MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

PRELIMINARY WQMP REPORT

Lake View Apartments

TENTATIVE TRACT NO. 18005

Prepared for:

MJM Investments, LLC

12300 Wilshire Blvd, Suite 410

Los Angeles, CA 90025

310-315-0002

Prepared by:

Urban Resource Corporation

2923 Saturn Street, Unit H

Brea, CA 92821

949-727-9095

Submittal Date: 12-29-2020

Revision No. and Date: 06/17/21

Revision No. and Date: -

Revision No. and Date: -

Revision No. and Date: -

Revision No. and Date: -

Final Approval Date:______________________

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for MJM Investments, LLC by Urban Resource Corporation. The WQMP is intended to comply with the requirements of the City of Victorville 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):	18005	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 3090-50-01

Owner's Signature			
Owner Name:			
Title			
Company	MJM Investments, LLC		
Address	12300 Wilshire Blvd, Suite 410, Los Angeles, CA 90025		
Email			
Telephone #	310-315-0222		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):	18005	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 3090-50-01

"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: Terry Au, P.E.		PE Stamp Below
Title	Principal	
Company	Urban Resource Corporation	
Address	2923 Saturn Street, Unit H, Brea, CA 92821	
Email	terry@urbresource.com	
Telephone #	949-727-9095	
Signature		
Date	6-18-21	

REGISTERED PROFESSIONAL ENGINEER
TERRY P. AU
C 68466
EXP. 9-30-21
CIVIL
STATE OF CALIFORNIA

Table of Contents

Forms

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)

<table>
<tr><th colspan="6">Form 1-1 Project Information</th></tr>
<tr><td colspan="2">Project Name</td><td colspan="4">Lake View Apartments</td></tr>
<tr><td colspan="2">Project Owner Contact Name:</td><td colspan="4">Michael Asheghian</td></tr>
<tr><td>Mailing Address:</td><td>12300 Wilshire Blvd, Suite 410
Los Angeles, CA 90025</td><td>E-mail Address:</td><td>michael@mjminvestco.com</td><td>Telephone:</td><td>310-315-0222</td></tr>
<tr><td colspan="2">Permit/Application Number(s):</td><td colspan="2">XXX</td><td>Tract/Parcel Map Number(s):</td><td>18005</td></tr>
<tr><td colspan="2">Additional Information/
Comments:</td><td colspan="4"></td></tr>
<tr><td colspan="2">Description of Project:</td><td colspan="4">This project is an residential development proposing a total of 272 apartment units. Proposed site amenities include a community commons, recreation building and lawn, and scenic outlook. The community commons includes a pool & spa, bocce ball, BBQ's and seating, and tot lot. The recreation building includes leasing, multi purpose rooms, gym, and offices.

Approximately 16.1 acres drains westerly and approximately 4.9 acres drains easterly. Estimated perviousness for the westerly and easterly drainage areas are 50% and 70%, respectively, for this Preliminary WQMP report. Preliminary Landscape drawings are included in Appendix B to show areas of proposed landscaping. Soil cover will consist primarily of shrubs, grass, and trees. Onsite streets will be graded relatively flat with most slopes at approximately 1%. The steepest parts of the site will be along the northerly, westerly, southerly, and easterly edges of the project where 2:1 down slopes are proposed.

The existing condition is a barren dessert vacant lot with scattered desert weeds and brush cover on the surface. Few scattered Joshua trees are also present. Topography onsite is hilly, ranging from relatively flat in the eastern and central portions to relatively steep in the western portion. Existing slopes in the eastern and central portions range from approximately 5% to 30%. Existing slopes in the western portion range from 15% to 50%. Approximately 5.5 acres drains easterly and approximately 15.5 acres drains westerly.</td></tr>
</table>

Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	

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):			
☒ #1 New development involving the creation of 5,000 ft² or more of impervious surface collectively over entire site	☐ #2 Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface
☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) *Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.*			

2 Project Area (ft2):	21 acres	3 Number of Dwelling Units:	272	4 SIC Code:	N/A
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.*					

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 property owner/developer is MJM Investments, LLC. MJM Investments, LLC is responsible for long term maintenance of WQMP stormwater facilities. MJM Investments, LLC may form a homeowners or property owners assocation for the long-term maintenance of project stormwater facilities.

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 ☒	N ☐	From animal or human fecal waste
Nutrients - Phosphorous	E ☒	N ☐	Landscape fertilizer
Nutrients - Nitrogen	E ☒	N ☐	Landscape fertilizer
Noxious Aquatic Plants	E ☒	N ☐	Landscaping
Sediment	E ☒	N ☐	From Landscaping
Metals	E ☒	N ☐	From Autos
Oil and Grease	E ☒	N ☐	From Autos
Trash/Debris	E ☒	N ☐	From litter, outdoor activities, other
Pesticides / Herbicides	E ☒	N ☐	Pest control, landscape areas
Organic Compounds	E ☒	N ☐	Landscape
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

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 34.4981	Longitude -117.2813	Thomas Bros Map page
1 San Bernardino County climatic region: ☒ Desert			
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
DA1 DMA C flows to DA1 DMA A	*Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property*
DA1 DMA A to Outlet 1	*See following page, Form 3-1 for DA 1 descriptions.
DA1 DMA B to Outlet 1	
DA2 to Outlet 2	*See following page, Form 3-1 for DA 2 descriptions.

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.4981	Longitude -117.2813	Thomas Bros Map page

[1] San Bernardino County climatic region: ☐ Valley ☐ Mountain

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

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA 1 to Outlet 1	Approximately 16.1 acres conveyed westerly by proposed PVC and RCP storm drain. DA 1 outlets into the bioretention basin located on the west side of the project. Approximately 6.1 acres of DA 1 is landscaped slope and basin area that does not drain across any impervious surface and is considered self-treating. Approximately 10.0 acres of apartment development will be routed to infiltration BMPs with the use of diversion manholes. Pretreatment will be provided with CDS units or approved similar.
DA 2A to Outlet 2	Approximately 1.83 acres conveyed easterly by proposed PVC and RCP storm drain. DA 2A is conveyed through a Torrent Maxwell Plus drywell system for pretreatment and infiltration. Peak flows will be mitigated in a proposed detention system (if needed), then is conveyed by proposed RCP storm drain to Outlet 2, where a connection will be made to the future RCP storm drain in future Ridgecrest Road.
DA 2B to Outlet 3	Approximately 2.55 acres conveyed easterly by proposed PVC and RCP storm drain. DA 2B is conveyed through a Torrent Maxwell Plus drywell system for pretreatment and infiltration. Peak flows will be mitigated in a proposed detention system (if needed), then is conveyed by proposed RCP storm drain to Outlet 3, where a connection will be made to the future RCP storm drain in future Ridgecrest Road. Approximately 0.5 acres adjacent to DA2B and fronting Ridgecrest Road is not routed to the proposed drywell(s) for infiltration due to the slope and elevations of the proposed landscaped slope (0.4ac.) adjacent to future Ridgecrest Road, and the slope and elevations of a portion of the proposed fire lane (013ac.) connection to future Ridgecrest Road. The landscaped slope is considered self-treating and and the portion of fire road (0.13ac) is untreated.

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)	21.0 acres (Total)			
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*	3			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	C			
5 Longest flowpath length (ft)	1306'			
6 Longest flowpath slope (ft/ft)	0.095			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Open Brush			
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***	Fair			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H
1 DMA drainage area (ft^2)				
2 Existing site impervious area (ft^2)				
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*				
4 Hydrologic soil group *County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*				
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*				

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	Mojave River (Mojave Forks Reservoir outlet to Upper Narrows), Mojave River (Upper Narrows to Lower Narrows), Mojave Rivers (below Lower Narrows)
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Mojave River (Mojave Forks Reservoir outlet to Upper Narrows): Fluoride Mojave River (Upper Narrows to Lower Narrows): Fluoride, Sulfates, Total Dissolved Solids
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Mojave River (Mojave Forks Reservoir outlet to Upper Narrows): Fluoride Mojave River (Upper Narrows to Lower Narrows): Fluoride, Sulfates, Total Dissolved Solids
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Desert Tortoise Habitat CAT 3, Mojave Ground Squirrel
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

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	☒	☐	Prior to occupancy, MJM Investments, LLC or POA (if formed) will provide the CC&R's (if applicable) and environmental awareness education materials to the new tenants. Educational materials are included in the Appendix.
N2	Activity Restrictions	☒	☐	MJM Investments, LLC or POA (if formed) will have the WQMP available for the tenant's needs and recommend the tenant review the WQMP.
N3	Landscape Management BMPs	☒	☐	MJM Investments, LLC or POA (if formed) shall maintain landscape and irrigation on a weekly basis.
N4	BMP Maintenance	☒	☐	MJM Investments, LLC or POA (if formed) is responsible for implementating each of the stated non-structural BMPs, and shall maintain and clean all strutural BMP facilities in accordance with the Final WQMP Operations and Maintenance schedule.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	MJM Investments, LLC or POA (if formed) to follow all State and County requirements.
N6	Local Water Quality Ordinances	☒	☐	MJM Investments, LLC to comply with any City of Victorville Water Quality Ordinances.
N7	Spill Contingency Plan	☒	☐	MJM Investments, LLC or POA (if formed) shall have a Spill Contingency Plan in place for spill prevention, control and cleanup.
N8	Underground Storage Tank Compliance	☐	☒	There are no underground storage tanks proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous waste

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 hazardous waste.
N11	Litter/Debris Control Program	☒	☐	MJM Investments, LLC or POA (if formed) shall implement weekly sweeping and trash pick-up within landscape areas and outside walkways. Daily inspection of trash receptacles to ensure that lids are closed and any excess trash on the ground is picked up.
N12	Employee Training	☒	☐	MJM Investments, LLC or POA (if formed) shall provide employee training monthly for both maintenance personnel and employees.
N13	Housekeeping of Loading Docks	☐	☒	No loading docks.
N14	Catch Basin Inspection Program	☒	☐	MJM Investments, LLC or POA (if formed) shall once a month have catch basins cleaned for debris and silt in bottom of catch basins. Intensified around October 1st of each year prior to the "first flush" storm.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	MJM Investments, LLC or POA (if formed) shall sweep streets weekly. Intensified around October 1st of each year prior to "first flush" storm.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not applicable.
N17	Comply with all other applicable NPDES permits	☒	☐	Comply with Construction General Permit.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One: Included	Check One: Not Applicable	Describe BMP Implementation OR, If not applicable, state reason
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Stencil all catch basins and brooks boxes in the street
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor material storage areas
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☐	☒	There are no trash and waste storage areas. Individual trash/recycle cans (2 per each unit) proposed in the Trash Collection Plan for this project.
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)	☒	☐	MJM Investments, LLC or POA (if formed) shall monitor landscape irrigation areas weekly in conjunction with maintenance activities. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray in hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Where possible, finish grade of landscapes areas will be set a minimum of 1-2 inches below top of curb, sidewalk, or hardscape.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Slopes shall be landscaped, and terrace drains will be proposed to capture runoff from slopes. Energy dissipation will be provided at outlets into the retention basin located on the west side, and where needed.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No docks.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No wash areas

S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing areas

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)	☐	☒	No equipment wash areas
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling areas
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☒	☐	All slopes along the project's perimeter shall be landscaped.
S14	Wash water control for food preparation areas	☒	☐	Sinks provided for any prposed outdoor wash areas such as around the pool and/or BBQ areas. Sinks connected to sewer.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No car wash racks

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
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: Landscaping proposed between buildings, and around project edges. Additionally, a large proposed retention/detention basin is proposed on the west side of the project.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Infiltration is assumed to be feasible, and thus, an infiltation basin and drywells are currently proposed to meet LID requirements.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Drainage patterns will be similar to the existing condition. Drainage will drain westery and eastery and detention will be provided to mitigate peak flowrate increases. Time of concentration is similar to existing condition.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes ☒ No ☐ Explanation:
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: Currently not proposed for the project.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: There are no sensitive areas onsite. Existing vegetation will be removed during construction of this development.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: Disturbed areas will be developed, and where designated, new landspacing will be installed.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Compaction recommendation(s) will be provided by the geotechnical engineer.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Swales will be vegetated unless otherwise required by the City of Victorville.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☐ No ☒ Explanation: Compaction recommendation(s will be provided by the geotechnical engineer.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: Project proposes an infiltration basin and drywells.
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: Not applicable.

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, evaportranspire, 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 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 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): 10.0 ac./435,600sf	2 Imperviousness after applying preventative site design practices (Imp%): 70%	3 Runoff Coefficient (Rc): _0.49389 *R_c = 0.858(Imp%)^3-0.78(Imp%)^2+0.774(Imp%)+0.04*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.357" http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.4416" *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (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): 15,542cu-ft *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 Hydromodification Assessment (DA 1)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

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 *(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)*

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 REFER TO FOLLOWING PAGES FOR FORM 4.2-2. ALSO, SEE APPENDIX E. *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 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area DA 2A (ft^2): 1.83 ac./79,715sf	**2** Imperviousness after applying preventative site design practices (Imp%): 70%	**3** Runoff Coefficient (Rc): _0.49389 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): 0.357" *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.4416" *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): 2,844cu-ft *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 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2B)

1 Project area DA 2B (ft^2): 2.55 ac./111,078sf	**2** Imperviousness after applying preventative site design practices (Imp%): 70%	**3** Runoff Coefficient (Rc): _0.49389 *R_c = 0.858(Imp%)^3-0.78(Imp%)^2+0.774(Imp%)+0.04*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): 0.357" *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.4416"

*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): 3,963cu-ft

*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 (DA1 West)

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

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

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

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

Condition	Runoff Volume (ft³)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 92,837 *Form 4.2-3 Item 12*	**2** 9.7 *Form 4.2-4 Item 13*	**3** 32.07 *Form 4.2-5 Item 10*
Post-developed	**4** 77,145 *Form 4.2-3 Item 13*	**5** 9.2 *Form 4.2-4 Item 14*	**6** 33.28 *Form 4.2-5 Item 14*
Difference	**7** *-15,692* *Item 4 – Item 1*	**8** *-0.5* *Item 2 – Item 5*	**9** *+1.21* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *-17%* *Item 7 / Item 1*	**11** *-5.2%* *Item 8 / Item 2*	**12** *3.8%* *Item 9 / Item 3*

Storm volumes will decrease in the proposed condition per Unit Hydrograph analysis included in Appendix E. Peak runoff will increase by 3.8% for the 10 year 24 hour storm event, but the increase is less than 5% and is considered negligible. Therefore, the project will not contribute to an HCOC in a downstream channel.

Form 4.2-2 Summary of HCOC Assessment (DA2 East)			
Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☒ No ☐ *Go to: http://sbcounty.permitrack.com/WAP/* If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)* If "No," then proceed to Section 4.3 Project Conformance Analysis			
Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 32,942 *Form 4.2-3 Item 12*	**2** 9.6 *Form 4.2-4 Item 13*	**3** 11.49 *Form 4.2-5 Item 10*
Post-developed	**4** 25,969 *Form 4.2-3 Item 13*	**5** 6.6 *Form 4.2-4 Item 14*	**6** 11.76 *Form 4.2-5 Item 14*
Difference	**7** *6,973* *Item 4 – Item 1*	**8** *+3.0* *Item 2 – Item 5*	**9** *+0.27* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *-21.2%* *Item 7 / Item 1*	**11** *+31%* *Item 8 / Item 2*	**12** *+2.3%* *Item 9 / Item 3*

Storm volumes will decrease in the proposed condition per Unit Hydrograph analysis included in Appendix E. Peak runoff will increase by 2.3% for the 10 year 24 hour storm event, but the increase is less than 5% and is considered negligible. Therefore, the project will not contribute to an HCOC in a downstream channel.

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

Weighted Curve Number Determination for: <u>Pre</u>-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: <u>Post</u>-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 10 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 hydromodification requirement, (ft^3):
*Vhydro = (Item 13 * 0.95) – 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 *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 hydromodification requirement (min): *$T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – 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) *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 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/Bioretention) 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).

Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

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
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 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.
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, Selection and Evaluation of Biotreatment 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, Site Design 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, Site Design BMPs.*

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 ☐ 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) (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) *$V_{retention}$ = (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 cont. Site Design BMPs (DA 1)

14 Implementation of Street Trees: Yes ☐ No ☐ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3): *$V_{retention}$ = Sum of Item 17 for all BMPs*			
19 Total Retention Volume from Site Design BMPs: Not considered in Preliminary WQMP Report; May be considered in the Final Project WQMP *Sum of Items 5, 13 and 18*			

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} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA BMP Type INFILTRATION TRENCH	DA 2 DMA 2A BMP Type DRYWELL(S)	DA 2 DMA 2B BMP Type DRYWELL(S) *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	See App. D for LID Calculations	See App. D for LID Calculations	See App. D for LID Calculations
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*			
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*			
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*			
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*			
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity			
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			
16 Total Retention Volume from LID Infiltration BMPs: *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: % *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained 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.*			

4.3.4 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)		
1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	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 4.3-5 and 4.3-6 to compute treated volume* ☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow* ☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-5 Item 15 + Form 4.3-6 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 4.3-5 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 4.3-6 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 4.3-7 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 4.3-8 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): Refer to Water Quality Summary in App. D *Copy Item 7 in Form 4.2-1*
2 On-site retention with site design BMP (ft^3): *Copy Item18 in Form 4.3-2*
3 On-site retention with LID infiltration BMP (ft^3): Refer to Water Quality Summary in App. D *Copy Item 16 in Form 4.3-3*
4 On-site biotreatment with volume based biotreatment BMP (ft^3): *Copy Item 3 in Form 4.3-4*
5 Flow capacity provided by flow based biotreatment BMP (cfs): *Copy Item 6 in Form 4.3-4*
6 LID BMP performance criteria are achieved if answer to any of the following is "Yes": • Full retention of LID DCV with site design or infiltration 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; therefore biotreatment BMP provides 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*
7 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 Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐ *Checked yes if Form 4.3-4 Item 7is 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)%* • 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: 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. ☐

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)	
1 Volume reduction needed for hydromodification performance criteria (ft^3): Refer to Appendix E *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	2 On-site retention with site design and infiltration, BMP (ft^3): *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*
3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*	4 Volume capture provided by incorporating additional on-site BMPs (ft^3):
5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐ *If yes, hydromodification 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 BMP ☐ • 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 ☐	
6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐ *If yes, hydromodification 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 retention BMPs ☐	

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.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

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

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Torrent Drywell	MJM Investments, LLC	Refer to Operations and Maintenance Manual in Appendix G.	Refer to Appendix G
Infiltratio n Trench	MJM Investments, LLC	Maintain landscaped areas in surface basin and adjacent hillside landscaping. Remove trash and debris in west side surface basin	Before rainy season beginning October 1st annually. Every 2 weeks, or as necessary to maintain a pleasant appearance
Infiltratoi n Trench	MJM Investments, LLC	Check infiltration trench observation well for ponding. If the trench becomes plugged, remove rock materials. If necessary, provide a fresh infiltration surface by excavating an additional 2 to 4 inches of soil. Replace the rock materials if needed.	Before rainy season beginning October 1st annually. 3 days after Major storm events
CDS Unit	MJM Investments, LLC	Refer to Maintenance Guide in Appendix G.	Refer to Appendix G

CUDO Storage Cubes	MJM Investments, LLC	Refer to Operations and Maintenance Manual in Appendix G.	Refer to Appendix G
StormCapture Vault	MJM Investments, LLC	Follow CUDO Operations and Maintenance Manual (where applicable) for sediment buildup in StormCapture vault. Refer to Appendix G.	Refer to Appendix G

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

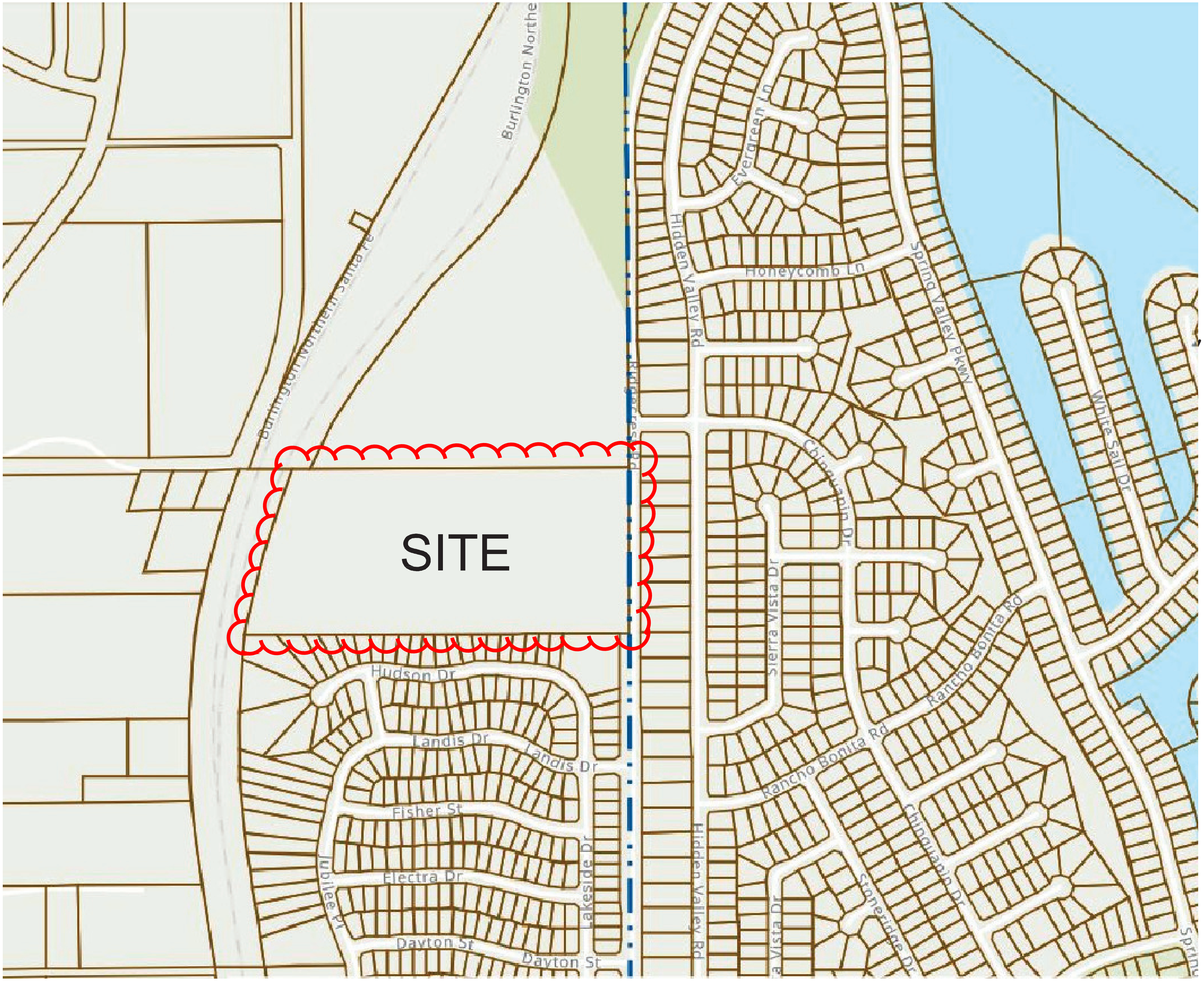
Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

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

APPENDIX A

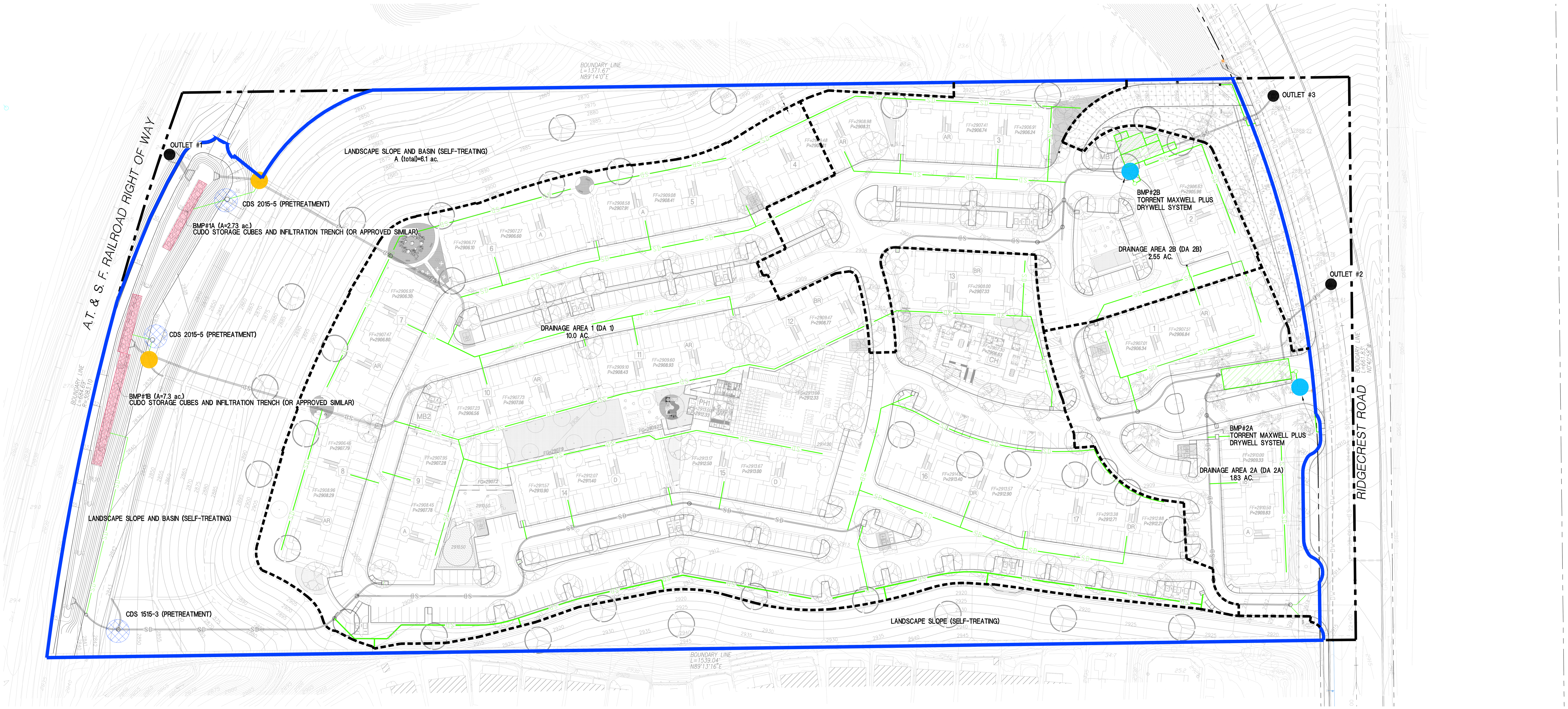
VICINITY MAP



LOCATION MAP

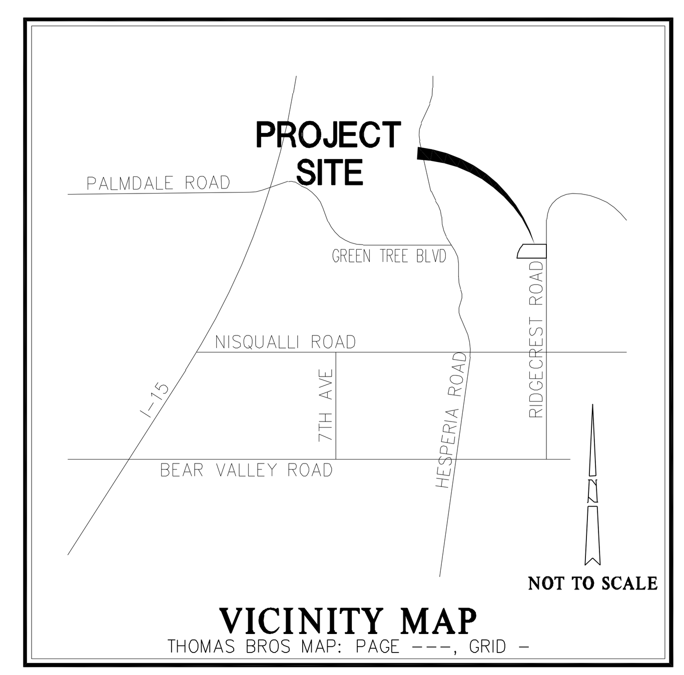
APPENDIX B

WATER QUALITY SITE PLAN



LEGEND

- BOUNDARY LINE (TRACT 18005)
- WATER QUALITY TREATMENT LIMITS (APPROX. 21.0 ACRES)
- APPROXIMATE DRAINAGE AREA BOUNDARY
- PROPOSED SUBSURFACE CUDO STORAGE CUBES/INFILTRATION TRENCH (OR APPROVED SIMILAR)
- PROPOSED STORMCAPTURE VAULT (OR APPROVED SIMILAR) FOR STORAGE/DETENTION
- PROPOSED TORRENT MAXWELL PLUS DRYWELL SYSTEM (WITH PRETREATMENT SETTLING CHAMBER)
- PROPOSED DIVERSION MANHOLE
- PROPOSED CONTECH CDS UNIT (PRETREATMENT)
- PROPOSED OUTLET (TO RCP SD OR TO EX. GRADE)
- PROPOSED LANDSCAPED SLOPE AREA (0.4ac) AND PORTION OF PROPOSED FIRE LANE (0.13ac) NOT ROUTED TO PROPOSED DRYWELL DUE TO SLOPE AND ELEVATION CONTRAINTS. LANDSCAPED SLOPE IS CONSIDERED SELF-TREATING AND FIRE ROAD IS UNTREATED.
- PROPOSED PVC STORM DRAIN
- SD PROPOSED RCP STORM DRAIN



VICINITY MAP
THOMAS BROS MAP: PAGE ---, GRID -

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

REVISIONS:

MARK	DESCRIPTION	BY	APP'R	DATE

DESIGNED BY: TPA
CHECKED BY: TPA
DRAWN BY: TPA
PROJECT MANAGER: TPA

URBAN RESOURCE
CONSULTING CIVIL ENGINEERS
23 MAUCHLY, SUITE 110
IRVINE, CA 92618
949-727-9095 PHONE
949-727-9098 FAX

PRELIMINARY WATER QUALITY SITE PLAN
LAKE VIEW APARTMENTS

GENERAL LANDSCAPE NOTES

1. All finished grades to be approved by the landscape architect prior to the installation of any plant material.
2. Plant material to be approved by the landscape architect prior to installation.
3. All tree locations to be staked by the landscape contractor and approved by the landscape architect prior to any holes being dug.
4. The contractor is to provide a 2 lb. sample of the proposed mulch for review and approval by the landscape architect & owner. The contractor shall provide 100% coverage of non-paved areas within the limits of construction.
5. For all tree planting that encounters hardpan/caliche, provide separate unit price to install trees with an auger.
6. It is the responsibility of the landscape contractor to inform the landscape architect of any plant material concerns based on the planting season. (E.G. Summer vs. Winter) Should the landscape contractor have any concerns about the plant material due to heat or frost exposure, the installer shall request a substitution or delay in planting. Once planted, all plant material is subject to specified warranties.
7. All deciduous trees to be unconditionally guaranteed for 1 year after installation. All other plants shall be guaranteed for a minimum period of 90 days from the date of final approval by the City/Owner. Any plant materials not approved by the City/Owner prior to October 1st of the calendar year (in which they are installed) shall be further guaranteed until May 20th of the following calendar year.
8. Trees, shrubs, groundcovers, vines, and turf which have to be replaced under the terms of the guarantee shall be guaranteed for an additional 90 days from the date of replacement.
9. The landscape contractor shall be responsible for providing all finished grades, and for maintaining positive drainage away from all buildings during the finish grading process. All slopes not to exceed 4:1 in landscape areas.
10. Under no circumstance shall any tree be planted within 6'-0" of any building without the the express written approval of the landscape architect.
11. Trees and shrubs shall be placed a minimum of 6'-0" from public accessways, utility cabinets, and fire hydrants.
12. Shrubs must be, at maturity, 6'-0" from the rear of a fire hydrant. No material, other than groundcovers, may be placed between a fire hydrant and the street or roadway, or 6'-0" on either side. Field verify all hydrant locations with the civil engineering plans.
13. All site improvements, including landscape and site clean-up, must be completed prior to final approval or certificate of occupancy.
14. Trees adjacent to pedestrian walkways should have a minimum canopy clearance of 6'-8".
15. The landscape contractor shall coordinate all construction with the appropriate utility companies and shall be responsible for all damage to utilities.
16. The landscape contractor shall be responsible for the fine grading of all planting areas. Ensure positive drainage off of landscape berms.
17. The landscape contractor shall verify all material quantities. In the event of a discrepancy, the quantities on the plan will take precedence.
18. Groundcover, when used, should extend under adjacent shrubs and trees.
19. All planting areas shall be fertilized with 12 lbs./1,000 s.f. of 10-10-10 fertilizer.
20. All planting beds (or mulch beds) shall be sprayed with Round-Up (or equal) prior to installation of the mulch.
21. The landscape contractor shall provide the owner with written instructions on the proper care of all specified plant materials prior to final payment.
22. Field adjustments may be required to avoid conflicts with proposed utilities or other site appurtenances. Notify the landscape architect prior to any field adjustments.
23. All vegetative material must meet the American Standard for Nursery Stock sponsored by the American Association of Nurserymen and be approved by the American National Standards Institute, Inc. (ANSI).
24. All new landscaping shall be in conformance with the standards of city ordinances.
25. All planting shall be properly irrigated.
26. All landscape islands to be excavated to a minimum depth of 24 inches.

GENERAL IRRIGATION NOTES

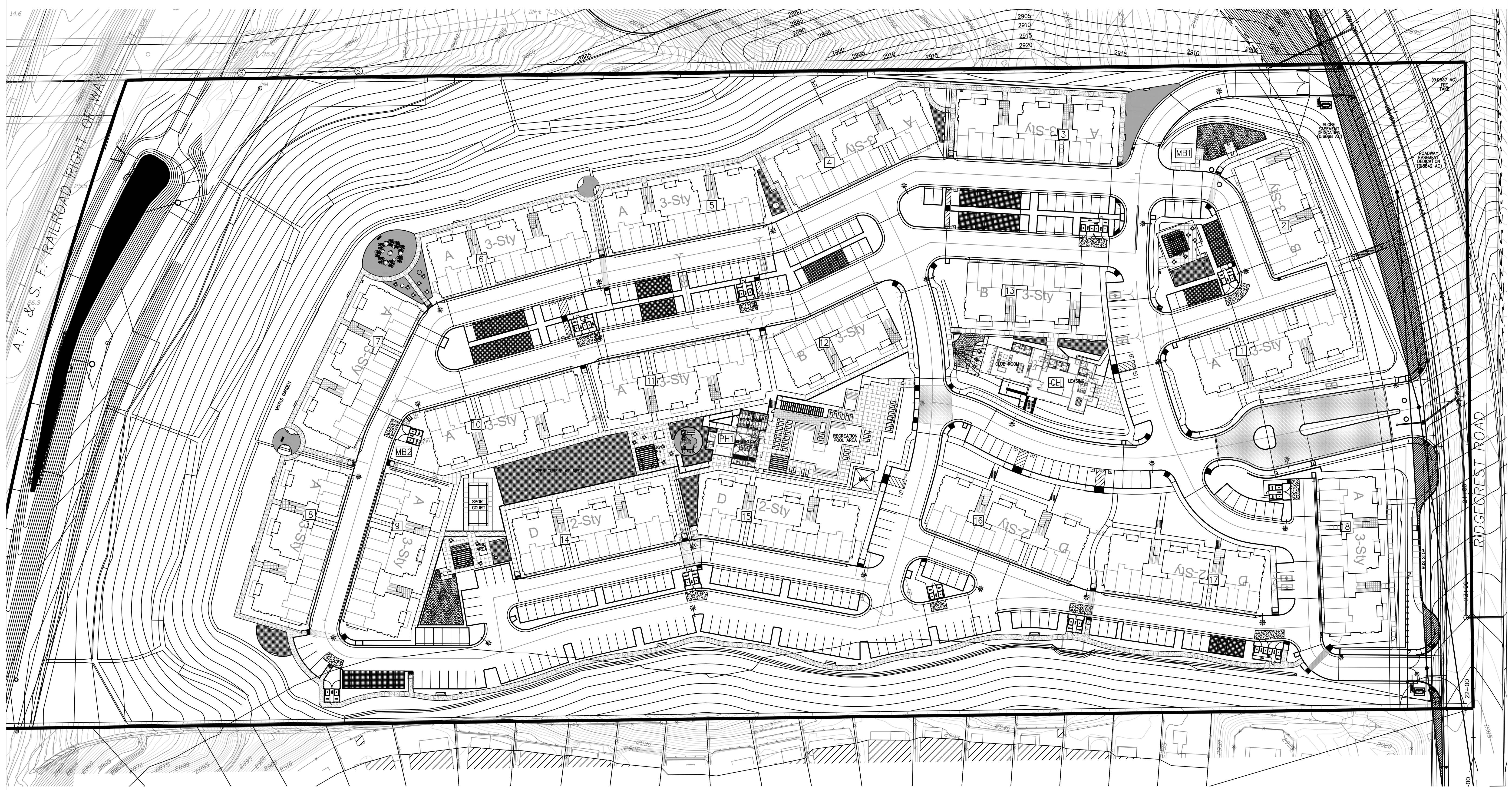
1. The irrigation plan is diagrammatic and it shall be the irrigation contractor's responsibility to adjust the location of or watering rate of any head or drip emitter to provide full and adequate coverage or to add additional heads as necessary to ensure 100% coverage to turf and optimum growing conditions for all plant material. Contractor to assume liability for insufficient irrigation.
2. Submit shop drawings of proposed system, layout and any pre-agreed upon equipment and/or layout modification for LA approval prior to installation.
3. Submit as-built record drawings illustrating complete irrigations system to LA/Owner Rep. at time of completion of construction and prior to final payment.
4. Locate parts and equipment (elec. valves, gate valves, flush valves, quick coupler valves and controllers) for LA approval prior to installation.
5. Install all drip irrigation components as per manufacturer's requirements.
6. All trenching within the dripline of existing trees is to be done by hand. Mo mechanical trencher shall be used in these areas and no roots larger than 1-½" in diameter shall be cut. Contact the landscape architect if a problem arises.
7. The irrigation system has been designed for 65 psi. The irrigation contractor shall verify the water pressure in the field and notify the landscape architect immediately should a discrepancy exist.
8. Irrigation heads and components shall be located a minimum of 24 inches from all buildings to avoid adverse performance of foundations and slabs due to the shrinking and swelling of clay sub-soils.
9. In areas where spray heads are zones with rotor heads use appropriate rotary nozzles to match precipitation rates.
10. Mainline may be shown diagrammatically. Contractor shall locate all mainline along sidewalks, within curblines, and inside property lines. Sleeves shall be provided by contractor wherever mainline or lateral lines cross under sidewalks or roadways, even if not indicated on plan. Sleeve sizes are to be 6" for mainline and 4" for lateral lines unless otherwise indicated. Additional sleeves may be indicated on plans to carry control wires.
11. The irrigation contractor shall size the pipe according to the pipe schedule. Gallons per minute are calculated by the combined emission head output downline from pipe being sized.
12. All valve boxes (irrigation, gate valves, flush cap, water features, control wire etc.) are to be placed in mulch/decomposed granite/planting areas. Under no circumstances are the valve boxes to placed in a lawn or hardscape area. Box/lid color to match adjacent granite/surface material as closely as possible.
13. Group valves as much as possible. Place boxes parallel to curbs, buildings and each other. Provide 6" base of pea gravel for all valve boxes installed.
14. All unsurfaced areas are to receive four inches of topsoil, seed, mulch, or sod and watered until a healthy strand of grass is obtained.
15. The general contractor is responsible to provide power to the irrigation controller.
16. Controllers are to be programmed to allow sufficient flow rates are maintained throughout the system.
17. All controller wires should be located underneath mainline piping inside trenches to avoid possible cutting of wires if lines are dug up in the future. Contractor shall also run spare control wires in each direction from controller to farthest valves to serve as backup wires.
18. 24 volt wiring to be #14 UFUL direct burial-solid copper.
19. Wire sleeve to be 2" class 200 PVC (min.).
20. Extend (2) additional control wires to furthest valve box, wire to controller, coil wire and label station numbers.
21. Irrigation sleeves are to be schedule 40 PVC with a minimum diameter twice the size of the irrigation main line. Irrigation sleeves are to extend 12" beyond edge of pavement, wall or curb and a minimum of 36" beyond edge of sidewalks. Provide separate sleeve for wire at each sleeve location.
22. If applicable contractor shall field verify best possible location to mount rain sensor within 25 feet of the controller. Avoid interference from trees, buildings, and other structures for optimum accuracy.
23. Installation contractor and maintenance contractor shall closely monitor system to ensure that excessive irrigation moisture does not cause swelling of clay subsoil thereby causing harm to foundations and slabs.
24. Civil plans shall govern in the installation of water, sewer, storm drainage and fire protection lines. See civil plans for location and sizes.

INSPECTIONS:
1. No excavation shall occur in city R.O.W. without a R.O.W. permit--contact Public Works Department.
2. The Contractor shall mark all water lines, sewer lines, and tree locations prior to calling for ROW permit.
3. The landscape installation shall comply with approved landscape drawings prior to Final Acceptance by the City and issuance of a Certificate of Occupancy. Contact Development Services landscape architect for a landscape inspection.
4. Water meters, cleanouts and other appurtenances, shall be accessible, adjusted to grade, clearly marked with flagging, and compliant with Public Works Department standards prior to calling for landscape and final R.O.W. inspections.

LANDSCAPE STANDARDS:
1. Plantings and landscape elements shall comply with Engineering Standards, Public R.O.W. Visibility requirements.
2. Unless otherwise specified, trees shall be planted no less than 6' from curbs, and 4' from sidewalks, utility lines, and screening walls. The City has final approval for all tree placements.
3. A Three foot radius around a fire hydrant shall remain clear of plant materials pursuant to the Fire Code.
4. Street trees, where required, shall be (10') minimum from the edge of a storm sewer curb inlet box and the edge of the root ball shall be (4') minimum from the water meter.
5. All plants shall be grown and harvested in accordance with The American Standard for Nursery Stock (ANSI Z60.1-2004)
6. Tree planting shall comply with details herein and the International Society of Arboriculture (ISA) standards.
7. Tree pits shall be tested for water percolation. If water does not drain out of tree pit within 24-hours, the tree shall be moved or drainage shall be provided.
8. Native site topsoil is to be protected from erosion or stockpiled.
9. Native site topsoil shall be laboratory tested by and accredited laboratory and amended per said laboratory's recommendations.

IRRIGATION STANDARDS:
1. Any changes to these approved irrigation drawings shall be authorized by the Development Services Landscape Architect.
2. Contact Development Services for irrigation permit prior to installing the irrigation system.
3. Irrigation overspray on streets and walks is prohibited.
4. Mainlines, valves, or control wires shall not be located in the R.O.W.
5. ET irrigation controllers shall be programmed and adjusted to not exceed the Landscape Water Allowance (LWA) prior to approval of landscape installation.
6. Valves shall be located a minimum of (3') away from storm sewers, and sanitary sewer lines and 5 feet from City fire hydrants and water valves.
7. The bore depth under streets, drive aisles, and fire lanes shall provide (2') of clearance (minimum).
8. Irrigation heads that run parallel and near public water and sanitary sewer lines; shall be fed from stubbed laterals or bull-beads. A minimum 5-foot separation is required between irrigation main lines and laterals that run parallel to public water and sanitary sewer lines.
9. No valves, backflow prevention assemblies, quick couplers etc. shall be located closer than 10' from the curb at street or driveway intersections.

MAINTENANCE STANDARDS:
1. The owner shall be responsible for the establishment, maintenance, and vigor of plant material in accordance with the design intent and as appropriate for the season of the year.
2. Landscape and open areas shall be free of trash, litter and weeds.
3. All trees and shrubs shall be maintained in accordance with the Engineering Design Standards - Public R.O.W. Visibility Requirements.
4. Tree maintenance shall be in accordance with the American National Standards for Tree Care Operations, ANSI A300 and the standards of the International Society of Arboriculture (ISA).
5. Tree staking materials, if used, shall be removed after (1) growing season and not more than (1) year after installation. Steel tree stakes, wires, and hoses are prohibited.



LANDSCAPE ARCHITECTURAL SITE PLAN

0' 15' 30' 60'
SCALE: 1" = 30'-0"

LANDSCAPE ARCHITECTURAL SHEET INDEX

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE COLOR: DESERT GOLD	
Cynodon Dactylon BERMUDA GRASS	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-10 - NOT FOR CONSTRUCTION

DESIGNED BY:	M.R.
DRAWN BY:	M.R.
LAOR:	DANIEL R. ERLANDSON
PLOT DATE:	03/10/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS

VICTORVILLE, CA

PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES. CA
P: 310-315-0002

SHEET TITLE
COVER SHEET

SHEET NUMBER
L1.00

SCALE: AS INDICATED

LANDSCAPE PLAN

OVERALL SITE

0' 10' 20' 40'
SCALE: 1" = 20'-0"

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE COLOR: DESERT GOLD	
Cynodon Dactylon BERMUDA GRASS	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY: M.R.
DRAWN BY: M.R.
LAOR: DANIEL R. ERLANDSON
PLOT DATE: 03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS
VICTORVILLE, CA
PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
LANDSCAPE PLAN

SHEET NUMBER
L4.00

SCALE: AS INDICATED

LANDSCAPE PLAN

OVERALL SITE

0' 10' 20' 40'
SCALE: 1" = 20'-0"

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE COLOR: DESERT GOLD	
Cynodon Dactylon BERMUDA GRASS	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY: M.R.
DRAWN BY: M.R.
LAOR: DANIEL R. ERLANDSON
PLOT DATE: 03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS
VICTORVILLE, CA
PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

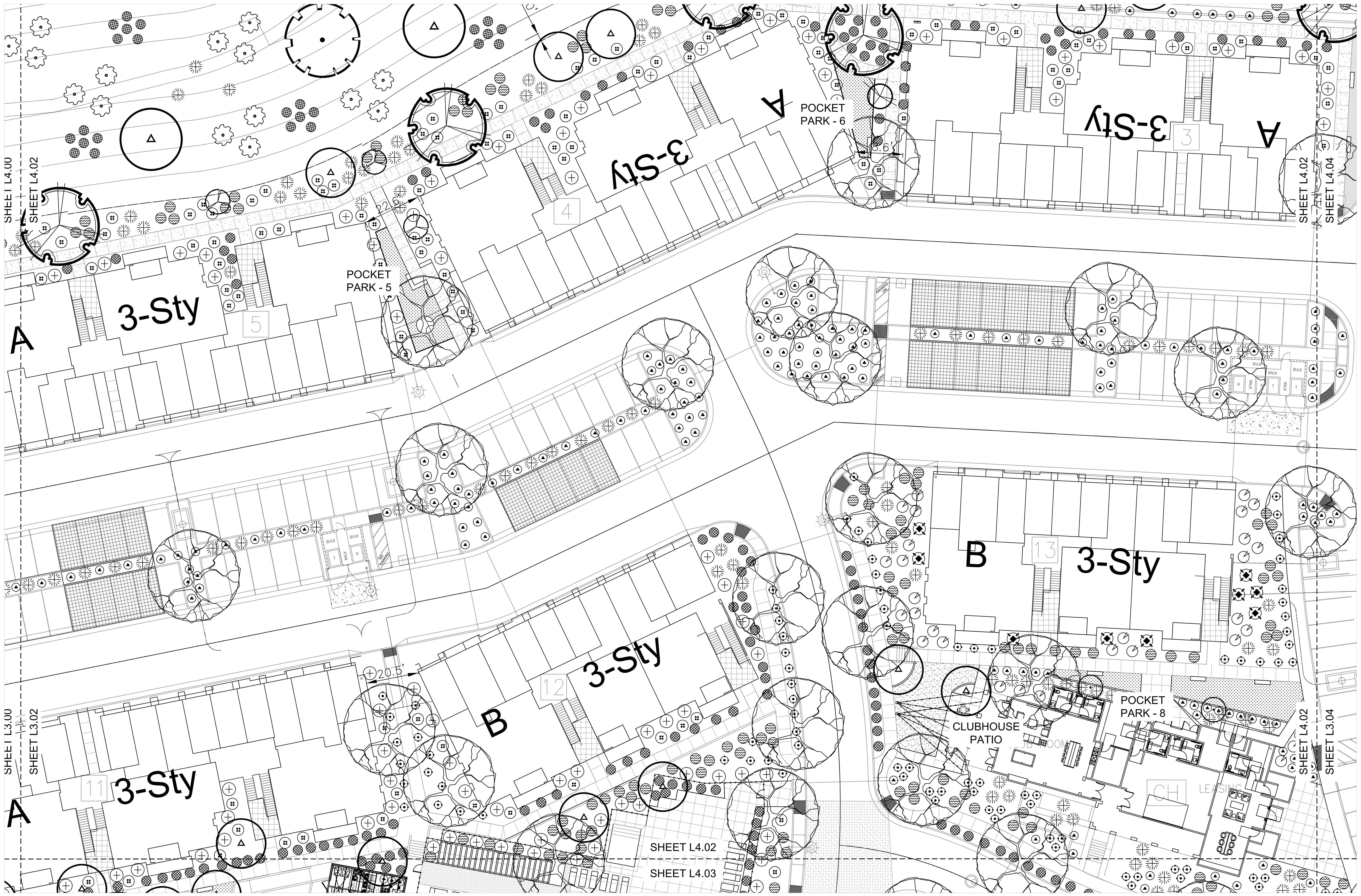
HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
LANDSCAPE PLAN

SHEET NUMBER
L4.01

SCALE: AS INDICATED



LANDSCAPE PLAN

OVERALL SITE

0' 10' 20' 40'

N

SCALE: 1" = 20'-0"

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE *COLOR: DESERT GOLD*	
Cynodon Dactylon *BERMUDA GRASS*	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY: M.R.
DRAWN BY: M.R.
LAOR: DANIEL R. ERLANDSON
PLOT DATE: 03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS

VICTORVILLE, CA

PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

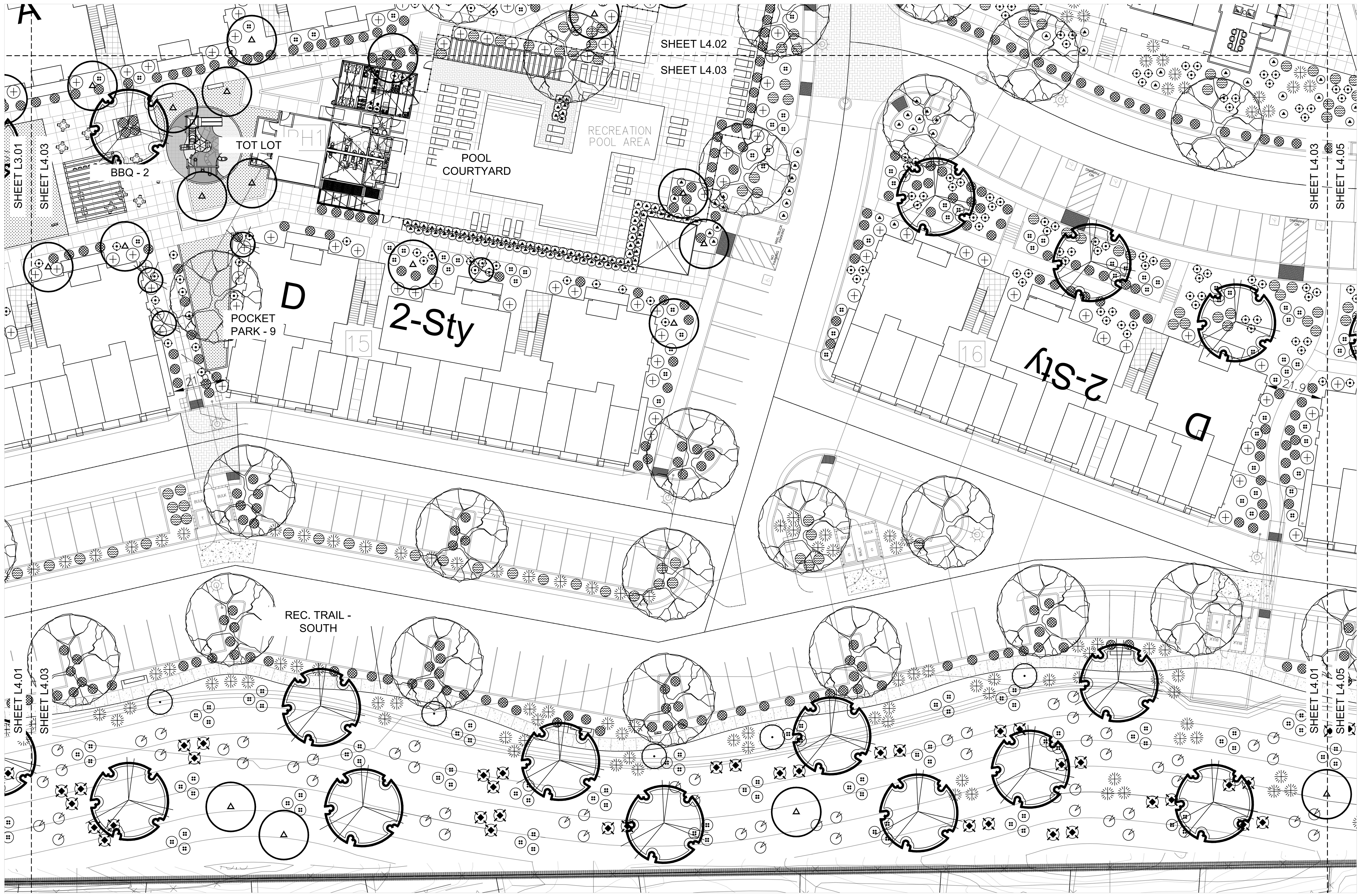
HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
LANDSCAPE PLAN

SHEET NUMBER
L4.02

SCALE: AS INDICATED



LANDSCAPE PLAN

OVERALL SITE

0' 10' 20' 40'
SCALE: 1" = 20'-0"

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE COLOR: DESERT GOLD	
Cynodon Dactylon BERMUDA GRASS	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY: M.R.
DRAWN BY: M.R.
LAOR: DANIEL R. ERLANDSON
PLOT DATE: 03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS

VICTORVILLE, CA

PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
LANDSCAPE PLAN

SHEET NUMBER
L4.03

SCALE: AS INDICATED

LANDSCAPE PLAN

OVERALL SITE

0' 10' 20' 40'
SCALE: 1" = 20'-0"

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE COLOR: DESERT GOLD	
Cynodon Dactylon BERMUDA GRASS	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY:	M.R.
DRAWN BY:	M.R.
LAOR:	DANIEL R. ERLANDSON
PLOT DATE:	03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS
VICTORVILLE, CA
PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

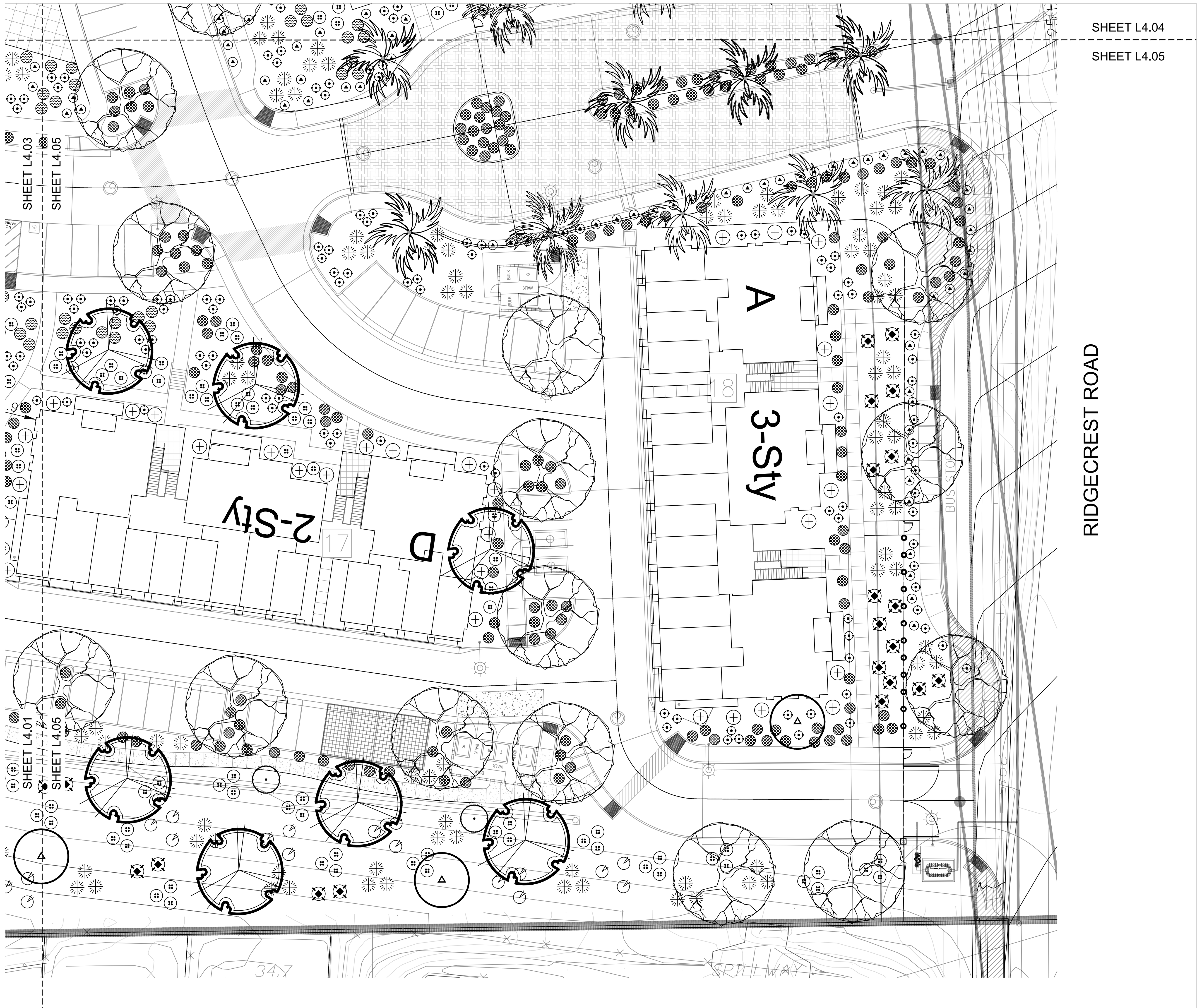
HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
LANDSCAPE PLAN

SHEET NUMBER
L4.04

SCALE: AS INDICATED



LANDSCAPE PLAN

OVERALL SITE

0' 10' 20' 40'
SCALE: 1" = 20'-0"

PLANT PALETTE - OVERALL SITE

CANOPY TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Fraxinus Velutina 'Modesto' MODESTO ASH	79	24" BOX	2.5" CAL. MIN.	10'-12' HT. MULTI-TRUNK
Parkinsonia 'Desert Museum' DESERT MUSEUM PALO VERDE	44	36" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Chitalpa 'Pink Dawn' DESERT WILLOW	74	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD
Acacia Farnesiana SWEET ACACIA	08	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Washingtonia Robusta MEXICAN FAN PALM	13	24" BOX	2.5" CAL. MIN.	12'-15' HT. STANDARD

FRUIT TREES

NAME	QTY.	SIZE	CALIPER	COMMENTS
Citrus x Meyeri MEYER LEMON TREE	16	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Citrus aurantifolia KEY LIME TREE	13	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD
Eriobotrya japonica LOQUAT 'JAPANESE PLUM'	11	24" BOX	2" CAL. MIN.	12'-15' HT. STANDARD

SHRUBS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Yucca Brevifolia JOSHUA TREE	08	5 GAL.	30" HT.	
Leucophyllum L. 'Lynn's Legacy' TEXAS RANGER	319	5 GAL.	30" HT.	
Penstemon Eatonii 'Firecracker' PENSTEMON	470	5 GAL.	30" HT.	
Dalea Frutescens BLACK DALEA	584	5 GAL.	30" HT.	
Yucca Filamentosa 'Gold Sword' GOLDEN YUCCA	570	1 GAL.	30" HT.	
Leucophyllum C. 'Thunder Cloud' TEXAS RANGER	98	5 GAL.	30" HT.	
Hesperaloe P. 'Brakelight' RED YUCCA	129	1 GAL.	30" HT.	
Hesperaloe parvifolia 'Yellow' YELLOW YUCCA	455	5 GAL.	30" HT.	
Festuca 'Maire' ATLAS FESCUE	588	1 GAL.	30" HT.	

