Preliminary

Water Quality Management Plan

For:

CarMax #4033 Redlands

APN: 016901138 AND 01690119

Parcels B and C of LLA #484 per INST. No. 2004-082479

Prepared for:

John Thatcher

CenterPoint Integrated Solutions

1626 Cole Blvd, Suite 125

Lakewood, CO 80401

Prepared by:

John Pollock, PE
Kimley-Horn and Associates
3801 University Avenue, Suite 300
Riverside, CA 92501
(951)543-9868

Submittal Date: February 7, 2023

Revision Date: October 2, 2023

Approval Date:_____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for **CenterPoint Integrated Solutions** by **Kimley Horn and Associates**. The WQMP is intended to comply with the requirements of the **City of Redlands** 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):		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: 016901138 and 01690119

Owner's Signature			
Owner Name: John Thatcher			
Title	Director/Senior Development Manager		
Company	CenterPoint Integrated Solutions		
Address	1626 Cole Blvd, Suite 125, Lakewood, CO 80401		
Email	jthatcher@centerpoint-is.com		
Telephone #	720.800.3355		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		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: 016901138 and 01690119

"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: John Pollock	
Title	Project Manager
Company	Kimley-Horn and Associates
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Telephone #	(951) 543-9868
Signature	
Date	10/2/2023

PE Stamp Below

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Forms

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	CarMax #4033 Redlands				
Project Owner Contact Name:	John Thatcher				
Mailing Address:	1626 Cole Blvd, Suite 125, Lakewood, CO 80401	E-mail Address:	jthatcher@centerpoint-is.com	Telephone:	720.800.3355
Permit/Application Number(s):			Tract/Parcel Map Number(s):		
Additional Information/ Comments:					
Description of Project:	The existing 18.50-acre lot will be developed into the proposed CarMax Auto Superstore. In the proposed condition, the project will not be phased. The proposed development will include a proposed 53,800 square foot building with carwash, production area, auction space, presentation area and retail service and sales space. There will be regular parking stalls for both employee and customer parking. A separate parking area will be used for sales display. Daily routine activities will consist of customers will park their cars, receive service from the salespersons, and walk the sales display area. Cars that are sold to CarMax will be reconditioned and those that are bought will go through the carwash. There will be no food preparation, service, or storage on-site. All wash water used on-site will be treated and recycled for re-use within the facility. Site improvements will include landscaping, concrete hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, infiltration basins, concrete and asphalt pavement, landscaping, and irrigation. The project site is approximately 18.56 acres and is located west of the intersection of New York Street and West Brockton Avenue in the City of Redlands, San Bernardino County. The APNs for the project site are 0169-011-38 and 0169-011-39. Appendix A contains an aerial photograph that depicts the project location. The existing condition of the project site is predominantly vacant, with some residual concrete that will be removed for the proposed improvements. There is an existing 12" VCP sanitary sewer line running west, through the center of APN: 0116901138, that transitions to a 15" VCP line. Under the existing conditions, the site predominately drains west to the Caltrans channel. Flows are ultimately tributary to the Santa Ana River. Expected waste for the proposed condition will include trash and debris. All proposed landscaping will consist of trees, shrubs and drought tolerant native ground cover. See Section 6.1 "WQMP Exhibit" for the WQMP Site Plan. For water quality purposes the proposed site drainage will be intercepted by proposed inlets with full trash capture filter inserts and will be routed to (1) one detention basin system (BMP 1) located on the northwestern side of the site. See Section 6.1 "WQMP Exhibit" for				

	Site Plan showing BMP location and details. The proposed detention system will be sized to treat the design capture volume (DCV) of 46,635 cubic feet. BMP-1 will provide the storm water mitigation through infiltration, and any flows greater than the required treatment volume will be released through a controlled outflow to the existing channel to the west of the project site to match the existing conditions. Two de-minimis areas along the northwesterly boundary and the easternly portion of the site will flow out of the site.
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 ft² or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft² 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 ft² or more
☐ Hillside developments of 5,000 ft² 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 ft² 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 ft² or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft² 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):	805,777	**3** Number of Dwelling Units:	N/A	**4** SIC Code:	5511

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:

The proposed project will be maintained by the ultimate owner, CenterPoint Integrated Services, Inc. (CSI). CSI will be responsible for maintaining and providing regular inspections on all post-construction BMPs as well as private utility infrastructure. All public off-site utility infrastructure maintenance will be deferred to the City of Redlands where applicable.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity.

There will be no infrastructure transfer to any public agencies after project completion.

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). **Per Section 6.4 "Other Supporting Materials" The NPDES infiltration basin fact sheet states that an infiltration basin can filter the POC's noted below.**

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Resulting from wild bird, pet waste, and garbage. Pollutant of concern for Santa Ana River Reach 3 and 4
Nutrients - Phosphorous	E ☒	N ☐	Resulting from fertilizers, food waste, and garbage. Will be mitigated through catch basin inserts and the biofiltration basin.
Nutrients - Nitrogen	E ☒	N ☐	Resulting from fertilizer and waste.
Noxious Aquatic Plants	E ☒	N ☐	Resulting from the infiltration basin. Water will be temporarily stagnant until it infiltrates into the soil, resulting in the promotion of the growth of aquatic plants.
Sediment	E ☒	N ☐	Resulting from cars, trucks, and parking areas.
Metals	E ☒	N ☐	Resulting from leaking vehicles and parking areas. Pollutant of concern for Santa Ana River Reach 3 and 4. Will be mitigated through catch basin inserts and the biofiltration basin.
Oil and Grease	E ☒	N ☐	Resulting from leaking vehicles and parking areas. Will be mitigated through catch basin inserts and the biofiltration basin.
Trash/Debris	E ☒	N ☐	Resulting from proposed landscaping areas and proposed use.
Pesticides / Herbicides	E ☒	N ☐	Resulting from proposed landscaping areas.
Organic Compounds	E ☒	N ☐	Resulting from proposed landscaping areas.
Other: Petroleum/Hydrocarbons	E ☒	N ☐	Resulting from cars, trucks, and parking areas.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
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

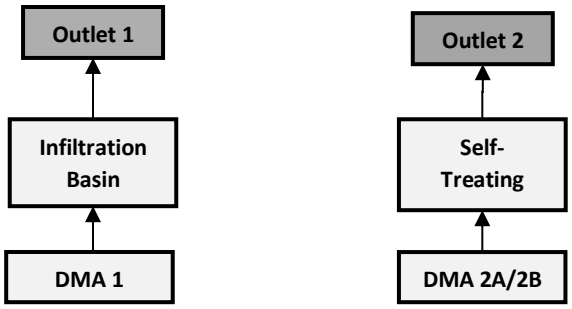
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and 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°04'00.7"N	Longitude 117°11'49.8"W	Thomas Bros Map page 608 A-6

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
DMA 1 to Outlet 1	*DMA-1 includes most of the project site, which sheets flows through the site and is intercepted by proposed inlets. The storm flows will then be conveyed into a proposed infiltration basin for treatment. The infiltration basin will treat the full DCV for the tributary area. Since the basin size will remain unchanged in the temporary and ultimate condition of the basin, the DCV treatment will work the same in both situations*
DMA 2A/2B to Outlet 2A/2B	DMA 2A/2B includes two small landscape sloped areas to the northwest and east of the site. Due to the existing and proposed grading, the areas drain offsite to an existing concrete channel and New York Street respectively. Per the EPA Stormwater management Practices Website, vegetated paths can be used in small drainage areas with low runoff. Vegetated areas help infiltrate and filter pollutants. **Per** See Section 6.4 "Other Supporting Materials" for additional EPA Stormwater information.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA 1			
1 DMA drainage area (ft^2)	805,777			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	A			
5 Longest flowpath length (ft)	960			
6 Longest flowpath slope (ft/ft)	1.72%			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Annual Grass			
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			

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/ See 'Drainage Facilities" link at this website*	Santa Ana River Reach 5, 4, 3, Prado Dam 2
Applicable TMDLs *Refer to Local Implementation Plan*	Warm Creek – Indicator Bacteria Santa Ana River Reach 4 – Indicator Bacteria Santa River Reach 3 – Indicator Bacteria, Copper, Lead Prado Basin – pH
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	SAR Reach 2
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	N/A
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	Santa Ana River Reach 5, 4, 3, Prado-2
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	☒	☐	Owners shall familiarize themselves with the contents of this WQMP and provide training to employees to understand best management practices and on ways to mitigate storm water pollution. Educational pamphlets have been provided that cover auto maintenance, mobile cleaning, hazardous waste disposal, and other pollution prevention practices.
N2	Activity Restrictions	☒	☐	Any activities that are in violation of the City of Redlands Ordinances and Codes shall be restricted, specifically those that violate the ordinances in Chapter 13.54 of the City of Redlands Municipal codes. Additionally, activities for which adequate BMPs have not been provided are restricted.
N3	Landscape Management BMPs	☒	☐	Landscape crews contracted shall inspect irrigation system and health of landscaping and shall report all repairs or problems to owner. Routine landscaping maintenance shall be done according to CASQA SC-73 fact sheets which is provided under the "Other Supporting Materials" section.
N4	BMP Maintenance	☒	☐	BMP maintenance shall be performed per the schedule in Form 5-1 of this WQMP.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Although no hazardous wastes are defined for this site, Title 22 CCR compliance will be implemented. The labeling and proper storage of Hazardous Materials will be required as described in Title 22 (storage) sections. Additional Hazardous waste requirements imposed by the City of Redlands will be implemented to properly dispose of leftover pesticides, fertilizers, antifreeze, batteries, etc.
N6	Local Water Quality Ordinances	☒	☐	Owner shall ensure business activities at the site comply with the City's Stormwater Ordinance through the implementation of BMP's included in this report.
N7	Spill Contingency Plan	☒	☐	A spill contingency plan is provided under the "Other Supporting Materials" section.

Form 4.1-1 Non-Structural Source Control BMPs				
N8	Underground Storage Tank Compliance	☒	☐	Building site owner or contracted maintenance crew shall inspect the underground infiltration system annually prior to the rainy season.
N9	Hazardous Materials Disclosure Compliance	☐	☒	N/A - No hazardous materials affiliated with proposed development

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	
N10	Uniform Fire Code Implementation	☐	☒	No proposed toxics and highly compressed gases are to be located on site. However, the site must comply with UFC Article 80 and all fire code requirements to ensure safety of the public and building(s).
N11	Litter/Debris Control Program	☒	☐	A program shall be implemented to pick up litter and sweep and clean the existing trash enclosures on a daily basis. Trash enclosures are designed to divert all flows around the enclosure and shall be checked on a weekly basis to ensure that no leaks are present, and that trash does not accumulate on the enclosure floor. All dumpsters will have lids installed and will be inspected to ensure that the dumpsters remain covered and leak-proof. The owner shall ensure that the site is daily inspected for stray trash and that is collected and disposed of correctly. The owner shall additionally ensure a tenant's contract with a refuse company to have the dumpsters emptied on a weekly basis, at a minimum.
N12	Employee Training	☒	☐	Property owner shall establish an educational program for site employees and contractors to inform and train personnel in "good housekeeping" practices general BMP inception and maintenance including: maintenance activities regarding the impact of dumping oil, paint, solvents, or other potentially harmful chemicals into the storm drain system; the use of fertilizers and pesticides in landscaping maintenance practices; and the impacts of litter and improper waste disposal. The owner shall ensure that employees receive training within 6 months of hire and on an annual basis thereafter.
N13	Housekeeping of Loading Docks	☐	☒	N/A- No proposed loading docks onsite.
N14	Catch Basin Inspection Program	☒	☐	The on-site catch basins shall be inspected monthly during the rainy season (October-May) and before and after each storm to ensure proper operation. The owner shall contract with a qualified landscape contractor to inspect and clean out accumulation of trash, litter, and sediment and check for evidence of illegal dumping of waste materials into on-site drains.

N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Parking lots shall be swept weekly to prevent sediment, garden waste, and trash, or other pollutants from entering on-site drains and public storm channels. Sweeping will be done by a landscape contractor or other contractor provided by the owner.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	N/A – Proposed project is not a Public Agency Project.
N17	Comply with all other applicable NPDES permits	☒	☐	The developer of this site shall comply with the state's General Construction Stormwater Permit by filling an NOI to obtain a permit WDID number prior to start of grading/construction. All future occupants requiring coverage under the NPDES General Industrial Activities Permit shall comply with the permit requirements by filing an NOI to obtain a permit WDID number or No Exposure Certification (NEC) with the state prior to commencement of industrial activities covered under the permit.

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)	☒	☐	A painted stencil/message blue on a white background with 2-1/2" in height and reading "No Dumping-Drains to River" shall be placed on each catch basin. 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 shall be inspected annually & repainted as necessary.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	N/A – No outdoor storage areas are proposed within this project.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Stormwater flows are not allowed to flow through existing waste areas under existing conditions. All dumpsters shall have working lids which shall be kept closed, at all times. Trash enclosure shall comply with CASQA SD-32 and shall have doors and a roof.
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)	☒	☐	The irrigation system will include devices to prevent low head drainage, overspray and run off through the use of pressure regulating devices, check valves, rain shutoff valves, flow sensors, pressure drop sensors, proper spacing, low precipitation emissions devises and ET or weather based controllers. Landscape and irrigation shall be consistent with the State Model Water Efficient landscape Ordinance. Plants installed will be arranged according to similar hydrozones and meet the required water budget for the site. Landscape areas used for water quality swales or infiltration areas shall have proper plants for saturated soils, drought tolerance and erosion control qualities. Shade trees shall be used to intercept rainwater and reduce gain on paving.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscape complies with depressed area requirements. See WQMP exhibit for finished grade detail.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	No slopes or channels are proposed on the project site.

S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	N/A-no covered dock areas proposed onsite.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	N/A – No maintenance bays are proposed within this project.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☒	☐	Proposed site follows vehicle washing requirements described in CASQA New Development BMP SD-33. See Section 6.4 "Other Supporting Materials" for Spill contingency plan prepared by owner for employees.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	N/A – No outdoor processing areas are proposed within this project.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☒	☐	Proposed site follows equipment washing requirements described in CASQA New Development BMP SD-33. Section 6.4 "Other Supporting Materials" for Spill contingency plan prepared by owner for employees.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☒	☐	Proposed site follows fueling area requirements described in CASQA New Development BMP SD-30. Section 6.4 "Other Supporting Materials" for contingency plan prepared by owner for employees.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	N/A – No hillside landscaping is being proposed within this project.
S14	Wash water control for food preparation areas	☐	☒	N/A – No food preparation areas are proposed within this project.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	N/A – No community car wash area is being proposed within this project.

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: Landscape area incorporated into site design to the maximum extent possible by minimizing driveway and parking area widths and incorporating landscape planters along the property perimeter.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Landscaping will be installed and implemented wherever possible onsite. Most of the site runoff is directed into an infiltration basin to utilize the infiltration capacity.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Existing drainage patterns are to be maintained and onsite stormwater features are to improve the time of concentration.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Runoff is directed into the landscape areas and infiltration basin.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: There is no existing vegetation onsite that needs to be preserved.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: All disturbed areas are to be re-vegetated.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Unnecessary compaction surrounding stormwater retention/infiltration basin/trench areas to be minimized in order to maximize infiltration.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: Vegetated swales to be installed and implemented whenever possible onsite.
Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐ Explanation: Landscape areas will be staked off in order to minimize compaction during construction.

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 mi^2), 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)

1 Project area DA 1 (ft^2): 802,430	**2** Imperviousness after applying preventative site design practices (Imp%): 72.7%	**3** Runoff Coefficient (Rc): 0.520 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.466 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.69 *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): 46,635 *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://permitrack.sbcounty.gov/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** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** *Form 4.2-5 Item 10*
Post-developed	**4** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** *Form 4.2-5 Item 14*
Difference	**7** *Item 4 – Item 1*	**8** *Item 2 – Item 5*	**9** *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** % *Item 7 / Item 1*	**11** % *Item 8 / Item 2*	**12** % *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	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

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

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

12 Pre-developed Volume (ft^3):
*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):
*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):
*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*								
2 Change in elevation (ft)								
3 Slope (ft/ft), *S_o = Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) *T_c = Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): *$T_{C\text{-}HCOC}$ = (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 (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		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)*							
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)*							
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)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
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 C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
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: *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):	*Maximum of Item 8, 9, and 10 (including additional forms as needed)*	
11 Post-developed Q_p at T_c for DMA A: *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):	*Maximum of Item 11, 12, and 13 (including additional forms as needed)*	
15 Peak runoff reduction needed to meet HCOC Requirement (cfs):	*$Q_{p\text{-}HCOC}$ = (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 DMA BMP Type	DA DMA 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):		$V_{retention}$ *=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): $V_{retention}$ *=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): $V_{retention}$ *= 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): $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: *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 (ft³): 46,635 *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 A DMA A BMP Type Infiltration Basin	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*	1.5		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.75		
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*	3		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3		
8 Infiltrating surface area, SA_{BMP} (ft²) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	38,029		
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*	0		
10 Amended soil porosity	0		
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*	0		
12 Gravel porosity	0		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft³) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	230,551		
15 Underground Retention Volume (ft³) *Volume determined using manufacturer's specifications and calculations*	N/A		

16 Total Retention Volume from LID Infiltration BMPs: 230,551 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 210% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/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*			
8Retention 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 *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 & 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)

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*	List pollutants of concern *Copy from Form 2.3-1.*	
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)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *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)*		
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.*		

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: *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 : *(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 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 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): 46,635 *Copy Item 7 in Form 4.2-1*

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

3 On-site retention with LID infiltration BMP (ft^3): 97,918 *Copy Item 16 in Form 4.3-3*

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

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

6 Flow capacity provided by flow based biotreatment BMP (cfs): N/A *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): *(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): *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): *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): *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 ☐
  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 ☐
  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
Litter/Debris Control Program	Owner	Litter shall be picked up, trash enclosure areas shall be swept and cleaned, dumpsters shall be emptied.	Weekly
Catch Basin Inspection Program	Owner	Catch basins shall be inspected to ensure proper operation.	Monthly during rainy season (Oct-May) and before and after each storm event
Parking Lot Sweeping	Owner	Parking lots must be swept	Quarterly (Minimum), Weekly during rainy season (Oct-May)
Landscape Management	Owner	Gardening and lawn care practices to prevent landscape waste to exit project site per SC-73	Weekly
Efficient Irrigation Systems	Owner	Irrigation systems must be inspected to ensure proper operation.	Weekly
Trash Storage Areas	Owner	Trash storage areas must be inspected to ensure integrity of structural elements.	Weekly
Infiltration Basins	Owner	See TC-11 Infiltration Basin O&M information. See Appendix D	See TC-11 Infiltration Basin O&M information.

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 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

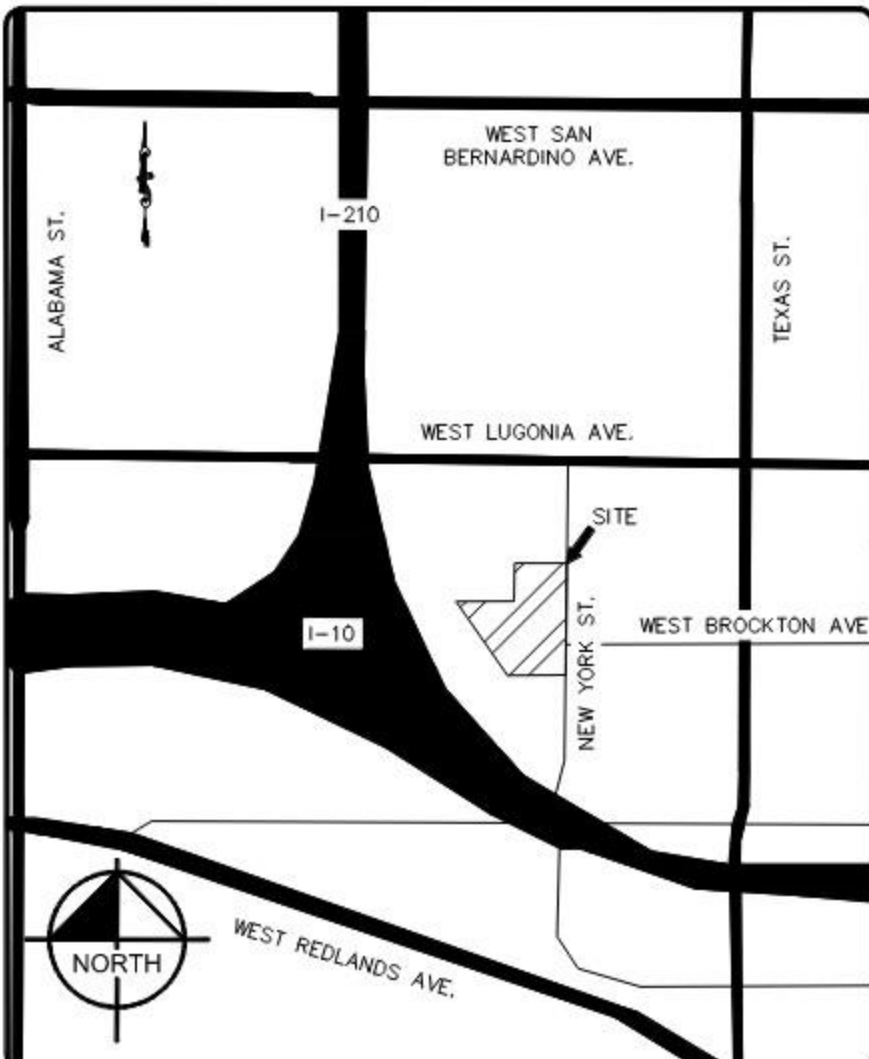
Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements

Section 6.1 WQMP Exhibit

VICINITY MAP - NOT TO SCALE




CARMAX REDLANDS
SITE LIMITS
Home Depot
The Home Depot
Garden Center at The Home Depot
PROJECT SITE
New York St
New York St & W Brockton Ave
W Brockto
New York St
N
500 ft
Google Earth

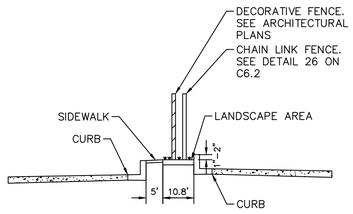
LEGEND

- 1695 — PROPOSED CONTOUR
- (1695) — EXISTING CONTOUR
- PROPERTY LINE
- DMA BOUNDARY
- PROPOSED STORM DRAIN
- FLOW ARROW
- X / XX — DA NAME / DA AREA (IN ACRES)
- RIGHT OF WAY
- LANDSCAPE AREA

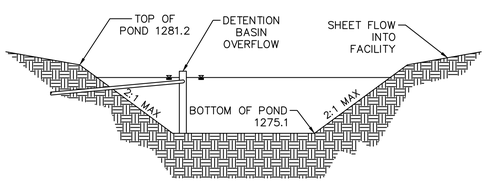
DRAINAGE NOTES:

1. PROPOSED INFILTRATION BASIN, SIDE SLOPES NO STEEPER THAN 2 TO 1 MAX. SIDE SLOPES TO BE LANDSCAPED TO PROVIDE ENERGY DISSIPATION. SEE DETAIL HEREON.
2. PROPOSED STORM DRAIN PIPE
3. PROPOSED INLET WITH FILTER
4. PROPOSED VEGETATED SWALE
5. SD-32, TRASH STORAGE AREA

NON-STRUCTURAL SOURCE CONTROL BMPS	
BMP ID	BMP DESCRIPTION
N1	EDUCATION OF PROPERTY OWNERS, TENANTS, AND OCCUPANTS ON STORMWATER BMPS
N2	ACTIVITY RESTRICTIONS
N3	LANDSCAPE MANAGEMENT BMPS
N11	LITTER/DEBRIS CONTROL PROGRAM
N12	EMPLOYEE TRAINING
N14	CATCH BASIN INSPECTION PROGRAM
N15	VACUUM SWEEPING OF PRIVATE STREETS AND PARKING LOTS

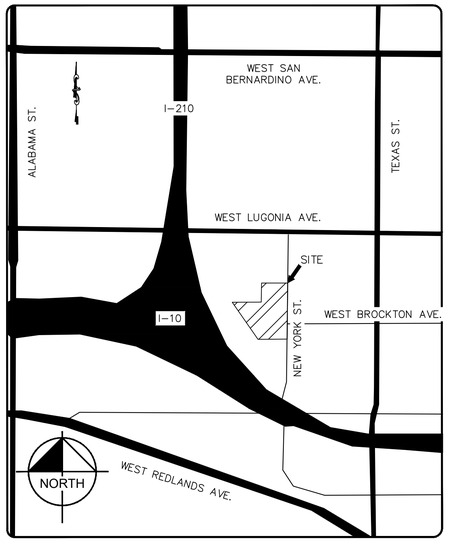


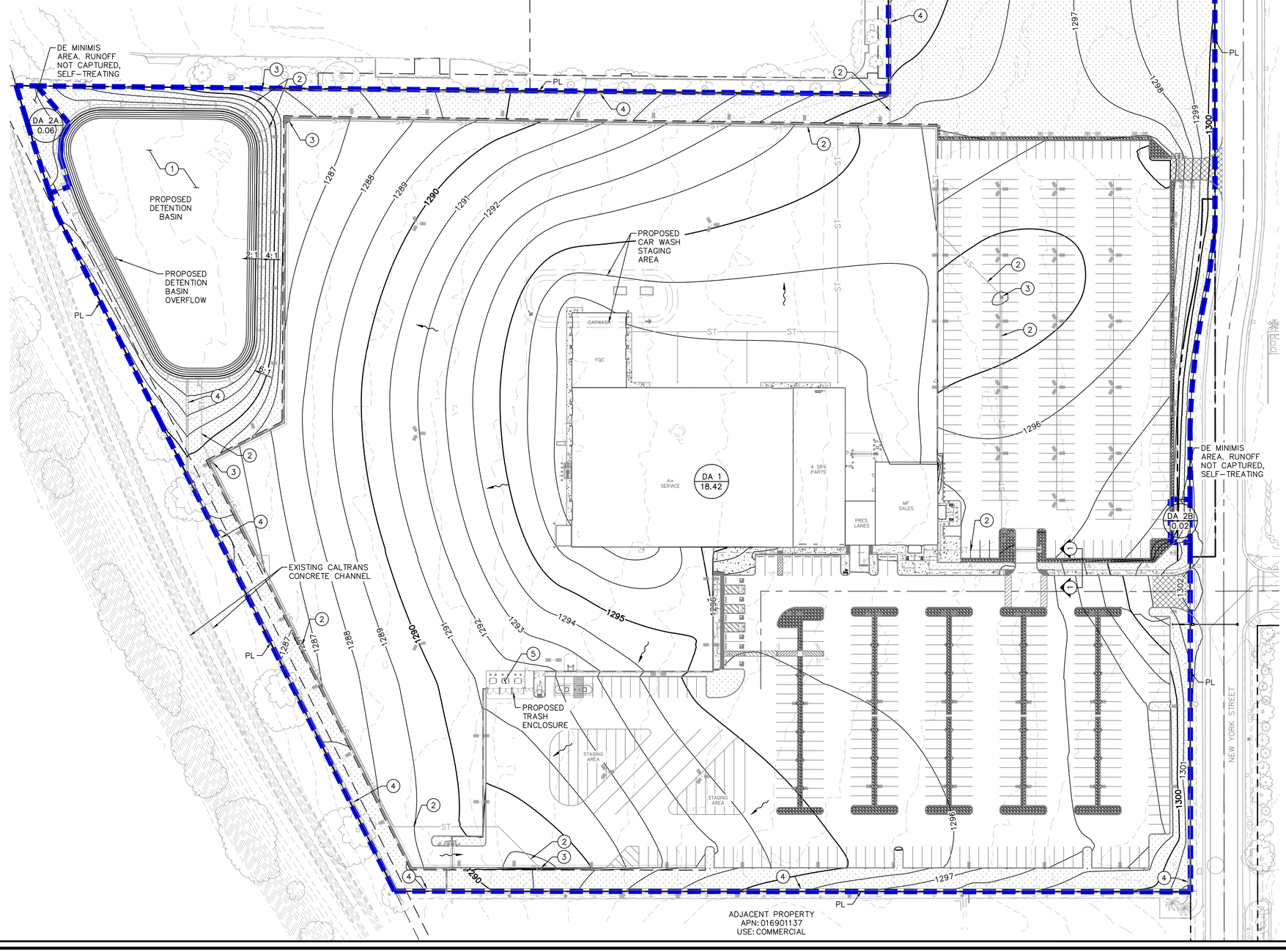
1 SECTION 1
N.T.S.



INFILTRATION BASIN
N.T.S.

