Preliminary Drainage Study for

Campus Point NDP

PTS 651935

Prepared For:

Alexandria Estate Equities, Inc.
San Diego, CA 92121
(858) 638-2800

Project Location:

10290 Campus Point Drive
San Diego, CA 92121
APN No. 343-230-38, 42 ,43 14 in the
City of San Diego, County of San Diego, CA

Prepared By:

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Michael Baker JN:
174310

Prepared:
April 30, 2020

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Table of Contents

List of Tables

List of Appendices

Section 1 Project Information

1.1 Project Data

Project Owner:	ARE-SD Region No. 57, LLC
	10996 Torreyana Rd, Suite 250
Project Site Address:	Campus Point Court, San Diego, CA 92121
APN Number(s):	343-230-38, 42 ,43 14
Parcel Area:	19.43-acres
Project Disturbed Area:	19.43-acres

1.2 Scope of Report

This report includes analyses of 100-year project-site peak flow under existing and proposed conditions. This report documents the hydrologic impact of the proposed improvements, as compared to the existing condition; and includes preliminary sizing for attenuation measures required to mitigate peak flow.

This report does not address temporary Best Management Practices (BMPs) required during construction, refer to the project Storm Water Pollution Prevention Plan (SWPPP). Post Construction BMPs are addressed in the project Storm Water Quality Management Plan (SWQMP).

1.3 Project Description

Proposed improvements include the demolition of two existing structures and the surrounding parking lot. A total of seven new structures are proposed along with accompanying parking area and hardscape. Total project-site impervious area will be slightly increased as a result of the proposed improvements; however, peak flow will not be diverted and will be mitigated to existing rates through proposed sub-terranean detention vaults.

Based on the Natural Resources Conservation Service's (NRCS) Websoil Survey, the project site is comprised of approximately 26.6-percent Chesterton fine sandy loam (CfB), with slopes ranging from 5 to 9 percent (hydrologic soil type D); and approximately 73.4-percent Altamont Clay (AtF) (hydrologic soil type C).

During surface exploration Geocon Inc. encountered man-made fill material across the project site. Due to this material it is recommended that the site be considered Hydrologic Soil Type D.

The Federal Emergency Management Agency (FEMA) has not mapped a Special Flood Hazard Area (SFHA) within the project site vicinity. The entire project site lies within un-shaded Zone X, which correlates with areas determined to be outside the 500-year floodplain. An exhibit is provided in Appendix A of this report.

1.4 Existing Conditions

The project site is entirely built out in the existing condition and has been hydrologically analyzed as three drainage basins.

Basin 1 is approximately 2.25-acres and includes a portion of the parking lot on the northern edge of the site. Runoff is collected by curb inlets and conveyed north. Runoff ultimately exits the project area through a 24" PVC pipe, which discharges into the canyon just west of the site.

Basin 2 is approximately 14.50-acres and includes both existing structures with a majority of the existing parking lot. Runoff is collected via area drains and is conveyed west. Runoff ultimately exits the project area through a 36" RCP, which discharges into the canyon just west of the site.

Basin 3 is approximately 2.68-acres and includes existing parking area. Runoff is collected by drains and is routed to an existing partial infiltration basin constructed by PTS# 526897, 39001-D.

Impervious area is comprised of the concrete walkways, parking stalls, drive isles and roofing. Pervious area is comprised of landscape located within parking islands and adjacent to the existing building. Refer to Appendix B for an exhibit detailing the existing condition.

1.5 Proposed Conditions

The proposed structures will be located close to the property lines on all sides of the project site. Roof leaders, area drains, and new on-site private storm drain will direct project site runoff to proposed storage vaults, described in more detail below. The project site is entirely built out in the proposed condition and has been hydrologically analyzed as 17 drainage basins.

Basin 1 is approximately 0.83-acres and includes a portion of the northern parking lot, CP4 and access road. Runoff is collected via curb inlets and routed to a concrete storage vault (Storage Vault 1). The vault has a volume of 8,320 cubic feet at the weir height, with a weir 3.5' above the vault bottom and a 1.4" orifice.

Basin 2 is approximately 3.96-acres and includes some parking lot, and CP5. Runoff is collected via inlets and routed to a concrete storage vault (Storage Vault 2). The vault has a volume of 13,246 cubic feet at the weir height, with a weir 4' above the vault bottom and a 1.9" orifice.

Basin 3 is approximately 0.98-acres and includes a portion of the southwest access road as well as part of the roof of CP6. Runoff is collected via inlets and routed to a concrete storage vault (Storage Vault 3). The vault has a volume of 4,163 cubic feet at the weir height, with a weir 4' above the vault bottom and a 0.9" orifice.

Basin 4 is approximately 0.58-acres and includes a portion of the southwest access road as well as a portion of the roof of CP6. Runoff is collected via inlets and routed to a concrete storage vault (Storage Vault 4). The vault has a volume of 2,965 cubic feet at the weir height, with a weir 6' above the vault bottom and a 0.6" orifice.

Basin 5 is approximately 1.29-acres and includes the southern portion of the access road as well as the roof of CP7. Runoff is collected via roof leaders and area drains and routed to a concrete storage vault (Storage Vault 5) located within the subterranean parking structure. The vault has a volume of 5,760 cubic feet at the weir height, with a weir 6' above the vault bottom and a 1" orifice.

Basin 6 is approximately 0.65-acres and includes the parts of the southern access road and associated parking lot. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 1). The basin has a footprint of 1,816 square feet and a 0.8" orifice

Basin 7 is approximately 1.03-acres and includes the portion of the access road in the middle of the site and a portion of CP7. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 2). The basin has a footprint of 2,440 square feet and a 1" orifice

Basin 8 is approximately 0.27-acres and includes the main access road onto Campus Point. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 3). The basin has a footprint 6,520 square feet and a 1.0" orifice.

Basin 9 is approximately 1.47-acres and includes the portion of the access road in the middle of the site and portions of the roof of CP6. Runoff is collected via inlets and routed to a Biofiltration basin (Biofiltration Basin 4). The basin has a footprint of 3,668 square feet and a 1.2" orifice.

Basin 10 is approximately 2.12-acres and includes the parking structure located on the eastern side of the site. Runoff is collected via inlets and routed to a separate concrete storage vault (Storage Vault 6). The vault has a volume of 10,100 cubic feet at the weir height, with a weir 4' above the vault bottom and a 1.3" orifice.

Basin 11 is approximately 1.92-acres and includes the parking structure located on the eastern side of the site. Runoff is collected via inlets and routed to a separate concrete storage vault (Storage Vault 7). The vault has a volume of 8,800 cubic feet and a 0.75" orifice.

Basin 12 is approximately 1.85-acres and located in the north easterly portion of the site. Runoff is collected via inlets and routed to a separate concrete storage vault (Storage Vault 8). The vault has a volume of 7,965 cubic feet at the weir height, with a weir 4" above the vault bottom and a 0.8" orifice.

Basin 13 is approximately 1.08-acres and includes portions of the plaza. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 5). The basin has a footprint of 1,946 square feet and a 1" orifice

Basin 14 is approximately 3.86-acres and includes the northern portion of the site and part of CP4 and the soccer fields. Runoff is collected via inlets and routed to a storage vault (Storage Vault 9). The vault has a volume of 7,965 cubic feet and a 2" orifice.