GROUNDCOVERS

NAME	QTY.	SIZE	HEIGHT	COMMENTS
Acacia Redolens BANK CATCLAW	168	1 GAL.	30" HT.	
Dalea Greggii TRAILING INDIGO BUSH	1,099	1 GAL.	30" HT.	

SURFACE MATERIALS

NAME	QTY.
3" THICK STABILIZED DECOMPOSED GRANITE COLOR: DESERT GOLD	
Cynodon Dactylon BERMUDA GRASS	10,815 S.F.
PAVED RECREATIONAL TRAIL	13,740 S.F.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY: M.R.
DRAWN BY: M.R.
LAOR: DANIEL R. ERLANDSON
PLOT DATE: 03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS
VICTORVILLE, CA
PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
LANDSCAPE PLAN

SHEET NUMBER
L4.05

SCALE: AS INDICATED

PLANT PALETTE

TREES

Acacia Farnesiana
Sweet Acacia

A 15-20 ft., multi-trunked tree or shrub. Branchlets spiny and bearing finely divided leaves, each of the many leaflets less than 1/4 inch long. The bipinnately compound foliage is light-green and ferny. Small, fragrant, orange-yellow flowers 1/2 inch in diameter cluster in globose heads with many protruding stamens per flower.

Washingtonia Robusta
Mexican Fan Palm

They tend to grow to a height of 80 to 100 feet (24-30 m.). Their leaves are dark green and fan shaped, reaching between 3 and 5 feet (1-1.5 m.) wide. The trunk is reddish brown, but with time its color fades into gray. The trunk is thin and tapered, and on a mature tree it will go from a diameter of about 2 feet (60 cm.) at the base to 8 inches (20 cm.) at the top.

Yucca Brevifolia
Joshua Tree

Iconic tree that represents California's high elevation deserts. This wide-spreading Yucca has stiff, sword-shaped leaves up to 2 feet long. Plant well away from entries and walkways. Demands dry conditions with well draining soil. Canopy coverage: 707 square feet.

Yucca filamentosa 'Gold sword'
Golden Yucca

Boldly striped green and creamy yellow sword-like leaves are topped by tall, showy spikes of fragrant, ivory white blooms in spring. Forms dramatic clumps with age. Use to create contrasting textures as a garden accent or container plant. Evergreen.

Fraxinus Velutina 'Modesto'
Modesto Ash

This ash is a small to medium-sized, deciduous shade tree, usually no taller than 40 ft. in cultivation. Tree with open, rounded crown of spreading branches and leaflets quite variable in shape and hairiness. Spreading branches form a rounded crown. Bark is deeply furrowing into ridges. Pinnately compound foliage turns yellow in fall.

Parkinsonia 'Desert Museum'
Desert Museum Palo Verde

The Desert Museum palo verde is a fast-growing tree of medium size that develops an upright canopy habit, 20-30 ft. tall, 20-25 ft. wide. In contrast to other types of palo verde, this cultivar has thornless chartreuse-green stems and branches. Vast numbers of lemon-yellow flowers are produced each spring for a dramatic display.

Chitalpa 'Pink Dawn'
Desert Willow

Desert-willow is a 15-40 ft., slender-twigged, small tree or large shrub, often with leaning, twisting trunk and open, spreading crown. Leaves are deciduous, willow-like, light green, both opposite and alternate, 4-12 inches long and 1/3 inch wide. The blossom is funnel-shaped, 1-1 1/2 inches long, spreading at the opening into 5 ruffled, petal-like lobes.

SHRUBS

Leucophyllum Candidum 'Thunder Cloud'
Texas Sage 'Thunder Cloud'

Compact size and masses of darker flowers distinguish this shrub with silvery gray foliage. Extraordinarily heat and drought resistant. Perfect for driveways and parking lots in desert climates as individual, informal hedge or in groups. Evergreen.

Dales Frutescens
Black Dalea

Thornless shrub up to 3 feet tall; stems gray to light brown, leaf bearing twigs thin, reddish brown. Occasional on shallow soil over limestone in unshaded upland situations. Leaves up to 1 inch long, divided into as many as 8 pairs of small leaflets and a terminal one on a central axis, leaflets 5 1/16 inch or less long, gland dotted on the lower surface.

Hesperaloe parviflora 'Yellow'
Yellow Yucca

This magnificent Southwestern native produces five-foot-tall wands of bright yellow, waxy, inch-long trumpet flowers in early spring. Blooms tower above the mound of thick, sword-shaped, gray-green, succulent foliage, and persist until fall.

Leucophyllum frutescens
Texas Ranger

This is the original Texas Ranger, which has grayish leaves. Look for improved selection 'Green Cloud' with light green leaves. 'White Cloud' produces white flowers. Canopy coverage: 50 square feet.

Penstamon Eatonii 'Firecracker'
Penstemon

Penstemon eatonii is a species in the Plantaginaceae (Plantain) family known by the common name Eaton's Firecracker. It is native to the western United States from California to the Rocky Mountains, where it grows in many types of desert, woodland, forest, and open plateau habitat. In California it is found primarily in high desert areas. It is a perennial herb producing several sprawling to erect stems reaching one meter in maximum height. The leaves, found mostly in the basal rosette, are lance-shaped to oval, untoothed, and up to 9 centimeters in length.

Hesperaloe parviflora
Red Yucca

Not a yucca, this member of the Century-Plant family produces soft, yucca-like, evergreen leaves, 2-3 ft. in length, crowded on the perennial's short, woody base. The flower stalk rises 5 ft. and bears showy, coral-colored, tubular flowers occur on arching, wand-like, pink stems. Leaves are plum-colored in winter; blue-green other times.

Festuca 'Maire'
Atlas Fescue

Atlas fescue is a tough grass with pleasing ornamental characteristics that is commonly planted in large scale areas where it can provide a strong visual pattern. It grows well in full sun, on well-drained soils and with regular water throughout the year.

Acacia Redolens
Bank Catclaw

Acacia redolens is a low growing, wide spreading evergreen ground cover, as the common name suggests. The foliage of the prostrate acacia is made up of phyllodes rather than true leaves. Similar in structure and function to true leaves, the olive-green phyllodes are long, flattened, ovate structures reaching three-quarter inch in length.

Dalea Greggii
Trailing Indigo Bush

Greggs prairie-clover or indigo bush is a 4-9 in., trailing sub-shrub, spreading 2-4 ft. Grown mostly for its silvery, blue-green, delicately compound leaves, the shrub is awash with clusters of tiny, pea-shaped purple flowers in spring and early summer. This plant is a good ground cover for rocky slopes and exposed sites in the Southwest. Grown chiefly for its foliage, but also gets covered with purple blooms in summer. It will tolerate dry conditions well.

FRUIT TREES

Citrus x Meyeri
Meyer Lemon Tree

Trees typically grow to 6-10' tall. Shiny dark green leaves are evergreen. Waxy, fragrant, white flowers appear year around in warm climates. Large rounded yellow fruit (to 3" diameter) with smooth, thin skin lacks the rough texture and pronounced nipple of the true lemon. Excellent small tree for fruit production. Ornamentally attractive around homes or patios.

Citrus aurantifolia
Key Lime Tree

Not only can you grow organic Key Limes effortlessly, and get fruit quickly, but you also get the promise of success. Because we've planted, grown and nurtured our Key Lime Trees for best results, long before they ship to your door, you get a well-rooted, healthy plant. You get a hardy, strong tree that's ready to acclimate to your homescape. And you won't get that same experience at other nurseries or your local big box store.

Eriobotrya Japonica
Loquat 'Japanese Plum'

Loquats will grow to a manageable mature height with pruning, making them a good size for a diversity of planting options. The shiny, thick leaves with sawtooth edges and delicate white flowers combine for an island-inspired look and fresh scent. But the best part is the fruit: Its juicy orange flesh has a delicious tropical flavor-like a sweet, tangy plum and a kumquat all in one.

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY:	M.R.
DRAWN BY:	M.R.
LAOR:	DANIEL R. ERLANDSON
PLOT DATE:	03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS
VICTORVILLE, CA
PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

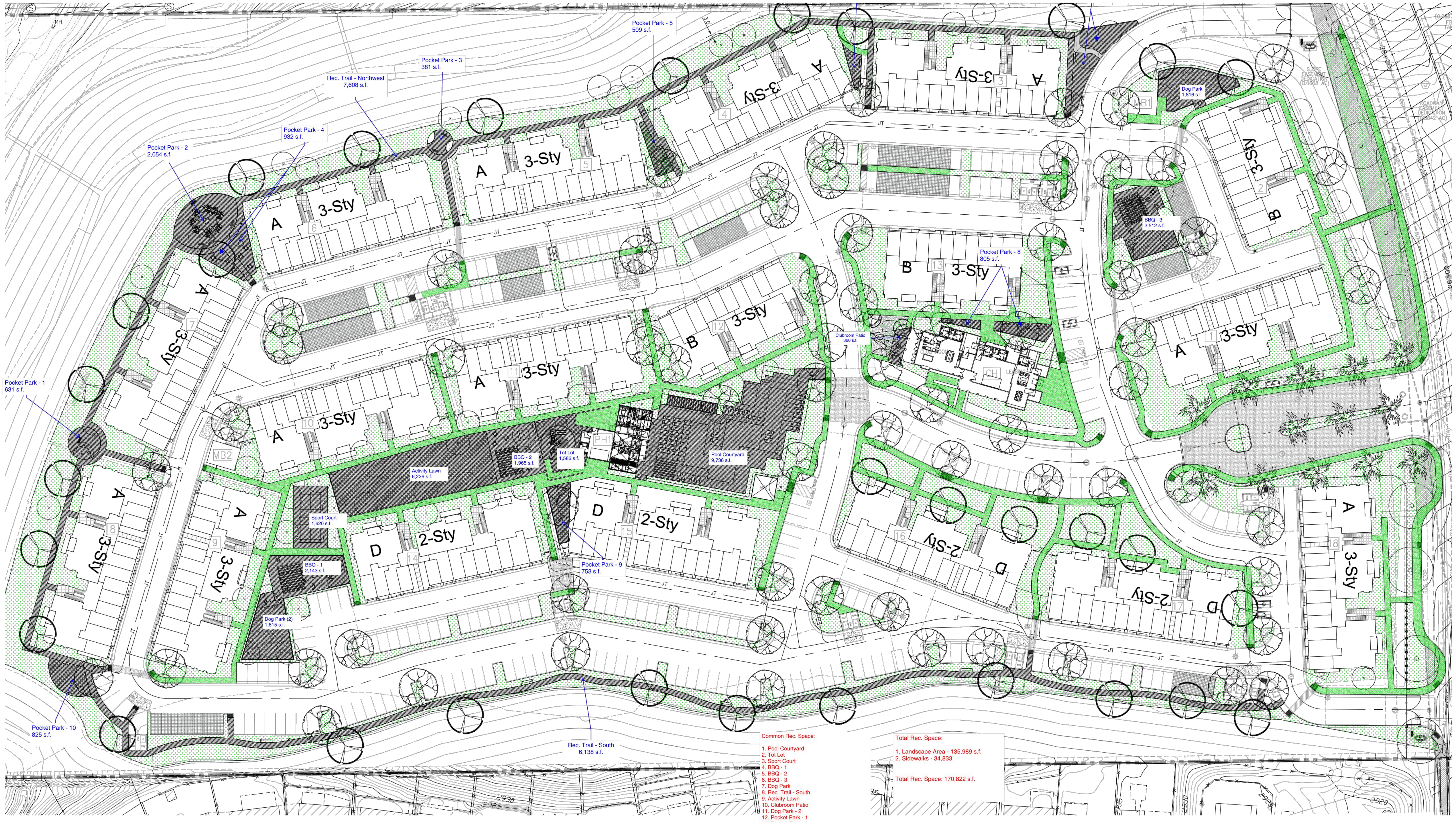
HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES. CA
P: 310-315-0002

SHEET TITLE
PLANT IMAGES

SHEET NUMBER
L4.06

SCALE: AS INDICATED



Common Rec. Space:

1. Pool Courtyard
2. Tot Lot
3. Sport Court
4. BBQ - 1
5. BBQ - 2
6. BBQ - 3
7. Dog Park
8. Rec. Trail - South
9. Activity Lawn
10. Clubroom Patio
11. Dog Park - 2
12. Pocket Park - 1
13. Pocket Park - 2
14. Pocket Park - 3
15. Pocket Park - 4
16. Pocket Park - 5
17. Pocket Park - 6
18. pocket Park - 7
19. Pocket Park - 8
20. Pocket Park - 9
21. Pocket Park - 10
22. Rec. Trail - Northwest

Total Common Rec. Space: 52,166 s.f.

Total Rec. Space:

1. Landscape Area - 135,989 s.f.
2. Sidewalks - 34,833

Total Rec. Space: 170,822 s.f.

AMENITY AREA

LANDSCAPE AREA

SIDEWALKS

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY: M.R.
DRAWN BY: M.R.
LAOR: DANIEL R. ERLANDSON
PLOT DATE: 03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS

VICTORVILLE, CA

PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

HUMPHREYS & PARTNERS LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

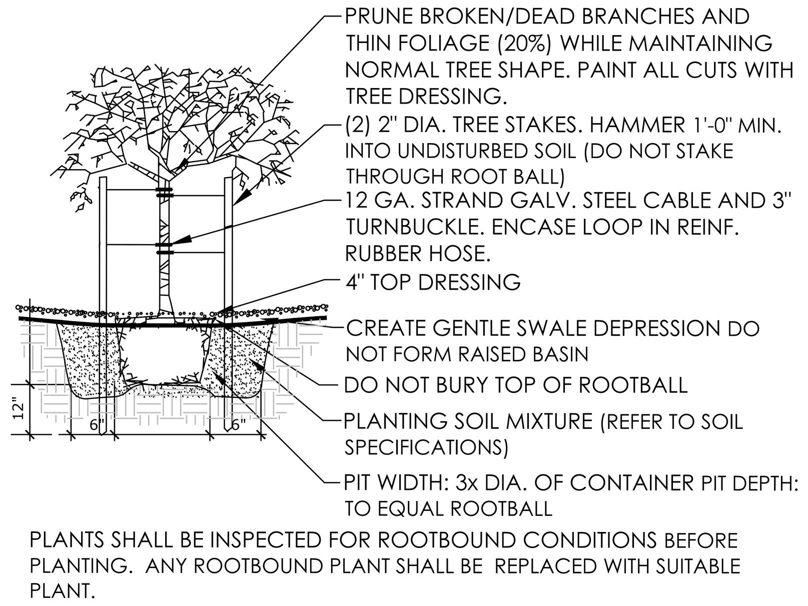
MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
OPEN SPACE CALCULATIONS

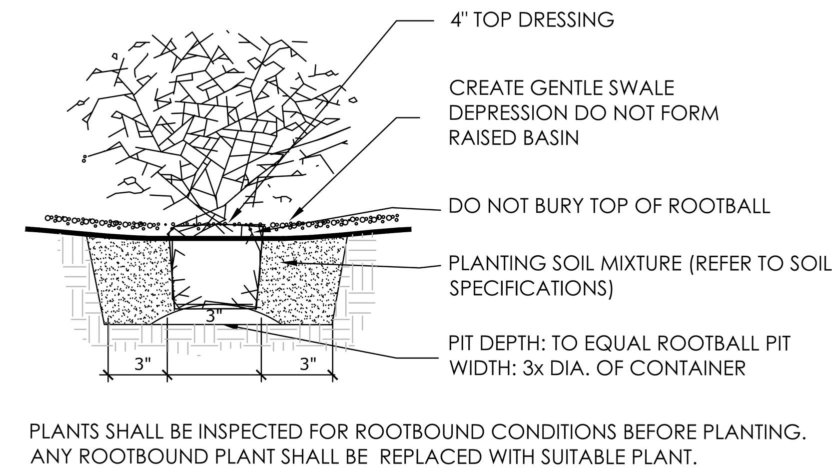
SHEET NUMBER
L4.07

SCALE: AS INDICATED

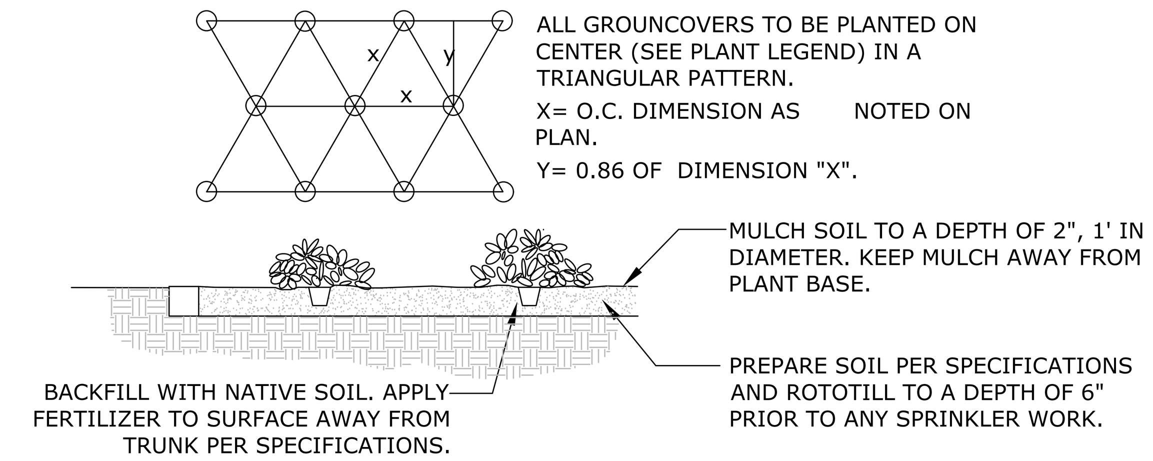
LANDSCAPE



TREE PLANTING (AT-GRADE)
NOT TO SCALE

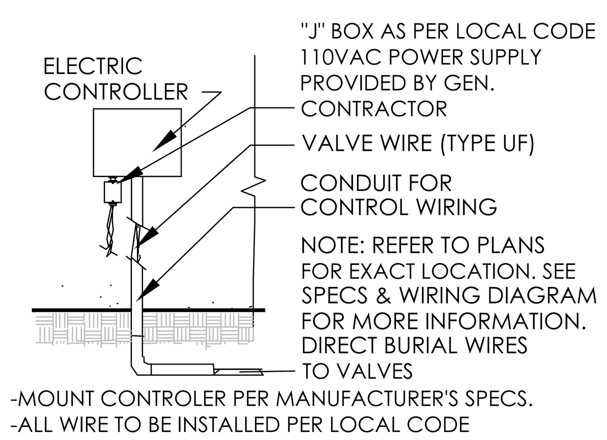


SHRUB PLANTING (AT-GRADE)
NOT TO SCALE

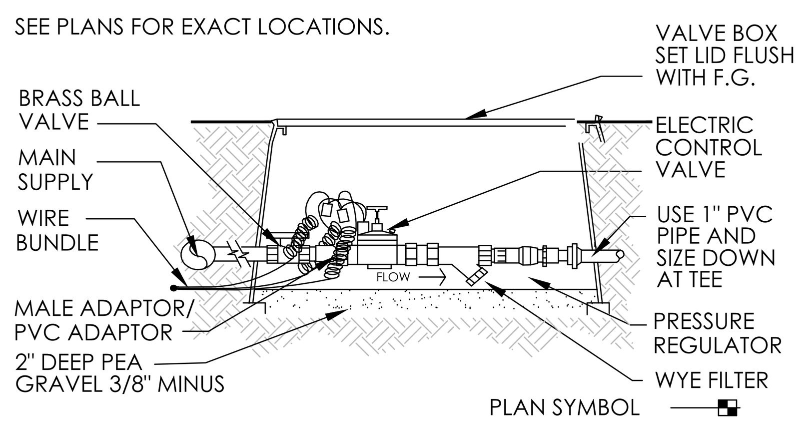


GROUNDCOVER PLANTING (AT-GRADE)
NOT TO SCALE

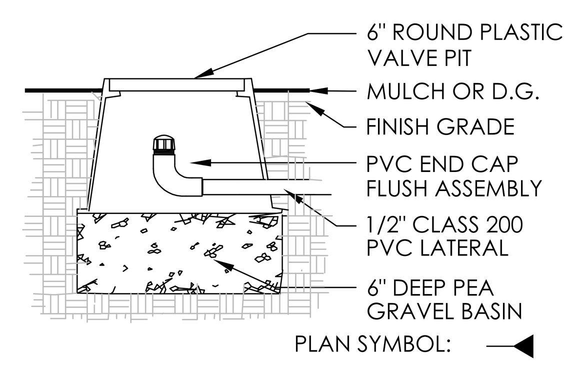
IRRIGATION



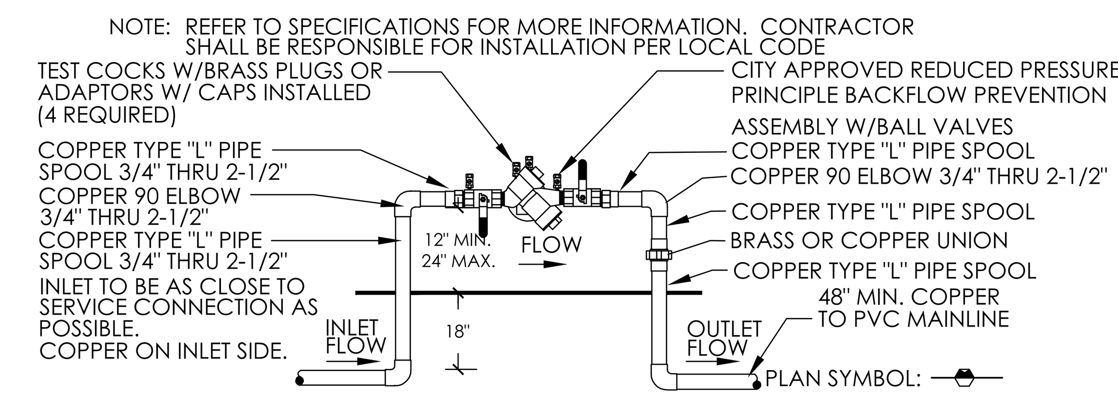
ELECTRIC CONTROLLER
NOT TO SCALE



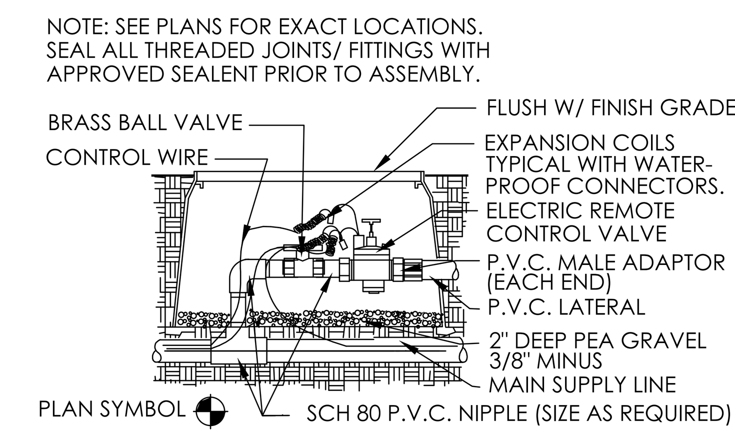
DRIP VALVE ASSEMBLY UNIT
NOT TO SCALE



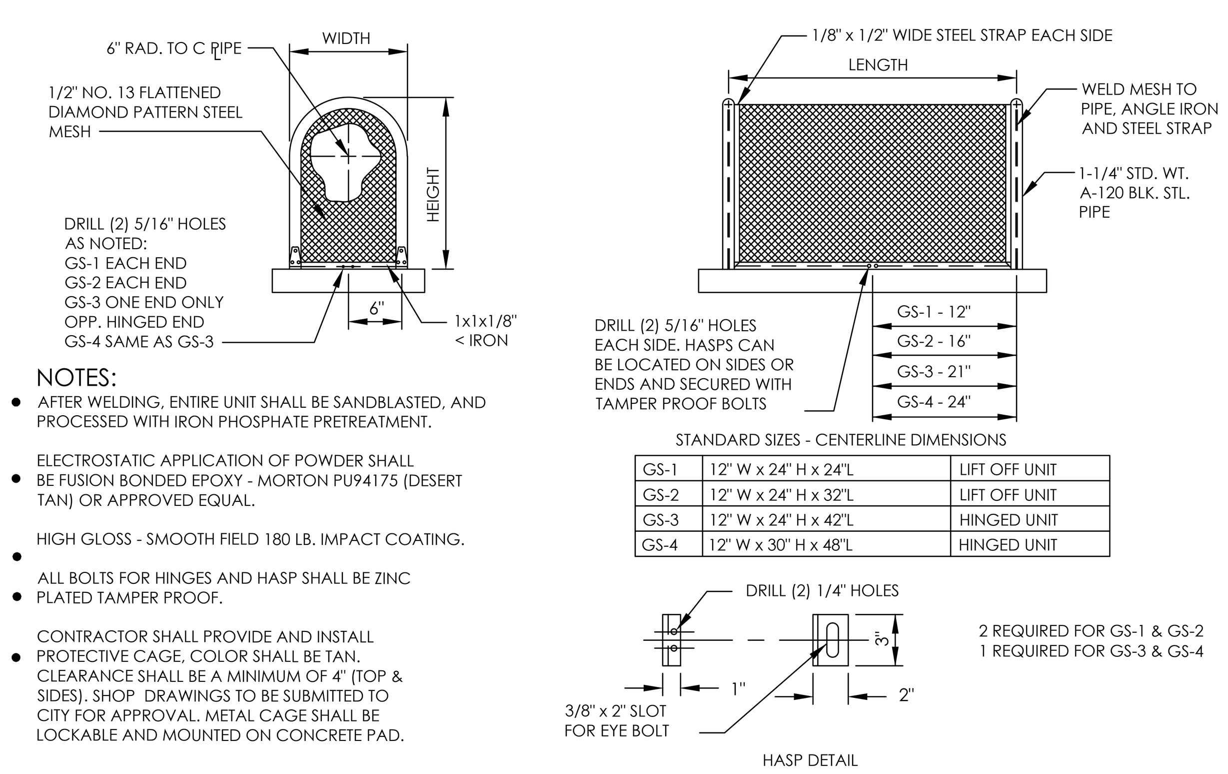
FLUSH VALVE
NOT TO SCALE



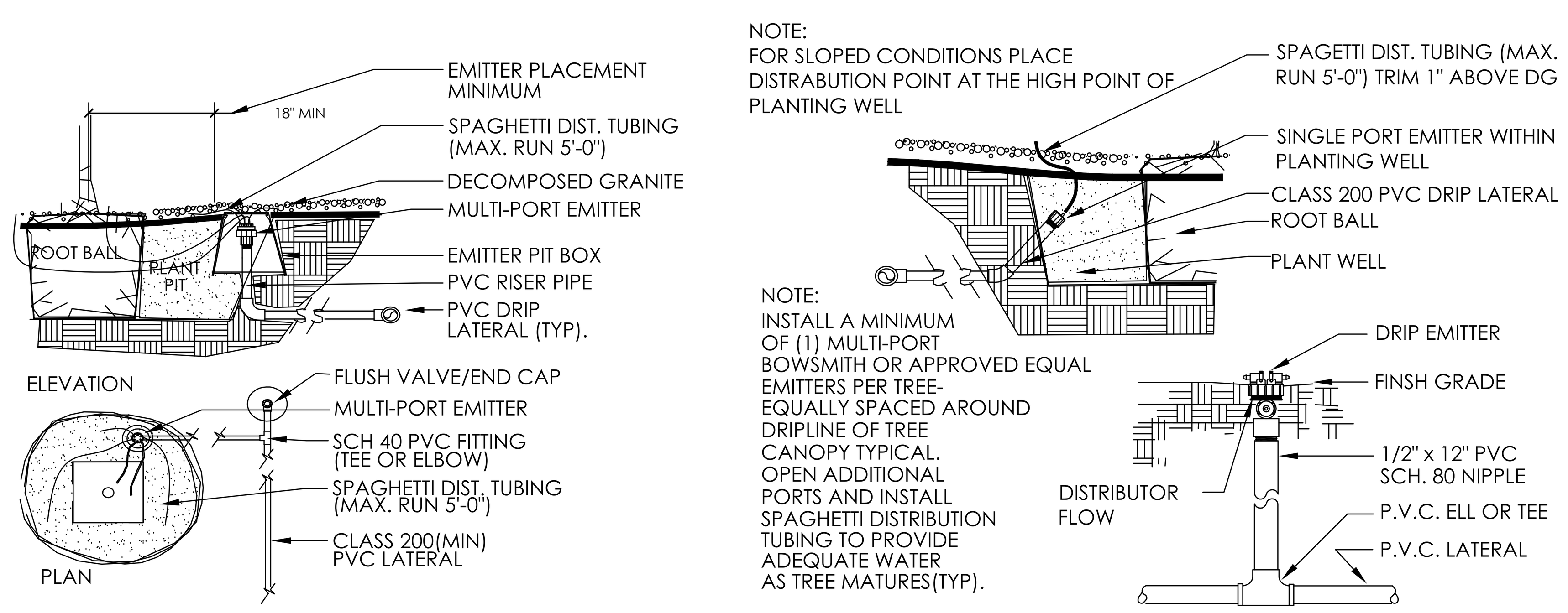
BACKFLOW PREVENTION ASSEMBLY (3/4" THRU 2-1/2")
NOT TO SCALE



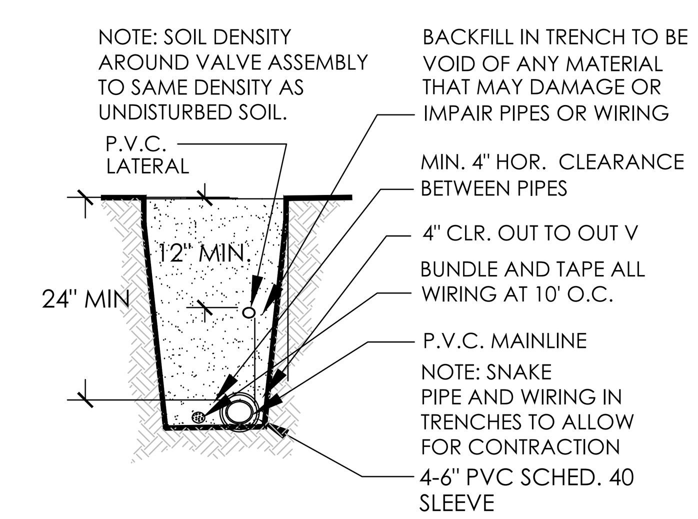
ELECTRIC REMOTE CONTROL VALVE
NOT TO SCALE



"GUARDSHACK" SECURITY CAGE
NOT TO SCALE



MULTI-PORT EMITTER & SINGLE-PORT EMITTER
NOT TO SCALE



TRENCHING
NOT TO SCALE

PRELIMINARY LANDSCAPE PLAN - 2021-MARCH-19 - NOT FOR CONSTRUCTION

DESIGNED BY:	M.R.
DRAWN BY:	M.R.
LAOR:	DANIEL R. ERLANDSON
PLOT DATE:	03/19/2020

ISSUE FOR PRICING/BIDDING:
ISSUE DATE

ISSUE FOR PERMIT APPLICATION:
ISSUE DATE

ISSUE FOR CONSTRUCTION:
ISSUE DATE

REVISION SCHEDULE

NO:	DATE:	DESCRIPTION:

LAKEVIEW APARTMENTS
VICTORVILLE, CA
PROJECT #: 18411

These drawings are for preliminary coordination only and not to be used for regulatory approval or construction.

hpla studio

HUMPHREYS & PARTNERS
LANDSCAPE ARCHITECTURE, L.L.C.
5339 ALPHA ROAD SUITE 300
DALLAS, TX 75240
T: (972) 701-9636
F: (972) 701-9639
W: www.hplastudio.com

MJM INVESTMENT COMPANY, LLC
12300 WILSHIRE BLVD. #410
LOS ANGELES, CA
P: 310-315-0002

SHEET TITLE
GENERAL LANDSCAPE & IRRIGATION DETAILS

SHEET NUMBER
L5.00

SCALE: AS INDICATED

APPENDIX C

INFILTRATION RESULTS/SOILS REPORT(S)

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

February 13, 2020

Project No. 12659.001

To: Village Lake East LLC
12300 Wilshire Boulevard, #410
Los Angeles, California 90404

Attention: Mr. Michael Asheghian

Subject: Infiltration Test Results, Proposed 22-Acre Multi-Family Residential Development, Tentative Tract 18005, Southwest of Ridgecrest Road and Chinquapin Drive, City of Victorville, California

References: Leighton and Associates, Inc., 2008, Preliminary Geotechnical Investigation, Proposed 22-Acre Apartment/Condominium Residential Development, Lake View Village Townhouse Development, Tract 18005, APN 3090-501-01, Southwest of Ridgecrest Road and Chinquapin Drive, City of Victorville, California, Project No. 022333-001, dated June 18, 2008

Leighton and Associates, Inc., 2020, Geotechnical Report Update, Proposed 22-Acre Multi-Family Residential Development, Tentative Tract 18005, Southwest of Ridgecrest Road and Chinquapin Drive, City of Victorville, California, Project 12659.001, dated February 10, 2020

In accordance with your request and authorization, Leighton and Associates, Inc. (Leighton) has conducted infiltration testing at the site of the proposed 22-acre Lake View Village Townhouse Development, Tract 18005, APN 3090-501-01, located southwest of Ridgecrest Road and Chinquapin Drive in the City of Victorville. Leighton previously conducted a geotechnical investigation for the development and recently prepared a geotechnical update based on the most recent grading plan. The previous geotechnical study did not include infiltration testing or infiltration recommendations (Leighton, 2008), as infiltration was not a part of the design at the time.

10532 Acacia Street, Suite B-6 ▪ Rancho Cucamonga, CA 91730-5455
909.484.2205 ▪ 909.484.2170 Fax

According to our discussions with and review of plans by Urban Resource, the project civil engineer, we understand that an infiltration basin is planned in the western portion of the site and dry wells are proposed in the eastern portion. The plan shows four locations where infiltration tests were recommended. The recommended depth of the tests were also provided. We conducted infiltration testing in near vicinity to the requested locations at depths provided or as discussed with the civil engineer.

Scope of Work

The scope of our study has included the following tasks:

- Background Review: We reviewed available, relevant geotechnical and geologic maps, reports, and aerial photographs available in our in-house library. This included review of the previously prepared geotechnical report (Leighton, 2008)

- Utility Coordination: We contacted Underground Service Alert (USA) prior to excavating borings so that utility companies could mark their utilities onsite.

- Field Exploration: We excavated, logged, and sampled four hollow-stem auger borings (B-1-20 to B-4-20) to a maximum depth of 101.5 feet bgs in near vicinity of the recommended test locations. Two borings were drilled for the purposes of infiltration testing in the western basin reaching depths of about 15 feet (B-1-20 and B-2-20), and two borings (B-3-20 and B-4-20) were drilled in the eastern portion of the site. B-3-20 reached a depth of approximately 61.5 feet, while B-4-20 was drilled to a depth of 101.5 feet. Ground elevations at the boring locations were obtained from the plans are noted in the boring logs.

  Encountered earth materials were logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D 2488). Relatively undisturbed soil samples were obtained at selected intervals within these borings using both a California ring-lined sampler and a Standard Penetration Test (SPT) split-spoon sampler.

- Infiltration Testing: We conducted well permeameter tests within the four borings (B-1-20 through B-4-20) to evaluate general infiltration rates of the subsurface soils at the depths and locations tested. The well permeameter tests were conducted based on the USBR 7300-89 method and in general accordance with San Bernardino County guidelines. The tests were conducted at depths below the surface ranging from approximately 10 to 15 feet in B-1-20 and B-2-20, 56 to 60 feet in B-3-20 and between a depth of about 16 feet to 100 feet in B-4-20. We used water from a nearby fire hydrant to conduct the tests.

After testing, all excavations were backfilled with the onsite soil cuttings. Logs of the geotechnical borings and the well permeameter test results are attached. Approximate boring and well permeameter test locations are shown on Figure 2.

- Engineering Analysis: Data obtained from our testing was evaluated and analyzed to provide the recommendations presented in this report.

- Report Preparation: Results of our infiltration study have been summarized in this report.

Subsurface Soil Conditions

The site is located in an area mapped as underlain by alluvial soil consisting of sand, silty sand and sandy silt. Gravel was encountered in some areas of the site and sandy clay was encounter in borings drilled in 2008.

The soil encountered in Borings B-1-20 and B-2-20 consisted of medium to coarse-grained sand with a trace of gravel; however, silty sand was encountered at the bottom of B-2-20. Boring B-3-20 encountered medium to coarse-grained sand with gravel through most of its depth. A silty sand layer was encountered near 40 feet. Sand and silty sand was encountered in the upper portion of B-4-20. Below a depth of 60 feet, finer grained soils were encountered, consisting of sandy silt with layers of slit and silty sand.

Additional descriptions of the subsurface conditions are presented on the boring logs. Boring logs from our geotechnical investigation (2008) were used in conjunction with the boring logs from this current study to evaluate subsurface conditions located at the proposed infiltration facilities.

Groundwater

Groundwater was not encountered in hollow-stem auger borings drilled during our current exploration to depths up to 101.5 feet. Boring B-4-20 was the deepest boring and had a surface elevation of about 2,910 feet msl. The bottom elevation of the boring was about 2,809 feet msl. Groundwater was encountered near the bottom of Boring B-1 drilled during our previous geotechnical investigation (Leighton, 2008) in the western portion of the site. The water elevation at that time was about 2,798 feet msl. This is very similar to the water level elevation of 2,790 feet msl in nearby Spring Valley Lake, suggesting the lake water level is associated with groundwater elevations in the area.

Infiltration Testing

Four well permeameter tests were conducted to estimate the infiltration rate at specific locations of the site. Well permeameter tests were conducted within Borings B-1-20 and B-2-20 in the depth interval between 10 and 15 feet. This depth interval was selected based on the recommendation of the civil engineer and the proposed bottom elevation of the designed western infiltration basin.

Dry wells are proposed for the eastern portion of the site, and the civil engineer desired to test the entire water column from the near surface to bottom depth of at least 10 feet above groundwater.

Well permeameter tests were conducted inside borings B-3-20 and B-4-20. In B-4-20, we conducted infiltration testing extending from about 9 to 16 feet below the surface to the bottom, 92 feet deep (10 feet above the bottom of the boring). Boring B-3 was tested in the depth range of 56 feet to 60 feet. We were unable to test the entire depth of B-3-20, as the infiltration was rapid (1,000 gallons of water over a 2-hour period).

A well permeameter test is useful for field measurements of soil infiltration rates, and is suited for testing when the design depth of the basin or chamber is deeper than current existing grades. The test consists of excavating a boring to the depth of the test. A layer of clean sand is placed in the boring bottom to support temporary perforated well casing pipe. In addition, sand is poured around the outside of the well casing within the test zone to prevent the boring from caving/collapsing or eroding when water is added. A float valve apparatus, placed inside the casing, adds water stored in barrels at the top of the hole to the boring as water infiltrates into the soil, while maintaining a constant water head in the boring. The volume percolated during timed intervals is converted into an incremental infiltration rate, in inches per hour. The test was conducted based on the USBR 7300-89 test method.

Due to the depth and volume of water required, barrels and a float apparatus were not used for the deep tests in the eastern portion. Instead, a hose was connected directly to a fire hydrant and the hose placed at the bottom of the boring. A valve in the hose at the top of the boring controlled the rate of water flow and a water meter measured the rate of flow. The flow was controlled to keep a constant head during testing. While the water level was rising, the amount of water needed to raise the elevation in the boring over a specific time period was also measured. In the case of B-3-20, the water level did not raise above a depth of 56 feet, despite the flow valve being completely open.

The results of the infiltration testing are summarized below:

Boring	Boring Depth (ft)	Test Bottom Depth (ft)	Approximate Infiltration Rate (in/hr)
B-1-20	15’	15’	4
B-2-20	15’	15’	1.8
B-3-20	61.5’	59.5’	70
B-4-20	101.5’	92’	3.5

These are raw values, before applying an appropriate factor of safety or correction factor. Results of the infiltration testing are provided in the attachments.

Infiltration Recommendations

We recommend a small-scale infiltration rate of 2 inches per hour be used for the western infiltration basin prior to applying correction factors. This is considered a reasonable conservative value for the more granular soils onsite. The incremental infiltration rate is defined as the incremental flow rate of water infiltrated, divided by the surface area of the infiltration interface. We recommend that a correction factor/safety factor be applied to the infiltration rate in conformance with San Bernardino County guidelines, since monitoring of actual facility performance has shown that actual infiltration rates are lower than for small-scale tests. The small-scale infiltration rate should be divided by a correction factor of at least 2 for buried chambers and at least 3 for open basins, but the correction/safety factor may be higher based on project-specific aspects.

The infiltration characteristics for dry wells in the eastern portion of the site is variable. While B-3-20 had a very high rate of infiltration, B-4-20 was significantly lower. As such, where dry wells are planned, we suggest they be designed with clusters of dry wells per general location based on a presumed-conservative infiltration rate of 4 inches per hour. After the first dry well is constructed in each general location, it should be tested for infiltration. If the tested infiltration rates are sufficient to reduce the number of dry wells at that location, some or all of the remaining planned dry wells may be omitted, as appropriate, based on review of the test data.

The bottom of the dry wells may extend to an elevation of 2,810. Based on available data, this elevation is on the order of 15 to 20 feet above groundwater in the area. It should be noted that finer grained material (silty sand and sandy silt) was encountered in the lower half of B-4-20, whereas sand and gravel was encountered in the upper portion of B-4-20 and in the majority of B-3-20.

The infiltration rates described herein are for a clean, unsilted infiltration surface in native, granular alluvial soil. These values may be reduced over time as silting of the basin or chamber occurs. Furthermore, if the basin or chamber bottom is allowed to be compacted by heavy equipment, this value is expected to be significantly reduced. Infiltration of water through soil is highly dependent on such factors as grain size distribution of the soil particles, particle shape, fines content, clay content, and density. Small changes in soil conditions, including density, can cause large differences in observed infiltration rates. Infiltration is not suitable in compacted fill.

It should be noted that during periods of prolonged precipitation, the underlying soils tend to become saturated to greater and greater depths/extents. Therefore, infiltration rates tend to decrease with prolonged rainfall. It is difficult to extrapolate longer-term, full-scale infiltration rates from small-scale tests, and as such, this is a significant source of uncertainty in infiltration rates.

Additional Review and Evaluation:
Infiltration rates are anticipated to vary significantly based on the location and depth. Infiltration concepts should be discussed with Leighton as infiltration plans are being developed. Leighton should review all infiltration plans, including locations and depths of proposed facilities.

General Design Considerations:
The periodic flow of water carrying sediments in the basin or chamber, plus the introduction of wind-blown sediments and sediments from erosion of the basin side walls, can eventually cause the bottom of the basin or chamber to accumulate a layer of silt, which has the potential of significantly reducing the overall infiltration rate of the basin or chamber. Therefore, we recommend that significant amounts of silt/sediment not be allowed to flow into the facility within storm water, especially during construction of the project and prior to achieving a mature landscape on site. As it is typically very difficult to remove accumulated silt from buried infiltration facilities, and silt-removal maintenance in open basins has the potential to adversely affect the infiltration rate due to compaction, we recommend that an easily maintained, robust silt/sediment removal system be installed to pretreat storm water before it enters the infiltration facility.

As infiltrating water can seep within the soil strata nearly horizontally for long distances, it is important to consider the impact that infiltration facilities can have on nearby subterranean structures, such as basement walls or open excavations, whether onsite or offsite, and whether existing or planned. Any such nearby features should be identified and evaluated as to whether infiltrating water can impact these. Such features should be brought to Leighton's attention as they are identified.

Infiltration facilities should not be constructed adjacent to or under buildings. Setbacks should be discussed with Leighton during the planning process.

Infiltration facilities should be constructed with spillways or other appropriate means that would cause overfilling to not be a concern to the facility or nearby improvements.

For buried chambers that allow interior standing water, control/access manhole covers should not contain holes or should be screened to prevent mosquitos from entering the cambers.

In general, the rate of infiltration reduces as the head of water in the infiltration facility reduces, and it also reduces with prolonged periods of infiltration. As such, water typically infiltrates much faster near the beginning of and/or immediately after storm events than at times well after a storm when the water level in the facility has receded, since the infiltration rate is then slower due to both lower head and longer overall duration of infiltration. In open basins with compacted or silty bottoms, this could be problematic, in that, even if the basin had already infiltrated significant amounts of storm water, the lower several inches or feet of water could remain in the basin for an extended period of time, creating a prolonged open-water safety concern and potential for mosquitos. In a buried/covered infiltration chamber, these conditions would be of less concern.

Estimating infiltration rates, especially based on small-scale testing, is inexact and indefinite, and often involves known and unknown soil complexities, potentially resulting in a condition where actual infiltration rates of the completed facility are significantly less than design rates. It should be confirmed that coarse sands are exposed in the infiltration bottom (the bottom of buried chambers or the bottom of infiltration trenches in basins), and that fine-grained soils are not located at shallow depths below the infiltration bottom.

Construction Considerations:
We recommend that Leighton evaluate the infiltration facility excavations, to confirm that granular, undisturbed alluvium is exposed in the bottoms and sides. Additional excavation or evaluation may be required if fine-grained soils are exposed.

It is critical to infiltration that the basin or chamber bottom not be allowed to be compacted during construction or maintenance; rubber-tired equipment and vehicles should not be allowed to operate on the bottom. We recommend that at least the bottom 3 feet of the basins or chambers be excavated with an excavator or similar.

If fill material is needed to be placed in the basin, such as due to removal of uncontrolled artificial fill, the fill material should be select and free-draining sand, and should be observed and evaluated by Leighton.

Maintenance Considerations:
The infiltration facilities should be routinely monitored, especially before and during the rainy season, and corrective measures should be implemented as/when needed. Things to check for include proper upkeep, proper infiltration, absence of accumulated silt, and that de-silting filters/features are clean and functioning. Pretreatment desilting features should be cleaned and maintained per manufacturers' recommendations. Even with measures to prevent silt from flowing into the infiltration facility, accumulated silt may need to be removed occasionally as part of maintenance.

We appreciate the opportunity to work with you on the development of this project. If you have any questions regarding this report, please call us at your convenience.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

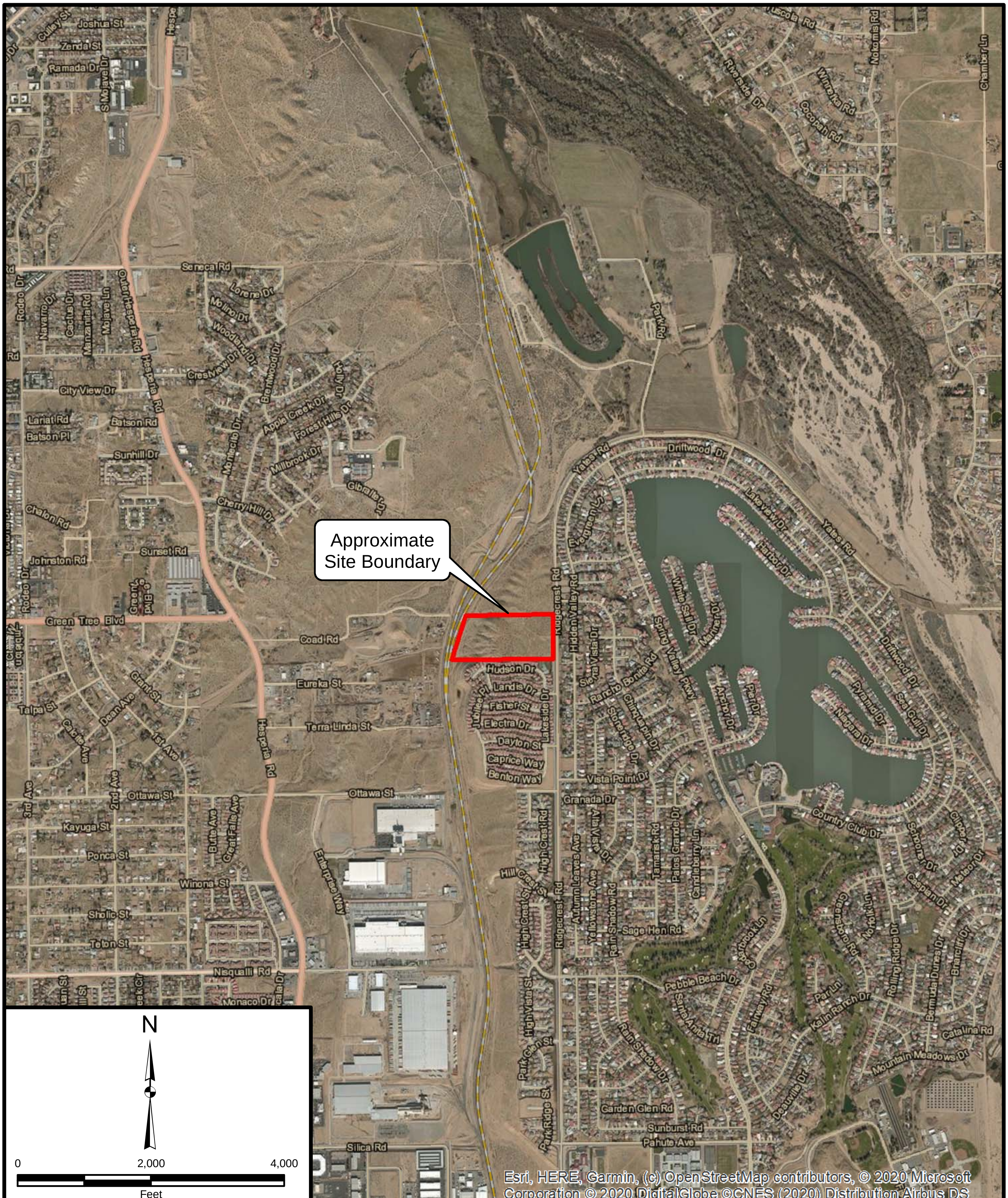
Jason D. Hertzberg, GE 2711
Principal Engineer

Philip A. Buchiarelli, CEG 1715
Principal Geologist

PB/JDH/rsm

Attachments: Figure 1 - Site Location Map
Figure 2 - Test Location Map
Borings Logs
Well Permeameter Logs

Distribution: (1) Addressee



Project: 12659.001	Eng/Geol: JDH/PB
Scale:1 " = 2,000 '	Date: February 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

SITE LOCATION MAP

Village Lake East
Ridgecrest Road
City of Victorville, California

Figure 1

Leighton

Map Saved as V:\Drafting\12659\001\Maps\12659-001_F01_SLM_2020-02-12.mxd on 2/12/2020 12:42:47 PM

LEGEND

B-4-20
T.D.101.5'
No G.W.