VICINITY MAP - NOT TO SCALE

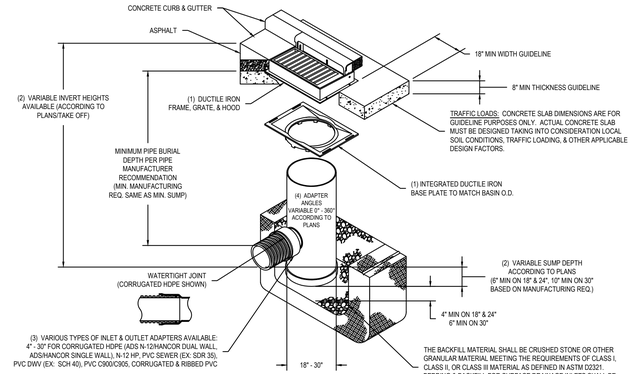




Kimley»Horn

WQMP SITE PLAN
CARMAX #4033 REDLANDS
10/3/2023

NYLOPLAST 2 FT X 3FT CURB INLET STRUCTURE: 30 _ _ AGR _ _ X



1 - 18" - 30" FRAMES, GRATES, HOODS, & BASE PLATES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
2 - DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS.
3 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, & PVC SEWER (4" - 24").
4 - ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7005-110-012.
5 - ALL CURB INLET GRATE OPTIONS (DIAGONAL & HIGH FLOW) SHALL MEET H-20 LOAD RATING

DRAWN BY	EBC	MATERIAL	
DATE	03-22-19		
REVISED BY	NMH	PROJECT NO./NAME	
DATE	03-10-16		
DWG SIZE	A	SCALE 1:40	SHEET 1 OF 1

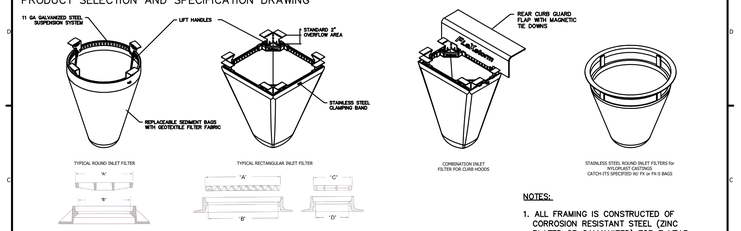
Nyloplast
3130 VERONA AVE
BUFORD, GA 30518
PHN (770) 932-2443
FAX (770) 932-2490
www.nyloplast-us.com

TITLE: DRAIN BASIN WITH 2 FT X 3 FT CURB INLET QUICK SPEC INSTALLATION DETAIL

DWG NO. 7002-110-087 REV C

DRAIN BASIN WITH CURB INLET DETAIL
NTS

FLEXSTORM CATCH–IT FILTERS FOR TEMPORARY INLET PROTECTION PRODUCT SELECTION AND SPECIFICATION DRAWING



1. IN IDENTIFY YOUR FRAME STYLE AN D SIZE

STYLE	FRAME STYLE AND SIZE	Frame P/N:
ROUND	Small Round (up to 20.0" dia grates (A) dim)	62SRD
	Med Round (20.1" - 26.0" dia grates (A) up to 25" dia openings (B))	62MRD
	Large Round (26.1" - 32.0" dia grates (A) up to 30" openings (B))	62LRD
	XL Round (32.1" dia - 39" dia grates (A) up to 37" dia openings (B))	62XLRD
RECT/ SQUARE	Small Rect / Square (up to 36" (B) x 35" (D) openings or 64" perimeter)	62SSQ
	Med Rect / Square (up to 24" (B) x 24" (D) openings or 96" perimeter)	62MSQ
	Large Rect / Square (up to 36" (B) x 24" (D) openings or 120" perimeter)	62LSQ
	XL Rect / Square (side by side 2 pc set to fit up to 48" (B) x 36" (D) openings)	62XLSQ
CURB INLETS	Small Rect / Square (ref Rect sizing; shipped with Magnetic Curb Flaps)	62SCB
	Med Rect / Square (ref Rect sizing; shipped with Magnetic Curb Flaps)	62MCB
	Large Rect / Square (ref Rect sizing; shipped with Magnetic Curb Flaps)	62LCB
	XL Rect / Square (ref Rect sizing; shipped with Magnetic Curb Flaps)	62XLCB
NYLOPLAST	12" diameter Nyloplast castings (Stainless Steel Framing standard)	62SDN-Y
	15" diameter Nyloplast castings (Stainless Steel Framing standard)	62LSN-Y
	18"diameter Nyloplast castings (Stainless Steel Framing standard)	62LNN-Y
	24" diameter Nyloplast castings (Stainless Steel Framing standard)	62LNN-Y
	30" diameter Nyloplast castings (Stainless Steel Framing standard)	62LNN-Y

SPECIFICATIONS FOR STANDATD BAGS BY NOMINAL SIZE

Nominal Bag Size	Solids Storage (Cuft)	Filtered Flow Rate at 50% Max (CFS) FX (Woven)	IL (NonWoven)
Small	1.6	1.2	0.9
Medium	2.5	1.7	1.3
Large	3.8	2.7	1.9
XL	4.2	3.6	2.6

2. SELECT YOUR BAG PART-NUMBER

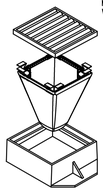
FLEXSTORM FILTER BAGS	(22" depth) STD Bag P/N	(12" depth) Short Bag P/N	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
FX- Standard Woven Bag	FX	FX-S	200	40
IL- IDOT Non-Woven Bag	IL	IL-S	145	70

3. CREATE YOUR FLEXSTORM INLET FILTER PART NUMBER

Frame P/N from Step 1. Filter Bag P/N from Step 2.

INSTALLATION:

1. REMOVE GRATE
2. DROP FLEXSTORM INLET FILTER ONTO LOAD BEARING LIP OF CASTING OR CONCRETE STRUCTURE
3. REPLACE GRATE



NOTES:

1. ALL FRAMING IS CONSTRUCTED OF CORROSION RESISTANT STEEL (ZINC PLATED OR GALVANIZED) FOR 7 YEAR MINIMUM SERVICE LIFE.
2. UPON ORDERING CONFIRMATION OF THE DOT CALLOUT, PRECAST OR CASTING MAKE AND MODEL, OR DETAILED DIMENSIONAL FORMS MUST BE PROVIDED TO CONFIGURE AND ASSEMBLE YOUR CUSTOMIZED FLEXSTORM INLET FILTER. PART NUMBER ALONE IS NOT SUFFICIENT.
3. FOR WRITTEN SPECIFICATIONS AND MAINTENANCE GUIDELINES VISIT WWW.INLETFILTERS.COM

ALL PRODUCTS MANUFACTURED BY INLET & PIPE PROTECTION, INC A DIVISION OF ADS, INC. WWW.INLETFILTERS.COM (866) 287-8655 PH (630) 355-3477 FX INFO@INLETFILTERS.COM

SIZE	DWG NO.	REV
C	IPP Flexstorm Specifications	A
SCALE	SHEET 1 OF 1	

INLET FILTER DETAIL
NTS

INLET STENCILING EXAMPLE
NTS

Section 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 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.

Section 6.3 Post Construction (O&M and BMP Agreement)

RECORDING REQUESTED BY:
MUNICIPAL UTILITIES AND
ENGINEERING DEPARTMENT
CITY OF REDLANDS

WHEN RECORDED RETURN TO:
CITY CLERK'S OFFICE
CITY OF REDLANDS
P.O. BOX 3005
REDLANDS, CA 92373

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE AGREEMENT

Assessor's Parcel Number(s)
0169-011-39, 0169-011-38

THIS AGREEMENT is made and entered into this Tuesday day of October 3, 2023, by and between CarMax Auto Superstores, Inc ("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 the CarMax Redlands Project and the intersection of New York Street and Brockton Avenue and filed as CUP 1179 (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 a Detention Basin BMP (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 referred to as the Water Quality Maintenance Plan; 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 CarMax Auto Superstores, Inc 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 Nos. 0169-011-39, 0169-011-38, and 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	OWNER
City Engineer	Steve Hudak
City of Redlands	CarMax Auto Superstores, Inc
P.O. Box 3005	12800 Tuckahoe Parkway
Redlands, CA 92373	Richmond, VA 23238

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:	OWNER:
_____	_____
Charles M. Duggan Jr., City Manager	[Steve Hudak
Attest:	
_____	
Jeanne Donaldson, City Clerk	

EXHIBIT "A"

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 I:

PARCEL B AS SHOWN ON EXHIBIT "B" OF THAT CERTAIN CERTIFICATE OF COMPLIANCE FOR LOT LINE ADJUSTMENT # 484 AS EVIDENCED BY DOCUMENT RECORDED NOVEMBER 12, 2004 AS INSTRUMENT NO. 2004-0822479 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL 5 OF PARCEL MAP NO. 15492, IN THE CITY OF REDLANDS, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP FILED IN BOOK 192, PAGES 4 THROUGH 8, INCLUSIVE, OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY;

EXCEPT THEREFROM THE NORTHERLY 272.13 FEET OF SAID PARCEL 5 MEASURED PERPENDICULAR TO THE NORTHERLY PARCEL LINE OF SAID PARCEL 5;

TOGETHER WITH PARCEL 1 OF PARCEL MAP NO. 2157, AS PER MAP FILED IN BOOK 20, PAGE 33 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY;

EXCEPT THEREFROM THAT PORTION OF SAID PARCEL 1 LYING NORTHERLY OF A LINE LOCATED 272.13 FEET SOUTHERLY OF THE NORTHERLY PARCEL LINE OF SAID PARCEL 1 SHOWN AS "S89°23'53" E 533.76'" ON SAID PARCEL MAP, SAID 272.13 FEET MEASURED PERPENDICULAR TO LAST SAID NORTHERLY PARCEL LINE;

TOGETHER WITH THE NORTHERLY 290.38 FEET OF PARCEL 1 OF PARCEL MAP NO. 2158, AS PER MAP FILED IN BOOK 20, PAGE 46 OF PARCEL MAPS, IN THE OFFICE OF SAID COUNTY RECORDER, SAID 290.38 FEET MEASURED PERPENDICULAR TO THE NORTHERLY PARCEL LINE OF SAID PARCEL 1.

PARCEL II:

PARCEL C AS SHOWN ON EXHIBIT "B" OF THAT CERTAIN CERTIFICATE OF COMPLIANCE FOR LOT LINE ADJUSTMENT # 484 AS EVIDENCED BY DOCUMENT RECORDED NOVEMBER 12, 2004 AS INSTRUMENT NO. 2004-0822479 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THE NORTHERLY 272.13 FEET OF PARCEL 5 OF PARCEL MAP NO. 15492, IN THE CITY OF REDLANDS, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP FILED IN BOOK 192, PAGES 4 THROUGH 8, INCLUSIVE, OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, SAID 272.13 FEET MEASURED PERPENDICULAR TO THE NORTHERLY PARCEL LINE OF SAID PARCEL 5;

TOGETHER WITH PARCEL 1 OF PARCEL MAP NO. 2157, AS PER MAP FILED IN BOOK 20, PAGE 33 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY;

EXCEPT THEREFROM THAT PORTION OF SAID PARCEL 1 LYING SOUTHERLY OF A LINE LOCATED 272.13 FEET SOUTHERLY OF THE NORTHERLY LINE OF SAID PARCEL 1 SHOWN AS "S89°23'53" E 533.76'" ON SAID PARCEL MAP, SAID 272.13 FEET MEASURED PERPENDICULAR TO THE LAST SAID NORTHERLY PARCEL LINE.

APN: **0169-011-38**, **0169-011-39**

EXCEPTIONS

AT THE DATE HEREOF, ITEMS TO BE CONSIDERED AND EXCEPTIONS TO COVERAGE IN ADDITION TO THE PRINTED EXCEPTIONS AND EXCLUSIONS IN SAID POLICY FORM WOULD BE AS FOLLOWS:

A. Property taxes, which are a lien not yet due and payable, including any assessments collected with taxes to be levied for the fiscal year 2022-2023.

B. The lien of supplemental or escaped assessments of property taxes, if any, made pursuant to the provisions of Chapter 3.5 (commencing with Section 75) or Part 2, Chapter 3, Articles 3 and 4, respectively, of the Revenue and Taxation Code of the State of California as a result of the transfer of title to the vestee named in Schedule A or as a result of changes in ownership or new construction occurring prior to Date of Policy.

1. Water rights, claims or title to water, whether or not disclosed by the public records.

2. The ownership of said Land does not include rights of access to or from the street, highway, or freeway abutting said Land, such rights having been relinquished by the document,

   Recording Date: January 27, 1961
   Recording No: in Book 5327 Page 572, of Official Records
   Affects: As described therein.

3. Waiver of any claims for damages to said Land by reason of the location, construction, landscaping or maintenance of the street or highway adjoining said Land, as contained in the deed to

   Recording Date: January 27, 1961
   Recording No: in Book 5327 Page 572, of Official Records

4. Easement and rights incidental thereto for sewer to The State of California, as set forth in a document recorded September 11, 1963 in Book 5985 Page 252, of Official Records.

   Said easements were quitclaimed to the City of Redlands by document recorded November 29, 1967 in Book 6932 Page 186, of Official Records.

5. Rights of access to or from the public road or street, highway or freeway adjacent to the Land were relinquished or severed as disclosed on said Map, September 11, 1963 in Book 5985 Page 252, of Official Records.

   Said deed further contains a waiver in favor of the State of California, of any claims for damages to said land by reason of the location, construction, landscaping or maintenance of a highway or freeway contiguous thereto.

6. Easement and rights incidental thereto for sewer to The City of Redlands, as set forth in a document recorded in Book 6932 Page 186, of Official Records.

7. The ownership of said Land does not include rights of access to or from the street, highway, or freeway abutting said Land, such rights having been relinquished by the document,

   Recording Date: September 22, 1978
   Recording No: in Book 9523 Page 751, of Official Records
   Affects: As described therein.

EXCEPTIONS
(Continued)

8. Easement(s) for the purpose(s) shown below and rights incidental thereto as set forth in a document:

In favor of:	City of Redlands, a municipal corporation, its successors and assigns
Purpose:	sewer and appurtenances
Recording Date:	February 20, 1980
Recording No:	80-043742, of Official Records
Affects:	As described therein.

9. Easement(s) for the purpose(s) shown below and rights incidental thereto, as delineated on or as offered for dedication on

Map/Plat:	Parcel Map No. 15492
Purpose:	sewer
Affects:	That portion of said land as shown on said parcel map.

10. Rights of access to or from the public road or street, highway or freeway adjacent to the Land were relinquished or severed as disclosed on said map, September 21, 1987 as Instrument No. 87-337567, of Official Records.

11. Easement and rights incidental thereto for utility purposes to The State of California, as set forth in a document recorded September 21, 1987 as Instrument No. 87-337568, of Official Records.

12. Easement(s) for the purpose(s) shown below and rights incidental thereto as set forth in a document:

In favor of:	Southern California Edison Company, a corporation
Purpose:	underground electrical supply systems and communication systems
Recording Date:	May 2, 2001
Recording No:	20010167046, of Official Records
Affects:	As described therein.

Limitations on the use, by the owners of said Land, of the easement area as set forth in the easement document shown hereinabove.

Reference is hereby made to said document for full particulars.

13. Easement(s) for the purpose(s) shown below and rights incidental thereto as set forth in a document:

In favor of:	Verizon California Inc., a corporation
Purpose:	pole lines
Recording Date:	June 28, 2001
Recording No:	20010252832, of Official Records
Affects:	As described therein.

Reference is hereby made to said document for full particulars.

EXCEPTIONS
(Continued)

14. Covenants, conditions, restrictions and easements but omitting any covenants or restrictions, if any, including but not limited to those based upon age, race, color, religion, sex, gender, gender identity, gender expression, sexual orientation, marital status, national origin, ancestry, familial status, source of income, disability, veteran or military status, genetic information, medical condition, citizenship, primary language, and immigration status, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth in the document

Recording Date: August 8, 2001
Recording No: 20010360755, of Official Records

Said covenants, conditions and restrictions provide that a violation thereof shall not defeat the lien of any mortgage or deed of trust made in good faith and for value.

An easement or other rights for the purpose shown below and rights incidental thereto as set forth in the document above mentioned.

For: utilities, water, sewer, drainage, ingress, egress, parking, landscaping and incidental purposes
Affects: Said land.

Modification(s) of said covenants, conditions and restrictions

Recording Date: January 18, 2002
Recording No: 20020028228, of Official Records

Modification(s) of said covenants, conditions and restrictions

Recording Date: April 19, 2002
Recording No: 2002-0200920, of Official Records

Modification(s) of said covenants, conditions and restrictions

Recording Date: December 2, 2002
Recording No: 2002-0651912, of Official Records

Modification(s) of said covenants, conditions and restrictions

Recording Date: March 31, 2004
Recording No: 2004-0220845, of Official Records

15. Matters contained in that certain document

Entitled: Covenant and Restriction Agreement
Recording Date: March 31, 2004
Recording No: 2004-0220847, of Official Records

Reference is hereby made to said document for full particulars.

Said covenants, conditions and restrictions provide that a violation thereof shall not defeat the lien of any mortgage or deed of trust made in good faith and for value.

EXCEPTIONS
(Continued)

16. Easement(s) for the purpose(s) shown below and rights incidental thereto as set forth in a document:

In favor of:	City of Redlands, a municipal corporation
Purpose:	sewer pipeline and appurtenances, ingress and egress
Recording Date:	October 28, 2004
Recording No:	2004-0786778, of Official Records
Affects:	As described therein.

Reference is hereby made to said document for full particulars.

17. Matters contained in that certain document

Entitled:	Development Incentive and Construction and Operation Covenant Agreement by and between the City of Redlands and Tom Bell Inc.
Recording Date:	December 27, 2004
Recording No:	2004-0950871, of Official Records

Reference is hereby made to said document for full particulars.

18. Easement(s) for the purpose(s) shown below and rights incidental thereto as set forth in a document:

In favor of:	City of Redlands, a municipal corporation
Purpose:	roadway, ingress and egress for vehicular or pedestrian traffic
Recording Date:	February 9, 2005
Recording No:	2005-0097209, of Official Records
Affects:	As described therein.

19. The Land described herein is included within a project area of the Redevelopment Agency shown below, and that proceedings for the redevelopment of said project have been instituted under the Redevelopment Law (such redevelopment to proceed only after the adoption of the Redevelopment Plan) as disclosed by a document.

Redevelopment Agency:	City of Redlands
Recording Date:	December 5, 2007
Recording No:	2007-0680912, of Official Records

20. Please be advised that our search did not disclose any open Deeds of Trust of record. If you should have knowledge of any outstanding obligation, please contact the Title Department immediately for further review prior to closing.

21. The fact that the public record does not disclose that the ownership of said land includes rights of access to or from any public street. Notwithstanding the insuring clauses of the policy, the Company does not insure against loss or damage by reason of a lack of a right of access to and from the land.

22. Matters which may be disclosed by an inspection and/or by a correct ALTA/NSPS Land Title Survey of said Land that is satisfactory to the Company, and/or by inquiry of the parties in possession thereof.

EXCEPTIONS
(Continued)

23. Any rights of the parties in possession of a portion of, or all of, said Land, which rights are not disclosed by the public records.

The Company will require, for review, a full and complete copy of any unrecorded agreement, contract, license and/or lease, together with all supplements, assignments and amendments thereto, before issuing any policy of title insurance without excepting this item from coverage.

The Company reserves the right to except additional items and/or make additional requirements after reviewing said documents.

PLEASE REFER TO THE "INFORMATIONAL NOTES" AND "REQUIREMENTS" SECTIONS WHICH FOLLOW FOR INFORMATION NECESSARY TO COMPLETE THIS TRANSACTION.

END OF EXCEPTIONS

EXHIBT "B" MAP

W.1/2, S.E1/4, Sec. 21, T.1S., R.3W., S.B.M.

THIS MAP IS FOR THE PURPOSE OF AD VALOREM TAXATION ONLY.

City of Redlands
Tax Rate Area
5016

0169 - 01

1" = 200'

NEW YORK STREET

AVENUE

W. LUGONIA

W. COLTON

HIGHWAY

STATE

P.M. 192/4-8

P.M. 20/33

P.M. 20/46

Par. 1

Par. 2 1.04 AC.

Par. 3 1.00 AC.

Par. 4 13.19 AC.

Par. 5

Ptn. Par. 1

Ptn. Par. 5

Ptn.Par.5

3.94 AC.

8.63 AC.

10.00 AC.

8.00 AC.

1.07 AC.

1.17 AC.

1.53 AC.

1.21 AC.

0167 / 17

011

02

10

11

34

Parcel Map No. 15492, P.M. 192/4-8
Parcel Map No. 2158, P.M. 20/46
Parcel Map No. 2157, P.M. 20/33

SEPT. 1949

Assessor's Map
Book 0169 Page 01
San Bernardino County

REVISED
04/05/12 BK-MC

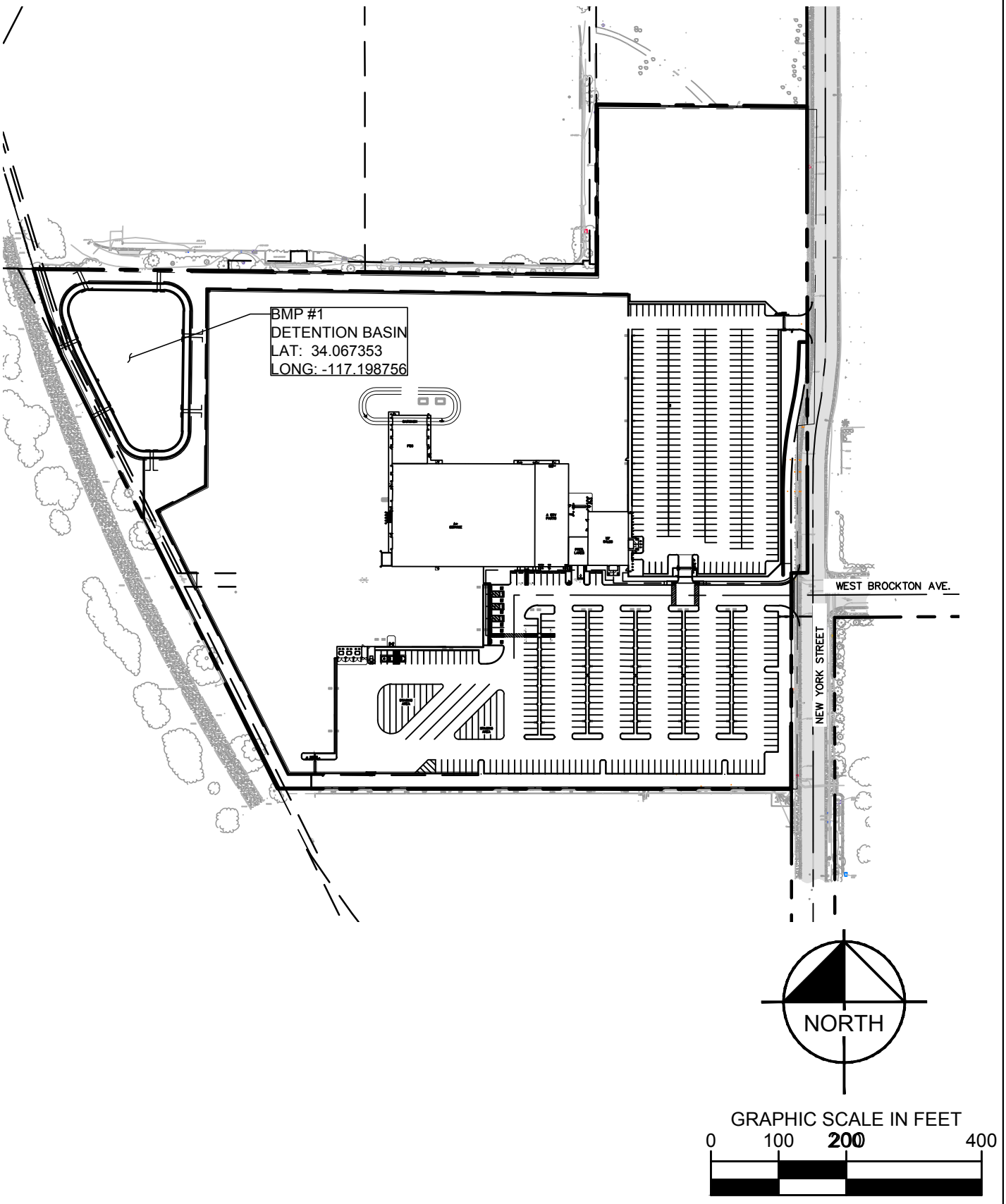
EXHIBIT “C”

STORMWATER POLLUTION CONTROL DEVICES

Stormwater Pollution Control Devices					
BMP #	BMP or Pollution Control Device	Latitude	Longitude	Maintenance Provided By	Frequency
1	DETENTION BASIN	34.06735	-117.198756	CarMax	Yearly
2					
3					
4					
5					
6					
7					
8					
9					
10					

EXHIBIT D

PLOT PLAN
SITE ADDRESS INTERSECTION OF NEW YORK ST. AND BROCKTON AVE.



Section 6.4 Other Supporting Materials

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

PRESORTED
STANDARD
U.S. POSTAGE
PAID
SACRAMENTO, CA
PERMIT# 000

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.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

or visit our websites:

www.co.san-bernardino.ca.us/flood/npdes

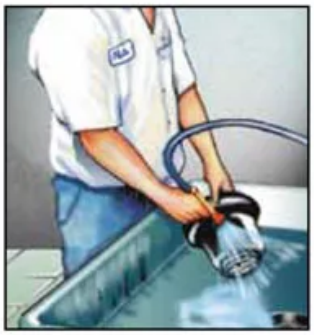
www.1800cleanup.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

AUTO MAINTENANCE

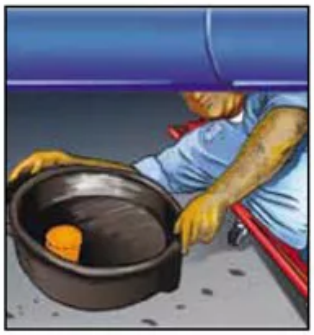
Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow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

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

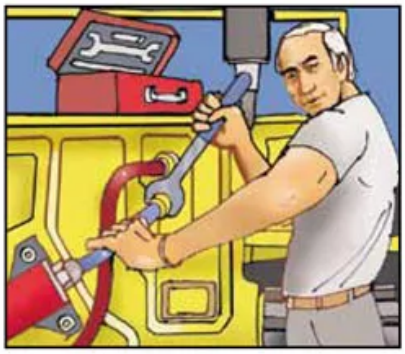
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling 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

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

sbcountystormwater.org

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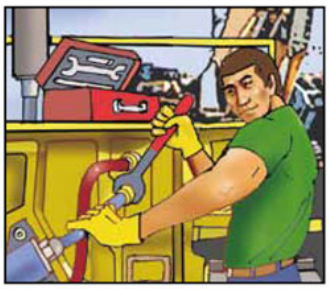
STORMWATER Pollution Prevention

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


SAN BERNARDINO COUNTY
STORMWATER SOLUTIONS
PAINT SAFELY
DISPOSE SAFELY
GARDEN SMART
A LOT DEPENDS ON IT!
STRATEGICALLY APPLY FERTILIZERS AND PESTICIDES ON SUNNY DAYS!
SPOT APPLY
ONLY TO THE PROBLEM SPOT
INSTEAD OF THE WHOLE AREA
AVOID APPLYING
FERTILIZERS
BEFORE IT RAINS!
COLLECTION CENTER
SBC OFFERS 9 HHW COLLECTION CENTERS THAT ACCEPT TOXIC WASTE FOR FREE!
FOR MORE POLLUTION PREVENTION TIPS VISIT:
sbcounty.gov/stormwater
(800) CLEANUP

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

Important Phone Numbers

San Bernardino County Flood Control
(909) 387-8112

County of San Bernardino
(909) 387-8109

City of Big Bear Lake
(909) 866-5831

City of Chino (909) 591-9850

City of Chino Hills (909) 364-2722

City of Colton (909) 370-6128

City of Fontana (909) 350-6772

City of Grand Terrace
(909) 824-6671 x 226

City of Highland (909) 864-8732 x 230

City of Loma Linda (909) 799-4405

City of Montclair (909) 625-9470

City of Ontario (909) 395-2025

City of Rancho Cucamonga
(909) 477-2740 x 4063

City of Redlands (909) 798-7655

City of Rialto (909) 421-4921

City of San Bernardino (909) 384-5154

City of Upland (909) 931-4370

City of Yucaipa (909) 797-2489 x 243

San Bernardino County
Stormwater Program
825 East Third Street • Room 201
San Bernardino, CA 94215-0835

STORMWATER

Pollution Prevention

INDUSTRIAL AND COMMERCIAL FACILITIES

Pollution STORMWATER Prevention

Industrial and Commercial Facilities

To reduce the amount of pollutants reaching our storm drain system, which leads to the Santa Ana River and Pacific Ocean, the San Bernardino County Stormwater Program has developed Best Management Practices (BMPs) for Industrial and Commercial Facilities. City and County ordinances require that businesses comply with these BMPs, where applicable, to protect local water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

- Discontinue all non-stormwater discharges to the storm drain system. It is prohibited to discharge any chemicals, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, except when in direct use.
- Sweep outdoor areas instead of using a hose or pressure washer.

