Labib Funk + Associates
Structural | Civil Engineers

Burnett + Young
Shoring Engineers

LOW IMPACT DEVELOPMENT & HYDROLOGY REPORT

FOR

514 Prospect Ave.,
Redondo Beach, CA 90277

Prepared for:
City of Redondo Beach

Prepared by:
Labib Funk + Associates
Structural | Shoring | Civil Consulting Engineers
319 Main St.
El Segundo, California 90245
JLA Job # 22709
January 25, 2022

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1.0 PROJECT SUMMARY

1.1 Existing Conditions

The existing project site is located at 514 Prospect Ave., Redondo Beach, California. The existing site is approximately 9.94 acres and consists of three commercial medical buildings, one three story parking garage, one subterranean parking level, asphalt and concrete paving, landscaping, and vacant dirt lot. Storm water runoff from the site sheet flows from East to West along the existing ground contours to Prospect Ave. and towards Towers St.

According to the project geotechnical report (Appendix D) groundwater was not encountered to a depth of 61.5 g, although this level could fluctuate due to local conditions or during rainy seasons.

1.2 Proposed Conditions

The proposed project consists of a multi-level building, parking lot, encircled by a combination of pervious and impervious walks. Storm water runoff from the proposed impervious areas will be collected in area drains and gutters and conveyed through storm drain piping to a system of three infiltration drywells. Storm water on the pervious areas of the site will infiltrate in place or in cases of large storm events be directed to drains to be conveyed to the BMP.

2.0 LOW IMPACT DEVELOPMENT (LID)

2.1 Methodology

The County of Los Angeles Low Impact Development Standards Manual was used to determine the appropriate storm water mitigation solution for the proposed project.
For sites subject to low impact development requirements, the City of Redondo Beach defines the storm water quality design volume (SWQDv) as the runoff from a 85th percentile 24-hour rain event. The proposed project must retain this volume of runoff onsite or demonstrate that doing so is technically infeasible.

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2.2 BMP Feasibility Screening

Due to groundwater depth being greater than 60' from the finished grade and existing soil condition according to the project geotechnical report (Appendix D), infiltration type BMPs will be used on site. The project site will utilize an infiltration drywell to treat the storm water on site and the overflow will be discharged to Prospect Avenue.

2.3 BMP Selection

The proposed infiltration drywell will be installed below grade in a concrete structure which will connect to the overflow sump pump pit. Additionally, a sump pump will convey storm water from the north end of the site to three drywells. Any overflow will be discharged to Prospect Ave. The proposed site incorporates three drywells to treat the site 85th percentile storm event.

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APPENDIX A
LID Calculation

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Legend

Hydrology GIS

Soils 2004

Final 85th Percentile, 24-hr Rainfall

HydroCalc Volume Analysis

Project: Beach City Health District - Subarea Site ** (Values from project "Peak Flow Hydrologic Analysis")*