APPROXIMATE LOCATION OF BORING

TEST LOCATION MAP
Village Lake East
Ridgecrest Road
City of Victorville, California

Proj: 12659.001	Eng/Geol: JDH/PB
Scale: NTS	Date: February 2020

Figure 2

Leighton

Drafted By: BQT Checked By: BQT

GEOTECHNICAL BORING LOG B-1-20

Project No.	12659.001	**Date Drilled**	2-6-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2835'
Location	See Test Location Map	**Sampled By**	JDO

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
2835	0							SP	@0-5' SAND, brown, moist, medium to coarse sand, nonplastic, <20% fines (field estimate), trace gravel	
2830	5									
								SP	@ 8', same as above	
2825	10									
				S1	9 12 10			SP	@13.5' SAND, medium dense, brown, moist, medium to coarse sand, nonplastic	
2820	15								@15.2' SAND, **Total Depth: 15.2 feet, ~2" gravel +set pipe** **Groundwater not encountered.** **Backfilled with soil cuttings**	
2815	20									
2810	25									
2805	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-2-20

Project No.	12659.001	**Date Drilled**	2-6-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2835'
Location	See Test Location Map	**Sampled By**	JDO

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
2835	0									
								SP	@0-13' SAND (SP), brown, slightly moist, medium to coarse sand, nonplastic, Trace gravel, trace fines	
2830	5									
								SP	@7', Same as above	
2825	10									
				S1	9 10 11			SP-SM	@13' SILTY SAND (SP-SM), medium dense, brown, moist, medium to coarse sand, nonplastic, <15% fines (field estimate), top cleaner sand, trace gravel	
2820	15								**Total Depth: 15 feet** **Groundwater not encountered.** **Backfilled with soil cuttings**	
2815	20									
2810	25									
2805	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG B-3-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2920'
Location	See Test Location Map	**Sampled By**	JDO

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
2920	0							SP	@surface: minor vegetation, silty sand with gravel **Alluvium (Qal)**	
2915	5							SP	@0-5' SAND with gravel (SP), red brown, medium to coarse sand, gravel max 1" (field estimate), trace fines	
2910	10									
2905	15							SP	Same as above	
2900	20			S1	6 13 9			SP	@20' SAND (SP), medium dense, light brown, fine to medium sand, trace fines, some coarse grain sand	
2895	25								grinding on gravel	
2890	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-3-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2920'
Location	See Test Location Map	**Sampled By**	JDO

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
2890	30							SP	@30' SAND with gravel (SP), fine to coarse sand	
2885	35							SP	similar to above	
2880	40			S2	3 4 13			SM	@40' SILTY SAND (SM), medium dense, olive, moist, fine to medium sand, nonplastic, 30-40% fines (field estimate), cohesive, some precipitates	
								SP	coarse sand in spoils, low fines	
2875	45									
2870	50							SP	more gravel with sand, max 3" (Field Estimate),	
2865	55									
2860	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-3-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2920'
Location	See Test Location Map	**Sampled By**	JDO

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
2860	60			S3	25 18 19			SP	@60' SAND with gravel (SP), medium dense, medium to coarse sand, bottom of sample loose 4" of very silty fine-coarse sand (field estimate) **Total Depth: 61.5 feet** **Groundwater not encountered.** **Backfilled with spoils**	
2855	65									
2850	70									
2845	75									
2840	80									
2835	85									
2830	90									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG B-4-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2910'
Location	See Test Location Map	**Sampled By**	JDO

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
2910	0							SP	@0-20' SAND with gravel, red brown, moist, fine to coarse sand, nonplastic, 5% fines (field estimate), mostly medium to coarse grain, gravel max 1" (field estimate)	
2905	5									
2900	10							SP	similar to above	
2895	15									
2890	20			S1	15 21 21			SP-SM	@20' SAND with gravel (SP-SM), medium dense, orange brown, moist, fine to coarse sand, nonplastic, 10% fines (field estimate), 2" max gravel (field estimate)	
2885	25								larger gravel/grinding	
2880	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-4-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2910'
Location	See Test Location Map	**Sampled By**	JDO

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
2880	30							SP-SM	SAND with gravel, medium to coarse sand, gravel max 3" in spoils (field estimate)	
2875	35									
2870	40			S2	9 11 17			SM	@40' SILTY SAND, medium dense, olive gray to orange, moist, fine to medium sand, nonplastic, 30% fines (field estimate), some coarse grain sand, cohesive, oxidized	
2865	45								more fines, difficult to drill	
2860	50							SP-SM	@51' SAND with silt, fine to medium sand	
2855	55									
2850	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-4-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2910'
Location	See Test Location Map	**Sampled By**	JDO

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
2850	60			S3	3 17 20			ML	@60' SILT with fine sand (ML), medium dense, olive, moist, fine to medium sand, nonplastic, precipitate nodules, interbedded fine-medium grain sand, very tight in sample	
2845	65								mixture of sand and silty material	
2840	70							ML	difficult drilling (Tight)	
2835	75								very difficult drilling (Tight)	
2830	80			S4	9 50/5			SM-ML	@80' SILTY SAND with gravel, medium dense, gray olive to orange, moist, fine to medium sand, nonplastic, Interbedded Silt and Silty Sand with gravel, oxidized, precipitates, very tight	
									very dense	
2825	85									
2820	90									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-4-20

Project No.	12659.001	**Date Drilled**	2-7-20
Project	Village Lake Infiltration	**Logged By**	JDO
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger	**Ground Elevation**	2910'
Location	See Test Location Map	**Sampled By**	JDO

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
2820	90							SM-ML	silty sand to sandy silt	
2815	95									
2810	100			S5	20 23 23			SM	@100' SILTY SAND, medium dense, brown, moist, fine sand, nonplastic, 20-30% fines (field estimate), tight	
									Total Depth: 101.5 feet **Groundwater not encountered.** **Backfill bentonite +soil to 92', gravel ~4" then set pipe** **Backfilled with soil cuttings**	
2805	105									
2800	110									
2795	115									
2790	120									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: Village Lake 12659.001

Exploration #/Location:	B-1	Initial estimated Depth to Water Surface (in.):	141
Depth Boring drilled to (ft):	15.3	Average depth of water in well, "h" (in.):	42
Tested by:	AIK	approx. h/r:	7.7
USCS Soil Type in test zone:	SP-SM	Tu (Fig. 8) (ft):	88.3
Weather (start to finish):	Clear	Tu>3h?:	yes, OK
Liquid Used/pH:	Water from drill rig		
Measured boring diameter:	11 in.	5.5 in. Well Radius	Cross-sectional area for vol calcs (in.^2): 38.0
Approx Depth to GW below GS:	100 ft		

Well Prep: Drilled to 21.5', Backfilled to 13', Bentonite + Soil to 10'8" bgs, 2"gravel below pipe, gravel around ~bottom 2 ' of pipe

	ft	in.	Total (in.)	
Depth to Bot of well (or top of soil over Bentonite)	15. ft	3. in.	183	
Pilot Tube stickup (+ is above ground)		-3. in.	-3	
Depth to top of sand outside of casing from top of pilot tube				
Depth to top of float assembly from top of pilot tube	10. ft	0.75 in.	121	123.75 Depth below GS (in.)
Float Assembly ID		F		
Float assembly Extension length (in.)		30		

Diameter of barrels (in.):	22.5
No. of Supply barrels:	1
Total Area of barrels (in.^2):	397.4

Field Data / **Calculations**

Date	Time	Water Level in Supply Barrel (in.)	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 2/6/2020	Start time: 12:11																			
-																				
2/6/20	12:11	29.25	9	8				0	119.0	64.0										
2/6/20	12:21	29.25	9	8			10	10	119.0	64.0	0	64	0	0	0	0	0	0.9	0.00	**0.00**
2/6/20	12:31	29.25	9	8			10	20	119.0	64.0	0	64	0	0	0	0	0	0.9	0.00	**0.00**
2/6/20	12:41					Ran out of battery	10	30	119.0	64.0	0	64	0	0	0	0	0	0.921	0.00	**0.00**
2/6/20						& Kink in hose fixed														
2/6/20	1:29	22.75	12	1				0	148.0	35.0										
2/6/20	1:39	19.5	11	9			10	0	144.0	39.0	4	37	1292	-152	1140	114	6838	0.9	1.15	**4.59**
2/6/20	1:49	14.75	11	9			10	0	144.0	39.0	0	39	1888	0	1888	189	11326	0.9	1.95	**7.24**
2/6/20	1:59	11.5	11	9			10	0	144.0	39.0	0	39	1292	0	1292	129	7749	0.9	1.34	**4.95**
2/6/20	2:09	10	11	9			10	0	144.0	39.0	0	39	596	0	596	60	3577	0.9	0.62	**2.29**
2/6/20	2:19	6.75	11	9			10	0	144.0	39.0	0	39	1292	0	1292	129	7749	0.9	1.34	**4.95**
2/6/20						Switch barrels														
2/6/20	2:34	28	11	9				0	144.0	39.0										
2/6/20	2:44	25	11	8			10	0	143.0	40.0	1	40	1192	-38	1154	115	6925	0.9	1.14	**4.37**
2/6/20	2:54	22	11	8			10	0	143.0	40.0	0	40	1192	0	1192	119	7153	0.9	1.19	**4.46**
2/6/20	3:04	19	11	8			10	0	143.0	40.0	0	40	1192	0	1192	119	7153	0.9	1.19	**4.46**
2/6/20	3:14	16.5	11	8			10	0	143.0	40.0	0	40	994	0	994	99	5961	0.9	0.99	**3.72**
2/6/20	3:24	13.75	11	8			10	0	143.0	40.0	0	40	1093	0	1093	109	6557	0.9	1.09	**4.09**
2/6/20	3:34	11	11	8			10	0	143.0	40.0	0	40	1093	0	1093	109	6557	0.9	1.09	**4.09**
2/6/20	3:44	8.25	11	8.3			10	0	143.3	39.7	-0.3	40	1093	11	1104	110	6626	0.9	1.11	**4.15**
2/6/20	3:54	5.5	11	8.3			10	0	143.3	39.7	0	40	1093	0	1093	109	6557	0.9	1.10	**4.12**

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project:	Village Lake 12659.001	Initial estimated Depth to Water Surface (in.):	127
Exploration #/Location:	*B-2*	Average depth of water in well, "h" (in.):	53
Depth Boring drilled to (ft):	15	approx. h/r:	9.6
Tested by:	AIK	Tu (Fig. 8) (ft):	89.4
USCS Soil Type in test zone:	SP-SM	Tu>3h?:	yes, OK
Weather (start to finish):	Clear		
Liquid Used/pH:	Water from drill rig		
Measured boring diameter:	11 in. — 5.5 in. Well Radius	Cross-sectional area for vol calcs (in.^2):	38.0
Approx Depth to GW below GS:	100 ft		

Well Prep: Drilled to 21.5', Backfilled to 13', Bentonite + Soil to 10'8" bgs, 2"gravel below pipe, gravel around ~bottom 2 ' of pipe

	ft	in.	Total (in.)	
Depth to Bot of well (or top of soil over Bentonite)	15. ft		180	
Pilot Tube stickup (+ is above ground)		5. in.	5	
Depth to top of sand outside of casing from top of pilot tube				
Depth to top of float assembly from top of pilot tube	10. ft	3. in.	123	118 Depth below GS (in.)
Float Assembly ID		E		
Float assembly Extension length (in.)		34		

Diameter of barrels (in.):	23.5
No. of Supply barrels:	1
Total Area of barrels (in.^2):	433.5

Field Data — **Calculations**

Date	Time	Water Level in Supply Barrel (in.)	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 2/6/2020	Start time: 12:17																			
-																				
2/6/20	12:17	29.5	6	5				0	72.0	108.0										
2/6/20	12:27	23.5	6				10	10	67.0	113.0	5	111	2601	-190	2411	241	14467	0.9	0.46	**3.41**
2/6/20	12:37	20.25				Ran out of battery	10	20	67.0	113.0	0	113	1409	0	1409	141	8454	0.9	0.27	**1.95**
2/6/20	12:47	17.5					10	30	67.0	113.0	0	113	1192	0	1192	119	7153	0.921	0.23	**1.65**
2/6/20																				
2/6/20	1:28	14.25						0	67.0	113.0										
2/6/20	1:38	13.25					10	0	67.0	113.0	0	113	434	0	434	43	2601	0.9	0.08	**0.60**
2/6/20	1:48	10.5					10	0	67.0	113.0	0	113	1192	0	1192	119	7153	0.9	0.23	**1.65**
2/6/20	1:58	9.75				Bend in pilot pipe fixed	10	0	67.0	113.0	0	113	325	0	325	33	1951	0.9	0.06	**0.45**
2/6/20	2:08	8.75	12.35				10	0	143.2	36.8	-76.2	75	434	2894	3327	333	19963	0.9	5.14	**6.86**
2/6/20	2:18	8	12.35				10	0	143.2	36.8	0	37	325	0	325	33	1951	0.9	0.37	**1.32**
2/6/20	2:28	6.75	12.37				10	0	143.4	36.6	-0.24	37	542	9	551	55	3306	0.9	0.63	**2.24**
2/6/20						Switch Barrels														
2/6/20	2:36	30	12.39					0	143.7	36.3										
2/6/20	2:46	28.75	12.39				10	0	143.7	36.3	0	36	542	0	542	54	3251	0.9	0.62	**2.22**
2/6/20	2:56	27.75	12.4				10	0	143.8	36.2	-0.12	36	434	5	438	44	2628	0.9	0.51	**1.80**
2/6/20	3:06	26.25	12.4				10	0	143.8	36.2	0	36	650	0	650	65	3902	0.9	0.75	**2.67**
2/6/20	3:16	25.25	12.4				10	0	143.8	36.2	0	36	434	0	434	43	2601	0.9	0.50	**1.78**
2/6/20	3:26	23.75	12.4				10	0	143.8	36.2	0	36	650	0	650	65	3902	0.9	0.75	**2.67**
2/6/20	3:36	22.25	12.4				10	0	143.8	36.2	0	36	650	0	650	65	3902	0.9	0.75	**2.67**
2/6/20	3:46	21.25	12.4				10	0	143.8	36.2	0	36	434	0	434	43	2601	0.9	0.50	**1.78**
2/6/20	3:56	20	12.4				10	0	143.8	36.2	0	36	542	0	542	54	3251	0.9	0.63	**2.23**

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: Village Lake 12659.001

Exploration #/Location: *B-3*

Depth Boring drilled to (ft): 61.5

Tested by: JDO

USCS Soil Type in test zone:

Weather (start to finish):

Liquid Used/pH: fire hydrant w/meter

Measured boring diameter: 10 in. — 5 in. Well Radius

Approx Depth to GW below GS: 100 ft

Well Prep:

Initial estimated Depth to Water Surface (in.): 666

Average depth of water in well, "h" (in.): 48

approx. h/r: 9.6

Tu (Fig. 8) (ft): 44.5

Tu>3h?: yes, OK

Cross-sectional area for vol calcs (in.^2): 31.4

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	59. ft	6. in.	714
Pilot Tube stickup (+ is above ground)		6. in.	6
Depth to top of sand outside of casing from top of pilot tube			
Depth to top of float assembly from top of pilot tube			0
Float Assembly ID			
Float assembly Extension length (in.)			

-6 Depth below GS (in.)

Flow Meter:

Meter ID: 3236

Meter Color: Black

Meter Unit: Gallons

DL ID:

0.05 gallons/pulse

Field Data / **Calculations**

Date / Start Date	Time / Start time:	Data from Flow Meter: Reading (cu-ft or gal)	Data from Flow Meter: Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change from Δh	Vol Change Total	Flow (in^3/min)	q, Flow (in^3/hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
2/11/2020	9:11	Gallons		ft	in.																
-																					
2/11/20	9:11	766		56.5					0	672.0	42.0										
2/11/20	9:15	807		56.4				4	4	670.8	43.2	1.2	43	9471	-38	9433	2358	141500	0.9	21.69	**97.47**
2/11/20	9:19	833		56.3				4	8	669.6	44.4	1.2	44	6006	-38	5968	1492	89525	0.9	13.15	**59.98**
2/11/20	9:29	917		56.25				10	18	669.0	45.0	0.6	45	19404	-19	19385	1939	116311	0.921	16.79	**76.35**
2/11/20	9:39	1001		56.17				10	28	668.0	46.0	0.96	45	19404	-30	19374	1937	116243	0.9	16.21	**75.00**
2/11/20	9:50	1094		56.13				11	39	667.6	46.4	0.48	46	21483	-15	21468	1952	117098	0.9	16.11	**74.37**
2/11/20	10:00	1179		56.08				10	49	667.0	47.0	0.6	47	19635	-19	19616	1962	117697	0.9	15.86	**73.89**
2/11/20	10:10	1262		56.09				10	59	667.1	46.9	-0.12	47	19173	4	19177	1918	115061	0.9	15.62	**71.87**
2/11/20	10:20	1347		56.05				10	69	666.6	47.4	0.48	47	19635	-15	19620	1962	117720	0.9	15.69	**73.25**
2/11/20	10:30	1432		56.04				10	79	666.5	47.5	0.12	47	19635	-4	19631	1963	117787	0.9	15.66	**72.83**
2/11/20	10:40	1516		56.02				10	89	666.2	47.8	0.24	48	19404	-8	19396	1940	116379	0.9	15.34	**71.68**
2/11/20	10:50	1601		56.01				10	99	666.1	47.9	0.12	48	19635	-4	19631	1963	117787	0.9	15.48	**72.28**
2/11/20	11:00	1687		55.97				10	109	665.6	48.4	0.48	48	19866	-15	19851	1985	119106	0.9	15.38	**72.63**
2/11/20	11:10	1772		55.92				10	119	665.0	49.0	0.6	49	19635	-19	19616	1962	117697	0.9	14.90	**70.98**

template updated: 8/14/19

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: Village Lake 12659.001

Exploration #/Location: *B-4*

Depth Boring drilled to (ft): 101.5

Tested by: JDO

USCS Soil Type in test zone: SP to ML/SM

Weather (start to finish):

Liquid Used/pH: fire hydrant w/meter

Measured boring diameter: 9 in. 4.5 in. Well Radius

Approx Depth to GW below GS: 100 ft

Well Prep:

Initial estimated Depth to Water Surface (in.): 647

Average depth of water in well, "h" (in.): 457

approx. h/r: 101.6

Tu (Fig. 8) (ft): 46.1

Tu>3h?: No, Cannot use Condition I Equation, must re-evaluate, shallow

Cross-sectional area for vol calcs (in.^2): 25.4

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	92. ft		1104
Pilot Tube stickup (+ is above ground)		3. in.	3
Depth to top of sand outside of casing from top of pilot tube			
Depth to top of float assembly from top of pilot tube			0
Float Assembly ID			
Float assembly Extension length (in.)			

-3 Depth below GS (in.)

Flow Meter:

Meter ID: 3242

Meter Colo: Black

Meter Unit: Gallons

DL ID:

0.05 gallons/pulse

Field Data | **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Data from Flow Meter: Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	Depth to WL in Boring in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change (in.^3) from Δh	Vol Change (in.^3) Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:																				
2/10/2020	8:56	Gallons		ft	in.																
-																					
2/10/20	8:56	720		75					0	897.0	207.0										
2/10/20	9:05	773		68				9	9	813.0	291.0	84	249	12243	-2135	10108	1123	67388	0.9	0.43	**8.82**
2/10/20	9:08	790		66				3	12	789.0	315.0	24	303	3927	-610	3317	1106	66341	0.9	0.38	**7.14**
2/10/20	9:11	810		64				3	15	765.0	339.0	24	327	4620	-610	4010	1337	80201	0.921	0.41	**8.00**
2/10/20	9:14	831		62				3	18	741.0	363.0	24	351	4851	-610	4241	1414	84821	0.9	0.38	**7.88**
2/10/20	9:18	852		60				4	22	717.0	387.0	24	375	4851	-610	4241	1060	63616	0.9	0.26	**5.53**
2/10/20	9:21	876		58				3	25	693.0	411.0	24	399	5544	-610	4934	1645	98681	0.9	0.36	**8.06**
2/10/20	9:25	900		56				4	29	669.0	435.0	24	423	5544	-610	4934	1234	74011	0.9	0.24	**5.70**
2/10/20	9:30	927		54				5	34	645.0	459.0	24	447	6237	-610	5627	1125	67525	0.9	0.20	**4.93**
2/10/20	9:35	951		54				5	39	645.0	459.0	0	459	5544	0	5544	1109	66528	0.9	0.20	**4.73**
2/10/20	9:37	960		53.9				2	41	643.8	460.2	1.2	460	2079	-30	2049	1024	61455	0.9	0.18	**4.36**
2/10/20	9:40	972		53.8				3	44	642.6	461.4	1.2	461	2772	-30	2742	914	54830	0.9	0.16	**3.88**
2/10/20	9:45	990		54.55				5	49	651.6	452.4	-9	457	4158	229	4387	877	52641	0.9	0.16	**3.76**
2/10/20	9:47	997		54.5				2	51	651.0	453.0	0.6	453	1617	-15	1602	801	48053	0.9	0.15	**3.46**
2/10/20	9:49	1005		54.75				2	53	654.0	450.0	-3	452	1848	76	1924	962	57727	0.9	0.18	**4.17**
2/10/20	9:51	1010		54.87				2	55	655.4	448.6	-1.44	449	1155	37	1192	596	35748	0.9	0.11	**2.59**
2/10/20	9:52	1014		54.9				1	56	655.8	448.2	-0.36	448	924	9	933	933	55989	0.9	0.18	**4.07**
2/10/20	9:53	1020		54.85				1	57	655.2	448.8	0.6	449	1386	-15	1371	1371	82245	0.9	0.26	**5.98**
2/10/20	9:55	1025		54.8				2	59	654.6	449.4	0.6	449	1155	-15	1140	570	34193	0.9	0.11	**2.48**
2/10/20	9:57	1034		54.7				2	61	653.4	450.6	1.2	450	2079	-30	2049	1024	61455	0.9	0.19	**4.45**
2/10/20	10:02	1053		54.4				5	66	649.8	454.2	3.6	452	4389	-91	4298	860	51570	0.9	0.16	**3.72**
2/10/20	10:12	1089		53.7				10	76	641.4	462.6	8.4	458	8316	-213	8103	810	48615	0.9	0.14	**3.46**
2/10/20	10:15	1100		53.6				3	79	640.2	463.8	1.2	463	2541	-30	2511	837	50210	0.9	0.15	**3.53**
2/10/20	10:25	1133		53.35				10	89	637.2	466.8	3	465	7623	-76	7547	755	45281	0.9	0.13	**3.17**
2/10/20	10:35	1170		53.15				10	99	634.8	469.2	2.4	468	8547	-61	8486	849	50916	0.9	0.15	**3.55**
2/10/20	10:45	1207		53				10	109	633.0	471.0	1.8	470	8547	-46	8501	850	51008	0.9	0.15	**3.54**
2/10/20	10:55	1243		52.9				10	119	631.8	472.2	1.2	472	8316	-30	8286	829	49713	0.9	0.14	**3.44**
2/10/20	11:05	1278		52.85				10	129	631.2	472.8	0.6	473	8085	-15	8070	807	48419	0.9	0.14	**3.34**
2/10/20	11:15	1313		52.7				10	139	629.4	474.6	1.8	474	8085	-46	8039	804	48236	0.9	0.14	**3.32**
2/10/20	11:26	1355		52.6				11	150	628.2	475.8	1.2	475	9702	-30	9672	879	52754	0.9	0.15	**3.62**
2/10/20	11:36	1392		52.1				10	160	622.2	481.8	6	479	8547	-152	8395	839	50367	0.9	0.14	**3.43**
2/10/20	11:41	1422		50.8				5	165	606.6	497.4	15.6	490	6930	-396	6534	1307	78402	0.9	0.20	**5.22**
2/10/20	11:46	1454		49.7				5	170	593.4	510.6	13.2	504	7392	-335	7057	1411	84678	0.9	0.21	**5.48**
2/10/20	11:51	1488		48.7				5	175	581.4	522.6	12	517	7854	-305	7549	1510	90588	0.9	0.22	**5.72**
2/10/20	11:56	1520		48				5	180	573.0	531.0	8.4	527	7392	-213	7179	1436	86142	0.9	0.20	**5.33**
2/10/20	12:02	1561		47.2				6	186	563.4	540.6	9.6	536	9471	-244	9227	1538	92270	0.9	0.21	**5.61**
2/10/20	12:07	1597		46.55				5	191	555.6	548.4	7.8	545	8316	-198	8118	1624	97413	0.9	0.21	**5.83**
2/10/20	12:12	1626		45.8				5	196	546.6	557.4	9	553	6699	-229	6470	1294	77643	0.9	0.17	**4.58**
2/10/20	12:17	1660		44.6				5	201	532.2	571.8	14.4	565	7854	-366	7488	1498	89856	0.9	0.18	**5.19**
2/10/20	12:22	1693		43.3				5	206	516.6	587.4	15.6	580	7623	-396	7227	1445	86718	0.9	0.17	**4.88**

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: Village Lake 12659.001

Exploration #/Location: *B-4*

Depth Boring drilled to (ft): 101.5

Tested by: JDO

USCS Soil Type in test zone: SP to ML/SM

Weather (start to finish):

Liquid Used/pH: fire hydrant w/meter

Measured boring diameter: 9 in. 4.5 in. Well Radius

Approx Depth to GW below GS: 100 ft

Well Prep:

Initial estimated Depth to Water Surface (in.): 260

Average depth of water in well, "h" (in.): 844

approx. h/r: 187.4

Tu (Fig. 8) (ft): 78.3

Tu>3h?: No, Cannot use Condition I Equation, must re-evaluate, shallow

Cross-sectional area for vol calcs (in.^2): 25.4

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	92. ft		1104
Pilot Tube stickup (+ is above ground)		3. in.	3
Depth to top of sand outside of casing from top of pilot tube			
Depth to top of float assembly from top of pilot tube			0
Float Assembly ID			
Float assembly Extension length (in.)			

-3 Depth below GS (in.)

Flow Meter:

Meter ID: 3242

Meter Colo Black

Meter Unit Gallons

DL ID

0.05 gallons/pulse

Field Data | **Calculations**

Date	Time	Data from Flow Meter		Depth to WL in Boring (measured from top of pilot tube)		Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Reading (cu-ft or gal)	Interval Pulse Count											from supply	from Δh	Total					
2/10/2020	12:12	Gallons		ft	in.																
-																					
2/10/20	12:12	1626		45.8					0	546.6	557.4										
2/10/20	12:17	1660		44.6				5	5	532.2	571.8	14.4	565	7854	-366	7488	1498	89856	0.9	0.18	**5.19**
2/10/20	12:22	1693		43.3				5	10	516.6	587.4	15.6	580	7623	-396	7227	1445	86718	0.9	0.17	**4.88**
2/10/20	12:28	1731		41.5				6	16	495.0	609.0	21.6	598	8778	-549	8229	1372	82290	0.921	0.15	**4.49**
2/10/20	12:38	1797		37.7				10	26	449.4	654.6	45.6	632	15246	-1159	14087	1409	84523	0.9	0.13	**4.36**
2/10/20	12:48	1862		34.2				10	36	407.4	696.6	42	676	15015	-1067	13948	1395	83686	0.9	0.12	**4.04**
2/10/20	12:58	1929		31.6				10	46	376.2	727.8	31.2	712	15477	-793	14684	1468	88104	0.9	0.12	**4.03**
2/10/20	13:08	1993		29.75				10	56	354.0	750.0	22.2	739	14784	-564	14220	1422	85319	0.9	0.11	**3.76**
2/10/20	13:18	2056		27.7				10	66	329.4	774.6	24.6	762	14553	-625	13928	1393	83567	0.9	0.10	**3.57**
2/10/20	13:29	2128		26.3				11	77	312.6	791.4	16.8	783	16632	-427	16205	1473	88391	0.9	0.10	**3.68**
2/10/20	13:38	2184		25.1				9	86	298.2	805.8	14.4	799	12936	-366	12570	1397	83800	0.9	0.09	**3.42**
2/10/20	13:49	2254		23.55				11	97	279.6	824.4	18.6	815	16170	-473	15697	1427	85622	0.9	0.09	**3.42**
2/10/20	13:59	2319		22.3				10	107	264.6	839.4	15	832	15015	-381	14634	1463	87803	0.9	0.09	**3.44**
2/10/20	14:10	2390		20.9				11	118	247.8	856.2	16.8	848	16401	-427	15974	1452	87131	0.9	0.09	**3.35**
2/10/20	14:20	2452		19.8				10	128	234.6	869.4	13.2	863	14322	-335	13987	1399	83919	0.9	0.08	**3.17**
2/10/20	14:30	2517		19				10	138	225.0	879.0	9.6	874	15015	-244	14771	1477	88626	0.9	0.08	**3.31**
2/10/20	14:41	2590		17.8				11	149	210.6	893.4	14.4	886	16863	-366	16497	1500	89984	0.9	0.08	**3.31**
2/10/20	14:51	2649		17				10	159	201.0	903.0	9.6	898	13629	-244	13385	1339	80310	0.9	0.07	**2.92**
2/10/20	15:01	2708		16.82				10	169	198.8	905.2	2.16	904	13629	-55	13574	1357	81445	0.9	0.07	**2.94**
2/10/20	15:04	2726		16.77				3	172	198.2	905.8	0.6	905	4158	-15	4143	1381	82855	0.9	0.07	**2.98**
2/10/20	15:08	2747		16.7				4	176	197.4	906.6	0.84	906	4851	-21	4830	1207	72445	0.9	0.06	**2.61**
2/10/20	15:18	2803		16.6				10	186	196.2	907.8	1.2	907	12936	-30	12906	1291	77433	0.9	0.07	**2.78**
2/10/20	15:28	2858		16.3				10	196	192.6	911.4	3.6	910	12705	-91	12614	1261	75681	0.9	0.07	**2.71**
2/10/20	15:38	2911		16.27				10	206	192.2	911.8	0.36	912	12243	-9	12234	1223	73403	0.9	0.06	**2.63**
2/10/20	15:48	2963		16.25				10	216	192.0	912.0	0.24	912	12012	-6	12006	1201	72035	0.9	0.06	**2.58**

117° 16' 57" W　　117° 16' 37" W

117° 16' 57" W　　117° 16' 37" W

Map Scale: 1:2,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator　Corner coordinates: WGS84　Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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, California, Mojave River Area
Survey Area Data: Version 10, Sep 13, 2018

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

Date(s) aerial images were photographed: Feb 1, 2015—Feb 4, 2015

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
107	BRYMAN LOAMY FINE SAND, 5 TO 9 PERCENT SLOPES	C	7.6	32.6%
108	BRYMAN LOAMY FINE SAND, 9 TO 15 PERCENT SLOPES	C	4.5	19.4%
113	CAJON SAND, 2 TO 9 PERCENT SLOPES	A	2.7	11.6%
130	HAPLARGIDS-CALCIORTHIDS COMPLEX, 15 TO 50 PERCENT SLOPES		8.4	36.4%
Totals for Area of Interest			**23.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

<u>APPENDIX D</u>

BMP DETAILS, CALCULATIONS, AND SUPPORTING DOCUMENTATION

Lake View Apartments
Preliminary Water Quality System Summary
Date: June 17, 2021

NOTE: CUDO storage/infiltration system and Stormcapture Vault is Preliminary, and a different type of system may be considered during Final Engineering (ie. CMP, vault, pipes, etc)

<u>BMP #1A</u>

DCV = 4,243 cu-ft

Treatment Area = 2.73 ac.

Pretreatment System: Contech CDS Unit 2015-5-C

<u>Subsurface Infiltration System</u>
CUDO STORAGE CUBES (2'x2'x2' cubes):
Cube Storage Capacity = 95%
$V_{storage}$ = 3,420 cu-ft
No. of Cubes = 450 Cubes
Footprint = 90'L x 10'W x 4'H

GRAVEL STORAGE:
n = 0.40
$V_{storage}$ = 864 cu-ft
Footprint = 90'L x 12'W x 2'H

$V_{storage-total}$ = 4,284 cu-ft > 4,243 cu-ft

<u>BMP #1B</u>

DCV = 11,346 cu-ft

Treatment Area = 7.3 ac.

Pretreatment System: Contech CDS Unit 2015-5-C and Contech CDS Unit 1515-3-C

<u>Subsurface Infiltration System</u>
CUDO STORAGE CUBES (2'x2'x2' cubes):
Cube Storage Capacity = 95%
$V_{storage}$ = 9,394 cu-ft
No. of Cubes = 864 Cubes
Footprint = 206'L x 12'W x 4'H

GRAVEL STORAGE:
n = 0.40
$V_{storage}$ = 1,978 cu-ft
Footprint = 206'L x 12'W x 2'H

$V_{storage-total}$ = 11,372 cu-ft > 11,346 cu-ft

BMP #2A

DCV = 2,844 cu-ft

Treatment Area = 1.83 ac.
BMP: Torrent Maxwell Plus Drywell System (Depth=55')
$V_{storage\text{-}drywell}$ = 953 cu-ft

Storage System: STORMCAPTURE VAULT
$V_{storage\text{-}CUDO}$ = 3,634 cu-ft (Based on approximate inside dimensions)
Minimum Footprint = 80'L x 24'W x 2'H Each

$V_{storage\text{-}total}$ = 4,587 cu-ft > 2,844 cu-ft

BMP #2B

DCV = 3,963 cu-ft

Treatment Area = 2.55ac.
BMP: Torrent Maxwell Plus Drywell System (Depth=55')
$V_{storage\text{-}drywell}$ = 935 cu-ft

Storage System: STORMCAPTURE VAULT
$V_{storage\text{-}CUDO}$ = 3,410 cu-ft (Based on approximate inside dimensions)
Minimum Footprint = 56'L x 32'W x 2'H

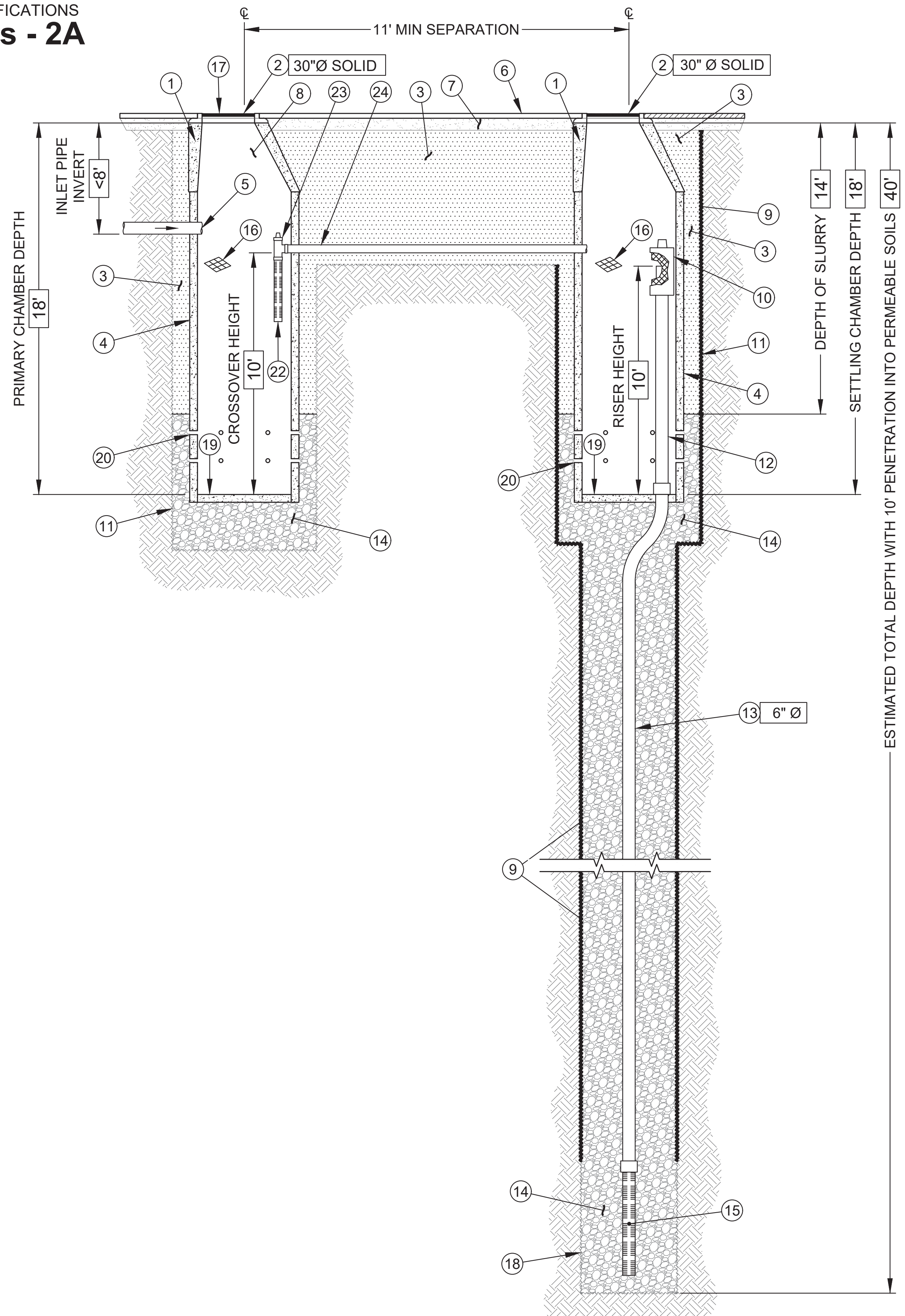
$V_{storage\text{-}total}$ = 4,345 cu-ft > 3,963 cu-ft

The MaxWell® Plus

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Lake View Apartments - 2A

Victorville



ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **BOLTED RING & GRATE/COVER** - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON WITH WORDING **"STORM WATER ONLY"** IN RAISED LETTERS. **BOLTED IN 2 LOCATIONS** AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX.
4. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE.**
5. **INLET PIPE (BY OTHERS). SEE SEPARATE PLAN FOR INVERT ELEVATIONS.**
6. **GRADED BASIN OR PAVING** (BY OTHERS).
7. **COMPACTED BASE MATERIAL**, IF REQUIRED (BY OTHERS).
8. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE PRIMARY AND SECONDARY CHAMBER DEPTHS AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. **NON-WOVEN GEOTEXTILE SLEEVE** - MIRAFI 140 NL. MIN. 6 FT Ø. HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED**.
11. **MIN. 6' Ø DRILLED SHAFT.**
12. **RISER PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. **DRAINAGE PIPE** - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. WITH TRI-B COUPLER. OVERALL LENGTH VARIES, UP TO 120" WITH TRI-B COUPLER.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, 2 PER CHAMBER.
17. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION. GRATED ONLY.
18. **MIN. 4' Ø DRILLED SHAFT.**
19. **BASE SEAL** - CONCRETE SLURRY.
20. **6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.**
21. NOT USED.
22. **INTAKE SCREEN** - 4" Ø SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/ FT. 48" OVERALL LENGTH WITH TRI-CEND CAP.
23. **VENTED ANTI-SIPHON INTAKE WITH FLOW REGULATOR.**
24. **CONNECTOR PIPE** - 4" Ø SCH. 40 PVC.

Manufactured and Installed by

TORRENT® RESOURCES

An evolution of McGuckin Drilling

www.torrentresources.com

CALIFORNIA 909-829-0740

ARIZONA 602-268-0785

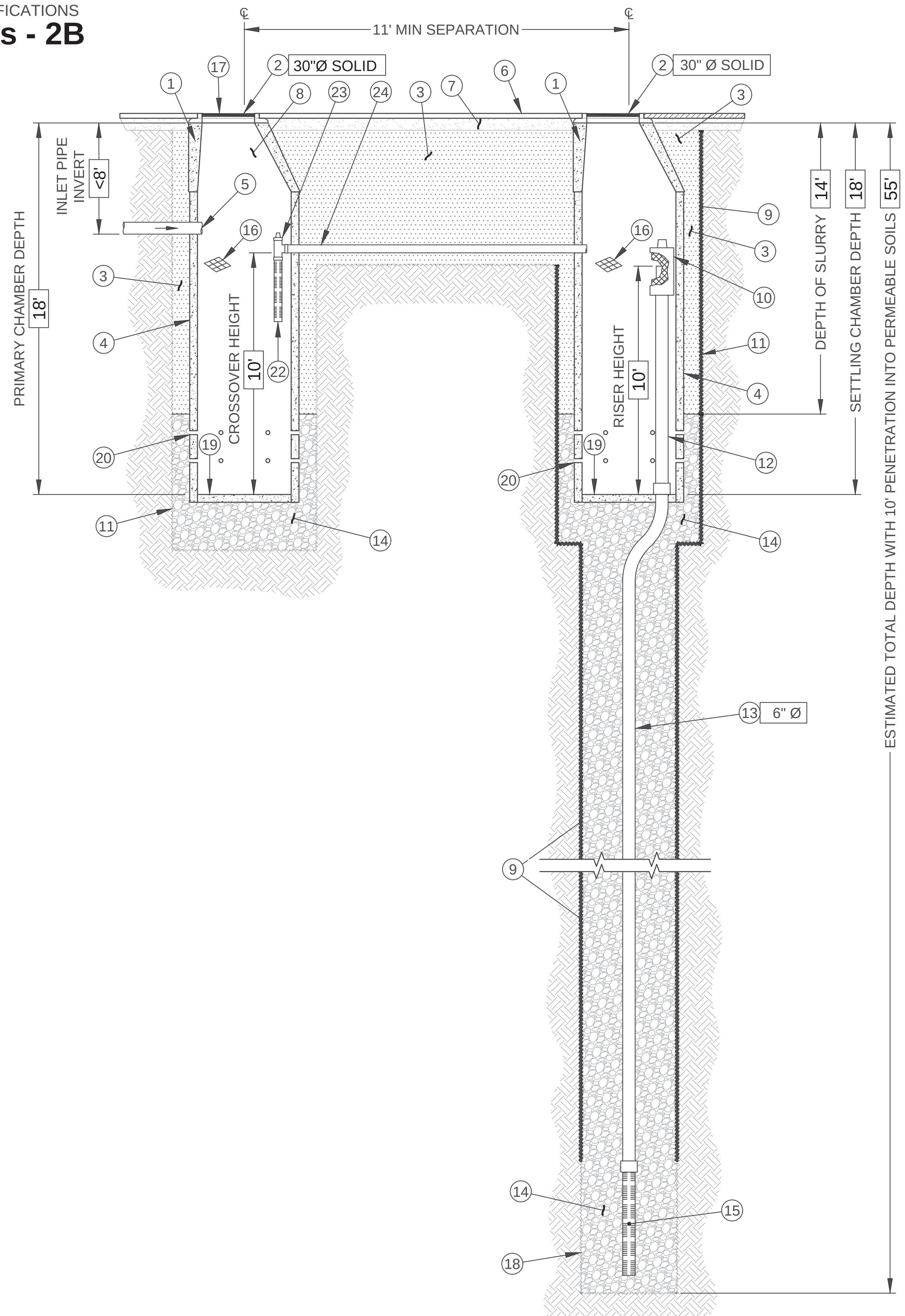
DETAIL :	PL-4-SS-CA	REVISED BY:	RJA		
DRAWN ON:	05-23-19	REVISED DATE:	06-18-21	SCALE:	N.T.S

The MaxWell® Plus

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Lake View Apartments - 2B

Victorville



ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **BOLTED RING & GRATE/COVER** - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON WITH WORDING **"STORM WATER ONLY"** IN RAISED LETTERS. **BOLTED IN 2 LOCATIONS** AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX.
4. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE.**
5. **INLET PIPE (BY OTHERS). SEE SEPARATE PLAN FOR INVERT ELEVATIONS.**
6. **GRADED BASIN OR PAVING** (BY OTHERS).
7. **COMPACTED BASE MATERIAL**, IF REQUIRED (BY OTHERS).
8. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE PRIMARY AND SECONDARY CHAMBER DEPTHS AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. **NON-WOVEN GEOTEXTILE SLEEVE** - MIRAFI 140 NL. MIN. 6 FT Ø. HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED**.
11. **MIN. 6' Ø DRILLED SHAFT.**
12. **RISER PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. **DRAINAGE PIPE** - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. WITH TRI-B COUPLER. OVERALL LENGTH VARIES, UP TO 120" WITH TRI-B COUPLER.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, 2 PER CHAMBER.
17. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION. GRATED ONLY.
18. **MIN. 4' Ø DRILLED SHAFT.**
19. **BASE SEAL** - CONCRETE SLURRY.
20. **6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.**
21. NOT USED.
22. **INTAKE SCREEN** - 4" Ø SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/ FT. 48" OVERALL LENGTH WITH TRI-CEND CAP.
23. **VENTED ANTI-SIPHON INTAKE WITH FLOW REGULATOR.**
24. **CONNECTOR PIPE** - 4" Ø SCH. 40 PVC.

Manufactured and Installed by

TORRENT RESOURCES®

An evolution of McGuckin Drilling

www.torrentresources.com

CALIFORNIA 909-829-0740

ARIZONA 602-268-0785

AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363
CA Lic. 886759, C-42, C-57, HAZ.
Also licensed in the following states: MT, NM, NV, OR, TX, UT, and WA.

U.S. Patent No. 4,923,330 - ™ Trademark 1974, 1990, 2004

DETAIL: PL-4-SS-CA	REVISED BY: RJA	
DRAWN ON: 05-23-19	REVISED DATE: 02-17-20	SCALE: N.T.S

Maxwell® Plus Drainage System Calculations Prepared on June 18, 2021

Project: **Lake View Apartments - 2A - Victorville,CA**

Contact: Terry Au at Urban Resource - Irvine, CA

Given:

Design Infiltration Rate	4.00	in/hr
Mitigated Volume	2,844	ft^3
Required Drawdown Time	48	hours
Depth to Emergency Overflow	0	ft
Min. Depth to Infiltration	0	ft
Groundwater Depth for Design	100	ft

Proposed:

Drywell Rock Shaft Diameter	4	ft
Primary Chamber Depth	18	ft
Drywell Chamber Depth	18	ft
Rock Porosity	40	%
Depth to Infiltration	14	ft
Drywell Bottom Depth	40	ft

Convert Design Rate from in/hr to ft/sec.

$$4.00 \frac{in}{hr} \times \frac{1\ ft}{12\ in} \times \frac{1\ hr}{3600\ sec} = 0.000093 \frac{ft}{sec}$$

A 4 foot diameter drywell provides 12.57 SF of infiltration area per foot of depth, plus 12.57 SF at the bottom.

For a 40 foot deep drywell, infiltration occurs between 14 feet and 40 feet below grade. This provides 26 feet of infiltration depth in addition to the bottom area. Infiltration area per drywell is calculated below.

$$6\ ft \times 18.85 \frac{ft^2}{ft} + 20\ ft \times 12.57 \frac{ft^2}{ft} + 12.57\ ft^2 = 377\ ft^2$$

Combine design rate with infiltration area to get flow (disposal) rate for each drywell.

$$0.000093 \frac{ft}{sec} \times 377\ ft^2 = 0.03491 \frac{ft^3}{sec}$$

Volume of disposal for each drywell based on various time frames are included below.

48 hrs: 0.0349 CFS x 48 hours x $\frac{3600\ sec}{1\ hr}$ = 6,032 cubic feet of retained water disposed of.

3 hrs: 0.0349 CFS x 3 hours x $\frac{3600\ sec}{1\ hr}$ = 377 cubic feet of retained water disposed of.

Chamber diameter = 4 feet. Drywell rock shaft diameter = 4 feet.

Volume provided in each primary settling chamber with depth of 18 feet.

$$18\ ft \times 12.57\ ft^2 = 227\ ft^3$$

Volume provided in each drywell with chamber depth of 18 feet.

$$18\ ft \times 12.57\ ft^2 + 2\ ft \times 28.27\ ft^2 \times 40\,\% + 20\ ft \times 12.57\ ft^2 \times 40\,\% = 349\ ft^3$$

The MaxWell System is composed of 1 drywell(s) and 1 primary chamber(s).

Total volume provided = 576 ft^3

Total 3 hour infiltration volume = 377 ft^3 `

Total 48 hour infiltration volume = 6,032 ft^3

Total infiltration flowrate = 0.03491 $\frac{ft^3}{sec}$

Based on the total mitigated volume of 2844 CF, after subtracting the volume stored in the MaxWell System and the volume infiltrated within 3 hours, the residual volume of 1891 CF could be stored in a separate detention system and connected to the drywell system.

For any questions, please contact Ryan Adaya at 909-202-1037 or via email at Radaya@TorrentResources.com

Torrent Resources (CA) Incorporated
9950 Alder Avenue
Bloomington, CA 92316
Phone 909-829-0740

Maxwell® Plus Drainage System Calculations Prepared on December 23, 2020

Project: **Lake View Apartments - 2B - Victorville,CA**

Contact: Terry Au at Urban Resource - Irvine, CA

Given:

Design Infiltration Rate	2.00 in/hr
Mitigated Volume	3,963 ft^3
Required Drawdown Time	48 hours
Depth to Emergency Overflow	0 ft
Min. Depth to Infiltration	0 ft
Groundwater Depth for Design	100 ft

Proposed:

Drywell Rock Shaft Diameter	4 ft
Primary Chamber Depth	18 ft
Drywell Chamber Depth	18 ft
Rock Porosity	40 %
Depth to Infiltration	14 ft
Drywell Bottom Depth	55 ft

Convert Design Rate from in/hr to ft/sec.

$2.00 \frac{in}{hr} \times \frac{1\ ft}{12\ in} \times \frac{1\ hr}{3600\ sec} = 0.000046 \frac{ft}{sec}$

A 4 foot diameter drywell provides 12.57 SF of infiltration area per foot of depth, plus 12.57 SF at the bottom.

For a 55 foot deep drywell, infiltration occurs between 14 feet and 55 feet below grade. This provides 41 feet of infiltration depth in addition to the bottom area. Infiltration area per drywell is calculated below.

$6\ ft \times 18.85 \frac{ft^2}{ft} + 35\ ft \times 12.57 \frac{ft^2}{ft} + 12.57\ ft^2 = 565\ ft^2$

Combine design rate with infiltration area to get flow (disposal) rate for each drywell.

$0.000046 \frac{ft}{sec} \times 565\ ft^2 = 0.02618 \frac{ft^3}{sec}$

Volume of disposal for each drywell based on various time frames are included below.

48 hrs: 0.0262 CFS x 48 hours x $\frac{3600\ sec}{1\ hr}$ = 4,524 cubic feet of retained water disposed of.

3 hrs: 0.0262 CFS x 3 hours x $\frac{3600\ sec}{1\ hr}$ = 283 cubic feet of retained water disposed of.

Chamber diameter = 4 feet. Drywell rock shaft diameter = 4 feet.

Volume provided in each primary settling chamber with depth of 18 feet.

$18\ ft \times 12.57\ ft^2 = 227\ ft^3$

Volume provided in each drywell with chamber depth of 18 feet.

$18\ ft \times 12.57\ ft^2 + 2\ ft \times 28.27\ ft^2 \times 40\ \% + 35\ ft \times 12.57\ ft^2 \times 40\ \% = 425\ ft^3$

The MaxWell System is composed of 1 drywell(s) and 1 primary chamber(s).

Total volume provided = 652 ft^3

Total 3 hour infiltration volume = 283 ft^3 `

Total 48 hour infiltration volume = 4,524 ft^3

Total infiltration flowrate = 0.02618 $\frac{ft^3}{sec}$

Based on the total mitigated volume of 3963 CF, after subtracting the volume stored in the MaxWell System and the volume infiltrated within 3 hours, the residual volume of 3028 CF could be stored in a separate detention system and connected to the drywell system.

For any questions, please contact Ryan Adaya at 909-202-1037 or via email at Radaya@TorrentResources.com

Torrent Resources (CA) Incorporated
9950 Alder Avenue
Bloomington, CA 92316
Phone 909-829-0740

CUDO® CUBES

Reshaping the Future of Stormwater Management

A new approach to underground stormwater storage, infiltration, treatment, harvesting or other stormwater management needs.

Potential LEED® credits for Sustainable Sites (6.1, 6.2), Materials & Resources (4, 5 in CA, AZ, NV, OR, UT) and Water Efficiency (1, 3)

CUDO® Water Storage System

A modular plastic cube for underground water storage

Cubes incorporate an arched design that adds structural integrity, increased water storage and enhanced access for inspection and maintenance. Made in the USA of injection molded polypropylene plastic, a single CUDO assembly requires just two modules and two end caps.

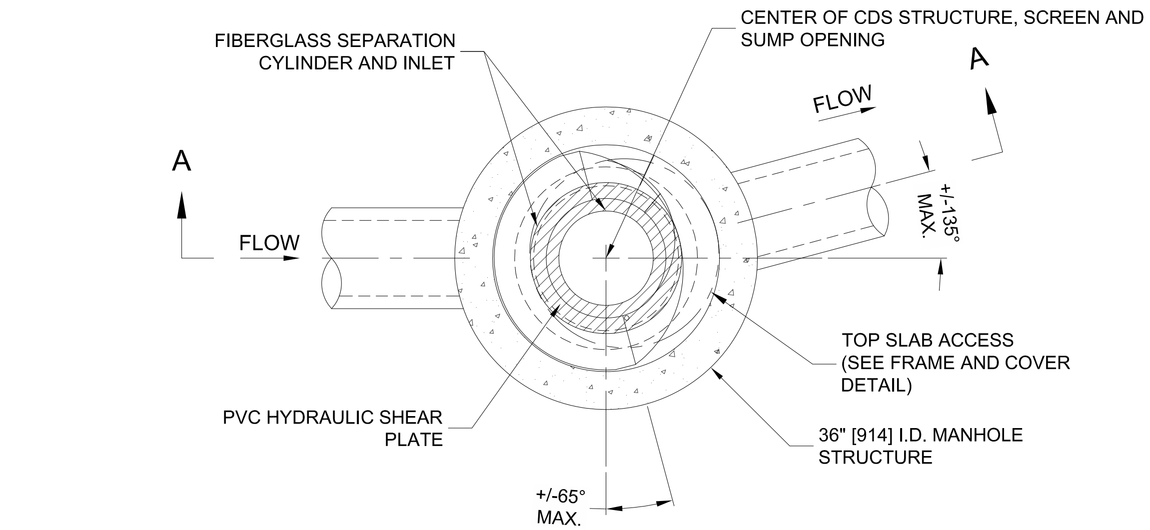
Per application, either a filter fabric or plastic liner is wrapped around the CUDO modules, encasing the entire system. Geo-grid or other structural enhancement may be incorporated into the CUDO installation, depending on the loading requirements.

FEATURES AND BENEFITS

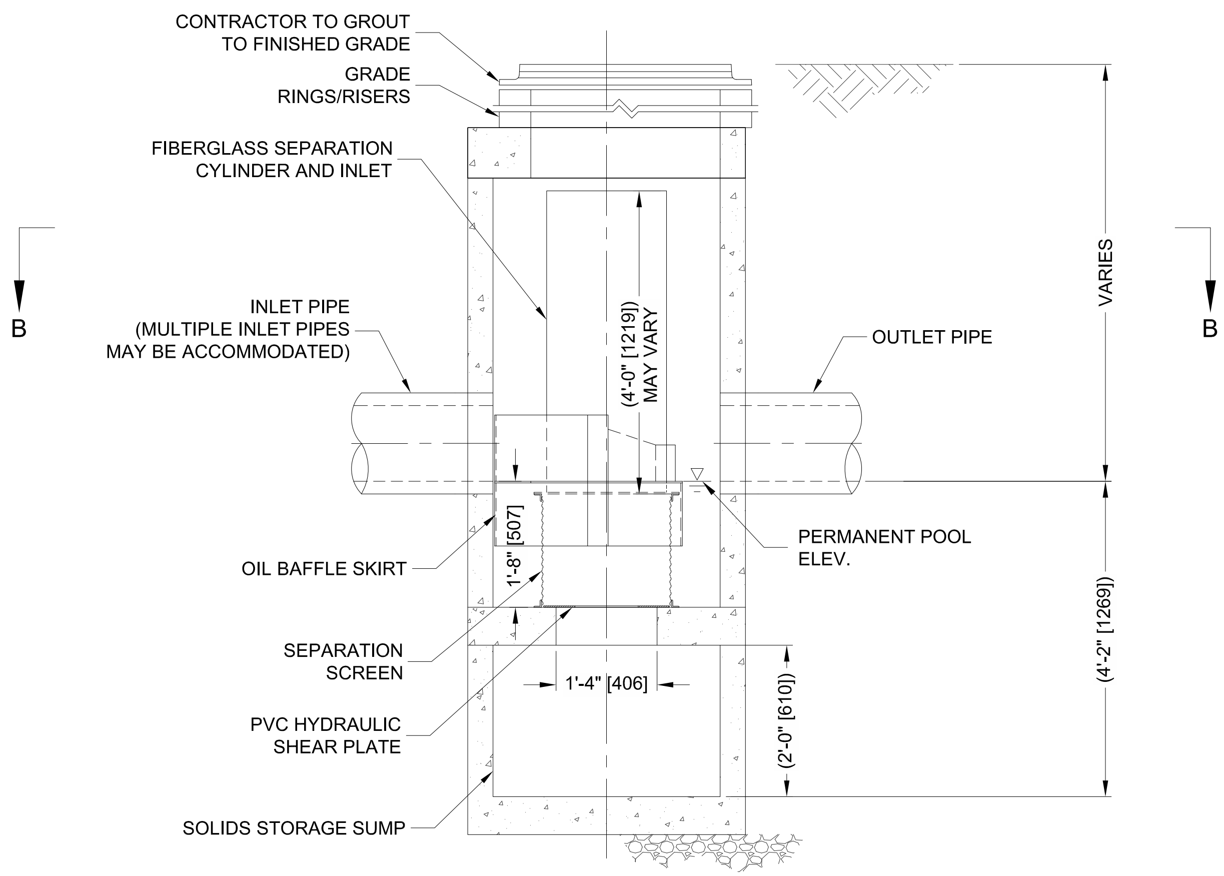
- Large interior openings offer ease of access for inspection and maintenance
- High water storage capacity (95%)
- CUDO size (24" x 24" x 24") offers ease of handling and installation
- Unique shape offers superior strength, rated for traffic loading under parking lots or driveways
- Minimal number of components required for assembly
- May be integrated into bioretention systems

CUDO stacks ready for installation in San Rosa, California

CUDO components snap together, forming a single or multiple stack. Assembled stacks are installed to form the desired system size and shape, with a maximum amount of footprint flexibility.



