

MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

Wal-Mart 1915 Fuel - Yucca Valley

CUP 01-25 | EA 02-25

Prepared for:

Wal-Mart Stores, Inc.

58501 29 Palms Hwy

Yucca Valley, CA 92284

479-871-7573

Prepared by:

Kimley-Horn

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Orange, CA 92868

714-939-1030

Submittal Date: 3/27/2025

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Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Final Approval Date: _____

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for Wal-Mart Stores, Inc., by Kimley-Horn. The WQMP is intended to comply with the requirements of the Town of Yucca Valley and the Phase II Small MS4 General Permit for the Mojave River Watershed. 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 the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town 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."

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):	APN: 0601201540000	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			CUP 01-25 EA 02-25
Owner's Signature			
Owner Name: Wal-Mart Stores, Inc.			
Title			
Company			
Address	Mail Stop 0505 702 SW 8th St., Bentonville, AR 72716		
Email			
Telephone #	479-871-7573		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):	APN: 0601201540000	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			CUP 01-25 EA 02-25

"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 the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: Jacob Glaze, P.E.		PE Stamp Below
Title	Professional Engineer	
Company	Kimley-Horn	
Address	1100 W Town and Country Rd, Suite 700, Orange, CA 92868	
Email	jacob.glaze@kimley-horn.com	
Telephone #	714-705-1374	
Signature		
Date	3/27/2025	

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Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: <http://cms.sbcounty.gov/dpw/Land/NPDES.aspx> to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name		Wal-Mart 1915 Fuel - Yucca Valley			
Project Owner Contact Name:					
Mailing Address:	Mail Stop 0505 702 SW 8th St., Bentonville, AR 72716	E-mail Address:		Telephone:	479-871-7573
Permit/Application Number(s):	CUP 01-25 EA 02-25	Tract/Parcel Map Number(s):	APN: 0601201540000		
Additional Information/ Comments:					
Description of Project:	<p>The project site is located on the northeast area of the existing Wal-Mart Supercenter parking lot, located in the Town of Yucca Valley. The project proposes a fuel station with 6 dispensers, overhead canopy, underground storage tanks, and associated convenience store. Proposed work includes hardscape pavement, landscaping and wet and dry utility trenching.</p> <p>The hydrologic soil type was not determined in the Geotech report and USDA Web Soil Survey does not have further information; therefore, soil type D will be assumed. Stormwater runoff will be collected by nearby catch basins and area drains and be conveyed to the existing detention basin on the north side of the parcel. For fueling areas, prior to entering the detention basin, the runoff collected from there will enter an Aqua-Swirl Trash Capture AS-2 Hydrodynamic separator for pre-treatment.</p> <p>The proposed project will provide more pervious surfaces than the existing conditions. The forms in this WQMP will reflect the proposed project area's impact to the site but will be compared to previous conditions to ultimately show that the proposed conditions does not increase the stormwater volumes to the existing detention basin on the north side of the Wal-Mart Parcel.</p>				

<p>Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.</p>	
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Section 2 Project Description

2.1 Project Information

The WQMP shall 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.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single-family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

Form 2.1-1 Description of Proposed Project					
1 Regulated Development Project Category (Select all that apply):					
<input type="checkbox"/> #1 New development involving the creation of 5,000 ft ² or more of impervious surface collectively over entire site	<input checked="" type="checkbox"/> #2 Significant re-development involving the addition or replacement of 5,000 ft ² or more of impervious surface on an already developed site	<input type="checkbox"/> #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	<input type="checkbox"/> #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface		
<input type="checkbox"/> Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) <i>Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.</i>					
2 Project Area (ft ²):	61,805	3 Number of Dwelling Units:	N/A	4 SIC Code:	5541
5 Is Project going to be phased? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.</i>					

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:

All proposed BMP's for the project site will be maintained by Wal-Mart Stores, Inc.

Maintenance of the WQMP facilities will be the responsibility of the property owner:

Wal-Mart Stores, Inc.

Mail Stop 0505 702 SW 8th Street, Bentonville, AR 72716

Phone: (479)-871-7573

The owner may choose to contract the appropriate employers for the maintenance of stormwater to whom will provide the proper equipment if the current general manager of the existing Wal-Mart Supercenter does not have the proper equipment and/or knowledge to do so. Any future property owner(s) will succeed Wal-Mart Stores, Inc., as the entity responsible for long term maintenance.

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Wild bird and pet waste, garbage
Nutrients - Phosphorous	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Fertilizers, food waste, & garbage
Nutrients - Nitrogen	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Fertilizer & waste
Noxious Aquatic Plants	E <input type="checkbox"/>	N <input checked="" type="checkbox"/>	The proposed development does not include any areas where water will be standing long enough to allow the growth of aquatic plants.
Sediment	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Driveways, rooftops, sidewalks, paved areas, & landscape
Metals	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Cars, trucks, & parking areas
Oil and Grease	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Leaking vehicles, & other related fueling activities
Trash/Debris	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Poorly managed trash containers & parking areas
Pesticides / Herbicides	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Landscape areas
Organic Compounds	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Cars & trucks
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMPs 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 Drainage Management Areas (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. A map presenting the DMAs must be included as an appendix to the WQMP document.***

Form 3-1 Site Location and Hydrologic Features			
Site coordinates take GPS measurement at approximate center of site	Latitude 34.13398	Longitude -116.38341	Thomas Bros Map page
¹ San Bernardino County climatic region: <input checked="" type="checkbox"/> Desert			
² Does the site have more than one drainage area (DA): Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>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</i>			
Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA		
DMA A1 to Existing Detention Basin	Proposed circulation and convenience store areas will have stormwater runoff sheet flow into nearby catch basins and is routed directly to the existing detention basin north of the project area.		
DMA A2 to Existing Detention Basin	Proposed canopy area will have stormwater runoff sheet flow via valley gutters to an area drain and is routed through a hydrodynamic separator for pre-treatment prior to reaching the existing detention basin		
DMA A3 to Existing Detention Basin	Proposed underground fuel storage will have stormwater runoff sheet flow via valley gutters to an area drain and is routed through a hydrodynamic separator for pre-treatment prior to reaching the existing detention basin		

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft ²)	61,805			
2 Existing site impervious area (ft ²)	55,390			
3 Antecedent moisture condition <i>For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf</i>	II			
4 Hydrologic soil group <i>Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf</i>	D			
5 Longest flowpath length (ft)	267			
6 Longest flowpath slope (ft/ft)	0.025			
7 Current land cover type(s) <i>Select from Fig C-3 of Hydrology Manual</i>	Commercial Landscaping, Commercial Paved Lot			
8 Pre-developed pervious area condition: <i>Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating</i>	Good			

Form 3-3 Watershed Description for Drainage Area	
Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Yucca Creek
Applicable TMDLs http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	N/A
303(d) listed impairments http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	N/A
Environmentally Sensitive Areas (ESA) Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	N/A
Hydromodification Assessment	<input checked="" type="checkbox"/> Yes Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal The project is in a hydromodification zone, but there is no additional volume to account for. Therefore, forms 4.2-2 through form 4.2-5. <input type="checkbox"/> No, project is within an HCOC exempt area

