Thienes Engineering, Inc.
CIVIL ENGINEERING LAND SURVEYING

CELEBRATING THIRTY YEARS 30th ANNIVERSARY 1986 - 2016

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN
(WQMP)

FOR:
ONTARIO RANCH COMMERCE CENTER
SEC OF EUCLID AVENUE AND EUCALYPTUS AVENUE
ONTARIO, CALIFORNIA
APNS: 1054-011-01, 1054-011-02, 1054-011-04, 1054-021-01, 1054-021-02, 1054-271-01, 1054-271-02, 1054-271-03, 1054-281-01, 1054-281-02 AND 1054-281-03

ONTARIO LAND DEVELOPMENT FILE NO. XXXXX

PREPARED FOR:
REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BOULEVARD, SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087
CONTACT: BILL GOLTERMANN

AUGUST 28, 2018
JUNE 18, 2019

JOB NO. 3635

PREPARED BY:
THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
PHONE: (714) 521-4811
FAX: (714) 521-4173
CONTACT: LUIS PRADO (luisp@thieneseng.com)

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN
(WQMP)

FOR

"ONTARIO RANCH COMMERCE CENTER"

PREPARED BY LUIS PRADO
UNDER THE SUPERVISION OF:

6/18/2019

REINHARD STENZEL DATE
R.C.E. 56155
EXP. 12/31/2020

CITY OF ONTARIO
ENGINEERING DEPARTMENT

Preliminary Water Quality Management Plan (PWQMP)

For compliance with Santa Ana Regional Water Quality Control Board

Order Number R8-2010-0036 (NPDES Permit No. CAS618036)

for

Project Name:	**Ontario Ranch Commerce Center**
Ontario Project #:	**XXXXX**
Project Description:	**Light Industrial**
Applicant Name:	**Real Estate Development Associates**
Applicant Address:	**4100 MacArthur Boulevard, Suite 120 Newport Beach, CA 92660**
Project Address:	**SEC of Euclid Avenue and Eucalyptus Avenue**
Size of Development:	**95.85 Acres (includes 11.80 of offsite areas)**

1st Submittal Date: 8/28/2018
2nd Submittal Date: 6/18/2019

Preliminary Water Quality Management Plan (PWQMP)

1. Introduction

The Preliminary Water Quality Management Plan (PWQMP) is a planning tool to improve integration of required water quality elements, stormwater management, water conservation, rainwater harvesting and re-use, and flood management in land use planning and the City's development process. The Preliminary WQMP will assist project applicants and planners in properly designing and laying out project sites so that water quality may be incorporated in the most effective manner and at the lowest cost for the developer.

The San Bernardino County Municipal Separate Storm Sewer System Permit (MS4 Permit) requires project-specific Water Quality Management plans (WQMP) to be prepared for all priority new development and significant redevelopment projects listed in Section 2 of this document. The MS4 Permit stipulates that the City of Ontario require priority project applicants to submit a Preliminary project-specific WQMP, as early as possible, during the environmental review or planning phase of a development project and that the Preliminary WQMP be approved prior to the issuance of land use entitlement.

2. Priority Projects (requiring a Preliminary WQMP)

Land Use entitlement shall not be issued for any of the listed projects, below, until a Preliminary WQMP has been approved by the City's Engineering Department. For construction projects not going through entitlement, a Preliminary and Final project-specific WQMP shall be approved, prior to the issuance of construction permits:

Check the appropriate project category below, for this project:

Check below	**Project Categories**
	1. All significant re-development projects. Significant re-development is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site subject to discretionary approval of the Permittee. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. Where redevelopment results in an increase of less than fifty percent of the impervious surfaces of a previously existing developed site, and the existing development was not subject to WQMP requirements, the numeric sizing criteria discussed below applies only to the addition or replacement, and not to the entire developed site. Where redevelopment results in an increase of fifty percent or more of the impervious surfaces of a previously existing developed site, the numeric sizing criteria applies to the entire development (new and existing).

Check below	Project Categories
X	2. New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions (i.e., detached single family home subdivisions, multi-family attached subdivisions or townhomes, condominiums, apartments, etc.), mixed-use, and public projects. This category includes development projects on public and private land, which fall under the planning and building authority of the permitting agency.
	3. Automotive repair shops (with SIC codes 5013, 5014, 5541, 7532- 7534, 7536-7539).
	4. Restaurants and Food Service Establishments where the land area of development is 5,000 square feet or more.
	5. Developments of 2,500 square feet of impervious surface or more adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas (ESA's) such as areas designated in the Ocean Plan as areas of special biological significance or waterbodies listed on the CWA Section 303(d) list of impaired waters.
	6. Parking lots of 5,000 square feet or more exposed to storm water. Parking lot is defined as land area or facility for the temporary storage of motor vehicles.
	7. Retail Gasoline Outlets (RGOs) that are either 5,000 sq ft or more, or have a projected average daily traffic of 100 or more vehicles per day.
	8. *This project is not covered under any of the categories listed above.

* If the development is not covered under any of the project categories listed in Section 2, the project is not required to design and install Site Design/LID BMPs or Treatment Control BMPs to treat the design storm event (Design Capture Volume) described in Section 4.

3. Preliminary WQMP Objectives

Through a combination of Site Design/LID BMPs (where feasible), Source Control, and/or Treatment Control BMPs, project-specific WQMPs shall address all identified pollutants and hydrologic conditions of concern from new development and significant re-development projects for the categories of projects (priority projects) listed in Section 2. Under each type of BMP, listed below, please indicate which BMPs are planned to be implemented and included in the Final WQMP for the project:

A. Site Design/LID (Low Impact Design) for Reducing Stormwater Runoff:

The MS4 Permit requires each priority development project to infiltrate, harvest and use, evapotranspire, or bio-treat the runoff from a 2-yr, 24-hour storm event (Design Capture Volume). If site conditions do not permit infiltration, harvest and use, evapotranspiration, and/or bio-treatment of the entire Design Capture Volume, at the project site, Site Design/LID techniques are required to be implemented to the Maximum Extent Practicable, at the project site, and the remainder of the DCV shall be infiltrated, harvested, bio-treated or treated by alternative measures.

Project applicants shall submit a Preliminary WQMP that documents the LID/Site Design BMPs, proposed for the project. Please indicate, in the table below, which Site Design/LID BMPs will be utilized on this project to accomplish this requirement:

Site Design/LID Practice	Planned	Not Planned
Provide at least the minimum effective area required for LID BMPs, to comply with the WQMP (see Table 3-1 below).		X[1]
Grade parking lot areas/drive aisles/roof drains to sheet flow runoff into landscaped swales, via curb cuts or zero-face curbs or otherwise disconnect direct drainage from MS4.		X[1]
Design landscaped areas as swales and grade to accept runoff from building roofs, parking lots and project roadways.		X[1]
Install surface retention basins or infiltration trenches to receive impervious area runoff.		X[2]
Install pervious pavement in parking stalls, alleys, driveways, gutters, walkways, trails or patios.		X[2]
Install underground stormwater retention chambers where downstream landscaped areas are limited.		X[2]
Install approved Stormwater Drywells in detention areas.		X[2]
Construct streets, sidewalks, and parking lot stalls to the minimum widths necessary.	X	
Install on-site Biotreatment basins/trenches with underdrains, where soil type is poorly draining.	X	
Install "Engineered Soil" to increase uptake/soil storage capacity and/or evapotranspiration.		X[2]
Install Rainwater Harvesting/Use Equipment.		X[3]
Utilize approved off-site retention/infiltration, biotreatment or proprietary treatment, where it is infeasible to install, on-site.		X[2]

[1] Project capable of treating the full DCV onsite and not required to demonstrate this site design.
[2]The site will be captured and treated by the proposed Contech underground CMP systems (CMP) and Bio Clean Modular Wetlands Systems (MWS).
[3] Concept not utilized because the impervious area is much greater than landscape.

Table 3-1 Minimum Effective Area[1] Required for LID BMPs (surface + subsurface facilities) for Project WQMP to Demonstrate Infeasibility[2] (% of site)

Project Type	New Development	Re-Development
SF/MF Residential < 7 du/ac	10%	5%
SF/MF Residential < 7 - 18 du/ac	7%	3.5%
SF/MF Residential > 18 du/ac	5%	2.5%
Mixed Use, Commercial/Industrial w/FAR< 1.0	10%	5%
Mixed Use, Commercial/Industrial w/FAR 1.0-2.0	7%	3.5%
Mixed Use, Commercial/Industrial w/FAR> 2.0	5%	2.5%
Podium (parking under > 75% of project)	3%	1.5%
Zoning allowing development to property lines	2%	1%
Transit Oriented Development[3]	5%	2.5%
Parking	5%	2.5%

[1] "Effective area" is defined as land area which 1) is suitable for a retention/infiltration BMP (based on infeasibility criteria) and 2) is located down-gradient from building roof or paved areas, so that it may receive gravity flow runoff.
[2] Criteria only required if the project WQMP seeks to demonstrate that the full DCV cannot be feasibly managed on-site.
[3] Transit oriented development is defined as a project with development center within one half mile of a mass transit center.
Key: du/ac = dwelling units/acre, FAR = Floor Area Ratio = ratio of gross floor area of building to gross lot area, MF = Multi Family, SF = Single Family

B. Source Control BMPs – The following BMPs are designed to control stormwater pollutants and runoff water at the location where it is generated. Please indicate which of the listed BMPs are planned to be implemented for the project:

Source Control BMPs	Planned	Not Planned
Minimize non-stormwater site runoff through efficient irrigation system design and controllers.	**X**	
Minimize trash and debris in storm runoff through a regular parking lot, storage yard and roadway sweeping program.	**X**	
Provide proper covers/roofs and secondary containment for outside material storage & work areas.		**X[1]**
Provide solid roofs over all trash enclosures.	**X**	
Site Owner(s)/Property Manager/HOA or POA will be familiar with the project WQMP and stormwater BMPs.	**X**	
Owner or HOA or POA to provide Education/Training of site occupants and employees on stormwater BMPs.	**X**	
Install stormwater placards/stenciled messages with a "No Dumping" message on all on-site/off-site storm drain inlets.	**X**	
Provide contained equipment/vehicle wash rack areas that discharge to sanitary sewer.		**X[2]**

[1] Not applicable. No outside material storage or work areas. Secondary containment not needed.
[2] Not applicable, no vehicle wash areas.

C. Treatment Control BMPs – The following BMPs are designed to control stormwater pollutants where it is not feasible to install on-site Site Design/LID BMPs, with the requisite capacity to treat the Design Capture Volume for identified Pollutants of Concern or where pretreatment of stormwater runoff is required, ahead of infiltration BMPs. Please indicate which of the listed BMPs are planned to be implemented for the project:

Treatment Control BMP	Planned	Not Planned
Gravity Separator devices for pretreatment of sediment, trash/litter or Oil & Grease	**X**[1]	
Proprietary Biofiltration vaults/devices	**X**[2]	
Media Cartridge Filtration Vaults		**X**
Proprietary Filter Inserts for on-site storm drain inlets or retention basin/trench overflow drains		**X**
Regional Treatment facilities are installed or are planned for installation, off-site, and provide a superior level of treatment or clear advantage to on-site treatment BMPs		**X**

[1]The site will be pre-treated by the proposed Bio Clean Hydrodynamic Separators (DSBB).
[2]The site will be captured and treated by the proposed Bio Clean Modular Wetlands Systems (MWS).

4. Volume-based calculation (approximate) for sizing on-site or off-site Stormwater Retention/Infiltration, Harvest & Re-Use or Biotreatment facilities

1) Calculate the "Watershed Imperviousness Ratio", i, which is equal to the percent of impervious area in the BMP Drainage Area (DA) divided by 100.

2) Calculate the composite runoff coefficient C_{BMP} for the Drainage Area (DA) above using the following equation:

$$\mathbf{C_{BMP} = 0.858i^3 - 0.78i^2 + 0.774i + 0.04}$$

where: $\mathbf{C_{BMP}}$ = composite runoff coefficient; and,

i = watershed imperviousness ratio.

3) Determine the area-averaged "6-hour Mean Storm Rainfall", P_6, for the Drainage Area (DA). This is calculated by multiplying the area averaged 2-year 1-hour value (0.55"-0.6") by the appropriate regression coefficient from Table 1 (1.4807). The 2-yr, 1-hr value for southern Ontario is approximately to 0.5" (P_6 = 0.5*1.4807 = 0.74 and northern Ontario is approximately 0.6" in/hr (P_6 = 0.6*1.4807 = 0.89).

4) Determine the appropriate drawdown time. Use the regression constant a = 1.582 for 24 hours and a = 1.963 for 48 hours. *Note: Regression constants are provided for both 24 hour and 48 hour drawdown times; however, 48 hour drawdown times should be used in most areas of California. Drawdown times in excess of 48 hours should be used with caution as vector breeding can be a problem after water has stood in excess of 72 hours. (Use of the 24 hour drawdown time should be limited to drainage areas with coarse soils (Class 'A' soils, that readily drain.)*

5) Calculate the "Maximized Detention Volume", P_0, using the following equation:

$$\mathbf{P_0 = a \cdot C_{BMP} \cdot P_6}$$

where: **P_0** = Maximized Detention Volume, in inches

a = 1.582 for 24 hour and a = 1.963 for 48 hour drawdown,

C_{BMP} = composite runoff coefficient; and,

P_6 = 6-hour Mean Storm Rainfall, in inches

6) Calculate the "Target Capture Volume", V_0, using the following equation:

$$\mathbf{V_0 = (P_0 \cdot A) / 12}$$

where: **V_0** = Target Capture Volume, in acre-feet

P_0 = Maximized Detention Volume, in inches; and,

A = BMP Drainage Area (DA), in acres

Project Volume-based calculation (approximate) for planned on-site or off-site Stormwater Retention/Infiltration, Harvest & Re-Use or Biotreatment facilities:

Variable	Factor/Formula	**DA 1 CMP & MWS #1**	**DA 2 CMP & MWS #2**	**DA 3 CMP & MWS #3**	**DA 4 CMP & MWS #4**
Ratio of impervious surface/total site surface	(i)	0.95	0.95	0.95	0.95
C_{BMP}= runoff coefficient	$0.858i^3 - 0.78i^2 + 0.774i + 0.04$ =	0.807	0.807	0.807	0.807
P_6 (inches)	**P_6 = 2-yr,1- hr depth*1.4807 =	0.851	0.851	0.851	0.851
Detention Volume-inches	P_0 = a * C_{BMP} * P_6 =	1.3487	1.3487	1.3487	1.3487
Drawdown rate of basin/trench (a)	1.582 for 24-hr drawdown or 1.963 for 48-hr drawdown =	1.963	1.963	1.963	1.963
Project Total Area (ac)	(A)	11.65	9.70	16.10	10.75
Design Capture Volume, cu. ft. (DCV)	$V_0 = [(P_0 * A)/12]*43560$ =	57,036	47,489	78,822	52,630
Water Volume infiltrated in first 3 hrs of storm	Vol= in/hr/12 x ft^2 of infiltration area x 3 hrs	N/A	N/A	N/A	N/A
Retention/treatment Volume provided, cu. ft.	*Retention capacity of basins, trenches, underground system or biotreatment proposed	57,182	47,709	79,336	52,821

Variable	Factor/Formula	**DA 5 CMP & MWS #5**	**DA 6 CMP & MWS #6**	**DA 7 CMP & MWS #7**	**DA 8 CMP & MWS #8**
Ratio of impervious surface/total site surface	(i)	0.95	0.95	0.95	0.95
C_{BMP}= runoff coefficient	$0.858i^3 - 0.78i^2 + 0.774i + 0.04$ =	0.807	0.807	0.807	0.807
P_6 (inches)	**P_6 = 2-yr,1- hr depth*1.4807 =	0.851	0.851	0.851	0.851
Detention Volume-inches	P_0 = a * C_{BMP} * P_6 =	1.3487	1.3487	1.3487	1.3487
Drawdown rate of basin/trench (a)	1.582 for 24-hr drawdown or 1.963 for 48-hr drawdown =	1.963	1.963	1.963	1.963
Project Total Area (ac)	(A)	4.55	3.00	12.70	3.40
Design Capture Volume, cu. ft. (DCV)	$V_0 = [(P_0 * A)/12]*43560$ =	22,276	14,687	62,177	16,646
Water Volume infiltrated in first 3 hrs of storm	Vol= in/hr/12 x ft^2 of infiltration area x 3 hrs	N/A	N/A	N/A	N/A
Retention/treatment Volume provided, cu. ft.	*Retention capacity of basins, trenches, underground system or biotreatment proposed	22,412	14,827	62,540	16,853

Variable	Factor/Formula	**DA 9 CMP & MWS #9**	**DA 10 CMP & MWS #10**	**DA 11 CMP & MWS #11**
Ratio of impervious surface/total site surface	(i)	0.95	0.95	0.95
C_{BMP}= runoff coefficient	$0.858i^3 - 0.78i^2 + 0.774i + 0.04$ =	0.807	0.807	0.807
P_6 (inches)	**P_6 = 2-yr,1- hr depth*1.4807 =	0.851	0.851	0.851
Detention Volume-inches	P_0 = a * C_{BMP} * P_6 =	1.3487	1.3487	1.3487
Drawdown rate of basin/trench (a)	1.582 for 24-hr drawdown or 1.963 for 48-hr drawdown =	1.963	1.963	1.963
Project Total Area (ac)	(A)	1.55	4.50	3.70
Design Capture Volume, cu. ft. (DCV)	$V_0 = [(P_0 * A)/12]*43560$ =	7,588	22,031	18,114
Water Volume infiltrated in first 3 hrs of storm	Vol= in/hr/12 x ft^2 of infiltration area x 3 hrs	N/A	N/A	N/A
Retention/treatment Volume provided, cu. ft.	*Retention capacity of basins, trenches, underground system or biotreatment proposed	7,754	22,280	18,390

*Volume treated utilizing the Contech underground CMP systems (CMP) and Modular Wetlands Systems (MWS). Refer to the DCV Calculations section for calculations.
**For P_6 value, use site coordinates and NOAA website to determine project's average 2-yr, 1-hr rainfall depth, at: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html.

Refer to the DCV Calculations section for onsite and offsite flow-based calculations.

5. Hydrologic Conditions of Concern (HCOC) and use of the on-line San Bernardino County HCOC Map for determining necessary mitigation steps necessary if there are HCOCs downstream of a project:

Project applicants may access the on-line HCOC Map at: http://sbcounty.permitrack.com/WAP/. The map will indicate any hydrology concerns with downstream waterways that are hydraulically connected to the project and will indicate if there are any approved regional projects downstream that could be utilized for off-site mitigation of HCOCs. Please indicate here if the project will or will not be able to retain/infilter, harvest and use or biotreat and detain the DCV, on-site, as calculated in Section 4 and if there are HCOCs identified downstream of the project:

Retain or Harvest/Use the DCV on site?	Yes		No	**X**
Biotreat the DCV but not infilter the runoff?	Yes	**X**	No	
HCOCs identified downstream of site?	Yes	**X**	No	

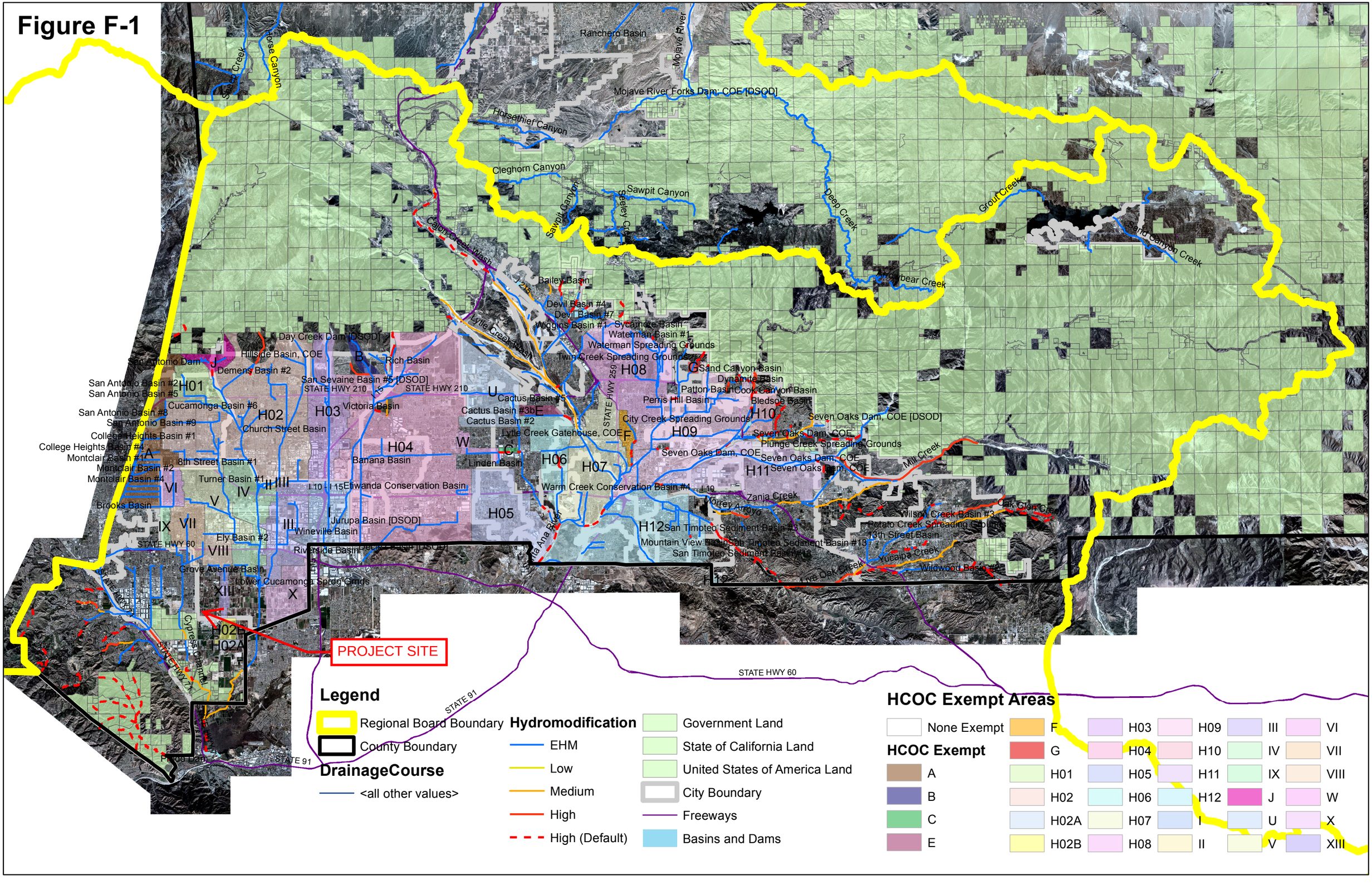
If the entire DCV will not be retained on site, the DCV is biotreated but not infiltered or additional detention capacity is needed to address identified HCOCs, downstream of the site, please list here, what additional mitigation measures will be utilized (on-site or off-site) to address HCOCs (see Section 4.2.1-4.2.3 of the SB County WQMP Technical Guidance):

Additional detention capacity is not required for HCOCs. Refer to HCOC Calculations.

6. Site Plan and Conceptual Grading/Drainage Plan requirements for submission with the Preliminary WQMP:

Provide a Site Plan and Conceptual Grading/Drainage Plan along with this Preliminary WQMP, which conceptually shows the proposed locations of buildings, homes, parking lots, parks, new paved roadways, landscaped areas, drainage patterns and drainage sub-areas, methods of conveyance, proposed retention/infiltration, harvest & use or biotreatment facilities that are planned for installation. Where it is determined to be infeasible to capture and detain design storm runoff volumes, on-site, please include other design features, as described in Section 3, above. Include numbered or lettered notes on the Site Plan with a legend detailing other BMPs, as described in Section 3.

Figure F-1



Legend

- Regional Board Boundary
- County Boundary

DrainageCourse

- <all other values>

Hydromodification

- EHM
- Low
- Medium
- High
- High (Default)

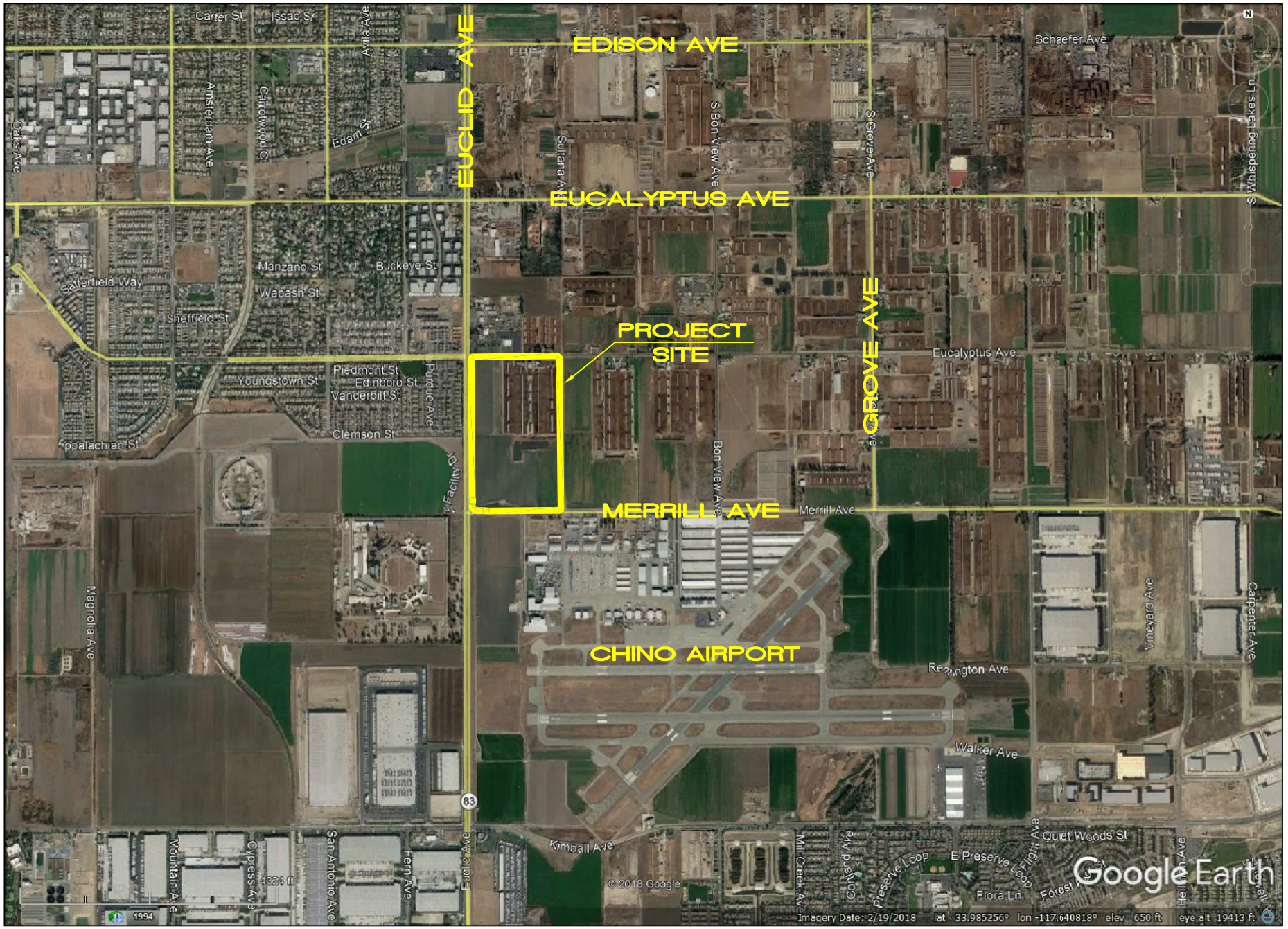
- Government Land
- State of California Land
- United States of America Land
- City Boundary
- Freeways
- Basins and Dams

HCOC Exempt Areas

- None Exempt

HCOC Exempt

- A
- B
- C
- E
- F
- G
- H01
- H02
- H02A
- H02B
- H03
- H04
- H05
- H06
- H07
- H08
- H09
- H10
- H11
- H12
- I
- II
- III
- IV
- V
- VI
- VII
- VIII
- IX
- J
- U
- W
- X
- XIII



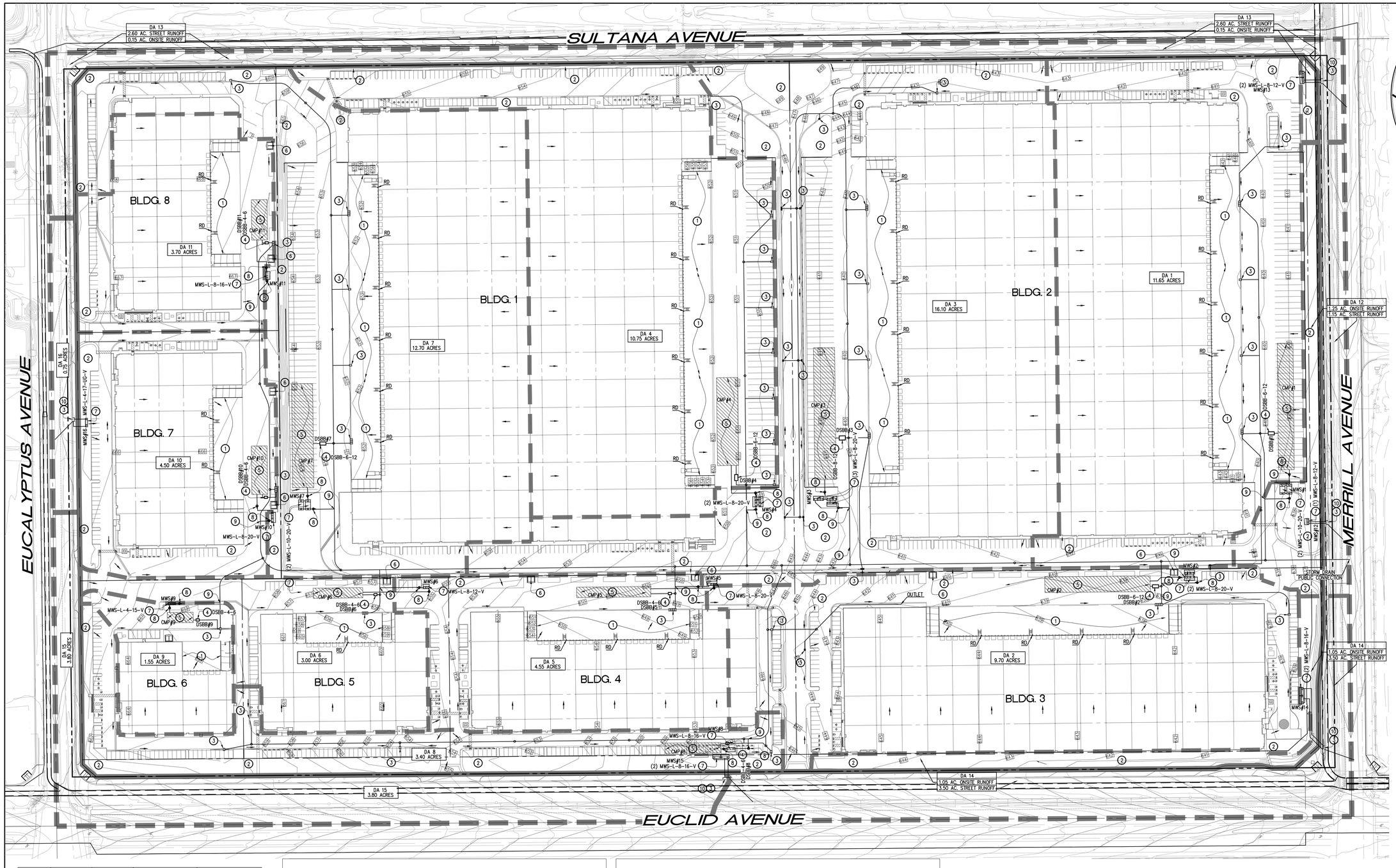
Last Update: 7/22/18
O:\3600-3699\3635\3635VicMap.dwg

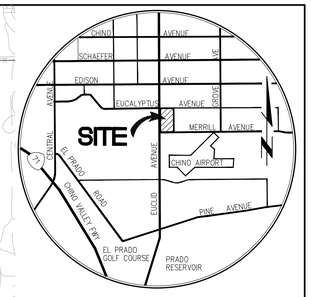
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

VICINITY MAP

FOR

ONTARIO RANCH COMMERCE CENTER





VICINITY MAP

N.T.S.