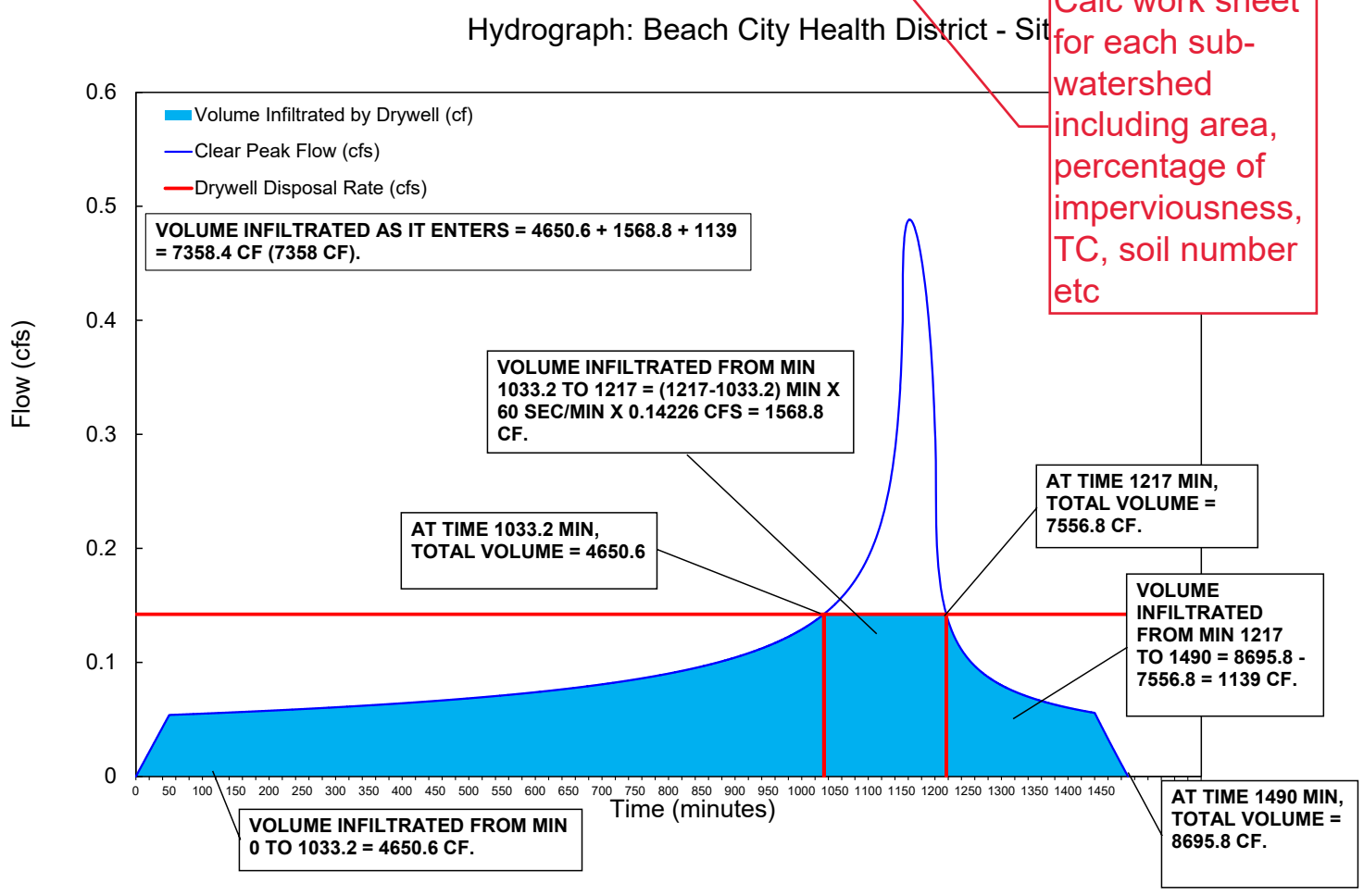
HydroCalc Output Results*

Clear Peak Flow (CFS)	0.4883
24-Hr Clear Runoff Volume (AC-FT)	0.1996
24-Hr Clear Runoff Volume (CF)	8696

Analysis

Drywell Disposal Rate (CFS)	***0.14226***
Total Volume Infiltrated During 1st Phase (CF)	4650.6
[2nd Phase] Storm Flow Rate Exceeds Drywell Disposal Rate @ (MIN)	1033.2
Total Volume Infiltrated During 2nd Phase (CF)	1568.8
[3rd Phase] Drywell Disposal Rate Exceeds Storm Flow Rate @ (MIN)	1217
Total Volume Infiltrated During 3rd Phase (CF)	1139
Total Time of Storm Event (MIN)*	1490
Total Volume Infiltrated as it Enters Drywell (CF)	***7358***
Total Storage within MaxWell System (CF)	1460
Remaining Detention Required (CF)	N/A

Provide Hydro Calc work sheet for each sub-watershed including area, percentage of imperviousness, TC, soil number etc



Maxwell® Plus Drainage System Calculations Prepared on January 27, 2022
Project: **Beach City Health District - Redondo Beach, CA**
Contact: Connor Crowley at Labib Funk + Associates - Los Angeles, CA

Given:

