Appendix F

Preliminary Water Quality Management Plan

PRELIMINARY PRIORITY
WATER QUALITY MANAGEMENT PLAN
(WQMP)

For:

Kornerstone Muslim Cemetery
2205 E. Palmyra Avenue & 290 S. Yorba Street, Orange, CA 92869
GPS: 33.78486°N, 117.82969° W

Prepared for:
Kornerstone Park LLC
2500 E. Ball Road, Suite 260
Anaheim, CA 92806
(714) 284-0111

Prepared by:
DRC Engineering, Inc.
Gregory R. Cooke, P.E., PLS, RCE 39478
160 S. Old Springs Road, Suite 210
Anaheim, CA 92808
(714) 685-6860

REGISTERED PROFESSIONAL ENGINEER
GREGORY R. COOKE
No. 39478
Exp. 12-31-21
CIVIL
STATE OF CALIFORNIA

Prepared on: April 2021

_____ _____
Public Works Director **Date**

_____ _____
City Engineer **Date**

OWNER'S CERTIFICATION
WATER QUALITY MANAGEMENT PLAN

FOR

Kornerstone Muslim Cemetery

This Water Quality Management Plan (WQMP) for the Kornerstone Muslim Cemetery has been prepared for Kornerstone Park LLC. This WQMP is intended to comply with the requirements of the City of Orange CUP 3130-20, MJSP 1023-20, requiring preparation of a Water Quality Management Plan.

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 City of Orange Local Implementation Plan (LIP), and the intent of NPDES Permit and Waste Discharge Requirements for the City of Orange, County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this WQMP. Maintenance requirements within Section V and Appendix D will be adhered to with particular emphasis on maintaining the BMPs described within Sections IV and V. The Owner's Annual Self Certification Statement along with a BMP maintenance implementation table will be submitted by June 30th every year following project completion. At least one copy of the approved WQMP shall be available on the subject property in perpetuity.

Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. The City of Orange will be notified of the change of ownership and the new owner will submit a new certification.

Signature: _____ Date: _____

Name: Abdul Saquib

Title: _____

Company: Kornerstone Park LLC

Address: 2500 E. Ball Road, Suite 260, Anaheim, CA 92806

Telephone Number: (714) 284-0111

Notice of Transfer of Responsibility

Water Quality Management Plan (WQMP)

WQMP Number – As assigned by the City of Orange:_____

Submission of this Notice of Transfer of Responsibility constitutes notice to the City that responsibility for the Water Quality Management Plan (WQMP) for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or portion thereof) to the New Owner, as further described below.

I. Previous Owner/ Responsible Party Information

Company/ Individual: Kornerstone Park LLC Contact Person: _____

Street Address: 2500 E. Ball Road, Suite 260 Title: _____

City Anaheim State CA Zip 92806 Phone: (714) 284-0111

II. Information about Site Relevant to WQMP

Name of Project: Kornerstone Muslim Cemetery_____

_____

Title of WQMP applicable to site: _____

Street Address of the site: 2205 E. Palmyra Avenue & 290 S. Yorba Street, Orange, CA 92869

Date of Transfer of Responsibility: _____

III. New Owner/ Responsible Party Information

Company/ Individual:_____ Contact Person:_____

Street Address:_____ Title:_____

City _____State____ Zip_____ Phone:_____

Table of Contents

Appendices

List of Tables

I. Discretionary Permit Number(s), Water Quality Condition Number(s) and Conditions of Approval

Tract No. Lots 36 to 40 of Tract 8009 and portion of A.B. Chapman Tract, Block "C"

GPS: 33.78486°N, 117.82969° W

Water Quality Conditions (WQMP conditions listed below):

A complete copy of the signed Conditions of Approval will be included as Appendix A once available.

II. Project Description

Planning Area: R-O Recreating Open Space (per Zoning Map)

Project Size (ac): 6.0 ac (Disturbed area: 4.3ac)

Percent Change in Impermeable Surfaces: +54.8%

SIC Code: 6553 – Cemetery Subdividers and Developers

Project Description

The project site is located at 2205 E. Palmyra Avenue and 290 S. Yorba Street on the northwest corner of Palmyra Avenue and Tracy Lane. It is bounded by Santiago Creek on the west, Palmyra Avenue and a residential development on the south, Orange Unified School District Child Development Center on the east, and City of Orange's Yorba Park and Orange Dog Park on the north. The land use for the project site is currently identified as "R-O Recreation Open Space" per City of Orange's Zoning Map.

A total of approximately 4.3 acres will be disturbed as a result of the development. The proposed development includes the removal of the existing paved parking area and the construction of a new paved parking area of 24,120 SF, an 800-SFshed, 12,610 SF of sidewalk, 6,330 SF of landscaped areas, and cemetery plots. The existing building will remain in place. The plots will be concrete encased with 4 inches of gravel on top.

Because portions of the site were landfill area, no infiltration will be allowed on the site.

Project Purpose and Activities

The purpose of the project is to construct a cemetery on the currently undeveloped area. A total of approximately 4.3 acres will be disturbed around the existing building which is to remain in place.

Activities that will be routinely conducted on the project site will be funeral procession, vehicle traffic in the parking lot, and pedestrian traffic in the cemetery. Materials for business operation will be loaded and unloaded only in the paved parking lot. There is no outdoor material storage or outdoor food preparation areas. Wastes stored on site are contained in designated trash enclosure and trash receptacles located on the site. Activities associated with equipment or vehicle maintenance and repair, washing, or cleaning are not permitted.

Potential Storm Water Pollutants

Expected pollutants from the rest of the site include suspended solid and sediments, nutrients, metals, pathogens (bacteria/virus), pesticides, oil and grease, organic compounds, oxygen demanding compounds, trash and debris.

Hydrologic Conditions of Concern

The portion of the site that drains directly into Santiago Creek will not be disturbed. The existing hiking path and the proposed wall will provide a barrier on the west side. This barrier and the proposed grading

will ensure the storm runoff from the area to be under construction will drain to the proposed storm drain systems.

The construction area has the potential to cause hydrologic conditions of concern based on the factors listed below:

1. The runoff volume for the 2-year, 24-hour storm will increase more than 5% from the existing condition to the proposed condition; the time of concentration will decrease more than 5% from the existing condition to the proposed condition:

Existing Condition			
	DA A	DA B	
Tc (min)	8.34	6.98	**Total**
Q_2 (cfs)	5.58	1.84	7.42
V_2 (cf)	6,534	871	7,405

Proposed Condition				
	DA A	DA B	DA C	
Tc (min)	6.87	5.00	5.00	**Total**
Q_2 (cfs)	6.92	2.42	0.28	9.62
V_2 (cf)	26,136	871	0	27,007

2. According to Orange County WQMP TGD Appendix XVI.3 Susceptibility Map, the site is in Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility. Also, the site will discharge into the storm drain systems that discharge into Santiago Creek. According to Fig. XVI.3, a portion of Santiago Creek downstream from the site is unstable earth channel.

Underground detention system is proposed to mitigate the increase of runoff volume and the decrease of time of concentration. The proposed storm drain system will convey the storm water from the constructed areas to a pretreatment unit before entering the underground detention system. The outflow storm drain will connect the detention system to a proposed diversion manhole. There are 2 outlets from the diversion manhole:

1. A storm drain pipe will connect from the invert of the detention system to a proposed pump so that the water stored in the underground detention pipes can be pumped to the proposed proprietary biofiltration system for treatment.

2. Flows greater than the required treatment rate will discharge through control device in the diversion manhole so that the peak discharge rates will not exceed the allowable rates.

Post Development Drainage Characteristics

The project site has 3 drainage areas:

- DA A: This area encompasses the majority of the construction area. DA A will include the grave areas, the existing building and the proposed parking and landscape areas. The proposed storm drain systems will convey the water to the proposed detention system.

- DA B: This is the area drains directly into Santiago Creek and it will not be undisturbed.

- DA C: This is a narrow strip of land along the south property boundary. This area will be outside of the proposed retaining wall. It will be infeasible to collect the storm water from this area to discharge into the proposed on-site storm drain. Since this area will be landscaped, it is a self-treat area.

Site Ownership and any Easements

The entire project site is owned and managed by Kornerstone Park LLC.

2500 E. Ball Road, Suite 260, Anaheim, CA, 92806

(714) 284-0111

III. Site Description

Reference Location Map: See Section VI of this WQMP for location map

Site Address: 2205 E. Palmyra Avenue & 290 S. Yorba Street, Orange, CA 92869

Zoning: R-O, Recreation Open Space

Predominant Soil type: A

Pre-project percent pervious: 10% **Post-project percent pervious:** 10%

Pre-project percent impervious: 90% **Post-project percent impervious:** 90%

Site Characteristics

The project site is located at 2205 E. Palmyra Avenue and 290 S. Yorba Street at the northwest corner of Palmyra Avenue and Tracy Lane. It is bounded by Santiago Creek on the west, Palmyra Avenue and a residential development on the south, Orange Unified School District Child Development Center on the east, and City of Orange's Yorba Park and Orange Dog Park on the north.

Historically, portions of the site were used as a refuse dump site operated by the County of Orange; however, it is not listed under California State Waterboard's Geotracker website (https://geotracker.waterboards.ca.gov/) as contaminated or requires cleanup.

The site is currently occupied by a building and a paved parking lot with site entrance at the knuckle near the street intersection of Palmyra Avenue and S. Tracy Lane. An existing trail/bike path divides the site into the westerly portion that is mainly the Santiago Creek, and the easterly portion that is mostly vacant but will be developed into a cemetery.

Geotechnical report is not yet available. Information regarding the soil onsite and groundwater will be provided once the geotechnical report is available.

There are existing underground sewer, water, and dry utilities servicing the existing building. The project proposes a new storm drain system to mitigate the stormwater runoff generated from the site.

Watershed Characteristics

Watershed: Lower Santa Ana River Watershed

Downstream Receiving Waters: Santiago Creek Reach 1, Santa Ana River Reaches 2 and 1, Pacific Ocean

Water Quality Impairments (if applicable): None

Identify hydromodification susceptibility:

According to Orange County WQMP TGD Appendix XVI.3 Susceptibility Map, the site is in Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility. Also, the site will discharge into the storm

drain systems that discharge into Santiago Creek. According to Fig. XVI.3, a portion of Santiago Creek downstream from the site is unstable earth channel.

IV. Best Management Practices

IV.1 Site Design and Drainage Characteristics

Table 1 - Site Design BMPs

Technique	Included?		If no, state justification.
	Yes	No	
Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction)	X		
Create Reduced or "Zero Discharge" Areas (Runoff Volume Reduction)[1]		X	The site was a landfill so infiltration is limited and not encouraged.
Minimize Impervious Area/Maximize Permeability (C-Factor Reduction)[2]		X	The site was a landfill so permeability is limited.
Conserve Natural Areas (C-Factor Reduction)	X		The existing slope in the westerly portion of the site is conserved.

1 Detention and retention areas incorporated into landscape design provide areas for retaining and detaining stormwater flows, resulting in lower runoff rates and reductions in volume due to limited infiltration and evaporation. Such Site Design BMPs may reduce the size of Treatment Control BMPs.

2 The "C Factor" is a representation of the ability of a surface to produce runoff. Surfaces that produce higher volumes of runoff are represented by higher C Factors. By incorporating more pervious, lower C Factor surfaces into a development, lower volumes of runoff will be produced. Lower volumes and rates of runoff translate directly to lowering treatment requirements.

Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction):

Proposed landscaped areas in the site design is used to minimize directly connected impervious areas to the maximum extent possible.

Conserve Natural Areas (C-Factor Reduction):

Santiago Creek, the slopes along the creek and the existing trail/bike path will not be disturbed; construction is proposed in the area east of the trail.

IV.2 Source Control BMPs

IV.2.1 Routine Non-Structural BMPs

Table 2 - Routine Non-Structural BMPs

BMP No.	Name	Check One		If not applicable, state brief reason.
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	X		
N2	Activity Restriction	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance		X	Hazardous materials will not be used, handled, or stored on the site.
N6	Local Water Quality Permit Compliance		X	This BMP is not applicable. The City of Orange does not issue water quality permits.
N7	Spill Contingency Plan		X	No gas or hazardous material proposed for this site.
N8	Underground Storage Tank Compliance		X	No underground storage tank is proposed for this site.
N9	Hazardous Materials Disclosure Compliance		X	Hazardous materials will not be used, handled, or stored on the site.
N10	Uniform Fire Code Implementation		X	Hazardous materials will not be used, handled, or stored on the site.
N11	Common Area Litter Control	X		
N12	Employee Training	X		
N13	Housekeeping of Loading Docks		X	No loading docks are proposed.
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		

N1. Education of Property Owners, Tenants and Occupants.