LEGEND

1. ABOVEGROUND LOADING DOCK
2. LANDSCAPE/IRRIGATION
3. STORM DRAIN SYSTEM SIGNS "NO DUMPING – DRAINS TO RIVER"
4. BIO CLEAN HYDRODYNAMIC SEPARATOR MODEL # PER PLAN
5. CONTECH UNDERGROUND CMP SYSTEM (PERFORATED)
6. TRASH ENCLOSURES
7. BIO CLEAN MODULAR WETLANDS SYSTEM
8. PACIFIC SOUTHWEST INDUSTRIES SUMP PUMP
9. PUMP DISCHARGE LOCATION
10. BIO CLEAN DIVERT SYSTEM

NOTES:

RD	ROOF DRAIN
CMP	UNDERGROUND CMP SYSTEM
MWS	MODULAR WETLAND SYSTEM
DSBB	DEBRIS SEPARATING BAFFLE BOX

BOUNDARY

DRAINAGE AREAS

FLOW DIRECTION

SAMPLE STENCIL TO BE USED AT GRATE AND CURB OPENING INLETS

SAMPLE CATCH BASIN STENCIL

DA DMA	BMP ID	AREA (SF)	VOLUME REQUIRED (CF)	VOLUME PROVIDED (CF)
DA 1	CMP & MWS #1	11.65	57,036	57,182
DA 2	CMP & MWS #2	9.70	47,489	47,709
DA 3	CMP & MWS #3	16.10	78,822	79,336
DA 4	CMP & MWS #4	10.75	52,630	52,821
DA 5	CMP & MWS #5	4.55	22,276	22,412
DA 6	CMP & MWS #6	3.00	14,687	14,827
DA 7	CMP & MWS #7	12.70	62,177	62,540
DA 8	CMP & MWS #8	3.40	16,646	16,853
DA 9	CMP & MWS #9	1.55	7,588	7,754
DA 10	CMP & MWS #10	4.50	22,031	22,280
DA 11	CMP & MWS #11	3.70	18,114	18,390

DYODS™ Design Your Own Detention System

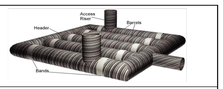
CONTECH CMP DETENTION SYSTEMS

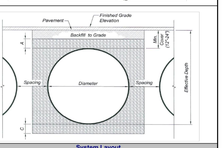
CONTECH Construction Products Inc.

For design assistance, drawings, and pricing send completed worksheet to: dyods@contech-cpi.com

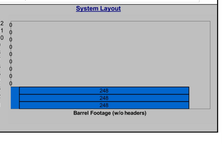
Project Summary		
Date:	6/17/2019	
Project Name:	Ontario Ranch Commerce Center	
City / County:	Ontario, CA	
State:	California	
Designed By:	Luis Prado	Enter Information in Blue Cells
Company:	Thienes Engineering, Inc.	
Telephone:	(714) 521-4811	
Corrugated Metal Pipe Calculator		
Storage Volume Required (cf):	52,919	
Limiting Width (ft):	40.00	
Invert Depth Below Asphalt (ft):	9.00	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft² Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	1	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	
System Sizing		
Pipe Storage:	38,905 cf	
Porous Stone Storage:	14,159 cf	
Total Storage Provided:	53,065 cf	100.3% Of Required Storage
Number of Barrels:	3 barrels	
Length per Barrel:	248.0 ft	
Length Per Header:	30.0 ft	
Rectangular Footprint (W x L):	32. ft x 258. ft	
CONTECH Materials		
Total CMP Footage:	774 ft	
Approximate Total Pieces:	35 pcs	
Approximate Coupling Bands:	34 bands	
Approximate Truckloads:	18 trucks	
Construction Quantities**		
Total Excavation:	2752 cy	
Porous Stone Backfill For Storage:	1311 cy stone	
Backfill to Grade Excluding Stone:	0 cy fill	

**Construction quantities are approximate and should be verified upon final design





System Layout



CMP DETAIL (CMP#1)

DYODS™ Design Your Own Detention System

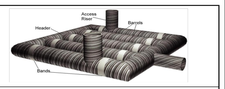
CONTECH CMP DETENTION SYSTEMS

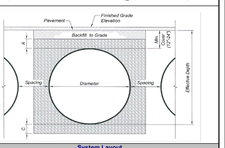
CONTECH Construction Products Inc.

For design assistance, drawings, and pricing send completed worksheet to: dyods@contech-cpi.com

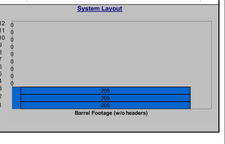
Project Summary		
Date:	6/17/2019	
Project Name:	Ontario Ranch Commerce Center	
City / County:	Ontario, CA	
State:	California	
Designed By:	Luis Prado	Enter Information in Blue Cells
Company:	Thienes Engineering, Inc.	
Telephone:	(714) 521-4811	
Corrugated Metal Pipe Calculator		
Storage Volume Required (cf):	44,001	
Limiting Width (ft):	40.00	
Invert Depth Below Asphalt (ft):	9.00	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft² Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	1	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	
System Sizing		
Pipe Storage:	32,421 cf	
Porous Stone Storage:	11,800 cf	
Total Storage Provided:	44,221 cf	100.5% Of Required Storage
Number of Barrels:	3 barrels	
Length per Barrel:	205.0 ft	
Length Per Header:	30.0 ft	
Rectangular Footprint (W x L):	32. ft x 215. ft	
CONTECH Materials		
Total CMP Footage:	645 ft	
Approximate Total Pieces:	29 pcs	
Approximate Coupling Bands:	28 bands	
Approximate Truckloads:	15 trucks	
Construction Quantities**		
Total Excavation:	2294 cy	
Porous Stone Backfill For Storage:	1093 cy stone	
Backfill to Grade Excluding Stone:	1 cy fill	

**Construction quantities are approximate and should be verified upon final design





System Layout



CMP DETAIL (CMP#2)

Last Update: 6/18/19
O:\3600-3699\3635\3635BMPSITEMAP.dwg

0 40 80 160 240

SCALE: 1"=80'

PREPARED FOR:

REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BLVD., SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087

PREPARED BY:

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH:(714)521-4811 FAX:(714)521-4173

CITY OF ONTARIO
PUBLIC WORKS DEPARTMENT

WQMP SITE PLAN

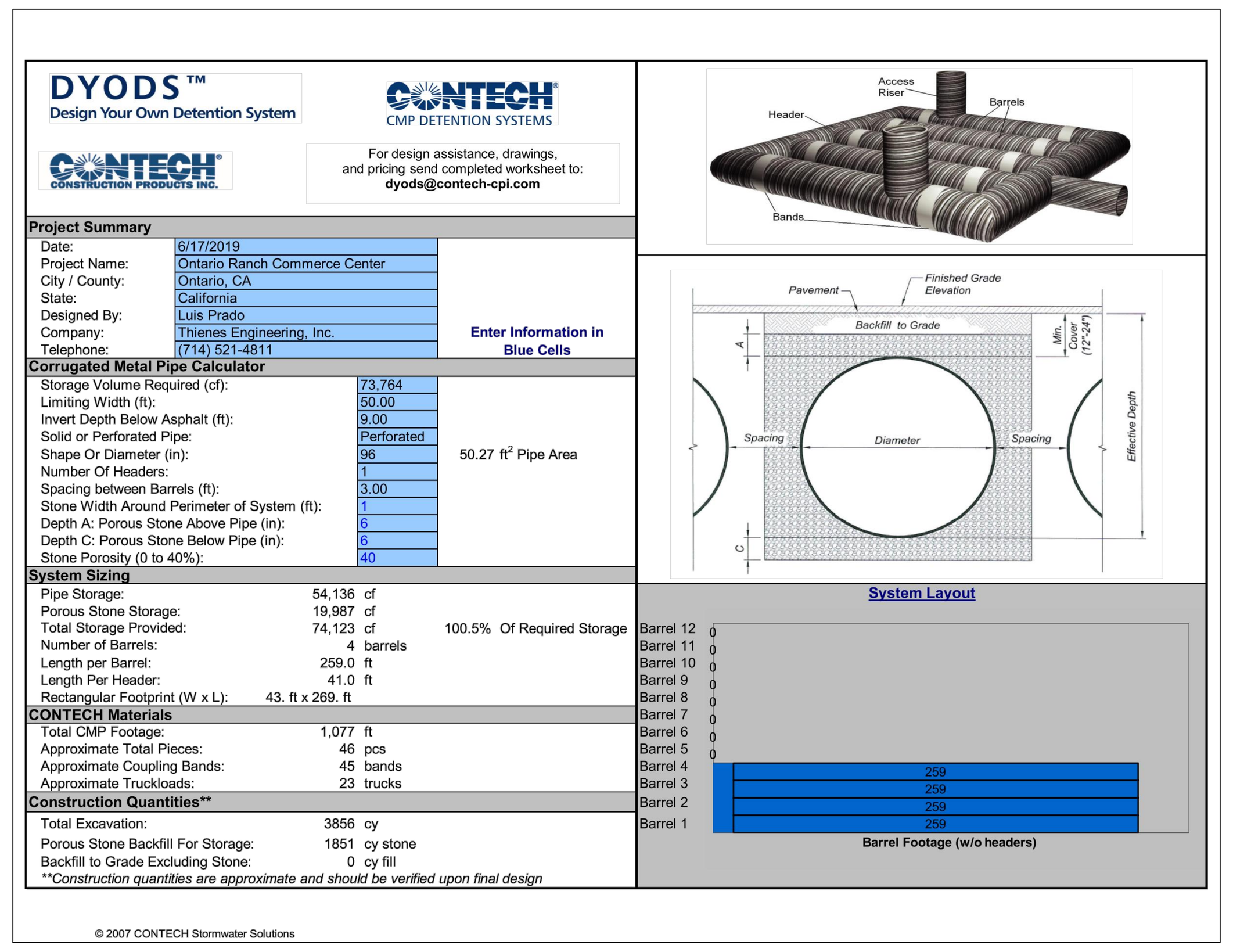
ONTARIO RANCH COMMERCE CENTER

SEC OF EUCLID AVENUE AND EUCALYPTUS AVENUE

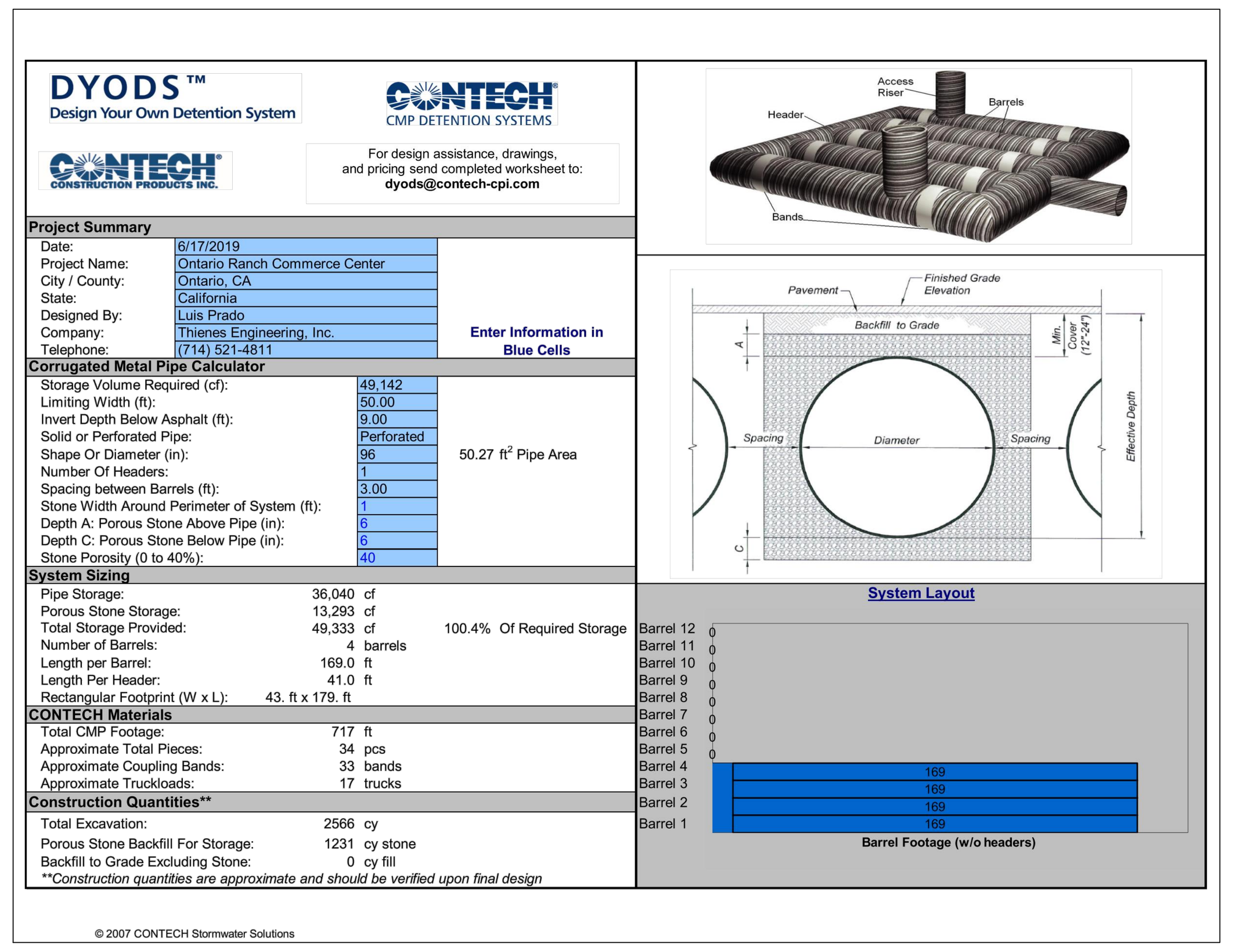
Designed by		Approved by	Date
Date			
Checked by			
Date			
Designed by		Public Works Director	R.C.E.
Date			
Checked by			
Date			

Sheet 1 of 3 Sheets

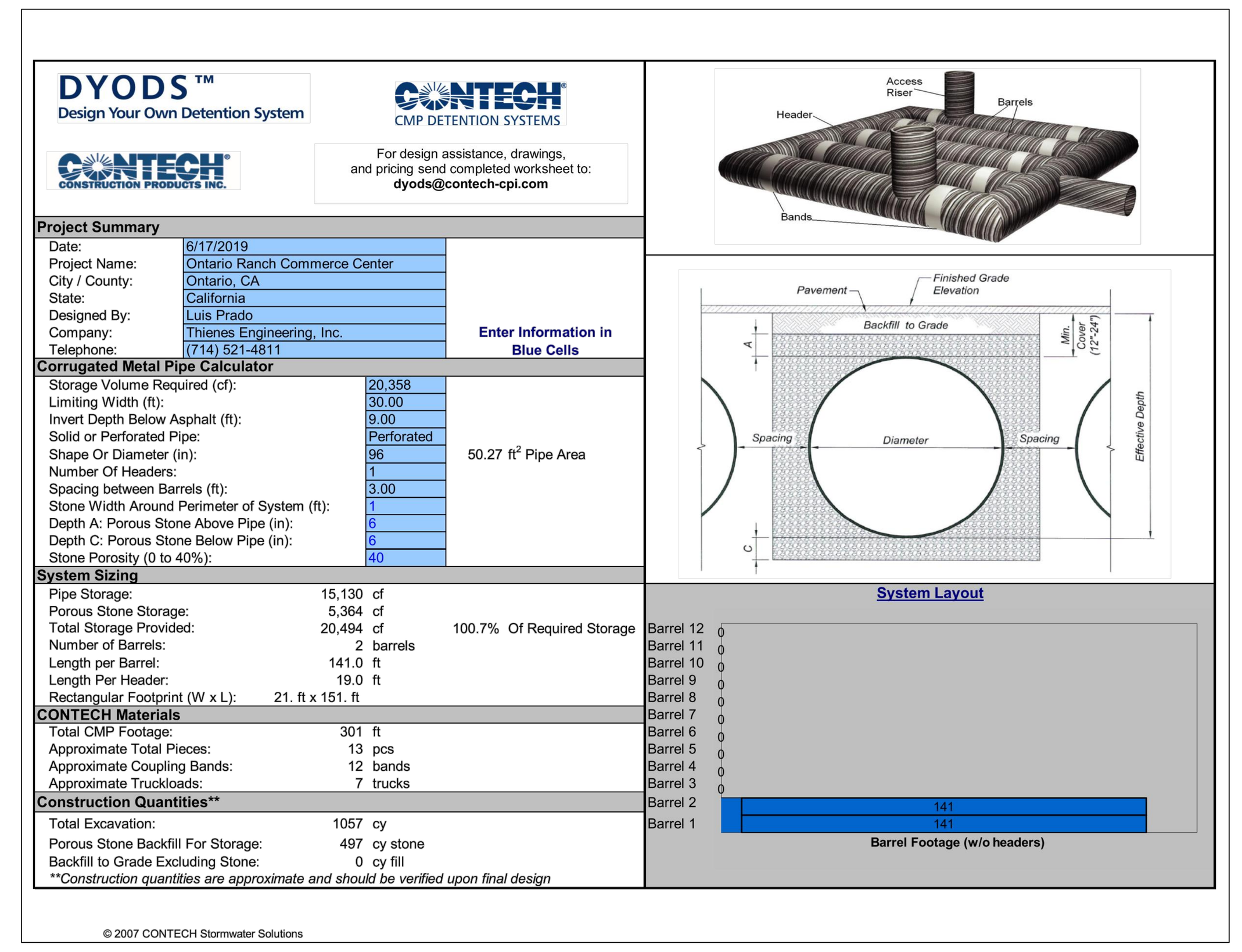
3635/1 OF 3 SHEET



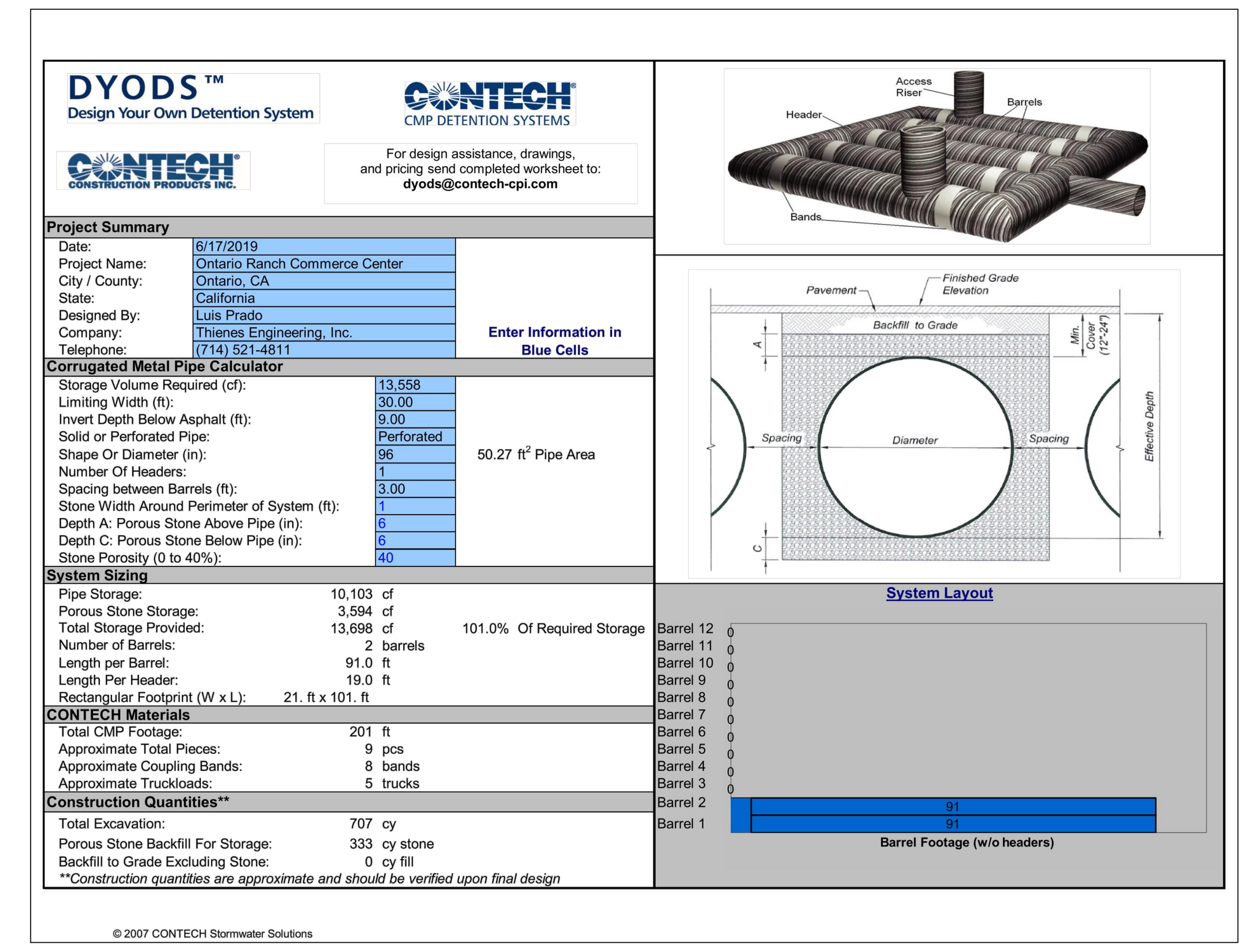
CMP DETAIL (CMP#3)



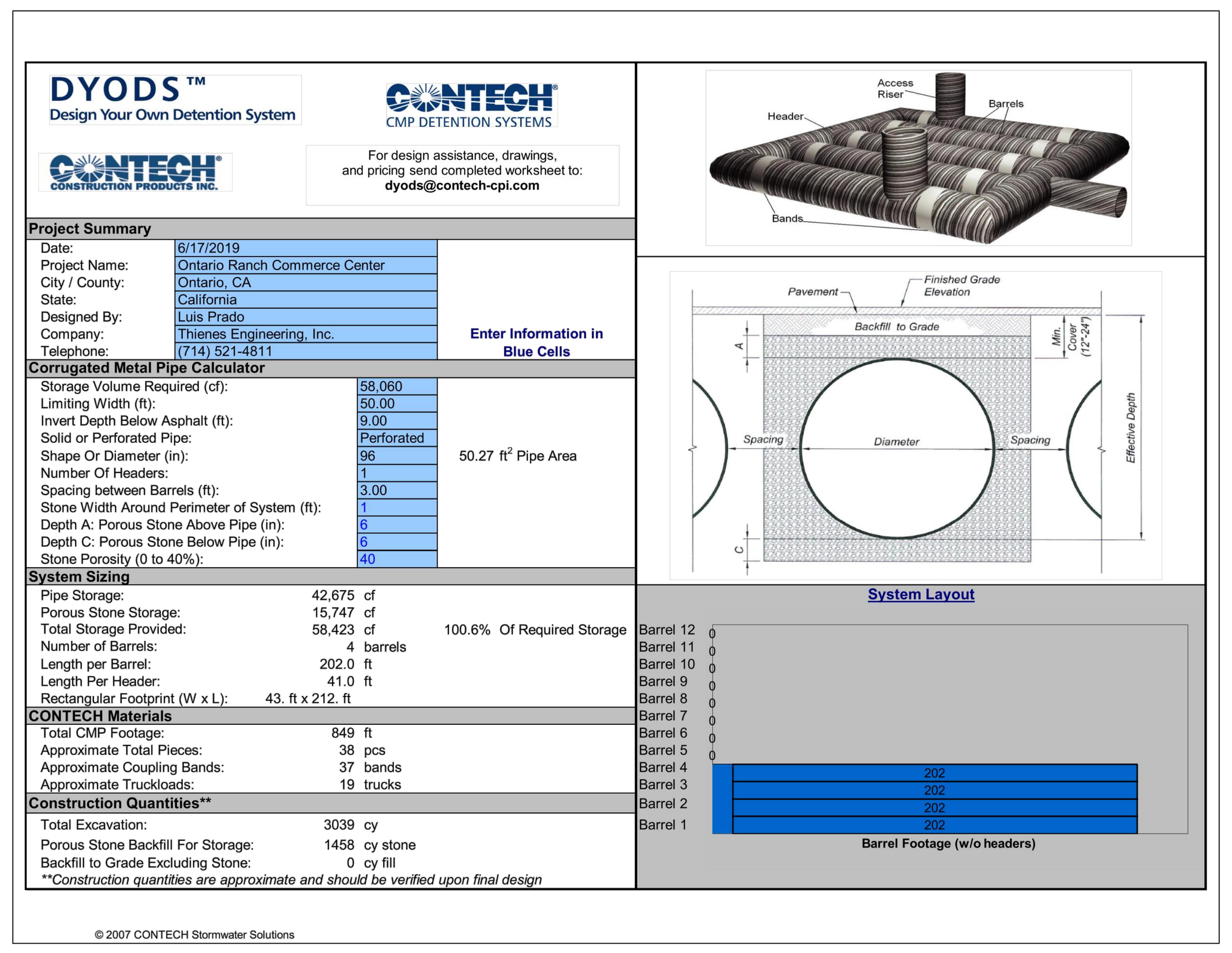
CMP DETAIL (CMP#4)



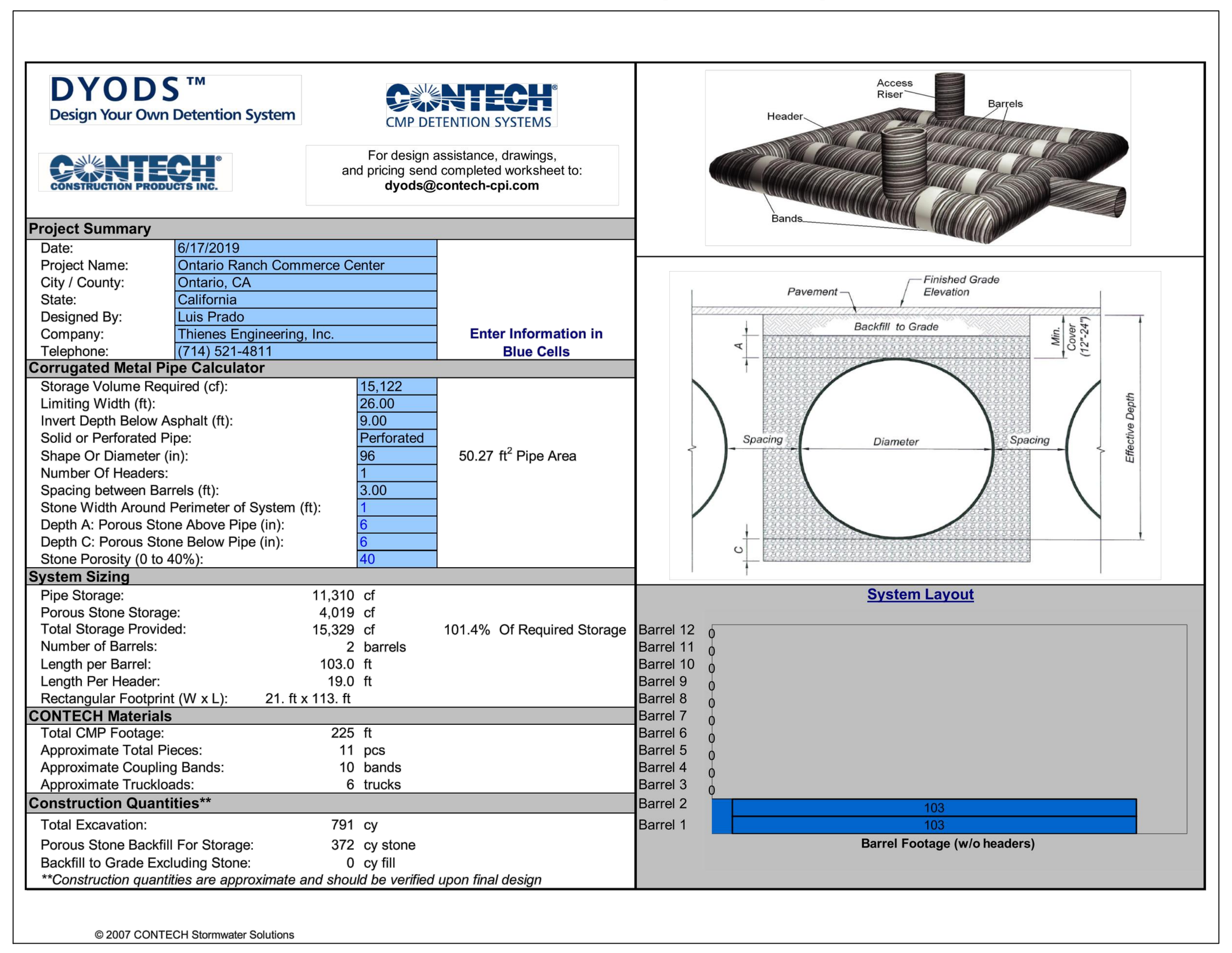
CMP DETAIL (CMP#5



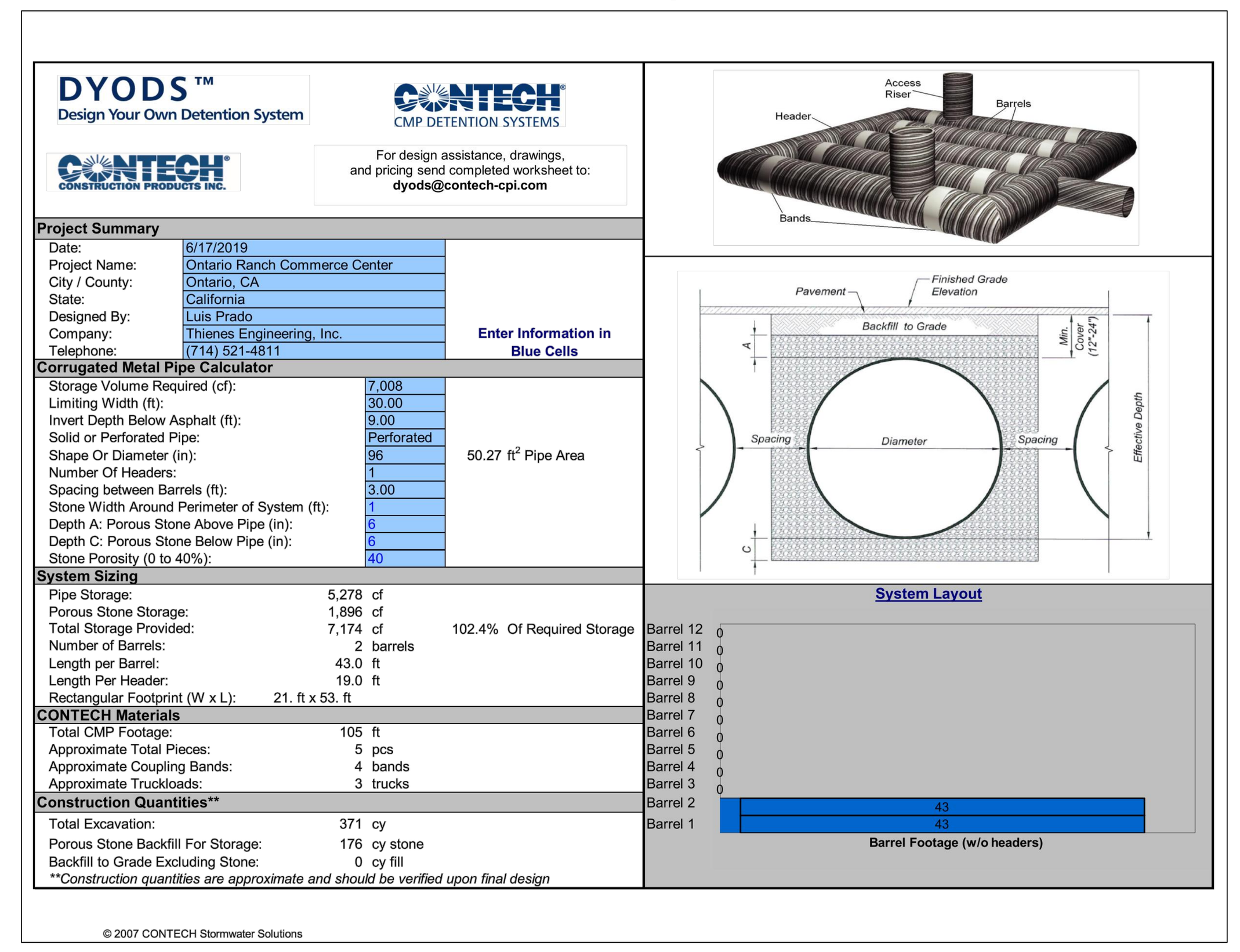
CMP DETAIL (CMP#6)



