
141	36120 Desert Sink Scrub		Scrub/Shrub
142	37000 Chaparral		Scrub/Shrub
143	37120 Southern Mixed Chaparral		Scrub/Shrub
144	37120 Southern Mixed Chapparal		Scrub/Shrub
145	37121 Granitic Southern Mixed Chaparral		Scrub/Shrub
146	37121 Southern Mixed Chaparral		Scrub/Shrub
147	37122 Mafic Southern Mixed Chaparral		Scrub/Shrub
148	37130 Northern Mixed Chaparral		Scrub/Shrub
149	37131 Granitic Northern Mixed Chaparral		Scrub/Shrub
150	37132 Mafic Northern Mixed Chaparral		Scrub/Shrub
151	37200 Chamise Chaparral		Scrub/Shrub
152	37210 Granitic Chamise Chaparral		Scrub/Shrub
153	37220 Mafic Chamise Chaparral		Scrub/Shrub
154	37300 Red Shank Chaparral		Scrub/Shrub
155	37400 Semi-Desert Chaparral		Scrub/Shrub
156	37500 Montane Chaparral		Scrub/Shrub
157	37510 Mixed Montane Chaparral		Scrub/Shrub
158	37520 Montane Manzanita Chaparral		Scrub/Shrub
159	37530 Montane Ceanothus Chaparral		Scrub/Shrub
160	37540 Montane Scrub Oak Chaparral		Scrub/Shrub
161	37800 Upper Sonoran Ceanothus Chaparral		Scrub/Shrub
162	37830 Ceanothus crassifolius Chaparral		Scrub/Shrub
163	37900 Scrub Oak Chaparral		Scrub/Shrub
164	37A00 Interior Live Oak Chaparral		Scrub/Shrub

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
165	37C30 Southern Maritime Chaparral	Scrub and Chaparral	Scrub/Shrub
166	37G00 Coastal Sage-Chaparral Scrub		Scrub/Shrub
167	37K00 Flat-topped Buckwheat		Scrub/Shrub
168	39000 Upper Sonoran Subshrub Scrub		Scrub/Shrub
169	Diegan Coastal Sage Scrub		Scrub/Shrub
170	Granitic Northern Mixed Chaparral		Scrub/Shrub
171	Southern Mixed Chaparral		Scrub/Shrub
172	11000 Non-Native Vegetation	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Unknown
173	11000 Non-Native VegetionVegetation		Unknown
174	11200 Disturbed Wetland		Unknown
175	11300 Disturbed Habitat		Unknown
176	13000 Unvegetated Habitat		Unknown
177	Disturbed Habitat		Unknown

Table A.1.3: Related Land Cover and Land Use Categories

Land Cover per San Diego County	Land Use per Table A.1.1
Agriculture/Grass	Meadow
Forest	Forest
Scrub/Shrub	Average (Meadow, Forest)
Unknown/Other	Meadow

Table A.1.4: Applicable Hydrologic Response Unit Calculations

Land Cover	Soil	Gradient	Runoff Coeff.	ET Coeff.	Infiltration Coeff.	Runoff/ Infiltration Ratio	Hydrologic Process Designation
Agriculture/Grass	A	0-2%	0.10	0.60	0.30	0.33	I
Agriculture/Grass	A	2-6%	0.16	0.60	0.24	0.67	U
Agriculture/Grass	A	6-10%	0.25	0.60	0.15	1.67	O
Agriculture/Grass	B	0-2%	0.14	0.60	0.26	0.54	I
Agriculture/Grass	B	2-6%	0.22	0.60	0.18	1.22	U
Agriculture/Grass	B	6-10%	0.30	0.60	0.10	3.00	O
Agriculture/Grass	C	0-2%	0.20	0.60	0.20	1.00	U
Agriculture/Grass	C	2-6%	0.28	0.60	0.12	2.33	O
Agriculture/Grass	C	6-10%	0.36	0.60	0.04	9.00	O
Agriculture/Grass	D	0-2%	0.24	0.60	0.16	1.50	U
Agriculture/Grass	D	2-6%	0.30	0.60	0.10	3.00	O
Agriculture/Grass	D	6-10%	0.40	0.60	0.00	infinite	O

Land Cover	Soil	Gradient	Runoff Coeff.	ET Coeff.	Infiltration Coeff.	Runoff/ Infiltration Ratio	Hydrologic Process Designation
Forest	A	0-2%	0.05	0.80	0.15	0.33	I
Forest	A	2-6%	0.08	0.80	0.12	0.67	U
Forest	A	6-10%	0.11	0.80	0.09	1.22	U
Forest	B	0-2%	0.08	0.80	0.12	0.67	U
Forest	B	2-6%	0.11	0.80	0.09	1.22	U
Forest	B	6-10%	0.14	0.80	0.06	2.33	O
Forest	C	0-2%	0.10	0.80	0.10	1.00	U
Forest	C	2-6%	0.13	0.80	0.07	1.86	O
Forest	C	6-10%	0.16	0.80	0.04	4.00	O
Forest	D	0-2%	0.12	0.80	0.08	1.50	U
Forest	D	2-6%	0.16	0.80	0.04	4.00	O
Forest	D	6-10%	0.20	0.80	0.00	infinite	O
Scrub/Shrub	A	0-2%	0.08	0.70	0.23	0.33	I
Scrub/Shrub	A	2-6%	0.12	0.70	0.18	0.67	U
Scrub/Shrub	A	6-10%	0.18	0.70	0.12	1.50	U
Scrub/Shrub	B	0-2%	0.11	0.70	0.19	0.58	I
Scrub/Shrub	B	2-6%	0.17	0.70	0.14	1.22	U
Scrub/Shrub	B	6-10%	0.22	0.70	0.08	2.75	O
Scrub/Shrub	C	0-2%	0.15	0.70	0.15	1.00	U
Scrub/Shrub	C	2-6%	0.21	0.70	0.10	2.16	O
Scrub/Shrub	C	6-10%	0.26	0.70	0.04	6.50	O
Scrub/Shrub	D	0-2%	0.19	0.70	0.12	1.50	U
Scrub/Shrub	D	2-6%	0.23	0.70	0.07	3.29	O
Scrub/Shrub	D	6-10%	0.30	0.70	0.00	infinite	O

Hydrologic Process Designation: I = Interflow; O = Overland Flow; U = Uncertain

Table A.1.5: Hydrologic Response Unit Designations

Land Cover	Slope	Soil Type				
		A	B	C	D	Other (fill/water)
Agriculture/ Grass/Unknown/ Other	0-2%	I	I	U	U	U
	2-6%	U	U	O	O	U
	6-10%	O	O	O	O	O
	>10%	O	O	O	O	O
Developed	0-2%	O	O	O	O	O
	2-6%	O	O	O	O	O
	6-10%	O	O	O	O	O
	>10%	O	O	O	O	O
Forest	0-2%	I	U	U	U	U
	2-6%	U	U	O	O	U
	6-10%	U	O	O	O	U
	>10%	O	O	O	O	O
Scrub/Shrub	0-2%	I	I	U	U	U
	2-6%	U	U	O	O	U
	6-10%	U	O	O	O	U
	>10%	O	O	O	O	O

Hydrologic Process Designation: I = Interflow; O = Overland Flow; U = Uncertain

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams
- Groundwater Basins

Dominant Hydrologic Processes

- Groundwater Recharge
- Interflow
- Overland Flow

S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
Poway Creek
SAN DIEGUITO LAGOON
DEL MAR
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carroll Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATIO LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Exhibit Showing Dominant Hydrologic Processes

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.2

STREAM CHARACTERIZATION

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams

S.D. COUNTY

San Dieguito River

Lusardi Creek

LAKE RAMONA

RESERVOIR

LAKE POWAY

S.D. COUNTY

POWAY

Rattlesnake Creek

SAN DIEGUITO LAGOON

DEL MAR

Poway Creek

LOS PENASQUITOS LAGOON

Los Penasquitos Creek

SAN DIEGO

MIRAMAR RESERVOIR

SAN VICENTE RESERVOIR

Carroll Canyon

Rose Creek

Sycamore Creek

SANTEE RECREATIO LAKES

San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Watershed Management Area Streams

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams

Hydrographic Category

- Intermittent
- Perennial

S.D. COUNTY

San Dieguito River

Lusardi Creek

LAKE RAMONA

RESERVOIR

LAKE POWAY

S.D. COUNTY

POWAY

Rattlesnake Creek

SAN DIEGUITO LAGOON

DEL MAR

Poway Creek

LOS PENASQUITOS LAGOON

Los Penasquitos Creek

SAN DIEGO

MIRAMAR RESERVOIR

SAN VICENTE RESERVOIR

Carroll Canyon

Rose Creek

Sycamore Creek

SANTEE RECREATIO LAKES

San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Watershed Management Area Streams by Hydrographic Category

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams within Federal/State/Indian Lands (not characterized, displayed for continuity)

Bed Material

- Concrete
- Earth
- Pipe / Culvert
- Riprap

S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON
DEL MAR
Poway Creek
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carroll Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATIO LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Watershed Management Area Streams by Bed Material

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams within Federal/State/Indian Lands (not characterized, displayed for continuity)

Other Streams (Non-Earthen)

- Pipe / Culvert
- Concrete
- Riprap

Geologic Group of Earthen Streams

- Coarse Bedrock
- Coarse Sedimentary Impermeable
- Coarse Sedimentary Permeable
- Fine Bedrock
- Fine Sedimentary Impermeable
- Fine Sedimentary Permeable

LAKE RAMONA RESERVOIR
S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON
DEL MAR
Poway Creek
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carroll Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150 NORTH

Watershed Management Area Streams by Geologic Group

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants | RICK ENGINEERING COMPANY

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams within Federal/State/Indian Lands (not characterized, displayed for continuity)

Reach Type

- Engineered Constrained
- Engineered Un-constrained
- Natural Constrained
- Natural Un-constrained

S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON
DEL MAR
Poway Creek
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carroll Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Watershed Management Area Streams by Reach Type

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

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ATTACHMENT A.3

LAND USES

Legend

- Regional WMAA Streams
- Watershed Boundaries
- Municipal Boundaries
- Federal/State/Indian Lands
- Rivers & Streams

Existing Land Use

Residential
- Spaced Rural Residential
- Single Family Residential
- Mobile Homes
- Multi-Family Residential
- Mixed Use

Commercial and Office
- Shopping Centers
- Commercial and Office

Industrial
- Heavy Industry
- Light Industry
- Extractive Industry

Public Facilities and Utilities
- Transport., Comm., Utilities
- Education
- Institutions
- Military

Parks and Recreation
- Recreation
- Open Space Parks

Agriculture
- Intensive Agriculture
- Extensive Agriculture

Other
- Indian Reservations
- Water
- Road Rights of Way
- Railroad Rights of Way

S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON
DEL MAR
Poway Creek
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carrol Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River

SAN JACINTO MOUNTAINS

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Existing Land Use

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Regional WMAA Streams
- Watershed Boundaries
- Municipal Boundaries
- Federal/State/Indian Lands
- Rivers & Streams

Planned Land Use

Residential
- Spaced Rural Residential
- Single Family Residential
- Mobile Homes
- Multi-Family Residential
- Mixed Use

Commercial and Office
- Shopping Centers
- Commercial and Office

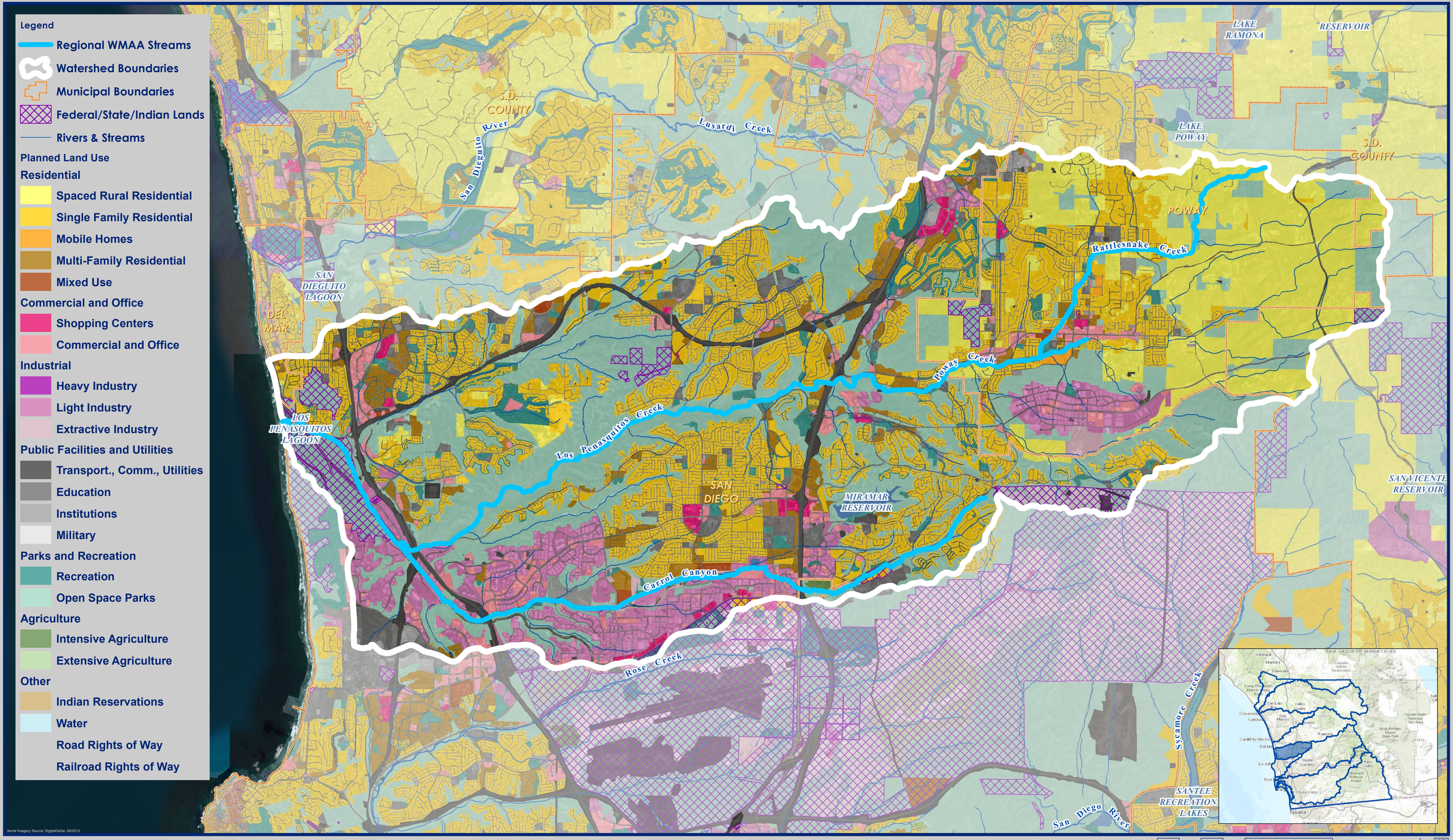
Industrial
- Heavy Industry
- Light Industry
- Extractive Industry