Design Infiltration Rate	4.18 in/hr
Mitigated Volume	8,696 ft^3
Required Drawdown Time	96 hours
Min. Depth to Infiltration	10 ft
Groundwater Depth for Design	61 ft

Proposed:

Drywell Rock Shaft Diameter	4 ft
Primary Chamber Depth	19 ft
Drywell Chamber Depth	19 ft
Rock Porosity	40 %
Depth to Infiltration	15 ft
Drywell Bottom Depth	50 ft

Provide details about each parameter with backup information

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

$4.18 \frac{in}{hr} \times \frac{1\ ft}{12\ in} \times \frac{1\ hr}{3600\ sec} = 0.000097 \frac{ft}{sec}$

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

For a 50 foot deep drywell, infiltration occurs between 15 feet and 50 feet below grade. This provides 35 feet of infiltration depth in addition to the bottom area. Infiltration area per drywell is calculated below.

$6\ ft \times 18.85 \frac{ft^2}{ft} + 29\ ft \times 12.57 \frac{ft^2}{ft} + 12.57\ ft^2 = 490\ ft^2$

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

$0.000097 \frac{ft}{sec} \times 490\ ft^2 = 0.04742 \frac{ft^3}{sec}$

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

96 hrs: 0.0474 CFS x 96 hours x $\frac{3600\ sec}{1\ hr}$ = 16,389 cubic feet of retained water disposed of.

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

Volume provided in each primary settling chamber with depth of 19 feet.

$19\ ft \times 12.57\ ft^2 = 239\ ft^3$

Volume provided in each drywell with chamber depth of 19 feet.

$19\ ft \times 12.57\ ft^2 + 2\ ft \times 28.27\ ft^2 \times 40\ \% + 29\ ft \times 12.57\ ft^2 \times 40\ \% = 407\ ft^3$

The MaxWell System is composed of 3 drywell(s) and 1 primary chamber(s).

Total volume provided = 1460 ft^3

Total 96 hour infiltration volume = 49,166 ft^3

Total infiltration flowrate = 0.14226 $\frac{ft^3}{sec}$

Based on the total mitigated volume of 8696 CF, after subtracting the volume infiltrated as quickly as it enters the drywell of 7358 CF, the remaining volume is 1338 CF. The storage provided in the drywell system is 1460 CF.

For any questions, please contact Alex Bennett at 213-248-4167 or via email at Alex.Bennett@Oldcastle.com

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HydroCalc Summary

Provide Hydrocalc backup calculations

Using the hydrograph produced by the HydroCalc Calculator, the area below the drywe
hydrograph curve is estimated as the volume infiltrated in the drywell as it enters. 3 differe
the 85th percentile storm event. Phase 1 will occur during the beginning of the storm ever
produced by the storm. When the storm flow is equal to the drywell flow disposal rate, phase 1 ends and phase 2 begins. Phase 2 is when the drywell performs at the flow rate it was design at. Any additional runoff that is produced due to the increase of storm flow will require a detention system. The storm will then hit its peak flow and begin to decrease. When the storm flow decreases to an amount equal to the drywell flow disposal rate, phase 2 ends and phase 3 begins. Phase 3 will occur near the end the storm when the drywell infiltrates the residual runoff until the end of the event.

Phase 1 – Initial Filling of Drywell

From time 0 minutes to 1033.2 minutes, the 85th storm event flowrate that enters the drywell is less than the drywell steady-state infiltration flowrate (flow disposal rate). Therefore, the entire volume entering the drywell from 0 minutes to 1033.2 minutes will infiltrate without overwhelming the drywell. This volume is 4650.6 CF.