Outdoor Processes

- Move all process operations including vehicle and equipment maintenance inside of the building or into a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to city standards, then discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Ups

- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials and followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors, vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the County Fire Department at (909) 386-8401.

- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator either at (800) CLEANUP or as listed at www.sbcounty.gov/stormwater.
- Report hazardous materials spills to (800) 33 TOXIC and your local Fire Department Hazmat Team at 911.

Training

Train employees in spill response procedures and prohibited discharges to the storm drain system, as prescribed in your local Stormwater Ordinance and in applicable Best Management Practices available at www.cabmphandbooks.com and www. sbcounty.gov/stormwater.

Permitting

Stormwater discharges associated with specific categories of commercial and industrial facilities are regulated by the State Water Resources Control Board (SWRCB) through an Industrial Storm Water General Permit. A copy of the General Permit and application forms are available at: www.waterboards.ca.gov/stormwtr/industrial.html

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

or visit our websites at:

www.sbcounty.gov/stormwater

www.1800cleanup.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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Printed on 55% Recycled, 30% Post Consumer Waste Paper

Mobile Cleaning and Maintenance

Discharge into storm drain, accidental or not, can lead to enforcement actions which can include fines.

Follow these best practices to prevent polluted water and other materials from flowing into the street, gutter, and storm drain.

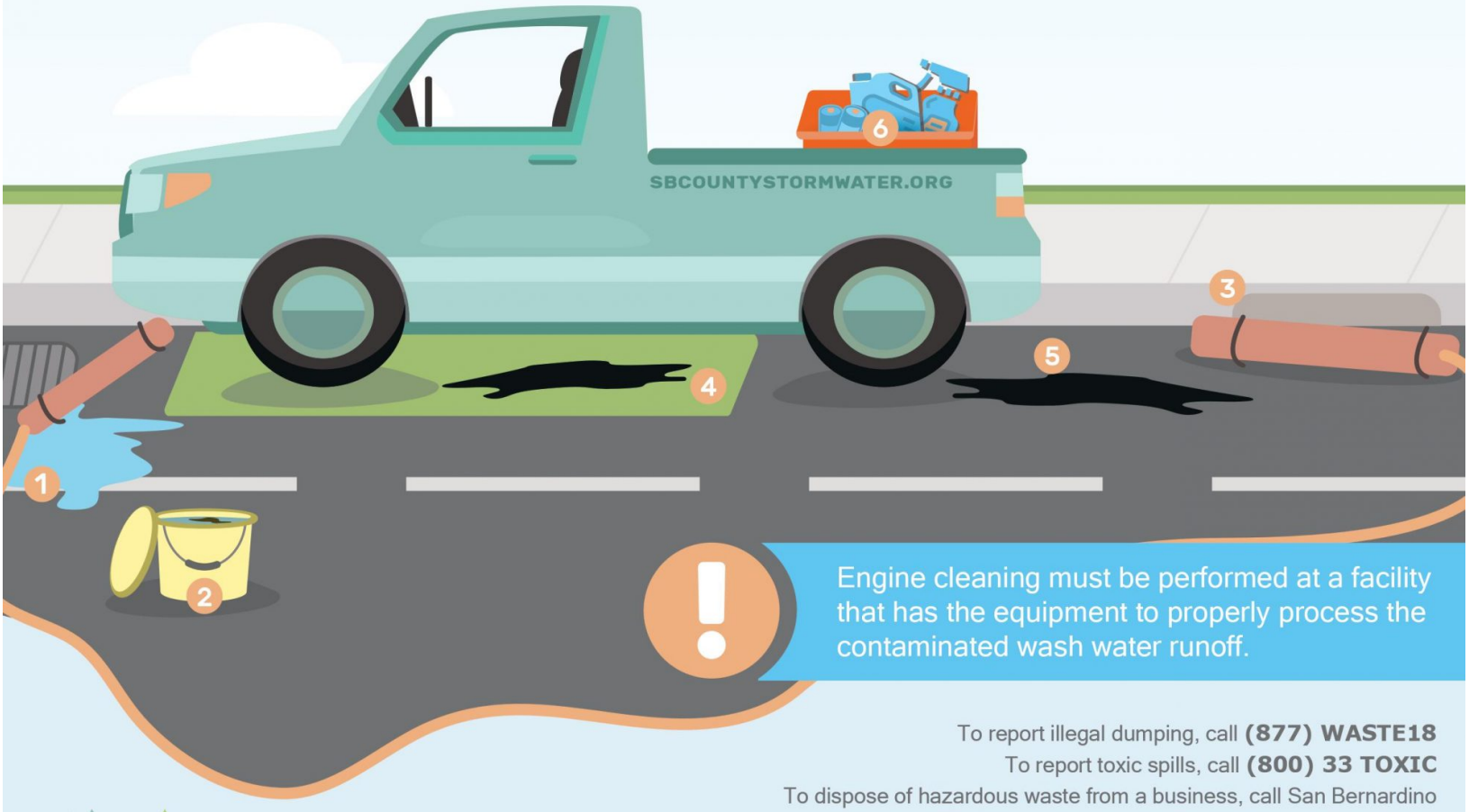
Wash Water Disposal

1. Wash in a contained area that has been bermed up to contain the wash water.
2. If washing items contaminated by hazardous materials, ensure the wash water is collected and hauled off-site for proper disposal.
3. Locate the nearest storm drain and place a barrier in front to ensure nothing can enter or be discharged into it.

Hazardous Waste Spill Clean-Up and Disposal

4. Use a tarp to catch drips and contain spills.
5. If a spill occurs, use absorbent material like kitty litter or absorbent pads to soak up the spill, then place in a bucket and properly dispose of at a local household hazardous waste facility.
6. Properly dispose of toxic materials at your local household hazardous waste facility.

Motor Oil	Batteries
Oil Filters	Gasoline
Antifreeze	



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

To report illegal dumping, call **(877) WASTE18**
To report toxic spills, call **(800) 33 TOXIC**
To dispose of hazardous waste from a business, call San Bernardino County Fire at **(909) 386-8401**

sbcountystormwater.org

SAN BERNARDINO COUNTY STORMWATER PROGRAM
WHERE WATER MEETS COMMUNITY

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Rialto • San Bernardino • San Bernardino County • San Bernardino County Flood Control District • Upland • Yucaipa

GAS STATIONS

AN ILLEGAL 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.**

WHEN CLEANING, USE **DRY CLEAN-UP METHODS:**

SWEEP TO REMOVE LITTER AND DEBRIS

USE RAGS AND ABSORBENTS FOR LEAKS AND SPILLS

PLACE CLEAN UP MATERIALS IN THE TRASH OR DISPOSE OF PROPERLY

When pressure washing, ensure wash water does not leave the site or enter the storm drain by placing a capture device on or around the storm drain. Clean out the capture device and properly dispose of the wastes. To avoid fines, be sure to advise your pressure washers to comply with operating procedures for proper collection and disposal of wash water.

SPILL CLEAN-UP

- ✓ **Stop the source of the spill immediately.** Be aware of the nearest storm drain location and ensure nothing can enter or be discharged into it.
- ✓ **Contain the spill.** Spill kit location must be properly marked and easily accessible. Train your personnel.
- ✓ **Clean up the excess.** Applied absorbent materials must be collected for re-use or proper disposal.

Keep hazardous materials out of the trash by disposing of them properly, this includes absorbent materials used to clean up toxic waste spills. **Hazardous materials may include used motor oil and oil filters, antifreeze, batteries and gasoline.** Keep containers with hazardous waste stored under a cover and on secondary containment.

TRASH AREAS

- ✓ **Place trash inside the bin** (preferably in sealed bags).
- ✓ **Prevent rainwater** from entering trash bins by keeping lids closed at all times or by placing the bins under a solid roof.

Pollutants from gas stations may make their way into the storm drain system. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to comply with regulations, prevent pollution and protect public health.
For more information about BMPs for gasoline services, visit cabmphandbooks.com.

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 the San Bernardino County Fire Dept. - CUPA Program (909) 386-8401

sbcountystormwater.org

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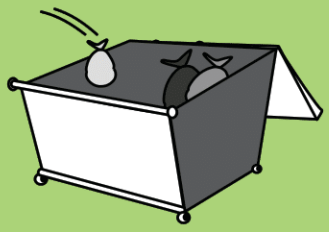
COMMERCIAL **TRASH ENCLOSURES** REQUIREMENTS

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.

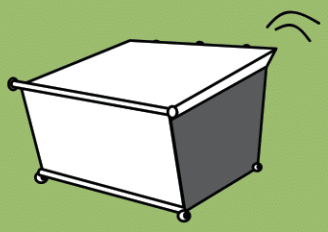
FOLLOW THESE REQUIREMENTS TO KEEP OUR WATERWAYS CLEAN

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

NO:

- Paint
- Grease
- Fats
- Used Oils
- Batteries
- Electronics
- Fluorescent Lights

These items should be disposed of at a local hazardous waste collection center

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.

SAN BERNARDINO COUNTY STORMWATER PROGRAM
WHERE WATER MEETS COMMUNITY

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

To dispose of hazardous waste, call **1 (800) OILYCAT**

sbcountystormwater.org

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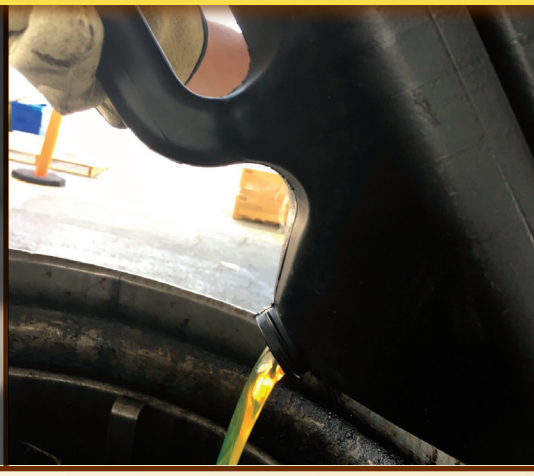
Redlands • Rialto • San Bernardino • San Bernardino County • San Bernardino County Flood Control District • Upland • Yucaipa

FREE!

ONLY FOR RESIDENTS *of* San Bernardino County

Be a part of the team that makes San Bernardino County *GREEN!*



Recycle your USED OIL & OIL FILTERS for FREE at any Used Oil Filter Exchange Event!

Bring a used oil filter and get a **FREE $15 voucher** for the purchase of an oil filter!

Look for events coming to a city near you, in:

Hesperia	**Grand Terrace**	**29 Palms**
Highland	**Adelanto**	**Colton**
Bloomington	**Redands**	**Big Bear Lake**
Yucca Valley	**Phelan**	**Loma Linda**

Offer available to San Bernardino County residents only – ID or utility bill needed.
No exchange or cash refund after event.

Call 1.800.OILY CAT (645.9228) or visit sbcfire.org/hhw for the nearest upcoming Used Oil Filter Exchange Event

SAN BERNARDINO COUNTY

SAN BERNARDINO COUNTY FIRE — RESCUE — EMS

RECYCLE USED OIL

Funded By CalRecycle

RECYCLE USED OIL FILTERS

United States
Environmental Protection
Agency

Solid Waste
and Emergency Response
(5306W)

EPA530-E-00-001d
October 2000
www.epa.gov/osw

EPA

Safe Hazardous Waste Recycling

The mission of the U.S. Environmental Protection Agency (EPA) is to protect human health and safeguard the environment. One way EPA helps fulfill its mission is by regulating the management and disposal of hazardous wastes under the Resource Conservation and Recovery Act (RCRA). RCRA has the following three general goals: To protect human health and the environment · To reduce waste while conserving energy and natural resources · To reduce or eliminate the generation of hazardous waste.

Hazardous waste recycling activities include combustion for energy recovery, use constituting disposal, reclamation, and direct use and reuse. EPA also regulates the recycling of the following hazardous materials: used oil, precious metals, and scrap metal.

Recycling hazardous waste fulfills two of RCRA's goals by reducing the consumption of raw materials and energy and by reducing the volume of waste materials that must be treated and disposed of. There are many benefits of recycling; however, it must be conducted in a way that ensures the protection of human health and the environment.

During the development of RCRA, EPA looked at recycling practices throughout the United States and determined that certain practices would pose a threat to human health and the environment if they were not properly conducted.

Hazardous waste recycling frequently requires the accumulation of large quantities of hazardous waste prior to processing. Improper storage of those materials might cause spills, leaks, fires, and contamination of soil and drinking water.

To encourage hazardous waste recycling while protecting health and the environment, EPA developed regulations to ensure recycling would be performed in a safe manner.

EPA varies the degree to which a recyclable material or recycling activity is regulated under RCRA based on the threat it poses to human health and the environment. Recycling activities that pose a significant threat are subject to the same strict regulations as hazardous waste treatment, storage, or disposal. Other hazardous waste recycling activities that resemble production processes, with checks and balances that ensure safe management, are subject to less stringent regulations. In addition, a hazardous material destined for recycling must be identified by type and recycling process in order to determine its level of regulation.

In other cases, EPA has set special standards for commonly recycled hazardous materials to reduce the regulatory burden on handlers and to encourage recycling.

Through other resource conservation initiatives, EPA encourages handlers of hazardous waste to adopt practices and choose materials that will reduce the amount of waste generated, thus preventing pollution at its source. In each case, the public derives significant benefits from EPA's safe hazardous waste recycling regulations.

Combustion for Energy Recovery

Combustion for energy recovery involves burning the hazardous waste directly as a fuel or using it as an ingredient to produce a fuel. Used solvents, for example, are frequently burned to produce heat or generate electricity. Because of the potential for release of harmful constituents from burning these wastes, EPA regulates this recycling activity as strictly as any other type of hazardous waste combustion. EPA requires combustion units that burn hazardous waste for energy recovery to obtain a permit and meet certain performance and operating standards under the boiler and industrial furnace regulations.

Use Constituting Disposal

Use constituting disposal involves applying a hazardous waste directly to the land or incorporating it into a product that will be applied to the land. Examples include using hazardous waste as fertilizer or as an ingredient in asphalt. EPA strictly regulates land disposal of hazardous waste, due to the potential for soil and ground-water contamination. Recycling a hazardous waste in a manner that constitutes disposal (land application) presents similar risks. The harmful constituents in hazardous wastes must be treated to reduce their toxicity and ability to leach into soil and ground water before the wastes are applied to the land. When a hazardous waste is used as an ingredient in a product, EPA will evaluate its use to ensure that it serves a legitimate purpose in the function of the product. If it does not, EPA considers this practice "sham" recycling; placing such a product on the land would be illegal.

Reclamation

Reclamation is processing a material to recover a useable product, such as recovering mercury from broken thermometers, or regenerating a material, such as cleaning used solvents to make them pure again. Reclamation activities are regulated differently depending on the type of hazardous waste to be recycled. Certain reclaimed materials enjoy "relief" from all hazardous waste regulations. Other materials, however, are subject to full regulation when reclaimed. EPA made this distinction based on the level of threat posed by common industry practices associated with reclaiming different types of materials.

Other Resource Conservation Initiatives

In addition to the special standards mentioned above, EPA implements two other resource conservation initiatives: universal waste rules and waste minimization. These intiatives also accomplish the goals of RCRA by striking a balance between protecting human health and the environment and encouraging recycling.

Universal Waste

Universal wastes include batteries, mercury thermostats, and certain pesticides. EPA regulates these wastes by using less stringent standards than other hazardous wastes to encourage recycling. Because the Agency found that large and diverse communities generate universal wastes that might be present in large quantities in the nonhazardous waste stream, EPA developed ways to encourage recycling.

EPA found that the hazardous waste regulations, as they are normally applied, discouraged collection, recycling, and proper management of universal wastes. To facilitate these activities, EPA streamlined the regulations that apply to universal waste handlers and transporters. Universal waste handlers, for example, can accumulate universal waste for up to 1 year, while hazardous waste generators can only accumulate waste for a fraction of that time. This extended period allows a universal waste handler to accumulate enough batteries, for example, to make recycling an economically viable option. Many recycling operations require large quantities of wastes to operate economically. Universal waste transporters can transport without a manifest or EPA identification number, while hazardous waste transporters must have both. EPA fully regulates universal waste destination facilities (i.e., where the waste is ultimately disposed of or recycled) in the same way hazardous waste treatment, storage, or disposal facilities are regulated, because the risks of recycling or disposing of universal wastes are similar to other hazardous waste management activities.

Direct Use and Reuse

The final type of hazardous waste recycling activity is using a waste directly (without reclamation) as an ingredient in an industrial process to make a product or using a waste directly as a substitute for a product. Under this activity, a facility will use a hazardous waste directly in place of a product, if the waste is similar enough to function in a similar manner. Since direct reuse of the material presents a low risk to human health and the environment, EPA does not regulate these activities, unless the waste will be burned or placed on the land. EPA will evaluate the legitimacy of a recycling practice by ensuring that it is not an attempt to avoid proper treatment or disposal and that the material is recycled in a timely manner.

Special Standards

To encourage recycling of certain common hazardous wastes, such as used oil, precious metal-bearing waste, and scrap metal, EPA developed different standards for their recycling and management. EPA regulates those materials differently because industry standards already encourage careful management. In addition, some of these materials have considerable value and there is an economic incentive to manage them safely. These special standards reduce the regulatory burden on recyclers while ensuring safe recycling. The public benefits from reducing materials that are disposed of and the amount of raw materials and energy required to produce new materials.

Used Oil

Used oil is crude or synthetic-based oil that has been used and includes impurities or contaminants such as dirt, metal scrapings, water, or chemicals. The most common example is used motor oil from automobile engines, but the term also includes industrial oils such as metal working fluids, hydraulic fluids, and oil from refrigerator compressors. Used oil is easily recycled; about 380 million gallons are recycled annually. Recyclers can re-refine used oil and return it to its original purpose, process it to create different products, or burn it for energy recovery.

To encourage used oil recycling, EPA developed less stringent standards for used oil handlers than for hazardous waste handlers. Used oil generators can store any quantity of used oil indefinitely and need only ensure that it is stored in tanks or containers that are in good condition.

Waste Minimization

While EPA encourages safe recycling practices, its ultimate goal is to promote the minimization of waste before it is generated. EPA encourages generators of hazardous waste to choose materials and practices that will reduce the volume and toxicity of their waste streams. Waste minimization is not just about reducing total waste quantities, but rather about reducing the amount of chemicals in wastes, particularly those chemicals that pose the greatest environmental concern.

To ensure that hazardous waste generators practice waste minimization, they must certify, with every shipment of hazardous waste they send for treatment or disposal, that they have a program in place to ensure waste reduction. Those facilities that treat, store, and dispose of hazardous wastes also are required to regularly certify they have a waste minimization program.

Here are some general examples of how a facility that generates hazardous waste can accomplish waste minimization:

Waste Minimization Case Study
A military equipment manufacturer used 8,250 gallons of a hazardous solvent each year. By substituting a nonhazardous solvent for the hazardous solvent, it saved more than $100,000 in disposal, purchasing, and regulatory compliance costs in less than 10 years.

- Set explicit goals for reducing the volume and toxicity of waste.
- Conduct periodic waste minimization assessments.
- Substitute nonhazardous raw materials for hazardous ones.
- Redesign equipment to produce less waste.
- Install systems that reuse waste materials directly in the process.

Used oil transporters do not need to carry a shipping manifest, which EPA requires hazardous waste transporters to carry. Used oil processors and re-refiners do not need permits to operate, while hazardous waste treatment, storage, and disposal facilities do. Used oil burners are regulated only if the quantity of harmful constituents in the used oil is above specifications.

To address the risks to human health and the environment associated with used oil recycling, EPA set minimum good housekeeping standards to ensure safe recycling. EPA requires that used oil be stored in tanks and containers that prevent releases to soil and ground water. EPA requires used oil transporters, marketers, processors, and re-refiners to keep records of the quantity, origin, destination, and date of shipment or acceptance of any shipment of used oil, to ensure that the oil is actually recycled. And, finally, EPA set standards for the cleanup of releases during storage and transit.

Precious Metals

Hazardous wastes can contain significant amounts of precious metals such as gold, silver, platinum, palladium, iridium, osmium, rhodium, and ruthenium. The precious metal components of such wastes can be reclaimed. One example is photographic fixer, which contains silver. Since precious metals are valuable commodities, businesses usually handle them very carefully. EPA standards for handling precious metal waste that will be recycled are significantly less stringent than for other hazardous wastes.

Scrap Metal

Scrap metal is bits and pieces of metal parts or metal pieces that can be recycled, such as auto bodies, used wire, and metal pieces from manufacturing and assembly operations. Scrap metal does not include materials generated from smelting and metal refining operations or materials that contain a significant liquid component. Reclaimed scrap metal is exempt from all hazardous waste regulations. EPA determined this activity does not pose a threat similar to other types of waste management.

Would You Like More Information?

RCRA, Superfund, and EPCRA Hotline

Call 800 424-9346 or 703 412-9810 in the Washington, DC area. For the hearing impaired, the number is TDD 800 553-7672. You also can access information via the hotline's Internet site at <www.epa.gov/epaoswer/hotline>.

Additional Documents

These additional documents can help you learn more about the requirements for hazardous waste recycling. These documents are free and can be ordered from the RCRA Hotline. Reference the EPA document number *(EPA530…)* when ordering.

Environmental Fact Sheet: Final Streamlined Regulations for Collecting and Managing Universal Wastes, (EPA530-F-95-011).

Managing Used Oil: Advice for Small Businesses, (EPA530-F-96-004).

Waste Minimization National Plan: Reducing Toxics in Our Nation's Waste, (EPA530-F-97-028).

RCRA Orientation Manual: 1998 Edition, (EPA530-R-98-004).

Contact Your State

Although EPA regulations set the national standard for compliance, states often have more stringent regulations. Contact your state about specific regulations. State environmental contacts are available from the hotline.

Stormwater Best Management Practice

Infiltration Basin

Minimum Measure: Post Construction Stormwater Management in New Development and Redevelopment
Subcategory: Infiltration

Description

An infiltration basin is a shallow impoundment that infiltrates stormwater into the soil. This control is effective at increasing groundwater recharge (thus increasing baseflow to nearby streams) and can also help remove pollutants from stormwater. Infiltration basins have specific underlying soil requirements, which can preclude them from being feasible on all sites. Pretreatment design and regular inspection and maintenance procedures are crucial to ensure they do not fail.

Applicability

While most regions of the country use infiltration basins, soil infiltration rate, groundwater contamination concerns, spatial constraints and shallow groundwater tables can limit their application.

Regional Applicability

Infiltration basins apply in most places, with some design modifications in cold and arid climates. They are often inappropriate in karst (i.e., limestone) regions due to concerns of sinkhole formation and groundwater contamination.

Urban Areas

Infiltration basins are generally not appropriate for dense urban areas largely due to space requirements, the potential of infiltrated water to interfere with existing infrastructure and the relatively poor infiltration capacity of most urban soils.

Stormwater Hot Spots

Infiltration basins should not receive discharges from stormwater hot spots, unless another control has already treated the stormwater. Direct infiltration of discharges from stormwater hot spots can lead to groundwater contamination.

Infiltration pond in a natural area. The infiltration portion consists of sand with a high infiltration rate.

Cold Water (Trout) Streams

Infiltration basins are an excellent option for cold water streams because they encourage infiltration of stormwater and maintain dry weather flow. Because stormwater travels underground to the stream, it has little opportunity to increase in temperature.

Common Terms

Stormwater hot spots are areas where land use or activities generate highly contaminated stormwater discharges, with concentrations of pollutants in excess of those typically found in stormwater. Examples include gas stations, vehicle repair areas and waste storage areas.

Siting Considerations

Designers need to carefully locate infiltration basins and ensure that the soils on-site are appropriate for infiltration and that the potential for groundwater contamination and long-term maintenance problems are minimal.

EPA-832-F-21-031B
December 2021

Drainage Area

Municipalities and site developers have historically used infiltration basins as large-scale facilities, serving for both quantity and quality control. In some regions of the country, they are feasible, particularly if the soils are sandy. In most areas, infiltration basins experience high rates of failure when treating too large a drainage area. In general, they best apply to relatively small drainage areas. Less than 5 acres is ideal, but less than 10 can be acceptable under the right conditions (MDE, 2009).

Slope

Infiltration pond in a natural area. Pond is filled with water and surrounded by vegetation

The bottom of an infiltration basin needs to be completely flat to allow infiltration throughout the entire basin bottom. Side slopes should be flat enough to prevent erosion of the sides of the basin.

Infiltration basin in an urban area. The basin has two gravel areas for infiltration. The remainder of the basin bottom and its slopes are planted with sod.
Credit: Massachusetts Department of Transportation

Soils

Soils are the most important factor when locating infiltration basins. Soils should be significantly permeable to ensure that the basin can infiltrate stormwater quickly enough. Soils that infiltrate too rapidly may not provide sufficient treatment, creating the potential for groundwater contamination. The infiltration rate should range between 0.5 and 3 inches per hour. In addition, the soils should have no greater than 20 percent clay content and less than 40 percent silt/clay content (MDE, 2009). Designers should confirm the infiltration rate and textural class of the soil in the field with approved testing methods; they should only use generic information such as soil surveys for preliminary siting considerations. Finally, infiltration basins may not be suitable in karst regions due to the potential for sinkhole formation or groundwater contamination.

Groundwater

Construction staff should maintain at least 4 feet of separation between the bottom of the infiltration basin's trench and the seasonal high groundwater table. For areas close to large waterbodies, this minimum distance may be as low as 2 feet. In either case, construction staff should follow local standards. Additional variables to consider may include the location of nearby drinking wells or sites with groundwater contamination.

Design Considerations

Specific designs may vary considerably, depending on local design requirements, site constraints or preferences of the designer or community. Designers should incorporate pretreatment, treatment, conveyance, maintenance reduction and landscaping into most infiltration basin designs.

Pretreatment

Pretreatment is important for all stormwater controls, but it is particularly important for infiltration basins. To ensure that pretreatment systems are effective, designers can consider a treatment train approach using multiple controls such as grassed swales, vegetated filter strips, rock swales, detention basins or plunge pools in series.

Treatment

Treatment design features enhance the effectiveness of a control. During the construction process, construction staff should stabilize the upland soils of an infiltration basin to ensure that it does not become clogged with sediment. Also, staff should size the treatment component itself so that the treatment volume can infiltrate into surrounding soils within 48 hours (ideally within 24 hours). Infiltration basins on less permeable soils can be significantly larger than those on more permeable soils.

Conveyance

It is important to convey stormwater through post-construction stormwater controls safely and in a way that

minimizes erosion. Designers should ensure that channels leading to an infiltration basin minimize erosion and can use a flow spreader or riprap to minimize erosion from water entering the infiltration basin. If a main conveyance system delivers stormwater to the basin, an offline design is recommended.

Common Terms

Offline design refers to using a flow separator structure in order to divert only a portion of flow to a stormwater control.

Pretreatment plays an important role in stormwater treatment. Pretreatment structures, installed immediately upgradient to a stormwater control, reduce flow rates and remove sediment and debris before stormwater enters the stormwater control. This helps to improve the stormwater control's pollutant removal efficiency and reduces maintenance requirements.

Maintenance Reduction

In addition to specifying regular maintenance activities, designers should incorporate features into the design to reduce the maintenance burden of a stormwater control. In infiltration basins, designers should provide access to the basin for regular maintenance. Where possible, the basin should include a drainage mechanism, such as an underdrain, in case the bottom becomes clogged, water begins ponding for too long or sediment needs removal.

Landscaping

Landscaping can enhance the aesthetic value of post-construction stormwater controls and improve their function. In an infiltration basin, the most important purpose of vegetation is to reduce the basin's tendency to clog. Construction staff should properly stabilize upland drainage with a thick layer of vegetation, especially following construction. In addition, providing a thick turf at the basin bottom helps encourage infiltration and prevent the formation of rills.

Arid or Semiarid Climates

In arid regions, infiltration basins are often highly recommended because of the need to recharge groundwater. Designers should strongly emphasize pretreatment to ensure that an infiltration basin in an arid region does not clog due to relatively high sediment concentrations in these environments. In addition, construction staff may plant the basin bottom with drought-tolerant species and/or cover it with an alternative material such as coarse sand or gravel.

Cold Climates

In extremely cold climates (i.e., regions that experience permafrost), infiltration basins may be infeasible. They are feasible in most cold climates, but there are some challenges to their use. First, a basin may become inoperable during portions of the year when its surface becomes frozen. Designers may also need to increase the treatment capacity to accommodate the additional volume of stormwater associated with spring snowmelt.