Basin 15 is approximately 2.43-acres and includes the eastern portion of the site and all of CP3. Runoff is collected via inlets and routed to a vault (Storage Vault 10). The basin has a volume of 7,965 cubic feet and a 1.5" orifice

Basin 16 is approximately 0.28-acres and includes the access road on the eastern portion of the site. Runoff is collected via inlets and routed to a vault (Storage Vault 11). The basin has a volume of 7,965 cubic feet and a 0.5" orifice

Basin 17 is approximately 0.26-acres and includes a landscaped slope adjacent to CP7. Runoff is collected via a brow ditch and conveyed to the discharge location.

Refer to Appendix C for an exhibit detailing the proposed condition.

Section 2 Study Objectives

The specific objectives of this study are as follows:

- Quantify 100-year peak flow rates under existing and proposed conditions to all discharge points;
- Develop measures to mitigate any increase in peak flow associated with proposed improvements;
- Demonstrate the proposed improvements will not increase the potential for erosion on the project site or downstream area.
- Demonstrate that the tributary area for the existing infiltration basin is reduced by the proposed improvements.

Section 3 Methodology

3.1 Hydrology

The Rational Method has been utilized to perform the hydrologic analyses. The following formula conforms to the hydrologic methodologies outlined in the City of San Diego Drainage Design Manual (January 2017).

$$Q = C * I * A$$

Where, **Q** = Peak Discharge - *(cfs)*

C = Runoff Coefficient

I = Average Rainfall Intensity - *(in/hr)*

A = Drainage Area - *(acres)*

A weighted runoff coefficient has been calculated for the existing and proposed conditions per Section A.1.2 of the City of San Diego Drainage Design Manual. The tabulated impervious area chosen for the project site is 80% (commercial use) for existing condition and 90% (industrial use) for the proposed condition. In this preliminary study the assumption of 90% impervious cover in the proposed condition is a conservative estimate as the land-use will remain commercial. Final engineering will revise this percentage to more accurately the impervious areas on-site.

Intensity has been calculated per the IDF Curve in Figure A-1 of the City of San Diego Drainage Design Manual. A time in concentration of 5 minutes has been assumed for the project area under existing and proposed conditions.

3.2 Hydraulics

The Hydraflow Hydrographs Extension within AutoCAD has been used to model peak flows from the project as they are mitigated by the proposed detention vaults. Hydrographs generated by Rick Engineering Company's RatHydro software have been routed through storage vaults modeled in Hydraflow Hydrographs. Refer to Appendix C for the modelling input and output.

Section 4 Results

4.1 Hydrologic Results

The table below summarizes the hydrologic results under existing and proposed conditions. Calculations are included in Appendices B (existing) and C (proposed).

Table 4-1 - Hydrologic Summary

Discharge Point	Basin ID	C	I*	A	Q_{100}
		-	(in/hr)	(ac)	(cfs)
Existing Condition					
1	Basin 1	0.85	4.5	2.02	7.7
2	Basin 2	0.85	4.5	23.26	89
3	Basin 3	0.85	4.5	0.69	2.6
Proposed Condition (Unmitigated)					
1	Basin 1	0.83	4.5	1.93	7.2
Total				**1.93**	**7.2**
2	Basin 2	0.71	4.5	3.96	12.7
	Basin 3	0.82	4.5	0.98	3.6
	Basin 4	0.93	4.5	0.58	2.4
	Basin 5	0.85	4.5	1.29	4.9
	Basin 6	0.63	4.5	0.65	1.8
	Basin 7	0.80	4.5	1.03	3.7
	Basin 8	0.71	4.5	0.27	0.9
	Basin 9	0.80	4.5	1.47	5.3
	Basin 10	0.89	4.5	2.12	8.5
	Basin 11	0.87	4.5	1.92	7.5
	Basin 12	0.83	4.5	1.85	6.9
	Basin 13	0.66	4.5	1.08	3.2
	Basin 14	0.88	4.5	3.86	15.3
	Basin 17	0.35	4.5	0.26	0.4
Total				**21.32**	**77.1**
3	Basin 15	0.89	4.5	2.43	9.7
	Basin 16	0.61	4.5	0.28	0.8
Total				**2.71**	**10.5**
Proposed Condition Discharge Point 3 (Mitigated)					
3	Basin 15	0.89	4.5	2.43	1.4
	Basin 16	0.61	4.5	0.28	0.8
Total				**2.71**	**2.2**

*A time in concentration of 5 minutes has been assumed for each basin. Per Figure A-1 of the Drainage Design Manual this will result in a similar intensity for all basins. Refer to Appendices B and C for hydrologic calculations.

4.2 Hydraulic Results

Discharge Point 1 - The peak flow rate at discharge location 1 is reduced by diverting a portion of the drainage area to discharge 2 as well a reduction in impervious area. No additional peak flow attenuation is required.

Discharge Point 2 - The peak flow rate at discharge location 1 is reduced by diverting a portion of the drainage area to discharge 2 and a reduction in impervious area. No additional peak flow attenuation is required.

Discharge Point 3 – The peak flow rate at this location increase due to an increase in impervious area along with additional flow that has been diverted from the other discharge locations. The table below summarizes the hydraulic performance of the proposed storage vault for Basin 15 used for mitigating the peak flow rate. Calculations are included in Appendix C.

Table 4-2 – Hydraulic Summary Storage Vault 10

Vault ID	Volume at weir elevation	Weir Height	Q100 (in)	Q100 (out)
	(ft^3)	(ft)	(cfs)	(cfs)
Vault 10	12,075	3.5	9.7	1.4

* 1-foot ponding depth above surface of the biofiltration basin and a standard sub-base section.

Section 5 Conclusions

Proposed improvements will not result in an increase to 100-year peak flow discharge from the site, as compared to the existing condition. The increases in peak flow at discharge point 3 is associated with an increase in impervious area and additional flow from the other two basins that has been diverted to it. This increase has been mitigated below existing conditions using the storage vault10 located at Basin 15. This vault BMP also provide hydromodification mitigation which is discussed in more detail within the SWQMP.

This project will not discharge, dredge, or fill material into any Water of The United States, thus the project is not required to obtain a Section 401 certification or Section 404 permit from the State or U.S. Army Corps of Engineers.

Section 6 Declaration of Responsible Charge

I, hereby declare that I am the Civil Engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current design.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for the project design.

Christopher Leary RCE 87309 Date

Section 7 Bibliography

City of San Diego. (January 2017). *Drainage Design Manual.* San Diego.

City of San Diego. (January 2018). *Storm Water Standards.* San Diego.

FEMA. (1997). *Flood Insurance Rate Map.* San Diego.