Time (min)	Incremental Masscurve	Incremental Design Storm Depth (in)	Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)	Clear Peak Flow Rate (cfs)	Incremental Volume (cu-ft)	Cumulative Volume (cu-ft)	Volume infiltrated by drywell (CF)
1033	0.559807157	0.419855368	0.044167482	0.1	0.324	0.142244	1.706363348	4648.877508	1.706363348
1033.2	0.560021195	0.420015896	0.044196779	0.1	0.324	0.1423384	1.707494428	4650.585003	1.70712
1033.4	0.560235402	0.420176552	0.044226139	0.1	0.324	0.1424329	1.70862788	4652.293631	1.70712

Phase 2 – Drywell Performing at the Design Rate

From time 1033.2 minutes to 1217 minutes, the flowrate that enters the drywell exceeds the drywell steady-state infiltration flowrate (flow disposal rate). Therefore, the drywell can only infiltrate up to its flow disposal rate which is 0.14226 CFS. Over this period, we multiply the time by the flowrate (and covert as needed) to determine the volume infiltrated in this phase. This volume is 1568.8 CF.

(1217-1033.2) x 60 SEC/MIN x 0.14226 CFS = 1568.8 CF

Time (min)	Incremental Masscurve	Incremental Design Storm Depth (in)	Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)	Clear Peak Flow Rate (cfs)	Incremental Volume (cu-ft)	Cumulative Volume (cu-ft)	Volume infiltrated by drywell (CF)
1216.8	0.890716593	0.668037445	0.044317065	0.1	0.324	0.1427258	1.715309165	7555.100421	1.70712
1217	0.89086488	0.66814866	0.044184018	0.1	0.324	0.1422973	1.710138282	7556.810559	1.70712
1217.2	0.891012952	0.668259714	0.044052444	0.1	0.324	0.1418735	1.705024915	7558.515584	1.705024915

Phase 3 – End of the Storm Event

From time 1217 to 1490 minute (end of storm event), the 85th storm event flowrate that enters the drywell is less than the drywell steady-state infiltration flowrate (flow disposal rate). Therefore, the entire volume entering the drywell from 1217 minutes to 1490 minutes will infiltrate without overwhelming the drywell. This volume is 1139 CF.

8695.8 CF - 7556.8 CF = 1139 CF

Time (min)	Incremental Masscurve	Incremental Design Storm Depth (in)	Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)	Clear Peak Flow Rate (cfs)	Incremental Volume (cu-ft)	Cumulative Volume (cu-ft)	Volume infiltrated by drywell (CF)
1489.8	1	0.75	6.62608E-05	0.1	0.324	0.0002134	0.003841563	8695.791709	0.003841563
1490	1	0.75	0	0.1	0.324	0	0.001280382	8695.79299	0.001280382
	0	0	0	0	0	0	0	0	0

The total volume infiltrated as it enters the drywell during the 85th percentile storm event is 4650.6 + 1568.8 + 1139 = 7358.3 CF (7358 CF)