PLAN VIEW B-B
N.T.S.



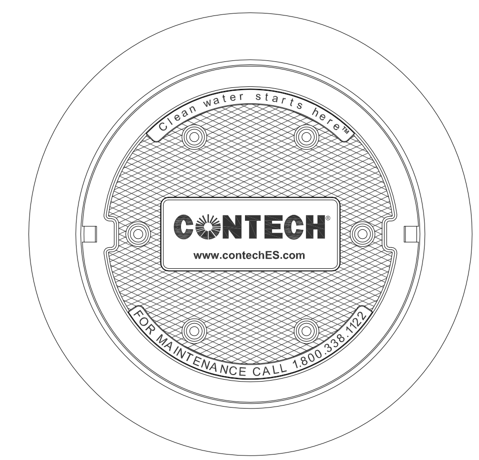
ELEVATION A-A
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 0.50 [14.16 L/s] CFS, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 6.0 [170 L/s] CFS. IF THE SITE CONDITIONS EXCEED 6.0 [170 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

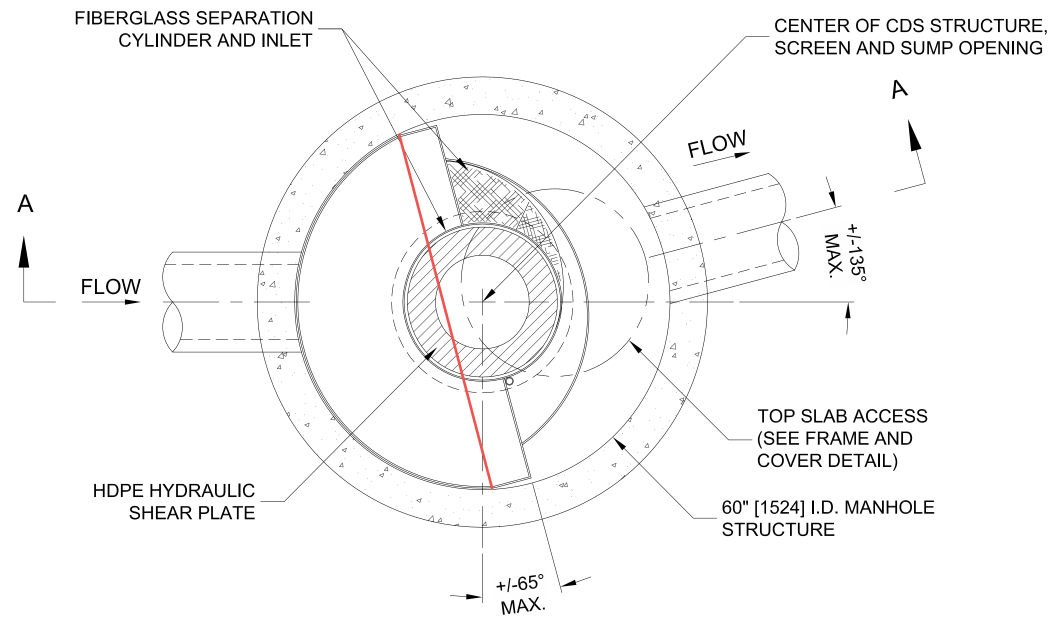
GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

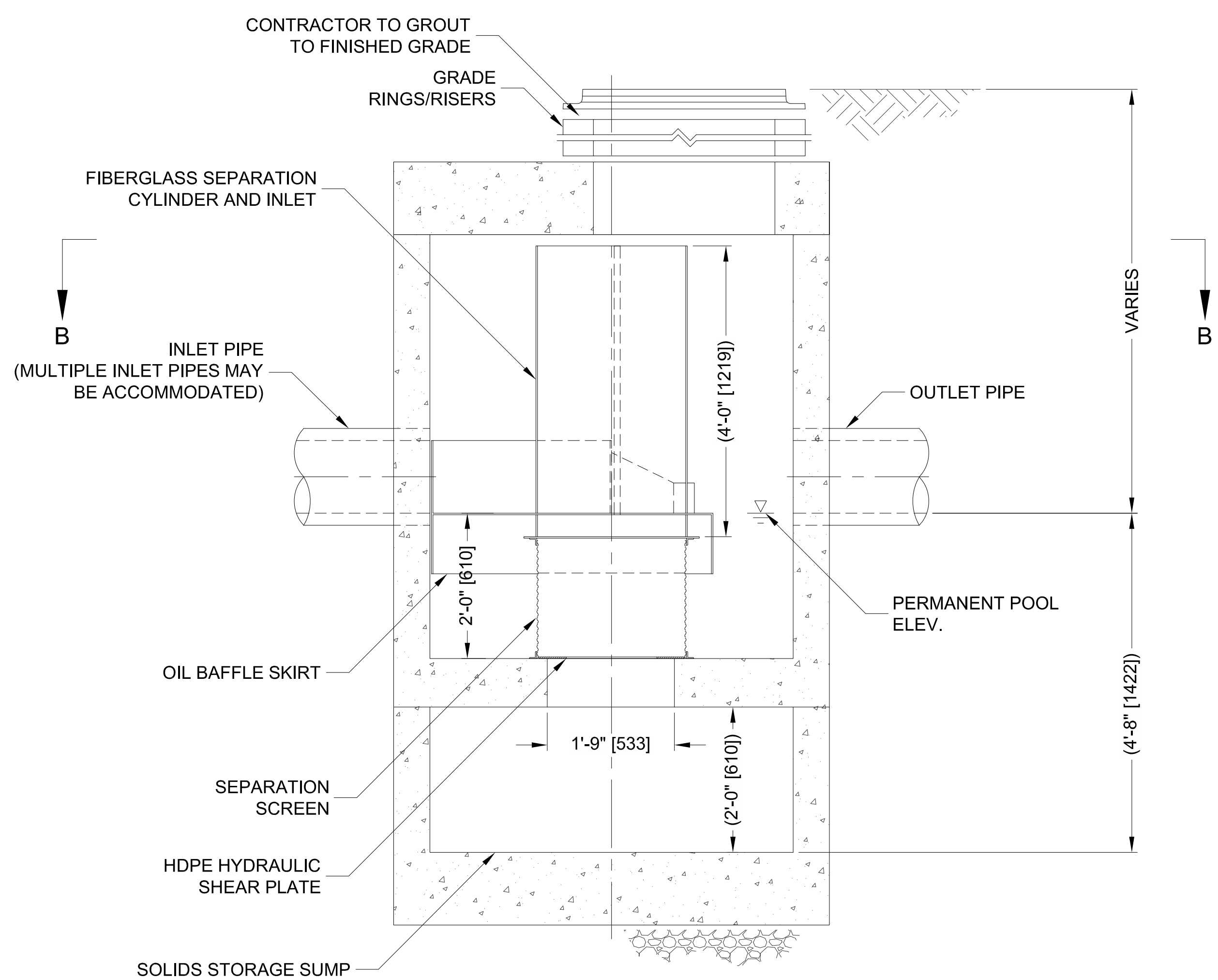
CONTECH®
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS1515-3-C
ONLINE CDS
STANDARD DETAIL

I:\COMMON\CAD\TREATMENT\22 CDS\40 STANDARD DRAWINGS\ONLINE (CDS-C)\DWG\CDS1515-3-C-DTL.DWG 2/27/2017 11:46 AM



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

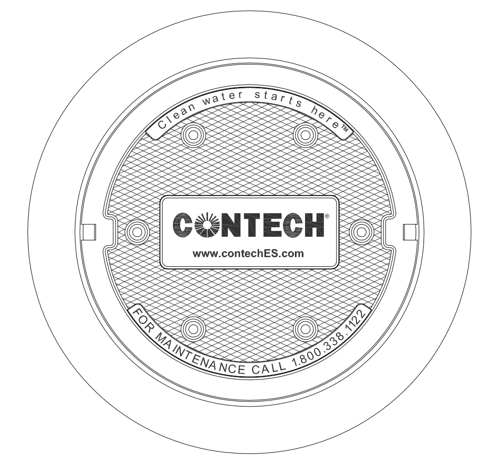
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS2015-5-C DESIGN NOTES

CDS2015-5-C RATED TREATMENT CAPACITY IS 0.7 CFS [19.8 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 10.0 CFS [396 L/s]. IF THE SITE CONDITIONS EXCEED 14.0 [396 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS2015-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)	*		
PEAK FLOW RATE (CFS OR L/s)	*		
RETURN PERIOD OF PEAK FLOW (YRS)	*		
SCREEN APERTURE (2400 OR 4700)	*		
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION	*		
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2015-5-C
ONLINE CDS
STANDARD DETAIL

\\AD.CONTECH-CPI.COM\ROOT\COMMON\CADTREATMENT\22 CDS\40 STANDARD DRAWINGS\ONLINE (CDS-C)\DWG\CDS2015-5-C-DTL.DWG 9/25/2015 8:09 AM

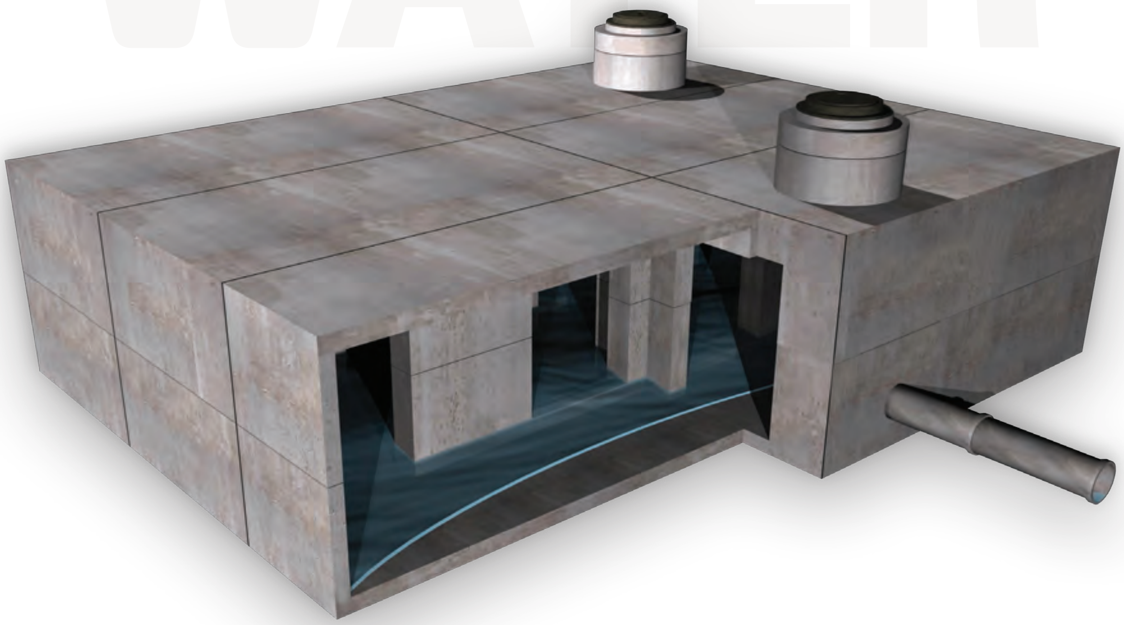
WEATHER
the Storm

StormCapture® System

Oldcastle Infrastructure™
A CRH COMPANY

STORMCAPTURE®

Modular Stormwater Management System for Infiltration, Detention, Retention, Treatment and Harvesting



StormCapture® System

Backfill Requirements–Modules are typically backfilled with existing site materials.

Custom Sizes–Available in internal heights from 2' to 14' to best-fit site needs.

Design Assistance–Let our professionals customize for your specific needs.

Easy to Install–Fast installation with minimal handling.

Large Storage Capacity–Smaller system footprint for greater design flexibility.

Modular Design–Precast concrete modules measure 8' wide by 16' long OD, (7' x 15' ID), with customizable heights.

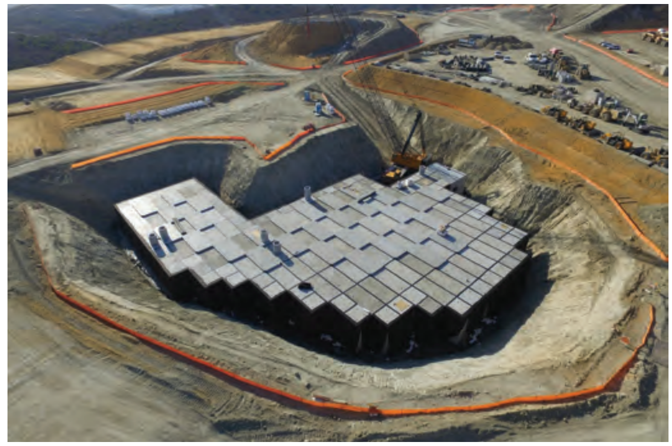
Traffic Loading–Only requires 6" of cover.

Treatment Train–Available with pre-treatment, post-treatment, or both.

StormCapture Advantages

Same-day staging and installation of StormCapture project.

StormCapture offers fast installation with minimal handling.



StormCapture modules are designed for HS20 traffic loading.

StormCapture detention system installed beneath office parking lot.

Fast Service – Get help from our national engineering team with layouts and specifications to meet your project's requirements.

Cost Savings – Highly competitive installation and maintenance costs.

Codes – Designed to the latest codes for HS-20-44 (full truckload plus impact).

Sustainability – The system is maintainable for long-term sustainability.

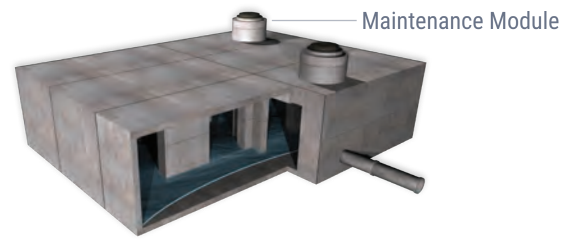
LID – Ideal for Low-Impact Development (LID).

LEED – Manufactured locally with recycled material for potential LEED credits. LEED 2009 for New Construction & Major Renovation, U.S. Green Building Council: Sustainable Sites (5.1, 5.2, 6.1, 6.2), Materials & Resources (4.1, 4.2, 5.1, 5.2), Water Efficiency (1.1, 1.2, 3.1, 3.2).

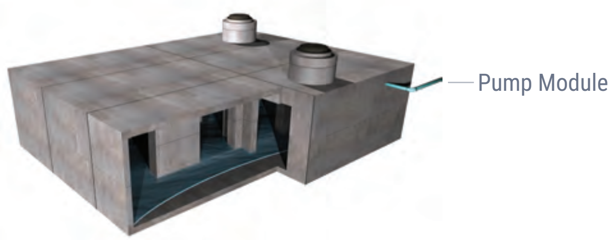
Oldcastle Infrastructure™
A CRH COMPANY

Applications

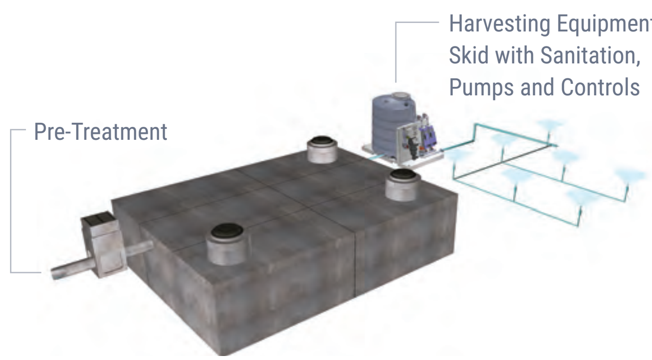
StormCapture offers numerous options for infiltration, detention, retention, treatment and harvesting to solve your stormwater management needs. Let us show you how we can design and customize a solution for you.



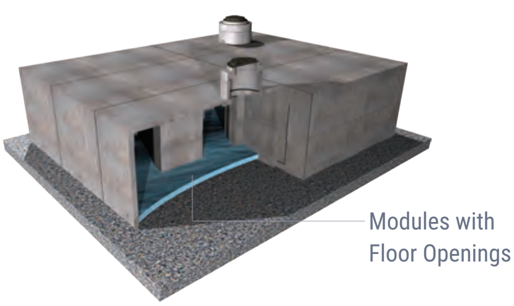
DETENTION



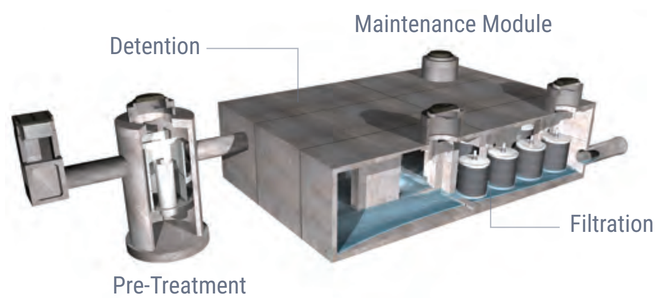
RETENTION



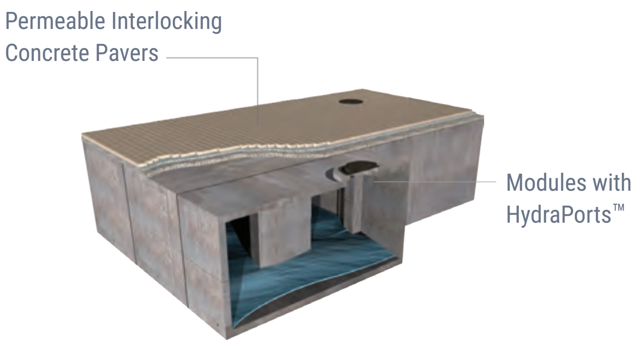
HARVESTING



INFILTRATION



TREATMENT

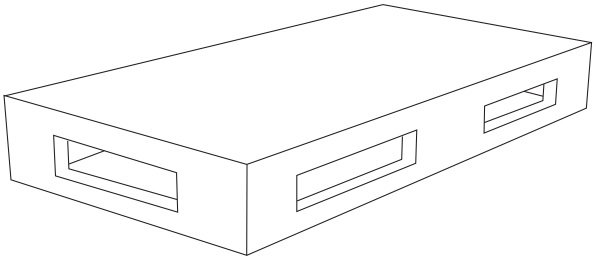


PERMECAPTURE

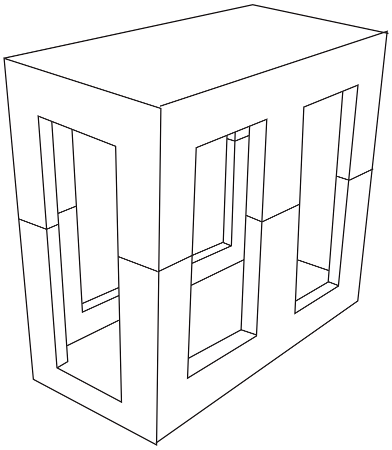
CISTERNS

INSTALLED IN JUST ONE DAY

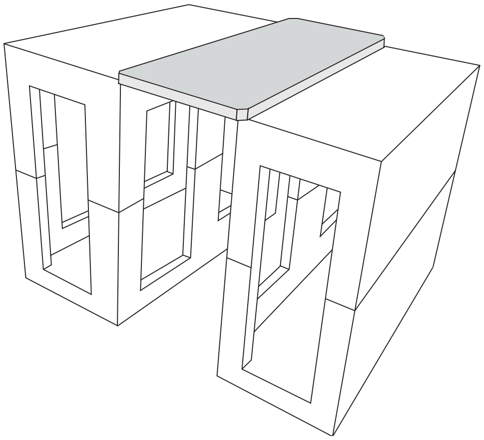
StormCapture Modules



SC1 - Single piece modules can be used for applications from 2' to 7' tall. Appropriate for cisterns, infiltration, detention and retention systems. SC1 modules are typically installed on minimally compacted gravel base, depending on specific project requirements.



SC2 - Two piece modules can be used for applications from 7' to 14' tall for maximum storage capacity in a condensed footprint. Appropriate for cisterns, infiltration, detention and retention systems. SC2 modules are typically installed on compacted native subgrade.



Link Slab - Unique design allows for significant reduction in the quantity of modules and associated costs, while providing maximum storage capacity.

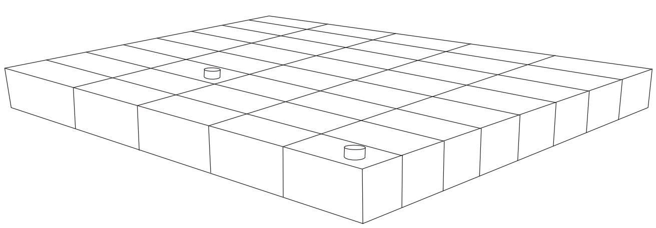
Module Sizes & Capacities

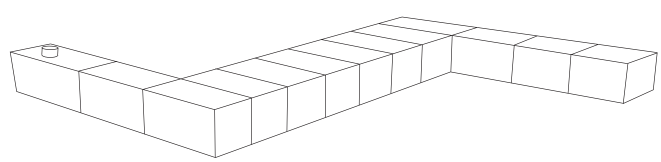
Modules are 8'x16' outside dimensions.
Capacity varies by configuration of openings.

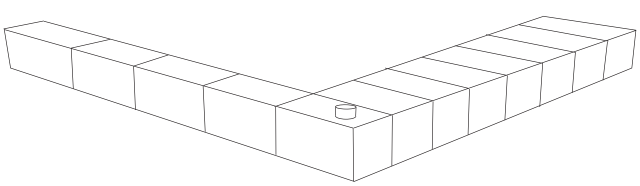
INSIDE DIMENSIONS (FT)	CAPACITY RANGE (FT^3)
7x15x2	210-212
7x15x3	315-325
7x15x4	420-442
7x15x5	525-559
7x15x6	630-678
7x15x7	735-793
7x15x8	840-910

INSIDE DIMENSIONS (FT)	CAPACITY RANGE (FT^3)
7x15x9	945-1,027
7x15x10	1,050-1,140
7x15x11	1,155 - 1,257
7x15x12	1,260 - 1,374
7x15x13	1,365 -1,491
7x15x14	1,470 - 1,608

Endless Configurations







Contact us today to start designing your system!

Oldcastle Infrastructure™
A CRH COMPANY

(800) 579-8819
oldcastleinfrastructure.com

Water

CDS Unit
Q_{Treat}
* Project is "Desert"
⇒ Use Mountain
(Hydro Manual only has "Valley" or "Desert")

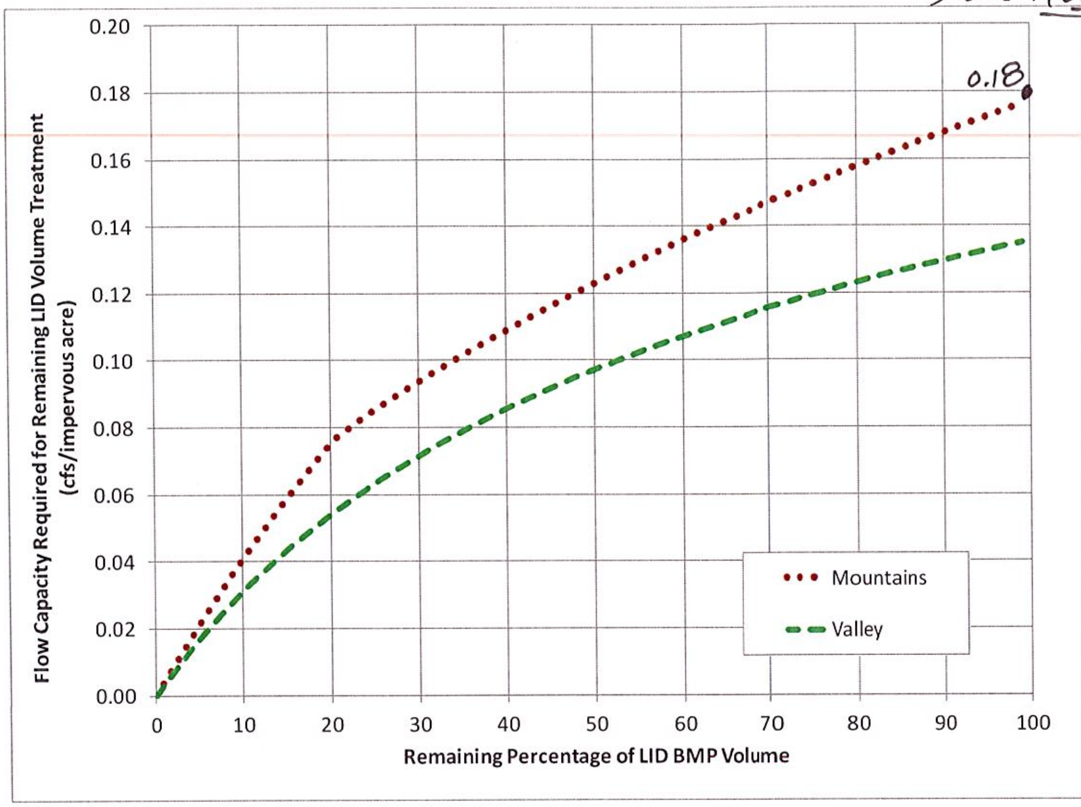


Figure 5-2. Nomograph for Determining Flow-based BMP Capacity Requirement to meet Remaining Unmet DCV

- Proprietary biotreatment - Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and soils but are especially applicable to urban parking lots, street, and roadways.

5.5 WQMP Conformance Analysis

Section 5.3.2 presented general feasibility criteria for determining project conditions that would preclude or restrict the use of one or more types of BMPs. This section describes specific, quantitative analyses to be conducted to determine the extent to which BMPs that

* For West Side

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		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, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	2	0.50 * (Split Infilt. BMPs to reduce drainage area)
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1.5
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					1.875 → Defer to soils recommendation
Observed Infiltration Rate, inch/hr, $K_{Observed}$ (corrected for test-specific bias)					2 in/hr
Design Infiltration Rate, in/hr, K_{DESIGN} = Kobserved/Stot					0.67 in/hr (Open Basin) 1.0 in/hr (Buried Chambers)

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Refer to soils report in Appendix C.

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

*For Drywells (DA 2B)

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		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, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	2	0.50
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1.5
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					1.875 → Use 2
Observed Infiltration Rate, inch/hr, $K_{Observed}$ (corrected for test-specific bias)					4in/hr (Recommended)
Design Infiltration Rate, in/hr, K_{DESIGN} = Kobserved/Stot					2in/hr

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Refer to soils report in Appendix C.

* For drywells (DA 2A), a presumed-conservative infiltration rate of 4in/hr used for design.

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

Terry Au

From: Philip Buchiarelli <pbuchiarelli@leightongroup.com>
Sent: Monday, February 17, 2020 10:40 AM
To: Terry Au
Cc: Jay Ruby
Subject: RE: Victorville - Soil Suitability Assessment

Terry,
Based on our data, the soils are granular and they seem homogeneous so those categories would be of Low Concern in our opinion. However we used an infiltrameter and did not use "extensive test pits". Thus the assessment method would be considered Medium Concern.
While we think the infiltration rate of 4 is conservative for the B-4 location, we believe it is appropriate to include a factor of safety there. It is possible the rate of infiltration at that location will be higher when the dry wells are installed and we suggest that the system be designed with some flexibility as noted in our report.

Phil
Philip A. Buchiarelli
VP/Managing Director
10532 Acacia Street, Suite B6
Rancho Cucamonga, CA 91730
951-907-6872 Cell
909-527-8778 Direct
Leighton
Solutions You Can Build On

From: Terry Au <Terry@urbresource.com>
Sent: Monday, February 17, 2020 9:55 AM
To: Philip Buchiarelli <pbuchiarelli@leightongroup.com>
Cc: Jay Ruby <Jay@urbresource.com>
Subject: Victorville - Soil Suitability Assessment

Good morning Phil,

Can you please provide your professional opinion for the 3 assessment items boxed in red in the attached pdf, based on the latest infiltration testing/results? These are soils considerations that go into the factor of safety calculation. Please provide your input west side for the infiltration basin, and east side for the drywell(s) if applicable. I am still reviewing the west side and may propose subsurface infiltration (i.e. subsurface chambers and gravel) for infiltration, or it could be a combination of subsurface storage and above ground storage to meet the water quality volume for infiltration. The groundwater consideration would be "low concern" based on the available groundwater data.

Question – In your infiltration recommendations for the west side, the recommendation specifies to apply a correction factor, which I will be calculating based on the SB/OC guidance documents. However, on the east side, a presumed-conservative infiltration rate of 4in/hr is recommended, which is very conservative at the B-3-20 location but is higher than the results at the B-4-20 location. Should I apply a factor of safety for the drywell(s) proposed near the B-4-20 location?

Thanks.

TERRY P. AU, P.E.
URBAN RESOURCE
CONSULTING CIVIL ENGINEERS

23 Mauchly, Suite 110
Irvine, CA 92618
949-727-9095 Phone
949-679-4218 Direct
949-727-9098 Fax
terry@urbresource.com

WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Thursday, November 14, 2019

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	309052114, 309052113, 309052125, 309052122, 309050101, 309052112, 309052126, 309052119, 309052109, 309051105, 309052123, 309052117, 309052115, 309052110, 309052128, 309050101, 309051105, 309051106, 309052120, 309052111, 309052116, 309052118, 309052124, 309052121, 048002116, 048002159, 309052188, 309052127
Project Site Acreage:	86.678
HCOC Exempt Area:	No
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	**System Number** - **Facility Name** - Mojave River **Owner** - SBCFCD
Closest channel segment's susceptibility to Hydromodification:	EHM
Highest downstream hydromodification susceptibility:	NULL
Is this drainage segment subject to TMDLs?	No
Are there downstream drainage segments subject to TMDLs?	No
Is this drainage segment a 303d listed stream?	No
Are there 303d listed streams downstream?	No
Are there unlined downstream waterbodies?	No
Project Site Onsite Soil Group(s):	A, B
Environmentally Sensitive Areas within 200':	DESERT TORTOISE HABITAT CAT 3,MOJAVE GROUND SQUIRREL
Groundwater Depth (FT):	No data available
Parcels with potential septic tanks within 1000':	Yes
Known Groundwater Contamination Plumes within 1000':	No
Studies and Reports Related to Project Site:	

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.4981°, Longitude: -117.2813°
Elevation: 2903.68 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	0.093 (0.077-0.114)	0.129 (0.106-0.158)	0.179 (0.147-0.220)	0.222 (0.181-0.275)	0.285 (0.225-0.365)	0.336 (0.260-0.439)	0.391 (0.295-0.524)	0.451 (0.331-0.621)	0.537 (0.378-0.770)	0.608 (0.414-0.902)
10-min	0.133 (0.110-0.163)	0.185 (0.152-0.226)	0.257 (0.211-0.315)	0.319 (0.260-0.395)	0.408 (0.322-0.523)	0.482 (0.373-0.630)	0.561 (0.423-0.751)	0.646 (0.474-0.890)	0.770 (0.542-1.10)	0.871 (0.593-1.29)
15-min	0.161 (0.133-0.197)	0.223 (0.184-0.274)	0.310 (0.255-0.381)	0.385 (0.314-0.477)	0.494 (0.390-0.632)	0.583 (0.451-0.762)	0.678 (0.512-0.908)	0.782 (0.574-1.08)	0.931 (0.655-1.34)	1.05 (0.717-1.56)
30-min	0.216 (0.179-0.265)	0.300 (0.248-0.368)	0.417 (0.343-0.513)	0.518 (0.423-0.642)	0.664 (0.524-0.850)	0.784 (0.606-1.02)	0.912 (0.688-1.22)	1.05 (0.771-1.45)	1.25 (0.881-1.80)	1.42 (0.964-2.10)
60-min	0.257 (0.213-0.315)	0.357 (0.295-0.437)	0.496 (0.408-0.609)	0.616 (0.503-0.763)	0.790 (0.623-1.01)	0.932 (0.720-1.22)	1.08 (0.818-1.45)	1.25 (0.917-1.72)	1.49 (1.05-2.13)	1.69 (1.15-2.50)
2-hr	0.363 (0.299-0.443)	0.488 (0.402-0.597)	0.660 (0.543-0.811)	0.808 (0.659-1.00)	1.02 (0.805-1.31)	1.19 (0.922-1.56)	1.38 (1.04-1.84)	1.57 (1.15-2.16)	1.85 (1.30-2.65)	2.08 (1.41-3.09)
3-hr	0.435 (0.360-0.532)	0.579 (0.478-0.710)	0.778 (0.640-0.955)	0.946 (0.772-1.17)	1.19 (0.937-1.52)	1.38 (1.07-1.80)	1.59 (1.20-2.12)	1.81 (1.33-2.48)	2.12 (1.49-3.03)	2.37 (1.61-3.51)
6-hr	0.591 (0.488-0.723)	0.782 (0.645-0.958)	1.04 (0.856-1.28)	1.26 (1.03-1.56)	1.57 (1.24-2.01)	1.81 (1.40-2.37)	2.07 (1.56-2.77)	2.34 (1.72-3.23)	2.73 (1.92-3.91)	3.03 (2.06-4.50)
12-hr	0.759 (0.627-0.928)	1.01 (0.836-1.24)	1.35 (1.11-1.66)	1.64 (1.34-2.03)	2.03 (1.60-2.60)	2.34 (1.81-3.06)	2.66 (2.01-3.56)	3.00 (2.20-4.13)	3.47 (2.44-4.97)	3.84 (2.61-5.69)
24-hr	0.986 (0.874-1.14)	1.34 (1.19-1.54)	1.81 (1.59-2.09)	2.19 (1.92-2.55)	2.72 (2.30-3.27)	3.13 (2.60-3.85)	3.55 (2.88-4.47)	3.99 (3.14-5.17)	4.59 (3.47-6.20)	5.07 (3.70-7.08)
2-day	1.14 (1.01-1.31)	1.57 (1.39-1.81)	2.15 (1.90-2.48)	2.62 (2.29-3.05)	3.27 (2.77-3.93)	3.77 (3.13-4.64)	4.29 (3.48-5.40)	4.83 (3.81-6.26)	5.58 (4.22-7.53)	6.16 (4.50-8.61)
3-day	1.24 (1.10-1.43)	1.73 (1.53-1.99)	2.37 (2.09-2.74)	2.90 (2.54-3.38)	3.63 (3.08-4.37)	4.20 (3.49-5.16)	4.79 (3.88-6.03)	5.40 (4.25-6.99)	6.24 (4.72-8.43)	6.91 (5.05-9.65)
4-day	1.32 (1.17-1.52)	1.84 (1.63-2.12)	2.53 (2.23-2.92)	3.10 (2.71-3.61)	3.88 (3.28-4.67)	4.48 (3.72-5.51)	5.10 (4.14-6.43)	5.75 (4.53-7.45)	6.65 (5.03-8.97)	7.35 (5.37-10.3)
7-day	1.43 (1.27-1.65)	1.98 (1.75-2.28)	2.70 (2.38-3.12)	3.29 (2.89-3.84)	4.11 (3.48-4.94)	4.74 (3.93-5.82)	5.38 (4.36-6.78)	6.05 (4.77-7.84)	6.97 (5.27-9.41)	7.69 (5.62-10.7)
10-day	1.51 (1.34-1.74)	2.08 (1.84-2.40)	2.83 (2.50-3.27)	3.45 (3.02-4.01)	4.29 (3.64-5.17)	4.95 (4.11-6.08)	5.62 (4.55-7.07)	6.31 (4.97-8.17)	7.26 (5.49-9.80)	8.00 (5.84-11.2)
20-day	1.73 (1.53-1.99)	2.39 (2.12-2.76)	3.28 (2.90-3.79)	4.01 (3.52-4.68)	5.03 (4.26-6.05)	5.82 (4.83-7.15)	6.63 (5.37-8.35)	7.48 (5.89-9.68)	8.63 (6.53-11.7)	9.54 (6.97-13.3)
30-day	1.95 (1.73-2.25)	2.72 (2.41-3.13)	3.76 (3.32-4.34)	4.63 (4.06-5.39)	5.85 (4.96-7.04)	6.81 (5.66-8.38)	7.81 (6.33-9.84)	8.85 (6.98-11.5)	10.3 (7.79-13.9)	11.4 (8.35-16.0)
45-day	2.28 (2.02-2.63)	3.20 (2.83-3.68)	4.46 (3.94-5.15)	5.54 (4.85-6.45)	7.08 (6.00-8.53)	8.32 (6.91-10.2)	9.63 (7.80-12.1)	11.0 (8.67-14.3)	13.0 (9.79-17.5)	14.5 (10.6-20.3)
60-day	2.48 (2.20-2.86)	3.48 (3.08-4.01)	4.89 (4.32-5.65)	6.11 (5.35-7.12)	7.89 (6.68-9.49)	9.34 (7.76-11.5)	10.9 (8.83-13.7)	12.6 (9.91-16.3)	15.0 (11.3-20.2)	16.9 (12.4-23.7)

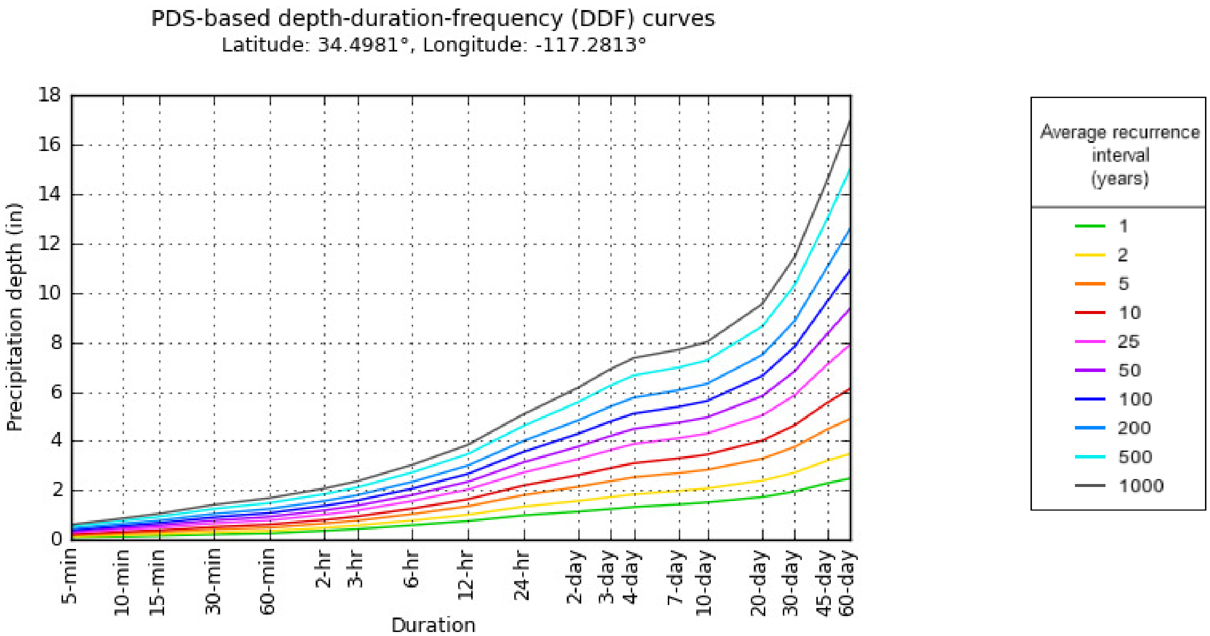
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

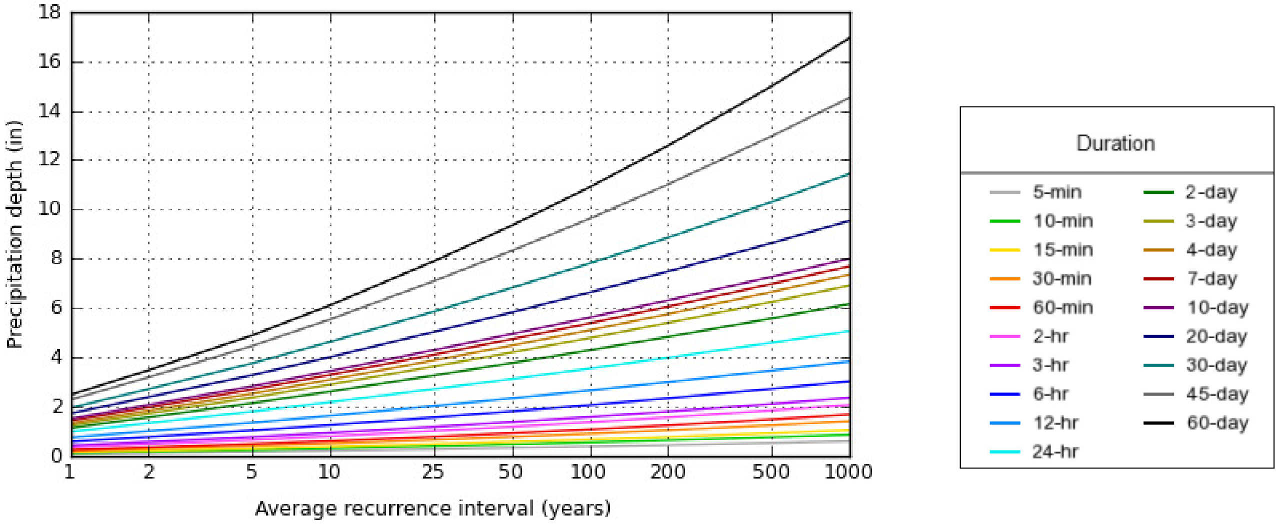
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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.

Back to Top

PF graphical





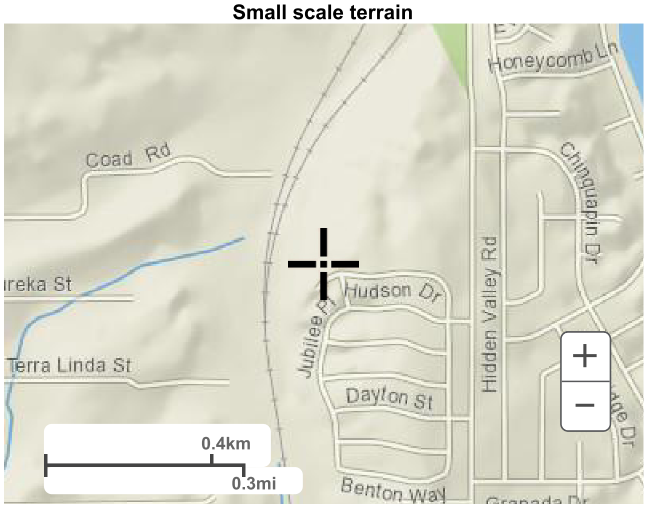
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Wed Jul 3 17:29:10 2019

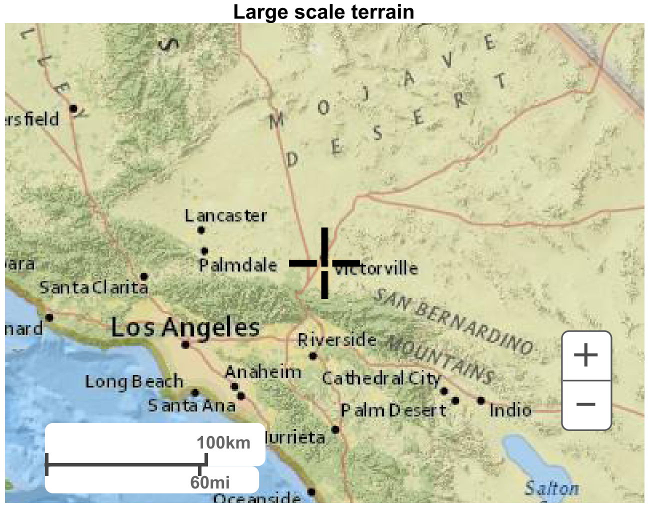
Back to Top

Maps & aerials

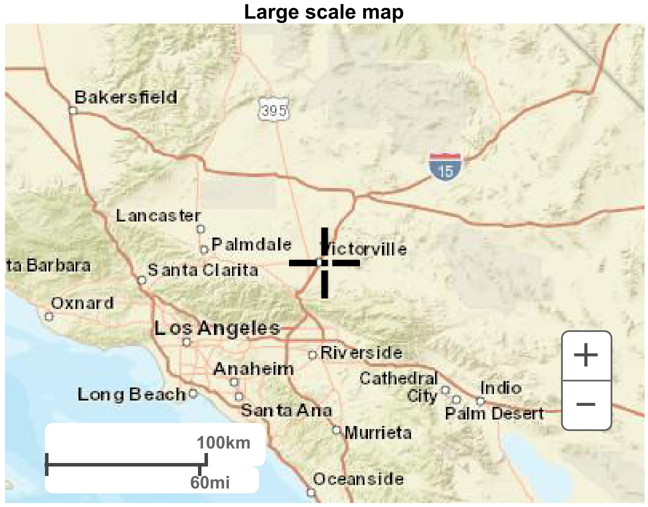
Small scale terrain



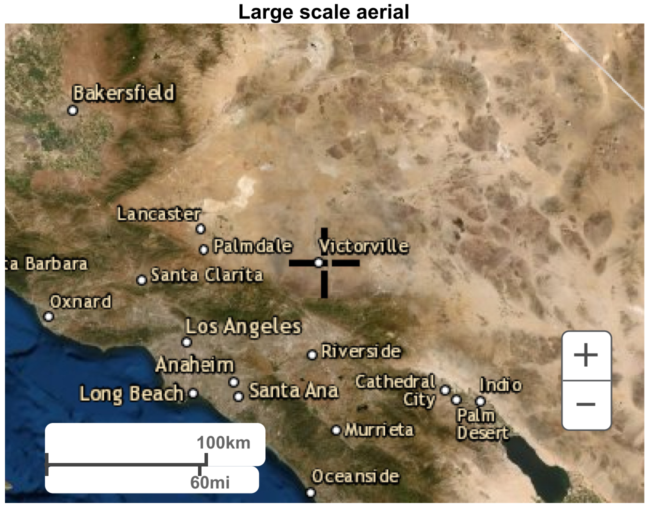
Large scale terrain



Large scale map



Large scale aerial



[Back to Top]

APPENDIX E

HYDROMOFIFICATION CALCULATIONS (COUNTY OF SAN BERNARDINO SYNTHETIC UNIT HYDROGRAPH, 10 YR 24 HOUR EVENT)

LAKE VIEW VILLLAGE
PRELIMINARY HYDROMODIFICATION ANALYSIS
10 YEAR 24 HOUR STORM EVENT
METHOD: SYNTHETIC UNIT HYDROGRAPH (COUNTY OF SAN BERNARDINO HYDROLOGY MANUAL)

EXISTING CONDITION:
***Approximately 15.5 acres draining West, and approximately 5.5 acres drainage East**

<u>Drainage to West</u>

A=15.5 ac.
CN=90 (Barren, AMC II)
A_p=1.0
V_{west} (10 yr 24 hr) = 92,837 cu-ft
Q_{west} (10 yr 24 hr) = 32.07cfs
Tc=9.7min.

<u>Drainage to East</u>

A=5.5 ac.
CN=90 (Barren, AMC II)
A_p=1.0
V_{east} (10 yr 24 hr) = 32,942 cu-ft
Q_{west} (10 yr 24 hr) = 11.47cfs
Tc=9.6min.

$\sum V_{Total\text{-}Existing}$ (10 yr 24 hr) = 92,837+32,942 = <u>125,779 cu-ft</u>

PROPOSED CONDITION:
***Approximately 16.1 acres draining West, and approximately 4.9 acres draining East. Drainage management areas may be adjusted during final engineering.**

<u>Drainage to West</u>

A=16.1 ac.
CN=69 (Residential or Commercial Landscaping, Type C Soil) and 98 (Impervious Surface)
A_p=0.50
V_{west} (10 yr 24 hr) = 77,145 cu-ft
Q_{west} (10 yr 24 hr) = 33.28cfs
Tc=9.2min.

<u>Drainage to East</u>

A=4.9 ac.
CN=69 (Residential or Commercial Landscaping, Type C Soil) and 98 (Impervious Surface)
A_p=0.30
V_{east} (10 yr 24 hr) = 25,969 cu-ft
Q_{west} (10 yr 24 hr) = 11.76cfs

$Tc = 6.6 min.$

$\sum V_{Total\text{-}Proposed}$ (10 yr 24 hr) = 77,145+25,969 = $\underline{\underline{103{,}114\ \text{cu-ft}}}$

$\sum V_{Total\text{-}Proposed} < \sum V_{Total\text{-}Existing}$

PROPOSED DEVELOPMENT DECREASES STORM VOLUMES FOR THE 10 YEAR 24 HOUR STORM EVENT. PROPOSED DEVELOPMENT WILL INCREASE PEAK RUNOFF FOR THE 10 YEAR 24 HOUR STORM EVENT, BUT THE INCREASE IS LESS THAN 5% AND IS CONSIDERED NEGLIGIBLE. THEREFORE, THIS DEVELOPMENT WILL NOT CONTRIBUTE TO HYDROMODIFICATION.