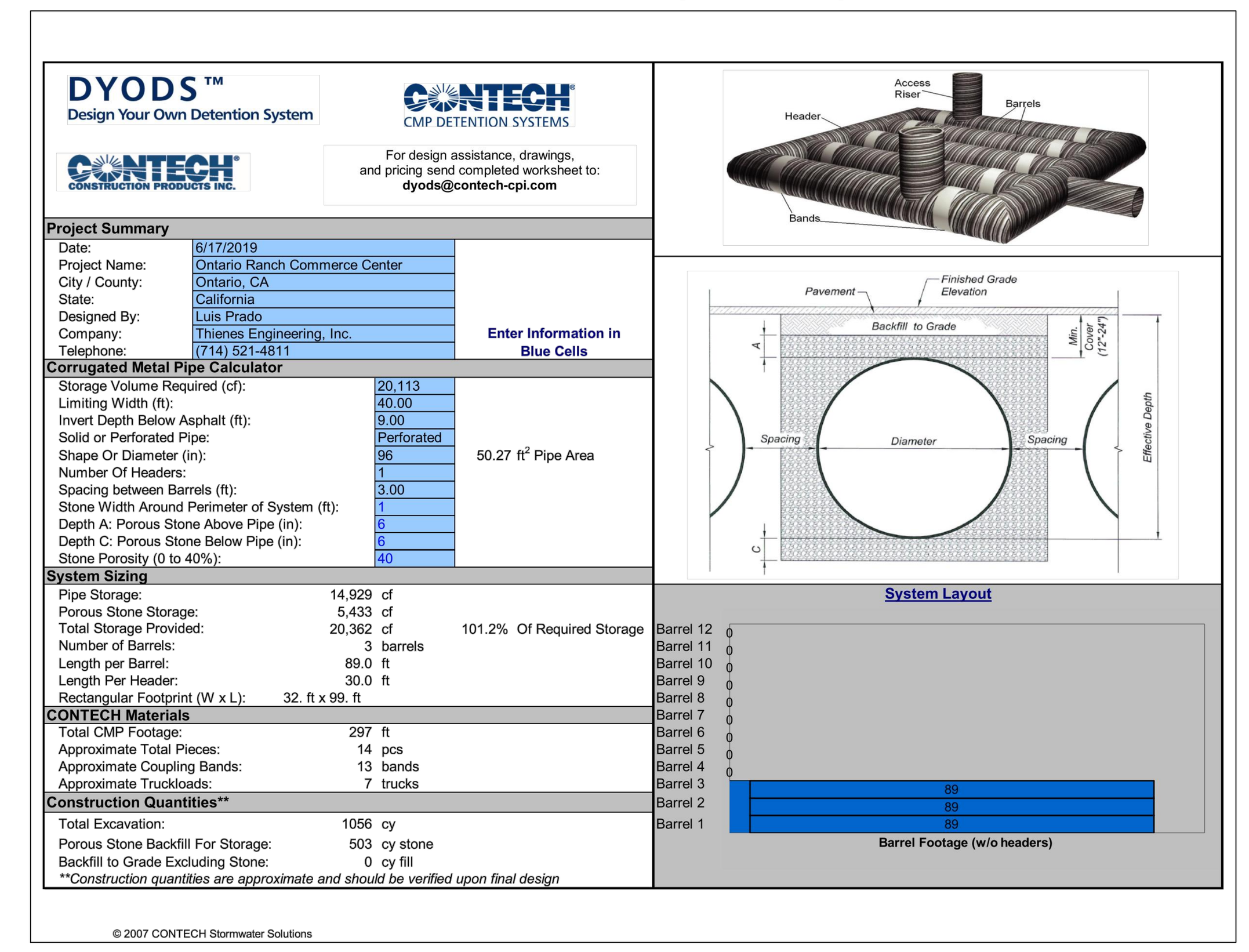
CMP DETAIL (CMP#7)



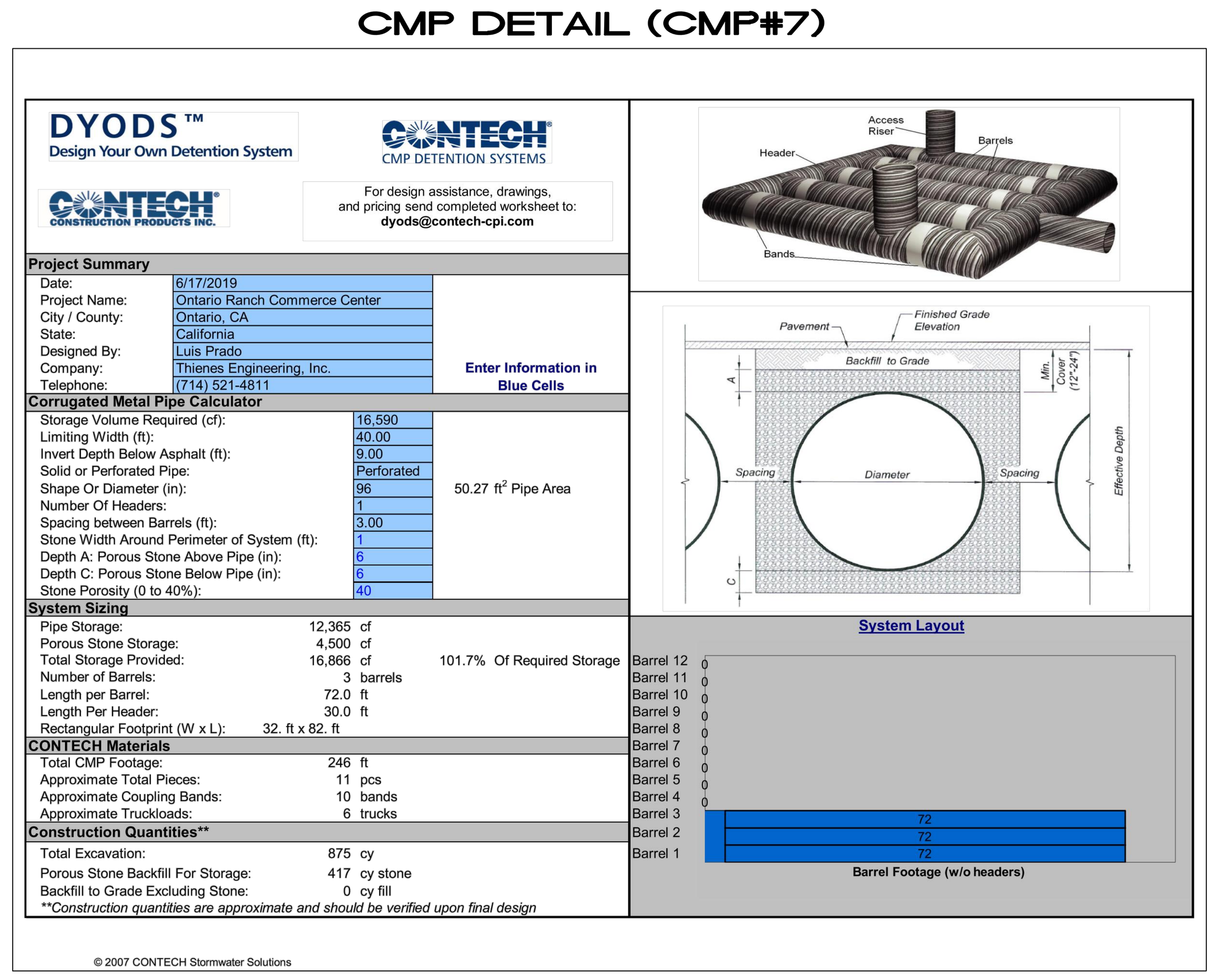
CMP DETAIL (CMP#8)



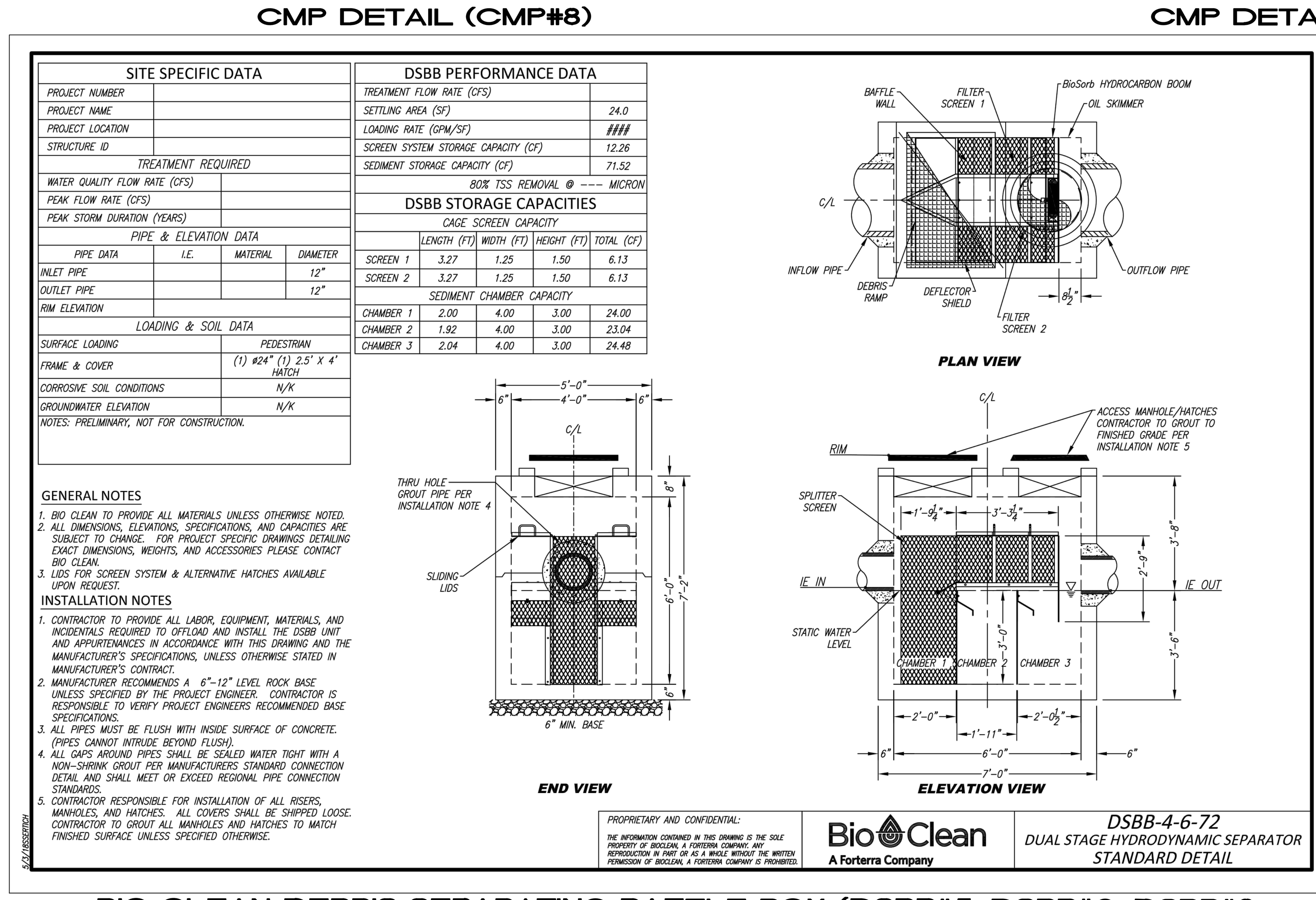
CMP DETAIL (CMP#9)



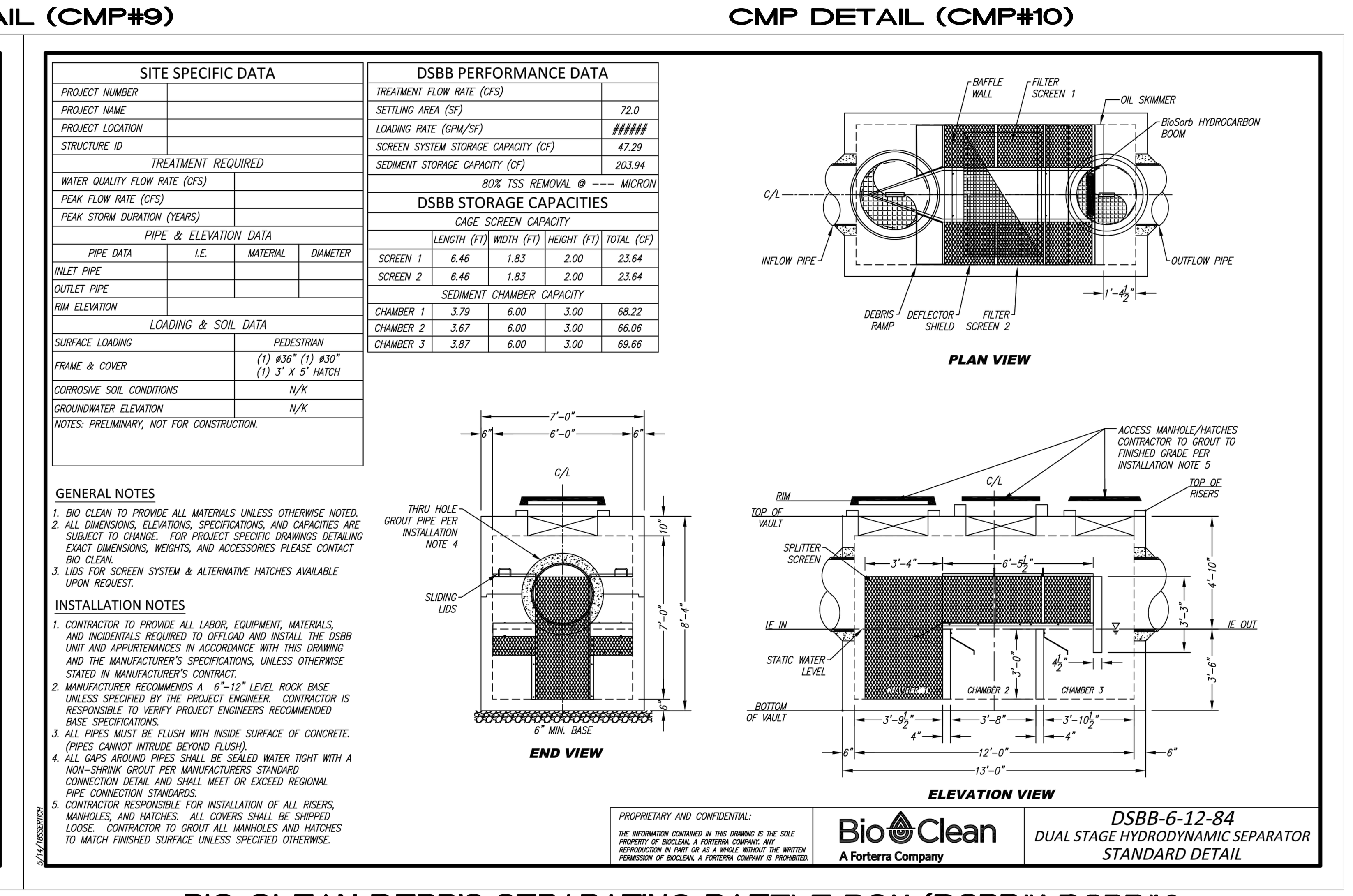
CMP DETAIL (CMP#10)



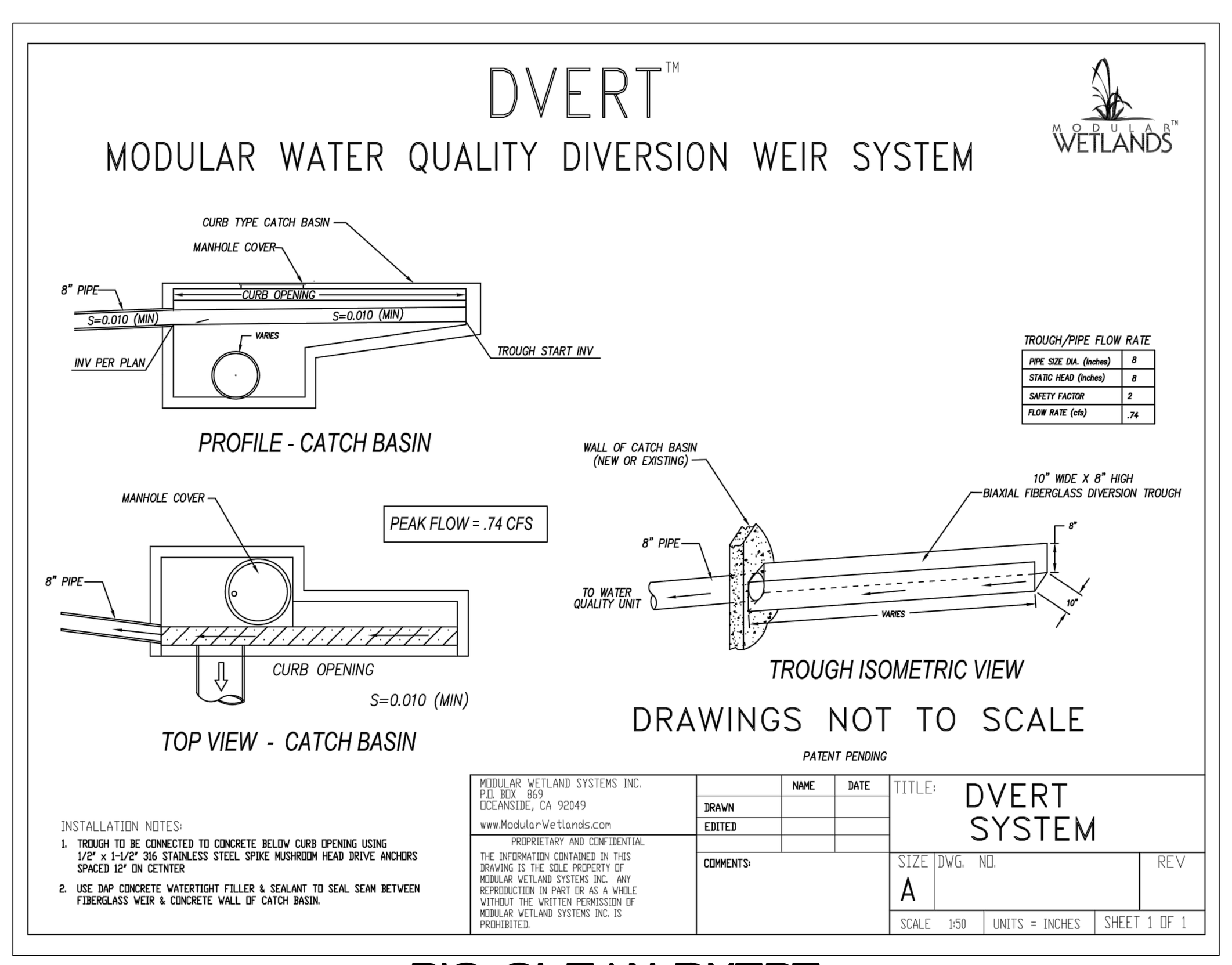
CMP DETAIL (CMP#11)



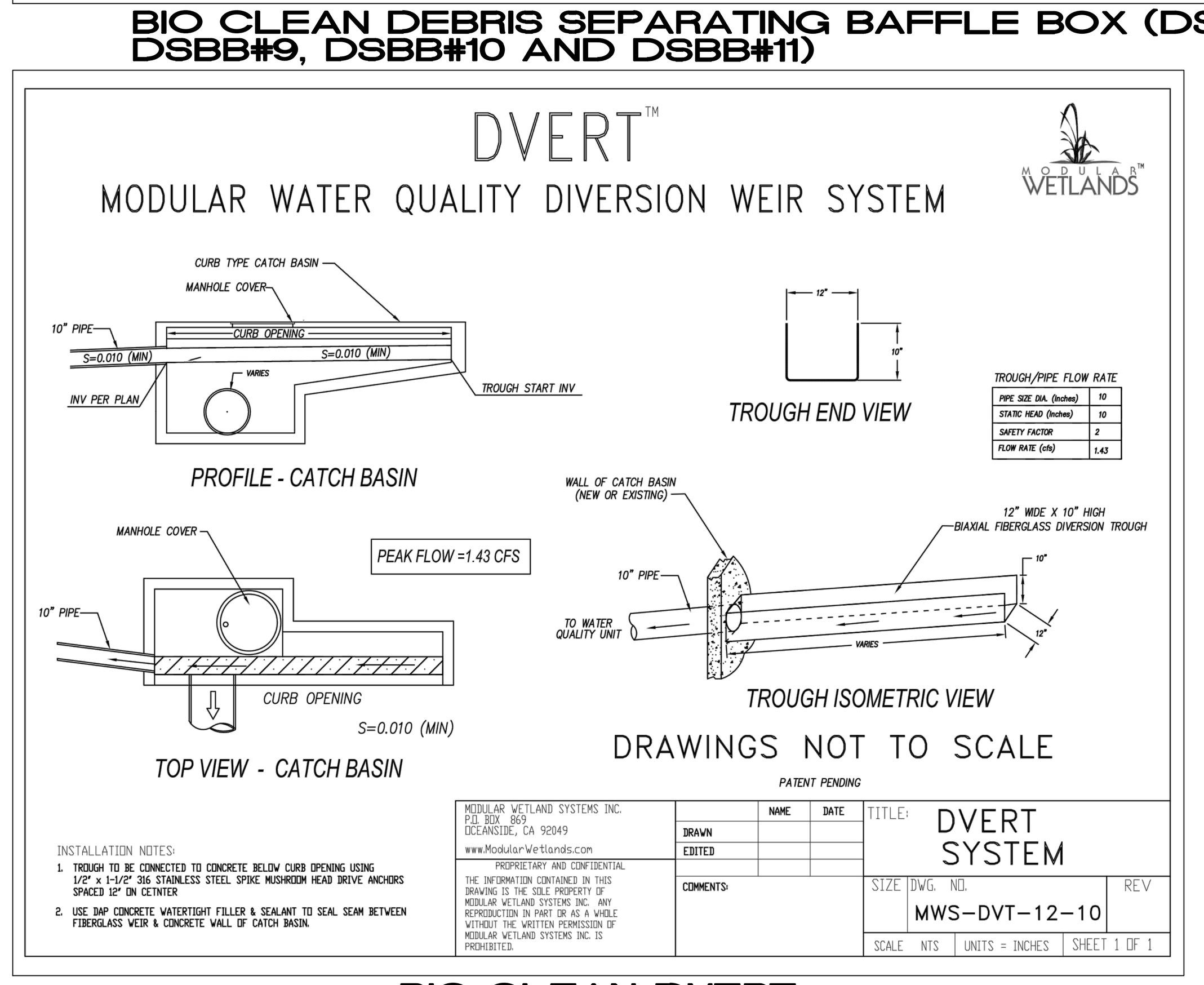
BIO CLEAN DEBRIS SEPARATING BAFFLE BOX (DSBB#5, DSBB#6, DSBB#8, DSBB#9, DSBB#10 AND DSBB#11)



BIO CLEAN DEBRIS SEPARATING BAFFLE BOX (DSBB#1 DSBB#2, DSBB#4 AND DSBB#7)



BIO CLEAN DVERT



BIO CLEAN DVERT

Last Update: 6/18/19
O:\3600-3699\3635\3635BMPSITEMAP.dwg

CITY OF ONTARIO
PUBLIC WORKS DEPARTMENT

WQMP SITE PLAN

ONTARIO RANCH COMMERCE CENTER

SEC OF EUCLID AVENUE AND EUCALYPTUS AVENUE

PREPARED FOR:

REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BLVD., SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087

PREPARED BY:

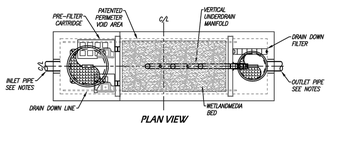
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by ______	Approved by ______ Date ______
Date ______	
Checked by ______	
Date ______	
Designed by ______	Public Works Director R.C.E. ______
Date ______	
Checked by ______	
Date ______	Sheet 2 of 3 Sheets

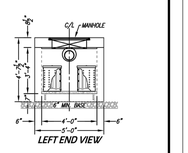
3635/2 OF 3 SHEET

MODULAR WETLANDS SYSTEM (MWS#9)

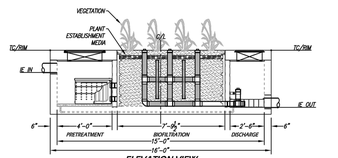
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			4.30
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.69"
MAXIMUM PICK WEIGHT (LBS)			31000
NOTES:			



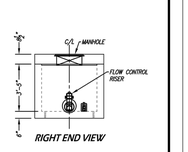
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT 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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

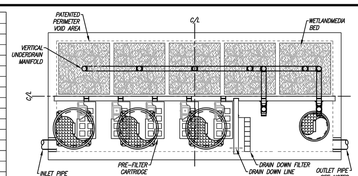
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

TREATMENT FLOW (CFS)	0.175
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

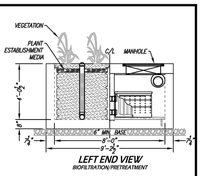
MWS-L-4-15-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

MODULAR WETLANDS SYSTEM (MWS#16)

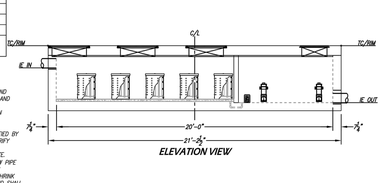
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			11.85
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.43"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



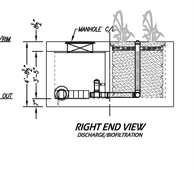
PLAN VIEW



LEFT END VIEW
BIOFILTRATION/PRETREATMENT



ELEVATION VIEW



RIGHT END VIEW
DISCHARGE/BIOFILTRATION

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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

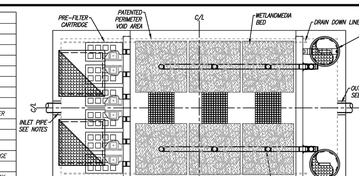
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

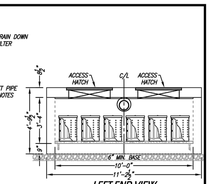
MWS-L-4-17-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

MODULAR WETLANDS SYSTEM (MWS#6, MWS#12 AND MWS#13)

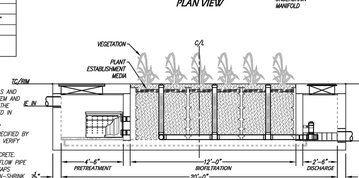
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	36" x 36"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			14.50
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.67"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



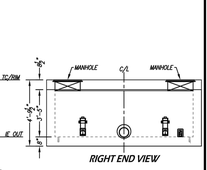
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT 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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

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 MANUFACTURER.

TREATMENT FLOW (CFS)	0.693
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

MODULAR WETLANDS SYSTEM (MWS#8, MWS#11, MWS#14 AND MWS#15)

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			24"
OUTLET PIPE			24"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PEDESTRIAN	
FRAME & COVER		(1) ø30" (2) 3' X 6' HATCH	
CORROSIVE SOIL CONDITIONS		N/A	
GROUNDWATER ELEVATION		N/A	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	96.0
LOADING RATE (GPM/SF)	###
SCREEN SYSTEM STORAGE CAPACITY (CF)	71.53
SEDIMENT STORAGE CAPACITY (CF)	274.80
80@ TSS REMOVAL @ ---- MICRON	

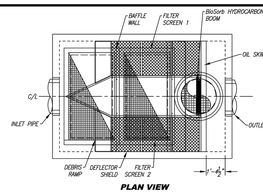
DSBB STORAGE CAPACITIES

CASE SCREEN CAPACITY

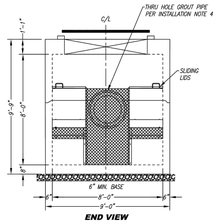
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	2.50	6.33	2.26	35.76
SCREEN 2	2.50	6.33	2.26	35.76

SEDIMENT CHAMBER CAPACITY

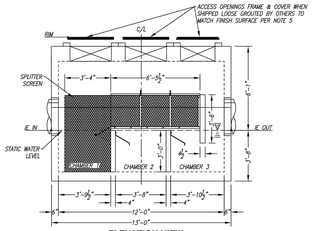
CHAMBER 1	3.79	8.00	3.00	90.96
CHAMBER 2	3.67	8.00	3.00	90.96
CHAMBER 3	3.87	8.00	3.00	92.88



PLAN VIEW



END VIEW



ELEVATION VIEW

GENERAL NOTES

1. BIO CLEAN 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.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE DSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. MANUFACTURER RECOMMENDS A 6"–12" LEVEL ROCK BASE, UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

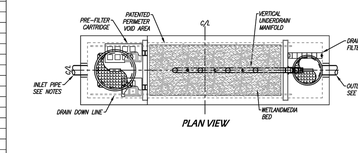
Bio Clean
A Forterra Company

DSBB-8-12-96
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

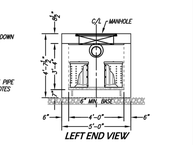
BIO CLEAN DEBRIS SEPARATING BAFFLE BOX (DSBB#3)

MODULAR WETLANDS SYSTEM (MWS#2, MWS#3, MWS#4, MWS#5 AND MWS#10)

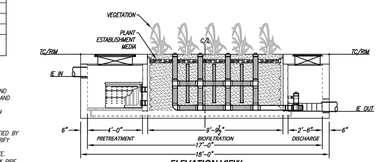
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			5.41
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.05"
MAXIMUM PICK WEIGHT (LBS)			36000
NOTES:			



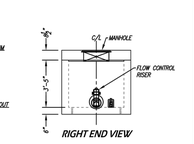
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT 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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

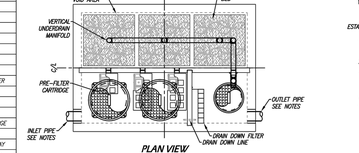
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

TREATMENT FLOW (CFS)	0.206
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

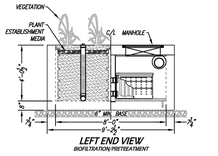
MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

MODULAR WETLANDS SYSTEM (MWS#1 AND MWS#7)

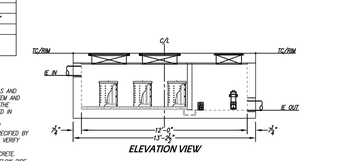
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			7.26
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.66"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



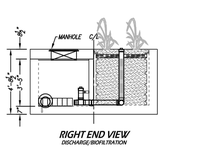
PLAN VIEW



LEFT END VIEW
BIOFILTRATION/PRETREATMENT



ELEVATION VIEW



RIGHT END VIEW
DISCHARGE/BIOFILTRATION

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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

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 MANUFACTURER.