Soil Survey Staff, N. R. (2018, September 24). *Web Soil Survey.* Retrieved from Web Soil Survey: https://websoilsurvey.sc.egov.usda.gov/

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Appendix A – Site Information

Vicinity Map
Rainfall Isopluvials
FEMA FIRM
NRCS WebSoil Survey
Stormwater Standards Appendix B.1.1 from City DDM (Jan. 2017)

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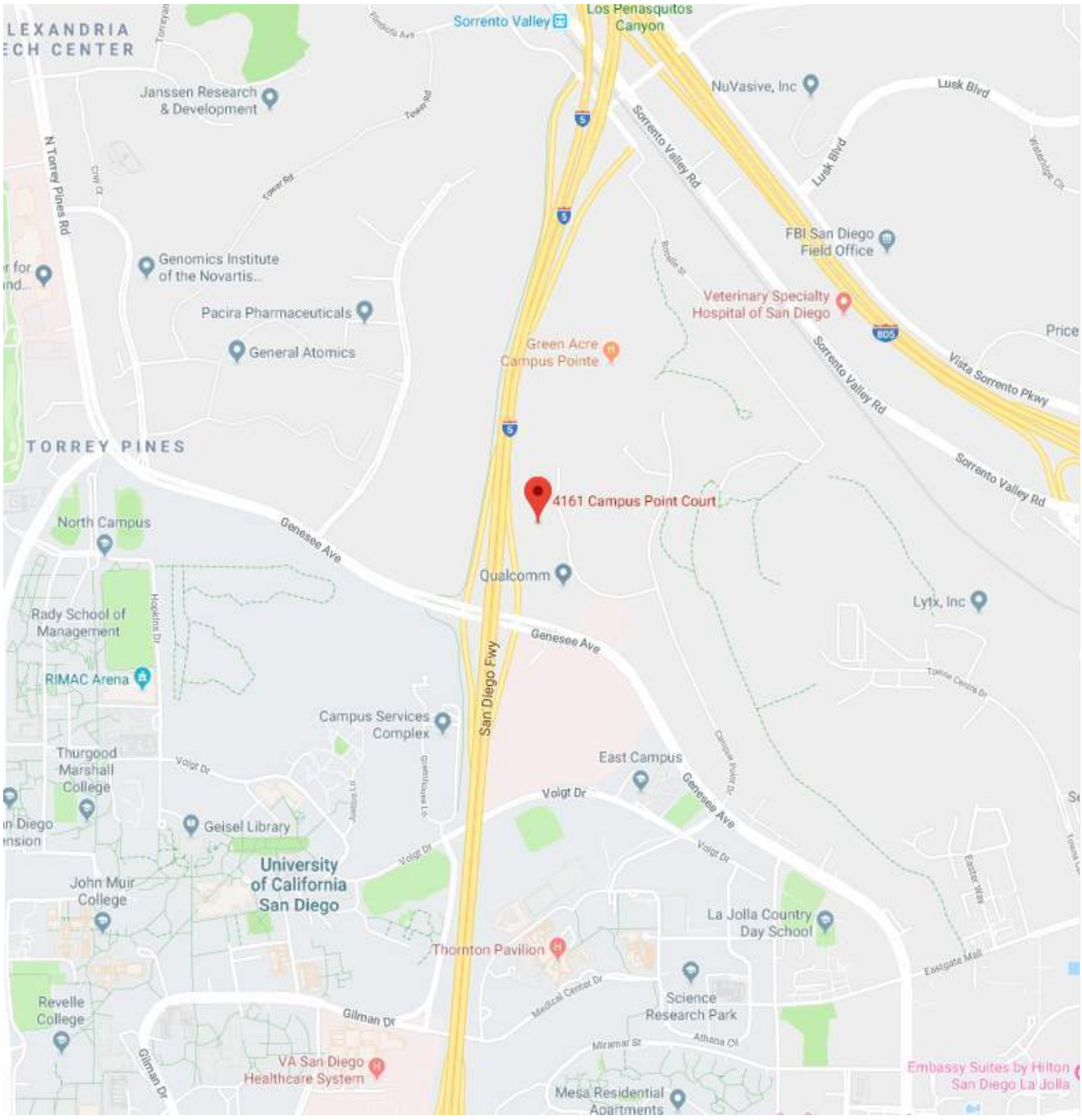

VICINITY MAP

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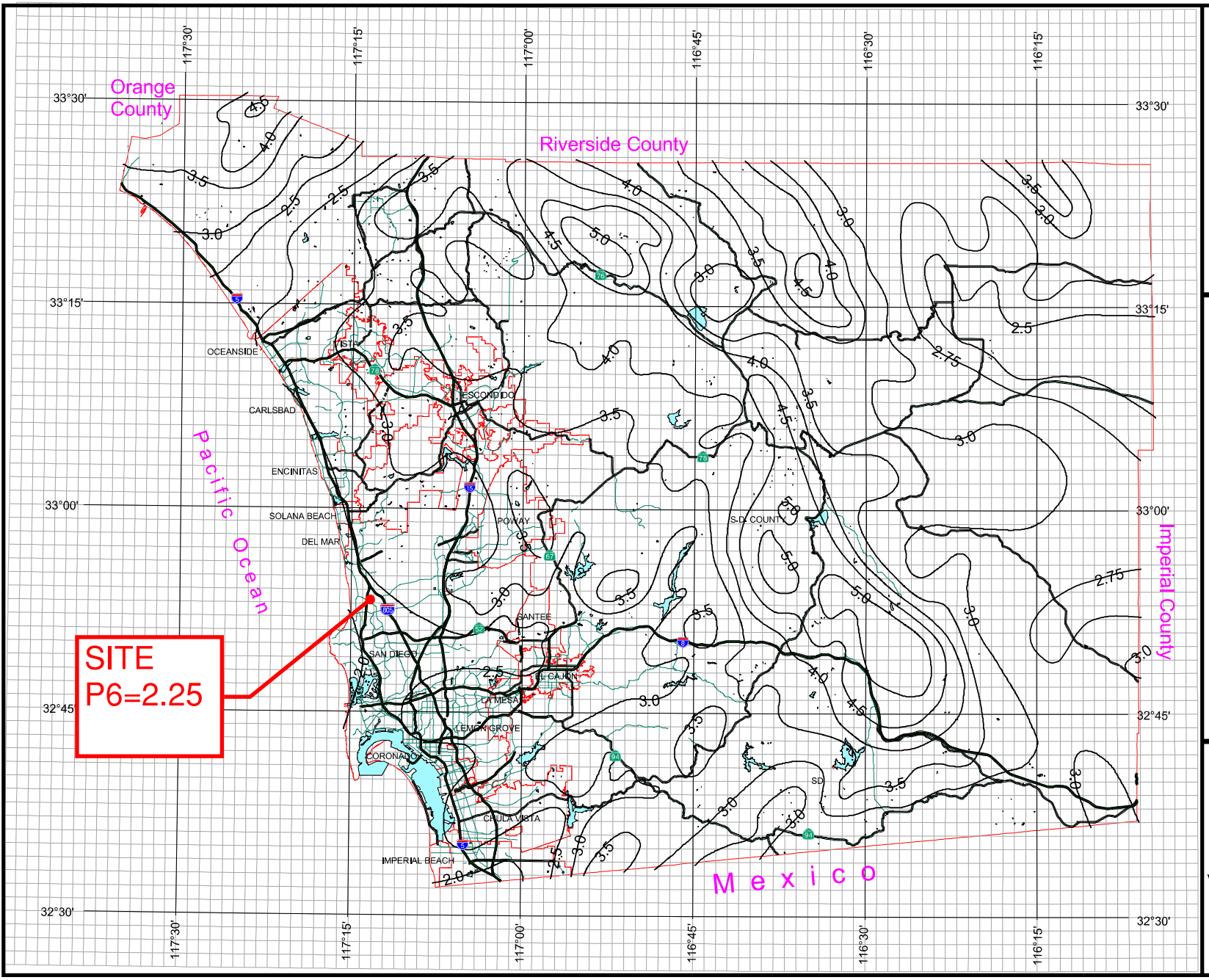