Public Facilities and Utilities
- Transport., Comm., Utilities
- Education
- Institutions
- Military

Parks and Recreation
- Recreation
- Open Space Parks

Agriculture
- Intensive Agriculture
- Extensive Agriculture

Other
- Indian Reservations
- Water
- Road Rights of Way
- Railroad Rights of Way



Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Planned Land Use

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Regional WMAA Streams
- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams

Developable Land

Residential
- Spaced Rural Residential
- Single Family Residential
- Mobile Homes
- Multi-Family Residential
- Mixed Use

Commercial and Office
- Shopping Centers
- Commercial and Office

Industrial
- Heavy Industry
- Light Industry
- Extractive Industry

Public Facilities and Utilities
- Transport., Comm., Utilities
- Education
- Institutions
- Military

Parks and Recreation
- Recreation
- Open Space Parks

Agriculture
- Intensive Agriculture
- Extensive Agriculture

Other
- Indian Reservations
- Water
- Road Rights of Way
- Railroad Rights of Way

S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON
DEL MAR
Poway Creek
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carroll Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Developable Land

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Regional WMAA Streams
- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams

Infill

- Employment
- Single Family
- Multi-Family

Redevelopment

- Residential to Employment
- Single Family to Multi-Family
- Mobile Home to Other
- Employment to Residential
- Employment to Employment
- Residential to Road or Freeway
- Employment to Road or Freeway
- Employment/Residential to Mixed Use

S.D. COUNTY
San Dieguito River
Lusardi Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON
DEL MAR
Poway Creek
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
SAN VICENTE RESERVOIR
Carroll Canyon
Rose Creek
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Redevelopment and Infill Areas

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.4

POTENTIAL COARSE SEDIMENT YIELD AREAS

A.4.1 Geology Grouping

Geologic grouping was based on the mapped geologic unit as determined by published geologic mapping information. The following describes the methodology utilized to determine bedrock or sedimentary characteristics, anticipated grain size, and suitability for infiltration. A complete list of the various geologic maps used in this evaluation is listed in Chapter 6.

Due to the various mapped scales of the published data and differing mapped unit names, the geologic units were initially compiled into similar categories where possible. For example, the Lindavista Formation is mapped as unit Ql on geologic maps at a scale of 1:24,000 but correlates to the same unit Qvop8 on geologic maps at a scale of 1:100,000. Following the compilation of geologic unit names, the units were differentiated between crystalline bedrock and sedimentary formations based on geologic characterization and material behavior. The Point Loma Formation for example, is a Cretaceous-age sandstone, but it was classified as a "coarse bedrock" unit due to its indurated and resistant nature.

For each site location, the predominant geologic units were then described as "coarse" or "fine" based on typical weathering characteristics of the bedrock units, or primary grain size of the sedimentary units. For example, granodiorite or tonalite crystalline rock typically weathers to a coarse material such as a silty sand and therefore was classified as "coarse," compared to a gabbro which generally weathers to a sandy clay and was characterized as "fine." Sedimentary formations can be more variable, such as the Mission Valley Formation. In this case, the Mission Valley Formation was characterized as "coarse" since the unit is predominantly comprised of sandstone even if it does contain localities of siltstone and claystone within the unit.

To further characterize the sedimentary formations, these units were evaluated for suitability of infiltration. Since no field investigations were performed for this evaluation to determine permeability, the differentiation between impermeable and permeable were based on the age of the geologic unit with the assumption that relatively younger sedimentary units of Pleistocene-age or younger (<1.6 mya) would be more susceptible to surface water infiltration. Geology grouping of different map units is presented in Table A.4.1

Table A.4.1 Geologic grouping for different map units

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
gr-m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
grMz	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Jcr	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Jhc	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Jsp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ka	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kbm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kbp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcm	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kd	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kdl	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgbf	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgd	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgdf	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgh	San Diego 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm1	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm2	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm3	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm4	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgr	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgu	San Diego 30' x 60'	Coarse	Bedrock	Impermeable	CB
Khg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ki	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kis	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kjd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
KJem	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
KJld	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kjv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Klb	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klh	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Km	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmgp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpa	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kqbd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kt	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ktr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kvc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwsr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Mzd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzq	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzs	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
sch	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Kp	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ql	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
QTf	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ec	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
K	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
Kccg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kcs	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kl	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ku	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvof	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmsc	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmss	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tp	San Diego & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tpm	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsc	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tscu	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsd	San Diego & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsdcg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsdss	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsm	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tso	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tst	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tt	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tta	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmv	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsi	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa11	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa12	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa13	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoc	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop1	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvop11a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop12	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop13	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop2	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop3	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop4	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop5	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop6	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsa	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qof	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Q	Jennings; CA	Coarse	Sedimentary	Permeable	CSP
Qa	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qd	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qmb	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qw	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qyf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qt	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa1-2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa2-6	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa5	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa6	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa7	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qoc	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qc	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qu	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop2-4	San Diego 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop3	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop4	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop6	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qya	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qyc	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Mzu	San Diego & Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
gb	Jennings; CA	Fine	Bedrock	Impermeable	FB
JTRm	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kat	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kc	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kgb	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
KJvs	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kmv	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Ksp	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kvsp	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kwmt	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Qv	Jennings; CA	Fine	Bedrock	Impermeable	FB
Tba	San Diego 30' x 60'	Fine	Bedrock	Impermeable	FB
Tda	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Tv	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Tvsr	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kgdfg	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Ta	San Diego 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tcs	Oceanside 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Td	San Diego & Oceanside	Fine	Sedimentary	Impermeable	FSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
	30' x 60'				
Td+Tf	San Diego 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Qls	San Diego, Oceanside & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tm	Oceanside 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tf	San Diego, Oceanside & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tfr	El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
To	San Diego & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Qpe	San Diego & Oceanside 30' x 60'	Fine	Sedimentary	Permeable	FSP
Mexico	San Diego 30' x 60'	NA	NA	Permeable	Other
Kuo	San Diego 30' x 60'	NA (Offshore)	NA	Permeable	Other
Teo	San Diego & Oceanside 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
Tmo	Oceanside 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
Qmo	San Diego 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
QTso	San Diego 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
af	San Diego & Oceanside 30' x 60'	Variable, dependent on source material	Sedimentary		Other

A.4.2 Quantitative Analysis

Soil loss estimates for each Geomorphic Landscape Unit were estimated using the Revised Universal Soil Loss Equation (RUSLE; Renard et al. 1997) listed below:

$$A = R \times K \times LS \times C \times P$$

Where

A = estimated average soil loss in tons/acre/year

R = rainfall-runoff erosivity factor

K = soil erodibility factor

LS = slope length and steepness factor

C = cover-management factor

P = support practice factor; assumed 1 for this analysis

Regional datasets used to estimate the inputs required to estimate the soil loss from each GLU are listed in table below:

Dataset	Source	Download year	Description
RUSLE – R Factor	SWRCB	2014	Regional R factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_R_Factor/
RUSLE – K Factor	SWRCB	2014	Regional K factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_K_Factor/
RUSLE – LS Factor	SWRCB	2014	Regional LS factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_LS_Factor/
RUSLE – C Factor	USEPA	2014	Regional C factor map was downloaded from http://www.epa.gov/esd/land-sci/emap_west_browser/pages/wemap_mm_sl_rusle_c_qt.htm#mapnav

GIS analysis was used to calculate the area weighted estimate of R, K, LS and C factors using the regional datasets listed in the table above. For the developed land cover the C factor was then adjusted to 0 from the regional estimate to account for management actions implemented on developed sites (e.g. impervious surfaces). Soil loss estimates ranged from 0 to 15.2 tons/acre/year.

For evaluating the degree of relative risk to a stream solely arising from changes in sediment and/or water delivery SCCWRP Technical Report 605, 2010 states:

> *"The challenge in implementing this step is that presently we have insufficient basis to defensibly identify either low-risk or high-risk conditions using these metrics. For example, channels that are close to a threshold for geomorphic change may display significant morphological changes under nothing more than natural year-to-year variability in flow or sediment load.*

- *Acknowledging this caveat, we nonetheless anticipate that changes of less than 10% in either driver are unlikely to instigate, on their own, significant channel changes. This value is a conservative estimate of the year-to-year variability in either discharge or sediment flux that can be accommodated by a channel system in a state of dynamic equilibrium. It does not "guarantee," however, that channel change may not occur—either in response to yet modest alterations in water or sediment delivery, or because of other urbanization impacts (e.g., point discharge of runoff or the trapping of the upstream sediment flux; see Booth 1990) that are not represented with this analysis.*
- *In contrast, recognizing a condition of undisputed "high risk" must await broader collection of regionally relevant data. We note that >60% reductions in predicted sediment production have resulted in both minimal (McGonigle) and dramatic (Agua Hedionda) channel changes, indicating that "more data" may never provide absolute guidance. At present, we suggest using predicted watershed changes of 50% or more in either runoff (as indexed by change in impervious area) or sediment production as provisional criteria for requiring a more detailed evaluation of both the drivers and the resisting factors for channel change, regardless of other screening-level assessments. Clearly, however, only more experience with the application of such "thresholds," and the actual channel conditions that accompany them, will provide a defensible basis for setting numeric standards."*

The following criterion was developed using the suggestions listed above and then used to assign relative sediment production rating to each GLU:

- Low: Soil Loss < 5.6 tons/acre/year [GLUs that have a soil loss of 0 to 5.6 tons/acre/year produces around 10% of the total coarse sediment soil loss from the study area]
- Medium: 5.6 tons/acre/year < Soil Loss < 8.4 tons/acre/year
- High: > 8.4 tons/acre/year [GLUs that have a soil loss greater than 8.4 tons/acre/year produces around 42% of the total coarse sediment soil loss from the study area]

Results from the quantitative analysis are summarized in Table A.4.2.

Table A.4.2 Relative Sediment Production for different Geomorphic Landscape Units

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CB-Agricultural/Grass-1	52883	0.20	4.67	0.14	50	6.5	Medium	No
CB-Agricultural/Grass-2	40633	0.21	5.19	0.14	56	8.3	Medium	No
CB-Agricultural/Grass-3	32617	0.22	6.04	0.14	57	10.6	High	Yes
CB-Agricultural/Grass-4	11066	0.23	7.38	0.14	57	13.5	High	Yes
CB-Developed-1	39746	0.22	3.77	0	49	0	Low	No
CB-Developed-2	32614	0.22	4.28	0	50	0	Low	No
CB-Developed-3	15841	0.22	4.86	0	49	0	Low	No
CB-Developed-4	1805	0.22	5.63	0	48	0	Low	No
CB-Forest-1	32231	0.20	6.38	0.14	39	6.8	Medium	No
CB-Forest-2	38507	0.20	7.20	0.13	45	8.8	High	Yes
CB-Forest-3	55303	0.20	8.14	0.13	48	10.6	High	Yes
CB-Forest-4	38217	0.20	9.95	0.14	50	13.6	High	Yes
CB-Other-1	1036	0.20	5.52	0.13	45	6.5	Medium	No
CB-Other-2	317	0.20	6.46	0.13	45	7.9	Medium	No
CB-Other-3	296	0.20	6.96	0.14	43	8.3	Medium	No
CB-Other-4	111	0.21	6.84	0.14	41	8.2	Medium	No
CB-Scrub/Shrub-1	88135	0.20	5.66	0.14	33	5.3	Low	No
CB-Scrub/Shrub-2	143694	0.20	6.51	0.14	37	6.8	Medium	No
CB-Scrub/Shrub-3	246703	0.21	7.33	0.14	41	8.4	Medium	No
CB-Scrub/Shrub-4	191150	0.21	8.28	0.14	42	9.8	High	No
CB-Unknown-1	1727	0.21	5.32	0.13	44	6.3	Medium	No
CB-Unknown-2	1935	0.21	5.95	0.13	44	7.1	Medium	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CB-Unknown-3	1539	0.22	6.21	0.13	44	7.7	Medium	No
CB-Unknown-4	278	0.22	6.61	0.13	44	8.4	High	Yes
CSI-Agricultural/Grass-1	14609	0.34	2.72	0.14	39	4.8	Low	No
CSI-Agricultural/Grass-2	9059	0.37	3.61	0.14	47	8.7	High	Yes
CSI-Agricultural/Grass-3	10096	0.38	3.99	0.14	47	9.8	High	Yes
CSI-Agricultural/Grass-4	2498	0.37	4.33	0.14	47	10.5	High	Yes
CSI-Developed-1	82371	0.28	2.51	0	39	0	Low	No
CSI-Developed-2	22570	0.30	2.66	0	41	0	Low	No
CSI-Developed-3	13675	0.30	2.89	0	40	0	Low	No
CSI-Developed-4	3064	0.27	3.20	0	39	0	Low	No
CSI-Forest-1	449	0.27	4.26	0.13	43	6.6	Medium	No
CSI-Forest-2	611	0.25	5.11	0.13	44	7.5	Medium	No
CSI-Forest-3	716	0.29	4.43	0.13	44	7.4	Medium	No
CSI-Forest-4	348	0.30	4.49	0.13	43	7.6	Medium	No
CSI-Other-1	319	0.31	2.50	0.13	32	3.2	Low	No
CSI-Other-2	83	0.27	3.01	0.13	39	4.3	Low	No
CSI-Other-3	45	0.28	3.03	0.13	39	4.5	Low	No
CSI-Other-4	13	0.24	4.01	0.14	39	5.2	Low	No
CSI-Scrub/Shrub-1	9051	0.26	3.53	0.13	39	4.7	Low	No
CSI-Scrub/Shrub-2	10802	0.27	4.36	0.13	41	6.3	Medium	No
CSI-Scrub/Shrub-3	28220	0.26	4.82	0.13	41	6.7	Medium	No
CSI-Scrub/Shrub-4	20510	0.26	5.52	0.13	41	7.8	Medium	No
CSI-Unknown-1	5292	0.28	2.38	0.13	36	3.1	Low	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CSI-Unknown-2	2074	0.29	2.98	0.13	40	4.5	Low	No
CSI-Unknown-3	2171	0.27	3.04	0.13	39	4.2	Low	No
CSI-Unknown-4	676	0.26	3.04	0.13	38	3.8	Low	No
CSP-Agricultural/Grass-1	59327	0.22	3.01	0.14	44	4.0	Low	No
CSP-Agricultural/Grass-2	8426	0.23	3.81	0.14	42	5.2	Low	No
CSP-Agricultural/Grass-3	2377	0.24	4.05	0.14	41	5.6	Low	No
CSP-Agricultural/Grass-4	291	0.22	6.28	0.14	52	10.1	High	Yes
CSP-Developed-1	85283	0.27	2.10	0	42	0	Low	No
CSP-Developed-2	7513	0.26	2.77	0	42	0	Low	No
CSP-Developed-3	2317	0.27	2.70	0	40	0	Low	No
CSP-Developed-4	272	0.27	2.76	0	38	0	Low	No
CSP-Forest-1	14738	0.22	4.52	0.14	44	6.0	Medium	No
CSP-Forest-2	3737	0.22	5.99	0.14	45	8.2	Medium	No
CSP-Forest-3	1858	0.21	6.42	0.14	45	8.5	High	Yes
CSP-Forest-4	484	0.21	7.62	0.14	48	10.2	High	Yes
CSP-Other-1	7404	0.23	2.61	0.14	39	3.2	Low	No
CSP-Other-2	343	0.24	3.68	0.13	40	4.8	Low	No
CSP-Other-3	126	0.24	3.76	0.13	40	4.9	Low	No
CSP-Other-4	17	0.24	4.19	0.13	39	5.3	Low	No
CSP-Scrub/Shrub-1	22583	0.23	3.75	0.14	41	4.8	Low	No
CSP-Scrub/Shrub-2	8938	0.24	5.63	0.14	40	7.1	Medium	No
CSP-Scrub/Shrub-3	7186	0.23	6.15	0.13	39	7.5	Medium	No
CSP-Scrub/Shrub-4	2609	0.22	7.16	0.14	43	9.3	High	Yes