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  06/17/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6150

---------------------------------------------------------------------
LAKE VIEW APARTMENTS
10 YEAR 24 HOUR EVENT
EXISTING CONDITION - DRAINING TO WEST

--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)           (hours)          (In)
Rainfall data for year 10
            15.50           1           0.75
--------------------------------------------------------------------
Rainfall data for year 2
            15.50           6           0.70
--------------------------------------------------------------------
Rainfall data for year 2
            15.50          24           1.00
--------------------------------------------------------------------
Rainfall data for year 100
            15.50           1           1.15
--------------------------------------------------------------------
Rainfall data for year 100
            15.50           6           1.80
--------------------------------------------------------------------
Rainfall data for year 100
            15.50          24           3.00
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 90.0      98.0         15.50      1.000     0.040    1.000    0.040

Area-averaged adjusted loss rate Fm (In/Hr) =  0.040

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
    15.50   1.000         90.0      98.0      0.20     0.877

Area-averaged catchment yield fraction, Y =  0.877
Area-averaged low loss fraction, Yb =  0.123
User entry of time of concentration  =   0.162 (hours)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      15.50(Ac.)
Catchment Lag time =   0.130 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 64.3004
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.040(In/Hr)
Average low loss rate fraction (Yb) = 0.123 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.356(In)
Computed peak 30-minute rainfall =  0.609(In)
Specified peak 1-hour rainfall =  0.750(In)
Computed peak 3-hour rainfall =  0.976(In)
Specified peak 6-hour rainfall =  1.153(In)
Specified peak 24-hour rainfall =  1.823(In)


Rainfall depth area reduction factors:
Using a total area of      15.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.356(In)
30-minute factor = 0.999    Adjusted rainfall =  0.609(In)
1-hour factor = 0.999       Adjusted rainfall =  0.749(In)
3-hour factor = 1.000       Adjusted rainfall =  0.976(In)
6-hour factor = 1.000       Adjusted rainfall =  1.152(In)
24-hour factor = 1.000      Adjusted rainfall =  1.823(In)
---------------------------------------------------------------------

                       U n i t   H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
Number            Mean values            ((CFS))
---------------------------------------------------------------------
                (K =       187.45 (CFS))

  1                6.444                 12.079
  2               45.630                 73.456
  3               70.616                 46.837
  4               81.394                 20.204
  5               87.737                 11.889
  6               91.721                  7.468
  7               94.495                  5.200
  8               96.426                  3.620
  9               97.687                  2.364
 10               98.437                  1.407
 11               99.199                  1.429
 12               99.747                  1.026
 13              100.000                  0.475
---------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number             (In)                 (In)
  1              0.3556               0.3556
  2              0.4378               0.0822
  3              0.4945               0.0566
  4              0.5390               0.0446
  5              0.5763               0.0373
  6              0.6087               0.0324
  7              0.6376               0.0288
  8              0.6636               0.0261
  9              0.6875               0.0239
 10              0.7096               0.0221
 11              0.7301               0.0206
 12              0.7495               0.0193
 13              0.7640               0.0146
 14              0.7777               0.0137
 15              0.7908               0.0130
 16              0.8031               0.0124
 17              0.8149               0.0118
 18              0.8262               0.0113
 19              0.8370               0.0108
 20              0.8474               0.0104
 21              0.8574               0.0100
 22              0.8670               0.0096
 23              0.8763               0.0093
 24              0.8853               0.0090
 25              0.8941               0.0087
 26              0.9025               0.0085
 27              0.9108               0.0082
```

28	0.9188	0.0080
29	0.9265	0.0078
30	0.9341	0.0076
31	0.9415	0.0074
32	0.9487	0.0072
33	0.9558	0.0070
34	0.9626	0.0069
35	0.9694	0.0067
36	0.9760	0.0066
37	0.9824	0.0064
38	0.9887	0.0063
39	0.9949	0.0062
40	1.0009	0.0061
41	1.0069	0.0059
42	1.0127	0.0058
43	1.0185	0.0057
44	1.0241	0.0056
45	1.0296	0.0055
46	1.0351	0.0054
47	1.0404	0.0054
48	1.0457	0.0053
49	1.0509	0.0052
50	1.0560	0.0051
51	1.0610	0.0050
52	1.0660	0.0050
53	1.0708	0.0049
54	1.0756	0.0048
55	1.0804	0.0047
56	1.0851	0.0047
57	1.0897	0.0046
58	1.0942	0.0046
59	1.0987	0.0045
60	1.1032	0.0044
61	1.1076	0.0044
62	1.1119	0.0043
63	1.1162	0.0043
64	1.1204	0.0042
65	1.1246	0.0042
66	1.1287	0.0041
67	1.1328	0.0041
68	1.1368	0.0040
69	1.1408	0.0040
70	1.1447	0.0039
71	1.1486	0.0039
72	1.1525	0.0039
73	1.1578	0.0053
74	1.1630	0.0052
75	1.1682	0.0052
76	1.1733	0.0051
77	1.1784	0.0051
78	1.1834	0.0050
79	1.1884	0.0050
80	1.1934	0.0050
81	1.1983	0.0049
82	1.2031	0.0049
83	1.2080	0.0048
84	1.2128	0.0048
85	1.2175	0.0048
86	1.2222	0.0047
87	1.2269	0.0047
88	1.2316	0.0046
89	1.2362	0.0046
90	1.2408	0.0046
91	1.2453	0.0045
92	1.2498	0.0045
93	1.2543	0.0045
94	1.2587	0.0044
95	1.2631	0.0044
96	1.2675	0.0044
97	1.2719	0.0044
98	1.2762	0.0043
99	1.2805	0.0043
100	1.2847	0.0043
101	1.2890	0.0042
102	1.2932	0.0042
103	1.2974	0.0042
104	1.3015	0.0042
105	1.3056	0.0041

106	1.3097	0.0041
107	1.3138	0.0041
108	1.3179	0.0040
109	1.3219	0.0040
110	1.3259	0.0040
111	1.3299	0.0040
112	1.3338	0.0040
113	1.3377	0.0039
114	1.3416	0.0039
115	1.3455	0.0039
116	1.3494	0.0039
117	1.3532	0.0038
118	1.3570	0.0038
119	1.3608	0.0038
120	1.3646	0.0038
121	1.3683	0.0038
122	1.3721	0.0037
123	1.3758	0.0037
124	1.3795	0.0037
125	1.3831	0.0037
126	1.3868	0.0036
127	1.3904	0.0036
128	1.3940	0.0036
129	1.3976	0.0036
130	1.4012	0.0036
131	1.4047	0.0036
132	1.4083	0.0035
133	1.4118	0.0035
134	1.4153	0.0035
135	1.4188	0.0035
136	1.4223	0.0035
137	1.4257	0.0034
138	1.4291	0.0034
139	1.4326	0.0034
140	1.4360	0.0034
141	1.4393	0.0034
142	1.4427	0.0034
143	1.4461	0.0034
144	1.4494	0.0033
145	1.4527	0.0033
146	1.4560	0.0033
147	1.4593	0.0033
148	1.4626	0.0033
149	1.4658	0.0033
150	1.4691	0.0032
151	1.4723	0.0032
152	1.4755	0.0032
153	1.4787	0.0032
154	1.4819	0.0032
155	1.4851	0.0032
156	1.4883	0.0032
157	1.4914	0.0031
158	1.4946	0.0031
159	1.4977	0.0031
160	1.5008	0.0031
161	1.5039	0.0031
162	1.5070	0.0031
163	1.5100	0.0031
164	1.5131	0.0031
165	1.5161	0.0030
166	1.5192	0.0030
167	1.5222	0.0030
168	1.5252	0.0030
169	1.5282	0.0030
170	1.5312	0.0030
171	1.5341	0.0030
172	1.5371	0.0030
173	1.5401	0.0029
174	1.5430	0.0029
175	1.5459	0.0029
176	1.5488	0.0029
177	1.5517	0.0029
178	1.5546	0.0029
179	1.5575	0.0029
180	1.5604	0.0029
181	1.5633	0.0029
182	1.5661	0.0029
183	1.5689	0.0028

184	1.5718	0.0028
185	1.5746	0.0028
186	1.5774	0.0028
187	1.5802	0.0028
188	1.5830	0.0028
189	1.5858	0.0028
190	1.5885	0.0028
191	1.5913	0.0028
192	1.5941	0.0028
193	1.5968	0.0027
194	1.5995	0.0027
195	1.6022	0.0027
196	1.6050	0.0027
197	1.6077	0.0027
198	1.6104	0.0027
199	1.6130	0.0027
200	1.6157	0.0027
201	1.6184	0.0027
202	1.6210	0.0027
203	1.6237	0.0026
204	1.6263	0.0026
205	1.6290	0.0026
206	1.6316	0.0026
207	1.6342	0.0026
208	1.6368	0.0026
209	1.6394	0.0026
210	1.6420	0.0026
211	1.6446	0.0026
212	1.6472	0.0026
213	1.6497	0.0026
214	1.6523	0.0026
215	1.6548	0.0025
216	1.6574	0.0025
217	1.6599	0.0025
218	1.6624	0.0025
219	1.6649	0.0025
220	1.6675	0.0025
221	1.6700	0.0025
222	1.6725	0.0025
223	1.6749	0.0025
224	1.6774	0.0025
225	1.6799	0.0025
226	1.6824	0.0025
227	1.6848	0.0025
228	1.6873	0.0025
229	1.6897	0.0024
230	1.6921	0.0024
231	1.6946	0.0024
232	1.6970	0.0024
233	1.6994	0.0024
234	1.7018	0.0024
235	1.7042	0.0024
236	1.7066	0.0024
237	1.7090	0.0024
238	1.7114	0.0024
239	1.7138	0.0024
240	1.7161	0.0024
241	1.7185	0.0024
242	1.7208	0.0024
243	1.7232	0.0023
244	1.7255	0.0023
245	1.7279	0.0023
246	1.7302	0.0023
247	1.7325	0.0023
248	1.7348	0.0023
249	1.7371	0.0023
250	1.7395	0.0023
251	1.7418	0.0023
252	1.7440	0.0023
253	1.7463	0.0023
254	1.7486	0.0023
255	1.7509	0.0023
256	1.7531	0.0023
257	1.7554	0.0023
258	1.7577	0.0023
259	1.7599	0.0022
260	1.7622	0.0022
261	1.7644	0.0022

262	1.7666	0.0022
263	1.7689	0.0022
264	1.7711	0.0022
265	1.7733	0.0022
266	1.7755	0.0022
267	1.7777	0.0022
268	1.7799	0.0022
269	1.7821	0.0022
270	1.7843	0.0022
271	1.7865	0.0022
272	1.7887	0.0022
273	1.7908	0.0022
274	1.7930	0.0022
275	1.7952	0.0022
276	1.7973	0.0022
277	1.7995	0.0022
278	1.8016	0.0021
279	1.8037	0.0021
280	1.8059	0.0021
281	1.8080	0.0021
282	1.8101	0.0021
283	1.8123	0.0021
284	1.8144	0.0021
285	1.8165	0.0021
286	1.8186	0.0021
287	1.8207	0.0021
288	1.8228	0.0021

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0021	0.0003	0.0018
2	0.0021	0.0003	0.0018
3	0.0021	0.0003	0.0019
4	0.0021	0.0003	0.0019
5	0.0021	0.0003	0.0019
6	0.0021	0.0003	0.0019
7	0.0021	0.0003	0.0019
8	0.0021	0.0003	0.0019
9	0.0022	0.0003	0.0019
10	0.0022	0.0003	0.0019
11	0.0022	0.0003	0.0019
12	0.0022	0.0003	0.0019
13	0.0022	0.0003	0.0019
14	0.0022	0.0003	0.0019
15	0.0022	0.0003	0.0019
16	0.0022	0.0003	0.0019
17	0.0022	0.0003	0.0019
18	0.0022	0.0003	0.0020
19	0.0022	0.0003	0.0020
20	0.0022	0.0003	0.0020
21	0.0023	0.0003	0.0020
22	0.0023	0.0003	0.0020
23	0.0023	0.0003	0.0020
24	0.0023	0.0003	0.0020
25	0.0023	0.0003	0.0020
26	0.0023	0.0003	0.0020
27	0.0023	0.0003	0.0020
28	0.0023	0.0003	0.0020
29	0.0023	0.0003	0.0020
30	0.0023	0.0003	0.0020
31	0.0023	0.0003	0.0021
32	0.0024	0.0003	0.0021
33	0.0024	0.0003	0.0021
34	0.0024	0.0003	0.0021
35	0.0024	0.0003	0.0021
36	0.0024	0.0003	0.0021
37	0.0024	0.0003	0.0021
38	0.0024	0.0003	0.0021
39	0.0024	0.0003	0.0021
40	0.0024	0.0003	0.0021
41	0.0025	0.0003	0.0021
42	0.0025	0.0003	0.0022
43	0.0025	0.0003	0.0022
44	0.0025	0.0003	0.0022
45	0.0025	0.0003	0.0022
46	0.0025	0.0003	0.0022

47	0.0025	0.0003	0.0022
48	0.0025	0.0003	0.0022
49	0.0025	0.0003	0.0022
50	0.0025	0.0003	0.0022
51	0.0026	0.0003	0.0023
52	0.0026	0.0003	0.0023
53	0.0026	0.0003	0.0023
54	0.0026	0.0003	0.0023
55	0.0026	0.0003	0.0023
56	0.0026	0.0003	0.0023
57	0.0026	0.0003	0.0023
58	0.0026	0.0003	0.0023
59	0.0027	0.0003	0.0023
60	0.0027	0.0003	0.0023
61	0.0027	0.0003	0.0024
62	0.0027	0.0003	0.0024
63	0.0027	0.0003	0.0024
64	0.0027	0.0003	0.0024
65	0.0028	0.0003	0.0024
66	0.0028	0.0003	0.0024
67	0.0028	0.0003	0.0024
68	0.0028	0.0003	0.0024
69	0.0028	0.0003	0.0025
70	0.0028	0.0003	0.0025
71	0.0028	0.0003	0.0025
72	0.0029	0.0004	0.0025
73	0.0029	0.0004	0.0025
74	0.0029	0.0004	0.0025
75	0.0029	0.0004	0.0025
76	0.0029	0.0004	0.0026
77	0.0029	0.0004	0.0026
78	0.0029	0.0004	0.0026
79	0.0030	0.0004	0.0026
80	0.0030	0.0004	0.0026
81	0.0030	0.0004	0.0026
82	0.0030	0.0004	0.0026
83	0.0030	0.0004	0.0027
84	0.0031	0.0004	0.0027
85	0.0031	0.0004	0.0027
86	0.0031	0.0004	0.0027
87	0.0031	0.0004	0.0027
88	0.0031	0.0004	0.0027
89	0.0032	0.0004	0.0028
90	0.0032	0.0004	0.0028
91	0.0032	0.0004	0.0028
92	0.0032	0.0004	0.0028
93	0.0032	0.0004	0.0028
94	0.0033	0.0004	0.0029
95	0.0033	0.0004	0.0029
96	0.0033	0.0004	0.0029
97	0.0033	0.0004	0.0029
98	0.0034	0.0004	0.0029
99	0.0034	0.0004	0.0030
100	0.0034	0.0004	0.0030
101	0.0034	0.0004	0.0030
102	0.0034	0.0004	0.0030
103	0.0035	0.0004	0.0031
104	0.0035	0.0004	0.0031
105	0.0035	0.0004	0.0031
106	0.0036	0.0004	0.0031
107	0.0036	0.0004	0.0032
108	0.0036	0.0004	0.0032
109	0.0036	0.0004	0.0032
110	0.0037	0.0005	0.0032
111	0.0037	0.0005	0.0033
112	0.0037	0.0005	0.0033
113	0.0038	0.0005	0.0033
114	0.0038	0.0005	0.0033
115	0.0038	0.0005	0.0034
116	0.0039	0.0005	0.0034
117	0.0039	0.0005	0.0034
118	0.0039	0.0005	0.0034
119	0.0040	0.0005	0.0035
120	0.0040	0.0005	0.0035
121	0.0040	0.0005	0.0036
122	0.0041	0.0005	0.0036
123	0.0041	0.0005	0.0036
124	0.0042	0.0005	0.0036

125	0.0042	0.0005	0.0037
126	0.0042	0.0005	0.0037
127	0.0043	0.0005	0.0038
128	0.0043	0.0005	0.0038
129	0.0044	0.0005	0.0038
130	0.0044	0.0005	0.0039
131	0.0045	0.0005	0.0039
132	0.0045	0.0006	0.0040
133	0.0046	0.0006	0.0040
134	0.0046	0.0006	0.0040
135	0.0047	0.0006	0.0041
136	0.0047	0.0006	0.0041
137	0.0048	0.0006	0.0042
138	0.0048	0.0006	0.0042
139	0.0049	0.0006	0.0043
140	0.0050	0.0006	0.0043
141	0.0050	0.0006	0.0044
142	0.0051	0.0006	0.0045
143	0.0052	0.0006	0.0045
144	0.0052	0.0006	0.0046
145	0.0039	0.0005	0.0034
146	0.0039	0.0005	0.0034
147	0.0040	0.0005	0.0035
148	0.0040	0.0005	0.0035
149	0.0041	0.0005	0.0036
150	0.0042	0.0005	0.0037
151	0.0043	0.0005	0.0038
152	0.0043	0.0005	0.0038
153	0.0044	0.0005	0.0039
154	0.0045	0.0006	0.0039
155	0.0046	0.0006	0.0040
156	0.0047	0.0006	0.0041
157	0.0048	0.0006	0.0042
158	0.0049	0.0006	0.0043
159	0.0050	0.0006	0.0044
160	0.0051	0.0006	0.0045
161	0.0053	0.0006	0.0046
162	0.0054	0.0007	0.0047
163	0.0055	0.0007	0.0049
164	0.0056	0.0007	0.0049
165	0.0058	0.0007	0.0051
166	0.0059	0.0007	0.0052
167	0.0062	0.0008	0.0054
168	0.0063	0.0008	0.0055
169	0.0066	0.0008	0.0058
170	0.0067	0.0008	0.0059
171	0.0070	0.0009	0.0062
172	0.0072	0.0009	0.0063
173	0.0076	0.0009	0.0066
174	0.0078	0.0010	0.0068
175	0.0082	0.0010	0.0072
176	0.0085	0.0010	0.0074
177	0.0090	0.0011	0.0079
178	0.0093	0.0011	0.0082
179	0.0100	0.0012	0.0088
180	0.0104	0.0013	0.0091
181	0.0113	0.0014	0.0099
182	0.0118	0.0014	0.0103
183	0.0130	0.0016	0.0114
184	0.0137	0.0017	0.0120
185	0.0193	0.0024	0.0169
186	0.0206	0.0025	0.0181
187	0.0239	0.0029	0.0209
188	0.0261	0.0032	0.0229
189	0.0324	0.0033	0.0291
190	0.0373	0.0033	0.0340
191	0.0566	0.0033	0.0533
192	0.0822	0.0033	0.0789
193	0.3556	0.0033	0.3523
194	0.0446	0.0033	0.0413
195	0.0288	0.0033	0.0255
196	0.0221	0.0027	0.0194
197	0.0146	0.0018	0.0128
198	0.0124	0.0015	0.0108
199	0.0108	0.0013	0.0095
200	0.0096	0.0012	0.0085
201	0.0087	0.0011	0.0077
202	0.0080	0.0010	0.0070

203	0.0074	0.0009	0.0065
204	0.0069	0.0008	0.0060
205	0.0064	0.0008	0.0056
206	0.0061	0.0007	0.0053
207	0.0057	0.0007	0.0050
208	0.0054	0.0007	0.0048
209	0.0052	0.0006	0.0045
210	0.0050	0.0006	0.0043
211	0.0047	0.0006	0.0042
212	0.0046	0.0006	0.0040
213	0.0044	0.0005	0.0038
214	0.0042	0.0005	0.0037
215	0.0041	0.0005	0.0036
216	0.0039	0.0005	0.0035
217	0.0053	0.0006	0.0046
218	0.0051	0.0006	0.0045
219	0.0050	0.0006	0.0044
220	0.0049	0.0006	0.0043
221	0.0048	0.0006	0.0042
222	0.0046	0.0006	0.0041
223	0.0045	0.0006	0.0040
224	0.0044	0.0005	0.0039
225	0.0044	0.0005	0.0038
226	0.0043	0.0005	0.0037
227	0.0042	0.0005	0.0037
228	0.0041	0.0005	0.0036
229	0.0040	0.0005	0.0035
230	0.0040	0.0005	0.0035
231	0.0039	0.0005	0.0034
232	0.0038	0.0005	0.0033
233	0.0038	0.0005	0.0033
234	0.0037	0.0005	0.0032
235	0.0036	0.0004	0.0032
236	0.0036	0.0004	0.0031
237	0.0035	0.0004	0.0031
238	0.0035	0.0004	0.0030
239	0.0034	0.0004	0.0030
240	0.0034	0.0004	0.0030
241	0.0033	0.0004	0.0029
242	0.0033	0.0004	0.0029
243	0.0032	0.0004	0.0028
244	0.0032	0.0004	0.0028
245	0.0031	0.0004	0.0028
246	0.0031	0.0004	0.0027
247	0.0031	0.0004	0.0027
248	0.0030	0.0004	0.0027
249	0.0030	0.0004	0.0026
250	0.0030	0.0004	0.0026
251	0.0029	0.0004	0.0026
252	0.0029	0.0004	0.0025
253	0.0029	0.0004	0.0025
254	0.0028	0.0003	0.0025
255	0.0028	0.0003	0.0025
256	0.0028	0.0003	0.0024
257	0.0027	0.0003	0.0024
258	0.0027	0.0003	0.0024
259	0.0027	0.0003	0.0024
260	0.0027	0.0003	0.0023
261	0.0026	0.0003	0.0023
262	0.0026	0.0003	0.0023
263	0.0026	0.0003	0.0023
264	0.0026	0.0003	0.0022
265	0.0025	0.0003	0.0022
266	0.0025	0.0003	0.0022
267	0.0025	0.0003	0.0022
268	0.0025	0.0003	0.0022
269	0.0024	0.0003	0.0021
270	0.0024	0.0003	0.0021
271	0.0024	0.0003	0.0021
272	0.0024	0.0003	0.0021
273	0.0024	0.0003	0.0021
274	0.0023	0.0003	0.0021
275	0.0023	0.0003	0.0020
276	0.0023	0.0003	0.0020
277	0.0023	0.0003	0.0020
278	0.0023	0.0003	0.0020
279	0.0022	0.0003	0.0020
280	0.0022	0.0003	0.0020

```
      281             0.0022           0.0003             0.0019
      282             0.0022           0.0003             0.0019
      283             0.0022           0.0003             0.0019
      284             0.0022           0.0003             0.0019
      285             0.0022           0.0003             0.0019
      286             0.0021           0.0003             0.0019
      287             0.0021           0.0003             0.0019
      288             0.0021           0.0003             0.0018
      --------------------------------------------------------------------
      --------------------------------------------------------------------
      Total soil rain loss =      0.17(In)
      Total effective rainfall =      1.65(In)
      Peak flow rate in flood hydrograph =     32.07(CFS)
      ---------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R   S T O R M
                     R u n o f f     H y d r o g r a p h
      --------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
-----------------------------------------------------------------------
  0+ 5       0.0002      0.02  Q         |         |         |         |
  0+10       0.0012      0.16  Q         |         |         |         |
  0+15       0.0029      0.24  Q         |         |         |         |
  0+20       0.0049      0.28  Q         |         |         |         |
  0+25       0.0070      0.30  Q         |         |         |         |
  0+30       0.0092      0.32  Q         |         |         |         |
  0+35       0.0114      0.33  Q         |         |         |         |
  0+40       0.0138      0.34  Q         |         |         |         |
  0+45       0.0161      0.34  Q         |         |         |         |
  0+50       0.0185      0.35  Q         |         |         |         |
  0+55       0.0209      0.35  Q         |         |         |         |
  1+ 0       0.0234      0.35  Q         |         |         |         |
  1+ 5       0.0258      0.36  Q         |         |         |         |
  1+10       0.0283      0.36  Q         |         |         |         |
  1+15       0.0308      0.36  Q         |         |         |         |
  1+20       0.0332      0.36  Q         |         |         |         |
  1+25       0.0357      0.36  Q         |         |         |         |
  1+30       0.0382      0.36  Q         |         |         |         |
  1+35       0.0408      0.36  Q         |         |         |         |
  1+40       0.0433      0.37  Q         |         |         |         |
  1+45       0.0458      0.37  Q         |         |         |         |
  1+50       0.0483      0.37  Q         |         |         |         |
  1+55       0.0509      0.37  Q         |         |         |         |
  2+ 0       0.0535      0.37  QV        |         |         |         |
  2+ 5       0.0560      0.37  QV        |         |         |         |
  2+10       0.0586      0.37  QV        |         |         |         |
  2+15       0.0612      0.38  QV        |         |         |         |
  2+20       0.0638      0.38  QV        |         |         |         |
  2+25       0.0664      0.38  QV        |         |         |         |
  2+30       0.0690      0.38  QV        |         |         |         |
  2+35       0.0717      0.38  QV        |         |         |         |
  2+40       0.0743      0.38  QV        |         |         |         |
  2+45       0.0770      0.39  QV        |         |         |         |
  2+50       0.0796      0.39  QV        |         |         |         |
  2+55       0.0823      0.39  QV        |         |         |         |
  3+ 0       0.0850      0.39  QV        |         |         |         |
  3+ 5       0.0877      0.39  QV        |         |         |         |
  3+10       0.0904      0.39  QV        |         |         |         |
  3+15       0.0931      0.40  QV        |         |         |         |
  3+20       0.0959      0.40  QV        |         |         |         |
  3+25       0.0986      0.40  QV        |         |         |         |
  3+30       0.1014      0.40  QV        |         |         |         |
  3+35       0.1041      0.40  QV        |         |         |         |
  3+40       0.1069      0.40  Q V       |         |         |         |
  3+45       0.1097      0.41  Q V       |         |         |         |
  3+50       0.1125      0.41  Q V       |         |         |         |
  3+55       0.1153      0.41  Q V       |         |         |         |
  4+ 0       0.1182      0.41  Q V       |         |         |         |
  4+ 5       0.1210      0.41  Q V       |         |         |         |
  4+10       0.1239      0.42  Q V       |         |         |         |
  4+15       0.1267      0.42  Q V       |         |         |         |
  4+20       0.1296      0.42  Q V       |         |         |         |
  4+25       0.1325      0.42  Q V       |         |         |         |
  4+30       0.1354      0.42  Q V       |         |         |         |
  4+35       0.1384      0.42  Q V       |         |         |         |
```

```
 4+40       0.1413      0.43  Q V        |         |         |         |
 4+45       0.1443      0.43  Q V        |         |         |         |
 4+50       0.1472      0.43  Q V        |         |         |         |
 4+55       0.1502      0.43  Q V        |         |         |         |
 5+ 0       0.1532      0.44  Q V        |         |         |         |
 5+ 5       0.1562      0.44  Q V        |         |         |         |
 5+10       0.1592      0.44  Q V        |         |         |         |
 5+15       0.1623      0.44  Q  V       |         |         |         |
 5+20       0.1654      0.44  Q  V       |         |         |         |
 5+25       0.1684      0.45  Q  V       |         |         |         |
 5+30       0.1715      0.45  Q  V       |         |         |         |
 5+35       0.1746      0.45  Q  V       |         |         |         |
 5+40       0.1777      0.45  Q  V       |         |         |         |
 5+45       0.1809      0.46  Q  V       |         |         |         |
 5+50       0.1840      0.46  Q  V       |         |         |         |
 5+55       0.1872      0.46  Q  V       |         |         |         |
 6+ 0       0.1904      0.46  Q  V       |         |         |         |
 6+ 5       0.1936      0.47  Q  V       |         |         |         |
 6+10       0.1968      0.47  Q  V       |         |         |         |
 6+15       0.2001      0.47  Q  V       |         |         |         |
 6+20       0.2034      0.47  Q  V       |         |         |         |
 6+25       0.2066      0.48  Q  V       |         |         |         |
 6+30       0.2099      0.48  Q  V       |         |         |         |
 6+35       0.2133      0.48  Q  V       |         |         |         |
 6+40       0.2166      0.48  Q   V      |         |         |         |
 6+45       0.2199      0.49  Q   V      |         |         |         |
 6+50       0.2233      0.49  Q   V      |         |         |         |
 6+55       0.2267      0.49  Q   V      |         |         |         |
 7+ 0       0.2301      0.50  Q   V      |         |         |         |
 7+ 5       0.2336      0.50  Q   V      |         |         |         |
 7+10       0.2370      0.50  Q   V      |         |         |         |
 7+15       0.2405      0.51  Q   V      |         |         |         |
 7+20       0.2440      0.51  Q   V      |         |         |         |
 7+25       0.2475      0.51  Q   V      |         |         |         |
 7+30       0.2511      0.52  Q   V      |         |         |         |
 7+35       0.2547      0.52  Q   V      |         |         |         |
 7+40       0.2583      0.52  Q   V      |         |         |         |
 7+45       0.2619      0.53  Q   V      |         |         |         |
 7+50       0.2655      0.53  Q   V      |         |         |         |
 7+55       0.2692      0.53  Q    V     |         |         |         |
 8+ 0       0.2729      0.54  Q    V     |         |         |         |
 8+ 5       0.2766      0.54  Q    V     |         |         |         |
 8+10       0.2803      0.54  Q    V     |         |         |         |
 8+15       0.2841      0.55  Q    V     |         |         |         |
 8+20       0.2879      0.55  Q    V     |         |         |         |
 8+25       0.2917      0.55  Q    V     |         |         |         |
 8+30       0.2956      0.56  Q    V     |         |         |         |
 8+35       0.2994      0.56  Q    V     |         |         |         |
 8+40       0.3033      0.57  Q    V     |         |         |         |
 8+45       0.3073      0.57  Q    V     |         |         |         |
 8+50       0.3112      0.58  Q    V     |         |         |         |
 8+55       0.3152      0.58  Q    V     |         |         |         |
 9+ 0       0.3192      0.58  Q    V     |         |         |         |
 9+ 5       0.3233      0.59  Q     V    |         |         |         |
 9+10       0.3274      0.59  Q     V    |         |         |         |
 9+15       0.3315      0.60  Q     V    |         |         |         |
 9+20       0.3357      0.60  Q     V    |         |         |         |
 9+25       0.3398      0.61  Q     V    |         |         |         |
 9+30       0.3441      0.61  Q     V    |         |         |         |
 9+35       0.3483      0.62  Q     V    |         |         |         |
 9+40       0.3526      0.62  Q     V    |         |         |         |
 9+45       0.3569      0.63  Q     V    |         |         |         |
 9+50       0.3613      0.63  Q     V    |         |         |         |
 9+55       0.3657      0.64  Q     V    |         |         |         |
10+ 0       0.3701      0.65  Q     V    |         |         |         |
10+ 5       0.3746      0.65  Q      V   |         |         |         |
10+10       0.3792      0.66  Q      V   |         |         |         |
10+15       0.3837      0.66  Q      V   |         |         |         |
10+20       0.3883      0.67  Q      V   |         |         |         |
10+25       0.3930      0.68  Q      V   |         |         |         |
10+30       0.3977      0.68  Q      V   |         |         |         |
10+35       0.4024      0.69  Q      V   |         |         |         |
10+40       0.4072      0.70  Q      V   |         |         |         |
10+45       0.4120      0.70  Q      V   |         |         |         |
10+50       0.4169      0.71  Q      V   |         |         |         |
10+55       0.4219      0.72  Q      V   |         |         |         |
11+ 0       0.4269      0.73  Q      V   |         |         |         |
11+ 5       0.4319      0.73  Q       V  |         |         |         |
```

```
11+10       0.4370      0.74  Q       V |         |         |         |
11+15       0.4422      0.75  Q       V |         |         |         |
11+20       0.4474      0.76  Q       V |         |         |         |
11+25       0.4527      0.77  Q       V |         |         |         |
11+30       0.4580      0.78  Q       V |         |         |         |
11+35       0.4634      0.78  Q       V |         |         |         |
11+40       0.4689      0.79  Q       V |         |         |         |
11+45       0.4744      0.80  Q       V |         |         |         |
11+50       0.4800      0.81  Q       V |         |         |         |
11+55       0.4857      0.82  Q        V|         |         |         |
12+ 0       0.4914      0.84  Q        V|         |         |         |
12+ 5       0.4972      0.83  Q        V|         |         |         |
12+10       0.5023      0.75  Q        V|         |         |         |
12+15       0.5071      0.70  Q        V|         |         |         |
12+20       0.5118      0.68  Q        V|         |         |         |
12+25       0.5165      0.68  Q        V|         |         |         |
12+30       0.5212      0.68  Q        V|         |         |         |
12+35       0.5259      0.69  Q        V|         |         |         |
12+40       0.5307      0.69  Q        V|         |         |         |
12+45       0.5356      0.70  Q         V         |         |         |
12+50       0.5405      0.71  Q         V         |         |         |
12+55       0.5455      0.73  Q         V         |         |         |
13+ 0       0.5506      0.74  Q         V         |         |         |
13+ 5       0.5558      0.75  Q         V         |         |         |
13+10       0.5611      0.77  Q         V         |         |         |
13+15       0.5665      0.78  Q         V         |         |         |
13+20       0.5720      0.80  Q         V         |         |         |
13+25       0.5776      0.82  Q         V         |         |         |
13+30       0.5834      0.84  Q         V         |         |         |
13+35       0.5893      0.86  Q         |V        |         |         |
13+40       0.5954      0.88  Q         |V        |         |         |
13+45       0.6016      0.90  Q         |V        |         |         |
13+50       0.6080      0.93  Q         |V        |         |         |
13+55       0.6145      0.95  Q         |V        |         |         |
14+ 0       0.6213      0.98  Q         |V        |         |         |
14+ 5       0.6282      1.01  |Q        |V        |         |         |
14+10       0.6353      1.04  |Q        |V        |         |         |
14+15       0.6427      1.07  |Q        | V       |         |         |
14+20       0.6503      1.11  |Q        | V       |         |         |
14+25       0.6582      1.14  |Q        | V       |         |         |
14+30       0.6664      1.19  |Q        | V       |         |         |
14+35       0.6748      1.23  |Q        | V       |         |         |
14+40       0.6837      1.28  |Q        | V       |         |         |
14+45       0.6929      1.33  |Q        | V       |         |         |
14+50       0.7025      1.40  |Q        |  V      |         |         |
14+55       0.7125      1.46  |Q        |  V      |         |         |
15+ 0       0.7231      1.54  |Q        |  V      |         |         |
15+ 5       0.7343      1.62  |Q        |  V      |         |         |
15+10       0.7461      1.72  |Q        |  V      |         |         |
15+15       0.7587      1.82  |Q        |   V     |         |         |
15+20       0.7722      1.96  |Q        |   V     |         |         |
15+25       0.7869      2.14  | Q       |   V     |         |         |
15+30       0.8047      2.58  | Q       |    V    |         |         |
15+35       0.8252      2.97  | Q       |    V    |         |         |
15+40       0.8484      3.38  |  Q      |    V    |         |         |
15+45       0.8748      3.82  |  Q      |     V   |         |         |
15+50       0.9061      4.55  |   Q     |     V   |         |         |
15+55       0.9444      5.55  |    Q    |      V  |         |         |
16+ 0       0.9974      7.71  |      Q  |       V |         |         |
16+ 5       1.0940     14.01  |         |   Q     V         |         |
16+10       1.3148     32.07  |         |         |   V     | Q       |
16+15       1.4710     22.67  |         |         | Q    V  |         |
16+20       1.5599     12.91  |         | Q       |        V|         |
16+25       1.6214      8.94  |       Q |         |         V         |
16+30       1.6655      6.40  |     Q   |         |         |V        |
16+35       1.6991      4.88  |   Q     |         |         |V        |
16+40       1.7255      3.83  |  Q      |         |         | V       |
16+45       1.7463      3.02  |  Q      |         |         | V       |
16+50       1.7630      2.43  | Q       |         |         |  V      |
16+55       1.7780      2.18  | Q       |         |         |  V      |
17+ 0       1.7908      1.85  |Q        |         |         |  V      |
17+ 5       1.8011      1.50  |Q        |         |         |  V      |
17+10       1.8096      1.23  |Q        |         |         |  V      |
17+15       1.8173      1.13  |Q        |         |         |   V     |
17+20       1.8245      1.05  |Q        |         |         |   V     |
17+25       1.8313      0.98  Q         |         |         |   V     |
17+30       1.8376      0.93  Q         |         |         |   V     |
17+35       1.8437      0.88  Q         |         |         |   V     |
```

```
17+40       1.8495      0.84  Q         |         |         |   V     |
17+45       1.8550      0.80  Q         |         |         |   V     |
17+50       1.8603      0.77  Q         |         |         |   V     |
17+55       1.8653      0.74  Q         |         |         |   V     |
18+ 0       1.8702      0.71  Q         |         |         |    V    |
18+ 5       1.8750      0.70  Q         |         |         |    V    |
18+10       1.8803      0.77  Q         |         |         |    V    |
18+15       1.8858      0.80  Q         |         |         |    V    |
18+20       1.8914      0.81  Q         |         |         |    V    |
18+25       1.8969      0.80  Q         |         |         |    V    |
18+30       1.9023      0.79  Q         |         |         |    V    |
18+35       1.9077      0.78  Q         |         |         |    V    |
18+40       1.9129      0.76  Q         |         |         |    V    |
18+45       1.9181      0.75  Q         |         |         |    V    |
18+50       1.9231      0.73  Q         |         |         |     V   |
18+55       1.9281      0.72  Q         |         |         |     V   |
19+ 0       1.9330      0.71  Q         |         |         |     V   |
19+ 5       1.9377      0.69  Q         |         |         |     V   |
19+10       1.9424      0.68  Q         |         |         |     V   |
19+15       1.9470      0.67  Q         |         |         |     V   |
19+20       1.9515      0.65  Q         |         |         |     V   |
19+25       1.9559      0.64  Q         |         |         |     V   |
19+30       1.9603      0.63  Q         |         |         |     V   |
19+35       1.9646      0.62  Q         |         |         |     V   |
19+40       1.9688      0.61  Q         |         |         |     V   |
19+45       1.9729      0.60  Q         |         |         |     V   |
19+50       1.9770      0.59  Q         |         |         |      V  |
19+55       1.9810      0.58  Q         |         |         |      V  |
20+ 0       1.9849      0.57  Q         |         |         |      V  |
20+ 5       1.9888      0.56  Q         |         |         |      V  |
20+10       1.9927      0.56  Q         |         |         |      V  |
20+15       1.9964      0.55  Q         |         |         |      V  |
20+20       2.0002      0.54  Q         |         |         |      V  |
20+25       2.0039      0.53  Q         |         |         |      V  |
20+30       2.0075      0.53  Q         |         |         |      V  |
20+35       2.0111      0.52  Q         |         |         |      V  |
20+40       2.0146      0.51  Q         |         |         |      V  |
20+45       2.0181      0.51  Q         |         |         |      V  |
20+50       2.0215      0.50  Q         |         |         |      V  |
20+55       2.0250      0.49  Q         |         |         |      V  |
21+ 0       2.0283      0.49  Q         |         |         |      V  |
21+ 5       2.0316      0.48  Q         |         |         |       V |
21+10       2.0349      0.48  Q         |         |         |       V |
21+15       2.0382      0.47  Q         |         |         |       V |
21+20       2.0414      0.47  Q         |         |         |       V |
21+25       2.0446      0.46  Q         |         |         |       V |
21+30       2.0477      0.46  Q         |         |         |       V |
21+35       2.0509      0.45  Q         |         |         |       V |
21+40       2.0539      0.45  Q         |         |         |       V |
21+45       2.0570      0.44  Q         |         |         |       V |
21+50       2.0600      0.44  Q         |         |         |       V |
21+55       2.0630      0.43  Q         |         |         |       V |
22+ 0       2.0660      0.43  Q         |         |         |       V |
22+ 5       2.0689      0.43  Q         |         |         |       V |
22+10       2.0718      0.42  Q         |         |         |       V |
22+15       2.0747      0.42  Q         |         |         |       V |
22+20       2.0775      0.41  Q         |         |         |       V |
22+25       2.0804      0.41  Q         |         |         |       V |
22+30       2.0832      0.41  Q         |         |         |        V|
22+35       2.0859      0.40  Q         |         |         |        V|
22+40       2.0887      0.40  Q         |         |         |        V|
22+45       2.0914      0.40  Q         |         |         |        V|
22+50       2.0941      0.39  Q         |         |         |        V|
22+55       2.0968      0.39  Q         |         |         |        V|
23+ 0       2.0995      0.39  Q         |         |         |        V|
23+ 5       2.1021      0.38  Q         |         |         |        V|
23+10       2.1047      0.38  Q         |         |         |        V|
23+15       2.1073      0.38  Q         |         |         |        V|
23+20       2.1099      0.37  Q         |         |         |        V|
23+25       2.1124      0.37  Q         |         |         |        V|
23+30       2.1150      0.37  Q         |         |         |        V|
23+35       2.1175      0.37  Q         |         |         |        V|
23+40       2.1200      0.36  Q         |         |         |        V|
23+45       2.1225      0.36  Q         |         |         |        V|
23+50       2.1249      0.36  Q         |         |         |        V|
23+55       2.1274      0.35  Q         |         |         |        V|
24+ 0       2.1298      0.35  Q         |         |         |        V|
24+ 5       2.1320      0.33  Q         |         |         |        V|
```

```
   24+10       2.1334      0.19  Q         |         |         |        V|
   24+15       2.1341      0.10  Q         |         |         |        V|
   24+20       2.1345      0.07  Q         |         |         |        V|
   24+25       2.1348      0.04  Q         |         |         |        V|
   24+30       2.1350      0.03  Q         |         |         |        V|
   24+35       2.1351      0.02  Q         |         |         |        V|
   24+40       2.1352      0.01  Q         |         |         |        V|
   24+45       2.1353      0.01  Q         |         |         |        V|
   24+50       2.1353      0.01  Q         |         |         |        V|
   24+55       2.1353      0.00  Q         |         |         |        V|
   25+ 0       2.1353      0.00  Q         |         |         |         V
-----------------------------------------------------------------------
```

U n i t   H y d r o g r a p h   A n a l y s i s

Study date 06/17/21

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6150

LAKE VIEW APARTMENTS
10 YEAR 24 HOUR EVENT
PROPOSED CONDITION - DRAINING TO WEST BASIN

Storm Event Year = 10

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

	Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10	16.10	1	0.75
Rainfall data for year 2	16.10	6	0.70
Rainfall data for year 2	16.10	24	1.00
Rainfall data for year 100	16.10	1	1.15
Rainfall data for year 100	16.10	6	1.80
Rainfall data for year 100	16.10	24	3.00

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	86.2	16.10	1.000	0.262	0.500	0.131

Area-averaged adjusted loss rate Fm (In/Hr) = 0.131

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
8.05	0.500	69.0	86.2	1.60	0.399
8.05	0.500	98.0	98.0	0.20	0.877

Area-averaged catchment yield fraction, Y = 0.638
Area-averaged low loss fraction, Yb = 0.362

```
User entry of time of concentration  =   0.153 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      16.10(Ac.)
Catchment Lag time =   0.122 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 68.0828
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.131(In/Hr)
Average low loss rate fraction (Yb) = 0.362 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.356(In)
Computed peak 30-minute rainfall =  0.609(In)
Specified peak 1-hour rainfall =  0.750(In)
Computed peak 3-hour rainfall =  0.976(In)
Specified peak 6-hour rainfall =  1.153(In)
Specified peak 24-hour rainfall =  1.823(In)


Rainfall depth area reduction factors:
Using a total area of      16.10(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.356(In)
30-minute factor = 0.999    Adjusted rainfall =  0.609(In)
1-hour factor = 0.999       Adjusted rainfall =  0.749(In)
3-hour factor = 1.000       Adjusted rainfall =  0.976(In)
6-hour factor = 1.000       Adjusted rainfall =  1.152(In)
24-hour factor = 1.000      Adjusted rainfall =  1.823(In)
---------------------------------------------------------------------

                       U n i t  H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph         Unit Hydrograph
Number            Mean values           ((CFS))
---------------------------------------------------------------------
                (K =       194.71 (CFS))

  1                7.324                14.260
  2               48.924                81.001
  3               72.631                46.160
  4               82.915                20.024
  5               88.962                11.773
  6               92.730                 7.337
  7               95.305                 5.013
  8               97.059                 3.416
  9               98.088                 2.003
 10               98.861                 1.506
 11               99.577                 1.394
 12              100.000                 0.823
---------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number             (In)                 (In)
  1              0.3556               0.3556
  2              0.4378               0.0822
  3              0.4944               0.0566
  4              0.5390               0.0446
  5              0.5763               0.0373
  6              0.6087               0.0324
  7              0.6375               0.0288
  8              0.6636               0.0261
  9              0.6875               0.0239
 10              0.7095               0.0221
 11              0.7301               0.0206
 12              0.7494               0.0193
 13              0.7640               0.0146
 14              0.7777               0.0137
 15              0.7907               0.0130
 16              0.8031               0.0124
 17              0.8149               0.0118
 18              0.8262               0.0113
 19              0.8370               0.0108
 20              0.8474               0.0104
 21              0.8574               0.0100
 22              0.8670               0.0096
 23              0.8763               0.0093
 24              0.8853               0.0090
 25              0.8941               0.0087
 26              0.9025               0.0085
 27              0.9107               0.0082
```

28	0.9187	0.0080
29	0.9265	0.0078
30	0.9341	0.0076
31	0.9415	0.0074
32	0.9487	0.0072
33	0.9558	0.0070
34	0.9626	0.0069
35	0.9694	0.0067
36	0.9760	0.0066
37	0.9824	0.0064
38	0.9887	0.0063
39	0.9949	0.0062
40	1.0009	0.0061
41	1.0069	0.0059
42	1.0127	0.0058
43	1.0185	0.0057
44	1.0241	0.0056
45	1.0296	0.0055
46	1.0351	0.0054
47	1.0404	0.0054
48	1.0457	0.0053
49	1.0509	0.0052
50	1.0560	0.0051
51	1.0610	0.0050
52	1.0660	0.0050
53	1.0708	0.0049
54	1.0756	0.0048
55	1.0804	0.0047
56	1.0851	0.0047
57	1.0897	0.0046
58	1.0942	0.0046
59	1.0987	0.0045
60	1.1032	0.0044
61	1.1076	0.0044
62	1.1119	0.0043
63	1.1162	0.0043
64	1.1204	0.0042
65	1.1246	0.0042
66	1.1287	0.0041
67	1.1328	0.0041
68	1.1368	0.0040
69	1.1408	0.0040
70	1.1447	0.0039
71	1.1486	0.0039
72	1.1525	0.0039
73	1.1578	0.0053
74	1.1630	0.0052
75	1.1682	0.0052
76	1.1733	0.0051
77	1.1784	0.0051
78	1.1834	0.0050
79	1.1884	0.0050
80	1.1934	0.0050
81	1.1983	0.0049
82	1.2031	0.0049
83	1.2080	0.0048
84	1.2128	0.0048
85	1.2175	0.0048
86	1.2222	0.0047
87	1.2269	0.0047
88	1.2316	0.0046
89	1.2362	0.0046
90	1.2408	0.0046
91	1.2453	0.0045
92	1.2498	0.0045
93	1.2543	0.0045
94	1.2587	0.0044
95	1.2631	0.0044
96	1.2675	0.0044
97	1.2719	0.0044
98	1.2762	0.0043
99	1.2805	0.0043
100	1.2847	0.0043
101	1.2890	0.0042
102	1.2932	0.0042
103	1.2974	0.0042
104	1.3015	0.0042
105	1.3056	0.0041

106	1.3097	0.0041
107	1.3138	0.0041
108	1.3179	0.0040
109	1.3219	0.0040
110	1.3259	0.0040
111	1.3299	0.0040
112	1.3338	0.0040
113	1.3377	0.0039
114	1.3416	0.0039
115	1.3455	0.0039
116	1.3494	0.0039
117	1.3532	0.0038
118	1.3570	0.0038
119	1.3608	0.0038
120	1.3646	0.0038
121	1.3683	0.0038
122	1.3721	0.0037
123	1.3758	0.0037
124	1.3795	0.0037
125	1.3831	0.0037
126	1.3868	0.0036
127	1.3904	0.0036
128	1.3940	0.0036
129	1.3976	0.0036
130	1.4012	0.0036
131	1.4047	0.0036
132	1.4083	0.0035
133	1.4118	0.0035
134	1.4153	0.0035
135	1.4188	0.0035
136	1.4223	0.0035
137	1.4257	0.0034
138	1.4291	0.0034
139	1.4326	0.0034
140	1.4360	0.0034
141	1.4393	0.0034
142	1.4427	0.0034
143	1.4461	0.0034
144	1.4494	0.0033
145	1.4527	0.0033
146	1.4560	0.0033
147	1.4593	0.0033
148	1.4626	0.0033
149	1.4658	0.0033
150	1.4691	0.0032
151	1.4723	0.0032
152	1.4755	0.0032
153	1.4787	0.0032
154	1.4819	0.0032
155	1.4851	0.0032
156	1.4883	0.0032
157	1.4914	0.0031
158	1.4946	0.0031
159	1.4977	0.0031
160	1.5008	0.0031
161	1.5039	0.0031
162	1.5070	0.0031
163	1.5100	0.0031
164	1.5131	0.0031
165	1.5161	0.0030
166	1.5192	0.0030
167	1.5222	0.0030
168	1.5252	0.0030
169	1.5282	0.0030
170	1.5312	0.0030
171	1.5341	0.0030
172	1.5371	0.0030
173	1.5401	0.0029
174	1.5430	0.0029
175	1.5459	0.0029
176	1.5488	0.0029
177	1.5517	0.0029
178	1.5546	0.0029
179	1.5575	0.0029
180	1.5604	0.0029
181	1.5633	0.0029
182	1.5661	0.0029
183	1.5689	0.0028

184	1.5718	0.0028
185	1.5746	0.0028
186	1.5774	0.0028
187	1.5802	0.0028
188	1.5830	0.0028
189	1.5858	0.0028
190	1.5885	0.0028
191	1.5913	0.0028
192	1.5941	0.0028
193	1.5968	0.0027
194	1.5995	0.0027
195	1.6022	0.0027
196	1.6050	0.0027
197	1.6077	0.0027
198	1.6104	0.0027
199	1.6130	0.0027
200	1.6157	0.0027
201	1.6184	0.0027
202	1.6210	0.0027
203	1.6237	0.0026
204	1.6263	0.0026
205	1.6290	0.0026
206	1.6316	0.0026
207	1.6342	0.0026
208	1.6368	0.0026
209	1.6394	0.0026
210	1.6420	0.0026
211	1.6446	0.0026
212	1.6472	0.0026
213	1.6497	0.0026
214	1.6523	0.0026
215	1.6548	0.0025
216	1.6574	0.0025
217	1.6599	0.0025
218	1.6624	0.0025
219	1.6649	0.0025
220	1.6675	0.0025
221	1.6700	0.0025
222	1.6724	0.0025
223	1.6749	0.0025
224	1.6774	0.0025
225	1.6799	0.0025
226	1.6824	0.0025
227	1.6848	0.0025
228	1.6873	0.0025
229	1.6897	0.0024
230	1.6921	0.0024
231	1.6946	0.0024
232	1.6970	0.0024
233	1.6994	0.0024
234	1.7018	0.0024
235	1.7042	0.0024
236	1.7066	0.0024
237	1.7090	0.0024
238	1.7114	0.0024
239	1.7138	0.0024
240	1.7161	0.0024
241	1.7185	0.0024
242	1.7208	0.0024
243	1.7232	0.0023
244	1.7255	0.0023
245	1.7279	0.0023
246	1.7302	0.0023
247	1.7325	0.0023
248	1.7348	0.0023
249	1.7371	0.0023
250	1.7395	0.0023
251	1.7417	0.0023
252	1.7440	0.0023
253	1.7463	0.0023
254	1.7486	0.0023
255	1.7509	0.0023
256	1.7531	0.0023
257	1.7554	0.0023
258	1.7577	0.0023
259	1.7599	0.0022
260	1.7622	0.0022
261	1.7644	0.0022

262	1.7666	0.0022
263	1.7689	0.0022
264	1.7711	0.0022
265	1.7733	0.0022
266	1.7755	0.0022
267	1.7777	0.0022
268	1.7799	0.0022
269	1.7821	0.0022
270	1.7843	0.0022
271	1.7865	0.0022
272	1.7886	0.0022
273	1.7908	0.0022
274	1.7930	0.0022
275	1.7951	0.0022
276	1.7973	0.0022
277	1.7995	0.0022
278	1.8016	0.0021
279	1.8037	0.0021
280	1.8059	0.0021
281	1.8080	0.0021
282	1.8101	0.0021
283	1.8123	0.0021
284	1.8144	0.0021
285	1.8165	0.0021
286	1.8186	0.0021
287	1.8207	0.0021
288	1.8228	0.0021

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0021	0.0008	0.0013
2	0.0021	0.0008	0.0013
3	0.0021	0.0008	0.0013
4	0.0021	0.0008	0.0013
5	0.0021	0.0008	0.0014
6	0.0021	0.0008	0.0014
7	0.0021	0.0008	0.0014
8	0.0021	0.0008	0.0014
9	0.0022	0.0008	0.0014
10	0.0022	0.0008	0.0014
11	0.0022	0.0008	0.0014
12	0.0022	0.0008	0.0014
13	0.0022	0.0008	0.0014
14	0.0022	0.0008	0.0014
15	0.0022	0.0008	0.0014
16	0.0022	0.0008	0.0014
17	0.0022	0.0008	0.0014
18	0.0022	0.0008	0.0014
19	0.0022	0.0008	0.0014
20	0.0022	0.0008	0.0014
21	0.0023	0.0008	0.0014
22	0.0023	0.0008	0.0014
23	0.0023	0.0008	0.0015
24	0.0023	0.0008	0.0015
25	0.0023	0.0008	0.0015
26	0.0023	0.0008	0.0015
27	0.0023	0.0008	0.0015
28	0.0023	0.0008	0.0015
29	0.0023	0.0008	0.0015
30	0.0023	0.0008	0.0015
31	0.0023	0.0008	0.0015
32	0.0024	0.0009	0.0015
33	0.0024	0.0009	0.0015
34	0.0024	0.0009	0.0015
35	0.0024	0.0009	0.0015
36	0.0024	0.0009	0.0015
37	0.0024	0.0009	0.0015
38	0.0024	0.0009	0.0015
39	0.0024	0.0009	0.0016
40	0.0024	0.0009	0.0016
41	0.0025	0.0009	0.0016
42	0.0025	0.0009	0.0016
43	0.0025	0.0009	0.0016
44	0.0025	0.0009	0.0016
45	0.0025	0.0009	0.0016
46	0.0025	0.0009	0.0016

47	0.0025	0.0009	0.0016
48	0.0025	0.0009	0.0016
49	0.0025	0.0009	0.0016
50	0.0025	0.0009	0.0016
51	0.0026	0.0009	0.0016
52	0.0026	0.0009	0.0016
53	0.0026	0.0009	0.0017
54	0.0026	0.0009	0.0017
55	0.0026	0.0009	0.0017
56	0.0026	0.0009	0.0017
57	0.0026	0.0010	0.0017
58	0.0026	0.0010	0.0017
59	0.0027	0.0010	0.0017
60	0.0027	0.0010	0.0017
61	0.0027	0.0010	0.0017
62	0.0027	0.0010	0.0017
63	0.0027	0.0010	0.0017
64	0.0027	0.0010	0.0017
65	0.0028	0.0010	0.0018
66	0.0028	0.0010	0.0018
67	0.0028	0.0010	0.0018
68	0.0028	0.0010	0.0018
69	0.0028	0.0010	0.0018
70	0.0028	0.0010	0.0018
71	0.0028	0.0010	0.0018
72	0.0029	0.0010	0.0018
73	0.0029	0.0010	0.0018
74	0.0029	0.0010	0.0018
75	0.0029	0.0011	0.0019
76	0.0029	0.0011	0.0019
77	0.0029	0.0011	0.0019
78	0.0029	0.0011	0.0019
79	0.0030	0.0011	0.0019
80	0.0030	0.0011	0.0019
81	0.0030	0.0011	0.0019
82	0.0030	0.0011	0.0019
83	0.0030	0.0011	0.0019
84	0.0031	0.0011	0.0020
85	0.0031	0.0011	0.0020
86	0.0031	0.0011	0.0020
87	0.0031	0.0011	0.0020
88	0.0031	0.0011	0.0020
89	0.0032	0.0011	0.0020
90	0.0032	0.0011	0.0020
91	0.0032	0.0012	0.0020
92	0.0032	0.0012	0.0021
93	0.0032	0.0012	0.0021
94	0.0033	0.0012	0.0021
95	0.0033	0.0012	0.0021
96	0.0033	0.0012	0.0021
97	0.0033	0.0012	0.0021
98	0.0034	0.0012	0.0021
99	0.0034	0.0012	0.0022
100	0.0034	0.0012	0.0022
101	0.0034	0.0012	0.0022
102	0.0034	0.0012	0.0022
103	0.0035	0.0013	0.0022
104	0.0035	0.0013	0.0022
105	0.0035	0.0013	0.0023
106	0.0036	0.0013	0.0023
107	0.0036	0.0013	0.0023
108	0.0036	0.0013	0.0023
109	0.0036	0.0013	0.0023
110	0.0037	0.0013	0.0023
111	0.0037	0.0013	0.0024
112	0.0037	0.0013	0.0024
113	0.0038	0.0014	0.0024
114	0.0038	0.0014	0.0024
115	0.0038	0.0014	0.0024
116	0.0039	0.0014	0.0025
117	0.0039	0.0014	0.0025
118	0.0039	0.0014	0.0025
119	0.0040	0.0014	0.0025
120	0.0040	0.0014	0.0026
121	0.0040	0.0015	0.0026
122	0.0041	0.0015	0.0026
123	0.0041	0.0015	0.0026
124	0.0042	0.0015	0.0026

125	0.0042	0.0015	0.0027
126	0.0042	0.0015	0.0027
127	0.0043	0.0016	0.0027
128	0.0043	0.0016	0.0028
129	0.0044	0.0016	0.0028
130	0.0044	0.0016	0.0028
131	0.0045	0.0016	0.0029
132	0.0045	0.0016	0.0029
133	0.0046	0.0017	0.0029
134	0.0046	0.0017	0.0029
135	0.0047	0.0017	0.0030
136	0.0047	0.0017	0.0030
137	0.0048	0.0017	0.0031
138	0.0048	0.0017	0.0031
139	0.0049	0.0018	0.0031
140	0.0050	0.0018	0.0032
141	0.0050	0.0018	0.0032
142	0.0051	0.0018	0.0032
143	0.0052	0.0019	0.0033
144	0.0052	0.0019	0.0033
145	0.0039	0.0014	0.0025
146	0.0039	0.0014	0.0025
147	0.0040	0.0014	0.0025
148	0.0040	0.0015	0.0026
149	0.0041	0.0015	0.0026
150	0.0042	0.0015	0.0027
151	0.0043	0.0015	0.0027
152	0.0043	0.0016	0.0028
153	0.0044	0.0016	0.0028
154	0.0045	0.0016	0.0029
155	0.0046	0.0017	0.0029
156	0.0047	0.0017	0.0030
157	0.0048	0.0017	0.0031
158	0.0049	0.0018	0.0031
159	0.0050	0.0018	0.0032
160	0.0051	0.0018	0.0033
161	0.0053	0.0019	0.0034
162	0.0054	0.0019	0.0034
163	0.0055	0.0020	0.0035
164	0.0056	0.0020	0.0036
165	0.0058	0.0021	0.0037
166	0.0059	0.0022	0.0038
167	0.0062	0.0022	0.0039
168	0.0063	0.0023	0.0040
169	0.0066	0.0024	0.0042
170	0.0067	0.0024	0.0043
171	0.0070	0.0025	0.0045
172	0.0072	0.0026	0.0046
173	0.0076	0.0027	0.0048
174	0.0078	0.0028	0.0050
175	0.0082	0.0030	0.0052
176	0.0085	0.0031	0.0054
177	0.0090	0.0033	0.0058
178	0.0093	0.0034	0.0059
179	0.0100	0.0036	0.0064
180	0.0104	0.0038	0.0066
181	0.0113	0.0041	0.0072
182	0.0118	0.0043	0.0075
183	0.0130	0.0047	0.0083
184	0.0137	0.0050	0.0088
185	0.0193	0.0070	0.0123
186	0.0206	0.0074	0.0131
187	0.0239	0.0086	0.0152
188	0.0261	0.0094	0.0166
189	0.0324	0.0109	0.0215
190	0.0373	0.0109	0.0264
191	0.0566	0.0109	0.0457
192	0.0822	0.0109	0.0713
193	0.3556	0.0109	0.3447
194	0.0446	0.0109	0.0337
195	0.0288	0.0104	0.0184
196	0.0221	0.0080	0.0141
197	0.0146	0.0053	0.0093
198	0.0124	0.0045	0.0079
199	0.0108	0.0039	0.0069
200	0.0096	0.0035	0.0062
201	0.0087	0.0032	0.0056
202	0.0080	0.0029	0.0051

203	0.0074	0.0027	0.0047
204	0.0069	0.0025	0.0044
205	0.0064	0.0023	0.0041
206	0.0061	0.0022	0.0039
207	0.0057	0.0021	0.0037
208	0.0054	0.0020	0.0035
209	0.0052	0.0019	0.0033
210	0.0050	0.0018	0.0032
211	0.0047	0.0017	0.0030
212	0.0046	0.0016	0.0029
213	0.0044	0.0016	0.0028
214	0.0042	0.0015	0.0027
215	0.0041	0.0015	0.0026
216	0.0039	0.0014	0.0025
217	0.0053	0.0019	0.0034
218	0.0051	0.0019	0.0033
219	0.0050	0.0018	0.0032
220	0.0049	0.0018	0.0031
221	0.0048	0.0017	0.0030
222	0.0046	0.0017	0.0030
223	0.0045	0.0016	0.0029
224	0.0044	0.0016	0.0028
225	0.0044	0.0016	0.0028
226	0.0043	0.0015	0.0027
227	0.0042	0.0015	0.0027
228	0.0041	0.0015	0.0026
229	0.0040	0.0015	0.0026
230	0.0040	0.0014	0.0025
231	0.0039	0.0014	0.0025
232	0.0038	0.0014	0.0024
233	0.0038	0.0014	0.0024
234	0.0037	0.0013	0.0024
235	0.0036	0.0013	0.0023
236	0.0036	0.0013	0.0023
237	0.0035	0.0013	0.0022
238	0.0035	0.0013	0.0022
239	0.0034	0.0012	0.0022
240	0.0034	0.0012	0.0021
241	0.0033	0.0012	0.0021
242	0.0033	0.0012	0.0021
243	0.0032	0.0012	0.0021
244	0.0032	0.0012	0.0020
245	0.0031	0.0011	0.0020
246	0.0031	0.0011	0.0020
247	0.0031	0.0011	0.0020
248	0.0030	0.0011	0.0019
249	0.0030	0.0011	0.0019
250	0.0030	0.0011	0.0019
251	0.0029	0.0011	0.0019
252	0.0029	0.0010	0.0018
253	0.0029	0.0010	0.0018
254	0.0028	0.0010	0.0018
255	0.0028	0.0010	0.0018
256	0.0028	0.0010	0.0018
257	0.0027	0.0010	0.0017
258	0.0027	0.0010	0.0017
259	0.0027	0.0010	0.0017
260	0.0027	0.0010	0.0017
261	0.0026	0.0010	0.0017
262	0.0026	0.0009	0.0017
263	0.0026	0.0009	0.0016
264	0.0026	0.0009	0.0016
265	0.0025	0.0009	0.0016
266	0.0025	0.0009	0.0016
267	0.0025	0.0009	0.0016
268	0.0025	0.0009	0.0016
269	0.0024	0.0009	0.0016
270	0.0024	0.0009	0.0015
271	0.0024	0.0009	0.0015
272	0.0024	0.0009	0.0015
273	0.0024	0.0009	0.0015
274	0.0023	0.0008	0.0015
275	0.0023	0.0008	0.0015
276	0.0023	0.0008	0.0015
277	0.0023	0.0008	0.0015
278	0.0023	0.0008	0.0014
279	0.0022	0.0008	0.0014
280	0.0022	0.0008	0.0014