TREATMENT FLOW (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-10-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Last Update: 6/8/19
O:\3600-3699\3635\3635BMPSITEMAP.dwg

CITY OF ONTARIO
PUBLIC WORKS DEPARTMENT

WQMP SITE PLAN

ONTARIO RANCH COMMERCE CENTER

SEC OF EUCLID AVENUE AND EUCALYPTUS AVENUE

PREPARED FOR:
REAL ESTATE DEVELOPMENT ASSOCIATES
4100 MACARTHUR BLVD., SUITE 120
NEWPORT BEACH, CA 92660
PHONE: (949) 954-3087

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH:(714)521-4811 FAX:(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director _____ R.C.E. _____
Sheet 3 of 3 Sheets

3635/3 OF 3 SHEET

DCV CALCULATIONS

www.nws.noaa.gov

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

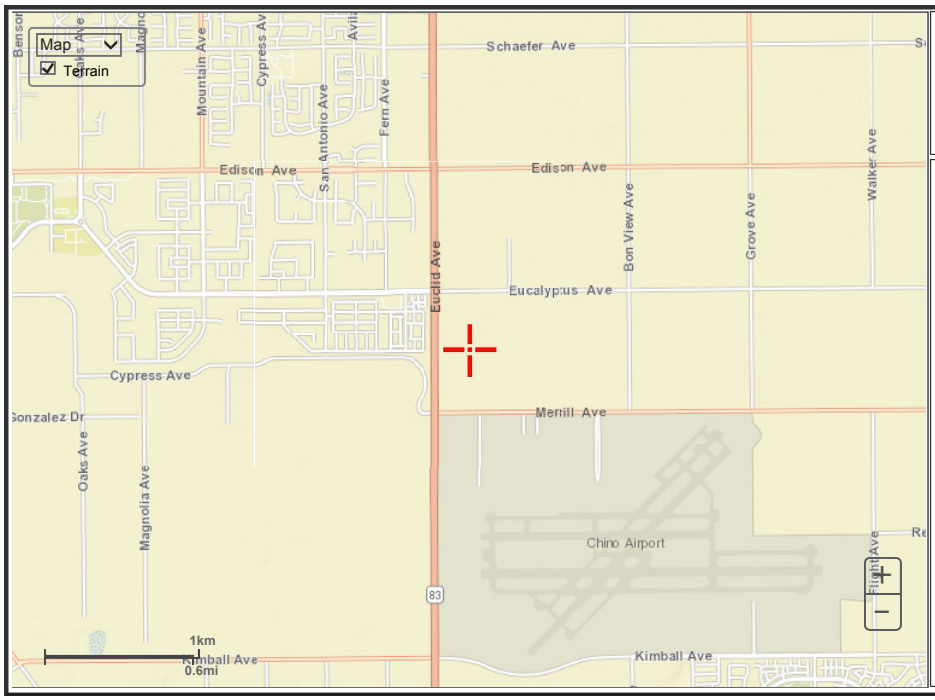
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: 33.986735 Longitude: -117.64815 Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Chino, California, USA*
Latitude: 33.9867°
Longitude: -117.6482°
Elevation: 649.38 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular PF graphical Supplementary information Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years) 1	2	5	10	25	50	100	200	500	1000
5-min	**0.115** (0.096–0.139)	**0.151** (0.126–0.183)	**0.199** (0.165–0.241)	**0.238** (0.196–0.291)	**0.290** (0.231–0.368)	**0.331** (0.258–0.430)	**0.373** (0.283–0.496)	**0.417** (0.307–0.571)	**0.476** (0.336–0.681)	**0.522** (0.356–0.775)
10-min	**0.165** (0.138–0.200)	**0.217** (0.181–0.263)	**0.285** (0.237–0.346)	**0.340** (0.281–0.417)	**0.416** (0.332–0.528)	**0.475** (0.370–0.616)	**0.535** (0.406–0.711)	**0.597** (0.440–0.818)	**0.682** (0.481–0.976)	**0.749** (0.510–1.11)
15-min	**0.200** (0.167–0.242)	**0.262** (0.219–0.318)	**0.345** (0.287–0.418)	**0.412** (0.340–0.504)	**0.503** (0.401–0.638)	**0.574** (0.447–0.745)	**0.647** (0.491–0.860)	**0.722** (0.532–0.989)	**0.825** (0.582–1.18)	**0.905** (0.616–1.34)
30-min	**0.296** (0.247–0.358)	**0.389** (0.324–0.470)	**0.510** (0.424–0.620)	**0.610** (0.503–0.747)	**0.745** (0.594–0.945)	**0.850** (0.662–1.10)	**0.958** (0.727–1.27)	**1.07** (0.788–1.46)	**1.22** (0.862–1.75)	**1.34** (0.913–1.99)
60-min	**0.438** (0.366–0.530)	**0.575** (0.480–0.696)	**0.755** (0.628–0.917)	**0.902** (0.744–1.11)	**1.10** (0.879–1.40)	**1.26** (0.981–1.63)	**1.42** (1.08–1.89)	**1.58** (1.17–2.17)	**1.81** (1.28–2.59)	**1.98** (1.35–2.94)
2-hr	**0.655** (0.547–0.791)	**0.859** (0.717–1.04)	**1.12** (0.933–1.36)	**1.33** (1.10–1.63)	**1.61** (1.28–2.04)	**1.82** (1.42–2.36)	**2.03** (1.54–2.70)	**2.24** (1.65–3.06)	**2.52** (1.78–3.60)	**2.73** (1.86–4.05)
3-hr	**0.823** (0.688–0.995)	**1.08** (0.901–1.31)	**1.41** (1.17–1.71)	**1.66** (1.37–2.04)	**2.00** (1.60–2.54)	**2.26** (1.76–2.93)	**2.51** (1.91–3.34)	**2.76** (2.04–3.78)	**3.10** (2.19–4.43)	**3.35** (2.28–4.97)
6-hr	**1.15** (0.958–1.39)	**1.50** (1.25–1.82)	**1.95** (1.63–2.37)	**2.31** (1.90–2.83)	**2.77** (2.21–3.52)	**3.12** (2.43–4.05)	**3.46** (2.63–4.61)	**3.81** (2.81–5.21)	**4.26** (3.01–6.09)	**4.60** (3.13–6.82)
12-hr	**1.50**	**1.97**	**2.58**	**3.05**	**3.68**	**4.16**	**4.63**	**5.10**	**5.74**	**6.21**

	(1.25–1.82)	(1.65–2.39)	(2.14–3.13)	(2.52–3.74)	(2.93–4.67)	(3.24–5.39)	(3.52–6.16)	(3.76–6.99)	(4.05–8.21)	(4.23–9.22)
24-hr	**1.96** (1.74–2.26)	**2.60** (2.30–3.00)	**3.42** (3.02–3.96)	**4.09** (3.57–4.77)	**4.98** (4.22–6.00)	**5.66** (4.70–6.97)	**6.35** (5.14–8.00)	**7.05** (5.56–9.13)	**8.00** (6.05–10.8)	**8.73** (6.38–12.2)
2-day	**2.38** (2.10–2.74)	**3.20** (2.83–3.69)	**4.29** (3.78–4.96)	**5.18** (4.53–6.05)	**6.41** (5.43–7.73)	**7.36** (6.11–9.06)	**8.34** (6.76–10.5)	**9.37** (7.38–12.1)	**10.8** (8.15–14.5)	**11.9** (8.68–16.6)
3-day	**2.56** (2.26–2.95)	**3.48** (3.08–4.02)	**4.72** (4.16–5.47)	**5.75** (5.03–6.71)	**7.18** (6.08–8.65)	**8.30** (6.88–10.2)	**9.46** (7.66–11.9)	**10.7** (8.41–13.8)	**12.4** (9.35–16.7)	**13.7** (10.0–19.1)
4-day	**2.77** (2.45–3.19)	**3.80** (3.36–4.39)	**5.18** (4.57–6.00)	**6.33** (5.53–7.38)	**7.91** (6.70–9.54)	**9.16** (7.60–11.3)	**10.5** (8.46–13.2)	**11.8** (9.30–15.3)	**13.7** (10.4–18.5)	**15.2** (11.1–21.2)
7-day	**3.18** (2.81–3.66)	**4.38** (3.87–5.06)	**5.98** (5.27–6.92)	**7.30** (6.38–8.52)	**9.11** (7.72–11.0)	**10.5** (8.73–13.0)	**12.0** (9.71–15.1)	**13.5** (10.6–17.5)	**15.6** (11.8–21.0)	**17.2** (12.6–24.0)
10-day	**3.46** (3.06–3.99)	**4.79** (4.23–5.53)	**6.54** (5.77–7.57)	**7.98** (6.98–9.32)	**9.97** (8.44–12.0)	**11.5** (9.55–14.2)	**13.1** (10.6–16.5)	**14.7** (11.6–19.1)	**17.0** (12.9–22.9)	**18.8** (13.7–26.2)
20-day	**4.16** (3.68–4.80)	**5.81** (5.13–6.71)	**8.01** (7.06–9.27)	**9.84** (8.60–11.5)	**12.4** (10.5–14.9)	**14.4** (11.9–17.7)	**16.4** (13.3–20.7)	**18.6** (14.6–24.0)	**21.5** (16.3–29.0)	**23.9** (17.5–33.3)
30-day	**4.94** (4.37–5.70)	**6.92** (6.11–7.99)	**9.59** (8.46–11.1)	**11.8** (10.4–13.8)	**15.0** (12.7–18.1)	**17.5** (14.5–21.5)	**20.1** (16.3–25.4)	**22.9** (18.0–29.6)	**26.8** (20.3–36.1)	**29.9** (21.8–41.7)
45-day	**5.86** (5.19–6.76)	**8.18** (7.23–9.45)	**11.4** (10.0–13.2)	**14.1** (12.4–16.5)	**18.0** (15.3–21.8)	**21.2** (17.6–26.1)	**24.6** (19.9–31.0)	**28.2** (22.2–36.5)	**33.3** (25.2–45.0)	**37.5** (27.4–52.3)
60-day	**6.77** (5.99–7.81)	**9.38** (8.29–10.8)	**13.0** (11.5–15.1)	**16.2** (14.2–18.9)	**20.8** (17.6–25.1)	**24.6** (20.4–30.3)	**28.7** (23.3–36.2)	**33.2** (26.1–43.0)	**39.6** (30.0–53.4)	**44.9** (32.9–62.7)

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

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Main Link Categories:
Home | OWP

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: April 21, 2017

Map Disclaimer
Disclaimer
Credits
Glossary

Privacy Poli
About
Career Opportuniti

FLOW-BASED BMP DESIGN (ONSITE)

CBMP = 0.858(imp)3 – 0.78(imp)2 + 0.774(imp) + 0.04
IBMP = (0.575)(0.2787)(2) = 0.321 in/hr
Q = CBMP * 0.321 * Area

DA 1 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#1

Region		Valley	
Drainage Area (acres)		11.65	acres
Drainage Area (sq-ft)		507,474	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.81	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	3.01	

Use DSBB-6-12
80% @ 75 Micron treats 3.53 cfs

DA 2 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#2

Region		Valley	
Drainage Area (acres)		9.70	acres
Drainage Area (sq-ft)		422,532	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.81	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	2.51	

Use DSBB-6-12
80% @ 75 Micron treats 3.53 cfs

DA 3 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#3

Region		Valley	
Drainage Area (acres)		16.10	acres
Drainage Area (sq-ft)		701,316	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**4.16**	

Use DSBB-8-12
80% @ 75 Micron treats 4.70 cfs

DA 4 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#4

Region		Valley	
Drainage Area (acres)		10.75	acres
Drainage Area (sq-ft)		468,270	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**2.78**	

Use DSBB-6-12
80% @ 75 Micron treats 3.53 cfs

DA 5 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#5

Region		Valley	
Drainage Area (acres)		4.55	acres
Drainage Area (sq-ft)		198,198	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**1.18**	

Use DSBB-4-6
80% @ 75 Micron treats 1.18 cfs

DA 6 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#6

Region		Valley	
Drainage Area (acres)		3.00	acres
Drainage Area (sq-ft)		130,680	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**0.78**	

Use DSBB-4-6
80% @ 75 Micron treats 1.18 cfs

DA 7 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#7

Region		Valley	
Drainage Area (acres)		12.70	acres
Drainage Area (sq-ft)		553,212	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**3.28**	

Use DSBB-6-12
80% @ 75 Micron treats 3.53 cfs

DA 8 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#8

Region		Valley	
Drainage Area (acres)		3.40	acres
Drainage Area (sq-ft)		148,104	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**0.88**	

Use DSBB-4-6
80% @ 75 Micron treats 1.18 cfs

DA 9 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#9

Region		Valley	
Drainage Area (acres)		1.55	acres
Drainage Area (sq-ft)		67,518	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**0.40**	

Use DSBB-4-6
80% @ 75 Micron treats 1.18 cfs

DA 10 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#10

Region		Valley	
Drainage Area (acres)		4.50	acres
Drainage Area (sq-ft)		196,020	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**1.16**	

Use DSBB-4-6
80% @ 75 Micron treats 1.18 cfs

DA 11 – BIO CLEAN DEBRIS SEPARATING BAFFLE BOX – DSBB#11

Region		Valley	
Drainage Area (acres)		3.70	acres
Drainage Area (sq-ft)		161,172	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**0.96**	

Use DSBB-4-6
80% @ 75 Micron treats 1.18 cfs

FLOW-BASED BMP DESIGN (OFFSITE)

DA 12 – FLOW-BASED MODULAR WETLANDS SYSTEM – MWS#12

STREET / MERRILL / CL TO ROW

Region		Valley	
Drainage Area (acres)		1.15	acres
Drainage Area (sq-ft)		50,094	sq-ft
Impervious Coeff	i =	0.9	< 1.0
Runoff Coeff	**C =**	0.73	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	0.27	

STREET / MERRILL / PRIVATE RUN-ON

Region		Valley	
Drainage Area (acres)		1.25	acres
Drainage Area (sq-ft)		54,450	sq-ft
Impervious Coeff	i =	0.3	< 1.0
Runoff Coeff	**C =**	0.23	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	0.09	

Total Q = 0.27 + 0.09 = 0.36 cfs
Use One (1) MWS-L-8-12-V
3.85’ HGL treats 0.392 cfs each

DA 13 – FLOW-BASED MODULAR WETLANDS SYSTEM – MWS#13

STREET / EUCALYPTUS, SULTANA & MERRILL / CL TO ROW

Region		Valley	
Drainage Area (acres)		2.60	acres
Drainage Area (sq-ft)		113,256	sq-ft
Impervious Coeff	i =	0.9	< 1.0
Runoff Coeff	**C =**	0.73	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	0.61	

STREET / MERRILL / PRIVATE RUN-ON

Region		Valley	
Drainage Area (acres)		0.15	acres
Drainage Area (sq-ft)		6,534	sq-ft
Impervious Coeff	i =	0.1	< 1.0
Runoff Coeff	**C =**	0.11	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	0.01	

Total Q = 0.61 + 0.01 = 0.62 cfs
Use Two (2) MWS-L-8-12-V
3.5’ HGL treats 0.357 cfs each

DA 14 – FLOW-BASED MODULAR WETLANDS SYSTEM – MWS#14

STREET / EUCLID & MERRILL / CL TO ROW

Region		Valley	
Drainage Area (acres)		3.50	acres
Drainage Area (sq-ft)		152,460	sq-ft
Impervious Coeff	i =	0.9	< 1.0
Runoff Coeff	**C =**	0.73	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	0.82	

STREET / EUCLID & MERRILL / PRIVATE RUN-ON

Region		Valley	
Drainage Area (acres)		1.05	acres
Drainage Area (sq-ft)		45,738	sq-ft
Impervious Coeff	i =	0.1	< 1.0
Runoff Coeff	**C =**	0.11	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.321	
Flow (cfs)	Q =	0.04	

Total Q = 0.82 + 0.04 = 0.86 cfs
Use Two (2) MWS-L-8-16-V
3.5’ HGL treats 0.476 cfs each

DA 15 – FLOW-BASED MODULAR WETLANDS SYSTEM – MWS#15

STREET / EUCALYPTUS & EUCLID / CL TO ROW

Region		Valley	
Drainage Area (acres)		3.80	acres
Drainage Area (sq-ft)		**165,528**	sq-ft
Impervious Coeff	i =	0.9	< 1.0
Runoff Coeff	**C =**	**0.73**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**0.89**	

Use Two (2) MWS-L-8-16-V
3.65’ HGL treats 0.496 cfs each

DA 16 – FLOW-BASED MODULAR WETLANDS SYSTEM – MWS#16

STREET / EUCALYPTUS / CL TO ROW

Region		Valley	
Drainage Area (acres)		0.75	acres
Drainage Area (sq-ft)		**32,670**	sq-ft
Impervious Coeff	i =	0.9	< 1.0
Runoff Coeff	**C =**	**0.73**	
1-hr 2-yr from NOAA		0.575	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.321**	
Flow (cfs)	Q =	**0.18**	

Use One (1) MWS-L-4-17-V
3.4’ HGL treats 0.206 cfs each

VOLUME-BASED BMP DESIGN

$C_{BMP} = 0.858(imp)^3 - 0.78(imp)^2 + 0.774(imp) + 0.04$
P6 = (0.575)(1.4807) = 0.851 inches
P0 = (1.963)(C_{BMP})(0.851)
DCV = (P0 * Area) / 12

DA 1 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #1

Region		Valley	
Drainage Area (acres)		11.65	acres
Drainage Area (sq-ft)		**507,474**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.851**	
Drawdown Rate (a)		1.963	
DCV		**57,036**	cu-ft
DCV		**1.309**	acre-ft
P0		**1.3487**	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 1)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	11.65	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	57036	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-10-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	2	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	78.50	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	3768.0	cubic feet	157.00 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	349	cubic feet	
Volume Needed in *Pre-Storage*	52919	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	57036	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	42.41	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

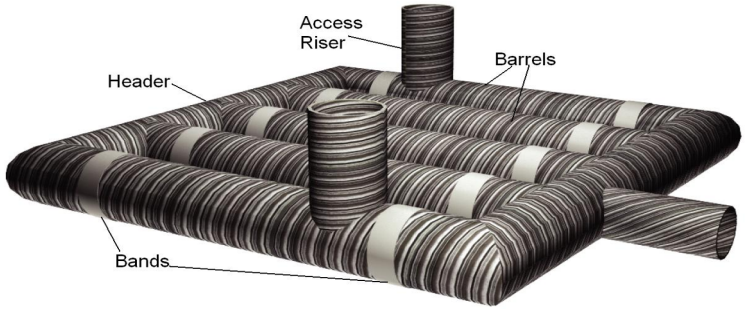
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

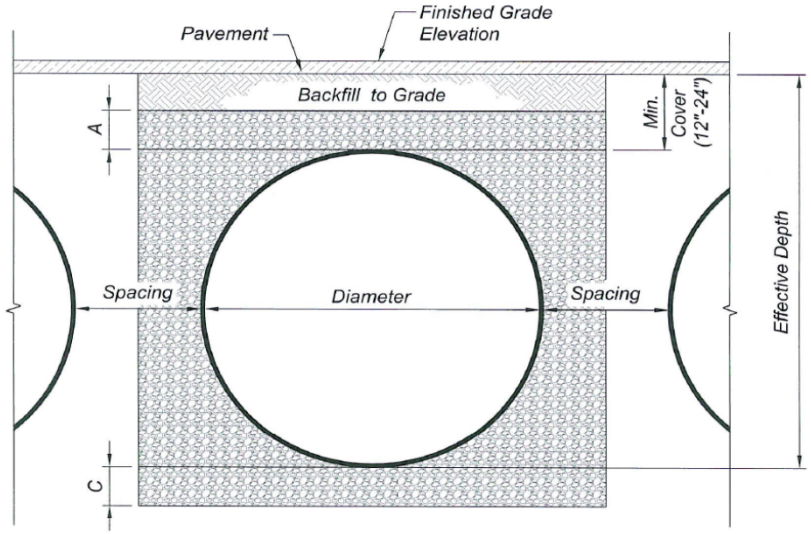
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	52,919
Limiting Width (ft):	40.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	38,905	cf	
Porous Stone Storage:	14,159	cf	
Total Storage Provided:	53,065	cf	100.3% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	248.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	32. ft x 258. ft		

CONTECH Materials

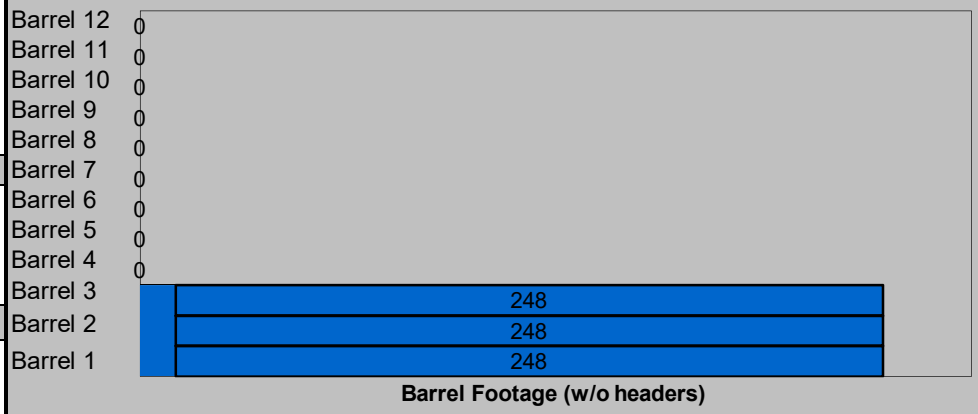
Total CMP Footage:	774	ft
Approximate Total Pieces:	35	pcs
Approximate Coupling Bands:	34	bands
Approximate Truckloads:	18	trucks

Construction Quantities**

Total Excavation:	2752	cy
Porous Stone Backfill For Storage:	1311	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 2 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #2

Region		Valley	
Drainage Area (acres)		9.70	acres
Drainage Area (sq-ft)		**422,532**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.851**	
Drawdown Rate (a)		1.963	
DCV		**47,489**	cu-ft
DCV		**1.090**	acre-ft
P0		**1.3487**	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 2)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	9.7	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	47489	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	2	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	3140.0	cubic feet	130.83 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	44001	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	47489	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	42.37	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

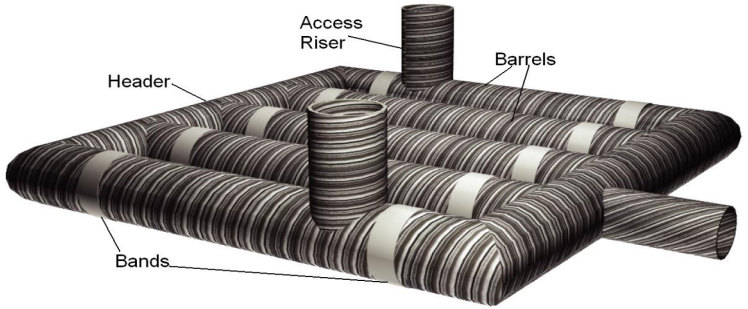
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

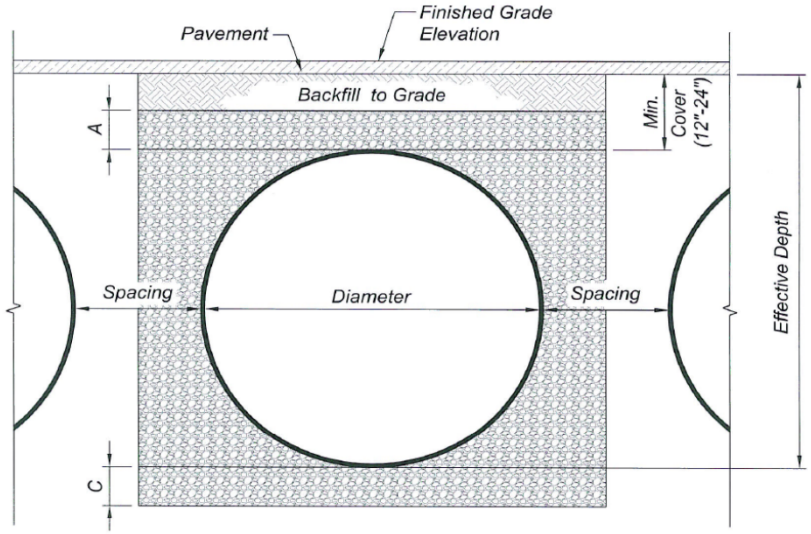
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	44,001
Limiting Width (ft):	40.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	32,421	cf	
Porous Stone Storage:	11,800	cf	
Total Storage Provided:	44,221	cf	100.5% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	205.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	32. ft x 215. ft		

CONTECH Materials

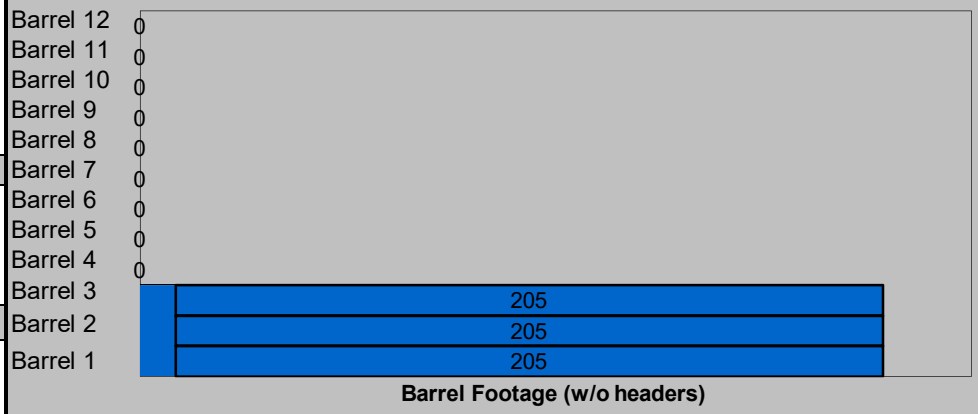
Total CMP Footage:	645	ft
Approximate Total Pieces:	29	pcs
Approximate Coupling Bands:	28	bands
Approximate Truckloads:	15	trucks

Construction Quantities**

Total Excavation:	2294	cy
Porous Stone Backfill For Storage:	1093	cy stone
Backfill to Grade Excluding Stone:	1	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 3 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #3

Region		Valley	
Drainage Area (acres)		16.10	acres
Drainage Area (sq-ft)		701,316	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		78,822	cu-ft
DCV		1.810	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 3)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	**Inputs**	**Units**	**Notes/References**
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	16.1	**Acres**	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	78822	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	3	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	4710.0	cubic feet	**196.25** gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	73764	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	78822	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	47.21	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

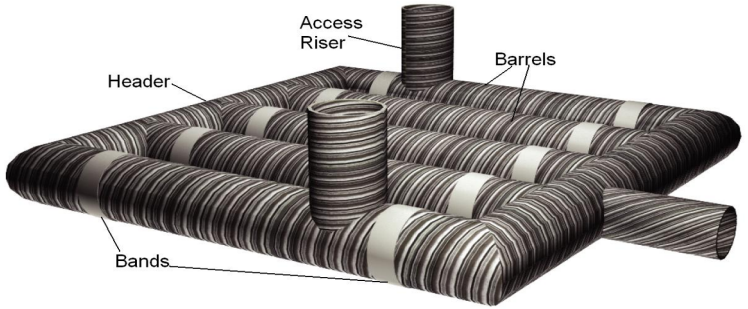
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

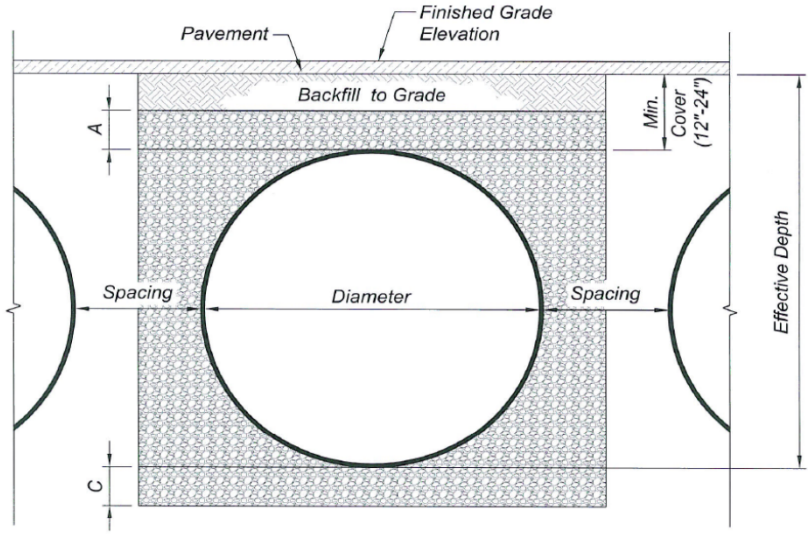
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	73,764
Limiting Width (ft):	50.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	54,136	cf	
Porous Stone Storage:	19,987	cf	
Total Storage Provided:	74,123	cf	100.5% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	259.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	43. ft x 269. ft		

CONTECH Materials

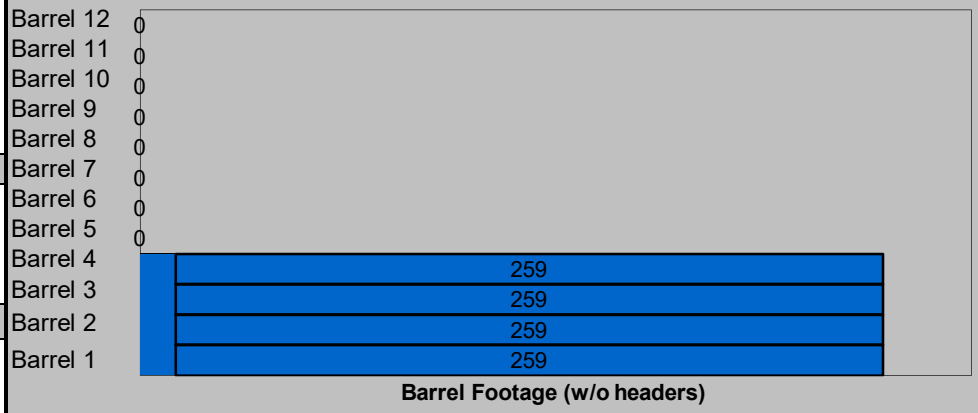
Total CMP Footage:	1,077	ft
Approximate Total Pieces:	46	pcs
Approximate Coupling Bands:	45	bands
Approximate Truckloads:	23	trucks

Construction Quantities**

Total Excavation:	3856	cy
Porous Stone Backfill For Storage:	1851	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 4 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #4

Region		Valley	
Drainage Area (acres)		10.75	acres
Drainage Area (sq-ft)		**468,270**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.851**	
Drawdown Rate (a)		1.963	
DCV		**52,630**	cu-ft
DCV		**1.208**	acre-ft
P0		**1.3487**	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 4)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	**Inputs**	**Units**	**Notes/References**
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	10.75	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	52630	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	2	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	3140.0	cubic feet	130.83 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	49142	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	52630	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	47.28	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

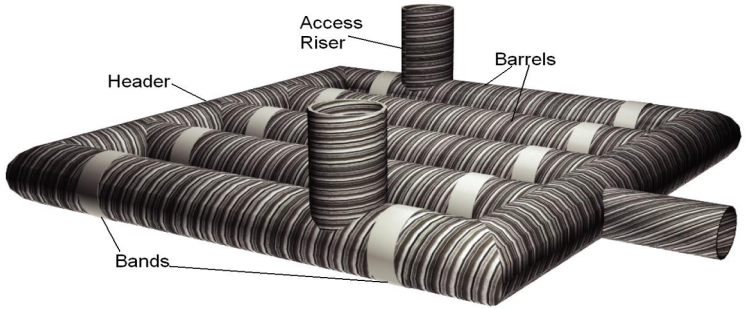
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

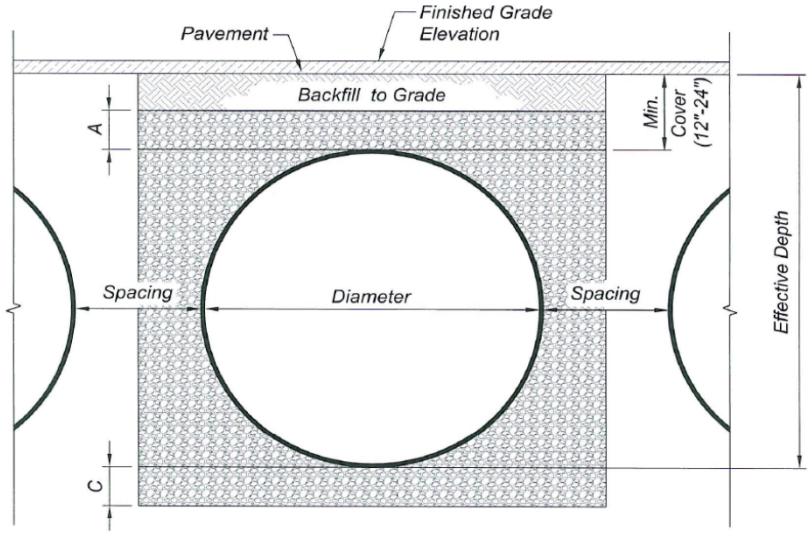
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	49,142
Limiting Width (ft):	50.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	36,040	cf	
Porous Stone Storage:	13,293	cf	
Total Storage Provided:	49,333	cf	100.4% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	169.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	43. ft x 179. ft		