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Systems Program

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

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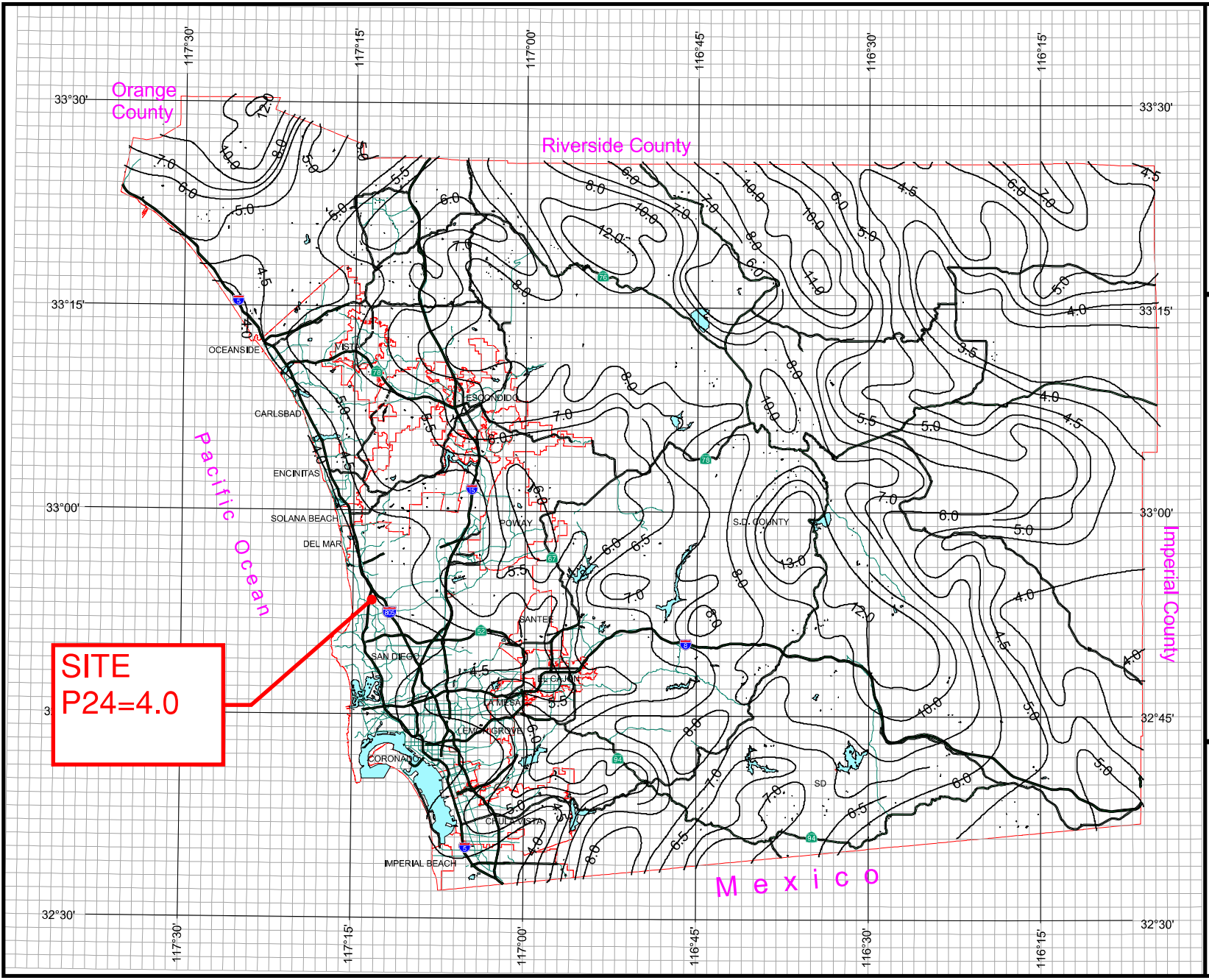
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS — Department of Public Works, Geographic Information Services

SanGIS — We Have San Diego Covered!

N W E S

3 0 3 Miles

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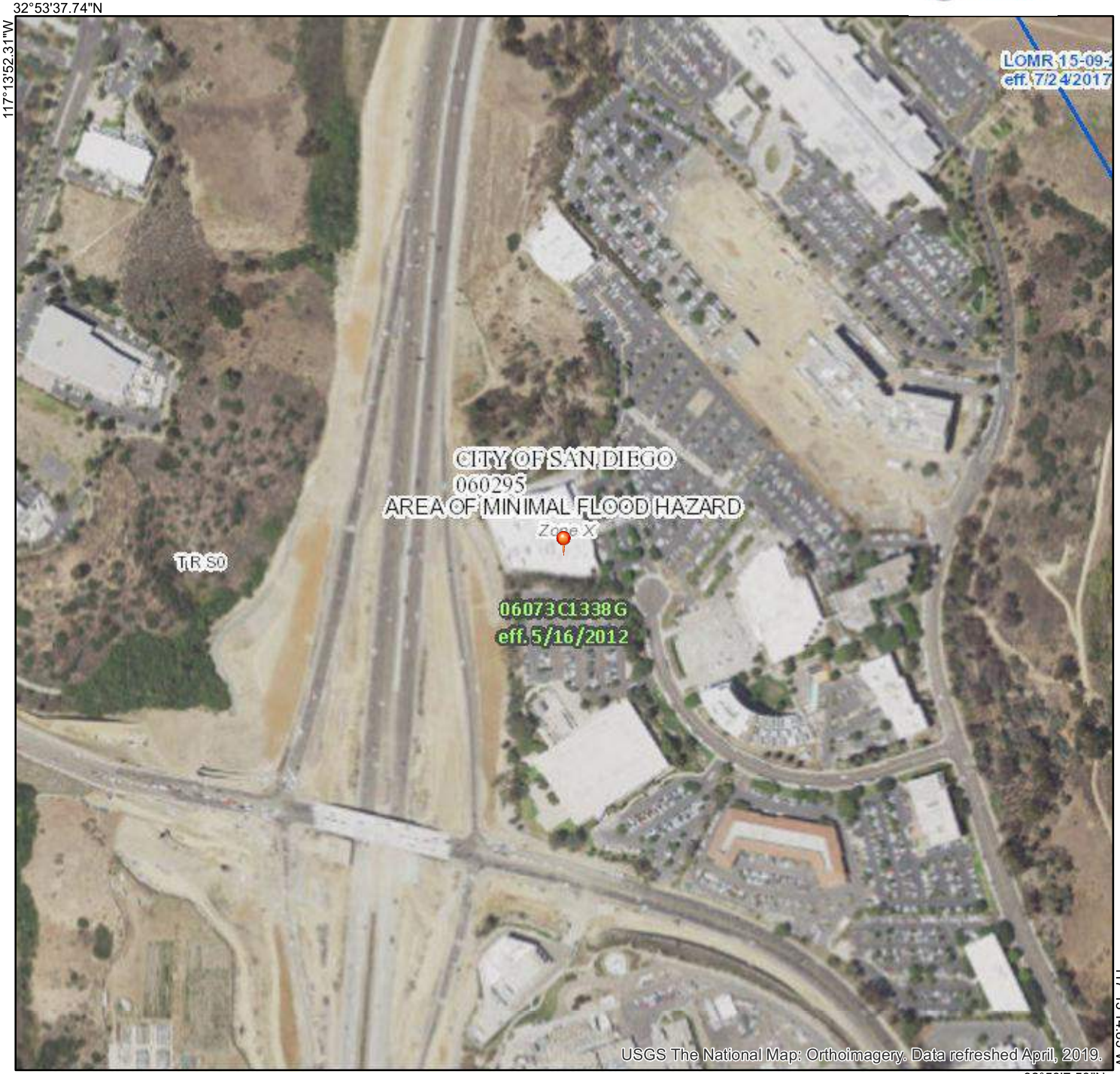
National Flood Hazard Layer FIRMette