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

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.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The current owner/developer and future owners and their POA shall be familiar with the contents of this WQMP and County & City ordinances and brochures and furnish copies of these documents to all future property owners.
N2	Activity Restrictions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Property owners and their tenants or occupants shall not be allowed to discharge chemicals, chemical residues, wastewater or other prohibited discharges listed in the City Stormwater Ordinance, to the outside, paved areas of the site, or store chemicals or other pollutant sources in non-spill containers or covered facilities as stipulated in the CC&Rs.
N3	Landscape Management BMPs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The POA and their landscape maintenance contractor shall inspect the irrigation system, plant health, and erosion problems after each landscape procedure and shall report all repairs and problems to the POA.
N4	BMP Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The POA shall inspect for standing water in underground chamber systems, 48 hours after significant storm events. BMP maintenance shall be performed per the schedule in Form 5-1, as needed to restore free drainage and maintain all other Source Control BMPs.
N5	Title 22 CCR Compliance (How development will comply)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The POA will file appropriate hazardous material disclosures, if any storage is conducted, and must comply with all Title 22 CCR, Chapter 29 regulations.
N6	Local Water Quality Ordinances	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The POA shall ensure that all maintenance activities at the site comply with the City Stormwater Ordinance, through the implementation of BMPs.
N7	Spill Contingency Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Building operators shall prepare specific plans based on materials on site for the cleanup of spills. Plans shall mandate stock piling of cleanup materials, notification of agencies, disposal, documentation, etc.
N8	Underground Storage Tank Compliance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compliance to be maintained by property owners or future property owners, and/or their tenants
N9	Hazardous Materials Disclosure Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The current owner and the future POA shall prohibit the storage of hazardous materials.

Form 4.1-1 Non-Structural Source Control BMPs

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The current owners or future POA shall require all fire code requirements to be implemented at this project site.
N11	Litter/Debris Control Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The property owners, POA and their contractor shall pick up litter and sweep and clean the existing trash enclosure weekly. The trash enclosure is designed to divert all flows around the dumpsters and shall be roofed. The HOA shall contract with a refuse company to have the dumpsters emptied on a weekly basis, at a minimum.
N12	Employee Training	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The POA shall require all maintenance contractors to train their employees in stormwater BMP implementation.
N13	Housekeeping of Loading Docks	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	There are no dock areas
N14	Catch Basin Inspection Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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 HOA 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 storm drains.
N15	Vacuum Sweeping of Private Streets and Parking Lots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The paved areas and common open areas of the project site shall be swept and cleaned weekly by the POA's contractor.
N16	Other Non-structural Measures for Public Agency Projects	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This development is not a part of a Public Agency Project.
N17	Comply with all other applicable NPDES permits	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The developer of this site shall comply with all BMP implementation requirements of the City for stormwater discharge during construction of this project and shall file for a permit coverage under the Statewide General Construction Stormwater Permit, prior to beginning construction/grading activities at this site. Following occupancy, owners, tenants, and POA shall comply with SB County MS4 Permit requirements, enforced by the City.

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)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	A painted message "No Dumping-Drains to River" shall be placed on each catch basin by the developer. The message shall be inspected annually & repainted as necessary by the POA.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This development does not include the storage of materials outdoors.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Stormwater flows are diverted away from the trash enclosure. All dumpsters shall have working lids which shall be kept closed at all times. Trash enclosures shall comply with CASQA SD-32 and shall have doors and a solid 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)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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 devices and ET or weather-based controllers. Landscape and irrigation shall be consistent with the State Model Water Efficient Landscape Ordinance and the City landscape development standards. Plants installed will be arranged according to similar hydrozones and meet the required water budget for the site. Shade trees shall be used to intercept rainwater and reduce heat gain on paving.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	<input checked="" type="checkbox"/>	<input type="checkbox"/>	All landscaped areas shall comply with depressed grading requirements by finish grading to a minimum of 1" below pavement grades or top of curb.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	All slopes shall be hard lined, rip-rapped or vegetated to provide erosion protection and prevent sediment transport.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	There are no loading docks
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Maintenance bays are not proposed as a part of this development, and no maintenance activities will be allowed on site.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Vehicle wash areas are not provided as part of this development and outdoor vehicle/equipment washing shall be prohibited by the owners and their POA..

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S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Outdoor processing is not associated with the proposed development.
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)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Outdoor equipment is not associated with the proposed development.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Fueling areas are not included as part of the proposed development.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No hillsides will require re-vegetation as part of the proposed development.
S14	Wash water control for food preparation areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The proposed development does not include food preparation areas.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The proposed development does not include community car wash areas.

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

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 Site Design Practices Checklist
<p>Site Design Practices <i>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</i></p>
<p>Minimize impervious areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: The proposed conditions will provide more pervious than the existing conditions, with additional landscaping</p>
<p>Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Additional pervious is proposed and storm water from impervious surfaces will enter the existing detention basin</p>
<p>Preserve existing drainage patterns and time of concentration: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: The flow of the existing conditions were maintained to be flowing from south to north</p>
<p>Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Rooftop drains for the canopy and fuel store are routed to the existing detention basin</p>
<p>Use of Porous Pavement.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: This project does not proposed pervious pavement</p>
<p>Protect existing vegetation and sensitive areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Existing vegetation will be preserved or replaced if found to be inadequate</p>
<p>Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes <input type="checkbox"/> No <input type="checkbox"/> Explanation: If applicable, appropriate plant types will be used to re-vegetate</p>
<p>Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Exisitng detention basin is fenced off</p>

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Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: Vegetated drainage swales are not feasible for the proposed development due to the development being primarily a paved parking lot
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Landscaping areas will be staked off after rough grading has been completed to prevent excessive compaction
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: N/A
Stream Setbacks. Includes a specified distance from an adjacent stream: : Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: N/A

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -

<http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795>

Recommended High-Desert Plants -

<http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553>

Mojave Water Agency:

Desert Ranch: <http://www.mojavewater.org/files/desertranchgardenprototype.pdf>

Summertree: <http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf>

Thornless Garden: <http://www.mojavewater.org/files/thornlessgardenprototype.pdf>

Mediterranean Garden: <http://www.mojavewater.org/files/mediterraneangardenprototype.pdf>

Lush and Efficient Garden: <http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf>

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – <http://hdawac.org/save-outdoors.html>

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evapotranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small 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 from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification 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): 61,805	2 Imperviousness after applying preventative site design practices (Imp%): 79%	3 Runoff Coefficient (Rc): <u>0.587</u> $R_c = 0.858(Imp\%)^{0.3} - 0.78(Imp\%)^{0.2} + 0.774(Imp\%) + 0.04$
4 Determine 1-hour rainfall depth for a 2-year return period P _{2yr-1hr} (in): 0.428 http://hdsc.nws.noaa.gov/hdsc/pfds/so/sca_pfds.html		
5 Compute P ₆ , Mean 6-hr Precipitation (inches): 0.529 <i>P₆ = Item 4 * C₁, where C₁ is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)</i>		
6 Drawdown Rate <i>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.</i>		24-hrs <input type="checkbox"/> 48-hrs <input checked="" type="checkbox"/>
7 Compute design capture volume, DCV (ft ³): 3,140 ** <i>DCV = 1/12 * [Item 1 * Item 3 * Item 5 * C₂], where C₂ is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)</i> <i>Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2</i>		

**The proposed area's impact to the northern basin decreases the design capture volume from existing. 3,140 cubic feet can be compared to the existing areas impact of 3,879 cubic feet, meaning there was a decrease to the overall site's DCV of 739 cubic feet. See appendix for full DCV calculations for the existing area being disturbed.