APPENDIX B
BMP Exhibit

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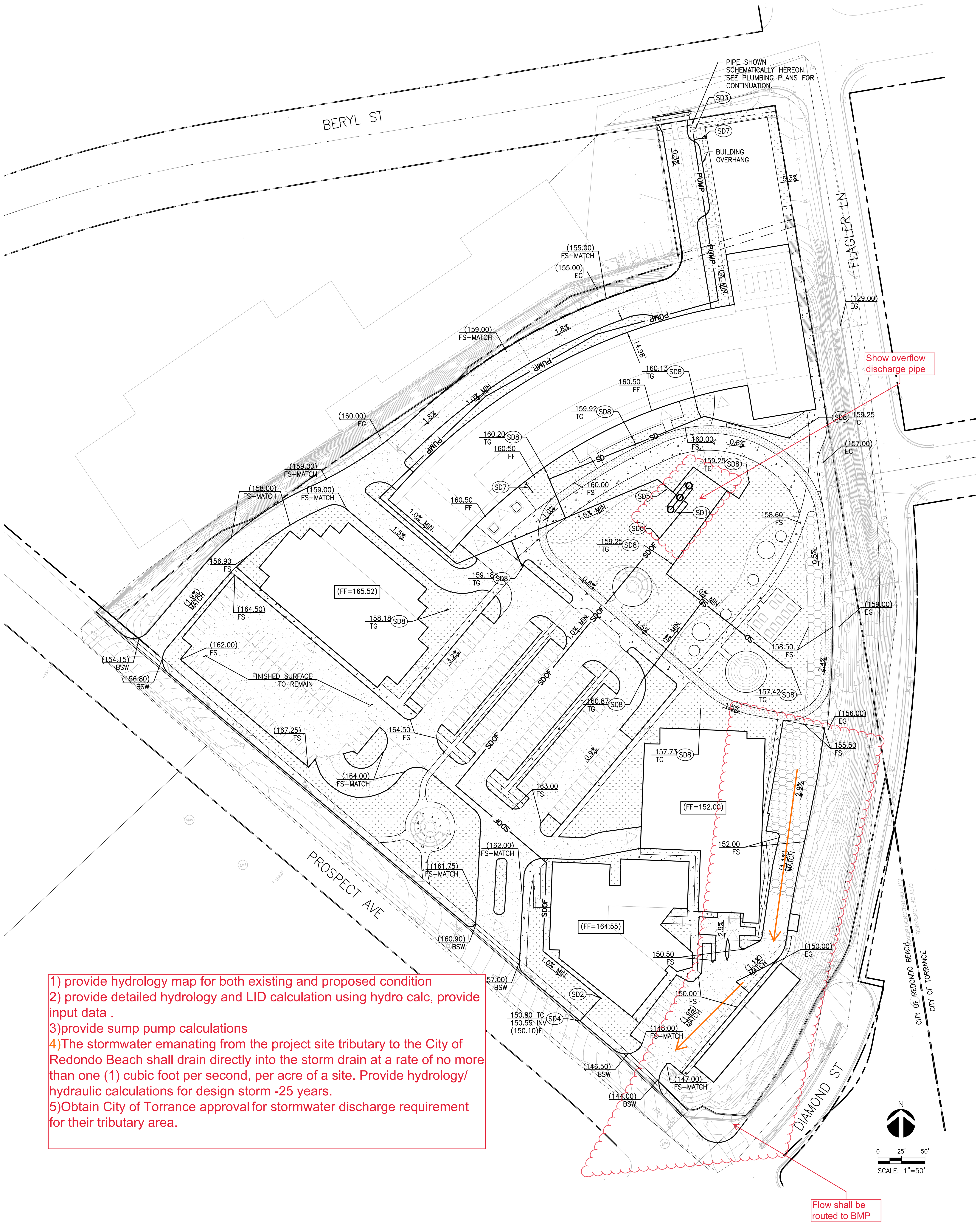


1) provide hydrology map for both existing and proposed condition
2) provide detailed hydrology and LID calculation using hydro calc, provide input data .
3)provide sump pump calculations
4)The stormwater emanating from the project site tributary to the City of Redondo Beach shall drain directly into the storm drain at a rate of no more than one (1) cubic foot per second, per acre of a site. Provide hydrology/ hydraulic calculations for design storm -25 years.
5)Obtain City of Torrance approval for stormwater discharge requirement for their tributary area.

LEGEND

- LANDSCAPE BY OTHERS.
- CONCRETE PAVING.
- ASPHALT PAVING. DEPTH OF ASPHALT AND BASE TO MATCH EXISTING.
- COMPACTED DG PER LANDSCAPE PLANS.
- GRASSCRETE.

PROJECT SITE CHARACTERISTICS	QUANTITIES
TOTAL SITE AREA (S.F.)	433,194
PROPOSED BUILDING FOOTPRINT(S.F)	46,807
EXISTING BUILDING FOOTPRINT(S.F)	57,336
PROPOSED HARDSCAPE(S.F)	183,954
EXISTING HARDSCAPE TO REMAIN(S.F)	27,947
IMPERVIOUS %	72%
LANDSCAPE	109,097
GRASSCRETE	11,053
TOTAL PERVIOUS AREA (S.F.)	120,150
RAINFALL INTENSITY (IN/HR)	0.75
DCV(cf)	8,696