Another option is to use a seasonally operated facility (Oberts, 1994). A seasonally operated infiltration/detention basin combines several techniques to improve performance in cold climates. Two of these features are underdrain systems and level control valves:

- At the beginning of the winter season, construction staff open the level control valve and drain the soil.
- As the snow begins to melt in the spring, construction staff close the underdrain and the level control valves. The snowmelt fills the basin until the soil reaches capacity. Then the facility acts as a detention facility, providing storage for particles to settle.

Other design features can help to minimize problems associated with winter conditions, particularly concerns that chlorides from deicing roads, parking lots and sidewalks may contaminate groundwater. If infiltration basins treat stormwater from roadsides or parking lots, construction staff may disconnect them during the winter to prevent chlorides from contaminating groundwater. If disconnection is infeasible or the basin provides snow storage, construction staff should plant the basin bottom with salt-tolerant vegetation.

Maintenance Considerations

Regular maintenance is critical to the successful operation of infiltration basins (see Table 1) and prevents sedimentation that could clog infiltration basins and lead to their failure (MDOT, 2018).

Table 1. Typical maintenance activities for infiltration basins

Activity	Schedule
▪ Replace pea gravel or topsoil (when clogged)	As needed
▪ Ensure inlets are clear of debris, including sediment and oil/grease ▪ Stabilize the surrounding area ▪ Mow grass and remove grass clippings of filter strip areas, if applicable ▪ Repair undercut and eroded areas at inflow/outflow structures	Monthly
▪ Inspect pretreatment devices and diversion structures for debris accumulation and structural integrity; take corrective action as needed	Semiannually
▪ Aerate the pretreatment basin bottom or de-thatch it, if applicable	Annually
▪ Scrape the pretreatment bottom to remove accumulated sediment and re-seed ground cover, if applicable	Every 5 years
▪ Perform total rehabilitation of the basin and restore design storage capacity Excavate the basin bottom to expose clean soil	Upon failure

Source: MPCA, 2016

Limitations

Infiltration basins are not appropriate for areas with compacted or poorly infiltrating soils, typically limiting their use in urban environments. They are also not suitable for areas with a high groundwater table or where groundwater contamination is a concern. Infiltration basins are not generally aesthetically pleasing, particularly if they clog. If an infiltration basin becomes clogged and takes more than 3 days to drain, the basin could become a source for mosquitoes. Finally, regular maintenance is key to the effectiveness of infiltration basins.

Effectiveness

Infiltration basins reduce stormwater discharge volume by enhancing groundwater recharge. In doing so, they address problems of low groundwater tables, flood control, channel erosion and pollutant removal to varying degrees.

Groundwater Recharge

Urbanization often changes the movement of water through the landscape by increasing stormwater and reducing groundwater recharge. Infiltration basins are effective at reversing these impacts, reducing stormwater by enhancing groundwater recharge.

Pollutant Removal

By reducing the volume of stormwater, infiltration basins also reduce the amount of pollutants that discharge directly to surface waters. In addition, by routing stormwater to underlying soils, infiltration basins use the soil as a filter, which can be an effective removal mechanism for pollutants like sediment, phosphorus and metals. Unfortunately, because the “outlet” of an infiltration basin is underlying soil, measuring effluent concentrations is impractical, and data are scarce on actual pollutant removal performance.

Instead, performance data for infiltration stormwater controls are generally related to the volume of stormwater that the basin captures and infiltrates, as well as the presumed level of filtration the soil provides for individual pollutants. For example, in pollutant loading guidance for infiltration basins, the New Hampshire Department of Environmental Services allows for an assumed removal efficiency of 90 percent for total suspended solids (TSS), 65 percent for total phosphorus, and 10 to 60 percent for total nitrogen for a 90 percent reduction in stormwater volume (NHDES, 2011). The TSS removal efficiency is due to TSS being composed of relatively large particles that the soil physically filters with high effectiveness. Total phosphorus removal is slightly lower and more due to

soil adsorption processes, which can be effective but vary by soil type. Nitrogen is generally not well filtered or adsorbed to natural soil, causing a lower removal efficiency.

Cost Considerations[1]

Infiltration basins can be relatively cost-effective post-construction stormwater controls because their construction requires minimal infrastructure. Typical construction costs, including contingency and design costs, can range from $55,000 to $85,000 per acre of impervious surface treated (King & Hagan, 2011). As with many other stormwater controls, economies of scale may lower this unit cost when treating larger areas.

[1]Prices updated to 2019 dollars. Inflation rates obtained from the Bureau of Labor Statistics CPI Inflation Calculator website: https://data.bls.gov/cgi-bin/cpicalc.pl.

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

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Disclaimer

This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.

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.

References and Resources

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Greening EPA

CONTACT US <https://epa.gov/greeningepa/forms/contact-us-about-greening-epa>

Stormwater Management Practices at EPA Facilities

EPA implements sustainable stormwater management, also called low impact development (LID) or green infrastructure, at its facilities. Sustainable stormwater management focuses on reducing runoff and improving water quality. LID practices help maintain natural hydrologic cycles through site grading, vegetation, soils and natural processes that absorb and filter stormwater onsite. They also help minimize erosion, flooding and water pollution downstream from EPA facilities.

Following are some of the green infrastructure and LID practices EPA uses to reduce stormwater runoff and pollution:

- Green Roofs
- Rain Barrels and Cisterns
- Permeable Pavements
- Bioretention Areas
- Vegetated Swales/Dry Swales
- Curb and Gutter Elimination
- Vegetated Filter Strips
- Sand and Organic Filters

Bioretention Areas

Rain garden and rain chains at EPA's Environmental Science Center in Fort Meade, Maryland

Bioretention areas are shallow, landscaped depressions that allow runoff to pond in a designated area, then filter through soil and vegetation. Small-scale bioretention areas are also known as rain gardens.

- EPA employees at the Environmental Science Center in Fort Meade, Maryland, helped construct a rain garden with native grasses and wildflowers. Rain chains guide rainwater from the roof gutter to the garden.

Vegetated Swales/Dry Swales

Swales are drainage paths or vegetated channels used to transport water. They can be used in small drainage areas with low runoff instead of underground storm sewers or concrete open channels. Swales help slow runoff, facilitate infiltration and filter pollutants as runoff flows through the system.

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Featured Story: Stormwater Runoff

Note: EPA no longer updates this information, but it may be useful as a reference or resource.

Prevent Chemicals, Garbage and Other Debris from Winding Up on Your Local Beach

Have you ever wondered where the oil goes that makes driving so dangerous after the first rainfall? Or what happens to the detergent that runs down the driveway when you wash your car? The used oil, as well as detergents, dirty water and soaps from washing your car, are carried through city drains into the nearest lake, stream, bay or ocean.

Anything dumped or dropped on the ground or in the gutter can end up in the nearest body of water. Stormwater pollution results from materials and chemicals washed into the storm drains from streets, gutters, neighborhoods, industrial sites, parking lots and construction sites. This type of pollution is significant because, unlike the water that goes down a sink or toilet in your home, stormwater is untreated and flows directly to a lake, river, or the ocean.

Stormwater systems were originally intended to route rainwater quickly off the streets during a heavy storm. Unfortunately, these systems can carry pollutants such as pesticides, bacteria and chemicals through city streets and straight to our waters. Stormwater pollution can include chemicals, fast food wrappers, cigarette butts, Styrofoam cups, sewage overflow, cooking oil, bacteria from pet waste, used motor oil, fertilizers, paint and construction debris.

Illegal Disposal to a Storm Drain

Used oil from a single oil change can pollute up to one million gallons of freshwater. Improper disposal of used oil, which includes oil leaking from cars, contributes significantly to stormwater pollution. The EPA estimates that American households improperly dump about 193 million gallons of used oil every year, or roughly the equivalent of 17 Exxon Valdez oil spills.

And household cleaners can hurt the environment as well, if not disposed of properly. One ounce of household bleach requires 312,000 ounces of water to be safe for fish. Even biodegradable soaps can pose problems for aquatic life — in order for one ounce of biodegradable detergent to be safe for fish, it needs to be diluted by almost 20,000 ounces of water.

National Links

- NPDES Stormwater Site
- Stormwater Rules and Notices
- Storm Water Management Model (SWMM)
- Polluted Runoff: Nonpoint Source (NPS) Pollution
- Urbanization and Storm Water Runoff

Regional Links

EXIT Disclaimer

- Heal the Bay
- Stormwater Program
  Los Angeles, CA
- Clean Water Program
  Alameda County, CA
- Stormwater Quality Program
  Sacramento County, CA
- Stormwater Qualtiy Program
  Honolulu, HI

Clogged Storm Drain

Photo courtesy of the City of Palo Alto, CA.

Stormwater Outlet at a Coastal Beach

Why is Stormwater Pollution So Bad?

As polluted water makes its way to the oceans, water quality can be affected, which often results in the closing of local beaches due to unhealthy water conditions. Stormwater carries disease-causing bacteria and viruses. Swimming in polluted waters can make you sick. A study in Santa Monica Bay showed that people who swim in front of flowing storm drains are 50 percent more likely to develop certain symptoms than those who swim 400 yards from the same drain. Illnesses generally associated with swimming in water contaminated with urban runoff include earaches, sinus problems, diarrhea, fever and rashes. Polluted stormwater can also hurt aquatic life. Cigarette butts, the number one most littered item in America, have been found in the stomachs of fish, birds, whales and other marine creatures that mistake them for food. The plastic loops that hold six-packs of beer or soda together can strangle seabirds.

What Can I Do to Prevent Stormwater Pollution?

The EPA controls storm water pollution at industries and construction sites by inspecting sites and enforcing the agency's requirements. However, a significant amount of storm water pollution is caused by everyday human activities that are not regulated by the EPA – washing and maintaining cars, littering, watering lawns, etc. There are many simple, basic steps people can do each day to prevent storm water pollution:

- Don't dump waste into storm drains.
- Keep yard clippings out of the street.
- Dispose of household chemicals properly by following the directions on the package or by calling the local public works department for proper disposal guidelines.
- Clean up oil spills and fix leaking automobiles.
- Use drip pans to catch engine oil and other pollutants while repairing cars.
- Recycle used motor oil.
- Sweep driveways clean instead of hosing them down.
- Water your lawn by hand, or adjusted sprinklers to avoid over-watering. If any water flows off your lawn, you're using too much water.
- Wash your car at a commercial car wash, or at least wash your car on an unpaved surface so the excess water can be absorbed by the ground.
- Drain swimming pools and spas into a sanitary sewer outlet, never into a street. Check first with your local wastewater treatment plant before disposing of anything in the sewer.

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Wastewater Technology Fact Sheet

Rapid Infiltration Land Treatment

DESCRIPTION

Rapid Infiltration (RI), which is also known as soil aquifer treatment, is one of the three major land treatment techniques that uses the soil ecosystem to treat wastewater. However, the RI process can treat a much larger volume of wastewater on a much smaller land area than other land treatment concepts. In RI systems, wastewater is applied to shallow basins constructed in deep and permeable deposits of highly porous soils. Wastewater application can be by flooding, or occasionally by sprinklers. Treatment, including filtration, adsorption, ion exchange, precipitation, and microbial action, occurs as the wastewater moves through the soil matrix. Phosphorus and most metals are retained in the soil while toxic organics are degraded or adsorbed.

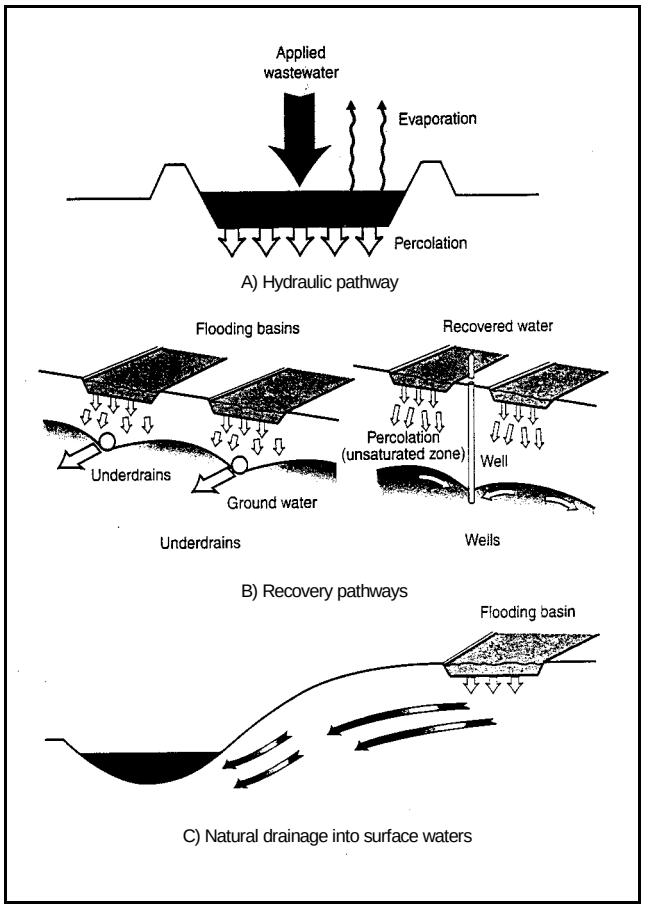
As wastewater percolates through the soil, it can be collected, or it can flow to native surface water or groundwater aquifers. Where the groundwater table is relatively shallow, the use of underdrains allows control of groundwater mounding and recovery of the renovated water. In areas with deeper groundwater, wells are used to recover the renovated water. This recovered water can be for irrigating crops or for industrial uses. This is known as "beneficial reuse." Water that is not recovered can recharge groundwater aquifers. The typical hydraulic pathways for water treated by RI are shown in Figure 1.

Common Modifications

Concerns regarding increased nitrogen levels in aquifers near RI systems have prompted several modifications to the general system design. RI sites may be located next to rivers or other surface water bodies, particularly if hydrogeological studies show that the percolate will flow to the surface water system and will not impact the general groundwater quality. When using underdrains or wells, an alternative is to design for a discharge rate that only slightly exceeds the percolation rate. This prevents any adverse impact on the adjacent groundwater. It is also possible to use special management approaches that maximize the nitrification and denitrification reactions, or to recycle the portion of the percolate with the highest nitrate concentration.

APPLICABILITY

RI is a simple and low cost wastewater treatment concept that has been used for more than 100 years. It is applicable for either primary or secondary effluent, and it has been used for treating municipal and some industrial wastewaters. Industries which have successfully used RI to treat their wastewater



Source: Crites, et al., 2000.

FIGURE 1 HYDRAULIC PATHWAYS FOR RAPID INFILTRATION

include breweries, distilleries, food processing plants, paper mills, and wool scouring plants.

RI can be used in a variety of different climates and at varied site locations. Unlike other land treatment and aquiculture concepts, RI systems do not have any special seasonal constraints, and they have been successfully operated throughout the winter months in the northern United States and southern Canada. RI is also very flexible in terms of site location. Unless groundwater recharge and recovery is intended, the most desirable sites are located immediately adjacent to surface waters to minimize any impact on the general groundwater quality. An underdrained system can be located wherever suitable soil and groundwater conditions exist.

There are more than 350 RI systems operating in the United States. However, the potential difficulty in identifying appropriate sites for the construction of RI systems and more stringent standards that must be met before the effluent can be applied to RI basins have led to a decrease in the use of RI as a treatment process for primary wastewater. Instead, many of the systems currently in use in the U.S. are used to polish secondary effluent. Other systems serve primarily as a wastewater disposal method, or as a method to replenish groundwater supplies. For example, the Landis Sewerage Authority in New Jersey operates an 3,100 m^3/day (8.2 MGD) advanced wastewater treatment facility (AWTF). After being processed in the AWTF, all of the water is discharged back to the groundwater through a RI basin, recharging the aquifer. RI basins have also recently been installed to dispose of treated effluent from an industrial area consisting of a hospital and a retirement home in Chester County, Pennsylvania. There are several basins covering a total of 1.2 ha (3 acres) in the system, and wastewater is applied by spraying it into each basin on a rotating schedule. Once the basins have reached their design effluent capacity, they are allowed to dry. The effluent then infiltrates through the soil and into the groundwater, further improving its quality and recharging the aquifer (Satterthwaite and Associates, 2003).

The town of Lake George, New York, has been using a RI system for over 60 years. The use of RI basins at Lake George stems from a 1942 New York state law that forbids discharge of wastewater to Lake George or any of its tributaries. Therefore, in order to dispose of its wastewater, the town discharges to natural basins consisting of more than 30 m (100 ft) of glacial sand deposits. The wastewater then percolates into the soil. After percolation, the sand is raked and/or rototilled to aerate the soil, and the beds can be reused.

Currently, the Lake George WWTP discharges 1.3 MGD during the summer, and between 0.5-0.6 MGD in the winter. Treatment consists of equalization, clarification, and trickling filters. After secondary settlement, wastewater is discharged to one of 26 RI basins. Each basin is filled to just below the spillway, and the water is then allowed to infiltrate into the soil. During peak flow periods in the summer, approximately one basin is filled per day. The basins take approximately 5 days to drain, and then each basin is raked and is ready for reuse.

Because of the concerns that using these basins could load high concentrations of nitrogen and phosphorous into the groundwater, the town's NPDES permit requires groundwater monitoring for increased nutrient concentrations. Nitrogen can be a particular problem during the winter months when nitrogen-fixing bacteria are less active.

ADVANTAGES AND DISADVANTAGES

Advantages

- Gravity distribution methods consume no energy.
- No chemicals are required.
- RI is a simple and economical treatment.
- The process is not constrained by seasonal changes.
- Effluent is of excellent quality.
- The process is very reliable with sufficient resting periods.
- RI provides a means for groundwater recharge, controlling groundwater levels, recovering renovated water for reuse or discharge to a particular surface water

body, and temporary storage of renovated water in the aquifer.

- The process is suitable for small plants where operator expertise is limited.

Disadvantages

- As typically operated, RI systems will not usually meet the stringent nitrogen levels required for discharge to drinking water aquifers.

- Requires long term commitment of a significant land area for treatment, with minimal secondary benefits such as are possible with other natural treatment systems (i.e., crop or forest production, habitat enhancement, etc.).

- Requires annual removal of accumulated deposits of organic matter on the infiltration surfaces in the basins.

- May require occasional removal and disposal of the top few inches of soil to expose clean material.

- Clogging can occur when influent is received at high application rates from algal laden facultative lagoons and polishing ponds.

DESIGN CRITERIA

Most RI failures are due to improper or incomplete site evaluation. Therefore, the primary design consideration for an RI system is site selection. Soil depth, soil permeability, and depth to groundwater are the most important factors in site evaluation. All of these factors must be very carefully evaluated during site investigation, regardless of system size, to ensure a successful design.

Once a suitable site has been selected, hydraulic loading rates, nitrogen loading rates, organic loading rates, land area requirements, hydraulic loading cycle, infiltration system design, and groundwater mounding must all be taken into account in designing the RI system. General design parameters for RI systems are shown in Table 1.

As described above, the RI process is entirely dependent on the soil and hydrogeological characteristics at a particular site, and these characteristics must be carefully considered before choosing the site for a RI system. The soil must have sufficient hydraulic capacity to allow the wastewater to infiltrate, then percolate and move either to the groundwater or into underdrains. Any fine textured top soil must be removed from the site so as to utilize the underlying coarse soils as the basin bottom and percolation media. In addition, the top 1.5-3 m (5-10 ft) of soil beneath the basin must be unsaturated at the start of the flooding cycle to allow the expected treatment to occur. There must be suitable subsurface conditions (i.e., slope and/or hydraulic gradient) to ensure that the percolate can flow away from the site at expected rates. The use of RI basins on fill material is not recommended because of potential damage to soil structure and hydraulic capacity during

TABLE 1 DESIGN CRITERIA

Item	Range
Basin Infiltration Area	0.3-5.5 ha/$10^3$$m^3$/d (3-56 acres/MGD)
Hydraulic Loading Rate	6-90 m/yr (20-300 ft/yr) [6-92 m^3/m^2/yr (150-2250 gal/ft^2/yr)]
BOD Loading	22-112 kg/ha/d (20 to 100 lb/acre/d)
Soil Depth	at least 3-4.5 m (10-15 ft)
Soil Permeability	at least 1.5 cm/hr (0.6 in/hr)
Wastewater Application Period	4 hrs to 2 wks
Drying Period	8 hrs to 4 wks
Soil Texture	coarse sands, sandy gravels
Individual Basin Size (at least 2 basins in parallel)	0.4-4 ha (1-10 acres)
Height of Dikes	0.15 m (0.5 ft) above maximum expected water level
Application Method	flooding or sprinkling
Pretreatment Required	primary or secondary

Source: Crites, et al., 2000.

construction. Exceptions may be possible for very coarse textured soils, but only if the hydraulic capacity is tested in a full scale fill. Performance limitations relate to removal of nitrogen, as discussed previously.

Some system designs include an underdrain, which is used to collect renovated water. In order for percolating water to move down through the soil and into an underdrain, the soil must be saturated. Therefore, the use of an underdrain pipe network for percolate recovery is not feasible unless the native groundwater is less than 3 m (10 ft) deep beneath the bottoms of the basins. This should allow for soil saturation during the flooding cycle.

Once the proper site is chosen, a preliminary estimate of the treatment area required for an RI system can be made with the following equation:

$$A = (0.250)(Q)/(L)(P)$$

Where: A = RI treatment area in acres; Q = wastewater flow, gal/d; L = annual hydraulic loading into the basin, ft/yr (typical range 6-90 m [20-300 ft]; higher values for coarse soils and secondary treated wastewater); P = number of weeks per year the system is operated.

If the RI system operates on a year-round basis, the equation reduces to:

$$A = (0.0048)(Q)/(L)$$

This is an estimate of the basin treatment area. The total site area would also include dikes and berms, access roads, etc.

Design of an RI basin must include mechanical equipment. Typical equipment associated with RI systems includes distribution piping or troughs, pumps, underdrain piping (if used), well piping and pumps (if used), and storage tanks or lined basins (if needed). Sprinklers or pumped groundwater recovery will require appropriate energy sources.

PERFORMANCE

RI systems produce effluent of excellent quality with sufficient travel distance through soil. The use of primary versus secondary level influent influences the hydraulic loading rate but not the expected performance of the system. Table 2 shows expected removal percentages for typical pollution parameters using RI.

OPERATION AND MAINTENANCE

RI has excellent reliability. With proper operation and management, several systems in the northeastern United States have operated continuously for more than 50 years without problems.

Operation

Preapplication treatment can be used to reduce the concentration of excess solids in the wastewater prior to introduction of the wastewater into the RI basin. Use of secondary effluent will allow a higher hydraulic loading rate and therefore a smaller RI basin system. RI basins receiving influent at high application rates from algal laden facultative lagoons and polishing ponds often experience rapid clogging.

Proper operation of a RI system requires a periodic cycle of flooding and drying of each basin at the site. First, wastewater is added to a dry bed in the "flooding" stage. The length of the flooding stage is determined by the design infiltration rate and the treatment requirements. After the bed is flooded for the appropriate period, it is allowed to dry. During the drying stage, wastewater infiltrates into the soil or is evapotranspired into the atmosphere. The drying period is essential to restore aerobic conditions in the soil profile and to allow for desiccation and decomposition of the organic solid matter retained on the soil surface. The drying period can range from several hours to several

TABLE 2 EFFLUENT QUALITY

Parameter	Percent Removal
BOD_5	95 to 99 percent
TSS	95 to 99 percent
TN	25 to 90 percent
TP	0 to 90 percent
Fecal Coliform	99.9 to 99.99+ percent

Source: Crites, et al., 2000.

weeks depending on the flooding period selected and the type of wastewater applied. Typically, the drying period is at least equal to the flooding period and may be twice as long. In cold climates, the drying period may be extended and the flooding period shortened during the winter months to compensate for the lower rate of treatment during that season.

Maintenance

The same maintenance requirements used at any earthen basin are applicable to RI systems. Special requirements for RI systems pertain to preserving the design infiltration capacity of the basins. The operator should perform daily inspections and record drainage time for the basins so that the infiltration rate can be tracked. Restoration of the infiltrative surface may be necessary when the infiltration rate decreases. Accumulated organic deposits are typically removed at least annually, and the infiltration surface is raked, disked or tilled to restore infiltration capacity. On a more extended interval, it may be necessary to remove the top few inches of soil to expose clean material. These maintenance activities should only occur when the basin bottom is dry to avoid soil compaction. Dikes and berms should also be monitored for signs of decay or erosion.

COSTS

With suitable soil and hydrogeologic conditions, RI systems can produce a percolate that is essentially equal in quality to that produced by more conventional advanced wastewater treatment processes, at a fraction of the cost. General equations for estimating preliminary costs for construction and O&M of RI systems are shown in Table 3. The following assumptions were made in developing the equations:

- Costs are based on May 2001 data (ENR Index 6318).
- Basin construction costs include field preparation, no seasonal storage, assumed hydraulic loading of 60 m/yr (200 ft/yr) [61 $m^3/m^2/yr$ (1496 $gal/ft^2/yr$),] gravel service roads, and stock fence around site perimeter.
- O&M includes the annual tillage of infiltration surfaces, and the repair of dikes, fences, and roads every 10 years.
- Construction for underdrained case also includes drain pipes at 2.5 m (8 ft) depth on 120 m (400 ft) spacing, with drains connecting to an interception ditch at the edge of the site.
- Construction of the recovery well case includes gravel packed well, vertical turbine pumps, simple shelter over well, and a 15 m (50 ft) vertical pumping head.
- Special O&M for underdrains includes jet cleaning of pipes every five years, and annual cleaning of interceptor ditch.
- Equations in Table 3 are valid for up to 3785 m^3/d (10 MGD) wastewater flow and use the following notation: C = costs in million of dollars; Q = wastewater flow in MGD.

Costs of preliminary treatment, monitoring wells, and transmission from preliminary treatment facility to the RI site are not included.

TABLE 3 COST ESTIMATION EQUATIONS

Construction ($)	Operation and Maintenance ($)
Case I Rapid Infiltration - No Underdrains, No Recovery Wells	
$C=0.580(Q)^{0.888}$	$C=0.054(Q)^{0.756}$
Case II Rapid Infiltration with 50 ft Deep Recovery Wells	
$C=0.597(Q)^{0.857}$	$C=0.058(Q)^{0.756}$
Case III Rapid Infiltration with Underdrains	
$C=0.683(Q)^{0.886}$	$C=0.075(Q)^{0.641}$

Source: Crites, et al., 2000

REFERENCES

Other Related Fact Sheets

Slow Rate Land Treatment
EPA 832-F-02-12
September 2002

Other EPA Fact Sheets can be found at the following web address:
http://www.epa.gov/owm/mtb/mtbfact.htm

1. Crites, R. W. and G. Tchobanoglous, 1998. Small and Decentralized Wastewater Management Systems. McGraw Hill.

2. Crites, R. W., S. C. Reed, and R. K. Bastian, 2000. Land Treatment Systems for Municipal and Industrial Wastes. McGraw-Hill.

3. Satterthwaite Associates, Inc., 2003. Internet site at http://www.wbsatterthwaite.com/ accessed August, 2003.

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6. U.S. EPA, 1984. Process Design Manual: Land Treatment of Municipal Wastewater, Supplement on Rapid Infiltration and Overland Flow. U.S. EPA CERI, Cincinnati, Ohio.

ADDITIONAL INFORMATION

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The mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Environmental Protection Agency.

Office of Water
EPA 832-F-03-025
June 2003

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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.

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.

Maintenance Bays & Docks SD-31

Design Objectives

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

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

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

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

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- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.
- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.
- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.
- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.
- Other features may be 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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

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.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

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

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

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

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.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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.

Vehicle Washing Areas SD-33

Photo Credit: Geoff Brosseau

Design Objectives

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

Description

Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of metals, oil and grease, solvents, phosphates, and suspended solids to wash waters that drain to stormwater conveyance systems.

Approach

Project plans should include appropriately designed area(s) for washing-steam cleaning of vehicles and equipment. Depending on the size and other parameters of the wastewater facility, wash water may be conveyed to a sewer, an infiltration system, recycling system or other alternative. Pretreatment may be required for conveyance to a sanitary sewer.

Suitable Applications

Appropriate applications include commercial developments, restaurants, retail gasoline outlets, automotive repair shops and others.

Design Considerations

Design requirements for vehicle maintenance are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. Design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Areas for washing/steam cleaning should incorporate one of the following features:

- Be self-contained and/or covered with a roof or overhang
- Be equipped with a clarifier or other pretreatment facility
- Have a proper connection to a sanitary sewer

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- Include other features which are comparable and equally effective

CAR WASH AREAS - Some jurisdictions' stormwater management plans include vehicle-cleaning area source control design requirements for community car wash racks in complexes with a large number of dwelling units. In these cases, wash water from the areas may be directed to the sanitary sewer, to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

Depending on the jurisdiction, developers may be directed to divert surface water runoff away from the exposed area around the wash pad (parking lot, storage areas), and wash pad itself to alternatives other than the sanitary sewer. Roofing may be required for exposed wash pads.