Form 4.2-2 Summary of Hydromodification Assessment (DA 1)			
Is the change in post- and pre- condition flows captured on-site? : Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			
If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below (<i>Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1</i>)			
If "No," then proceed to Section 4.3 BMP Selection and Sizing			
Condition	Runoff Volume (ft ³)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	1 <i>Form 4.2-3 Item 12</i>	2 <i>Form 4.2-4 Item 13</i>	3 <i>Form 4.2-5 Item 10</i>
Post-developed	4 <i>Form 4.2-3 Item 13</i>	5 <i>Form 4.2-4 Item 14</i>	6 <i>Form 4.2-5 Item 14</i>
Difference	7 <i>Item 4 – Item 1</i>	8 <i>Item 2 – Item 5</i>	9 <i>Item 6 – Item 3</i>

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Difference (as % of pre-developed)	10 % <i>Item 7 / Item 1</i>	11 % <i>Item 8 / Item 2</i>	12 % <i>Item 9 / Item 3</i>
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Form 4.2-3 Hydromodification 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): $S = (1000 / \text{Item } 5) - 10$				9 Initial abstraction, I _a (in): $I_a = 0.2 * \text{Item } 7$			
6 Post-Developed area-weighted CN:	8 Post-developed soil storage capacity, S (in): $S = (1000 / \text{Item } 6) - 10$				10 Initial abstraction, I _a (in): $I_a = 0.2 * \text{Item } 8$			
11 Precipitation for 10 yr, 24 hr storm (in): Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/qa/sca_pfds.html								
12 Pre-developed Volume (ft ³): $V_{pre} = (1 / 12) * (\text{Item sum of Item } 3) * [(\text{Item } 11 - \text{Item } 9)^2 / ((\text{Item } 11 - \text{Item } 9 + \text{Item } 7))$								
13 Post-developed Volume (ft ³): $V_{pre} = (1 / 12) * (\text{Item sum of Item } 3) * [(\text{Item } 11 - \text{Item } 10)^2 / ((\text{Item } 11 - \text{Item } 10 + \text{Item } 8))$								
14 Volume Reduction needed to meet hydromodification requirement, (ft ³): $V_{hydro} = (\text{Item } 13 * 0.95) - \text{Item } 12$								

Form 4.2-4 Hydromodification 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 <i>Use additional forms if there are more than 4 DMA</i>				Post-developed DA1 <i>Use additional forms if there are more than 4 DMA</i>			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) <i>Use Form 3-2 Item 5 for pre-developed condition</i>								
2 Change in elevation (ft)								
3 Slope (ft/ft), $S_o = \text{Item 2} / \text{Item 1}$								
4 Land cover								
5 Initial DMA Time of Concentration (min) <i>Appendix C-1 of the TGD for WQMP</i>								
6 Length of conveyance from DMA outlet to project site outlet (ft) <i>May be zero if DMA outlet is at project site outlet</i>								
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) $V_{fps} = (1.49 / \text{Item 9}) * (\text{Item 7}/\text{Item 8})^{0.67} * (\text{Item 3})^{0.5}$								
11 Travel time to outlet (min) $T_t = \text{Item 6} / (\text{Item 10} * 60)$								
12 Total time of concentration (min) $T_c = \text{Item 5} + \text{Item 11}$								
13 Pre-developed time of concentration (min):	<i>Minimum of Item 12 pre-developed DMA</i>							
14 Post-developed time of concentration (min):	<i>Minimum of Item 12 post-developed DMA</i>							
15 Additional time of concentration needed to meet hydromodification requirement (min):	$T_{C-Hydro} = (\text{Item 13} * 0.95) - \text{Item 14}$							

Form 4.2-5 Hydromodification 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 $I_{peak} = 10^{(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 / 60)}$						
2 Drainage Area of each DMA (Acres) <i>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)</i>						
3 Ratio of pervious area to total area <i>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)</i>						
4 Pervious area infiltration rate (in/hr) <i>Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP</i>						
5 Maximum loss rate (in/hr) $F_m = Item 3 * Item 4$ <i>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)</i>						
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 <i>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)</i>	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): <i>Maximum of Item 8, 9, and 10 (including additional forms as needed)</i>						
11 Post-developed Q_p at T_c for DMA A: <i>Same as Item 8 for post-developed values</i>	12 Post-developed Q_p at T_c for DMA B: <i>Same as Item 9 for post-developed values</i>			13 Post-developed Q_p at T_c for DMA C: <i>Same as Item 10 for post-developed values</i>		
14 Peak runoff from post-developed condition confluence analysis (cfs): <i>Maximum of Item 11, 12, and 13 (including additional forms as needed)</i>						
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): $Q_{p-hydro} = (Item 14 * 0.95) - Item 10$						

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretenention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small 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 Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

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 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 Form 4.3-2 to determine the feasibility of applicable Site Design 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 Site Design 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 site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

- 1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;
- 2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and
- 3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)	
Feasibility Criterion – Complete evaluation for each DA on the Project Site	
<p>¹ Would infiltration BMP pose significant risk for groundwater related concerns? <i>Refer to Section 5.3.2.1 of the TGD for WQMP</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p>² Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):</p> <ul style="list-style-type: none"> • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten 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. 	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p>³ Would infiltration of runoff on a Project site violate downstream water rights?</p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p>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?</p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p>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)?</p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p>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? <i>See Section 3.5 of the TGD for WQMP and WAP</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p>⁷ Any answer from Item 1 through Item 3 is “Yes”: <i>If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.</i> <i>If no, then proceed to Item 8 below.</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<p>⁸ Any answer from Item 4 through Item 6 is “Yes”: <i>If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.</i> <i>If no, then proceed to Item 9, below.</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<p>⁹ All answers to Item 1 through Item 6 are “No”: <i>Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.</i> <i>Proceed to Form 4.3-2, Site Design BMPs.</i></p>	

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures 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 Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs 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 BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design 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 <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 2-5; If no, proceed to Item 6</i>	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
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) $V = \text{Item 2} * \text{Item 3} * (0.5/12)$, assuming retention of 0.5 inches of runoff			
5 Sum of retention volume achieved from impervious area dispersion (ft ³):		$V_{\text{retention}} = \text{Sum of Item 4 for all BMPs}$	
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; if no, proceed to Item 14</i>	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
7 Ponding surface area (ft ²)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft ²)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft ³) $V_{\text{retention}} = (\text{Item 7} * \text{Item 8}) + (\text{Item 9} * \text{Item 10} * \text{Item 11})$			
13 Runoff volume retention from on-lot infiltration (ft ³):		$V_{\text{retention}} = \text{Sum of Item 12 for all BMPs}$	

Form 4.3-2 Site Design BMPs (DA 1)

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

14 Implementation of Street Trees: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 14-18. If no, proceed to Item 19</i>	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft ²)			
17 Runoff volume retention from street trees (ft ³) <i>V_{retention} = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches</i>			
18 Runoff volume retention from street tree BMPs (ft ³): <i>V_{retention} = Sum of Item 17 for all BMPs</i>			
19 Total Retention Volume from Site Design BMPs: <i>Sum of Items 5, 13 and 18</i>			

4.3.3 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 C 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 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).

