Preliminary Water Quality Management Plan

For:

Redlands Self Storage

CUP No. XXX

(APN 0298-051-07)

Prepared for:

Dave Bird

Madison Capital Group, LLC

450 Newport Center Drive, Suite 250

Newport Beach, CA 92660

949-215-4650

Prepared by:

Hicks & Hartwick, Inc.

37 E Olive Ave. STE C

Redlands, CA 92373

909-793-2257

Job No. 10301

Approval Date: To be Determined

HICKS & HARTWICK, INC.
ENGINEERS & SURVEYORS
ESTABLISHED 1902

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Redlands Self Storage, by Hicks & Hartwick, Inc.. The WQMP is intended to comply with the requirements of the County of San Bernardino and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

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Project Data			
Permit/Application Number(s):	**CUP xxxx**	Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 0298-051-07

Owner's Signature		
Owner Name: Dave Bird		
Title	**Senior Vice President Construction and Development**	
Company	Madison Capital Group, LLC	
Address	450 Newport Center Drive, Suite 250, Newport Beach, CA 92660	
Email	dbird@madisoncapgroup.com	
Telephone #	909-215-4650	
Signature	Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):	**CUP xxxx**	Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 0298-051-07

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Matthew C. Hicks	
Title	President
Company	Hicks & Hartwick, Inc.
Address	37 E Olive Ave STE C Redlands, CA 92372
Email	matt@verycivil.com
Telephone #	909-793-2257
Signature	
Date	1//30/2022

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Forms

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Redlands Self Storage				
Project Owner Contact Name:	Dave Bird				
Mailing Address:	450 Newport Center Drive, Suite 250, Newport Beach, CA 92660	E-mail Address:	dbird@madisoncapgroup.com	Telephone:	909-215-4650
Permit/Application Number(s):	**CUP xxxx**		Tract/Parcel Map Number(s):		
Additional Information/ Comments:					
Description of Project:	**Water Treatment Overview** The Redlands Self Storage project is a proposed multi-building self-storage project located on approximately 6.43 acres of vacant land. For WQMP analysis the study will include a small off-site landscape area that drains onto the property from the adjacent development along the southerly property line. The project is bounded on the other three sides of the rectangular-shaped parcel by public streets and project access is provided at Wabash Avenue to the west and Jasper Avenue to the east. Site drainage is managed between the project drive aisles thru trench drains and cross-gutters that drain primarily in a westerly direction across the property. Storm drain inlets are located at sump locations adjacent to the infiltration basins that collect and distribute site drainage into the basins. Perimeter landscaping areas drain to catch basin inlets that also outlet into the basins. The storm drain system and inlets are sized to accommodate both water treatment flow rates and larger storm events that will pass through the infiltration basins before the outlet into Wabash Avenue. The project site is within soils group A & B indicating infiltration feasibility. Infiltration testing results confirm that the on-site soils are suitable for infiltration according to County of San Bernardino WQMP criteria. The full LID DCV and HCOC requirements will be handled by the infiltration basins located adjacent to Wabash Avenue along the western edge of the project. Project flows enter the basins through a storm drain system connected to a series of on-site catch basin inlets. Higher flow rates exceeding the DCV and HCOC volumes will pass through the basins to a curb outlet structure into Wabash Avenue. Maintenance of the basins will be provided by the facility owner.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.					

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	280,285	**3** Number of Dwelling Units:	N/A	**4** SIC Code:	4225

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

Water Quality Management Plan related storm water facilities maintenance and ownership will be addressed as follows:

Redlands Self Storage is privately owned and operated. The building property owner will manage and maintain the WQMP storm water facilities. No infrastructure will transfer to public agencies.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	The proliferation of bacteria and viruses is generally caused by the transport of animal or fecal waste within stormwater runoff from a project site. Infiltration BMPs are incorporated into the site design to treat pathogens with medium removal efficiency.
Nutrients - Phosphorous	E ☒	N ☐	The primary source of nutrients is typically the overuse of fertilizers and eroded soils. Slope grading will be stabilized in accordance with City standard grading guidelines and the potential of nutrient laden run-off from erodible soils in considered minimal. The project will have fertilized landscape areas and infiltration BMPs are incorporated into the site design to treat nutrients with medium removal efficiency.
Nutrients - Nitrogen	E ☒	N ☐	
Noxious Aquatic Plants	E ☒	N ☐	Construction/land development is a known source of this pollutant. Infiltration BMPs are incorporated into the site design to treat noxious aquatic plants with medium removal efficiency.
Sediment	E ☒	N ☐	Sediments are generally caused by eroded soils, transport of sediment not properly contained and poorly maintained landscape and pavements. Infiltration BMPs are incorporated into the site design that will treat for sediments with high removal efficiency.
Metals	E ☒	N ☐	The project parking lot and drive aisles are expected to gather metals from various sources on vehicles parking and driving through the lot. Infiltration BMPs will be incorporated into the site design that will treat for metals with high removal efficiency.
Oil and Grease	E ☒	N ☐	The project streets and driveways are expected to gather oil and grease from various sources on vehicles parking and driving through the project. Infiltration BMPs are incorporated into the site design that will treat for oil and grease with high removal efficiency.
Trash/Debris	E ☒	N ☐	Trash and other debris including papers, plastic, foam, aluminum, leaves, cut grass and food wastes are expected from common residential waste containers. Infiltration BMPs are incorporated into the site design that will treat for trash/debris with high removal efficiency.
Pesticides / Herbicides	E ☒	N ☐	Pesticides and herbicides are commonly used for landscaping and pest control. Their use should be kept to a minimum and applied per the manufacturer's specifications. Infiltration BMPs are incorporated into the site design that will treat for pesticides/herbicides with medium removal efficiency.
Organic Compounds	E ☒	N ☐	Sources of organic compounds include waste container storage areas and landscape maintenance equipment stored outside. Infiltration BMPs are incorporated into the site design that will treat for organic compounds with medium removal efficiency.
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
2 Total Credit % 0 *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)	N/A		

Section 3 Site and Watershed Description

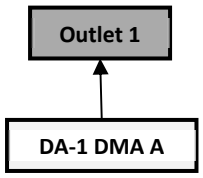
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.0508°	Longitude -117.1533°	Thomas Bros Map page 648

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA-1 DMA A flows to Outlet 1	Project flows from off-site areas and perimeter landscape areas within DA-1 are collected in drainage swales around the site perimeter and are conveyed through a storm drain system to two infiltration basins. The site buildings (storage units and leasing office) and parking lot/drive aisles drain to a series of trench drain and catch basin inlets that all outlet through a storm drain system into the site infiltrations basins for DCV and HCOC treatment. The outlet from the infiltration basins is a concrete curb drain spillway that drains to Wabash Avenue adjacent to the site.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	280,285			
2 Existing site impervious area (ft^2)	218,200			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	2			
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	**B**			
5 Longest flowpath length (ft)	776			
6 Longest flowpath slope (ft/ft)	0.028			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	poor			

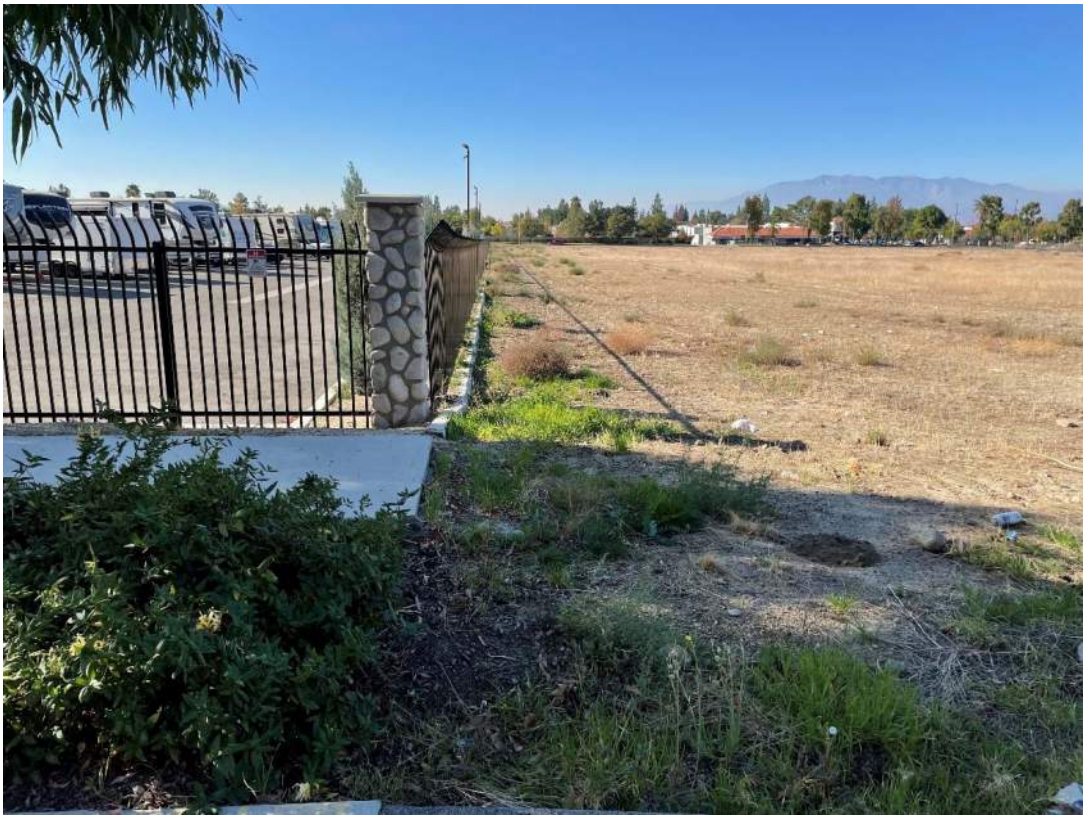
Photo 1: On Wabash Avenue looking east along the south property line of the project site.

Photo 2: On Wabash Avenue looking north along the westerly property line of the project site.

Photo 3: On Naples Avenue at the Wabash Avenue intersection looking southeasterly across project site.

Photo 4: At the Jasper Avenue/Naples Avenue intersection looking southwesterly across the project site.

Photo 5: On Jasper Avenue looking west along the south property line of the project site.



Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://sbcounty.permitrack.com/WAP* *See 'Drainage Facilities" link at this website*	Santa Ana River Reach 5 v Santa Ana River Reach 4 v Santa Ana River Reach 3 v Prado Basin
Applicable TMDLs *Refer to Local Implementation Plan*	Santa Ana River Reach 4 – pathogens Santa Ana River Reach 3 – pathogens / Metals
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	None for immediate receiving waters Santa Ana River Reach 4 – pathogens Santa Ana River Reach 3 – pathogens / Metals
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	None
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	Santa Ana River Reach 5, Reach 4, Reach 3
Hydrologic Conditions of Concern	☒ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☐ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The project owner will provide water quality training for all employees of this project. The training shall be based on this WQMP and educational materials supplied in **Section 6.4C** – **Educational Information**. Initial training shall occur within six months of employment and shall be refreshed on a yearly basis.
N2	Activity Restrictions	☒	☐	All activities are restricted for which there isn't an appropriate BMP provided for in this WQMP.
N3	Landscape Management BMPs	☒	☐	Landscape Maintenance will shall be in accordance with SC-73 attached under the BMP section 6.4. This BMP applies to all landscaping, medians, parking islands and planter boxes.
N4	BMP Maintenance	☒	☐	The project owner will be responsible for BMP maintenance which includes regularly scheduled cleaning and repair of BMPs, and replacement when needed.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	The project owner and employees must comply with City of Redlands ordinances for Hazardous waste and waste disposal. The City of Redlands through the Fire Department provides for hazardous waste collection. The project owner and employees shall comply by using this facility to dispose of all leftover pesticides, fertilizers, herbicides, oil, paints, antifreeze, batteries, corrosives, and flammables. Alternate approved sites for disposal are available. See the San Bernardino County stormwater website for additional disposal locations. Additionally, there are educational material covering hazardous waste covered under N1. The current educational materials are attached to this WQMP.
N6	Local Water Quality Ordinances	☒	☐	The Project must comply with any applicable local water quality ordinances. The local jurisdiction (City of Redlands), under local water quality ordinances (Ord. 13.54), has authority to ensure clean stormwater discharges from areas of concern to public properties.
N7	Spill Contingency Plan	☐	☒	There are no hazardous materials to be stored on-site.

Form 4.1-1 Non-Structural Source Control BMPs				
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks on this project
N9	Hazardous Materials Disclosure Compliance	☐	☒	There are no hazardous materials to be stored on-site.
N10	Uniform Fire Code Implementation	☒	☐	Fire Code compliance with Article 80 of the Uniform Fire Code is enforced by the City of Redlands Fire department and generally applies to commercial sites where significant amounts of hazardous materials may be stored. The storage of this amount of hazardous materials is not anticipated for the project and therefore not applicable.
N11	Litter/Debris Control Program	☒	☐	The project owner will be responsible for contracting with a landscape maintenance company or hiring a groundskeeper to provide litter and debris control on the property limits.
N12	Employee Training	☒	☐	The project owner will provide water quality training for all employees of this project. The training shall be based on this WQMP and educational materials supplied in **Section 6.4C** – **Educational Information**. Initial training shall occur within six months of employment and shall be refreshed on a yearly basis.
N13	Housekeeping of Loading Docks	☐	☒	No loading docks on this project.
N14	Catch Basin Inspection Program	☒	☐	The project owner is required to have the drainage facilities inspected, cleaned and maintained on a semi-annual basis and checked for standing water 72 hours after any storm. Cleaning shall take place in the late summer/early fall prior to the start of the rainy season and mid-winter during the rainy season. Drainage facilities include all catch basins (storm drain inlets) on site.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	The project owner shall have the project parking and drive areas swept on a regular frequency (minimum monthly) based on usage and field observations of waste accumulation, using a vacuum assisted sweeper.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	This is not a public agency project.

Form 4.1-1 Non-Structural Source Control BMPs				
N17	Comply with all other applicable NPDES permits	☒	☐	A SWPPP will be prepared for construction activities and a notice of intent will be filed with the State Water Resources Control Board.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Storm drain stenciling and signage notices regarding discharge prohibitions will be placed at storm drain inlets to eliminate or reduce dumping and littering. The stenciling shall be blue on a white background with lettering 2-1/2" in height and reading "No Dumping – Drains to river". A fish or similar water dependent creature silhouette may be included subject to City approval. In lieu of a stencil, a catch basin curb marker, circular or rectangular, at least 4" in height or diameter may be used. The message will be the same and is subject to City approval. A painted circular stencil shall not be bigger than 8" in diameter.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	There are no outdoor material storage on this site
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	The trash and waste storage areas will be walled to prevent off-site transport of trash. The trash enclosure will have a roof or awning cover with fixed lids attached to the trash containers. They are located to avoid drainage run-on from the project site and no storm drain systems are located in the immediate vicinity of the storage area.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Irrigation methods will be utilized to minimize runoff of excess irrigation water across impervious surfaces and into the storm water conveyance system. Such measures shall include employing rain-triggered shutoff devices to eliminate or reduce irrigation during and immediately after precipitation, using mulches (such as wood chips) to minimize sediment in runoff and to maintain soil infiltration capacity, and coordinating design of the irrigation system and landscape to minimize overspray and runoff. Irrigation systems shall use flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or water supply lines. Water conservation devices such as programmable irrigation timers and soil moisture sensors shall be used. This project will be designed for efficient irrigation by implementation of BMP SD-12. Reference SD-12 attached under the BMP section 6.4B.

S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	All planter areas shall be finish-graded at a minimum of 1-2 inches below top of curb or sidewalk for increased retention/infiltration of stormwater and irrigation water.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Energy dissipaters (riprap or concrete pad) are provided at roof drain and storm drain outlet locations.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	N/A There are no covered dock areas.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	N/A There are no covered maintenance bays.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	N/A There are no vehicle wash areas.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	N/A There are no outdoor processing areas.
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	N/A None on this site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	N/A None on this site.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	N/A None on this site.
S14	Wash water control for food preparation areas	☐	☒	N/A None on this site.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	N/A None on this site.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist

Site Design Practices
If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets

Minimize impervious areas: Yes ☒ No ☐

Explanation: Site design practices are used to maximize the retention of existing pervious areas that would potentially be impervious if said practices were not implemented, thereby minimizing the addition of new impervious areas. The following site design practices will be implemented to minimize addition of impervious area to the site:

- The minimum amount of required parking spaces and drive aisle widths allowed by City code are being used to provide a smaller parking lot area.

Maximize natural infiltration capacity: Yes ☒ No ☐

Explanation: The site areas that will be used for infiltration will be staked off during grading operations to preserve the natural infiltration capacity of those areas and prevent compaction during construction.

Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐

Explanation: The project maintains the existing site drainage pattern and the use of two infiltration basins is intended to preserve the existing time of concentration that typically decreases due to the addition of impervious site area.

Disconnect impervious areas: Yes ☒ No ☐

Explanation: The project is proposing to direct runoff to planters and landscaped areas and incorporates permeable areas throughout the site to accept runoff. All roof downspouts will drain to pervious areas.

Protect existing vegetation and sensitive areas: Yes ☐ No ☒

Explanation: There are no existing vegetation or sensitive areas on this site.

Re-vegetate disturbed areas: Yes ☐ No ☒

Explanation: The existing site is a barren field and the proposed grading disturbance will not remove any existing vegetated areas that would require re-vegetation after construction.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐

Explanation: Unnecessary compaction will be avoided by staking off the infiltration basin areas during grading operations to prevent equipment from entering those areas.

Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐
Explanation: The site buildings will be surrounded with vegetated swales sloping at 1% minimum in lieu of using imperviously lined swales. No BMP credit is proposed for the use of the vegetated swales although they will be planted.

Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐
Explanation: The building and drive aisle areas will not utilize this feature, but the perimeter landscape and infiltration basins will use this feature.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA-1 – DMA A)

1 Project area DA 1 (ft^2): 280,285	**2** Imperviousness after applying preventative site design practices (Imp%): 77.85%	**3** Runoff Coefficient (Rc): 0.57 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.49 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.73 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 19,155 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of HCOC Assessment (DA-1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☒ No ☐

Go to: http://sbcounty.permitrack.com/WAP

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)*

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 22,338 *Form 4.2-3 Item 12*	**2** 15.40 *Form 4.2-4 Item 13*	**3** 4.86 *Form 4.2-5 Item 10*
Post-developed	**4** 26,746 *Form 4.2-3 Item 13*	**5** 7.93 *Form 4.2-4 Item 14*	**6** 9.10 *Form 4.2-5 Item 14*
Difference	**7** *4,408* *Item 4 – Item 1*	**8** *7.47* *Item 2 – Item 5*	**9** *4.24* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *19.7%* *Item 7 / Item 1*	**11** *48.5%* *Item 8 / Item 2*	**12** *87.2%* *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA-1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	
1a Land Cover type	Barren							
2a Hydrologic Soil Group (HSG)	B							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	280,285							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	86							
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	
1b Land Cover type	Commercial Commercial L/S							
2b Hydrologic Soil Group (HSG)	B							
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	280,285							
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	89							

5 Pre-Developed area-weighted CN: 86	**7** Pre-developed soil storage capacity, S (in): 1.63 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 0.33 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 58	**8** Post-developed soil storage capacity, S (in): 1.24 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 0.25 *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in): 2.14
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 22,338
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): 26,746
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3): 3,071
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA-1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	776				476			
2 Change in elevation (ft)	21.6				14.2			
3 Slope (ft/ft), *S_o = Item 2 / Item 1*	0.028				0.030			
4 Land cover	Barren				Commercial			
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	15.40				7.30			
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	0				677			
7 Cross-sectional area of channel (ft^2)	N/A				3.14			
8 Wetted perimeter of channel (ft)	N/A				6.28			
9 Manning's roughness of channel (n)	N/A				0.009			
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	N/A				17.94			
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*	N/A				0.63			
12 Total time of concentration (min) *T_c = Item 5 + Item 11*	N/A				7.93			

13 Pre-developed time of concentration (min): 15.40 *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): 7.93 *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet HCOC requirement (min): 6.70 *$T_{C\text{-}HCOC}$ = (Item 13 * 0.95) – Item 14*

Form 4.2-5 HCOC Assessment for Peak Runoff (DA-1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet			Post-developed DA to Project Outlet		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*		1.11			1.74		
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		6.43			6.43		
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		1.00			0.22		
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		0.27			0.75		
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA*		0.27			0.17		
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		4.86			9.10		
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: 2.42 *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*

10 Peak runoff from pre-developed condition confluence analysis (cfs): 4.86 *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

11 Post-developed Q_p at T_c for DMA A: 9.10 *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*

14 Peak runoff from post-developed condition confluence analysis (cfs): 9.10 *Maximum of Item 11, 12, and 13 (including additional forms as needed)*

15 Peak runoff reduction needed to meet HCOC Requirement (cfs): 3.78 *$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

1 Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒

Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒

(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒

See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

7 Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒

If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

8 Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒

If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

9 All answers to Item 1 through Item 6 are "No":

Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA 1 DMA A BMP Type	DA 1 DMA B BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3):		$V_{retention}$ *=Sum of Item 4 for all BMPs*	
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): 0		$V_{retention}$ *=Sum of Item 12 for all BMPs*	

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3): 0 $V_{retention}$ *=Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3): 0 $V_{retention}$ *= Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrel/cisterns: Yes ☐ No ☒ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): 0 $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: 0 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA-1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 7,442 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A BMP Type (Infiltration Basin 'A' and 'B')	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	4.68		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	3.5		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.34		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	4.00		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	2.50		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	3,251		
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	3.0		
10 Amended soil porosity	0.3		
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	4		
12 Gravel porosity	0.4		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	31,680		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0		

16 Total Retention Volume from LID Infiltration BMPs: 31,680 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 165.39% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA-)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA DMA A BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*			
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*			
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*			
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*			
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*			
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity			
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			
16 Total Retention Volume from LID Infiltration BMPs: *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and infiltration BMPs? Yes ☐ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 0
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16

BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			

9 Total Retention Volume (ft^3) from Harvest and Use BMP 0 *Sum of Item 8 for all harvest and use BMP included in plan*

10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs? Yes ☒ No ☐
If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)

<table>
<tr><td colspan="2">1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 0 Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9</td><td colspan="3">List pollutants of concern Copy from Form 2.3-1.
Pathogens (Bacterial / Virus)
Nutrients - Phosphorous
Nutrients - Nitrogen
Noxious Aquatic Plants
Sediment
Oil and Grease
Trash/Debris
Pesticides / Herbicides
Organic Compounds</td></tr>
<tr><td rowspan="2">2 Biotreatment BMP Selected
(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)</td><td colspan="2">Volume-based biotreatment
Use Forms 4.3-6 and 4.3-7 to compute treated volume</td><td>Flow-based biotreatment
Use Form 4.3-8 to compute treated volume</td></tr>
<tr><td colspan="2">☐ Bioretention with underdrain
☐ Planter box with underdrain
☐ Constructed wetlands
☐ Wet extended detention
☐ Dry extended detention</td><td>☐ Vegetated swale
☐ Vegetated filter strip
☐ Proprietary biotreatment</td></tr>
<tr><td>3 Volume biotreated in volume based biotreatment BMP (ft^3): 0 Form 4.3-6 Item 15 + Form 4.3-7 Item 13</td><td>4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 Item 1 – Item 3</td><td colspan="2">5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0% Item 4 / Item 1</td></tr>
<tr><td colspan="4">6 Flow-based biotreatment BMP capacity provided (cfs): 0 Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)</td></tr>
<tr><td colspan="4">7 Metrics for MEP determination:
• Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.</td></tr>
</table>

Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: 0 *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ + *Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ + *Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : 0 *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA 1 DMA B BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*	-		
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	-		
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	-		
4 Manning's roughness coefficient	-		
5 Bottom width (ft) *b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*	-		
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	-		
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*	-		
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*	-		
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	-		
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*	-		
11 Water surface area at water quality flow depth (ft^2) *SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10*	-		

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA-1)

1 Total LID DCV for the Project DA-1 (ft^3): 19,155 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 31,680 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☒
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA-1)

1 Volume reduction needed for HCOC performance criteria (ft^3): 3,070 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): 31,680 *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): 0 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): 0 *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☒ Run-off from the DA will be stored and infiltrated in a series of infiltration basins which will increase the overall project time of concentration.
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☒ Run-off from the DA will be stored and infiltrated in a series of infiltration basins which will decrease peak run-off from the site.
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Education of Property Owners, Tenants and Occupants	Project Owner	Renew and update educational materials. Copies of current materials are provided in Section 6.4C. Download the latest educational material published by the County of San Bernardino and available on the County's website at: http://www.sbcountystormwater.org/agency.	Yearly
Activity Restrictions	Project Owner	Project owner to review activity restrictions identified in City of Redlands Ordinance and Codes, specifically those that would violate the ordinances in Chapter 13.54 of the City Municipal Code. Any violation of these codes are to be reported to the City of Redlands.	Daily
Local Water Quality Ordinances	Project Owner	Check the City of Redlands web site at the address below regarding changes in local water quality ordinance on annual basis. https://www.cityofredlands.org/cms/One.aspx?portalId=6255746&pageId=7308741	Yearly
Litter / Debris Control Program	Lot Owners and City of Redlands	Maintenance shall consist of litter patrol, emptying of trash receptacles (trash collection service provided by City of Redlands), picking up pet waste and using the proper containers for trash pickup. Containers should be cleaned at least every six months.	Daily & 6 Months
Storm Drain Signage	Project Owner	Owner to inspect signage for legibility and repaint/replace storm drain signage as necessary.	Yearly
Landscape Finished Grade	Project Owner	This inspection and maintenance normaly refers to some areas of the the lot and parkway grade held at a lower grade than the surrounding area. Verfify landscaping is 1-2" below the adjacent finished surface grade to allow for ponding. Remove excessive soil and/or vegetation to restore 1" minimum depth of lanscaping area below adjacent	Monthly

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
		grade. Replant landscaping areas disturbed during soil removal.	
Protect Slopes and Channels	Project Owner	Channels (Drainage Swales) – inspect for debris and/or overgrowth, clean, repair and replace all channel stabilization and vegetation. Slopes - Lot owner's to inspect for erosion and/or overgrowth, clean, repair and replace all slope stabilization and vegetation as necessary. Rock Outlet Pads at Infiltration Basins – inspect and maintain the rock outlet pad for debris, overgrown vegetation and sediment build up – remove as necessary.	Monthly
Landscape Planning	Project Owner	Landscapes shall be maintained to ensure water efficiency and healthy appearance. A regular maintenance schedule shall include, but not be limited to, checking, adjusting, and repairing the irrigation equipment; resetting the automatic controller; aerating and dethatching turf areas; replenishing mulch; fertilizing; pruning, weeding, removing litter and replacement of plants as required. Verify fertilizer and pesticide usage requirements consistent with the instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation Comply with product labels as new products are purchased and update new regulations by the State Department of Pesticide Regulation (http://www.cdpr.ca.gov/)	Weekly
Roof Runoff Controls	Project Owner	Roof Inlets and Outlets - Inspect and clean as necessary all roof inlets, outlets and drains (CASQA New Development BMP Handbook SD-11)	Twice a year – once in October and once in April/May
Efficient Irrigation	Project Owner	1. Rain and pressure shutoff devices inspect and replace as necessary 2. Timers inspect and replace as necessary 3. Mulch Add mulch (wood chips) 4. Overspray Inspect and adjust system	Monthly
SD-21 Alternative Building Materials	Project Owner	Decking & Fencing - inspect, repair and replace. Use no Chromated Copper Arsenate products for repair or replacement. Roofing - inspect, repair and replace. If repair or replacement product is metal, use only appropriately coated products.Paved areas - see pervious pavement maintenance. Building siding - inspect, repair and replace. Pesticide	Yearly

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
		reduction - inspect, repair and replace termite barriers	
TC-11 Infiltration Basin	Project Owner	1. Inspect for sediment accumulation and trash/debris. 2. Remove trash and debris. 3. Inspect vegetation health. 4. Prune vegetation, remove weeds and remove/replace dead or diseased vegetation. 5. Inspect basin side slopes for erosion. 6. Revetage eroded side slopes and stabilize with an erosion control mulch or mat until vegetation cover is established. 7. Inspect for standing water (annually at end of rainy season). 8. Remove deposited sediments and use a hand-guided rotarty tiller to scarify top 12" of basin (only as needed when standing water is present at end of rainy season)	Monthly
MP-52 Drain Inserts	Project Owner	Project Owner to inspect and maintain according to manufacturer's recommendations included in Section 6.4B (Flogard+Plus Catch Basin Inlet Filter Inspection and Maintenance Guide).	Monthly

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

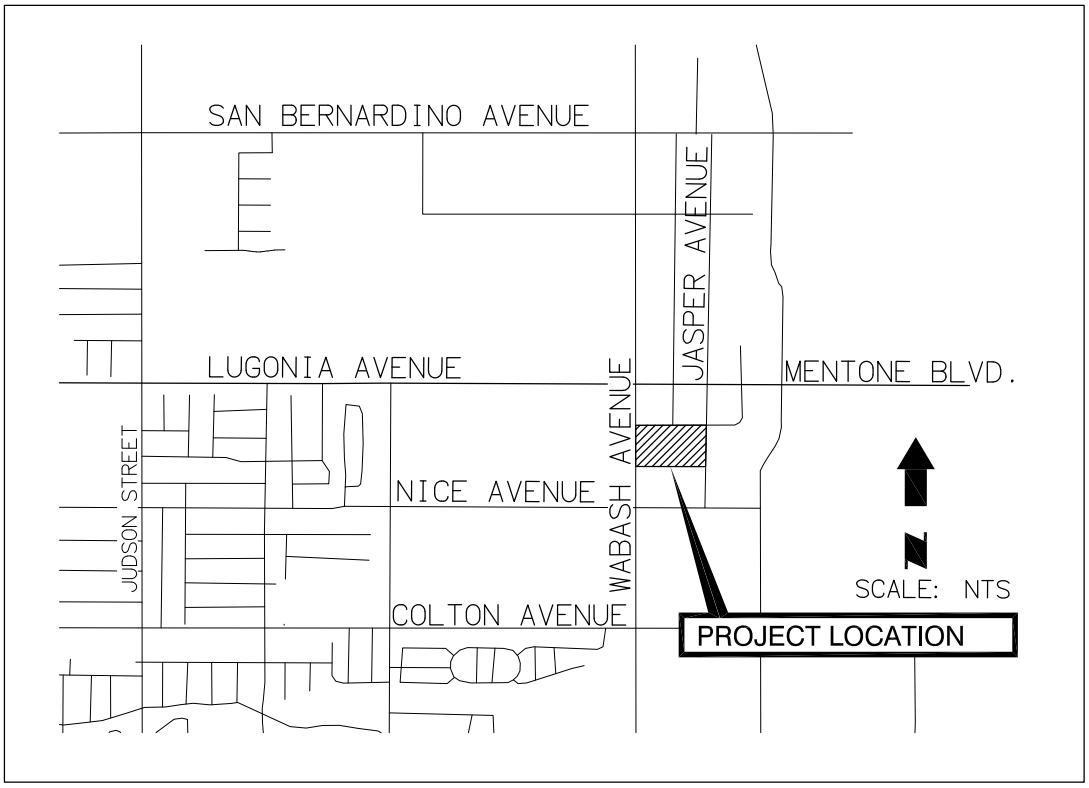
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

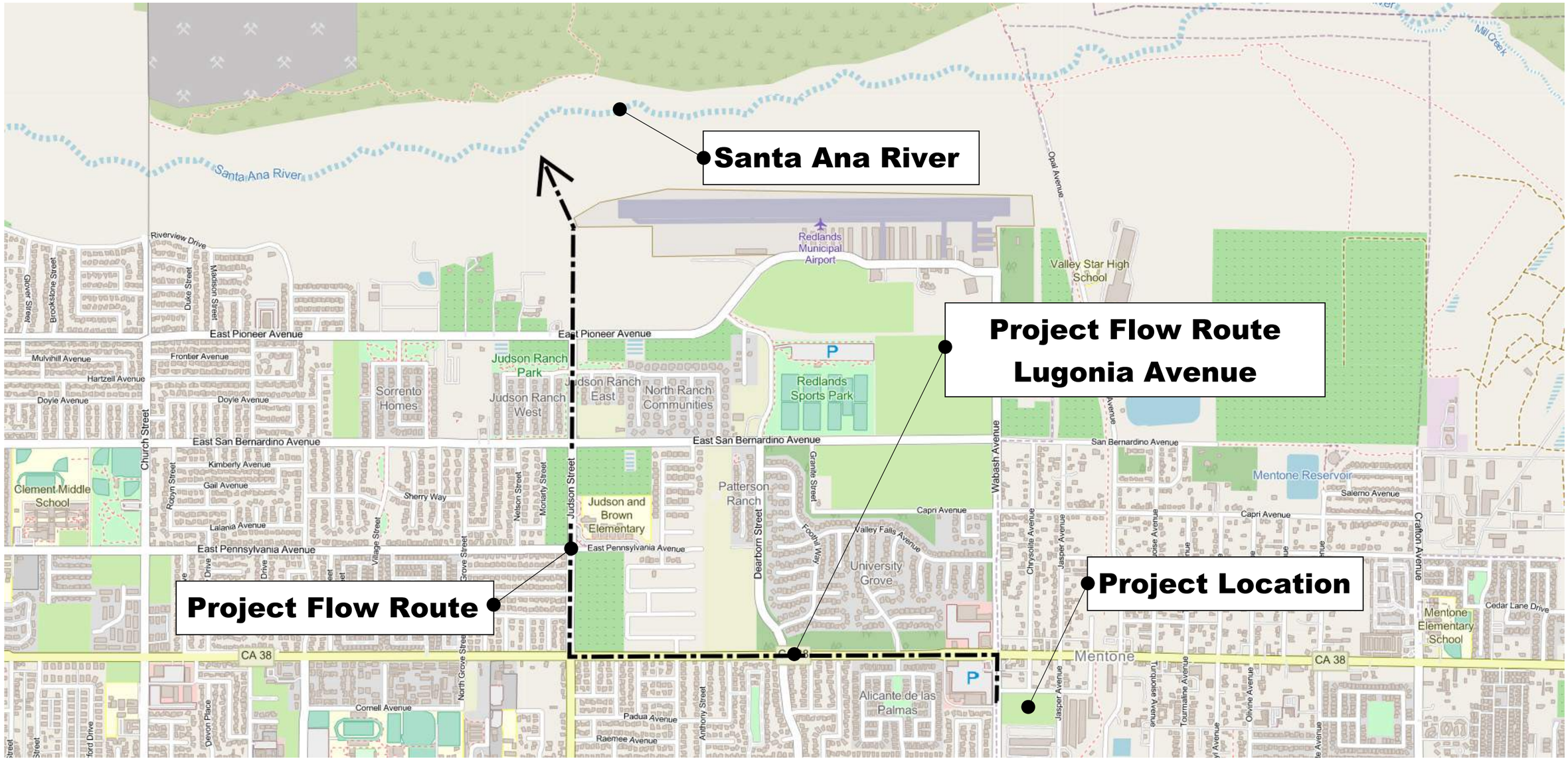
- 6.4A Hydrology
- 6.4B BMP Educational Materials
- 6.4C Educational Materials
- 6.4D Calculations
- 6.4E Miscellaneous Data



VICINITY MAP

CITY OF REDLANDS, CALIFORNIA

Project Drainage Path



Hicks & Hartwick, Inc.
37 East Olive Ave. Ste C
Redlands, CA. 92373
909.793.2257

Project Drainage Path
City of Redlands
Redlands Self Storage

PRELIMINARY GRADING PLAN
REDLANDS SELF STORAGE - WABASH AVENUE/NAPLES AVENUE
APN 0298-051-07

OWNER / APPLICANT
MADISON CAPITAL GROUP
450 NEWPORT CENTER DRIVE - SUITE 250
NEWPORT BEACH, CA 92660

CIVIL ENGINEER
HICKS & HARTWICK, INC.
37 EAST OLIVE AVENUE, SUITE C
REDLANDS, CA 92373
PH: (909) 793-2257

PLAN PREPARED BY:
Hicks & Hartwick, Inc.
37 East Olive Ave. Ste C
Redlands, CA. 92373
909.793.2257

REGISTERED PROFESSIONAL ENGINEER
MATTHEW C. HICKS
No. 63494
CIVIL
STATE OF CALIFORNIA

GENERAL NOTES
1. TOTAL PROJECT GROSS AREA: 328,321 SF (7.54 AC) - INCLUSIVE OF ADJACENT STREET R/W
2. PROJECT CONSISTS OF APN: 0298-05-107
3. NUMBER OF PARCELS: 1
4. DATE PREPARED: 01/31/2022
5. NET DEVELOPMENT AREA: 275,638 SF (6.33 AC)

LEGAL DESCRIPTION
THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF REDLANDS, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL NO. 1:
LOT A, TRACT NO. 7076, IN THE CITY OF REDLANDS, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORD IN BOOK 91 OF MAPS, PAGES 43 AND 44, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, AND THE WEST 1/2 OF THE ALLEY CLOSED ADJACENT ON THE EAST AND THE NORTH 1/2 OF FLORENCE STREET VACATED ADJACENT ON THE SOUTH.

PARCEL NO. 2:
LOT B, TRACT NO. 7076, IN THE CITY OF REDLANDS, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 91 OF MAPS, PAGES 43 AND 44, RECORDS OF SAID COUNTY, AND THE WEST 1/2 STREET CLOSED ON THE EAST AND THE EAST 1/2 OF THE ALLEY CLOSED ADJACENT ON THE WEST AND THE NORTH 1/2 FLORENCE AVENUE VACATED ON THE SOUTH.

PARCEL NO. 3:
LOT C, TRACT NO. 7076, IN THE CITY OF REDLANDS, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 91, PAGES 43 AND 44,OF MAPS, RECORDS OF SAID COUNTY, AND THE EAST 1/2 STREET CLOSED ON THE WEST AND THE WEST 1/2 ALLEY ADJACENT ON THE EAST AND THE NORTH 1/2 OF FLORENCE AVENUE VACATED ADJACENT ON THE SOUTH.

PARCEL NO.4:
LOT D, TRACT NO. 7076, IN THE CITY OF REDLANDS, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 91, PAGES 43 AND 44, OF MAPS, RECORDS OF SAID COUNTY.
TOGETHER WITH THE EAST 1/2 ALLEY ADJACENT ON THE WEST AND THE NORTH 1/2 FLORENCE AVENUE VACATED ADJACENT SOUTH.

ALSO TOGETHER WITH THAT PORTION OF JASPER AVENUE VACATED BY RESOLUTION NO. 90-294 OF THE BOARD OF SUPERVISORS OF THE COUNTY OF SAN BERNARDINO, RECORDED JUNE 27, 1990 AS INSTRUMENT NO. 90-251131, OF OFFICIAL RECORDS IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.

SURVEYOR'S NOTES
1. THE BASIS OF BEARINGS FOR THIS SURVEY WAS DERIVED FROM THE CENTERLINE OF JASPER AVENUE SHOWN AS N00°01'57"W ON RECORD OF SURVEY 135/20.
2. ADEQUATE INGRESS TO AND EGRESS FROM THE SUBJECT PROPERTY IS PROVIDED BY WABASH AVENUE,NAPLES AVENUE AND JASPER AVENUE. THE SAME BEING PAVED, DEDICATED PUBLIC RIGHT-OF-WAY MAINTAINED BY THE CITY OF REDLANDS.
3. EXCEPT AS SET FORTH BELOW, THERE ARE NO POTENTIAL ENCROACHMENTS UPON THE SUBJECT PROPERTY BY IMPROVEMENTS ON ADJACENT PROPERTY, NO ENCROACHMENTS ON ANY EASEMENTS OR ON ADJACENT PROPERTY, STREETS, OR ALLEYS BY ANY IMPROVEMENTS ON THE SUBJECT PROPERTY, NO PARTY WALLS, NO CONFLICTS OR PROTRUSIONS. THE EXCEPTIONS TO THE ABOVE STATEMENTS ARE AS FOLLOWS:
   (1) A POTENTIAL ENCROACHMENT OF CONCRETE SIDEWALK AT THE SOUTHWEST OF PROPERTY.
   (2) A POTENTIAL ENCROACHMENT OF CONCRETE CURB AT THE SOUTHEAST CORNER OF PROPERTY.
   (3) A POTENTIAL ENCROACHMENT OF CONCRETE CURB ALONG THE SOUTHERLY LINE OF PROPERTY DUE TO THE BATTER OF THE CURB.
   (4) A POTENTIAL 1.6' ENCROACHMENT OF GUY WIRE ALONG THE NORTH LINE OF PROPERTY.
4. THE LOCATION OF THE UTILITIES SHOWN HEREON ARE FROM OBSERVED VISIBLE EVIDENCE OF ABOVE GROUND APPURTENANCES AND MARKING ONLY. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN GUARANTEE AS TOT THE EXACT LOCATION OF UNDERGROUND UTILITIES.