It is generally advisable to cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area. Sumps or drain lines can be installed to collect wash water, which may be treated for reuse or recycling, or for discharge to the sanitary sewer. Jurisdictions may require some form of pretreatment, such as a trap, for these areas.

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.

Additional Information

Maintenance Considerations

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

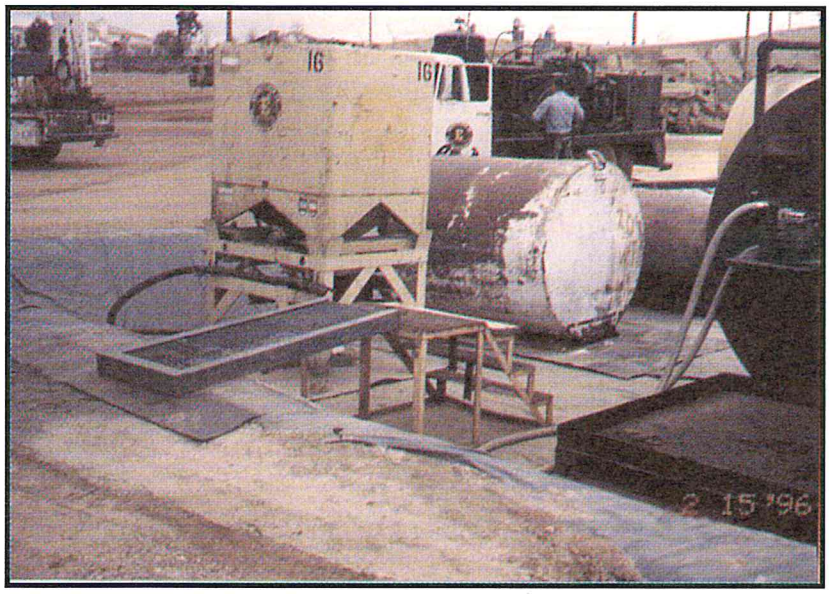
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

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.

Outdoor Material Storage Areas SD-34



Design Objectives

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

Description

Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach

Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Suitable Applications

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

Design Considerations

Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design requirements

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for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

Designing New Installations

Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.
- The storage area should be paved and sufficiently impervious to contain leaks and spills.
- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.
- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

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.

Outdoor Processing Areas SD-36

Description

Outdoor process equipment operations such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, landfills, waste piles, wastewater and solid waste treatment and disposal, and others operations may contribute a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the storm conveyance system.

Approach

Outdoor processing areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor process equipment areas, infiltration is discouraged. Containment is encouraged, accompanied by collection and conveyance. Preventative measures include enclosures, secondary containment structures, dead-end sumps, and conveyance to treatment facilities in accordance with conditions established by the applicable sewer agency.

Design Objectives

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

Suitable Applications

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

Design Considerations

Design requirements for outdoor processing areas are governed by Building and Fire codes, and by current local agency ordinances, and zoning requirements.

Designing New Installations

Operations determined to be a potential threat to water quality should consider to the following recommendations:

- Cover or enclose areas that would be the most significant source of pollutants; or slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.
- Grade or berm area to prevent run-on from surrounding areas.
- Do not install storm drains in areas of equipment repair.
- Consider other features that are comparable or equally effective.
- Provide secondary containment structures (not double wall containers) where wet material processing occurs (e.g., electroplating), to hold spills resulting from accidents, leaking tanks, or equipment, or any other unplanned releases (Note: if these are plumbed to the sanitary sewer, they must be with the prior approval of the sewering agency.)

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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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

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.

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

Emergency Contingency Plan – Spill Procedures

The Department of Transportation in 49CFR177.85 requires that motor carriers and drivers take all means necessary to prevent the spillage or leakage of hazardous material onto a highway or roadway.

On the road, the driver is the first line of defense when a spill occurs and is responsible for containing and cleaning up minor releases or spills. Major spills may require the assistance of a licensed clean-up contractor.

Once released or spilled, materials may be considered hazardous waste, requiring that all local, state, and federal regulations regarding the handling and transport of hazardous waste be followed.

SPILL KIT CONTENTS

Vehicle spill kits generally contain the following items:

* Sorbent materials such as snakes, booms, or pigs
* Mats or pads
* Putty
* Wooden plugs
* Nitrile gloves
* Chemical and puncture proof protective gloves
* Disposal bags

PROCEDURES

If the leak is major, contact 911 for emergency services and then notify your company.

In the event of a minor spill the driver should follow four basic steps.

1. Protect personal safety first. Place safety goggles and gloves on the eyes and hands.
2. Stop the leak using the wooden plugs and putty, if needed.
3. Contain the spill. Place booms, snakes, or pigs in front of drains or grates to prevent leakage to waterways. Place remaining pigs or snakes at the outside edges of the spill; soak up the spilled fuel or liquid by placing the mats or pads on the liquid within the boom area.
4. Clean up the spilled material. Place all used/contaminated sorbents into the disposal bags and place the bags in the cab, cargo box, or trailer. Transport the waste back to the company for proper disposal by a regulated waste disposal company.

Note: Do not place bags in the cab with you or in the trailer if you transport food products. Call the company for further disposal instructions.

SAFETY PRECAUTIONS

Drivers should remember:

* to pull the vehicle away from ignition sources, water and storm drains, and out of the flow of traffic, allowing for a safe exit from the vehicle;
* to avoid smoking, igniting a lighter, striking a match, or bringing an open flame near the spill area;
* to turn off the ignition to the vehicle

* to not park under overhead electric lines
* to don the provided safety goggles and gloves;
* not to attempt to repair a punctured fuel tank or broken crossover line unless the driver has received appropriate training as required by OSHA and other applicable laws; and
* to immediately replace the contents of the spill kit.

TRAINING

Prior to their initial driving assignment, drivers should receive training in the company's spill response procedures.

Emergency Contingency Plan – Spill Procedures

I have read, understand and agree to abide by the above policy.

Employee Signature: _____

Employee Name: _____

Date: _____

Manager Signature: _____

Manager Name: _____

Date: _____

SPILL CONTINGENCY PLAN

(Sample template)

Unit or Organization: _____ **Date:**_____

A. RESPONSIBLE PERSONS.

1. Primary Contact.

Name:_____ Rank:_____

Duty Phone:_____ Cell Phone: _____

2. Alternate Contacts. *(One alternate is required; more is o.k.)*

Name:_____ Rank:_____

Duty Phone:_____ Cell Phone: _____

Name:_____ Rank:_____

Duty Phone:_____ Cell Phone: _____

B. SPECIAL PRECAUTIONARY MEASURES FOR BUILDINGS AND ASSOCIATED AREAS. *(If this facility has no special precautionary measures to be noted, please insert a statement so stating. Otherwise, complete the following. If more than 2 buildings, complete another site specific spill plan form for those buildings.)*

Building Number:_____ Precautionary Measure:_____

_____

Building Number:_____ Precautionary Measure:_____

_____

C. SPILL RESPONSE EQUIPMENT ON-HAND. *(e.g., dry sweep, brooms, absorbent booms, dust pans, spill kits, etc.)*

Building # _____

Building # _____

D. HAZARDOUS MATERIAL INVENTORY. *(Hazardous material inventory must be included.)*

1. Hazardous Material Inventory and quantities of hazardous material normally maintained on-hand are enclosed at Appendix A.

2. Material Safety Data Sheets are readily available and located at *(Specific location is required.)*:

   Building #_____

   Building #_____

E. AREA SITE LAYOUT. *(Attach a sketched site drawing of the area. The sketch must illustrate the locations of buildings with building numbers, North Arrow, building layout, location of MSDSs, locations of hazardous materials, locations of hazardous waste accumulation points, storm and surface water drains, locations of spill response equipment and materials, evacuation routes, and the routes a spilled material or waste will travel from the site.)*

Area Site Layout is enclosed at Appendix B.

F. SPILL RESPONSE AND NOTIFICATION PROCEDURES.

1. Spills 10 gallons or more:

a. Assess the situation before attempting any action.
b. If you can turn off a switch, turn a valve closed or up righting the container **safely** do so.
c. If you can or cannot do the above action safely call and do the following in order:
    1) Warn others in the immediate area that a spill has occurred.
    2) Call **Fire and Emergency Services Division**: **117 or 738-5200/5020** and provide the following:
        a) Name
        b) Telephone number
        c) Type and estimated quantity of fuel/hazardous material
        d) Date and Time
        e) Location
        f) Is there a hazard to life or property?
    3) Call the **Environmental Division**: **724-6150/6151** and provide the same information as above.
    4) Return to a safe area where you can control access to the spill site and only allow trained responders into the area.
    5) Do not leave the area until you have talked to the Incident Commander (IC) and provided them with your spill information.

2. Spill less than 10-gallons:

a. Assess the situation before attempting to contain any fuel or hazardous material spill.
b. If you cannot stop the flow safely follow procedures 1c(1) thru 1c(5); or If you can stop the spill safely do the follow:
    1) Quickly contain the spill by turning off flow or up righting the container.
    2) Using Proper Protective Equipment use absorbent pads/material to soak up spilled fuel/hazardous material.
    3) Prevent fuel from spreading to storm drains by blocking flow using available absorbent material, if the fuel/hazardous material enters the storm drains follow procedures under 1c(2) thru 1c(5).
    4) Call immediately
        a) During duty hrs 0800 to 1700 hrs, **Environmental Division, DPW**: **724-6150/6151**
        b) After duty hours call **Fire and Emergency Services Division**: **738-5200/5020**

3. **Unit or Organization Notification:** The following people will be notified:

   a. **Primary EO:**

   Name: _____ Rank: _____

   Phone No. (Duty Hours): _____ Off-Duty Phone:_____

   b. **Alternate EO:**

   Name: _____ Rank: _____

   Phone No. (Duty Hours): _____ Off-Duty Phone:_____

   c. **Commanding Officer or Supervisor Directed Contacts:** *(If required by the Commanding Officer or Supervisor, additional people to be notified within the chain-of-command. If not required, this section can be omitted.)*

   Name:_____ Rank: _____

   Phone No. (Duty Hours): _____ Off-Duty Phone:_____

   Name:_____ Rank: _____

   Phone No. (Duty Hours): _____ Off-Duty Phone:_____

   Name:_____ Rank: _____

   Phone No. (Duty Hours): _____ Off-Duty Phone:_____

4. Spill Clean-up.

a. Cleanup operations will normally be conducted by the Unit or Organization that created the spill.

5. Disposal of Spilled Material. All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed.

a. Unit or Organization creating the spill has the responsibility for collecting and disposing of spilled material and residue.

b. DPW, Environmental Division will determine disposal method and provide guidance as needed.

c. Fuel or oil contaminated soil and organic absorbent materials will be placed in a DOT approved container. And then, the containers will be located in the Hazardous Waste Accumulation Point (HWAP) or appropriate locations directed by DPW, Environmental Division. Call DPW, Environmental Division at 724-6150 to dispose of them.

d. Other spill residues will be properly classified and disposed of as directed by the DPW, Environmental Division at 724-6150.

Prepared By: _____
(Name and rank of person preparing plan)

Unit/Organization Approval: _____
(Unit Commander's or Supervisor's Signature Block)

Environmental Division
Review and approval: _____

BMP Inspection and Maintenance Plan

BMP	Responsible Party	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
Parking Area Maintenance	Owner	Parking lots and private streets must be swept.	Quarterly (minimum), weekly during rainy season (oct-may)
Drainage System Maintenance	Owner	Inspect, clean and maintain drainage facilities.	Prior to rainy season and after every rain event greater than 0.5 inches.
Plaza and Sidewalk Cleaning	Owner	Litter shall be picked up. Sidewalk and plaza areas shall be swept.	Weekly
Landscape Maintenance	Owner	Vegetated Areas Mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions. Vegetated areas must be inspected at least annually for erosion and scour. Vegetated areas should also be inspected at least annually for unwanted growth, which should be removed with minimum disruption to the planting soil bed and remaining vegetation. When establishing or restoring vegetation, biweekly inspections of vegetation health should be performed during the first growing season or until the vegetation is established. Once established, inspections of vegetation health, density, and diversity should be performed at least twice annually during both the growing and non-growing seasons. The vegetative cover should be maintained at 85 percent. If vegetation has greater than 50 percent damage, the area should be reestablished in accordance with the original specifications and the inspection requirements presented above. All use of fertilizers, mechanical treatments, pesticides and other means to assure optimum vegetation health should not compromise the intended purpose of the bioretention system. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible.	Weekly

BMP Inspection and Maintenance Plan

BMP	Responsible Party	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
Efficient Irrigation	Owner	Irrigation systems must be inspected to ensure proper functionality. Timers must be inspected to avoid overwatering and water cycle and duration shall be adjusted seasonally by landscape maintenance contractor.	Weekly
Storm Drain Signage	Owner	Maintain legibility of stenciling and signs.	Yearly.
Trash Storage Areas	Owner	Trash and waste storage areas must be inspected to ensure receptacles are not collecting storm water. Trash enclosure areas shall be swept and cleaned, dumpsters shall be emptied. Lids must always be maintained closed.	Weekly
Flow-Well Drywell	Owner	Inspect, clean and maintain dry well system. Inspect for clogging and excessive debris and sediment accumulation.	Prior to rainy season and after every rain event greater than 0.5 inches.
Bio-retention Facility	Owner	All bioretention system components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four times annually as well as after every storm exceeding 1 inch of rainfall. Such components may include bottoms, trash racks, low flow channels, outlet structures, riprap or gabion aprons, and cleanouts. Sediment removal should take place when the basin is thoroughly dry. Disposal of debris, trash, sediment, and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state, and federal waste regulations. Grass outside of the bioretention system should be mowed at least once a month during the growing season. Grasses within the bioretention system must be carefully maintained so as not to compact the soil, and through hand-held equipment, such as a hand held line trimmer.	Bi-annual and after every rain event greater than 1.0 inches.

BMP Inspection and Maintenance Log

Date	Inspection/Maintenance Task Performed	Inspector

BMP Inspection and Maintenance Log

Date	Inspection/Maintenance Task Performed	Inspector

Nyloplast® A DIVISION OF ADVANCED DRAINAGE SYSTEMS, INC.
Tomorrow's Drainage System Today

Nyloplast Drain Basin
Maintenance Considerations

Background:

The Nyloplast Drain Basin is an engineered PVC surface drainage structure. These drain basins are custom manufactured according to the plans/takeoff specified by the site engineer. Nyloplast Drain Basins have a quick production time, creates water tight connections, and provide simple and quick installations.

Installation shall be in accordance with Nyloplast installation procedures and those issued by local building/construction regulations. The required minimum sump located in the typical installation is for manufacturing purposes. Due to these manufacturing restrictions, the sump may collect sediment over time and the structure could require some maintenance.

Maintenance Recommendations

- Over the span of the first year of a new installation, visually inspect each basin every 2 months or after 2 storm events once the site has stabilized.
- Check for obstructions and debris at the openings of the grate and remove as needed.
- After cleaning the surface of the grate, remove the grate from the frame.
- Once the grate is removed from the frame, check for obstructions and debris inside the basin (including the sump and inlet and outlet pipes) and clean out as needed.
- A vacuum truck is best for the removal of debris when necessary. After the collection of the debris, it shall be disposed of according to the local environment requirements.
- After the maintenance or inspection of the structure completed, set the grate back in the frame so it sits flush and does not rock.
- Once the monitoring period is over, it is best to continually schedule maintenance based on the amount of debris or sediment that accumulates over time.

3130 Verona Avenue • Buford, Georgia 30518 • Tel: (770) 932-2443 • Fax: (770) 932-2490
www.nyloplast-us.com & www.ads-pipe.com

FLEXSTORM OPERATION AND MAINTENANCE PLAN

OPERATION & MAINTENANCE PLAN

Installation Instructions:

1. Remove grate from the drainage structure
2. Clean stone and dirt from ledge (lip) of drainage structure
3. Drop the FLEXSTORM inlet filter through the clear opening such that the hangers rest firmly on the lip of the structure.
4. Replace the grate and confirm it is not elevated more than 1/8", the thickness of the steel hangers.

Frequency of Inspections:

1. Inspection should occur following any rain event >½".
2. Post construction inspections should occur 4 times per year. In snowfall affected regions additional inspections should take place before and after snowfall season.
3. Industrial application site inspections (loading ramps, wash racks, maintenance facilities) should occur on a regularly scheduled basis no less than 3 times/year.

Maintenance Guidelines:

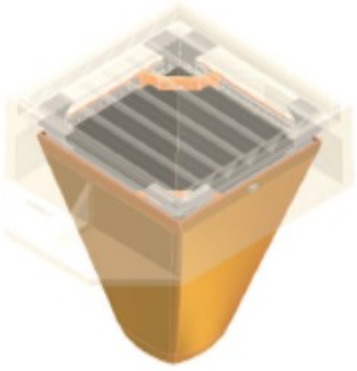
1. Empty the sediment bag if more than half filled with sediment and debris, or as directed.
2. Remove the grate, engage the lifting bars with the FLEXSTORM Removal Tool, and lift from drainage structure.
3. Dispose of sediment or debris as directed by the Engineer or Maintenance contract.
4. An industrial vacuum can be used to collect sediment.
5. Remove caked on silt from sediment bag and flush with Medium spray with optimal filtration.
6. Replace bag if torn or punctured to >½" diameter on lower half of bag.

Post Construction PC Bag Maintenance:

1. At 50% saturation the average 2'x2' Adsorb-it lined PC filter will retain approximately 75 oz (4.2 lbs) of oil and should be serviced. To recover the oils the filter can be centrifuged or passed through a wringer.
2. Oil skimmer pouches start to turn black when saturated, indicating time for replacement. Each ClearTec Rubberizer pouch will absorb ~62oz (4 lbs) of oil before needing replacement.
3. Dispose of all oil contaminated products in accordance with EPA guidelines. ClearTec Rubberizer, since a solidifier, will not leach under pressure and can be disposed of in most landfills, recycled for industrial applications, or burned as fuel.

Sediment Bag Replacement:

1. Remove the bag by loosening or cutting off clamping bag.
2. Take new sediment bag and secure worm drive clamping band to the frame channel.
3. Ensure Bag is secure and there is no slack around perimeter.



STRUCTURE ID#/LOCATION:

DATE	TASK PERFORMED	INSPECTOR

SAN BERNARDINO COUNTY STORMWATER PROGRAM

WHERE WATER MEETS COMMUNITY

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 *http://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/industrial.shtml* 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 *https://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/construction_new.shtml.*
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SAN BERNARDINO COUNTY STORMWATER PROGRAM

WHERE WATER MEETS COMMUNITY

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Santa Ana Regional Water Quality Control Board Municipal NPDES Permit Order No. R8-2002-0Q12

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- **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 undercover with spill containment or inside to prevent contamination of rainwater runoff.
- **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 polishing auto parts. Contact a licensed hazardous waste hauler. For more recycling information, call (909) 382-5401.
- **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 sink or the fluid holding tank. Do not wash parts or equipment in a parking lot, driveway or street.
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- **Washing Vehicles:** Wash vehicles where the wash water can soak into grass, gravel or be diverted to nearby landscaping, away from the street and storm drains. Wash vehicles at a designated wash rack that is connected to the sanitary sewer or take vehicles to a professional car wash. Use soaps, cleaners and detergents that are labeled phosphate free or biodegradable. The safest products for the environment are vegetable-based or citrus-based soaps.

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Notice to Businesses Which Generate Hazardous Waste

Businesses in the State of California, which generate hazardous waste, are subject to state and county hazardous waste regulations, regardless of the amount generated.

What is hazardous waste?

Hazardous Waste is defined in the California Health and Safety Code of Regulations. In basic terms, it is a solid, liquid, or gaseous substance that you no longer use, which may pose a substantial hazard to human health or the environment. Generally, a hazardous waste has one or more of the following properties:

- Ignitable (catches fire easily)
- Toxic (can affect you if inhaled, swallowed or gets on your skin)
- Reactive (can catch fire, explode or give off fumes when exposed to air or water)
- Corrosive (burns eyes, skin, etc. on contact, will corrode metal)

What are hazardous waste generators required to do?

As a generator of hazardous waste, you are required to:

- Have an EPA ID number
- Have a Hazardous Waste Generator's permit from the county
- Have an extremely hazardous waste permit, if applicable
- Identify, analyze, properly label and sort all hazardous waste
- Provide a secure storage area for the waste
- Inspect the area regularly for spills, leaks, etc.
- Have a contingency plan for fire, explosions and spills
- Provide training and appropriate protective equipment to personnel
- Use a manifest when shipping waste via a licensed hazardous waste transporter to a licensed hazardous waste facility
- Maintain records of compliance with the above requirements.

How can I properly dispose of my hazardous waste?

As indicated above, you are required to ship your hazardous waste via a licensed hazardous waste transporter. You are required to ship this waste to a licensed hazardous waste recycling, treatment or disposal facility. Your disposal options will depend on the nature and type of waste that you have. For your convenience we have listed the licensed hazardous transporters operating in San Bernardino County. This listing is not an endorsement of these companies but is provided for your convenience. Additionally, we have listed some hazardous waste recycling companies which may be able to handle your waste. Please note that it is county, state and federal policy to manage hazardous waste according to the following hierarchy:

- Source reduction, reduce the waste being generated
- Recycle to the extent possible
- Treat the waste to reduce the volume and/or toxicity
- Dispose of the residual waste left after treatment.

What permits do I need?

It will be necessary for you to obtain an Identification Number. Application forms for Identification Numbers may be obtained from the Cal EPA, Toxic Substances Control Program, (916) 324-1781. Additionally, you are required to have a hazardous waste generator's permit from San Bernardino County. Call the Office of the Fire Marshal at (909) 386-8401 and request an application packet for a Hazardous Waste Generators Permit and additional information on your responsibilities as a hazardous waste generator.

Hazardous Waste Haulers

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hazardous waste hauler license is current.

ACTenviro Redlands 92373 (909) 406-4400 (Redlands) (408) 548-5050 (Corporate) info@actenviro.com https://www.actenviro.com/	**Environmental Dynamics, Inc.** Gardena 90248 (310) 527-6242 (800) 888-0702 (Emergency line) txccowboys@environmentaldynamicsinc.com https://environmentaldynamicsinc.com/
All Valley Environmental Big Bear Lake 92315 (909) 584-9284 avewaste@gmail.com	**Environmental Logistics** Rialto 92316 (888) 641-3940 service@environmentallogistics.org https://environmentallogistics.org/
Amberwick Corporation Long Beach 90813 (562) 901-2350 http://www.amberwickcorp.com/	**FRS Environmental Incorporated** Corona 92879 (800) 297-7292 (951) 898-1888 Info@frsenvironmental.com https://frsenvironmental.com/hazardous-waste-management/
Clean Earth Riverside 92501 (951) 683-6994 (Facility) (678) 822-9963 (customer service) https://www.cleanearthinc.com/locations/riverside	**Hazmat TSDF** Bloomington 92316 (909) 873-4141 (800) 698-4377 (24 hr response) https://www.usahazmat.com/ **Note:** Treated Wood Waste Accepted
Clean Harbors Camarillo 93010 (805) 987-0217 https://www.cleanharbors.com/	**Haz Mat Trans Inc** San Bernardino 92401 (909) 889-5607 info@hazmattrans.com
Desert Environmental Services Victorville 92392 (760) 243-7619 desertfr@verizon.net https://www.desertenvironmentalinc.com/	**HCI Environmental & Engineering Service** Riverside 92503 (951) 280-0298 (800) 988-4424 customerservice@hcienv.com http://www.hcienv.com/

Hazardous Waste Haulers (cont'd)

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Industrial Waste Utilization Montclair 91763 (909) 984-9984 (800) 667-9278 24hr Service info@iwu.com https://www.iwu.com/	**Safety Kleen Systems** Highland 92346 (909) 862-8300 800) 282-0058 (Corporate) https://www.safety-kleen.com/locations
JSE Environmental Rancho Cucamonga 91730 (909) 984-5886 greg@jse-environmental.com	**Starlite Reclamation Environmental Services** Fontana 92337 (909) 434-0480 (800) 576-9278 info@starlitewaste.com https://starlitewaste.com
KVAC Environmental Rancho Cucamonga 91730 (909) 476-2308 Diana.knifer@kvacenv.com https://kvacenv.com/	**Statewide Emergency Services** San Bernardino 92408 (951) 685-9336 (24-hr response) (909) 927-6400 https://statewide-hazmat.com/
Melfred Industrial Services Inc. Oak Hills 92344 (760) 948-1131	**United Pumping Service** City of Industry 91746 (626) 961-9326 http://unitedpumping.com/index.php
Ocean Blue Environmental Services Long Beach 90813 (562) 624-4120 (800) 990-9930 24hr Service info@ocean-blue.com https://www.ocean-blue.com/	**World Oil Environmental Services** Fontana/Compton (800) 974-4495 (310) 886-3400 https://worldoilcorp.com/
Patriot Environmental Services Inc. Wilmington 90744 / Ontario 91761 (562) 436-2614 (Corporate) (800) 624-9136 (24-hr response) (909-786-2934 (Ontario) info@patriotenvironmental.com https://www.patriotenvironmental.com/locations/	**Waste Management Special Waste Services** Orange County (714) 750-8422 https://www.wm.com/us/en/business/specialized-waste

Electronic Waste Haulers

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Note: Before contacting verify hauler license is current.

Attan Recycling Corporation 13941 Norton Ave Unit D Chino, CA 91710 (909) 591-8408 or (909) 662-2180 attanrecyclingcorp@hotmail.com Monday-Friday 8 AM- 4PM https://attanrecycling.com/	**Burrtec Waste- West Valley MRF** 13373 Napa St., Fontana, CA 92335 (909) 899- 5501 Monday-Friday 7AM – 6 PM, Saturday 7 AM-3 PM, Sunday 8 AM- 3 PM
Big Bear Disposal 41970 Garstin Dr. , Big Bear Lake, CA 92315 (909) 709-6113 Tuesday, Wednesday, Friday 8 AM-5 PM; Saturday 8:00am-3:00pm (closed 11:30 AM- 12:30 PM) https://bigbeardisposal.com/e-waste-appliances/	**Burrtec Waste- Victor Valley MRF** 17000 Abbey Lane, Victorville, CA (760) 241- 1284 Monday – Friday 8 AM-4PM https://www.victorvilleca.gov/government/city-departments/community-services/trash-recycling/recycling/victor-valley-material-recovery-center
Burrtec Waste - Barstow 2340 W. Main Street Barstow, CA 92311 (760) 256-2730 Monday - Friday, 8 AM-5 PM, Saturday 8AM- 12 PM https://www.barstowca.org/departments/community-services-department/environmental-services-division/solid-waste-business/universal-waste-and-electronic-waste	**Cal Micro Recycling** 1541 Brooks St., Ontario, CA 91762 (909) 757- 1922 Monday – Friday 7:30 AM – 2 PM https://www.calmicrousa.com/
Burrtec Waste - Crestline 988 Waterman Canyon Road Crestline, CA 92325 (909) 338-2417 Monday-Friday 8:00am-5:00pm **(Numerous Drop off Locations on Mountain)**	**Fontana HHW Collection Center** 16454 Orange Way, Fontana, CA 92336 (909) 350-6760 Saturday 8 AM – 12PM https://www.fontana.org/606/Electronic-Collection
Burrtec Waste – Twentynine Palms Curbside Service Only for 29 Palms residents (760) 367-9168 or (760) 340-2113 https://www.ci.twentynine-palms.ca.us/hazardouswaste	**Hazmat TSDF** Bloomington 92316 (909) 873-4141 (800) 698-4377 (24 hr response) https://www.usahazmat.com/
Burrtec Waste- Low Desert 4878 Newton Rd., Yucca Valley, CA 92284 (760) 365- 2015 https://www.ci.twentynine-palms.ca.us/hazardouswaste	**Safe Way Recycling** 21516 Main Street, Grand Terrace, CA 92313 (951) 742-5719 Monday – Sunday 8AM – 4:30 PM https://www.safewayrecyclinginc.com/

Electronic Waste Haulers (cont'd)

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hauler license is current.

The Salvation Army Adult Rehabilitation Center (San Bernardino) – TVs, Monitors Only 363 D Doolittle Ave, San Bernardino, CA 92408 (909) 889-9605 https://sanbernardinoarc.salvationarmy.org/	
Union Battery Disposal 5312 W Mission Blvd, Ontario, CA 91762 (909) 627-7717 Monday – Friday 8 AM-5:30 PM, Saturday 8 AM – 5 PM atorres@unionbatterydisposal.com https://unionbatterydisposal.com/	
Urban Conservation Corps of the Inland Empire (a DBA of Southern California Mountains Foundation) 1335 West 26th Street, San Bernardino, CA 92405 (909) 890-0400 Call for hours of Pick Up https://mountainsfoundation.org/programs/urban-conservation-corps/	
The Home Dept, Compact Fluorescent Lights All stores offer free service. Consumers need to place CFL bulbs/tubes in plastic bags and deposit them in orange CFL unit in front of the store or by service desk. https://www.homedepot.com/c/ab/how-to-dispose-of-lightbulbs/9ba683603be9fa5395fab901b263d806	
Staples All stores accept certain types of E-waste. Max 7 items per customer. TVs not accepted. Call for confirmation. https://www.staples.com/sbd/cre/marketing/sustainability-center/recycling-services/electronics/	

Used Oil Recyclers

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hauler license is current.

All Valley Environmental Big Bear Lake 92315 (909) 584-9284 avewaste@gmail.com	**JSE Environmental** Rancho Cucamonga 91730 (909) 984-5886 greg@jse-environmental.com
Hazmat TSDS Bloomington 92316 (800) 698-4377 (24 hr response) (909) 873-4141 https://www.usahazmat.com/locations	**World Oil Environmental Services** Fontana/Compton (800) 974-4495 (310)-886-3400 https://worldoilcorp.com/
HCI Environmental & Engineering Service Riverside 92503 (951) 280-0298 (800) 988-4424 customerservice@hcienv.com http://www.hcienv.com/	**World Oil Recycling** Compton 90222 (310) 537-7100

Used Oil Filter Recyclers

All Valley Environmental Big Bear Lake 92315 (909) 584-9284 avewaste@gmail.com	**JSE Environmental** Rancho Cucamonga 91730 (909) 984-5886 greg@jse-environmental.com
Hazmat TSDS Bloomington 92316 (800) 698-4377 (24 hr response) (909) 873-4141 https://www.usahazmat.com/locations	**Safety Kleen Systems** Highland 92346 (909) 862-8300 800) 282-0058 (Corporate) https://www.safety-kleen.com/locations
HCI Environmental & Engineering Service Riverside 92503 (951) 280-0298 (800) 988-4424 customerservice@hcienv.com http://www.hcienv.com/	**World Oil Environmental Services** Fontana/Compton (800) 974-4495 (310)-886-3400 https://worldoilcorp.com/

Used Oil Filter Recyclers (cont'd)

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hauler license is current.

World Oil Recycling Compton 90222 (310) 537-7100	

Antifreeze Recyclers

HCI Environmental & Engineering Service Riverside 92503 (951) 280-0298 (800) 988-4424 customerservice@hcienv.com http://www.hcienv.com/	**Toxguard Fluid Technologies** Stanton 90860 (714) 698-3400 info@toxguard.com http://www.toxguard.com/
JSE Environmental Rancho Cucamonga 91730 (909) 984-5886 greg@jse-environmental.com	**World Oil Environmental Services** Fontana/Compton (800) 974-4495 (310) 886-3400 https://worldoilcorp.com/
Safety Kleen Systems Highland 92346 (909) 862-8300 (800) 282-0058 (Corporate) https://www.safety-kleen.com/locations	

Soil Remediation

Soil Safe of California 12328 Hibiscus Rd, Adelanto, CA, 92301 (760) 246-8001 https://www.soilsafe.com/index.php/facilities/adelanto	

Sharps/Needles Disposal

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hauler license is current.

GRP (800) 207-0976 sharps@sharpsdisposal.com https://www.sharpsdisposal.com/	**Sharps Compliance, Inc.** SCI Mail Sharps Disposal System (800) 772-5657 www.sharpsinc.com
Medasend, Inc. (Mail Back Program Only) (800) 200-3581 info@medasend.com www.medasend.com	**Stericycle, Inc.** (866) 783-7422 www.stericycle.com
Republic Services- Sharps Dept. (855) 737-7871 https://www.republicsharps.com/	

Treated Wood Waste Disposal

Hazmat TSDF 180 W. Monte Ave. Bloomington 92316 (909) 873-4141 (800) 698-4377 (24 hr response) https://www.usahazmat.com/locations	

Asbestos Disposal

Azusa Land Reclamation Azusa 91702 (626) 224-9127 https://www.wmsolutions.com/locations/details/id/181	

Environmental Consultant List

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hauler license is current.

Alliance Environmental & Compliance, Inc. Murrieta 92562 (951) 677-5636 (951) 965-7000 (24-hour emergency response)	**Converse Consultants** Monrovia 91016 (626) 930-1200 info@converseconsultants.com https://www.converseconsultants.com/
Alliance Environmental Group Riverside (760) 340-2943 (877) 858-6220 https://www.alliance-enviro.com/locations/riverside-san-bernardino/	**Dufour Law** Sacramento 95814 (916) 553-3111 http://www.dufourlegal.com/
Alta EM, Incorporated Rancho Cucamonga 91730 (909) 476-2120 info@altaem.com http://altaem.com/	**Frey Environmental** Newport Beach 92663 (949) 723-1645 https://www.freyinc.com/
Earth Systems Pacific Bermuda Dunes 92201/ Perris 92571/ Palmdale 93551 (760) 345-1588 (Bermuda Dunes) (661) 948-7538 (Palmdale) (951)-928-9799 (Perris) https://www.earthsystems.com/contact/	**El Capitan Environmental Services** Sun Valley 91352 (818) 768-9222
BSK Associates San Bernardino 92408 (909)-796-2059 https://www.bskassociates.com/contact/	**Etac** (Hazwoper Courses) Anaheim 92806 (800) 949-4473 http://www.etac-online.com/index.html
Bureau Veritas Santa Ana 92705 (714) 431-4100 https://www.bvna.com/	**Executive Environmental Services Corporation** Arcadia 91006 (626) 441-7050 info@execenv.com https://executiveenvironmental.com/
Chambers Group Santa Ana 92707 (949) 261-5414 https://chambersgroupinc.com/	**Excel Environmental** LA Region (562) 789-8451
Clean Harbors Camarillo 93010 (805) 987-0217 https://www.cleanharbors.com/	**Fluor Corporation** Aliso Viejo 92698 (949) 349-2000 https://www.fluor.com/services

Environmental Consultant List (cont'd)

Inclusion of company names on list is not an endorsement or recommendation by the San Bernardino County Fire Protection District, HHW Section.
Note: Before contacting verify hauler license is current.

Fuel Pros Chino 91710 (909) 614-1379 info@fuelpros.net https://www.fuelpros.net/	**National Econ Corporation** Anaheim 92805 (714) 978-6320 office@nationalecon.com https://nationalecon.com/
Geo Cal San Bernardino 92407 (909) 880-1146 info@geo-cal.com http://www.geo-cal.com/	**Tait & Associates** Santa Ana 92705 / Norco 92860 (714) 560-8200 (Corporate) info@tait.com https://tait.com/
Green Environmental Management Hemet 952543 (541) 549-1966 https://green-em.com/	**Terracon** Colton 92324 (909) 824-7311 https://www.terracon.com/
HVN Environmental Services Torrance 90503 (714) 715-0397 (310) 370-9656 (Corporate) info@hvnenvironmental.com http://www.hvnenvironmental.com/	**Tetra Tech** San Bernardino 92408 (909) 381-1674 https://www.tetratech.com/en
Stantec San Bernardino 92408 (909) 335-6116 (866) 782-6832 (Corporate) https://www.stantec.com/en	**TRC Companies** Irvine 92618/ Riverside 92507 (949) 727-9336 (Irvine/Corporate) (951) 788-6028 (Riverside) https://www.trccompanies.com/
Marc Boogay, Consulting Engineer Oceanside 92056 (760) 407-4000 (760) 212-0012 marc@boogay.com https://www.boogay.com/	

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

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

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

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

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.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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.

Section 6.4.1 Soils Report and Precipitation

Soil Map—San Bernardino County Southwestern Part, California

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 14, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2022—Jun 12, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
TuB	Tujunga loamy sand, 0 to 5 percent slopes	18.2	100.0%
Totals for Area of Interest		**18.2**	**100.0%**

NOAA Atlas 14, Volume 6, Version 2
Location name: Redlands, California, USA*
Latitude: 34.0667°, Longitude: -117.1972°
Elevation: 1294.41 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	0.097 (0.080-0.117)	0.124 (0.103-0.151)	0.161 (0.134-0.197)	0.192 (0.158-0.236)	0.234 (0.186-0.298)	0.267 (0.208-0.347)	0.301 (0.229-0.402)	0.337 (0.248-0.462)	0.386 (0.273-0.552)	0.425 (0.289-0.630)
10-min	0.138 (0.115-0.168)	0.178 (0.148-0.217)	0.231 (0.192-0.282)	0.275 (0.226-0.338)	0.336 (0.267-0.427)	0.383 (0.298-0.498)	0.432 (0.328-0.576)	0.483 (0.356-0.662)	0.553 (0.391-0.792)	0.609 (0.415-0.902)
15-min	0.167 (0.139-0.203)	0.216 (0.179-0.262)	0.280 (0.232-0.341)	0.333 (0.274-0.409)	0.406 (0.323-0.517)	0.463 (0.360-0.602)	0.523 (0.396-0.696)	0.584 (0.430-0.801)	0.669 (0.472-0.957)	0.736 (0.502-1.09)
30-min	0.248 (0.207-0.301)	0.320 (0.266-0.389)	0.415 (0.344-0.506)	0.494 (0.406-0.607)	0.603 (0.479-0.767)	0.688 (0.535-0.894)	0.775 (0.588-1.03)	0.867 (0.639-1.19)	0.993 (0.701-1.42)	1.09 (0.745-1.62)
60-min	0.362 (0.301-0.439)	0.466 (0.387-0.566)	0.605 (0.501-0.737)	0.719 (0.591-0.884)	0.878 (0.697-1.12)	1.00 (0.779-1.30)	1.13 (0.856-1.50)	1.26 (0.930-1.73)	1.45 (1.02-2.07)	1.59 (1.08-2.36)
2-hr	0.514 (0.428-0.624)	0.659 (0.548-0.801)	0.851 (0.706-1.04)	1.01 (0.830-1.24)	1.23 (0.975-1.56)	1.40 (1.09-1.82)	1.57 (1.19-2.09)	1.75 (1.29-2.40)	2.00 (1.41-2.86)	2.19 (1.50-3.25)
3-hr	0.633 (0.527-0.768)	0.811 (0.674-0.985)	1.05 (0.867-1.27)	1.24 (1.02-1.52)	1.50 (1.19-1.91)	1.71 (1.33-2.22)	1.92 (1.45-2.56)	2.14 (1.57-2.93)	2.44 (1.72-3.48)	2.67 (1.82-3.96)
6-hr	0.891 (0.741-1.08)	1.14 (0.947-1.39)	1.47 (1.22-1.79)	1.74 (1.43-2.13)	2.10 (1.67-2.67)	2.39 (1.86-3.10)	2.68 (2.03-3.56)	2.97 (2.19-4.08)	3.38 (2.39-4.84)	3.70 (2.52-5.48)
12-hr	1.19 (0.991-1.45)	1.53 (1.27-1.86)	1.97 (1.63-2.40)	2.33 (1.91-2.86)	2.82 (2.24-3.58)	3.19 (2.48-4.15)	3.57 (2.71-4.76)	3.96 (2.92-5.43)	4.49 (3.17-6.43)	4.90 (3.34-7.27)
24-hr	1.59 (1.41-1.84)	2.06 (1.82-2.37)	2.66 (2.35-3.08)	3.15 (2.76-3.68)	3.81 (3.23-4.59)	4.32 (3.58-5.31)	4.83 (3.91-6.08)	5.35 (4.22-6.93)	6.06 (4.58-8.16)	6.60 (4.83-9.20)
2-day	1.97 (1.75-2.28)	2.58 (2.29-2.98)	3.39 (2.99-3.92)	4.04 (3.53-4.71)	4.93 (4.18-5.94)	5.62 (4.66-6.91)	6.31 (5.12-7.95)	7.03 (5.54-9.10)	8.01 (6.06-10.8)	8.77 (6.42-12.2)
3-day	2.13 (1.89-2.46)	2.84 (2.51-3.27)	3.77 (3.32-4.36)	4.54 (3.97-5.29)	5.60 (4.75-6.75)	6.44 (5.34-7.91)	7.29 (5.91-9.19)	8.19 (6.46-10.6)	9.42 (7.13-12.7)	10.4 (7.61-14.5)
4-day	2.30 (2.04-2.65)	3.08 (2.73-3.56)	4.13 (3.64-4.78)	5.00 (4.38-5.83)	6.21 (5.26-7.49)	7.17 (5.95-8.82)	8.16 (6.61-10.3)	9.21 (7.26-11.9)	10.7 (8.06-14.4)	11.8 (8.64-16.5)
7-day	2.67 (2.37-3.08)	3.60 (3.18-4.15)	4.85 (4.28-5.61)	5.89 (5.15-6.87)	7.34 (6.22-8.84)	8.49 (7.04-10.4)	9.68 (7.84-12.2)	10.9 (8.62-14.1)	12.7 (9.59-17.1)	14.1 (10.3-19.6)
10-day	2.90 (2.56-3.34)	3.92 (3.46-4.52)	5.29 (4.67-6.12)	6.44 (5.64-7.52)	8.05 (6.82-9.70)	9.32 (7.74-11.5)	10.6 (8.62-13.4)	12.0 (9.49-15.6)	14.0 (10.6-18.8)	15.5 (11.4-21.6)
20-day	3.58 (3.17-4.13)	4.88 (4.32-5.63)	6.64 (5.86-7.69)	8.12 (7.11-9.47)	10.2 (8.64-12.3)	11.8 (9.83-14.6)	13.6 (11.0-17.1)	15.4 (12.1-19.9)	17.9 (13.6-24.2)	20.0 (14.6-27.8)
30-day	4.21 (3.73-4.85)	5.76 (5.09-6.64)	7.85 (6.93-9.09)	9.62 (8.42-11.2)	12.1 (10.3-14.6)	14.1 (11.7-17.3)	16.2 (13.1-20.4)	18.4 (14.5-23.8)	21.4 (16.2-28.9)	23.9 (17.5-33.4)
45-day	5.03 (4.45-5.79)	6.87 (6.08-7.93)	9.38 (8.28-10.9)	11.5 (10.1-13.4)	14.5 (12.3-17.5)	16.9 (14.0-20.8)	19.4 (15.7-24.4)	22.0 (17.4-28.5)	25.8 (19.5-34.8)	28.8 (21.1-40.2)
60-day	5.88 (5.20-6.77)	8.01 (7.08-9.24)	10.9 (9.62-12.6)	13.4 (11.7-15.6)	16.8 (14.3-20.3)	19.6 (16.3-24.1)	22.5 (18.2-28.3)	25.6 (20.2-33.1)	29.9 (22.7-40.4)	33.4 (24.5-46.6)

[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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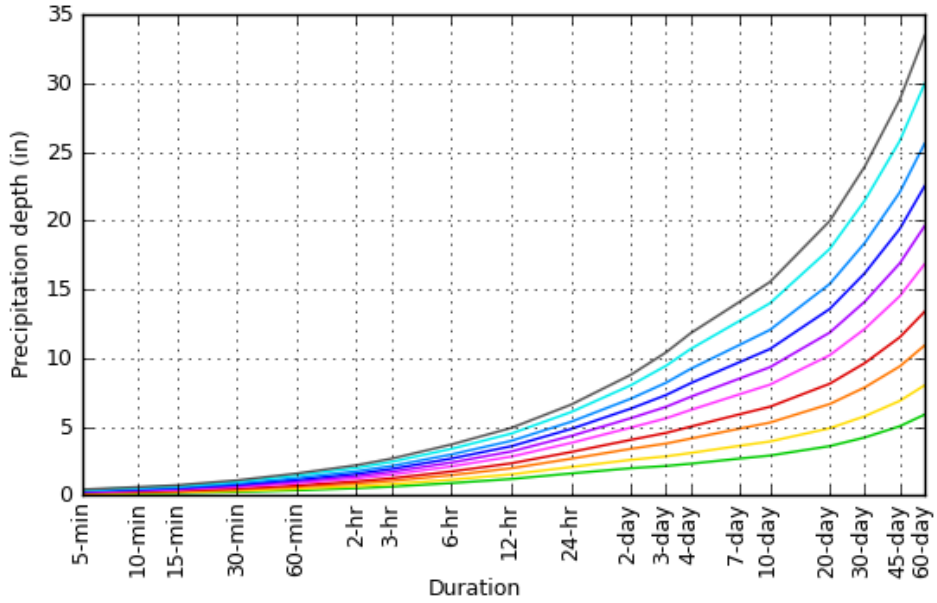
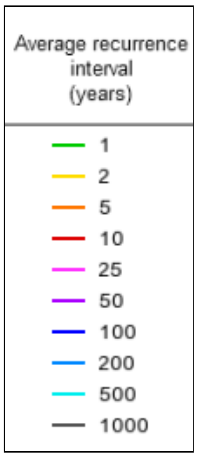
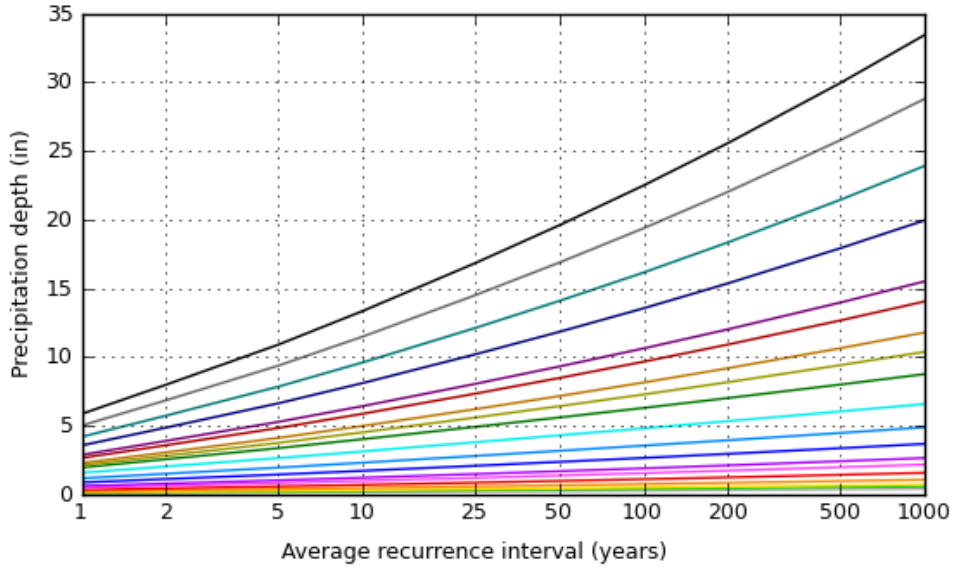
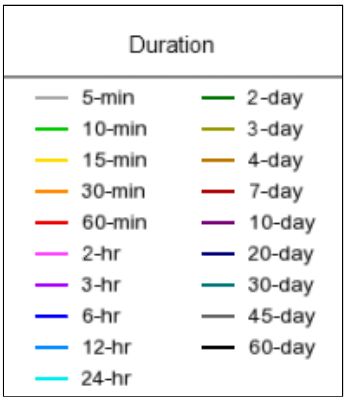
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 34.0667°, Longitude: -117.1972°









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Maps & aerials

Small scale terrain

Large scale terrain

Large scale map

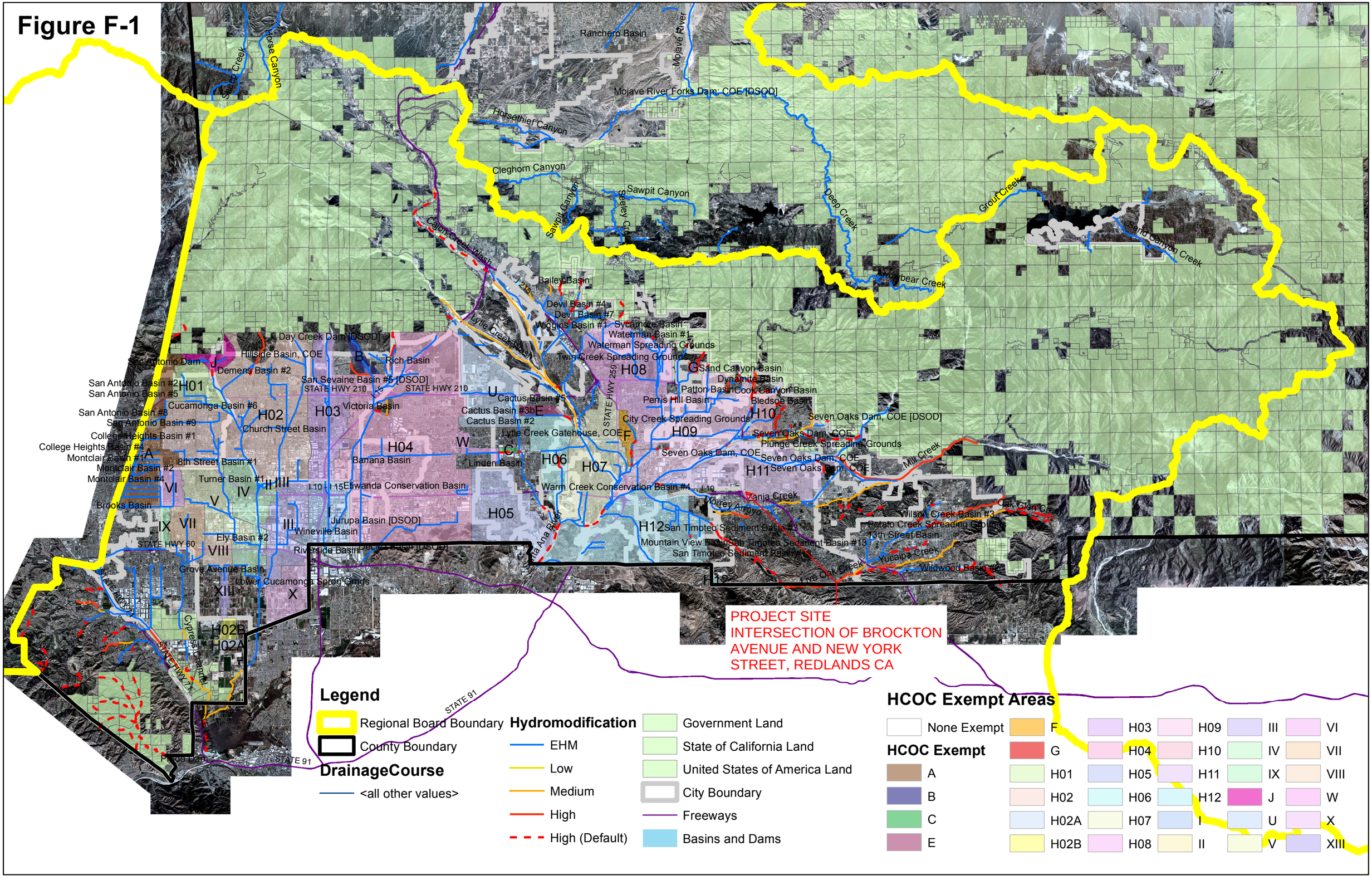
Large scale aerial

Back to Top

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

Section 6.4.2 HCOC and Pollutants of Concern

Figure F-1


Ranchero Basin
Mojave River
Mojave River Forks Dam: COE [DSOD]
Horsethief Canyon
Cleghorn Canyon
Sawpit Canyon
Deep Creek
Grout Creek
Bear Creek
Sand Canyon Creek
Cajon Creek Wash
Lytle Creek Wash
Bailey Basin
Devil Basin #4
Devil Basin #7
Wiggins Basin #1
Sycamore Basin
Waterman Basin #1
Waterman Spreading Grounds
Twin Creek Spreading Grounds
Day Creek Dam [DSOD]
Hillside Basin, COE
San Antonio Dam
Demens Basin #2
Rich Basin
San Sevaine Basin #5 [DSOD]
San Antonio Basin #2
San Antonio Basin #5
Cucamonga Basin #6
San Antonio Basin #8
San Antonio Basin #9
College Heights Basin #1
College Heights Basin #4
Montclair Basin #1
Montclair Basin #2
Montclair Basin #4
Church Street Basin
8th Street Basin #1
Turner Basin #1
Victoria Basin
Banana Basin
Etiwanda Conservation Basin
Jurupa Basin [DSOD]
Wineville Basin
Ely Basin #2
Riverside Basin
Brooks Basin
Grove Avenue Basin
Lower Cucamonga Sprdg Grnds
Cactus Basin #5
Cactus Basin #3b
Cactus Basin #2
Lytle Creek Gatehouse, COE
Linden Basin
Warm Creek Conservation Basin #4
Santa Ana River
Cypress Channel
Prado Dam
City Creek Spreading Grounds
Seven Oaks Dam, COE [DSOD]
Seven Oaks Dam, COE
Plunge Creek Spreading Grounds
Sand Canyon Basin
Dynamite Basin
Patton Basin
Cook Canyon Basin
Perris Hill Basin
Bledsoe Basin
Mill Creek
Zanja Creek
Morey Arroyo
Wilson Creek Basin #3
Potato Creek Spreading Grounds
3th Street Basin
Oak Glen C
San Timoteo Sediment Basin #3
San Timoteo Sediment Basin #13
Mountain View Basin
Yucaipa Creek
Wildwood Basin #2
NB Oak Creek
PROJECT SITE
INTERSECTION OF BROCKTON AVENUE AND NEW YORK STREET, REDLANDS CA
H01
H02
H03
H04
H05
H06
H07
H08
H09
H10
H11
H12
H02A
H02B
A
B
C
E
F
G
J
U
W
I
II
III
IV
V
VI
VII
VIII
IX
X
XIII
STATE HWY 60
STATE HWY 210
STATE HWY 259
STATE HWY 71
STATE 91
I 10
I 15
I 215
Legend
Regional Board Boundary
County Boundary
DrainageCourse
<all other values>
Hydromodification
EHM
Low
Medium
High
High (Default)
Government Land
State of California Land
United States of America Land
City Boundary
Freeways
Basins and Dams
HCOC Exempt Areas
None Exempt
HCOC Exempt
A
B
C
E
F
G
H01
H02
H02A
H02B
H03
H04
H05
H06
H07
H08
H09
H10
H11
H12
I
II
III
IV
V
VI
VII
VIII
IX
J
U
W
X
XIII

Hydromodification

A.1 Hydrologic Conditions of Concern (HCOC) Analysis

HCOC Exemption:

1. **Sump Condition:** All downstream conveyance channel to an adequate sump (for example, Prado Dam, Santa Ana River, or other Lake, Reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

2. **Pre = Post**: The runoff flow rate, volume and velocity for the post-development condition of the Priority Development Project do not exceed the pre-development (i.e, naturally occurring condition for the 2-year, 24-hour rainfall event utilizing latest San Bernardino County Hydrology Manual.

    a. Submit a substantiated hydrologic analysis to justify your request.

3. **Diversion to Storage Area**: The drainage areas that divert to water storage areas which are considered as control/release point and utilized for water conservation.

    a. See Appendix F for the HCOC Exemption Map and the on-line Watershed Geodatabase (http://sbcounty.permitrack.com/wap) for reference.

4. **Less than One Acre**: The Priority Development Project disturbs less than one acre. The Co-permittee has the discretion to require a Project Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The project disturbs less than one acre and is not part of a common plan of development.

5. **Built Out Area**: The contributing watershed area to which the project discharges has a developed area percentage greater than 90 percent.

    a. See Appendix F for the HCOC Exemption Map and the on-line Watershed Geodatabase (http://sbcounty.permitrack.com/wap) for reference.

Summary of HCOC Exempted Area

	HCOC Exemption reasoning				
	1	2	3	4	5
Area					
A			X		X
B			X		
C					X
E			X		
F					X
G			X		X
H01	X		X		
H02	X		X		
H02A	X		X		
H02B			X		
H03			X		
H04	X		X		
H05	X				
H06			X		
H07	X				
H08	X		X		
H09	X				
H10	X		X		
H11	X		X		
H12	X				
J			X		
U			X		
W			X		
I			X		
II			X		
III					X
IV			X		X
V			X*		
VI					X
VII					X
VIII			X		
IX					X
X			X		
XIII			X		

*Detention/Conservation Basin

Section 6.4.3 Geotechnical Report

Geotechnical Engineering Report

CarMax Redlands
Redlands, San Bernardino County, California
October 6, 2022
Terracon Project No. 60225109

Prepared for:
CenterPoint Integrated Solutions, LLC
Lakewood, Colorado

Prepared by:
Terracon Consultants, Inc.
Laguna Hills, California

October 6, 2022

CenterPoint Integrated Solutions, LLC
1626 Cole Boulevard, Suite 125
Lakewood, Colorado 80401

Attn: Ms. Katharine Ayerst
P: (561) 699-7166
E: kayerst@centerpoint-is.com

Re: Geotechnical Engineering Report
CarMax Redlands
New York Street
Redlands, San Bernardino County, California
Terracon Project No. 60225109

Dear Ms. Ayerst:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P60225109 dated August 3, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork, the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Smriti Dhital, P.E.*
Senior Staff Engineer
*Registered in North Carolina

Keith Askew, P.E., G.E.
Department Manager

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS (Boring Logs and Laboratory Data)
SUPPORTING INFORMATION (General Notes and Unified Soil Classification System)

Geotechnical Engineering Report

CarMax Redlands

New York Street

Redlands, San Bernardino County, California

Terracon Project No. 60225109

October 6, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed CarMax facility, which includes a single-story building with associated parking and drive areas to be located at New York Street in Redlands, San Bernardino County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Infiltration design and considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per CBC
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of twenty test borings to depths ranging from approximately 6½ to 51½ feet below existing site grades. Four of these borings were used for percolation testing (B-1, B-3, B-4, and B-7). Our scope also included laboratory testing on samples retrieved from the borings, and preparation of this report.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site is located west of New York Street and south of Lugonia Avenue in Redlands, San Bernardino County, California and is approximately 18.6-acres in size. Approximate coordinates for the center of the site are 34.0669°N, 117.1972°W
Existing Improvements	The site is currently undeveloped. There is an existing Home Depot bordering the northwest side of the site and an automobile dealership bordering the south side of the site. To the west of the property is Interstate 210 (I-210) with a slope (ascending from outside the site boundary to the freeway) varying in height from 15 to 20 feet, and an inclination on the order of 2:1 (horizontal:vertical). A drainage channel is also present outside of the western property boundary and adjacent/parallel to the I-210 toe of slope. The drainage channel and the slope are not part of the property and are separated by a fence; improvements to the channel or slope are not proposed. A sewer line extends east to west on the southern portion of the site and north to south on the western portion along the fence line.
Current Ground Cover	Exposed soil and vegetation.
Existing Topography (from Google Earth)	Majority of the site is relatively flat and has an approximate elevation ranging between 1297 feet and 1291 feet. To the west of the property is Interstate 210 (I-210) with a slope (ascending from outside the site boundary to the freeway) varying in height from 15 to 20 feet, and an inclination on the order of 2:1 (horizontal:vertical). A drainage channel is also present outside of the western property boundary and adjacent/parallel to the I-210 toe of slope.