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

- 1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.
- 2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).
- 3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.
- 4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

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

1 Remaining LID DCV not met by site design BMP (ft ³): $V_{unmet} = \text{Form 4.2-1 Item 7} - \text{Form 4.3-2 Item 19}$			
BMP Type <i>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</i>	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
2 Infiltration rate of underlying soils (in/hr) <i>See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods</i>			
3 Infiltration safety factor <i>See TGD Section 5.4.2 and Appendix D</i>			
4 Design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$			
5 Ponded water drawdown time (hr) <i>Copy Item 6 in Form 4.2-1</i>			
6 Maximum ponding depth (ft) <i>BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details</i>			
7 Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$			
8 Infiltrating surface area, SA_{BMP} (ft ²) <i>the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP</i>			
9 Amended soil depth, d_{media} (ft) <i>Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details</i>			
10 Amended soil porosity			
11 Gravel depth, d_{media} (ft) <i>Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details</i>			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) <i>Typical ~ 3hrs</i>			
14 Above Ground Retention Volume (ft ³) $V_{retention} = \text{Item 8} * [\text{Item 7} + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$			
15 Underground Retention Volume (ft ³) <i>Volume determined using manufacturer's specifications and calculations</i>			
16 Total Retention Volume from LID Infiltration BMPs: $(\text{Sum of Items 14 and 15 for all infiltration BMP included in plan})$			
17 Fraction of DCV achieved with infiltration BMP: $\% \text{ Retention\%} = \text{Item 16} / \text{Form 4.2-1 Item 7}$			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes <input type="checkbox"/> No <input type="checkbox"/> <i>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.</i>			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. 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 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)		
<p>1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft³): <i>Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16</i></p>	<p>List pollutants of concern <i>Copy from Form 2.3-1.</i></p>	
<p>2 Biotreatment BMP Selected <i>(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)</i></p>	<p style="text-align: center;">Volume-based biotreatment <i>Use Forms 4.3-5 and 4.3-6 to compute treated volume</i></p> <p><input type="checkbox"/> Bioretention with underdrain <input type="checkbox"/> Planter box with underdrain <input type="checkbox"/> Constructed wetlands <input type="checkbox"/> Wet extended detention <input type="checkbox"/> Dry extended detention</p>	<p style="text-align: center;">Flow-based biotreatment <i>Use Form 4.3-7 to compute treated flow</i></p> <p><input type="checkbox"/> Vegetated swale <input type="checkbox"/> Vegetated filter strip <input type="checkbox"/> Proprietary biotreatment</p>
<p>3 Volume biotreated in volume based biotreatment BMP (ft³): <i>Form 4.3-5 Item 15 + Form 4.3-6 Item 13</i></p>	<p>4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft³): <i>Item 1 – Item 3</i></p>	<p>5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % <i>Item 4 / Item 1</i></p>
<p>6 Flow-based biotreatment BMP capacity provided (cfs): <i>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)</i></p>		
<p>7 Metrics for MEP determination:</p> <ul style="list-style-type: none"> • 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: <input type="checkbox"/> <i>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.</i> 		

Form 4.3-5 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains			
Biotreatment BMP Type <i>(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)</i>	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
1 Pollutants addressed with BMP <i>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</i>			
2 Amended soil infiltration rate <i>Typical ~ 5.0</i>			
3 Amended soil infiltration safety factor <i>Typical ~ 2.0</i>			
4 Amended soil design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$			
5 Ponded water drawdown time (hr) <i>Copy Item 6 from Form 4.2-1</i>			
6 Maximum ponding depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
7 Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$			
8 Amended soil surface area (ft ²)			
9 Amended soil depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
10 Amended soil porosity, <i>n</i>			
11 Gravel depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
12 Gravel porosity, <i>n</i>			
13 Duration of storm as basin is filling (hrs) <i>Typical ~ 3hrs</i>			
14 Biotreated Volume (ft ³) $V_{biotreated} = \text{Item 8} * [(\text{Item 7}/2) + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: <i>Sum of Item 14 for all volume-based BMPs included in this form</i>			

Form 4.3-6 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type <i>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.</i>	DA DMA BMP Type		DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin <i>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</i>				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft ²) $A_{bottom} = \text{Item 2} * \text{Item 3}$				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft ²) $A_{surface} = (\text{Item 2} + (2 * \text{Item 5} * \text{Item 6})) * (\text{Item 3} + (2 * \text{Item 5} * \text{Item 6}))$				
8 Storage volume (ft ³) <i>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</i> $V = \text{Item 6} / 3 * [\text{Item 4} + \text{Item 7} + (\text{Item 4} * \text{Item 7})^{0.5}]$				
9 Drawdown Time (hrs) <i>Copy Item 6 from Form 2.1</i>				
10 Outflow rate (cfs) $Q_{BMP} = (\text{Item } 8_{forebay} + \text{Item } 8_{basin}) / (\text{Item } 9 * 3600)$				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft ³) $V_{biotreated} = (\text{Item } 8_{forebay} + \text{Item } 8_{basin}) + (\text{Item } 10 * \text{Item } 11 * 3600)$				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : <i>(Sum of Item 12 for all BMP included in plan)</i>				