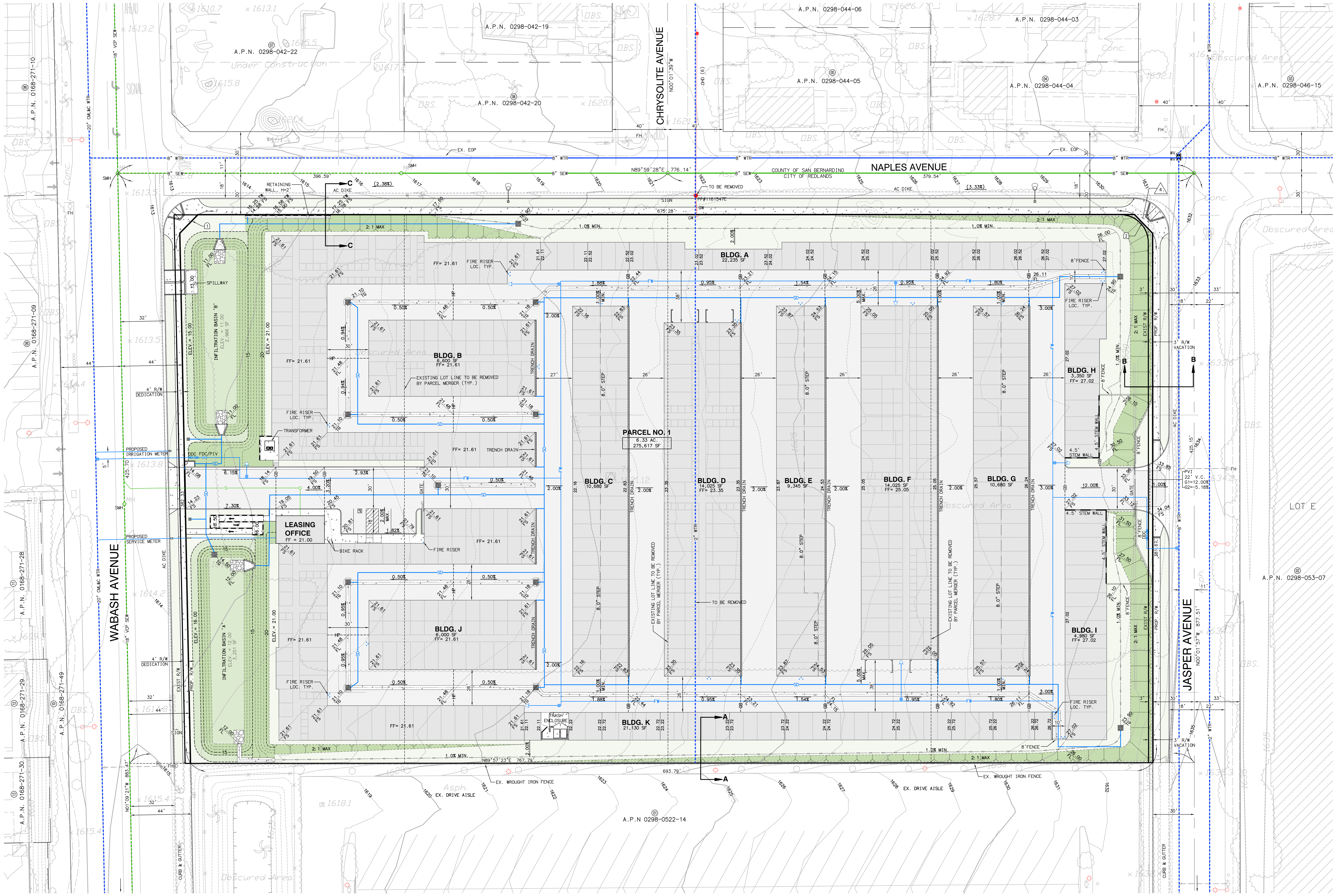
BENCHMARK
THE BENCHMARK FOR THIS SURVEY IS NGS DESIGNATION 107105, A BRASS DISK LOCATED AT THE SOUTHWEST CORNER OF MENTONE BLVD. AND WABASH AVE.
ELEVATION: 1613.12 FEET (NAVD 88)

EASEMENTS OF RECORD
EASEMENTS AND RESTRICTIONS OF RECORD UNDER TITLE REPORT PREPARED BY WFG NATIONAL TITLE COMPANY OF CALIFORNIA DATED AUGUST 12, 2021. ORDER NO. 21-261660

1. CATHERINE INGRAM, THE HOLDER OF AN EASEMENT FOR PIPELINES AND INCIDENTAL PURPOSES AS DISCLOSED BY DOCUMENT RECORDED FEBRUARY 26, 1886 IN BOOK 44 OF DEEDS, PAGE 356, OFFICIAL RECORDS OF SAN BERNARDINO COUNTY. SAID EASEMENT CANNOT BE LOCATED FROM RECORD.
2. THE MENTONE IRRIGATION COMPANY, THE HOLDER OF AN EASEMENT FOR PIPELINES AND INCIDENTAL PURPOSES AS DISCLOSED BY DOCUMENT RECORDED JANUARY 30,1888 IN BOOK 69 OF DEEDS, PAGE 144, AND RE-RECORDED FEBRUARY 11, 1888 IN BOOK 69 OF DEEDS, PAGE 327, OFFICIAL RECORDS OF SAN BERNARDINO COUNTY. SAID EASEMENT CANNOT BE LOCATED FROM RECORD.
3. UNKNOWN GRANTEE, THE HOLDER OF AN EASEMENT FOR PIPELINES AND INCIDENTAL PURPOSES AS DISCLOSED BY DOCUMENT RECORDED MAY 17, 1890 IN BOOK 114 OF DEEDS, PAGE 76, OFFICIAL RECORDS OF SAN BERNARDINO COUNTY. SAID EASEMENT CANNOT BE LOCATED FROM RECORD.
4. SAN BERNARDINO COUNTY, THE HOLDER OF AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES AS DISCLOSED BY RESOLUTION NO. 90-294 OF THE BOARD OF SUPERVISORS OF THE COUNTY OF SAN BERNARDINO. SAID RESOLUTION STATES THAT THE EASEMENT CEASES TO EXIST ONCE THE RESOLUTION IS RECORDED. THE RESOLUTION WAS RECORDED JUNE 27, 1990 AS INSTRUMENT NO. 90-251131, OFFICIAL RECORDS OF SAN BERNARDINO COUNTY. THE EASEMENT HAS NOT BEEN PLOTTED.

(4) SAN BERNARDINO COUNTY, THE HOLDER OF AN EASEMENT FOR HIGHWAY, ROAD AND INCIDENTAL PURPOSES AS DISCLOSED BY DOCUMENT RECORDED JULY 6, 1990 AS INSTRUMENT NO. 90-264542, OFFICIAL RECORDS OF SAN BERNARDINO COUNTY. SAID EASEMENT IS DELINEATED HEREON.

ADJACENT PROPERTY OWNERS
01. 0298-052-14 JACINTO, LARRY LIVING TRUST
02. 0298-053-07 JACINTO, LARRY LIVING TRUST
03. 0298-046-15 MAXWELL, BILL
04. 0298-044-04 JACOBO, JACOB
05. 0298-044-05 RUIZ, ROSA A
06. 0298-042-20 BREWSTER, TERRENCE K
07. 0298-042-22 KO, YIE BIN
08. 0168-271-10 HAREFF LLC.
09. 0168-271-09 LUGONIA CAPITAL LLC.
10. 0168-270-49 ORANGE BLOSSOM HOMEOWNERS ASSN.
11. 0168-271-28 BORELL, DANIEL M
12. 0168-271-29 ROURK, BRIAN P
13. 0168-271-30 STANLEY, SCOTTY



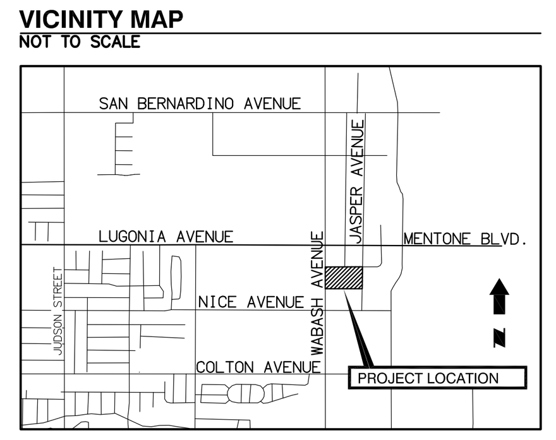
LEGEND
(hatch)	ASPHALT PAVEMENT
(hatch)	BUILDING
(hatch)	LANDSCAPING
(hatch)	CONCRETE
(line)	PROPOSED SCREEN WALL
(line)	PROPOSED RETAINING WALL
—(1210)—	EXISTING CONTOUR
---1210---	PROPOSED CONTOUR
—S—	PROPOSED SEWER SERVICE
—SD—	PROPOSED STORM DRAIN
—SEW—	PROPOSED SEWER MAIN (SIZE AS SHOWN)
—WTR—	PROPOSED WATER MAIN (SIZE AS SHOWN)
—FW—	PROPOSED FIRE WATER
(line)	EXISTING STORM DRAIN
(line)	EXISTING WATER SERVICE
(line)	EXISTING SEWER LATERAL
(line)	EXISTING WATER MAIN (SIZE AS SHOWN)
(line)	EXISTING SEWER MAIN (SIZE AS SHOWN) AND MANHOLE
----G----	EXISTING GAS LINE (SIZE AS SHOWN)
----OH----	EXISTING OVERHEAD COMMUNICATION/POWER LINES
----GTE----	EXISTING GENERAL TELEPHONE
----SCE----	PROPOSED SOUTHERN CALIFORNIA EDISON
----GB----	PROPOSED GRADE BREAK
(symbol)	FIRE HYDRANT ASSEMBLY
(symbol)	SWALE FLOW LINE
(symbol)	PROPOSED STREET LIGHT

ABBREVIATIONS
AC	ASPHALT PAVEMENT	LF	LINEAR FEET
APN	ASSESSOR'S PARCEL NUMBER	LS	LANDSCAPE
BLDG	BUILDING	MAX	MAXIMUM
℄	CENTERLINE	MIN	MINIMUM
CF	CURB FACE	PIV	POST INDICATOR VALVE
CLF	CHAIN LINK FENCE	PL	PROPERTY LINE
CONC.	CONCRETE	PP	POWER POLE
COR	CORNER	PROP	PROPOSED
DDC	DOUBLE DETECTOR CHECK	GB	GRADE BREAK
DIA	DIAMETER	GP	GUARD POST
EX.	EXISTING	GTE	GENERAL TELEPHONE
EG	EXISTING GRADE	GW	GUY-WIRE
FDC	FIRE DEPARTMENT CONNECTION	H	HEIGHT
FF	FINISHED FLOOR	R/W	RIGHT OF WAY
FG	FINISHED GRADE	SMH	SEWER MAIN HOLE
FH	FIRE HYDRANT	SW	SIDEWALK
FL	FLOW LINE	TC	TOP OF CURB
FS	FINISHED SURFACE	TG	TOP OF GRATE
FW	FIRE WATER	WTR	WATER
INV	INVERT	WV	WATER VALVE
LAT	LATERAL	WM	WATER METER
LOC	LOCATION	XING	CROSSING

DATA TABLE

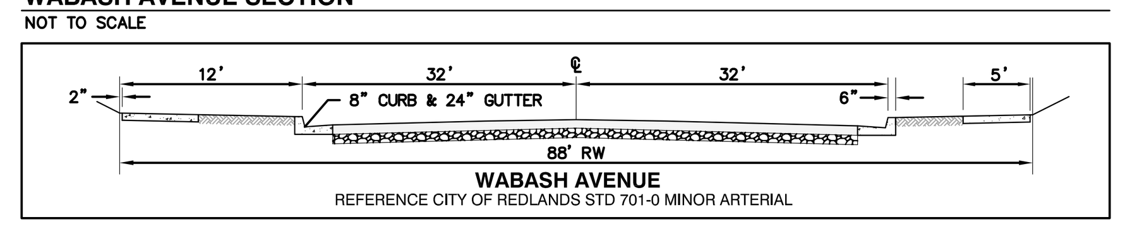
⌒	BEARING/DELTA	RADIUS	LENGTH	TANGENT
1	N 44°25'03" E	--	18.57'	--
2	N 43°56'25" W	--	18.74'	--

VICINITY MAP
NOT TO SCALE



GRAPHIC SCALE
(IN FEET)
1 INCH = 30 FT.

WABASH AVENUE SECTION
NOT TO SCALE



NAPLES AVENUE SECTION
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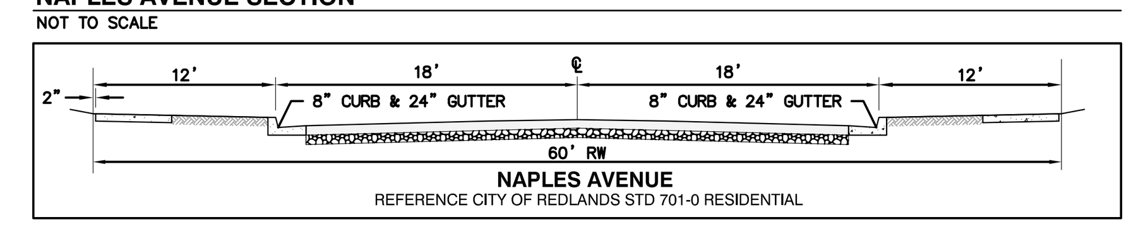

JASPER AVENUE SECTION
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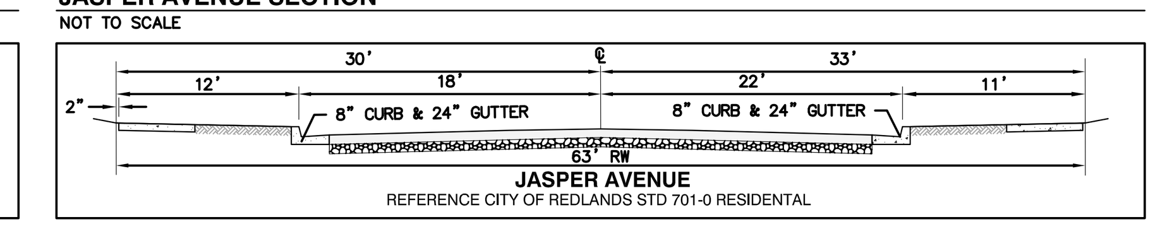
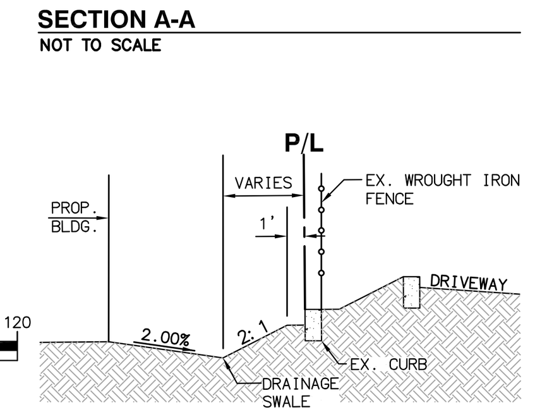


SECTION A-A
NOT TO SCALE



SECTION B-B
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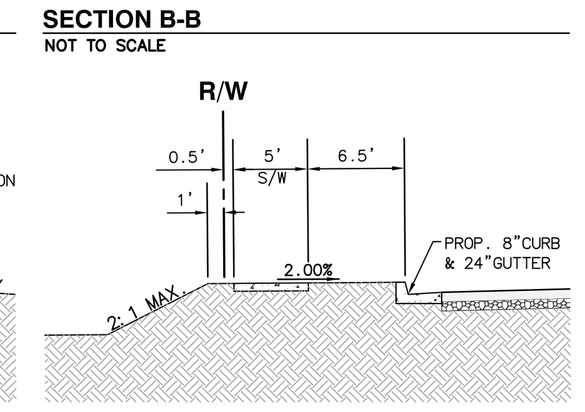

SECTION C-C
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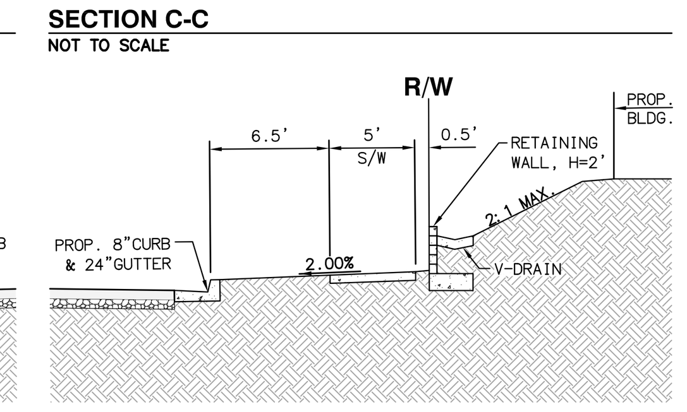
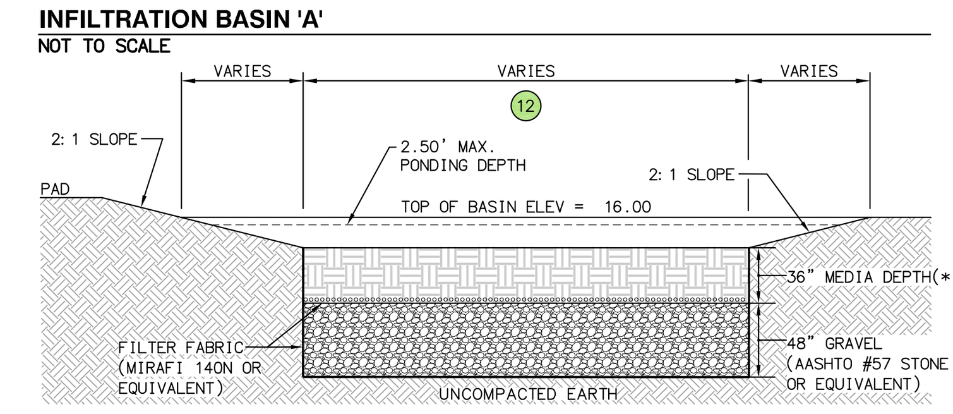
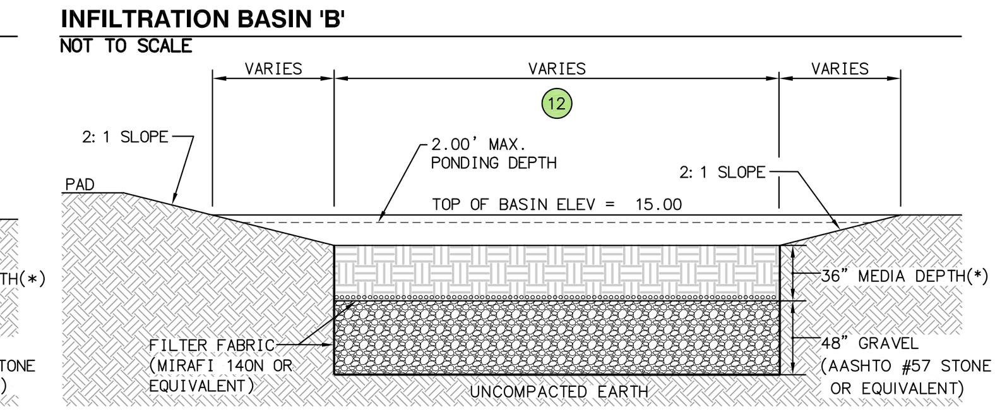


INFILTRATION BASIN 'A'
NOT TO SCALE



INFILTRATION BASIN 'B'
NOT TO SCALE



(*) 36" MEDIA DEPTH
SOIL MEDIA SHALL BE COMPRISED OF 85% MINERAL COMPONENT AND 15% ORGANIC COMPONENT, BY VOLUME. THE MINERAL COMPONENT SHALL B A CLASS A SANDY LOAM TOPSOIL THAT MEETS THE RANGE SPECIFIED IN THE TABLE BELOW. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST, SUCH THAT NITROGEN DOES NOT LEACH FROM THE MEDIA.

MINERAL COMPONENT RANGE REQUIREMENTS	
PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

\\T1\acaddata_10000_\10301 MCG Wabash-Naples\c_EXHIB\PRELIMINARY GRADING\ 10301G

PRELIMINARY WATER QUALITY MANAGEMENT PLAN
REDLANDS SELF STORAGE - WABASH AVENUE/NAPLES AVENUE
APN 0298-051-07

OWNER / APPLICANT
MADISON CAPITAL GROUP
450 NEWPORT CENTER DRIVE - SUITE 250
NEWPORT BEACH, CA 92660

CIVIL ENGINEER
HICKS & HARTWICK, INC.
37 EAST OLIVE AVENUE, SUITE C
REDLANDS, CA 92373
PH: (909) 793-2257

PLAN PREPARED BY:
Hicks & Hartwick, Inc.
37 East Olive Ave. Ste C
Redlands, CA. 92373
909.793.2257

REGISTERED PROFESSIONAL ENGINEER
MATTHEW C. HICKS
No. 63494
CIVIL
STATE OF CALIFORNIA

GENERAL NOTES
1. TOTAL WQMP PROJECT AREA: 280,285 SF (6.43 AC)
2. DATE PREPARED: 12-17-2021

SITE IMPLEMENTED BMP's
NOTE: ALL BMPs LISTED ARE PER CALIFORNIA STORMWATER QUALITY ASSOCIATION BEST MANAGEMENT PRACTICE HANDBOOK, (CONSTRUCTION, JULY 2012)

SOURCE CONTROL BMP's
ROUTINE STRUCTURAL

1	LANDSCAPE PLANNING	SD-10
2	ROOF RUNOFF CONTROLS	SD-11
3	EFFICIENT IRRIGATION	SD-12
4	PROTECT SLOPES AND CHANNELS	-
5	STORM DRAIN SIGNAGE	SD-13
6	INLET TRASH RACKS	-
7	ENERGY DISSIPATERS	-
8	TRASH STORAGE AREAS AND LITTER CONTROL	SD-32

HYDROLOGIC SOURCE CONTROL

9	IMPERVIOUS AREA DISPERSION	-

ALTERNATIVE MATERIAL

10	PERVIOUS PAVEMENT (PAVERS, ETC.)	SD-20

NOTE: APPLIES TO PARKING AND ACCESS AREAS

11	ALTERNATIVE BUILDING MATERIALS	SD-21

NOTE: APPLIES TO BUILDING, FENCING AND DECKING

DESIGN BASIS OF TREATMENT CONTROL BMP's
TREATMENT CONTROL BMP

12	INFILTRATION BASIN	VOLUME BASED	TC-11
13	CATCH BASIN INSERTS (KRISTAR FLOGARD OR EQUIV.)	FLOW BASED	MP-52

WQMP STUDY AREA SUMMARY
TOTAL WQMP STUDY AREA: 280,285 SF (6.43 AC)

DA-1 DMA A		280,285 SF	6.43 AC
BUILDINGS		123,150 SF	
ASPHALT CONCRETE PAVEMENT		86,560 SF	
CONC. SIDEWALK, CONC. CURB/GUTTER, TRASH ENCLOSURE ETC.		8,490 SF	
	TOTAL IMPERVIOUS	218,200 SF	5.00 AC
LANDSCAPING (TURF, PLANTERS, SLOPES & DECOMPOSED GRANITE)		57,416 SF	
OFF-SITE AREA		4,669 SF	
	TOTAL PERVIOUS	62,085 SF	1.43 AC

TREATMENT FLOW SUMMARY

			TREATMENT VOLUME REQUIRED		TREATMENT VOLUME PROVIDED	
DA-1 DMA A	280,285 SF	6.43 AC	DCV	19,155 c.f.	DCV	31,680 c.f.
IMPERVIOUS AREA	218,200 SF					

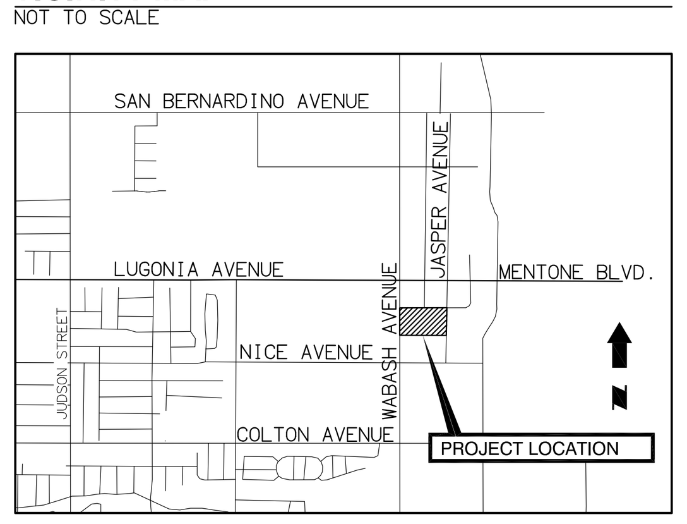
LEGEND
- EXISTING 5' CONTOUR
- EXISTING 1' CONTOUR
- PROPOSED 5' CONTOUR
- PROPOSED 1' CONTOUR
- TOTAL WQMP PROJECT AREA BOUNDARY
- DRAINAGE AREAS PER HYDRO STUDY
- EXISTING STORM DRAIN PIPE
- SD — PROPOSED STORM DRAIN PIPE
- GRADED SWALE
- OPEN SPACE & LANDSCAPING
- 2:1 SLOPE OR LESS
- AC PAVEMENT
- CONCRETE
- BUILDING
- OFF-SITE
- FLOW ARROW

ABBREVIATIONS

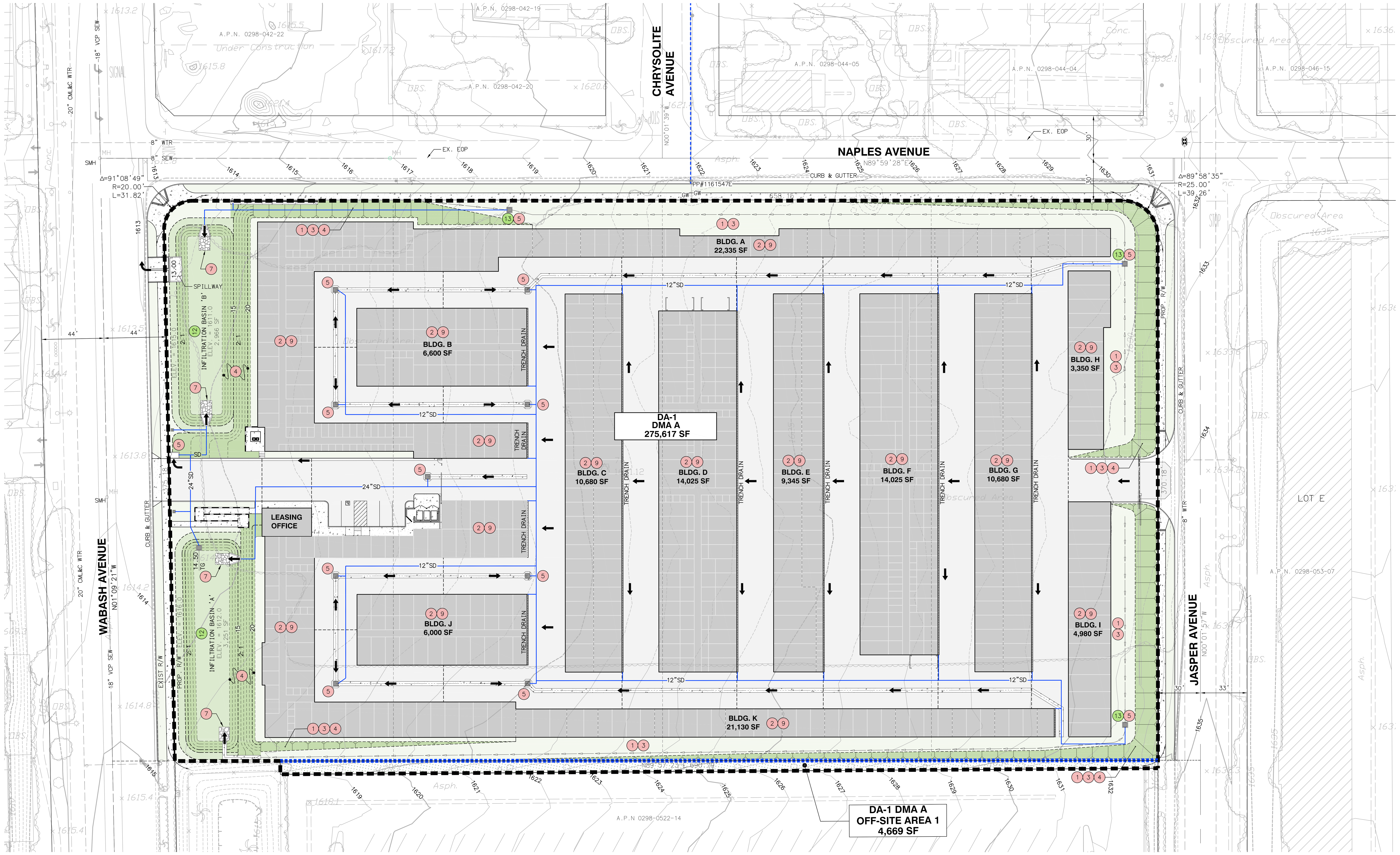
AC	ASPHALT CONCRETE/ACRES
AVE	AVENUE
BLDG.	BUILDING
℄	CENTERLINE
CF	CUBIC FEET
CFS	CUBIC FEET PER SECOND
ELEV	ELEVATION
EX.	EXISTING
L=	LENGTH
MAX.	MAXIMUM
MB	MAP BOOK
MIN.	MINIMUM
PROP.	PROPOSED
R=	RADIUS
SD	STORM DRAIN
SF	SQUARE FEET
TYP	TYPICAL

BENCHMARK
THE BENCHMARK FOR THIS SURVEY IS NGS DESIGNATION 107105, A BRASS DISK LOCATED AT THE SOUTHWEST CORNER OF MENTONE BLDG. AND WABASH AVE.
ELEVATION: 1613.12 FEET (NAVD 88)

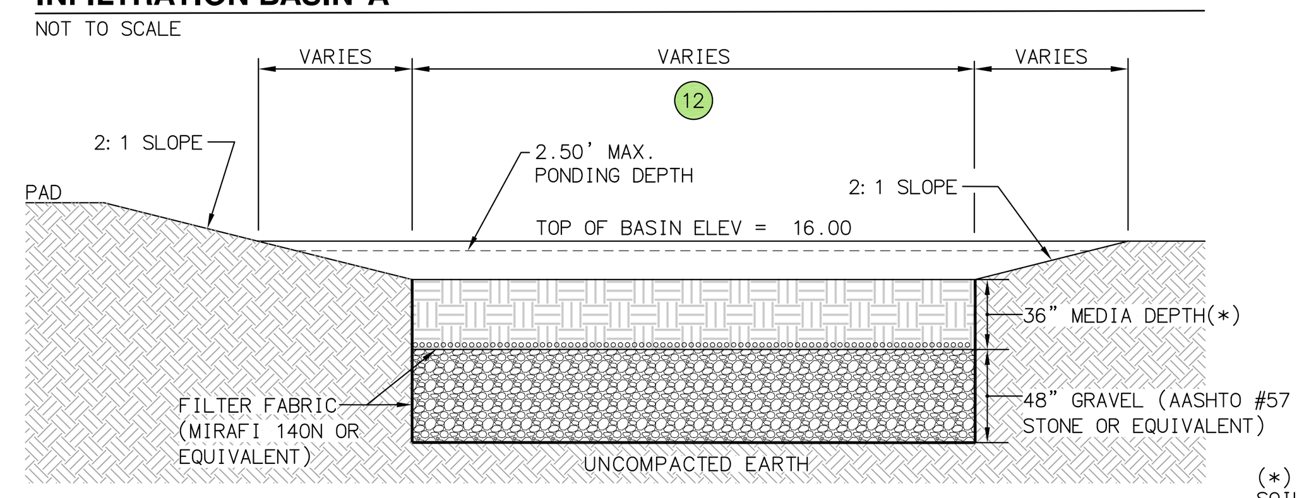
VICINITY MAP
NOT TO SCALE



GRAPHIC SCALE
0 10 20 40 60 80
(IN FEET)
1 INCH =40 FT.



INFILTRATION BASIN 'A'
NOT TO SCALE



INFILTRATION BASIN 'B'
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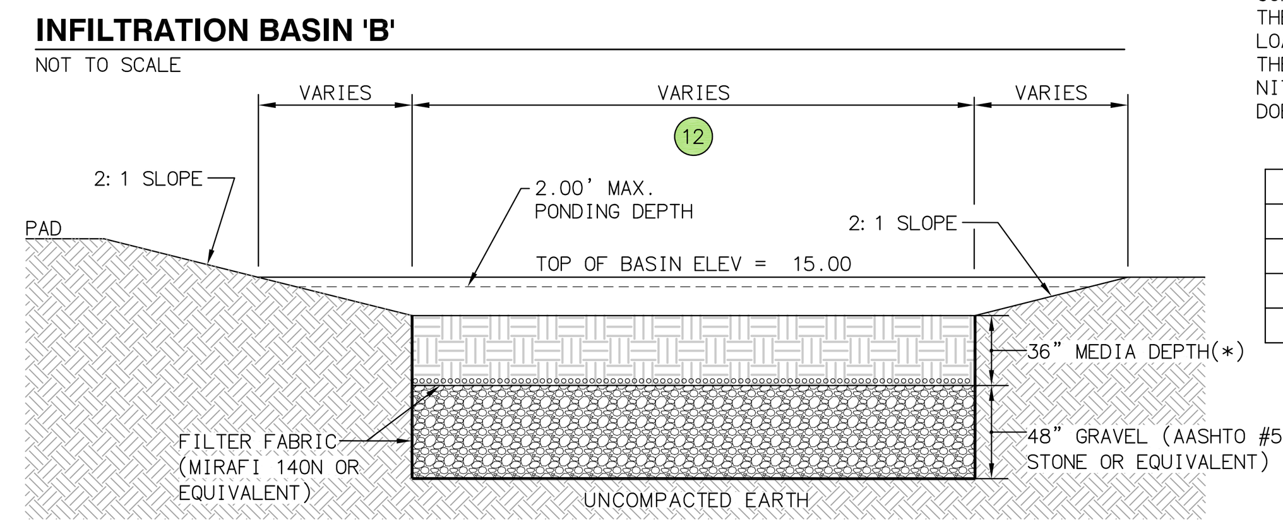
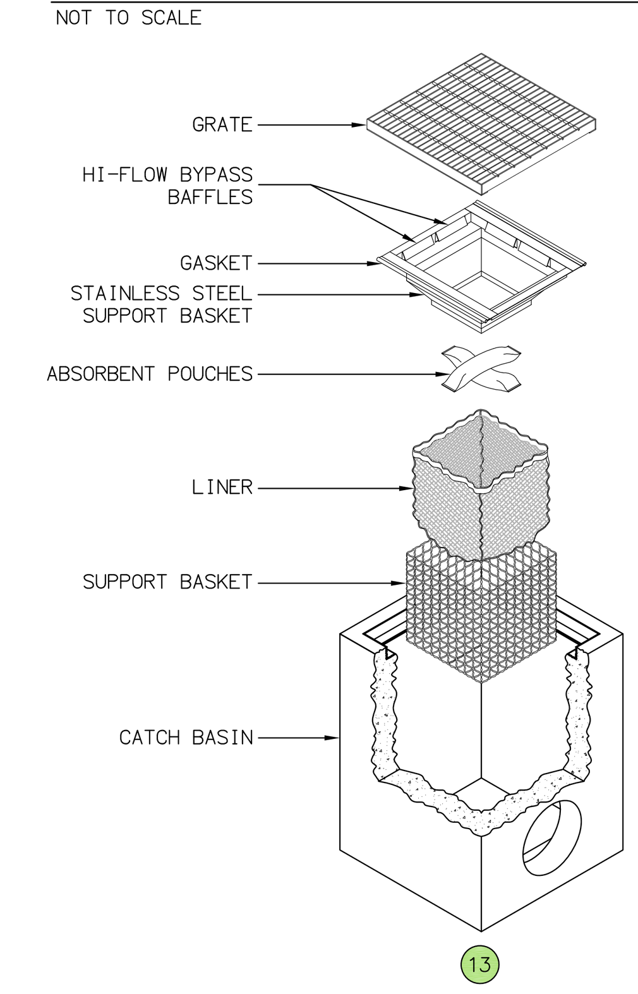


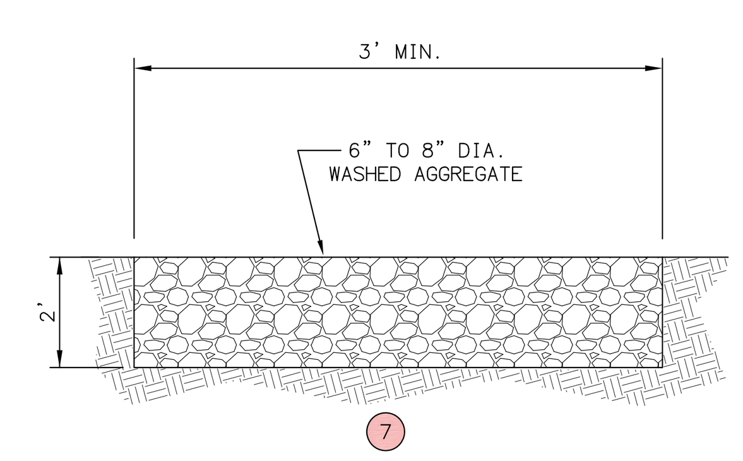
(*) 36" MEDIA DEPTH
SOIL MEDIA SHALL BE COMPRISED OF 85% MINERAL COMPONENT AND 15% ORGANIC COMPONENT, BY VOLUME. THE MINERAL COMPONENT SHALL B A CLASS A SANDY LOAM TOPSOIL THAT MEETS THE RANGE SPECIFIED IN THE TABLE BELOW. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST, SUCH THAT NITROGEN DOES NOT LEACH FROM THE MEDIA.

MINERAL COMPONENT RANGE REQUIREMENTS	
PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

TYPICAL CATCH BASIN WITH INSERT
NOT TO SCALE



ENERGY DISSIPATER
NOT TO SCALE



RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

CITY CLERK
CITY OF REDLANDS
P.O. BOX 3005
REDLANDS, CA 92373

SPACE ABOVE THIS LINE FOR RECORDER'S USE

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE AGREEMENT

Assessor's Parcel Number(s)
APN 0298-051-07

THIS AGREEMENT is made and entered into this _____ day of _____, 20__, by and between Redlands Self Storage ("Owner"), and the City of Redlands, a municipal corporation ("City"). The Owner and the City are sometimes each individually referred to herein as a "Party" and, collectively, as the "Parties."

RECITALS

WHEREAS, the Owner owns real property ("Property") in the City specifically described in Exhibits "A" and "B" which are attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of approval of the Owner's development project commonly known as Redlands Self Storage and filed as Cup XXX (the "Project"), the City required the Project to employ on-site control measures to minimize pollutants in urban stormwater runoff; and

WHEREAS, the Owner has chosen to install an Infiltration Basin and Catch Basin Inserts (the "Devices") to minimize pollutants in urban stormwater runoff; specifically described in Exhibit "C" and shown in Exhibit "D" both of which are attached hereto and incorporated herein by this reference; and

WHEREAS, the Devices have been installed in accordance with plans and specifications approved by the City; and

WHEREAS, the Devices being installed on private property and draining only private property, are private facilities with all maintenance or replacement therefor being the sole responsibility of the Owner; and

WHEREAS, the Owner is aware that periodic and continuous maintenance including, but not necessarily limited to, filter material replacement and sediment removal is required to assure proper performance of the Devices and that such maintenance activity will require compliance with all Federal, State and local laws and regulations, including those pertaining to confined space and waste disposal methods in effect at the time such maintenance occurs;

NOW, THEREFORE, in consideration of the City's approval of the Project and the mutual promises contained herein, the City of Redlands and Redlands Highland agree as follows:

AGREEMENT

1. The Owner hereby provides the City and its designees with full right of access to the Devices and the Owner's Property in the immediate vicinity of the Devices (a) at any time, upon reasonable notice; or (b) in the event of emergency, as determined by the City Engineer with no advance notice; for the purpose of inspecting, sampling and testing of the Devices, and in cases of emergency, to undertake all necessary repairs or other preventative measures at the Owner's expense as provided for in Section 3, below. The City shall make every effort at all times to minimize or avoid interference with the Owner's use of the Property when undertaking such inspections and repairs.

2. The Owner shall diligently maintain the Devices in a manner consistent with the manufacturers' recommended maintenance schedule to ensure efficient performance. All reasonable precautions shall be exercised by the Owner and the Owner's representatives in the removal and extraction of materials from the Devices, and the ultimate disposal of the materials in a manner consistent with all applicable laws. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the materials removed, the quantity and the location of disposal destinations, as appropriate.

3. In the event the Owner fails to perform the necessary maintenance required by this Agreement within thirty (30) days of being given written notice by the City to do so, setting forth with specificity the action to be taken, the City is authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by law, twenty (20) days after the Owner's receipt of the notice of expense until paid in full.

4. This Agreement affects County of San Bernardino Assessor's Parcel No. 0298-051-07 shall be recorded in the Official Records of the County of San Bernardino at the expense of the Owner and shall constitute notice to all successors and assigns to the title to the Property of the obligations herein set forth. This Agreement shall also constitute a lien against the Property in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

5. In event any action is commenced to enforce or interpret any of the terms or conditions of this Agreement the prevailing Party shall, in addition to any costs and other relief, be entitled to

the recovery of its reasonable attorneys' fees, including fees for the use of in-house counsel by a Party.

6. It is the intent of the Parties that the burdens and benefits herein undertaken shall constitute equitable servitudes that run with the Property and shall be binding upon future owners of all or any portion of the Property. Any owner's liability hereunder shall terminate at the time it ceases to be an owner of the encumbered Property, except for obligations which accrue prior to the date of transfer by such owner, which shall remain the personal obligation of such owner.

7. Time is of the essence in the performance of this Agreement.

8. Any notice to a Party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A Party may change notice address only by providing written notice thereof to the other Party.

CITY
City Engineer
City of Redlands
P.O. Box 3005
Redlands, CA 92373

OWNER
Madison Capital Group
450 Newport Center Drive – Suite 250
Newport Beach, CA 92660

9. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

10. Any amendment to this Agreement shall be in writing and approved by the City Council of City and signed by the City and the Owner.

IN WITNESS WHEREOF, the Parties hereto have affixed their signatures as of the date first written above.

CITY OF REDLANDS:

_____
Paul W. Foster, Mayor

OWNER:

_____
Madison Capital Group
450 Newport Center Drive – Suite 250
New Port Beach, CA 92660

Attest:

_____
Jeanne Donaldson, City Clerk

Replace this page with a fully executed Notary Acknowledgment page.