FEMA

32°53'37.74"N

117°13'52.31"W



117°13'14.85"W

32°53'7.53"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/18/2019 at 7:08:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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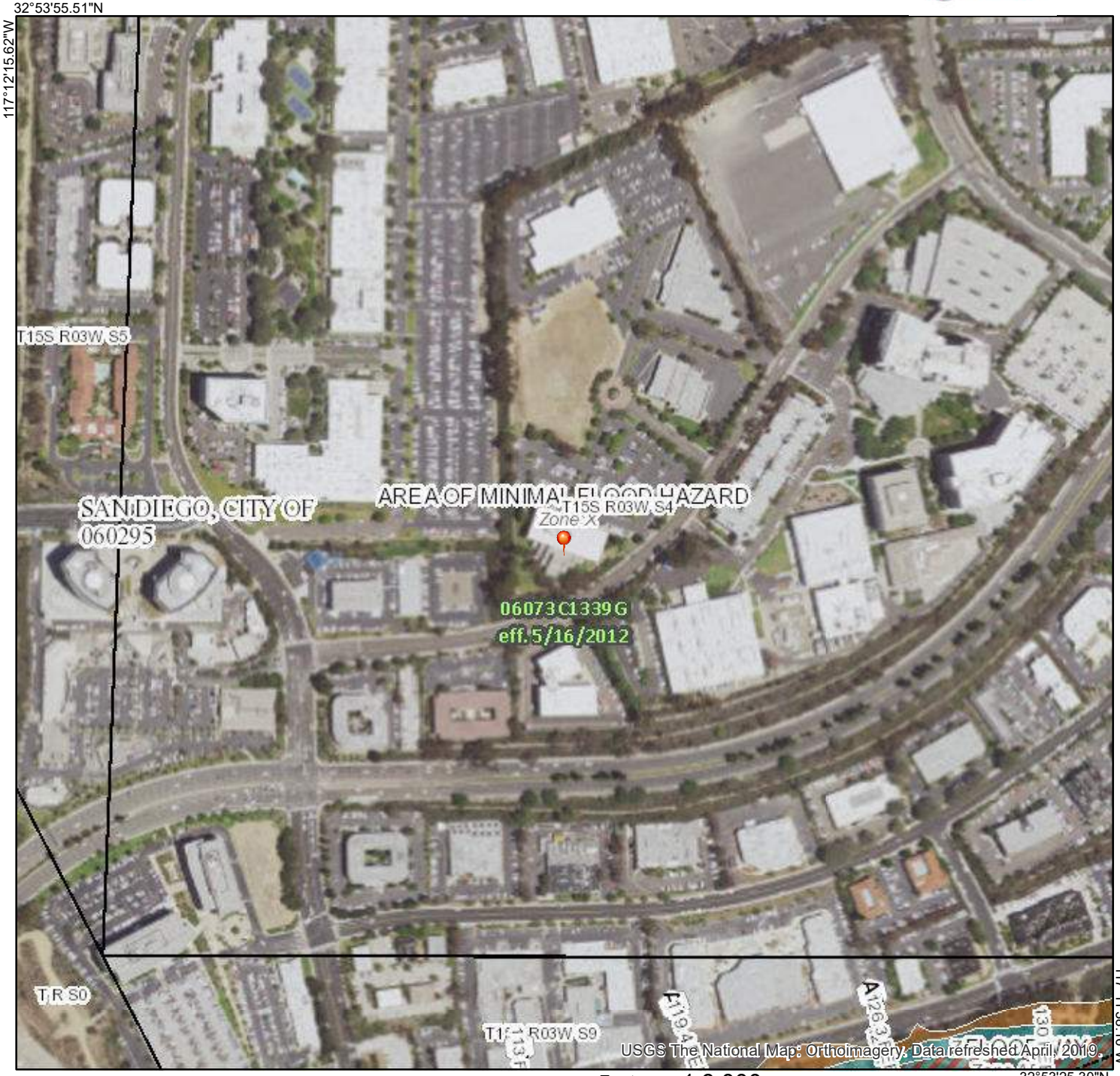
National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
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- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
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- Limit of Study
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- Coastal Transect Baseline
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- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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Map Scale: 1:3,480 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

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

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MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 13, Sep 12, 2018

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

Date(s) aerial images were photographed: May 3, 2010—Jan 4, 2015

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AtF	Altamont clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	C	19.3	66.2%
CfC	Chesterton fine sandy loam, 5 to 9 percent slopes	D	9.9	33.8%
Totals for Area of Interest			**29.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

B.1.1 Runoff Factor

Estimate the area weighted runoff factor for the tributary area to the BMP using runoff factor (from Table B.1-1) and area of each surface type in the tributary area and Equation B.1-2.

Equation B.1-2: Estimating Runoff Factor for Area

$$C = \frac{\sum C_x A_x}{\sum A_x}$$

where:

C_x = Runoff factor for area X

A_x = Tributary area X (acres)

These runoff factors apply to areas receiving direct rainfall only. For conditions in which runoff is routed onto a surface from an adjacent surface, see Section B.2 for determining composite runoff factors for these areas.

Table B.1-1: Runoff factors for surfaces draining to BMPs – Pollutant Control BMPs

Surface	Runoff Factor
Roofs[1]	0.90
Concrete or Asphalt[1]	0.90
Unit Pavers (grouted)[1]	0.90
Decomposed Granite	0.30
Cobbles or Crushed Aggregate	0.30
Amended, Mulched Soils or Landscape[2]	0.10
Compacted Soil (e.g., unpaved parking)	0.30
Natural (A Soil)	0.10
Natural (B Soil)	0.14
Natural (C Soil)	0.23
Natural (D Soil)	0.30

[1]Surface is considered impervious and could benefit from use of Site Design BMPs and adjustment of the runoff factor per Section B.2.1.

[2]Surface shall be designed in accordance with SD-F (Amended soils) fact sheet in Appendix E

Appendix B –Existing Hydrology

On-Site Hydrologic Work Map
Figure A-1 from the City DDM (Jan. 2017)

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10300 CAMPUS POINT DRIVE
APN 343-230-13
PARCEL 1 PM 10898

BASIN-2

1
DISCHARGE POINT 1
A=2.02 AC
Q100= 7.7 CFS

BASIN-1

DISCHARGE POINT 3
A=0.69 AC
Q100=2.6 CFS

10290 CAMPUS POINT DRIVE

APN 343-230-14
PARCEL 2 PM 10898

3

CAMPUS POINT DRIVE

BASIN-3

CP3
10260 CAMPUS POINT DR

APN 343-230-42
PORTION PARCEL 1
PARCEL 3 PM 14065

4110 CAMPUS POINT CT.

BASIN-2

DISCHARGE POINT 2
A=23.26 AC
Q100=89 CFS
2

APN 343-230-43
PARCEL 1 PM 20824
4161 CAMPUS POINT COURT

4224 CAMPUS POINT CT

APN 343-230-41
PARCEL 4 PM 20824

G1
4242 CAMPUS POINT CT

4181 CAMPUS POINT CT

CAMPUS POINT CT.