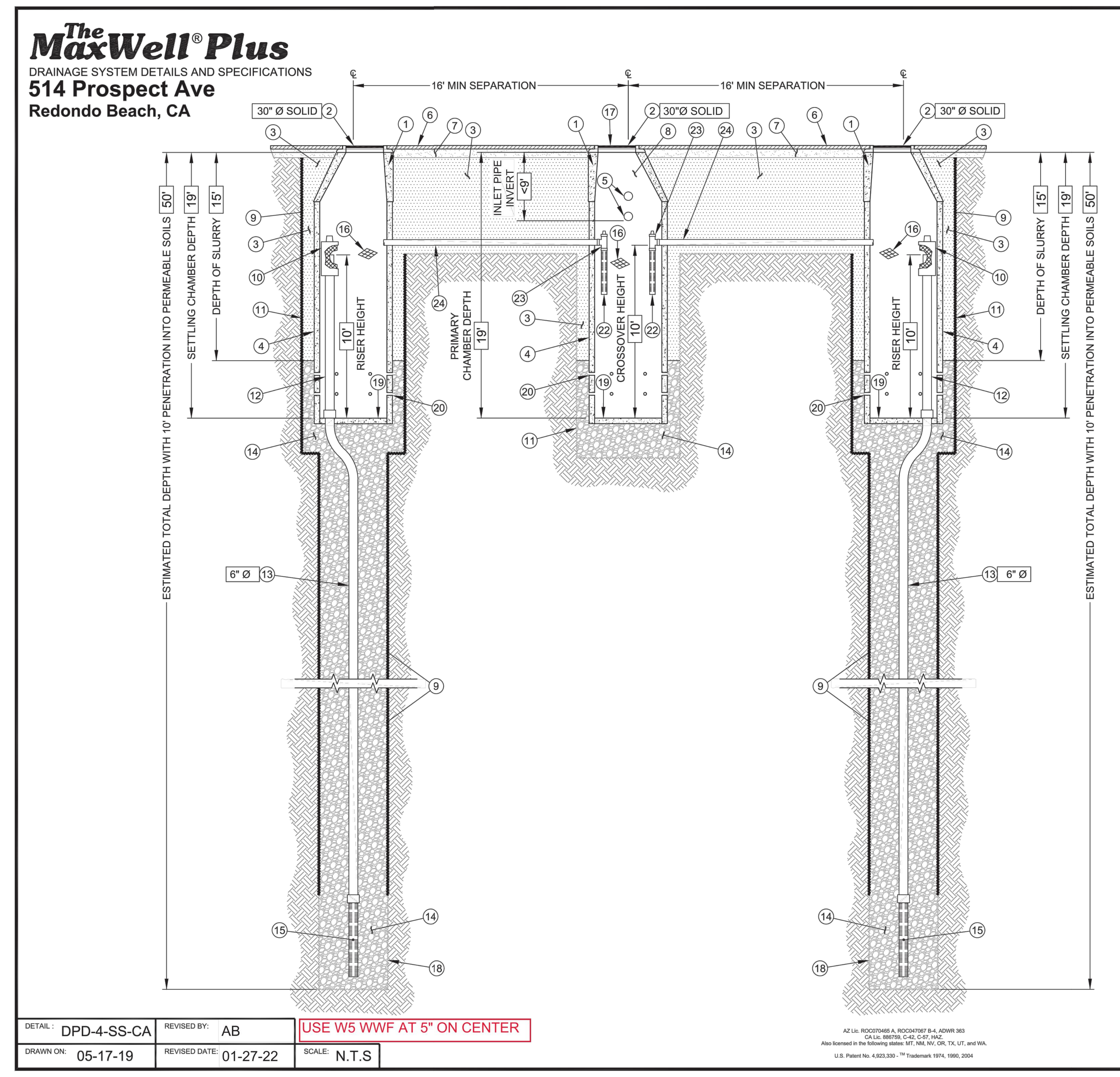
CONSTRUCTION NOTES

STORM DRAIN

- SD1 INSTALL DRYWELL PER DETAIL 1, HEREON.
- SD2 STORM DRAIN OVERFLOW POINT OF CONNECTION.
- SD3 SUMP PUMP PER OTHERS. SHOWN SCHEMATICALLY HEREON.
- SD4 INSTALL CURB DRAIN APWA STD. PLAN 151-4.
- SD5 PVC STORM DRAIN CONVEYANCE PIPING.
- SD6 PVC OVERFLOW PIPE.
- SD7 STORM DRAIN POINT OF CONNECTION. SEE PLUMBING PLANS FOR CONTINUATION FROM ROOF DRAINS.
- SD8 6" AREA DRAIN BY NDS PRO OR APPROVED EQUAL.