CONTECH Materials

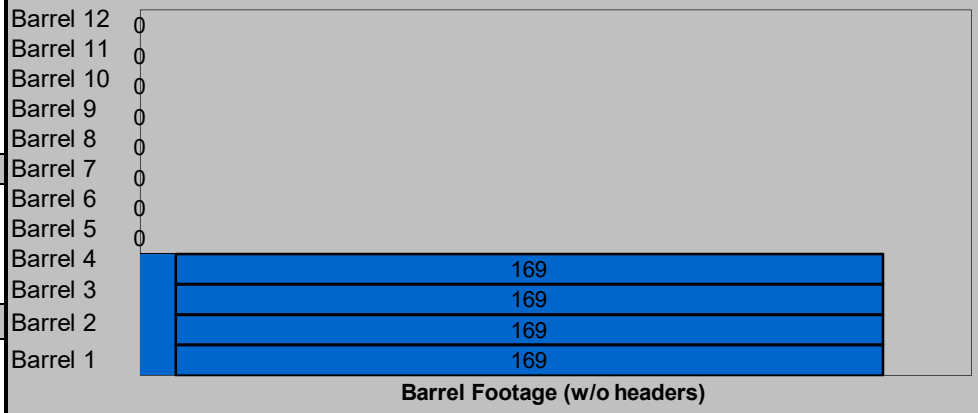
Total CMP Footage:	717	ft
Approximate Total Pieces:	34	pcs
Approximate Coupling Bands:	33	bands
Approximate Truckloads:	17	trucks

Construction Quantities**

Total Excavation:	2566	cy
Porous Stone Backfill For Storage:	1231	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 5 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #5

Region		Valley	
Drainage Area (acres)		4.55	acres
Drainage Area (sq-ft)		198,198	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		22,276	cu-ft
DCV		0.511	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 5)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	**Inputs**	**Units**	**Notes/References**
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	4.55	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	22276	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	1	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	1570.0	cubic feet	**65.42 gals/minute**
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	20358	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	22276	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	39.57	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

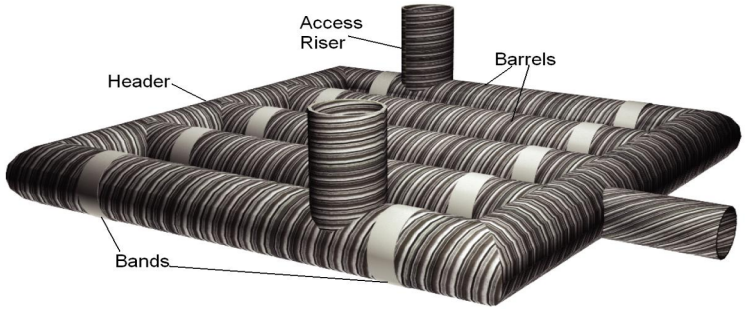
Phone: 760.433.7640
Fax: 760.433.3176
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

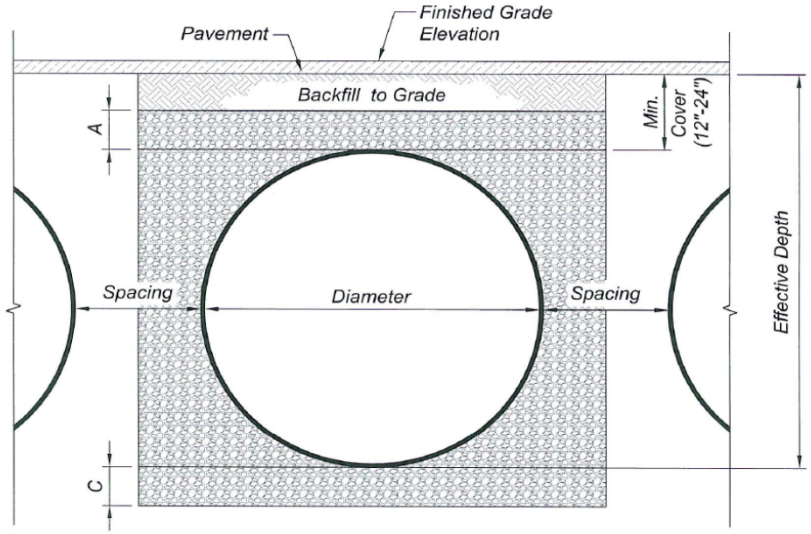
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	20,358
Limiting Width (ft):	30.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	15,130	cf	
Porous Stone Storage:	5,364	cf	
Total Storage Provided:	20,494	cf	100.7% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	141.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	21. ft x 151. ft		

CONTECH Materials

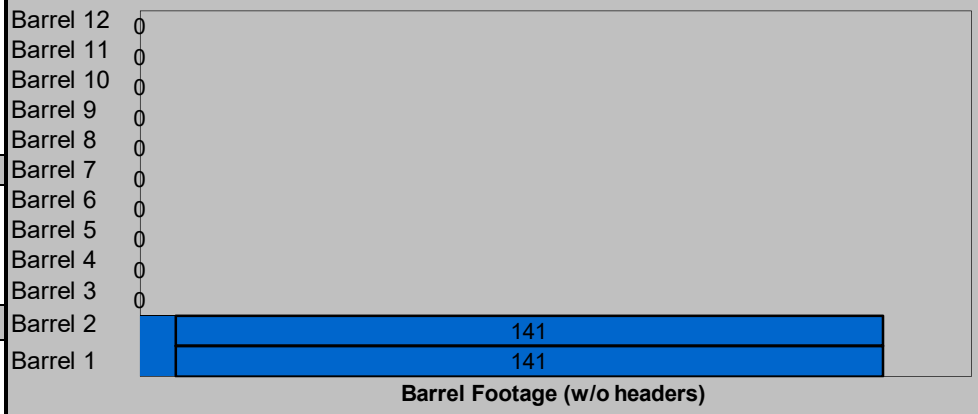
Total CMP Footage:	301	ft
Approximate Total Pieces:	13	pcs
Approximate Coupling Bands:	12	bands
Approximate Truckloads:	7	trucks

Construction Quantities**

Total Excavation:	1057	cy
Porous Stone Backfill For Storage:	497	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 6 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #6

Region		Valley	
Drainage Area (acres)		3.00	acres
Drainage Area (sq-ft)		130,680	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		14,687	cu-ft
DCV		0.337	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 6)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	**Inputs**	**Units**	**Notes/References**
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	3	**Acres**	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	14687	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-12	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	1	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	39.25	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	942.0	cubic feet	**39.25 gals/minute**
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	187	cubic feet	
Volume Needed in *Pre-Storage*	13558	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	14687	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	43.77	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

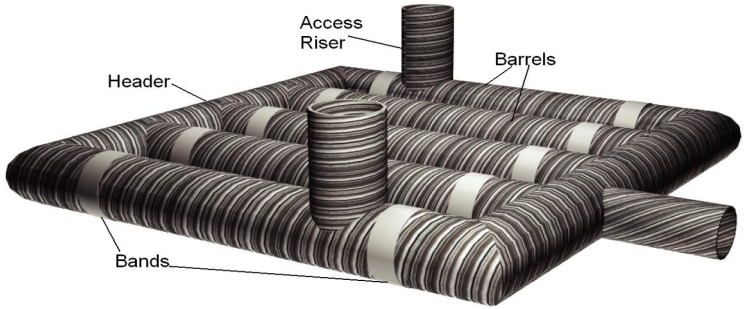
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

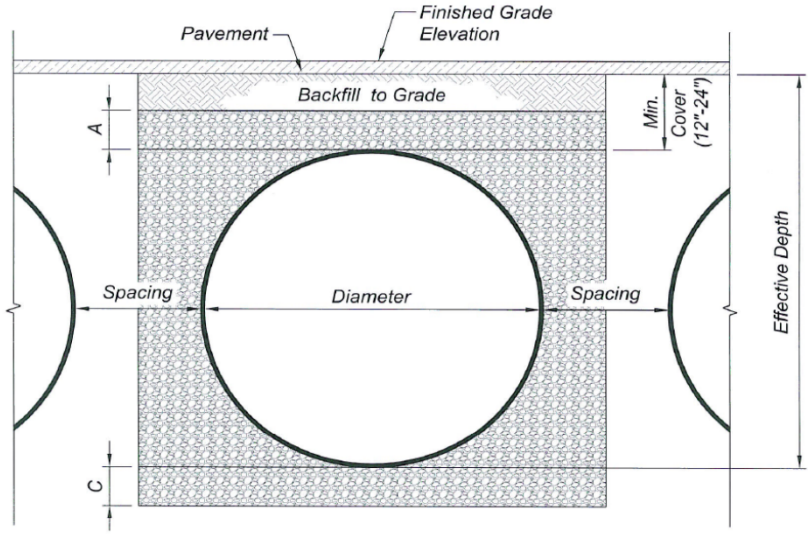
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	13,558
Limiting Width (ft):	30.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	10,103	cf	
Porous Stone Storage:	3,594	cf	
Total Storage Provided:	13,698	cf	101.0% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	91.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	21. ft x 101. ft		

CONTECH Materials

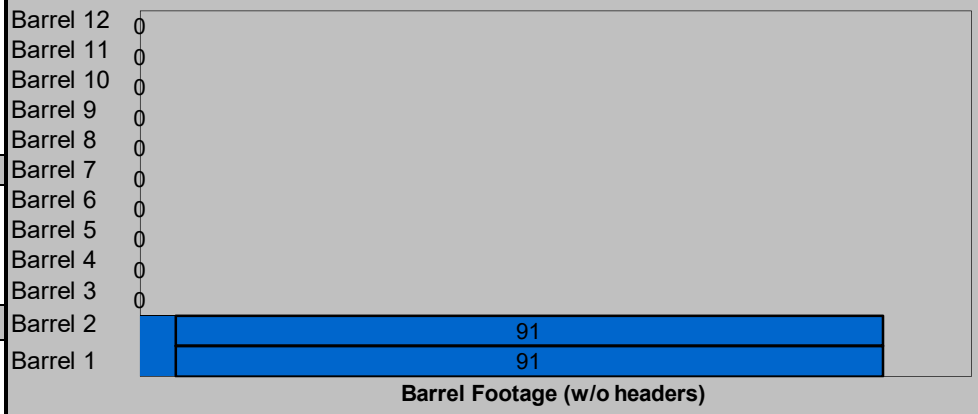
Total CMP Footage:	201	ft
Approximate Total Pieces:	9	pcs
Approximate Coupling Bands:	8	bands
Approximate Truckloads:	5	trucks

Construction Quantities**

Total Excavation:	707	cy
Porous Stone Backfill For Storage:	333	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 7 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #7

Region		Valley	
Drainage Area (acres)		12.70	acres
Drainage Area (sq-ft)		**553,212**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.851**	
Drawdown Rate (a)		1.963	
DCV		**62,177**	cu-ft
DCV		**1.427**	acre-ft
P0		**1.3487**	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 7)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	12.7	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	62177	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-10-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	2	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	78.50	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	3768.0	cubic feet	157.00 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	349	cubic feet	
Volume Needed in *Pre-Storage*	58060	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	62177	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	46.50	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

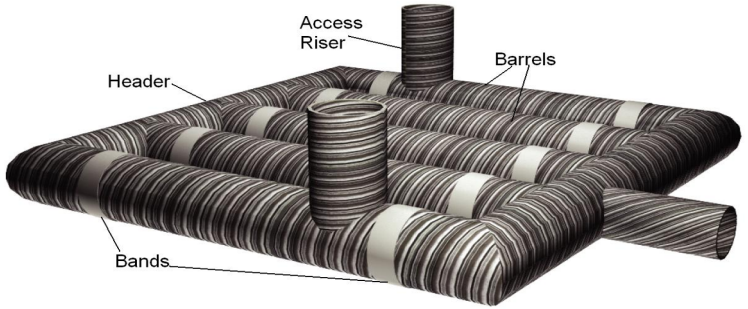
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

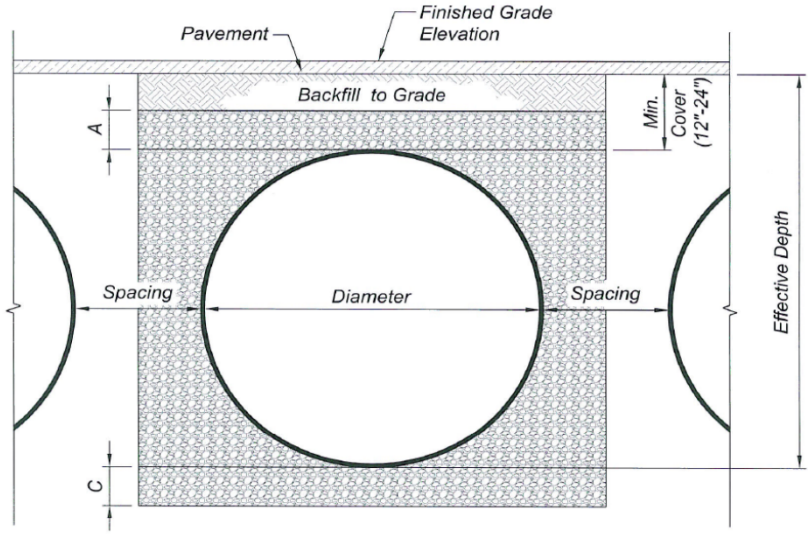
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	58,060
Limiting Width (ft):	50.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	42,675	cf	
Porous Stone Storage:	15,747	cf	
Total Storage Provided:	58,423	cf	100.6% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	202.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	43. ft x 212. ft		

CONTECH Materials

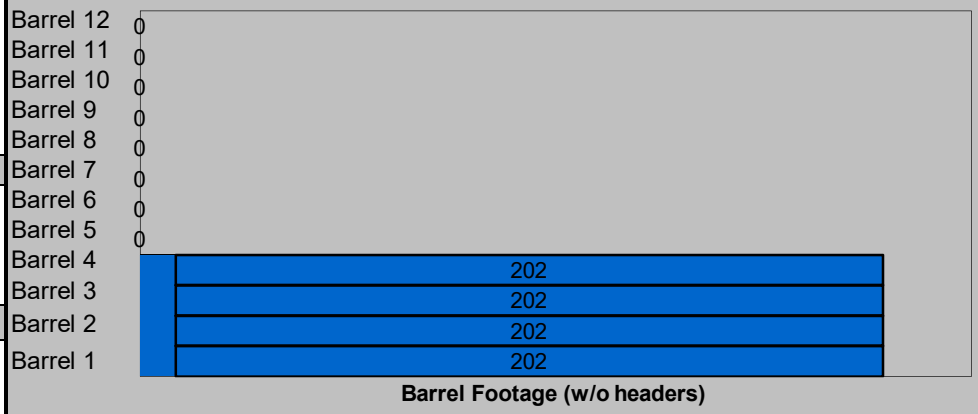
Total CMP Footage:	849	ft
Approximate Total Pieces:	38	pcs
Approximate Coupling Bands:	37	bands
Approximate Truckloads:	19	trucks

Construction Quantities**

Total Excavation:	3039	cy
Porous Stone Backfill For Storage:	1458	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 8 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #8

Region		Valley	
Drainage Area (acres)		3.40	acres
Drainage Area (sq-ft)		148,104	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		16,646	cu-ft
DCV		0.382	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 8)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	**Inputs**	**Units**	**Notes/References**
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	3.4	**Acres**	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	16646	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-16	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	1	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	52.33	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	1256.0	cubic feet	**52.33 gals/minute**
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	268	cubic feet	
Volume Needed in *Pre-Storage*	15122	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	16646	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	36.76	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

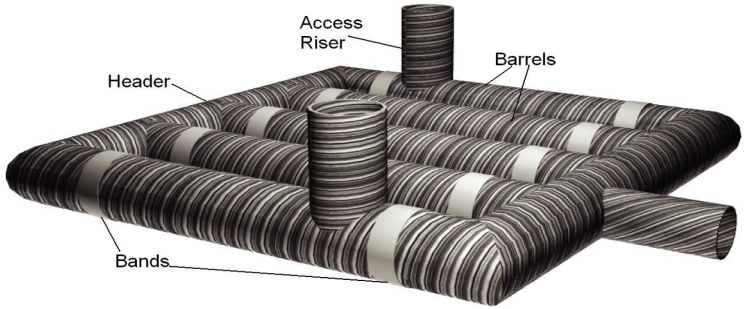
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

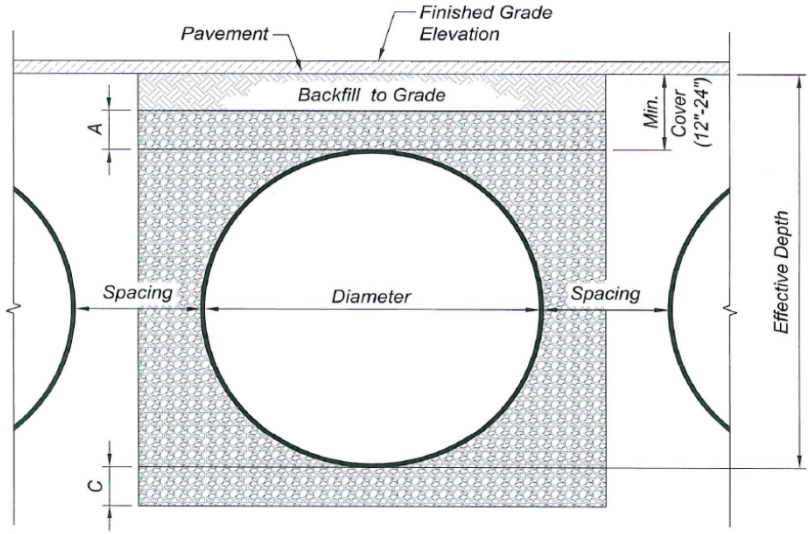
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	15,122
Limiting Width (ft):	26.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	11,310	cf	
Porous Stone Storage:	4,019	cf	
Total Storage Provided:	15,329	cf	101.4% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	103.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	21. ft x 113. ft		

CONTECH Materials

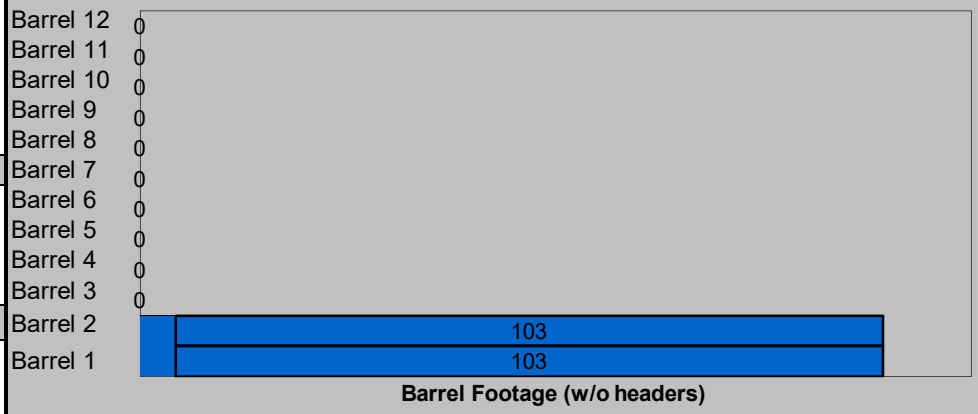
Total CMP Footage:	225	ft
Approximate Total Pieces:	11	pcs
Approximate Coupling Bands:	10	bands
Approximate Truckloads:	6	trucks

Construction Quantities**

Total Excavation:	791	cy
Porous Stone Backfill For Storage:	372	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 9 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #9

Region		Valley	
Drainage Area (acres)		1.55	acres
Drainage Area (sq-ft)		67,518	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		7,588	cu-ft
DCV		0.174	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 9)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	1.55	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	7588	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-4-15	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	1	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	19.80	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	475.2	cubic feet	19.80 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	105	cubic feet	
Volume Needed in *Pre-Storage*	7008	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	7588	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	44.90	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

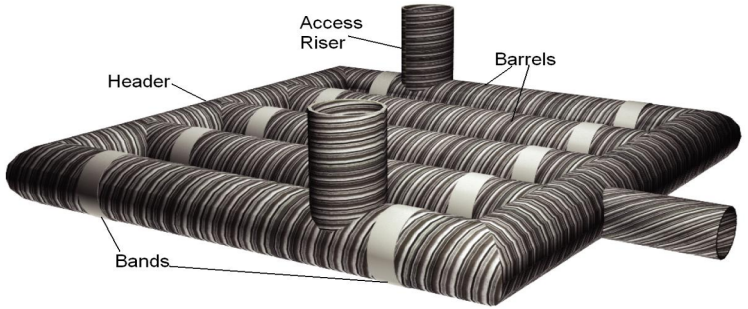
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

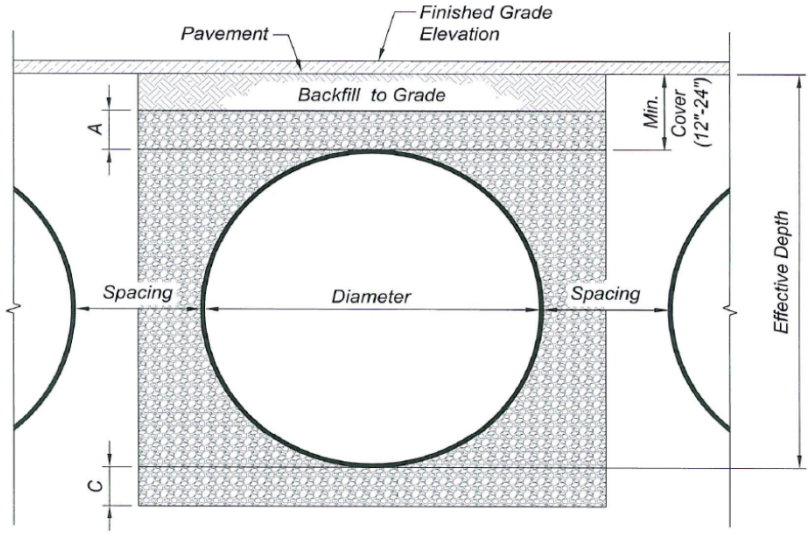
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	7,008
Limiting Width (ft):	30.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	5,278	cf	
Porous Stone Storage:	1,896	cf	
Total Storage Provided:	7,174	cf	102.4% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	43.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	21. ft x 53. ft		

CONTECH Materials

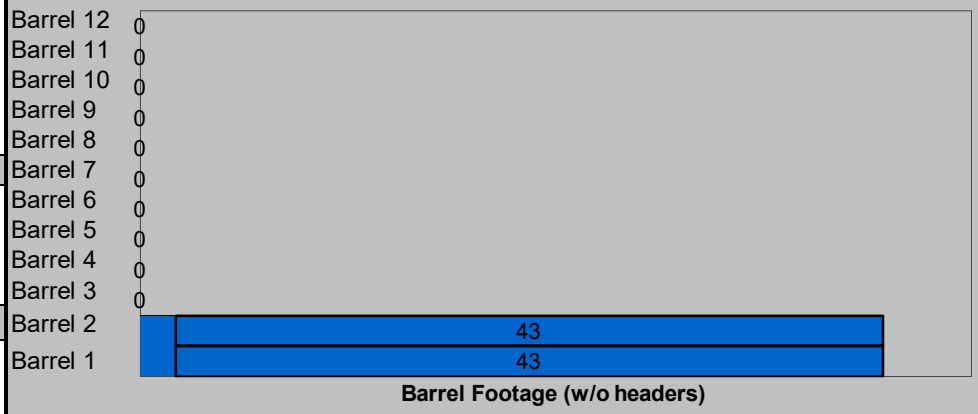
Total CMP Footage:	105	ft
Approximate Total Pieces:	5	pcs
Approximate Coupling Bands:	4	bands
Approximate Truckloads:	3	trucks

Construction Quantities**

Total Excavation:	371	cy
Porous Stone Backfill For Storage:	176	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 10 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #10

Region		Valley	
Drainage Area (acres)		4.50	acres
Drainage Area (sq-ft)		196,020	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		22,031	cu-ft
DCV		0.506	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 10)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	4.5	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	22031	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	1	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	1570.0	cubic feet	65.42 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	20113	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	22031	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	39.10	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

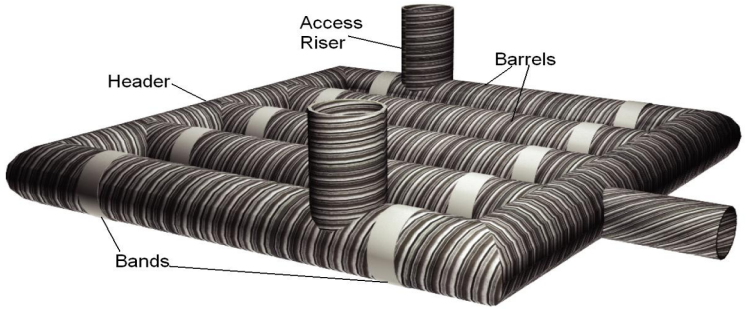
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

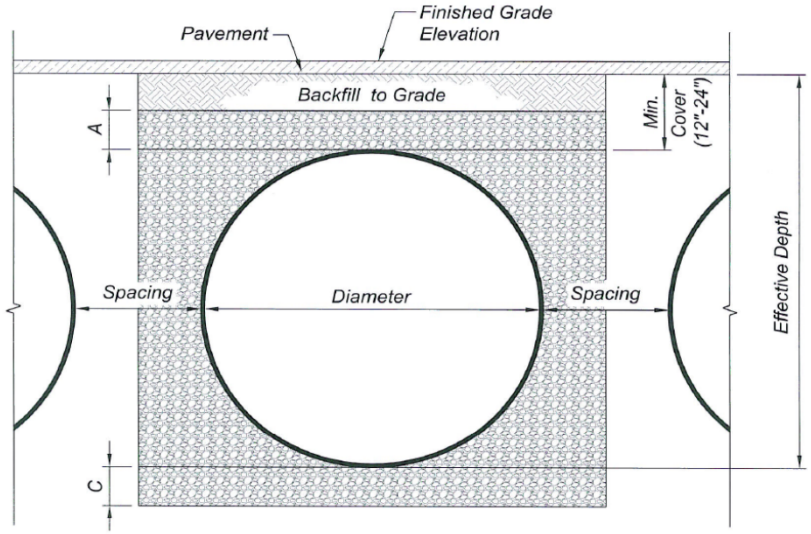
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	20,113
Limiting Width (ft):	40.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	14,929	cf	
Porous Stone Storage:	5,433	cf	
Total Storage Provided:	20,362	cf	101.2% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	89.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	32. ft x 99. ft		

CONTECH Materials

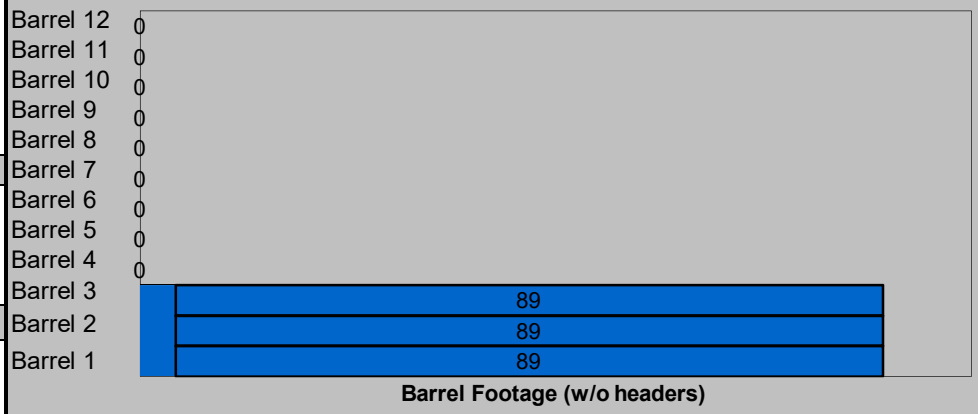
Total CMP Footage:	297	ft
Approximate Total Pieces:	14	pcs
Approximate Coupling Bands:	13	bands
Approximate Truckloads:	7	trucks

Construction Quantities**

Total Excavation:	1056	cy
Porous Stone Backfill For Storage:	503	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 11 – CONTECH UNDERGROUND CMP SYSTEM & MODULAR WETLANDS SYSTEM – CMP & MWS #11

Region		Valley	
Drainage Area (acres)		3.70	acres
Drainage Area (sq-ft)		161,172	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.575	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.851	
Drawdown Rate (a)		1.963	
DCV		18,114	cu-ft
DCV		0.416	acre-ft
P0		1.3487	inches

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	Ontario Ranch Commerce Center (DA 11)
City/Town	Ontario
State	California
Zip Code	91762

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	3.7	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	18114	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-16	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	1	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	52.33	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	1256.0	cubic feet	52.33 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	268	cubic feet	
Volume Needed in *Pre-Storage*	16590	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	18114	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	40.27	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

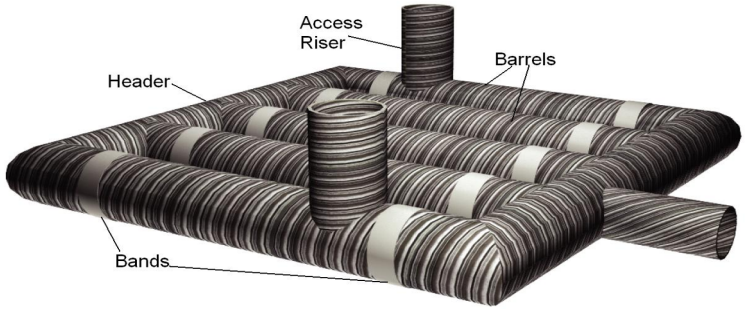
Email: Info@modularwetlands.com

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

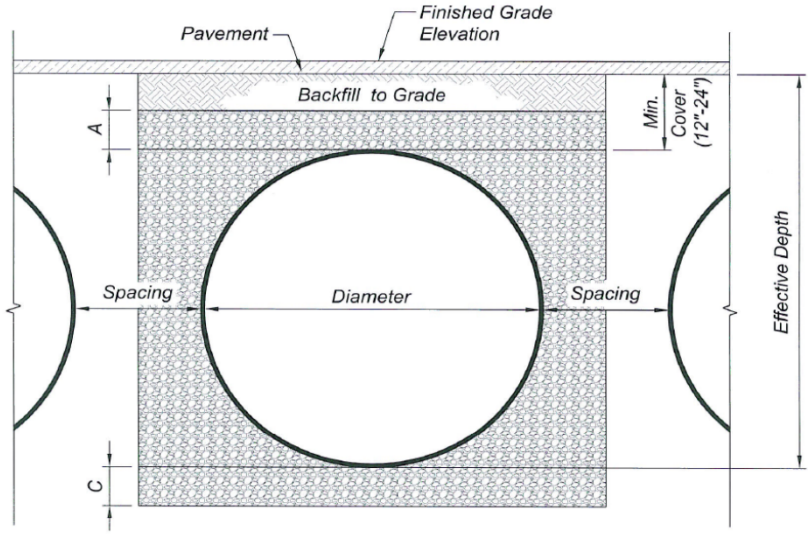
Date:	6/17/2019
Project Name:	Ontario Ranch Commerce Center
City / County:	Ontario, CA
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering, Inc.
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	16,590
Limiting Width (ft):	40.00
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	12,365	cf	
Porous Stone Storage:	4,500	cf	
Total Storage Provided:	16,866	cf	101.7% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	72.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	32. ft x 82. ft		

CONTECH Materials

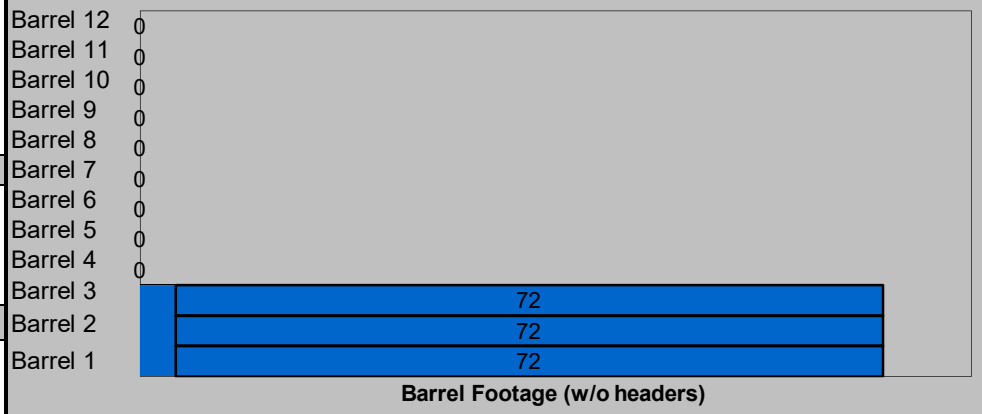
Total CMP Footage:	246	ft
Approximate Total Pieces:	11	pcs
Approximate Coupling Bands:	10	bands
Approximate Truckloads:	6	trucks

Construction Quantities**

Total Excavation:	875	cy
Porous Stone Backfill For Storage:	417	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



HCOC CALCULATIONS

Form 4.2-2 of HCOC Assessment

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

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

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

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

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] 327,074 *Form 4.2-3 Item 12*	[2] TBD *Form 4.2-4 Item 13*	[3] TBD *Form 4.2-5 Item 10*
Post-developed	[4] 658,771 *Form 4.2-3 Item 13*	[5] TBD *Form 4.2-4 Item 14*	[6] TBD *Form 4.2-5 Item 14*
Difference	[7] 331,697 *Item 4 – Item 1*	[8] TBD *Item 5 – Item 2*	[9] TBD *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] 101% *Item 7 / Item 1*	[11] TBD *Item 8 / Item 2*	[12] TBD *Item 9 / Item 3*

To meet HCOC requirements, a mitigation volume must be achieved by using LID and/or hydromodification mitigation BMPs. The mitigation volume is approximately 298,758 cu-ft ((0.95 * 658,771) – 327,074). The total volume being detained by underground CMP and proprietary biofiltration devices is 401,309 cu-ft, which is greater than the mitigation volume needed. As a result, the mitigation volume has been contained by the proposed BMPs. Since the mitigation volume has been met, it is physically impossible for the project to avoid increasing the time of concentration and reducing peak runoff by more than five percent of pre-development conditions (see Section 5.6.1 of the Technical Guidance Document for more information).