LEGEND

OVERALL BASIN LIMIT

BASIN ID NUMBER — BASIN-X

FLOW DIRECTION

EXISTING STORM DRAIN

DISCHARGE POINT — 1

SCALE 1"=80'

80 40 0 80 160 240
SCALE: 1"=80'

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CAMPUS POINT NDP
On-Site Hydrologic Work Map Existing

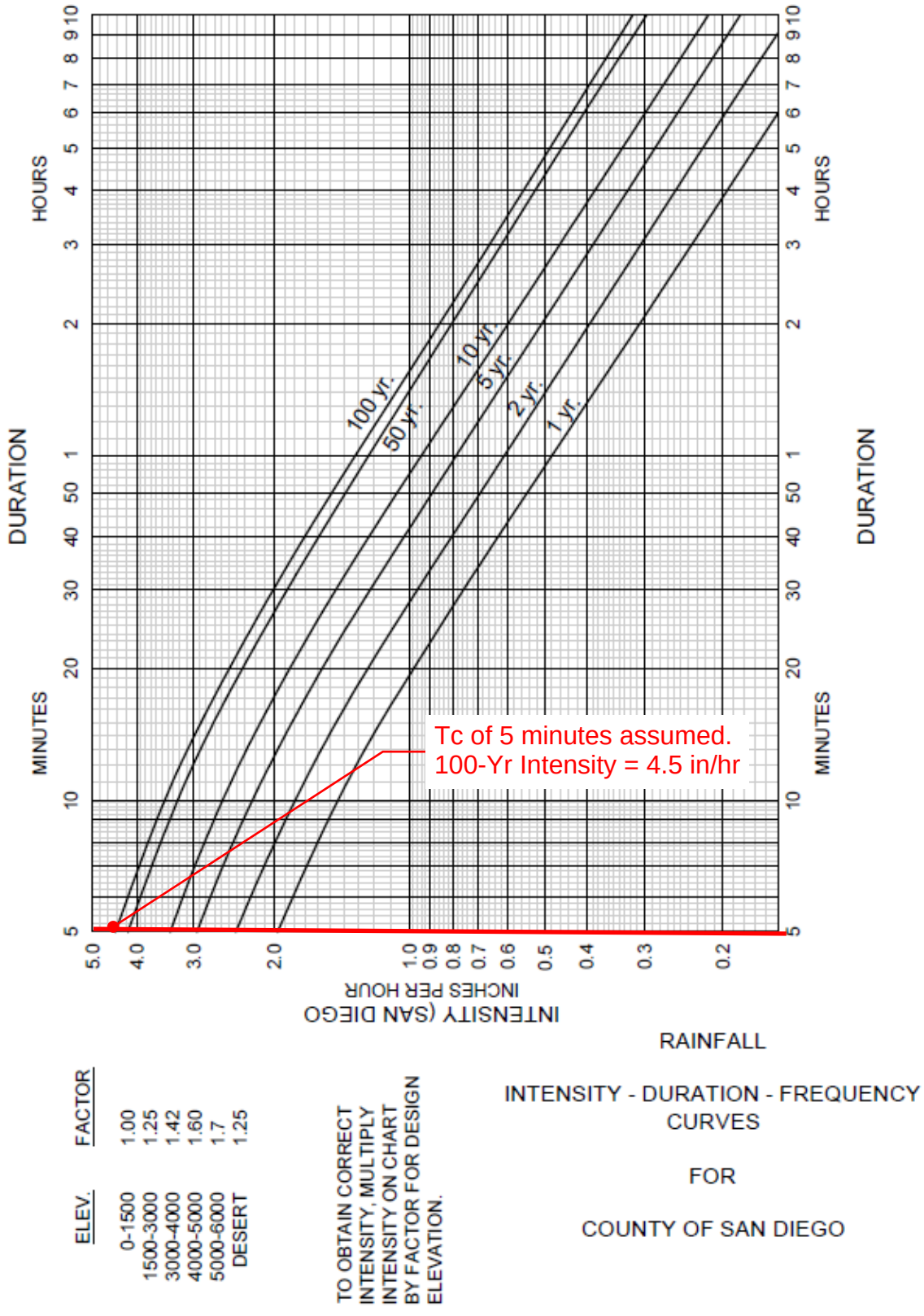

Figure A-1. Intensity-Duration-Frequency Design Chart

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Basin 1 Existing

Impervious Area	74,792	SF	1.72 ac
Pervious Area	13,199	SF	0.30 ac
Total	87,991	SF	2.02 ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

Q_{100} = C*I*A

Q_{100} = 7.7

Basin 2 Existing

Impervious Area	861,224	SF	19.77	ac
Pervious Area	151,981	SF	3.49	ac
Total	1,013,205	SF	23.26	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

$Q_{100} = C*I*A$

$Q_{100} = 89.0$

Basin 3 Existing

Impervious Area	25,548	SF	0.59	ac
Pervious Area	4,508	SF	0.10	ac
Total	30056	SF	0.69	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 2.6$

Appendix C – Proposed Hydrology

On-Site Hydrologic Work Map
Figure A-1 from the City DDM (Jan. 2017)
Hydraulic Routing Input and Output

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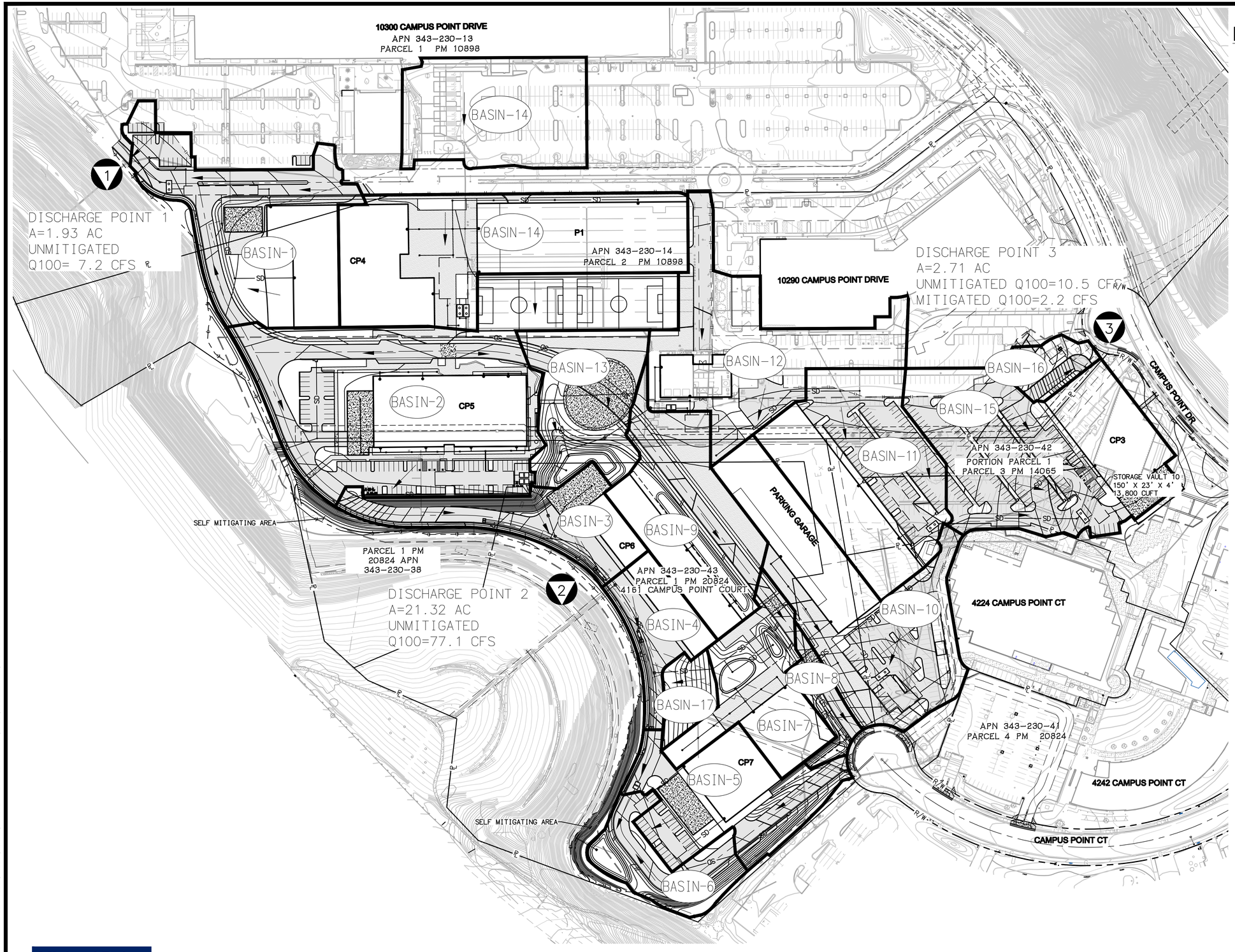