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CSP-Unknown-1	6186	0.25	2.63	0.13	40	3.4	Low	No
CSP-Unknown-2	744	0.27	3.49	0.13	39	4.8	Low	No
CSP-Unknown-3	350	0.28	3.32	0.13	38	4.5	Low	No
CSP-Unknown-4	78	0.28	3.26	0.13	40	4.5	Low	No
FB-Agricultural/Grass-1	6103	0.25	5.49	0.14	49	9.2	High	No
FB-Agricultural/Grass-2	7205	0.25	5.87	0.14	51	10.1	High	No
FB-Agricultural/Grass-3	6730	0.24	6.43	0.14	53	11.3	High	No
FB-Agricultural/Grass-4	2586	0.22	8.62	0.14	57	15.2	High	No
FB-Developed-1	10116	0.28	3.94	0	46	0	Low	No
FB-Developed-2	9075	0.28	4.41	0	45	0	Low	No
FB-Developed-3	5499	0.27	4.72	0	44	0	Low	No
FB-Developed-4	785	0.27	5.08	0	43	0	Low	No
FB-Forest-1	3780	0.21	7.24	0.13	39	8.0	Medium	No
FB-Forest-2	7059	0.21	7.53	0.13	43	8.8	High	No
FB-Forest-3	13753	0.22	8.02	0.13	43	9.7	High	No
FB-Forest-4	8899	0.26	9.63	0.13	35	11.5	High	No
FB-Other-1	172	0.26	5.72	0.13	44	8.6	High	No
FB-Other-2	75	0.26	5.97	0.13	38	7.7	Medium	No
FB-Other-3	76	0.28	6.27	0.13	34	7.6	Medium	No
FB-Other-4	36	0.31	6.70	0.13	33	8.6	High	No
FB-Scrub/Shrub-1	10297	0.24	6.94	0.14	36	8.3	Medium	No
FB-Scrub/Shrub-2	25150	0.25	7.24	0.14	38	9.0	High	No
FB-Scrub/Shrub-3	70895	0.25	7.89	0.13	38	10.0	High	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FB-Scrub/Shrub-4	70679	0.26	9.05	0.14	39	12.1	High	No
FB-Unknown-1	654	0.30	5.33	0.13	37	7.6	Medium	No
FB-Unknown-2	829	0.29	5.26	0.13	40	7.9	Medium	No
FB-Unknown-3	1062	0.29	5.54	0.13	39	8.2	Medium	No
FB-Unknown-4	299	0.28	6.02	0.13	38	8.4	High	No
FSI-Agricultural/Grass-1	8462	0.32	3.91	0.13	24	3.9	Low	No
FSI-Agricultural/Grass-2	4979	0.33	4.29	0.13	31	5.7	Medium	No
FSI-Agricultural/Grass-3	4808	0.34	4.26	0.13	34	6.3	Medium	No
FSI-Agricultural/Grass-4	1055	0.35	4.11	0.13	36	6.7	Medium	No
FSI-Developed-1	9953	0.29	3.09	0	34	0	Low	No
FSI-Developed-2	4972	0.31	3.22	0	37	0	Low	No
FSI-Developed-3	3350	0.29	3.30	0	36	0	Low	No
FSI-Developed-4	763	0.28	3.31	0	37	0	Low	No
FSI-Forest-1	186	0.33	4.62	0.13	37	7.2	Medium	No
FSI-Forest-2	217	0.35	4.47	0.13	39	7.9	Medium	No
FSI-Forest-3	262	0.37	4.71	0.13	40	9.2	High	No
FSI-Forest-4	111	0.36	4.73	0.13	40	9.2	High	No
FSI-Other-1	266	0.31	3.11	0.13	24	2.9	Low	No
FSI-Other-2	81	0.30	3.29	0.13	25	3.1	Low	No
FSI-Other-3	56	0.31	3.04	0.13	27	3.2	Low	No
FSI-Other-4	15	0.29	3.57	0.13	33	4.4	Low	No
FSI-Scrub/Shrub-1	2241	0.27	4.46	0.13	29	4.5	Low	No
FSI-Scrub/Shrub-2	3911	0.28	4.96	0.13	31	5.7	Medium	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FSI-Scrub/Shrub-3	7590	0.29	5.05	0.13	34	6.3	Medium	No
FSI-Scrub/Shrub-4	3502	0.30	5.14	0.13	37	7.5	Medium	No
FSI-Unknown-1	1117	0.29	2.83	0.13	27	3.0	Low	No
FSI-Unknown-2	780	0.30	3.44	0.13	32	4.3	Low	No
FSI-Unknown-3	855	0.29	3.41	0.13	31	4.0	Low	No
FSI-Unknown-4	285	0.28	3.21	0.13	32	3.7	Low	No
FSP-Agricultural/Grass-1	13	0.22	2.22	0.13	40	2.5	Low	No
FSP-Agricultural/Grass-2	3	0.22	2.59	0.13	40	3.0	Low	No
FSP-Agricultural/Grass-3	2	0.22	2.69	0.13	40	3.2	Low	No
FSP-Agricultural/Grass-4	0	0.20	2.94	0.12	40	2.9	Low	No
FSP-Developed-1	180	0.26	2.85	0	40	0	Low	No
FSP-Developed-2	13	0.25	2.69	0	40	0	Low	No
FSP-Developed-3	8	0.21	2.25	0	40	0	Low	No
FSP-Developed-4	0	0.21	2.29	0	40	0	Low	No
FSP-Forest-1	8	0.22	2.29	0.14	40	2.9	Low	No
FSP-Forest-2	5	0.20	2.22	0.14	40	2.5	Low	No
FSP-Forest-3	0	0.20	2.22	0.14	40	2.5	Low	No
FSP-Other-1	1307	0.20	2.38	0.14	40	2.7	Low	No
FSP-Other-2	34	0.21	2.36	0.14	40	2.7	Low	No
FSP-Other-3	8	0.22	2.56	0.13	40	3.0	Low	No
FSP-Other-4	0	0.43	4.35	0.12	40	9.3	High	No
FSP-Scrub/Shrub-1	147	0.23	2.68	0.14	40	3.3	Low	No
FSP-Scrub/Shrub-2	18	0.23	2.55	0.14	40	3.3	Low	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FSP-Scrub/Shrub-3	4	0.20	2.23	0.14	40	2.6	Low	No
FSP-Scrub/Shrub-4	0	0.20	1.70	0.12	40	1.7	Low	No
FSP-Unknown-1	40	0.20	1.87	0.13	40	1.9	Low	No
FSP-Unknown-2	5	0.20	1.99	0.12	40	2.0	Low	No
FSP-Unknown-3	1	0.20	2.39	0.12	40	2.4	Low	No
O-Agricultural/Grass-1	2433	0.20	2.93	0.14	34	2.8	Low	No
O-Agricultural/Grass-2	112	0.21	3.44	0.14	32	3.2	Low	No
O-Agricultural/Grass-3	30	0.23	3.89	0.13	32	3.8	Low	No
O-Agricultural/Grass-4	1	0.26	6.47	0.13	37	7.9	Medium	No
O-Developed-1	8327	0.27	1.37	0	39	0	Low	No
O-Developed-2	474	0.25	2.12	0	40	0	Low	No
O-Developed-3	157	0.26	3.07	0	41	0	Low	No
O-Developed-4	26	0.24	3.89	0	41	0	Low	No
O-Forest-1	235	0.22	6.15	0.13	43	7.6	Medium	No
O-Forest-2	67	0.21	5.07	0.13	45	6.6	Medium	No
O-Forest-3	45	0.21	5.43	0.13	47	7.3	Medium	No
O-Forest-4	20	0.20	5.95	0.13	59	9.0	High	No
O-Other-1	9362	0.25	3.86	0.13	36	4.3	Low	No
O-Other-2	344	0.24	3.32	0.13	35	3.5	Low	No
O-Other-3	120	0.23	4.86	0.13	35	5.0	Low	No
O-Other-4	37	0.22	5.64	0.13	39	6.6	Medium	No
O-Scrub/Shrub-1	688	0.22	4.83	0.13	40	5.7	Medium	No
O-Scrub/Shrub-2	224	0.22	5.80	0.13	36	6.3	Medium	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
O-Scrub/Shrub-3	209	0.22	6.47	0.13	41	7.5	Medium	No
O-Scrub/Shrub-4	96	0.22	6.62	0.13	44	8.2	Medium	No
O-Unknown-1	1236	0.28	1.60	0.12	26	1.5	Low	No
O-Unknown-2	62	0.27	1.48	0.13	36	1.8	Low	No
O-Unknown-3	15	0.29	3.52	0.13	38	4.9	Low	No
O-Unknown-4	7	0.34	3.87	0.12	40	6.6	Medium	No

GLU Nomenclature: Geology – Land Cover – Slope Category

Geology Categories:

CB Coarse Bedrock

CSI Coarse Sedimentary Impermeable

CSP Coarse Sedimentary Permeable

FB Fine Bedrock

FSI Fine Sedimentary Impermeable

FSP Fine Sedimentary Permeable

O Other

Slope Categories:

1 0%-10%

2 10% - 20%

3 20% - 40%

4 > 40%

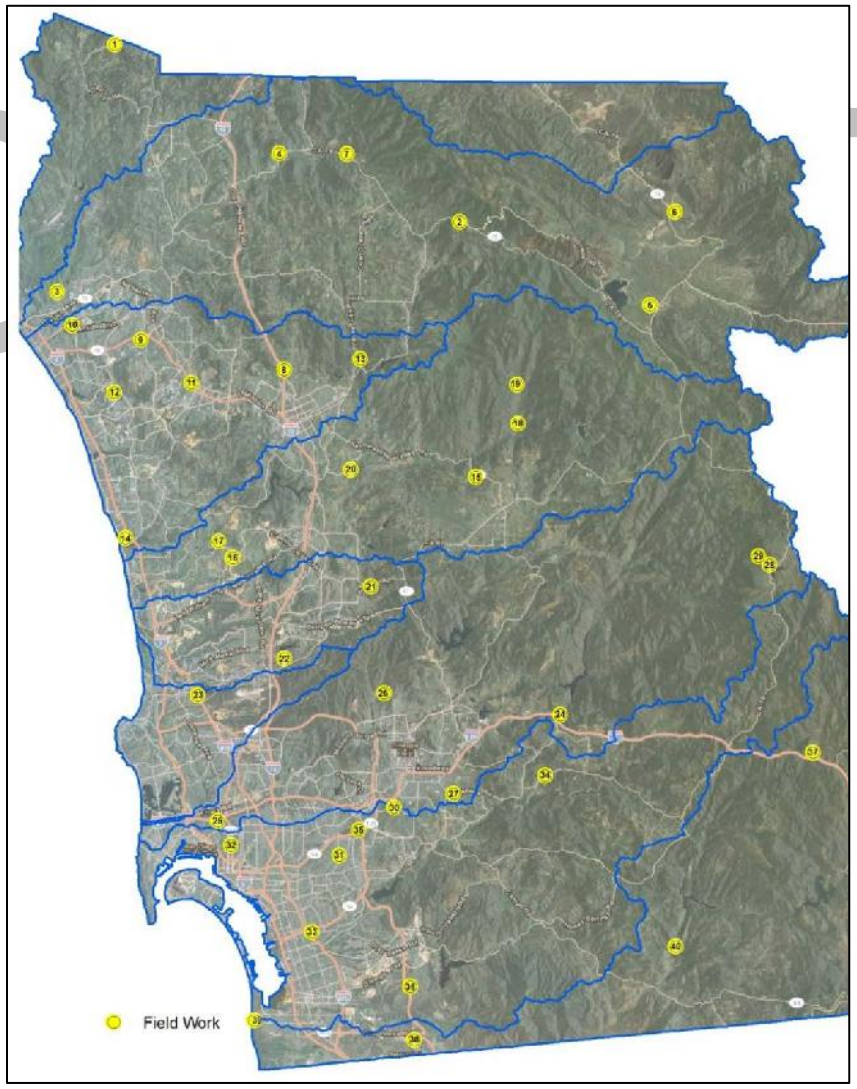
A4.3 Field Assessment

Site Selection:

Forty locations were selected from the study region for field assessment. Sites were selected such that they are accessible by existing road network based on review of satellite imagery and are uniformly distributed considering the following criteria:

- Geologic grouping
- Land cover
- Slope category
- WMA
- Jurisdiction

Yellow circles in the figure below shows the 40 locations for which field assessment was performed.



Pre-Field Activities

Prior to conducting field activities, the consultant team reviewed available published geologic information at each site location and prepared satellite imagery of each site using Google Earth™. Pre-field activities consisted of evaluating site access at each location using aerial imagery and logistics were coordinated based on regional site location to maximize field efficiency.