Form 4.2-3 HCOC Assessment for Runoff Volume

Compute weighted curve number for pre and post developed conditions	**Pre-developed DA** *Add more columns if more than 4 DMA*				**Post-developed DA** *Add more columns if more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
[1] Land Cover type	Row Crops (Poor)	Impervious Cover			Roof, Asphalt & Concrete	Urban Cover Commercial Landscape		
[2] Hydrologic Soil Group (HSG)	B	B			B	B		
[3] DMA Area, ft² *sum of areas of DMA should equal area of DA*	3,442,403	218,815			3,478,157	183,061		
[4] Curve Number (CN) *Use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	81	98			98	56		
	[5] Pre-Developed area-weighted CN: 82				**[6] Post-Developed area-weighted CN: 96**			
	[7] Pre-developed soil storage capacity, S (in): 2.20 *S = (1000 / Item 5) – 10*				**[8] Post-developed soil storage capacity, S (in): 0.42** *S = (1000 / Item 6) - 10*			
	[9] Initial abstraction, I_a (in): 0.44 *I_a = 0.2 * Item 7*				**[10] Initial abstraction, I_a (in): 0.08** *I_a = 0.2 * Item 8*			
[11] Precipitation for 2 yr, 24 hr storm (in): 2.60 *Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*								
[12] Pre-developed Volume (ft³): 327,074 *V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*								
[13] Post-developed Volume (ft³): 658,771 *V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*								
[14] Volume Reduction needed to meet HCOC Requirement, (ft³): 298,758 *V_{HCOC} = (Item 13 * 0.95) – Item 12*								

INFILTRATION FEASIBILITY

August 9, 2018

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Real Estate Development Associates
4100 MacArthur Boulevard, Suite 120
Newport Beach, California 92660

Attention: Mr. Chad Manista
Vice President

Project No.: **18G129-3**

Subject: **Results of Additional Infiltration Testing**
Ontario Gateway Center
NEC Euclid Avenue and Merrill Avenue
Ontario, California

References: 1) Geotechnical Feasibility Study, Proposed Commercial/Industrial Development, NEC Euclid Avenue and Merrill Avenue, Ontario, California, prepared by Southern California Geotechnical, Inc. (SCG) for Real Estate Development Associates (REDA), SCG Project No. 18G129-1, dated April 11, 2018.

2) Results of Infiltration Testing, Proposed Commercial/Industrial Development, NEC Euclid Avenue and Merrill Avenue, Ontario, California, prepared by SCG for REDA, SCG Project No. 18G129-2, dated April 25, 2018.

Gentlemen:

In accordance with your request, we have conducted additional infiltration testing at the subject site. We are pleased to present this report summarizing the results of the additional infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 18P181-2, dated June 12, 2018. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with the Technical Guidance Document for Water Quality Management Plans prepared for the County of San Bernardino Areawide Stormwater Program dated June 7, 2013. The San Bernardino County standards defer to guidelines published by Riverside County Department of Environmental Health (RCDEH).

Site and Project Description

The subject site is located at the northeast corner of Euclid Avenue and Merrill Avenue in Ontario, California. The site is bounded to the north by Eucalyptus Avenue, to the west by Euclid Avenue, to the south by Merrill Avenue, and to the east by an existing dairy farm. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The overall site is a rectangular-shaped property consisting of several contiguous parcels, which total 84.1± acres in size. The northeastern portion of the site is presently developed as a dairy farm with cattle pens, multiple canopy structures, farm houses, and structures associated with milking activities. The buildings appear to be single-story structures of wood frame construction and the canopies appear to be of metal frame construction. We expect that these structures are supported on conventional shallow foundations. Ground surface cover generally consists of turf grass, asphaltic concrete, and concrete pavements surrounding the farm houses and the other structures, manure in the cattle pen areas, and exposed soils with sparse native grass and weed growth in the remaining areas.

The northwestern portion and southern half of the site are presently being utilized for agricultural purposes. The ground surface cover throughout these areas consists of row crops and limited areas of exposed soil. Additionally, a detention pond is located in the south-central portion of the overall site and is approximately 3 to 5 feet deep. Due to the existing row crops, the southwestern area of the site was inaccessible to drilling equipment.

Topographic information for the subject site was obtained from a grading plan prepared by Thienes Engineering, Inc. The plan indicates that the site topography generally slopes downward to the south at a gradient of 1 to 2± percent, with some local variations. The existing site grades range from an elevation of 667± feet mean sea level (msl) in the northern area of the site to 631± feet msl in the southern area of the site.

Proposed Development

Based on a site plan prepared by HPA, the subject site will be developed with eight (8) new commercial/industrial buildings. The buildings will be identified as Building 1 through Building 8. Building 1 will be located in the east-central area of the site and will have a footprint of 571,000± ft² and Building 2 will be located in the southeastern area of the site and will have a footprint of 588,000± ft². These two building will be constructed with dock-high doors along the north and south sides of the buildings. Building 3 through Building 6 will be located along the western side of the site and will have footprints that range from 39,000 to 217,700± ft². These buildings will be constructed with dock-high doors along a portion of their eastern walls. Buildings 7 and 8 will be located in the northern area of the site and will have footprints of 85,400 and 96,400± ft², respectively. These buildings will be constructed with dock-high doors along a portion of their south walls. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive areas, Portland cement concrete pavements in the truck court areas with concrete flatwork and landscape planters.

We understand that the proposed development will include on-site infiltration to dispose of storm water. Based on an infiltration test exhibit prepared by Thienes Engineering, Inc., the project civil engineer, the proposed infiltration system will consist of eleven (11) below-grade chamber systems (identified as Infiltration Chambers A through K) located throughout the subject site. The bottoms of the below-grade chambers will extend to depths ranging from 10 to 20± feet below the existing site grades.

Previous Studies

Southern California Geotechnical, Inc. (SCG) previously performed a geotechnical feasibility study at the subject site. As a part of this study, four (4) borings were advanced to depths of 10 to 30± feet below existing site grades. In addition to the four borings, four (4) trenches were excavated at the site to depths of 4 to 12± feet below existing site grades. Manure was present at the ground surface at two of the trenches and one of the boring locations, with thicknesses of 4 to 8± inches. Highly organic topsoil materials were encountered at one of the boring and trench locations. These materials were approximately 1 to 1½ feet in thickness and generally consisted of silty fine sands, which contained manure and/or other fibrous organic material. Artificial fill soils were encountered at the ground surface or below the manure/topsoil at all but one of the boring and trench locations. The fill materials generally extend to depths of 2 to 4½± feet and consisted of loose to medium dense silty fine sands and fine sandy silts, and medium stiff to stiff clayey sands, and sandy clays with occasional silty clays.

Additional soils classified as possible fill were encountered at the ground surface at one boring and one trench location, extending to depths of 1½ to 5½± feet. Native alluvial soils were encountered beneath the fill and possible fill soils at all of the boring and trench locations. The near-surface alluvium generally consisted of loose to medium dense silty fine sands to fine sandy silts, fine to medium sands, clayey fine sands, and soft to medium stiff fine sandy clays, silty clays, and clayey silts, extending to at least the maximum depth explored of 30± feet below existing site grades. Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 30± feet at the time of the previous subsurface exploration.

SCG also previously performed infiltration testing at the subject site. The results of the previous infiltration testing were presented in the infiltration report referenced above. One (1) infiltration test was performed at the site as part of the previous infiltration testing. The infiltration testing was conducted for one of the chamber systems located in the northwestern area of the site. One (1) infiltration test boring (identified as Infiltration Test No. I-1) was advanced to a depth of 15± feet below existing site grades. Native alluvial soils were encountered at the ground surface at the infiltration boring location, extending to at least 15± feet below existing site grades. The alluvial soils generally consisted of loose to medium dense fine sandy silts, clayey fine sands, fine sandy clays, and silty fine to medium sands with varying amounts of coarse sand, fine gravel, clay, and silt content. Free water was not encountered during the drilling of the infiltration boring. The results indicated that the infiltration rate at the test location was 7.5 inches per hour. Based on this result, we preliminarily recommended a design infiltration rate of 7.5 inches per hour be used for the design of the proposed below-grade chamber system located in the northwestern area of the site.

The approximate locations of the four (4) borings, four (4) trenches, and one (1) infiltration boring from the previous studies are indicated on the Infiltration Test Location Plan, included as Plate 2 of this report.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the additional infiltration testing consisted of fifteen (15) infiltration test borings, advanced to depths of 10 to 20± feet below the existing site grades. The borings were advanced using a truck-mounted drilling rig, equipped with 8-inch diameter hollow stem augers. The borings were logged during drilling by a member of our staff. The approximate locations of the infiltration borings (identified as I-2 through I-16) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon completion of the drilling, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Infiltration Boring Nos. I-2 through I-5 were drilled within the cattle pen areas, in the northeastern region of the site. Manure, which measured 2 to 4± inches in thickness, was present at the ground surface at these four (4) boring locations. Native alluvial soils were encountered beneath the manure and at the ground surface at all of the remaining boring locations, extending to at least 20± feet below the existing site grades. The alluvial soils generally consist of medium stiff to very stiff clayey silts, silty clays, and fine sandy clays, and loose to medium dense silty fine sands, clayey fine sands, and fine sandy silts. Infiltration Boring No. I-2 encountered a layer of dense silty fine to coarse sands with little fine gravel at depths ranging from 8½ to 13± feet below existing site grades. Infiltration Boring No. I-3 encountered layers of dense to very dense fine to coarse sands with trace to little fine gravel and trace silt at depths ranging from 12 to 20± feet below existing site grades. The Boring Logs, which illustrate the conditions encountered at the boring locations, are included with this report.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 20± feet at the time of the subsurface exploration. As part of our research, we reviewed available groundwater data in order to determine regional groundwater depths. Recent water level data was obtained from the California State Water Resources Control Board, GeoTracker website, http://geotracker.waterboards.ca.gov/. Available data for a monitoring well, located approximately 4,200± feet west from the site, indicates a high groundwater level of 83± feet below the ground surface.

Infiltration Testing

The infiltration testing was performed in general accordance with Technical Guidance Document for Water Quality Management Plans, prepared for the County of San Bernardino Areawide Stormwater Program.

Pre-soaking

The first phase of the infiltration testing consisted of pre-soaking all fifteen (15) of the infiltration test holes. The pre-soaking process for the borings consisted of filling each test boring by inverting a full 5-gallon bottle of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of each infiltration boring. Pre-soaking was considered complete after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. All of the infiltration test borings were pre-soaked one (1) day prior to when the infiltration testing was conducted.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing over the next few days. The test holes were filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of the test holes prior to each test interval. In accordance with the San Bernardino County guidelines, since "sandy soils" were encountered at the bottom of Infiltration Boring Nos. I-2, I-3, I-7, I-11, and I-13 (where 6 inches of water infiltrated into the surrounding soils for two-consecutive 25-minute readings), readings were taken at 10-minute intervals for a total of 1 hour at these five (5) infiltration test locations. Since "non-sandy soils" were encountered at the bottom of Infiltration Boring Nos. I-4, I-5, I-6, I-8, I-9, I-10, I-12, I-14, I-15, and I-16, readings were taken at 30-minute intervals for a total of 6 hours at these ten (10) infiltration test locations. After each reading, water was added to each test boring so that the depth of the water was again at a level of at least 5 times the hole's radius above the bottom of each infiltration boring. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-2	13	Silty fine to coarse Sand, little fine Gravel	8.7
I-3	20	Fine to coarse Sand, little fine Gravel, trace Silt	9.9
I-4	20	Silty Clay, trace fine Sand	0.0
I-5	13½	Fine Sandy Clay, little Silt	0.2
I-6	14	Silty Clay, little fine Sand	0.1
I-7	16	Fine Sandy Clay, little medium Sand, trace Silt	0.8
I-8	17	Clayey fine Sand to fine Sandy Clay, trace Silt	0.3
I-9	15	Silty Clay, trace fine Sand	0.0
I-10	10	Silty Clay	0.0
I-11	12	Fine Sandy Silt, trace Clay	1.1
I-12	11	Silty Clay, trace fine Sand	0.1
I-13	20	Silty fine Sand	4.8
I-14	20	Silty fine Sand, little Clay	1.0
I-15	13½	Silty Clay	0.0
I-16	14	Clayey Silt, trace fine Sand	0.2

Design Recommendations

A total of fifteen (15) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations range from 0 to 9.9 inches per hour. The primary factors affecting the infiltration rates are the silt and clay content of the encountered soils, which vary at different depths and locations at the subject site. The high clay and silt content of the soils encountered at the bottom of Infiltration Boring Nos. I-4 through I-6, I-8 through I-10, I-12, I-15, and I-16 resulted in very low and nearly non-existent infiltration rates at these nine (9) infiltration test locations.

Based on the very low infiltration rates at the majority of the infiltration test locations, the on-site soils are generally not considered suitable for infiltration at the depths and locations tested. Although Infiltration Test Nos. I-2, I-3, I-11, I-13, and I-14 resulted in infiltration rates ranging from 1.0 to 9.9 inches per hour, the underlying interbedded silts and clays will restrict infiltration at this site. Therefore, we recommend that storm water infiltration not be utilized at this site.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and

preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Scott McCann
Staff Scientist

Gregory K. Mitchell, GE 2364
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (17 pages)
Infiltration Test Results Spreadsheets (15 pages)
Grain Size Distribution Graphs (15 pages)

SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP

ONTARIO GATEWAY CENTER

ONTARIO, CALIFORNIA

SCALE: 1" = 2400'

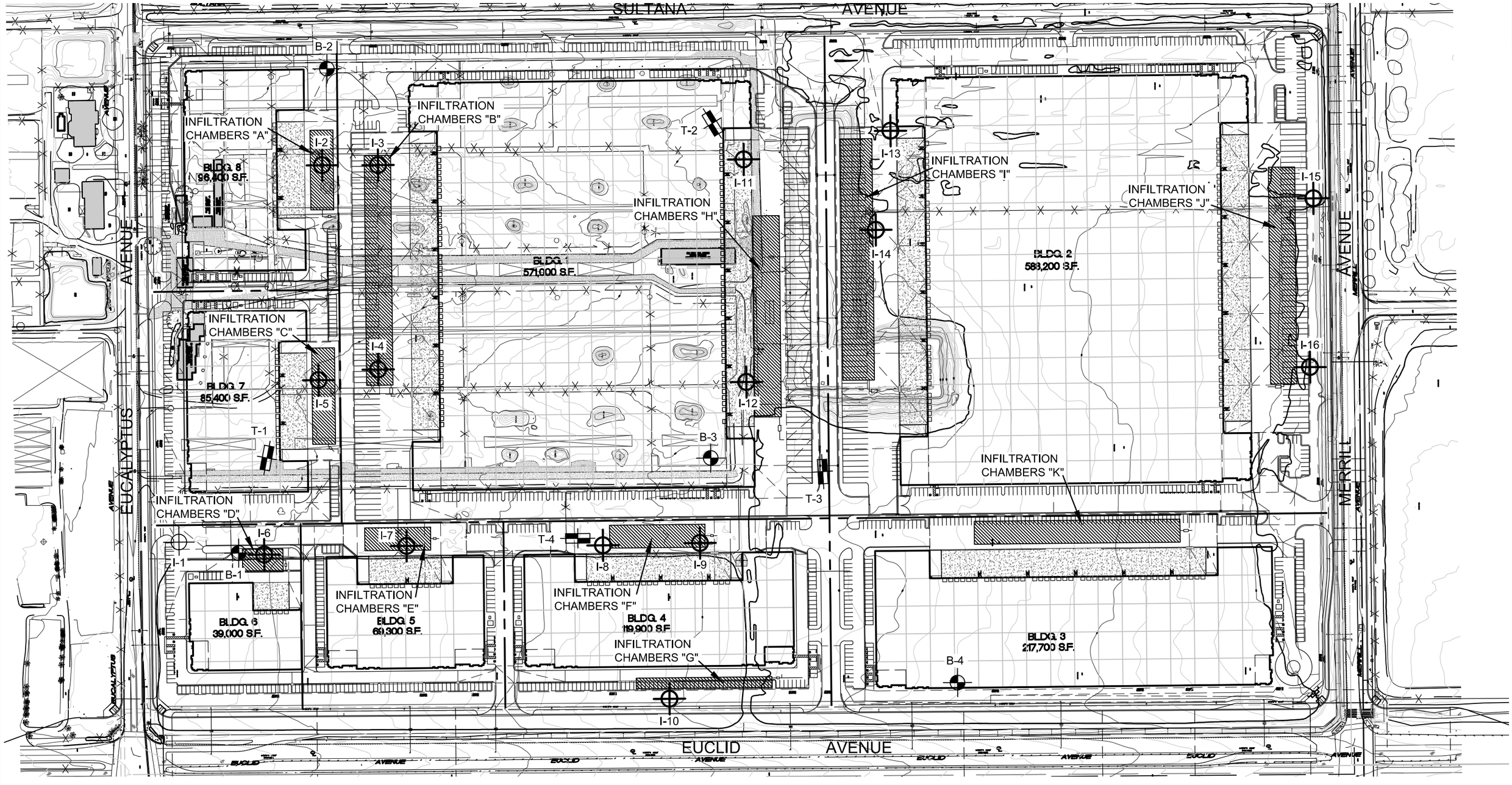
DRAWN: SM
CHKD: GKM

SCG PROJECT
18G129-3

PLATE 1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 18G129-1)
- PREVIOUS TRENCH LOCATION (SCG PROJECT NO. 18G129-1)
- PREVIOUS INFILTRATION TEST LOCATION (SCG PROJECT NO. 18G129-2)

NORTH

NOTE: BASE MAP PREPARED BY THIENES ENGINEERING, INC.

INFILTRATION TEST LOCATION PLAN

ONTARIO GATEWAY CENTER

ONTARIO, CALIFORNIA

SCALE: 1" = 200'

DRAWN: DRK
CHKD: GKM

SCG PROJECT 18G129-3

PLATE 2

SOUTHERN CALIFORNIA GEOTECHNICAL

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 18G129-3
PROJECT: Ontario Gateway Center
LOCATION: Ontario, California

DRILLING DATE: 7/12/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					3½ inches Manure							
		10			ALLUVIUM: Gray Brown fine Sandy Silt, loose to medium dense-moist to very moist		16					
		10					10					
5		15	3.5		Light Gray Silty Clay, trace fine Sand, trace calcareous veining, stiff to very stiff-moist to very moist		15					
10		35			Light Brown Silty fine to coarse Sand, little fine Gravel, dense-damp		5			13		
					Boring Terminated at 13'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG

PLATE I-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 18G129-3 | DRILLING DATE: 7/12/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					2 inches Manure							
		14			ALLUVIUM: Gray Brown fine Sandy Silt, trace Clay, medium dense-moist		12					
		7					13					
5												
		26	4.5+		Light Gray Silty Clay, trace fine Sand, little calcareous veining, very stiff-moist to very moist		15					
		17	4.0		Light Gray fine Sandy Clay, trace calcareous and Iron oxide staining, very stiff-moist		14					
10												
					Light Gray Brown fine to medium Sand, little coarse Sand, trace fine Gravel, trace Silt, dense-damp							
		44					3					
15												
					Light Gray fine to coarse Sand, little fine Gravel, trace Silt, very dense-damp							
		82					2			5		
20												
					Boring Terminated at 20'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-4

JOB NO.: 18G129-3 | DRILLING DATE: 7/12/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					4 inches Manure							
		16			ALLUVIUM: Gray Brown fine Sandy Silt, trace Clay, trace calcareous veining, medium dense-moist		14					
		8					14					
5												
		12	4.5+		Gray Brown Silty Clay, trace fine Sand, little calcareous veining/nodules, stiff to very stiff-very moist		20					
		17	4.0				18					
10												
					Light Gray Brown Silty fine Sand to fine Sandy Silt, trace medium Sand, medium dense-damp							
		28					7					
15												
					Light Gray Brown Silty Clay, trace fine Sand, stiff-very moist							
		14	1.5				28			87		
20					Boring Terminated at 20'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-3**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-5

JOB NO.: 18G129-3
PROJECT: Ontario Gateway Center
LOCATION: Ontario, California

DRILLING DATE: 7/12/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					3 inches Manure							
		10			ALLUVIUM: Gray Brown fine Sandy Silt, trace Clay, loose to medium dense-moist to very moist		13					
		11					16					
5												
		14	2.0		Light Gray fine Sandy Clay, stiff-very moist		20					
		17	4.5		Light Gray Brown fine Sandy Clay, little Silt, trace Iron oxide staining, trace calcareous nodules and veining, stiff to very stiff-very moist		18					
10												
		18	2.5				19			55		
					Boring Terminated at 13½'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG

PLATE I-4

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-6

JOB NO.: 18G129-3 | DRILLING DATE: 7/13/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		27			ALLUVIUM: Gray Brown fine Sandy Silt, trace Clay, medium dense-damp to moist		9					
		15					10					
5		7	3.0		Gray Silty Clay, little fine Sand, trace calcareous veining, stiff-very moist		22					
		11	2.5				21					
10		12	3.0				19			83		
					Boring Terminated at 14'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-5**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-7

JOB NO.: 18G129-3 | DRILLING DATE: 7/13/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		10			ALLUVIUM: Gray fine Sandy Silt, loose to medium dense-very moist		21					
		6					21					
5		17	4.5+		Gray Silty Clay, little fine Sand, trace Iron oxide staining, very stiff-moist to very moist		16					
		16	4.5				16					
10												
					Light Gray Brown fine Sandy Clay, little medium Sand, trace Silt, very stiff-moist to very moist							
15		24	2.0				17			57		
					Boring Terminated at 16'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-6**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-8

JOB NO.: 18G129-3 | DRILLING DATE: 7/13/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		10			ALLUVIUM: Gray Brown fine Sandy Silt, loose to medium dense-moist		11					
		9	3.5		Gray Silty Clay, trace fine Sand, trace calcareous veining, stiff to very stiff-very moist		19					
5		13	3.5				19					
		18	4.5				17					
10												
					Light Gray Brown Clayey fine Sand to fine Sandy Clay, trace Silt, trace calcareous nodules, very stiff to medium dense-very moist							
15		18	4.0				20			52		
					Boring Terminated at 17'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-7**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-9

JOB NO.: 18G129-3 | DRILLING DATE: 7/13/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		15			ALLUVIUM: Gray Brown fine Sandy Silt, trace Clay, medium dense-moist		11					
		12					15					
5		17	3.5		Gray Silty Clay, trace fine Sand, trace Iron oxide staining, stiff to very stiff-very moist		22					
		13	3.5				21					
10												
		20	4.0				26			87		
15					Boring Terminated at 15'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-8**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-10

JOB NO.: 18G129-3 | DRILLING DATE: 7/13/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		11			ALLUVIUM: Dark Gray Brown fine Sandy Silt, trace Clay, medium dense-very moist		28					
		13	3.0		Gray Brown Clayey Silt to Silty Clay, trace fine Sand, stiff to very stiff-very moist		21					
5		9	3.5				19					
		19	3.5		Gray Silty Clay, very stiff-very moist		21			92		
10					Boring Terminated at 10'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-9**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-11

JOB NO.: 18G129-3 | DRILLING DATE: 7/12/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		10			ALLUVIUM: Gray Brown fine Sandy Silt, little Clay, loose to medium dense-very moist		27					
		9					24					
5		7			Light Gray fine Sandy Silt, trace Clay, trace Iron oxide staining, loose-very moist to wet		42					
10		9					37			71		
					Boring Terminated at 12'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-10**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-12

JOB NO.: 18G129-3
PROJECT: Ontario Gateway Center
LOCATION: Ontario, California

DRILLING DATE: 7/12/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		12	4.0		ALLUVIUM: Dark Gray Brown Silty Clay, trace fine Sand, slightly porous, very stiff-very moist to wet		39					
		13	4.5				23					
5												
		14	2.5		Light Gray Silty Clay, trace fine Sand, trace calcareous nodules, stiff-very moist		22					
10		11	2.0				26			89		
					Boring Terminated at 11'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG

PLATE I-11

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-13

JOB NO.: 18G129-3 | DRILLING DATE: 7/11/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		12			ALLUVIUM: Dark Gray Brown fine Sandy Silt, little Clay, trace medium Sand, stiff-very moist		33					
		7					26					
5		10	1.5		Gray Brown Silty Clay, stiff-very moist		27					
		9			Gray Silty fine Sand to fine Sandy Silt, loose-very moist		25					
10												
		5	0.5		Gray Brown Silty Clay, trace fine Sand, soft to medium stiff-very moist		27					
15												
		17			Light Gray Brown Silty fine Sand, medium dense-moist		13			23		
20					Boring Terminated at 20'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-12**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-14

JOB NO.: 18G129-3 | DRILLING DATE: 7/11/18 | WATER DEPTH: 19.5 feet
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		10			ALLUVIUM: Dark Gray Brown fine Sandy Silt, loose to medium dense-very moist							No Sample Recovered
		7					30					
5		8	2.0		Gray Brown Silty Clay, stiff-very moist		28					
		10			Gray Brown Silty fine Sand to fine Sandy Silt, medium dense-very moist		27					
10												
		24					22					
15												
		11			Brown Silty fine Sand, little Clay, medium dense-very moist to wet		33			45		
20					Boring Terminated at 20'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-13**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-15

JOB NO.: 18G129-3 | DRILLING DATE: 7/11/18 | WATER DEPTH: Dry
PROJECT: Ontario Gateway Center | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Ontario, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		8			ALLUVIUM: Dark Gray Brown fine Sandy Silt, trace Clay, loose-very moist		28					
		10	2.5		Dark Gray Brown Silty Clay, little fine Sand, stiff-very moist		23					
5		13	2.5		Gray Brown Silty Clay, trace Iron oxide staining, stiff to very stiff-very moist		21					
		18	3.0				23					
10					Gray Brown Silty Clay, stiff-very moist							
		12	2.0				26			92		
					Boring Terminated at 13½'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG **PLATE I-14**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-16

JOB NO.: 18G129-3
PROJECT: Ontario Gateway Center
LOCATION: Ontario, California

DRILLING DATE: 7/11/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		10	2.5		ALLUVIUM: Gray Brown fine Sandy Clay, stiff-very moist		20					
		13	4.5		Dark Gray Brown Silty Clay, little fine Sand, medium stiff to stiff-very moist to wet		38					
5		6	1.5				27					
		8	1.5		Dark Gray Brown Clayey Silt, trace fine Sand, medium stiff to stiff-very moist		32					
10												
		7	1.5				29			87		
					Boring Terminated at 14'							

TBL 18G129-3.GPJ SOCALGEO.GDT 8/9/18

TEST BORING LOG

PLATE I-15

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	13.3	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	12:00 PM	25.0	11.51	1.79	0.90	8.09	Pre-Sat
	Final	12:25 PM		13.30				
P2	Initial	12:26 PM	25.0	11.60	1.70	0.85	8.03	
	Final	12:51 PM		13.30				
1	Initial	1:52 PM	10.0	11.60	1.04	1.18	9.27	Infiltration Testing
	Final	2:02 PM		12.64				
2	Initial	2:03 PM	10.0	11.60	1.02	1.19	9.02	
	Final	2:13 PM		12.62				
3	Initial	2:14 PM	10.0	11.60	1.01	1.20	8.90	
	Final	2:24 PM		12.61				
4	Initial	2:25 PM	10.0	11.60	1.01	1.20	8.90	
	Final	2:35 PM		12.61				
5	Initial	2:36 PM	10.0	11.60	0.99	1.21	8.66	
	Final	2:46 PM		12.59				
6	Initial	2:47 PM	10.0	11.60	0.99	1.21	8.66	
	Final	2:57 PM		12.59				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	19.8	(ft)

Infiltration Test Hole	I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	12:05 PM	25.0	18.10	1.70	0.85	8.03	Pre-Sat
	Final	12:30 PM		19.80				
P2	Initial	12:31 PM	25.0	18.10	1.70	0.85	8.03	
	Final	12:56 PM		19.80				
1	Initial	1:57 PM	10.0	18.10	1.13	1.14	10.42	Infiltration Testing
	Final	2:07 PM		19.23				
2	Initial	2:08 PM	10.0	18.10	1.13	1.14	10.42	
	Final	2:18 PM		19.23				
3	Initial	2:19 PM	10.0	18.10	1.11	1.15	10.16	
	Final	2:29 PM		19.21				
4	Initial	2:30 PM	10.0	18.10	1.10	1.15	10.03	
	Final	2:40 PM		19.20				
5	Initial	2:41 PM	10.0	18.10	1.10	1.15	10.03	
	Final	2:51 PM		19.20				
6	Initial	2:52 PM	10.0	18.10	1.09	1.16	9.90	
	Final	3:02 PM		19.19				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	19.8	(ft)

Infiltration Test Hole	I-4

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:10 AM	30.0	18.09	0.03	1.70	0.06
	Final	10:40 AM		18.12			
2	Initial	10:41 AM	30.0	18.10	0.02	1.69	0.04
	Final	11:11 AM		18.12			
3	Initial	11:12 AM	30.0	18.08	0.02	1.71	0.04
	Final	11:42 AM		18.10			
4	Initial	11:43 AM	30.0	18.10	0.01	1.70	0.02
	Final	12:13 PM		18.11			
5	Initial	12:14 PM	30.0	18.09	0.01	1.71	0.02
	Final	12:44 PM		18.10			
6	Initial	12:45 PM	30.0	18.10	0.02	1.69	0.04
	Final	1:15 PM		18.12			
7	Initial	1:16 PM	30.0	18.09	0.01	1.71	0.02
	Final	1:46 PM		18.10			
8	Initial	1:47 PM	30.0	18.10	0.01	1.70	0.02
	Final	2:17 PM		18.11			
9	Initial	2:18 PM	30.0	18.10	0.01	1.70	0.02
	Final	2:48 PM		18.11			
10	Initial	2:49 PM	30.0	18.10	0.02	1.69	0.04
	Final	3:19 PM		18.12			
11	Initial	3:20 PM	30.0	18.10	0.01	1.70	0.02
	Final	3:50 PM		18.11			
12	Initial	3:51 PM	30.0	18.10	0.01	1.70	0.02
	Final	4:21 PM		18.11			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	13.3	(ft)