```
281              0.0022           0.0008            0.0014
282              0.0022           0.0008            0.0014
283              0.0022           0.0008            0.0014
284              0.0022           0.0008            0.0014
285              0.0022           0.0008            0.0014
286              0.0021           0.0008            0.0014
287              0.0021           0.0008            0.0014
288              0.0021           0.0008            0.0013
---------------------------------------------------------------------
---------------------------------------------------------------------
Total soil rain loss =      0.50(In)
Total effective rainfall =      1.32(In)
Peak flow rate in flood hydrograph =     33.28(CFS)
----------------------------------------------------------------------
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                    24 - H O U R    S T O R M
               R u n o f f      H y d r o g r a p h
---------------------------------------------------------------------
            Hydrograph in   5   Minute intervals ((CFS))

---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
-----------------------------------------------------------------------
  0+ 5      0.0001      0.02  Q         |         |         |         |
  0+10      0.0010      0.13  Q         |         |         |         |
  0+15      0.0023      0.19  Q         |         |         |         |
  0+20      0.0038      0.22  Q         |         |         |         |
  0+25      0.0054      0.23  Q         |         |         |         |
  0+30      0.0071      0.24  Q         |         |         |         |
  0+35      0.0088      0.25  Q         |         |         |         |
  0+40      0.0106      0.26  Q         |         |         |         |
  0+45      0.0124      0.26  Q         |         |         |         |
  0+50      0.0142      0.26  Q         |         |         |         |
  0+55      0.0160      0.27  Q         |         |         |         |
  1+ 0      0.0179      0.27  Q         |         |         |         |
  1+ 5      0.0198      0.27  Q         |         |         |         |
  1+10      0.0216      0.27  Q         |         |         |         |
  1+15      0.0235      0.27  Q         |         |         |         |
  1+20      0.0254      0.27  Q         |         |         |         |
  1+25      0.0272      0.27  Q         |         |         |         |
  1+30      0.0291      0.27  Q         |         |         |         |
  1+35      0.0310      0.28  Q         |         |         |         |
  1+40      0.0329      0.28  Q         |         |         |         |
  1+45      0.0349      0.28  Q         |         |         |         |
  1+50      0.0368      0.28  Q         |         |         |         |
  1+55      0.0387      0.28  Q         |         |         |         |
  2+ 0      0.0406      0.28  Q         |         |         |         |
  2+ 5      0.0426      0.28  Q         |         |         |         |
  2+10      0.0445      0.28  QV        |         |         |         |
  2+15      0.0465      0.28  QV        |         |         |         |
  2+20      0.0485      0.29  QV        |         |         |         |
  2+25      0.0504      0.29  QV        |         |         |         |
  2+30      0.0524      0.29  QV        |         |         |         |
  2+35      0.0544      0.29  QV        |         |         |         |
  2+40      0.0564      0.29  QV        |         |         |         |
  2+45      0.0584      0.29  QV        |         |         |         |
  2+50      0.0604      0.29  QV        |         |         |         |
  2+55      0.0624      0.29  QV        |         |         |         |
  3+ 0      0.0645      0.30  QV        |         |         |         |
  3+ 5      0.0665      0.30  QV        |         |         |         |
  3+10      0.0686      0.30  QV        |         |         |         |
  3+15      0.0706      0.30  QV        |         |         |         |
  3+20      0.0727      0.30  QV        |         |         |         |
  3+25      0.0748      0.30  QV        |         |         |         |
  3+30      0.0769      0.30  QV        |         |         |         |
  3+35      0.0790      0.30  QV        |         |         |         |
  3+40      0.0811      0.31  QV        |         |         |         |
  3+45      0.0832      0.31  QV        |         |         |         |
  3+50      0.0853      0.31  QV        |         |         |         |
  3+55      0.0874      0.31  QV        |         |         |         |
  4+ 0      0.0896      0.31  Q V       |         |         |         |
  4+ 5      0.0917      0.31  Q V       |         |         |         |
  4+10      0.0939      0.31  Q V       |         |         |         |
  4+15      0.0960      0.32  Q V       |         |         |         |
  4+20      0.0982      0.32  Q V       |         |         |         |
  4+25      0.1004      0.32  Q V       |         |         |         |
  4+30      0.1026      0.32  Q V       |         |         |         |
  4+35      0.1048      0.32  Q V       |         |         |         |
```

```
 4+40       0.1071      0.32  Q V        |         |         |         |
 4+45       0.1093      0.32  Q V        |         |         |         |
 4+50       0.1115      0.33  Q V        |         |         |         |
 4+55       0.1138      0.33  Q V        |         |         |         |
 5+ 0       0.1161      0.33  Q V        |         |         |         |
 5+ 5       0.1183      0.33  Q V        |         |         |         |
 5+10       0.1206      0.33  Q V        |         |         |         |
 5+15       0.1229      0.33  Q V        |         |         |         |
 5+20       0.1252      0.34  Q V        |         |         |         |
 5+25       0.1276      0.34  Q V        |         |         |         |
 5+30       0.1299      0.34  Q V        |         |         |         |
 5+35       0.1323      0.34  Q V        |         |         |         |
 5+40       0.1346      0.34  Q  V       |         |         |         |
 5+45       0.1370      0.34  Q  V       |         |         |         |
 5+50       0.1394      0.35  Q  V       |         |         |         |
 5+55       0.1418      0.35  Q  V       |         |         |         |
 6+ 0       0.1442      0.35  Q  V       |         |         |         |
 6+ 5       0.1466      0.35  Q  V       |         |         |         |
 6+10       0.1491      0.35  Q  V       |         |         |         |
 6+15       0.1515      0.36  Q  V       |         |         |         |
 6+20       0.1540      0.36  Q  V       |         |         |         |
 6+25       0.1565      0.36  Q  V       |         |         |         |
 6+30       0.1590      0.36  Q  V       |         |         |         |
 6+35       0.1615      0.36  Q  V       |         |         |         |
 6+40       0.1640      0.37  Q  V       |         |         |         |
 6+45       0.1665      0.37  Q  V       |         |         |         |
 6+50       0.1691      0.37  Q  V       |         |         |         |
 6+55       0.1717      0.37  Q  V       |         |         |         |
 7+ 0       0.1742      0.38  Q  V       |         |         |         |
 7+ 5       0.1768      0.38  Q   V      |         |         |         |
 7+10       0.1795      0.38  Q   V      |         |         |         |
 7+15       0.1821      0.38  Q   V      |         |         |         |
 7+20       0.1847      0.38  Q   V      |         |         |         |
 7+25       0.1874      0.39  Q   V      |         |         |         |
 7+30       0.1901      0.39  Q   V      |         |         |         |
 7+35       0.1928      0.39  Q   V      |         |         |         |
 7+40       0.1955      0.39  Q   V      |         |         |         |
 7+45       0.1982      0.40  Q   V      |         |         |         |
 7+50       0.2010      0.40  Q   V      |         |         |         |
 7+55       0.2038      0.40  Q   V      |         |         |         |
 8+ 0       0.2066      0.41  Q   V      |         |         |         |
 8+ 5       0.2094      0.41  Q   V      |         |         |         |
 8+10       0.2122      0.41  Q   V      |         |         |         |
 8+15       0.2150      0.41  Q   V      |         |         |         |
 8+20       0.2179      0.42  Q   V      |         |         |         |
 8+25       0.2208      0.42  Q   V      |         |         |         |
 8+30       0.2237      0.42  Q    V     |         |         |         |
 8+35       0.2266      0.43  Q    V     |         |         |         |
 8+40       0.2296      0.43  Q    V     |         |         |         |
 8+45       0.2326      0.43  Q    V     |         |         |         |
 8+50       0.2356      0.44  Q    V     |         |         |         |
 8+55       0.2386      0.44  Q    V     |         |         |         |
 9+ 0       0.2416      0.44  Q    V     |         |         |         |
 9+ 5       0.2447      0.45  Q    V     |         |         |         |
 9+10       0.2478      0.45  Q    V     |         |         |         |
 9+15       0.2509      0.45  Q    V     |         |         |         |
 9+20       0.2540      0.46  Q    V     |         |         |         |
 9+25       0.2572      0.46  Q    V     |         |         |         |
 9+30       0.2604      0.46  Q    V     |         |         |         |
 9+35       0.2636      0.47  Q    V     |         |         |         |
 9+40       0.2669      0.47  Q     V    |         |         |         |
 9+45       0.2701      0.48  Q     V    |         |         |         |
 9+50       0.2734      0.48  Q     V    |         |         |         |
 9+55       0.2768      0.48  Q     V    |         |         |         |
10+ 0       0.2801      0.49  Q     V    |         |         |         |
10+ 5       0.2835      0.49  Q     V    |         |         |         |
10+10       0.2869      0.50  Q     V    |         |         |         |
10+15       0.2904      0.50  Q     V    |         |         |         |
10+20       0.2939      0.51  Q     V    |         |         |         |
10+25       0.2974      0.51  Q     V    |         |         |         |
10+30       0.3010      0.52  Q     V    |         |         |         |
10+35       0.3045      0.52  Q     V    |         |         |         |
10+40       0.3082      0.53  Q     V    |         |         |         |
10+45       0.3118      0.53  Q      V   |         |         |         |
10+50       0.3155      0.54  Q      V   |         |         |         |
10+55       0.3193      0.54  Q      V   |         |         |         |
11+ 0       0.3231      0.55  Q      V   |         |         |         |
11+ 5       0.3269      0.55  Q      V   |         |         |         |
```

```
11+10       0.3307      0.56  Q      V  |         |         |         |
11+15       0.3346      0.57  Q      V  |         |         |         |
11+20       0.3386      0.57  Q      V  |         |         |         |
11+25       0.3426      0.58  Q      V  |         |         |         |
11+30       0.3466      0.59  Q      V  |         |         |         |
11+35       0.3507      0.59  Q      V  |         |         |         |
11+40       0.3548      0.60  Q       V |         |         |         |
11+45       0.3590      0.61  Q       V |         |         |         |
11+50       0.3633      0.62  Q       V |         |         |         |
11+55       0.3676      0.62  Q       V |         |         |         |
12+ 0       0.3719      0.63  Q       V |         |         |         |
12+ 5       0.3762      0.63  Q       V |         |         |         |
12+10       0.3801      0.56  Q       V |         |         |         |
12+15       0.3837      0.53  Q       V |         |         |         |
12+20       0.3873      0.52  Q       V |         |         |         |
12+25       0.3908      0.51  Q       V |         |         |         |
12+30       0.3943      0.51  Q       V |         |         |         |
12+35       0.3979      0.52  Q        V|         |         |         |
12+40       0.4015      0.52  Q        V|         |         |         |
12+45       0.4052      0.53  Q        V|         |         |         |
12+50       0.4089      0.54  Q        V|         |         |         |
12+55       0.4127      0.55  Q        V|         |         |         |
13+ 0       0.4165      0.56  Q        V|         |         |         |
13+ 5       0.4205      0.57  Q        V|         |         |         |
13+10       0.4245      0.58  Q        V|         |         |         |
13+15       0.4286      0.59  Q        V|         |         |         |
13+20       0.4328      0.61  Q        V|         |         |         |
13+25       0.4370      0.62  Q        V|         |         |         |
13+30       0.4414      0.64  Q        V|         |         |         |
13+35       0.4459      0.65  Q         V         |         |         |
13+40       0.4505      0.67  Q         V         |         |         |
13+45       0.4552      0.68  Q         V         |         |         |
13+50       0.4600      0.70  Q         V         |         |         |
13+55       0.4650      0.72  Q         V         |         |         |
14+ 0       0.4701      0.74  Q         V         |         |         |
14+ 5       0.4753      0.76  Q         V         |         |         |
14+10       0.4808      0.79  Q         V         |         |         |
14+15       0.4864      0.81  Q         |V        |         |         |
14+20       0.4921      0.84  Q         |V        |         |         |
14+25       0.4981      0.87  Q         |V        |         |         |
14+30       0.5043      0.90  Q         |V        |         |         |
14+35       0.5108      0.93  Q         |V        |         |         |
14+40       0.5175      0.97  Q         |V        |         |         |
14+45       0.5244      1.01  |Q        |V        |         |         |
14+50       0.5317      1.06  |Q        | V       |         |         |
14+55       0.5394      1.11  |Q        | V       |         |         |
15+ 0       0.5474      1.17  |Q        | V       |         |         |
15+ 5       0.5559      1.23  |Q        | V       |         |         |
15+10       0.5649      1.31  |Q        | V       |         |         |
15+15       0.5745      1.39  |Q        |  V      |         |         |
15+20       0.5848      1.49  |Q        |  V      |         |         |
15+25       0.5960      1.64  |Q        |  V      |         |         |
15+30       0.6097      1.98  |Q        |  V      |         |         |
15+35       0.6253      2.27  | Q       |   V     |         |         |
15+40       0.6431      2.59  | Q       |   V     |         |         |
15+45       0.6634      2.93  | Q       |    V    |         |         |
15+50       0.6878      3.55  |  Q      |    V    |         |         |
15+55       0.7190      4.53  |   Q     |     V   |         |         |
16+ 0       0.7660      6.83  |     Q   |      V  |         |         |
16+ 5       0.8617     13.88  |         |  Q     V|         |         |
16+10       1.0908     33.28  |         |         |   V     |  Q      |
16+15       1.2375     21.30  |         |         |Q      V |         |
16+20       1.3175     11.61  |         |Q        |        V|         |
16+25       1.3712      7.80  |      Q  |         |         |V        |
16+30       1.4087      5.44  |    Q    |         |         |V        |
16+35       1.4367      4.06  |   Q     |         |         | V       |
16+40       1.4581      3.11  |  Q      |         |         | V       |
16+45       1.4743      2.36  | Q       |         |         |  V      |
16+50       1.4879      1.96  |Q        |         |         |  V      |
16+55       1.4997      1.72  |Q        |         |         |  V      |
17+ 0       1.5092      1.37  |Q        |         |         |   V     |
17+ 5       1.5160      1.00  Q         |         |         |   V     |
17+10       1.5223      0.90  Q         |         |         |   V     |
17+15       1.5280      0.84  Q         |         |         |   V     |
17+20       1.5334      0.78  Q         |         |         |   V     |
17+25       1.5384      0.73  Q         |         |         |   V     |
17+30       1.5432      0.69  Q         |         |         |   V     |
17+35       1.5478      0.66  Q         |         |         |    V    |
```

```
17+40       1.5521      0.63   Q         |         |         |    V    |
17+45       1.5562      0.60   Q         |         |         |    V    |
17+50       1.5602      0.58   Q         |         |         |    V    |
17+55       1.5640      0.55   Q         |         |         |    V    |
18+ 0       1.5676      0.53   Q         |         |         |    V    |
18+ 5       1.5713      0.53   Q         |         |         |    V    |
18+10       1.5753      0.58   Q         |         |         |    V    |
18+15       1.5795      0.61   Q         |         |         |    V    |
18+20       1.5837      0.61   Q         |         |         |    V    |
18+25       1.5878      0.60   Q         |         |         |    V    |
18+30       1.5920      0.60   Q         |         |         |     V   |
18+35       1.5960      0.59   Q         |         |         |     V   |
18+40       1.6000      0.58   Q         |         |         |     V   |
18+45       1.6038      0.56   Q         |         |         |     V   |
18+50       1.6077      0.55   Q         |         |         |     V   |
18+55       1.6114      0.54   Q         |         |         |     V   |
19+ 0       1.6151      0.53   Q         |         |         |     V   |
19+ 5       1.6187      0.52   Q         |         |         |     V   |
19+10       1.6222      0.51   Q         |         |         |     V   |
19+15       1.6256      0.50   Q         |         |         |     V   |
19+20       1.6290      0.49   Q         |         |         |     V   |
19+25       1.6324      0.48   Q         |         |         |     V   |
19+30       1.6357      0.48   Q         |         |         |      V  |
19+35       1.6389      0.47   Q         |         |         |      V  |
19+40       1.6421      0.46   Q         |         |         |      V  |
19+45       1.6452      0.45   Q         |         |         |      V  |
19+50       1.6482      0.45   Q         |         |         |      V  |
19+55       1.6513      0.44   Q         |         |         |      V  |
20+ 0       1.6542      0.43   Q         |         |         |      V  |
20+ 5       1.6572      0.43   Q         |         |         |      V  |
20+10       1.6601      0.42   Q         |         |         |      V  |
20+15       1.6629      0.41   Q         |         |         |      V  |
20+20       1.6657      0.41   Q         |         |         |      V  |
20+25       1.6685      0.40   Q         |         |         |      V  |
20+30       1.6712      0.40   Q         |         |         |      V  |
20+35       1.6739      0.39   Q         |         |         |      V  |
20+40       1.6766      0.39   Q         |         |         |      V  |
20+45       1.6792      0.38   Q         |         |         |       V |
20+50       1.6818      0.38   Q         |         |         |       V |
20+55       1.6844      0.37   Q         |         |         |       V |
21+ 0       1.6870      0.37   Q         |         |         |       V |
21+ 5       1.6895      0.36   Q         |         |         |       V |
21+10       1.6920      0.36   Q         |         |         |       V |
21+15       1.6944      0.36   Q         |         |         |       V |
21+20       1.6968      0.35   Q         |         |         |       V |
21+25       1.6992      0.35   Q         |         |         |       V |
21+30       1.7016      0.34   Q         |         |         |       V |
21+35       1.7040      0.34   Q         |         |         |       V |
21+40       1.7063      0.34   Q         |         |         |       V |
21+45       1.7086      0.33   Q         |         |         |       V |
21+50       1.7109      0.33   Q         |         |         |       V |
21+55       1.7131      0.33   Q         |         |         |       V |
22+ 0       1.7154      0.32   Q         |         |         |       V |
22+ 5       1.7176      0.32   Q         |         |         |       V |
22+10       1.7198      0.32   Q         |         |         |       V |
22+15       1.7219      0.32   Q         |         |         |       V |
22+20       1.7241      0.31   Q         |         |         |        V|
22+25       1.7262      0.31   Q         |         |         |        V|
22+30       1.7283      0.31   Q         |         |         |        V|
22+35       1.7304      0.30   Q         |         |         |        V|
22+40       1.7325      0.30   Q         |         |         |        V|
22+45       1.7346      0.30   Q         |         |         |        V|
22+50       1.7366      0.30   Q         |         |         |        V|
22+55       1.7386      0.29   Q         |         |         |        V|
23+ 0       1.7407      0.29   Q         |         |         |        V|
23+ 5       1.7426      0.29   Q         |         |         |        V|
23+10       1.7446      0.29   Q         |         |         |        V|
23+15       1.7466      0.28   Q         |         |         |        V|
23+20       1.7485      0.28   Q         |         |         |        V|
23+25       1.7504      0.28   Q         |         |         |        V|
23+30       1.7524      0.28   Q         |         |         |        V|
23+35       1.7543      0.28   Q         |         |         |        V|
23+40       1.7561      0.27   Q         |         |         |        V|
23+45       1.7580      0.27   Q         |         |         |        V|
23+50       1.7599      0.27   Q         |         |         |        V|
23+55       1.7617      0.27   Q         |         |         |        V|
24+ 0       1.7635      0.27   Q         |         |         |        V|
24+ 5       1.7652      0.24   Q         |         |         |        V|
```

```
   24+10       1.7662      0.14  Q         |         |         |        V|
   24+15       1.7667      0.07  Q         |         |         |        V|
   24+20       1.7670      0.05  Q         |         |         |        V|
   24+25       1.7672      0.03  Q         |         |         |        V|
   24+30       1.7673      0.02  Q         |         |         |        V|
   24+35       1.7674      0.01  Q         |         |         |        V|
   24+40       1.7674      0.01  Q         |         |         |        V|
   24+45       1.7675      0.01  Q         |         |         |        V|
   24+50       1.7675      0.00  Q         |         |         |        V|
   24+55       1.7675      0.00  Q         |         |         |         V
----------------------------------------------------------------------
```

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  06/17/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6150

---------------------------------------------------------------------
LAKE VIEW APARTMENTS
10 YEAR 24 HOUR EVENT
EXISTING CONDITION - DRAINING TO EAST

--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)           (hours)         (In)
Rainfall data for year 10
             5.50           1           0.75
--------------------------------------------------------------------
Rainfall data for year 2
             5.50           6           0.70
--------------------------------------------------------------------
Rainfall data for year 2
             5.50          24           1.00
--------------------------------------------------------------------
Rainfall data for year 100
             5.50           1           1.15
--------------------------------------------------------------------
Rainfall data for year 100
             5.50           6           1.80
--------------------------------------------------------------------
Rainfall data for year 100
             5.50          24           3.00
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 90.0      98.0          5.50      1.000     0.040    1.000    0.040

Area-averaged adjusted loss rate Fm (In/Hr) =  0.040

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     5.50   1.000         90.0      98.0      0.20    0.877

Area-averaged catchment yield fraction, Y =  0.877
Area-averaged low loss fraction, Yb =  0.123
User entry of time of concentration  =   0.160 (hours)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =       5.50(Ac.)
Catchment Lag time =   0.128 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 65.1042
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.040(In/Hr)
Average low loss rate fraction (Yb) = 0.123 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.356(In)
Computed peak 30-minute rainfall =  0.609(In)
Specified peak 1-hour rainfall =  0.750(In)
Computed peak 3-hour rainfall =  0.976(In)
Specified peak 6-hour rainfall =  1.153(In)
Specified peak 24-hour rainfall =  1.823(In)


Rainfall depth area reduction factors:
Using a total area of       5.50(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.356(In)
30-minute factor = 1.000    Adjusted rainfall =  0.609(In)
1-hour factor = 1.000       Adjusted rainfall =  0.750(In)
3-hour factor = 1.000       Adjusted rainfall =  0.976(In)
6-hour factor = 1.000       Adjusted rainfall =  1.153(In)
24-hour factor = 1.000      Adjusted rainfall =  1.823(In)
---------------------------------------------------------------------

                       U n i t   H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
Number            Mean values            ((CFS))
---------------------------------------------------------------------
                (K =        66.52 (CFS))

  1               6.621                  4.404
  2              46.358                 26.432
  3              71.060                 16.431
  4              81.731                  7.098
  5              88.011                  4.177
  6              91.943                  2.615
  7              94.679                  1.820
  8              96.569                  1.257
  9              97.782                  0.807
 10              98.525                  0.494
 11              99.292                  0.510
 12             100.000                  0.471
---------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number              (In)               (In)
  1             0.3558              0.3558
  2             0.4380              0.0822
  3             0.4947              0.0567
  4             0.5393              0.0446
  5             0.5766              0.0373
  6             0.6090              0.0324
  7             0.6379              0.0288
  8             0.6639              0.0261
  9             0.6878              0.0239
 10             0.7099              0.0221
 11             0.7305              0.0206
 12             0.7498              0.0193
 13             0.7643              0.0145
 14             0.7781              0.0137
 15             0.7911              0.0130
 16             0.8034              0.0123
 17             0.8152              0.0118
 18             0.8264              0.0113
 19             0.8372              0.0108
 20             0.8476              0.0104
 21             0.8576              0.0100
 22             0.8672              0.0096
 23             0.8765              0.0093
 24             0.8855              0.0090
 25             0.8942              0.0087
 26             0.9027              0.0085
 27             0.9109              0.0082
 28             0.9189              0.0080
```

29	0.9267	0.0078
30	0.9342	0.0076
31	0.9416	0.0074
32	0.9488	0.0072
33	0.9559	0.0070
34	0.9627	0.0069
35	0.9694	0.0067
36	0.9760	0.0066
37	0.9825	0.0064
38	0.9888	0.0063
39	0.9949	0.0062
40	1.0010	0.0061
41	1.0069	0.0059
42	1.0128	0.0058
43	1.0185	0.0057
44	1.0241	0.0056
45	1.0297	0.0055
46	1.0351	0.0054
47	1.0405	0.0054
48	1.0457	0.0053
49	1.0509	0.0052
50	1.0560	0.0051
51	1.0611	0.0050
52	1.0660	0.0050
53	1.0709	0.0049
54	1.0757	0.0048
55	1.0804	0.0047
56	1.0851	0.0047
57	1.0897	0.0046
58	1.0943	0.0046
59	1.0988	0.0045
60	1.1032	0.0044
61	1.1076	0.0044
62	1.1119	0.0043
63	1.1162	0.0043
64	1.1204	0.0042
65	1.1246	0.0042
66	1.1287	0.0041
67	1.1328	0.0041
68	1.1368	0.0040
69	1.1408	0.0040
70	1.1448	0.0039
71	1.1487	0.0039
72	1.1525	0.0039
73	1.1578	0.0053
74	1.1630	0.0052
75	1.1682	0.0052
76	1.1733	0.0051
77	1.1784	0.0051
78	1.1834	0.0050
79	1.1884	0.0050
80	1.1934	0.0050
81	1.1983	0.0049
82	1.2032	0.0049
83	1.2080	0.0048
84	1.2128	0.0048
85	1.2176	0.0048
86	1.2223	0.0047
87	1.2270	0.0047
88	1.2316	0.0046
89	1.2362	0.0046
90	1.2408	0.0046
91	1.2453	0.0045
92	1.2498	0.0045
93	1.2543	0.0045
94	1.2588	0.0044
95	1.2632	0.0044
96	1.2676	0.0044
97	1.2719	0.0044
98	1.2762	0.0043
99	1.2805	0.0043
100	1.2848	0.0043
101	1.2890	0.0042
102	1.2932	0.0042
103	1.2974	0.0042
104	1.3016	0.0042
105	1.3057	0.0041
106	1.3098	0.0041

107	1.3138	0.0041
108	1.3179	0.0040
109	1.3219	0.0040
110	1.3259	0.0040
111	1.3299	0.0040
112	1.3338	0.0039
113	1.3378	0.0039
114	1.3417	0.0039
115	1.3456	0.0039
116	1.3494	0.0039
117	1.3532	0.0038
118	1.3571	0.0038
119	1.3609	0.0038
120	1.3646	0.0038
121	1.3684	0.0037
122	1.3721	0.0037
123	1.3758	0.0037
124	1.3795	0.0037
125	1.3832	0.0037
126	1.3868	0.0036
127	1.3904	0.0036
128	1.3941	0.0036
129	1.3977	0.0036
130	1.4012	0.0036
131	1.4048	0.0036
132	1.4083	0.0035
133	1.4118	0.0035
134	1.4153	0.0035
135	1.4188	0.0035
136	1.4223	0.0035
137	1.4257	0.0034
138	1.4292	0.0034
139	1.4326	0.0034
140	1.4360	0.0034
141	1.4394	0.0034
142	1.4427	0.0034
143	1.4461	0.0034
144	1.4494	0.0033
145	1.4527	0.0033
146	1.4561	0.0033
147	1.4593	0.0033
148	1.4626	0.0033
149	1.4659	0.0033
150	1.4691	0.0032
151	1.4724	0.0032
152	1.4756	0.0032
153	1.4788	0.0032
154	1.4820	0.0032
155	1.4851	0.0032
156	1.4883	0.0032
157	1.4914	0.0031
158	1.4946	0.0031
159	1.4977	0.0031
160	1.5008	0.0031
161	1.5039	0.0031
162	1.5070	0.0031
163	1.5101	0.0031
164	1.5131	0.0031
165	1.5162	0.0030
166	1.5192	0.0030
167	1.5222	0.0030
168	1.5252	0.0030
169	1.5282	0.0030
170	1.5312	0.0030
171	1.5342	0.0030
172	1.5371	0.0030
173	1.5401	0.0029
174	1.5430	0.0029
175	1.5460	0.0029
176	1.5489	0.0029
177	1.5518	0.0029
178	1.5547	0.0029
179	1.5575	0.0029
180	1.5604	0.0029
181	1.5633	0.0029
182	1.5661	0.0029
183	1.5690	0.0028
184	1.5718	0.0028

185	1.5746	0.0028
186	1.5774	0.0028
187	1.5802	0.0028
188	1.5830	0.0028
189	1.5858	0.0028
190	1.5886	0.0028
191	1.5913	0.0028
192	1.5941	0.0028
193	1.5968	0.0027
194	1.5996	0.0027
195	1.6023	0.0027
196	1.6050	0.0027
197	1.6077	0.0027
198	1.6104	0.0027
199	1.6131	0.0027
200	1.6157	0.0027
201	1.6184	0.0027
202	1.6211	0.0027
203	1.6237	0.0026
204	1.6264	0.0026
205	1.6290	0.0026
206	1.6316	0.0026
207	1.6342	0.0026
208	1.6368	0.0026
209	1.6394	0.0026
210	1.6420	0.0026
211	1.6446	0.0026
212	1.6472	0.0026
213	1.6497	0.0026
214	1.6523	0.0026
215	1.6549	0.0025
216	1.6574	0.0025
217	1.6599	0.0025
218	1.6625	0.0025
219	1.6650	0.0025
220	1.6675	0.0025
221	1.6700	0.0025
222	1.6725	0.0025
223	1.6750	0.0025
224	1.6774	0.0025
225	1.6799	0.0025
226	1.6824	0.0025
227	1.6848	0.0025
228	1.6873	0.0025
229	1.6897	0.0024
230	1.6922	0.0024
231	1.6946	0.0024
232	1.6970	0.0024
233	1.6994	0.0024
234	1.7018	0.0024
235	1.7042	0.0024
236	1.7066	0.0024
237	1.7090	0.0024
238	1.7114	0.0024
239	1.7138	0.0024
240	1.7162	0.0024
241	1.7185	0.0024
242	1.7209	0.0024
243	1.7232	0.0023
244	1.7256	0.0023
245	1.7279	0.0023
246	1.7302	0.0023
247	1.7325	0.0023
248	1.7349	0.0023
249	1.7372	0.0023
250	1.7395	0.0023
251	1.7418	0.0023
252	1.7441	0.0023
253	1.7464	0.0023
254	1.7486	0.0023
255	1.7509	0.0023
256	1.7532	0.0023
257	1.7554	0.0023
258	1.7577	0.0023
259	1.7599	0.0022
260	1.7622	0.0022
261	1.7644	0.0022
262	1.7667	0.0022

263	1.7689	0.0022
264	1.7711	0.0022
265	1.7733	0.0022
266	1.7755	0.0022
267	1.7777	0.0022
268	1.7799	0.0022
269	1.7821	0.0022
270	1.7843	0.0022
271	1.7865	0.0022
272	1.7887	0.0022
273	1.7908	0.0022
274	1.7930	0.0022
275	1.7952	0.0022
276	1.7973	0.0022
277	1.7995	0.0022
278	1.8016	0.0021
279	1.8038	0.0021
280	1.8059	0.0021
281	1.8080	0.0021
282	1.8102	0.0021
283	1.8123	0.0021
284	1.8144	0.0021
285	1.8165	0.0021
286	1.8186	0.0021
287	1.8207	0.0021
288	1.8228	0.0021

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0021	0.0003	0.0018
2	0.0021	0.0003	0.0018
3	0.0021	0.0003	0.0019
4	0.0021	0.0003	0.0019
5	0.0021	0.0003	0.0019
6	0.0021	0.0003	0.0019
7	0.0021	0.0003	0.0019
8	0.0021	0.0003	0.0019
9	0.0022	0.0003	0.0019
10	0.0022	0.0003	0.0019
11	0.0022	0.0003	0.0019
12	0.0022	0.0003	0.0019
13	0.0022	0.0003	0.0019
14	0.0022	0.0003	0.0019
15	0.0022	0.0003	0.0019
16	0.0022	0.0003	0.0019
17	0.0022	0.0003	0.0019
18	0.0022	0.0003	0.0020
19	0.0022	0.0003	0.0020
20	0.0022	0.0003	0.0020
21	0.0023	0.0003	0.0020
22	0.0023	0.0003	0.0020
23	0.0023	0.0003	0.0020
24	0.0023	0.0003	0.0020
25	0.0023	0.0003	0.0020
26	0.0023	0.0003	0.0020
27	0.0023	0.0003	0.0020
28	0.0023	0.0003	0.0020
29	0.0023	0.0003	0.0020
30	0.0023	0.0003	0.0020
31	0.0023	0.0003	0.0021
32	0.0024	0.0003	0.0021
33	0.0024	0.0003	0.0021
34	0.0024	0.0003	0.0021
35	0.0024	0.0003	0.0021
36	0.0024	0.0003	0.0021
37	0.0024	0.0003	0.0021
38	0.0024	0.0003	0.0021
39	0.0024	0.0003	0.0021
40	0.0024	0.0003	0.0021
41	0.0025	0.0003	0.0021
42	0.0025	0.0003	0.0022
43	0.0025	0.0003	0.0022
44	0.0025	0.0003	0.0022
45	0.0025	0.0003	0.0022
46	0.0025	0.0003	0.0022
47	0.0025	0.0003	0.0022

48	0.0025	0.0003	0.0022
49	0.0025	0.0003	0.0022
50	0.0025	0.0003	0.0022
51	0.0026	0.0003	0.0023
52	0.0026	0.0003	0.0023
53	0.0026	0.0003	0.0023
54	0.0026	0.0003	0.0023
55	0.0026	0.0003	0.0023
56	0.0026	0.0003	0.0023
57	0.0026	0.0003	0.0023
58	0.0026	0.0003	0.0023
59	0.0027	0.0003	0.0023
60	0.0027	0.0003	0.0023
61	0.0027	0.0003	0.0024
62	0.0027	0.0003	0.0024
63	0.0027	0.0003	0.0024
64	0.0027	0.0003	0.0024
65	0.0028	0.0003	0.0024
66	0.0028	0.0003	0.0024
67	0.0028	0.0003	0.0024
68	0.0028	0.0003	0.0024
69	0.0028	0.0003	0.0025
70	0.0028	0.0003	0.0025
71	0.0028	0.0003	0.0025
72	0.0029	0.0004	0.0025
73	0.0029	0.0004	0.0025
74	0.0029	0.0004	0.0025
75	0.0029	0.0004	0.0025
76	0.0029	0.0004	0.0026
77	0.0029	0.0004	0.0026
78	0.0029	0.0004	0.0026
79	0.0030	0.0004	0.0026
80	0.0030	0.0004	0.0026
81	0.0030	0.0004	0.0026
82	0.0030	0.0004	0.0026
83	0.0030	0.0004	0.0027
84	0.0031	0.0004	0.0027
85	0.0031	0.0004	0.0027
86	0.0031	0.0004	0.0027
87	0.0031	0.0004	0.0027
88	0.0031	0.0004	0.0027
89	0.0032	0.0004	0.0028
90	0.0032	0.0004	0.0028
91	0.0032	0.0004	0.0028
92	0.0032	0.0004	0.0028
93	0.0032	0.0004	0.0028
94	0.0033	0.0004	0.0029
95	0.0033	0.0004	0.0029
96	0.0033	0.0004	0.0029
97	0.0033	0.0004	0.0029
98	0.0034	0.0004	0.0029
99	0.0034	0.0004	0.0030
100	0.0034	0.0004	0.0030
101	0.0034	0.0004	0.0030
102	0.0034	0.0004	0.0030
103	0.0035	0.0004	0.0031
104	0.0035	0.0004	0.0031
105	0.0035	0.0004	0.0031
106	0.0036	0.0004	0.0031
107	0.0036	0.0004	0.0032
108	0.0036	0.0004	0.0032
109	0.0036	0.0004	0.0032
110	0.0037	0.0005	0.0032
111	0.0037	0.0005	0.0033
112	0.0037	0.0005	0.0033
113	0.0038	0.0005	0.0033
114	0.0038	0.0005	0.0033
115	0.0038	0.0005	0.0034
116	0.0039	0.0005	0.0034
117	0.0039	0.0005	0.0034
118	0.0039	0.0005	0.0034
119	0.0040	0.0005	0.0035
120	0.0040	0.0005	0.0035
121	0.0040	0.0005	0.0036
122	0.0041	0.0005	0.0036
123	0.0041	0.0005	0.0036
124	0.0042	0.0005	0.0036
125	0.0042	0.0005	0.0037

126	0.0042	0.0005	0.0037
127	0.0043	0.0005	0.0038
128	0.0043	0.0005	0.0038
129	0.0044	0.0005	0.0038
130	0.0044	0.0005	0.0039
131	0.0045	0.0005	0.0039
132	0.0045	0.0006	0.0040
133	0.0046	0.0006	0.0040
134	0.0046	0.0006	0.0040
135	0.0047	0.0006	0.0041
136	0.0047	0.0006	0.0041
137	0.0048	0.0006	0.0042
138	0.0048	0.0006	0.0042
139	0.0049	0.0006	0.0043
140	0.0050	0.0006	0.0043
141	0.0050	0.0006	0.0044
142	0.0051	0.0006	0.0045
143	0.0052	0.0006	0.0045
144	0.0052	0.0006	0.0046
145	0.0039	0.0005	0.0034
146	0.0039	0.0005	0.0034
147	0.0040	0.0005	0.0035
148	0.0040	0.0005	0.0035
149	0.0041	0.0005	0.0036
150	0.0042	0.0005	0.0037
151	0.0043	0.0005	0.0037
152	0.0043	0.0005	0.0038
153	0.0044	0.0005	0.0039
154	0.0045	0.0006	0.0039
155	0.0046	0.0006	0.0040
156	0.0047	0.0006	0.0041
157	0.0048	0.0006	0.0042
158	0.0049	0.0006	0.0043
159	0.0050	0.0006	0.0044
160	0.0051	0.0006	0.0045
161	0.0053	0.0006	0.0046
162	0.0054	0.0007	0.0047
163	0.0055	0.0007	0.0049
164	0.0056	0.0007	0.0049
165	0.0058	0.0007	0.0051
166	0.0059	0.0007	0.0052
167	0.0062	0.0008	0.0054
168	0.0063	0.0008	0.0055
169	0.0066	0.0008	0.0058
170	0.0067	0.0008	0.0059
171	0.0070	0.0009	0.0062
172	0.0072	0.0009	0.0063
173	0.0076	0.0009	0.0066
174	0.0078	0.0010	0.0068
175	0.0082	0.0010	0.0072
176	0.0085	0.0010	0.0074
177	0.0090	0.0011	0.0079
178	0.0093	0.0011	0.0082
179	0.0100	0.0012	0.0088
180	0.0104	0.0013	0.0091
181	0.0113	0.0014	0.0099
182	0.0118	0.0014	0.0103
183	0.0130	0.0016	0.0114
184	0.0137	0.0017	0.0120
185	0.0193	0.0024	0.0169
186	0.0206	0.0025	0.0181
187	0.0239	0.0029	0.0209
188	0.0261	0.0032	0.0229
189	0.0324	0.0033	0.0291
190	0.0373	0.0033	0.0340
191	0.0567	0.0033	0.0534
192	0.0822	0.0033	0.0789
193	0.3558	0.0033	0.3525
194	0.0446	0.0033	0.0413
195	0.0288	0.0033	0.0255
196	0.0221	0.0027	0.0194
197	0.0145	0.0018	0.0128
198	0.0123	0.0015	0.0108
199	0.0108	0.0013	0.0095
200	0.0096	0.0012	0.0084
201	0.0087	0.0011	0.0076
202	0.0080	0.0010	0.0070
203	0.0074	0.0009	0.0065

204	0.0069	0.0008	0.0060
205	0.0064	0.0008	0.0056
206	0.0061	0.0007	0.0053
207	0.0057	0.0007	0.0050
208	0.0054	0.0007	0.0048
209	0.0052	0.0006	0.0045
210	0.0050	0.0006	0.0043
211	0.0047	0.0006	0.0042
212	0.0046	0.0006	0.0040
213	0.0044	0.0005	0.0038
214	0.0042	0.0005	0.0037
215	0.0041	0.0005	0.0036
216	0.0039	0.0005	0.0035
217	0.0053	0.0006	0.0046
218	0.0051	0.0006	0.0045
219	0.0050	0.0006	0.0044
220	0.0049	0.0006	0.0043
221	0.0048	0.0006	0.0042
222	0.0046	0.0006	0.0041
223	0.0045	0.0006	0.0040
224	0.0044	0.0005	0.0039
225	0.0044	0.0005	0.0038
226	0.0043	0.0005	0.0037
227	0.0042	0.0005	0.0037
228	0.0041	0.0005	0.0036
229	0.0040	0.0005	0.0035
230	0.0039	0.0005	0.0035
231	0.0039	0.0005	0.0034
232	0.0038	0.0005	0.0033
233	0.0037	0.0005	0.0033
234	0.0037	0.0005	0.0032
235	0.0036	0.0004	0.0032
236	0.0036	0.0004	0.0031
237	0.0035	0.0004	0.0031
238	0.0035	0.0004	0.0030
239	0.0034	0.0004	0.0030
240	0.0034	0.0004	0.0030
241	0.0033	0.0004	0.0029
242	0.0033	0.0004	0.0029
243	0.0032	0.0004	0.0028
244	0.0032	0.0004	0.0028
245	0.0031	0.0004	0.0028
246	0.0031	0.0004	0.0027
247	0.0031	0.0004	0.0027
248	0.0030	0.0004	0.0027
249	0.0030	0.0004	0.0026
250	0.0030	0.0004	0.0026
251	0.0029	0.0004	0.0026
252	0.0029	0.0004	0.0025
253	0.0029	0.0004	0.0025
254	0.0028	0.0003	0.0025
255	0.0028	0.0003	0.0025
256	0.0028	0.0003	0.0024
257	0.0027	0.0003	0.0024
258	0.0027	0.0003	0.0024
259	0.0027	0.0003	0.0024
260	0.0027	0.0003	0.0023
261	0.0026	0.0003	0.0023
262	0.0026	0.0003	0.0023
263	0.0026	0.0003	0.0023
264	0.0026	0.0003	0.0022
265	0.0025	0.0003	0.0022
266	0.0025	0.0003	0.0022
267	0.0025	0.0003	0.0022
268	0.0025	0.0003	0.0022
269	0.0024	0.0003	0.0021
270	0.0024	0.0003	0.0021
271	0.0024	0.0003	0.0021
272	0.0024	0.0003	0.0021
273	0.0024	0.0003	0.0021
274	0.0023	0.0003	0.0021
275	0.0023	0.0003	0.0020
276	0.0023	0.0003	0.0020
277	0.0023	0.0003	0.0020
278	0.0023	0.0003	0.0020
279	0.0022	0.0003	0.0020
280	0.0022	0.0003	0.0020
281	0.0022	0.0003	0.0019

```
     282             0.0022          0.0003              0.0019
     283             0.0022          0.0003              0.0019
     284             0.0022          0.0003              0.0019
     285             0.0022          0.0003              0.0019
     286             0.0021          0.0003              0.0019
     287             0.0021          0.0003              0.0019
     288             0.0021          0.0003              0.0018
     --------------------------------------------------------------------
     --------------------------------------------------------------------
     Total soil rain loss =      0.17(In)
     Total effective rainfall =      1.65(In)
     Peak flow rate in flood hydrograph =     11.49(CFS)
     ---------------------------------------------------------------------
     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R    S T O R M
                    R u n o f f      H y d r o g r a p h
     --------------------------------------------------------------------
                 Hydrograph in   5   Minute intervals ((CFS))

     --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        5.0      10.0      15.0      20.0
-----------------------------------------------------------------------
  0+ 5       0.0001      0.01  Q         |         |         |         |
  0+10       0.0004      0.06  Q         |         |         |         |
  0+15       0.0010      0.09  Q         |         |         |         |
  0+20       0.0017      0.10  Q         |         |         |         |
  0+25       0.0025      0.11  Q         |         |         |         |
  0+30       0.0033      0.11  Q         |         |         |         |
  0+35       0.0041      0.12  Q         |         |         |         |
  0+40       0.0049      0.12  Q         |         |         |         |
  0+45       0.0057      0.12  Q         |         |         |         |
  0+50       0.0066      0.12  Q         |         |         |         |
  0+55       0.0075      0.12  Q         |         |         |         |
  1+ 0       0.0083      0.13  Q         |         |         |         |
  1+ 5       0.0092      0.13  Q         |         |         |         |
  1+10       0.0101      0.13  Q         |         |         |         |
  1+15       0.0109      0.13  Q         |         |         |         |
  1+20       0.0118      0.13  Q         |         |         |         |
  1+25       0.0127      0.13  Q         |         |         |         |
  1+30       0.0136      0.13  Q         |         |         |         |
  1+35       0.0145      0.13  Q         |         |         |         |
  1+40       0.0154      0.13  Q         |         |         |         |
  1+45       0.0163      0.13  Q         |         |         |         |
  1+50       0.0172      0.13  Q         |         |         |         |
  1+55       0.0181      0.13  Q         |         |         |         |
  2+ 0       0.0190      0.13  QV        |         |         |         |
  2+ 5       0.0199      0.13  QV        |         |         |         |
  2+10       0.0208      0.13  QV        |         |         |         |
  2+15       0.0217      0.13  QV        |         |         |         |
  2+20       0.0227      0.13  QV        |         |         |         |
  2+25       0.0236      0.13  QV        |         |         |         |
  2+30       0.0245      0.14  QV        |         |         |         |
  2+35       0.0255      0.14  QV        |         |         |         |
  2+40       0.0264      0.14  QV        |         |         |         |
  2+45       0.0273      0.14  QV        |         |         |         |
  2+50       0.0283      0.14  QV        |         |         |         |
  2+55       0.0292      0.14  QV        |         |         |         |
  3+ 0       0.0302      0.14  QV        |         |         |         |
  3+ 5       0.0311      0.14  QV        |         |         |         |
  3+10       0.0321      0.14  QV        |         |         |         |
  3+15       0.0331      0.14  QV        |         |         |         |
  3+20       0.0340      0.14  QV        |         |         |         |
  3+25       0.0350      0.14  QV        |         |         |         |
  3+30       0.0360      0.14  QV        |         |         |         |
  3+35       0.0370      0.14  QV        |         |         |         |
  3+40       0.0380      0.14  Q V       |         |         |         |
  3+45       0.0390      0.14  Q V       |         |         |         |
  3+50       0.0400      0.14  Q V       |         |         |         |
  3+55       0.0410      0.15  Q V       |         |         |         |
  4+ 0       0.0420      0.15  Q V       |         |         |         |
  4+ 5       0.0430      0.15  Q V       |         |         |         |
  4+10       0.0440      0.15  Q V       |         |         |         |
  4+15       0.0450      0.15  Q V       |         |         |         |
  4+20       0.0460      0.15  Q V       |         |         |         |
  4+25       0.0471      0.15  Q V       |         |         |         |
  4+30       0.0481      0.15  Q V       |         |         |         |
  4+35       0.0491      0.15  Q V       |         |         |         |
  4+40       0.0502      0.15  Q V       |         |         |         |
```

```
  4+45      0.0512      0.15  Q V       |         |         |         |
  4+50      0.0523      0.15  Q V       |         |         |         |
  4+55      0.0533      0.15  Q V       |         |         |         |
  5+ 0      0.0544      0.15  Q V       |         |         |         |
  5+ 5      0.0555      0.16  Q V       |         |         |         |
  5+10      0.0565      0.16  Q V       |         |         |         |
  5+15      0.0576      0.16  Q  V      |         |         |         |
  5+20      0.0587      0.16  Q  V      |         |         |         |
  5+25      0.0598      0.16  Q  V      |         |         |         |
  5+30      0.0609      0.16  Q  V      |         |         |         |
  5+35      0.0620      0.16  Q  V      |         |         |         |
  5+40      0.0631      0.16  Q  V      |         |         |         |
  5+45      0.0642      0.16  Q  V      |         |         |         |
  5+50      0.0653      0.16  Q  V      |         |         |         |
  5+55      0.0665      0.16  Q  V      |         |         |         |
  6+ 0      0.0676      0.16  Q  V      |         |         |         |
  6+ 5      0.0687      0.17  Q  V      |         |         |         |
  6+10      0.0699      0.17  Q  V      |         |         |         |
  6+15      0.0710      0.17  Q  V      |         |         |         |
  6+20      0.0722      0.17  Q  V      |         |         |         |
  6+25      0.0734      0.17  Q  V      |         |         |         |
  6+30      0.0745      0.17  Q  V      |         |         |         |
  6+35      0.0757      0.17  Q  V      |         |         |         |
  6+40      0.0769      0.17  Q   V     |         |         |         |
  6+45      0.0781      0.17  Q   V     |         |         |         |
  6+50      0.0793      0.17  Q   V     |         |         |         |
  6+55      0.0805      0.18  Q   V     |         |         |         |
  7+ 0      0.0817      0.18  Q   V     |         |         |         |
  7+ 5      0.0829      0.18  Q   V     |         |         |         |
  7+10      0.0841      0.18  Q   V     |         |         |         |
  7+15      0.0854      0.18  Q   V     |         |         |         |
  7+20      0.0866      0.18  Q   V     |         |         |         |
  7+25      0.0879      0.18  Q   V     |         |         |         |
  7+30      0.0891      0.18  Q   V     |         |         |         |
  7+35      0.0904      0.18  Q   V     |         |         |         |
  7+40      0.0917      0.19  Q   V     |         |         |         |
  7+45      0.0930      0.19  Q   V     |         |         |         |
  7+50      0.0943      0.19  Q   V     |         |         |         |
  7+55      0.0956      0.19  Q    V    |         |         |         |
  8+ 0      0.0969      0.19  Q    V    |         |         |         |
  8+ 5      0.0982      0.19  Q    V    |         |         |         |
  8+10      0.0995      0.19  Q    V    |         |         |         |
  8+15      0.1008      0.19  Q    V    |         |         |         |
  8+20      0.1022      0.20  Q    V    |         |         |         |
  8+25      0.1035      0.20  Q    V    |         |         |         |
  8+30      0.1049      0.20  Q    V    |         |         |         |
  8+35      0.1063      0.20  Q    V    |         |         |         |
  8+40      0.1077      0.20  Q    V    |         |         |         |
  8+45      0.1091      0.20  Q    V    |         |         |         |
  8+50      0.1105      0.20  Q    V    |         |         |         |
  8+55      0.1119      0.21  Q    V    |         |         |         |
  9+ 0      0.1133      0.21  Q    V    |         |         |         |
  9+ 5      0.1148      0.21  Q     V   |         |         |         |
  9+10      0.1162      0.21  Q     V   |         |         |         |
  9+15      0.1177      0.21  Q     V   |         |         |         |
  9+20      0.1191      0.21  Q     V   |         |         |         |
  9+25      0.1206      0.22  Q     V   |         |         |         |
  9+30      0.1221      0.22  Q     V   |         |         |         |
  9+35      0.1236      0.22  Q     V   |         |         |         |
  9+40      0.1252      0.22  Q     V   |         |         |         |
  9+45      0.1267      0.22  Q     V   |         |         |         |
  9+50      0.1282      0.23  Q     V   |         |         |         |
  9+55      0.1298      0.23  Q     V   |         |         |         |
 10+ 0      0.1314      0.23  Q     V   |         |         |         |
 10+ 5      0.1330      0.23  Q      V  |         |         |         |
 10+10      0.1346      0.23  Q      V  |         |         |         |
 10+15      0.1362      0.24  Q      V  |         |         |         |
 10+20      0.1378      0.24  Q      V  |         |         |         |
 10+25      0.1395      0.24  Q      V  |         |         |         |
 10+30      0.1412      0.24  Q      V  |         |         |         |
 10+35      0.1428      0.24  Q      V  |         |         |         |
 10+40      0.1445      0.25  Q      V  |         |         |         |
 10+45      0.1463      0.25  Q      V  |         |         |         |
 10+50      0.1480      0.25  Q      V  |         |         |         |
 10+55      0.1497      0.25  Q      V  |         |         |         |
 11+ 0      0.1515      0.26  Q      V  |         |         |         |
 11+ 5      0.1533      0.26  Q       V |         |         |         |
 11+10      0.1551      0.26  Q       V |         |         |         |
```

```
11+15       0.1570      0.27  Q       V |         |         |         |
11+20       0.1588      0.27  Q       V |         |         |         |
11+25       0.1607      0.27  Q       V |         |         |         |
11+30       0.1626      0.28  Q       V |         |         |         |
11+35       0.1645      0.28  Q       V |         |         |         |
11+40       0.1664      0.28  Q       V |         |         |         |
11+45       0.1684      0.29  Q       V |         |         |         |
11+50       0.1704      0.29  Q       V |         |         |         |
11+55       0.1724      0.29  Q        V|         |         |         |
12+ 0       0.1744      0.30  Q        V|         |         |         |
12+ 5       0.1765      0.29  Q        V|         |         |         |
12+10       0.1783      0.27  Q        V|         |         |         |
12+15       0.1800      0.25  Q        V|         |         |         |
12+20       0.1817      0.24  Q        V|         |         |         |
12+25       0.1833      0.24  Q        V|         |         |         |
12+30       0.1850      0.24  Q        V|         |         |         |
12+35       0.1867      0.24  Q        V|         |         |         |
12+40       0.1884      0.25  Q        V|         |         |         |
12+45       0.1901      0.25  Q         V         |         |         |
12+50       0.1918      0.25  Q         V         |         |         |
12+55       0.1936      0.26  Q         V         |         |         |
13+ 0       0.1954      0.26  Q         V         |         |         |
13+ 5       0.1973      0.27  Q         V         |         |         |
13+10       0.1991      0.27  Q         V         |         |         |
13+15       0.2011      0.28  Q         V         |         |         |
13+20       0.2030      0.28  Q         V         |         |         |
13+25       0.2050      0.29  Q         V         |         |         |
13+30       0.2071      0.30  Q         V         |         |         |
13+35       0.2092      0.30  Q         |V        |         |         |
13+40       0.2113      0.31  Q         |V        |         |         |
13+45       0.2135      0.32  Q         |V        |         |         |
13+50       0.2158      0.33  Q         |V        |         |         |
13+55       0.2181      0.34  Q         |V        |         |         |
14+ 0       0.2205      0.35  Q         |V        |         |         |
14+ 5       0.2230      0.36  Q         |V        |         |         |
14+10       0.2255      0.37  Q         |V        |         |         |
14+15       0.2281      0.38  Q         | V       |         |         |
14+20       0.2308      0.39  Q         | V       |         |         |
14+25       0.2336      0.41  Q         | V       |         |         |
14+30       0.2365      0.42  Q         | V       |         |         |
14+35       0.2395      0.44  Q         | V       |         |         |
14+40       0.2427      0.45  Q         | V       |         |         |
14+45       0.2459      0.47  Q         | V       |         |         |
14+50       0.2493      0.50  Q         |  V      |         |         |
14+55       0.2529      0.52  |Q        |  V      |         |         |
15+ 0       0.2567      0.55  |Q        |  V      |         |         |
15+ 5       0.2606      0.57  |Q        |  V      |         |         |
15+10       0.2648      0.61  |Q        |  V      |         |         |
15+15       0.2693      0.65  |Q        |   V     |         |         |
15+20       0.2741      0.70  |Q        |   V     |         |         |
15+25       0.2793      0.76  |Q        |   V     |         |         |
15+30       0.2856      0.92  |Q        |    V    |         |         |
15+35       0.2929      1.06  | Q       |    V    |         |         |
15+40       0.3012      1.20  | Q       |    V    |         |         |
15+45       0.3106      1.36  | Q       |     V   |         |         |
15+50       0.3217      1.62  |  Q      |     V   |         |         |
15+55       0.3354      1.98  |  Q      |      V  |         |         |
16+ 0       0.3543      2.75  |    Q    |       V |         |         |
16+ 5       0.3890      5.03  |         Q         V         |         |
16+10       0.4681     11.49  |         |         | Q V     |         |
16+15       0.5232      7.99  |         |    Q    |      V  |         |
16+20       0.5545      4.55  |        Q|         |        V|         |
16+25       0.5762      3.15  |     Q   |         |         V         |
16+30       0.5917      2.25  |   Q     |         |         |V        |
16+35       0.6036      1.72  |  Q      |         |         |V        |
16+40       0.6128      1.34  | Q       |         |         | V       |
16+45       0.6201      1.06  | Q       |         |         | V       |
16+50       0.6260      0.86  |Q        |         |         |  V      |
16+55       0.6313      0.77  |Q        |         |         |  V      |
17+ 0       0.6360      0.68  |Q        |         |         |  V      |
17+ 5       0.6393      0.48  Q         |         |         |  V      |
17+10       0.6423      0.43  Q         |         |         |  V      |
17+15       0.6450      0.40  Q         |         |         |   V     |
17+20       0.6475      0.37  Q         |         |         |   V     |
17+25       0.6499      0.35  Q         |         |         |   V     |
17+30       0.6522      0.33  Q         |         |         |   V     |
17+35       0.6543      0.31  Q         |         |         |   V     |
17+40       0.6564      0.30  Q         |         |         |   V     |
```

```
17+45       0.6583      0.28  Q         |         |         |   V     |
17+50       0.6602      0.27  Q         |         |         |   V     |
17+55       0.6620      0.26  Q         |         |         |   V     |
18+ 0       0.6637      0.25  Q         |         |         |    V    |
18+ 5       0.6654      0.25  Q         |         |         |    V    |
18+10       0.6673      0.27  Q         |         |         |    V    |
18+15       0.6693      0.29  Q         |         |         |    V    |
18+20       0.6712      0.29  Q         |         |         |    V    |
18+25       0.6732      0.28  Q         |         |         |    V    |
18+30       0.6751      0.28  Q         |         |         |    V    |
18+35       0.6770      0.28  Q         |         |         |    V    |
18+40       0.6789      0.27  Q         |         |         |    V    |
18+45       0.6807      0.27  Q         |         |         |    V    |
18+50       0.6825      0.26  Q         |         |         |     V   |
18+55       0.6842      0.26  Q         |         |         |     V   |
19+ 0       0.6860      0.25  Q         |         |         |     V   |
19+ 5       0.6877      0.25  Q         |         |         |     V   |
19+10       0.6893      0.24  Q         |         |         |     V   |
19+15       0.6910      0.24  Q         |         |         |     V   |
19+20       0.6926      0.23  Q         |         |         |     V   |
19+25       0.6941      0.23  Q         |         |         |     V   |
19+30       0.6957      0.22  Q         |         |         |     V   |
19+35       0.6972      0.22  Q         |         |         |     V   |
19+40       0.6987      0.22  Q         |         |         |     V   |
19+45       0.7001      0.21  Q         |         |         |     V   |
19+50       0.7016      0.21  Q         |         |         |      V  |
19+55       0.7030      0.21  Q         |         |         |      V  |
20+ 0       0.7044      0.20  Q         |         |         |      V  |
20+ 5       0.7058      0.20  Q         |         |         |      V  |
20+10       0.7071      0.20  Q         |         |         |      V  |
20+15       0.7085      0.19  Q         |         |         |      V  |
20+20       0.7098      0.19  Q         |         |         |      V  |
20+25       0.7111      0.19  Q         |         |         |      V  |
20+30       0.7124      0.19  Q         |         |         |      V  |
20+35       0.7137      0.18  Q         |         |         |      V  |
20+40       0.7149      0.18  Q         |         |         |      V  |
20+45       0.7162      0.18  Q         |         |         |      V  |
20+50       0.7174      0.18  Q         |         |         |      V  |
20+55       0.7186      0.18  Q         |         |         |      V  |
21+ 0       0.7198      0.17  Q         |         |         |      V  |
21+ 5       0.7210      0.17  Q         |         |         |       V |
21+10       0.7221      0.17  Q         |         |         |       V |
21+15       0.7233      0.17  Q         |         |         |       V |
21+20       0.7244      0.17  Q         |         |         |       V |
21+25       0.7256      0.16  Q         |         |         |       V |
21+30       0.7267      0.16  Q         |         |         |       V |
21+35       0.7278      0.16  Q         |         |         |       V |
21+40       0.7289      0.16  Q         |         |         |       V |
21+45       0.7300      0.16  Q         |         |         |       V |
21+50       0.7310      0.16  Q         |         |         |       V |
21+55       0.7321      0.15  Q         |         |         |       V |
22+ 0       0.7331      0.15  Q         |         |         |       V |
22+ 5       0.7342      0.15  Q         |         |         |       V |
22+10       0.7352      0.15  Q         |         |         |       V |
22+15       0.7362      0.15  Q         |         |         |       V |
22+20       0.7372      0.15  Q         |         |         |       V |
22+25       0.7382      0.15  Q         |         |         |       V |
22+30       0.7392      0.14  Q         |         |         |        V|
22+35       0.7402      0.14  Q         |         |         |        V|
22+40       0.7412      0.14  Q         |         |         |        V|
22+45       0.7422      0.14  Q         |         |         |        V|
22+50       0.7431      0.14  Q         |         |         |        V|
22+55       0.7441      0.14  Q         |         |         |        V|
23+ 0       0.7450      0.14  Q         |         |         |        V|
23+ 5       0.7460      0.14  Q         |         |         |        V|
23+10       0.7469      0.13  Q         |         |         |        V|
23+15       0.7478      0.13  Q         |         |         |        V|
23+20       0.7487      0.13  Q         |         |         |        V|
23+25       0.7496      0.13  Q         |         |         |        V|
23+30       0.7505      0.13  Q         |         |         |        V|
23+35       0.7514      0.13  Q         |         |         |        V|
23+40       0.7523      0.13  Q         |         |         |        V|
23+45       0.7532      0.13  Q         |         |         |        V|
23+50       0.7541      0.13  Q         |         |         |        V|
23+55       0.7549      0.13  Q         |         |         |        V|
24+ 0       0.7558      0.12  Q         |         |         |        V|
24+ 5       0.7566      0.12  Q         |         |         |        V|
24+10       0.7570      0.07  Q         |         |         |        V|
```

```
  24+15       0.7573      0.04  Q         |         |         |        V|
  24+20       0.7574      0.02  Q         |         |         |        V|
  24+25       0.7575      0.01  Q         |         |         |        V|
  24+30       0.7576      0.01  Q         |         |         |        V|
  24+35       0.7577      0.01  Q         |         |         |        V|
  24+40       0.7577      0.00  Q         |         |         |        V|
  24+45       0.7577      0.00  Q         |         |         |        V|
  24+50       0.7577      0.00  Q         |         |         |        V|
  24+55       0.7577      0.00  Q         |         |         |        V|
-----------------------------------------------------------------------
```