Proper education of employees will help to reduce all potential and anticipated pollutants from the site. Practical information shall be provided by the property owner to the employees on general good housekeeping BMPs and other practices that contribute to protection of storm water quality. Prior to sell of land, the current property owner will provide a copy of the WQMP to the future property owner. This WQMP shall be provided with emphasis placed on the materials included in, but not limited to, Sections IV, V, VI and VII of this report. For additional information, see BMP SC-10, Non-Stormwater Discharges, included in Section VII and the BMP Maintenance Responsibility/Frequency Matrix in Section V. Education Materials to be used include, but are not limited to, SC-10, Non-Stormwater Discharges, SC-34, Building & Grounds Maintenance, and City of Orange LIP Section A-5.

N2. Activity Restrictions.

Onsite activities shall be restricted to those currently granted by the City of Orange Municipal Code and not prohibited within this WQMP. Some general activity restrictions that shall be adhered to are:

- No discharges of fertilizer, pesticides, and wastes to streets or storm drains
- No blowing or sweeping of debris into streets or storm drains
- No hosing down of paved surfaces
- No vehicle fueling, washing, or maintenance

In addition, onsite activities shall be limited to the requirements of this WQMP as described herein. Adhering to appropriate activity restrictions will help to reduce all anticipated and potential pollutants from the site.

N3. Common Area Landscape Management.

All maintenance shall be consistent with the *City of Orange Water Quality Ordinance*. Proper landscape maintenance practices will help to reduce or eliminate pollution from pesticides, nutrients, trash/debris, and sediments. General guidelines include the following: Plant vegetation that reduces water, fertilizer, herbicide, and pesticide use. Waste shall be disposed of by composting or at a permitted landfill and shall not be raked or blown into the street, gutter, or storm drains. Irrigation systems shall be inspected monthly for poorly aligned sprinkler heads, broken sprinkler heads, and leaks. Detected problems shall be repaired as soon as they are observed. Avoid over-watering of vegetation. If excessive runoff is observed, automatic timers shall be adjusted. Note that the actual irrigation schedule and levels may vary based on soil type, maturity of vegetation, exposure, and seasonal conditions. If fertilizer is spilled on a paved surface it should be swept up immediately and placed in its container. Water shall not be used to clean fertilizer spills unless necessary and only after the area has been thoroughly cleaned using dry cleaning methods. Pesticides, herbicides, and fertilizers shall not be applied within 48 hours prior to rain or if wind speeds exceed 5 mph. Pesticides shall be applied only as a last resort and after other pest mitigation efforts have been attempted. Non-pesticide mitigation measures include cultural tactics (modifying routine landscape activities, adjusting the amount of irrigation applied to the area, etc.), mechanical tactics (mulching and manual removal of weeds and larger pests such as snails), environmental/ physical tactics (netting, etc.), and biological tactics (using living organisms such as lady bugs and herbivores to control pests). Storage of pesticides shall

be away from living areas and in a covered area that is not subject to temperature extremes. For additional information, see BMP SC-41, Building & Grounds Maintenance, SC-73, Landscape Maintenance, and BMP SD-10, Site Design and Landscape Planning, included in Section VII and the BMP Maintenance Responsibility/Frequency Matrix in Section V. Also refer to Water Quality Guidelines for Landscaping and Gardening included in Section VII and the City of Orange LIP Section A-5, a copy of which is included in Section VII.

N4. BMP Maintenance.

Selected BMPs will be maintained to ensure proper operation and daily function as applicable. See the BMP Maintenance Responsibility/Frequency Matrix in Section V for details. Appropriate BMP Maintenance practices will help to reduce all pollutants from the site.

N11. Common Area Litter Control.

Kornerstone Park LLC shall implement trash management and litter control procedures aimed at reducing pollution of storm water runoff due to trash and debris. Kornerstone Park LLC will contract with a maintenance firm to provide regularly scheduled landscape maintenance and parking lot maintenance that will include litter removal, emptying of trash receptacles, and picking up of grass and plant clippings. Litter receptacles shall be cleaned frequently to prevent spillage. Spills shall be wiped up with rags or other absorbent materials and not hosed down to a storm drain system. For additional information, see BMP SC-41, Building & Grounds Maintenance, and SC-43, Parking/Storage Area Maintenance, included in Section VII. Also see the BMP Maintenance Responsibility/Frequency Matrix in Section V.

N12. Employee Training.

Ensuring that employees are properly trained will help to reduce all anticipated and potential pollutants from the site. All new employees will be trained on how to minimize impacts to water quality. The educational materials provided in Section VII will be reviewed. For additional information, see the BMP Maintenance Responsibility/Frequency Matrix in Section V.

N14. Common Area Catch Basin Inspection.

Proper maintenance of the onsite catch basins will help to reduce the amount of trash/debris and silt/sediment in runoff. The onsite catch basins shall be inspected and cleared of any trash or debris in or around the opening prior to the rainy season (by October 1st). Thereafter, inspections will be conducted every four months. Also see the Maintenance Responsibility/ Frequency Matrix in Section V.

N15. Street Sweeping Private Streets and Parking Lots

The parking lots and drive aisles shall be swept weekly to remove debris. For additional information, see BMP SC-43, Parking/Storage Area Maintenance and BMP SC-70, Road and Street Maintenance

IV.2.2 Routine Structural BMPs

Table 3 - Routine Structural BMPs

Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Provide storm drain system stenciling and signage- "No Dumping – Drains to Ocean"	X		
Design and construct outdoor material storage areas to reduce pollution introduction		X	No material is stored outdoor on the project site.
Design and construct trash and waste storage areas to reduce pollution introduction	X		
Use efficient irrigation systems & landscape design	X		
Protect slopes and channels and provide energy dissipation		X	Santiago Creek and the trail along the creek are maintained by the state
Incorporate requirements applicable to individual project features			
a. Dock areas		X	The project does not include the construction of dock areas.
b. Maintenance bays		X	The project does not include the construction of maintenance bays.
c. Vehicle or community wash areas		X	Vehicle wash areas are not present or proposed on the project site.
d. Outdoor processing areas		X	There are no outdoor processing areas on the site.
e. Equipment wash areas		X	Equipment wash areas are not present or proposed on the project site.
f. Fueling areas		X	Fueling areas are not present or proposed on the project site.
g. Hillside landscaping		X	Hillside is to be protected in place in the current condition.
h. Wash water control for food preparation areas		X	No new food preparation areas are proposed.

Provide storm drain system stenciling and signage – "No Dumping – Drains to Ocean".

Mark all inlets with the words "No Dumping – Drains to Ocean". Maintain and annually inspect for the need to repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in CASQA BMP SC-44, "Drainage System Maintenance" and SD-13, "Storm Drain System Signs".

Design and construct trash and waste storage areas to reduce pollution introduction.

A trash enclosure is proposed at the southeast side of the site. The trash containers will be fitted with lids to prevent storm water from entering the containers. The storm runoff from the trash enclosure area will drain into the proposed storm drain system to the detention system and treatment units.

Use efficient irrigation system & landscape design.

Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. Recess the landscaped area by 1" to 2" from the top of curb to prevent irrigation runoff and hold smaller storm events in planter. See BMP SD-12, "Efficient Irrigation".

Protect slopes and channels and provide energy dissipation

The channel and slopes along Santiago Creek are maintained by the state.

IV.3 Low Impact Development BMP Selection

IV.3.1 Hydrologic Source Controls

None of the Hydrologic Source Control BMPs below will be implemented at the project site due to the historical use of the site as a landfill.

Table 4 - Hydrologic Source Control BMPs

Name	Check If Used
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☒
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

Impervious area dispersion

Grate inlets are proposed on the north side of the existing building. The storm water from the roof drains on the north side of the building will flow through the proposed landscape areas before entering the new inlets.

IV.3.2 Infiltration BMPs

Table 5 - Infiltration BMPs

Name	Check If Used
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Table 6 - Evapotranspiration, Rainwater Harvesting BMP

Name	Check If Used
All HSCs; See Section IV.3.1	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☒
Other:	☐
Other:	☐
Other:	☐

Underground Detention

Underground detention system is proposed to mitigate the storm water volume and time of concentration, and to reduce the peak discharge rate after the construction. The detention system will have a pretreatment unit. The outlets of the detention system include 2 bubble-out inlets and a pump. The pump will pump the storm water to a proposed biofiltration unit before discharge the water into the street.

IV.3.4 Biotreatment BMPs

Table 7 - Biotreatment BMPs

Bioretention with underdrains	☐
Storm water planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☒
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Proprietary vegetated biotreatment systems

Modular Wetlands System (MWS) units are proposed for stormwater treatment. MWS units have small foot print that can retrofit to the site design. According to BioClean, the manufacture of MWS units, the pollutant removal efficiency of MWS units include 85% of total suspended solids (TSS), 64% of total phosphorus, 67% of ortho phosphorus and 95% of motor oil.

IV.3.5 Hydromodification Control BMPs

Underground detention system is proposed to mitigate the increase of runoff volume and the decrease of time of concentration after the construction. The underground system has been sized to meet the following criteria:

- To store the required stormwater quality design volume before the water is pumped through the proposed MWS unit for treatment

- To detain storm water so that the peak discharge rate from the site after construction will not exceed the peak discharge rate from existing condition during a 2-year storm event

- To detain storm water so that the peak discharge rate from the site after construction will not exceed the peak discharge rate from existing condition during a 25-year storm event. This is to meet the protection requirement from Orange County Hydrology Manual.

IV.3.6 Regional/Sub-Regional LID BMPs

N/A

IV.3.7 Treatment Control BMPs

N/A

IV. 4 Water Quality Credits

N/A

IV.5 Alternative Compliance Plan

N/A

IV.6 Vector Control

The storm water will be collected and conveyed to the proposed underground detention pipes. The water stored in the detention pipes will be pumped to the proposed proprietary treatment system (MWS unit). From the MWS unit, the water will drain to the street via a proposed parkway drain. The dewatering of the detention system will take no longer than 48 hours.

IV.7 Drainage Management Area (DMA)

DMA		
DMA No.	BMPs	Area Treated
DA A	- N11 Common Area Litter Control - N14 Common Area Catch Basin Inspection - N15 Street Sweeping Private Streets and Parking Lots - Storm drain system stenciling and signage - Design and construct trash and waste storage areas to reduce pollution introduction - Use efficient irrigation systems & landscape Design - Impervious Area dispersion - Underground detention - Proprietary vegetated biotreatment systems - Vortex separator	193,234 SF
DA B	N/A, not disturbed	60,952 SF
DA C	Self-treating area (landscaped)	6,939 SF
Total Area		261,125 SF

See Sit Plan and Hydrology Map included in Section VI for designation of areas.

IV.8 Calculations

TECHNICAL GUIDANCE DOCUMENT APPENDICES

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	4.436	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.9	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.83	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	10692	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{observed}$[1] (in/hr) (**Appendix VII**)	$K_{observed}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{total} (unitless)	S_{total}=		
3	Calculate design infiltration rate, $K_{design} = K_{observed} / S_{total}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

[1] $K_{observed}$ is the vertical infiltration measured in the field, before applying a factor of safety. If field testing measures a rate that is different than the vertical infiltration rate (for example, three-dimensional borehole percolation rate), then this rate must be adjusted by an acceptable method (for example, Porchet method) to yield the field estimate of vertical infiltration rate, $K_{observed}$. See Appendix VII.