Infiltration Test Hole: I-5

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:00 AM	30.0	11.54	0.10	1.71	0.21
	Final	10:30 AM		11.64			
2	Initial	10:31 AM	30.0	11.53	0.08	1.73	0.17
	Final	11:01 AM		11.61			
3	Initial	11:02 AM	30.0	11.59	0.09	1.67	0.20
	Final	11:32 AM		11.68			
4	Initial	11:33 AM	30.0	11.60	0.08	1.66	0.18
	Final	12:03 PM		11.68			
5	Initial	12:04 PM	30.0	11.60	0.08	1.66	0.18
	Final	12:34 PM		11.68			
6	Initial	12:35 PM	30.0	11.59	0.08	1.67	0.17
	Final	1:05 PM		11.67			
7	Initial	1:06 PM	30.0	11.58	0.07	1.69	0.15
	Final	1:36 PM		11.65			
8	Initial	1:37 PM	30.0	11.60	0.08	1.66	0.18
	Final	2:07 PM		11.68			
9	Initial	2:08 PM	30.0	11.60	0.08	1.66	0.18
	Final	2:38 PM		11.68			
10	Initial	2:39 PM	30.0	11.60	0.07	1.67	0.15
	Final	3:09 PM		11.67			
11	Initial	3:10 PM	30.0	11.59	0.07	1.68	0.15
	Final	3:40 PM		11.66			
12	Initial	3:41 PM	30.0	11.60	0.07	1.67	0.15
	Final	4:11 PM		11.67			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	14.2	(ft)

Infiltration Test Hole	I-6

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:30 AM	30.0	12.00	0.06	2.17	0.10
	Final	11:00 AM		12.06			
2	Initial	11:01 AM	30.0	12.00	0.06	2.17	0.10
	Final	11:31 AM		12.06			
3	Initial	11:32 AM	30.0	12.00	0.05	2.18	0.09
	Final	12:02 PM		12.05			
4	Initial	12:03 PM	30.0	12.00	0.04	2.18	0.07
	Final	12:33 PM		12.04			
5	Initial	12:34 PM	30.0	12.00	0.04	2.18	0.07
	Final	1:04 PM		12.04			
6	Initial	1:05 PM	30.0	12.00	0.04	2.18	0.07
	Final	1:35 PM		12.04			
7	Initial	1:36 PM	30.0	12.00	0.04	2.18	0.07
	Final	2:06 PM		12.04			
8	Initial	2:07 PM	30.0	12.00	0.03	2.19	0.05
	Final	2:37 PM		12.03			
9	Initial	2:38 PM	30.0	12.00	0.04	2.18	0.07
	Final	3:08 PM		12.04			
10	Initial	3:09 PM	30.0	12.00	0.04	2.18	0.07
	Final	3:39 PM		12.04			
11	Initial	3:40 PM	30.0	12.00	0.04	2.18	0.07
	Final	4:10 PM		12.04			
12	Initial	4:11 PM	30.0	12.00	0.04	2.18	0.07
	Final	4:41 PM		12.04			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	15.9	(ft)

Infiltration Test Hole	I-7

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	11:00 AM	25.0	13.90	1.14	1.43	3.43	Pre-Sat
	Final	11:25 AM		15.04				
P2	Initial	11:26 AM	25.0	13.90	0.78	1.61	2.11	
	Final	11:51 AM		14.68				
1	Initial	11:52 AM	10.0	13.90	0.28	1.86	1.66	Infiltration Testing
	Final	12:02 PM		14.18				
2	Initial	12:03 PM	10.0	13.90	0.24	1.88	1.41	
	Final	12:13 PM		14.14				
3	Initial	12:14 PM	10.0	13.90	0.15	1.93	0.86	
	Final	12:24 PM		14.05				
4	Initial	12:25 PM	10.0	13.90	0.14	1.93	0.80	
	Final	12:35 PM		14.04				
5	Initial	12:36 PM	10.0	13.90	0.14	1.93	0.80	
	Final	12:46 PM		14.04				
6	Initial	12:47 PM	10.0	13.90	0.14	1.93	0.80	
	Final	12:57 PM		14.04				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	17.4	(ft)

Infiltration Test Hole	I-8

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:00 AM	30.0	14.50	0.14	2.83	0.19
	Final	10:30 AM		14.64			
2	Initial	10:31 AM	30.0	14.64	0.15	2.69	0.21
	Final	11:01 AM		14.79			
3	Initial	11:02 AM	30.0	14.79	0.15	2.54	0.22
	Final	11:32 AM		14.94			
4	Initial	11:33 AM	30.0	14.94	0.14	2.39	0.22
	Final	12:03 PM		15.08			
5	Initial	12:04 PM	30.0	15.08	0.14	2.25	0.23
	Final	12:34 PM		15.22			
6	Initial	12:35 PM	30.0	15.22	0.14	2.11	0.25
	Final	1:05 PM		15.36			
7	Initial	1:06 PM	30.0	15.36	0.14	1.97	0.26
	Final	1:36 PM		15.50			
8	Initial	1:37 PM	30.0	15.50	0.13	1.84	0.26
	Final	2:07 PM		15.63			
9	Initial	2:08 PM	30.0	15.63	0.13	1.71	0.28
	Final	2:38 PM		15.76			
10	Initial	2:39 PM	30.0	15.69	0.12	1.65	0.26
	Final	3:09 PM		15.81			
11	Initial	3:10 PM	30.0	15.70	0.12	1.64	0.27
	Final	3:40 PM		15.82			
12	Initial	3:41 PM	30.0	15.70	0.12	1.64	0.27
	Final	4:11 PM		15.82			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	14.7	(ft)

Infiltration Test Hole	I-9

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:30 AM	30.0	12.90	0.02	1.79	0.04
	Final	11:00 AM		12.92			
2	Initial	11:01 AM	30.0	12.92	0.01	1.78	0.02
	Final	11:31 AM		12.93			
3	Initial	11:32 AM	30.0	12.93	0.01	1.77	0.02
	Final	12:02 PM		12.94			
4	Initial	12:03 PM	30.0	12.94	0.01	1.76	0.02
	Final	12:33 PM		12.95			
5	Initial	12:34 PM	30.0	12.95	0.01	1.75	0.02
	Final	1:04 PM		12.96			
6	Initial	1:05 PM	30.0	12.96	0.00	1.74	0.00
	Final	1:35 PM		12.96			
7	Initial	1:36 PM	30.0	12.96	0.01	1.74	0.02
	Final	2:06 PM		12.97			
8	Initial	2:07 PM	30.0	12.97	0.01	1.73	0.02
	Final	2:37 PM		12.98			
9	Initial	2:38 PM	30.0	12.98	0.01	1.72	0.02
	Final	3:08 PM		12.99			
10	Initial	3:09 PM	30.0	13.00	0.00	1.70	0.00
	Final	3:39 PM		13.00			
11	Initial	3:40 PM	30.0	13.00	0.01	1.70	0.02
	Final	4:10 PM		13.01			
12	Initial	4:11 PM	30.0	13.01	0.01	1.69	0.02
	Final	4:41 PM		13.02			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	10.0	(ft)

Infiltration Test Hole: I-10

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:00 AM	30.0	8.00	0.01	2.00	0.02
	Final	8:30 AM		8.01			
2	Initial	8:31 AM	30.0	8.01	0.01	1.99	0.02
	Final	9:01 AM		8.02			
3	Initial	9:02 AM	30.0	8.02	0.00	1.98	0.00
	Final	9:32 AM		8.02			
4	Initial	9:33 AM	30.0	8.02	0.01	1.98	0.02
	Final	10:03 AM		8.03			
5	Initial	10:04 AM	30.0	8.03	0.01	1.97	0.02
	Final	10:34 AM		8.04			
6	Initial	10:35 AM	30.0	8.04	0.01	1.96	0.02
	Final	11:05 AM		8.05			
7	Initial	11:06 AM	30.0	8.05	0.00	1.95	0.00
	Final	11:36 AM		8.05			
8	Initial	11:37 AM	30.0	8.05	0.01	1.95	0.02
	Final	12:07 PM		8.06			
9	Initial	12:08 PM	30.0	8.06	0.01	1.94	0.02
	Final	12:38 PM		8.07			
10	Initial	12:39 PM	30.0	8.07	0.00	1.93	0.00
	Final	1:09 PM		8.07			
11	Initial	1:10 PM	30.0	8.07	0.01	1.93	0.02
	Final	1:40 PM		8.08			
12	Initial	1:41 PM	30.0	8.08	0.01	1.92	0.02
	Final	2:11 PM		8.09			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	12.1	(ft)

Infiltration Test Hole	I-11

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	9:00 AM	25.0	10.34	0.67	1.43	2.02	Pre-Sat
	Final	9:25 AM		11.01				
P2	Initial	9:26 AM	25.0	10.33	0.50	1.52	1.42	
	Final	9:51 AM		10.83				
1	Initial	9:52 AM	10.0	10.37	0.19	1.64	1.27	Infiltration Testing
	Final	10:02 AM		10.56				
2	Initial	10:03 AM	10.0	10.40	0.17	1.62	1.14	
	Final	10:13 AM		10.57				
3	Initial	10:14 AM	10.0	10.40	0.16	1.62	1.07	
	Final	10:24 AM		10.56				
4	Initial	10:25 AM	10.0	10.40	0.17	1.62	1.14	
	Final	10:35 AM		10.57				
5	Initial	10:36 AM	10.0	10.40	0.16	1.62	1.07	
	Final	10:46 AM		10.56				
6	Initial	10:47 AM	10.0	10.40	0.16	1.62	1.07	
	Final	10:57 AM		10.56				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.4
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	11.2	(ft)

Infiltration Test Hole: I-12

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:00 AM	30.0	9.41	0.05	1.77	0.10
	Final	8:30 AM		9.46			
2	Initial	8:31 AM	30.0	9.46	0.04	1.72	0.08
	Final	9:01 AM		9.50			
3	Initial	9:02 AM	30.0	9.50	0.04	1.68	0.09
	Final	9:32 AM		9.54			
4	Initial	9:33 AM	30.0	9.47	0.04	1.71	0.09
	Final	10:03 AM		9.51			
5	Initial	10:04 AM	30.0	9.49	0.04	1.69	0.09
	Final	10:34 AM		9.53			
6	Initial	10:35 AM	30.0	9.48	0.03	1.71	0.06
	Final	11:05 AM		9.51			
7	Initial	11:06 AM	30.0	9.49	0.03	1.70	0.06
	Final	11:36 AM		9.52			
8	Initial	11:37 AM	30.0	9.49	0.03	1.70	0.06
	Final	12:07 PM		9.52			
9	Initial	12:08 PM	30.0	9.50	0.04	1.68	0.09
	Final	12:38 PM		9.54			
10	Initial	12:39 PM	30.0	9.48	0.03	1.71	0.06
	Final	1:09 PM		9.51			
11	Initial	1:10 PM	30.0	9.49	0.03	1.70	0.06
	Final	1:40 PM		9.52			
12	Initial	1:41 PM	30.0	9.50	0.03	1.69	0.06
	Final	2:11 PM		9.53			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	19.4	(ft)

Infiltration Test Hole	I-13

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	10:15 AM	25.0	17.70	1.53	0.93	6.67	Pre-Sat
	Final	10:40 AM		19.23				
P2	Initial	10:41 AM	25.0	17.70	1.51	0.94	6.52	
	Final	11:06 AM		19.21				
1	Initial	11:07 AM	10.0	17.60	0.68	1.46	5.02	Infiltration Testing
	Final	11:17 AM		18.28				
2	Initial	11:18 AM	10.0	17.68	0.67	1.39	5.18	
	Final	11:28 AM		18.35				
3	Initial	11:29 AM	10.0	17.70	0.66	1.37	5.15	
	Final	11:39 AM		18.36				
4	Initial	11:40 AM	10.0	17.69	0.65	1.39	5.03	
	Final	11:50 AM		18.34				
5	Initial	11:51 AM	10.0	17.70	0.63	1.39	4.87	
	Final	12:01 PM		18.33				
6	Initial	12:02 PM	10.0	17.70	0.62	1.39	4.78	
	Final	12:12 PM		18.32				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	19.8	(ft)

Infiltration Test Hole	I-14

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:00 AM	30.0	18.05	0.54	1.48	1.31
	Final	10:30 AM		18.59			
2	Initial	10:31 AM	30.0	18.00	0.51	1.55	1.19
	Final	11:01 AM		18.51			
3	Initial	11:02 AM	30.0	18.08	0.48	1.48	1.17
	Final	11:32 AM		18.56			
4	Initial	11:33 AM	30.0	18.10	0.47	1.47	1.15
	Final	12:03 PM		18.57			
5	Initial	12:04 PM	30.0	18.10	0.45	1.48	1.10
	Final	12:34 PM		18.55			
6	Initial	12:35 PM	30.0	18.09	0.44	1.49	1.06
	Final	1:05 PM		18.53			
7	Initial	1:06 PM	30.0	18.10	0.43	1.49	1.04
	Final	1:36 PM		18.53			
8	Initial	1:37 PM	30.0	18.10	0.42	1.49	1.01
	Final	2:07 PM		18.52			
9	Initial	2:08 PM	30.0	18.09	0.42	1.50	1.01
	Final	2:38 PM		18.51			
10	Initial	2:39 PM	30.0	18.08	0.42	1.51	1.00
	Final	3:09 PM		18.50			
11	Initial	3:10 PM	30.0	18.10	0.41	1.50	0.99
	Final	3:40 PM		18.51			
12	Initial	3:41 PM	30.0	18.10	0.41	1.50	0.99
	Final	4:11 PM		18.51			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	13.3	(ft)

Infiltration Test Hole	I-15

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:15 AM	30.0	11.14	0.02	2.15	0.03
	Final	8:45 AM		11.16			
2	Initial	8:46 AM	30.0	11.16	0.02	2.13	0.03
	Final	9:16 AM		11.18			
3	Initial	9:17 AM	30.0	11.18	0.01	2.12	0.02
	Final	9:47 AM		11.19			
4	Initial	9:48 AM	30.0	11.19	0.01	2.11	0.02
	Final	10:18 AM		11.20			
5	Initial	10:19 AM	30.0	11.20	0.02	2.09	0.04
	Final	10:49 AM		11.22			
6	Initial	10:50 AM	30.0	11.22	0.01	2.08	0.02
	Final	11:20 AM		11.23			
7	Initial	11:21 AM	30.0	11.23	0.00	2.07	0.00
	Final	11:51 AM		11.23			
8	Initial	11:52 AM	30.0	11.23	0.01	2.07	0.02
	Final	12:22 PM		11.24			
9	Initial	12:23 PM	30.0	11.24	0.01	2.06	0.02
	Final	12:53 PM		11.25			
10	Initial	12:54 PM	30.0	11.25	0.00	2.05	0.00
	Final	1:24 PM		11.25			
11	Initial	1:25 PM	30.0	11.25	0.01	2.05	0.02
	Final	1:55 PM		11.26			
12	Initial	1:56 PM	30.0	11.26	0.01	2.04	0.02
	Final	2:26 PM		11.27			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Ontario Gateway Center
Project Location	Ontario, CA
Project Number	18G129-3
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	14.3	(ft)

Infiltration Test Hole	I-16

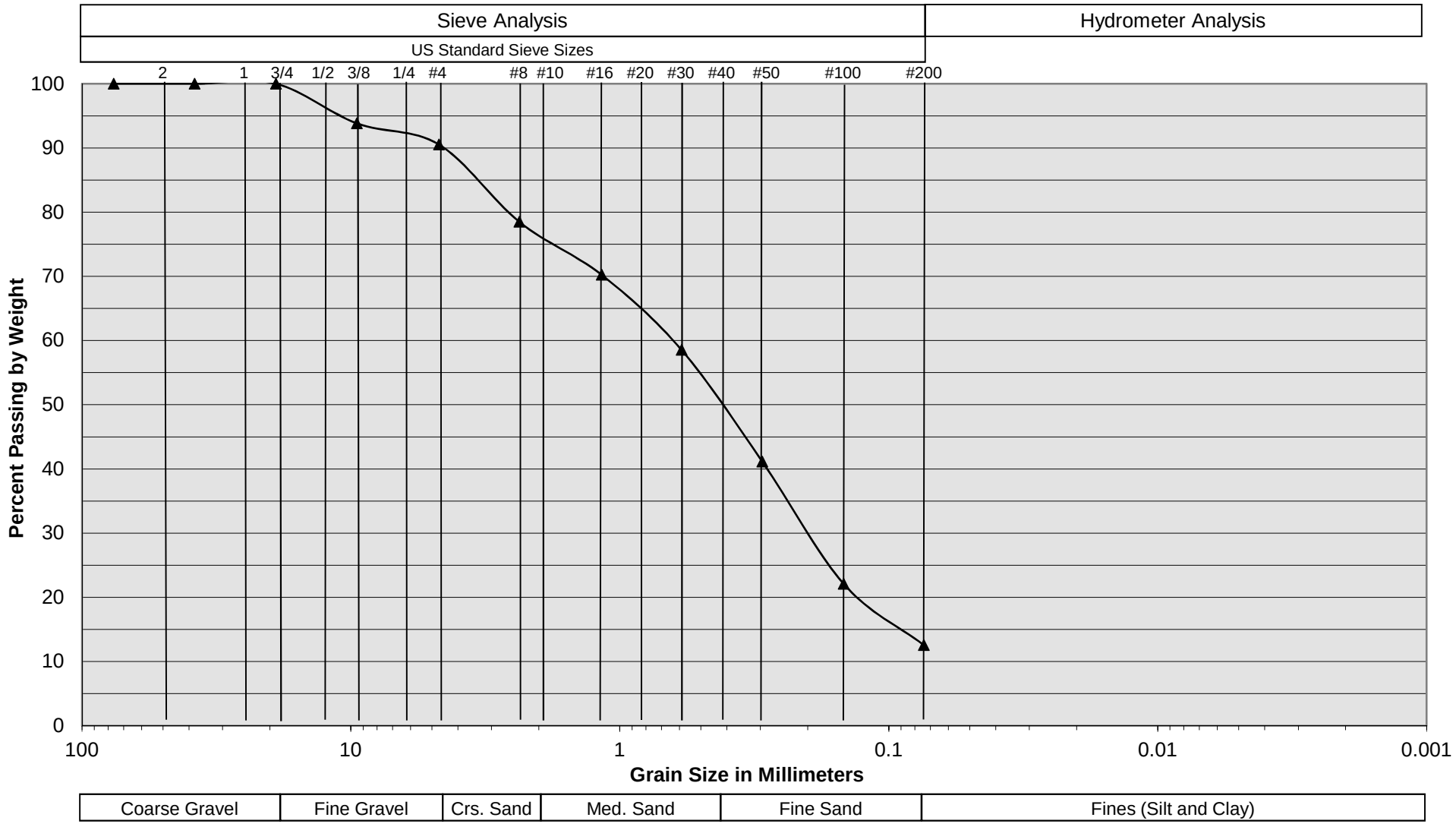
Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:00 AM	30.0	13.09	0.07	1.18	0.21
	Final	8:30 AM		13.16			
2	Initial	8:31 AM	30.0	13.08	0.06	1.19	0.18
	Final	9:01 AM		13.14			
3	Initial	9:02 AM	30.0	13.09	0.06	1.18	0.18
	Final	9:32 AM		13.15			
4	Initial	9:33 AM	30.0	13.10	0.06	1.17	0.18
	Final	10:03 AM		13.16			
5	Initial	10:04 AM	30.0	13.09	0.05	1.19	0.15
	Final	10:34 AM		13.14			
6	Initial	10:35 AM	30.0	13.10	0.05	1.18	0.15
	Final	11:05 AM		13.15			
7	Initial	11:06 AM	30.0	13.09	0.06	1.18	0.18
	Final	11:36 AM		13.15			
8	Initial	11:37 AM	30.0	13.09	0.05	1.19	0.15
	Final	12:07 PM		13.14			
9	Initial	12:08 PM	30.0	13.10	0.05	1.18	0.15
	Final	12:38 PM		13.15			
10	Initial	12:39 PM	30.0	13.10	0.05	1.18	0.15
	Final	1:09 PM		13.15			
11	Initial	1:10 PM	30.0	13.09	0.05	1.19	0.15
	Final	1:40 PM		13.14			
12	Initial	1:41 PM	30.0	13.10	0.05	1.18	0.15
	Final	2:11 PM		13.15			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

Grain Size Distribution



Sample Description	I-2 @ 11.5 to 13 feet
Soil Classification	Light Brown Silty fine to coarse Sand, little fine Gravel

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

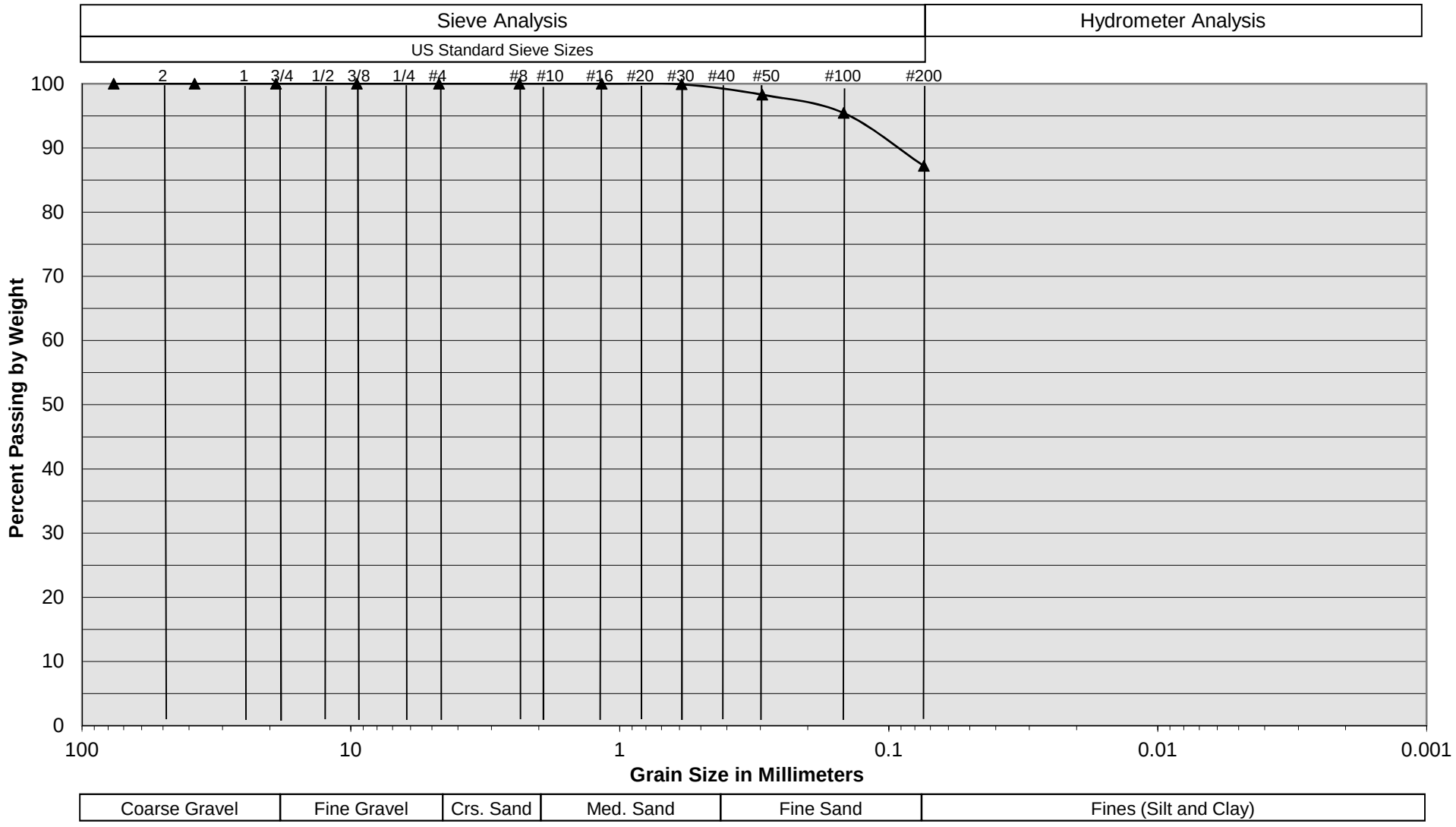
Grain Size Distribution

Sample Description	I-3 @ 18.5 to 20 feet
Soil Classification	Light Gray fine to coarse Sand, little fine Gravel, trace Silt

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

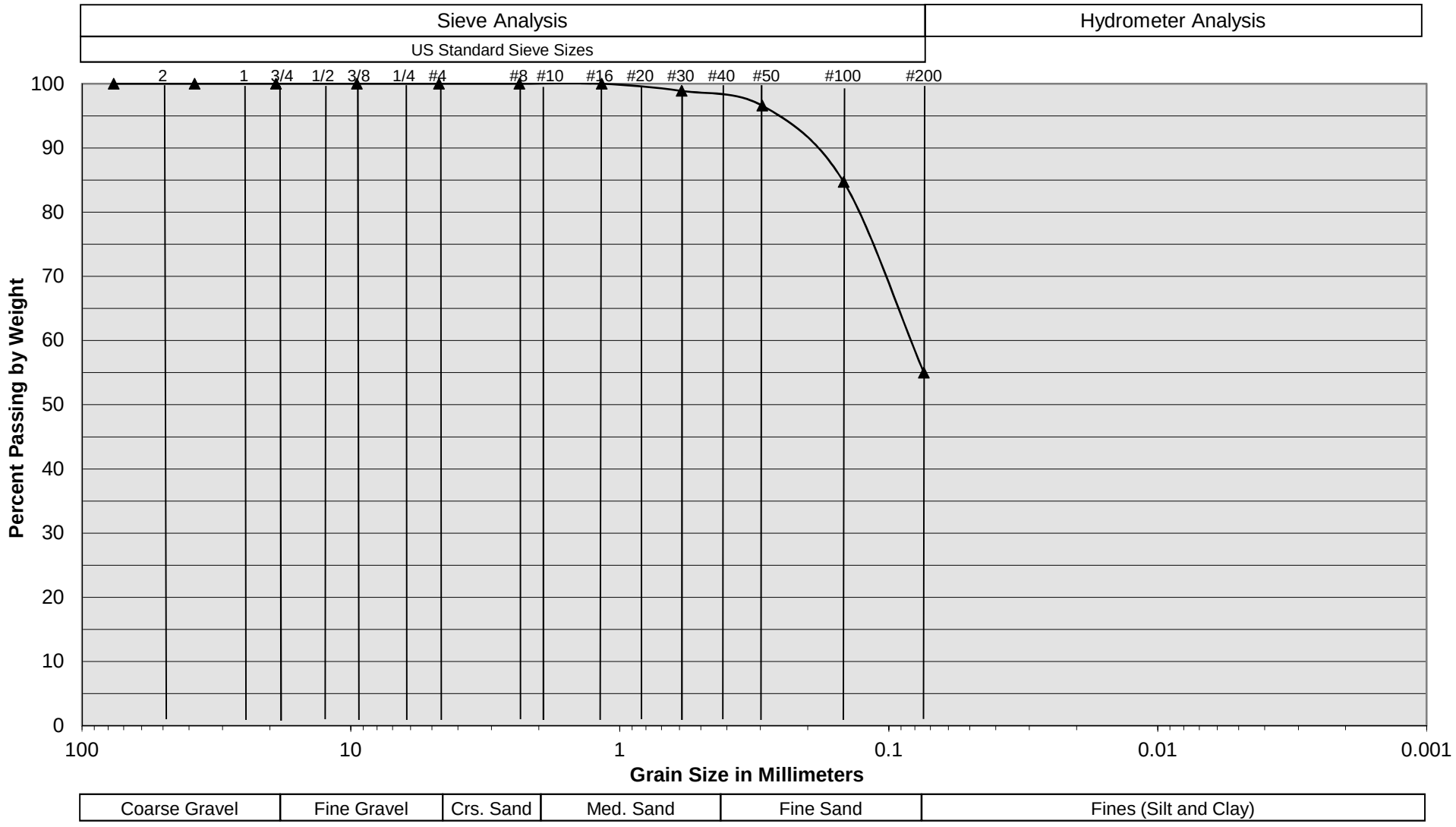


Sample Description	I-4 @ 18.5 to 20 feet
Soil Classification	Light Gray Brown Silty Clay, trace fine Sand

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

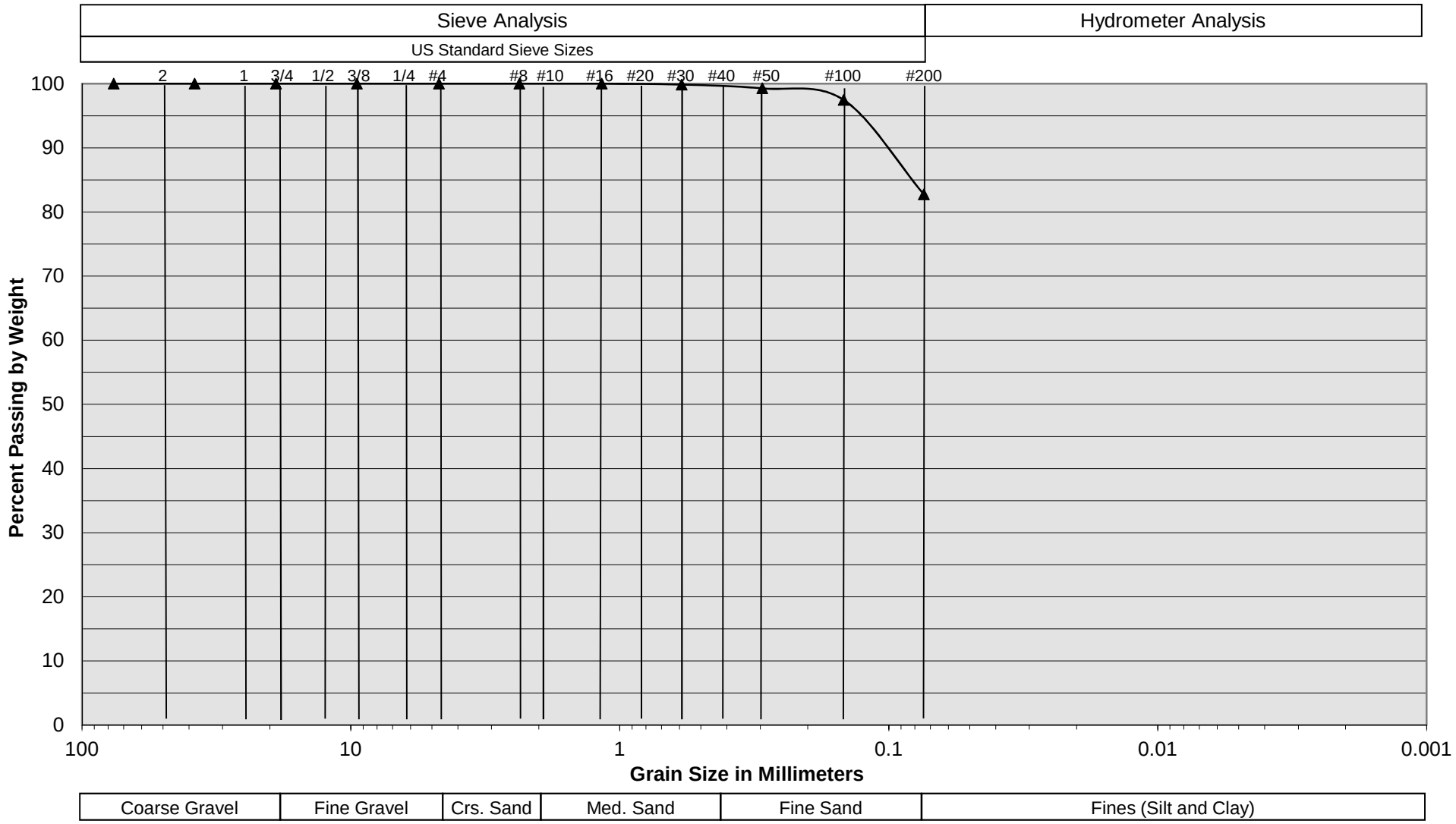


Sample Description	I-5 @ 12 to 13.5 feet
Soil Classification	Light Gray Brown fine Sandy Clay, little Silt