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  06/17/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6150

---------------------------------------------------------------------
LAKE VIEW APARTMENTS
10 YEAR 24 HOUR EVENT
PROPOSED CONDITION - DRAINING TO THE EAST

--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)           (hours)         (In)
Rainfall data for year 10
             4.90           1           0.75
--------------------------------------------------------------------
Rainfall data for year 2
             4.90           6           0.70
--------------------------------------------------------------------
Rainfall data for year 2
             4.90          24           1.00
--------------------------------------------------------------------
Rainfall data for year 100
             4.90           1           1.15
--------------------------------------------------------------------
Rainfall data for year 100
             4.90           6           1.80
--------------------------------------------------------------------
Rainfall data for year 100
             4.90          24           3.00
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 69.0      86.2          4.90      1.000     0.262    0.300    0.078

Area-averaged adjusted loss rate Fm (In/Hr) =  0.078

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     1.47   0.300         69.0      86.2       1.60     0.399
     3.43   0.700         98.0      98.0       0.20     0.877

Area-averaged catchment yield fraction, Y =  0.734
Area-averaged low loss fraction, Yb =  0.266
```

```
User entry of time of concentration  =   0.110 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =       4.90(Ac.)
Catchment Lag time =   0.088 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 94.6970
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.078(In/Hr)
Average low loss rate fraction (Yb) = 0.266 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.356(In)
Computed peak 30-minute rainfall =  0.609(In)
Specified peak 1-hour rainfall =  0.750(In)
Computed peak 3-hour rainfall =  0.976(In)
Specified peak 6-hour rainfall =  1.153(In)
Specified peak 24-hour rainfall =  1.823(In)


Rainfall depth area reduction factors:
Using a total area of       4.90(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.356(In)
30-minute factor = 1.000    Adjusted rainfall =  0.609(In)
1-hour factor = 1.000       Adjusted rainfall =  0.750(In)
3-hour factor = 1.000       Adjusted rainfall =  0.976(In)
6-hour factor = 1.000       Adjusted rainfall =  1.153(In)
24-hour factor = 1.000      Adjusted rainfall =  1.823(In)
---------------------------------------------------------------------

                        U n i t   H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph         Unit Hydrograph
Number            Mean values            ((CFS))
---------------------------------------------------------------------
                (K =        59.26 (CFS))

  1              15.498                 9.184
  2              64.965                29.314
  3              82.606                10.453
  4              90.463                 4.656
  5              94.742                 2.535
  6              97.231                 1.475
  7              98.497                 0.750
  8              99.522                 0.607
  9             100.000                 0.283
---------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number              (In)                (In)
  1             0.3558              0.3558
  2             0.4380              0.0822
  3             0.4947              0.0567
  4             0.5393              0.0446
  5             0.5766              0.0373
  6             0.6090              0.0324
  7             0.6379              0.0288
  8             0.6639              0.0261
  9             0.6878              0.0239
 10             0.7099              0.0221
 11             0.7305              0.0206
 12             0.7498              0.0193
 13             0.7644              0.0145
 14             0.7781              0.0137
 15             0.7911              0.0130
 16             0.8034              0.0123
 17             0.8152              0.0118
 18             0.8265              0.0113
 19             0.8372              0.0108
 20             0.8476              0.0104
 21             0.8576              0.0100
 22             0.8672              0.0096
 23             0.8765              0.0093
 24             0.8855              0.0090
 25             0.8942              0.0087
 26             0.9027              0.0085
 27             0.9109              0.0082
 28             0.9189              0.0080
 29             0.9267              0.0078
 30             0.9342              0.0076
```

31	0.9416	0.0074
32	0.9488	0.0072
33	0.9559	0.0070
34	0.9627	0.0069
35	0.9694	0.0067
36	0.9760	0.0066
37	0.9825	0.0064
38	0.9888	0.0063
39	0.9949	0.0062
40	1.0010	0.0061
41	1.0069	0.0059
42	1.0128	0.0058
43	1.0185	0.0057
44	1.0241	0.0056
45	1.0297	0.0055
46	1.0351	0.0054
47	1.0405	0.0054
48	1.0457	0.0053
49	1.0509	0.0052
50	1.0560	0.0051
51	1.0611	0.0050
52	1.0660	0.0050
53	1.0709	0.0049
54	1.0757	0.0048
55	1.0804	0.0047
56	1.0851	0.0047
57	1.0897	0.0046
58	1.0943	0.0046
59	1.0988	0.0045
60	1.1032	0.0044
61	1.1076	0.0044
62	1.1119	0.0043
63	1.1162	0.0043
64	1.1204	0.0042
65	1.1246	0.0042
66	1.1287	0.0041
67	1.1328	0.0041
68	1.1368	0.0040
69	1.1408	0.0040
70	1.1448	0.0039
71	1.1487	0.0039
72	1.1525	0.0039
73	1.1578	0.0053
74	1.1630	0.0052
75	1.1682	0.0052
76	1.1733	0.0051
77	1.1784	0.0051
78	1.1834	0.0050
79	1.1884	0.0050
80	1.1934	0.0050
81	1.1983	0.0049
82	1.2032	0.0049
83	1.2080	0.0048
84	1.2128	0.0048
85	1.2176	0.0048
86	1.2223	0.0047
87	1.2270	0.0047
88	1.2316	0.0046
89	1.2362	0.0046
90	1.2408	0.0046
91	1.2453	0.0045
92	1.2498	0.0045
93	1.2543	0.0045
94	1.2588	0.0044
95	1.2632	0.0044
96	1.2676	0.0044
97	1.2719	0.0044
98	1.2762	0.0043
99	1.2805	0.0043
100	1.2848	0.0043
101	1.2890	0.0042
102	1.2932	0.0042
103	1.2974	0.0042
104	1.3016	0.0042
105	1.3057	0.0041
106	1.3098	0.0041
107	1.3139	0.0041
108	1.3179	0.0040

109	1.3219	0.0040
110	1.3259	0.0040
111	1.3299	0.0040
112	1.3338	0.0039
113	1.3378	0.0039
114	1.3417	0.0039
115	1.3456	0.0039
116	1.3494	0.0039
117	1.3532	0.0038
118	1.3571	0.0038
119	1.3609	0.0038
120	1.3646	0.0038
121	1.3684	0.0037
122	1.3721	0.0037
123	1.3758	0.0037
124	1.3795	0.0037
125	1.3832	0.0037
126	1.3868	0.0036
127	1.3904	0.0036
128	1.3941	0.0036
129	1.3977	0.0036
130	1.4012	0.0036
131	1.4048	0.0036
132	1.4083	0.0035
133	1.4118	0.0035
134	1.4153	0.0035
135	1.4188	0.0035
136	1.4223	0.0035
137	1.4257	0.0034
138	1.4292	0.0034
139	1.4326	0.0034
140	1.4360	0.0034
141	1.4394	0.0034
142	1.4427	0.0034
143	1.4461	0.0034
144	1.4494	0.0033
145	1.4527	0.0033
146	1.4561	0.0033
147	1.4593	0.0033
148	1.4626	0.0033
149	1.4659	0.0033
150	1.4691	0.0032
151	1.4724	0.0032
152	1.4756	0.0032
153	1.4788	0.0032
154	1.4820	0.0032
155	1.4851	0.0032
156	1.4883	0.0032
157	1.4915	0.0031
158	1.4946	0.0031
159	1.4977	0.0031
160	1.5008	0.0031
161	1.5039	0.0031
162	1.5070	0.0031
163	1.5101	0.0031
164	1.5131	0.0031
165	1.5162	0.0030
166	1.5192	0.0030
167	1.5222	0.0030
168	1.5252	0.0030
169	1.5282	0.0030
170	1.5312	0.0030
171	1.5342	0.0030
172	1.5371	0.0030
173	1.5401	0.0029
174	1.5430	0.0029
175	1.5460	0.0029
176	1.5489	0.0029
177	1.5518	0.0029
178	1.5547	0.0029
179	1.5576	0.0029
180	1.5604	0.0029
181	1.5633	0.0029
182	1.5661	0.0029
183	1.5690	0.0028
184	1.5718	0.0028
185	1.5746	0.0028
186	1.5774	0.0028

187	1.5802	0.0028
188	1.5830	0.0028
189	1.5858	0.0028
190	1.5886	0.0028
191	1.5913	0.0028
192	1.5941	0.0028
193	1.5968	0.0027
194	1.5996	0.0027
195	1.6023	0.0027
196	1.6050	0.0027
197	1.6077	0.0027
198	1.6104	0.0027
199	1.6131	0.0027
200	1.6157	0.0027
201	1.6184	0.0027
202	1.6211	0.0027
203	1.6237	0.0026
204	1.6264	0.0026
205	1.6290	0.0026
206	1.6316	0.0026
207	1.6342	0.0026
208	1.6368	0.0026
209	1.6394	0.0026
210	1.6420	0.0026
211	1.6446	0.0026
212	1.6472	0.0026
213	1.6497	0.0026
214	1.6523	0.0026
215	1.6549	0.0025
216	1.6574	0.0025
217	1.6599	0.0025
218	1.6625	0.0025
219	1.6650	0.0025
220	1.6675	0.0025
221	1.6700	0.0025
222	1.6725	0.0025
223	1.6750	0.0025
224	1.6774	0.0025
225	1.6799	0.0025
226	1.6824	0.0025
227	1.6848	0.0025
228	1.6873	0.0025
229	1.6897	0.0024
230	1.6922	0.0024
231	1.6946	0.0024
232	1.6970	0.0024
233	1.6994	0.0024
234	1.7018	0.0024
235	1.7042	0.0024
236	1.7066	0.0024
237	1.7090	0.0024
238	1.7114	0.0024
239	1.7138	0.0024
240	1.7162	0.0024
241	1.7185	0.0024
242	1.7209	0.0024
243	1.7232	0.0023
244	1.7256	0.0023
245	1.7279	0.0023
246	1.7302	0.0023
247	1.7325	0.0023
248	1.7349	0.0023
249	1.7372	0.0023
250	1.7395	0.0023
251	1.7418	0.0023
252	1.7441	0.0023
253	1.7464	0.0023
254	1.7486	0.0023
255	1.7509	0.0023
256	1.7532	0.0023
257	1.7554	0.0023
258	1.7577	0.0023
259	1.7599	0.0022
260	1.7622	0.0022
261	1.7644	0.0022
262	1.7667	0.0022
263	1.7689	0.0022
264	1.7711	0.0022

265	1.7733	0.0022
266	1.7755	0.0022
267	1.7777	0.0022
268	1.7799	0.0022
269	1.7821	0.0022
270	1.7843	0.0022
271	1.7865	0.0022
272	1.7887	0.0022
273	1.7908	0.0022
274	1.7930	0.0022
275	1.7952	0.0022
276	1.7973	0.0022
277	1.7995	0.0022
278	1.8016	0.0021
279	1.8038	0.0021
280	1.8059	0.0021
281	1.8080	0.0021
282	1.8102	0.0021
283	1.8123	0.0021
284	1.8144	0.0021
285	1.8165	0.0021
286	1.8186	0.0021
287	1.8207	0.0021
288	1.8228	0.0021

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0021	0.0006	0.0015
2	0.0021	0.0006	0.0015
3	0.0021	0.0006	0.0015
4	0.0021	0.0006	0.0016
5	0.0021	0.0006	0.0016
6	0.0021	0.0006	0.0016
7	0.0021	0.0006	0.0016
8	0.0021	0.0006	0.0016
9	0.0022	0.0006	0.0016
10	0.0022	0.0006	0.0016
11	0.0022	0.0006	0.0016
12	0.0022	0.0006	0.0016
13	0.0022	0.0006	0.0016
14	0.0022	0.0006	0.0016
15	0.0022	0.0006	0.0016
16	0.0022	0.0006	0.0016
17	0.0022	0.0006	0.0016
18	0.0022	0.0006	0.0016
19	0.0022	0.0006	0.0016
20	0.0022	0.0006	0.0016
21	0.0023	0.0006	0.0017
22	0.0023	0.0006	0.0017
23	0.0023	0.0006	0.0017
24	0.0023	0.0006	0.0017
25	0.0023	0.0006	0.0017
26	0.0023	0.0006	0.0017
27	0.0023	0.0006	0.0017
28	0.0023	0.0006	0.0017
29	0.0023	0.0006	0.0017
30	0.0023	0.0006	0.0017
31	0.0023	0.0006	0.0017
32	0.0024	0.0006	0.0017
33	0.0024	0.0006	0.0017
34	0.0024	0.0006	0.0017
35	0.0024	0.0006	0.0018
36	0.0024	0.0006	0.0018
37	0.0024	0.0006	0.0018
38	0.0024	0.0006	0.0018
39	0.0024	0.0006	0.0018
40	0.0024	0.0006	0.0018
41	0.0025	0.0007	0.0018
42	0.0025	0.0007	0.0018
43	0.0025	0.0007	0.0018
44	0.0025	0.0007	0.0018
45	0.0025	0.0007	0.0018
46	0.0025	0.0007	0.0018
47	0.0025	0.0007	0.0018
48	0.0025	0.0007	0.0019
49	0.0025	0.0007	0.0019

50	0.0025	0.0007	0.0019
51	0.0026	0.0007	0.0019
52	0.0026	0.0007	0.0019
53	0.0026	0.0007	0.0019
54	0.0026	0.0007	0.0019
55	0.0026	0.0007	0.0019
56	0.0026	0.0007	0.0019
57	0.0026	0.0007	0.0019
58	0.0026	0.0007	0.0019
59	0.0027	0.0007	0.0020
60	0.0027	0.0007	0.0020
61	0.0027	0.0007	0.0020
62	0.0027	0.0007	0.0020
63	0.0027	0.0007	0.0020
64	0.0027	0.0007	0.0020
65	0.0028	0.0007	0.0020
66	0.0028	0.0007	0.0020
67	0.0028	0.0007	0.0020
68	0.0028	0.0007	0.0020
69	0.0028	0.0007	0.0021
70	0.0028	0.0008	0.0021
71	0.0028	0.0008	0.0021
72	0.0029	0.0008	0.0021
73	0.0029	0.0008	0.0021
74	0.0029	0.0008	0.0021
75	0.0029	0.0008	0.0021
76	0.0029	0.0008	0.0021
77	0.0029	0.0008	0.0022
78	0.0029	0.0008	0.0022
79	0.0030	0.0008	0.0022
80	0.0030	0.0008	0.0022
81	0.0030	0.0008	0.0022
82	0.0030	0.0008	0.0022
83	0.0030	0.0008	0.0022
84	0.0031	0.0008	0.0022
85	0.0031	0.0008	0.0023
86	0.0031	0.0008	0.0023
87	0.0031	0.0008	0.0023
88	0.0031	0.0008	0.0023
89	0.0032	0.0008	0.0023
90	0.0032	0.0008	0.0023
91	0.0032	0.0009	0.0024
92	0.0032	0.0009	0.0024
93	0.0032	0.0009	0.0024
94	0.0033	0.0009	0.0024
95	0.0033	0.0009	0.0024
96	0.0033	0.0009	0.0024
97	0.0033	0.0009	0.0024
98	0.0034	0.0009	0.0025
99	0.0034	0.0009	0.0025
100	0.0034	0.0009	0.0025
101	0.0034	0.0009	0.0025
102	0.0034	0.0009	0.0025
103	0.0035	0.0009	0.0026
104	0.0035	0.0009	0.0026
105	0.0035	0.0009	0.0026
106	0.0036	0.0009	0.0026
107	0.0036	0.0010	0.0026
108	0.0036	0.0010	0.0026
109	0.0036	0.0010	0.0027
110	0.0037	0.0010	0.0027
111	0.0037	0.0010	0.0027
112	0.0037	0.0010	0.0027
113	0.0038	0.0010	0.0028
114	0.0038	0.0010	0.0028
115	0.0038	0.0010	0.0028
116	0.0039	0.0010	0.0028
117	0.0039	0.0010	0.0029
118	0.0039	0.0010	0.0029
119	0.0040	0.0011	0.0029
120	0.0040	0.0011	0.0029
121	0.0040	0.0011	0.0030
122	0.0041	0.0011	0.0030
123	0.0041	0.0011	0.0030
124	0.0042	0.0011	0.0030
125	0.0042	0.0011	0.0031
126	0.0042	0.0011	0.0031
127	0.0043	0.0011	0.0031

128	0.0043	0.0012	0.0032
129	0.0044	0.0012	0.0032
130	0.0044	0.0012	0.0032
131	0.0045	0.0012	0.0033
132	0.0045	0.0012	0.0033
133	0.0046	0.0012	0.0034
134	0.0046	0.0012	0.0034
135	0.0047	0.0012	0.0034
136	0.0047	0.0013	0.0035
137	0.0048	0.0013	0.0035
138	0.0048	0.0013	0.0035
139	0.0049	0.0013	0.0036
140	0.0050	0.0013	0.0036
141	0.0050	0.0013	0.0037
142	0.0051	0.0014	0.0037
143	0.0052	0.0014	0.0038
144	0.0052	0.0014	0.0038
145	0.0039	0.0010	0.0028
146	0.0039	0.0010	0.0029
147	0.0040	0.0011	0.0029
148	0.0040	0.0011	0.0030
149	0.0041	0.0011	0.0030
150	0.0042	0.0011	0.0031
151	0.0043	0.0011	0.0031
152	0.0043	0.0012	0.0032
153	0.0044	0.0012	0.0033
154	0.0045	0.0012	0.0033
155	0.0046	0.0012	0.0034
156	0.0047	0.0012	0.0034
157	0.0048	0.0013	0.0035
158	0.0049	0.0013	0.0036
159	0.0050	0.0013	0.0037
160	0.0051	0.0014	0.0037
161	0.0053	0.0014	0.0039
162	0.0054	0.0014	0.0039
163	0.0055	0.0015	0.0041
164	0.0056	0.0015	0.0041
165	0.0058	0.0016	0.0043
166	0.0059	0.0016	0.0044
167	0.0062	0.0016	0.0045
168	0.0063	0.0017	0.0046
169	0.0066	0.0018	0.0048
170	0.0067	0.0018	0.0049
171	0.0070	0.0019	0.0052
172	0.0072	0.0019	0.0053
173	0.0076	0.0020	0.0056
174	0.0078	0.0021	0.0057
175	0.0082	0.0022	0.0060
176	0.0085	0.0023	0.0062
177	0.0090	0.0024	0.0066
178	0.0093	0.0025	0.0068
179	0.0100	0.0027	0.0073
180	0.0104	0.0028	0.0076
181	0.0113	0.0030	0.0083
182	0.0118	0.0031	0.0086
183	0.0130	0.0035	0.0095
184	0.0137	0.0037	0.0101
185	0.0193	0.0051	0.0142
186	0.0206	0.0055	0.0151
187	0.0239	0.0064	0.0175
188	0.0261	0.0065	0.0195
189	0.0324	0.0065	0.0259
190	0.0373	0.0065	0.0308
191	0.0567	0.0065	0.0501
192	0.0822	0.0065	0.0757
193	0.3558	0.0065	0.3493
194	0.0446	0.0065	0.0381
195	0.0288	0.0065	0.0223
196	0.0221	0.0059	0.0162
197	0.0145	0.0039	0.0107
198	0.0123	0.0033	0.0091
199	0.0108	0.0029	0.0079
200	0.0096	0.0026	0.0071
201	0.0087	0.0023	0.0064
202	0.0080	0.0021	0.0059
203	0.0074	0.0020	0.0054
204	0.0069	0.0018	0.0050
205	0.0064	0.0017	0.0047

206	0.0061	0.0016	0.0044
207	0.0057	0.0015	0.0042
208	0.0054	0.0014	0.0040
209	0.0052	0.0014	0.0038
210	0.0050	0.0013	0.0036
211	0.0047	0.0013	0.0035
212	0.0046	0.0012	0.0033
213	0.0044	0.0012	0.0032
214	0.0042	0.0011	0.0031
215	0.0041	0.0011	0.0030
216	0.0039	0.0010	0.0029
217	0.0053	0.0014	0.0039
218	0.0051	0.0014	0.0038
219	0.0050	0.0013	0.0037
220	0.0049	0.0013	0.0036
221	0.0048	0.0013	0.0035
222	0.0046	0.0012	0.0034
223	0.0045	0.0012	0.0033
224	0.0044	0.0012	0.0033
225	0.0044	0.0012	0.0032
226	0.0043	0.0011	0.0031
227	0.0042	0.0011	0.0031
228	0.0041	0.0011	0.0030
229	0.0040	0.0011	0.0030
230	0.0039	0.0011	0.0029
231	0.0039	0.0010	0.0028
232	0.0038	0.0010	0.0028
233	0.0037	0.0010	0.0028
234	0.0037	0.0010	0.0027
235	0.0036	0.0010	0.0027
236	0.0036	0.0010	0.0026
237	0.0035	0.0009	0.0026
238	0.0035	0.0009	0.0025
239	0.0034	0.0009	0.0025
240	0.0034	0.0009	0.0025
241	0.0033	0.0009	0.0024
242	0.0033	0.0009	0.0024
243	0.0032	0.0009	0.0024
244	0.0032	0.0008	0.0023
245	0.0031	0.0008	0.0023
246	0.0031	0.0008	0.0023
247	0.0031	0.0008	0.0023
248	0.0030	0.0008	0.0022
249	0.0030	0.0008	0.0022
250	0.0030	0.0008	0.0022
251	0.0029	0.0008	0.0021
252	0.0029	0.0008	0.0021
253	0.0029	0.0008	0.0021
254	0.0028	0.0008	0.0021
255	0.0028	0.0007	0.0021
256	0.0028	0.0007	0.0020
257	0.0027	0.0007	0.0020
258	0.0027	0.0007	0.0020
259	0.0027	0.0007	0.0020
260	0.0027	0.0007	0.0020
261	0.0026	0.0007	0.0019
262	0.0026	0.0007	0.0019
263	0.0026	0.0007	0.0019
264	0.0026	0.0007	0.0019
265	0.0025	0.0007	0.0019
266	0.0025	0.0007	0.0018
267	0.0025	0.0007	0.0018
268	0.0025	0.0007	0.0018
269	0.0024	0.0007	0.0018
270	0.0024	0.0006	0.0018
271	0.0024	0.0006	0.0018
272	0.0024	0.0006	0.0017
273	0.0024	0.0006	0.0017
274	0.0023	0.0006	0.0017
275	0.0023	0.0006	0.0017
276	0.0023	0.0006	0.0017
277	0.0023	0.0006	0.0017
278	0.0023	0.0006	0.0017
279	0.0022	0.0006	0.0017
280	0.0022	0.0006	0.0016
281	0.0022	0.0006	0.0016
282	0.0022	0.0006	0.0016
283	0.0022	0.0006	0.0016

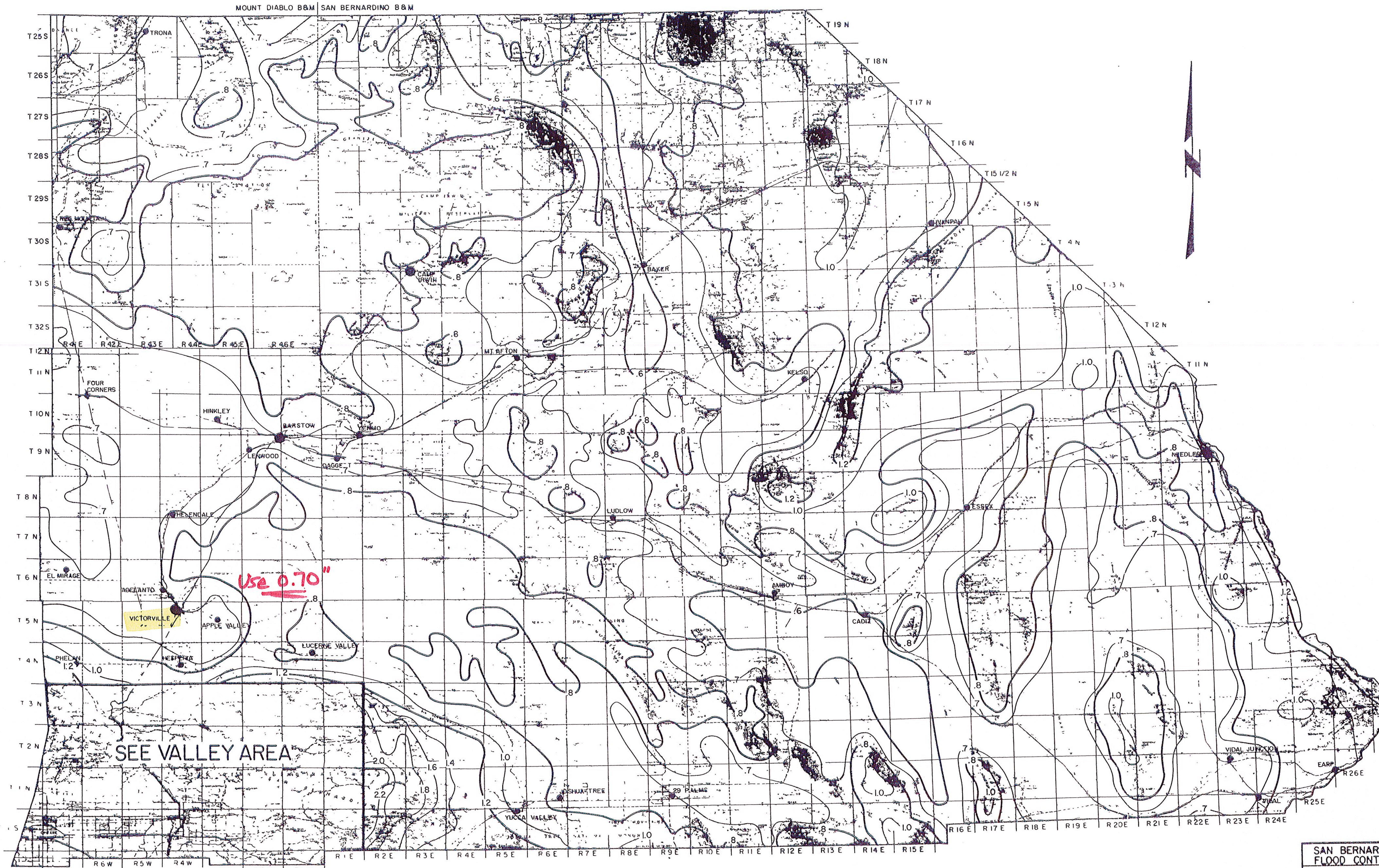
```
     284              0.0022           0.0006              0.0016
     285              0.0022           0.0006              0.0016
     286              0.0021           0.0006              0.0016
     287              0.0021           0.0006              0.0016
     288              0.0021           0.0006              0.0015
     ----------------------------------------------------------------
     ----------------------------------------------------------------
     Total soil rain loss =      0.36(In)
     Total effective rainfall =      1.46(In)
     Peak flow rate in flood hydrograph =     11.76(CFS)
     -----------------------------------------------------------------
     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        24 - H O U R   S T O R M
                   R u n o f f     H y d r o g r a p h
     ----------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

     ----------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        5.0      10.0      15.0      20.0
---------------------------------------------------------------------
  0+ 5       0.0001      0.01  Q         |         |         |         |
  0+10       0.0005      0.06  Q         |         |         |         |
  0+15       0.0010      0.08  Q         |         |         |         |
  0+20       0.0016      0.08  Q         |         |         |         |
  0+25       0.0022      0.09  Q         |         |         |         |
  0+30       0.0028      0.09  Q         |         |         |         |
  0+35       0.0034      0.09  Q         |         |         |         |
  0+40       0.0041      0.09  Q         |         |         |         |
  0+45       0.0047      0.09  Q         |         |         |         |
  0+50       0.0054      0.09  Q         |         |         |         |
  0+55       0.0060      0.09  Q         |         |         |         |
  1+ 0       0.0067      0.09  Q         |         |         |         |
  1+ 5       0.0073      0.09  Q         |         |         |         |
  1+10       0.0080      0.09  Q         |         |         |         |
  1+15       0.0086      0.10  Q         |         |         |         |
  1+20       0.0093      0.10  Q         |         |         |         |
  1+25       0.0099      0.10  Q         |         |         |         |
  1+30       0.0106      0.10  Q         |         |         |         |
  1+35       0.0113      0.10  Q         |         |         |         |
  1+40       0.0119      0.10  Q         |         |         |         |
  1+45       0.0126      0.10  Q         |         |         |         |
  1+50       0.0133      0.10  Q         |         |         |         |
  1+55       0.0140      0.10  Q         |         |         |         |
  2+ 0       0.0146      0.10  Q         |         |         |         |
  2+ 5       0.0153      0.10  QV        |         |         |         |
  2+10       0.0160      0.10  QV        |         |         |         |
  2+15       0.0167      0.10  QV        |         |         |         |
  2+20       0.0174      0.10  QV        |         |         |         |
  2+25       0.0181      0.10  QV        |         |         |         |
  2+30       0.0188      0.10  QV        |         |         |         |
  2+35       0.0195      0.10  QV        |         |         |         |
  2+40       0.0202      0.10  QV        |         |         |         |
  2+45       0.0209      0.10  QV        |         |         |         |
  2+50       0.0216      0.10  QV        |         |         |         |
  2+55       0.0223      0.10  QV        |         |         |         |
  3+ 0       0.0230      0.10  QV        |         |         |         |
  3+ 5       0.0237      0.10  QV        |         |         |         |
  3+10       0.0244      0.10  QV        |         |         |         |
  3+15       0.0252      0.10  QV        |         |         |         |
  3+20       0.0259      0.11  QV        |         |         |         |
  3+25       0.0266      0.11  QV        |         |         |         |
  3+30       0.0273      0.11  QV        |         |         |         |
  3+35       0.0281      0.11  QV        |         |         |         |
  3+40       0.0288      0.11  QV        |         |         |         |
  3+45       0.0296      0.11  QV        |         |         |         |
  3+50       0.0303      0.11  Q V       |         |         |         |
  3+55       0.0310      0.11  Q V       |         |         |         |
  4+ 0       0.0318      0.11  Q V       |         |         |         |
  4+ 5       0.0326      0.11  Q V       |         |         |         |
  4+10       0.0333      0.11  Q V       |         |         |         |
  4+15       0.0341      0.11  Q V       |         |         |         |
  4+20       0.0348      0.11  Q V       |         |         |         |
  4+25       0.0356      0.11  Q V       |         |         |         |
  4+30       0.0364      0.11  Q V       |         |         |         |
  4+35       0.0372      0.11  Q V       |         |         |         |
  4+40       0.0379      0.11  Q V       |         |         |         |
  4+45       0.0387      0.11  Q V       |         |         |         |
  4+50       0.0395      0.11  Q V       |         |         |         |
```

```
  4+55       0.0403      0.11  Q V       |         |         |         |
  5+ 0       0.0411      0.12  Q V       |         |         |         |
  5+ 5       0.0419      0.12  Q V       |         |         |         |
  5+10       0.0427      0.12  Q V       |         |         |         |
  5+15       0.0435      0.12  Q V       |         |         |         |
  5+20       0.0443      0.12  Q V       |         |         |         |
  5+25       0.0451      0.12  Q  V      |         |         |         |
  5+30       0.0460      0.12  Q  V      |         |         |         |
  5+35       0.0468      0.12  Q  V      |         |         |         |
  5+40       0.0476      0.12  Q  V      |         |         |         |
  5+45       0.0484      0.12  Q  V      |         |         |         |
  5+50       0.0493      0.12  Q  V      |         |         |         |
  5+55       0.0501      0.12  Q  V      |         |         |         |
  6+ 0       0.0510      0.12  Q  V      |         |         |         |
  6+ 5       0.0518      0.12  Q  V      |         |         |         |
  6+10       0.0527      0.12  Q  V      |         |         |         |
  6+15       0.0535      0.13  Q  V      |         |         |         |
  6+20       0.0544      0.13  Q  V      |         |         |         |
  6+25       0.0553      0.13  Q  V      |         |         |         |
  6+30       0.0562      0.13  Q  V      |         |         |         |
  6+35       0.0570      0.13  Q  V      |         |         |         |
  6+40       0.0579      0.13  Q  V      |         |         |         |
  6+45       0.0588      0.13  Q  V      |         |         |         |
  6+50       0.0597      0.13  Q   V     |         |         |         |
  6+55       0.0606      0.13  Q   V     |         |         |         |
  7+ 0       0.0615      0.13  Q   V     |         |         |         |
  7+ 5       0.0624      0.13  Q   V     |         |         |         |
  7+10       0.0634      0.13  Q   V     |         |         |         |
  7+15       0.0643      0.13  Q   V     |         |         |         |
  7+20       0.0652      0.14  Q   V     |         |         |         |
  7+25       0.0661      0.14  Q   V     |         |         |         |
  7+30       0.0671      0.14  Q   V     |         |         |         |
  7+35       0.0680      0.14  Q   V     |         |         |         |
  7+40       0.0690      0.14  Q   V     |         |         |         |
  7+45       0.0700      0.14  Q   V     |         |         |         |
  7+50       0.0709      0.14  Q   V     |         |         |         |
  7+55       0.0719      0.14  Q   V     |         |         |         |
  8+ 0       0.0729      0.14  Q   V     |         |         |         |
  8+ 5       0.0739      0.14  Q   V     |         |         |         |
  8+10       0.0749      0.14  Q    V    |         |         |         |
  8+15       0.0759      0.15  Q    V    |         |         |         |
  8+20       0.0769      0.15  Q    V    |         |         |         |
  8+25       0.0779      0.15  Q    V    |         |         |         |
  8+30       0.0789      0.15  Q    V    |         |         |         |
  8+35       0.0799      0.15  Q    V    |         |         |         |
  8+40       0.0810      0.15  Q    V    |         |         |         |
  8+45       0.0820      0.15  Q    V    |         |         |         |
  8+50       0.0831      0.15  Q    V    |         |         |         |
  8+55       0.0841      0.15  Q    V    |         |         |         |
  9+ 0       0.0852      0.16  Q    V    |         |         |         |
  9+ 5       0.0863      0.16  Q    V    |         |         |         |
  9+10       0.0874      0.16  Q    V    |         |         |         |
  9+15       0.0885      0.16  Q    V    |         |         |         |
  9+20       0.0896      0.16  Q     V   |         |         |         |
  9+25       0.0907      0.16  Q     V   |         |         |         |
  9+30       0.0918      0.16  Q     V   |         |         |         |
  9+35       0.0929      0.16  Q     V   |         |         |         |
  9+40       0.0941      0.17  Q     V   |         |         |         |
  9+45       0.0952      0.17  Q     V   |         |         |         |
  9+50       0.0964      0.17  Q     V   |         |         |         |
  9+55       0.0976      0.17  Q     V   |         |         |         |
 10+ 0       0.0987      0.17  Q     V   |         |         |         |
 10+ 5       0.0999      0.17  Q     V   |         |         |         |
 10+10       0.1011      0.17  Q     V   |         |         |         |
 10+15       0.1024      0.18  Q     V   |         |         |         |
 10+20       0.1036      0.18  Q     V   |         |         |         |
 10+25       0.1048      0.18  Q      V  |         |         |         |
 10+30       0.1061      0.18  Q      V  |         |         |         |
 10+35       0.1073      0.18  Q      V  |         |         |         |
 10+40       0.1086      0.19  Q      V  |         |         |         |
 10+45       0.1099      0.19  Q      V  |         |         |         |
 10+50       0.1112      0.19  Q      V  |         |         |         |
 10+55       0.1125      0.19  Q      V  |         |         |         |
 11+ 0       0.1139      0.19  Q      V  |         |         |         |
 11+ 5       0.1152      0.20  Q      V  |         |         |         |
 11+10       0.1166      0.20  Q      V  |         |         |         |
 11+15       0.1179      0.20  Q      V  |         |         |         |
 11+20       0.1193      0.20  Q      V  |         |         |         |
```

```
11+25       0.1207      0.20  Q       V |         |         |         |
11+30       0.1222      0.21  Q       V |         |         |         |
11+35       0.1236      0.21  Q       V |         |         |         |
11+40       0.1251      0.21  Q       V |         |         |         |
11+45       0.1265      0.21  Q       V |         |         |         |
11+50       0.1280      0.22  Q       V |         |         |         |
11+55       0.1295      0.22  Q       V |         |         |         |
12+ 0       0.1311      0.22  Q       V |         |         |         |
12+ 5       0.1326      0.22  Q       V |         |         |         |
12+10       0.1339      0.19  Q       V |         |         |         |
12+15       0.1351      0.18  Q        V|         |         |         |
12+20       0.1363      0.18  Q        V|         |         |         |
12+25       0.1375      0.18  Q        V|         |         |         |
12+30       0.1388      0.18  Q        V|         |         |         |
12+35       0.1400      0.18  Q        V|         |         |         |
12+40       0.1413      0.18  Q        V|         |         |         |
12+45       0.1426      0.19  Q        V|         |         |         |
12+50       0.1439      0.19  Q        V|         |         |         |
12+55       0.1452      0.19  Q        V|         |         |         |
13+ 0       0.1466      0.20  Q        V|         |         |         |
13+ 5       0.1480      0.20  Q        V|         |         |         |
13+10       0.1494      0.21  Q         V         |         |         |
13+15       0.1508      0.21  Q         V         |         |         |
13+20       0.1523      0.22  Q         V         |         |         |
13+25       0.1538      0.22  Q         V         |         |         |
13+30       0.1554      0.23  Q         V         |         |         |
13+35       0.1570      0.23  Q         V         |         |         |
13+40       0.1586      0.24  Q         V         |         |         |
13+45       0.1603      0.24  Q         V         |         |         |
13+50       0.1620      0.25  Q         V         |         |         |
13+55       0.1638      0.26  Q         V         |         |         |
14+ 0       0.1656      0.26  Q         |V        |         |         |
14+ 5       0.1674      0.27  Q         |V        |         |         |
14+10       0.1694      0.28  Q         |V        |         |         |
14+15       0.1714      0.29  Q         |V        |         |         |
14+20       0.1734      0.30  Q         |V        |         |         |
14+25       0.1756      0.31  Q         |V        |         |         |
14+30       0.1778      0.32  Q         |V        |         |         |
14+35       0.1801      0.33  Q         | V       |         |         |
14+40       0.1825      0.35  Q         | V       |         |         |
14+45       0.1850      0.36  Q         | V       |         |         |
14+50       0.1876      0.38  Q         | V       |         |         |
14+55       0.1903      0.40  Q         | V       |         |         |
15+ 0       0.1932      0.42  Q         | V       |         |         |
15+ 5       0.1963      0.44  Q         |  V      |         |         |
15+10       0.1995      0.47  Q         |  V      |         |         |
15+15       0.2030      0.50  |Q        |  V      |         |         |
15+20       0.2067      0.54  |Q        |  V      |         |         |
15+25       0.2109      0.61  |Q        |   V     |         |         |
15+30       0.2160      0.75  |Q        |   V     |         |         |
15+35       0.2219      0.85  |Q        |   V     |         |         |
15+40       0.2286      0.97  |Q        |    V    |         |         |
15+45       0.2364      1.13  | Q       |    V    |         |         |
15+50       0.2460      1.40  | Q       |     V   |         |         |
15+55       0.2585      1.81  |  Q      |      V  |         |         |
16+ 0       0.2771      2.71  |    Q    |       V |         |         |
16+ 5       0.3199      6.21  |         | Q       |V        |         |
16+10       0.4009     11.76  |         |         |  Q  V   |         |
16+15       0.4390      5.53  |         |Q        |        V|         |
16+20       0.4606      3.14  |     Q   |         |         V         |
16+25       0.4747      2.04  |   Q     |         |         |V        |
16+30       0.4842      1.38  | Q       |         |         | V       |
16+35       0.4908      0.96  |Q        |         |         | V       |
16+40       0.4961      0.78  |Q        |         |         |  V      |
16+45       0.5001      0.58  |Q        |         |         |  V      |
16+50       0.5031      0.43  Q         |         |         |  V      |
16+55       0.5057      0.38  Q         |         |         |  V      |
17+ 0       0.5080      0.34  Q         |         |         |   V     |
17+ 5       0.5102      0.32  Q         |         |         |   V     |
17+10       0.5122      0.29  Q         |         |         |   V     |
17+15       0.5141      0.28  Q         |         |         |   V     |
17+20       0.5159      0.26  Q         |         |         |   V     |
17+25       0.5176      0.25  Q         |         |         |   V     |
17+30       0.5192      0.23  Q         |         |         |   V     |
17+35       0.5208      0.22  Q         |         |         |   V     |
17+40       0.5222      0.21  Q         |         |         |    V    |
17+45       0.5236      0.20  Q         |         |         |    V    |
17+50       0.5250      0.20  Q         |         |         |    V    |
```

```
17+55       0.5263      0.19  Q         |         |         |    V    |
18+ 0       0.5275      0.18  Q         |         |         |    V    |
18+ 5       0.5288      0.19  Q         |         |         |    V    |
18+10       0.5302      0.21  Q         |         |         |    V    |
18+15       0.5317      0.22  Q         |         |         |    V    |
18+20       0.5332      0.21  Q         |         |         |    V    |
18+25       0.5347      0.21  Q         |         |         |    V    |
18+30       0.5361      0.21  Q         |         |         |    V    |
18+35       0.5375      0.20  Q         |         |         |     V   |
18+40       0.5389      0.20  Q         |         |         |     V   |
18+45       0.5402      0.20  Q         |         |         |     V   |
18+50       0.5415      0.19  Q         |         |         |     V   |
18+55       0.5428      0.19  Q         |         |         |     V   |
19+ 0       0.5441      0.18  Q         |         |         |     V   |
19+ 5       0.5453      0.18  Q         |         |         |     V   |
19+10       0.5466      0.18  Q         |         |         |     V   |
19+15       0.5478      0.17  Q         |         |         |     V   |
19+20       0.5489      0.17  Q         |         |         |     V   |
19+25       0.5501      0.17  Q         |         |         |     V   |
19+30       0.5512      0.16  Q         |         |         |     V   |
19+35       0.5523      0.16  Q         |         |         |      V  |
19+40       0.5534      0.16  Q         |         |         |      V  |
19+45       0.5545      0.16  Q         |         |         |      V  |
19+50       0.5556      0.15  Q         |         |         |      V  |
19+55       0.5566      0.15  Q         |         |         |      V  |
20+ 0       0.5577      0.15  Q         |         |         |      V  |
20+ 5       0.5587      0.15  Q         |         |         |      V  |
20+10       0.5597      0.15  Q         |         |         |      V  |
20+15       0.5607      0.14  Q         |         |         |      V  |
20+20       0.5616      0.14  Q         |         |         |      V  |
20+25       0.5626      0.14  Q         |         |         |      V  |
20+30       0.5636      0.14  Q         |         |         |      V  |
20+35       0.5645      0.14  Q         |         |         |      V  |
20+40       0.5654      0.13  Q         |         |         |      V  |
20+45       0.5663      0.13  Q         |         |         |      V  |
20+50       0.5672      0.13  Q         |         |         |       V |
20+55       0.5681      0.13  Q         |         |         |       V |
21+ 0       0.5690      0.13  Q         |         |         |       V |
21+ 5       0.5699      0.13  Q         |         |         |       V |
21+10       0.5707      0.13  Q         |         |         |       V |
21+15       0.5716      0.12  Q         |         |         |       V |
21+20       0.5724      0.12  Q         |         |         |       V |
21+25       0.5733      0.12  Q         |         |         |       V |
21+30       0.5741      0.12  Q         |         |         |       V |
21+35       0.5749      0.12  Q         |         |         |       V |
21+40       0.5757      0.12  Q         |         |         |       V |
21+45       0.5765      0.12  Q         |         |         |       V |
21+50       0.5773      0.12  Q         |         |         |       V |
21+55       0.5781      0.11  Q         |         |         |       V |
22+ 0       0.5789      0.11  Q         |         |         |       V |
22+ 5       0.5797      0.11  Q         |         |         |       V |
22+10       0.5804      0.11  Q         |         |         |       V |
22+15       0.5812      0.11  Q         |         |         |       V |
22+20       0.5819      0.11  Q         |         |         |        V|
22+25       0.5827      0.11  Q         |         |         |        V|
22+30       0.5834      0.11  Q         |         |         |        V|
22+35       0.5841      0.11  Q         |         |         |        V|
22+40       0.5849      0.10  Q         |         |         |        V|
22+45       0.5856      0.10  Q         |         |         |        V|
22+50       0.5863      0.10  Q         |         |         |        V|
22+55       0.5870      0.10  Q         |         |         |        V|
23+ 0       0.5877      0.10  Q         |         |         |        V|
23+ 5       0.5884      0.10  Q         |         |         |        V|
23+10       0.5891      0.10  Q         |         |         |        V|
23+15       0.5897      0.10  Q         |         |         |        V|
23+20       0.5904      0.10  Q         |         |         |        V|
23+25       0.5911      0.10  Q         |         |         |        V|
23+30       0.5918      0.10  Q         |         |         |        V|
23+35       0.5924      0.10  Q         |         |         |        V|
23+40       0.5931      0.10  Q         |         |         |        V|
23+45       0.5937      0.09  Q         |         |         |        V|
23+50       0.5944      0.09  Q         |         |         |        V|
23+55       0.5950      0.09  Q         |         |         |        V|
24+ 0       0.5957      0.09  Q         |         |         |        V|
24+ 5       0.5962      0.08  Q         |         |         |        V|
24+10       0.5964      0.03  Q         |         |         |        V|
24+15       0.5965      0.02  Q         |         |         |        V|
24+20       0.5966      0.01  Q         |         |         |        V|
```

```
  24+25       0.5966      0.00  Q         |         |         |        V|
  24+30       0.5966      0.00  Q         |         |         |        V|
  24+35       0.5967      0.00  Q         |         |         |        V|
  24+40       0.5967      0.00  Q         |         |         |         V
----------------------------------------------------------------------
```



SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT	
DESERT AREA	
ISOHYETALS	
X_1 - 2 YEAR 6 HOUR	
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973	
APPROVED BY	FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 MI.	WRD-1	7 of 12

WATER RESOURCES DIVISION

REDUCED DRAWING

0 1 2 3

3 INCHES ON ORIGINAL

LEGEND:

1.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

FIGURE B-7

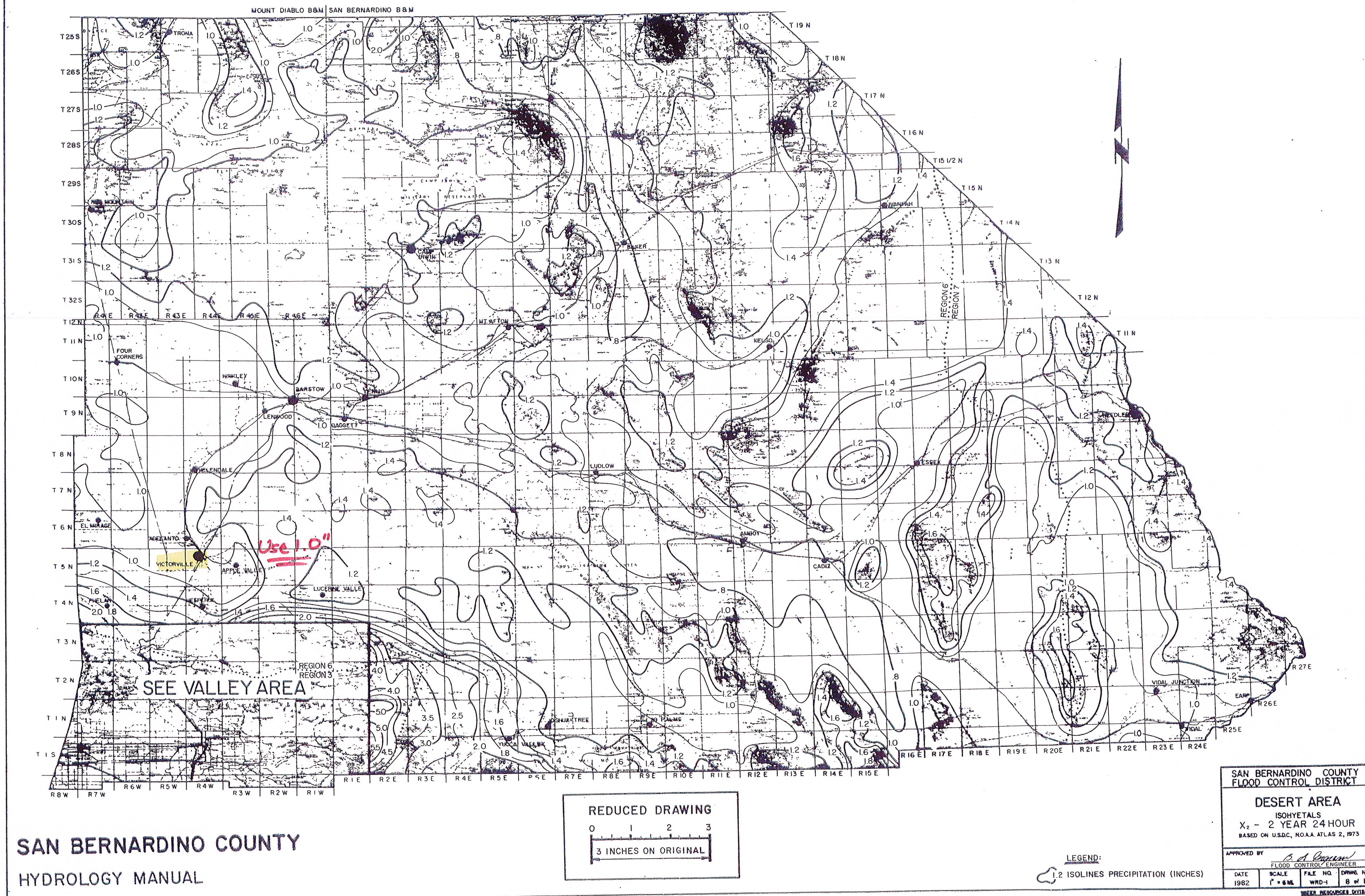
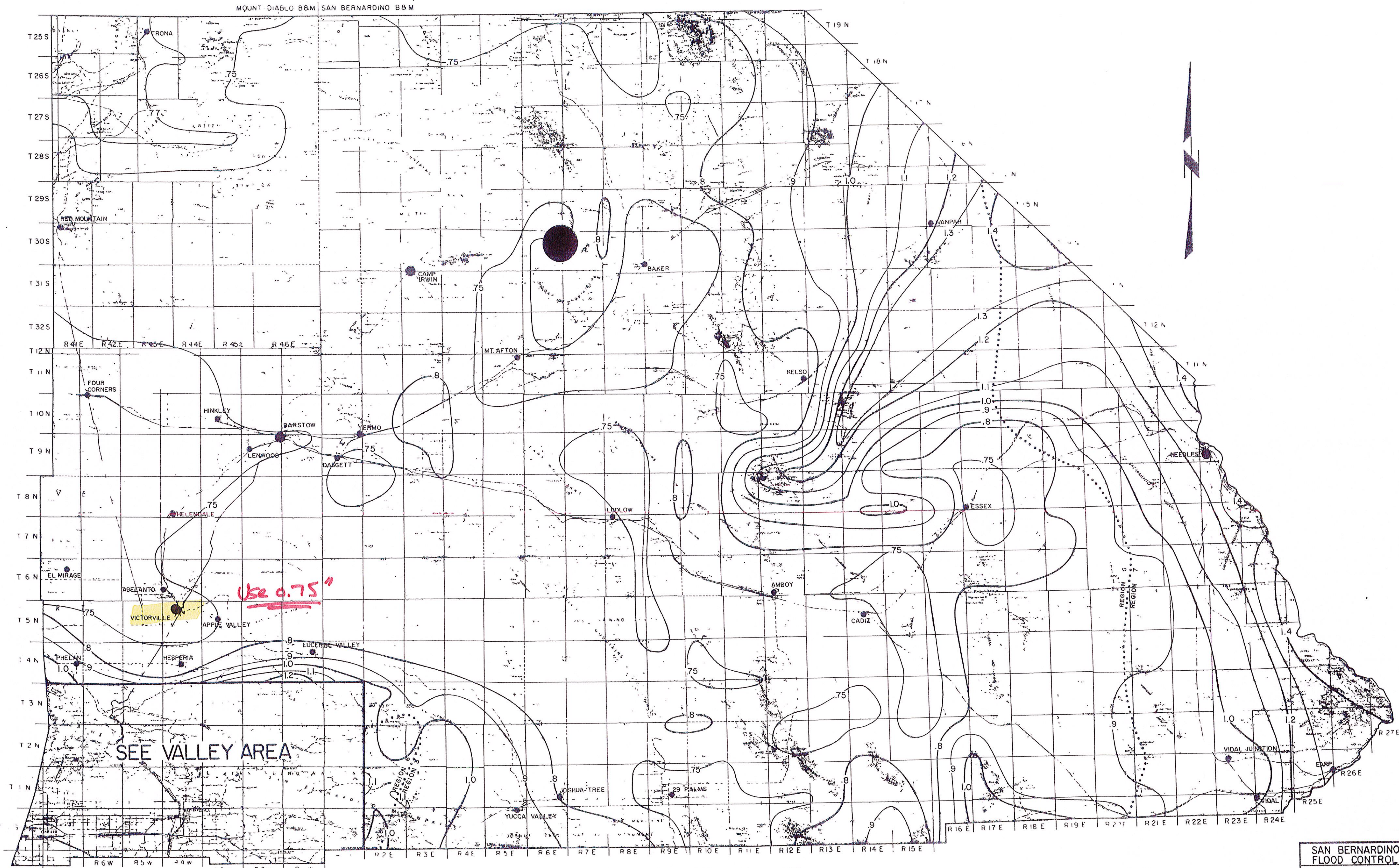

MOUNT DIABLO B&M | SAN BERNARDINO B&M
TRONA
CAMP IRWIN
BAKER
MT. AFTON
KELSO
FOUR CORNERS
HINKLEY
BARSTOW
LENWOOD
DAGGETT
YERMO
HELENDALE
EL MIRAGE
ADELANTO
VICTORVILLE
APPLE VALLEY
LUCERNE VALLEY
PHELAN
HESPERIA
LUDLOW
AMBOY
CADIZ
ESSEX
IVANPAH
NEEDLES
VIDAL JUNCTION
VIDAL
EARP
JOSHUA TREE
YUCCA VALLEY
29 PALMS
REGION 6
REGION 7
REGION 6
REGION 3
SEE VALLEY AREA
Use 1.0"
REDUCED DRAWING
0 1 2 3
3 INCHES ON ORIGINAL
LEGEND:
1.2 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
DESERT AREA
ISOHYETALS
X₂ - 2 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1" = 6 MI.
FILE NO. WRD-1
DRAWG. NO. 8 of 12
WATER RESOURCES DIVISION
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

FIGURE B-8



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

REDUCED DRAWING

0 1 2 3

3 INCHES ON ORIGINAL

LEGEND:

3.5 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

DESERT AREA

ISOHYETALS

Y_{10} - 10 YEAR 1 HOUR

BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

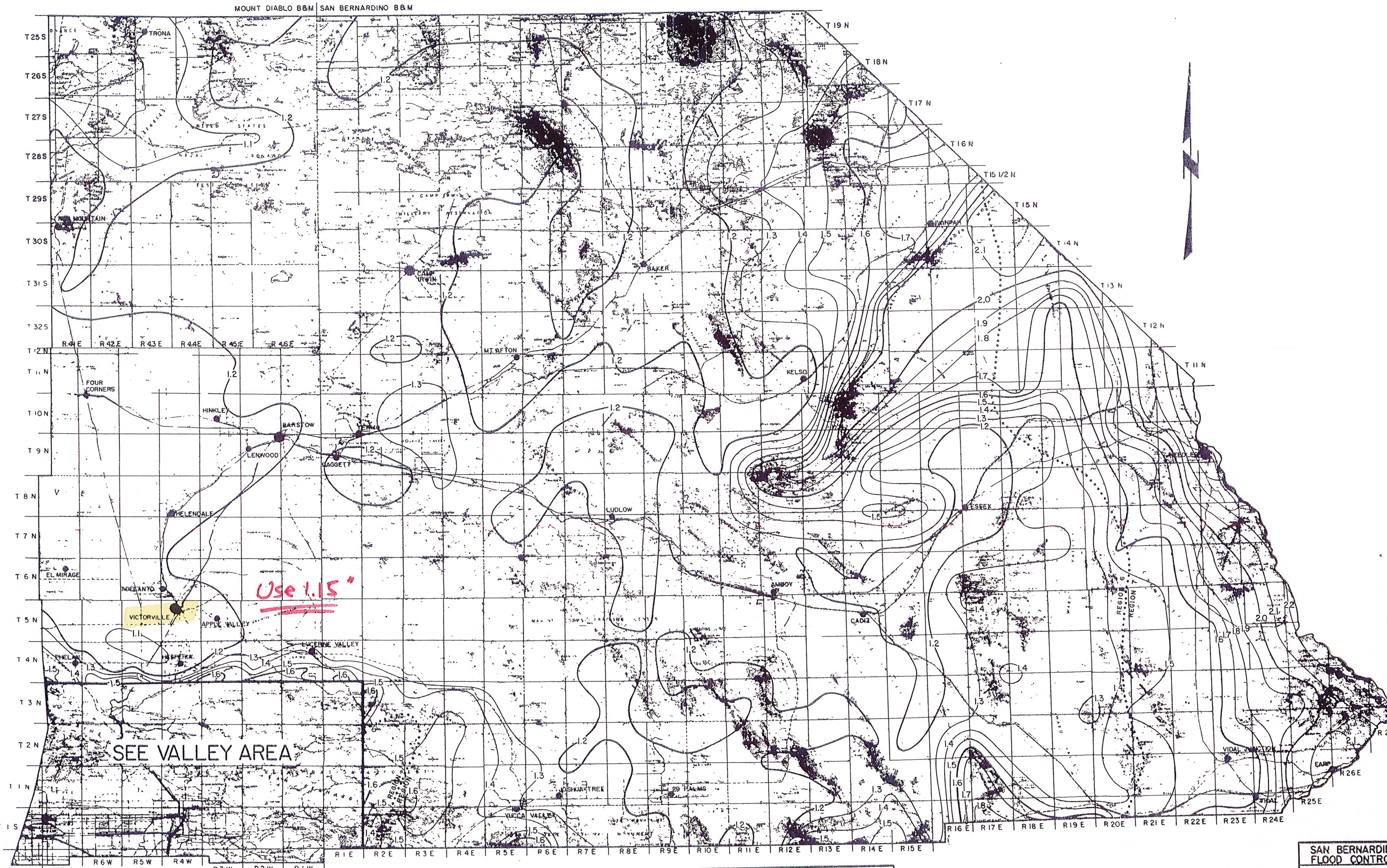
APPROVED BY

FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 Mi.	WRD-1	9 of 12

WATER RESOURCES DIVISION

FIGURE B-9



REDUCED DRAWING

0 1 2 3

3 INCHES ON ORIGINAL

LEGEND:

1.2 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

DESERT AREA

ISOHYETALS

Y_{100} - 100 YEAR 1 HOUR

BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

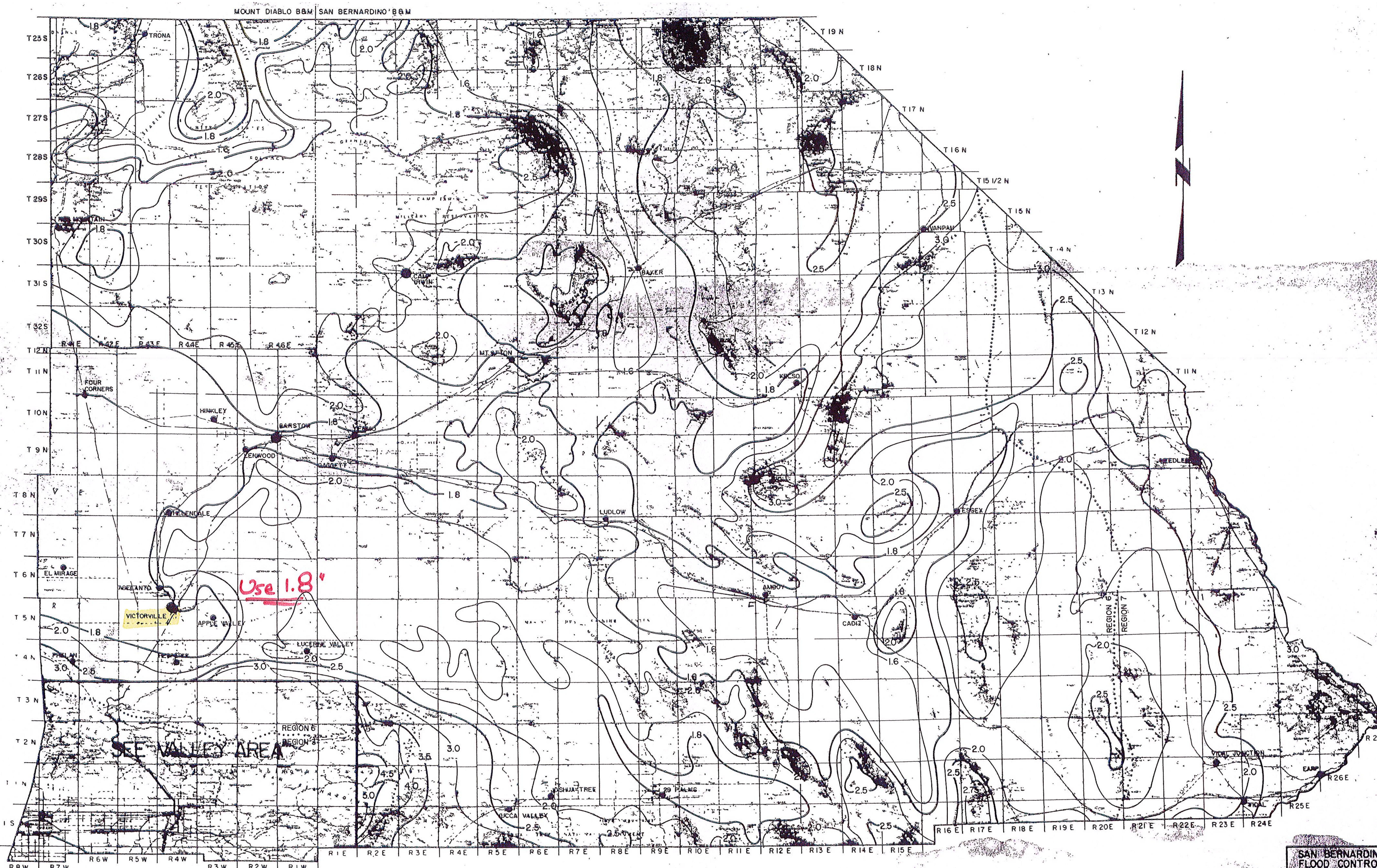
APPROVED BY FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 MI.	WRD-1	10 of 18

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

FIGURE B-10



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

REDUCED DRAWING

0 1 2 3

3 INCHES ON ORIGINAL

LEGEND:

2.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

DESERT AREA

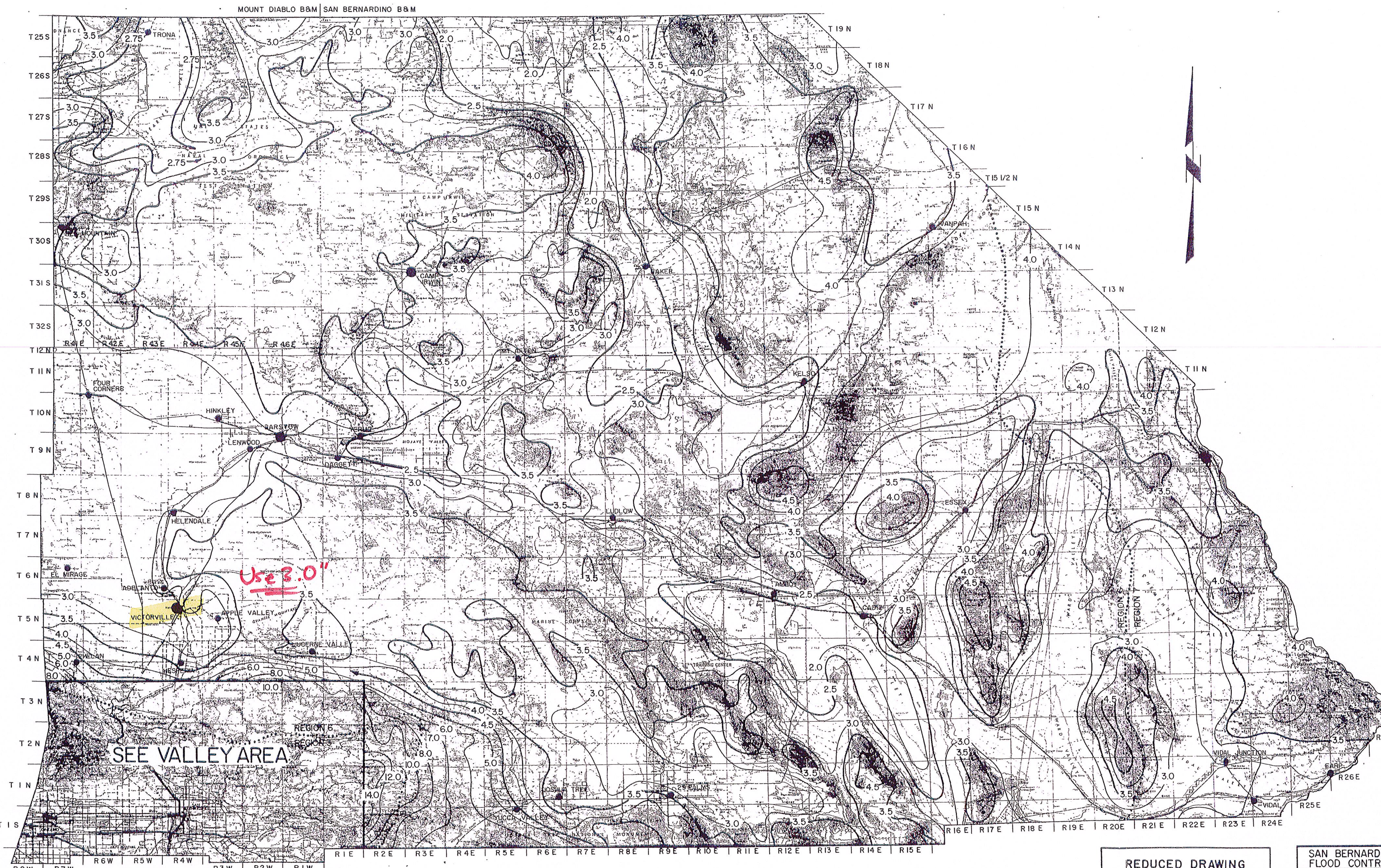
ISOHYETALS

X_3 100 YEAR 6 HOUR

BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY		FLOOD CONTROL ENGINEER	
DATE 1982	SCALE 1" = 6 MI.	FILE NO. WRD-1	DRWG. NO. 11 of 12

FIGURE B-11



REDUCED DRAWING

0 1 2 3

3 INCHES ON ORIGINAL

LEGEND:

3.5 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESERT AREA

ISOHYETALS

X_4 -100 YEAR 24 HOUR

BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY B. L. [signature]
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 MI.	WRD-I	12 of 12

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

FIGURE B-12

APPENDIX F

EDUCATIONAL MATERIALS

IT'S A STORMWATER POLLUTION REVOLUTION!

Keeping construction sites and the Mojave River Watershed clean!

Stormwater runoff from construction sites are major contributors to toxins entering the Mojave River - harming our natural wildlife and eventually making its way back to our faucets, hoses, drinking water and other waterways in the High Desert.

We need your help! Follow these simple steps when doing small or large-scale construction to prevent stormwater pollution and protect our community from toxins:

- Identify path for stormwater discharge
- Secure storm drain inlets with sandbags
- Protect slopes and channels
- Store materials off the ground on wooden pallets
- Never sweep or wash anything into a storm drain

Installing Storm Drain Inlet Protection 101

Prevent sediment from entering a storm drain by following the simple installation and maintenance steps outlined below. Use silt fence, rock-filled bags, or block and gravel.

Installation:

Install protection prior to starting activity; Protect all inlets that may receive discharge; Design protection to handle maximum volume of water expected.

Maintenance:

Inspect frequently; Remove trapped sediment; Replace or repair protection as needed; Sweep streets, sidewalks and other paved areas regularly.

To report illegal dumping or for more information on stormwater pollution prevention call 1 (800) 78 CRIME or visit our website at www.mojaveriver.org, Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed.

Disposal Centers

Apple Valley
13450 Nomwaket Road

Hesperia Fire Station
17443 Lemon Street

Victorville Fire Department
East of Desert Knoll Drive
on Loves Lane

Barstow Corporation Yard
900 South Avenue H

San Bernardino County
2824 East W Street
San Bernardino, CA

Don't Get Turned Away!

For hours of operation, quantity limitations and other rules and regulations, call (800) 645-9228 or visit the MRWG website at www.mojaveriver.org before dropping off materials.

IT'S A STORMWATER POLLUTION REVOLUTION!

Keeping your grass green and the Mojave River Watershed clean!

Excess fertilizer use is a major contributor to toxins entering the Mojave River - harming our natural wildlife and eventually making its way back to our faucets, hoses, drinking water and other waterways in the High Desert.

We need your help! Follow these simple steps when applying fertilizer to prevent stormwater pollution and protect our community from toxins:

- Read the label and use only as directed
- Avoid applying near driveways and gutters
- Never apply 24 hours before rain
- Store in a covered area in sealed, waterproof containers
- Buy non-toxic! They're just as effective and better for our watershed.

Fertilizer Chemistry 101

Fertilizers serve different purposes depending on what your lawn needs. Each bag has three percentages (N-P-K) of ingredients to meet your needs. Buy smart and apply safely to save money!

- **N** Nitrogen makes for greener grass
- **P** Phosphorus helps establish a new lawn or tree
- **K** Potassium protects plants from temperature extremes, insects, and disease

To report illegal dumping or for more information on stormwater pollution prevention call 1 (800) 78 CRIME or visit our website at www.mojaveriver.org, Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed.

Disposal Centers

Apple Valley
13450 Nomwaket Road

Hesperia Fire Station
17443 Lemon Street

Victorville Fire Department
East of Desert Knoll Drive
on Loves Lane

Barstow Corporation Yard
900 South Avenue H

San Bernardino County
2824 East W Street
San Bernardino, CA

Don't Get Turned Away!

For hours of operation, quantity limitations and other rules and regulations, call (800) 645-9228 or visit the MRWG website at www.mojaveriver.org before dropping off materials.

IT'S A STORMWATER POLLUTION REVOLUTION!

Keeping your yard bug free and the Mojave River Watershed clean!

Excess pesticide use is a major contributor to toxins entering the Mojave River - harming our natural wildlife and eventually making its way back to our faucets, hoses, drinking water and other waterways in the High Desert.

We need your help! Follow these simple steps when applying pesticides to prevent stormwater pollution and protect our community from toxins:

- Read the label and use only as directed
- Spot apply rather than blanketing an entire area
- Never apply 24 hours before rain
- Buy non-toxic! They're just as effective and better for our watershed.

Pesticide Chemistry 101

Cost-saving alternatives are available to keep pests at bay rather than using pesticides. Try these pesticide-free tips to keep your lawn bug free, prevent stormwater pollution, and save money!

BARRIERS AND TRAPS: Collars, netting and coffee can traps capture or impede pests

TRAP PLANTS: Strategically plant plants that lure harmful insects away from plants you wish to protect. Once infested, the plant can be disposed.

BENEFICIAL INSECTS: Introduce safe insects (ladybugs, praying mantises, spiders and more!) for your garden that feed on harmful ones.

COMPANION PLANTING: Plant insect-repelling plants near ones you want to protect.

To report illegal dumping or for more information on stormwater pollution prevention call 1 (800) 78 CRIME or visit our website at www.mojaveriver.org, Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed.

MOJAVE RIVER WATERSHED GROUP

Disposal Centers

Apple Valley
13450 Nomwaket Road

Hesperia Fire Station
17443 Lemon Street

Victorville Fire Department
East of Desert Knoll Drive
on Loves Lane

Barstow Corporation Yard
900 South Avenue H

San Bernardino County
2824 East W Street
San Bernardino, CA

Don't Get Turned Away!

For hours of operation, quantity limitations and other rules and regulations, call (800) 645-9228 or visit the MRWG website at www.mojaveriver.org before dropping off materials.

IT'S A STORMWATER POLLUTION REVOLUTION!

Responsible Tips for Washing Your Car

Water runoff from washing your own car or holding a car wash fundraiser can collect harmful and toxic chemicals on the roadway. This polluted water flows into the Mojave River and our watershed, the underground basins and aquifers of the High Desert. Ultimately, stormwater pollution impacts our waterways and the water we use in faucets, hoses and for drinking.

We need your help! Residents and community organizations holding fundraisers can play an important role in pollution prevention by following these simple steps:

- **When you need to wash your car, consider a commercial or do-it-yourself facility, which saves water and keeps our stormwater safe.**
- **If you choose not to use a commercial or do-it-yourself facility, wash your car over a porous surface or a grassy lawn to catch the runoff.**
- **Always keep water runoff on the washing site – do not allow water to flow into the street!**
- **Avoid harsh chemicals and use biodegradable products.**
- **Use a high pressure/low volume hose with a shut-off nozzle.**

Always refer to local city or county permitting requirements before getting started.

- County of San Bernardino Public Works – (909) 387-8063
- City of Hesperia – (760) 947-1000
- City of Victorville – (760) 955-5000
- Town of Apple Valley – (760) 240-7000

Bonus Tips for Car Wash Fundraising:

- Only conduct fundraisers at commercial locations with stormwater-safe drainage on site.
- Sell coupons to local commercial wash locations.
- Call MRWG today to schedule a FREE stormwater pollution prevention training for your program directors, student leadership team, etc. (951) 462-1106

Be a good neighbor by adopting these stormwater savvy business practices. Failure to do so could result in violations and fines.

Have more questions about stormwater safe mobile washing? Contact us at www.mojaveriver.org, on Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed. To report illegal dumping, call 1 (800) 78CRIME or visit the website to use our digital pollution reporting form.

IT'S A STORMWATER POLLUTION REVOLUTION!

Smart Tips for Mobile Wash and Car Detailing Businesses

Water runoff from mobile car washing and detailing can collect harmful and toxic chemicals on the roadway. This polluted water flows into the Mojave River and our watershed, the underground drainage basins and aquifers of the High Desert. Ultimately, stormwater pollution impacts our waterways and the water we use in faucets, hoses and for drinking.

We need your help! Businesses can play an important role in pollution prevention by following these simple steps:

- Call MRWG today to schedule a FREE stormwater pollution prevention training for your employees (951) 462-1106.
- Safely prep the area by sweeping up debris and throwing it away in a trashcan.
- Avoid harsh chemicals and use biodegradable products.
- Always keep water on the washing site – do not allow water to flow into the street.
- Use a portable vacuum recovery system to contain water runoff and dispose of properly, and if possible, recycle the water.
- Do not wash undercarriage of vehicle – only cosmetic washing is permitted to reduce amount of metal, oil and antifreeze runoff.
- Use a high pressure/low volume hose with a shut-off nozzle.
- Invest in containment tools such as booms and drain covers.

Always refer to local city or county permitting requirements before getting started.

- County of San Bernardino Public Works – (909) 387-8063
- City of Hesperia – (760) 947-1000
- City of Victorville – (760) 955-5000
- Town of Apple Valley – (760) 240-7000

Be a good neighbor by adopting these stormwater savvy business practices. Failure to do so could result in violations and fines.

Have more questions about stormwater safe mobile washing? Contact us at www.mojaveriver.org, on Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed. To report illegal dumping, call 1 (800) 78 CRIME or visit the website to use our digital pollution reporting form.

MOJAVE RIVER WATERSHED GROUP

IT'S A STORMWATER POLLUTION REVOLUTION!

Flat or sheen? Let's keep the Mojave River Watershed clean!

Washing a paint brush and dumping rinse water in the gutter are major contributors to toxins entering the Mojave River - harming our natural wildlife and eventually making its way back to our faucets, hoses, drinking water and other waterways in the High Desert.

We need your help! Follow these simple steps when using paint to prevent stormwater pollution and protect our community from toxins:

- Store in sealed containers
- Use water-based paint whenever possible, not oil-based
- Clean water-based paint materials in the sink and oil-based paint materials with thinner
- Never clean or rinse brushes and containers in the street, gutter or near a storm drain

Paint Chemistry 101

Want your paint to last longer? Use the tips below repeatedly to maximize the effectiveness of your paint – and save money!

FLAT: Almost no shine; Good for low foot traffic areas (dining rooms & bedrooms); Hides surface irregularities

LOW-LUSTER, SATIN, OR EGGSHELL: Subtle sheen; Good for bedrooms, hallways & family rooms

SEMI-GLOSS: More gloss; More durable; Good for kids' rooms, bathrooms, & trim; More water-resistant

HIGH-GLOSS: Shiny; Good for trim, molding, doors, & cabinets; Takes abuse; Easy to clean

To report illegal dumping or for more information on stormwater pollution prevention call 1 (800) 78 CRIME or visit our website at www.mojaveriver.org, Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed.

MOJAVE RIVER WATERSHED GROUP

Disposal Centers

Apple Valley
13450 Nomwaket Road

Hesperia Fire Station
17443 Lemon Street

Victorville Fire Department
East of Desert Knoll Drive
on Loves Lane

Barstow Corporation Yard
900 South Avenue H

San Bernardino County
2824 East W Street
San Bernardino, CA

Don't Get Turned Away!

For hours of operation, quantity limitations and other rules and regulations, call (800) 645-9228 or visit the MRWG website at www.mojaveriver.org before dropping off materials.

IT'S A STORMWATER POLLUTION REVOLUTION!

Animal Doo-Doo is a Stormwater Don't!

Animal waste is a major contributor to toxins entering the Mojave River - harming our natural wildlife and eventually making its way back to our faucets, hoses, drinking water and other waterways in the High Desert.

We need your help! Follow these simple steps to prevent stormwater pollution and protect our community from toxins:

DOGS:

- Regularly pick up waste in the yard
- Carry disposable bags while on walks
- Waste not in plastic bags can be flushed down a toilet

CATS:

- Put waste and litter in the trash
- Wrap waste carefully to prevent spillage
- Do not flush cat waste or litter

HORSES:

- Remove soiled bedding and manure from pens at least once daily
- Deposit waste in sturdy, sealed containers
- Cover manure before a rain
- Arrange for weekly manure pick-up service
- Compost waste for personal use or donate to community gardens or nurseries

Pet Chemistry 101

Did you know pet waste is not a fertilizer? In fact, it's just theopposite! Your pet's waste contains bacteria and parasites that can create an overly nutrient rich environment causing excess weed and algae growth.

MOJAVE RIVER WATERSHED GROUP

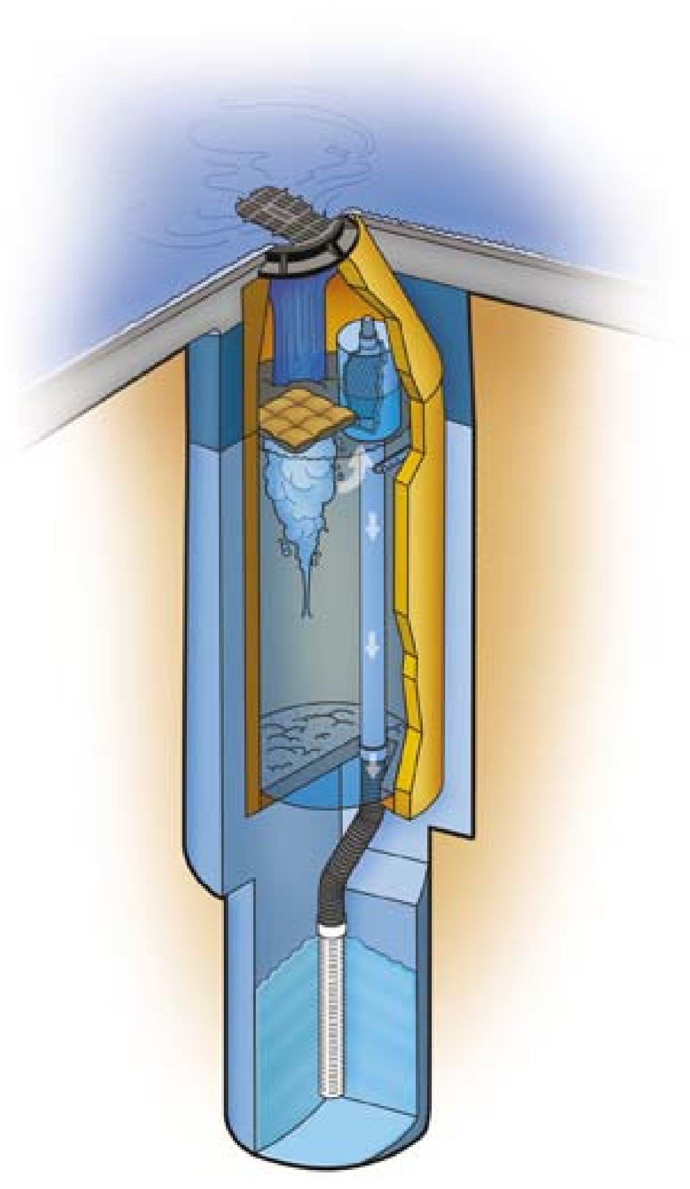
To report illegal dumping or for more information on stormwater pollution prevention call 1 (800) 78 CRIME or visit our website at www.mojaveriver.org, Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed.

APPENDIX G

OPERATION AND MAINTENANCE MANUAL(S)

OPERATION AND MAINTENANCE MANUAL

The ***MaxWell® IV*** Drainage System



Torrent Resources Incorporated

The watermark for drainage solutions.®

Table of Contents

Company Overview

Torrent Resources Incorporated…an Employee-Owned Company.

First licensed as a drainage contractor, Torrent Resources has evolved into a full-service; drainage solutions partner to address ever-growing customer needs in California, Arizona, New Mexico, Nevada and Texas. The company is headquartered in Phoenix, with an additional office in Fontana, California.

Since 1972, Torrent Resources has set the standard in design and construction of water drainage systems for the mitigation of excess surface water. In 1974, the company revolutionized the industry with its exclusive, patented ***MaxWell***® systems – products unmatched in efficiency and reliability by any other type of stormwater disposal application. To date, more than 80,000 MaxWell drywells have been installed throughout the western United States.

General Purpose

With a greater awareness of the need to address the quality of urban stormwater runoff, on-site drainage systems used for the stormwater elimination have come under closer scrutiny. One such system is the drywell which has been used previously throughout the United States to dispose of retained or surplus surface water. The early versions of this structure were not much more than holes in the ground filled with rocks. This meant that maintenance on these primitive types was impossible, and inundation from silt-loading quickly led to clogging and failure of the drywells.

Fortunately, the introduction of the MaxWell concept provided a solution to this problem by incorporating a deep settling basin to trap out the suspended solids for easy removal during routine cleaning. To that end, all MaxWell drainage systems are designed to remove not only sediment and debris, but also floating hydrocarbons and organic compounds prior to recharging the treated stormwater back into the sub-grade. The water is then further polished by the soil envelope as it passes through the vadose zone to eventually replenish the resource.

The MaxWell is a treatment and infiltration BMP, which recharges cleaned stormwater back into the ground to recharge the aquifer beneath. In most cases, the system will be utilized in one of two applications: mitigation of the entire amount of retained water from a rainfall event of some historic frequency and duration, in which case the product would be considered volume-based; or, removal of only first flush constituents from an incremental portion of a larger rainfall event. In the latter, the system would be considered a flow-based BMP.

The system itself is <u>not intended to provide storage volume</u>, but instead is designed to gradually dispose of accumulated stormwater to ensure maximum pre-treatment efficiency. Therefore, in both applications described above, a means of storing the required capture volume should be provided separately. This can be done in shallow surface basins or planter areas with the drywells incorporated into the low spots, or by interconnecting the drainage systems to underground tanks or vaults. This allows the minimum number of drainage systems to be used to percolate the water into the sub soils, using the total allowable draw-down timeframe. More systems could be used in lieu of storage to increase processing rates, but this is generally not as cost-effective as providing a means or retaining the required volume.

MaxWell® IV Description

Initial treatment is provided in the deep sump of the MaxWell IV, which provides 1,000 gallons of volume to capture sediment and trash. Depending upon the permeability of the soils, the pilot-hole excavations for the drywells may be up to 120 feet deep.

The typical MaxWell IV processes incoming stormwater for the removal of suspended solids and floating hydrocarbons (gasoline and diesel). These chambers are constructed of 4000 PSI pre-cast concrete liner segments that are 48-inches I.D., 54-inches O.D. with a 3-inch wall thickness. In constructing the chambers, these sections are carefully aligned, centered, and stacked in the borehole to maximize bearing surfaces.

Next, a corrugated HDPE drainage pipe with a slotted Schedule 40 PVC drainage screen attached to the lower end is inserted into the pilot-hole excavation. This component is then capped and suspended slightly off the bottom of the borehole. Clean, washed aggregate sized between 3/8" to 1 ½" to best complement site soil conditions is utilized for the backfill material surrounding the drainage pipe in the lower excavation of the main well. The pre-cast concrete chambers are then erected in the 72-inch diameter reamed portions of the upper excavation.

An overflow pipe constructed of Schedule 40 PVC is installed in the main chamber, and is mated to the drainage pipe with a coupling under the chamber bottom. This vertical pipe is supported by a fusion-bonded epoxy-coated galvanized steel bracket attached to the liner wall. Our ***PureFlo***® Debris Shield equipped with an internal screen is then fitted onto the top of the overflow inlet. This cylindrical shield is approximately 24-inches in length, and is fabricated from rolled 16-gauge galvanized steel. The component is coated with fusion-bonded epoxy, and fitted with an anti-siphon vent. In operation, the shield forces water to be drawn into the system from several inches beneath the surface, effectively isolating and containing floating trash, paper, debris and pavement oils within the chambers. The internal screen effectively filters out suspended material, and the vent prevents floating debris from being sucked into the overflow pipe as the water level inside the chamber subsides.

The chamber is equipped with a hydrophobic floating absorbent pillows, which will remove a wide range of hydrocarbons and organic liquids. The sponges are 100% water repellant, and literally "wick" floating petrochemical compounds from the surface of the water. Each pillow has a removal capacity of at least 128 ounces to accommodate effective, long-term treatment.

At the surface of the ground, the inlet structure will be equipped with a 24" or 30" diameter cast-iron grate and ring assembly capable of handling H-20 loads. See Appendix 1-A for MaxWell detail.

Installation

Once the locations of any utilities have been identified, the exact locations of the drywell on the jobsite is laid out and identified by an onsite survey team. When installed with standard inverts, the layout requires a center stake for the chamber, with a 10' offset.

The installation begins with the excavation of a 48" pilot-hole boring down to the bottom of the proposed gravel pack. The upper part of this excavation, where the chamber will sit, must then be enlarged to 72" in order to provide sufficient space to stack the liner segments and place the aggregate backfill in the annular space around the outside of the chamber.

It is vital to the function of the finished drainage system that a 10' minimum penetration into permeable soil is achieved. As the drilling progresses and each load of cuttings is discharged, the composition of the drainage soils is assessed for suitable permeability. Optimum permeability is found in soils comprised of clean sand, gravel, and small cobbles, with an absence of silt, clay or excessive fines. However, other materials may possess acceptable transmissibility, such as clean sand or decomposed granite.

When the drilling is completed, the drilling crew will leave the site protected by covering the open holes with steel plates, and constructing a berm around the immediate well site. Barricades and flagging are additionally utilized to protect the drilled shafts after the excavation is complete. A construction crew will then arrive within a day or two to finish the installation process.

The actual construction sequence begins with pulling the plates back far enough to allow the placement of a setting platform over the first open boring. The first component lowered into the excavation is the slotted drainage screen, connected to the lower end of the drainage pipe. The material used for the drainage pipe is heavy-duty ADS Highway Grade corrugated polyethylene. This HDPE drainage pipe is lowered into position, and held slightly off the bottom of the pilot-hole. The pipe is then capped and suspended by a chain, which has been secured to the setting platform above the excavation.

As the fabrication progresses, the protective steel plates are pulled completely away so that there is access for the backfill operation. A skip loader is utilized to place the gravelpack into the entire length of the 48-inch pilot hole around the suspended drainage pipe. Next, the lower perforated section of 48-inch precast liner for the main well is lowered into place within the enlarged 6-foot diameter excavation. Additional liner segments are carefully aligned and stacked in the enlarged portion of the shaft to create the settling chamber of the system. The last section to be placed at grade is a modified manhole cone. The opening in the manhole cone is covered to prevent the accidental introduction of gravel as the upper excavation is backfilled with this same washed, graded aggregate.

In order to prevent subsidence and lock all of the components in place, a 1-sack slurry mixture is used to backfill the upper 5' of annular space and around the cone. This material effectively encapsulates the components and exceeds the compaction of native soil. With the chamber completed, the interior components are installed. The overflow pipe is lowered into position in the main well chamber as assembly progresses.

After securing the grate to the cast-iron ring, a layer of ultraviolet-resistant geotextile fabric is applied over the grate. This UV-resistant fabric layer is banded to the grated inlet, and is intended to prevent incidental introduction of trash or debris before the well goes into service. This fabric will be removed by the General Contractor after final landscaping and paving are completed. Premature fabric removal could result in system damage and may void some, or all warranty conditions.

The metal grates and covers used are embossed with “Torrent Resources”, the MaxWell trade name, and the words “Storm Water Only” as a general reminder to the public as to the intended usage of the structure.

The final step in the installation process is the application of a mortar mix to affix the ring and grate assemblies securely to the manhole cone. This completes the construction sequence.

MaxWell Operation

Influent stormwater enters the system either through the grate at the ground surface or through a piped inlet. Upon entering the drywell chamber, stormwater will accumulate, giving silt and other heavy particles a chance to settle. A vented, screened, and shielded inlet ensures containment of floating debris within the chamber and elimination of petroleum constituents through the floating absorbent pillows. The system is drained as water rises under the PureFlo™ Debris Shield, and spills into the top of the overflow pipe. The drainage assembly returns the cleaned water to the surrounding soil through the FloFast™ Drainage Screen.

All MaxWell IV Systems are equipped with bolted, theft-deterrent cast iron grates as standard security features. Special inset castings are available for use in landscaped applications, which are resistant to loosening from accidental impact. Machined mating surfaces, and “Storm Water Only” wording are standard on these components.

Maintenance

The responsible party, such as a Property Management Company or Homeowners Association, is typically responsible for maintaining the drywell(s).

New systems should receive a thorough visual examination following the first several significant rainfall events. This assessment will assure that there is no standing water, and that runoff or nuisance water flows are being eliminated within the allowable 48 hour draw-down timeframe. Beyond that, the drainage structures should be inspected once a year and within 48 hours of a significant storm event to ensure that there is no standing water in the chambers.

Standing water problems are usually caused by inadequate performance of the existing drainage systems on the property. Reasons are varied but may be due to system aging, reduced soil permeability, pavement settlement, ineffective site maintenance, property expansions and additions, or change in property usage.

If a drywell is draining slowly or leaves water standing over the grate for longer than regulations allow, debris may simply be blocking the inlet. The maintenance guidelines begin with the performance of an annual inspection, which should include assessing the need for cleaning and inspecting the functional and structural continuity of the system. At the same time, surface aspects of the drainage way are evaluated for evidence of staining or standing water.

A typical cleaning is carried out using a truck-mounted hydro-vactor (see below) when accumulated trash, debris, and sediment occupy 15% or more of the original settling chamber capacity. The hydro-vactor utilizes streams of air and high-pressure water to dislodge built-up material, which is then removed via vacuum hose and disposed of off-site.

Inlet grates and covers are removed for this operation and all filters and screens are cleaned during this procedure. At the same time, any obstructions or accumulated debris in remote inlets and connecting pipes is removed by jet-rodding. The cleaning operation also involves replacement of the floating absorbent pillows and changing out the filter fabric at the bottom of the chambers where applicable.

After the initial cleaning, most systems generally will not require subsequent cleaning for 3-5 years. When afforded regularly scheduled maintenance, our records indicate that our MaxWell Drywells will provide decades of efficient, reliable service.

A written log shall be kept of all inspections and maintenance actions performed on the drywell systems.

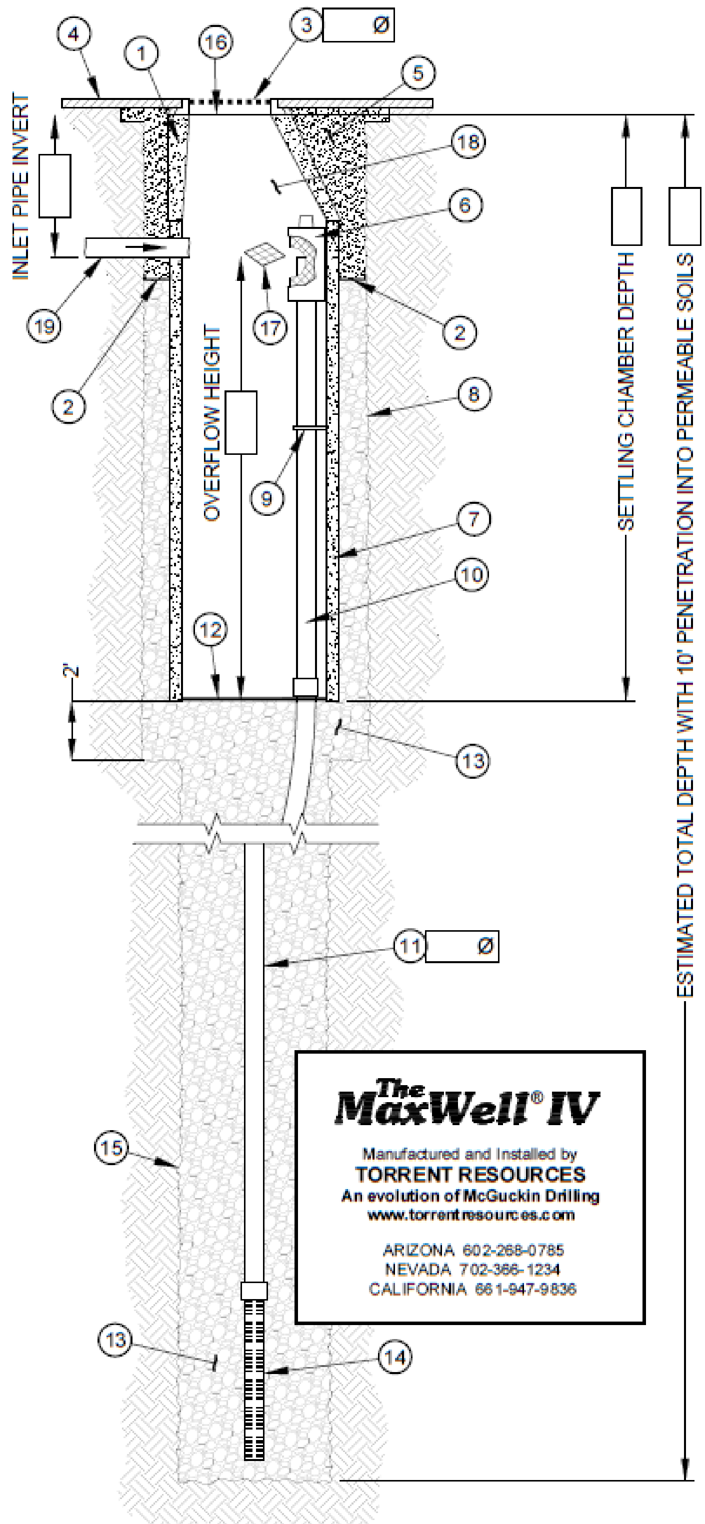
Typical Hydrovactor Truck used for Drywell Maintenance

APPENDIX
1-A

The MaxWell® IV Drainage System Detail And Specifications

NOTES

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **MOISTURE MEMBRANE** - 6 MIL. PLASTIC. APPLIES ONLY WHEN NATIVE MATERIAL IS USED FOR BACKFILL. PLACE MEMBRANE SECURELY AGAINST ECCENTRIC CONE AND HOLE SIDEWALL.
3. **BOLTED RING & GRATE** - DIAMETER AS SHOWN. CLEAN CAST IRON WITH WORDING **"STORM WATER ONLY"** IN RAISED LETTERS. **BOLTED IN 2 LOCATIONS** AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
4. **GRADED BASIN OR PAVING** (BY OTHERS).
5. **STABILIZED BACKFILL** - 1 SACK SLURRY.
6. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL .265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED.**
7. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS TO **MAXIMIZE BEARING SURFACE**.
8. **MIN. 6' Ø DRILLED SHAFT**.
9. **SUPPORT BRACKET** - FORMED 12 GA. STEEL. **FUSION BONDED EPOXY COATED**.
10. **OVERFLOW PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
11. **DRAINAGE PIPE** - ADS HIGHWAY GRADE WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS TO PREVENT BUCKLING OR BREAKAGE. DIAMETER AS NOTED.
12. **BASE SEAL** - GEOTEXTILE OR CONCRETE SLURRY.
13. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2" TO **BEST COMPLEMENT SOIL CONDITIONS**.
14. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. 120" OVERALL LENGTH WITH TRI-B COUPLER.
15. **MIN. 4' Ø SHAFT** - DRILLED TO **MAINTAIN PERMEABILITY** OF DRAINAGE SOILS.
16. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION.
17. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY.
18. **FREEBOARD DEPTH** VARIES WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE OVERFLOW PIPE INLET.
19. **INLET PIPE** (BY OTHERS).



CUDO® CUBES

Operations and Maintenance Manual
(Underground Retention/Detention/Infiltration/Water Reuse Systems)

Water

CUDO® Stormwater Cube - Modular Stormwater Systems

Description / Basic Function

CUDO is a modular stormwater system comprised of a grouping of modular polypropylene or concrete cubes that when constructed form an underground storage area for stormwater. This system can be used for infiltration, retention, detention or water reuse. CUDO can help achieve runoff detainment and storage to help attenuate the peak flow to pre-construction levels and can help conform to current Low Impact Development requirements.

Infiltration

The purpose of a CUDO infiltration system is to capture stormwater runoff, store the runoff, and then allow it to percolate into the ground via the open space area of the cubes and perforations in the side wall. The system is backfilled with a Class I material defined by ASTM D2321 as a cleaned open graded rock or a Class II permeable sand. The rock or sand provide additional storage capacity but also allow for a percolation interface with the native material. The ground water is "recharged" with this type of system.

Detention

The purpose of a CUDO detention system is to capture stormwater runoff, store the runoff, and then allow it to be released at a controlled rate through an appropriately sized orifice control. A detention system helps attenuate the peak flow from the site assuring that pre-development runoff flows are not exceeded as a result of the development. A CUDO detention requires the cubes to be encapsulated with an impermeable liner for the polypropylene system or the seams of the concrete system to be sealed with a water proof mastic.

Retention

A CUDO retention system is a hybrid system. It is a combination of a detention system and an infiltration system. A retention system is utilized to attenuate peak flow as well as promote groundwater re-charge. A retention system is outfitted with an overflow pipe at the top of the system which allows the system to fill for infiltration but also outlet if the ground is saturated.

Water Reuse

The purpose of a water-reuse CUDO system is to capture and store water for future use. The system is constructed in a similar fashion to a detention system but instead of a controlled outlet the system is constructed with an emergency overflow. A water reuse system is a Low-Impact Development (LID) device that helps attenuate peak flows as well as conserve water. Water may be reused through an active pump system or passive irrigation.

Inspection/Cleanout Ports

Inspection and cleanout ports are 18-inch diameter vertical risers connected to the uppermost polypropylene CUDO cubes or up to 30-inch manhole access connected to the concrete CUDO. They are used for entrance into the system, or for access to place vacuum truck hoses or water-jetting devices or CCTV equipment. Ports are strategically located near inlet and outlet pipes and in other areas or probable deposition in the system. It is recommended to keep surface level access lids sealed and bolted at all times when the system is in service.

Inlet Bay

Some systems are configured so that pretreatment of the stormwater occurs within the CUDO system. In this case, the CUDO system will house an inlet bay. The inlet bay is separated from the rest of the CUDO system by sidewall plugs and is intended to separate gross pollutants, trash and debris and floatables from the CUDO system and pre-treatment device. The bay contains its own sump area and unique access ports.

Maintenance Overview for CUDO

State and Local regulations require that stormwater storage systems be maintained and serviced on a recurring basis. The purpose of maintaining a clean and obstruction free CUDO system is to ensure the system performs the intended function of the primary design. Trash and debris, floatables, gross pollutants and sediment can build up in the CUDO leading to clogging of the native soil interface or blockage of the inlet or outlet pipes. This can cause the system to function improperly by limiting storage volume, limiting the design percolation rates or impeding flow in and out of the system. Downstream and upstream, areas could run the risk of flooding and deleterious environmental impact.

Recommended Frequency of Service

It is recommended that the CUDO stormwater systems be serviced on a regularly occurring basis. Ultimately the frequency depends on the amount of runoff, pollutant loading, and interference from trash, debris and gross pollutants as well as proper maintenance of upstream pretreatment devices. However, it is recommended that each installation be inspected at least two times per year to assess service needs.

Recommended Timing of Service

Guidelines for the timing of service are as follows:

1. For areas with a definite rainy season the system should be serviced prior to and following the rainy season.
2. For areas subject to year-round rainfall service should occur on a regularly occurring basis. (A minimum of two times per year.)
3. For areas with winter snow and summer rain the system should be serviced prior to and after the snow season.
4. For installed devices that are subject to dry weather flows only (i.e. wash racks, parking garages, etc...) the unit should be serviced on a regularly occurring basis. (A minimum of two times per year.)

Inspection

An inspection should be performed when the system is new. This allows the owner to establish a baseline condition for comparison to future inspections. Sediment build up can typically be monitored without entering the system. (No confined space entry.) Initial and subsequent inspection data should be recorded and filed for reference. Some regulatory agencies require that the results of the inspections be documented and reported. Inspection reports should comply with regulatory requirements and be submitted as required.

Inspection Procedures

5. Locate the inspection, cleanout and access ports. Inspection and cleanout ports are typically 18-inch diameter. Access ports are typically 24-inch or 30-inch diameter. Pictures should be taken to document the location or a site map should be generated to detail the as-built locations of the ports.
6. Unbolt and remove the access port lids.
7. Insert a measuring device into the opening making note of a point of reference to determine the quantity of sediment and other accumulated material. If access is required to measure, ensure only certified confined space entry personnel having appropriate equipment are allowed to enter the system.
8. In addition, for accessible concrete CUDO systems personnel should utilize appropriate confined space entry procedures to enter the system and photograph its condition.
9. Inspect inlet and outlet locations for obstructions. Obstructions should be removed at this time.
10. Inspect the structural components of the system.
11. Fill in the CUDO Inspection/Maintenance Data Sheet and send a copy to the regulatory agency if necessary.

Disinfection of Water Reuse System

Periodic disinfection of water held for reuse may be required to abate bacteria and algae growth. This may be done using calcium hypochlorite tablets or by the addition of an ozone generator in a small recirculation system.

Maintenance

Cleanout of the CUDO system should be considered if there is sediment buildup of two or more inches at over 50% of the inspection ports. Cleaning shall be performed if sediment buildup is two inches or more over 75% of the system floor. In the event of a spill of a foreign substance, cleanout of the system should be considered.

Maintenance Procedures

1. Locate the inspection, cleanout and access ports. Inspection and cleanout ports are typically 18-inch diameter. Access ports are typically 24-inch or 30-inch diameter. Pictures should be taken to document the location or a site map should be generated to detail the as-built locations of the ports.
2. Unbolt and remove the access port lids.
3. Measure the sediment buildup at each port. If access is required to measure ensure only certified confined space entry personnel having appropriate equipment are allowed to enter the system.
4. A thorough cleaning of the system (inlets, outlets, ports, and inlet bays) shall be performed by either a vacuum truck or by manual methods.
5. Inspect inlet and outlet locations for obstructions. Obstructions should be removed at this time.
6. Inspect the structural components of the system.
7. Fill in the CUDO Inspection/Maintenance Data Sheet and send a copy to the regulatory agency if necessary.

Inspection / Maintenance Requirements

Below are some recommendations for equipment and training of personnel to inspect and maintain a CUDO system.

Personnel: OSHA Confined Space Entry Training is a prerequisite for entrance into a system. In the state of California personnel should be CalOSHA certified.

Equipment: Record Taking (pen, paper, voice recorder)
Proper Clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
Flashlight
Tape Measure
Measuring Stick
Pry Bar
Traffic Control (flagging, barricades, signage, cones, etc.)
First Aid Materials
Debris and Contaminant Containers
Vacuum Truck

Disposal of Gross Pollutants, Hydrocarbons, and Sediment

The collected gross pollutants, hydrocarbons, and sediment shall be offloaded from the vacuum truck into DOT approved containers for disposal. Once in the container the maintenance contractor has possession and is responsible for disposal in accordance with local, state and federal agency requirements.

Note: As the generator, the landowner is ultimately responsible for the proper disposal of the collected materials. Because the material likely contains petroleum hydrocarbons, heavy metals, and other harmful pollutants, the materials must be treated as EPA class 2 Hazardous Waste. Proper disposal is required.

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

CONTECH® ENGINEERED SOLUTIONS

800.925.5240
www.ContechES.com

CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.