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

SITE

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

P:\9526E\16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

TITLE: RAINFALL ZONES

JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE XVI-1

V. Implementation, Maintenance and Inspection Responsibility for BMPs (O&M Plan)

Responsible Party Information (Local Contact Information)

Name: Abdul Saquib Title: _____

Company: Kornerstone Park LLC Phone No.: (714) 284-0111

Table 8 - Frequency Inspection Matrix

BMP	Responsible Party	*Maintenance Activity	*Inspection / Maintenance Frequency
Source Control BMPs (Structural and Non-structural)			
N1 Education for Property Owners, Tenants and Occupants	Kornerstone Park LLC 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Education of current employees/owner(s) shall be done within 4 weeks of startup with each new onsite employee/owner(s) being given a water quality orientation using this WQMP as reference within two weeks of hire date.	Ongoing with refresh instruction given on an annual basis
N2 Activity Restriction	Kornerstone Park LLC 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	There shall be no discharges of fertilizer, pesticides, or wastes to streets or storm drains. There shall be no blowing or sweeping of debris into storm drain. All debris shall be collected and relocated to an approved landfill. In addition, onsite activities shall be limited to the requirements of this WQMP as described herein.	Daily
N3 Common Area Landscape Management	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Landscape maintenance will consist of trimming and replanting of vegetation, repair and maintenance of irrigation systems, and appropriate use of fertilizers and pesticides.	Landscape maintenance shall be performed on a weekly basis. Irrigation systems shall be inspected monthly for leaks. Leaks shall be repaired as soon as they are observed.

BMP	Responsible Party	*Maintenance Activity	*Inspection / Maintenance Frequency
N4 BMP Maintenance	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	The proposed treatment BMPs will be maintained as outlined in Appendix D of this report.	As outlined in Appendix D of this report and in this matrix.
N11 Common Area Litter Control	Kornerstone Park LLC (via maintenance personnel and solid waste disposal service) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	The Owner will contract with a maintenance firm to provide weekly landscape maintenance and parking lot maintenance that will include litter removal and picking up grass and plant clippings. During routine maintenance all trash and debris will be picked up and placed in waste receptacles.	Weekly
N12 Employee Training	Kornerstone Park LLC 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Education of current employees shall be done within 4 weeks of startup with each new onsite employee being given a water quality orientation using this WQMP as reference within two weeks of hire date.	Ongoing with refresh instruction given on an annual basis
N14 Common Area Catch Basin Inspection	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Inspect area around catch basins for trash/debris and clean as necessary	Once prior to the rainy season (by October 1st) and every four months thereafter.
N15 Street Sweeping Private Streets and Parking Lots	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	The access roads and drive aisles shall be swept to remove debris	Weekly

BMP	Responsible Party	*Maintenance Activity	*Inspection / Maintenance Frequency
Provide storm drain system stenciling and signage – "No Dumping – Drains to Ocean".	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Maintain legibility of markers and signs.	Inspect a minimum of once per year in September and re-stencil/re-label as necessary to maintain legibility. See BMP SD-13 in Appendix C.
Use efficient irrigation system & landscape design.	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Check water sensors and adjust irrigation heads and timing.	Inspect irrigation equipment on a monthly basis for proper operation. Check water sensors monthly. Adjust irrigation heads and timing as necessary. See BMP SD-12 in Appendix C.
Modular Wetlands System (MWS Units)	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Inspect annually or per manufacturer's requirements whichever is more stringent.	Provide maintenance as per manufacturer's instructions included in Section D of this document. Remove trash/debris as necessary. Replace cartridge and drain down filter media. Trim vegetation. Unit maintenance as required by manufacturer.
Vortex separator (CDS)	Kornerstone Park LLC (via maintenance personnel) 2500 E. Ball Road, Suite 260 Anaheim, CA 92806 Contact: Abdul Saquib Ph: (714) 284-0111	Inspect minimum twice per year, more frequent if rapid accumulation of sediment or debris is observed.	Provide maintenance as per manufacturer's instructions included in Section D of this document. Remove trash/debris as necessary. Unit maintenance as required by manufacturer.

*Attach in appendix additional inspection, maintenance and operations information if required.

Regulatory Permits

N/A

Funding

Installation and on-going maintenance for all BMPs will be funded by Kornerstone Park LLC.

OWNER SELF CERTIFICATION STATEMENT

As the owner representative of the **Kornerstone Park LLC** for which a Water Quality Management Plan (WQMP) was approved by the City, I hereby certify under penalty of law that all Best Management Practices contained within the approved Project WQMP have been maintained and inspected in accordance with the schedule and frequency outlined in the approved WQMP Maintenance Table.

The maintenance activities and inspections conducted are shown in the attached table and have been performed by qualified and knowledgeable individuals. Structural Treatment BMPs have been inspected and certified by a licensed professional engineer.

To the best of my knowledge, the information submitted is true and accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and citations for violating water quality regulations.

Signature: _____ Date: _____

Name: Abdul Saquib

Title: _____

Company: Kornerstone Park LLC

Address: 2500 E. Ball Road, Suite 260, Anaheim, CA 92806

Telephone Number: (714) 284-0111

* This Owner Self Certification and the BMP tracking pages are to be submitted by no later than July 15th each year following construction.

Table 9 - BMP Implementation Tracking Table

BMP	Activity	Completion Dates or Frequency	Initial
Source Control BMPs (Structural and Nonstructural)			
N1 – Education for Property Owners, Tenants and Occupants	Educate current employees/owner(s) within 4 weeks of startup with each new onsite employee/owner(s) being given a water quality orientation. The training shall also take place annually thereafter.		
N2 – Activity Restriction	There shall be no discharges of fertilizer, pesticides, or wastes to streets or storm drains.		
	There shall be no blowing or sweeping of debris into storm drain. All debris shall be collected and relocated to an approved landfill.		
N3 – Common Area Landscape Management	Trim and replant of vegetation.		
	Repair and maintenance of irrigation systems.		
	Appropriate use of fertilizers and pesticides.		
N4 – BMP Maintenance	Maintain BMPs as outlined in Appendix D of the project WQMP.		
N11 – Common Area Litter Control	The maintenance firm contracted with the Owner is to provide weekly landscape maintenance and parking lot maintenance that includes litter removal and picking up grass and plant clipping.		
	All trash and debris are to be picked up and placed in waste receptacles.		
N12 – Employee Training	Educate current employees within 4 weeks of startup with each new onsite employee being given a water quality orientation using this		

BMP	Activity	Completion Dates or Frequency	Initial
	WQMP as reference within 2 weeks of hire date. . The training shall also take place annually thereafter.		
N14 – Common Area Catch Basin Inspection	Inspect area around catch basins for trash/debris and clean as necessary.		
N15 – Street Sweeping Private Streets and Parking Lots	Sweep access roads and drive aisles to remove debris.		
Provide storm drain system stenciling and signage – "No Dumping – Drains to Ocean".	Maintain legibility of markers and signs.		
Use efficient irrigation system & landscape design.	Check water sensors.		
	Adjust irrigation heads and timing.		
Low Impact Development and Treatment BMPs			
Modular Wetlands System (MWS Units)	Inspect annually or per manufacturer's requirements whichever is more stringent.		
Vortex separator (CDS)	Inspect minimum twice per year, more frequent if rapid accumulation of sediment or debris is observed.		

* This sheet is to be submitted annually with the Owner Self Certification Statement.

** Structural Treatment BMPs should be certified by a Licensed Professional Engineer.

VI. Location Map, Site Plan, and BMP Details

The following maps/exhibits are included in this section of the document:

Location Map

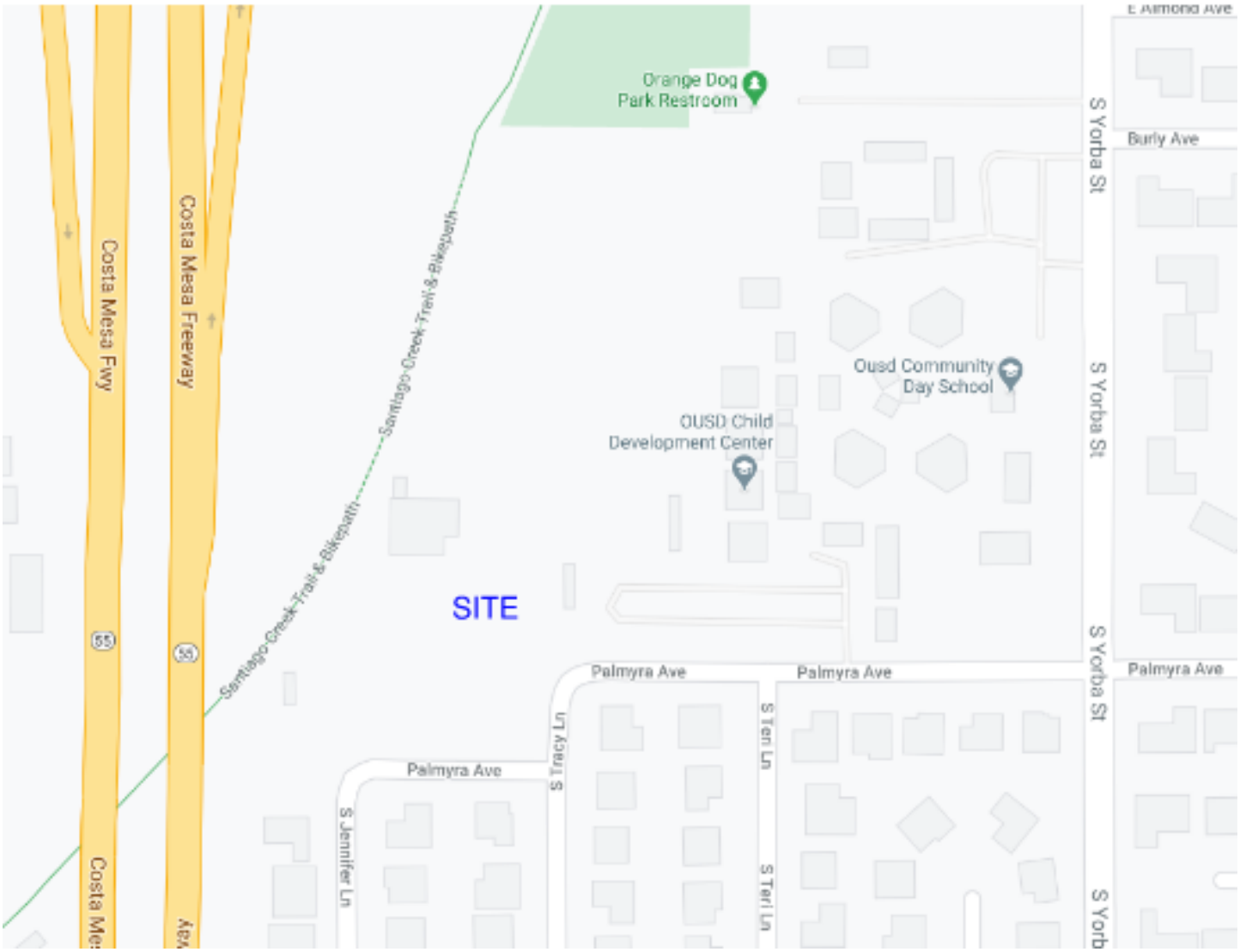
Site Plan

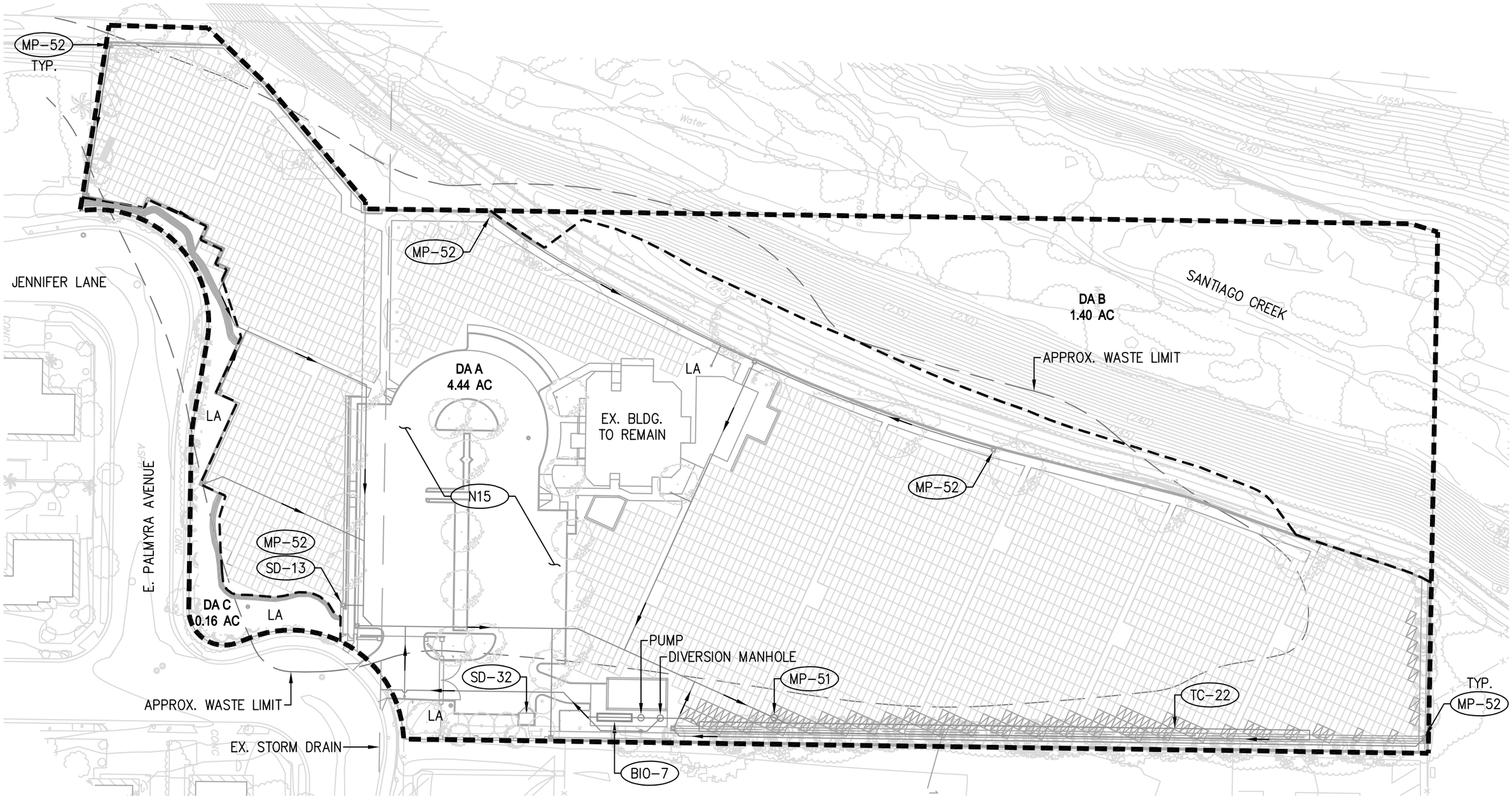
Proposed Hydrology Map

Drainage Area Exhibit

Details of the Low Impact Development BMPs used on the project are included in Appendix C.

Location Map





BMPs

BIO-7	PROPRIETARY BIOTREATMENT
N15	STREET SWEEPING
MP-51	VORTEX SEPARATOR
MP-52	DRAIN INLET (INLET INSERT)
SD-13	STORM DRAIN SIGNAGE
SD-32	TRASH STORAGE AREAS
TC-22	UNDERGROUND DETENTION SYSTEM

LEGEND

DA XX-X X.XX AC	DRAINAGE AREA ID ACREAGE
LA	LANDSCAPE AREA
	SITE BOUNDARY
	DRAINAGE AREA BOUNDARY
	PIPE FLOW DIRECTION

N

SCALE: 1"=60'

KORNERSTONE MUSLIM CEMETERY

WQMP SITE PLAN

ORANGE, CA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

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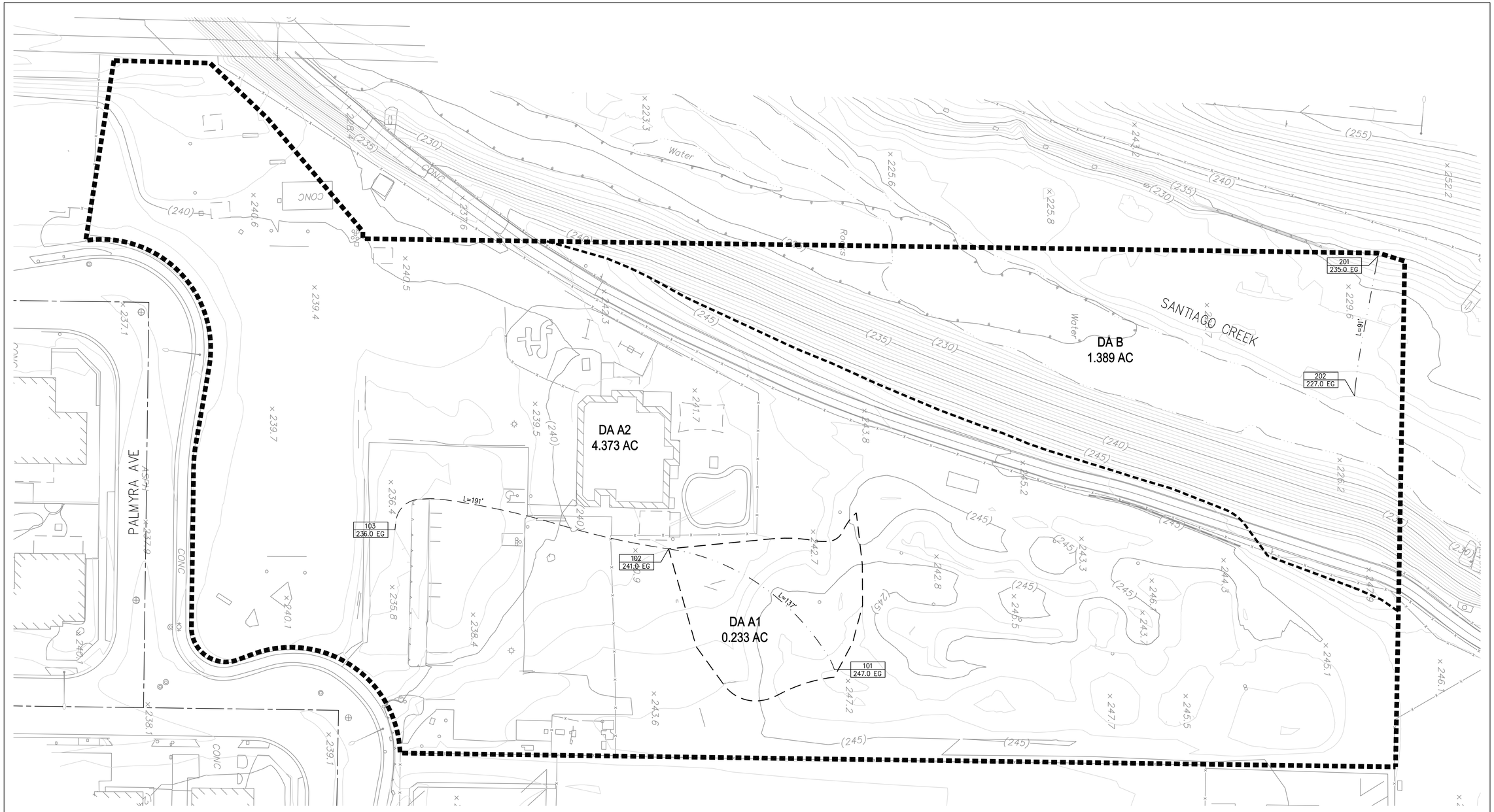

LEGEND

XXX / XXX.X FS	NODE NUMBER / ELEVATION
DA XX-X X.XX AC	DRAINAGE AREA ID / ACREAGE
	SITE BOUNDARY
	DRAINAGE AREA BOUNDARY
	DRAINAGE SUBAREA BOUNDARY
	FLOW PATH
L=XXX'	FLOW PATH LENGTH

30' 0' 30' 60' 90'

GRAPHIC SCALE: 1"=30'

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860
GREGORY R. COOKE R.C.E. 39478 DATE

NOT FOR CONSTRUCTION

NO.:	REVISION:	DATE:

PROJECT: **KORNERSTONE MUSLIM CEMETERY**
2205 E. PALMYRA AVE. & 290 S. YORBA ST.
ORANGE, CA

DRAWING NAME: **HYDROLOGY MAP - EXISTING**

ISSUE:	**CONCEPTUAL**
DATE:	**2021-03-30**
CHECKED: **DRC** DRAWN: **DRC**	
DRAWING FILE: .	
PROJECT NO.: **19-124**	
SHEET NUMBER: **1** OF 1 SHEETS	
SCALE: **AS SHOWN**	

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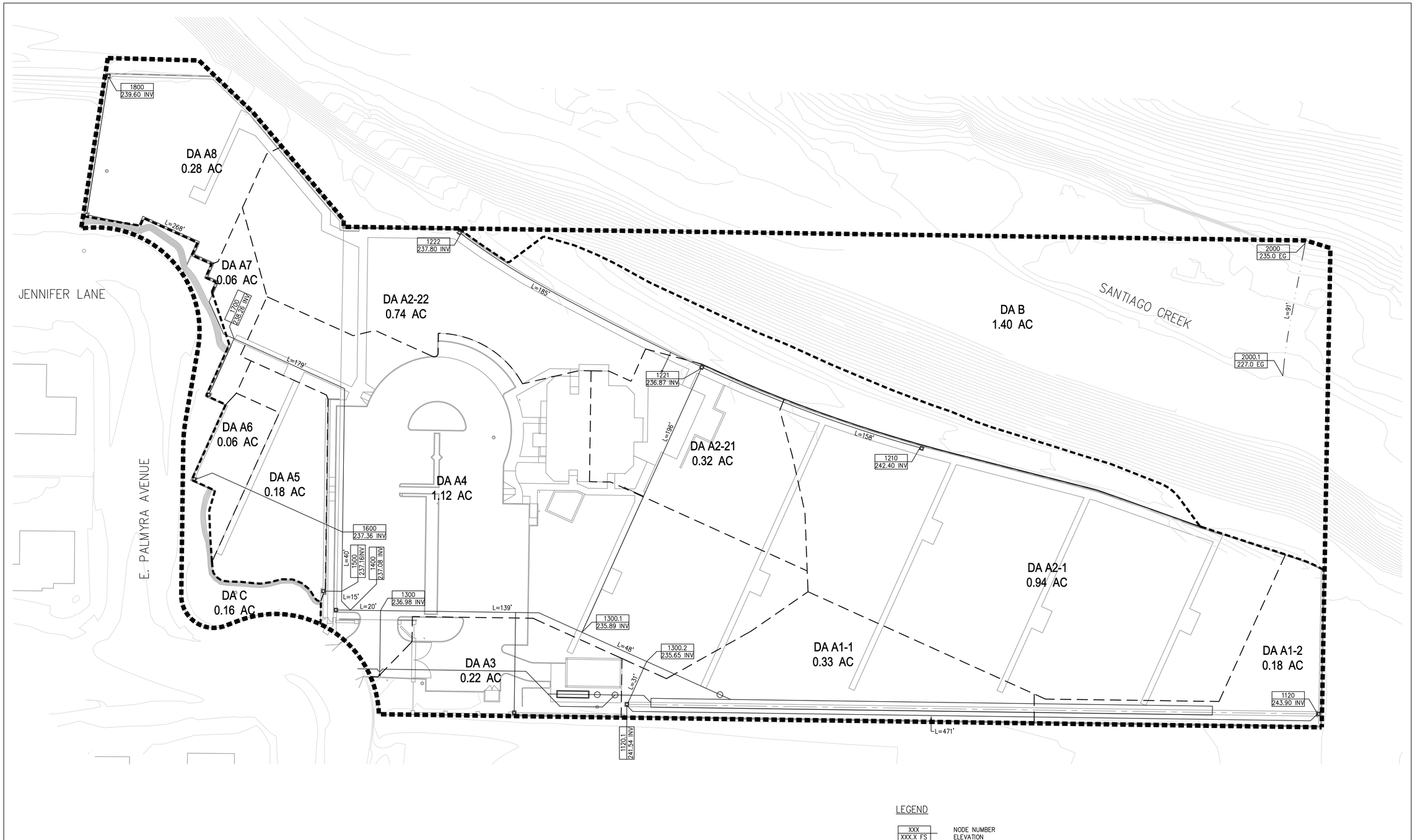

LEGEND

XXX / XXX.X FS	NODE NUMBER / ELEVATION
DA XX-X / X.XX AC	DRAINAGE AREA ID / ACREAGE
■■■■■	SITE BOUNDARY
- - - - -	DRAINAGE AREA BOUNDARY
— — —	DRAINAGE SUBAREA BOUNDARY
L=XXX'	FLOW PATH LENGTH

30' 0' 30' 60' 90'

GRAPHIC SCALE: 1"=30'

160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

R.C.E. 39478
GREGORY R. COOKE
DATE

NOT FOR CONSTRUCTION

NO.:	REVISION:	DATE:

PROJECT:
KORNERSTONE MUSLIM CEMETERY
2205 E. PALMYRA AVE. & 290 S. YORBA ST.
ORANGE, CA

DRAWING NAME:
HYDROLOGY MAP - PROPOSED

ISSUE:	CONCEPTUAL
DATE:	2021-03-30
CHECKED: DRC	DRAWN: DRC
DRAWING FILE:	.
PROJECT NO.:	19-124
SHEET NUMBER:	1
OF	1 SHEETS
SCALE:	AS SHOWN

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VII. Educational Materials

Refer to the City's website or the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available.

Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☒
Household Tips	☐	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (North County)	☐	Illegal Discharge/Illicit Connection CASQA Fact Sheet	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill Response	☒		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☐		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

Appendix A:

Conditions of Approval
Resolution No. _____dated _____

(Insert COA)

Appendix B:

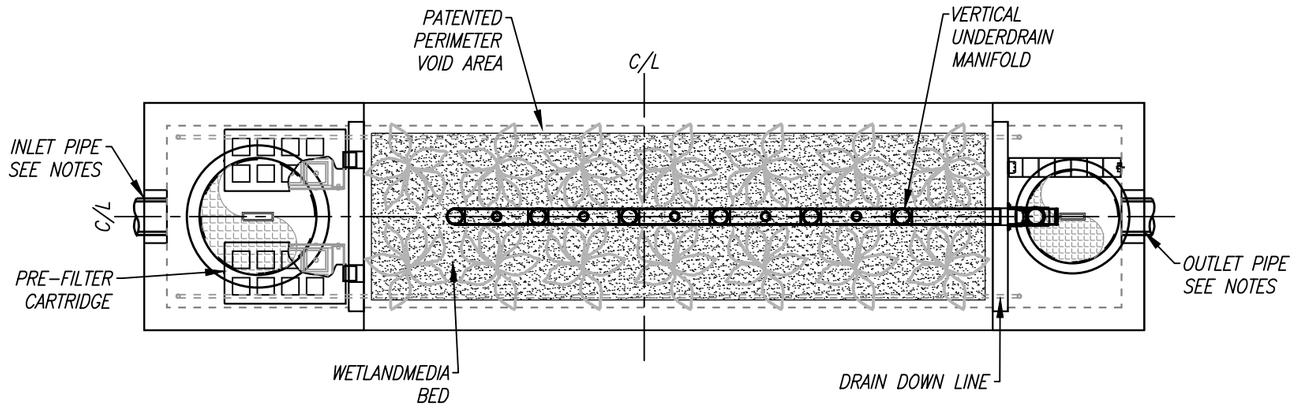
Educational Material

Appendix C:

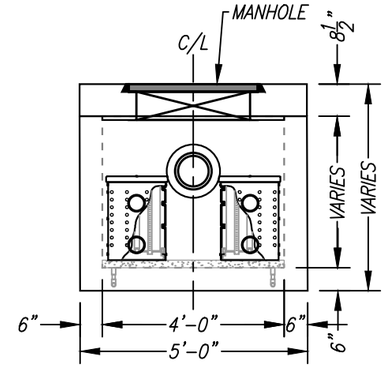
BMP Details

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.268	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



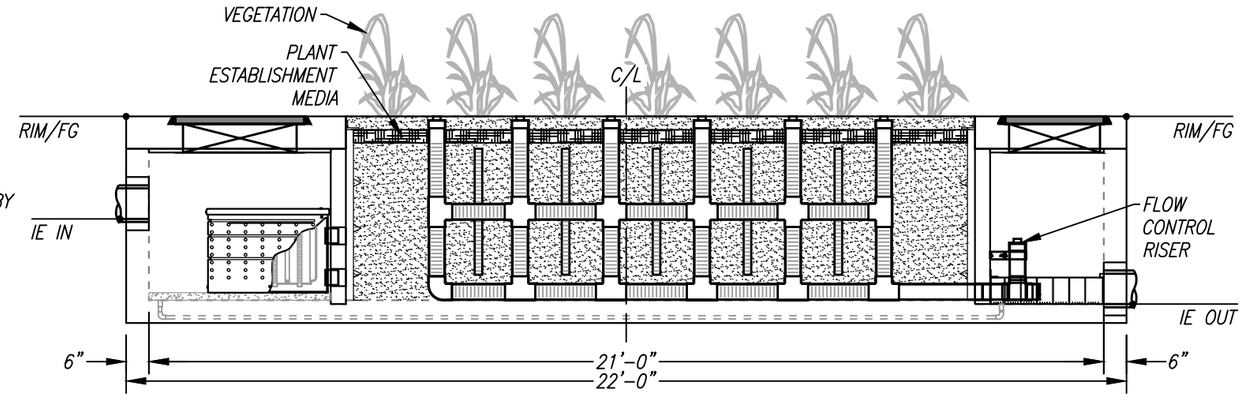
LEFT END VIEW

INSTALLATION NOTES

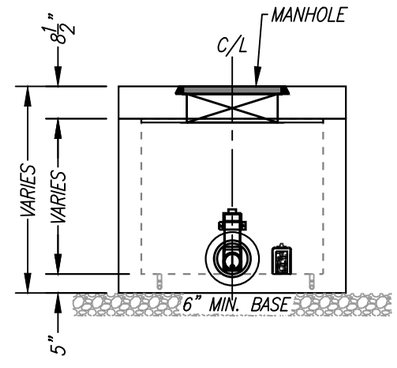
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



ELEVATION VIEW

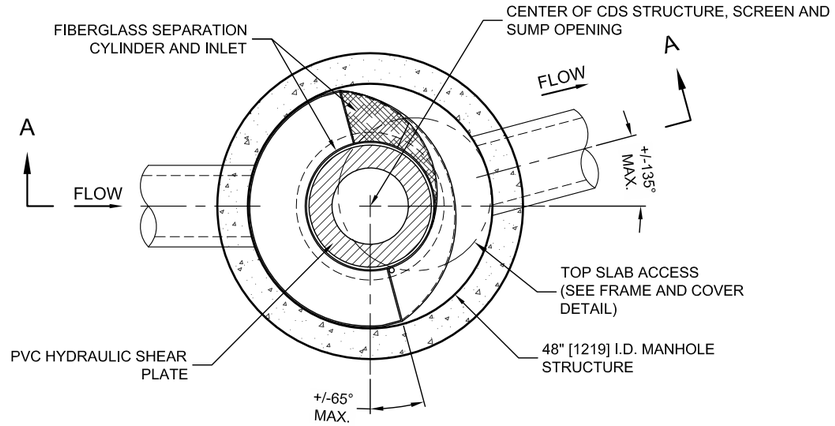


RIGHT END VIEW

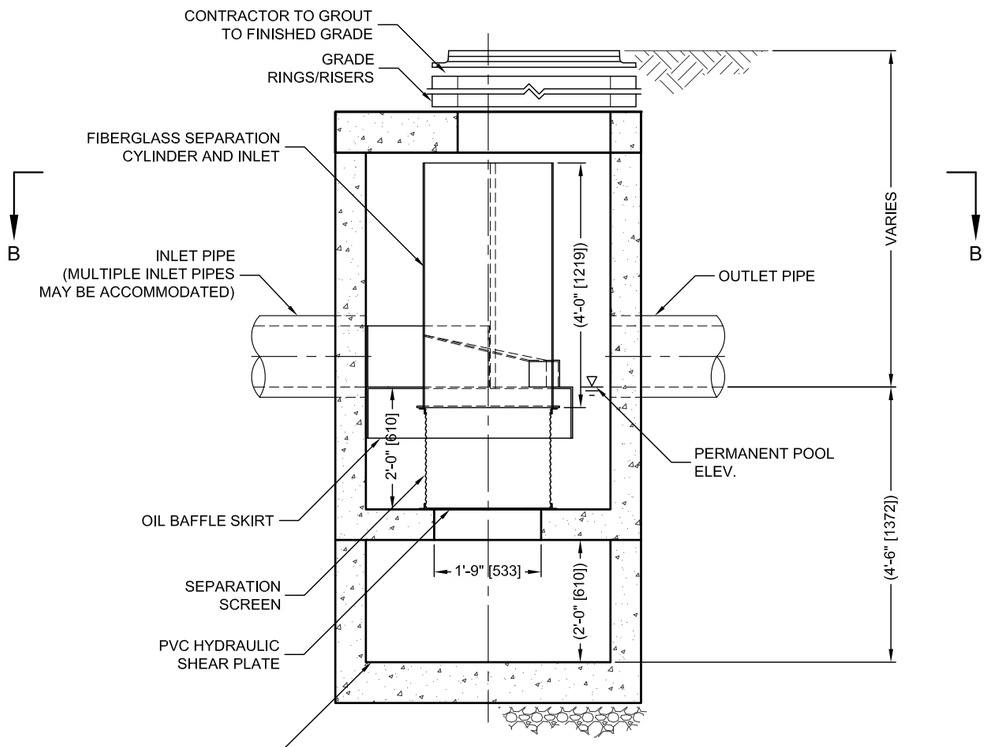
TREATMENT FLOW (CFS)	0.268
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.3
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-4-21-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

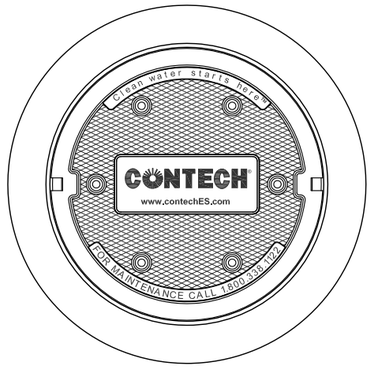
5/23/19TOLEE



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



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

CDS2015-4-C DESIGN NOTES

THE STANDARD CDS2015-4-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

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:

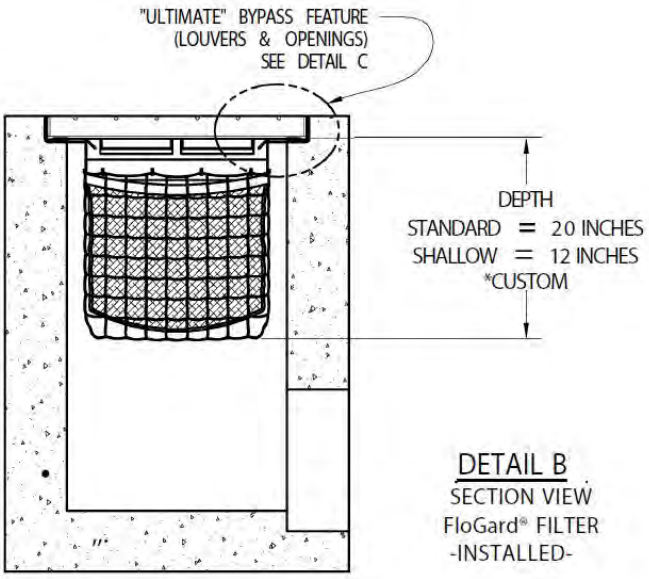
* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

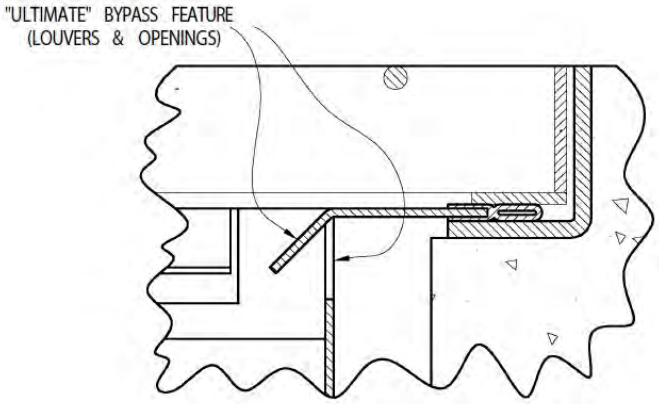
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
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

CDS2015-4-C
INLINE CDS
STANDARD DETAIL



DETAIL B
SECTION VIEW
FloGard® FILTER
-INSTALLED-



DETAIL C
"ULTIMATE" BYPASS
FEATURE

*** MANY** OTHER STANDARD & CUSTOM SIZES AND DEPTHS AVAILABLE UPON REQUEST.

FloGard Flat Grated Inlet									
SPECIFIER CHART									
MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columns is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-		
	INLET ID Inside Dimension (inch x inch)	GRADE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)	
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25	
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4	
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4	
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9	
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85	
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85	
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15	
FGP-2448F	24 X 48	24 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35	
FGP-32F-TN	28 X 28	32 X 32	6.3	2.2	1.5	FGP-32F8-TN	1.25	.85	
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15	
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35	
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85	
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25	
FGP-1633F	16 X 34	18 X 36	6.9	2.3	1.6	FGP-1633F8	1.3	.9	
FGP-2234F	22 X 34	24 X 36	8.0	3.4	2.0	FGP-2234F8	1.95	1.15	

Appendix D:

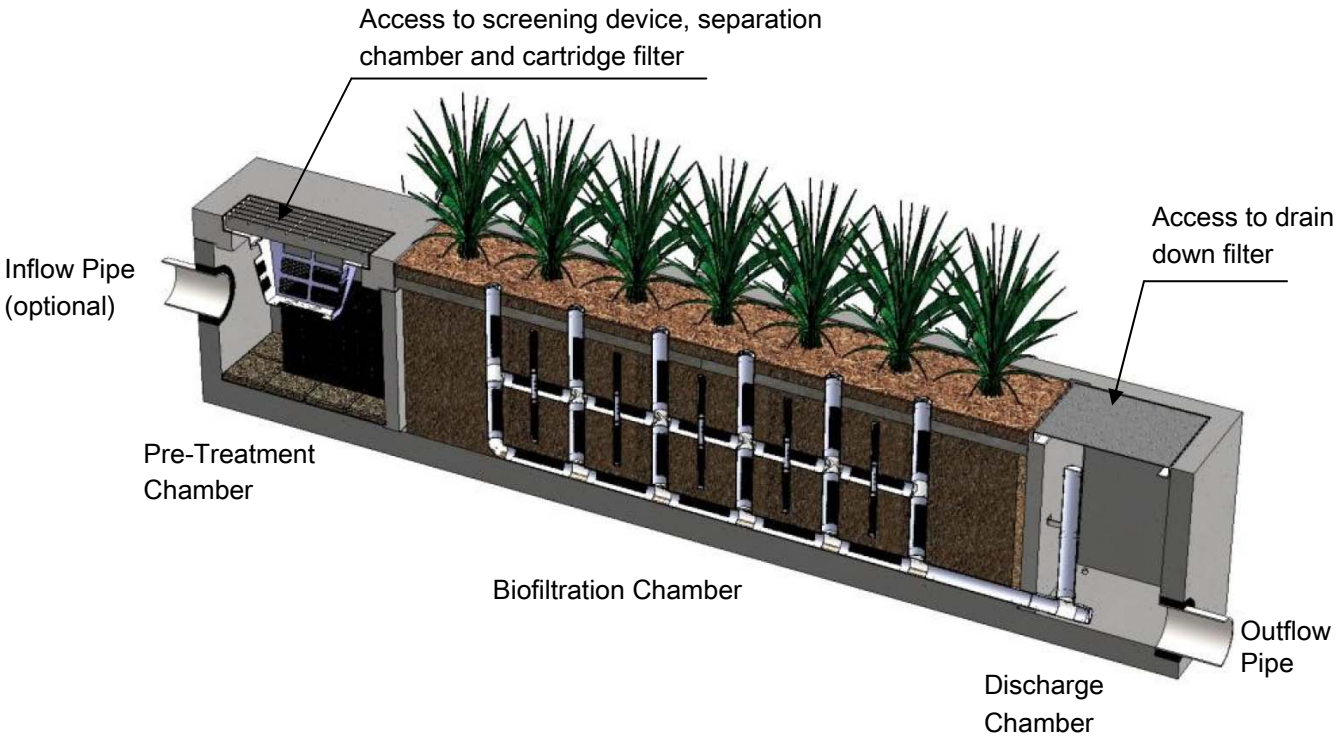
BMP Maintenance Information

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes:

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176



CONTECH®
ENGINEERED SOLUTIONS

CDS®

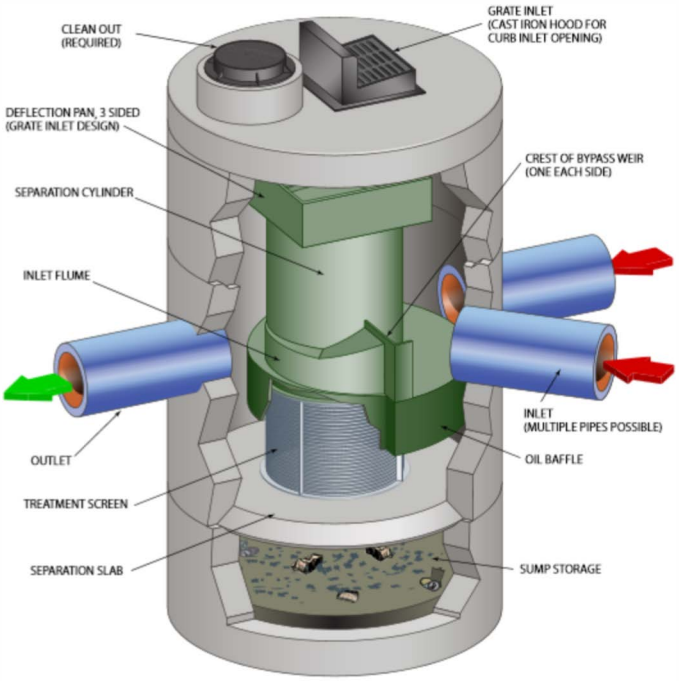
Solutions Guide

Continuous Deflective Separation - CDS®

Superior Stormwater Trash and Sediment Removal

The CDS is a swirl concentrator hybrid technology that uses continuous deflective separation – a combination of swirl concentration and indirect screening to screen, separate and trap debris, sediment, and hydrocarbons from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material debris 2.4 mm or larger, without binding. CDS retains all captured pollutants, even at high flow rates, and provides easy access for maintenance.

CDS is used to meet trash Total Maximum Daily Load (TMDL) requirements, for stormwater quality control, inlet and outlet pollution control, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and a variety of green infrastructure practices.



Learn more about the CDS system at www.ContechES.com/CDS

CDS® Approvals

CDS has been verified by some of the most stringent stormwater technology evaluation organizations in North America, including:

- Washington State Department of Ecology
- New Jersey Department of Environmental Protection
- Canadian Environmental Technology Verification (ETV)
- California Statewide Trash Amendments Full Capture System Certified*

** The CDS System has been certified by the California State Water Resources Control Board as a Full Capture System provided that it is sized to treat the peak flow rate from the region specific 1-year, 1-hour design storm, or the peak flow capacity of the corresponding storm drain, whichever is less.*

CDS® Features & Benefits

Feature	Benefit
1. Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger	1. Superior pollutant removal
2. Self-cleaning screen	2. Ease of maintenance
3. Isolated storage sump eliminates scour potential	3. Excellent pollutant retention
4. Internal bypass	4. Eliminates the need for additional structures
5. Multiple pipe inlets and 90-180° angles	5. Design flexibility
6. Numerous regulatory approvals	6. Proven performance

The CDS® Screen

Traditional approaches to trash control typically involve "direct screening" that can easily become clogged, as trash is pinned to the screen as water passes through. Clogged screens can lead to flooding as water backs up.

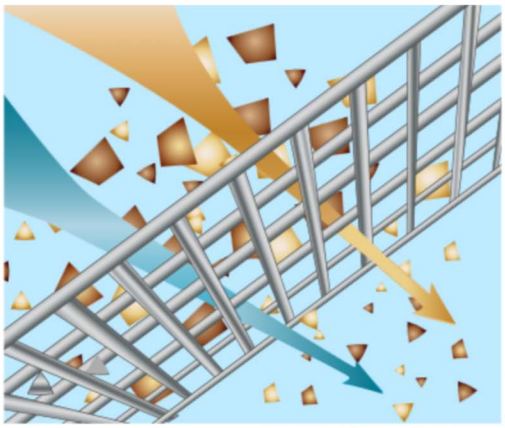
The design of the CDS screen is fundamentally different. Flow is introduced to the screen face which is louvered so that it is smooth in the downstream direction. The effect created is called "Continuous Deflective Separation." The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder.

Key Features:

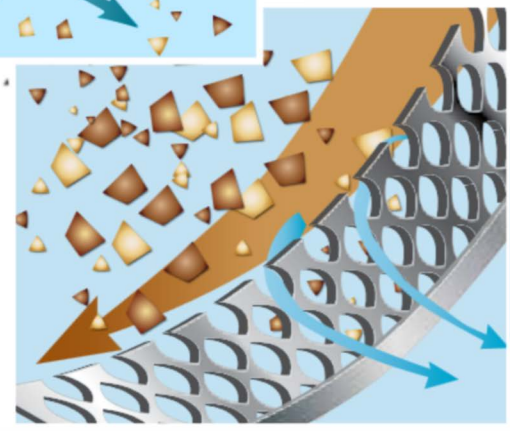
Self-Cleaning Screening Technology

- CDS Screen captures neutrally buoyant materials missed by other separator systems.
- Screen is hydraulically designed to be self-cleaning.
- Runoff entering the separation cylinder must pass through the screen prior to discharge, eliminating potential for scouring previously captured trash at high flow rates.

The CDS Screen – Self-Cleaning Screening Technology ❖ ❖ ❖



Direct Screening – particles that are larger than the aperture size of the screen can cause clogging, resulting in flooding if not maintained frequently.



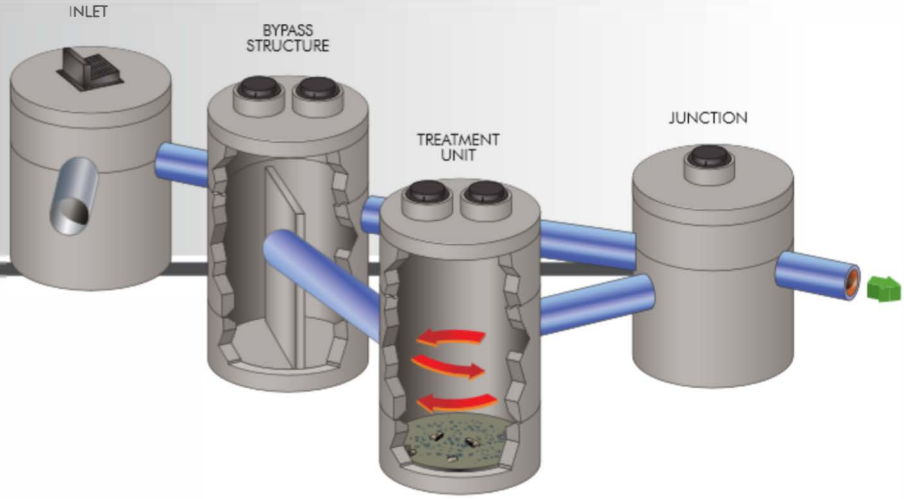
Continuous Deflective Separation Indirect Screening – water velocities within the swirl chamber continually shear debris off the screen to keep it clean.

CDS® Configuration - One System that Can Do It All!

The CDS effectively treats stormwater runoff while reducing the number of structures on your site.

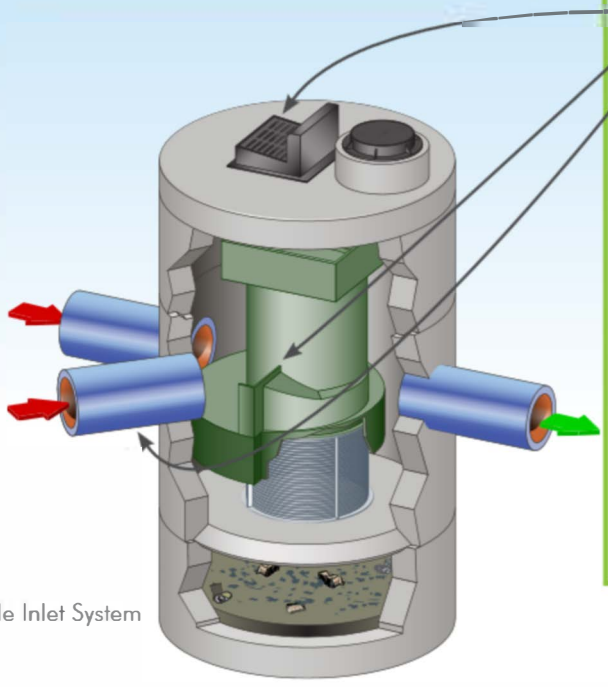
WHY GO THROUGH ALL THIS?

TRADITIONAL STORMWATER TREATMENT SITE DESIGN



ONE SYSTEM CAN DO IT ALL!

- Inline, offline, grate inlet, and drop inlet configurations available
- Internal and external peak bypass options available



CDS® Multiple Inlet System

Save Time, Space, and Money with CDS®

- Grate inlet option available
- Internal bypass weir
- Accepts multiple inlets at a variety of angles
- Advanced hydrodynamic separator
- Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger
- Indirect screening capability keeps screen from clogging
- Retention of all captured pollutants, even at high flows
- Performance verified by NJCAT, WA Ecology, and ETV Canada

CDS® Applications

CDS is commonly used in the following stormwater applications:

- Stormwater quality control – trash, debris, sediment, and hydrocarbon removal
- Urban retrofit and redevelopment
- Inlet and outlet protection
- Pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and Low Impact Development designs.

CDS provides trash control.

CDS pretreats a bioswale.

CDS pretreats a rainwater harvesting cistern.

CDS standalone system removes trash and sediment.

CDS® Models and Capacities

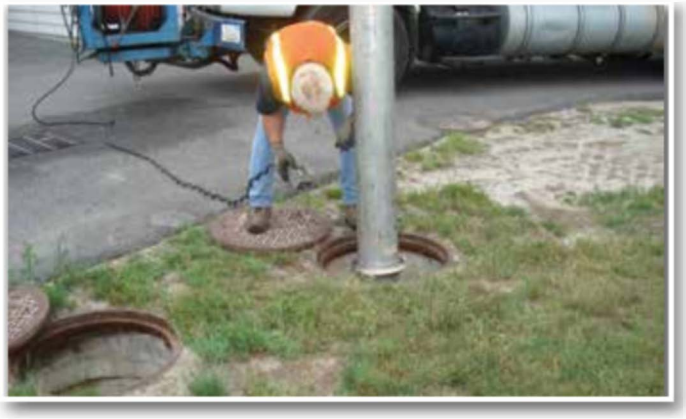
	CDS MODEL	Treatment Flow Rates[1]			Estimated Maximum Peak Conveyance Flow[3] (cfs)/(L/s)	Minimum Sump Storage Capacity[4] (yd^3)/(m^3)	Minimum Oil Storage Capacity[4] (gal)/(L)
		75 microns (cfs)/(L/s)	125 microns[2] (cfs)/(L/s)	Trash & Debris (cfs)/(L/s)			
PRECAST	CDS2015-4	0.5 (14.2)	0.7 (19.8)	1.0 (28.3)	10 (283)	0.9 (0.7)	61 (232)
	CDS2015-5	0.5 (14.2)	0.7(19.8)	1.0 (28.3)	10 (283)	1.5 (1.1)	83 (313)
	CDS2020-5	0.7 (19.8)	1.1 (31.2)	1.5 (42.5)	14 (396)	1.5 (1.1)	99 (376)
	CDS2025-5	1.1 (31.2)	1.6 (45.3)	2.2 (62.3)	14 (396)	1.5 (1.1)	116 (439)
	CDS3020-6	1.4 (39.6)	2.0 (56.6)	2.8 (79.3)	20 (566)	2.1 (1.6)	184 (696)
	CDS3025-6	1.7 (48.1)	2.5 (70.8)	3.5 (99.2)	20 (566)	2.1 (1.6)	210 (795)
	CDS3030-6	2.0 (56.6)	3.0 (85.0)	4.2 (118.9)	20 (566)	2.1 (1.6)	236 (895)
	CDS3035-6	2.6 (73.6)	3.8 (106.2)	5.3 (150.0)	20 (566)	2.1 (1.6)	263 (994)
	CDS4030-8	3.1 (87.7)	4.5 (127.4)	6.3 (178.3)	30 (850)	5.6 (4.3)	426 (1612)
	CDS4040-8	4.1 (116.1)	6.0 (169.9)	8.4 (237.8)	30 (850)	5.6 (4.3)	520 (1970)
	CDS4045-8	5.1 (144.4)	7.5 (212.4)	10.5 (297.2)	30 (850)	5.6 (4.3)	568 (2149)
	CDS5640-10	6.1 (172.7)	9.0 (254.9)	12.6 (356.7)	50 (1416)	8.7 (6.7)	758 (2869)
	CDS5653-10	9.5 (268.9)	14.0 (396.5)	19.6 (554.8)	50 (1416)	8.7 (6.7)	965 (3652)
	CDS5668-10	12.9 (365.1)	19.0 (538.1)	26.6 (752.9)	50 (1416)	8.7 (6.7)	1172 (4435)
	CDS5678-10	17.0 (481.2)	25.0 (708.0)	35.0 (990.7)	50 (1416)	8.7 (6.7)	1309 (4956)
	CDS9280-12	27.2 (770.2)	40.0 (1132.7)	56.0 (1585.7)	Offline	16.8 (12.8)	N/A
	CDS9290-12	35.4 (1002.4)	52.0 (1472.5)	72 (2038.8)		16.8 (12.8)	
	CDS92100-12	42.8 (1212.0)	63.0 (1783.9)	88 (2491.9)		16.8 (12.8)	
CAST-IN-PLACE	CDS150134-22	100.7 (2851.5)	148.0 (4190.9)	270 (7645.6)		56.3 (43.0)	
	CDS200164-26	183.6 (5199.0)	270.0 (7645.6)	378.0 (10703.8)		78.7 (60.2)	
	CDS240160-32	204 (5776.6)	300.0 (8495.1)	420.0 (11893.0)		119.1 (91.1)	
	Additional Cast-in-Place models available upon request.						

1. Alternative PSD/D_{50} sizing is available upon request.
2. 125 micron flows are based on the CDS Washington State Department of Ecology approval for 80% removal of a particle size distribution (PSD) having a mean particle size (D_{50}) of 125 microns.
3. Estimated maximum peak conveyance flow is calculated using conservative values and may be exceeded on sites with lower inflow velocities and sufficient head over the weir.
4. Sump and oil capacities can be customized to meet site needs.

CDS® Maintenance

Systems vary in their maintenance needs, and the selection of a cost-effective and easy-to-access treatment system can mean a huge difference in maintenance expenses for years to come.

A CDS unit is designed to minimize maintenance and make it as easy and inexpensive as possible to keep our systems working properly.



Most CDS units can easily be cleaned in 30 minutes.

Inspection

Inspection is the key to effective maintenance. Pollutant deposition and transport may vary from year to year and site to site. Semi-annual inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed more frequently where site conditions may cause rapid accumulation of pollutants.

Recommendations for CDS Maintenance

The recommended cleanout of solids within the CDS unit's sump should occur at 75% of the sump capacity. Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection and cleanout of the separation chamber and sump, and another allows inspection and cleanout of sediment captured and retained behind the screen. A vacuum truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30 minutes for most installations.

DYOHDS™ Tool

Design Your Own Hydrodynamic Separator

Features

- Choose from three HDS technologies - CDS®, Vortechs® and VortSentry® HS
- Site specific questions ensure the selected unit will comply with site constraints
- Unit size based on selected mean particle size and targeted removal percentage
- Localized rainfall data allows for region specific designs
- PDF report includes detailed performance calculations, specification and standard drawing for the unit that was sized

DYO Project
design made easy.

Design Your Own (DYO) Hydrodynamic Separator online at www.ContechES.com/dyohds

Next Steps

Learn more

See our CDS systems in action at **www.ContechES.com/videos**

Connect with Us

We're here to make your job easier – and that includes being able to get in touch with us when you need to. **www.ContechES.com/localresources**

Start a Project

If you are ready to begin a project, visit us at **www.ContechES.com/startaproject**

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, retaining walls, sanitary sewer, stormwater, erosion control and soil stabilization products.

CONTECH® ENGINEERED SOLUTIONS

COMPLETE SITE SOLUTIONS

Stormwater Solutions

Helping to satisfy stormwater management requirements on land development projects

- Stormwater Treatment
- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretention

Pipe Solutions

Meeting project needs for durability, hydraulics, corrosion resistance, and stiffness

- Corrugated Metal Pipe (CMP)
- Steel Reinforced Polyethylene (SRPE)
- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)

Structures Solutions

Providing innovative options and support for crossings, culverts, and bridges

- Plate, Precast & Truss bridges
- Hard Armor
- Retaining Walls
- Tunnel Liner Plate

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CDS Brochure - 03/2018

Oldcastle Infrastructure™
A CRH COMPANY

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

DRAINAGE PROTECTION SYSTEMS
DPS
A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Appendix E:

Geotechnical Infiltration Testing

Infiltration is not recommended per environmental engineer, see enclosed letter from the environmental engineer

No infiltration test was conducted

ARDENT
ENVIRONMENTAL GROUP, INC.

March 25, 2021
Project No. 10122805

Mr. Abdul Saquib
Kornerstone Park LLC
2500 East Ball Road, Suite 260
Anaheim, CA 92806

Subject: Stormwater Infiltration System
Proposed Korner Stone Park
2205 East Palmyra Avenue
Orange, California

Dear Mr. Saquib:

It is our understanding that the feasibility of a stormwater infiltration system is being evaluated as one of several approaches to stormwater management at 2205 East Palmyra Avenue, Orange California (site). The site has historically been used as a landfill, and as a result, elevated metals potentially exceeding hazardous waste criteria have been detected in samples collected within the landfill waste. Based on this information, the installation of a stormwater infiltration system is not recommended at the site as it may enhance the potential for the migration of contaminants to groundwater.

If there are any questions, please feel free to call the undersigned at your convenience.

Sincerely,
Ardent Environmental Group, Inc.

Dennis Kawasaki
Senior Project Scientist

Paul A. Roberts, P.G.
Principal Geologist

PAR/DK/aw

Appendix F:

Hydrology Information (Two-year Frequency Storm Evaluation)

(For Reference Only)

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******************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                           DRC Engineering, Inc.
                     160 South Old Springs Road, Suite 210
                           Anaheim Hills, CA 92808
                                714-685-6860

 ************************* DESCRIPTION OF STUDY *************************
* 19-124 KORNERSTONE MUSLIM CEMETERY                                     *
* EXISTING CONDITION                                                     *
* 2-YEAR FREQUENCY                                                       *
 ************************************************************************

  FILE NAME: 9124E002.DAT
  TIME/DATE OF STUDY: 09:16 09/30/2020
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    247.00  DOWNSTREAM(FEET) =    241.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.024
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.863
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL POOR COVER
  "BARREN"                    A        0.23      0.40     1.000     61     7.02
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.23   PEAK FLOW RATE(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    241.00  DOWNSTREAM(FEET) =    236.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   191.00   CHANNEL SLOPE =  0.0262
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.31
  FLOW VELOCITY(FEET/SEC) =   2.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.31   Tc(MIN.) =    8.34
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     328.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.34
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.688
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    A        4.37      0.40     1.000     61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     4.37      SUBAREA RUNOFF(CFS) =     5.07
  EFFECTIVE AREA(ACRES) =      4.61   AREA-AVERAGED Fm(INCH/HR) =  0.40
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        4.6       PEAK FLOW RATE(CFS) =       5.34

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    91.00
  ELEVATION DATA: UPSTREAM(FEET) =    235.00  DOWNSTREAM(FEET) =    227.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.976
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.870
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                A        1.39      0.40     1.000     28    6.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.84
  TOTAL AREA(ACRES) =      1.39   PEAK FLOW RATE(CFS) =      1.84
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                               714-685-6860

 ************************* DESCRIPTION OF STUDY *************************
* 19-124 KORNERSTONE MUSLIM CEMETERY                                    *
* PROPOSED CONDITION                                                    *
* 2-YEAR FREQUENCY                                                      *
 ************************************************************************

  FILE NAME: 9124P002.DAT
  TIME/DATE OF STUDY: 13:46 03/29/2021
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE   1800.00 TO NODE   1800.00 IS CODE =  22
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
========================================================================
  USER SPECIFIED Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.28      0.40      0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.56
```