LEGEND

- OVERALL BASIN LIMIT
- BASIN ID NUMBER (BASIN-X)
- FLOW DIRECTION
- EXISTING STORM DRAIN
- DISCHARGE POINT (1)

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CAMPUS POINT NDP
On-Site Hydrologic Work Map Proposed

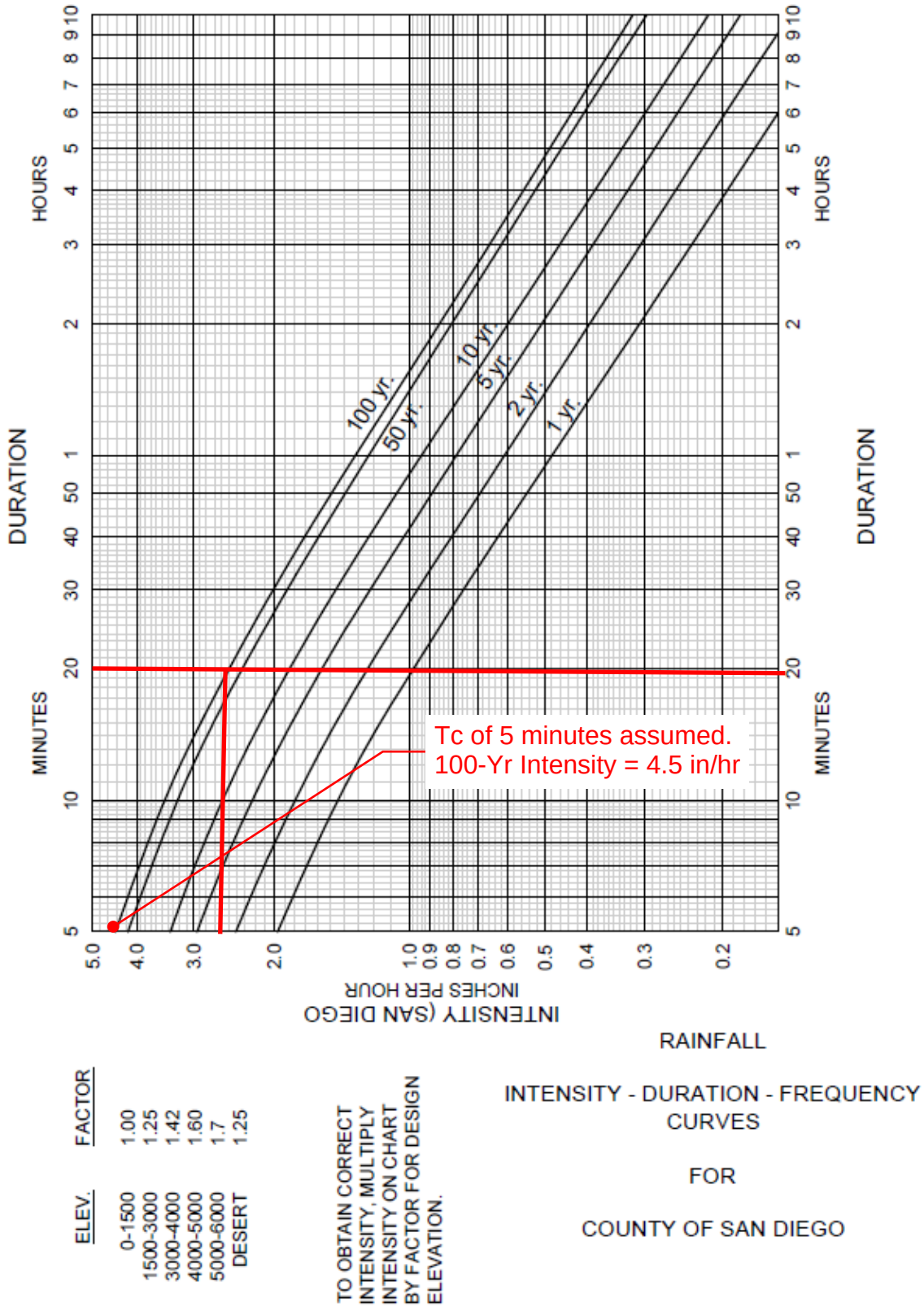

Figure A-1. Intensity-Duration-Frequency Design Chart

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Basin 1 Proposed

Impervious Area	67,383	SF	1.55	ac
Pervious Area	16,846	SF	0.39	ac
Total	84,229	SF	1.93	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.83

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

Q_{100} = 7.2

Basin 2 Proposed				
Impervious Area	103,485	SF	2.38	ac
Pervious Area	68,990	SF	1.58	ac
Total	172,475	SF	3.96	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.71

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 12.7$

Basin 3 Proposed

Impervious Area	33,820	SF	0.78	ac
Pervious Area	8,990	SF	0.21	ac
Total	42,810	SF	0.98	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.82

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 3.6$

Basin 4 Proposed

Impervious Area	24,662	SF	0.57	ac
Pervious Area	763	SF	0.02	ac
Total	25,425	SF	0.58	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.93

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 2.4$

Basin 5 Proposed			
Impervious Area	46,767	SF	1.07 ac
Pervious Area	9,579	SF	0.22 ac
Total	56,346	SF	1.29 ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

Q_{100} = C*I*A

Q_{100} = 4.9

Basin 6 Proposed				
Impervious Area	12,977	SF	0.30	ac
Pervious Area	15,234	SF	0.35	ac
Total	28,211	SF	0.65	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.63

*90% Impervious is considered to be a conservative estimate for the site and may be revised during final Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

Q_{100} = C*I*A

Q_{100} = 1.8

Basin 7 Proposed				
Impervious Area	33,512	SF	0.77	ac
Pervious Area	11,171	SF	0.26	ac
Total	44,683	SF	1.03	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.80

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 3.7$

Basin 8 Proposed				
Impervious Area	6,974	SF	0.16	ac
Pervious Area	4,650	SF	0.11	ac
Total	11,624	SF	0.27	ac

C Value

DMA is entirely natural land cover Type D

C= 0.71

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 0.9$

Basin 9 Proposed			
Impervious Area	48,007	SF	1.10 ac
Pervious Area	16,002	SF	0.37 ac
Total	64,009	SF	1.47 ac