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

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, 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 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)	
1	Total LID DCV for the Project DA-1 (ft ³): Δ = -731 cu. Ft. <i>Copy Item 7 in Form 4.2-1</i>
2	On-site retention with site design BMP (ft ³): <i>Copy Item 18 in Form 4.3-2</i>
3	On-site retention with LID infiltration BMP (ft ³): <i>Copy Item 16 in Form 4.3-3</i>
4	On-site biotreatment with volume based biotreatment BMP (ft ³): <i>Copy Item 3 in Form 4.3-4</i>
5	Flow capacity provided by flow based biotreatment BMP (cfs): <i>Copy Item 6 in Form 4.3-4</i>
6	<p>LID BMP performance criteria are achieved if answer to any of the following is "Yes":**</p> <ul style="list-style-type: none"> • Full retention of LID DCV with site design or infiltration BMP: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>If yes, sum of Items 2, 3, and 4 is greater than Item 1</i> • 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 <input type="checkbox"/> No <input type="checkbox"/> <i>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</i> ▪ On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes <input type="checkbox"/> No <input type="checkbox"/> <i>If yes, Form 4.3-1 Items 7 and 8 were both checked yes</i>
7	<p>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:</p> <ul style="list-style-type: none"> • Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: <input type="checkbox"/> <i>Checked yes if Form 4.3-4 Item 7 is checked yes, Form 4.3-4 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, $V_{alt} = (Item\ 1 - Item\ 2 - Item\ 3 - Item\ 4 - Item\ 5) * (100 - Form\ 2.4-1\ Item\ 2)\%$</i> • Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: <ul style="list-style-type: none"> 1) Equal or greater amount of runoff infiltrated or evapotranspired; <input type="checkbox"/> 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; <input type="checkbox"/> 3) Equal or greater protection against shock loadings and spills; <input type="checkbox"/> 4) Equal or greater accessibility and ease of inspection and maintenance. <input type="checkbox"/>

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DA 1)	
<p>1 Volume reduction needed for hydromodification performance criteria (ft³):</p> <p><i>(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1</i></p>	<p>2 On-site retention with site design and infiltration, BMP (ft³): <i>Sum of Form 4.3-8 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 hydromodification volume reduction</i></p>
<p>3 Remaining volume for hydromodification volume capture (ft³): <i>Item 1 – Item 2</i></p>	<p>4 Volume capture provided by incorporating additional on-site BMPs (ft³):</p>
<p>5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p><i>If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:</i></p> <ul style="list-style-type: none"> • Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP <input type="checkbox"/> • 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 <input type="checkbox"/> 	
<p>6 Form 4.2-2 Item 12 less than or equal to 5%: Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p><i>If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:</i></p> <ul style="list-style-type: none"> • Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs <input type="checkbox"/> 	

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, 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 Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

- 1) Equal or greater amount of runoff infiltrated or evapotranspired;
- 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;
- 3) Equal or greater protection against shock loadings and spills;
- 4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs 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 a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance			
(use additional forms as necessary)			
BMP	Responsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Onsite storm drain catch basins	Property Owner	Onsite catch basins shall be inspected quarterly for debris buildup and evidence of illegal dumping and shall be cleaned whenever debris/sediment accumulates. Removal can be accomplished by vac-truck or other equally effective methods.	Quarterly
Underground Infiltration System	Property Owner	Regular inspections of system to observe sediment build up and infiltration capacity. Cleaning of accumulated trash, debris, and sediments as determined by inspections. Cleaning is recommended during dry weather. See manufacturer recommendations for additional maintenance activities.	Monthly and within 48 hours following a significant storm event to verify there is no standing water in the chambers
Hydrodynamic Separator	Property Owner	Visual inspection and debris removed quarterly per manufacturer recommendations.	Quarterly
Landscape Maintenance	Property Owner	Maintain landscape area vegetation, slope protection and grades, adjacent to hardscape and prevent discharge of landscape maintenance waste into storm drains.	Weekly
Litter Control	Property Owner	Maintain roofed waste collection areas and vacuum-sweep drive aisles and parking areas to remove potential stormwater contamination before anticipated storm events.	Weekly/Monthly
Anti-Dumping Stenciling & Signage	Property Owner	Visual inspection and replacement of damaged or illegible stenciling and signage over on-site catch basins	Annually

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

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

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

6.2 Electronic Data Submittal

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

6.3 Post Construction

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

6.4 Other Supporting Documentation

- 6.4.1 Calculations
- 6.4.2 NOAA Precipitation Data
- 6.4.3 Education Materials
- 6.4.4 Construction Plans

Variable	Factor/Formula	Proposed	Unit
Ratio of impervious surface/total site surface	(imp%)	79%	
R _C = runoff coefficient	$0.858(\text{imp}\%)^3 - 0.78(\text{imp}\%)^2 + 0.774(\text{imp}\%) + 0.04 =$	0.587	
P ₆	**P ₆ = 2-yr, 1- hr depth*1.2371 =	0.529	in
Detention Volume- inches	P ₀ = a * C _{BMP} * P ₆ =	0.610	inches
Drawdown rate of basin/trench (a)	1.582 for 24-hr drawdown or 1.963 for 48-hr drawdown =	1.963	in
Project Total Area (ac)	(A)	1.42	ac
Design Capture Volume, cu. ft. (DCV)	V ₀ = [(P ₀ * A)/12]*43560 =	3140.445	cu.ft.

**For P₆ value, use site coordinates and NOAA website to determine project's average 2-yr, 1 hr storm
For this location the depth is 0.428"

Proposed Area

	SF	AC
Total Area	61805	1.41885
Impervious Area	48770	1.1196051
Pervious	13035	0.2992424
impervious ratio =	0.789094733	
2-year, 1 Hour Rainfall Depth=	0.428 in	

Variable	Factor/Formula	Proposed	Unit
Ratio of impervious surface/total site surface	(imp%)	90%	
R _C = runoff coefficient	$0.858(\text{imp}\%)^3 - 0.78(\text{imp}\%)^2 + 0.774(\text{imp}\%) + 0.04 =$	0.725	
P ₆	**P ₆ = 2-yr, 1- hr depth*1.2371 =	0.529	in
Detention Volume- inches	P ₀ = a * C _{BMP} * P ₆ =	0.753	inches
Drawdown rate of basin/trench (a)	1.582 for 24-hr drawdown or 1.963 for 48-hr drawdown =	1.963	in
Project Total Area (ac)	(A)	1.42	ac
Design Capture Volume, cu. ft. (DCV)	V ₀ = [(P ₀ * A)/12]*43560 =	3879.892	cu.ft.

Existing Area

	SF	AC
Total Area	61805	1.41885
Impervious Area	55390	1.2715794
Pervious	6415	0.1472681
Impervious ratio =	0.896205809	
2-year, 1 Hour Rainfall Depth=	0.428 in	



NOAA Atlas 14, Volume 6, Version 2
Location name: Yucca Valley, California, USA*
Latitude: 34.1323°, Longitude: -116.3844°
Elevation: 3215 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