```
 TOTAL AREA(ACRES) =      0.28   PEAK FLOW RATE(CFS) =      0.56

****************************************************************************
 FLOW PROCESS FROM NODE   1800.00 TO NODE   1700.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   239.60  DOWNSTREAM(FEET) =   238.26
 FLOW LENGTH(FEET) =   268.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.58
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.56
 PIPE TRAVEL TIME(MIN.) =   1.73    Tc(MIN.) =    6.73
 LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1700.00 =     268.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1700.00 TO NODE   1700.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.73
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.909
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        0.06      0.40     0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.06      SUBAREA RUNOFF(CFS) =    0.10
 EFFECTIVE AREA(ACRES) =      0.34   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.57

****************************************************************************
 FLOW PROCESS FROM NODE   1700.00 TO NODE   1600.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   238.26  DOWNSTREAM(FEET) =   237.36
 FLOW LENGTH(FEET) =   179.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.58
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.57
 PIPE TRAVEL TIME(MIN.) =   1.16    Tc(MIN.) =    7.89
 LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1600.00 =     447.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1600.00 TO NODE   1600.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.89
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.743
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        0.06      0.40     0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
```

```
  SUBAREA AREA(ACRES) =    0.06      SUBAREA RUNOFF(CFS) =    0.09
  EFFECTIVE AREA(ACRES) =      0.40   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.4       PEAK FLOW RATE(CFS) =       0.61

****************************************************************************
  FLOW PROCESS FROM NODE   1600.00 TO NODE   1500.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   237.36  DOWNSTREAM(FEET) =   237.16
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.64
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.61
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.14
  LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1500.00 =     487.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1500.00 TO NODE   1500.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.711
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.18      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.27
  EFFECTIVE AREA(ACRES) =      0.58   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.6       PEAK FLOW RATE(CFS) =       0.87

****************************************************************************
  FLOW PROCESS FROM NODE   1500.00 TO NODE   1400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   237.16  DOWNSTREAM(FEET) =   237.08
  FLOW LENGTH(FEET) =    15.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.91
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.87
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.22
  LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1400.00 =     502.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1400.00 TO NODE   1400.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.701
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  COMMERCIAL                  A        1.12      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.12      SUBAREA RUNOFF(CFS) =    1.67
  EFFECTIVE AREA(ACRES) =      1.70   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.7       PEAK FLOW RATE(CFS) =       2.54

****************************************************************************
  FLOW PROCESS FROM NODE   1400.00 TO NODE   1300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   237.08  DOWNSTREAM(FEET) =   236.98
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.54
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.31
  LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.00 =     522.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1300.00 TO NODE   1300.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.31
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.691
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        0.22      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.33
  EFFECTIVE AREA(ACRES) =      1.92   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.9       PEAK FLOW RATE(CFS) =       2.85

****************************************************************************
  FLOW PROCESS FROM NODE   1300.00 TO NODE   1300.10 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   236.98  DOWNSTREAM(FEET) =   235.89
  FLOW LENGTH(FEET) =   139.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.44
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.85
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    8.84
  LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.10 =     661.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1300.10 TO NODE   1300.10 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
```

```
 FLOW PROCESS FROM NODE   1222.00 TO NODE   1222.00 IS CODE =  22
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   139.00
 USER SPECIFIED Tc(MIN.) =    5.000
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        0.74      0.40      0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.48
 TOTAL AREA(ACRES) =      0.74   PEAK FLOW RATE(CFS) =      1.48

****************************************************************************
 FLOW PROCESS FROM NODE   1222.00 TO NODE   1221.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   237.80  DOWNSTREAM(FEET) =   236.87
 FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.28
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.48
 PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =    5.94
 LONGEST FLOWPATH FROM NODE   1222.00 TO NODE   1221.00 =     324.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1221.00 TO NODE   1221.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE   1210.00 TO NODE   1210.00 IS CODE =  22
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   185.00
 USER SPECIFIED Tc(MIN.) =    5.000
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        0.94      0.40      0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.88
 TOTAL AREA(ACRES) =      0.94   PEAK FLOW RATE(CFS) =      1.88

****************************************************************************
 FLOW PROCESS FROM NODE   1210.00 TO NODE   1221.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   242.40  DOWNSTREAM(FEET) =   236.87
```

```
  FLOW LENGTH(FEET) =   158.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.20
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.88
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    5.37
  LONGEST FLOWPATH FROM NODE   1210.00 TO NODE   1221.00 =     343.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1221.00 TO NODE   1221.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        1.88    5.37    2.174  0.40( 0.04) 0.10       0.9    1210.00
  LONGEST FLOWPATH FROM NODE   1210.00 TO NODE   1221.00 =     343.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        1.48    5.94    2.050  0.40( 0.04) 0.10       0.7    1222.00
  LONGEST FLOWPATH FROM NODE   1222.00 TO NODE   1221.00 =     324.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        3.30    5.37    2.174  0.40( 0.04) 0.10       1.6    1210.00
      2        3.25    5.94    2.050  0.40( 0.04) 0.10       1.7    1222.00
    TOTAL AREA(ACRES) =         1.7

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        3.30  Tc(MIN.) =    5.366
  EFFECTIVE AREA(ACRES) =      1.61  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.7
  LONGEST FLOWPATH FROM NODE   1210.00 TO NODE   1221.00 =     343.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1221.00 TO NODE   1221.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE   1221.00 TO NODE   1221.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.37
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.174
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.32      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.32      SUBAREA RUNOFF(CFS) =    0.61
  EFFECTIVE AREA(ACRES) =      1.93   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.0       PEAK FLOW RATE(CFS) =       3.70
```

```
****************************************************************************
 FLOW PROCESS FROM NODE   1221.00 TO NODE   1300.10 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   236.87  DOWNSTREAM(FEET) =   235.89
 FLOW LENGTH(FEET) =   196.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.06
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.70
 PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =    6.17
 LONGEST FLOWPATH FROM NODE   1210.00 TO NODE   1300.10 =     539.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1300.10 TO NODE   1300.10 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        3.70    6.17    2.006  0.40( 0.04) 0.10       1.9    1210.00
     2        3.62    6.75    1.906  0.40( 0.04) 0.10       2.0    1222.00
 LONGEST FLOWPATH FROM NODE   1210.00 TO NODE   1300.10 =     539.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        2.85    8.84    1.633  0.40( 0.04) 0.10       1.9    1800.00
 LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.10 =     661.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        6.16    6.17    2.006  0.40( 0.04) 0.10       3.3    1210.00
     2        6.17    6.75    1.906  0.40( 0.04) 0.10       3.5    1222.00
     3        5.94    8.84    1.633  0.40( 0.04) 0.10       3.9    1800.00
   TOTAL AREA(ACRES) =          3.9

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        6.17  Tc(MIN.) =    6.750
 EFFECTIVE AREA(ACRES) =      3.47  AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        3.9
 LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.10 =     661.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1300.10 TO NODE   1300.10 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE   1300.10 TO NODE   1300.20 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   235.89  DOWNSTREAM(FEET) =   235.65
```

```
  FLOW LENGTH(FEET) =    48.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.60
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.17
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    6.92
  LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.20 =     709.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1300.20 TO NODE   1300.20 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE   1120.00 TO NODE   1120.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    48.00
  USER SPECIFIED Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.18      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.18   PEAK FLOW RATE(CFS) =      0.36

****************************************************************************
  FLOW PROCESS FROM NODE   1120.00 TO NODE   1120.10 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   243.90  DOWNSTREAM(FEET) =   241.54
  FLOW LENGTH(FEET) =   471.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.31
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.36
  PIPE TRAVEL TIME(MIN.) =   3.39    Tc(MIN.) =    8.39
  LONGEST FLOWPATH FROM NODE   1120.00 TO NODE   1120.10 =     519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1120.10 TO NODE   1120.10 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.39
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.681
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.33      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.33      SUBAREA RUNOFF(CFS) =    0.49
  EFFECTIVE AREA(ACRES) =      0.51   AREA-AVERAGED Fm(INCH/HR) =  0.04
```

```
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       0.75

****************************************************************************
 FLOW PROCESS FROM NODE   1120.10 TO NODE   1300.20 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   241.54  DOWNSTREAM(FEET) =   235.65
 FLOW LENGTH(FEET) =    31.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.55
 ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.75
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    8.44
 LONGEST FLOWPATH FROM NODE   1120.00 TO NODE   1300.20 =     550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1300.20 TO NODE   1300.20 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.75    8.44    1.676  0.40( 0.04) 0.10       0.5    1120.00
 LONGEST FLOWPATH FROM NODE   1120.00 TO NODE   1300.20 =     550.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        6.16    6.34    1.974  0.40( 0.04) 0.10       3.3    1210.00
     2        6.17    6.92    1.878  0.40( 0.04) 0.10       3.5    1222.00
     3        5.94    9.01    1.614  0.40( 0.04) 0.10       3.9    1800.00
 LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.20 =     709.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        6.83    6.34    1.974  0.40( 0.04) 0.10       3.7    1210.00
     2        6.87    6.92    1.878  0.40( 0.04) 0.10       3.9    1222.00
     3        6.76    8.44    1.676  0.40( 0.04) 0.10       4.3    1120.00
     4        6.67    9.01    1.614  0.40( 0.04) 0.10       4.4    1800.00
   TOTAL AREA(ACRES) =         4.4

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        6.87  Tc(MIN.) =    6.923
 EFFECTIVE AREA(ACRES) =      3.88  AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.4
 LONGEST FLOWPATH FROM NODE   1800.00 TO NODE   1300.20 =     709.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1300.20 TO NODE   1300.20 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE   2000.00 TO NODE   2000.10 IS CODE =  21
```

```
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    91.00
  ELEVATION DATA: UPSTREAM(FEET) =    235.00  DOWNSTREAM(FEET) =    227.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                A        1.40      0.40      0.850    17    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      2.42
  TOTAL AREA(ACRES) =      1.40   PEAK FLOW RATE(CFS) =      2.42

******************************************************************************
  FLOW PROCESS FROM NODE   3000.00 TO NODE   3000.00 IS CODE =  22
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    91.00
  USER SPECIFIED Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                A        0.16      0.40      0.850    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.28
 ==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Tuesday, 03 / 30 / 2021

Pond No. 1 - detention

Pond Data

UG Chambers -Invert elev. = 235.30 ft, Rise x Span = 6.00 x 6.00 ft, Barrel Len = 380.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	235.30	n/a	0	0
0.60	235.90	n/a	561	561
1.20	236.50	n/a	970	1,531
1.80	237.10	n/a	1,182	2,713
2.40	237.70	n/a	1,302	4,014
3.00	238.30	n/a	1,360	5,374
3.60	238.90	n/a	1,360	6,734
4.20	239.50	n/a	1,301	8,036
4.80	240.10	n/a	1,181	9,217
5.40	240.70	n/a	971	10,188
6.00	241.30	n/a	559	10,746

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	10.00	0.00	0.00
Span (in)	= 24.00	10.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 235.30	235.40	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 240.30	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	235.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.60	561	235.90	0.84 ic	0.80 ic	---	---	0.00	---	---	---	---	1.000	1.804
1.20	1,531	236.50	2.08 ic	2.05 ic	---	---	0.00	---	---	---	---	1.000	3.053
1.80	2,713	237.10	2.81 ic	2.77 ic	---	---	0.00	---	---	---	---	1.000	3.765
2.40	4,014	237.70	3.39 ic	3.36 ic	---	---	0.00	---	---	---	---	1.000	4.356
3.00	5,374	238.30	3.90 ic	3.87 ic	---	---	0.00	---	---	---	---	1.000	4.870
3.60	6,734	238.90	4.33 ic	4.33 ic	---	---	0.00	---	---	---	---	1.000	5.327
4.20	8,036	239.50	4.75 ic	4.75 ic	---	---	0.00	---	---	---	---	1.000	5.748
4.80	9,217	240.10	5.16 ic	5.14 ic	---	---	0.00	---	---	---	---	1.000	6.140
5.40	10,188	240.70	5.61 ic	5.50 ic	---	---	2.53	---	---	---	---	1.000	9.025
6.00	10,746	241.30	5.91 ic	5.84 ic	---	---	9.99	---	---	---	---	1.000	16.83

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Tuesday, 03 / 30 / 2021

Hyd. No. 11

2-yr routing

Hydrograph type	= Reservoir	Peak discharge	= 3.309 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.52 hrs
Time interval	= 7 min	Hyd. volume	= 24,834 cuft
Inflow hyd. No.	= 1 - 2-yr	Max. Elevation	= 236.92 ft
Reservoir name	= detention	Max. Storage	= 1,922 cuft

Storage Indication method used.