NOTES

1. ALL DOWNSPOUTS TO DRAIN TO PROPOSED BMPS. SEE PLUMBING PLANS.
2. INSTALL STENCIL EPR DETAIL AT ALL APPLICABLE LOCATIONS



○ ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **BOLTED RING & COVER** - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON PRESSURIZED COVER WITH GASKET (NEENAH R-6462-HH). BOLTED. RIM ELEVATION±0.02' OF PLANS.
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX.
4. **PRE-CAST LINER -** 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE.**
5. **INLET PIPE/OUTLET PIPE (BY OTHERS). SEE SEPARATE PLAN FOR INVERT ELEVATIONS.**
6. **GRADED BASIN OR PAVING** (BY OTHERS).
7. **COMPACTED BASE MATERIAL**, IF REQUIRED (BY OTHERS).
8. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE PRIMARY AND SECONDARY CHAMBER DEPTHS AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. **NON-WOVEN GEOTEXTILE SLEEVE** - MIRAFI 140 NL. MIN. 6 FT Ø. HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED**.
11. **MIN. 6' Ø DRILLED SHAFT.**
12. **RISER PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. **DRAINAGE PIPE** - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. OVERALL LENGTH VARIES, UP TO 120" WITH TRI-B COUPLER.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, 2 PER CHAMBER.
17. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION. GRATED ONLY.
18. **MIN. 4' Ø DRILLED SHAFT.**
19. **BASE SEAL** - CONCRETE SLURRY.
20. **6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.**
21. NOT USED.
22. **INTAKE SCREEN** - 4" Ø SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/ FT. 48" OVERALL LENGTH WITH TRI-C END CAP.
23. **VENTED ANTI-SIPHON INTAKE WITH FLOW REGULATOR.**
24. **CONNECTOR PIPE** - 4" Ø SCH. 40 PVC.

DETAIL: DPD-4-SS-CA	REVISED BY: AB	USE W5 WWF AT 5" ON CENTER
DRAWN ON: 05-17-19	REVISED DATE: 01-27-22	SCALE: N.T.S

1 / C300 MAXWELL IV DRYWELL
NTS

Maxwell® Plus Drainage System Calculations Prepared on January 27, 2022
Project: **Beach City Health District - Redondo Beach, CA**
Contact: Connor Crowley at Labib Funk + Associates - Los Angeles, CA

Given:

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Groundwater Depth for Design	61 ft

Proposed:

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$19\ ft \times 12.57\ ft^2 + 2\ ft \times 28.27\ ft^2 \times 40\% + 29\ ft \times 12.57\ ft^2 \times 40\% = 407\ ft^3$

The MaxWell System is composed of 3 drywell(s) and 1 primary chamber(s).
Total volume provided = 1460 ft^3
Total 96 hour infiltration volume = 49,166 ft^3
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Based on the total mitigated volume of 8696 CF, after subtracting the volume infiltrated as quickly as it enters the drywell of 7358 CF, the remaining volume is 1338 CF. The storage provided in the drywell system is 1460 CF.