C Value

DMA is entirely natural land cover Type D

C= 0.80

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 5.3$

Basin 10 Proposed				
Impervious Area	83,030	SF	1.91	ac
Pervious Area	9,226	SF	0.21	ac
Total	92,256	SF	2.12	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.89

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 8.5$

Basin 11 Proposed			
Impervious Area	71,916	SF	1.65 ac
Pervious Area	11,707	SF	0.27 ac
Total	83,623	SF	1.92 ac

C Value

DMA is entirely natural land cover Type D

C= 0.87

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 7.5$

Basin 12 Proposed				
Impervious Area	64,480	SF	1.48	ac
Pervious Area	16,120	SF	0.37	ac
Total	80,600	SF	1.85	ac

C Value

DMA is entirely natural land cover Type D

C= 0.83

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

Q_{100} = C*I*A

Q_{100} = 6.9

Basin 13 Proposed				
Impervious Area	24,098	SF	0.55	ac
Pervious Area	23,153	SF	0.53	ac
Total	47,251	SF	1.08	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.66

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

$Q_{100} = C*I*A$

$Q_{100} = 3.2$

Basin 14 Proposed				
Impervious Area	147,970	SF	3.40	ac
Pervious Area	20,178	SF	0.46	ac
Total	168,148	SF	3.86	ac

C Value

DMA is entirely natural land cover Type D

C= 0.88

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 15.3$

Basin 15 Proposed				
Impervious Area	95,250	SF	2.19	ac
Pervious Area	10,583	SF	0.24	ac
Total	105,833	SF	2.43	ac

C Value

DMA is entirely natural land cover Type D

C= 0.89

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 9.7$

Basin 16 Proposed				
Impervious Area	5,276	SF	0.12	ac
Pervious Area	6,994	SF	0.16	ac
Total	12,270	SF	0.28	ac

C Value

Per City of San Diego DDM Section A.1.2

C= 0.61

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 0.8$

Basin 17 Proposed				
Impervious Area	0	SF	0.00	ac
Pervious Area	11,434	SF	0.26	ac
Total	11,434	SF	0.26	ac

C Value

DMA is entirely natural land cover Type D

C= 0.35

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 0.4$

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	9.700	5	245	19,290	------	------	------	Basin 15 - Q100 PR. Un-Mitigated
2	Reservoir	1.366	5	260	19,285	1	4.55	12,228	Discharge Location 3

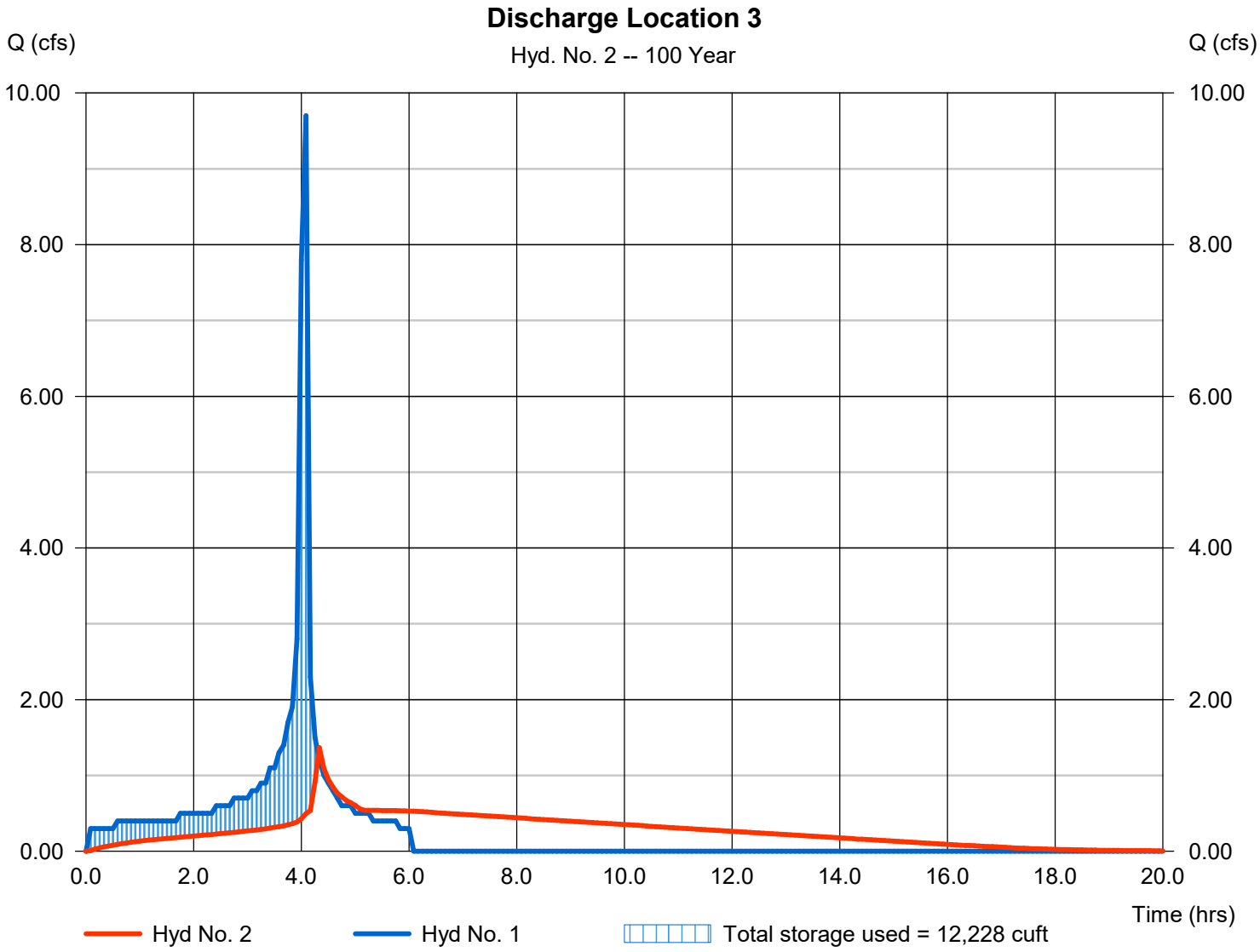
Hydrograph Report

Hyd. No. 2

Discharge Location 3

Hydrograph type	=	Reservoir	Peak discharge	=	1.366 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.33 hrs
Time interval	=	5 min	Hyd. volume	=	19,285 cuft
Inflow hyd. No.	=	1 - Basin 15 - Q100 PR. Un-Mitigated	Max. Elevation	=	4.55 ft
Reservoir name	=	Storage Vaullt 10	Max. Storage	=	12,228 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Storage Vaullt 10

Pond Data

UG Chambers -Invert elev. = 1.00 ft, Rise x Span = 4.00 x 23.00 ft, Barrel Len = 150.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1.00	n/a	0	0
0.40	1.40	n/a	1,380	1,380
0.80	1.80	n/a	1,380	2,761
1.20	2.20	n/a	1,380	4,141
1.60	2.60	n/a	1,380	5,521
2.00	3.00	n/a	1,380	6,901
2.40	3.40	n/a	1,380	8,282
2.80	3.80	n/a	1,380	9,662
3.20	4.20	n/a	1,380	11,042
3.60	4.60	n/a	1,380	12,422
4.00	5.00	n/a	1,380	13,803

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	1.50	0.00	0.00
Span (in)	= 24.00	1.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	0.00	0.00	0.00
Crest El. (ft)	= 4.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

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