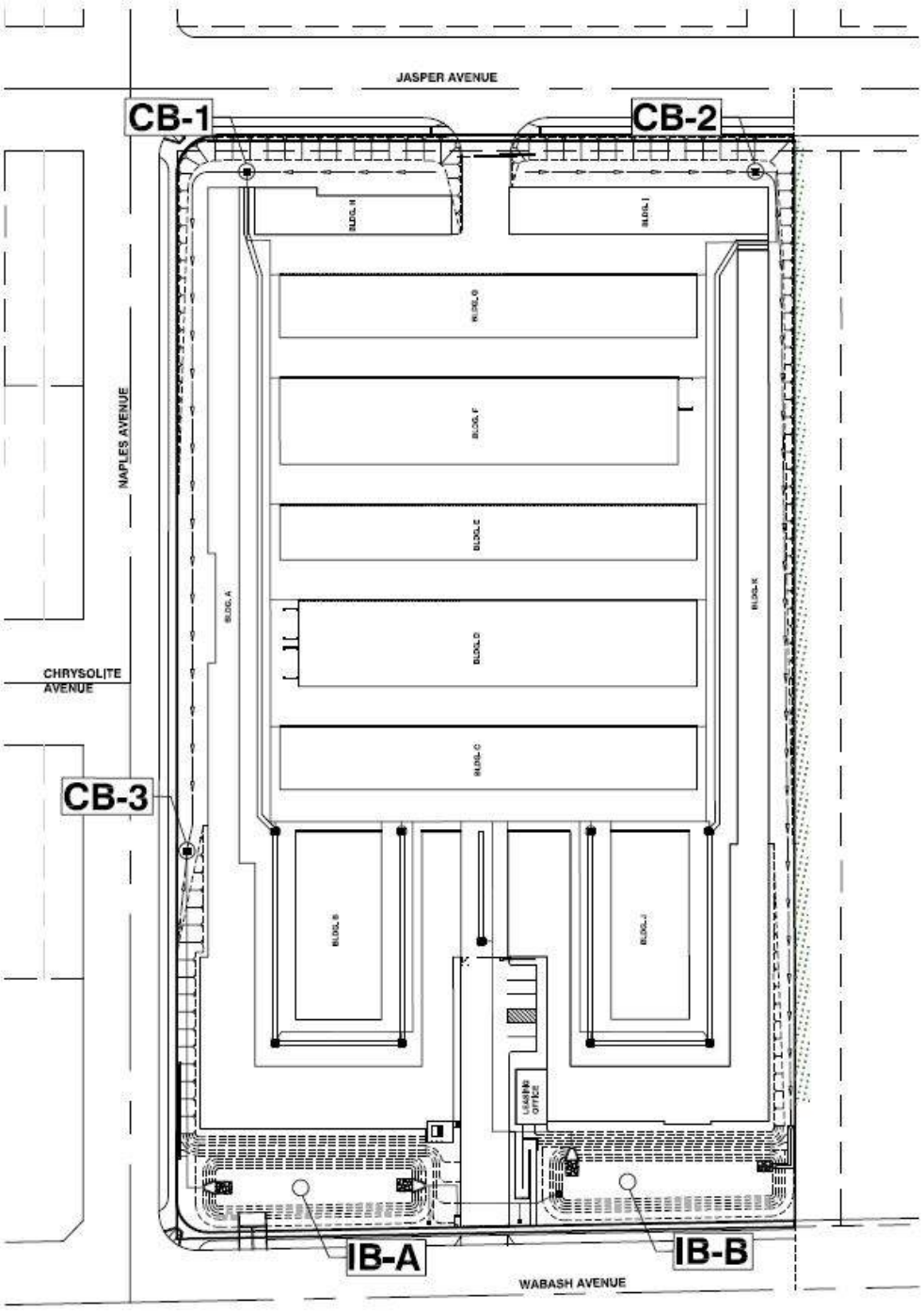
Exhibit "A"
Legal Description

Exhibit "B"
Plat Exhibit

Exhibit C
Stormwater Pollution Control Devices

Stormwater Pollution Control Devices					
BMP #	BMP or Pollution Control Device	Latitude	Longitude	Maintenance Provided By	Frequency
1	Infiltration Basin 'A' IB-A	34.068502	-117138677	CFD	Yearly
2	Infiltration Basin 'B' IB-B	34.068516	-117.138650	CFD	Yearly
3	Catch Basin Insert CB-1	34.068692	-117.136515	CFD	Yearly
4	Catch Basin Insert CB-2	34.067803	-117.136523	CFD	Yearly
5	Catch Basin Insert CB-3	34.068828	-117.137942	CFD	Yearly
6					
7					
8					
9					
10					

Exhibit D
BMP Map



Landscape Maintenance SC-73

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a know in location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

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Drainage System Maintenance SC-74

Photo Credit: Geoff Brosseau

Objectives

- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

Suggested Protocols

Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

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- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Record the amount of waste collected.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect flushed effluent and pump to the sanitary sewer for treatment.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

Open Channel

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies

(SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS

Illicit Connections and Discharges

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections
  - Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).
- The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

Spill Response and Prevention

- Refer to SC-11, Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Cleanup activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.

- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

- Arrangements must be made for proper disposal of collected wastes.

- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

Supplemental Information

Further Detail of the BMP

Storm Drain flushing

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to

cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to re-collect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75 percent for organics and 55-65 percent for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm drain flushing.

Flow Management

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

Stream Corridor Planning

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for steam alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.

Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.

When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to he reclaimed.

Examples

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank aid watershed instability arid floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

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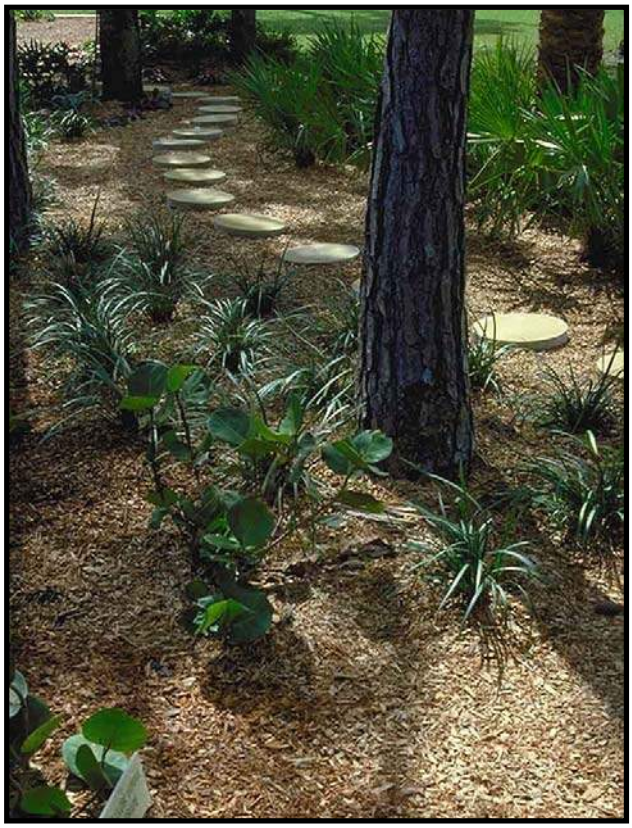
Site Design & Landscape Planning SD-10



Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- ✓ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ✓ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ✓ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING –

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DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Alternative Building Materials SD-21

Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Source Control
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutant
- Collect and Convey

Description

Alternative building materials are selected instead of conventional materials for new construction and renovation. These materials reduce potential sources of pollutants in stormwater runoff by eliminating compounds that can leach into runoff, reducing the need for pesticide application, reducing the need for painting and other maintenance, or by reducing the volume of runoff.

Approach

Alternative building materials are available for use as lumber for decking, roofing materials, home siding, and paving for driveways, decks, and sidewalks.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Decking

One of the most common materials for construction of decks and other outdoor construction has traditionally been pressure treated wood, which is now being phased out. The standard treatment is called CCA, for chromated copper arsenate. The key ingredients are arsenic (which kills termites, carpenter ants and other insects), copper (which kills the fungi that cause wood to rot) and chromium (which reacts with the other ingredients to bind them to the wood). The amount of arsenic is far from trivial. A deck just 8 feet x 10 feet contains more than 1 1/3 pounds of this highly potent poison. Replacement materials include a new type of pressure treated wood, plastic and composite lumber.

There are currently over 20 products in the market consisting of plastic or plastic-wood composites. Plastic lumber is made from 100% recycled plastic, # 2 HDPE and polyethylene plastic milk jugs

and soap bottles. Plastic-wood composites are a combination of plastic and wood fibers or sawdust. These materials are a long lasting exterior weather, insect, and chemical resistant wood lumber replacement for non structural applications. Use it for decks, docks, raised garden beds and planter boxes, pallets, hand railings, outdoor furniture, animal pens, boat decks, etc.

New pressure treated wood uses a much safer recipe, ACQ, which stands for ammoniacal copper quartenary. It contains no arsenic and no chromium. Yet the American Wood Preservers Association has found it to be just as effective as the standard formula. ACQ is common in Japan and Europe.

Roofing

Several studies have indicated that metal used as roofing material, flashing, or gutters can leach metals into the environment. The leaching occurs because rainfall is slightly acidic and slowly dissolved the exposed metals. Common traditional applications include copper sheathing and galvanized (zinc) gutters.

Coated metal products are available for both roofing and gutter applications. These products eliminate contact of bare metal with rainfall, eliminating one source of metals in runoff. There are also roofing materials made of recycled rubber and plastic that resemble traditional materials.

A less traditional approach is the use of green roofs. These roofs are not just green, they're alive. Planted with grasses and succulents, low- profile green roofs reduce the urban heat island effect, stormwater runoff, and cooling costs, while providing wildlife habitat and a connection to nature for building occupants. These roofs are widely used on industrial facilities in Europe and have been established as experimental installations in several locations in the US, including Portland, Oregon. Their feasibility is questionable in areas of California with prolonged, dry, hot weather.

Paved Areas

Traditionally, concrete is used for construction of patios, sidewalks, and driveways. Although it is non-toxic, these paved areas reduce stormwater infiltration and increase the volume and rate of runoff. This increase in the amount of runoff is the leading cause of stream channel degradation in urban areas.

There are a number of alternative materials that can be used in these applications, including porous concrete and asphalt, modular blocks, and crushed granite. These materials, especially modular paving blocks, are widely available and a well established method to reduce stormwater runoff.

Building Siding

Wood siding is commonly used on the exterior of residential construction. This material weathers fairly rapidly and requires repeated painting to prevent rotting. Alternative “new” products for this application include cement-fiber and vinyl. Cement-fiber siding is a masonry product made from Portland cement, sand, and cellulose and will not burn, cup, swell, or shrink.

Pesticide Reduction

A common use of powerful pesticides is for the control of termites. Chlordane was used for many years for this purpose and is now found in urban streams and lakes nationwide. There are a

number of physical barriers that can be installed during construction to help reduce the use of pesticides.

Sand barriers for subterranean termites are a physical deterrent because the termites cannot tunnel through it. Sand barriers can be applied in crawl spaces under pier and beam foundations, under slab foundations, and between the foundation and concrete porches, terraces, patios and steps. Other possible locations include under fence posts, underground electrical cables, water and gas lines, telephone and electrical poles, inside hollow tile cells and against retaining walls.

Metal termite shields are physical barriers to termites which prevent them from building invisible tunnels. In reality, metal shields function as a helpful termite detection device, forcing them to build tunnels on the outside of the shields which are easily seen. Metal termite shields also help prevent dampness from wicking to adjoining wood members which can result in rot, thus making the material more attractive to termites and other pests. Metal flashing and metal plates can also be used as a barrier between piers and beams of structures such as decks, which are particularly vulnerable to termite attack.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

There are no good, independent, comprehensive sources of information on alternative building materials for use in minimizing the impacts of stormwater runoff. Most websites or other references to "green" or "alternative" building materials focus on indoor applications, such as formaldehyde free plywood and low VOC paints, carpets, and pads. Some supplemental information on alternative materials is available from the manufacturers.

Fires are a source of concern in many areas of California. Information on the flammability of alternative decking materials is available from the University of California Forest Product Laboratory (UCFPL) website at: http://www.ucfpl.ucop.edu/WDDeckIntro.htm

Infiltration Basin TC-11

Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff. Infiltration facilities store runoff until it gradually exfiltrates through the soil and eventually into the water table. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems. Infiltration basins can be challenging to apply on many sites, however, because of soils requirements. In addition, some studies have shown relatively high failure rates compared with other management practices.

Targeted Constituents

✓	Sediment	■
✓	Nutrients	■
✓	Trash	■
✓	Metals	■
✓	Bacteria	■
✓	Oil and Grease	■
✓	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

California Experience

Infiltration basins have a long history of use in California, especially in the Central Valley. Basins located in Fresno were among those initially evaluated in the National Urban Runoff Program and were found to be effective at reducing the volume of runoff, while posing little long-term threat to groundwater quality (EPA, 1983; Schroeder, 1995). Proper siting of these devices is crucial as underscored by the experience of Caltrans in siting two basins in Southern California. The basin with marginal separation from groundwater and soil permeability failed immediately and could never be rehabilitated.

Advantages

- Provides 100% reduction in the load discharged to surface waters.
- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a

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significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.

- If the water quality volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

Limitations

- May not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration basins once clogged.

Design and Sizing Guidelines

- Water quality volume determined by local requirements or sized so that 85% of the annual runoff volume is captured.
- Basin sized so that the entire water quality volume is infiltrated within 48 hours.
- Vegetation establishment on the basin floor may help reduce the clogging rate.

Construction/Inspection Considerations

- Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabililized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete.
- Place excavated material such that it can not be washed back into the basin if a storm occurs during construction of the facility.
- Build the basin without driving heavy equipment over the infiltration surface. Any equipment driven on the surface should have extra-wide (“low pressure”) tires. Prior to any construction, rope off the infiltration area to stop entrance by unwanted equipment.
- After final grading, till the infiltration surface deeply.
- Use appropriate erosion control seed mix for the specific project and location.

Performance

As water migrates through porous soil and rock, pollutant attenuation mechanisms include precipitation, sorption, physical filtration, and bacterial degradation. If functioning properly, this approach is presumed to have high removal efficiencies for particulate pollutants and moderate removal of soluble pollutants. Actual pollutant removal in the subsurface would be expected to vary depending upon site-specific soil types. This technology eliminates discharge to surface waters except for the very largest storms; consequently, complete removal of all stormwater constituents can be assumed.

There remain some concerns about the potential for groundwater contamination despite the findings of the NURP and Nightingale (1975; 1987a,b,c; 1989). For instance, a report by Pitt et al. (1994) highlighted the potential for groundwater contamination from intentional and unintentional stormwater infiltration. That report recommends that infiltration facilities not be sited in areas where high concentrations are present or where there is a potential for spills of toxic material. Conversely, Schroeder (1995) reported that there was no evidence of groundwater impacts from an infiltration basin serving a large industrial catchment in Fresno, CA.

Siting Criteria

The key element in siting infiltration basins is identifying sites with appropriate soil and hydrogeologic properties, which is critical for long term performance. In one study conducted in Prince George's County, Maryland (Galli, 1992), all of the infiltration basins investigated clogged within 2 years. It is believed that these failures were for the most part due to allowing infiltration at sites with rates of less than 0.5 in/hr, basing siting on soil type rather than field infiltration tests, and poor construction practices that resulted in soil compaction of the basin invert.

A study of 23 infiltration basins in the Pacific Northwest showed better long-term performance in an area with highly permeable soils (Hilding, 1996). In this study, few of the infiltration basins had failed after 10 years. Consequently, the following guidelines for identifying appropriate soil and subsurface conditions should be rigorously adhered to.

- Determine soil type (consider RCS soil type ‘A, B or C’ only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30% clay or more than 40% of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.

- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.

- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15% should not be considered.

- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.

- Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.

- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.

- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.

- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Additional Design Guidelines

(1) Basin Sizing - The required water quality volume is determined by local regulations or sufficient to capture 85% of the annual runoff.

(2) Provide pretreatment if sediment loading is a maintenance concern for the basin.

(3) Include energy dissipation in the inlet design for the basins. Avoid designs that include a permanent pool to reduce opportunity for standing water and associated vector problems.

(4) Basin invert area should be determined by the equation:

$$A = \frac{WQV}{kt}$$

where A = Basin invert area (m^2)

WQV = water quality volume (m^3)

k = 0.5 times the lowest field-measured hydraulic conductivity (m/hr)

t = drawdown time (48 hr)

(5) The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).

Maintenance

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Inspections and maintenance to ensure.
- Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time has been obtained.
- Schedule semiannual inspections for beginning and end of the wet season to identify potential problems such as erosion of the basin side slopes and invert, standing water, trash and debris, and sediment accumulation.
- Remove accumulated trash and debris in the basin at the start and end of the wet season.
- Inspect for standing water at the end of the wet season.
- Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin.
- If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.
- To avoid reversing soil development, scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a very light tractor.

Cost

Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. One study estimated the total construction cost at about $2 per ft (adjusted for inflation) of storage for a 0.25-acre basin (SWRPC, 1991). As with other BMPs, these published cost estimates may deviate greatly from what might be incurred at a specific site. For instance, Caltrans spent about $18/ft^3 for the two infiltration basins constructed in southern California, each of which had a water quality volume of about 0.34 ac.-ft. Much of the higher cost can be attributed to changes in the storm drain system necessary to route the runoff to the basin locations.

Infiltration basins typically consume about 2 to 3% of the site draining to them, which is relatively small. Additional space may be required for buffer, landscaping, access road, and fencing. Maintenance costs are estimated at 5 to 10% of construction costs.

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly maintained, infiltration basins have a high failure rate. Thus, it may be necessary to replace the basin with a different technology after a relatively short period of time.

References and Sources of Additional Information

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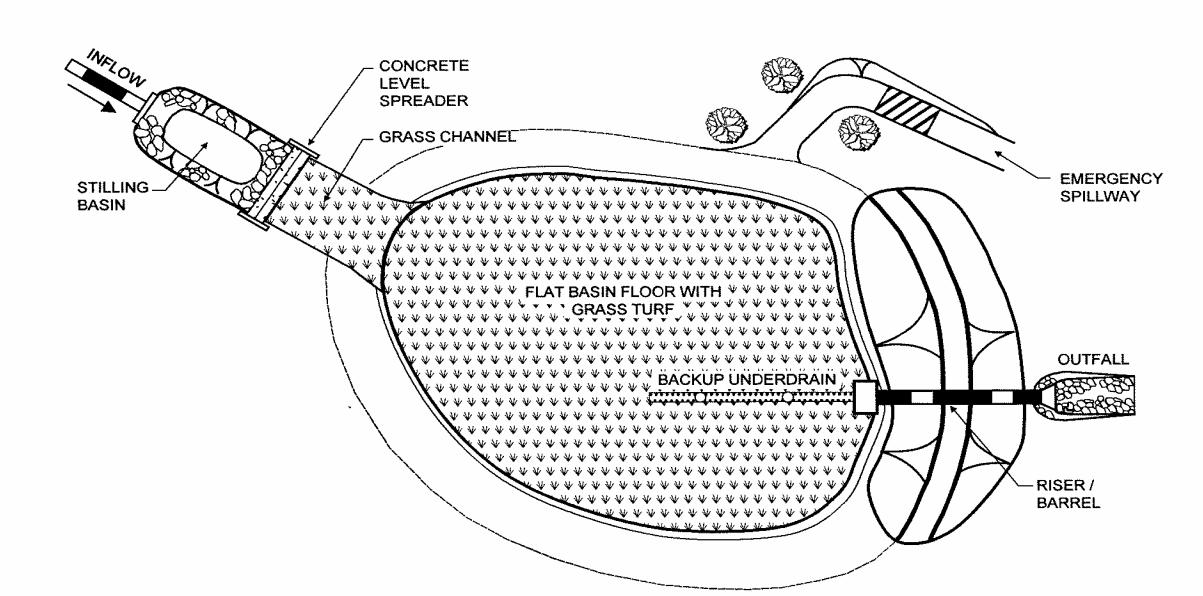
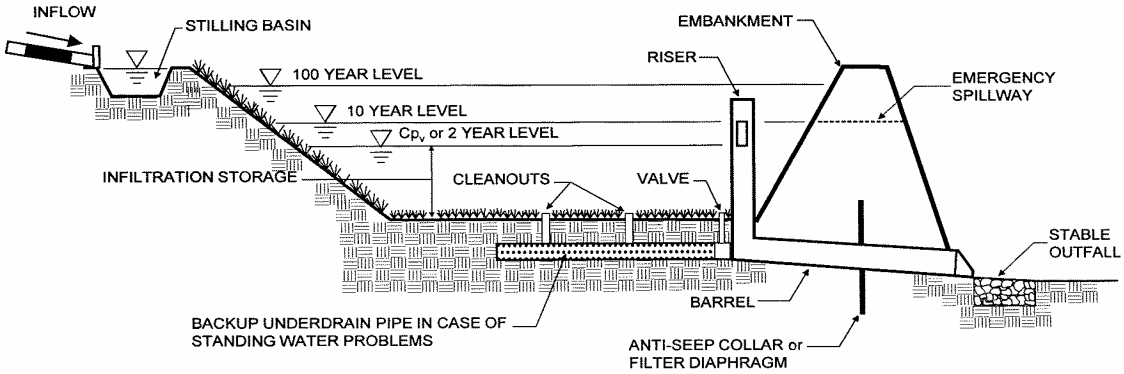


PLAN VIEW



PROFILE

Drain Inserts MP-52

Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer's guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals
- Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

CASQA California Stormwater Quality Association

one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

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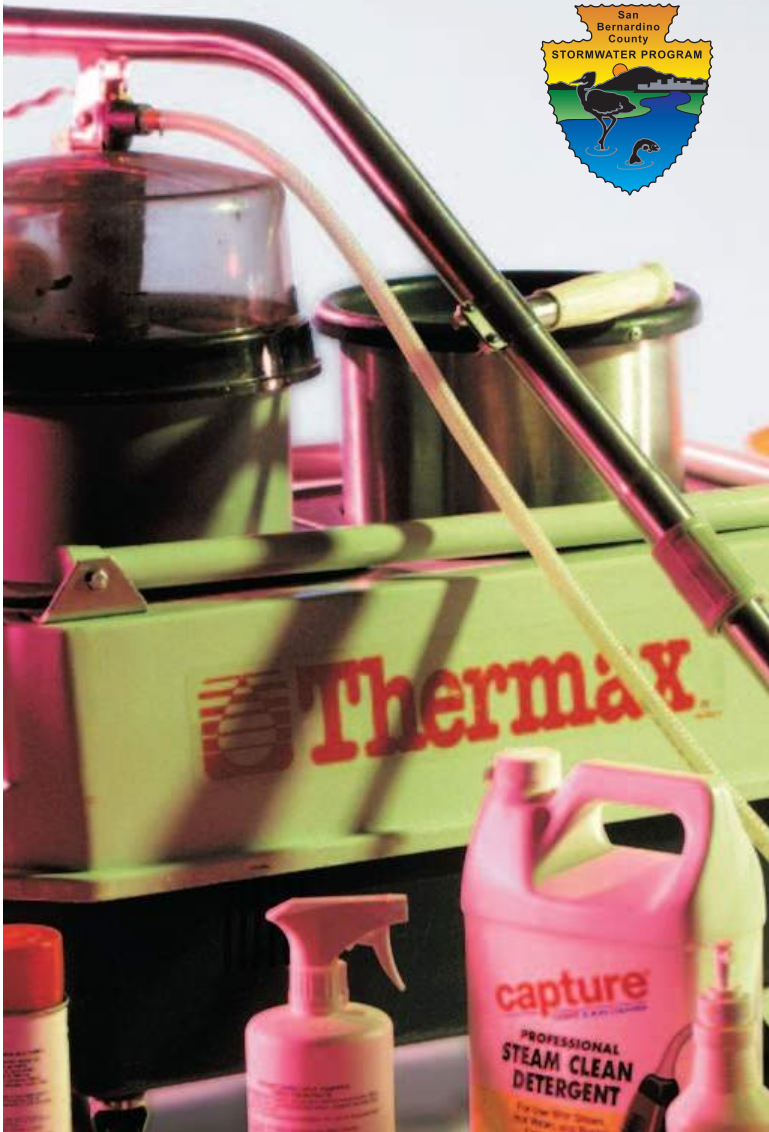
STORMWATER Pollution Prevention

CARPET CLEANING ACTIVITIES



STORMWATER Pollution Prevention

Stormwater Management Practices for Carpet Cleaning Activities

Toxic chemicals and discharged waste water from carpet, drapery, furniture and window cleaning often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

These guidelines apply even if the cleaning products are labeled "nontoxic" or "biodegradable". Although these products may be less harmful to the environment, they can still have harmful effects if they enter the storm drain untreated.

Dispose of Wastewater Properly
Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer system within sanitary sewer discharge limits, hauled off and disposed of properly, or may be discharged to a pervious area, for example, a lawn area, as long as it does not overflow into the street, gutter, parking lot or storm drain. Wastewater should never be discharged into a street, gutter, parking lot or storm drain.

Filter Wastewater
Carpet cleaning wastewater should be filtered before discharging it to the sanitary sewer since fibers and other debris in the wastewater can clog pipes. The filtered material can be disposed of in the garbage, provided that the waste is not contaminated with hazardous pollutants.

To report illegal dumping call
(877) WASTE18
or visit our website:
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

WASH YOUR CAR THE ECO-FRIENDLY WAY!

When possible, wash in a professional car wash.

1. **Locate** the nearest storm drain and ensure that wash water does not flow into it.

2. **Wash** in a contained area or on grass*, gravel or other permeable surface. Dispose of excess soapy water into the sanitary sewer *(ie. sink or toilet)* or onto grass.

3. **Use** eco-friendly cleaning products (*non-toxic, phosphate free or biodegradable*). Use as little soap as possible and wipe brake dust off tires with a rag before washing.

4. **Conserve** water by using a high pressure hose and turn off the water when not in use.

**Some local ordinances may not allow a car to be parked on the front lawn. Check with your City's Building and Code department if you are unsure.*

How Does Eco Car Washing Help Local Waterways?

When excess wash water travels through the street it has the potential to pick up oil, grease and other chemicals along the way before it ends up in the curb, gutter and the storm drain system. **This contaminated water then travels to our creeks and the Santa Ana River making it unsafe for people and wildlife.**

To report illegal dumping, call **(877) WASTE18** or visit **sbcountystormwater.org**
To find a Hazardous Waste Facility, call **(800) OILY CAT**

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¡LAVE SU AUTO DE MANERA ECOLÓGICA!

Cuando sea posible, lávelo en un lavadero profesional de autos.

1. **Ubique** el desagüe pluvial más cercano y asegúrese de que nada pueda entrar en él que pueda descargarse allí.

2. **Lave** su auto sobre el cesped, grava u otras superficies permeables. Elimine el exceso de agua jabonosa en un drenaje sanitario *(por ejemplo, lavamanos o inodoro)* o en el césped.

3. **Use** productos de limpieza ecológicos *(no tóxicos, sin fosfato o biodegradables)*. Use la menor cantidad de jabón posible y limpie el polvo de frenos de los neumáticos con un trapo antes de lavar.

4. **Conserve** agua usando una manguera de alta presión y cierre el agua cuando no la use.

** Es posible que algunas ordenanzas locales no permitan estacionar sobre el césped en el frente de la casa. Consulte con el departamento de Código Urbano y Edificación de su ciudad si no está seguro.*

¿De qué Manera el Lavado de Autos Ecológico Ayuda a Proteger los Canales Fluviales Locales?

Cuando el exceso de agua de lavado viaja por la calle, es posible que recoja aceite, grasa y otros elementos químicos en el camino antes de que llegue en el desagüe pluvial y el sistema de la boca de tormenta. **Esa agua contaminada luego viaja hacia nuestros arroyos y al Río Santa Ana, haciendo que sea inseguro para la gente y los animales.**

Para reportar actividades ilegales, llame a **(877) WASTE18** o visite **sbcountystormwater.org**. Para encontrar un establecimiento de Desechos Peligrosos, llame al **(800) OILY CAT**

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Pool Discharge Tips

Maintain your pool properly and help protect the environment

DID YOU KNOW?

Routine swimming pool maintenance generates a variety of wastes such as cleaning wastewater, filter back-wash residues, biocides and acid washes that can contribute to stormwater pollution. Chlorine and other pool chemicals can harm our waterways when they are discharged improperly.

Share these good housekeeping practices with your pool service personnel to keep pollutants out of our waterways:

HOLD IT BEFORE YOU DRAIN IT.

- De-chlorinate the water before draining the pool to the storm drain.
- Consult with your pool contractor before de-chlorinating the pool to learn about your options.

IMPORTANT:

- Dispose of filter backwash solids in the trash or landscape area.
- Neutralize acid washes before discharging to the sewer. Do not discharge to the storm drain.

SHUT: Shut off the chlorination system or stop adding chlorine.

HOLD: Hold the water in the pool for at least 5 days or add a de-chlorinating agent.

TEST: Use a pool testing kit to ensure the level of chlorine is at 0.1ppm before discharging the water.

- Make sure all debris is removed and chemicals are dissipated.
- pH of pool water should be between 6.5 and 8.5 before discharging.
- Make sure the water is free of any discoloration, mosquitoes, dirt or algae.

DRAIN: Check with your city for local requirements before discharging your pool to the storm drain or sewer.

- **Alternative 1:** Sanitary Sewer — Some cities allow pools to be drained to the sanitary sewer during non-peak hours.
- **Alternative 2:** Lawn or Garden — Discharge the pool water through the lawn or garden. The flow should be controlled to prevent erosion problems or the water entering a neighbor's property.
- **For Saltwater Pools:** Saltwater pools should only be drained to the sewer or hauled away.

To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org

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Consejos para Vaciar su Piscina

Conserve su piscina en buen estado y ayude a proteger el medio ambiente

¿Sabía que...?

El mantenimiento de la piscina genera desechos, como las aguas residuales de limpieza, los residuos del agua estancada de los filtros y los lavados al ácido y otros químicos, que pueden contribuir a la contaminación de las aguas en las alcantarillas. El cloro y otros productos químicos para piscinas pueden dañar el medio ambiente cuando se desechan de manera inadecuada.

Comparta estas buenas prácticas de limpieza con su personal de servicio de piscinas para mantener las alcantarillas libres de contaminantes:

ESPERE ANTES DE VACIAR.

- Debe eliminar el cloro del agua antes de vaciar la piscina en las alcantarillas.
- Consulte con su contratista de piscina para obtener más información sobre sus opciones.

IMPORTANTE:

- Deseche los sólidos del agua estancada de los filtros en la basura o en el jardín.
- Neutralice los lavados al ácido antes de vaciarlos en la alcantarilla. No deseche nada contaminante en las alcantarillas.

CORTAR:

Corte el sistema de cloración o deje de agregar cloro.

CONSERVAR:

Conserve el agua en la piscina 5 días o agregue un agente de descloración.

PROBAR:

Utilice un equipo de pruebas para piscinas con el fin de asegurar que el nivel de cloro esté en 0.1ppm antes de vaciar el agua.

- Asegúrese de retirar todos los desechos y disipar los químicos.
- El pH del agua de la piscina debe estar entre 6.5 y 8.5 antes del vaciado.
- Asegúrese de que el agua no contenga contaminacion, zancudos, suciedad o algas.

VACIAR:

Verifique los requisitos locales de su ciudad antes de vaciar su piscina en el desagüe de las alcantarillas.

- **Alternativa 1:** Drenaje Sanitario — Algunas ciudades permiten que las piscinas se vacíen en el drenaje sanitario.
- **Alternativa 2:** Césped o Jardín — Vacíe el agua de la piscina en el césped o jardín. Se debe controlar la corriente de agua para evitar problemas de erosión o que el agua entre en la propiedad del vecino.
- **Para las Piscinas de Agua Salada:** Estas piscinas solo se deben ser vaciados en la alcantarilla o se debe transportar el agua y los residuos a algún lugar adecuado.

Para reportar desechos ilegales, comuníquese al (877) WASTE18 o visite sbcountystormwater.org
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WISHFUL THINKING...

UNTIL THIS IS A REALITY,

PLEASE PICK UP AFTER YOUR PET.

San Bernardino County STORMWATER PROGRAM

sbcountystormwater.org
or (877) WASTE18

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MOBILE VEHICLE CLEANING & MAINTENANCE

DISCHARGE INTO THE STORM DRAIN, **ACCIDENTAL OR NOT,**
CAN LEAD TO ENFORCEMENT ACTIONS, WHICH CAN INCLUDE FINES.

These best management practices will help you **prevent polluted water and other materials from flowing into the street, gutter and storm drain.**

WASH WATER DISPOSAL

- When washing items contaminated by hazardous materials, wash water should be collected and hauled off-site for proper disposal.
- Wash in customers wash bay or pump wastewater to the wash bays' pretreatment system.

Engine cleaning must be performed at a facility that has the equipment to properly process the contaminated wash water runoff.

HAZARDOUS WASTE SPILL CLEAN-UP & DISPOSAL

- If a spill occurs, use an absorbent material such as kitty litter or absorbent pads.
- Clean up the excess. Properly dispose of absorbent material used to clean up spills - contact an approved hauler for assistance/disposal. Sweep work area thoroughly after cleaning.
- Keep toxics out of the trash by disposing of them properly, this includes absorbent materials used to clean up toxic waste spills. Toxic materials may include used motor oil and oil filters, antifreeze, batteries and gasoline. Make sure to maintain hauling records for all hazardous waste.

To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org
To report toxic spills call (800) 33 TOXIC
To dispose of hazardous waste, call the CUPA Program (909) 386-8401

sbcountystormwater.org

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Regulatory information

The Federal Water Pollution Control Act prohibits the discharge of any pollutant to navigable waters from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 passage of the Water Quality Act established NPDES permit requirements for discharges of storm water. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

Industrial facilities and construction sites are regulated by the Regional Water Quality Control Board and State Water Resources Control Board, through general storm water permits. Most industrial, manufacturing or transportation businesses that store materials, products or equipment outdoors, or conduct vehicle washing or process operations outdoors are required to obtain coverage under the State Water Resources Control Board's General Industrial Activities Stormwater Permit. For more information about this permit, visit www.swrcb.ca.gov/stormwtr/industrial.html or contact your local storm water coordinator.

If your business conducts construction activities, including clearing, grading, stockpiling or excavation that results in soil disturbances of at least one acre, you are subject to the State Water Resources Control Board's General Construction Activities Stormwater Permit. To find out more about this storm water permit for construction, visit: www.swrcb.ca.gov/stormwtr/construction.html.

Cities and counties are regulated through permits issued by the Regional Boards. Since 1990, operators of large storm drain systems such as San Bernardino County's have been required to:

- Develop a storm water management program designed to prevent harmful pollutants from being dumped or washed by storm water runoff, into the storm water system, then discharged into local water bodies; and
- Obtain a National Pollutant Discharge Elimination System (NPDES) permit.

The NPDES permit programs in California are administered by the State Water Resources Control Board and by nine regional boards that issue NPDES permits and enforce regulations within their respective region.

San Bernardino County lies within the jurisdiction of the Santa Ana Region. This regional board issues a permit to the San Bernardino County Permittees, which includes the County of San Bernardino, San Bernardino County Flood Control District and incorporated cities of San Bernardino County. Since the program's inception, the County of San Bernardino has served as the principal permittee.

Documents & reports:

The following documents describe the regulations and programs for water quality in San Bernardino County. You can review the latest Basin Plan, National Pollutant Discharge Elimination System (NPDES) Permit and Drainage Area Management Plan (DAMP).

- **Basin Plans:** The document for each region of the State Water Quality Board's jurisdiction, including Santa Ana, is the Water Quality Control Plan, commonly referred to as the Basin Plan. It is the foundation for the regulatory programs of each regional board. The Basin Plan documents the beneficial uses of the region's ground and surface waters, existing water quality conditions, problems, and goals, and actions by the regional board and others that are necessary to achieve and maintain water quality standards.

▶Water Control Plan for the Santa Ana River Basin

- **Municipal National Pollutant Discharge Elimination System (NPDES) Permits:** The permits of each region outline additional steps for a storm water management program and specify requirements to help protect the beneficial uses of the receiving waters. They require permittees to develop and implement Best Management Practices (BMPs) to control/reduce the discharge of pollutants to waters of the United States to the maximum extent practicable (MEP).

  ▶Santa Ana Regional Water Quality Control Board Municipal NPDES Permit Order No. R8-2002-0012

- **Report of Waste Discharge:** The Report of Waste Discharge (ROWD) describes the San Bernardino Stormwater Program, implemented by the County and cities to comply with their jointly held stormwater permit. It is the principle policy and guidance document for the NPDES Stormwater Program.

  ▶Report of Waste Discharge 2000

- **San Bernardino County Storm Water Program Annual Status Report:** The Annual Status Report is a requirement of the NPDES permit for submittal to the Regional Boards and United States Environmental Protection Agency. The report presents an analysis and assessment of permit compliance activities.

▶Annual report - will be posted soon

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

IT'S A WIN WIN
FOR A FREE RAIN BARREL

Be part of the solution and join the great giveaway!

Sign up for San Bernardino County Stormwater's e-newsletter for a chance to win this FREE rain barrel (estimated value: $125 dollars).

Note: we will not share, sell or otherwise distribute email addresses to other organizations or companies.

EVERY DROP COUNTS!

Safely capture rainwater on your property and then reuse it for your home's irrigation. Join others in saving on water expenses and preserving our local waterways.

PICK UP
After Your Pet!

Protect the health of your pet and the environment

For more information about current campaigns visit **sbcountystormwater.org/dog**

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WHY IT MATTERS

PROTECT
YOUR FAMILY AND YOUR PET

- Dog waste can infect children and adults with disease-causing bacteria and parasites.
- Your dog can get infected from the waste of other dogs.

PROTECT
OUR ENVIRONMENT

Leaving dog waste on the streets or on your property can have a negative impact on water quality. Pet waste that's not disposed of properly flows untreated through the storm drain system and directly into our local water bodies. Pet waste is a pollutant that contains nutrients, parasites and bacteria that can affect the quality of our rivers and the ocean and make the water unsafe for swimming, drinking or fishing.

BAG IT AND TRASH IT

It's that simple to protect our health and the environment!

- Keep a supply of bags near your dog leash or tie them to the leash
- Use a poop scooper
- Bring several plastic bags with you
- Reuse plastic grocery bags or purchase special doggie waste bags at pet supplies stores
- Make sure your pet's waste gets into a trash can

Encourage your neighbors and other pet owners to do the right thing and pick up after their pets.




¡RECOJA los desechos de sus mascotas!

Proteja la salud de su mascota y el medio ambiente

Si desea más información, visite
sbcountystormwater.org/dog

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POR QUÉ ES IMPORTANTE

PROTEJA
A SU FAMILIA Y A SU MASCOTA

- Los desechos de los perros pueden infectar a niños y adultos con enfermedades causadas por bacterias y parásitos.
- Su perro puede contraer una infección de los desechos de otros perros.

PROTEJA
EL MEDIO AMBIENTE

Dejar desechos de perros en la calle o en su propiedad puede tener un impacto negativo en la calidad del agua. Los desechos de mascotas que no se eliminan de la propiedad fluyen sin tratamiento por el sistema de drenaje de tormentas y llegan directamente a las masas de agua locales. Los desechos de mascotas son agentes contaminantes que contienen nutrientes, parásitos y bacterias que pueden afectar la calidad de nuestros ríos y océanos, y hacer que el agua no sea segura para nadar, beber o pescar.

COLÓQUELA EN UNA BOLSA Y TÍRELA EN LA BASURA

Así de simple es proteger nuestra salud y el medio ambiente.

- Guarde algunas bolsas cerca de la correa de su perro o átelas a la correa;
- Use una cuchara para recojer el desecho;
- Lleve varias bolsas plásticas;
- Reutilice bolsas plásticas de comestibles o compre bolsas especiales para desechos de perros en las tiendas para mascotas;
- Asegúrese de tirar los desechos de su perro en un cesto de basura.

Aliente a sus vecinos y otros dueños de mascotas a hacer lo correcto y levantar los desechos de sus mascotas.




WE DID IT OURSELVES AND WE DID IT RIGHT

When painting your home, protect your family and community.

- **PAINTS** that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- **SAFELY** dispose of unwanted paint. The County of San Bernardino offers 9 HHW Centers that accept paint and other toxic waste FREE of charge.

To report illegal dumping, call
(877) WASTE18 or visit
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

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LO HICIMOS NOSOTROS MISMOS
Y LO HICIMOS BIEN

Cuando pinte su casa, proteja a su familia y a su comunidad.

- **PINTURAS** a base de agua son menos tóxicas y debe de utilizarlas cuando sea posible.
- **BROCHAS** a base de agua deben ser lavadas en el lavabo. Esas con pintura a base de aceite deben ser limpiadas con disolvente.
- **SANAMENTE** deshágase de la pintura que no necesita. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pintura y otros desechos tóxicos GRATUITAMENTE.

Para reportar actividades ilegales llamar al
(877) WASTE18 o visite
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

WE DID IT OURSELVES AND WE DID IT RIGHT

When painting your home, protect your family and community.

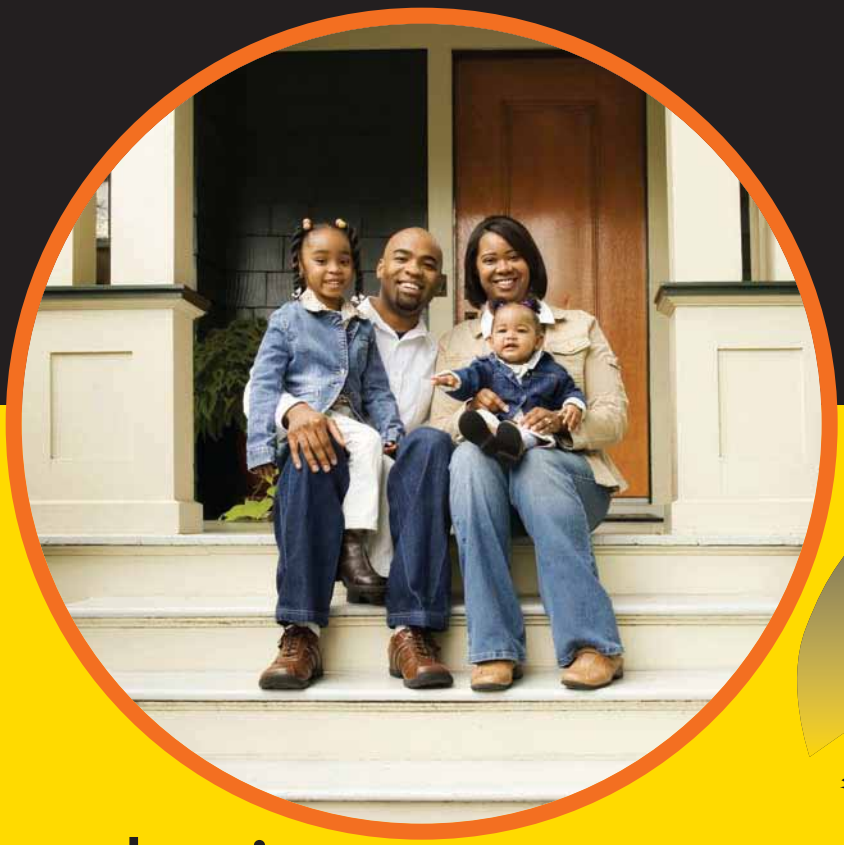
- **PAINTS** that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- **SAFELY** dispose of unwanted paint. The County of San Bernardino offers 9 HHW Centers that accept paint and other toxic waste FREE of charge.