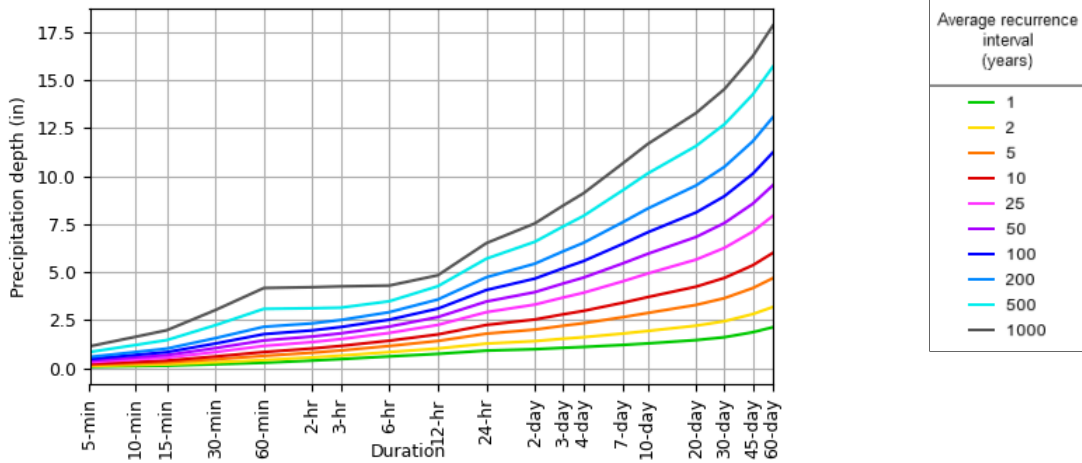
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.079 (0.065-0.096)	0.117 (0.097-0.143)	0.176 (0.145-0.216)	0.231 (0.189-0.285)	0.318 (0.252-0.406)	0.396 (0.307-0.516)	0.485 (0.367-0.648)	0.590 (0.434-0.810)	0.845 (0.597-1.21)	1.14 (0.779-1.69)
10-min	0.113 (0.093-0.137)	0.168 (0.139-0.205)	0.252 (0.208-0.309)	0.331 (0.271-0.409)	0.456 (0.361-0.582)	0.567 (0.440-0.739)	0.696 (0.526-0.929)	0.846 (0.623-1.16)	1.21 (0.855-1.73)	1.64 (1.12-2.42)
15-min	0.136 (0.113-0.166)	0.203 (0.168-0.248)	0.305 (0.252-0.374)	0.400 (0.328-0.495)	0.551 (0.436-0.704)	0.686 (0.532-0.894)	0.841 (0.637-1.12)	1.02 (0.753-1.40)	1.46 (1.03-2.10)	1.98 (1.35-2.93)
30-min	0.208 (0.172-0.254)	0.310 (0.257-0.379)	0.466 (0.385-0.571)	0.612 (0.501-0.756)	0.843 (0.667-1.08)	1.05 (0.813-1.37)	1.29 (0.973-1.72)	1.56 (1.15-2.15)	2.24 (1.58-3.20)	3.03 (2.06-4.48)
60-min	0.288 (0.238-0.351)	0.428 (0.354-0.523)	0.644 (0.531-0.788)	0.845 (0.691-1.04)	1.16 (0.920-1.48)	1.45 (1.12-1.89)	1.78 (1.34-2.37)	2.16 (1.59-2.96)	3.09 (2.18-4.42)	4.18 (2.85-6.18)
2-hr	0.401 (0.332-0.490)	0.567 (0.469-0.693)	0.810 (0.668-0.993)	1.03 (0.843-1.27)	1.36 (1.08-1.74)	1.65 (1.28-2.15)	1.97 (1.49-2.63)	2.34 (1.72-3.20)	3.42 (2.20-4.46)	4.22 (2.88-6.24)
3-hr	0.476 (0.394-0.581)	0.660 (0.546-0.807)	0.926 (0.764-1.14)	1.16 (0.951-1.44)	1.52 (1.20-1.94)	1.82 (1.41-2.37)	2.14 (1.62-2.86)	2.51 (1.85-3.45)	3.15 (2.23-4.51)	4.26 (2.91-6.30)
6-hr	0.616 (0.510-0.751)	0.841 (0.696-1.03)	1.16 (0.955-1.42)	1.43 (1.17-1.77)	1.84 (1.45-2.34)	2.17 (1.68-2.83)	2.53 (1.91-3.37)	2.92 (2.15-4.00)	3.48 (2.46-4.98)	4.30 (2.94-6.37)
12-hr	0.748 (0.619-0.913)	1.03 (0.850-1.26)	1.42 (1.17-1.74)	1.76 (1.44-2.17)	2.26 (1.78-2.88)	2.66 (2.06-3.47)	3.10 (2.34-4.14)	3.58 (2.63-4.91)	4.27 (3.01-6.10)	4.84 (3.30-7.16)
24-hr	0.919 (0.814-1.06)	1.28 (1.14-1.48)	1.80 (1.59-2.08)	2.25 (1.97-2.62)	2.92 (2.47-3.51)	3.47 (2.88-4.26)	4.07 (3.30-5.12)	4.73 (3.73-6.12)	5.70 (4.32-7.67)	6.51 (4.77-9.06)
2-day	0.991 (0.878-1.14)	1.41 (1.25-1.63)	2.01 (1.78-2.33)	2.54 (2.22-2.96)	3.31 (2.81-3.99)	3.96 (3.29-4.86)	4.66 (3.78-5.87)	5.44 (4.29-7.03)	6.58 (4.98-8.86)	7.53 (5.52-10.5)
3-day	1.06 (0.943-1.23)	1.54 (1.36-1.77)	2.21 (1.95-2.56)	2.81 (2.46-3.27)	3.68 (3.12-4.43)	4.41 (3.66-5.42)	5.21 (4.22-6.55)	6.08 (4.80-7.87)	7.38 (5.59-9.94)	8.47 (6.20-11.8)
4-day	1.11 (0.982-1.28)	1.62 (1.43-1.86)	2.34 (2.07-2.71)	2.98 (2.61-3.48)	3.92 (3.33-4.72)	4.71 (3.91-5.79)	5.57 (4.52-7.01)	6.52 (5.15-8.43)	7.92 (6.00-10.7)	9.10 (6.66-12.7)
7-day	1.21 (1.08-1.40)	1.80 (1.60-2.08)	2.66 (2.34-3.07)	3.41 (2.98-3.97)	4.52 (3.83-5.44)	5.45 (4.53-6.70)	6.46 (5.24-8.14)	7.59 (5.99-9.82)	9.25 (7.01-12.5)	10.6 (7.80-14.8)
10-day	1.29 (1.14-1.49)	1.94 (1.72-2.24)	2.87 (2.54-3.32)	3.70 (3.24-4.31)	4.92 (4.17-5.93)	5.95 (4.94-7.31)	7.06 (5.73-8.89)	8.30 (6.55-10.7)	10.1 (7.67-13.6)	11.7 (8.54-16.2)
20-day	1.46 (1.30-1.69)	2.22 (1.96-2.55)	3.29 (2.91-3.81)	4.24 (3.72-4.95)	5.65 (4.79-6.80)	6.83 (5.67-8.39)	8.10 (6.57-10.2)	9.51 (7.50-12.3)	11.6 (8.76-15.6)	13.3 (9.72-18.5)
30-day	1.61 (1.43-1.86)	2.44 (2.16-2.82)	3.64 (3.22-4.21)	4.70 (4.11-5.48)	6.26 (5.30-7.54)	7.55 (6.27-9.28)	8.95 (7.26-11.3)	10.5 (8.27-13.5)	12.7 (9.61-17.1)	14.5 (10.6-20.2)
45-day	1.87 (1.66-2.16)	2.82 (2.49-3.25)	4.17 (3.68-4.82)	5.36 (4.69-6.24)	7.11 (6.02-8.56)	8.56 (7.11-10.5)	10.1 (8.20-12.7)	11.8 (9.31-15.3)	14.2 (10.8-19.2)	16.2 (11.9-22.6)
60-day	2.14 (1.89-2.46)	3.18 (2.82-3.67)	4.69 (4.14-5.42)	6.00 (5.25-6.99)	7.93 (6.72-9.54)	9.52 (7.90-11.7)	11.2 (9.10-14.1)	13.1 (10.3-16.9)	15.7 (11.9-21.1)	17.8 (13.1-24.8)

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.