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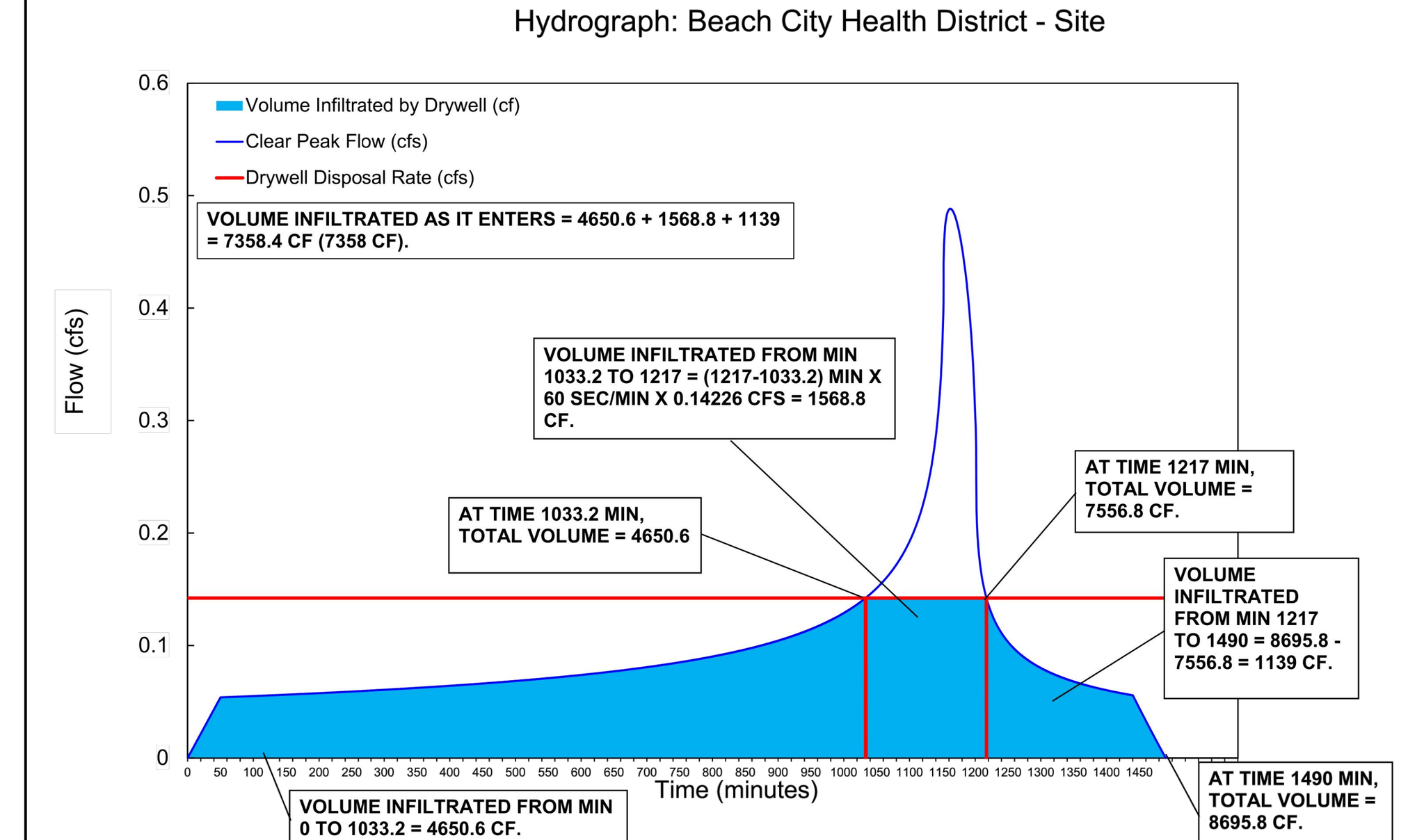
Total Storage within MaxWell System (CF)	1460
Remaining Detention Required (CF)	N/A

Hydrograph: Beach City Health District - Site



PAUL MURDOCH ARCHITECTS

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JLA Job No. 19725

REGISTERED PROFESSIONAL ENGINEER FRANCIS JOSEPH LAPORTA No. C75121 Exp. 12/31/2021 CIVIL STATE OF CALIFORNIA
SIGN DATE 01/28/2022

NO.	DATE	REVISION

BEACH CITIES HEALTH DISTRICT HEALTHY LIVING CAMPUS

514 NORTH PROSPECT AVE.
REDONDO BEACH, CA 90277

PMA PROJECT NO.
19010

DRAWING TITLE
LOW IMPACT DEVELOPMENT PLAN

SCALE
AS NOTED

DATE
01/06/20

DRAWN	CHECKED
Author	Checker

SHEET NO.
C-300