To report illegal dumping, call
(877) WASTE18 or visit
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

LO HICIMOS NOSOTROS MISMOS
Y LO HICIMOS BIEN



Cuando pinte su casa, proteja a su familia y a su comunidad.

- **PINTURAS** a base de agua son menos tóxicas y debe de utilizarlas cuando sea posible.
- **BROCHAS** a base de agua deben ser lavadas en el lavabo. Esas con pintura a base de aceite deben ser limpiadas con disolvente.
- **SANAMENTE** deshágase de la pintura que no necesita. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pintura y otros desechos tóxicos GRATUITAMENTE.

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Paint SAFELY

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Pinte De Manera

SANA

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Mobile vehicle maintenance

Wash in a designated area that has been bermed up to contain the wash water.

Common water control devices are: recycling systems; pretreatment or sewer discharge systems; limited recycling systems; wash pits(portable vinyl wash pads), vacuum sludge filtering systems; wet-dry vacuums, sump pumps; drain covers; portable dams; vacu-brooms; oil absorbent pads, booms, pillows, and tubes; plastic sheeting; filter tubs; buckets; pans; and squeegees.

When cleaning engines using chemical additives like soaps, solvents or degreasers, the cleaning must be performed at a facility that has the equipment to properly process the contaminated wastewater runoff, or using a leak-proof ground cover device that will catch and contain all contaminated wastewater runoff for later disposal in a manner that complies with city, county, state and federal codes.

Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer

LANDSCAPE MAINTENANCE

DISCHARGE TO THE STORM DRAIN, **ACCIDENTAL OR NOT**, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to **prevent water pollution from landscaping activities.**

RECYCLE YARD WASTE

- Recycle leaves, grass clippings and other yard waste.
- Do not blow, sweep, rake or hose yard waste into the street or catch basin.
- **Try grasscycling:** the natural recycling of grass by leaving clippings on the lawn when mowing.

  For more information, please visit: **www.calrecycle.ca.gov/organics/grasscycling**

USE FERTILIZERS, HERBICIDES AND PESTICIDES SAFELY

- Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural and non-toxic alternatives as often as possible.
- If you must use chemical fertilizers, herbicides or pesticides:
  - Spot apply, rather than blanketing entire areas.
  - Avoid applying near curbs and driveways, and **never** before a rain.
  - Apply fertilizers as needed: when plants could best use it and when the potential runoff would be low.
  - Follow the manufacturer's instructions carefully—this will not only give the best results, but will save money.

USE WATER WISELY

- Control the amount of water and direction of sprinklers. Sprinklers should only be on long enough to allow water to soak into the ground, but not so long as to cause runoff.
- Periodically inspect, fix leaks and realign sprinkler heads.
- Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.

HOMEOWNERS

KEEP THESE TIPS IN MIND WHEN HIRING PROFESSIONAL LANDSCAPERS AND REMIND AS NECESSARY.

Leftover pesticides, fertilizers, and herbicides contaminate landfills and should be disposed of through a Hazardous Waste Facility.

For more information on proper disposal call,

(909) 382-5401 or 1-800-OILY CAT.

*FREE for San Bernardino County residents only. Businesses can call for cost inquiries and to schedule an appointment.

To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org
To report toxic spills, call 1(800) 33 TOXIC
To dispose of hazardous waste, call 1(800) OILY CAT

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MANTENIMIENTO DE JARDINERÍA

LAS DESCARGAS A LOS DESAGUES PLUVIALES, DE MANERA ACCIDENTAL O NO, PUEDEN INDUCIR A LA APLICACIÓN DE MULTAS Y OTRAS MEDIDAS.

Siga las mejores prácticas descritas debajo para evitar la contaminación del agua por actividades de jardinería.

RECICLAJE DE LOS DESECHOS DE JARDÍN

- Reciclar las hojas, recortes de césped y otros desechos de jardín.
- No soplar, barrer, o usar la manguera para empujar los desechos de jardín a la calle.
- **Poner a prueba el reciclaje de césped (grasscycling): la manera natural de reciclar el césped dejando los recortes sobre el césped cuando son cortados. Para más información, visite la página web: www.calrecycle.ca.gov/organics/grasscycling**

USAR FERTILIZANTES, HERBICIDAS Y PESTICIDAS DE MANERA SEGURA

- Los fertilizantes, herbicidas y pesticidas son arrastrados con frecuencia hacia el sistema de desagüe pluvial mediante el escurrimiento de los rociadores. Use alternativas naturales no tóxicas siempre que sea posible.
- Si tiene que usar fertilizantes, herbicidas o pesticidas químicos:
  Aplicar solo en el sitio necesario, en lugar de cubrir todas las áreas.
  Evitar aplicar cerca de los bordillos y las calzadas, y nunca antes de que llueva.
  Aplicar los fertilizantes cuando sea necesario: esto es, cuando las plantas mejor podrían usarlo y el posible escurrimiento sea bajo.
  Seguir las instrucciones del fabricante cuidadosamente – esto no solo le proporcionará los mejores resultados, pero le permitirá ahorrar dinero.

USAR EL AGUA DE MANERA PRUDENTE

- Controlar la cantidad de agua y la orientación de los rociadores. Los rociadores deben ser **solo lo suficientemente largos como para** permitir que el agua remoje el suelo, pero no tan largos que causen un escurrimiento.
- Inspeccione, repare los escapes y alinee los aspersores periódicamente.
- Siembre plantas nativas para reducir el uso de agua, fertilizantes, herbicidas y pesticidas.

PROPIETARIOS DE HOGARES

Tengan en cuenta estos consejos cuando contraten a paisajistas profesionales y recuérdenselos según sea necesario.

Los sobrantes de pesticidas, fertilizantes y herbicidas contaminan los vertederos y deben ser desechados a través de Plantas de Tratamiento para Residuos Peligrosos.

Para más información sobre el manejo adecuado de residuos peligrosos, llame a **(909) 382-5401 o 1-800-OILY CAT.**

*GRATIS únicamente para los residentes del Condado de San Bernardino. Las empresas pueden llamar para indagar sobre los costos y concertar una cita

Para denunciar el vertido ilegal de basura, llame al (877) WASTE18 o visite sbcountystormwater.org
Para denunciar derrames tóxicos, llame al 1(800) 33 TOXIC
Para desechar residuos peligrosos, llame al 1(800) OILY CAT

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San Bernardino County STORMWATER PROGRAM

FOR MORE INFORMATION ON PREVENTING STORMWATER POLLUTION

CALL 1(800) CLEANUP OR VISIT WWW.SBCOUNTY.GOV/STORMWATER

The San Bernardino County Stormwater Program is a cooperative effor t including the Flood Control District, the County of San Bernardino,and the cities of
Big Bear Lake, Chino, Chino Hills, Colton, Fontana, Grand T errace, Highland, Loma Linda, Montclair, Ontario, Rancho Cucamonga, Redlands, Rialto, San Ber nardino, Upland, and Yucaipa.

Stormwater Pollution Prevention

Best Management Practices for Homeowner's Associations, Property Managers and Property Owners

Your Guide To Maintaining Water Friendly Standards In Your Community

sbcountystormwater.org

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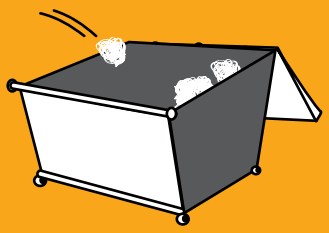
COMMERCIAL TRASH ENCLOSURES

FOLLOW THESE **REQUIREMENTS** TO **KEEP OUR WATERWAYS CLEAN**

Trash enclosures, such as those found in commercial and apartment complexes, typically contain materials that are intended to find their way to a landfill or a recycling facility. **These materials are NOT meant to go into our local lakes and rivers.**

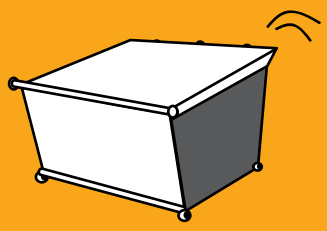
PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

PUT TRASH INSIDE



Place trash inside the bin (preferably in sealed bags)

CLOSE THE LID



Prevent rain from entering the bin in order to avoid leakage of polluted water runoff

KEEP TOXICS OUT

- Paint
- Grease, fats and used oils
- Batteries, electronics and fluorescent lights

SOME ADDITIONAL GUIDELINES, INCLUDE

✓ SWEEP FREQUENTLY
Sweep trash enclosure areas frequently, instead of hosing them down, to prevent polluted water from flowing into the streets and storm drains.

✓ FIX LEAKS
Address trash bin leaks immediately by using dry clean up methods and report to your waste hauler to receive a replacement.

✓ CONSTRUCT ROOF
Construct a solid cover roof over the existing trash enclosure structure to prevent rainwater from coming into contact with trash and garbage. Check with your local City/County for Building Codes.

In San Bernardino County, stormwater pollution is caused by food waste, landscape waste, chemicals and other debris that are washed into storm drains and end up in our waterways - untreated! You can be part of the solution by maintaining a water-friendly trash enclosure.

THANK YOU FOR HELPING TO KEEP SAN BERNARDINO COUNTY CLEAN AND HEALTHY!

San Bernardino County STORMWATER PROGRAM

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

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CESQG PROGRAM

Conditionally Exempt Small Quantity Generator

WHAT IS A CESQG?

Businesses that generate 27 gallons or 220 lbs. of hazardous waste, or 2.2 lbs. of extremely hazardous waste per month are called "Conditionally Exempt Small Quantity Generators," or CESQGs. San Bernardino County Household Hazardous Program provides waste management services to CESQG businesses. The most common CESQGs in San Bernardino County are painters, print shops, auto shops, builders, agricultural operators and property managers, but there are many others. When you call, be ready to describe the types and amounts of waste your business generates in a typical month. If you generate hazardous waste on a regular basis, you must:

- Register with San Bernardino County Fire Department (909) 386-8401 as a hazardous waste generator.
- To obtain an EPA ID# and application form from the State visit www.dtsc.ca.gov.
- Manage hazardous waste in accordance with all applicable local, state and federal laws and regulations.

HOW DO I GET SERVICE?

To arrange an appointment for the CESQG Program, call 1-800-OILY CAT or 909-382-5401. Be ready to describe the type and amount of hazardous waste your business is ready to dispose of, and the types and size(s) of containers that the waste is in.

Waste Type and Cost

There is a small handling fee involved in the collection of hazardous waste from your business. Disposal costs depend on the type of waste.

Aerosols	$1.29/lb.
Automobile motor oil	$.73/gal.
Anti-freeze	$1.57/gal.
Contaminated oil	$4.48/gal.
Car batteries	$.62/ea.
Corrosive liquids, solids	$2.80/lb.
Flammable solids, liquids	$1.57/lb.
Latex Paint	$.73/lb.
Mercury	$10.08/lb.
NiCad/Alkaline Batteries	$2.13/lb.
Oil Base Paints	$1.00/lb.
Oil Filters	$.56/ea.
Oxidizers	$9.63/lb.
PCB Ballasts	$5.94/lb.
Pesticides (most)	$2.91/lb.
Photofixer, developer	$4.31/gal.
Television & Monitors	$11.20/ea.
Additional Handling	$138.00/hr.

Rates subject to change without notice

WE CANNOT ACCEPT

- Radioactives
- Water reactives
- Explosives
- Compressed gas cylinders
- Medical or biohazardous waste
- Asbestos
- Remediation wastes

HAZARDOUS WASTE

WHY IS THE FIRE DEPARTMENT COLLECTING HAZARDOUS WASTE?

Small Quantity Generators often have difficulty disposing of small quantities of hazardous waste. Hazardous waste companies usually have a minimum amount of waste that they will pick up, or charge a minimum fee for service. Typically, the minimum fee exceeds the cost of disposal for the hazardous waste. This leaves the small quantity generator in a difficult situation. Some respond by storing hazardous waste until it becomes economical for the hazardous waste transporter to pick it up, putting the business out of compliance by exceeding regulatory accumulation time limits. Other businesses simply store their hazardous wastes indefinitely, creating an unsafe work environment and exceeding accumulation time limits. Yet other businesses attempt to illegally dispose of their waste at household hazardous waste collection facilities. These facilities are not legally permitted to accept commercial wastes, nor are prepared to provide legal documentation for commercial hazardous waste disposal. In answer to the problems identified above, the San Bernardino County Fire Department Household Hazardous Program instituted the Conditionally Exempt Small Quantity Generator Program.

PAYMENT FOR SERVICES

The CESQG Program will prepare an invoice for your business at the time of service. You can pay at the time of service with cash or a check, or you can mail your payment to the Fire Department within 30 days. Please note that we do not accept credit card payments. The preferred method of payment is to handle payment at time of service. Additional charges may apply for accounts not paid within 30 days.

ARE THERE ANY OTHER WAYS THAT I CAN SAVE MONEY ON HAZARDOUS WASTE DISPOSAL?

Yes! First, start by reducing the amount of waste that you produce by changing processes or process chemicals, at your business. Next, examine if there is a way that you can recycle your waste back into your processes. Network with similar businesses or trade associations for waste minimization and pollution prevention solutions.

WHAT IF YOUR BUSINESS DOES NOT QUALIFY?

Call the San Bernardino County Fire Department Field Services Division for assistance with hazardous waste management at 909-386-8401. If you reduce the amount of waste you generate each month to 27 gallons or less, you may qualify in the future.

WHAT HAPPENS TO YOUR HAZARDOUS WASTE?

Hazardous waste collected by the CESQG Program is transported to a state permitted processing facility in San Bernardino. The waste is further processed at this point and packaged for off-site recycling (oil filters, oil, latex paint, antifreeze, and batteries) or destructive incineration (pesticides, corrosives, flammables, oil based paint).

San Bernardino County Fire Department
CESQG Program
2824 East "W" Street
San Bernardino, CA 92415-0799
Phone: 909-382-5401
Fax: 909-382-5413
www.sbcfire.org/hazmat/hhw.asp
Email: jschwab@sbcfire.org

WHEN WORKING OUTDOORS USE THE 3Cs

CUANDO TRABAJE AL AIRE LIBRE UTILICE LAS 3Cs

CONTROL | CONTROL

Locate the nearest storm drain and ensure nothing can enter or be discharged into it.
Ubique el desagüe de aguas pluviales más cercano y asegúrese de que nada pueda ingresar a éste ni descargarse en él.

CONTAIN | CONTENER

Isolate your area to prevent material from potentially flowing or being blown away.
Aísle su área para evitar que el material pueda discurrirse o ser llevado por el viento.

CAPTURE | CAPTURAR

Sweep up debris and place it in the trash. Clean up spills with an absorbent material (e.g. kitty litter) or vacuum with a Wet-Vac and dispose of properly.
Recoja los restos y colóquelos en la basura. Limpie los derrames con un material absorbente (como la arena para gatos) o aspírelos con una Wet-Vac (aspiradora de humedad) y deséchelos correctamente.

COMMERCIAL LANDSCAPE

DISCHARGE TO THE STORM DRAIN, **ACCIDENTAL OR NOT**, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to **prevent water pollution from landscaping activities.**

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SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. Fountain water containing chlorine and copperbased algaecides is toxic to aquatic life. Proper inspection, cleaning, and repair of pedestrian areas and HOA owned surfaces and structures can reduce pollutant runoff from these areas. Maintaining these areas may involve one or more of the following activities:

1. **Surface Cleaning**
2. **Graffiti Cleaning**
3. **Sidewalk Repair**
4. **Controlling Litter**
5. **Fountain Maintenance**

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for sidewalk, plaza, and fountain maintenance and cleaning include:

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).
- Once per year, educate HOA staff and tenants on pollution prevention measures.

MODEL PROCEDURES:

1. Surface Cleaning

Discharges of wash water to the storm water drainage system from cleaning or hosing of impervious surfaces is prohibited.

Sidewalks, Plazas

✓ Use dry methods (e.g. sweeping, backpack blowers, vacuuming) whenever practical to clean sidewalks and plazas rather than hosing, pressure washing, or steam cleaning. DO NOT sweep or blow material into curb; use devices that contain the materials.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

Parking Areas, Driveways, Drive-thru

✓ Parking facilities should be swept/vacuumed on a regular basis. Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

✓ Sweep all parking lots at least once before the onset of the wet season.

✓ Use absorbents to pick up oil; then dry sweep.

✓ Appropriately dispose of spilled materials and absorbents.

OPTIONAL:

- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

Building Surfaces, Decks, etc., without loose paint

✓ Use high-pressure water, no soap.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

Unpainted Building Surfaces, Wood Decks, etc.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

✓ Use biodegradable cleaning agents to remove deposits.

✓ Make sure pH is between 6.5 and 8.5 THEN discharge to landscaping (if cold water without a cleaning agent) otherwise dispose of properly.

2. Graffiti Cleaning

Graffiti Removal

✓ Avoid graffiti abatement activities during rain events.

✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal in the Roads, Streets, and Highway Operation and Maintenance procedure sheet.

✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.

OPTIONAL:

• Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

3. Sidewalk Repair

Surface Removal and Repair

✓ Schedule surface removal activities for dry weather if possible.

✓ Avoid creating excess dust when breaking asphalt or concrete.

✓ Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up material.

✓ Designate an area for clean up and proper disposal of excess materials.

✓ Remove and recycle as much of the broken pavement as possible.

✓ When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains shovel or vacuum the slurry, remove from site and dispose of properly.

✓ Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Discharge wash water to landscaping, pump to the sanitary sewer if permitted to do so or contain and dispose of properly.

Concrete Installation and Repair

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

✓ Wash concrete trucks off-site or in designated areas on-site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other storm water conveyance structures. (See Concrete Waste Management BMP WM – 8)

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

✓ Store dry and wet concrete materials under cover, protected from rainfall and runoff and away from drainage areas. After job is complete remove temporary stockpiles (asphalt materials, sand, etc.) and other materials as soon as possible.

✓ Return leftover materials to the transit mixer. Dispose of small amounts of excess concrete, grout, and mortar in the trash.

✓ When washing concrete to remove fine particles and expose the aggregate, contain the wash water for proper disposal.

✓ Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.

✓ Protect applications of fresh concrete from rainfall and runoff until the material has hardened.

4. Litter Control

✓ Enforce anti-litter laws.

✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.

✓ Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.

OPTIONAL:

• Post "No Littering" signs.

5. Fountain Maintenance

✓ Do not use copper-based algaecides. Control algae with chlorine or other alternatives, such as sodium bromide.

✓ Allow chlorine to dissipate for a few days and then recycle/reuse water by draining it gradually onto a landscaped area. Water must be tested prior to discharge to ensure that chlorine is not present (concentration must be less than 0.1 ppm).

✓ Contact local agency for approval to drain into sewer or storm drain.

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

EQUIPMENT MAINTENANCE & REPAIR

Vehicle or equipment maintenance has the potential to be a significant source of stormwater pollution. Engine repair and service (parts cleaning, spilled fuel, oil, etc.), replacement of fluids, and outdoor equipment storage and parking (dripping engines) can all contaminate stormwater. Conducting the following activities in a controlled manner will reduce the potential for stormwater contamination:

1. **General Maintenance and Repair**
2. **Vehicle and Machine Repair**
3. **Waste Handling/Disposal**

Related vehicle maintenance activities are covered under the following program headings in this manual: "Vehicle and Equipment Cleaning", "Vehicle and Equipment Storage", and "Vehicle Fueling".

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for equipment maintenance and repair include:

- Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Minimize use of solvents. Clean parts without using solvents whenever possible. Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- Once per year, educate HOA staff and tenants on pollution prevention measures.

EQUIPMENT MAINTENANCE & REPAIR

MODEL PROCEDURES:

1. General Maintenance and Repair

General Guidelines

➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

- ✓ Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- ✓ Regularly inspect vehicles and equipment for leaks.
- ✓ Move activity indoors or cover repair area with a permanent roof if feasible.
- ✓ Minimize contact of stormwater with outside operations through berming the local sewering and drainage routing.
- ✓ Place curbs around the immediate boundaries of the process equipment.
- ✓ Clean yard storm drain inlets regularly and stencil them.

Good Housekeeping

- ✓ Avoid hosing down work areas. If work areas are washed and if discharge to the sanitary sewer is allowed, treat water with an appropriate treatment device (e.g. clarifier) before discharging. If discharge to the sanitary sewer is not permitted, pump water to a tank and dispose of properly.
- ✓ Collect leaking or dripping fluids in drip pans or container. Fluids are easier to recycle or dispose of properly if kept separate.
- ✓ Keep a drip pan under the vehicle while you unclip hoses, unscrew filters, any discharge of or remove other parts. Place a drip pan under any vehicle that might leak while you work on it to keep splatters or drips off the shop floor.
- ✓ Educate employees on proper handling and disposal of engine fluids.
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Do not pour liquid waste to floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- ✓ Post signs at sinks and stencil outdoor storm drain inlets.

2. Vehicle Repair

General Guidelines

- ✓ Perform vehicle fluid removal or changing inside of a building or in a contained covered area, where feasible, to prevent the run-on of stormwater and the runoff of spills.
- ✓ Regularly inspect vehicles and equipment for leaks, and repair as needed.

EQUIPMENT MAINTENANCE & REPAIR

- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Immediately drain all fluids from wrecked vehicles. Ensure that the drain pan or drip pan is large enough to contain drained fluids (e.g. larger pans are needed to contain antifreeze, which may gush from some vehicles).
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- ✓ Oil filters disposed of in trash cans or dumpsters can leak oil. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- ✓ Store cracked batteries in a non-leaking secondary container and dispose of properly at recycling facilities or at County hazardous waste disposal site.

Vehicle Leak and Spill Control

- ✓ Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- ✓ Place a stockpile of spill cleanup materials where it will be readily accessible.
- ✓ Sweep floor using dry absorbent material.

3. Machine Repair

- ✓ Keep equipment clean; don't allow excessive build-up of oil or grease.
- ✓ Minimize use of solvents.
- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Perform major equipment repairs at the corporation yard, when practical.
- ✓ Following good housekeeping measures in Vehicle Repair section.

4. Waste Handling/Disposal

Waste Reduction

- ✓ Prevent spills and drips of solvents and cleansers to the shop floor.
- ✓ Do liquid cleaning at a centralized station so the solvents and residues stay in one area. Recycle liquid cleaners when feasible.

✓ Locate drip pans, drain boards, and drying racks to direct drips back into a solvent sink or fluid holding tank for reuse.

OPTIONAL:

- If possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous material:

  -Use non-caustic detergents instead of caustic cleaning for parts cleaning.

  -Use a water-based cleaning service and have tank cleaned. Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.

  -Replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents.

  -Choose cleaning agents that can be recycled.

Recycling

OPTIONAL:

- Separate wastes for easier recycling. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents separate from non-chlorinated solvents.

- Label and track the recycling of waste material (e.g. used oil, spent solvents, batteries).

- Purchase recycled products to support the market for recycled materials.

LIMITATIONS:

Space and time limitations may preclude all work being conducted indoors. It may not be possible to contain and clean up spills from vehicles/equipment brought on-site after working hours. Dry floor cleaning methods may not be sufficient for some spills – see spill prevention and control procedures sheet. Identification of engine leaks may require some use of solvents.

POOL MAINTENANCE

Pool chemicals and filter solids, when discharged to the City streets, gutters or storm drans, DO NOT GET TREATED before reaching the Santa Ana River. Chlorine, acid cleaning chemicals and metal-based algaecides used in pools can kill beneficial organisms in the food chain and pollute our drinking water.

When emptying your swimming pool, spa or fountain, please use one of the following best management practices to prevent water pollution:

- Reuse the water as landscape irrigation
- Empty the water into the sewer between midnight and 6:00 am
- Remove solids and floating debris and dispose of in the trash, de-chlorinate the water to a chlorine residual = 0, wait 24 hours, then discharge the water to the street or storm drain
- Try not to use metal-based algaecides (i.e. copper sulfate) in your pool or spa. If you have, empty your pool or spa into the sewer. *Prior to discharging pool water into the sanitary sewer system, contact your local agency.*
- If the pool contains algae and mosquito larvae, discharge the water to the sewer

When acid cleaning or other chemical cleaning:

- Neutralize the pool water to pH of 6.5 to 8.5, then discharge to the sewer

For swimming pool and spa filter backwash:

- Dispose of solids into trash bag, then wash filter into a landscape area
- Settle, dispose of solids in trash and discharge water to the sewer, never to the storm drain

» For Residents

The following is a preview of the information we have available to residents. For more fact sheets, visit ***sbcountystormwater.org***

Household Hazardous Waste Center Locations

TOO TOXIC TO TRASH

Dispose of your **HOUSEHOLD HAZARDOUS WASTE** (HHW) at a **FREE** HHW Center near you. Examples of items collected: pesticides, fertilizers, paints, cleaners, antifreeze, batteries, motor oil, oil filters, and electronic waste.

SERVICE AREA	LOCATION	DAYS OPEN	HOURS
Big Bear Lake (does not accept E-waste)	42040 Garstin Dr. (cross: Big Bear Blvd.)	Saturdays	9 a.m. - 2 p.m.
Chino	5050 Schaefer Ave. (cross: 4th St.)	2nd & 4th Sat.	8 a.m. - 1 p.m.
Fontana (Fontana residents only)	16454 Orange Way (cross: Cypress Ave.) Note: Provide a trash bill and a driver's license as proof of residency.	Saturdays	8 a.m. - 12 p.m.
Ontario	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m. - 2 p.m.
Rancho Cucamonga	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m. - 12 p.m.
Redlands	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m. - 12:30 p.m.
Rialto (does not accept E-waste)	246 Willow Ave. (cross: Rialto Ave.)	2nd & 4th Fri. & Sat.	8 a.m. - 12 p.m.
San Bernardino	2824 East 'W' St., 302 (cross: Victoria Ave.)	Mon. – Fri.	9 a.m. - 4 p.m.
Upland	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m. - 2 p.m.

San Bernardino County STORMWATER PROGRAM

To report illegal dumping, call (877) WASTE18
or visit sbcountystormwater.org

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

TAKE ONE

WE DID IT OURSELVES AND WE DID IT RIGHT

When painting your home, protect your family and community.

- **PAINTS** that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- **SAFELY** dispose of unwanted paint and paint thinner. The County of San Bernardino offers 9 HHW Centers that accept paint and other household hazardous waste from residents FREE of charge. For a list of acceptable materials, location information, and hours of operation call 1-800-OILY CAT.

VEHICLE MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Cleaning Auto Parts
Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a sink, parking lot, driveway or street.

Storing Hazardous Waste
Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Preventing Leaks and Spills
Conduct all vehicle maintenance inside of a garage. Place drip pans underneath vehicle to capture fluids. Use absorbent materials instead of water to clean work areas.

Cleaning Spills
Use dry methods for spill cleanup (sweeping, absorbent materials). To report accidental spills into the street or storm drain call (877) WASTE18 or 911.

Proper Disposal of Hazardous Waste
Dispose of household hazardous waste by taking it to your nearest household hazardous waste center. For more information, call 1-800-OILY CAT or check out sbcountystormwater.org/Disposal.html

PET WASTE DISPOSAL

FREE

DOGGIE WASTE BAGS

Remember to pick up after your pet every time to keep San Bernardino County clean and healthy!

San Bernardino County STORMWATER PROGRAM

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernadino • San Bernadino County • San Bernadino County Flood Control District • Upland • Yucaipa

» Get In Touch With Us Online!

» Website
sbcountystormwater.org

» eUpdates
sbcountystormwater.org/newsletter

» Facebook
facebook.com/sbcountystormwater

» YouTube
youtube.com/sbcountystormwater

» Report Pollution Violations
sbcountystormwater.org/report

» Email
info@sbcountystormwater.org

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SERVICE AREA	LOCATION	DAYS OPEN	HOURS
Big Bear Lake (does not accept E-waste)	42040 Garstin Dr. (cross: Big Bear Blvd.)	Saturdays	9 a.m. - 2 p.m.
Chino	5050 Schaefer Ave. (cross: 4th St.)	2nd & 4th Sat.	8 a.m. - 1 p.m.
Fontana (Fontana residents only)	16454 Orange Way (cross: Cypress Ave.) Note: Provide a trash bill and a driver's license as proof of residency.	Saturdays	8 a.m. - 12 p.m.
Ontario	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m. - 2 p.m.
Rancho Cucamonga	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m. - 12 p.m.
Redlands	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m. - 12:30 p.m.
Rialto (does not accept E-waste)	246 Willow Ave. (cross: Rialto Ave.)	2nd & 4th Fri. & Sat.	8 a.m. - 12 p.m.
San Bernardino	2824 East 'W' St., 302 (cross: Victoria Ave.)	Mon. – Fri.	9 a.m. - 4 p.m.
Upland	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m. - 2 p.m.

San Bernardino County STORMWATER PROGRAM

To report illegal dumping, call (877) WASTE18
or visit sbcountystormwater.org

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

TAKE ONE

MUY TÓXICO PARA LA BASURA

Desháguese de sus **DESECHOS PELIGROSOS** gratuitamente en un centro de recolección cerca de usted. Ejemplos de artículos que se aceptan: pesticidas, fertilizantes, pinturas, limpiadores, anticongelante, baterías, aceite de motores y filtros, y aparatos electrónicos.

ÁREA DE SERVICIO	UBICACIÓN	ABIERTO	HORARIO
Big Bear Lake (no se acepta materiales electronicas)	42040 Garstin Dr. (Big Bear Blvd.)	Sábado	9 a.m. - 2 p.m.
Chino	5050 Schaefer Ave. (4th St.)	2nd & 4th Sábado	8 a.m. - 1 p.m.
Fontana (residentes de Fontana solamente)	16454 Orange Way (Cypress Ave.) Nota: Presentar un recibo de basura y licencia de conducir como prueba de residencia.	Sábado	8 a.m. - 12 p.m.
Ontario	1430 S. Cucamonga Ave. (Belmont St.)	Viernes & Sábado	9 a.m. - 2 p.m.
Rancho Cucamonga	8794 Lion Street (Off 9th St, between Vineyard & Hellman)	Sábado	8 a.m. - 12 p.m.
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San Bernardino	2824 East 'W' St., 302 (Victoria Ave.)	Lunes – Viernes	9 a.m. - 4 p.m.
Upland	1370 N. Benson Ave. (14th St.)	Sábado	9 a.m. - 2 p.m.

San Bernardino County STORMWATER PROGRAM

Para reportar actividades ilegales llamar al (877) WASTE18
o visite sbcountystormwater.org

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

TOME UNO

A SAFE GARDEN:
A LOT DEPENDS ON IT.

Protect your family and community when using pesticides and fertilizers.

- **STRATEGICALLY** apply products on your lawn when rain is not expected. Rain can wash toxic chemicals from your lawn into local waterways.
- **SPOT-APPLY** products directly on the problem instead of the whole area. Use less chemicals, and conserve the supply of your product.
- **SAFELY** dispose of unwanted products. The County of San Bernardino offers 9 HHW Centers that accept pesticides, fertilizers and other toxic waste FREE of charge.

To report illegal dumping, call
(877) WASTE18 or visit
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

UN JARDÍN SANO:
MUCHO DEPENDE DE ÉL.

Proteja a su familia y a su comunidad cuando utilice pesticidas y fertilizantes.

- **ESTRATÉGICAMENTE** aplique productos en su césped solamente cuando no se espera lluvia. La lluvia puede llevarse químicos tóxicos de su césped hacia los canales pluviales en su área.
- **ESCASAMENTE** aplique los productos directamente en el área en donde exista el problema en lugar de distribuirlo en todo el jardín. Así, utilizará menos productos químicos y le rendirá más.
- **ELIMINE** productos tóxicos sanamente. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pesticidas, fertilizantes y otros desechos tóxicos GRATUITAMENTE.

Para reportar actividades ilegales llamar al
(877) WASTE18 o visite
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

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San Bernardino County
STORMWATER PROGRAM

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(877) WASTE18 o visite
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

SPOT-APPLY

pesticides directly on the problem rather than blanketing the whole area.

sbcountystormwater.org

A SAFE GARDEN:
A LOT DEPENDS ON IT.

San Bernardino County STORMWATER PROGRAM

(877) WASTE18

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ESCASAMENTE

aplique pesticidas directamente en el problema en lugar de distribuirlo en todo el jardín.

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UN J ARDÍN SANO:
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San Bernardino County
STORMWATER PROGRAM

(877) WASTE18

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GARDEN SMART:
Use Pesticides and Fertilizers Sparingly

sbcounty.gov/stormwater

Artwork Courtesy of the City of Los Angeles Stormwater Program

Managing
FATS, OIL and GREASE
"It's Easier than YOU Think!"

THE WRONG WAY
La Forma Incorrecta

1

Do not pour cooking residue directly into the drain.

No vierta residuos de cocinar directamente en el desague.

2

Do not dispose of food waste into the garbage disposal.

No ponga desperdicios de comida en el triturador de comida.

3

Do not pour waste oil directly into the drain.

No ponga desperdicio de aceite directamente en el desague.

4

Do not wash floor mats where water will run off directly into the storm drain.

No lave tapetes de piso en un lugar donde el agua corra hacia el desague.

THE RIGHT WAY
La Forma Correcta

1

Wipe pots, pans, and work areas prior to washing.

Limpie con una toallita las ollas, cazuelas, y areas de trabajo antes de lavarlos.

2

Dispose of food waste directly into the trash.

Deseche los desperdicios de comida en el bote de basura.

3

Collect waste oil and store for recycling.

Junte el desperdicio de aceite y guardelo para que sea reciclado.

4

Clean mats inside over a utility sink.

Limpie los tapetes de piso detro de un lavabo o fregador.

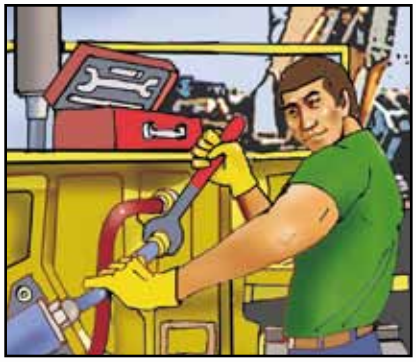
STORMWATER Pollution Prevention

ROADWORK AND PAVING

Asphalt, saw-cut slurry and excavated materials from road paving, surfacing and pavement removal often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Preventing Erosion
Schedule excavation and grading work during dry weather. Develop and implement erosion and sediment control plans for excavated embankments. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

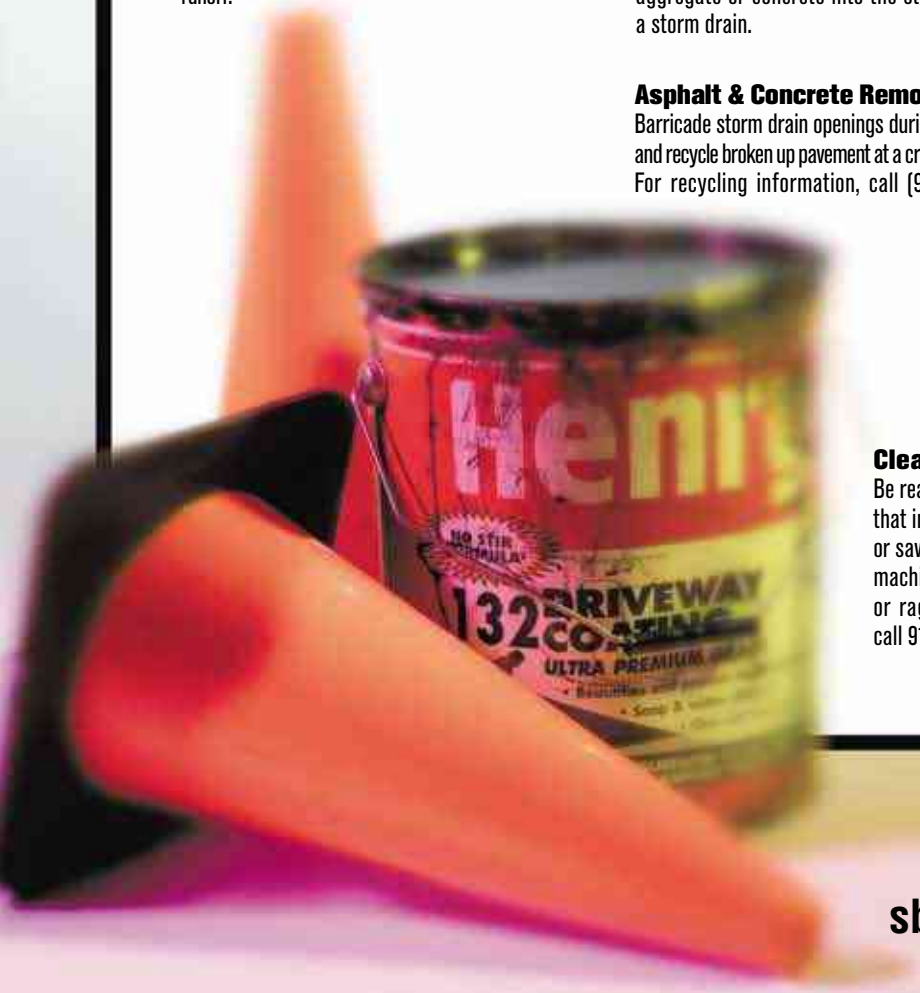
During Construction
Cover catch basins and maintenance holes when applying seal coat, slurry seal or fog seal. Use check dams, ditches or berms around excavations, and avoid over applying water for dust control. Never wash excess materials from exposed aggregate or concrete into the street, gutter or a storm drain.



Maintaining Vehicles & Equipment
Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

Asphalt & Concrete Removal
Barricade storm drain openings during saw-cutting, and recycle broken up pavement at a crushing company. For recycling information, call (909) 386-8401.

Cleaning & Preventing Spills
Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Sweep up dry spills, instead of hosing. Prevent spills from paver machines by using drip pans, or by placing absorbent materials like cloths or rags under the machines when not in use. To report serious spills, call 911.



To report illegal dumping call

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

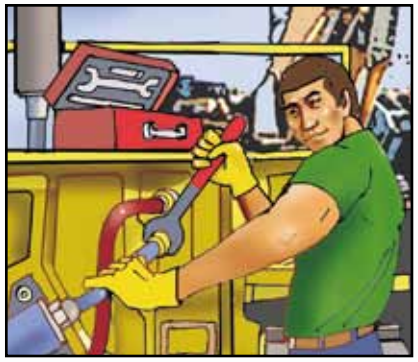
Prevención de Contaminación del Desagüe

TRABAJO DE CARRETERAS & PAVIMENTO

Asfalto, mezcla y materiales de excavaciones del pavimento acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Previniendo Erosiones
Planea las excavaciones trabajo de jardineria durante el clima seco. Desarrolla e implementa planes de embancamientos de control de sedimento y excavaciones. Cubre montones de tierra, grava y otros materiales con un plastico para protejerlos de la llvia, aire y desagüe.

Durante Construcción
Cubre los lavados y da mantenimiento a los hoyos al aplicar selladura o mezcla. Revisa las areas de excavaciones, y evita pasarte de agua para preveenir polvadura. Nunca laves los materiales llenos de concreto en la calle, drenajes o en el desagüe.



Mantenimiento de Vehiculos & Herramientas
Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura y evita goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador.

Removiendo Asfalto & Concreto
Bloquea alrededor de los drenajes cuando estes usando las maquinas de sierra, tambien recicla todo el pavimento roto en la compañia demolidora. Para más información llama al (909) 386-8401.

Limpiando & Previniendo Derrames
Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin Barre los derrames en ves de lavarlos con la manguera. Previene los derrames de las maquinas usando enbudos o colocanto garras para absorver cualquier liquido. Para reportar derrames llama al 911.

Para reportar actividades ilegales llamar al:

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

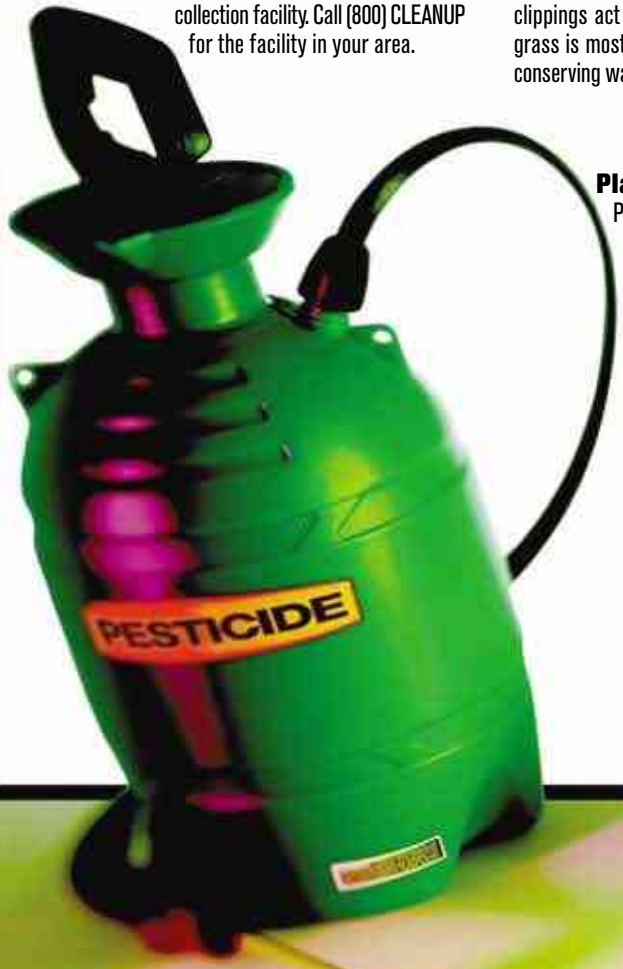
HOME & GARDEN

Yard waste and household toxics like paints and pesticides often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.

Recycle Household Hazardous Waste
Household products like paint, pesticides, solvents and cleaners are too dangerous to dump and too toxic to trash. Take them to be recycled at a convenient household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.