Site Reconnaissance

Site reconnaissance was performed at forty locations between 22 January and 7 February 2014 by a team of geologists. The reconnaissance consisted of:

- Visual soil classification,
- Assessing existing vegetative cover (0-100%),
- Qualitative assignment of existing sediment production (low, medium, and high) [based on existing vegetative cover],
- Qualitative assignment of potential sediment production (low, medium, and high)[assuming there is 0% vegetative cover], and
- Identifying existing erosional features.

Descriptions and visual classifications of the surficial materials were based on the Unified Soil Classification System (USCS). Underlying geologic units were confirmed where exposed formations were observed within the individual site limits.

SITE AND GEOLOGIC CONDTIONS

Our knowledge of the site conditions has been developed from a review of available geologic literature, previous geologic and geotechnical investigations by the consultant team in the study region, professional experience, site reconnaissance, and field investigations performed for this study.

Surface Conditions

Site locations were sited in open space with the exception of sites ID-27, -30, and -31 which were situated within developed areas with paved streets and sidewalks. The surface conditions at the site locations were characterized by sloping terrain varying from relatively flat (< 5%) to very steep slopes (> 40%). At the time of our reconnaissance the natural hillsides along the areas of interest were covered by varying degrees of moderate to dense growth scrub brush, low grasses, and scattered trees.

Existing erosional and geomorphic features at each site location were identified where possible. The observed erosional features included notable drainages, rilling, scour, and sediment accumulation. Observed geomorphic features included areas of minor slope instability and surficial slumping. Several sources of ground disturbance were identified during the site reconnaissance included active grading operations and bioturbation.

An evaluation of the existing and potential sediment production for each site was determined based on surface conditions. Sediment production was assigned as “high, medium, or low” based on the existing conditions and consultant team’s professional experience.

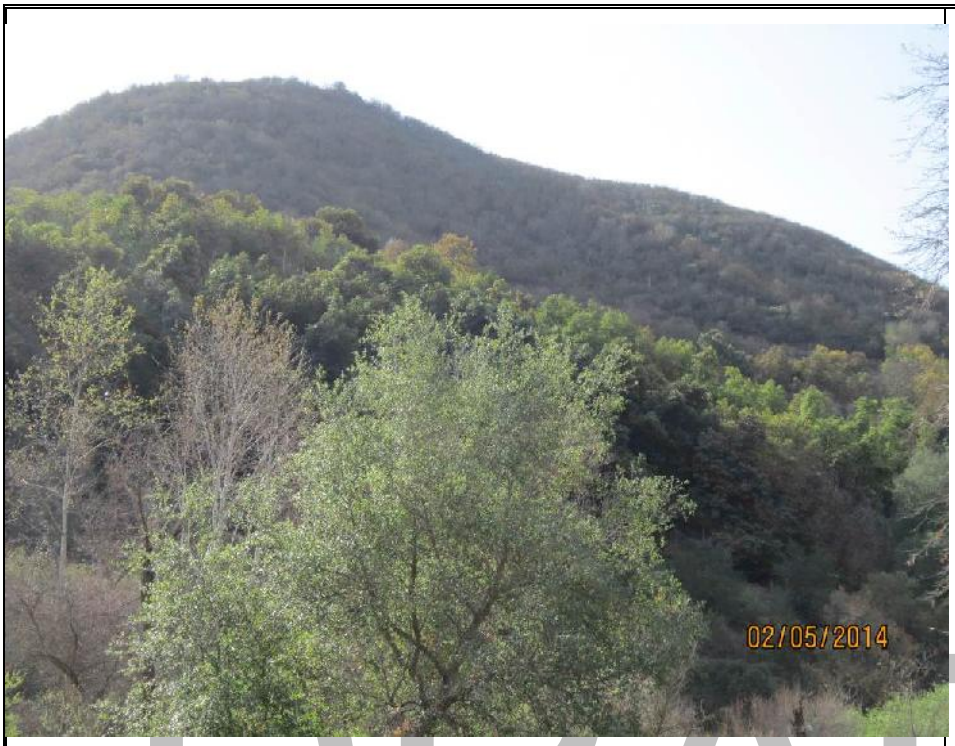
Surficial Deposits

Surficial deposits, including topsoil, alluvium, colluvium, slopewash, and residual soils are present in portions of the study area within the natural drainages and mantling the slope areas. The composition and grain size of these materials are variable depending on the age, parent sources, and mode of deposition.

Geologic Conditions

Our knowledge of the subsurface conditions at the site locations is based on a review of available published geologic information, professional experience, site reconnaissance, previous explorations and geotechnical investigations performed by the consultant team in the study region.

Field Assessment Photo Log



Field Visit ID-1

GLU: CB-Scrub/Shrub-4

View: Looking southwest

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 90%

Field Visit ID-2

GLU: CB-Forest-4

View: Looking north

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

Field Visit ID-3

GLU: CSI-Agricultural/ Grass-3

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover:

95-100%

Field Visit ID-4

GLU: CSI-Scrub/Shrub-2

View: Looking north

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 70%

Field Visit ID-5

GLU: CSP-Agricultural/ Grass-1

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 90%

Field Visit ID-6

GLU: CSP-Agricultural/ Grass-3

View: Looking east

Existing sediment production: Low to Med

Potential sediment production:

Low to Med

Existing veg. cover:
Southeast slope ~50%

Northeast slope ~70%

Field Visit ID-7

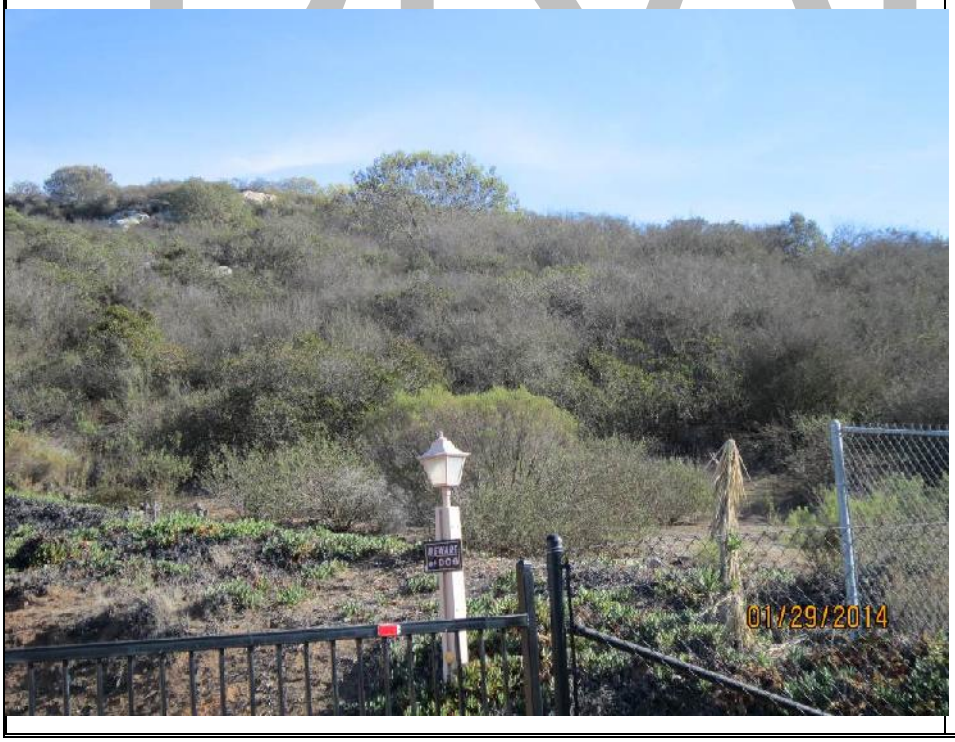
GLU: CSP-Forest-3

View: Looking east

Existing sediment production: Med to High

Potential sediment production: High

Existing veg. cover: 75-80%



Field Visit ID-8

GLU: CB-Scrub/Shrub-3

View: Looking southeast

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 90-95%

Field Visit ID-9

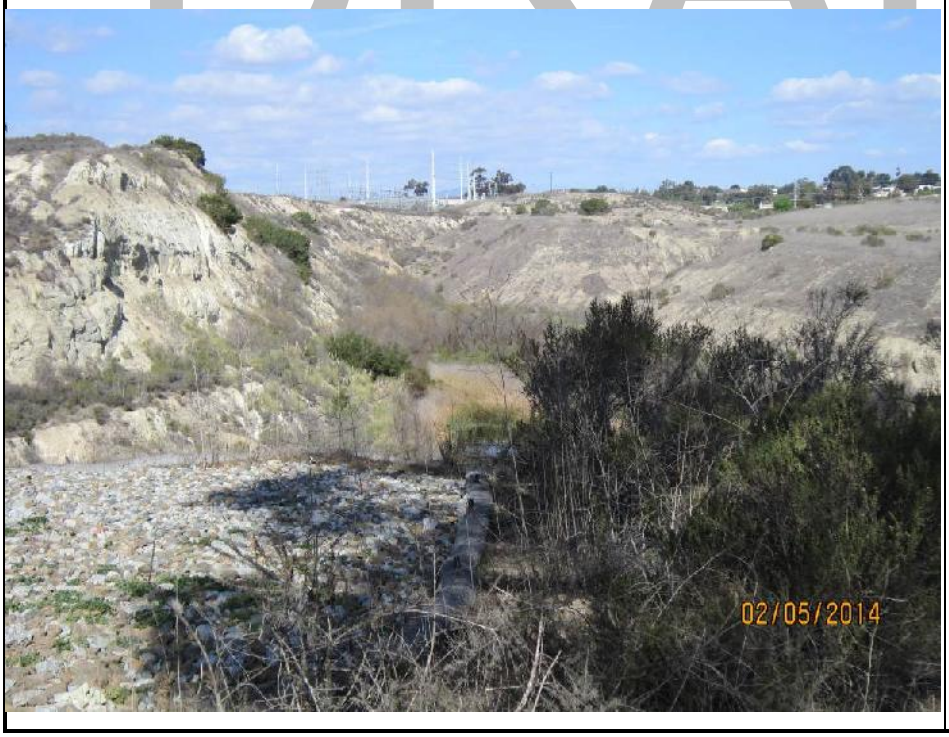
GLU: CB-Agricultural/ Grass-2

View: Looking northwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 70%



Field Visit ID-10

GLU: CSI-Unknown-2

View: Looking north

Existing sediment production: Med to High

Potential sediment production: High

Existing veg. cover: 75%

Field Visit ID-11

GLU: CSI-Agricultural/ Grass-2

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 85%

Field Visit ID-12

GLU: CSP-Unknown-2

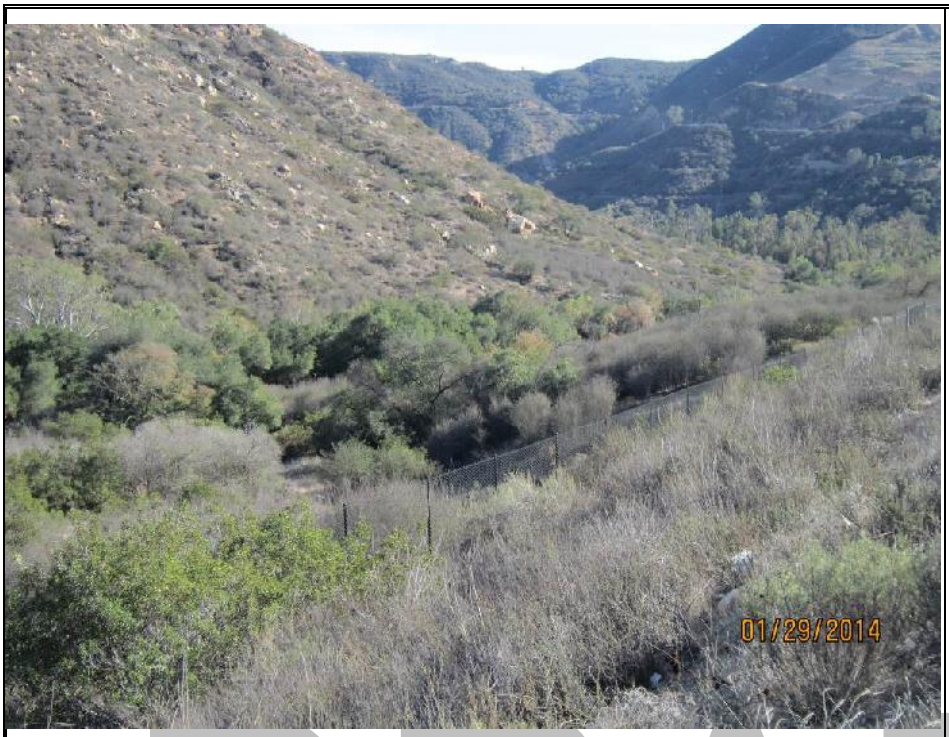
View: Looking southwest

Existing sediment production: Low

Potential sediment production:

Low to Med

Existing veg. cover: 50%



Field Visit ID-13

GLU: CSP-Scrub/Shrub-2

View: Looking southeast

Existing sediment production: Med

Potential sediment production:

Med to High

Existing veg. cover: 80-85%

Field Visit ID-14

GLU: FSP-Scrub/Shrub-1

View: Looking northeast

Existing sediment production: Low

Potential sediment production:

Low to Med

Existing veg. cover:

95-100%

Field Visit ID-15

GLU: CB-Agricultural/ Grass-4

View: Looking west

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

.