PROJECT DESCRIPTION

Item	Description
Proposed Structure	According to the updated site plan dated September 2, 2022, the project will consist of developing a CarMax facility. The facility will include a 936 square-foot (SF) carwash building, staging and sales display areas of approximately 11.63 acres, and employee parking with light poles across the site.
Building Construction	Structural steel framing, metal studs with masonry veneer and load bearing reinforced CMU.
Maximum Loads	Buildings ■ Columns: 120 kips maximum ■ Walls: 4 kips per linear foot (klf) maximum ■ Slabs (assumed): 150 pounds per square foot (psf)
Finished Floor Elevation	Assumed within one foot of existing grade.
Grading/Slopes	Minimal cut/fill – assumed to be less than one foot (excluding remedial grading). Modifications to the existing slope and the drainage facility west of the property are not planned for the project.

Item	Description
Infiltration Systems	Based on our experience given the footprint of the site, a shallow infiltration system is anticipated.
Pavements	New pavements will be constructed and geotechnical recommendations for pavements are included in this project.
Traffic Loading[1]	Both rigid (concrete) and flexible (asphalt) pavement sections are to be considered. Anticipated traffic is as follows based on a design life of 20-years: ■ Light Duty Paving – 7,500 ESAL's (Traffic Index ~ 5) ■ Heavy Duty Paving – 75,000 ESAL's (Traffic Index ~ 6.5)

[1]Based on our local experience flexible pavement thickness design will be performed in accordance with Caltrans Methodology.

GEOTECHNICAL CHARACTERIZATION

Site Geology

The site is located on a broad terrace plain of the Santa Ana River in the San Bernardino Valley. The San Bernardino Valley in this area is bounded on the north by the San Bernardino Mountains, from which the Santa Ana River emanates.

The site is mapped as younger alluvial valley deposits of Holocene age. The Holocene-age alluvium was encountered in our exploratory borings and consists of interbeded sands with silts, silty sand and gravel lenses.

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The general characterization of the subsurface soil is as follows:

In general, the subsurface soil was characterized as loose to dense sand with varying amount of silt and loose to dense gravel with varying amount of silt and sand.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater

Groundwater was not observed in the borings while drilling, or for the short duration the boring remained open. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

According to data collected from the Water Data Library for the State of California from a nearby well, located approximately 0.5 mile northeast of the site in State Well Number 01S03W21H007S, historic groundwater levels between January 1, 2012 and June 04, 2019 were recorded at greater than 100 feet bgs.[1]

SEISMIC CONSIDERATIONS

The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that “In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites.” Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

[1] *Groundwater elevation was obtained from the Water Data Library for the State of California Well ID01S03W21H007S (http://wdl.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=37361).*

Description	Value
2019 California Building Code Site Classification (CBC) [1]	D [2]
Site Latitude (°N)	34.0669
Site Longitude (°W)	117.1972
S_s Spectral Acceleration for a 0.2-Second Period	1.795
S_1 Spectral Acceleration for a 1-Second Period	0.716
F_a Site Coefficient for a 0.2-Second Period	1.0
F_v Site Coefficient for a 1-Second Period	1.7

1. Seismic site classification in general accordance with the *2019 California Building Code*.
2. The 2019 California Building Code (CBC) utilizes a site soil profile extending to a depth of 100 feet for seismic site classification. The current scope does not include the 100-foot soil profile determination. Borings were extended to a maximum depth of 50½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

Typically, a site-specific ground motion study may generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in the seismically active southern California area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the San Andreas Fault (San Bernardino segment), which is considered to have the most significant effect at the site from a design standpoint, has a maximum earthquake magnitude of 8.2 and is located approximately 7.6 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the design peak ground acceleration (PGA_M) at the project site is 0.83g. Based on the USGS Unified Hazard Tool, the project site has a de-aggregated modal magnitude of 7.9. The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are

areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

Based on review of the County of San Bernardino Land use plan, the site is not located within a liquefaction risk zone. Other geologic hazards related to liquefaction, such as lateral spreading, are therefore also considered low; however, the site is subject to dry sand seismic settlement due to the potential for seismic shaking. To determine the magnitude of dry sand seismic settlement, we utilized the software "LiquefyPro" by CivilTech Software. The analysis was based on the soil data from the soil borings, a Peak Ground Acceleration (PGA) of 0.83g, and the deaggregated magnitude of 7.41 for the project site. Calculations assumed the groundwater was greater than the depth of our analysis based on the available data. Settlement analysis used the Tokimatsu M-correction method, and the fines percentage were corrected for liquefaction using the Stark/Olson method.

Based on calculation results, seismically induced total settlement of dry sands is estimated to be less than 1½ inches. Differential seismic dry sand settlement is anticipated to be less than 1 inch.

CORROSIVITY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary									
Boring	Sample Depth (ft)	Soil Description	Soluble Sulfate (%)	Sulfides (ppm)	Chlorides (ppm)	Red-Ox Potential (mV)	Electrical Resistivity (Ω-cm)	Total Salts (ppm)	pH
B-4	0-5	Silty Sand	0.01	--	80	726	13580	301	7.61

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

STORMWATER MANAGEMENT

Four in-situ percolation tests were performed to approximate depths of 5 and 10 feet bgs. A 2-inch-thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring. Gravel was used to backfill between the perforated pipes and the boring

sidewall. At the beginning of the test, the pipes were refilled with water and readings were taken at standardized time intervals. Percolation rates are provided in the following table:

TEST RESULTS			
Test Location (depth, feet bgs)	**Soil Classification**	**Average of the Last Three Measured Percolation Rate (in/hr.)**	**Correlated Infiltration Rate[1] (in/hr.)**
B-1 (0 to 10 ft)	Poorly graded sand	178.5	4.9
B-3 (0 to 5 ft)	Poorly graded sand with silt	219	4.7
B-4 (0 to 5 ft)	Silty Sand	73.5	1.5
B-7 (0 to 5 ft)	Silty Sand	225.8	4.6

1. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. The infiltration rates were correlated using the Porchet method.

The permeability tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Infiltration testing should be performed after construction to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of on-site soils. The actual infiltration rate may vary from the values reported here.

GEOTECHNICAL OVERVIEW

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

We assume the existing sewer line will be left in place. If so, special care should be taken while performing any earthwork or placement of new pavement above the sewer line.

Due to the presence of loose subgrade soils we recommend remedial grading consisting of the removal and replacement of the upper existing soils within the footprint of the building pads. Conventional shallow foundations may be used for the proposed sales and carwash buildings, and should bear on engineered fill placed as recommended in the Earthwork section of this report.

Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained. Exposed ground, extending at least 10 feet from the perimeter, should be sloped a minimum of 5% away from the building to provide positive drainage away from the structure. Grades around the structure should be periodically inspected and adjusted as part of the structure's maintenance program.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results** section), engineering analyses, and our current understanding of the proposed project.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing topsoil and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

We assume the existing sewer line will be left in place. If so, special care should be taken while performing any earthwork or placement of new pavement above the sewerline. Although evidence of underground facilities such as septic tanks, cesspools, or basements was not observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

Due to the relatively loose condition of the near surface soils, we recommend the subsurface soils within the proposed building pads be removed to a minimum depth of 4 feet below existing site grades, or 2 feet below bottom of proposed foundations, whichever is greater. Deeper removals may be required if loose soils are still encountered at a depth of 4 feet bgs. Grading for the proposed structures should incorporate the limits of the footings plus 3 feet beyond the outside edge of perimeter footings. Bottoms of excavations should be probed to determine if it is firm and unyielding. Localized deeper removals may be needed where soft soils at encountered at the excavation bottom. Compacted engineered fill should then be placed to design finish grade elevations.

Subgrade soils beneath exterior slabs and pavements should be removed to a depth of 1 foot below the proposed pavement section, including bottom of proposed aggregate base materials. Compacted engineered fill should then be placed to design elevations.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 6 inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas
- exterior slab areas

Imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	Percent Finer by Weight (ASTM C 136)
3”	100
No. 4 Sieve	50-100
No. 200 Sieve	10-40

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum expansion index* ..... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
On-site soils and low volume change imported fill:			
Beneath foundations:	90	0%	+3%
Beneath interior slabs:	90	0%	+3%

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
Fill greater than 5 feet in depth	95	0%	+3%
Miscellaneous backfill and behind retain walls:	90	0%	+3%
Beneath pavements:	95	0%	+3%
Utility Trenches*:	90	0%	+3%
Bottom of excavation receiving fill:	90	0%	+3%
Aggregate base (beneath pavements):	95	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas. Low-volume change imported soils should be used in structural areas.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

Utility Trenches

It is anticipated that the on-site soils and fill materials will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 should be used for bedding and shading of utilities, unless allowed or specified otherwise by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Imported low volume change soils should be used for trench backfill in structural areas.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

Construction Observation and Testing

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill. This testing frequency criteria may be adjusted during construction as specified by the Geotechnical Engineer of record.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

Provided the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Shallow Foundation Design Recommendations

DESCRIPTION	RECOMENDATION
Foundation Type	Spread footing foundations
Bearing Material	Engineered fill extended to minimum depth of 4 feet below the ground surface or 2 feet below the foundation.
Allowable Bearing Pressure	2,000 psf
Minimum Dimensions	Columns: 24 inches
Minimum Embedment Depth Below Finished Grade	18 inches
Total Estimated Settlement	1 inch
Estimated Differential Settlement	½ inch across 40 feet

Finished grade is defined as the lowest adjacent grade within five feet of the foundation for perimeter (or exterior) footings. The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

FLOOR SLABS

DESCRIPTION	RECOMMENDATION
Interior floor system	Slab-on-grade concrete
Floor slab support	Engineered fill extending to a minimum depth of 2 feet below the corresponding footing, or 4 feet below the existing ground surface.
Subbase	Minimum 4-inches of Aggregate Base
Modulus of subgrade reaction	200 pounds per square inch per inch (psi/in) (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Pavement Design Parameters

R-value testing conducted on a near-surface soil (0 to 5 feet) sample resulted in an R-value of 50 which was used to calculate the asphalt concrete pavement sections and the Portland cement concrete pavement sections. Additional R-value testing should be completed prior to pavement construction to verify the design R-value.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement calculations.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

	Recommended Pavement Section Thickness (inches) [1]	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 5	**Heavy Duty (Driveways and Delivery Areas) Assumed TI = 6.5**
Section I Portland Cement Concrete (600 psi Flexural Strength)	5.0-inches PCC over 4-inches Class II Aggregate Base	5-inches PCC over 4-inches Class II Aggregate Base
Section II Asphaltic Concrete	3-inches AC over 5-inches Class II Aggregate Base	4-inches AC over 4-inches Class II Aggregate Base

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.

These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. The project civil engineer should confirm minimum sections are in accordance with requirements from local agencies and jurisdictions. The pavement sections are expected to be functional with periodic maintenance and overlays if good drainage is provided and maintained.

All materials should meet the Caltrans Standard Specifications for Highway Construction. Aggregate base materials should meet the gradation and quality requirement of Class 2 Aggregate Base (¾ inch maximum) in Caltrans Standard Specifications, latest edition, Sections 25 through 29.

All concrete for rigid pavements should have a minimum flexural strength of 600 psi (4,250 psi Compressive Strength) and be placed with a maximum slump of four inches. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Pavement Construction Considerations

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the State of California Department of Transportation, or other approved local governing specifications.

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in

the geographic vicinity and at the time these services have been performed. No warranty or guarantee, express or implied, is made. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Borings	Boring Depth (feet)	Location
B-02, B-05, B-06, B-08, B-09 and B-10	21.5 to 51.5	Proposed carwash and service building
B-01, B-03, B-04 and B-07	6.5 to 11.5	Pavement and Percolation boring
B-11 to B-20	6.5 to 21.5	Pavement borings

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from Google Earth Pro. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted drill rig using continuous hollow stem flight augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling were collected during drilling in general accordance with the appropriate ASTM methods using Standard Penetration Testing (SPT) and sampling using either standard split-spoon method or Modified California Samplers. A sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer. In addition, we observed and recorded groundwater levels (or absence thereof) during drilling and sampling. The building borings (B-02, B-05, B-06, B-08 to B-10) were backfilled with cement grout. Pavement borings (B-01, B-03, B-04, B-07, B-11 to B-20) were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D7263 Standard Test Methods for Laboratory Determination of Dry Density (Unit Weight) of Soil Specimens
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM C136 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
- ASTM D2844-01 Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils
- Corrosivity Testing included pH, chlorides, sulfates, sulfides, Redox potential, and electrical lab resistivity

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION

CarMax- Redlands, CA ■ Redlands, CA
October 6, 2022 ■ Terracon Project No. 60225109

Terracon GeoReport

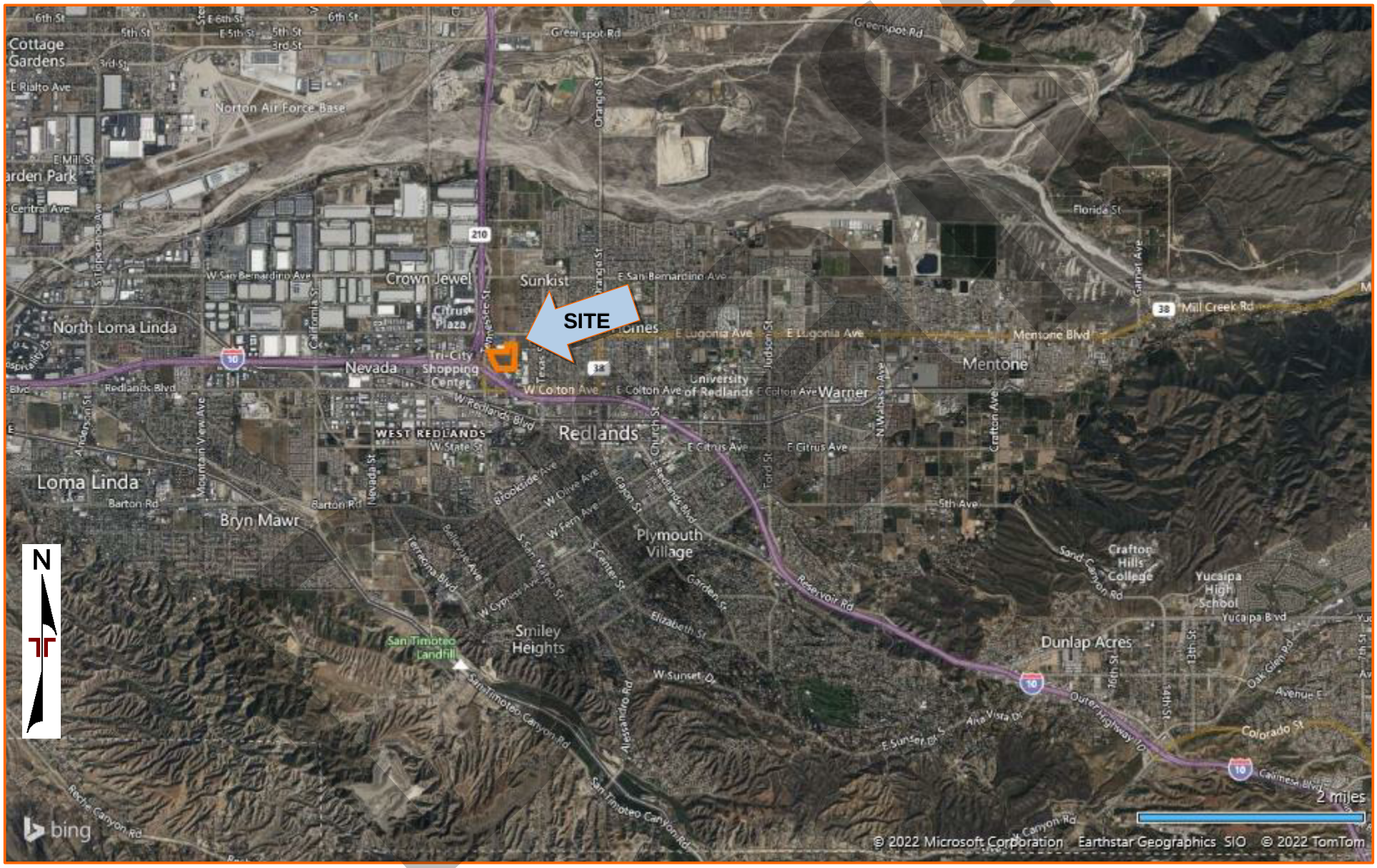


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: .

EXPLORATION PLAN

CarMax- Redlands, CA ■ Redlands, CA

October 6, 2022 ■ Terracon Project No. 60225109

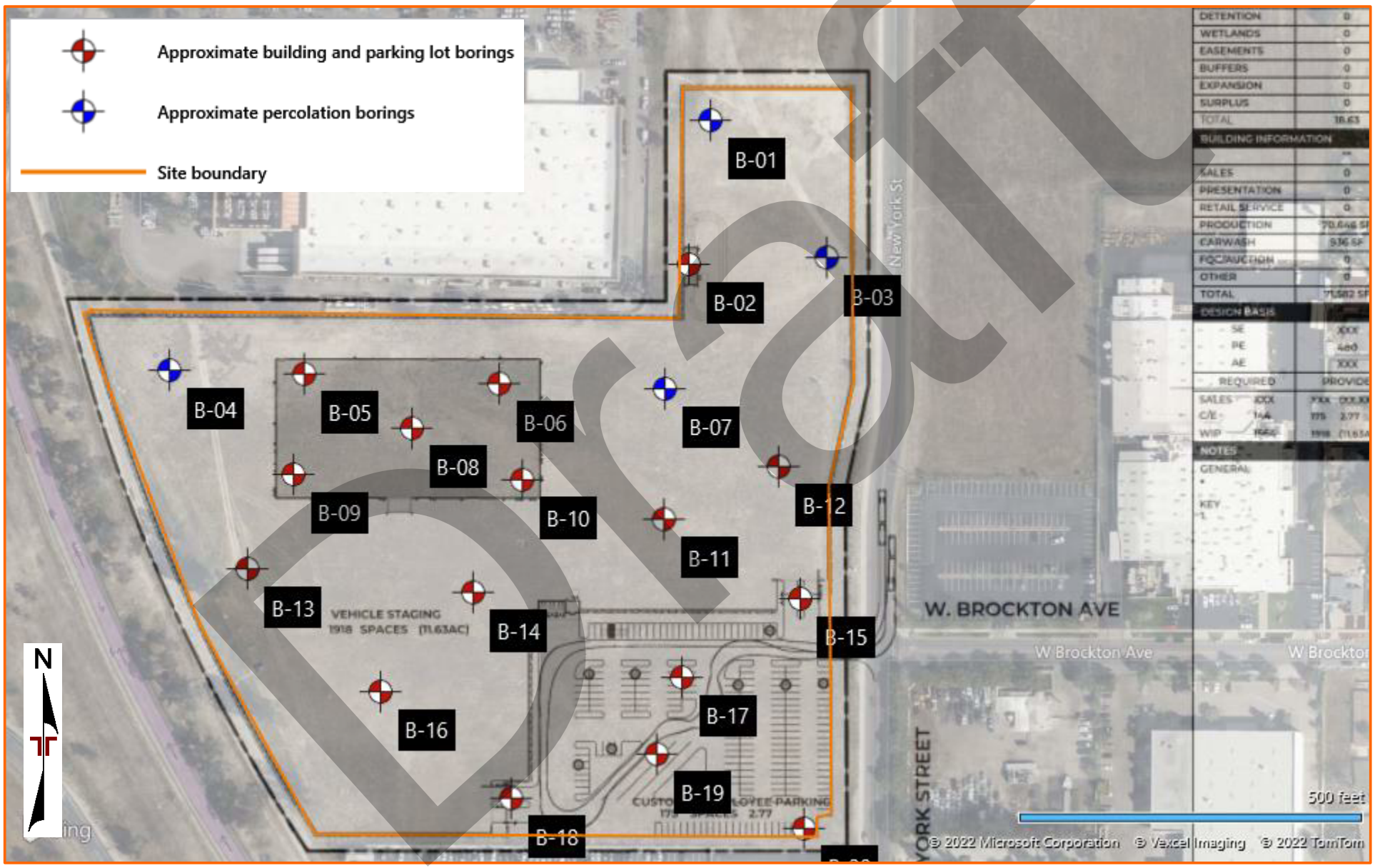


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SITE PLAN PROVIDED BY THE CLIENT

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0686° Longitude: -117.1964°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), trace gravel, light brown medium dense				1-6-7 N=13				
	5.0 **POORLY GRADED SAND (SP)**, trace silt, light brown, medium dense	5			3-5-9 N=14				4
	dense	10			14-16-18 N=34				
	11.5 ***Boring Terminated at 11.5 Feet***				5-17-20 N=37				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-2

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0680° Longitude: -117.1965°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light gray medium dense				8-7-15	1.4	109		
	5.0 **POORLY GRADED SAND (SP)**, trace silt and gravel, light gray with brown, medium dense	5			7-11-18	2.3	104		
					5-9-21	2.7			
		10			9-13-13				
	light greenish gray and brown	15			5-11-18 N=29				
	light gray with brown, dense	20			8-17-22 N=39				
	21.5 ***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-3

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0681° Longitude: -117.1958°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), light brown								
	loose				3-3-4 N=7				
	medium dense	5			3-5-6 N=11				5
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-4

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0676° Longitude: -117.1990°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), brown								
	medium dense				5-5-5 N=10				
	loose	5			3-4-3 N=7				20
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-5

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0676° Longitude: -117.1983°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown								
		medium dense				5-10-12	1.8			
			5			7-10-16	1.5	108		
7.5		**POORLY GRADED SAND (SP)**, light gray, medium dense				7-14-19	1.6			
			10			7-14-20	1.6			
15.0		**SILTY SAND (SM)**, light gray, medium dense	15			5-6-6 N=12				
			20			3-6-7 N=13				
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-6

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0676° Longitude: -117.1974°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown loose				5-5-7	2.3	103		
5.0		**SILTY GRAVEL (GM)**, brown and gray, loose	5			5-7-8				
7.5		**POORLY GRADED SAND WITH GRAVEL (SP)**, trace silt, light gray, medium dense				7-8-12	3.7	107		
			10			7-4-19				3
15.0		**POORLY GRADED SAND (SP)**, light gray, medium dense	15			4-8-10 N=18				
			20			5-11-15 N=26				
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-7

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0675° Longitude: -117.1966°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown								
		soft				2-2-2 N=4				
			5			2-1-2 N=3				21
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-8

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0674° Longitude: -117.1978°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0		**SILTY SAND (SM)**, light brown and gray, medium dense	5-8-11	2.5	103	
5			6-6-12			
7.5		**POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)**, trace silt and gravel, light gray, medium dense	3-15-16	1.8	100	
10			8-14-18			5
15.0		**SILTY SAND (SM)**, trace gravel, light gray, loose	4-4-4 N=8			31
20		medium dense	4-6-6 N=12			
25						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-8

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0674° Longitude: -117.1978°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel, light gray, loose *(continued)* light gray and brown			5-10-10 N=20				
30					4-5-12 N=17				
35.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, light grayish brown, dense			7-14-18 N=32				6
40		light gray, medium dense			9-9-12 N=21				7
45		gray			7-11-16 N=27				8
50									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-8

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 34.0674° Longitude: -117.1978° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), light grayish brown, dense *(continued)* 51.5 dense				12-20-20 N=40				
	Boring Terminated at 51.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-9

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0672° Longitude: -117.1984°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
POORLY GRADED SAND (SP), trace silt, light gray									
loose					4-4-8				3
trace silt and gravel, light gray, medium dense		5			7-9-11	1.6	99		
white and black, loose					4-7-8	1.9	105		
10.0		10							
WELL GRADED SAND WITH SILT (SP-SM), gray, medium dense					8-12-18				6
15.0		15							
POORLY GRADED SAND (SP), trace silt, light brownish gray, medium dense					5-8-6 N=14				
brownish gray, loose		20			3-3-6 N=9				
21.5									
Boring Terminated at 21.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-10

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0672° Longitude: -117.1973°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
SILTY SAND (SM), trace gravel, brown loose					4-5-5				
5.0		5							
POORLY GRADED SAND WITH GRAVEL (SP), trace silt, light gray, loose					3-6-7	1.9	111		
7.5									
POORLY GRADED SAND (SP), trace silt, light gray, medium dense					6-4-14				
		10			5-14-22	1.2	108		
loose		15			3-3-5 N=8				
medium dense		20			5-6-6 N=12				1
21.5									
Boring Terminated at 21.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-11

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0670° Longitude: -117.1966°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown loose				2-2-3 N=5				
	5.0	**POORLY GRADED SAND (SP)**, trace silt, light gray, loose	5			3-4-4 N=8				
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-12

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0672° Longitude: -117.1960°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND (SP), light brown loose	5			2-3-4 3-4-5				4
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-13

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0668° Longitude: -117.1986°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light brown loose	5			3-2-4 N=6 3-4-4 N=8				
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-14

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0667° Longitude: -117.1975°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light brown, loose				2-3-4 N=7			NP	
	5.0	5							
	POORLY GRADED SAND (SP), trace silt, light gray, medium dense				3-5-6 N=11				
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-15

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0667° Longitude: -117.1959°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY GRAVEL WITH SAND (GM), gray medium dense				4-5-5 N=10				
	5.0	5							
	POORLY GRADED SAND WITH SILT (SP-SM), gray with brown, loose				3-4-5 N=9				6
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-16

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0663° Longitude: -117.1979°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), trace silt, light brown								
		medium dense				4-5-5 N=10				
		gray, loose	5			3-3-5 N=8				
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-17

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0664° Longitude: -117.1965°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown								
		loose				5-5-9	1.4	110		
			5			5-6-7	2.5	114		
7.5										
		POORLY GRADED SAND (SP), trace silt, gray and white, medium dense				7-8-16	1.0			
10.0			10							
		SILTY SAND (SM), brown, medium dense				7-10-11				
		loose	15			2-3-5 N=8				
			20							
		medium dense				4-5-5 N=10				
21.5										
		Boring Terminated at 21.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-18

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0659° Longitude: -117.1973°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown loose				2-2-2 N=4				
	5.0		5							
		POORLY GRADED SAND (SP), trace silt, gray, medium dense				3-4-6 N=10				
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-19

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0661° Longitude: -117.1966°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light brown loose				4-6-7	1.1	106		
	5.0 **POORLY GRADED SAND (SP)**, trace silt, grayish brown, loose	5			4-5-7	2.4	105		4
	7.5 **POORLY GRADED SAND WITH GRAVEL (SP)**, trace silt, grayish brown, medium dense				5-7-25	1.5	118		
	10.0 **POORLY GRADED SAND (SP)**, trace silt, gray, medium dense	10			6-9-11				
	loose	15			4-4-5 N=9				
	medium dense	20			4-6-8 N=14				
	21.5 ***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

BORING LOG NO. B-20

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0658° Longitude: -117.1959°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), trace silt, gray							
		loose			4-7-9	0.9			
5		medium dense			6-9-15				
		trace cobbles			8-15-33	1.9	123		
10		light gray and brown			14-23-24				
15		trace silt, gray, dense			8-18-18 N=36				
20		trace silt and gravel, gray, medium dense			7-11-14 N=25				
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

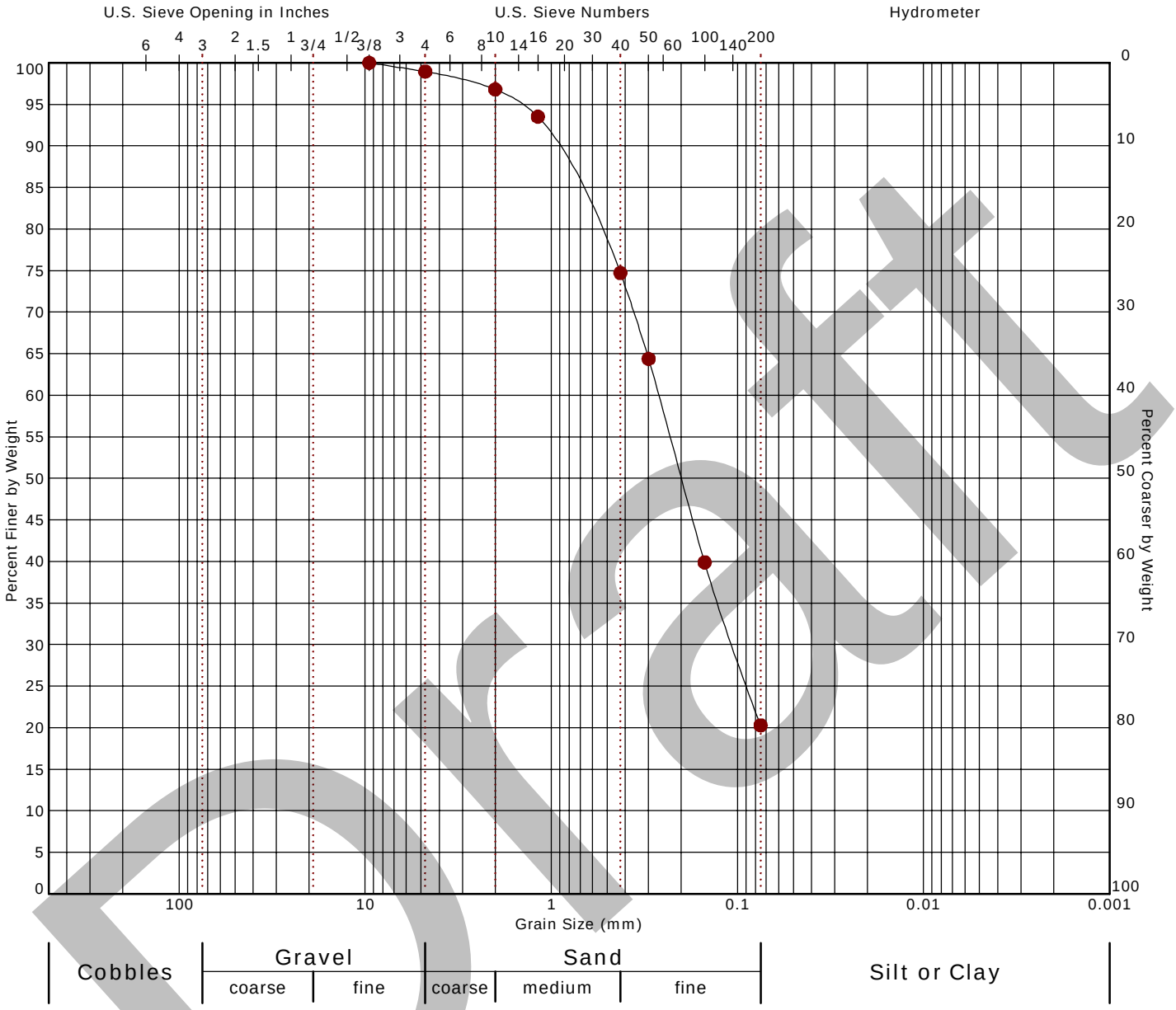
Project No.: 60225109

CarMax- Redlands
New York St | Redlands, CA
Terracon Project No. 60225109

Terracon
23041 Avenida De La Carlota
Ste 350
Laguna Hills, CA

Grain Size Distribution

ASTM D422 / ASTM C136



Boring ID	Depth (Ft)	Description		LL	PL	PI	Cc	Cu
B-4	5 - 6.5	Silty sand						

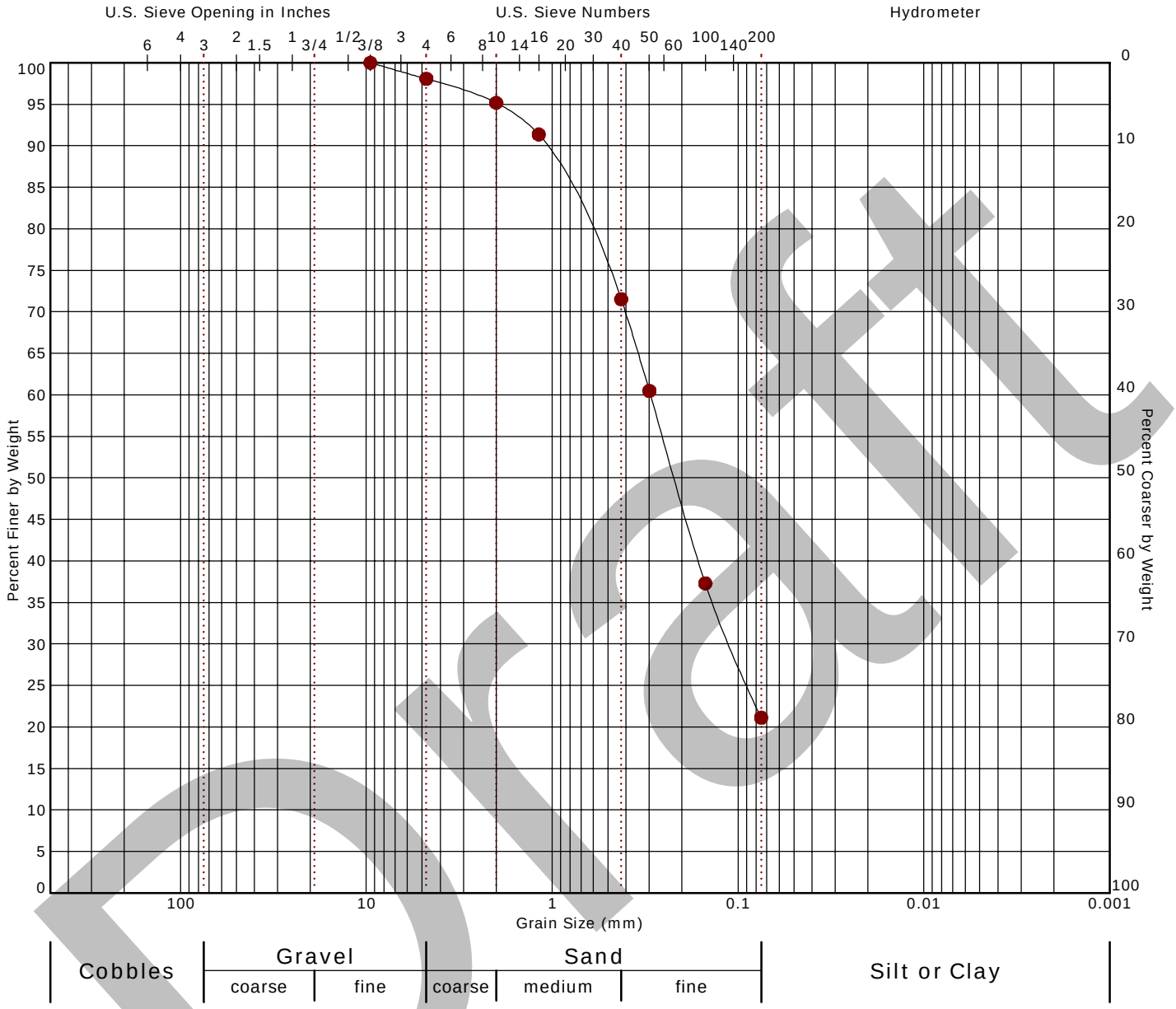
Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
B-4	5 - 6.5	9.5	0.265	0.106		0.0	1.1	78.7	20.3		

CarMax- Redlands
New York St | Redlands, CA
Terracon Project No. 60225109

Terracon
23041 Avenida De La Carlota
Ste 350
Laguna Hills, CA

Grain Size Distribution

ASTM D422 / ASTM C136

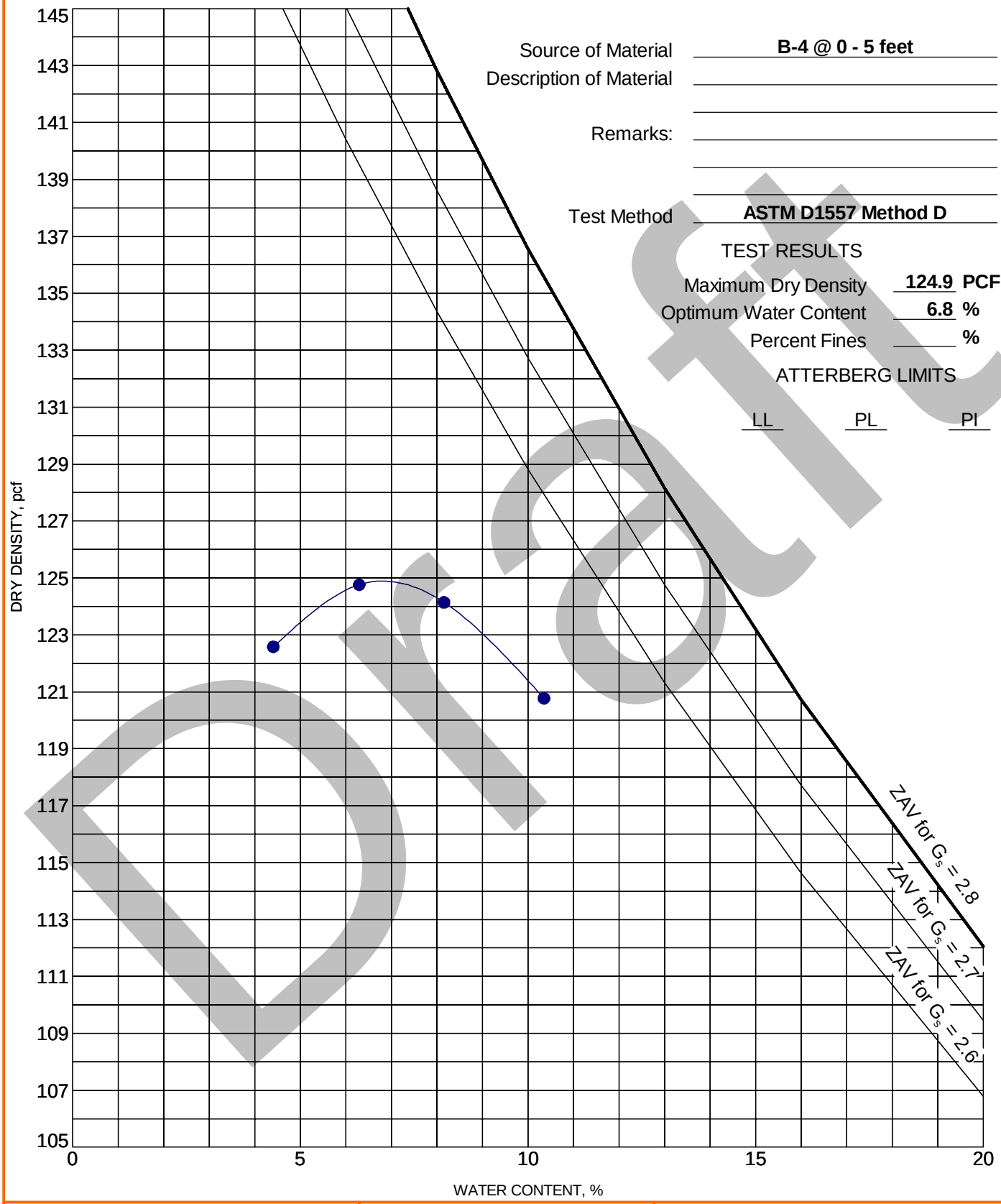


Boring ID	Depth (Ft)	Description		LL	PL	PI	Cc	Cu
B-7	5 - 6.5	Silty sand						

Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
B-7	5 - 6.5	9.5	0.296	0.11		0.0	1.9	77.0	21.1		

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-4 @ 0 - 5 feet**

Description of Material:

Remarks:

Test Method: **ASTM D1557 Method D**

TEST RESULTS

Maximum Dry Density	**124.9**	**PCF**
Optimum Water Content	**6.8**	**%**
Percent Fines		**%**

ATTERBERG LIMITS

LL	PL	PI

PROJECT: CarMax- Redlands

SITE: New York St
Redlands, CA

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

PROJECT NUMBER: 60225109

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

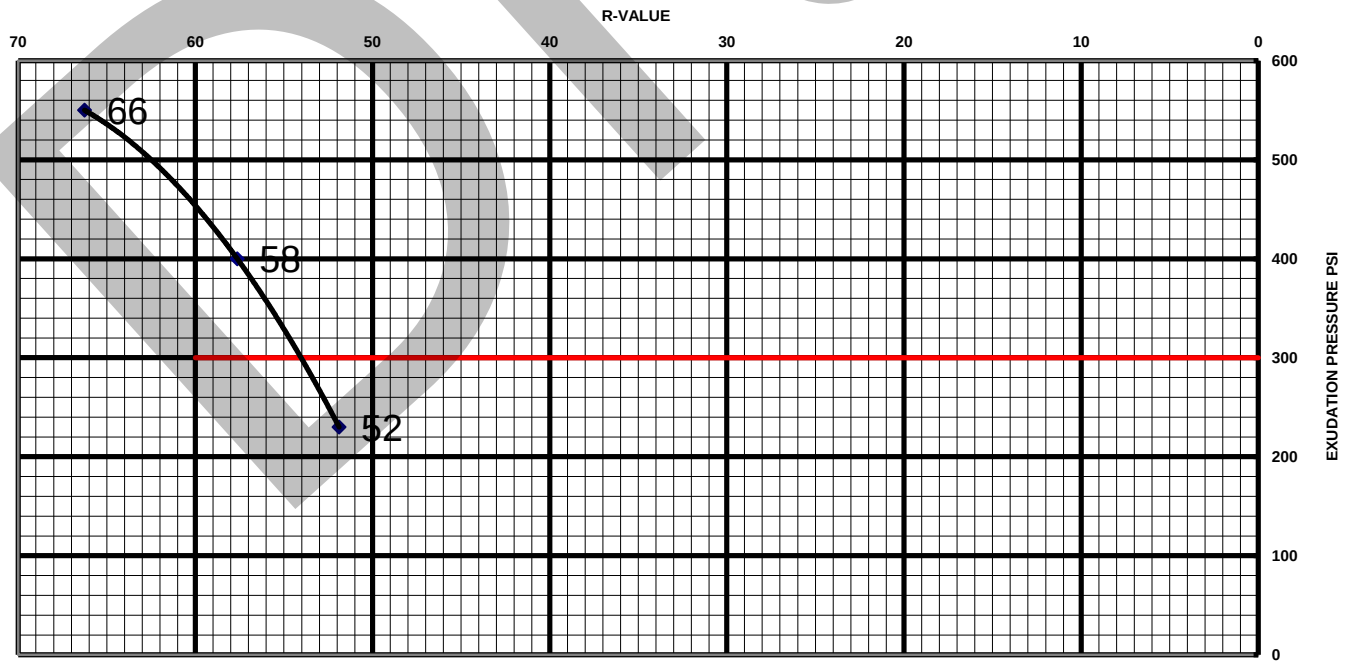
Job No. 60225109
Date. 9/30/2022

LABORATORY RECORD OF TESTS MADE ON BASE, SUBBASE, AND BASEMENT SOILS

CLIENT: **CenterPoint Integrated Solutions, LLC**
PROJECT **Carmax-Redlands**
LOCATION: **Redlands, CA**
R-VALUE # : **B3A**
T.I. :

	A	B	C	D
COMPACTOR AIR PRESSURE P.S.I.	350	350	350	
INITIAL MOISTURE %	1.1	1.1	1.1	
WATER ADDED, ML	80	77	75	
WATER ADDED %	7.7	7.4	7.2	
MOISTURE AT COMPACTION %	8.8	8.5	8.3	
HEIGHT OF BRIQUETTE	2.50	2.47	2.48	
WET WEIGHT OF BRIQUETTE	1052	1049	1054	
DENSITY LB. PER CU.FT.	117.2	118.6	118.9	
STABILOMETER PH AT 1000 LBS.	33	27	20	
2000 LBS.	50	43	33	
DISPLACEMENT	5.10	5.00	4.90	
R-VALUE	52	58	66	
EXUDATION PRESSURE	230	400	550	
THICK. INDICATED BY STAB.	0.00	0.00	0.00	
EXPANSION PRESSURE	0	0	0	
THICK. INDICATED BY E.P.	0.00	0.00	0.00	

EXUDATION CHART



R-Value: **54**

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client
CenterPoint Integrated Sp;itopms. LLC

Project
CarMax
Redlands, CA

Sample Submitted By: Terracon (60) **Date Received:** 9/28/2022 **Lab No.: 22-0683**

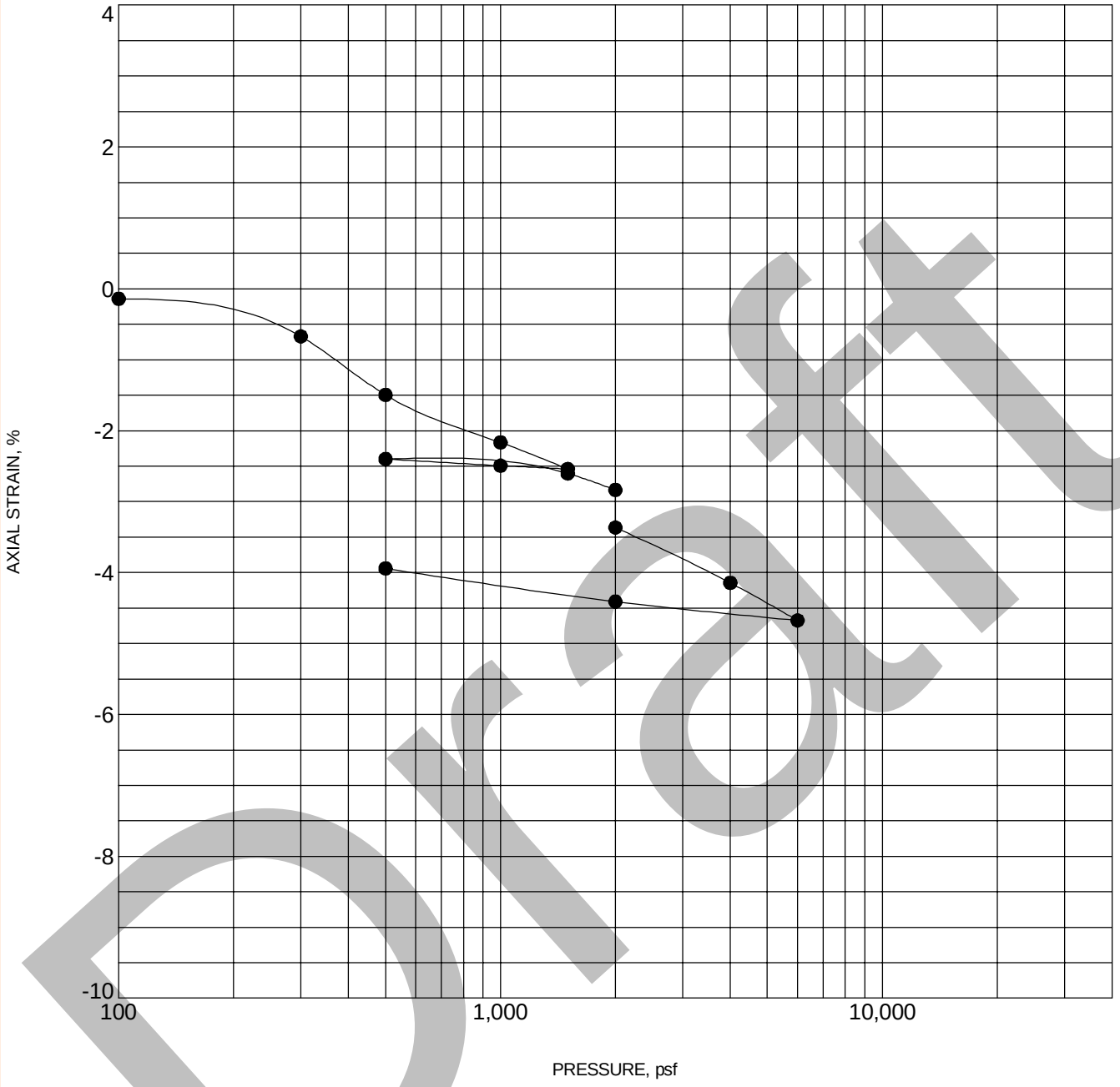
Results of Corrosion Analysis

Sample Number	B-4A
Sample Location	B-4
Sample Depth (ft.)	--
pH Analysis, ASTM G 51	7.61
Water Soluble Sulfate (SO4), ASTM C 1580 (percent %)	0.01
Sulfides, AWWA 4500-S D, (mg/kg)	Nil
Chlorides, ASTM D 512, (mg/kg)	80
Red-Ox, ASTM G 200, (mV)	+726
Total Salts, AWWA 2540, (mg/kg)	301
Resistivity, ASTM G 57, (ohm-cm)	13580

Analyzed By:
Nathan Campo
Engineering Technician II

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-8	5 - 6.5 ft	Silty sand	91	9.5

NOTES:

PROJECT: CarMax- Redlands

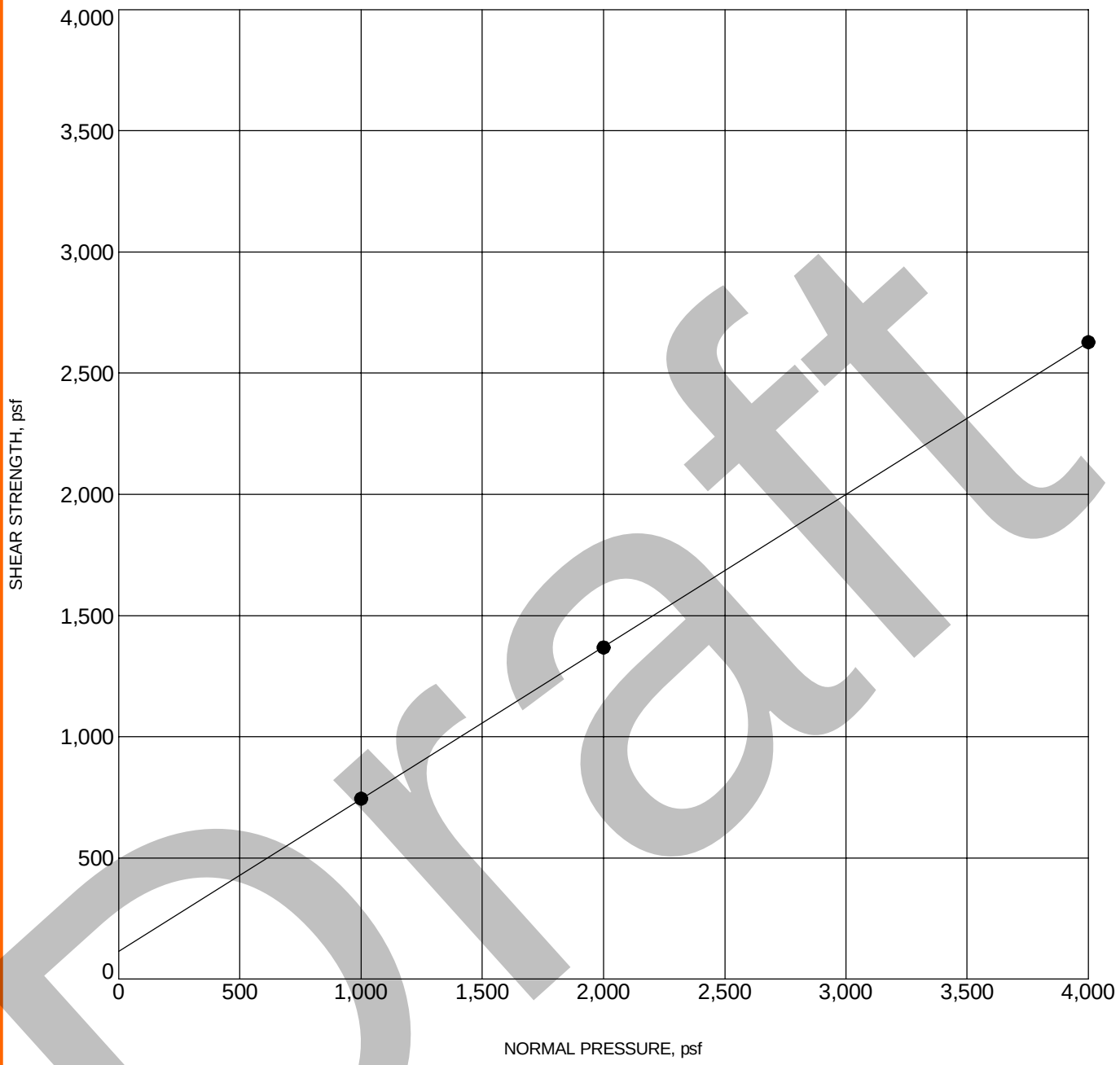
PROJECT NUMBER: 60225109

SITE: New York St
Redlands, CA

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

DIRECT SHEAR TEST ASTM D3080



Specimen Identification		Classification	γ_d, pcf	WC,%	c, psf	$\phi°$
● B-10	2.5ft	Silty sand (SM)	105	0	114	32

PROJECT: CarMax- Redlands

SITE: New York St
Redlands, CA

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

PROJECT NUMBER: 60225109

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_DIRECT_SHEAR 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/4/22

SUPPORTING INFORMATION

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

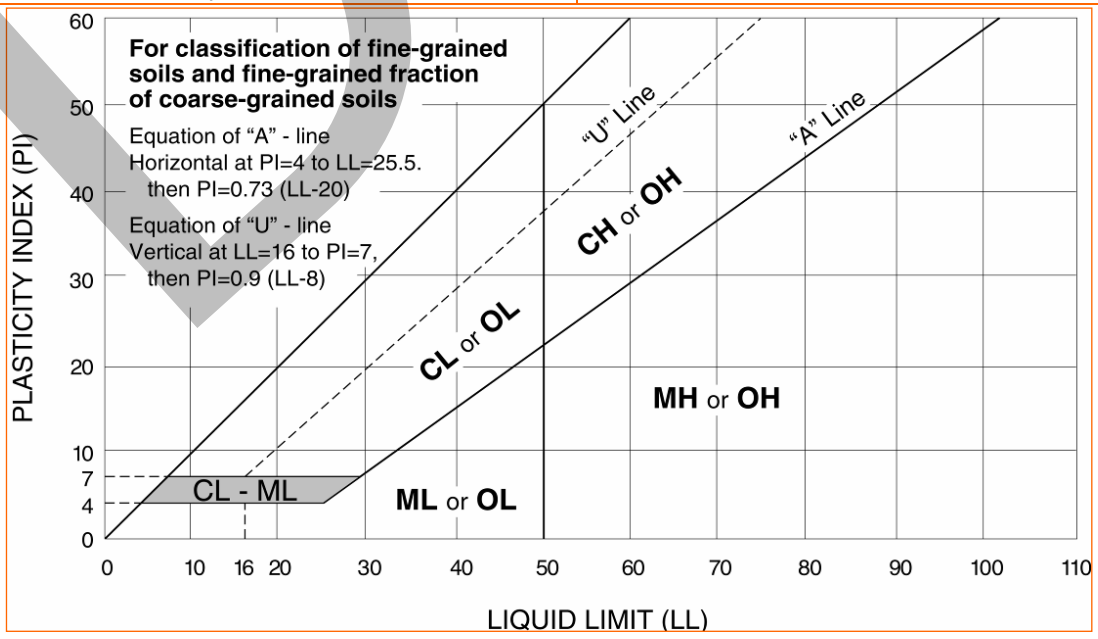
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



GENERAL NOTES

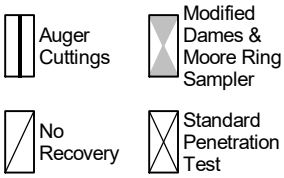
DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

CarMax- Redlands ■ Redlands, CA

Terracon Project No. 60225109

Terracon GeoReport

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

Section 6.4.4 Calculations

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	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.0
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.00
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					2.00
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					1.5
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$					0.75

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Infiltration tests reveal 1.5 in/hr rates at boring near the proposed detention basin. The Geotechnical Engineering Report and Infiltration Testing was completed by Terracon Consultants, Inc. and is included in Section 6.4.3.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.