Disposing of Yard Waste
Recycle leaves, grass clippings and other yard waste, instead of blowing, sweeping or hosing into the street. Try grasscycling, leaving grass clippings on your lawn instead of using a grass catcher. The clippings act as a natural fertilizer, and because grass is mostly water, it also irrigates your lawn, conserving water.

Use Fertilizers & Pesticides Safely
Fertilizers and pesticides are often carried into the storm drain system by sprinkler runoff. Try using organic or non-toxic alternatives. If you use chemical fertilizers or pesticides, avoid applying near curbs and driveways and never apply before a rain.



Planting in the Yard
Produce less yard waste and save water by planting low maintenance, drought-tolerant trees and shrubs. Using drip irrigation, soaker hoses or micro-spray systems for flower beds and vegetation can also help reduce your water bill and prevent runoff.

Use Water Wisely
Cut your water costs and prevent runoff by controlling the amount of water and direction of sprinklers. The average lawn needs about an inch of water a week, including rainfall, or 10 to 20 minutes of watering. A half-inch per week is enough for fall and spring. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff.

To report illegal dumping call

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

JARDIN

Basura del jardín y otros toxicos caseros como pintura, pesticidas y otros mas acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Disponiendo Desechos del Jardin
Recicla hojas, pasto y otras basuras del jardín en ves de soplarlas, barrerlas hacia la calle. El pasto sirve como fertilizante, y como el pasta es la mayoria agua tambien riega tu jardín, ahorrandote agua.

Reciclando Materiales del Hogar Peligrosos
Limpiadores del hogar como pintura, pesticidas, solventes y limpiadores son demasiado toxicos para tirarlos en la basura. Desechalos en unlugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.

Usando Fertilizantes & Pesticidas Adecuadamente
Fertilizantes y pesticidas muchas veces terminan en los drenajes. Usa alternativas que no sean toxicas. Si tu usas fertilizantes y pesticidas con quimicos, no los uses cerca de las banquetas y cocheras y nunca los uses en tiempos de lluvia.

Cembrando en el Jardin
Reduce la basura del jardín y ahorra agua plantando arboles y plantas de bajo mantenimiento. Riega moderadamente con mangueras u otros metodos para las flores o vegetacion asi reduciras tu pago del mes y previenes el desagüe.

Usando el Agua Adecuadamente
Reduce el pago del agua y previene el desagüe controlando la cantidad y direccion de tus regaderas para el jardin. Solo necesitas regar de 10 a 20 minutos a la semana. Durante la primavera y otoño es la mitad. Las regaderas del jardin deverian estar ajustadas a que rieguen lo suficinete y evitar el desagüe.

Para reportar actividades ilegales llamar al:

(877) WASTE18

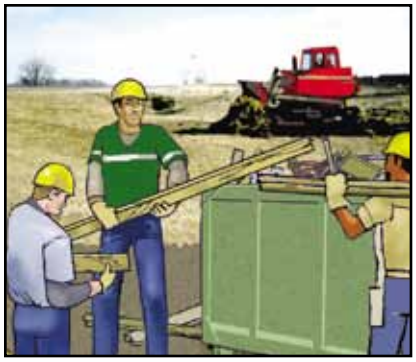
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

EXCAVATION AND GRADING

Sediment, cement wash, asphalt and vehicle fluids from soil excavation and grading often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Recycling Waste

Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.

Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutters and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks. Use gravel approaches where truck traffic is heavy to reduce soil compaction and limit the tracking of sediment into the street.

Cleaning & Preventing Spills

Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids. To report serious spills, call 911.

Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

Preventing Erosion

Avoid excavation or grading during wet weather. Plant temporary vegetation on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff. Channels can be lined with grass or roughened pavement to reduce runoff velocity.

To report illegal dumping call

(877) WASTE18

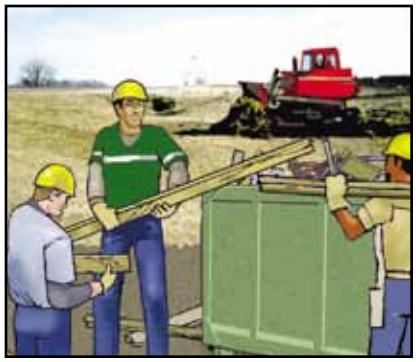
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

EXCAVACIONES

Sedimento, cemento, asfalto y liquidos de auto, tierra y residuos peligrosos de lugares de construcción acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



Reciclando Desechos
Recicla el aspfalto, concreto, madera y la vegetacion cuando sea posible. Materiales no reciclados se deverian llevar a lugares de desechos peligrosos. Para màs informacion llama al (909) 386-8401.

Manteniendo Vehiculos & Herramientas
Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura. Usa grava donde mayormente se consentra el trafico de camiones para y reducir el sedimento en las calles.

Limpiando & Previniendo Derrames
Usa siempre un enbudo al vaciar liquidos. Barre los derrames en ves de lavarlos con la manguera. Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Preveen goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador. Para reportar derrames llama al 911.

Almacenando Materiales
Manten materiales de construccion y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y erramientas para excavar cuviertos con algun plastico para protejerlos de la lluvia, el aire y el desagüe.

Previniendo Erosiones
Evita las excavaciones durante lluvia. Planta vegetacion temporal en colinas donde aun no hay planes de construcción y planta vegetacion permanente al terminar las excavaciones. Construye algunos canales para el desagüe. Estos pueden ser creados con pasto y cemento para reducir la velocidad del desagüe.

Para reportar actividades ilegales llamar al:

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

CONSTRUCTION

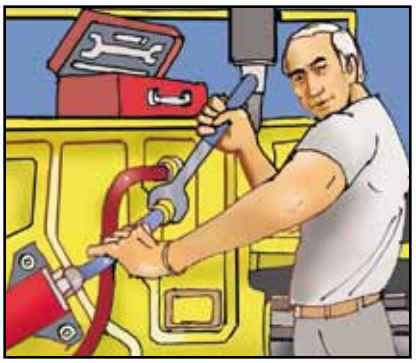
Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Store Materials Safely
Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

Ordering Materials & Recycling Waste
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.

Cleaning & Preventing Spills
Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.

Preventing Erosion
Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydromulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Channels can be lined with grass or roughened pavement to reduce runoff velocity.



Maintaining Vehicles & Equipment
Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

To report illegal dumping call
(877) WASTE18
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

CONSTRUCCIÓN

Cemento, sedimentos, liquidos de auto, polvos y residuos peligrosos acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Almacenando Materiales Cuidadosamente

Manten materiales de construcción y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y herramientas para excavar cuviertos con algun plastico para protejerlos de la lluvia, el aire y el desagüe.

Ordenando Materiales & Reciclando Desechos

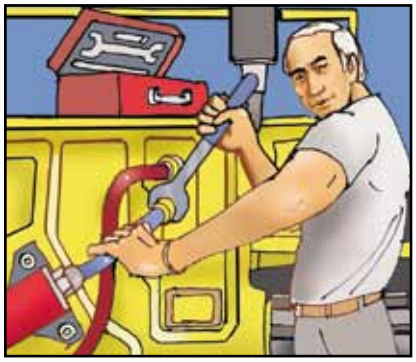
Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales que se puedan reciclar cuando sea posible. Se puede reciclar el aspfalto, concreto, madera y la vegetacion. Materiales no reciclados se deven llevar a lugares de desechos peligrosos. Para mas información llama al (909) 386-8401.

Limpiando & Previniendo Derrames

Usa siempre un enbudo al vaciar liquidos. Barre los derrames en ves de lavarlos con la manguera. Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Para reportar derrames llama al 911.

Previniendo Erosiones

Evita las excavaciones durante lluvia. Planta vegetacion temporal en colinas donde aun no hay planes de construccion y planta vegetacion permanente al terminar las excavaciones. Construye algunos canales para el desagüe. Estos pueden ser creados con pasto y cemento para reducir la velocidad del desagüe.



Mantenimiento de Vehiculos & Herramientas

Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura y preveen goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador.

Para reportar actividades ilegales llamar al:

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

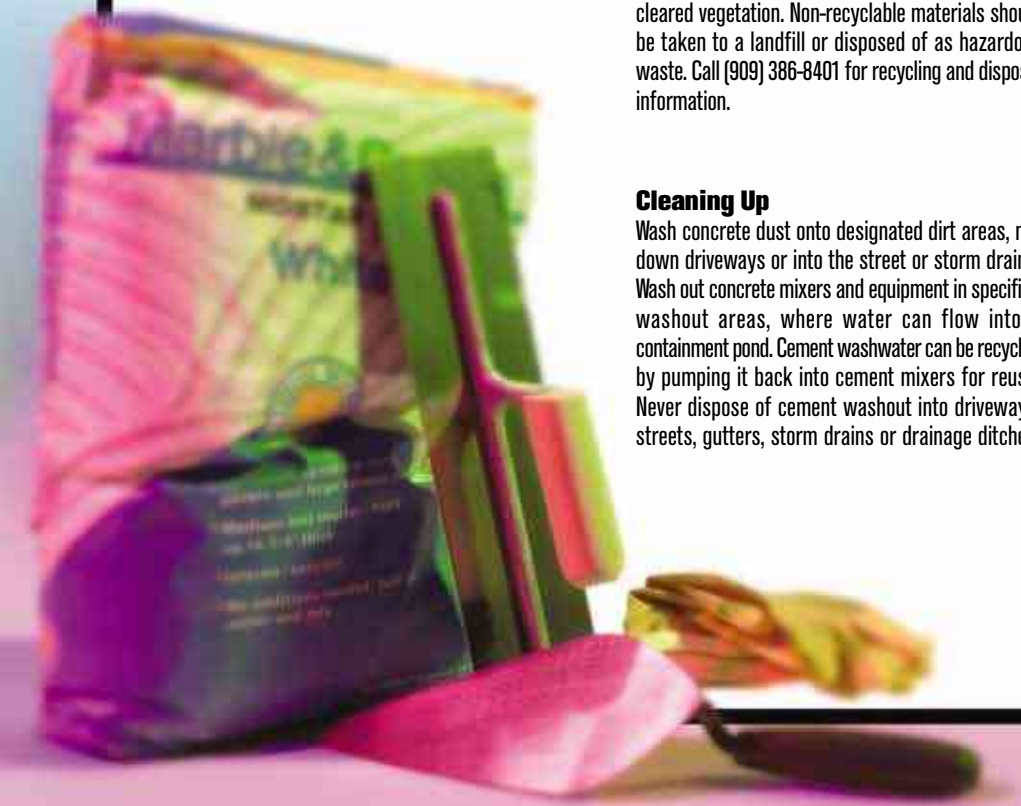
FRESH CONCRETE & MORTAR APPLICATION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

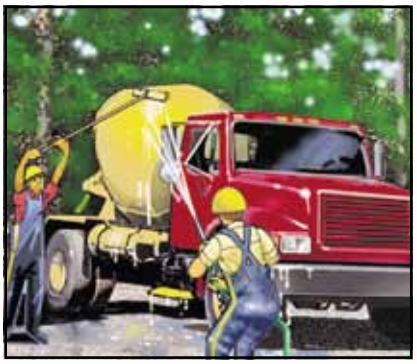
Storing Materials
Keep construction materials and debris away from the street, gutter and storm drains. Secure open bags of cement and cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

Ordering Materials & Recycling Waste
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. Call (909) 386-8401 for recycling and disposal information.

During Construction
Schedule excavation and grading during dry weather. Prevent mortar and cement from entering the street and storm drains by placing erosion controls. Setup small mixers on tarps or drop cloths, for easy cleanup of debris. Never bury waste material. Recycle or dispose of it as hazardous waste.



Cleaning Up
Wash concrete dust onto designated dirt areas, not down driveways or into the street or storm drains. Wash out concrete mixers and equipment in specified washout areas, where water can flow into a containment pond. Cement washwater can be recycled by pumping it back into cement mixers for reuse. Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.



To report illegal dumping call
(877) WASTE18
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

APLICANDO CONCRETO FRESCO

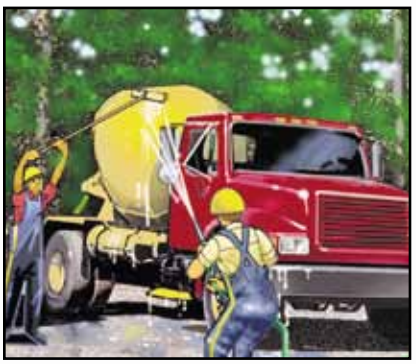
Cemento, grava, asfalto y liquidos de auto, tierra y residuos peligrosos de lugares de concreto fresco por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Almacenando Materiales
Manten materiales de construcción y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y herramientas para excavar cuviertos con algun plastico para protejerlos de la lluvia, el aire y el desagüe.

Ordenando Materiales & Reciclando
Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales recicables cuando sea posible. Cuando estes rompiendo el pavimento, recicla los pedasos en la compañia demolidora. Se puede reciclar el aspfalto, concreto, madera y la vegetacion. Materiales no reciclados se deverian llevar a lugares de desechos peligrosos. llama al (909) 386-8401 para más información.

Durante Construcción
Planea las excavaciones durante clima seco. No dejes que el cemento o la cal lleguen hasta las calles o drenajes, evita esto con plantas temporales para detener el desagüe. Cubre las maquinas de mesclar con alguna garra para que se facilite la limpieza de residuos. Nunca entierres los desechos. Recicla todos los desechos peligrosos.

Limpiando
Lava la cal en un area designada, no la eches hacia la cochera o en la calle. Lava las mescladoras y las herramientas en un lugar especifico, donde el agua llegue a un contenedor. El agua de cemento se puede reciclar volviendola a usar en las mescladoras. Nunca dejes el agua de cemento que corra hacia las calles, alcantarillas o drenajes.



Para reportar actividades ilegales llamar al:

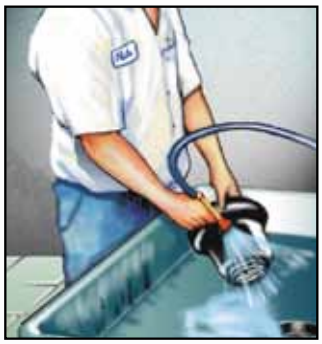
(877) WASTE18
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

STORMWATER Pollution Prevention

AUTO MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Cleaning Auto Parts
Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a shop sink, parking lot, driveway or street.

Storing Hazardous Waste
Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Metal Grinding and Polishing
Keep a bin under your lathe or grinder to capture metal filings. Send uncontaminated filings to a scrap metal recycler for reclamation. Store metal filings in a covered container or indoors.

Preventing Leaks and Spills
Place drip pans underneath to capture fluids. Use absorbent cleaning agents instead of water to clean work areas.

Cleaning Spills
Use dry methods for spill cleanup (sweeping, absorbent materials). Follow your hazardous materials response plan, as filed with your local fire department or other hazardous materials authority. Be sure that all employees are aware of the plan and are capable of implementing each phase. To report serious toxic spills, call 911.

Proper Disposal of Hazardous Waste
Recycle used motor oil and oil filters, anti-freeze and other hazardous automotive fluids, batteries, tires and metal filings collected from grinding or polishing auto parts. Contact a licensed hazardous waste hauler. For more recycling information, call (909) 386-8401.

To report illegal dumping call

(877) WASTE18

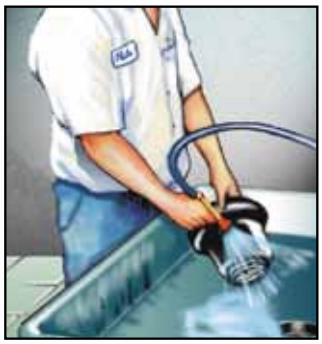
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

MANTENIMIENTO DE AUTO

Aceite, grasa, anti-congelantes y otros liquidos toxicos para el auto acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



Limpiar Partes De Autos
Limpia las partes de auto con un cepillo de alambres o usa un limpiador de hornos en vez de usar limpiadores líquidos. Arregla las graseras, perchas para secar y tablas de escurrir para que los líquidos sean dirigidos al lavadero o recipientes para guardar líquidos. No laves las partes de auto o herramientas en el estacionamiento, la cochera o la calle.

Almacenando Desechos Peligrosos
Manten los desechos líquidos separados. Varios líquidos pueden ser reciclados por compañias que se especializan en desechos tóxicos si aun no estan mezclados. Guarda y cubre todos los materiales dentro de un lugar para prevenir la contaminación del desagüe.

Desechos de Metal & Pulidos
Manten un recipiente debajo de las maquinas de tornos o amoladoras para colectar desechos de metal. Manda los desechos de metal a un centro de reciclaje de metales. Guarda los desechos de metal en un recipiente cuvierto o dentro del local.

Prevenir Goteaduras & Derrames
Utilisa caserolas para el goteo de líquidos. Use limpiadores absorbentes en lugar de agua para limpiar el área de trabajo.

Limpiando Derrames
Sigue tu plan de como actuar sobre los materiales tóxicos, como esta indicado en el departamento de bomberos local u otras autoridades de materiales tóxicos. Asegurate que todos los empleados estén informados y capaz de aplicar cada fase del plan. Usa métodos secos para limpiar derramamientos (barriendo, materiales absorbentes, etc.).

Manera Correcta de Depositar los Desechos Peligrosos
Recicla el aceite de motor y filtros de aceite usados, anti-congelante, baterias, lubricantes, y desechos de metal y partes de auto pulidas. Llama a un colector de desechos tóxicos para disponer de absorbentes saturados. Mas iformación sobre reciclaje, llama al (909) 386-8401.

Para reportar actividades ilegales llamar al:

(877) WASTE18
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

SAN BERNARDINO COUNTY
STORMWATER POLLUTION PREVENTION

Construction & development:

Soil, cement wash, asphalt, oil and other hazardous debris from construction sites often make their way into the San Bernardino County storm drain system, and flow untreated into local waterways. Follow these best management practices to prevent pollution, protect public health and avoid fines or legal action.

- **Store Materials Safely:** Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.
- **Preventing Erosion:** Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydro mulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Use gravel approaches where truck traffic is frequent to reduce soil compaction and limit the tracking of sediment into the streets. For more information on erosion control, call (909) 799-7407.

- **Cleaning & Preventing Spills:** Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.
- **Maintaining Vehicles & Equipment:** Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, and brake and radiator fluids.
- **Ordering Materials & Recycling Waste:** Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Dispose of hazardous materials through a hazardous waste hauler or other means in accordance with the construction permit. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.
- **Concrete and mortar application:** Never dispose of cement washout into driveways, streets, gutters or drainage ditches. Wash concrete mixers and equipment only in specified washout areas, where the water flows into lined containment ponds. Cement wash water can be recycled by pumping it back into cement mixers for reuse.

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

NOTICE

DISCHARGE INTO OUR WATERWAYS, ACCIDENTAL OR NOT, CAN LEAD TO ENFORCEMENT ACTIONS, WHICH CAN INCLUDE FINES.

WHEN WORKING WITH CONCRETE USE THE 3Cs

CONTROL

Locate the nearest storm drain and ensure nothing can enter or be discharged into it. Use plastic covers and sandbags when working within 50' of a storm drain or catch basin.

CONTAIN

Isolate area and secure bags of cement after they are open. Keep cement, sand and aggregate (wet/dry) and slurries from saw cutting, from flowing into the streets, gutter and storm drains or being blown away. Cover bags of cement in case of rain.

CAPTURE

Sweep dry residue or vacuum wet concrete residue and dispose of properly. Create a designated washout area for equipment and tools and place away from driveways and storm drains. Dispose of concrete/plaster waste and rinsewater by hauling off to an approved disposal site.

To report illegal dumping, call **(877) WASTE18** or visit **sbcountystormwater.org**

SAN BERNARDINO COUNTY STORMWATER POLLUTION PREVENTION

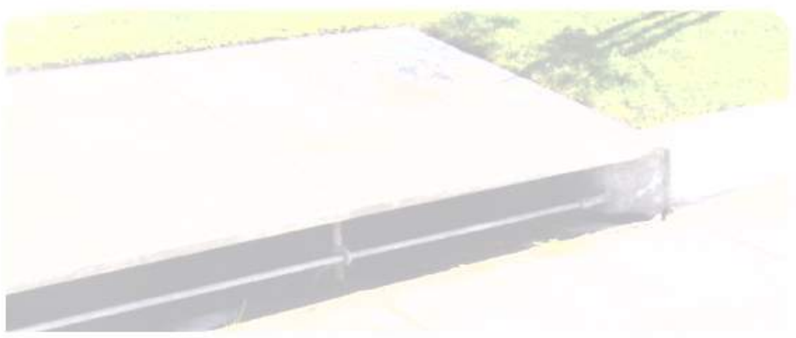
Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernardino • San Bernardino County • San Bernardino County Flood Control District • Upland • Yucaipa

AVISO

LA DESCARGA EN NUESTRAS VÍAS FLUVIALES, DE FORMA ACCIDENTAL O NO, PUEDE LLEVAR A TOMAR MEDIDAS PARA CUMPLIR CON LA LEY QUE PUEDEN INCLUIR MULTAS.

APLIQUE LAS 3 C

CONTROL



Ubique el desagüe pluvial más cercano y asegúrese de que nada pueda entrar en él o que pueda descargarse allí. Use cubiertas de plástico y bolsas de arena cuando trabaje a una distancia de 50' de un desagüe pluvial o sumidero.

CONTENCIÓN

Aísle el área y asegure las bolsas de cemento una vez que las haya abierto. Impida que el cemento, la arena y los componentes del concreto (secos y húmedos) y los residuos acuosos resultantes después de cortar con sierra, fluyan hacia la calle, la alcantarilla y los desagües o que se vuelen con el viento.
Cubra las bolsas de cemento en caso de lluvia.

CAPTURA

Barra los residuos secos o limpie con una aspiradora los residuos de concreto húmedo y elimínelos en forma apropiada. Cree un área específica para enjuagar equipos y herramientas, y colóquela lejos de las entradas de automóviles y de los desagües pluviales.
Desheche los residuos de concreto o yeso y el agua de enjuague, llevándolos a un sitio aprobado para su eliminación.

PREVENCIÓN DE CONTAMINACIÓN DE AGUAS PLUVIALES EN EL CONDADO DE SAN BERNARDINO

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga • Redlands
Rialto • San Bernardino • Condado de San Bernardino • Distrito de Control de Inundaciones del Condado de San Bernardino • Upland • Yucaipa

SAN BERNARDINO COUNTY
STORMWATER POLLUTION PREVENTION

Commercial landscape maintenance:

Yard waste, sediments and toxic lawn and garden chemicals used in commercial landscape maintenance often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution, protect public health and avoid fines or legal action.

- **Recycle Yard Waste:** Recycle leaves, grass clippings and other yard waste. Do not blow, sweep, rake or hose yard waste into the street. Let your customers know about grass cycling --the natural recycling of grass by leaving clippings on the lawn when mowing instead of using a grass catcher. Grass clippings will quickly decompose, returning valuable nutrients to the soil. You can get more information at www.ciwmb.ca.gov/Organics.
- **Use Fertilizers, Herbicides & Pesticides Safely:** Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural, non-toxic alternatives to traditional garden chemicals. If you must use chemical fertilizers, herbicides, or pesticides spot apply rather than blanketing entire areas, avoid applying near curbs and driveways and never apply before a rain.
- **Recycle Hazardous Waste:** Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility. For information on proper disposal, call (909) 386-8401.
- **Use Water Wisely:** Conserve water and prevent runoff by controlling the amount of water and direction of sprinklers. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff. Periodically inspect, fix leaks and realign sprinkler heads.
- **Planting:** Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.
- **Prevent Erosion:** Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways. Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff. Avoid excavation or grading during wet weather.
- **Store Materials Safely:** Keep landscaping materials and debris away from the street, gutter and storm drains. On-site stockpiles of materials should be covered with plastic sheeting to protect from rain, wind and runoff.

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

Carpet cleaning:

Toxic chemicals and discharged waste water from carpet, drapery, furniture and window cleaning often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

These guidelines apply even if the cleaning products are labeled "nontoxic" or "biodegradable". Although these products may be less harmful to the environment, they can still have harmful effects if they enter the storm drain untreated.

- **Dispose of wastewater properly:** Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer system within sanitary sewer discharge limits, or hauled off and disposed of properly. Wastewater should never be discharged into a street, gutter, parking lot or storm drain.
- **Filter wastewater:** Carpet cleaning wastewater should be filtered before discharging it to the sanitary sewer since fibers and other debris in the wastewater can clog pipes. The filtered material can be disposed of in the garbage, as long as the waste is not contaminated with hazardous pollutants.

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PERMIT# 000

San Bernardino County Stormwater Program
825 East Third Street • Room 127
San Bernardino, CA 94215-0835

STORMWATER Pollution Prevention

LANDSCAPE MAINTENANCE

Stormwater Pollution Prevention

Stormwater Management Practices for Commercial Landscape Maintenance

Yard waste, sediments, and toxic lawn/garden chemicals used in commercial landscape maintenance often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

Recycle Yard Waste

Recycle leaves, grass clippings and other yard waste. Do not blow, sweep, rake or hose yard waste into the street. Try grasscycling - the natural recycling of grass by leaving clippings on the lawn when mowing. Grass clippings will quickly decompose, returning valuable nutrients to the soil. Further information can be obtained at www.ciwmb.ca.gov/Organics.

Use Fertilizers, Herbicides and Pesticides Safely

Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use of natural, non-toxic alternatives to the traditional fertilizers, herbicides and pesticides is highly recommended. If you must use chemical fertilizers, herbicides, or pesticides:

- Spot apply pesticides and herbicides, rather than blanketing entire areas.
- Avoid applying near curbs and driveways, and never apply before a rain.
- Apply fertilizers as needed, when plants can best use it, and when the potential for it being carried away by runoff is low.

Recycle Hazardous Waste

Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility, which accepts these types of materials. For information on proper disposal call, (909) 386-8401.

Use Water Wisely

Conserve water and prevent runoff by controlling the amount of water and direction of sprinklers. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff. Periodically inspect, fix leaks and realign sprinkler heads. Plant native vegetation to reduce the need of water, fertilizers, herbicides, and pesticides.

Prevent Erosion

Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways.

- Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff.
- Avoid excavation or grading during wet weather.

Store Materials Safely

Keep landscaping materials and debris away from the street, gutter and storm drains. On-site stockpiles of materials must be covered with plastic sheeting to protect from rain, wind and runoff.

San Bernardino County STORMWATER PROGRAM

To report illegal dumping call

(877) WASTE18

or visit our website:

sbcountystormwater.org

DCV Analysis (DA-1)
Redlands Self Storage

Design Capture Volume Calculation	Template Item	Value	Comment
Project Area (ft^2)	1	280,285	
Impervious Area (ft^2)		218,200	
Imperviousness (Imp %)	2	77.85%	Imperviousness after applying preventative site design practices
Runoff Coefficient (Rc)	3	0.57	$Rc=0.858(Imp\%)^3-0.78(Imp\%)^2+0.774(Imp\%)+0.04$
$P_{2yr-1hr}$(in)	4	0.491	Determine 1-hour rainfall depth for a 2-year return period from NOAA
C_1		1.4807	Climatic region Valley=1.4807, Mountain=1.909, Desert=1.2371
P_6(in)	5	0.73	Mean 6-hr precipitation = $P_{2yr-1hr}(in)*C_1$
C_2	6	1.963	24 hrs = 1.582, 48 hrs = 1.963 Drawdown Rate
DCV (ft^3)	7	**19,155**	Design Capture Volume
Flow Based BMP Calculation (Qbmp)			
Regression Coefficeint for Intensity ($I\ R_{C)}$		0.2787	Valley=0.2787 Mountain=0.3614 Desert=0.3250
Qbmp(ft^3/sec)		**0.51**	Q=(Rc)(PxIRc)(Area(ac))

WQMP Inflitration Basin 'A' Sizing (DA-1)
Redlands Self Storage

Infiltration			
Remaining DCV	1	19,155	ft^3
Infiltration Rate	2	4.68	in/hr
Safety Factor	3	3.5	
P_{design}	4	1.34	in/hr
Max Drawdown Time	5	48	hrs
Max Pond Depth to Drain in 48 hrs	6	5.35	ft
Max Pond Depth (Basin Max. Depth)	6	4.00	ft
Pond Depth	7	2.50	ft
Infiltrating Surface Area	8	3,251	ft^2
Amended Soil Depth d_{media}	9	3	ft
Amended Soil Porosity	10	0.3	
Gravel Depth d_{media}	11	4	ft
Gravel Porosity	12	0.4	
Storm Duration	13	3	hrs
V_{ret} =	14	17,342	ft^3
Manufacturer's Retention	15	0	ft^3
Total Retention Volume	16	17,342	ft^3
Fraction of DCV Achieved	17	90.53%	
Full DCV Achieved	18	No	
Actual		44.87	hrs

WQMP Inflitration Basin 'B' Sizing (DA-1)
Redlands Self Storage

Infiltration			
Remaining DCV	1	1,813	ft^3
Infiltration Rate	2	4.68	in/hr
Safety Factor	3	3.5	
P_{design}	4	1.34	in/hr
Max Drawdown Time	5	48	hrs
Max Pond Depth to Drain in 48 hrs	6	5.35	ft
Max Pond Depth (Basin Max. Depth)	6	4.00	ft
Pond Depth	7	2.00	ft
Infiltrating Surface Area	8	2,966	ft^2
Amended Soil Depth d_{media}	9	3	ft
Amended Soil Porosity	10	0.3	
Gravel Depth d_{media}	11	4	ft
Gravel Porosity	12	0.4	
Storm Duration	13	3	hrs
V_{ret} =	14	14,338	ft^3
Manufacturer's Retention	15	0	ft^3
Total Retention Volume	16	14,338	ft^3
Fraction of DCV Achieved	17	790.87%	
Full DCV Achieved	18	Yes	
Actual		40.38	hrs

Land Cover	Units	DA-1 Soil Group B		DA-# Soil Group #		DA-# Soil Group #	
		Pre-developed	Post-developed	Pre-developed	Post-developed	Pre-developed	Post-developed
Commercial Landscaping with Good Cover	CN	56	56				
	Area (ac.)	0.000	1.430				
Commercial (Rooftop and Pavement)	CN	98	98				
	Area (ac.)	0.000	5.000				
Barren	CN	86	86				
	Area (ac.)	6.430	0.000				
	CN						
	Area (ac.)						
	CN						
	Area (ac.)						
	CN						
	Area (ac.)						
	CN						
	Area (ac.)						
Area-Weighted CN	**CN**	**86**	**89**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

HCOC Runoff Volume Analysis (DA-1)
REDLANDS SELF STORAGE

HCOC Volume			
Land Cover Type	1	Varies	
Hydrologic Soils Group	2	B	
Pre-developed DMA Area	3a	280,285	ft^2
Post-developed DMA Area	3b	280,285	ft^2
Curve Number (CN)	4	-	
Pre-developed area-weighted CN	5	86	
Post-developed area-weighted CN	6	89	
Pre-developed soil storage capacity	7	1.63	in
Post-developed soil storage capacity	8	1.24	in
Pre-developed Initial Abstraction	9	0.33	in
Post-developed Initial Abstraction	10	0.25	in
Precipitation for 2-yr, 24-hr storm	11	2.14	in
Pre-developed Volume	12	22,338	ft^3
Post-developed Volume	13	26,746	ft^3
HCOC Volume Reduction Needed	14	3,071	ft^3

HCOC Time of Concentration Analysis (DA-1)
REDLANDS SELF STORAGE

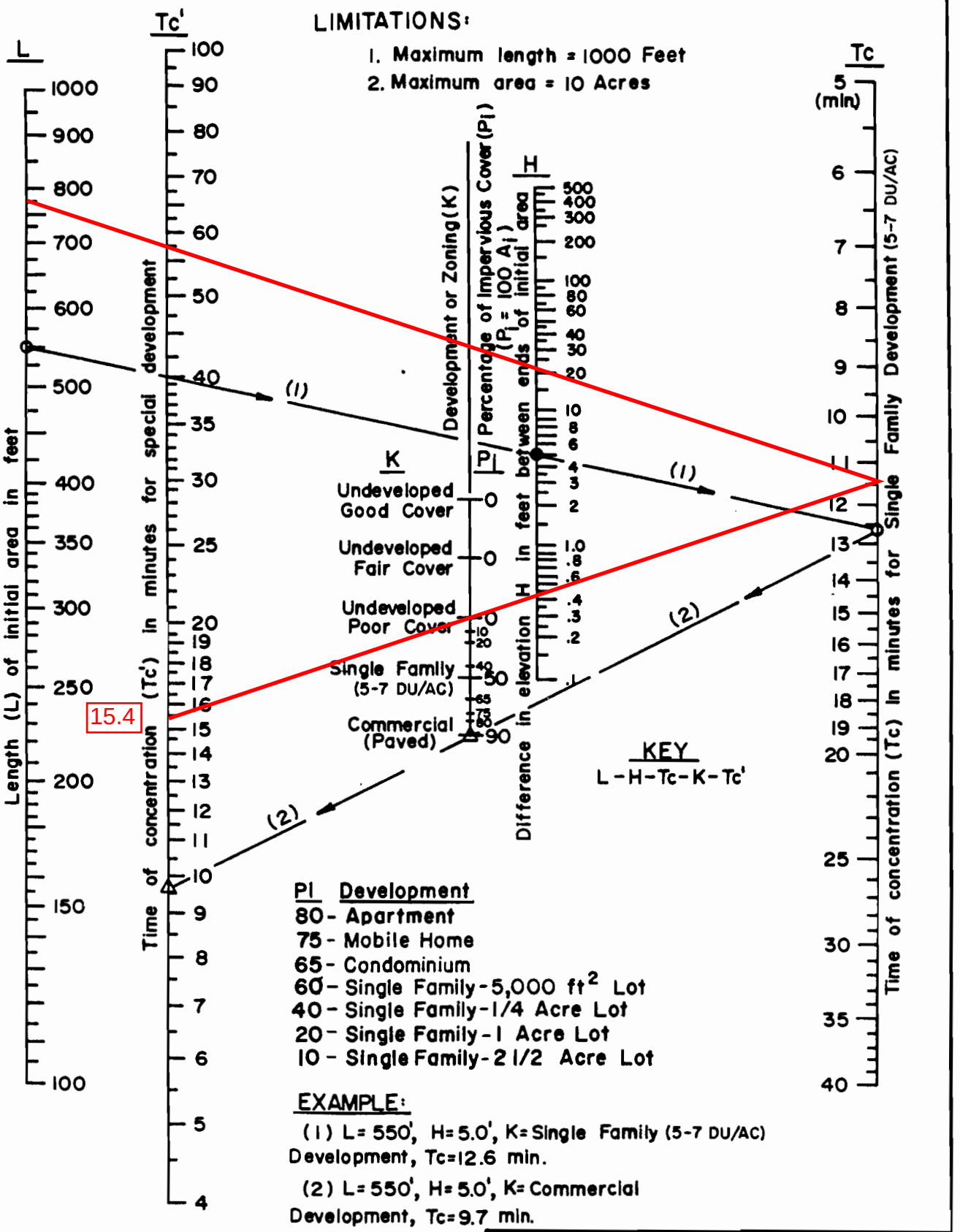
HCOC Time of Concentration		**Pre-developed**		**Post-developed**	
Length of Flowpath	1	776	ft	476	ft
Change in Elevation	2	21.63	ft	14.15	ft
Slope	3	0.028	ft/ft	0.030	ft/ft
Land Cover (Predominant)	4	Barren		Commercial	
Initial DMA Time of Concentration	5	15.40	min	7.30	min
Length of conveyance from DMA outlet to project site outlet	6	0	ft	677	ft
Cross sectional area of channel	7	0	ft^2	3.14	ft^2
Wetted perimeter of channel	8	0.00	ft	6.28	ft
Manning's roughness of channel	9	0.000	n	0.009	n
Channel flow velocity	10	#DIV/0!	ft/sec	17.94	ft/sec
Travel time to outlet	11	#DIV/0!	min	0.63	min
Total time of concentration	12	#DIV/0!	min	7.93	min
Pre-developed time of concentration	13	15.40	min		
Post-developed time of concentratior	14	7.93	min		
HCOC additional TOC needed	15	6.70	min		

HCOC Peak Runoff Analysis (DA-1)
REDLANDS SELF STORAGE

HCOC Peak Runoff		**Pre-developed DMA A**		**Post-developed DMA A**	
Rainfall Intensity	1	1.11	in/hr	1.74	in/hr
Drainage Area	2	6.43	ac	6.43	ac
Ratio of pervious area to total area	3	1.00		0.22	
Pervious area infiltration rate	4	0.27	in/hr	0.75	in/hr
Maximum loss rate	5	0.27	in/hr	0.17	in/hr
Peak Flow from DMA	6	4.86	cfs	9.10	cfs
Time of concetration adjustment factor for other DMA to site discharge point	7	n/a		n/a	
Pre-developed Q_p at T_c for DMA A	8	4.86	cfs		
Pre-developed Q_p at T_c for DMA B	9	-	cfs		
Pre-developed Q_p at T_c for DMA C	10	-	cfs		
Peak runoff from pre-developed condition confluence anlaysis	10b	4.86	cfs		
Post-developed Q_p at T_c for DMA A	11			9.10	cfs
Post-developed Q_p at T_c for DMA B	12			-	cfs
Post-developed Q_p at T_c for DMA C	13			-	cfs
Peak runoff from post-developed condition confluence analysis	14			9.10	cfs
Peak runoff reduction needed to meet HCOC requirements	15	3.78	cfs		

	Pre-developed		Post-developed	
1-hour rainfall depth for 2-yr storm	0.491	in	0.491	in
Initial DMA Time of Concentration	15.4	min	7.3	min

DA-1 DMA A
PRE-DEVELOPED CONDITION

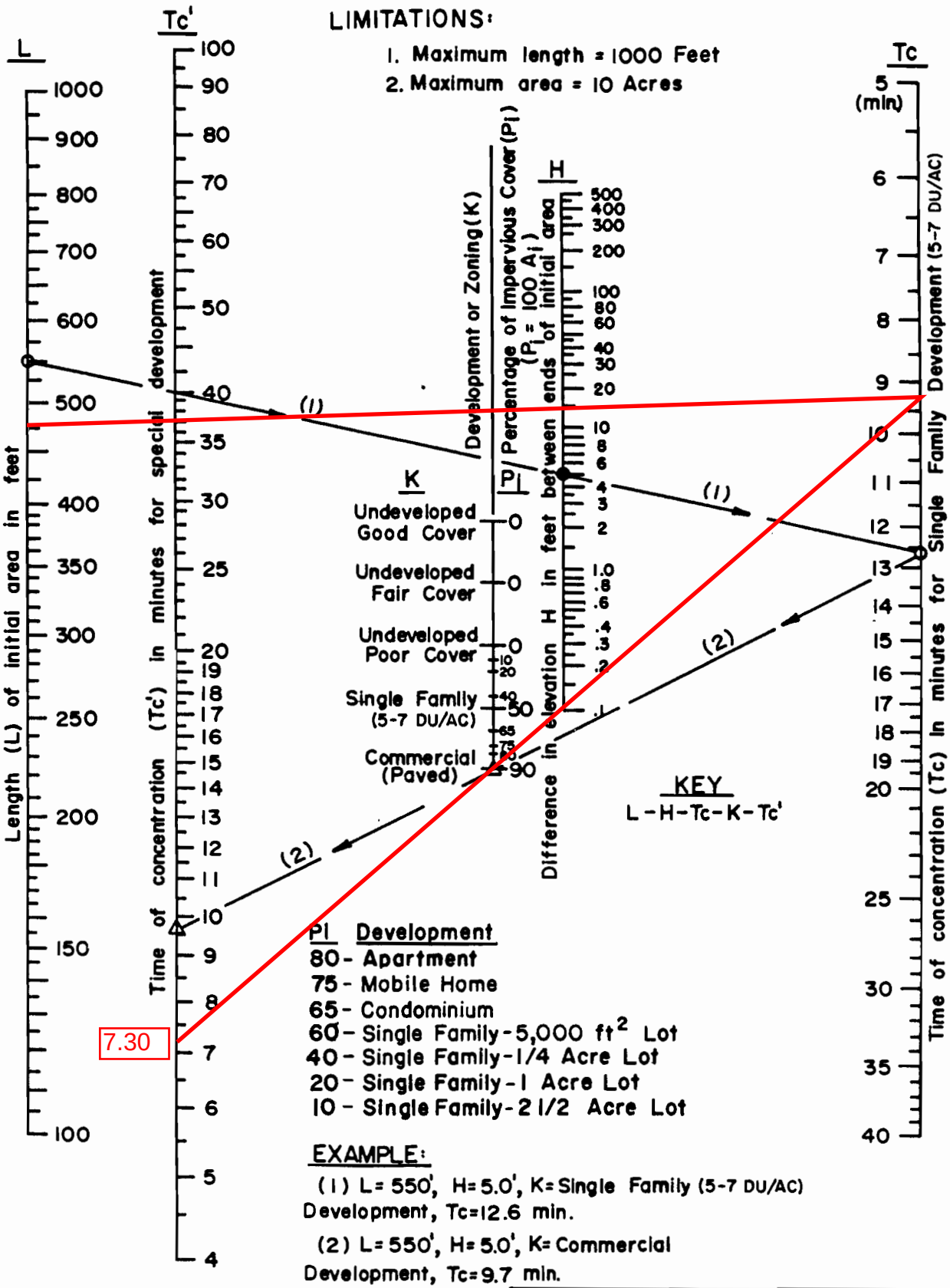


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

DA-1 DMA A
POST-DEVELOPED CONDITION

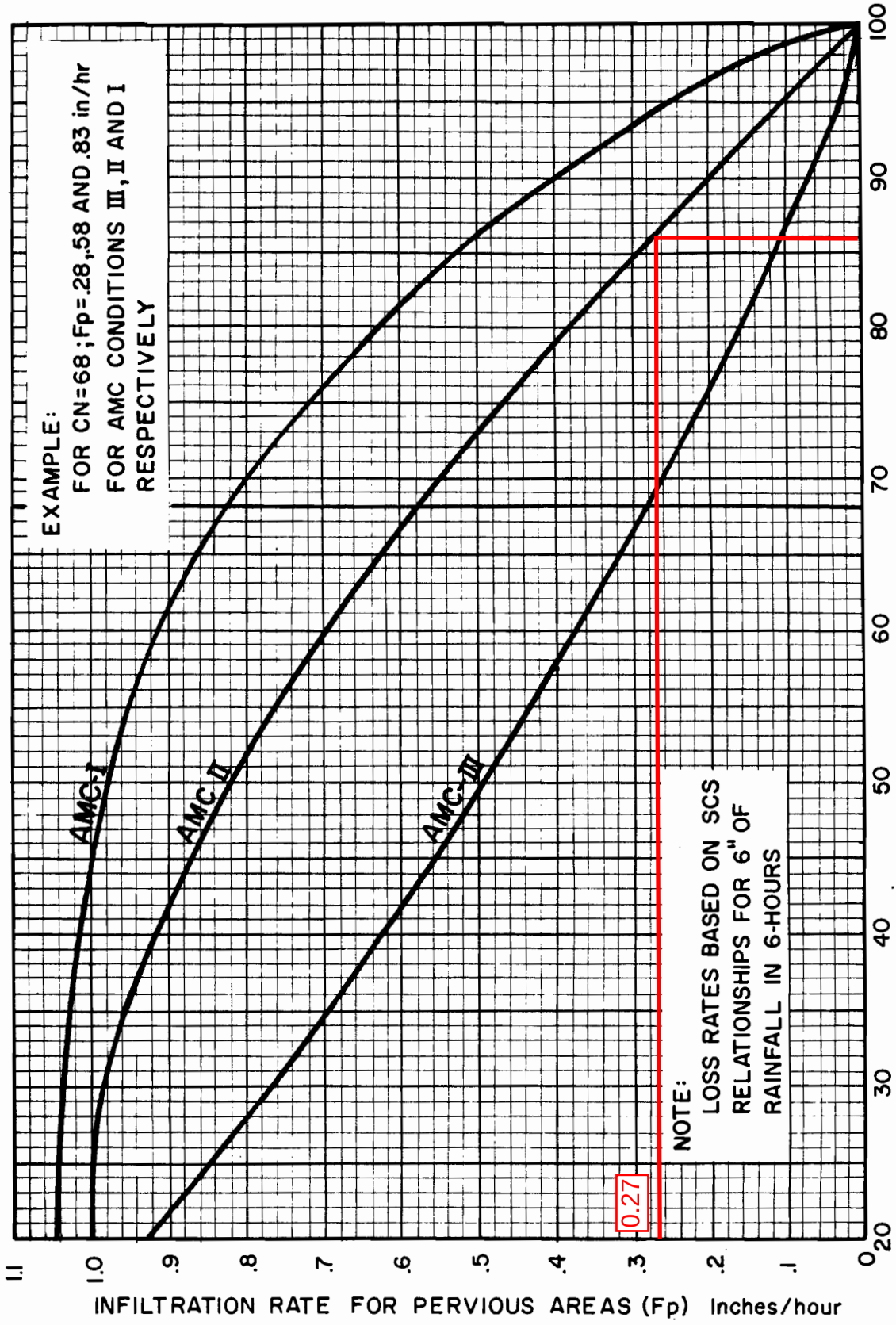


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

DA-1 DMA A
PRE-DEVELOPED CONDITION

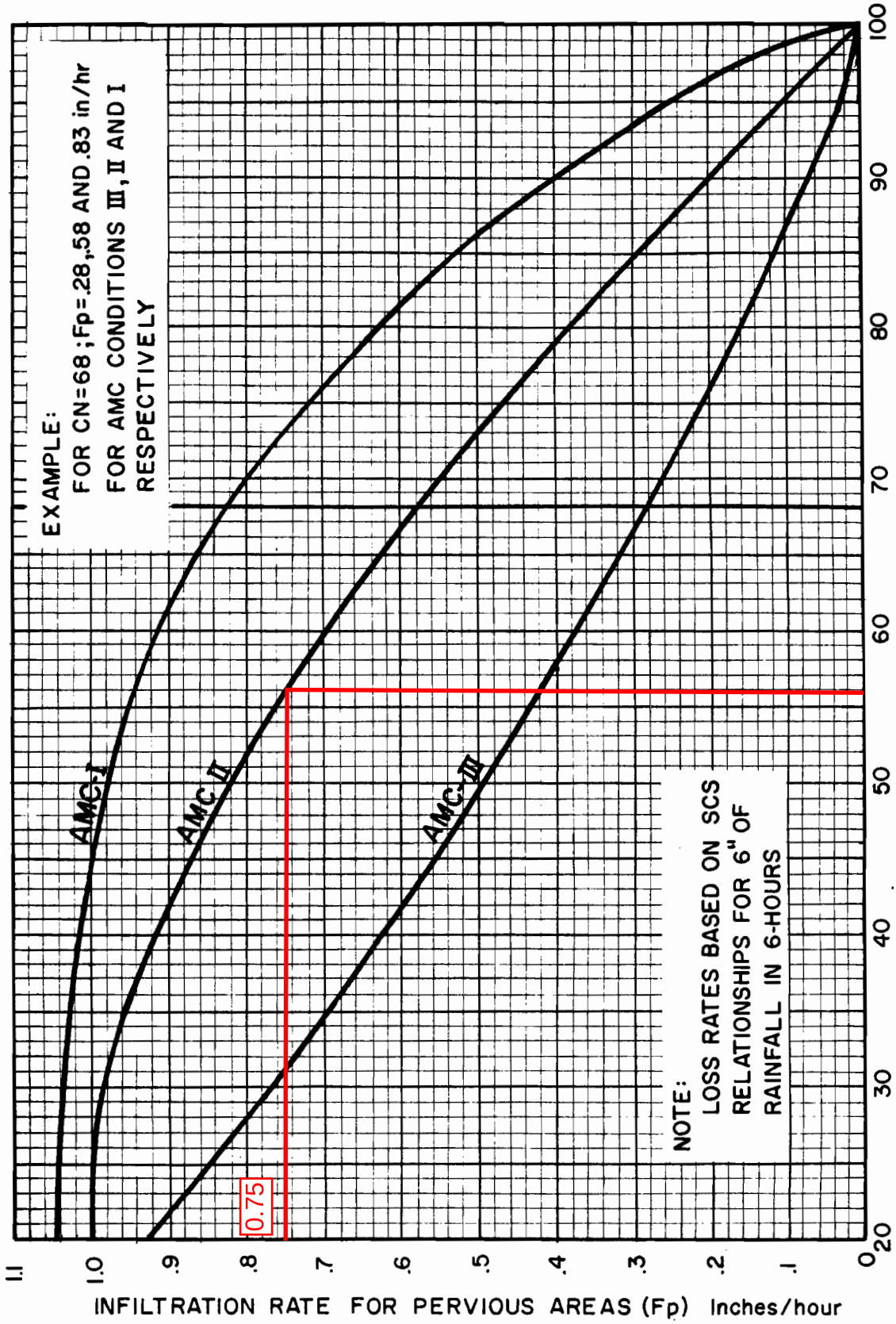


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

INFILTRATION RATE FOR PERVIOUS AREAS VERSUS SCS CURVE NUMBERS

Figure C-6

DA-1 DMA A
POST-DEVELOPED CONDITION



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

INFILTRATION RATE FOR PERVIOUS AREAS VERSUS SCS CURVE NUMBERS

Figure C-6

WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Saturday, December 18, 2021

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	029805107
Project Site Acreage:	6.336
HCOC Exempt Area:	No
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	**System Number** - 0-000-00 **Facility Name** - **Owner** - SBCFCD
Closest channel segment's susceptibility to Hydromodification:	EHM
Highest downstream hydromodification susceptibility:	High
Is this drainage segment subject to TMDLs?	No
Are there downstream drainage segments subject to TMDLs?	No
Is this drainage segment a 303d listed stream?	No
Are there 303d listed streams downstream?	Yes
Are there unlined downstream waterbodies?	No
Project Site Onsite Soil Group(s):	A, B
Environmentally Sensitive Areas within 200':	None
Groundwater Depth (FT):	-180
Parcels with potential septic tanks within 1000':	No
Known Groundwater Contamination Plumes within 1000':	No
Studies and Reports Related to Project Site:	CSDP 4 CALC SHEET FOR HYDRO CSDP 4 Hydrological Design Criteria SBVMWD High Groundwater / Pressure Zone Area

NOAA Atlas 14, Volume 6, Version 2
Location name: Redlands, California, USA*
Latitude: 34.0678°, Longitude: -117.1384°
Elevation: 1618.84 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.104** (0.087-0.127)	**0.137** (0.114-0.167)	**0.183** (0.151-0.223)	**0.222** (0.183-0.273)	**0.279** (0.222-0.355)	**0.326** (0.253-0.423)	**0.376** (0.285-0.501)	**0.430** (0.317-0.590)	**0.509** (0.359-0.729)	**0.575** (0.392-0.852)
10-min	**0.149** (0.124-0.181)	**0.196** (0.163-0.239)	**0.262** (0.217-0.319)	**0.319** (0.262-0.392)	**0.400** (0.318-0.509)	**0.467** (0.363-0.607)	**0.539** (0.408-0.718)	**0.617** (0.454-0.846)	**0.730** (0.515-1.04)	**0.823** (0.561-1.22)
15-min	**0.181** (0.150-0.219)	**0.238** (0.197-0.289)	**0.317** (0.263-0.386)	**0.385** (0.317-0.473)	**0.484** (0.384-0.616)	**0.565** (0.439-0.734)	**0.652** (0.494-0.868)	**0.746** (0.550-1.02)	**0.883** (0.623-1.26)	**0.996** (0.679-1.48)
30-min	**0.265** (0.221-0.322)	**0.349** (0.290-0.424)	**0.465** (0.386-0.567)	**0.566** (0.465-0.696)	**0.711** (0.565-0.904)	**0.830** (0.645-1.08)	**0.957** (0.726-1.28)	**1.10** (0.807-1.50)	**1.30** (0.915-1.86)	**1.46** (0.997-2.17)
60-min	**0.374** (0.311-0.454)	**0.491** (0.408-0.597)	**0.655** (0.543-0.799)	**0.797** (0.655-0.979)	**1.00** (0.795-1.27)	**1.17** (0.908-1.52)	**1.35** (1.02-1.80)	**1.54** (1.14-2.12)	**1.83** (1.29-2.61)	**2.06** (1.40-3.05)
2-hr	**0.535** (0.446-0.650)	**0.692** (0.575-0.842)	**0.908** (0.753-1.11)	**1.09** (0.897-1.34)	**1.35** (1.07-1.72)	**1.56** (1.22-2.03)	**1.79** (1.35-2.38)	**2.03** (1.49-2.78)	**2.37** (1.67-3.39)	**2.64** (1.80-3.92)
3-hr	**0.656** (0.546-0.796)	**0.842** (0.700-1.02)	**1.10** (0.908-1.34)	**1.31** (1.08-1.61)	**1.61** (1.28-2.05)	**1.86** (1.44-2.41)	**2.11** (1.60-2.81)	**2.38** (1.76-3.27)	**2.77** (1.95-3.96)	**3.08** (2.10-4.56)
6-hr	**0.916** (0.762-1.11)	**1.17** (0.970-1.42)	**1.51** (1.25-1.84)	**1.79** (1.47-2.20)	**2.19** (1.74-2.78)	**2.50** (1.94-3.25)	**2.82** (2.14-3.76)	**3.16** (2.33-4.34)	**3.64** (2.57-5.21)	**4.02** (2.74-5.96)
12-hr	**1.24** (1.03-1.50)	**1.58** (1.31-1.92)	**2.03** (1.69-2.48)	**2.41** (1.98-2.96)	**2.93** (2.32-3.72)	**3.33** (2.59-4.33)	**3.74** (2.84-4.99)	**4.17** (3.07-5.72)	**4.76** (3.36-6.81)	**5.22** (3.56-7.74)
24-hr	**1.66** (1.47-1.92)	**2.14** (1.89-2.47)	**2.77** (2.44-3.21)	**3.29** (2.88-3.83)	**3.99** (3.38-4.81)	**4.53** (3.76-5.57)	**5.08** (4.12-6.40)	**5.65** (4.46-7.32)	**6.43** (4.87-8.67)	**7.04** (5.15-9.81)
2-day	**2.03** (1.79-2.33)	**2.65** (2.34-3.06)	**3.47** (3.06-4.02)	**4.15** (3.64-4.84)	**5.09** (4.31-6.13)	**5.82** (4.83-7.15)	**6.56** (5.32-8.26)	**7.34** (5.78-9.49)	**8.40** (6.36-11.3)	**9.23** (6.75-12.9)
3-day	**2.17** (1.92-2.50)	**2.88** (2.54-3.32)	**3.82** (3.37-4.42)	**4.60** (4.03-5.37)	**5.69** (4.82-6.86)	**6.55** (5.43-8.05)	**7.43** (6.02-9.36)	**8.35** (6.59-10.8)	**9.63** (7.29-13.0)	**10.6** (7.79-14.8)
4-day	**2.34** (2.07-2.70)	**3.12** (2.76-3.60)	**4.18** (3.69-4.83)	**5.06** (4.43-5.90)	**6.28** (5.32-7.57)	**7.25** (6.02-8.91)	**8.25** (6.69-10.4)	**9.31** (7.34-12.0)	**10.8** (8.15-14.5)	**11.9** (8.74-16.6)
7-day	**2.70** (2.39-3.11)	**3.64** (3.22-4.21)	**4.92** (4.34-5.69)	**5.98** (5.23-6.97)	**7.46** (6.32-8.98)	**8.62** (7.16-10.6)	**9.83** (7.97-12.4)	**11.1** (8.75-14.4)	**12.9** (9.74-17.3)	**14.3** (10.4-19.9)
10-day	**2.92** (2.59-3.37)	**3.97** (3.51-4.58)	**5.38** (4.75-6.23)	**6.56** (5.74-7.65)	**8.21** (6.95-9.89)	**9.50** (7.88-11.7)	**10.8** (8.79-13.7)	**12.3** (9.66-15.9)	**14.2** (10.8-19.2)	**15.8** (11.5-22.0)
20-day	**3.63** (3.22-4.19)	**4.99** (4.41-5.75)	**6.81** (6.01-7.88)	**8.34** (7.30-9.73)	**10.5** (8.87-12.6)	**12.2** (10.1-15.0)	**13.9** (11.3-17.5)	**15.8** (12.4-20.4)	**18.3** (13.9-24.7)	**20.4** (14.9-28.4)
30-day	**4.32** (3.82-4.97)	**5.92** (5.24-6.84)	**8.10** (7.15-9.37)	**9.92** (8.68-11.6)	**12.5** (10.6-15.0)	**14.5** (12.0-17.8)	**16.6** (13.5-20.9)	**18.8** (14.8-24.4)	**21.9** (16.6-29.5)	**24.4** (17.8-34.0)
45-day	**5.20** (4.61-5.99)	**7.10** (6.28-8.19)	**9.66** (8.52-11.2)	**11.8** (10.3-13.8)	**14.8** (12.6-17.9)	**17.2** (14.3-21.2)	**19.7** (16.0-24.9)	**22.4** (17.6-29.0)	**26.1** (19.7-35.1)	**29.0** (21.2-40.4)
60-day	**6.15** (5.45-7.09)	**8.31** (7.35-9.59)	**11.2** (9.91-13.0)	**13.7** (12.0-16.0)	**17.1** (14.5-20.7)	**19.9** (16.5-24.5)	**22.8** (18.4-28.7)	**25.8** (20.3-33.4)	**30.0** (22.7-40.5)	**33.4** (24.4-46.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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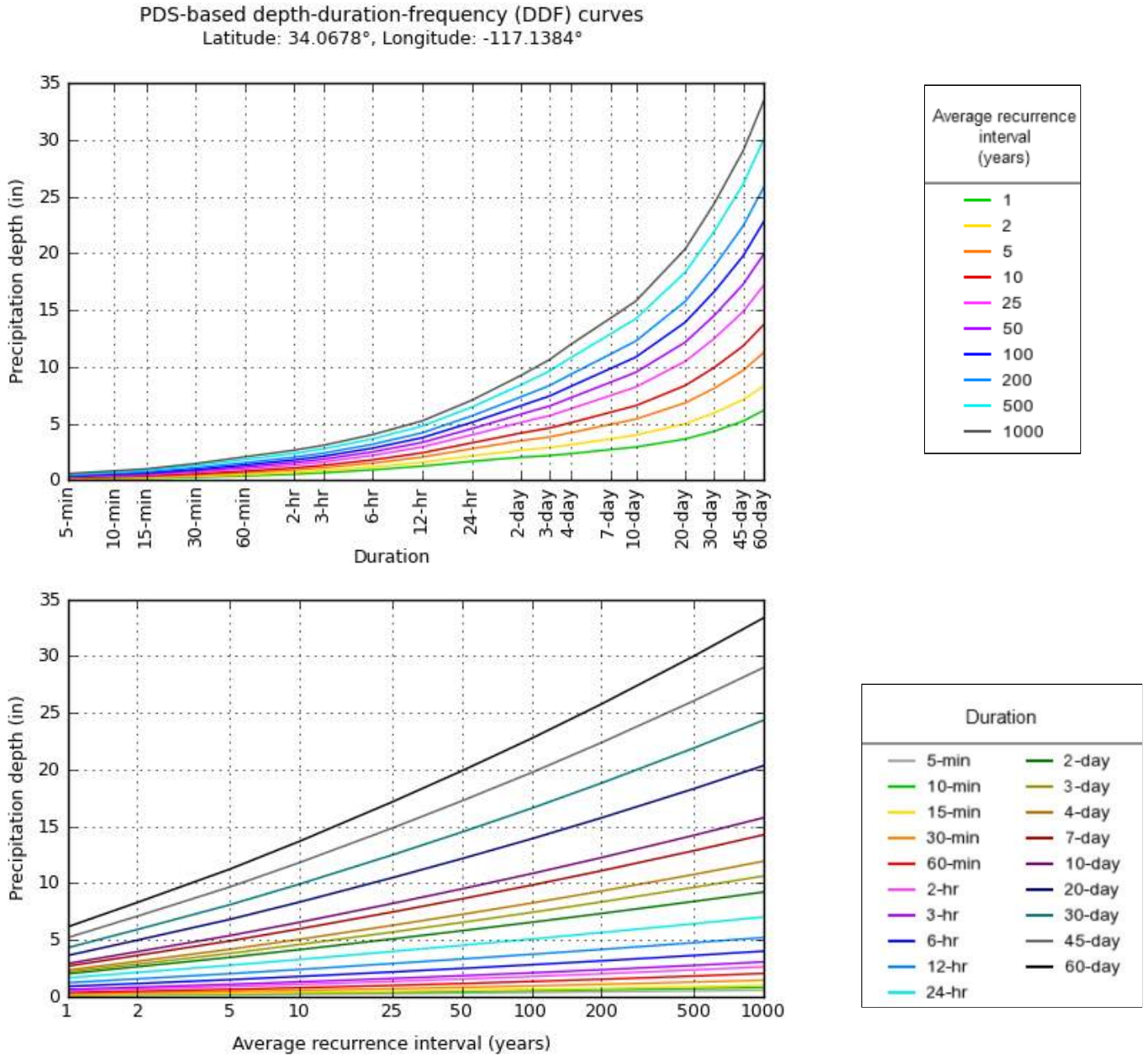
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Sun Dec 19 00:58:30 2021

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Maps & aerials

Small scale terrain

Large scale terrain

Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	.50
		Predominant soil texture	0.25	1	.25
		Site soil variability	0.25	2	.50
		Depth to groundwater / impervious layer	0.25	1	.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	2	.50
		Level of pretreatment/ expected sediment loads	0.25	2	.50
		Redundancy	0.25	2	.50
		Compaction during construction	0.25	2	.50
		Design Safety Factor, $S_B = \Sigma p$			2.00
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					3.50
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					4.68
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$					1.34

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

PLEASE SEE ATTACHED SOILS TESTING UNDER TAB 6.4E MISC. DATA.
LOWER AVERAGE TESTED INFILTRATION RATE USED TO DETERMINE DESIGN INFILTRATION RATE.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Preliminary Geotechnical Investigation for proposed self-storage facility and retail development, Southeast corner of North Wabash Ave and Naples Ave, Redlands, California 92359.

PN 21031-01
November 1, 2021

KCG KLING Consulting Group, Inc.

KCG KLING Consulting Group, Inc.

November 1, 2021 **PN 21031-01**

Mr. Adam Lentz
Madison Capital Group, LLC
6805 Morrison Boulevard, Suite 250
Charlotte, North Carolina 28211

Subject: Preliminary Geotechnical Investigation for proposed self-storage facility and retail development, Southeast corner of North Wabash Ave and Naples Ave, Redlands, California 92359.

Dear Mr. Lentz,

At your request and authorization, Kling Consulting Group, Inc. (KCG) has performed a preliminary geotechnical investigation for a proposed self-storage facility and retail development at the southeast corner of North Wabash Avenue and Naples Avenue, Redlands, California (**see Figure 1 - Site Location Map**). Our findings from subsurface exploration, laboratory testing, and geotechnical analyses are presented herein. Conclusions and recommendations are provided regarding the existing geotechnical conditions and the design of the proposed development. This report is also subject to the limitations presented in Section 6.0 of our report and the ASFE (Associated Soil and Foundation Engineers) insert included in Appendix G.

We appreciate this opportunity to be of continued service and to work with you on this project. Should you have any questions regarding this report, please do not hesitate to call.

Respectfully,

KLING CONSULTING GROUP

Sean M. Webb
Staff Geologist/Engineer

REGISTERED PROFESSIONAL ENGINEER HENRY F. KLING No. 2205 GEOTECHNICAL STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST JEFFREY P. BLAKE No. EG 2248 Exp. 10/31/23 STATE OF CALIFORNIA

Henry F. Kling
Principal Geotechnical Engineer
GE 2205 Expires 3/31/22

Jeffrey P. Blake
Associate Engineering Geologist
CEG 2248 Expires 10/31/23

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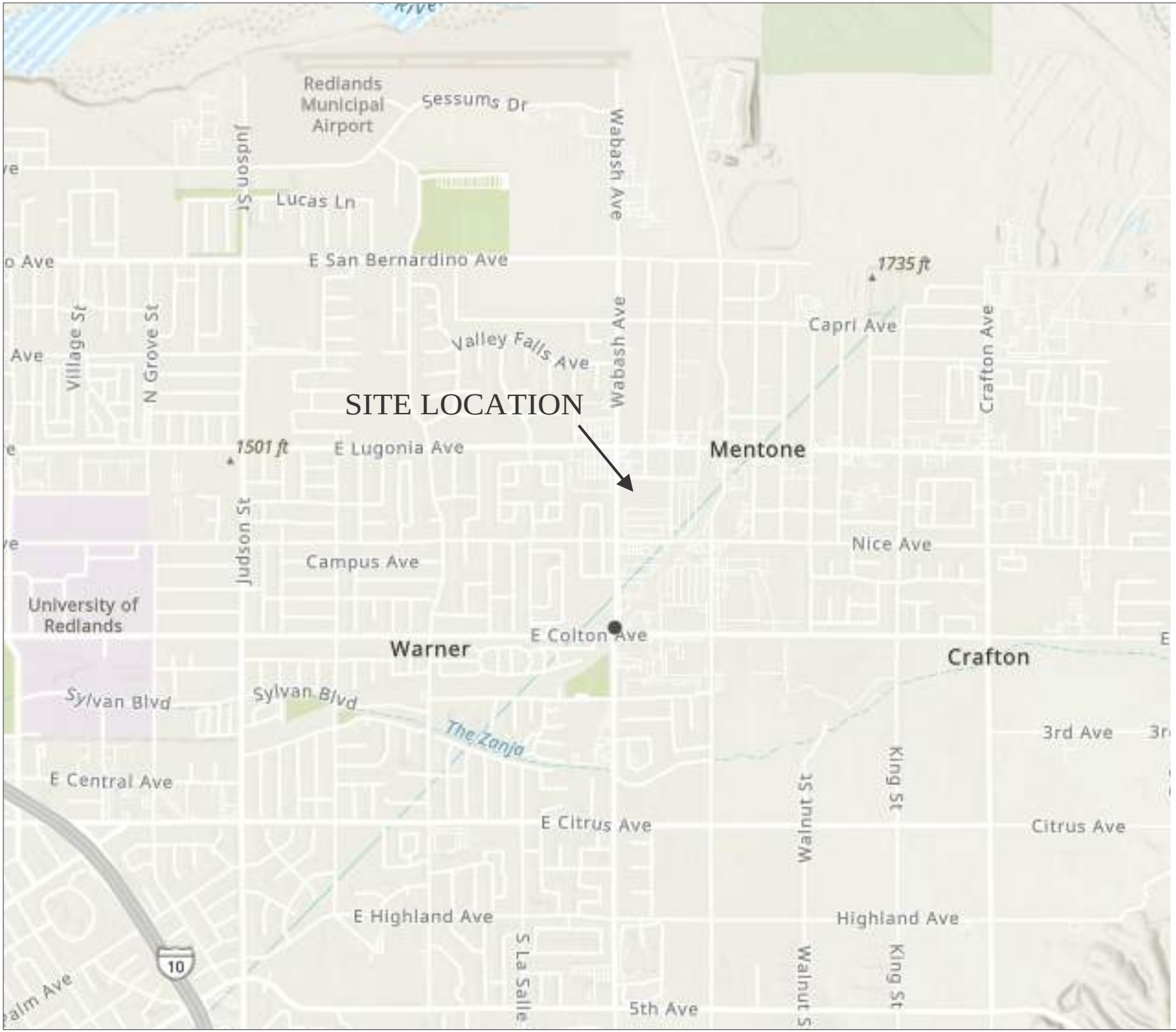

Notes:

Scale: 1'': 1850'

KCG KLING Consulting Group, Inc.

Client: Madison Capital Group, LLC

Address: N Wabash Ave. & Naples Ave., Redlands, CA 92359

Tract 30387 - Beaumont

Site Location Map

Drawn: J.H.	**Date:** 10/7/2021
P/N: 21031-00	**Figure:** 1

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Attachments:

Figure 1 – Site Location Map
Figure 2 – Geotechnical Map

Appendix A - References
Appendix B - Exploration Boring Logs
Appendix C - Percolation Test Results
Appendix D - Laboratory Procedures and Test Results
Appendix E - General Earthwork and Grading Specifications
Appendix F - Hardscape Recommendations
Appendix G - ASFE Insert
Appendix H - Retaining Wall Details

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of our preliminary geotechnical investigation was to evaluate near-surface soil conditions to provide geotechnical design recommendations for a proposed self-storage facility and retail center. Our subsurface exploration consisted of the excavation of seven hollow-stem auger borings and two percolation tests located within the vicinity of the proposed development. The locations of the borings and percolation tests are shown on **Figure 2 - Geotechnical Map**. Continuous logs of the subsurface conditions, as encountered in the borings, were recorded and are presented in **Appendix B**. The results of the percolation tests were recorded and are presented in **Appendix C**. Bulk and drive samples were obtained in the field and delivered to our laboratory for testing and evaluation and included herein as **Appendix D.**

1.2 SITE AND PROJECT DESCRIPTION

The subject site is a roughly 6.3-acre rectangular parcel of land surrounded by existing residential and commercial properties. The site is bordered on the north by Naples Avenue, to the west by Wabash Avenue, to the east by Jasper Avenue and to the south by commercial storage warehouses. According to the United States Geological Survey (USGS) 7.5 Minute Redlands Quadrangle (USGS, 2018), the site surface is gently sloping toward the west. The approximate elevation in the western portion of the site is 1,620 feet and approximately 1,640 feet in the eastern part of the site. The site at the time of our subsurface exploration was primarily covered in dry brush and shrub. A 36 square-foot concrete pad was located in the center of the site. An approximately 15 to 20 foot high tree was roughly located within the northeast corner of the site.

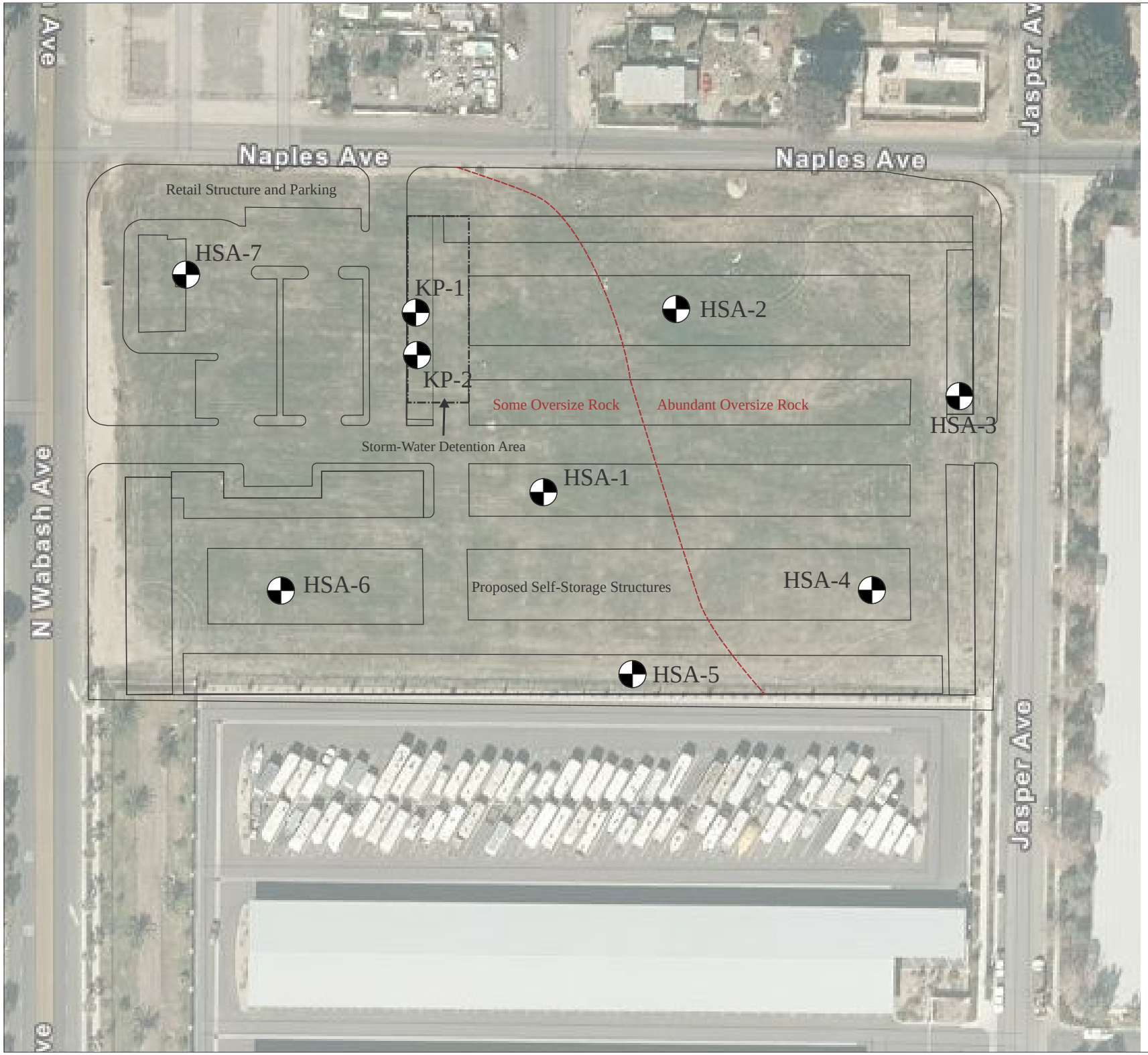
Conceptual site plans provided by Magellan Architecture, indicate the following improvements:

- The existing site will be developed for one story self-storage building facilities totaling an area of approximately 125,000 square feet.
- A 2,700 square foot retail building and an adjacent parking lot will be constructed in the northwestern portion of the subject site.
- A storm water detention area approximately 6,500 square feet in size will be constructed in the north central portion of the site.

2.0 GEOLOGIC CONDITIONS

2.1 Subsurface Investigation and Sampling

On October 15, 2021, seven borings and two percolation tests were advanced using a drill rig equipped with a hollow stem auger, placed at readily accessible locations. The borings were excavated to depths between approximately 5 and 30 feet below the existing ground surface within the proposed development area. Practical refusal was encountered in Borings HSA-3 and HAS-6 at a depth of 9.8 feet and in Borings HSA-4 and HSA-7 at a depth of 5 feet all due to cobbles and boulders. The percolation test borings were excavated to depths of 5 and 10 feet. The borings were observed and logged by a



Notes:

Boring Hole Location

Scale: 1'': 100'

KCG KLING Consulting Group, Inc.

Client: Madison Capital Group, LLC

Address: N Wabash Ave. & Naples Ave., Redlands, CA 92359

Geotechnical Map

Drawn: J.H.	**Date:** 10/11/2021
P/N: 21031-00	**Figure:** 2

geologist from KCG. Logs of the exploratory borings are included in Appendix B. The approximate locations of the borings are illustrated in **Figure 2 - Geotechnical Map**.

During our field exploration, selected ring and bulk samples were obtained for laboratory testing. Bulk composite samples were collected from drilling excavation spoils. All samples collected were transported to our laboratory for evaluation and testing. Laboratory tests included in-situ moisture and density, direct shear, expansion index, R-value, consolidation, max density and sulfate content. Test descriptions and results are presented in the summary of laboratory testing, Appendix D.

2.2 Regional and Site Specific Geologic Setting

The subject site is located in the valley plains, southwest of the San Bernardino Mountains in San Bernardino County, California. This area resides in the northern margin of the Peninsular Range Geomorphic Province. This province is characterized by northwest-trending elongated ranges and intervening alluvial-filled valleys. The dominant geologic structures of the province are northwest trending fault zones, including the San Andreas Fault Zone to the north and the San Jacinto Fault Zone to the south of the subject site.

Geological mapping of the area indicates near-surface native soil deposits consisting of Holocene to late Pleistocene age Alluvial sediments comprised of varying sediments of sand and clay of valley areas. The sediments are typically covered with gray clay soil and include pebbly sands adjacent to mountain terranes. These deposits are anticipated to be on the order of several hundred feet in thickness and subsequently underlain by several thousand feet of sedimentary rock formations.

2.3 Subsurface Conditions

2.3.1 Young Alluvial Fan Deposits (Qya)

The site is underlain by Young Alluvial Fan Deposits of Quaternary age to the total depth explored of 30 feet below the ground surface.

The Holocene to late Pleistocene age alluvial deposits were comprised of primarily silty sand with varying amounts of gravels, cobbles and boulders. The silty sand is typically light brown, dry, and dense. The gravels, cobbles and boulders are granitic and are generally subrounded or subangular and typically range from 0.25 to 12 inches in diameter. Based on our limited subsurface exploration, the easterly portion of the site appears to contain significantly more boulders and cobbles than the westerly portion (See Figure 2 – Site Plan).

3.0 Groundwater

Groundwater was not encountered in any borings undertaken to the total depth explored of 30 feet. The nearest groundwater observation well, monitored by the California Department of Water Resources, is located on E. Colton Avenue in Redlands at a ground surface elevation of 1651 feet above sea level. The highest recorded groundwater was recorded at 48 feet below the ground surface in April 1948 (Reference 6). The subject site is approximately 0.4 miles northwest from this observation well. Typically historical

groundwater levels can be obtained via a State of California Hazard Zone Report; however, one has not been established for the Redlands Quadrangle. Based on this information, we do not expect that groundwater would be encountered during the proposed construction. It should be noted that variations in groundwater or seepage may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not be evident at the time of our subsurface exploration.

4.0 GEOTECHNICAL ENGINEERING

4.1 Expansive Soil Characteristics

Based on our laboratory testing on a bulk sample from the borehole, Expansion Index (EI) testing was performed on a representative soil sample that exhibited an Expansion Index of 0, which is considered Non-Expansive (EI < 20) according to the CBC.

4.2 Sulfate Content

Sulfate testing was performed on a representative sample of the soil. The soils tested during this investigation indicated a class "S0" sulfate per ACI-318 (Reference 2), with a soluble sulfate content of 108 ppm.

4.3 Moisture and Density

Samples were retrieved at various depths below the ground surface from each boring location and used to determine in-place dry density and moisture content. Moisture results indicate the soils to have a moisture content of between 0.4 and 3.8 percent and a dry density of between 104.7 and 135.2 pcf.

4.4 Earthwork Shrinkage and Subsidence

Based on our field and laboratory density tests and observations, the following estimate of shrinkage and subsidence factors of the upper alluvial materials to be utilized as on-site compacted fill soils are presented for design consideration.

Shrinkage Factor	-	5% to 10%
Subsidence Factor	-	0.10 feet

Although the above values are only approximate, they represent our best estimate of shrinkage and lost yardage which would likely occur during re-grading.

4.5 Seismic Design Parameters

Presented below are the site seismic parameters utilizing generic geologic, seismic, and geotechnical data gathered for the site and the SEAC Seismic Design Tool (Reference 15). All structures should be designed for earthquake-induced strong ground motions in accordance with the 2019 CBC procedures utilizing the following parameters:

Seismic Design Parameters

Site Class (Soil Profile)	D
Latitude	34.068308
Longitude	-117.137801
Short Period Spectral Acceleration, Ss:	1.994
1-Second Period Spectral Acceleration, S1:	0.816
Site Coefficient, Fa:	1.0
Site Coefficient, Fv:	1.7
Maximum Considered Earthquake Spectral Response Acceleration, SMS:	1.994
Maximum Considered Earthquake Spectral Response Acceleration, SM1:	1.387
Design Spectral Response Acceleration, SDS:	1.329
Design Spectral Response Acceleration, SD1:	0.924
Site modified peak ground acceleration PGA_M	0.928
Seismic Design Category	D

Note: A site specific ground motion analysis was not included in the scope of this investigation. Per ASCE 7-16, 11.4.8, structures on Site Class D with S_1 greater than or equal to 0.2 may require Site Specific Ground Motion Analysis. However, a site specific ground motion analysis may not be required based on exceptions listed in ASCE 7-16, 11.4.8. The project structural engineer should verify whether exceptions are valid for this site and if a Site Specific Ground Motion Analysis is required.

4.6 Faulting and Surface Rupture

The subject site is not located within the State of California designated Fault-Rupture Hazard Zone (formerly known as Alquist-Priolo Zones), where a site-specific investigation to determine the locations of any active faults would be required. However, the Southern California region is seismically active. Active and potentially active faults within Southern California are capable of producing seismic shaking at the site. It is anticipated that the site will periodically experience ground acceleration due to exposure to moderate to large magnitude earthquakes occurring on distant faults. However, no active faults are know to exist at the site, and the risk of surface fault rupture is considered low. The closest active fault zone to the subject site is the San Andreas Fault Zone, located approximately 2.5 miles to the northeast.

4.7 Secondary Seismic Hazards

Secondary seismic hazards generally consist of liquefaction, lateral spreading, landsliding and seismic settlement without liquefaction. The subject is relatively flat with no slopes. Landslide potential is non-existent.

4.8 Liquefaction Potential

Based on our review of published geologic data, subsurface data, laboratory testing, the lack of a shallow static groundwater table, and the overall relatively dense nature of the on-site soils, it is our opinion that the site is not susceptible to liquefaction. The state of California has not established a seismic hazard zone for the area.

4.9 Seismically Induced Settlement

Based on the overall dense nature of the underlying on-site soils, the potential for seismic induced settlement to occur at the site during a seismic event is considered unlikely.

4.10 Lateral Spreading

The potential for lateral spreading is unlikely based on information that indicates that the site is not likely to be liquefiable, as discussed above.

4.11 Percolation Testing

Percolation testing was performed at the site in order to establish the basic infiltration characteristics of the site. Once a drainage plan has been developed additional percolation testing may be warranted.

4.11.1 Percolation Test Procedure

Percolation testing for this study was performed in general accordance with the Riverside County Low Impact Development Best Management Practice Guidelines for Design, Investigation, and Reporting (Reference 14). Following the completion of drilling, the percolation test holes were pre-saturated. Following pre-saturation of the percolation test borings, the water level was filled to a minimum of five times the hole's radius and allowed to percolate into the soil. Two consecutive 25-minute readings indicated a change in water level greater than 6 inches, and the test met the criteria for measuring percolation rates of sandy soil. Based on the criteria for sandy soil, measurements were taken at 10-minute intervals for an additional hour. The percolation test results are presented in Appendix C.

Test excavations were drilled using a hollow stem auger with a diameter of 8-inches to a depth 5 feet and 10 feet. Before pre-soaking the test holes, a four-inch diameter slotted pipe was installed into the excavations. A filter pack consisting of 2-inch graded gravel was placed on the bottom of the hole. The excavations were pre-soaked by filling the pipes with a 5-gallon bottle of clear water supported over

the hole so that water flow into the hole is constant and fill at least 5 times the hole's radius.

4.11.2 Percolation Test Results

The following table presents a summary of the results for the testing location. The percolation rates obtained during field testing were converted to infiltration rates utilizing the "Porchet Method." A Factor of Safety of 3 has been applied to the rates as per Reference 14. Calculated infiltration rates are tabulated below.

Infiltration Rates

Test Boring Number	Depth Below Existing Ground Surface (ft)	Soil Description	*Infiltration Rate (inches per hour)
KP-1	5	Silty Sand (SM)	2.88
KP-2	10	Gravelly Sand (SP)	1.56

*Factor of Safety of 3 has been applied to this rate.

5.0 CONCLUSIONS

The following conclusions are based upon our analysis and data review obtained during our subsurface field investigation and laboratory testing. It is our opinion that the subject site is considered geotechnically suitable for the proposed development discussed above, provided the recommendations presented herein are implemented during design and construction.

- Based upon our review of the site, the soils on-site are considered to have sufficient bearing capacity to support the proposed development, provided the recommendations herein are implemented.

- Oversize rock materials (i.e. cobbles and boulders) are present at relatively shallow depths. Oversize materials will be encountered during earthwork operations throughout the site and particularly within the eastern portion of the site (See Figure 2 – Site Plan). Oversize rock will likely result in difficult excavation during construction of utility trenches and foundations. Additional handling by the grading contractor would result in order to separate the oversize material (rocks) stockpile them and probably haul offsite.

- The potential for liquefaction to occur within the site is unlikely due to the lack of a shallow static groundwater table and the overall dense nature of the underlying on-site soils.

- Based on our laboratory testing soils, the soils underlying the site have a very low expansion potential.

- Seismically induced settlement and lateral spreading are not likely to occur at the site during seismic events;

- No active fault is known to exist at the site, and the risk of surface fault rupture is considered to be very low.

- Groundwater was not encountered in any of our borings and is considered to be at a depth such that it should not impact the proposed developments construction.

- The proposed development should not adversely affect neighboring properties if proper care is taken during the construction of proposed improvements.

6.0 RECOMMENDATIONS

Recommendations presented below are based on preliminary information obtained from the client along with the geotechnical information gathered and analyzed to date.

6.1 Earthwork Specifications

All grading should be performed in accordance with the General Earthwork and Grading Specifications presented in Appendix E, unless specifically revised or amended below. Grading should also conform to all applicable governing agency requirements. Prior to commencement of grading operations, all vegetation, organic topsoil, and man-made structures (i.e., tanks, pipes, fences, etc.) should be cleared and disposed of off-site. Any undocumented fill or backfill encountered should be removed and recompacted. All areas receiving fill should be scarified to 6 inches and/or over-excavated, moisture-conditioned to between optimum moisture and two to four percent above optimum moisture content, and re-compacted to a minimum of 90 percent relative compaction as determined by ASTM D1557. Soil material excavated from the site should be adequate for re-use as compacted fill provided it is free of oversize rock, trash, vegetation, and other deleterious material. All earthwork and grading operations should be performed under the observation and testing of the geotechnical consultant of record.

6.2 Remedial Earthwork and Over-Excavation

Proposed Structural Areas

The upper three (3) feet of the soils underlying the site are considered potentially compressible with additional fill or structural loads. In order to reduce the potential for settlement and differential settlement, and maintain a uniform fill blanket beneath the bottom of the foundations, we recommend the building pad areas be over-excavated to provide and maintain a minimum thickness of at least three (3) feet of fill below finish grade elevations, or a minimum depth of approximately two (2) feet below the bottom of the proposed footing depths and recompacted. The removal depth may vary laterally. As such, the recommended excavation depth may vary; this will need to be observed during construction. At a minimum, the removals should extend laterally beyond the building

footprint at least five feet, where practical. Footings should be underlain by a minimum of two feet of engineered fill below the bottom of footings.

Oversize materials will likely be encountered during remedial grading throughout the site and particularly within the eastern portion of the site. Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically recommended by the geotechnical consultant. However, 12-inch rock can create difficulties during utility trench and foundation excavations. In order to help mitigate this difficulty, the maximum oversize rock could be reduced to 6-inches.

Bottom of removal areas should be scarified and to a minimum depth of 6- to 12-inches, moisture-conditioned to at least 2 to 4 percentage points above the optimum moisture content, and compacted to a minimum of 90 percent relative compaction in accordance with ASTM D1557. Soil/Rock material excavated from these areas should be adequate for re-use as compacted fill provided that it is free of trash, vegetation, and other deleterious material. Any fill should be placed in relatively thin lifts (6- to 12-inches depending on the oversize material), in thickness such that the required relative compaction and moisture content is achieved throughout.

Proposed Pavement and Flatwork Areas

In areas outside of proposed structural areas that would support pavement and flatwork, the exposed subgrade soils should be processed and re-compacted to a depth of 12-inches. If soils are disturbed during removal of existing improvements, the disturbed soil should be removed and replaced with compacted fill. After removals are made, exposed soils should be scarified to a depth of 6- to 12-inches, brought to near optimum moisture content, and re-compacted.

6.3 Proposed Building Foundations

All foundation criteria are considered minimum requirements that may be superseded by more stringent requirements from the architect, structural engineer, or governing agencies; recommended geotechnical design parameters are being provided for conventional spread footing systems for the proposed one story commercial self-storage and retail buildings;

The following geotechnical design parameters are provided for the design of proposed foundations for proposed buildings. The proposed buildings may be supported by continuous and square pad footings utilizing an allowable bearing pressure of 2000 pounds per square foot. The width of the continuous footings should be a minimum of 15 inches and embedded to a minimum depth of 18 inches below the lowest adjacent grade. For square pad footings, it is recommended that the width be at least 24 inches embedded a minimum of 18 inches below the lowest adjacent grade. Bearing pressures may be increased by 250 pounds per square foot per additional foot of width or depth to a maximum allowable bearing pressure of 3000 pounds per square foot. A coefficient of friction of 0.40 may be used, along with a passive lateral resistance of 250 pounds per

square foot per foot of embedment. Footings should bear on at least two feet of compacted fill.

If normal code requirements are used, the allowable bearing pressure value may be increased by one-third (1/3) for short-duration loads such as wind or seismic forces.

Static settlement of foundations supporting the proposed one story buildings is not expected to exceed ¼-inch over fifty horizontal feet.

If any utility lines are within a 1:1 (horizontal: vertical) projection from the bottom of a footing, they may be within the influence zone of the proposed footing load. If this condition exists, the proposed footing should be deepened so that the utility is outside the zone of influence; the utility line could also be relocated or encased with concrete slurry. These conditions should be evaluated on a case by case basis.

6.4 Footing Setbacks

All footings should maintain a minimum 7-foot horizontal setback from the base of the footing to any descending slope. This distance is measured from the outside footing face at the bearing elevation. Footings should maintain a minimum horizontal setback of H/3 (H=slope height) from the base of the footing to the descending slope face and should be no less than 7 feet, and it need not be greater than 40 feet. This is likely not required due to the relatively small amount of relief across the site.

6.5 Slab-On-Grade

These recommendations are considered minimum requirements that may be superseded by more stringent requirements from the architect, structural engineer, or governing agencies.

Concrete slabs should be at least 4-inches in thickness. Actual slab thickness and reinforcement should be determined by the structural engineer based on structural loads and soil interaction. Our recommendations should be superseded by the recommendations of the structural engineer or architect.

New slabs-on-grade should minimally conform to the design procedure contained in Section 1808 of the 2019 California Building Code. The project structural engineer should consider these recommendations as minimum requirements and modify these recommendations as appropriate. The subgrade soil is considered “non-expansive.”

Slab subgrade soil moisture should be at least optimum moisture prior to placement of concrete or vapor barrier. If the moisture content of the existing subgrade soil is less than optimum, pre-wetting may be required to achieve optimum moisture prior to placing the capillary layer or Stego.

Interior concrete slab-on-grade should be at least 4-inches in thickness underlain by a minimum 4-inch capillary break using ½-inch open graded gravel or material approved by the geotechnical engineer. The 4-inch capillary layer should be underlain by a 15-mil Stego Wrap vapor retarder or equivalent product with a permeance rate of 0.012 perms

(or less) and puncture resistance of Class "A" or "B" per ASTM E 1745-11. As per the manufacturer recommendations, all seams should overlap a minimum of 6 inches and should be sealed in accordance with the specifications provided by the vapor retarder manufacturer. All penetrations must be sealed using a combination of Stego Wrap, Stego Tape and/or Stego Mastic or approved equivalent. The vapor retarder should be lapped downward a minimum of 12 inches where the vapor retarder encounters an interior footing or exterior thickened edge or footing. The vapor retarder must be placed on top of the capillary layer if it is expected to become wet prior to the concrete pour. If the capillary layer can be kept dry before pouring concrete, the vapor retarder may be placed under the capillary layer. The water-cement ratio of structural concrete should be not greater than 0.50. The actual slab thickness and reinforcement should be determined by the project structural engineer.

If moisture-sensitive floor coverings are utilized, interior concrete slabs should be designed and constructed in accordance with the applicable floor manufacturer's specifications. The flooring installer should conduct all applicable testing to determine if concrete slabs have sufficiently cured and dried to receive flooring materials.

6.6 Retaining Walls (if applicable)

General guidelines are provided below for low retaining walls up to ten feet in retained height. Please note that drainage recommendations are provided only as a means to create a drained condition behind proposed retaining walls. Surface drains should not be connected to retaining wall sub-drainage. These drains are not intended as a means of waterproofing. If moisture or salt deposition is not desired, or if stone facing, stucco, or paint is to be applied to the wall outer surface, the wall should be provided with suitable waterproofing. The waterproofing system for the wall should be designed by a qualified waterproofing consultant. Any waterproofing or drainage system damaged by soil placement and compaction efforts should be repaired prior to completion of backfilling.
Foundations for proposed retaining and perimeter (non-retaining) walls which are to be founded into compacted fill materials may be designed utilizing an allowable bearing pressure as presented above for conventional foundations.

Cantilevered retaining walls should be designed to resist equivalent fluid pressures as indicated in the tables below:

Case 1 – Select (Clean Sand) Backfill Condition[1]

Backfill Condition (Active)	**Equivalent Fluid Pressure (psf/ft)**
Level	35
2:1 Slope	55

[1]Assumes clean sand (Sand Equivalent >30) backfill see attached detail RW-1.

Case 2 – Native Backfill Condition[2]

Backfill Condition (Active)	Equivalent Fluid Pressure (psf/ft)
Level	45
2:1 Slope	65

[2]Assumes drained native soil backfill see attached detail RW-1.

Both the clean sand and native backfill conditions provided above assume a drained condition behind the proposed retaining wall. A backdrain consisting of 4-inch perforated plastic pipe SDR 35 or Schedule 40, encased in ¾-inch gravel wrapped in Mirafi 140N or equivalent filter fabric, and properly outletted. Details for retaining wall drainage are provided in our attached Retaining Wall Detail RW-1 (Appendix H). A seismic surcharge of 19H should be applied at mid-height of the wall, where H= the retained height of the wall greater than 6 feet.

Additional surcharge loading considerations are not incorporated into the above values. If the project structural engineer wishes to incorporate additional loading due to these factors, the additional loads should be added to the values provided above. Foundations for proposed retaining walls may be designed by utilizing the recommendations for conventional foundations. However, when combining both frictional and passive lateral resistance, one or the other should be reduced by one-half.

6.7 Preliminary Pavement Design

Pavement section design is provided below based on near surface soil conditions encountered during our investigation and assumed traffic loading.

6.7.1 Asphalt Concrete Pavement

The upper on-site subgrade soils were classified as silty sand to sandy silt with an R-Value of 76. To allow for soil variability, we are assuming an R-Value of 50 for preliminary design purposes.

Based on R-value of 50 the parameters below are provided for preliminary design purposes. Pavement sections were calculated for traffic indices of 4.0 and 5.5, which are commonly used for parking stalls and drive aisles subject to passenger vehicles and service trucks, respectively. *However, the selection of actual traffic index should be the purview of the project civil or traffic engineer*.

Pavement Section Design

Location	R-Value	Traffic Index	Multiple Layered	
			Asphalt Concrete (inches)	Aggregate Base* (inches)
Parking Stall	50	4.0	3.0	6.0
Drive Aisles	50	5.5	3.0	8.0

*Aggregate base material should consist of Class 2 aggregate base materials or Crushed Miscellaneous Base (CMB).

The upper 12 inches of the subgrade soils should be compacted to at least 90 percent of the laboratory maximum dry density (ASTM D1557). All base materials should be compacted to at least 95 percent of the laboratory maximum dry density (ASTM D1557).

6.7.2 Portland Cement Concrete Pavement

For preliminary design of concrete pavement, it is recommended that a concrete pavement section consisting of 6-inches of concrete underlain by at least 4-inches of either Class 2 aggregate base or crushed miscellaneous base (CMB) be used for preliminary design. Concrete Compressive strength should be 4000 psi or greater. Aggregate base material should be compacted to a minimum of 95 percent relative compaction as per ASTM D1557. Subgrade soil should be compacted to at least 90 percent of the laboratory maximum dry density in accordance with ASTM D1557. If concrete crack control is desired, the slabs should be minimally reinforced with No. 4 rebar, placed every 24 inches on center, both ways. A 10-foot square or less grid system should be used in the construction of continuous sections of concrete pavement or as recommended by the structural engineer.

For trash enclosures, concrete pavement should consist of a minimum 8-inch thick concrete slab placed over a minimum of 6-inches of either Class 2 or crushed miscellaneous base material, compacted to 95 percent relative compaction. Concrete should have a minimum strength of 4000 psi and be reinforced with a minimum of No. 4 bars placed at 24 inches on center, in each direction, positively supported (with concrete chairs or other devices) at mid-height in the slab. Crack control joints should be placed at a 10-foot maximum spacing in each direction in the slab or as recommended by the structural engineer. Concrete mix design should incorporate the recommendations presented in the slab on grade section of this report for improved geotechnical performance.

6.8 Exterior Flatwork

The following general recommendations may be considered for concrete hardscape including expansive soils mitigation and may be superseded by the requirements of San Bernardino County.

6.8.1 Sidewalk, Pedestrian Walkways

Expansion Potential	Minimum Concrete Thickness (in)	Subgrade Pre-Soaking Depth	Reinforcement	Joint * Spacing
Non-expansive (EI <20)	4 (Full)	At least Optimum to 12"	#3 @ 18" OC, EW	4-5 Feet

* Joints at curves and angle points are recommended.

6.8.2 Driveways, Patios, Entryways

Expansion Potential	Minimum Concrete Thickness (in)	Subgrade Pre-Soaking Depth	Reinforcement	Joint[3] Spacing (Max)
Non-expansive (EI <20)	General Flatwork 4 (Full) Driveways 6 (Full)	At least Optimum to 12"	#3 @ 18" OC, EW	4-5 Feet

[3] Joints at curves and angle points are recommended.

The above recommendations may be superseded by the project architect, structural engineer or the governing agency's requirements. These recommendations are not intended to mitigate cracking caused by shrinkage and temperature warping.

6.9 Drainage

Positive drainage should be maintained away from any building or graded slope face and directed to suitable areas via non-erosive devices, as designed by the project civil engineer. For drainage over soil and paved areas immediately adjacent to structures, please refer to Section 1804.4 of the 2019 CBC.

6.10 Geotechnical Observation and Testing

Geotechnical observation and testing should be conducted during the following stages of grading:

- During all phases of rough and precise grading, footing excavations, etc.
- During slab and flatwork subgrade pre-saturation and moisture conditioning.
- During utility trench excavation and compaction.

- During placement of retaining wall sub-drainage, backfill, and compaction.

- For any unusual conditions encountered during grading.

7.0 PROFESSIONAL LIMITATIONS

Geotechnical services are provided by KCG in accordance with generally accepted professional engineering and geologic practice in the area where these services are to be rendered. Client acknowledges that the present standard in the engineering and geologic and environmental profession does not include a guarantee of perfection and, except as expressly set forth in the conditions above, no warranty, expressed or implied, is extended by KCG.

Geotechnical reports are based on the project description and proposed scope of work as described in the proposal. Our conclusions and recommendations are based on the results of the field, laboratory, and office studies, combined with an interpolation and extrapolation of soil conditions as described in the report. The results reflect our geotechnical interpretation of the limited direct evidence obtained. Our conclusions and recommendations are made contingent upon the opportunity for KCG to continue to provide geotechnical services beyond the scope in the proposal to include all geotechnical services. If parties other than KCG are engaged to provide such services, they must be notified that they will be required to assume complete responsibility for the geotechnical work of the project by concurring with the recommendations in our report or providing alternate recommendations.

It is the reader's responsibility to verify the correct interpretation and intention of the recommendations presented herein. KCG assumes no responsibility for misunderstandings or improper interpretations that result in unsatisfactory or unsafe work products. It is the reader's further responsibility to acquire copies of any supplemental reports, addenda, or responses to public agency reviews that may supersede recommendations in this report.

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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APPENDIX B

EXPLORATION BORING LOGS

LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-1**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD | California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Young Alluvial Fan Deposits (Qyf)			
						@ 0 feet - Top Soil: organic silt, dry brush and shrub			
						@ 0.5 feet - Silty Sand (SM): light brown, fine grained, dry.			
5			7 13 19	0.4		**@ 5 feet - Gravelly Sand (SP):** light brown, fine grained gravel: subrounded to subangular, 0.5”-3.0”, dry, medium dense.			
10			5 50 for 6”	1.2	118.4	**@ 10 feet - Silty Sand (SM):** light brown, fine to medium grained, gravel: subangular, 0.5”-2.0”, dry, very dense.			
15			50 for 4”	1.1	120.8				
20			13 35 30	2.4	135.2	**@ 20 feet - Silty Sand (SM):** light brown, coarse grained, gravel: subrounded, 0.5”-3.0”, very dense.	4.5		
25						**@ 25 feet - Silty Sand (SM):** light brown, coarse grained, gravel: subrounded, 0.5”-3.0”, rock fragments, very dense.			

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-1**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD
California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			25 50 for 6”	1.2	109.5				
						@ 30 feet - <u>Silty Sand (SM):</u> light brown, coarse grained, major gravel: subrounded to subangular, 0.25”-3.0”, very dense.			
30			30 50 for 6”	1.4	119.4	Total Depth: 30 feet. No Groundwater encountered. No Caving.			

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-2**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD | California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Young Alluvial Fan Deposits (Qyf) **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry.			
5			8 37 50 for 6”	0.7	127.4	**@ 5 feet - Silty Sand (SM):** light brown, fine to medium grained, gravel: rounded, up to 2 inches, rock fragments, dry, very dense.			
						@ 10 feet - Silty Sand (SM): light brown, coarse grained, minor gravel, loose.			
10			5 6 7	3.8	104.7	Total Depth: 10 feet. No Groundwater encountered. No Caving.	2.5		

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-3**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD | California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Young Alluvial Fan Deposits (Qyf) **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry.			
5						**@ 5 feet - Silty Sand (SM):** light brown, fine grained trace gravel: 0.1" to 0.25", dry.			No recovery for California Sample
						@ 9.8 feet - Silty Sand (SM): brown, fine grained, very dense.			
10			50 for 3"			Total Depth: 9.8 feet upon Auger refusal. No Groundwater encountered. No Caving.			No recovery for California Sample

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-4**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD
California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Young Alluvial Fan Deposits (Qyf) **@ 0 feet - Top Soil:** organic silt, dry brush and shrub			
						@ 5 feet - Silty Sand (SM): light brown, fine to medium grained, gravel: up to 1.0", rock fragments, dry.			grinding against rock obstruction
5			23 27 50 for 6"	1.2	128.8	Total Depth: 5 feet upon auger refusal. No Groundwater encountered. No Caving.	>4.5		

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-5**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD | California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Young Alluvial Fan Deposits (Qyf) **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry.			
5			15 50 for 3"	0.4		**@ 5 feet - Gravelly Sand (SP):** light brown, fine to medium grained gravel: rounded, up to 0.5", dry, very dense.			
						@ 10 feet - Gravelly Sand (SP): light brownish white, gravel: rounded, up to 0.5", dry.			
10						Total Depth: 10 feet. No Groundwater encountered. No Caving.			No recovery for California Sample

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-6**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD
California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
5			18 19 21	0.8	117.3	**Young Alluvial Fan Deposits (Qyf)** **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry. **@5 feet - Silty Sand (SM):** light brown, fine to medium grained, gravel: up to 1.5", rock fragments, dry, dense.			grinding against rock obstruction
10						Total Depth: 9.6 feet upon auger refusal. No Groundwater encountered. No Caving.			

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**HSA-7**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	**140lb / 18in**
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD
California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
5			9 23 50 for 6"	0.6	130.9	**Young Alluvial Fan Deposits (Qyf)** **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry. **@ 5 feet - Gravelly Sand (SP):** light brown, fine to medium grained, gravel: up to 1.5", rock fragments, dry, very dense. Total Depth: 5 feet upon auger refusal. No Groundwater encountered. No Caving.			grinding against rock obstruction

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**KP-1**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD
California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
5						**Young Alluvial Fan Deposits (Qyf)** **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry. **@ 5 feet - Silty Sand (SM):** light brown, fine grained gravel: rounded, 0.5”-2.0”, dry. Total Depth: 5 feet. No Groundwater encountered. Caving observed.			

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LOG OF EXPLORATORY BORING

Project:	**Wabash Ave. & Naples Ave., Redlands, CA**	Boring No.:	**KP-2**
Project Number:	**21031-00**	Driller:	**BC2 Environmental**
Date Drilled:	**10/15/21**	Drill Type:	**Hollow Stem Auger**
Logged By:	**S.W. and J.H.**	Hammer Wt. / Drop:	
		Ground Elev. [ft]:	**---**

Standard Split Spoon | Shelby Tube | Water Level ATD | California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Young Alluvial Fan Deposits (Qyf) **@ 0 feet - Top Soil:** organic silt, dry brush and shrub **@ 0.5 feet - Silty Sand (SM):** light brown, fine grained, dry.			
5						**@ 5 feet - Silty Sand (SM):** light brown, fine to medium grained, gravel: rounded, 0.5”-2.0”, dry.			
10						**@ 10 feet - Gravelly Sand (SP):** light brown, cobbles, rounded, 3.0”-4.0”, dry. Total Depth: 10 feet. No Groundwater encountered. No Caving.			

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APPENDIX C

PERCOLATION TESTING FIELD MEASURMENTS

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Infiltration Test Data Sheet

Project: 21031-00
Date: October 15, 2021

Test Hole No: KP-1
Hole Depth, D_T (inches): 60
Diameter (inches): 8
Soil Description: (SM)

Tested Infiltration Rate[1]
2.88 in/hr

Sandy Soil Criteria Test

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (ft.)	Initial Depth to Water (in.)	Final Depth to Water (ft.)	Final Depth to Water (in.)	Change in Water Level (in.)	Great than or Equal to 6"? (Y/N)
1	10.07	10.32	25	4.50	54.00	5.00	60.00	6.00	Y
2	10.35	11.00	25	4.50	54.00	5.00	60.00	6.00	Y

Trial Readings

Trial No.	Start Time	Stop Time	Time Interval (min.)	Measured Initial Depth to Water (ft.)	Initial Depth to Water (in.)	Measured Final Depth to Water (Ft.)	Final Depth to Water (in.)	Change in Water Level (in.)	Percolation Rate (min./in.)
1	11.37	11.47	10	4.60	55.20	5.50	66.00	10.80	0.93
2	11.47	11.57	10	4.60	55.20	5.40	64.80	9.60	1.04
3	11.57	12.07	10	4.60	55.20	5.40	64.80	9.60	1.04
4	12.07	12.17	10	4.60	55.20	5.00	60.00	4.80	2.08
5	12.17	12.27	10	4.60	55.20	5.00	60.00	4.80	2.08
6	12.27	12.37	10	4.60	55.20	4.90	58.80	3.60	2.78

Comments: [1]Tested infiltration rate from San Bernadino County - Infiltration Rate Evaluation Protocol and Factor of Safety Recommendation (Appendix VII - 2011) Minimum factor of safety of 3 is applied to this rate.

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Infiltration Test Data Sheet

Project: 21031-00
Date: October 15, 2021

Test Hole No: KP-2
Hole Depth, D_T (inches): 120
Diameter (inches): 8
Soil Description: (SP)

Tested Infiltration Rate[1]
1.56 in/hr

Sandy Soil Criteria Test

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (ft.)	Initial Depth to Water (in.)	Final Depth to Water (ft.)	Final Depth to Water (in.)	Change in Water Level (in.)	Great than or Equal to 6"? (Y/N)
1	10:07	10:32	25	7.00	84.00	10.00	120.00	36.00	Yes
2	10:35	11:00	25	7.00	84.00	10.00	120.00	36.00	Yes

Trial Readings

Trial No.	Start Time	Stop Time	Time Interval (min.)	Measured Initial Depth to Water (ft.)	Initial Depth to Water (in.)	Measured Final Depth to Water (ft.)	Final Depth to Water (in.)	Change in Water Level (in.)	Percolation Rate (min./in.)
1	11:37	11:47	10	6.70	80.40	10.00	120.00	39.60	0.25
2	11:47	11:57	10	7.10	85.20	10.00	120.00	34.80	0.29
3	11:57	12:07	10	7.10	85.20	10.00	120.00	34.80	0.29
4	12:07	12:17	10	7.10	85.20	8.90	106.80	21.60	0.46
5	12:17	12:27	10	7.10	85.20	8.80	105.60	20.40	0.49
6	12:27	12:37	10	7.10	85.20	8.10	97.20	12.00	0.83

Comments: [1]Tested infiltration rate from Riverside County - Low Impact Development BMP Design Handbook (Appendix A- 2011)
Minimum factor of safety of 3 is applied to this rate.

APPENDIX D

LABORATORY TEST PROCEDURES AND RESULTS

APPENDIX D

LABORATORY TEST PROCEDURES

VISUAL CLASSIFICATION OF SOILS

As a part of the routine laboratory soil testing, the soil samples are visually classified in accordance with the Unified Soil Classification System by experienced laboratory technicians. If necessary, in order to verify the visual classification, selected samples are classified utilizing the results of Standard Classification tests performed in accordance with ASTM D2487-00.

MOISTURE CONTENT AND DRY DENSITY DETERMINATION

Moisture content and dry density determinations were performed on relatively undisturbed samples obtained during our field exploration. The field moisture content is obtained by methods described in ASTM D2216-05. The in-situ dry unit weight was computed using the net weight and volume of the relatively undisturbed samples. The results of these tests are presented on the borings logs in Appendix B.

DIRECT SHEAR TESTS

Direct shear tests were performed in general accordance with ASTM D3080-98 on selected remolded and relatively undisturbed samples that were pre-soaked for a minimum of 24 hours. The samples were then tested under various normal loads with a different specimen being used for each normal load. The samples were sheared in a motor driven, strain-controlled direct shear testing apparatus at a strain rate of 0.05 inches per minute. The results of this test are presented in the Laboratory Summary.

EXPANSION INDEX

SOLUBLE SULFATES

Soluble sulfate tests determined in general accordance with California Test Method No. 417 were also performed on representative samples collected during the field investigation. Soils with a sulfate concentration greater than 0.07% may be corrosive to metals; concentrations greater than 0.10% are considered potentially harmful to concrete and would require following the current ACI or CBC for "moderate" or more severe sulfate exposure requirements. The results of this test are presented in the Laboratory Summary.

LABORATORY TEST RESULTS

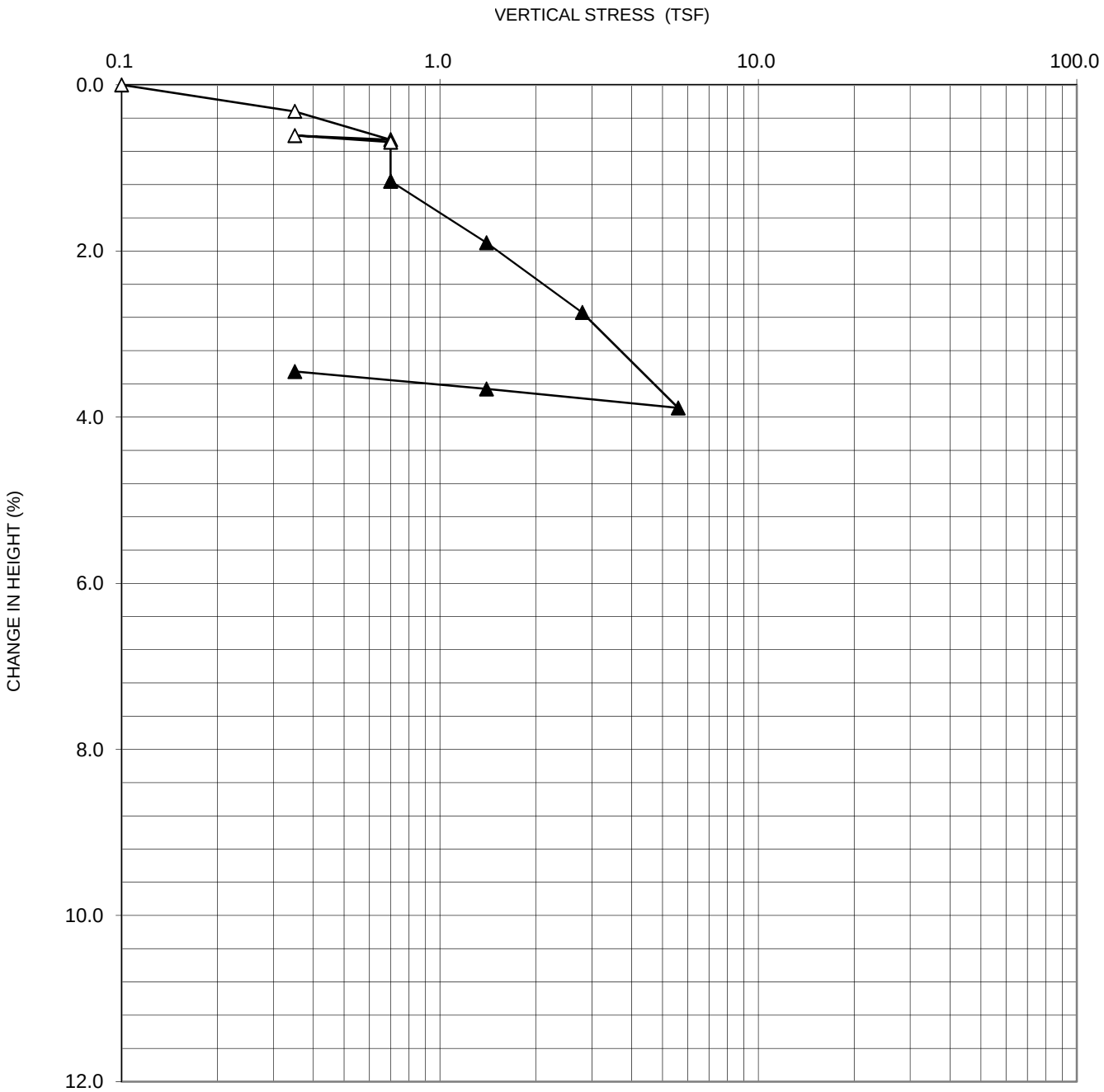
Direct Shear Test Summary*

Location	Depth (ft)	Cohesion (psf)	Internal Angle of Friction (degrees)
B-4	5.0'	100	30
B-6	5.0’	50	32

* Test also plotted graphically in the following pages.

Expansion Index and Soluble Sulfate

Location	Soil Description	Expansion Index	Soluble Sulfate (%)
B-5 5-10 ft	Clayey Sand (SM)	< 20	N/A
B-2 5-10 ft	Silty Sand (SM)	N/A	0.0108



PROJECT NO.: 21031-00 SOIL DESCRIPTIONS: OLIVE BR. SILTY SAND W/ GRAVEL (SP/SM)

BORING NO./LOCATION : B1 DEPTH / ELEV. : 10' LIQUID LIMIT : -

SPECIFIC GRAVITY : 2.68 (Assumed) PLASTIC LIMIT: -

REMARKS :

	SPECIMEN HEIGHT (INCHES)	MOISTURE CONTENT (%)	(PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	2.1	118.2	13.6	0.415
FINAL	0.9655	18.2	122.4	133.4	0.367

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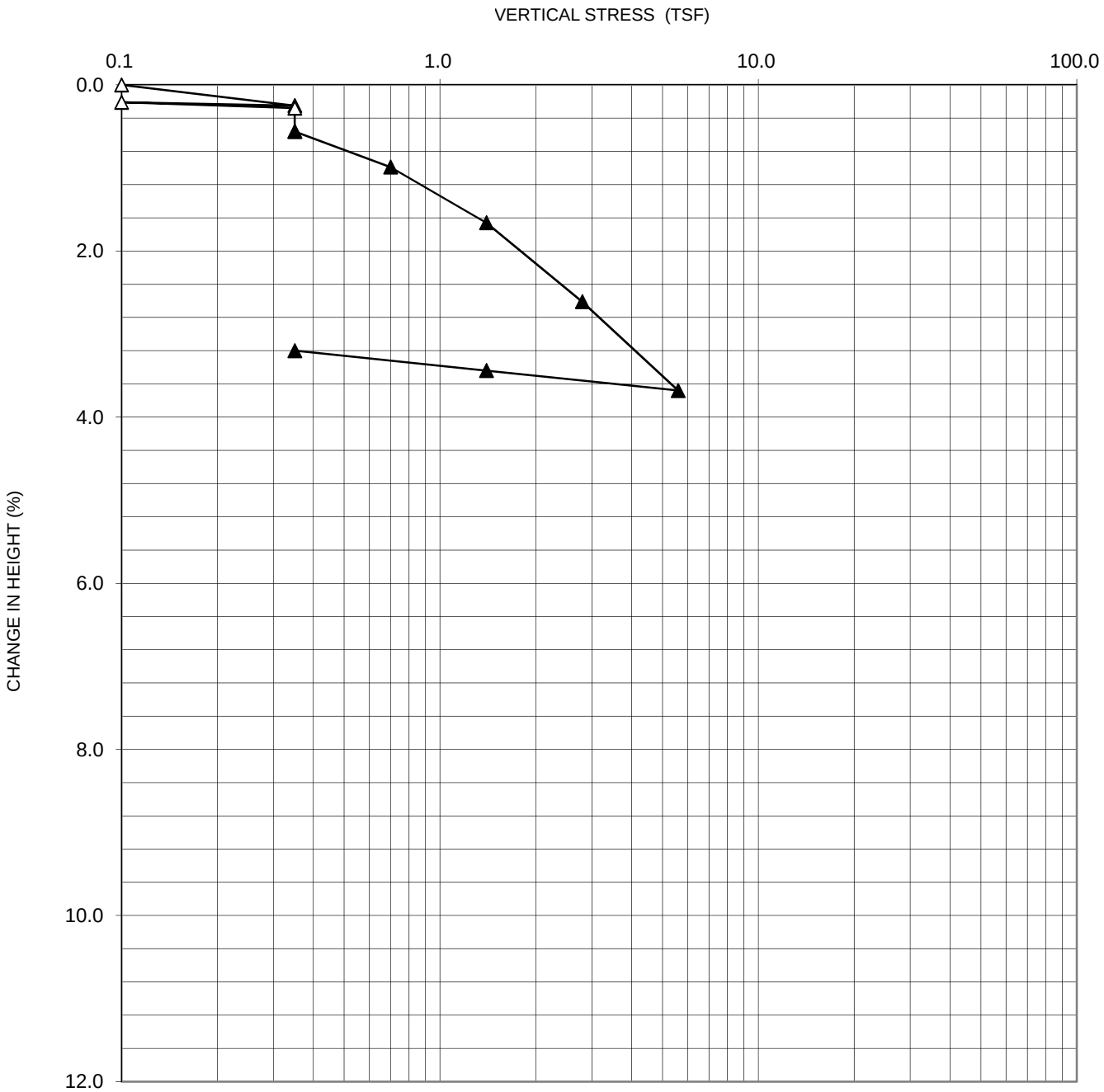
CONSOLIDATION TEST CURVE



PROJECT NO.: 21031-00 SOIL DESCRIPTIONS: BR. SILTY SAND W/ GRAVEL (SP/SM)

BORING NO./LOCATION : B4 DEPTH / ELEV. : 5' LIQUID LIMIT : -

SPECIFIC GRAVITY : 2.68 (Assumed) PLASTIC LIMIT: -

REMARKS :

	SPECIMEN HEIGHT (INCHES)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SATURATION (%)	VOID RATIO
INITIAL	1.0000	4.2	121.1	29.5	0.381
FINAL	0.9680	17.6	125.0	139.8	0.337

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CONSOLIDATION TEST CURVE

Project Name :	REDLANDS	Project No. :	21031-00
Boring / Sample No :	B4	Depth : 5' (ft.)	Tested By : RB Date: 22-Oct-21
Sample Descriptions / Classification :	LT BROWN SILTY SAND (SP/SM)		

Applied Normal Load (ksf)	1.0		2.0		4.0	
Shear Stress,(Peak) (ksf)	0.828		1.572		2.736	
Shear Stress,(Ultimate) (ksf)	0.708		1.356		2.424	
Density and Saturation	Initial	Final	Initial	Final	Initial	Final
Wet Weight of Soil + Ring (gms)	180.58	197.15	184.58	200.39	189.34	204.48
Dry Weight of Soil + Ring (gms)		178.93		182.92		187.63
Weight of Water (gms)	-	46.54	-	47.28	-	45.81
Weight of Ring (gms)	-	41.83	-	44.17	-	44.77
Weight of Dry Soil (gms)	-	137.10	-	138.75	-	142.86
Moisture Content (%)	1.2	33.9	1.2	34.1	1.2	32.1
Wet Density (pcf)	115.9	129.6	117.2	130.4	120.7	133.3
Dry Density (pcf)	-	96.8	-	97.3	-	100.9
Specific Gravity,G_s (Assumed)	2.68					
Thickness of Specimen, (in.)	1.00					
Degree of Saturation, (%)	4.4	125.0	4.5	126.9	4.9	130.8
Void Ratio	-	0.728	-	0.720	-	0.657

Lateral Displacement, d_h 0.36 (in.)

Displacement Rate, d_r 0.05 (in./min.)

Elapsed Time of Test, t_e 7.20 (min.)

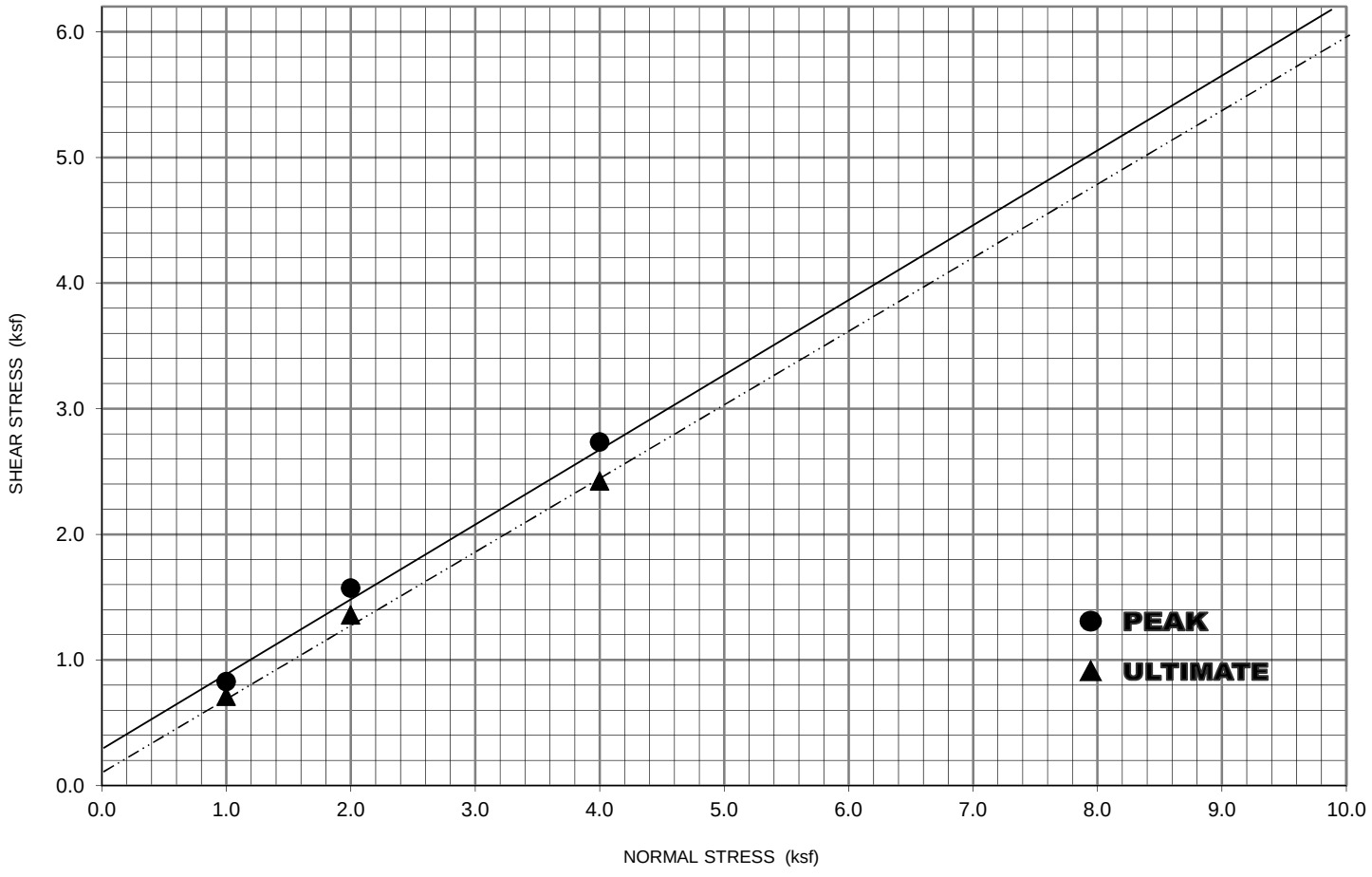
Specimen : Undisturbed : X

Remolded : -

Reconstituted : -

	PEAK	ULTIMATE
Cohesion,c (psf)	300	100
Friction Angle, ϕ	31	30

Remarks :



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DIRECT SHEAR TEST

(ASTM D3080)

Project Name :	REDLANDS	Project No. :	21031-00
Boring / Sample No :	B6	Depth : 5' (ft.)	Tested By : RB Date: 25-Oct-21
Sample Descriptions / Classification :	LT . BROWN SILTY SAND (SM)		

Applied Normal Load (ksf)	1.0		2.0		4.0	
Shear Stress,(Peak) (ksf)	0.924		1.680		2.640	
Shear Stress,(Ultimate) (ksf)	0.660		1.416		2.532	
Density and Saturation	Initial	Final	Initial	Final	Initial	Final
Wet Weight of Soil + Ring (gms)	183.11	199.89	186.05	202.96	177.2	195.26
Dry Weight of Soil + Ring (gms)		181.99		184.93		176.13
Weight of Water (gms)	-	46.54	-	47.28	-	45.81
Weight of Ring (gms)	-	42.21	-	45.28	-	41.99
Weight of Dry Soil (gms)	-	139.78	-	139.65	-	134.14
Moisture Content (%)	0.8	33.3	0.8	33.9	0.8	34.2
Wet Density (pcf)	117.7	131.6	117.5	131.6	112.9	127.9
Dry Density (pcf)	-	98.7	-	98.3	-	95.4
Specific Gravity,G_s (Assumed)	2.68					
Thickness of Specimen, (in.)	1.00					
Degree of Saturation, (%)	3.1	128.6	3.1	129.5	2.8	121.4
Void Ratio	-	0.694	-	0.701	-	0.754

Lateral Displacement, d_h 0.36 (in.)

Displacement Rate, d_r 0.05 (in./min.)

Elapsed Time of Test, t_e 7.20 (min.)

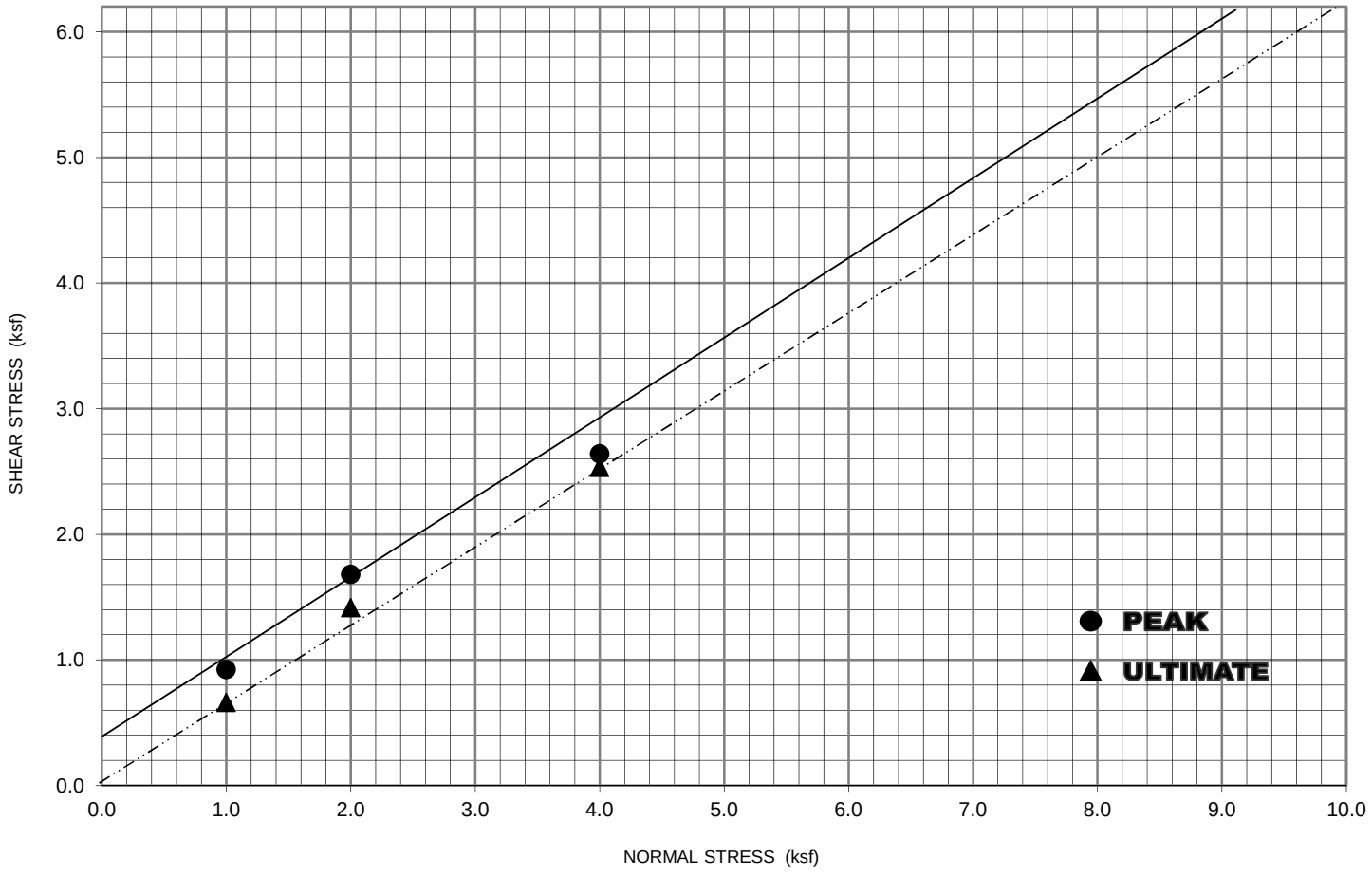
Specimen : Undisturbed : -

Remolded : X

Reconstituted : -

	PEAK	ULTIMATE
Cohesion,c (psf)	400	50
Friction Angle, ϕ	33	32

Remarks :



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DIRECT SHEAR TEST

(ASTM D3080)

PROJECT NAME : REDLANDS

PROJECT NUMBER : 21031-00

TRACT NUMBER :

TESTED BY : RB DATE : 22-Oct-21

LOT NUMBER :

SAMPLED BY: S,W DATE : 15-Oct-21

SAMPLE NO. :

LOCATION : B5 @ 5' - 10'

SOIL DESCRIPTIONS / CLASSIFICATION : BROWN CLAYEY SAND (SM)

TRIAL NUMBER		1	2	3	4
WET WT. OF SOIL + RING	(g)	629.12	637.22		
WEIGHT OF RING	(g)	204.22	204.22		
WET WEIGHT OF SOIL	(g)	424.90	433.00		
FACTOR		0.3030	0.3030		
WET DENSITY	(pcf)	128.7	131.2		
DRY DENSITY	(pcf)	122.0	122.7		
DEGREE OF SATURATION	(%)	39.2	50.0		

MOISTURE DETERMINATION

WET WEIGHT OF SOIL	(g)	310.51	307.16		
DRY WEIGHT OF SOIL	(g)	294.23	287.33		
MOISTURE CONTENT	(%)	5.5	6.9		

RACK NO. : 2

SURCHARGE : 144 psf

FINAL DENSITY & SATURATION

WET WT. + RING	(g)	
DRY WT. + RING	(g)	
MOISTURE CONTENT	(%)	
SAMPLE LENGTH	(cm)	
SAMPLE AREA	(cm^2)	
VOLUME	(cc)	
WT. OF RING	(g)	
DRY DENSITY	(pcf)	
SPEC.GRAVITY (assumed)		
SATURATION	(%)	
% RETAINED ON #4 SIEVE		

DATE	TIME	ELAPSED TIME (min.)	DIAL READING (in.)	DEFLECTION (in.)
25-Oct	6:28		0.211	0.000

E. I. | SO_4 ppm

REMARKS :

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EXPANSION INDEX

(UBC 18-2)

JOB NAME :	REDLANDS	JOB NUMBER:	21031-00
SAMPLE NUMBER :		TESTED BY :	RB
SAMPLE LOCATION :	B2 @ 5'- 10'	DATE :	21-Oct-21
SAMPLE DESCRIPTIONS / CLASSIFICATION :	LT. BROWN GRAVELLY SAND (SP)		

TEST STANDARD	ASTM D 698 - 07	**ASTM D 1557- 07**
METHOD	C	**C**

TRIAL NUMBER	1	2	3	4	5
WATER ADDED, (ml)	110	220	330	440	
WT. OF SOIL + MOLD, (g)	7434	7592	7689	7686	
WT.OF MOLD, (g)	2603	2603	2603	2603	
WT. OF WET SOIL, (g)	4831	4989	5086	5083	
WET DENSITY, (pcf)	142.0	146.6	149.5	149.4	

CAN NUMBER	M	S	R	N	
WET SOIL + TARE, (g)	387.29	393.94	403.18	415.87	
DRY SOIL + TARE, (g)	376.82	376.02	377.97	382.96	
TARE, (g)	0.00	0.00	0.00	0.00	
DRY SOIL, (g)	376.82	376.02	377.97	382.96	
WATER, (g)	10.47	17.92	25.21	32.91	
MOISTURE CONTENT, (%)	2.8	4.8	6.7	8.6	
DRY DENSITY, (pcf)	138.2	140.0	140.2	137.6	

DIAMETER OF MOLD : 6.0 in.

VOLUME OF MOLD : 0.0750 $ft.^3$

SCALPED ON SIEVE SIZE / NO. : 3/4"

PERCENT RETAINED, (%) : 17.1

MAXIMUM DRY DENSITY : 140.5 pcf.

OPT. MOISTURE CONTENT : 6.0 %

FOR OVERSIZE CORRECTION (ASTM D4718):

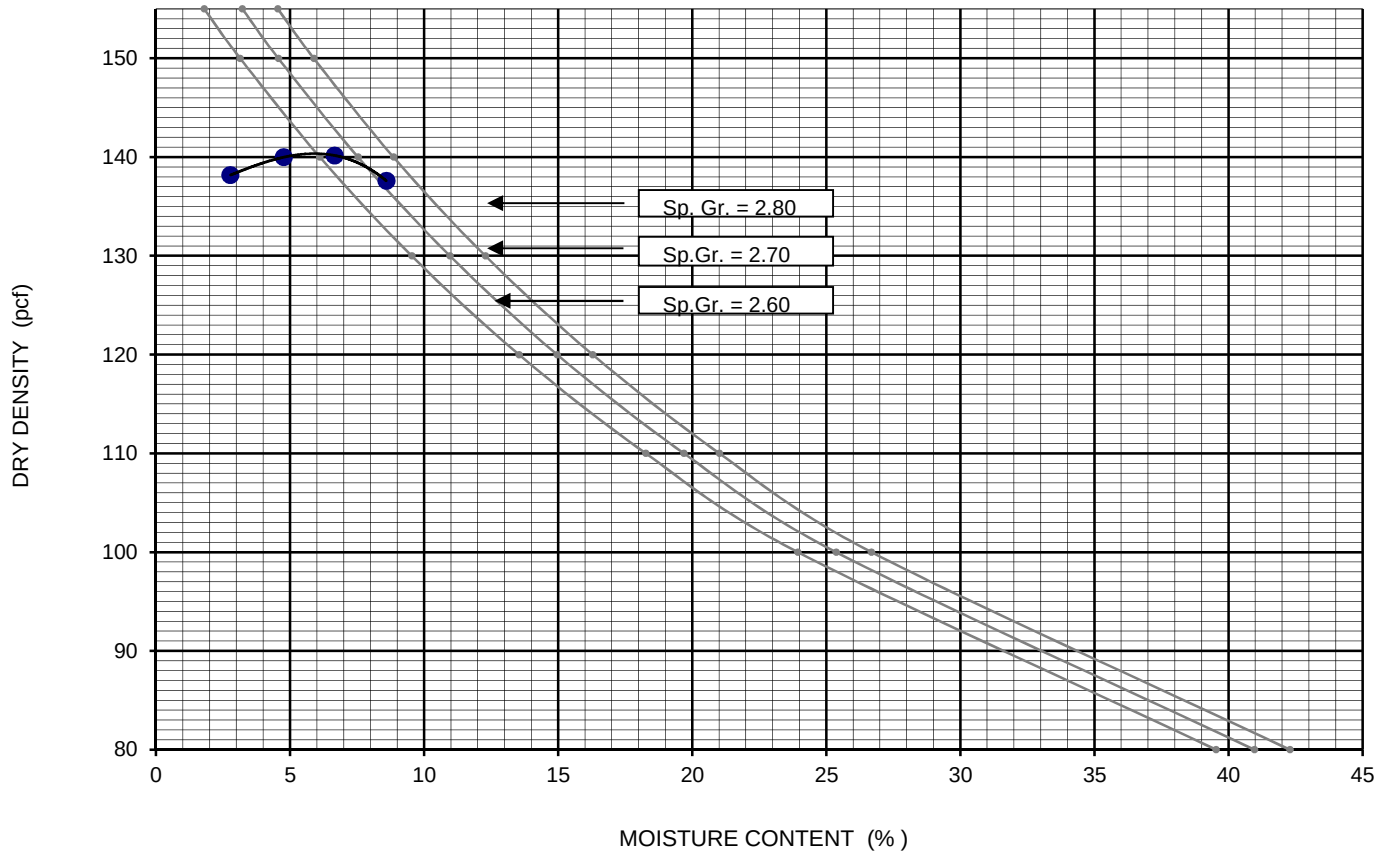
%,Finer Fraction,(P_f) = 82.9 % Moisture = 0.9

%,Oversize Fraction,(P_c) = 17.1 Assumed S.G. = 2.64

Corrected MDD of Total Materials, (pcf) = 144.1

Corrected OMC of Total Materials, (%) = 5.0

Remarks :



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MAXIMUM DENSITY TEST

JOB NAME :	REDLANDS	JOB NUMBER:	21031-00
SAMPLE NUMBER :		TESTED BY :	RB
SAMPLE LOCATION :	B5 @ 5'-10'	DATE :	20-Oct-21
SAMPLE DESCRIPTIONS / CLASSIFICATION :	BROWN CLAYEY SAND W/ GRAVEL (SM)		

TEST STANDARD	ASTM D-698 - 00			**ASTM D 1557-02**		
METHOD	A	B	C	**A**	B	C
TRIAL NUMBER	1	2	3	4	5	
WATER ADDED (ML)	100	150	200	250		
WT. SOIL + MOLD (GMS)	4003	4070	4097	4081		
WT.OF MOLD (GMS)	1967	1967	1967	1967		
WT. OF WET SOIL (GMS)	2036	2103	2130	2114		
WET DENSITY (PCF)	134.7	139.1	140.9	139.8		
CAN NUMBER	S	R	N	M		
WET SOIL + TARE (GMS)	308.89	313.07	315.83	320.43		
DRY SOIL + TARE (GMS)	294.53	292.94	290.06	288.91		
TARE (GMS)	0.00	0.00	0.00	0.00		
DRY SOIL (GMS)	294.53	292.94	290.06	288.91		
WATER (GMS)	14.36	20.13	25.77	31.52		
MOISTURE CONTENT (%)	4.9	6.9	8.9	10.9		
DRY DENSITY (PCF)	128.4	130.1	129.4	126.1		

DIAMETER OF MOLD:	4	In.	
VOLUME OF MOLD:	0.0333	Cu.Ft.	
SCALPED ON SIEVE SIZE/NO.:	#4		
PERCENT RETAINED,(%) :	24.8		
MAXIMUM DRY DENSITY:	**130.5**	Pcf.	
OPT. MOIST. CONTENT :	**7.5**	%	

FOR OVERSIZE CORRECTION (ASTM D4718):

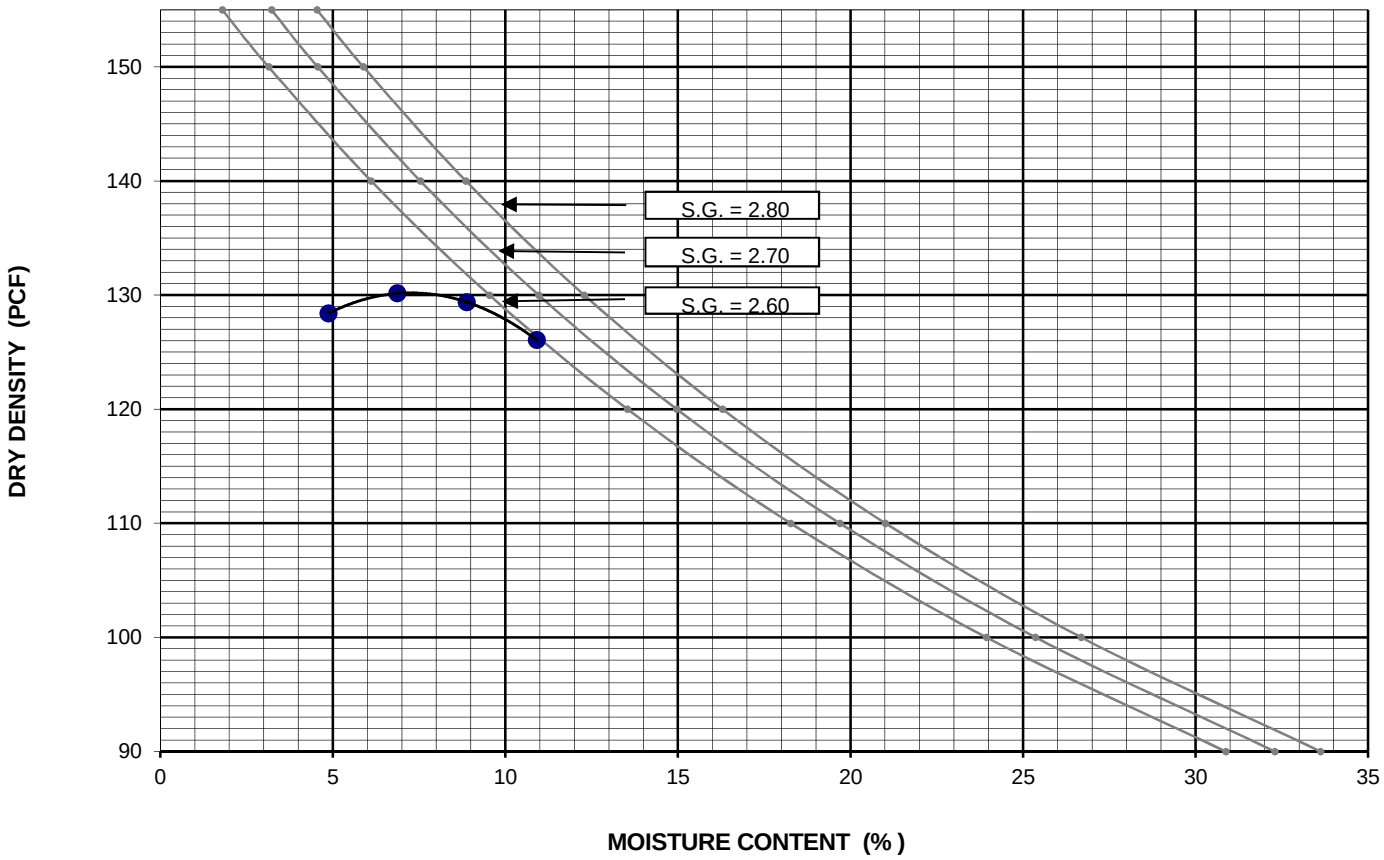
%,Finer Fraction = 75.2 % Moisture = 1.00

%,Oversize Fraction = 24.8 Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = **137.6**

Corrected OMC of Total Materials, (%) = **5.6**

REMARKS :



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MAXIMUM DENSITY TEST

PROJECT:	REDLANDS	**NO.:**	21031-00	**TECHNICIAN :**	RB	DATE :	19-Oct-21

Hole No.		B1										
Sample No.												
Sample Depth:		5'	10'	15'	20'	25'	30'					
Visual Soil Classification	Top	LT. BROWN GRAVELLY SAND (SP)	OLIVE BROWN SILTY SAND W/ GRAVEL (LOOSE) (SP/SM)	SAME	OLIVE BROWN SILTY SAND W/ GRAVEL (SP/SM)	OLIVE BROWN SILTY SAND W/ GRAVEL & 2 PIECE ROCKS (LOOSE) (SP/SM)	OLIVE BROWN SILTY SAND W/ GRAVEL (LOOSE) (SP/SM)					
	Bottom											
Pocket Penetrometer Reading, (tsf)		disturb	-	-	4.50	-	-					
Weight of Moist Soil and Rings, (gms.)			945.20	383.66	1056.50	713.18	571.83					
No. of Rings			5	2	5	4	3					
Dish No.		B16	B8	B4	A16	B50	A3					
Weight of Moist Soil and Dish, (gms.)		153.94	120.14	148.24	171.35	103.46	177.57					
Weight of Dry Soil and Dish, (gms.)		153.36	119.01	146.91	167.94	102.51	175.42					
Weight of Dish, (gms.)		24.14	24.27	25.57	25.50	25.47	25.38					
Weight of Dry Soil, (gms.)		129.22	94.74	121.34	142.44	77.04	150.04					
Wet Density, (pcf)			119.8	122.1	138.4	110.9	121.1					
Moisture Content, (%)		0.4	1.2	1.1	2.4	1.2	1.4					
Dry Density, (pcf)			118.4	120.8	135.2	109.5	119.4					
Degree of Saturation, (%) (G =2.68)			7.8	7.6	27.0	6.3	9.6					
Void Ratio			0.412	0.384	0.237	0.527	0.400					
Porosity			0.292	0.277	0.192	0.345	0.286					
Remarks :												

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MOISTURE - DENSITY TEST

PROJECT:	REDLANDS	**NO.:**	21031-00	**TECHNICIAN :**	RB	DATE :	19-Oct-21

Hole No.		B2		B4	B5	B6	B7					
Sample No.												
Sample Depth:		5'	10'	5'	5'	5'	5'					
Visual Soil Classification	Top	LT. BROWN SILTY SAND W/ GRAVEL & 1 PIECE OF ROCK (SP/SM)	OLIVE BROWN SILTY SAND (SM)	LT. BROWN SILTY SAND W/ GRAVEL & 1 PIECE OF ROCK (SP/SM)	LT. BROWN GRAVELLY SAND (SP)	LT. BROWN SILTY SAND W/ GRAVEL & 1 PIECE ROCKS (SM)	LT. BROWN GRAVELLY SAND W/ 2 PIECE OF ROCKS (SP)					
	Bottom											
Pocket Penetrometer Reading, (tsf)		-	2.50	>4.5	disturb	-	-					
Weight of Moist Soil and Rings, (gms.)		796.69	878.30	1008.50		935.60	609.88					
No. of Rings		4	5	5		5	3					
Dish No.		B14	A11	B1	B19	B11	A23					
Weight of Moist Soil and Dish, (gms.)		98.98	154.07	138.02	128.78	108.28	169.92					
Weight of Dry Soil and Dish, (gms.)		98.50	149.36	136.64	128.33	107.63	169.04					
Weight of Dish, (gms.)		25.49	25.77	25.56	25.54	25.16	25.57					
Weight of Dry Soil, (gms.)		73.01	123.59	111.08	102.79	82.47	143.47					
Wet Density, (pcf)		128.3	108.7	130.4		118.2	131.7					
Moisture Content, (%)		0.7	3.8	1.2	0.4	0.8	0.6					
Dry Density, (pcf)		127.4	104.7	128.8		117.3	130.9					
Degree of Saturation, (%) (G =2.68)		5.6	17.1	11.2		5.0	5.9					
Void Ratio		0.312	0.598	0.299		0.426	0.277					
Porosity		0.238	0.374	0.230		0.299	0.217					
Remarks :												

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MOISTURE - DENSITY TEST

• ANALYSIS
• DESIGN

LaBelle • Marvin

• SOILS, ASPHALT TECHNOLOGY

PROFESSIONAL PAVEMENT ENGINEERING
A CALIFORNIA CORPORATION

October 27, 2021

Mr. Dante Domingo
Kling Consulting Group
18008 Sky Park Circle #250
Irvine, California 92614

Project No. 47715

Dear Mr. Domingo:

Testing of the bulk soil sample delivered to our laboratory on 10/22/2020 has been completed.

Reference: J.N. 21031-00
Project: Redlands
Sample: B-2 @ 5'-10'

Data sheets are attached for your use and file. Any untested portion of the sample will be retained for a period of 60 days prior to disposal. The opportunity to be of service is sincerely appreciated and should you have any questions, kindly call.

Respectfully Submitted,

REGISTERED PROFESSIONAL ENGINEER
STEVEN R. MARV
DocuSigned by:
D9A356504F9B448...
CIVIL
STATE OF CALIFORNIA

Steven R. Marvin
RCE 30659

SRM:jw
Enclosure

2700 S. GRAND AVENUE • SANTA ANA, CA 92705-5404 • (714) 546-3468 • FAX (714) 546-5841
INFO@LABELLEMARVIN.COM

LaBelle Marvin

R - VALUE DATA SHEET

PROJECT No. 47715

DATE: 10/27/2021

BORING NO. B-2 @ 5'-10'

Redlands

P.N. 21031-00

SAMPLE DESCRIPTION: Brown Gravelly Slightly Silty Sand

R-VALUE TESTING DATA | CA TEST 301			
	SPECIMEN ID		
	a	b	c
Mold ID Number	4	5	6
Water added, grams	40	32	50
Initial Test Water, %	7.2	6.5	8.0
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	304	762	100
Height Sample, Inches	2.58	2.58	2.48
Gross Weight Mold, grams	3179	3156	3145
Tare Weight Mold, grams	1954	1942	1953
Sample Wet Weight, grams	1225	1214	1192
Expansion, Inches x 10exp-4	0	0	0
Stability 2,000 lbs (160psi)	15 / 24	13 / 20	16 / 25
Turns Displacement	4.65	4.50	4.59
R-Value Uncorrected	75	80	75
R-Value Corrected	76	81	75
Dry Density, pcf	134.2	133.9	134.8

DESIGN CALCULATION DATA

Traffic Index	Assumed:	4.0	4.0	4.0
G.E. by Stability		0.25	0.19	0.26
G. E. by Expansion		0.00	0.00	0.00

Equilibrium R-Value	**76** by EXUDATION	Examined & Checked: 10 /27/ 21
REMARKS:	Gf = 1.25 0.3% Retained on the 3/4" Sieve. Partial Free Drainage.	DocuSigned by: D9A356504F9B448... Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

R-VALUE GRAPHICAL PRESENTATION

LaBelle Marvin

PROJECT NO. 47715

DATE: 10 /27/ 2021

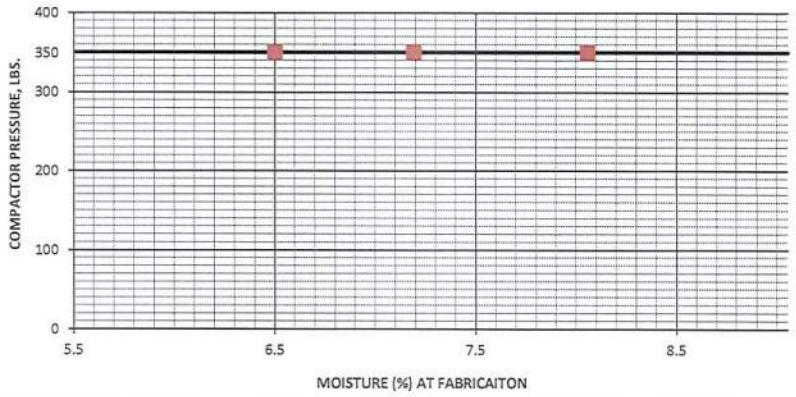
REMARKS:

BORING NO. B-2 @ 5'-10'

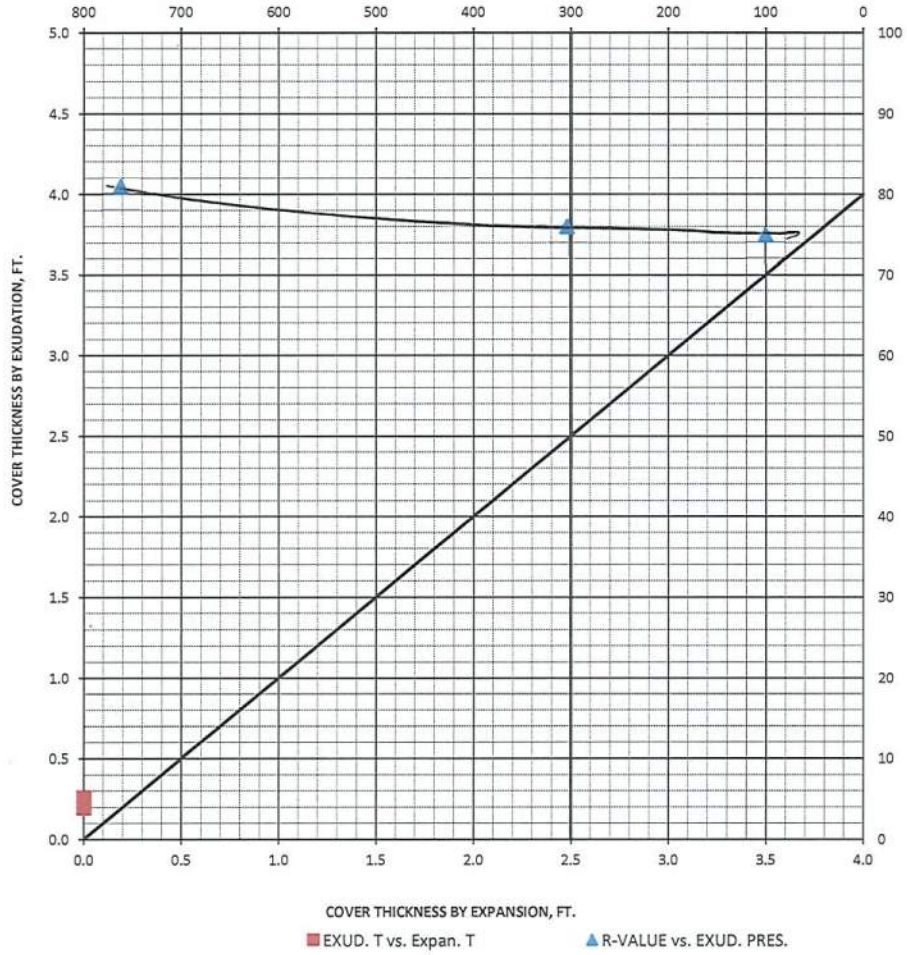
Redlands

P.N. 21031-00

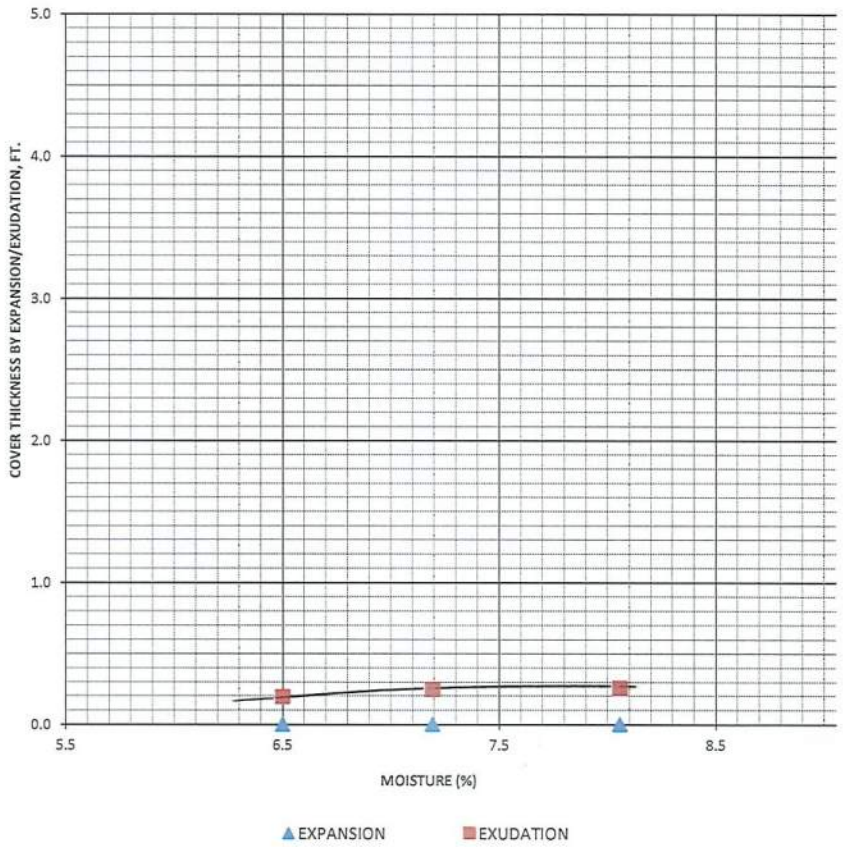
COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %



PROJECT NAME : REDLANDS CHECKED BY: TESTED BY : RB

PROJECT NUMBER : 21031-00 SAMPLED BY: S.W DATE : 15-Oct-21

LOCATION	SOIL DESCRIPTION	SO_4 (PPM)	SO_4 (%)	DATE OF TEST
B2 @ 5' - 10'	LT. BROWN SILTY SAND(SM)	108	0.0108	25-Oct-21

REMARKS :

KCG KLING Consulting Group, Inc.
18008 Sky Park Circle, Suite 250
Irvine, Ca. 92614
Tel: (949)797-6241 Fax: (949)797-6260

SOLUBLE SULFATE TEST

CA TEST 417 / AASHTO T290-94 (B)

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

KCG KLING Consulting Group, Inc.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL INTENT

These specifications present general procedures and requirements for grading and earthwork as shown on the project grading plans, including preparation of areas to be filled, placement of fill, installation of subsurface drainage, and excavations. The recommendations contained in the geotechnical report(s) are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict. Evaluations performed by the geotechnical consultant during the course of grading may result in new specifications or recommendations in addition to those contained in the geotechnical report(s).

2.0 EARTHWORK OBSERVATION AND TESTING

Prior to the commencement of grading, a qualified geotechnical consultant (soils engineer and engineering geologist, and their representatives) shall be employed for the purpose of observing earthwork procedures and testing the fills for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the geotechnical consultant provide adequate testing and observation so that he may determine that the work was accomplished as specified. If conditions exposed during grading differ significantly from those interpreted during the preliminary design investigation, the geotechnical consultant shall inform the client, recommend appropriate changes in the geotechnical design to account for the observed conditions, and notify City or County grading authorities, as necessary. It shall be the responsibility of the contractor to assist the geotechnical consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

The Project Geotechnical Consultant shall observe processing, moisture conditioning, and compaction of fill and subgrade materials. Testing of compacted fill in representative locations shall be performed by the Project Geotechnical Consultant's field representative. Daily reports and test results shall be provided to the client representative on a regular and frequent basis. Maximum dry density tests used to determine the degree of compaction and optimum moisture content shall be performed in accordance with the American Society for Testing and Materials test method ASTM D1557.

It shall be the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the work in accordance with the geotechnical report(s) applicable grading codes and project grading plans. If, in the opinion of the geotechnical consultant, unsatisfactory conditions, such as questionable soil, poor moisture condition, inadequate compaction, adverse weather, etc., are resulting in the quality of work less than required in these specifications, the geotechnical consultant will be empowered to reject the work and recommend that construction be stopped until the conditions are rectified.

3.0 PREPARATION OF AREA TO BE FILLED

3.1 Clearing and Grubbing

All brush, vegetation, trash, debris and other deleterious material shall be removed from fill areas and disposed of off site. Vegetation cleared from the site shall not be placed within engineered compacted fill areas.

3.2 Processing

The existing ground which is determined to be satisfactory for support of fill shall be scarified to a minimum depth of six (6) inches. Existing ground which is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until the soils are broken down and free of large clay lumps or clods and until the working surface is reasonably uniform and free of uneven features which would inhibit uniform compaction.

3.3 Overexcavation

Soft, dry, spongy, highly fractured or otherwise unsuitable ground, extending to such a depth that surface processing cannot adequately improve the condition, shall be overexcavated to firm ground, and verified by the project geotechnical consultant.

3.4 Moisture Conditioning

Overexcavated and processed soils shall be watered, dried-back, blended, and/or mixed as required to attain a uniform moisture content near optimum.

3.5 Recompaction

Overexcavated and processed soils which have been properly mixed and moisture-conditioned shall be recompacted to a minimum relative compaction of 90 percent, ASTM D1557.

3.6 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal: vertical units), the ground shall be stepped or benched. The lowest bench shall be a minimum of 15 feet wide, shall be at least 2 feet deep, shall expose firm material, and shall be verified by the geotechnical consultant. Other benches shall be excavated in firm material for a minimum width of 4 feet. Ground sloping flatter than 5:1 shall be benched or otherwise overexcavated when considered necessary by the geotechnical consultant.

3.7 Evaluation of Areas to Receive Fill

All areas to receive fill, including processed areas, removal areas and toe-of-fill benches shall be observed, tested, and/or mapped by the geotechnical consultant prior to fill placement. A written evaluation of the area to be filled shall be obtained by the Contractor prior to placement of fill.

4.0 FILL MATERIAL

4.1 General

Material to be placed as fill shall be free of roots, grasses, branches, wood or other organic matter and other deleterious materials, and shall be tested by the geotechnical consultant prior to use as fill. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by the geotechnical consultant or shall be mixed with other soils to serve as satisfactory fill material.

4.2 Oversize Material

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically recommended by the geotechnical consultant. Oversized disposal operations shall be such that nesting of oversize material does not occur, and such that the oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet vertically of finish grade or construction, unless specifically recommended by the geotechnical consultant.

4.3 Import

If importing of fill material is required for grading, the import material shall meet the requirements of Section 4.1. Samples of import soils shall be provided for testing a minimum of 48 hours before the import materials are brought on site.

5.0 FILL PLACEMENT AND COMPACTION

5.1 Fill Lifts

Fill material shall be placed in prepared areas in near-horizontal layers not exceeding 8 inches in loose thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to attain uniformity of material and moisture in each layer.

5.2 Fill Moisture

Fill layers at a moisture content less than optimum shall be watered and mixed, and wet fill layers shall be aerated by scarification or shall be blended with drier material. Moisture-conditioning and mixing of fill layers shall continue until the fill material is at a uniformly processed at a minimum of 125 percent of the optimum moisture content.

5.3 Fill Compaction

Each layer of fill shall be evenly spread, moisture-conditioned, mixed, and shall be uniformly compacted to not less than 90 percent of the maximum dry density at a minimum of 125 percent of the optimum moisture content. Compaction equipment shall be adequately sized and shall be either specifically designed for soil compaction or of proven reliability, to efficiently achieve the specified degree of compaction.

5.4 Fill Slopes

Compacting of slopes shall be accomplished, in addition to normal compacting procedures, by overfilling and compacting the slope face a minimum of four feet horizontally from finish grade, and cutting the slope face back to the core of compacted fill. In restricted spaces where overfilling is not possible, fill slopes may be compacted by back-rolling of slopes, with sheepsfoot rollers at frequent increments of 1 to 2 feet in fill elevation gain. At the completion of grading, the relative compaction of the slope out to the slope face shall be a minimum of 90 percent.

5.5 Compaction Testing

Field tests to check the fill moisture and degree of compaction will be performed by the geotechnical consultant. The location and frequency of tests shall be at the geotechnical consultant's discretion. In general, the tests will be taken at an interval not exceeding 2 feet in vertical elevation and/or 1,000 cubic yards of fill placed.

6.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in locations recommended by the geotechnical consultant to conform to the approximate alignment and details shown on the plans or herein. The subdrain location or materials shall not be changed or modified without the recommendation of the geotechnical consultant. The geotechnical consultant; however, may recommend changes in subdrain line, grade or material. All subdrains should be surveyed for line and grade after installation. Sufficient time shall be allowed for the surveys, prior to commencement of filling over subdrain areas.

7.0 EXCAVATION

Excavation and cut slopes will be geologically mapped and examined during grading. Sufficient time shall be allowed by the contractor to permit geologic mapping of excavation bottoms and cut slopes. If directed by the geotechnical consultant, further excavation or overexcavation and refilling of cut areas shall be performed, and/or remedial grading of cut slopes. All fill-over-cut slopes are to be graded, unless otherwise stated, shall be constructed as a fill slope with the use of minimum width stabilization fills, as necessary.

APPENDIX F

HARDSCAPE RECOMMENDATIONS

KCG KLING Consulting Group, Inc.

HARDSCAPE RECOMMENDATIONS FOR EXPANSIVE SOILS (COMMERCIAL/INDUSTRIAL BUILDING)[4]

Description	Minimum Concrete Thickness (Inches)	Subgrade Pre-Soaking Depth	Reinforcement [(1)]	Cutoff Barrier or Edge Thickness	Joint [(2)] Spacing (Max)	Base
Common Sidewalks - Isolated						
EI<21	4	Optimum to 12"	N.R.	N.R.	5-10 Feet	N.R.
EI 21-50	4	120% of/or 5% over optimum (whichever is greater) to 12”			5-10 Feet	
EI 51-90	4	120% of/or 5% over optimum (whichever is greater) to 18”			5-10 Feet	
EI 91-130	5	120% of/or 5% over optimum (whichever is greater) to 24”			6 feet	
EI>130	5	130% of/or 5% over optimum (whichever is greater) to 24”			6 feet	
Common Sidewalks - Not Isolated (adjacent to curbs or structures)						
EI<21	4	Optimum to 12"	Dowel into curbs and entries with #4 Re-bar at 24” O.C.	N.R.	5-10 Feet	N.R.
EI 21-50	4	120% of/or 5% over optimum (whichever is greater) to 12”			5-10 Feet	
EI 51-90	4	120% of/or 5% over optimum (whichever is greater) to 18”			5-10 Feet	
EI 91-130	5	120% of/or 5% over optimum (whichever is greater) to 24”			6 feet	
EI>130	5	120% of/or 5% over optimum (whichever is greater) to 24”			6 feet	
Enhanced or Decorative Concrete (where higher degree of crack control is desired)						
E<21	5	Optimum to 12"	6x6 – W1.4xW1.4 Mesh	12” thick x 12” wide	5-10 Feet	N.R.
EI 21-50	5	120% of/or 5% over optimum (whichever is greater) to 12”	6x6 – W2.9xW2.9 Mesh	12” thick x 12” wide	5-10 Feet	
EI 51-90	5	120% of/or 5% over optimum (whichever is greater) to 18”	#3 re-bar @ 18” O.C., E.W.	12” thick x 12” wide	5-10 Feet	
EI 91-130	6	120% of/or 5% over optimum (whichever is greater) to 24”	#3 re-bar @ 12” O.C., E.W.	12” thick x 12” wide	6 feet	
EI>130	6	120% of/or 5% over optimum (whichever is greater) to 24”	#4 re-bar @ 12” O.C., E.W.	12” thick x 12” wide	6 feet	
Curb and Gutter	C.S.	Scarify 6”/Pre-Moisten	N.R.	N.R.	10 Feet	N.R.
General Concrete Paving [3]	7	N.R.	N.R.	12”x12” where adjacent to landscape	10 Feet	6”
Trash Enclosure/Loading Bay [3]	8	N.R.	N.R.	12”x12” where adjacent to landscape	10 Feet	6"

N.R. = Not Recommended
C.S. = City/County Standard
O.C. = On Center
E.W. = Each Way

General Notes:
(A) All concrete thickness should be “full”
(B) Square concrete panels when possible
(C) Maintain positive drainage from concrete flatwork
(D) All slab reinforcement should be placed at mid-height of slab
(E) The above recommendations are intended to mitigate expansive soils independent of other design considerations. The recommendations of the structural engineer and/or architect should also be incorporated into the final design.

Footnotes:
(1) Reinforcement to extend into cutoff barrier in thickened edge.
(2) Joint at curves or angle points.
(3) The above concrete paving recommendations are for planning purposes only.
An actual pavement design should be generated based on concrete strength, and frequency and magnitude of anticipated axle loads.
(4) The above recommendations are intended to mitigate expansive soils independent of other design considerations.
The recommendations of the structural engineer and/or architect should also be incorporated into the final design.

APPENDIX G

ASFE INSERT

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from alight industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ-sometimes significantly from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in-this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer For Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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