Field Visit ID-16

GLU: CB-Agricultural/ Grass-3

View: Looking south

Existing sediment production: High*

Potential sediment production: High

Existing veg. cover: 90-95%

* Area was burned in 2014 fires after the field assessment so existing sediment production was adjusted to High (based on potential sediment production) from Medium

Field Visit ID-17

GLU: CSI-Scrub/Shrub-4

View: Looking west

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

Field Visit ID-18

GLU: CSP-Forest-1

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 80%

Field Visit ID-19

GLU: CSP-Scrub/Shrub-3

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 60%

Field Visit ID-20

GLU: CSP-Unknown-1

View: Looking southeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 95%

Field Visit ID-21

GLU: CB-Unknown-3

View: Looking northwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 50-60%

Field Visit ID-22

GLU: CSI-Forest-3

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 60%

Field Visit ID-23

GLU: CSI-Scrub/Shrub-1

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 80%

Field Visit ID-24

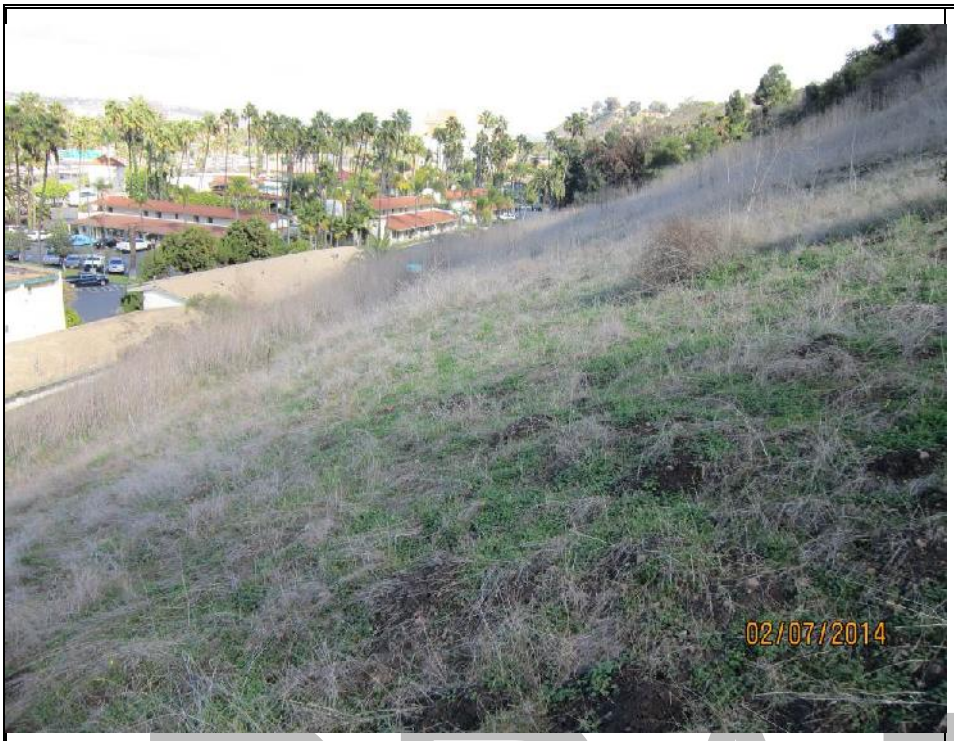
GLU: CB-Unknown-4

View: Looking northeast

Existing sediment production: Low to Med

Potential sediment production: High

Existing veg. cover: 80%



Field Visit ID-25

GLU: CSI-Agricultural/ Grass-4

View: Looking east

Existing sediment production: Low

Potential sediment production: Med-High

Existing veg. cover: 95%

Field Visit ID-26

GLU: CSI-Scrub/Shrub-3

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 100%

.

Field Visit ID-27

GLU: CSP-Developed-2

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%

.

Field Visit ID-28

GLU: CSP-Agricultural/ Grass-2

View: Looking north

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 90-95%

.

Field Visit ID-29

GLU: FB-Forest-3

View: Looking northwest

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 80-85%

Field Visit ID-30

GLU: CB-Developed-4

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 70%

.

Field Visit ID-31

GLU: CSI-Developed-3

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%

Field Visit ID-32

GLU: CSI-Unknown-3

View: Looking west

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 70-75%

Field Visit ID-33

GLU: CSP-Scrub/Shrub-1

View: Looking northeast

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 70%

Field Visit ID-34

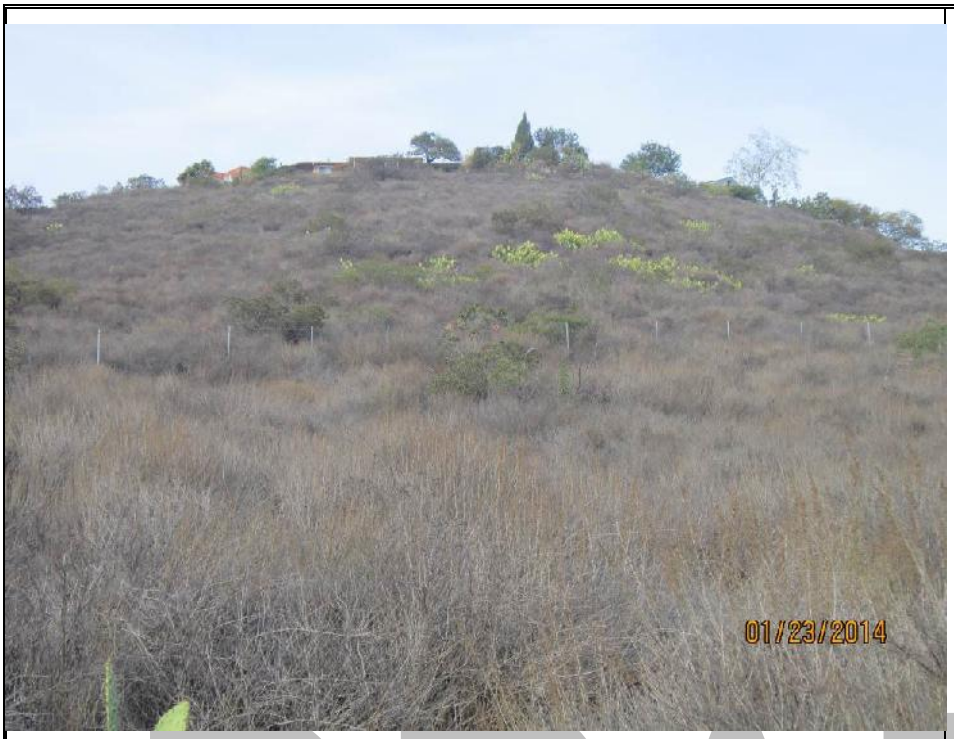
GLU: CSP-Developed-2

View: Looking south

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 95%



Field Visit ID-35

GLU: FB-Scrub/Shrub-3

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 90-95%

Field Visit ID-36

GLU: FSI-Agricultural/ Grass-2

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 95%

Field Visit ID-37

GLU: CB-Forest-3

View: Looking southeast

Existing sediment production: Med-High

Potential sediment production: High

Existing veg. cover: 75-80%

Field Visit ID-38

GLU: CSI-Agricultural/ Grass-1

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 85%

Field Visit ID-39

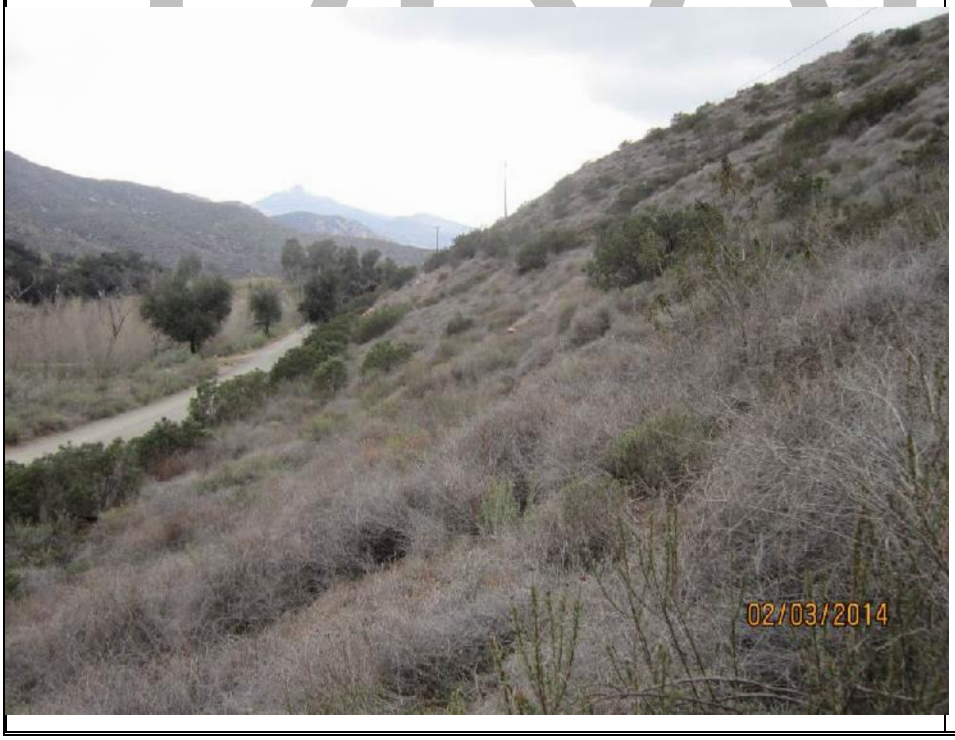
GLU: CSP-Developed-1

View: Looking west

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%



Field Visit ID-40

GLU: CSP-Scrub/Shrub-4

View: Looking south

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 90-95%

Legend

- Regional WMAA Streams
- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams

Geologic Group

- Coarse Bedrock
- Coarse Sedimentary Impermeable
- Coarse Sedimentary Permeable
- Fine Bedrock
- Fine Sedimentary Impermeable
- Fine Sedimentary Permeable
- Other

ENCINITAS
Escondido Creek
Elfio Lagoon
S.D. COUNTY
San Dieguito River
Lusardi Creek
SOLANA BEACH
SAN DIEGUITO LAGOON
DEL MAR
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
Carroll Canyon Creek
Rose Creek
LAKE RAMONA
RESERVOIR
LAKE POWAY
S.D. COUNTY
POWAY
Rattlesnake Creek
Poway Creek
Poway Creek
SAN VICENTE RESERVOIR
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Geologic Group

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams
- Potential Critical Coarse Sediment Yield Areas

S.D. COUNTY

San Dieguito River

Lusardi Creek

LAKE RAMONA

RESERVOIR

LAKE POWAY

S.D. COUNTY

POWAY

Rattlesnake Creek

SAN DIEGUITO LAGOON

DEL MAR

Poway Creek

LOS PENASQUITOS LAGOON

Los Penasquitos Creek

SAN DIEGO

MIRAMAR RESERVOIR

SAN VICENTE RESERVOIR

Carroll Canyon Creek

Rose Creek

Sycamore Creek

SANTEE RECREATION LAKES

San Diego River

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Potential Critical Coarse Sediment Yield Areas

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.5

PHYSICAL STRUCTURES

A.5 Physical Structures

The desktop-level analysis to identify existing physical structures within the nine watershed management areas within the San Diego region utilized the following GIS data sources:

- ESRI ArcMap, Google Earth, and Google Maps products
- Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) Flood Profiles and FEMA Flood Insurance Rate Map (FIRM)
- National Flood Hazard Layer (NFHL)
- Municipal master drainage plans (as provided)
- San Diego Geographic Information Source (SanGIS) Municipal Boundaries and Hydrologic Basins
- United States Geological Survey (USGS) National Hydrography Dataset (NHD) California data
- Stream data generated as indicated in Section 2.2

The following documents the process used to identify the physical structures along the reaches and the resulting GIS data:

- The process began by importing the data sources indicated above into a single ArcMap document that served as a master map file from which all further analysis proceeded.
- The data were screened and selected for inclusion as appropriate to the project scope.
- Point features were placed along river reach line segments to coincide with visually identified structures, utilizing different feature symbols according to the type of infrastructure.
- In the case of levees, the point was placed at the downstream-most end of the FEMA NFHL Shapefile. All point features generated in this task appear in the GIS shapefile.
- Municipal boundaries intersecting river reaches were identified to identify the applicable municipal drainage plan data.
- Point feature attributes and associated information for Physical Structures GIS shapefile is indicated in Table A.5.1 below.

Table A.5.1: Structure Identification Point Feature Attribute Development and Information

Attribute	Description
Struct_ID	The Structure ID field provides a six-digit identification number based upon the structure's specific location within a watershed. The first three digits in the code reflect the structure's Hydrologic Unit (HU) Basin number (ranging between 902-911 for Region 9, as defined in the Water Quality Control Plan for the San Diego Basin). The subsequent three digits reflect the structure's location along the reach, ascending along the channel from the headwaters to tailwaters (ranging between 001-999, beginning at the confluence and increasing in the upstream direction).

Attribute	Description
WMA	The Watershed Management Area field provides the name of the watershed in which the structure exists. The WMA corresponds with the HU identified in the first three digits in the Struct_ID (e.g., 911, Tijuana Watershed).
Channel_ID	The Channel ID field provides the name of the channel in which the structure exists.
Struct_Typ	The Structure Type field classifies known structures as one of the following types:, Bridge, Culvert, Dam, Energy Dissipater, Flood Management Basin, Flood Wall, Grade Control, Levee, Pipeline, Weir.
Struct_Dtl	The Structure Detail field provides known quantitative information for multi-section culverts.
Struct_Mtl	The Structure Material field provides known qualitative information for structure material composition.
Struct_Shp	The Structure Shape field provides known geometric information for culvert shapes, and is classified as one of the following types: Arch, Box, Pipe.
Jurisd_ID	The Jurisdiction ID field, when applicable, provides the known separate structure identification number developed and utilized by the jurisdiction or entity responsible for creating and distributing the coinciding structure Shapefile data used for this analysis. This number was copied from the coinciding external Shapefile data attribute field best representing a unique jurisdiction or entity-based identification number (external Shapefile data received from regional WMAA data call; for jurisdictional information, see "Other" attribute field). Coinciding external Shapefile data was used to determine various structure attributes.
Plan_ID	The Plan ID field, when applicable, provides the known structure plan number corresponding with the Jurisdiction ID. This number was copied from the coinciding external Shapefile data attribute field best representing a unique plan number received from the regional WMAA data call (external Shapefile data received from regional WMAA data call; for jurisdictional information, see "Other" field). Coinciding external Shapefile data was used to determine various structure attributes.
Diameter	The Diameter field, when applicable, provides the known diameter (in US feet) for culverts.
Length	The Length field, when applicable, provides the known length (in US feet) for select structure types. When lengths were determined using FEMA FIS Flood Profiles, the scaled horizontal distances along the indicated roadway or channel slope were used.
Width	The Width field, when applicable, provides the known width (in US feet) for select structure types.
Height	The Height field, when applicable, provides the known height (in US feet) for select structure types. When heights were determined using FEMA FIS Flood Profiles, the scaled vertical distances from channel bed to indicated roadway bottom were used.
US_Invert	The Upstream Invert field, when applicable, provides the known upstream invert elevation (in US feet) for select structure types.
DS_Invert	The Downstream Invert field, when applicable, provides the known downstream invert elevation (in US feet) for select structure types.

Attribute	Description
RD_EL_NAVD	The Roadway Elevation (NAVD) field, when applicable, provides the known roadway elevation (in US feet, NAVD) for select structure types. When roadway elevations were determined using FEMA FIS Flood Profiles, the horizontal projection onto the vertical grid scales were used.
Loc_Descr	The Location Description field, when applicable, provides information for structures crossing a known roadway. In nearly all cases, Google Earth imagery was used to determine the roadway name.
Other	The Other field is used to convey any information not present within the preceding fields. Typically, "other" information includes jurisdictional, plan, and supplemental dimensions for a given structure.

Example Structure Identification

The following example demonstrates the structure identification process for a discrete structure (ID 907029) along the San Diego River. The San Diego River is located in the San Diego River watershed (WMA 907). Scanning the river from lower to higher reached, a new point feature was placed at the road crossing over the San Diego River as indicated in Figure A.5.1. Select attributes of this particular structure were available from the FEMA NFHL as displayed in the highlighted boxes in Figure A.5.1. Additional attributes such as the culvert height, length, roadway elevation, and name were also determined from the FIS Flood Profile as indicated in Figure A.5.2. Satellite imagery (e.g., Google) was used to verify the existence of structure. In this case, the most current Google Map data indicated that the culvert still exists and that the roadway name has been changed to Qualcomm Way. When structures could not be verified with satellite imagery, the structure identification was based solely upon the information provided or readily available and was not physically verified in the field. Figure A.5.3 displays an example of imagery used to identify structures.

Figure A.5.1: Typical ArcMap Window

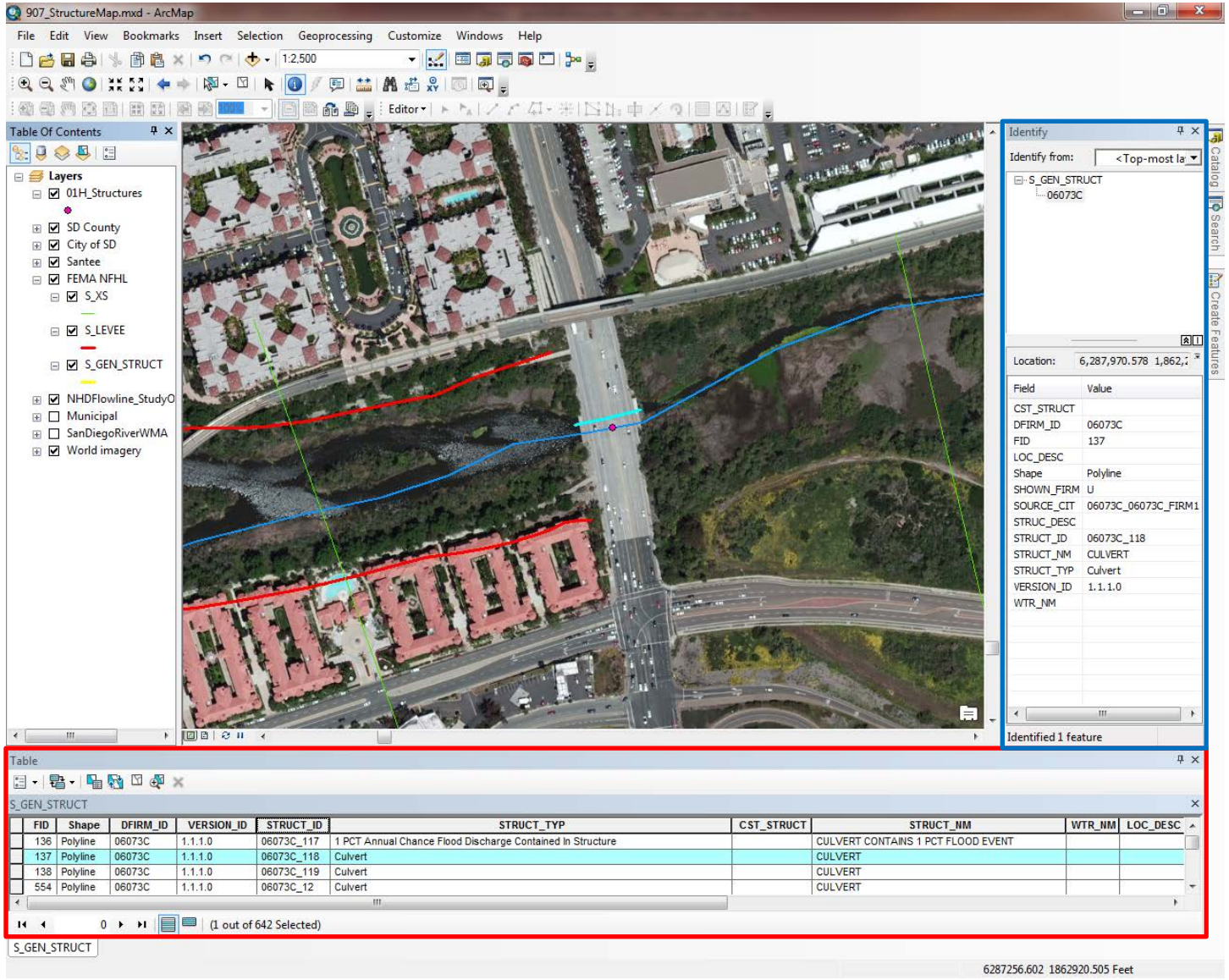
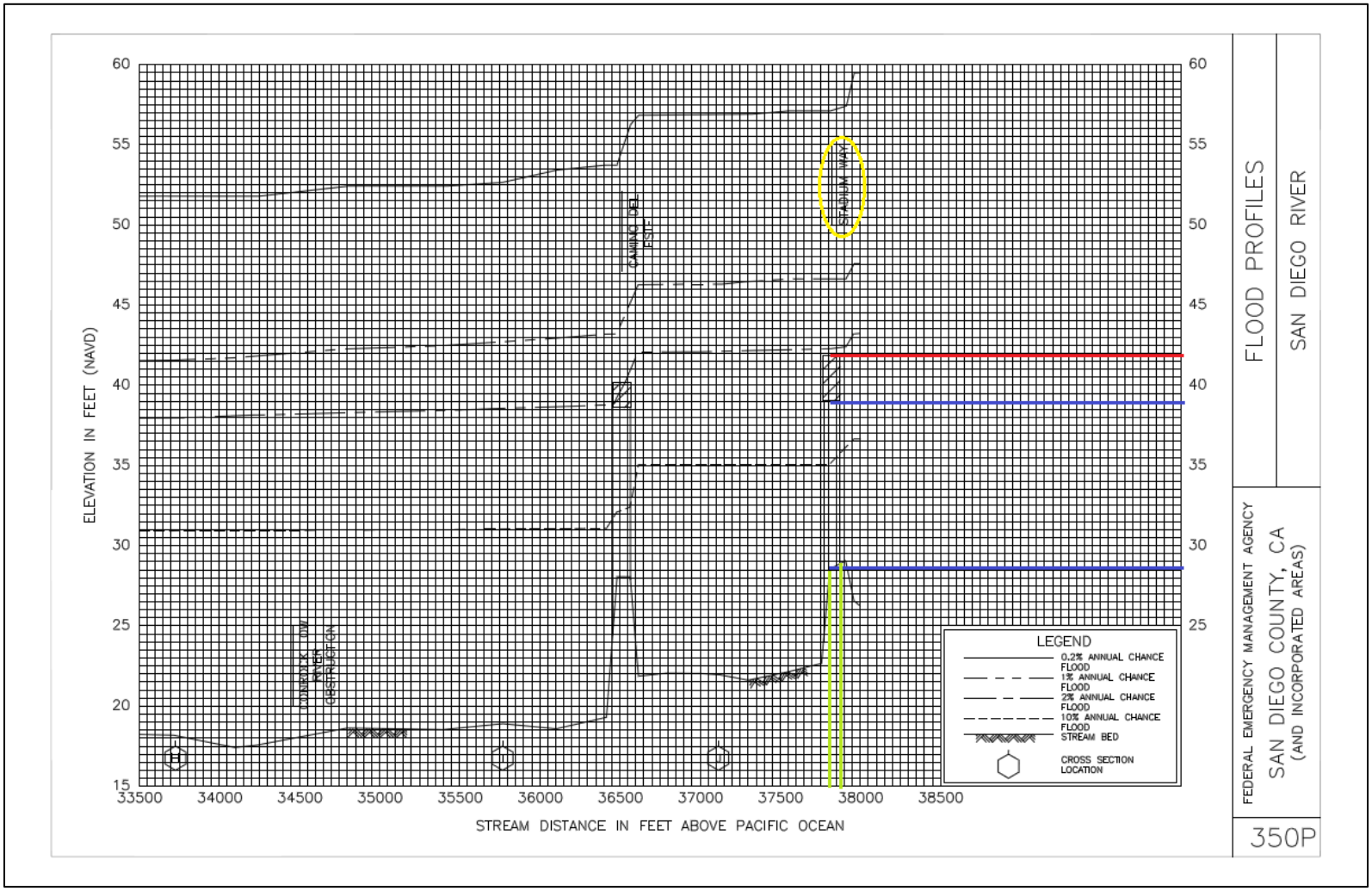


Figure A.5.2: Typical FEMA FIS Flood Profile



Legend: roadway elevation (red), roadway name (yellow), culvert height (blue), culvert width (green)

Figure A.5.3: Google Map Imagery for Structure Identification

The following bridge structure dimensional attributes were included in the point feature attributes:

- length 110 feet
- height 10 feet
- roadway elevation 41.9 feet

The attribute table associated with the identified structure included in the GIS shapefile is indicated in Table A.5.2.

Table A.5.2: Structure 907029 Attribute Table

Attribute	Description
Struct_ID	907029
WMA	San Diego
Channel_ID	San Diego River
Struct_Typ	Culvert
Struct_Dtl	
Struct_Mtl	
Struct_Shp	
Jurisd_ID	06073C_118
Plan_ID	06073C_06073C_FIRM1
Diameter	0
Length	110
Width	0
Height	10
US_Invert	0
DS_Invert	0
RD_EL_NAVD	41.9
Loc_Descr	Qualcomm Way
Other	Info from FEMA NFHL shapefile data/FIS FP V.9-350P

Legend

Channel Structure Type

- Bridge
- Culvert
- Dam
- Energy Dissipator
- Pipeline
- Unknown
- Regional WMAA Streams
- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams

ENCINITAS
SAN ELIJO LAGOON
San Elijo Lagoon
Escondido Creek
S.D. COUNTY
San Dieguito River
Lusardi Creek
SOLANA BEACH
SAN DIEGUITO LAGOON
DEL MAR
LOS PENASQUITOS LAGOON
Los Penasquitos Creek
SAN DIEGO
MIRAMAR RESERVOIR
Carroll Canyon
Rose Creek
Poway Creek
Rattlesnake Creek
POWAY
LAKE RAMONA
LAKE POWAY
RESERVOIR
S.D. COUNTY
SAN VICENTE RESERVOIR
Sycamore Creek
SANTEE RECREATION LAKES
San Diego River
SAN JACINTO MOUNTAINS
Tijuana

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Watershed Management Area Streams with Channel Structures

Los Penasquitos Watershed - HU 906.00, 94 mi2

Exhibit Date: Sept. 8, 2014

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ATTACHMENT B
HYDROMODIFICATION MANAGEMENT EXEMPTION MAPPING

Los Penasquitos Watershed Management Area
HU 906.00, 94 mi2

Legend

- Watershed Boundaries
- Municipal Boundaries
- Regional WMAA Streams
- **Exempt Bodies:** Water Storage Reservoirs, Lakes, Enclosed Embayments, Pacific Ocean, Buena Vista Lagoon
- **Exempt River Reaches:** Reaches of San Luis Rey River, San Dieguito River, San Diego River, Forester Creek, Sweetwater River, Otay River
- **Exempt Conveyance Systems:** Existing underground storm drains or conveyance channels whose bed and bank are concrete-lined, discharging directly to exempt water bodies, exempt rivers, or localized areas of Agua Hedionda Lagoon and Batiquitos Lagoon

S.D. COUNTY
Lusardi Creek
San Dieguito River
DEL MAR
POWAY
Rattlesnake Creek
S.D. COUNTY
Poway Creek
Los Penasquitos Creek
SAN DIEGO
Carroll Canyon Creek
Rose Creek
Rose Creek
Sycamore Creek
SAN JACINTO MOUNTAINS
Key Map (Not to Scale)

Aerial Imagery Source: Digital Globe, 06/2012

0 1.5 3 6 Miles

NORTH

Receiving Waters and Conveyance Systems Exempt from Hydromodification Management Requirements

Exhibit Date: Sept. 8, 2014

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ATTACHMENT C
ELECTRONIC FILES

Electronic Folder titled “Los Penasquitos_WMAA_Attachment C Electronic_Data.zip” Contents:

1. ArcMap 10.0 and 10.1 map files created for purpose of viewing Regional WMAA data
   - WMAA_05_Los Penasquitos_Data_2014_0908_v10.mxd
   - WMAA_05_Los Penasquitos_Data_2014_0908_v101.mxd
2. ESRI Geodatabase titled " WMAA_05_Los Penasquitos_Data_2014_0908_v10.gdb" containing the following data:
   - WatershedBoundaries
     - Watershed_Boundaries
   - HydrologicProcesses
     - HRUAnalysis
   - Streams – description of existing streams in the watershed
     - SD_Regional_WMAA_Streams (streams selected for detailed analysis)
     - SD_NHD_Streams (portion of NHD dataset included for reference)
   - LandUsePlanning
     - SanGIS_ExistingLandUse
     - SanGIS_PlannedLandUse
     - SanGIS_DevelopableLands
     - SanGIS_RedevelopmentandInfill
     - SanGIS_MunicipalBoundaries
     - Federal_State_Indian_Lands
     - SanGIS_MHPA_SD
     - SanGIS_MSCP_CN
     - SanGIS_MSCP_EAST_DRAFT_CN
     - SanGIS_Draft_North_County_MSCP_Version_8_Categories
   - PotentialCoarseSedimentYield
     - GLUAnalysis
     - PotentialCoarseSedimentYieldAreas
     - MacroLevelPotentialCriticalAreas
     - PotentialCriticalCoarseSedimentYieldAreas
   - ChannelStructures
     - ChannelStructures
   - HydromodExemptions
     - Exempt_Systems
     - Exempt_Bodies
   - Floodplains: included for reference
     - FEMA_NFHL
   - Baselayers: included for reference
     - SanGIS_Lakes
     - link to ESRI World Imagery (internet connection is required to access ESRI World Imagery basemap)

Electronic Folder titled "Los Penasquitos_WMAA_Attachment C Electronic_Data.zip" Contents, continued:

3. Google Earth – KMZ file titled: "WMAA_05_LosPenasquitos_Data_2014_0908_GoogleEarth.kmz"**,** containing the following data:
   - WatershedBoundaries
   - Streams
     - SD Regional WMAA Streams (streams selected for detailed analysis)
     - SD NHD Streams (portion of NHD dataset included for reference)
   - LandUsePlanning
     - Municipal Boundaries
     - Federal/State/Indian Lands
   - ChannelStructures
   - HydromodExemptions
     - Exempt_Systems
     - Exempt_Bodies
   - Floodplains: included for reference
     - FEMA Floodplain
   - Dominant Hydrologic Processes
   - Potential Critical Coarse Sediment Yield Areas

Notes:

- Open a map file (with extension .mxd) using ArcMap to view the data.
- All data contained in the geodatabase is loaded into the map.

ATTACHMENT D
REGIONAL MS4 PERMIT CROSSWALK

Table below provides a linkage between the Regional MS4 Permit requirements for WMAA and this report.

Regional MS4 Permit Provision	Regional WMAA Report
B.3.b.(4)(a)	Chapter 2; Section 5.1; Attachment A and Attachment C
B.3.b.(4)(a)(i)	Section 2.1; Attachment A.1 and Attachment C
B.3.b.(4)(a)(ii)	Section 2.2; Attachment A.2 and Attachment C
B.3.b.(4)(a)(iii)	Section 2.3; Attachment A.3 and Attachment C
B.3.b.(4)(a)(iv)	Section 2.4; Attachment A.4 and Attachment C
B.3.b.(4)(a)(v)	Section 2.5; Attachment A.5 and Attachment C
B.3.b.(4)(b)	Chapter 3 and Section 5.2
B.3.b.(4)(c)	Chapter 4; Section 5.3; Attachment B and Attachment C

Attachment N-3

Alternative Compliance Draft Candidate Projects Lists

Intentionally left blank

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
Public Parcels Identified as Suitable for Further Assessment to Determine Feasibility of Retrofitting with Green Infrastructure												
Parcels on this list that are 0.25 acres or greater have been assessed using broad assumptions necessary for computer modeling and were found to be potentially effective as an opportunity for contributing to load reduction goals. Considerable further assessment would be required before determining any of these sites to be viable retrofit sites for implementation of Green Infrastructure. That assessment includes verifying public ownership, determining if land use agreements and financing can be established, assessing feasibility based upon further investigation of physical site constraints at a project design level, and determining that construction and necessary approvals, including approvals from regulatory agencies other than the City of San Diego, can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.											
1	Los Penasquitos	City of San Diego	Solana Beach School District	TBD	3040903200	6258086.89885432	1928708.80708885	TBD	2.99	TBD	TBD	TBD
2	Los Penasquitos	City of San Diego	Solana Beach School District	TBD	3044501300	6262351.65457244	1927330.39122760	TBD	3	TBD	TBD	TBD
3	Los Penasquitos	City of San Diego	Del Mar Union School District	TBD	3070233300	6261411.92620246	1923460.62110312	TBD	3.09	TBD	TBD	TBD
4	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3045511100	6268638.45877949	1926135.94790220	TBD	1.70	TBD	TBD	TBD
5	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3044501200	6262623.59288862	1927657.83179940	TBD	11.49	TBD	TBD	TBD
6	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070404500	6265139.15494507	1923442.98029293	TBD	36.57	TBD	TBD	TBD
7	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070220500	6260026.16000000	1925775.69600000	TBD	2.97	TBD	TBD	TBD
8	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071433100	6261085.48145944	1922756.93528571	TBD	0.10	TBD	TBD	TBD
9	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3040903100	6258270.19919300	1928706.52806200	TBD	0.02	TBD	TBD	TBD
10	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3113204800	6287887.22372202	1913975.88888889	TBD	31.96	TBD	TBD	TBD
11	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042435300	6262647.14094857	1928523.19094469	TBD	0.67	TBD	TBD	TBD
12	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3110303200 3110303500	6283502.51535813	1913077.69011886	TBD	5.24	TBD	TBD	TBD
13	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3112222700	6284436.26514808	1913898.66339777	TBD	9.92	TBD	TBD	TBD
14	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3180130400	6294573.93181812	1916163.17117621	TBD	10.02	TBD	TBD	TBD
15	Los Penasquitos	City of San Diego	Del Mar Union School District	TBD	3044800600	6267434.28338029	1929137.41950107	TBD	2.74	TBD	TBD	TBD

Los Penasquitos WMAA Candidate Projects in the City of San Diego

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
16	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3045021400	6268562.85463215	1928391.04407926	TBD	0.30	TBD	TBD	TBD
17	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3044604700	6267762.67455500	1926162.14450800	TBD	1.46	TBD	TBD	TBD
18	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3060202800	6288880.60004607	1934975.04938272	TBD	5.16	TBD	TBD	TBD
19	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3410800300	6288282.80275281	1910623.24382716	TBD	9.93	TBD	TBD	TBD
20	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042624800	6264420.15672074	1926224.24026879	TBD	0.03	TBD	TBD	TBD
21	Los Penasquitos	City of San Diego	United States Of America	TBD	3181107400	6294532.32058261	1915614.96041211	TBD	0.50	TBD	TBD	TBD
22	Los Penasquitos	City of San Diego	United States Postal Service	TBD	3180904000 3180902200 3180903500	6291970.22542315	1914303.38580915	TBD	3.12	TBD	TBD	TBD
23	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042616300	6264465.80079469	1927032.74244577	TBD	0.02	TBD	TBD	TBD
24	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180130300	6294646.12581761	1916824.95626908	TBD	8.80	TBD	TBD	TBD
25	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3183122700	6291675.53507552	1916862.04413893	TBD	7.65	TBD	TBD	TBD
26	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3110304100	6283316.89144404	1910871.06948742	TBD	4.82	TBD	TBD	TBD
27	Los Penasquitos	City of San Diego	State Of California Department Of Transportation	TBD	3100800100 3100800500 3100800200 3100800600	6259070.90429584	1914462.73611792	TBD	3.84	TBD	TBD	TBD
28	Los Penasquitos	City of San Diego	State Of California	TBD	3012301200	6252230.25614235	1922342.01481409	TBD	5.70	TBD	TBD	TBD
29	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3194721300	6303561.49262459	1920534.24074074	TBD	5.60	TBD	TBD	TBD
30	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3044800500	6267324.95103203	1929503.07204557	TBD	8.46	TBD	TBD	TBD
31	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3093215000	6285839.79590066	1917413.98043967	TBD	4.77	TBD	TBD	TBD
32	Los Penasquitos	City of San Diego	United States Postal Service	TBD	3154903000	6292006.44162020	1928503.04556481	TBD	3.31	TBD	TBD	TBD

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
33	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070511100	6259325.83287318	1920981.46548622	TBD	9.17	TBD	TBD	TBD
34	Los Penasquitos	City of San Diego	United States Of America	TBD	3412700900	6289215.02623600	1905353.33284800	TBD	17.22	TBD	TBD	TBD
35	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3040722300	6260229.60496683	1926601.39542656	TBD	0.28	TBD	TBD	TBD
36	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3130430700	6309069.13339992	1937942.60601703	TBD	1.84	TBD	TBD	TBD
37	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3073316700	6264644.86322984	1924310.97906856	TBD	3.00	TBD	TBD	TBD
38	Los Penasquitos	City of San Diego	San Diego Community College District	TBD	3181200300	6294334.80650105	1911889.88564106	TBD	97.28	TBD	TBD	TBD
39	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3136801800	6304273.30588096	1932622.65432099	TBD	0.46	TBD	TBD	TBD
40	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042716500	6264371.50606843	1927813.78714876	TBD	0.55	TBD	TBD	TBD
41	Los Penasquitos	City of San Diego	United States Of America Military Reservation	TBD	3450600800	6292264.00000000	1905604.60400000	TBD	98.35	TBD	TBD	TBD
42	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3110304200	6283616.88238851	1910602.35802469	TBD	13.17	TBD	TBD	TBD
43	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042634000	6264721.21854575	1926487.01851852	TBD	0.20	TBD	TBD	TBD
44	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3410700100	6287296.21153177	1910633.46031482	TBD	4.68	TBD	TBD	TBD
45	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3194721200	6303032.77587207	1920821.97812106	TBD	18.93	TBD	TBD	TBD
46	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3110301200	6282793.13015575	1913225.72629422	TBD	10.21	TBD	TBD	TBD
47	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3181200200	6292942.71743721	1911266.05076097	TBD	31.39	TBD	TBD	TBD
48	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3194720900	6302021.11798709	1918977.91278711	TBD	1.74	TBD	TBD	TBD
49	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3077004500	6264981.07845000	1918432.03773400	TBD	1.01	TBD	TBD	TBD
50	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3075808600	6264269.03850253	1918322.08436736	TBD	4.68	TBD	TBD	TBD
51	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3181200100	6292918.72801788	1912604.98847394	TBD	14.73	TBD	TBD	TBD

Los Penasquitos WMAA Candidate Projects in the City of San Diego

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
52	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3093116100	6289506.79265579	1918496.47160167	TBD	14.13	TBD	TBD	TBD
53	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3101200200	6260164.37173796	1911070.16666667	TBD	1.85	TBD	TBD	TBD
54	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042634100	6264743.98600724	1926393.44270871	TBD	0.18	TBD	TBD	TBD
55	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3401502900 3401202500	6263233.02257870	1908155.22998066	TBD	1.11	TBD	TBD	TBD
56	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3181106600	6294657.50636625	1915759.32002357	TBD	0.07	TBD	TBD	TBD
57	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3122214500	6293447.87154457	1934167.04514212	TBD	0.39	TBD	TBD	TBD
58	Los Penasquitos	City of San Diego	San Diego Metropolitan Transit Development Board	TBD	3101100900	6259568.81514393	1913288.17926615	TBD	5.14	TBD	TBD	TBD
59	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3011500300 3011610400	6254474.06900000	1920385.53400000	TBD	2.47	TBD	TBD	TBD
60	Los Penasquitos	City of San Diego	Solana Beach School District	TBD	3040903300	6258261.96892400	1928781.08457200	TBD	0.01	TBD	TBD	TBD
61	Los Penasquitos	City of San Diego	San Diego Metropolitan Transit Development Board	TBD	3401502500	6263225.04920844	1908566.38610483	TBD	3.06	TBD	TBD	TBD
62	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3137910300	6307036.38185606	1932354.86245400	TBD	0.26	TBD	TBD	TBD
63	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3090301800	6285948.56937182	1918184.13623743	TBD	0.94	TBD	TBD	TBD
64	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042633900	6264612.78521694	1926801.49352082	TBD	0.03	TBD	TBD	TBD
65	Los Penasquitos	City of San Diego	Del Mar Union School District	TBD	3081430500	6269073.57281600	1918102.09824100	TBD	5.34	TBD	TBD	TBD
66	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3432521600	6277262.03360835	1900944.07583230	TBD	5.00	TBD	TBD	TBD
67	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3094213700	6288288.82399597	1926061.88744782	TBD	3.58	TBD	TBD	TBD
68	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3094130100	6288646.32403280	1923206.05774795	TBD	4.64	TBD	TBD	TBD
69	Los Penasquitos	City of San Diego	San Diego Metropolitan Transit Development Board	TBD	3164200500	6303433.07748330	1931483.58887840	TBD	1.63	TBD	TBD	TBD
70	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3042616200	6264542.99602112	1926784.24074074	TBD	0.03	TBD	TBD	TBD

Los Penasquitos WMAA Candidate Projects in the City of San Diego

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
71	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071727500	6262159.17408684	1924998.81792779	TBD	0.51	TBD	TBD	TBD
72	Los Penasquitos	City of San Diego	Northern San Diego Housing Commission F H A L L C	TBD	3180501400	6290149.60238669	1913214.75258853	TBD	0.20	TBD	TBD	TBD
73	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3194601700	6302279.33799919	1921282.49693363	TBD	6.70	TBD	TBD	TBD
74	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3413924000	6273174.97100000	1909758.59100000	TBD	9.65	TBD	TBD	TBD
75	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3413300100	6293705.37381148	1908928.14351862	TBD	1.74	TBD	TBD	TBD
76	Los Penasquitos	City of San Diego	Northern San Diego Housing Commission F H A L L C	TBD	3180501600	6290283.59883159	1913258.83821286	TBD	0.19	TBD	TBD	TBD
77	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3090220600	6287745.05826358	1923008.76149040	TBD	21.45	TBD	TBD	TBD
78	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3072024000	6264087.14345523	1926043.05456785	TBD	0.02	TBD	TBD	TBD
79	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3081430200	6269082.72264000	1918356.52354800	TBD	2.25	TBD	TBD	TBD
80	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071714300	6261309.43388398	1924931.25147211	TBD	0.62	TBD	TBD	TBD
81	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3090301900	6285829.52667336	1918181.41975309	TBD	0.51	TBD	TBD	TBD
82	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070720400	6264141.23694965	1920506.90740741	TBD	0.95	TBD	TBD	TBD
83	Los Penasquitos	City of San Diego	City Of San Diego Municipal Corp	TBD	3154904100	6291720.63900000	1927485.17300000	TBD	0.10	TBD	TBD	TBD
84	Los Penasquitos	City of San Diego	Regents Of The University Of California	TBD	3431600700	6263664.86045315	1901376.91122635	TBD	29.77	TBD	TBD	TBD
85	Los Penasquitos	City of San Diego	State Of California(Coastal Conservancy)	TBD	3101200100	6260283.76746644	1911740.41089627	TBD	19.69	TBD	TBD	TBD
86	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070711100	6263704.77420179	1919081.78395062	TBD	0.92	TBD	TBD	TBD
87	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3011610300	6257032.40775000	1919702.65449999	TBD	8.66	TBD	TBD	TBD
88	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3075806400	6263803.31282367	1918373.84726112	TBD	4.80	TBD	TBD	TBD
89	Los Penasquitos	City of San Diego	Del Mar Union School District	TBD	3051502200	6270535.93764200	1928296.42421600	TBD	11.31	TBD	TBD	TBD

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
90	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3410322200	6270924.61724400	1910358.17493800	TBD	5.58	TBD	TBD	TBD
91	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070711900	6263908.51513233	1919692.81248307	TBD	0.95	TBD	TBD	TBD
92	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071200500	6258125.83677459	1920085.92618640	TBD	1.64	TBD	TBD	TBD
93	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3090220200	6285148.92592366	1922831.84940674	TBD	6.12	TBD	TBD	TBD
94	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3121002000	6291905.44838254	1933310.15055111	TBD	0.17	TBD	TBD	TBD
95	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070711000	6263704.56392555	1919282.15364152	TBD	0.95	TBD	TBD	TBD
96	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3113844300	6282081.24490100	1913829.22448600	TBD	0.04	TBD	TBD	TBD
97	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071432700	6260856.10514191	1923389.86771772	TBD	0.06	TBD	TBD	TBD
98	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3095114400	6284308.13709428	1925025.61517891	TBD	7.43	TBD	TBD	TBD
99	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3194113600	6306487.88125699	1916890.12275735	TBD	0.71	TBD	TBD	TBD
100	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071432900	6260952.33898500	1923039.28391829	TBD	0.04	TBD	TBD	TBD
101	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071003900	6268694.06786700	1918297.03557300	TBD	3.39	TBD	TBD	TBD
102	Los Penasquitos	City of San Diego	San Diego Metropolitan Transit Development Board	TBD	3011300700	6253461.88003462	1920143.44444444	TBD	33.06	TBD	TBD	TBD
103	Los Penasquitos	City of San Diego	State Of California(Torrey Pines State Reserve)	TBD	3100203100	6257539.28043298	1914781.78724213	TBD	70.93	TBD	TBD	TBD
104	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3195910800	6307817.07875903	1916817.68791502	TBD	0.03	TBD	TBD	TBD
105	Los Penasquitos	City of San Diego	San Diego Metropolitan Transit Development Board	TBD	3100202700	6257980.63822205	1915360.46062935	TBD	12.21	TBD	TBD	TBD
106	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3432522700	6276359.24598141	1900931.78743816	TBD	1.95	TBD	TBD	TBD
107	Los Penasquitos	City of San Diego	State Of California	TBD	3011300100	6252771.95150000	1920139.24725001	TBD	111.13	TBD	TBD	TBD
108	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3151000500	6297881.99925224	1930297.68804909	TBD	1.90	TBD	TBD	TBD

Los Penasquitos WMAA Candidate Projects in the City of San Diego

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
109	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071003700	6268132.16352288	1918211.37422116	TBD	1.79	TBD	TBD	TBD
110	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3071004000	6268404.19512216	1918170.30804611	TBD	4.14	TBD	TBD	TBD
111	Los Penasquitos	City of San Diego	California Housing Finance Agency	TBD	3431402005	6266621.26438303	1901493.96678822	TBD	4.24	TBD	TBD	TBD
112	Los Penasquitos	City of San Diego	United States Of America	TBD	3450600700	6287407.38236239	1901895.15747066	TBD	567.95	TBD	TBD	TBD
113	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3431220700	6270003.62323185	1902384.82908136	TBD	11.40	TBD	TBD	TBD
114	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3060512600	6282793.16300000	1931071.87774999	TBD	12.83	TBD	TBD	TBD
115	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3095514100	6283428.72282156	1918306.75992000	TBD	0.90	TBD	TBD	TBD
116	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070722800	6264251.41938239	1920063.56117380	TBD	23.85	TBD	TBD	TBD
117	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3062717000	6282147.18071400	1933170.41571700	TBD	3.68	TBD	TBD	TBD
118	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3194244300	6307336.75040900	1916251.68684000	TBD	0.01	TBD	TBD	TBD
119	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070710900	6263704.40370478	1919487.56076698	TBD	0.97	TBD	TBD	TBD
120	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3400805200	6265653.89378890	1905705.44746064	TBD	0.62	TBD	TBD	TBD
121	Los Penasquitos	City of San Diego	State Of California Park	TBD	3013502100	6255166.46646073	1924453.31796018	TBD	0.65	TBD	TBD	TBD
122	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180230800	6295923.21711633	1920354.50702760	TBD	0.12	TBD	TBD	TBD
123	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234000	6296084.75724989	1920426.23985185	TBD	0.11	TBD	TBD	TBD
124	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180232000	6296270.03773288	1920279.75913505	TBD	0.12	TBD	TBD	TBD
125	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180231700	6296231.91191283	1920107.73774790	TBD	0.20	TBD	TBD	TBD
126	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3011401200	6257774.41713628	1917325.62198963	TBD	15.20	TBD	TBD	TBD
127	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801800	6309230.70700000	1910220.99300000	TBD	3.41	TBD	TBD	TBD

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
128	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180233900	6296063.86922983	1920375.34131897	TBD	0.08	TBD	TBD	TBD
129	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180230700	6295932.56269020	1920412.76871373	TBD	0.14	TBD	TBD	TBD
130	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180231000	6295924.43187526	1920215.04938272	TBD	0.13	TBD	TBD	TBD
131	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3082201700	6275821.89469878	1923397.51428455	TBD	3.71	TBD	TBD	TBD
132	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180230900	6295918.50892495	1920283.71575186	TBD	0.12	TBD	TBD	TBD
133	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3070241300	6259872.41280129	1922480.19425113	TBD	0.25	TBD	TBD	TBD
134	Los Penasquitos	City of San Diego	State Of California	TBD	3011610500	6256487.57890935	1919182.77257506	TBD	39.58	TBD	TBD	TBD
135	Los Penasquitos	City of San Diego	United States Of America	TBD	3430206900	6272297.82720772	1900921.08454813	TBD	130.01	TBD	TBD	TBD
136	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180233700	6296047.46492725	1920258.31946812	TBD	0.12	TBD	TBD	TBD
137	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180233500	6296136.67670038	1920316.54422653	TBD	0.15	TBD	TBD	TBD
138	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180231800	6296238.94916417	1920179.61190747	TBD	0.10	TBD	TBD	TBD
139	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180233800	6296051.00024660	1920327.51579608	TBD	0.10	TBD	TBD	TBD
140	Los Penasquitos	City of San Diego	Del Mar Union School District	TBD	3070762900	6265583.68205007	1918857.73843090	TBD	6.05	TBD	TBD	TBD
141	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180231900	6296252.42708118	1920224.77970846	TBD	0.11	TBD	TBD	TBD
142	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180233600	6296120.40004924	1920247.10924458	TBD	0.13	TBD	TBD	TBD
143	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3156100500	6298339.33092869	1921982.54922846	TBD	1.14	TBD	TBD	TBD
144	Los Penasquitos	City of San Diego	United States Of America Military Reservation	TBD	3630600400	6297216.48993020	1905455.98721752	TBD	23.57	TBD	TBD	TBD
145	Los Penasquitos	City of San Diego	City Of San Diego Municipal Corp	TBD	3154904000	6291593.22300000	1927483.97500000	TBD	0.04	TBD	TBD	TBD
146	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3095027400	6285221.99526634	1919958.49004035	TBD	0.11	TBD	TBD	TBD

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
147	Los Penasquitos	City of San Diego	United States Of America	TBD	3432602000	6274013.55852892	1900373.91846142	TBD	1.31	TBD	TBD	TBD
148	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3194602100	6302056.22172227	1921531.33501437	TBD	0.04	TBD	TBD	TBD
149	Los Penasquitos	City of San Diego	San Dieguito Union High School District	TBD	3050312600	6273454.54799285	1929651.00124673	TBD	40.06	TBD	TBD	TBD
150	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3063900500	6284158.96031810	1930510.37060328	TBD	0.95	TBD	TBD	TBD
151	Los Penasquitos	City of San Diego	United States Of America Military Reservation	TBD	3450600400	6293029.28310379	1902823.31312324	TBD	541.69	TBD	TBD	TBD
152	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3063702600	6284201.43700000	1929863.80800000	TBD	4.61	TBD	TBD	TBD
153	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3400805100	6265547.90676883	1905877.95126380	TBD	0.51	TBD	TBD	TBD
154	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202800800	6309819.72700000	1909959.95500000	TBD	0.23	TBD	TBD	TBD
155	Los Penasquitos	City of San Diego	State Of California	TBD	3011300600	6255856.34945900	1918085.71696700	TBD	67.06	TBD	TBD	TBD
156	Los Penasquitos	City of San Diego	State Of California	TBD	3011401300	6256969.73258812	1918074.19977901	TBD	25.57	TBD	TBD	TBD
157	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090100800	6282679.97042191	1925368.73950046	TBD	4.87	TBD	TBD	TBD
158	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3433001900	6276519.84004847	1901540.65637171	TBD	0.05	TBD	TBD	TBD
159	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180232200	6296288.74556640	1920373.27685673	TBD	0.12	TBD	TBD	TBD
160	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180232100	6296280.23536459	1920321.56073313	TBD	0.09	TBD	TBD	TBD
161	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801200	6309545.06100000	1909979.38300000	TBD	0.25	TBD	TBD	TBD
162	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3060114900	6282211.71724021	1932832.97542464	TBD	0.12	TBD	TBD	TBD
163	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234100	6296104.46770789	1920476.66947184	TBD	0.12	TBD	TBD	TBD
164	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801900	6309150.69900000	1909903.48600000	TBD	0.27	TBD	TBD	TBD
165	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3115515000	6273069.84857676	1914442.11777013	TBD	0.54	TBD	TBD	TBD

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
166	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801300	6309485.67900000	1909940.99600000	TBD	0.24	TBD	TBD	TBD
167	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801700	6309501.13500000	1910198.32900000	TBD	0.21	TBD	TBD	TBD
168	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801600	6309437.38800000	1910158.98400000	TBD	0.26	TBD	TBD	TBD
169	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234700	6296083.76674609	1920790.62949690	TBD	0.11	TBD	TBD	TBD
170	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180233400	6296143.96531634	1920376.55246914	TBD	0.19	TBD	TBD	TBD
171	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234300	6296093.40651397	1920584.89506173	TBD	0.09	TBD	TBD	TBD
172	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090102300	6283993.43524535	1925722.85208059	TBD	19.96	TBD	TBD	TBD
173	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234400	6296096.66560015	1920637.58464219	TBD	0.10	TBD	TBD	TBD
174	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234500	6296098.30742690	1920684.22017535	TBD	0.09	TBD	TBD	TBD
175	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234600	6296094.28891064	1920739.14445922	TBD	0.11	TBD	TBD	TBD
176	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180234200	6296094.58715603	1920531.94687387	TBD	0.10	TBD	TBD	TBD
177	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801000	6309646.21500000	1909973.23100000	TBD	0.30	TBD	TBD	TBD
178	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180232300	6296281.15688411	1920424.86726091	TBD	0.12	TBD	TBD	TBD
179	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801500	6309289.86300000	1909961.40000000	TBD	0.34	TBD	TBD	TBD
180	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180223900	6296074.52133794	1920840.53432044	TBD	0.12	TBD	TBD	TBD
181	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3180223800	6296053.75116982	1920885.00407307	TBD	0.12	TBD	TBD	TBD
182	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202800900	6309726.81500000	1909973.85600000	TBD	0.23	TBD	TBD	TBD
183	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801100	6309599.93600000	1910053.53900000	TBD	0.23	TBD	TBD	TBD
184	Los Penasquitos	City of San Diego	State Of California	TBD	3011500400	6255119.41008966	1919788.89150678	TBD	23.51	TBD	TBD	TBD

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
185	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090100900	6283083.81809105	1925213.95535621	TBD	3.40	TBD	TBD	TBD
186	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3090102600	6281601.70316515	1925097.18565224	TBD	5.20	TBD	TBD	TBD
187	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3202801400	6309354.59200000	1909926.55200000	TBD	0.26	TBD	TBD	TBD
188	Los Penasquitos	City of San Diego	San Diego Unified School District	TBD	3413924100	6272947.78300000	1909311.21200000	TBD	0.11	TBD	TBD	TBD
189	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3090100200	6281387.70200228	1924965.28590857	TBD	16.93	TBD	TBD	TBD
190	Los Penasquitos	City of San Diego	City Of San Diego	TBD	3090102800	6281883.02934573	1925995.25688954	TBD	5.44	TBD	TBD	TBD
191	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090102700	6281751.31766191	1925061.83418552	TBD	2.21	TBD	TBD	TBD
192	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090102900	6282115.23533825	1925532.01755528	TBD	0.59	TBD	TBD	TBD
193	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090103100	6283128.71188994	1925515.69006993	TBD	0.74	TBD	TBD	TBD
194	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090103300	6282322.64663300	1925601.39142600	TBD	2.82	TBD	TBD	TBD
195	Los Penasquitos	City of San Diego	State Of California Department Of Fish&Game	TBD	3090101000	6283593.32113879	1925941.51987153	TBD	3.26	TBD	TBD	TBD
Public Parcels Identified as Suitable for Further Assessment to Determine Feasibility of Retrofitting												
Parcels on this list have been assessed using broad assumptions necessary for computer modeling and were found to be potentially effective as an opportunity for contributing to load reduction goals. Considerable further assessment would be required before determining any of these sites to be viable retrofit. That assessment includes verifying public ownership, determining if land use agreements and financing can be established, assessing feasibility based upon further investigation of physical site constraints at a project design level, and determining that construction and necessary approvals, including approvals from regulatory agencies other than the City of San Diego, can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												
196	Los Penasquitos	City of San Diego	City of San Diego	TBD	3161801900	N/A	N/A	TBD	22.57	TBD	TBD	Canyon Site
197	Los Penasquitos	City of San Diego	County of San Diego	TBD	3150301000	N/A	N/A	TBD	43.32	TBD	TBD	Canyon Site
198	Los Penasquitos	City of San Diego	City of San Diego	TBD	3061615800	N/A	N/A	TBD	9.18	TBD	TBD	Canyon Site

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
199	Los Penasquitos	City of San Diego	City of San Diego	TBD	3070234200	N/A	N/A	TBD	41.7	TBD	TBD	Canyon Site
200	Los Penasquitos	City of San Diego	City of San Diego	TBD	3044123400	N/A	N/A	TBD	4.33	TBD	TBD	Canyon Site
201	Los Penasquitos	City of San Diego	State of California	TBD	3011300300	N/A	N/A	TBD	0	TBD	TBD	Canyon Site
202	Los Penasquitos	City of San Diego	City of San Diego	TBD	3130407700	N/A	N/A	TBD	40.68	TBD	TBD	Canyon Site
203	Los Penasquitos	City of San Diego	City of San Diego	TBD	3185211400	N/A	N/A	TBD	28.5	TBD	TBD	Canyon Site
204	Los Penasquitos	City of San Diego	City of San Diego	TBD	3063513200	N/A	N/A	TBD	22.53	TBD	TBD	Canyon Site
205	Los Penasquitos	City of San Diego	City of San Diego	TBD	3076920200	N/A	N/A	TBD	4.54	TBD	TBD	Canyon Site
Project Concept for Green Streets Retrofits – Quantity and Location of Suitable City Streets To-Be-Determined												
The City of San Diego is in the process of identifying potential public street locations that could feasibly be retrofitted with Green Infrastructure and provide a meaningful contribution to pollutant load reduction goals. As locations become verified for feasibility and effectiveness, funding mechanisms under an Alternate Compliance program could potentially be used to fill gaps in construction and maintenance funding necessary for the project to go forward. This is pending the ability to establish suitable legal mechanisms and verify that approvals and construction can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												
206	Los Penasquitos	City of San Diego	City of San Diego	TBD	N/A	N/A	N/A	TBD	4.54	TBD	TBD	Green Street TBD