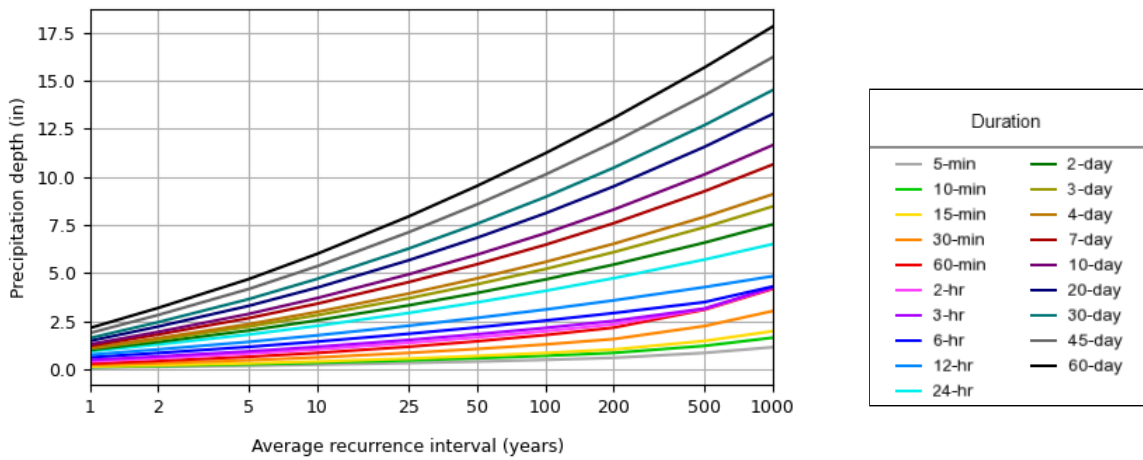
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PF graphical

PDS-based depth-duration-frequency (DDF) curves
 Latitude: 34.1323°, Longitude: -116.3844°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
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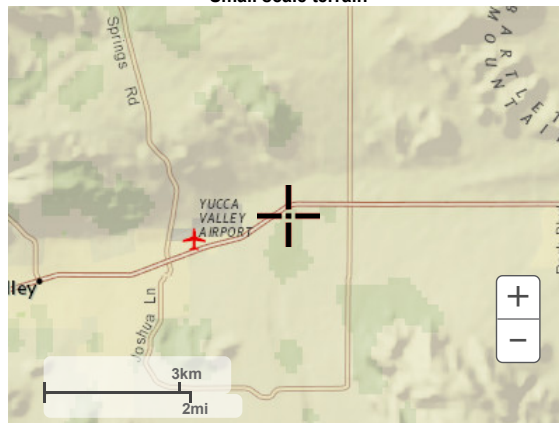
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Fri Mar 28 14:10:45 2025

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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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AQUA-SWIRL[®] TRASH CAPTURE

HYDRODYNAMIC SEPARATOR FEATURES

- 1** The Aqua-Swirl[®] Trash Capture is constructed of durable, lightweight, high performance materials to withstand up to HS-25 loads.
- 2** Floatable trash, debris and coarse sediments enter tangentially into the unit.
- 3** Vortex separation removes coarse particles of TSS, floatable debris, and free oil.
- 4** Stainless steel screen removes trash larger than 5 mm.
- 5** Independent testing & validation for 100% trash removal larger than 5 mm before discharging into sensitive receiving waters.



Aqua-Swirl® TRASH CAPTURE System

- Provides customized solutions for project specific requirements.
- Systems designed for specific water quality treatment flow rates.
- Modular sizes from 2.5 – 13 ft diameters with attached riser(s) to finish grade.
- Online project and system design tool at <http://pda.aquashieldinc.com>.

Vortex Separation Technology

- Utilizes hydrodynamic and gravitational forces incorporating a stainless steel screen to remove trash/debris greater than 5mm, coarse sediment (TSS), and free oil.
- Extensive full-scale laboratory testing with independent 3rd parties.
- Certified Full Trash Capture device by CA State Water Resources Control Board.

Bypass Designs

- Systems are designed to treat water quality flow rates and bypass peak storm events.
- Internal and external bypass configurations are available and tailored to site-specific needs.

Pipe Connections

- Systems are designed with custom inlet/outlet diameters at various configuration angles.
- Inlet/outlet stub outs are provided for easy coupling to storm drain lines.
- Easily plumbed to RCP, CMP, PVC, and HDPE piping with dissimilar pipe diameters.

Installation Benefits

- Quick and simple installation, resulting in measurable project cost savings.
- Designed to withstand HS-25 loadings with capabilities of heavier loads available.
- Small footprint design reduces excavation costs.
- Lightweight and durable construction eliminating the need of a crane.
- Lifting lugs attached for easy maneuverability on site.

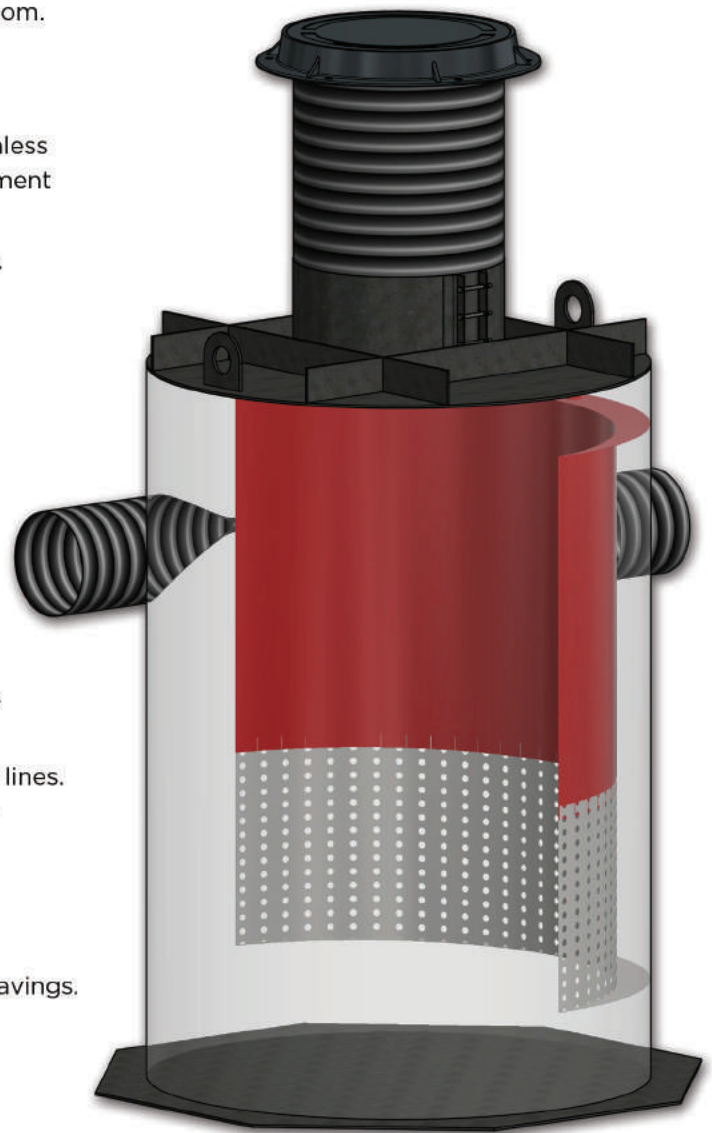
Storage Capacities

- Large storage capacities for sediment, debris and free oil to extend maintenance frequency.
- Screened trash capture storage capacities up to 122 ft³.
- Sediment storage capacities up to 310 ft³.

Inspection & Maintenance

- AquaShield™ offers an extensive network of local service providers across the country to ensure system performance efficiency.
- I&M manuals are available to download at www.aquashieldinc.com.

AQUA-SWIRL®
TRASH CAPTURE



AquaShield™
WATER TREATMENT SOLUTIONS

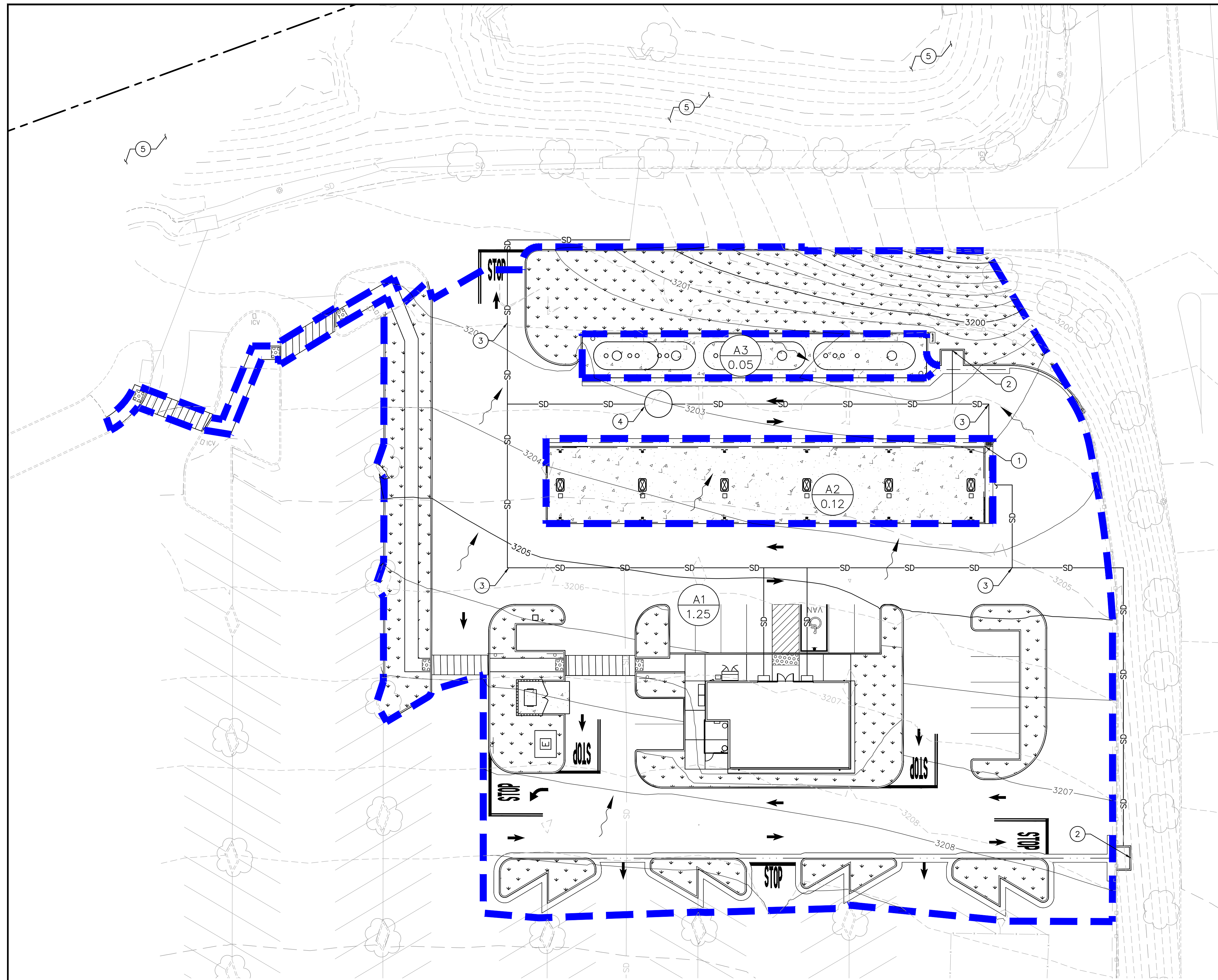
www.aquashieldinc.com

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LEGEND

- PROPERTY LINE
- PROPOSED STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- DRAINAGE MANAGEMENT AREA (DMA)
- DIRECTION OF FLOW
- DMA NAME
DMA AREA (IN ACRES)

NOTES

- ① PROPOSED AREA DRAIN
- ② PROPOSED CATCH BASIN
- ③ PROPOSED STORM DRAIN LINE
- ④ PROPOSED BMP - AQUASHIELD AQUA-SWIRL TRASH CAPTURE AS-2S HYDRODYNAMIC SEPARATOR
- ⑤ EXISTING BMP - DETENTION BASIN

WQMP SUMMARY				
DRAINAGE AREA NO.		TRIBUTARY AREA (SF)	TRIBUTARY AREA (AC)	DCV (CF)
A	PERVIOUS	13,035	0.30	3,140
	IMPERVIOUS	48,770	1.12	
TOTAL		61,805	1.42	3,140

No.	REVISIONS	DATE

Kimley»Horn
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 PHONE: 714-939-1030
 WWW.KIMLEY-HORN.COM

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 NOT FOR CONSTRUCTION
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SCALE AS SHOWN	DESIGNED BY RA	DRAWN BY MJ	CHECKED BY JG
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Walmart FUEL STATION
 YUCCA VALLEY, CA STORE #1915
 WAL-MART STORES, INC.
 YUCCA VALLEY, CA

DATE 3/28/2025
 PROJECT NO. 094507747
 SHEET NUMBER