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-6 @ 12.5 to 14 feet
Soil Classification	Gray Silty Clay, little fine Sand

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

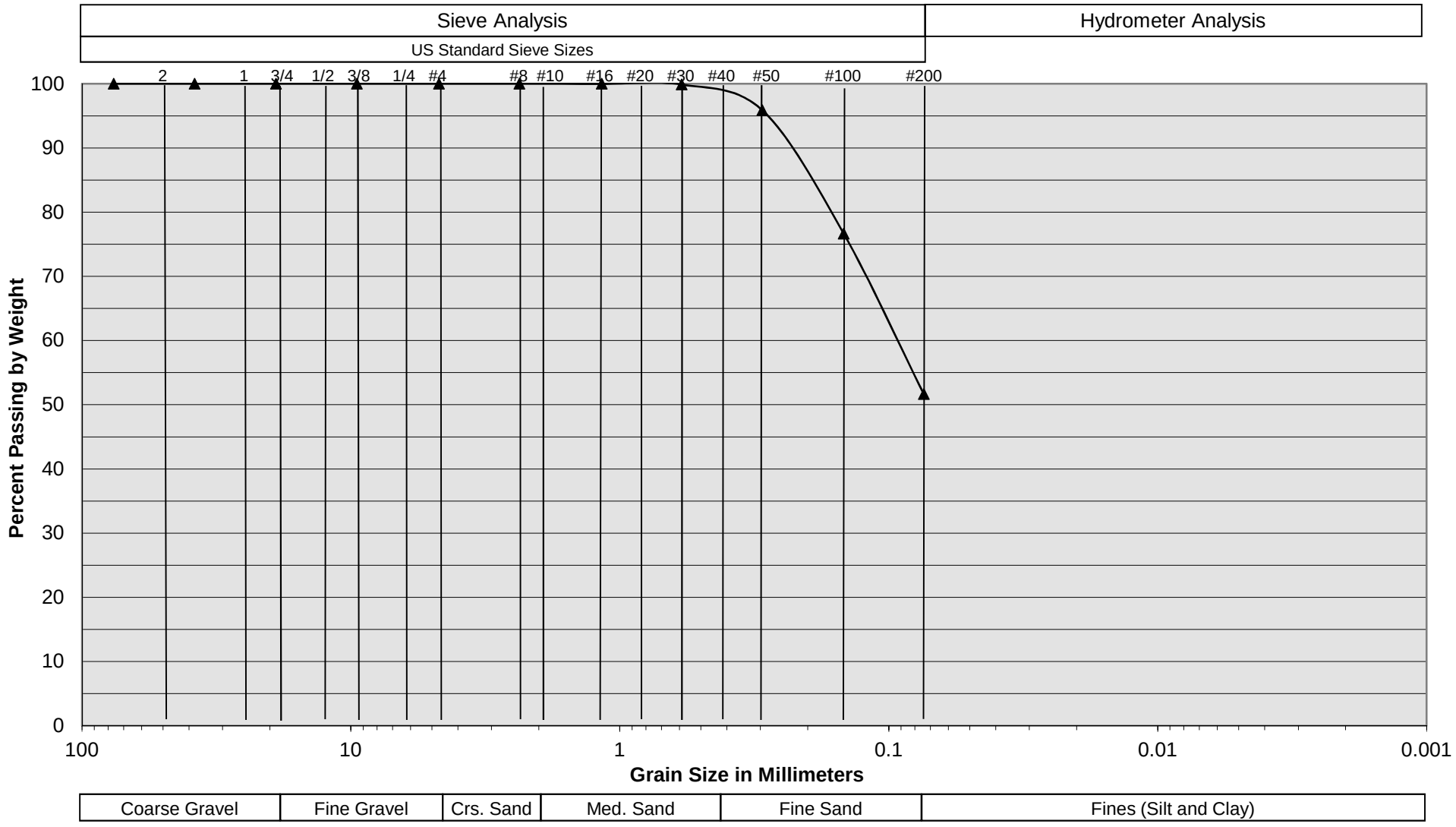
Grain Size Distribution

Sample Description	I-7 @ 14.5 to 16 feet
Soil Classification	Light Gray Brown fine Sandy Clay, little medium Sand, trace Silt

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

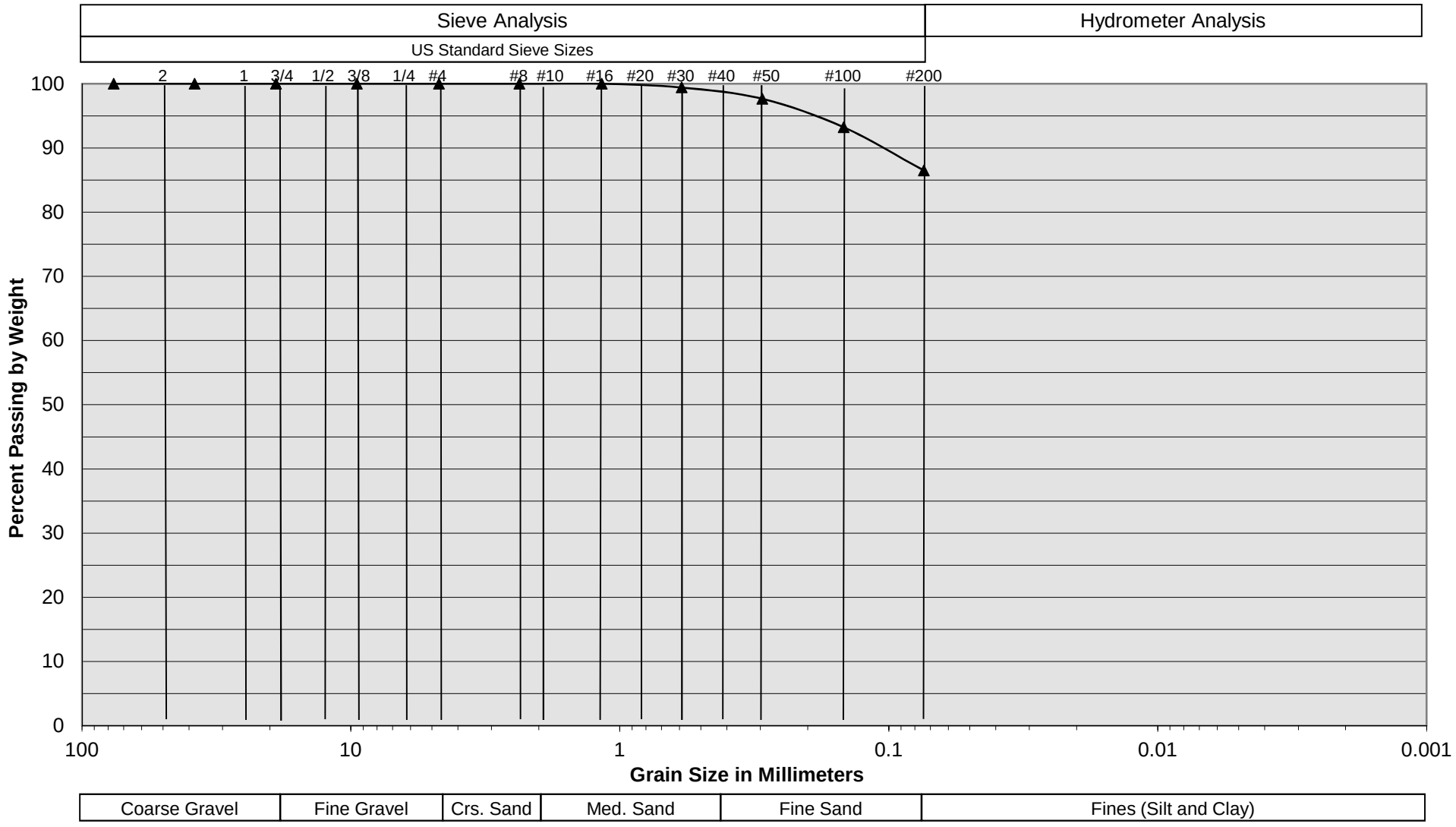


Sample Description	I-8 @ 15.5 to 17 feet
Soil Classification	Light Gray Brown Clayey fine Sand to fine Sandy Clay, trace Silt

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

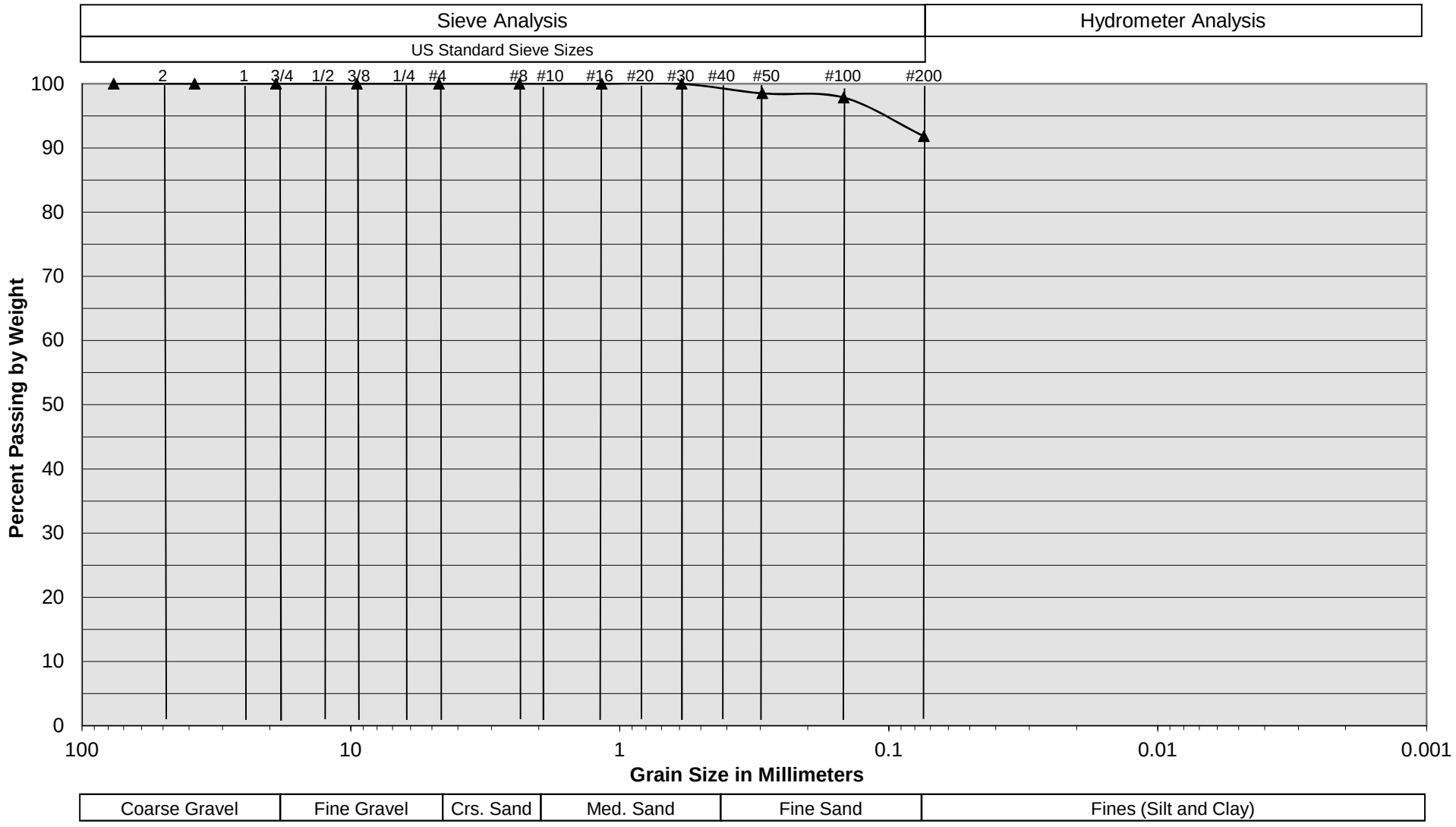


Sample Description	I-9 @ 13.5 to 15 feet
Soil Classification	Gray Silty Clay, trace fine Sand

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-8

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

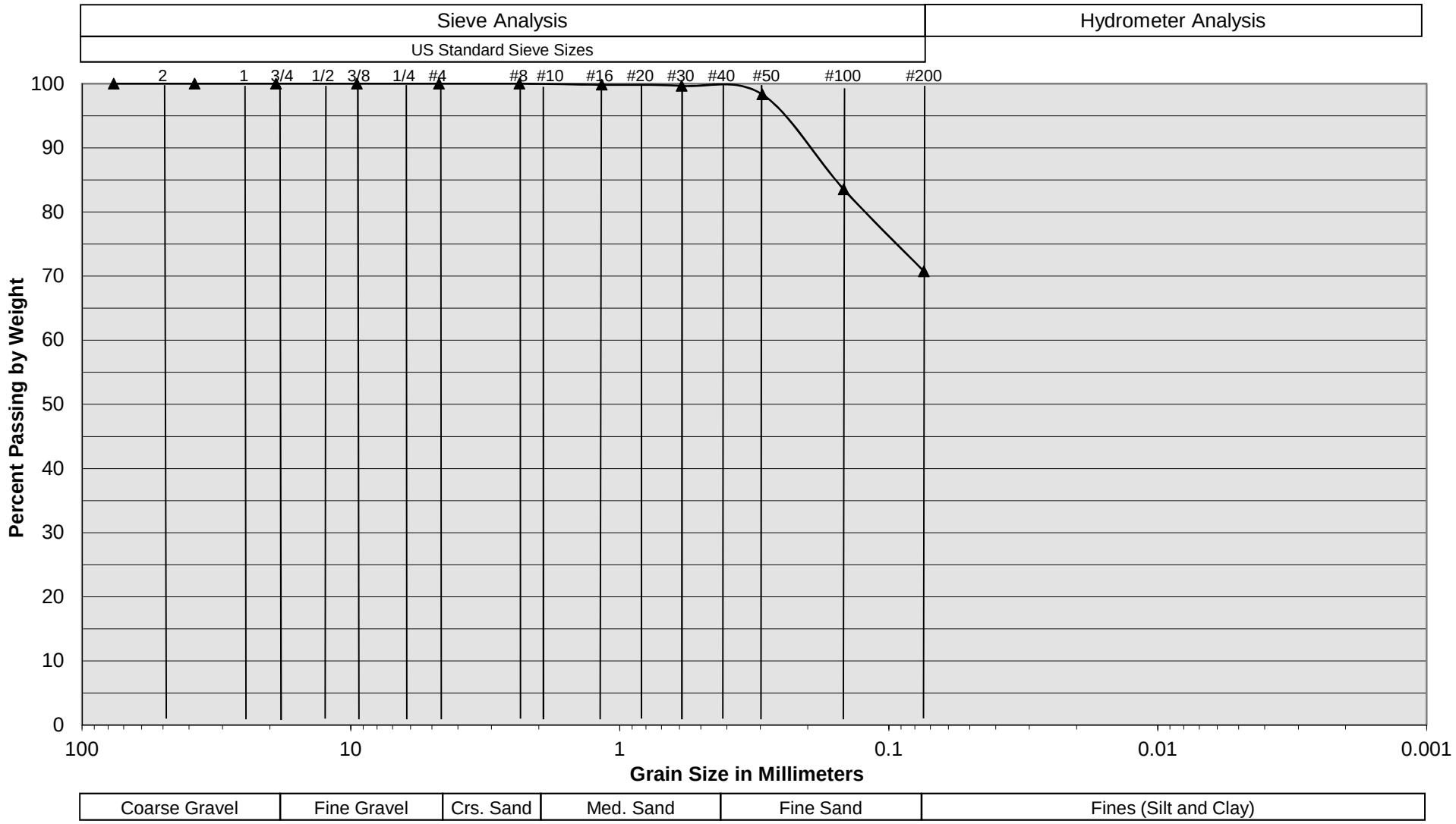


Sample Description	I-10 @ 8.5 to 10 feet
Soil Classification	Gray Silty Clay

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-9

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

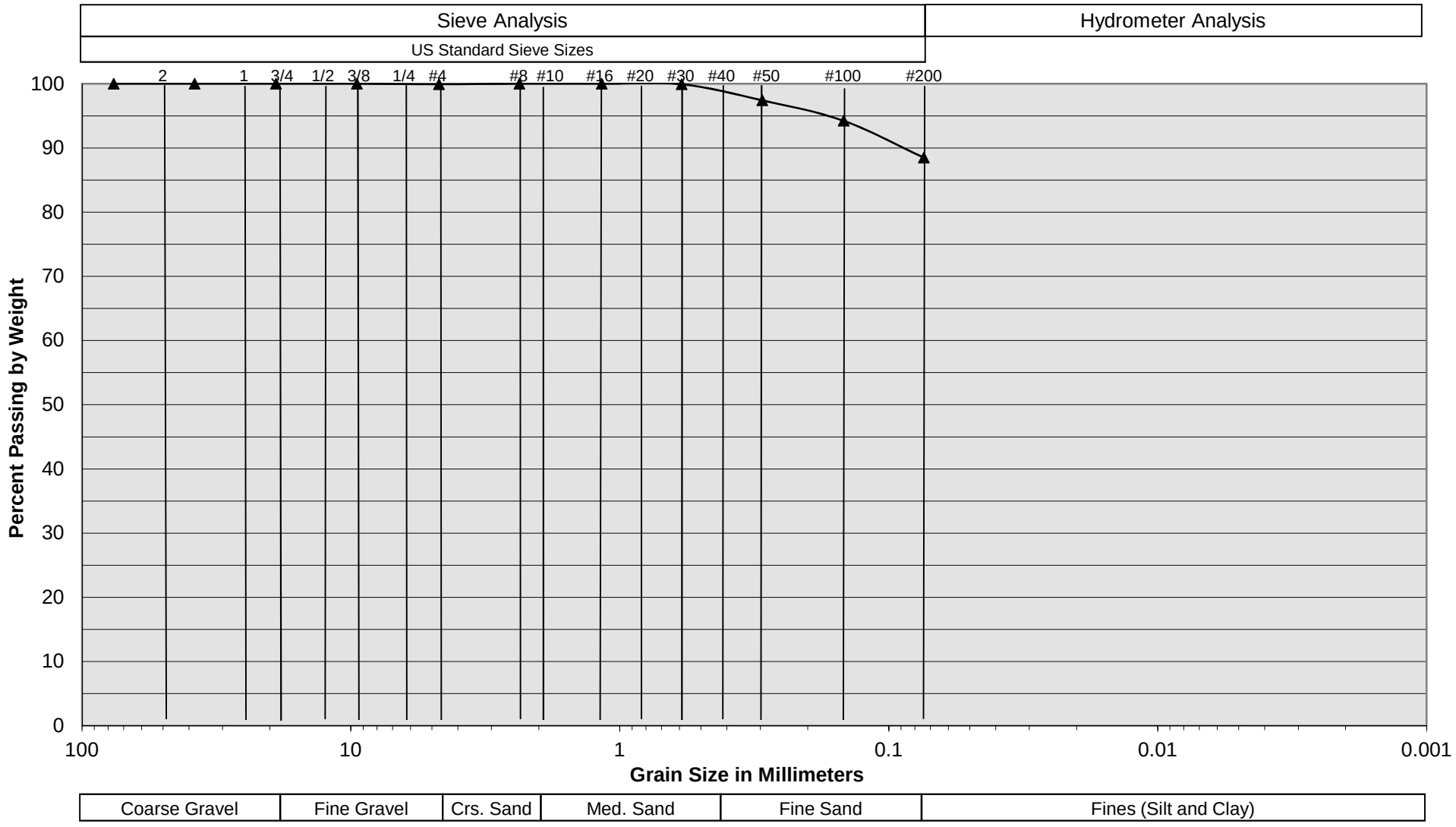


Sample Description	I-11 @ 10.5 to 12 feet
Soil Classification	Light Gray fine Sandy Silt, trace Clay

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-10

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

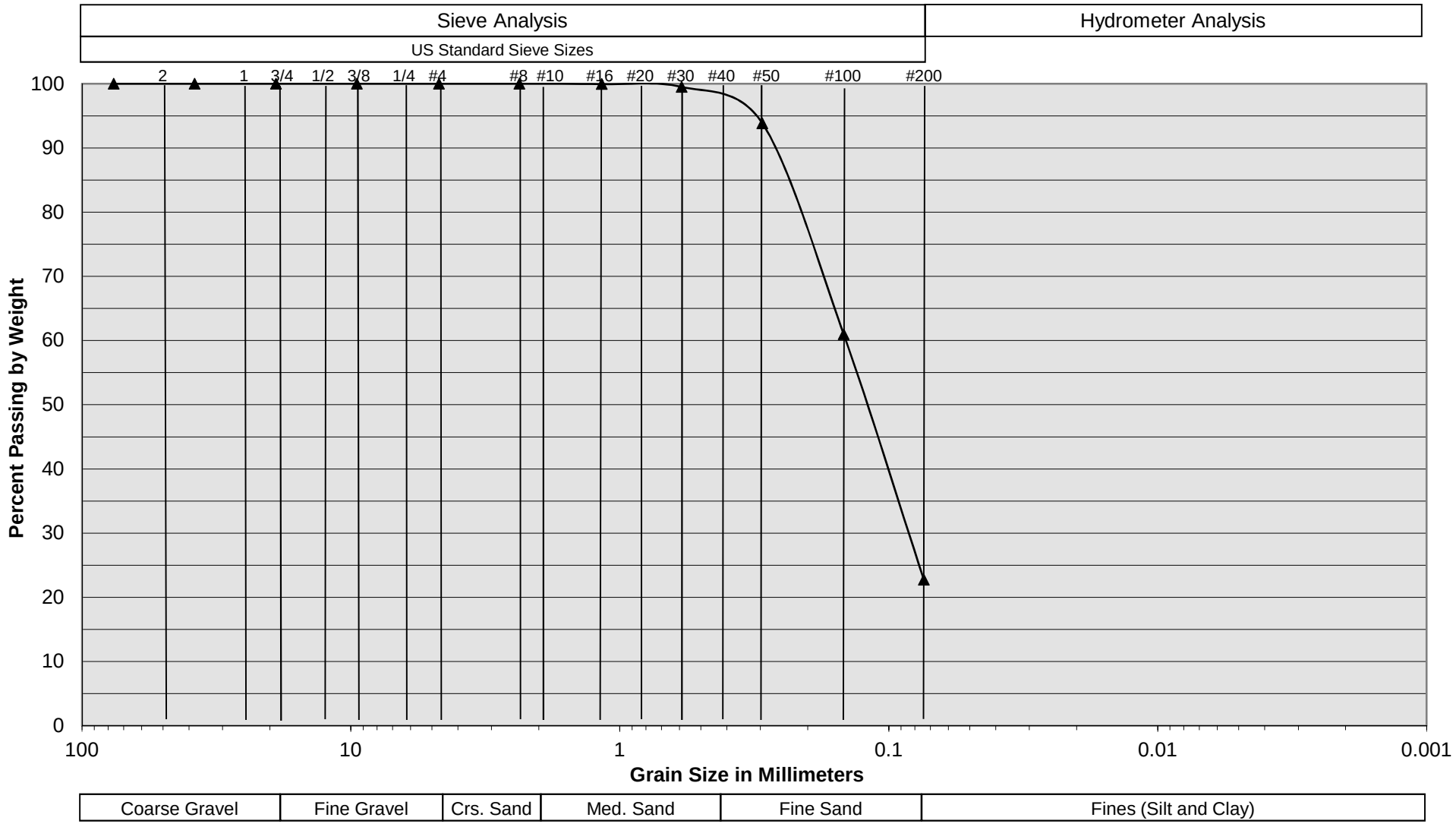


Sample Description	I-12 @ 9.5 to 11 feet
Soil Classification	Light Gray Silty Clay, trace fine Sand

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-11

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-13 @ 18.5 to 20 feet
Soil Classification	Light Gray Brown Silty fine Sand

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-12

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

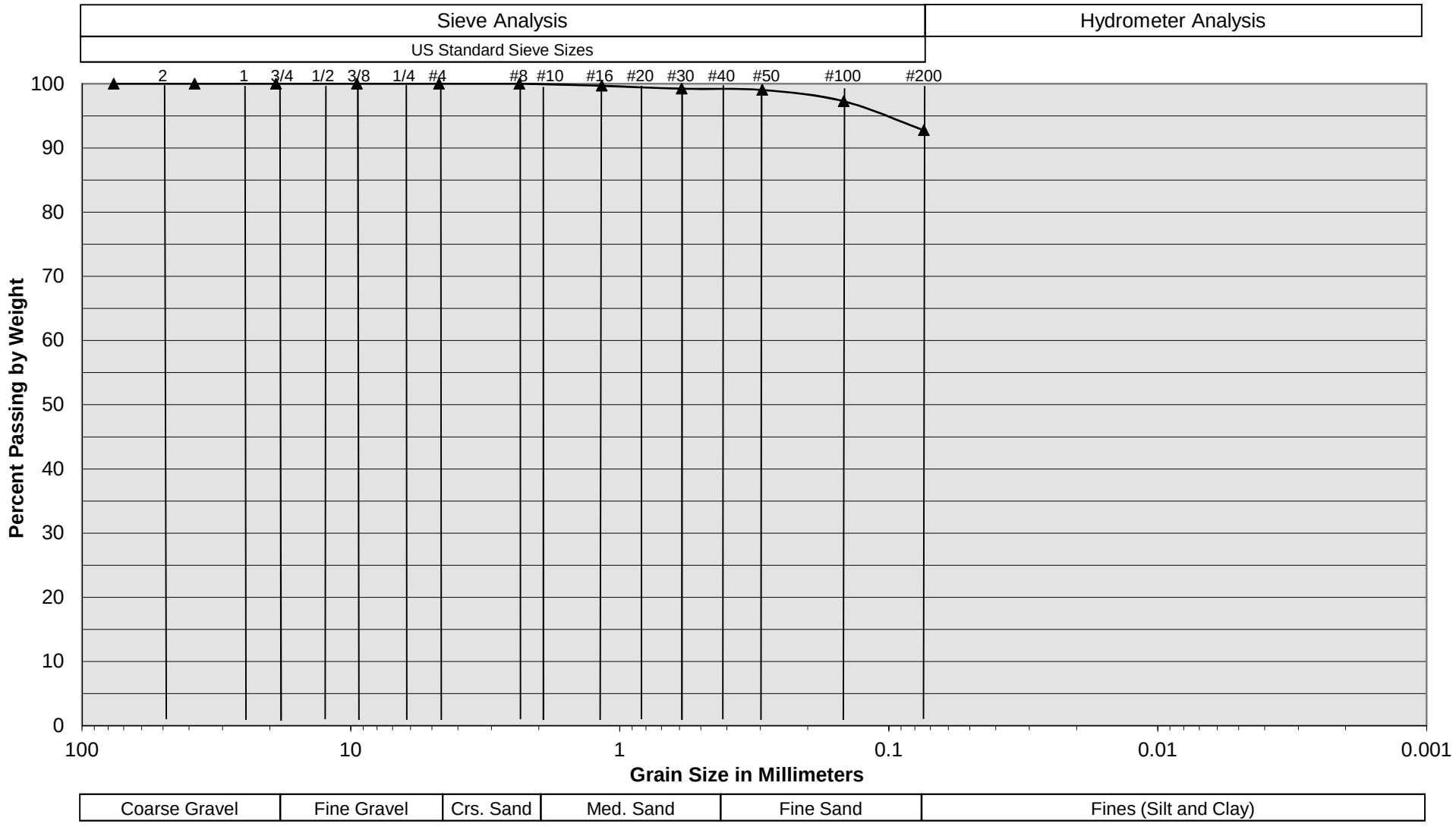
Grain Size Distribution

Sample Description	I-14 @ 18.5 to 20 feet
Soil Classification	Brown Silty fine Sand, little Clay

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-13

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

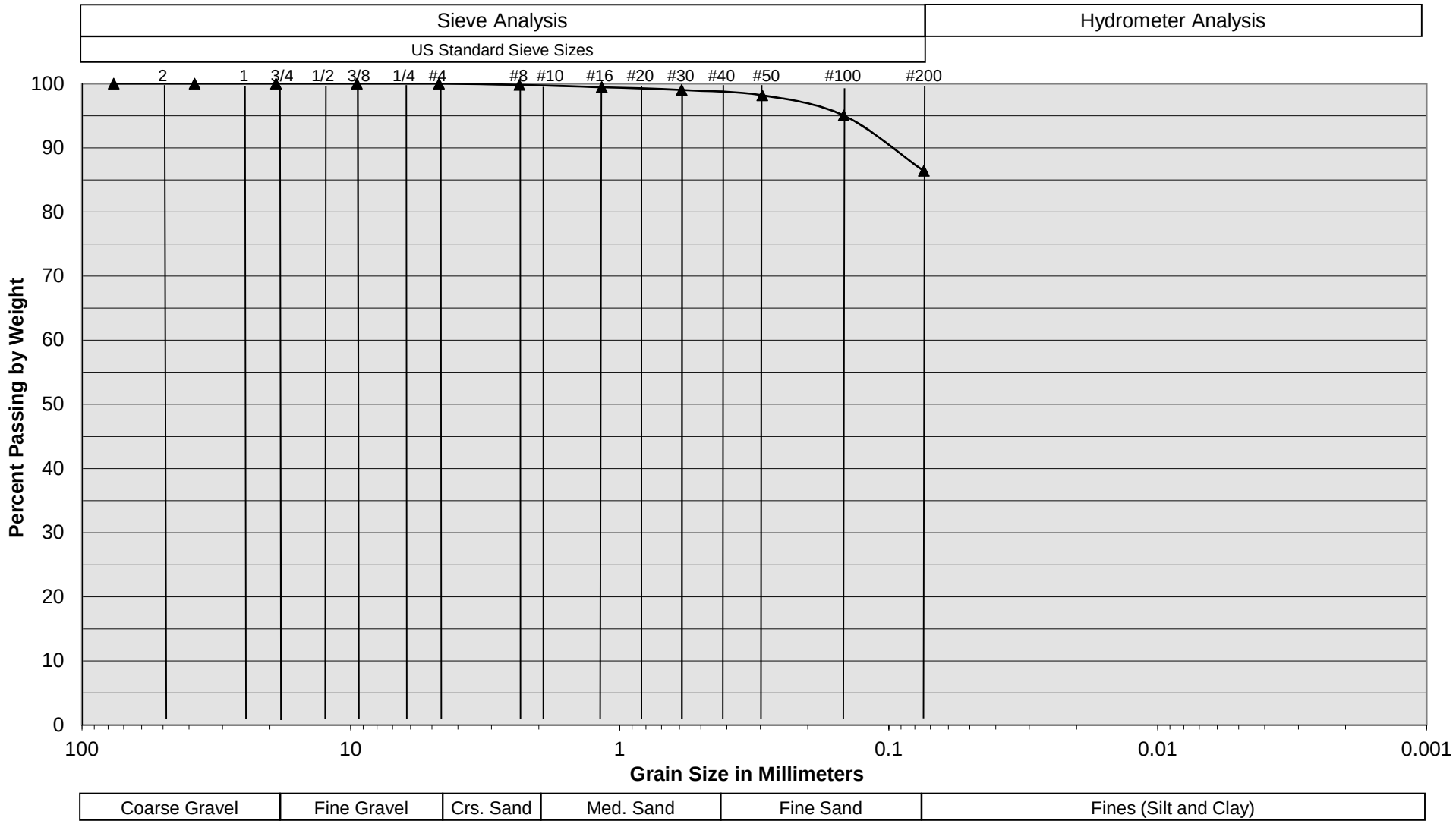


Sample Description	I-15 @ 12 to 13.5 feet
Soil Classification	Gray Brown Silty Clay

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-14

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-16 @ 12.5 to 14 feet
Soil Classification	Dark Gray Clayey Silt, trace fine Sand

Ontario Gateway Center
Ontario, CA
Project No. 18G129-3
PLATE C-15

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation