Appendix F. Drainage Study and Storm Water Quality Management Plan

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Preliminary Drainage Study

North Coast Highway 101 Improvements
City of Encinitas, California

City Project Code No. 88539

August 2014
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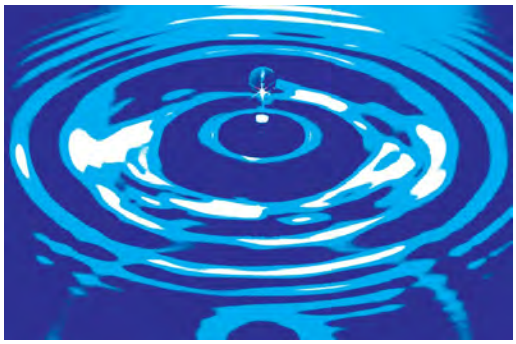

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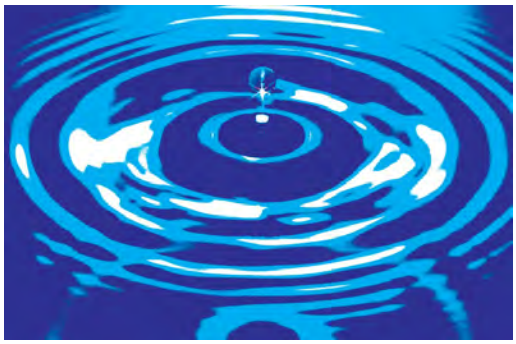

Introduction

This drainage report presents an analysis of the effects the proposed Highway 101 Improvements might have on the *quantity* and *pattern* of storm water runoff in the local watershed. The purpose of this report is to help fulfill requirements of the California Environmental Quality Act (CEQA). Storm water *quality* is addressed in the Storm Water Quality Management Plan (SWQMP) for the project, under separate cover from this document.

This report examines the existing and proposed hydrology of the site and nearby watershed and presents preliminary design of drainage facilities. This report is for planning purposes and does not present final design engineering recommendations for the project.

Section 1. Project Information

This section describes the location, activities, and hydrologic setting (watershed, topography, land use, soils and vegetation, drainage patterns, and impervious cover) of the project site.

1.1 Project Description

1.1.1 Project Location

The project is located in the City of Encinitas, in the County of San Diego. The project proposes improvements on Highway 101 from A Street to La Costa Avenue. Refer to the Vicinity Map **Exhibit A**. Proposed improvements include sidewalk, curb and gutter, angled and parallel parking, tree grates, bioretention areas, and landscaped areas. The construction of the project will occur in phases to be determined at a later time. This report assumes no phasing, instead covering the entire project as a whole.

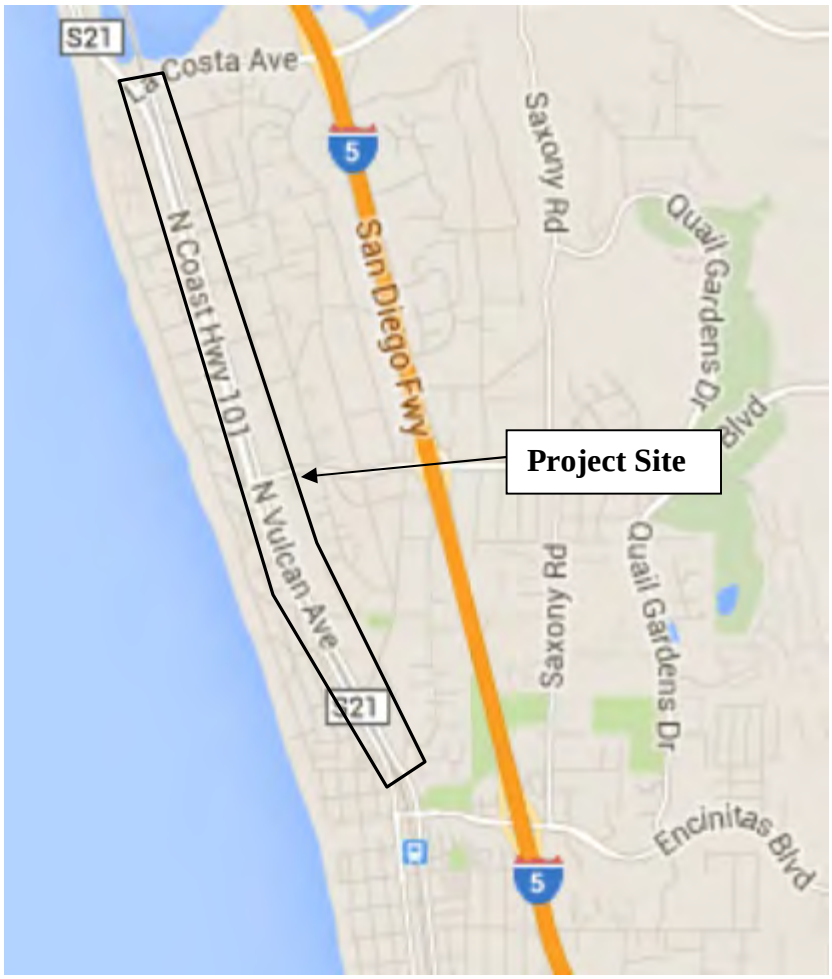

Exhibit A- Vicinity Map (Reference Google Maps)

1.2 Hydrologic Setting

This section summarizes the project's size and location in the context of the larger watershed perspective, topography, soil and vegetation conditions, percent impervious area, natural and infrastructure drainage features, and other relevant hydrologic and environmental factors specific to the project area's watershed.

The project site is located in the 22,120-acre (31.4-square mile) Batiquitos Hydrologic Sub-Area (HSA 904.51), which is part of the Carlsbad Hydrologic Unit (HU 904.00). The 20.5-acre project site accounts for approximately 0.09 percent of the local watershed area. **Table 1-1** summarizes the area occupied by the site inside the watershed. **Exhibit B** is the Watershed Vicinity Map.

Table 1-1 Project Watershed

Area	Area (acres)	% of Total
Batiquitos HSA 904.51	22,120	100%
Subject Property	20.5	0.093%
Existing Impervious Area	14.7	0.066%
Proposed Impervious Area	14.0	0.063%

Exhibit B- Watershed Vicinity Map (Reference California Regional Water Quality Control Board, San Diego Region, HSA 904.51)

1.2.1 Current and Adjacent Land Use

Existing site conditions for Highway 101 include a paved, 4-lane asphalt street. There is existing curb and gutter along the majority of west side of the project roadway. The edge of pavement on the east side of the roadway matches the grade of the undeveloped area to the east Highway 101, within NCTD right-of-way. High points occur between A Street and Marcheta Street, at North Court, north of Basil Street, and south of La Costa Avenue. Areas of very flat roadway occur from Diana Street to north of Grand View Street. The road longitudinal slopes range from 0.0% to 5.0%.

1.2.2 Soil and Vegetation Conditions

The NRCS Web Soil Survey indicates that the majority of soils in this area consist of loamy course sand with Hydrologic Soil Type B.

1.2.3 Existing Drainage Patterns and Facilities

Runoff from the project site either drains to existing storm drain inlets or ponds in the flatter areas of Highway 101. Refer to the drainage areas and nodes on the Existing Hydrology Map in **Appendix A.**

The runoff to nodes 100 through 110 flows to curb or grate inlets, primarily via gutter flow. Runoff to node 102 channelizes in existing pervious area and flows to a grate inlet. The flow from all of these nodes enters an existing storm drain system and travels north to outfall north of La Costa Avenue.

The runoff to node 800 flows to an existing curb inlet south of A Street on the west side of the roadway. The runoff channelizes at the edge of pavement before entering the gutter at A Street, which conveys the flow to the curb inlet. The flow travels south after entering the storm drain system and outfalls south of B Street.

The runoff to node 900 flows to an existing curb inlet south of A Street on the east side of the roadway. The runoff channelizes at the edge of pavement before entering the gutter at A Street, which conveys the flow to the curb inlet. The flow travels east after entering the storm drain system.

The runoff to node 200 flows onto Jasper Street and into grate inlets in the alleys branching off to the north and south. The flow travels to Jasper Street in either the gutter on the west side of Highway 101 or channelizes on the east side before crossing the roadway and flowing onto Jasper Street. After entering the storm drain system the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 300 flows onto W Leucadia Blvd and to a cross-gutter that conveys flow to a grate inlet in Leucadia Roadside Park. The flow travels to W Leucadia Blvd in either the gutter on the west side of Highway 101 or channelizes on the east side before crossing Highway 101 and flowing onto W Leucadia Blvd. After entering the storm drain system, the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 400 flows in a gutter on the west side of Highway 101 onto Europa Street to a grate inlet. The runoff to node 401 flows in a gutter on the west side of Highway 101 onto Daphne Street, and then into a gutter that conveys the flow to the grate inlet on Europa Street. After entering the storm drain system, the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 500 flows in a gutter on the west side of Highway 101 onto Cadmus Street to a cross-gutter that conveys flow to an inlet. After entering the storm drain system the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 600 flows in a gutter on the west side of Highway 101 onto Basil Street and enters a cross-gutter that conveys flow to a curb inlet. The runoff to node 601 flows in a gutter on the west side of Highway 101 onto Athena Street. It then enters a cross-gutter that conveys flow to a curb inlet. After entering the storm drain system, the runoff from both nodes travels to the north and outfalls north of La Costa Avenue.

The runoff to node 700 flows off of Highway 101 and onto El Portal Street. The runoff to node 701 flows off of Highway 101 and onto Marcheta Street. The flow from both nodes travels in a series of gutters to discharge to Cottonwood Creek at Moonlight Beach.

The runoff from nodes 1000 to 1800 sheet flows off the east side of the roadway and channelizes to natural sump areas between Highway 101 and the train tracks. While these sump areas infiltrate the majority of the runoff volume, localized ponding occurs in areas with flat slopes.

1.2.4 FEMA Floodplain Mapping

The Federal Emergency Management Agency (FEMA) has not mapped any Special Flood Hazard Areas (SFHAs) through the project site. The FEMA FIRM Map for the project area is shown in **Exhibit C**.

1.2.5 Existing Leucadia Watershed and Floodplain

The existing 10-year and 100-year watersheds in Leucadia were delineated in the report "Hydrologic and Hydraulic Study for Leucadia Drainage Improvement Alternatives" by Rick Engineering, dated June 14, 2004. The 10-year and 100-year Floodplain and Watershed Maps from the report are included in **Exhibit D**. The exhibits show the 10-year and 100-year floodplains encroaching onto Highway 101 within the project limits.

1.2.6 Downstream Conditions

Analysis of downstream conditions has not been attempted, because there is a decrease in peak runoff as a result of the project. Refer to **Table 3-2**. In addition, proposed water quality bioretention areas will capture runoff, providing additional peak flow reduction. Refer to peak volume and storage calculations in **Appendix C**.

1.2.7 Impervious Cover

The site is approximately 72% impervious in the existing condition. Existing pervious area is shown on the Hydrology Map in **Appendix A**. The project will add approximately

0.7 acres of pervious area to the project site in the form of landscaped planter areas. As a result the site is approximately 68% impervious in the proposed condition.

Section 2. Methodology and Design Criteria

This section summarizes the design criteria and methodology applied during drainage analysis of the project site. The design criteria and methodology follow the County of San Diego Hydrology Manual (June 2003) as appropriate for the project site.

2.1 Rational Method

Rational Method Peak Flow for the area of interest at the southwest corner of the development footprint was calculated using methodology in the County of San Diego Hydrology manual for the rational method. These calculations were performed for both the existing and proposed conditions, so as to quantify increase in peak rate of discharge. Runoff coefficients were based upon type 'B' site soils per the NRCS Web Soil Survey. Runoff intensities for the 100-year storm were based upon a 6-hour precipitation of 2.5 inches. The time of concentration (Tc) to each Node was found using the procedure described in the San Diego County Hydrology Manual:

- Initial time of concentration (T_i) was assumed to be 5 minutes.
- Travel time (T_t) was found for concentrated flows traveling in a concrete gutter per Figure 3-6 of the Hydrology Manual**,** and for flow in natural channels by using Hydraflow Express software.
- The overall time of concentration (Tc) was found by adding together (T_i) and (T_t).
- See time of concentration calculations in **Appendices A and B**.

The intensity was found using Figure 3-2 of the Hydrology Manual. The Flow (Q) at each node was calculated using the Rational Equation Q=CIA, where:

- Q = Flow (cubic feet per second)
- C = runoff coefficient
- I = Intensity (inches per hour)
- A = Drainage Area (acres)

Using results from rational method calculations for peak flow in the proposed condition, 6-hour hydrographs were generated using the County approved software prepared by Rick Engineering Company, which utilizes the methods described in Section 6 of the San Diego County Hydrology Manual. Hydraflow Hydrographs software was used to quantify the peak runoff volume at each node in the existing and proposed condition. Refer to the hydrographs calculations in **Appendices A and B**.

A summary of the peak flow and volume calculations can be found in **Tables 3-1** and **3-2** for the existing and proposed conditions, respectively.

Section 3. Hydrologic Effects of Project

This section characterizes the quantities and location of storm water runoff from the project site. Discussion of the water quality aspects of the project can be found in the Storm Water Quality Management Plan (SWQMP), which is under separate cover from this report.

3.1 Drainage Patterns

Drainage patterns on Highway 101 will not drastically change as a result of the proposed improvements. The proposed improvements direct flow into curb and gutter and reduces ponding in the street, adjacent to the railroad tracks, and at private driveways. While drainage areas change to some extent due to the improvements, the ultimate downstream discharge points remain the same. Refer to the drainage areas and nodes on the Proposed Hydrology Map in **Appendix A.**

The runoff to nodes 100 through 110 will flow in gutters to bioretention areas before entering existing storm drain systems. The flow will travel north and outfall north of La Costa Avenue. The proposed curb, gutter, and bioretention areas will convey the runoff previously flowing to the existing node 1800 into an existing storm drain system, thereby combining the runoff flows from existing nodes 106 and 1800 into the proposed node 106. Furthermore, the proposed grading will reduce the drainage area of the existing node 1800, adding the surplus area to node 1400. The proposed roadway grading will also cause the drainage areas of nodes 109 and 110 to be reduced from the existing condition. The surplus drainage area from node 109 will be added to the area of existing node 1200. The surplus area from node 110 will form the drainage area for the proposed nodes 200 and 1200. The added flow to nodes 200 and 1200 will be mitigated by storage volume in proposed bioretention areas, and also by proposed permeable gravel parking area within the NCTD property of node 200.

The runoff to node 800 flows in gutters to a proposed bioretention area before entering proposed storm drain piping. This proposed piping will connect to an existing storm drain system and is conveyed to the south.

The runoff to node 900 flows in gutters to a series of proposed bioretention areas before entering proposed storm drain piping. This proposed piping will connect to an existing storm drain system and is conveyed to the north.

The runoff to node 200 flows in gutters to proposed bioretention areas. The runoff then enters proposed storm drain piping and is discharged onto Jasper Street. It then flows to grate inlets in the alleys branching off of Jasper Street. After entering the storm drain system the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 300 flows in gutters to proposed bioretention areas. It then enters proposed storm drain piping and is discharged onto W Leucadia Blvd. The runoff flows to a cross-gutter that conveys flow to a grate inlet in Leucadia Roadside Park. After

entering the storm drain system the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 400 flows in gutters to proposed bioretention areas, and is discharged onto Europa Street before entering an existing grate inlet. The runoff to node 401 flows in gutters to proposed bioretention areas, and then is discharged onto Daphne Street. The flow from node 401 travels to a gutter that conveys the flow to the grate inlet on Europa Street. After entering the storm drain system, the flow from both nodes travels to the north and outfalls north of La Costa Avenue.

The runoff to node 500 flows in gutters to proposed bioretention areas, and then is discharged onto Cadmus Street. The runoff flows to a cross-gutter that conveys flow to a curb inlet. After entering the storm drain system, the flow travels to the north and outfalls north of La Costa Avenue.

The runoff to node 600 flows in gutters to proposed bioretention areas, and then is discharged onto Basil Street. The runoff flows to a cross-gutter that conveys flow to a curb inlet. The runoff to node 601 flows in gutters onto Athena Street and enters a cross-gutter that conveys flow to a curb inlet. After entering the storm drain system, the flow from both nodes travels to the north and outfalls north of La Costa Avenue.

The runoff to node 602 flows onto North Court, and then travels in a series of gutters to discharge at Moonlight Beach.

The runoff to node 700 flows in gutters to proposed bioretention areas, and then is discharged onto El Portal Street off of Highway 101 and onto El Portal Street. The runoff to node 701 flows off of Highway 101 and onto Marcheta Street. The flow from both nodes travels in a series of gutters to discharge to Cottonwood Creek at Moonlight Beach.

The runoff from nodes 1000 to 1700 will flow in gutters to curb openings that discharge into the pervious areas east of the roadway. The drainage area to the existing node 1700 was added to the area for node 101 in the proposed condition.

3.2 Impervious Cover

The site is approximately 72% impervious in the existing condition. The project will add approximately 0.7 acres of pervious area to the project site in the form of landscaped planter areas, including bioretention areas. As a result the site is approximately 68% impervious in the proposed condition.

3.3 Peak Runoff

The project will not increase the peak discharge from the watershed. The project increases pervious area within the project site, reducing the runoff coefficient. Proposed curb and gutter will reduce localized ponding in the street, essentially combining drainage areas that have a longer time of concentration.

Tables 3-1 and **3-2** summarize the hydrologic effects in terms of calculated peak runoff from the watershed under both the existing and proposed conditions, respectively. Nodes

at points of drainage discharge from the project pre- and post-development are labeled on the hydrology maps in **Appendices A** and **B**.

The highlighted cells in **Table 3-2** are areas where peak flows are increasing in the proposed condition. It should be noted that the peak flows shown are "unmitigated." The presence of bioretention areas in the proposed condition will provide storm water storage that will decrease these peak flows. A detailed hydraulic analysis of the effects of bioretention on peak flows will be done during final design. The storage volume provided by the bioretention will serve to keep the peak runoff volume within the street right-of-way, and will not adversely impact adjacent private properties.

Table 3-1 - Runoff Summary for Pre-Improvement Peak Flows

Node	Q_{10} (cfs)	Q_{100} (cfs)
100	20.7	28.7
200	2.6	3.6
300	7.5	10.4
400	2.6	3.6
500	0.6	0.8
600	1.9	2.6
700	5.9	8.2
800	4.9	6.9
900	3.9	5.5
1000	4.5	6.2
1100	2.1	3.0
1200	1.3	1.7
1300	1.4	2.0
1400	1.4	2.0
1500	1.1	1.6
1600	2.2	3.1
1700	0.3	0.4
1800	4.1	5.7
Total:	**69.1**	**96.0**

Table 3-2 – Runoff Summary for Post-Improvement Peak Flows (unmitigated)

Node	Q_{10} (cfs)	Q_{100} (cfs)
100	16.5	22.9
200	3.9	5.4
300	5.0	6.9
400	2.9	4.0
500	0.8	1.1
600	2.7	3.8
700	6.1	8.5
800	3.4	4.7
900	3.1	4.3
1000	5.5	7.6
1100	2.3	3.2
1200	2.5	3.4
1300	1.6	2.2
1400	1.7	2.4
1500	1.7	2.4
1600	1.7	2.3
Total:	**61.3**	**85.1**

3.4 Peak Runoff Attenuation (Stormwater Storage)

The San Diego Water Board MS4 Permit requires priority development projects to install pollutant control and hydromodification management BMPs. Refer to the project Storm Water Quality Management Plan (SWQMP) under a different cover. The flow-control aspect of the BMPs serves to attenuate peak flow in the proposed condition.

In the post-development condition, BMPs are proposed in the form of bioretention areas. The proposed bioretention areas will be located throughout the project area, intercepting runoff from the improved roadway (via curb cuts) and sidewalk, prior to discharging to underground stormdrain and downstream receiving waters. Each bioretention area consists of 10" surface ponding, 18" biofiltration soil, variable depth gravel layer (12" minimum), perforated underdrain pipe, and overflow atrium drain. Runoff filters through the soil & gravel layers. Low flows will infiltrate in the underlying subgrade. The underdrain will help convey stored water that is not able to infiltrate.

The bioretention areas have been sized to comply with the MS4 hydromodification management requirements. In addition, the storage attenuates the peak runoff volume and prevents flooding within the roadway. The BMP storage volumes compared to the 10-year peak runoff volume in the proposed condition are shown in **Table 3-3**. For the majority of the drainage areas, the 10-year peak runoff volume is stored within the BMP. However, there are several areas where a portion of the peak volume will bypass the BMP and directly enter the storm drain. Bioretention areas are shown on the Hydrology Maps in **Appendix B**.

Table 3-3 – 10-Year Peak Storage Volume

Node	V_{10} (cf) (10-year peak runoff volume)	V_{BMP} (cf) (volume retained)	Volume Bypassing BMP (cf)
100	44,100	38,980	4,120
200	12,650	9,990	-
300	14,130	23,390	-
400	5,670	3,275	2,395
500	880	765	115
600	5,000	5,050	-
700	14,190	17,160	-
800	7,860	7,850	10
900	6,860	7,800	-
1000	15,300	20,915	-
1100	4,810	1,885	2,925
1200	9,110	14,950	-
1300	4,700	11,110	-
1400	5,800	24,740	-
1500	4,100	7,430	-
1600	4,100	21,890	-
Total:	**159,260**	**217,180**	

3.5 Project Impacts to Existing Drainage Facilities

The proposed bioretention BMPs provide stormwater storage, which greatly reduces the peak runoff entering the downstream drainage facilities. Therefore, the project will improve the functionality of the existing drainage facilities.

Section 4. Summary and Conclusions

This section provides a summary discussion of the potential effects of the proposed project on local water resources in terms of quantity and location.

- The project will not increase peak discharges or other points downstream. It accomplishes this by means of on-site bioretention basins and increase in pervious surfaces.
- The project will decrease flooding on private properties along the project area by adding curb & gutter and storm drain inlets to capture street runoff.
- Ponding will decrease in existing sump areas within the project site due to addition of bioretention areas, serving as water-quality and flow-control facilities.

These calculations show that the peak runoff increases in certain drainage areas in the post-improvement condition, but overall there is a decrease in peak runoff as a result of the improvements. In addition, the proposed bioretention areas will retain the 10-year peak runoff volume onsite in most areas. The storage of the bioretention areas mitigates any increases in peak runoff due to the project improvements.

The pre and post-improvement drainage areas have been identified and can be found, along with rational method hydrology calculations, in **Appendices A and B**.

Section 5. CEQA Summary

This section summarizes the results of the hydrology, hydraulics and drainage analysis in the context of CEQA significance guidelines.

5.1 Drainage

5.1.1 Erosion and/or Sedimentation

Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?

No. The project will not substantially alter existing drainage patterns of the site area in a manner that would result in substantial erosion or siltation. The project does not alter the course of a stream or river.

- The project proposes to preserve the alignment and profile of existing drainage patterns throughout the project site.

- Bioretention areas will help mitigate the potential increase in peak runoff, such that no significant erosion and/or siltation are expected.

5.1.2 Flooding

Does the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?

The project will not substantially alter existing drainage patterns of the site area in a manner that would result in flooding on- of off-site. The project does not alter the course of a stream or river.

- The drainage study demonstrates that the project will not increase the peak discharge from the on-site contributing watershed.
- Proposed bioretention areas will help capture and store stormwater volumes that currently pond at sump areas along Highway 101.
- In large storm events, where peak runoff volume exceeds the bioretention storage, runoff will enter proposed overflow storm drain piping and be conveyed offsite. Due to the bioretention storage and the addition of curb & gutter, the 10-year peak storm will be 100% retained within the street right-of-way.
- With the addition of bioretention storage and overflow piping, flooding on private property will be reduced as a result of the project. The bioretention areas ensure that there will be no additional stormwater impacts resulting from the street improvements.

5.1.3 Drainage System Capacity

Does the project create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems?

This study does not analyze existing storm drain system capacity. However, the project will not increase peak runoff to the existing facilities due to the proposed bioretention areas. Although, the project will decrease localized ponding, and divert it to the existing storm drain system, the increase in concentrated runoff will be mitigated by the stormwater storage volume created by the bioretention. Effectively, the runoff will be stored in the bioretention volume instead of ponding at the roadway surface.

5.2 Flood Hazards

5.2.1 Residential Flood Hazard

Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps?

No. The project does not propose to locate any housing within the 100-year flood hazard area.

5.2.2 Flood Flow

Does the project place within a 100-year flood hazard area structures that would impede or redirect flood flows?

No. The project does not propose to locate any structures or grading in the floodplain that would impede or redirect flood flows.

5.2.3 Flood Hazard

Does the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

No. The project does not place any people or structures at significant risk of loss, injury, or death due to flooding.

5.2.4 Other Hazards

Is the project at significant risk of inundation by seiche, tsunami, or mudflow?

No. The project is not located within an area at risk of inundation by seiche (lake slosh) tsunami, or mud flow.

5.3 Waiver and Release Agreements

The project does not alter downstream flow characteristics significantly, either due to increase in flow or flood condition, diversion of flow, or flow concentration. Therefore, it should not be necessary to obtain waiver and release agreements from any affected property owners.

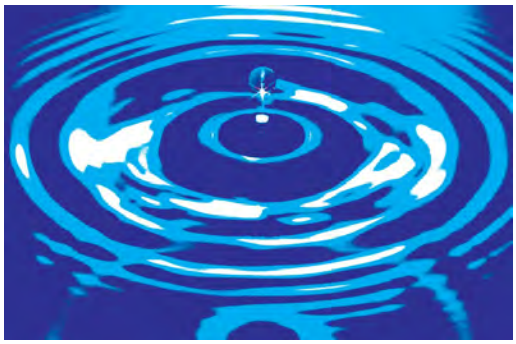

Exhibit “C”

FEMA Flood Map

Michael Baker INTERNATIONAL

MBI JN 137350 (November 2016)

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ance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

0 500 1,000 1,500 2,000 FEET

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

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ance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

0 500 1,000 1,500 2,000 FEET

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

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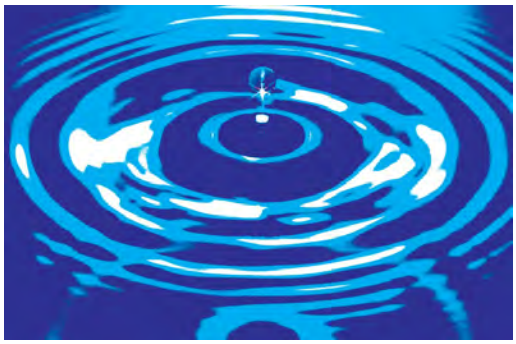

Exhibit "D"

Existing Leucadia 10-Year and 100-Year Floodplain and Watershed Maps

(Rick Engineering 2004)

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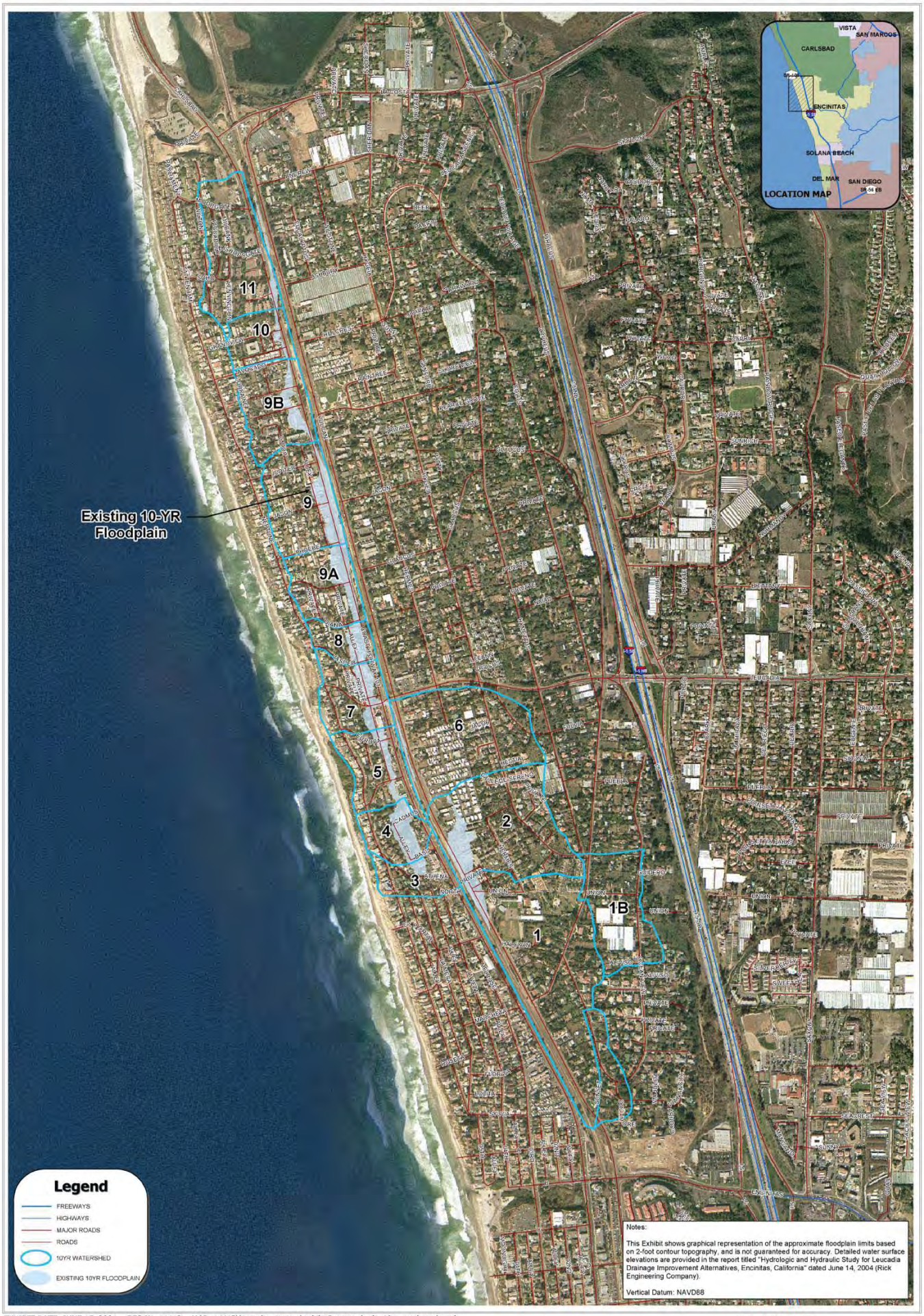


EXHIBIT DATE: JUNE 15, 2004 REC JN: 14413 U:\D_14413\leucadia_coast...\exhibit5_watersheds_10yr_unaltered.mxd

Exhibit 5: EXISTING 10-YEAR FLOODPLAIN AND WATERSHED MAP FOR LEUCADIA

THIS PROJECT LOCATED WITHIN THE CITY OF ENCINITAS

NO SCALE

RICK ENGINEERING COMPANY

5620 Friars Road
San Diego
California 92110-2990
(619) 291-0707

PREPARED BY GIS SERVICES DIVISION

EXHIBIT DATE: JUNE 15, 2004 REC JN: 14413 U:\D_14413\leucadia_coast...\exhibit6_watersheds_100yr_unaltered.mxd

Exhibit 6: EXISTING 100-YEAR FLOODPLAIN AND WATERSHED MAP FOR LEUCADIA

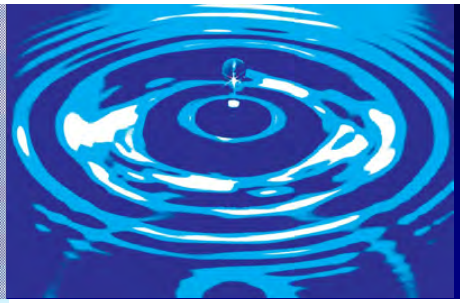
THIS PROJECT LOCATED WITHIN THE CITY OF ENCINITAS

NO SCALE

RICK ENGINEERING COMPANY

5620 Friars Road
San Diego
California 92110-2596
(619) 291-0707

PREPARED BY GIS SERVICES DIVISION



APPENDIX A

Existing Conditions Hydrology

This Section Contains:

- Work Map
- Rational Method T_c Calculations

EXISTING HYDROLOGY SUMMARY

SAN DIEGO COUNTY HYDROLOGY MANUAL

C = 0.9(%IMPERVIOUS) + 0.25(1-%IMP)

$T_C = T_I + T_T$

T_I = 5 MIN (ASSUMED)

T_T = GUTTER FLOW (SEE CALCS)

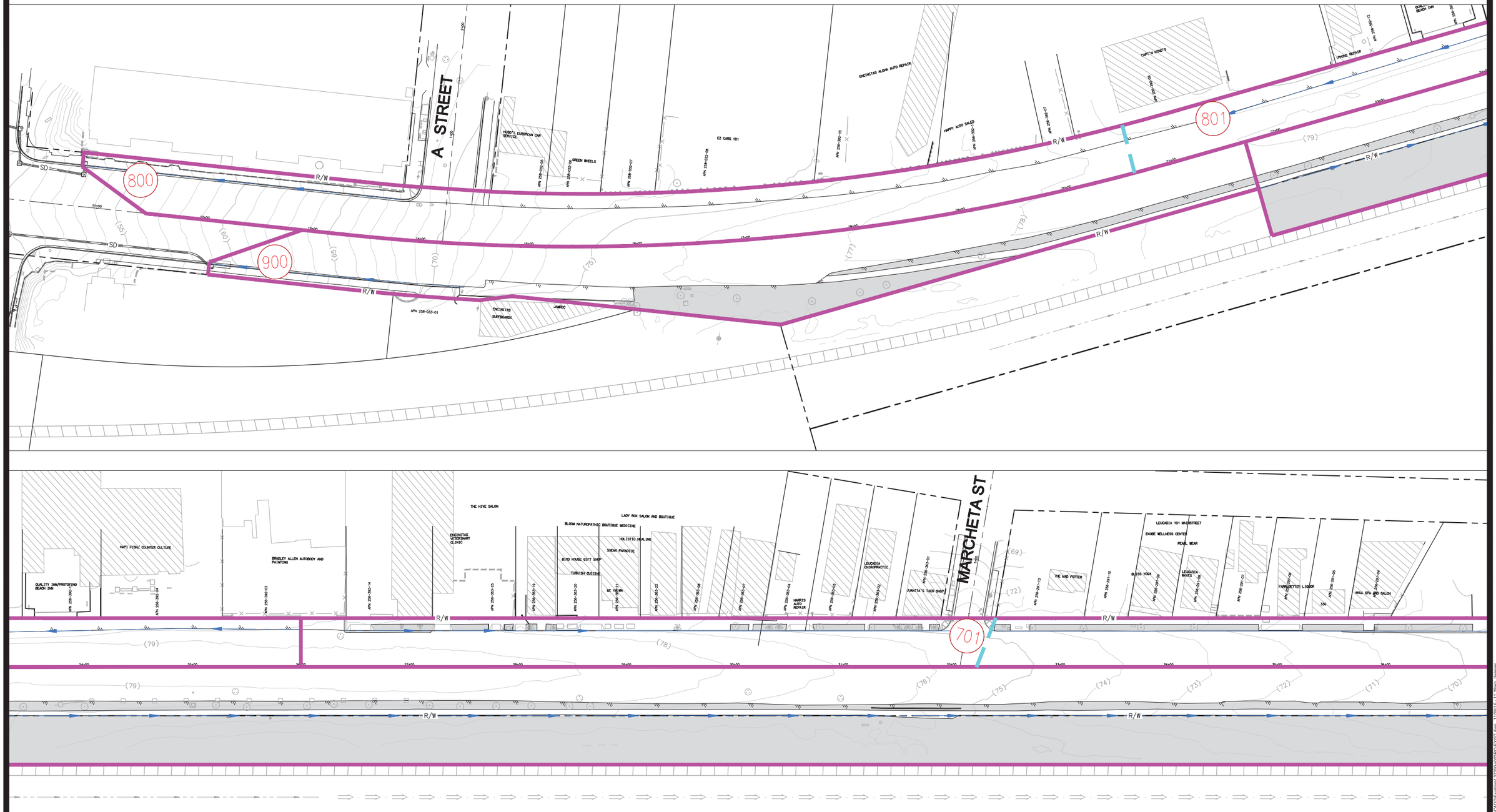
10-YEAR P_6 = 1.8 INCHES
100-YEAR P_6 = 2.5 INCHES

I = (7.44 * P_6 * Tc^-.645)

Q = CIA

EXISTING DRAINAGE AREAS

NODE	AREA (SF)	AREA (AC)	PERVIOUS (SF)	% PERVIOUS	C	Tc (min)	Q_{10} (cfs)	Q_{100} (cfs)
100	56,875	1.306	19,096	34%	0.68	6.7	3.5	4.9
101	14,700	0.337	3,654	25%	0.74	7.7	0.9	1.2
102	73,924	1.697	38,187	52%	0.56	12.9	2.5	3.4
103	26,501	0.608	1,072	4%	0.87	19.8	1.0	1.4
104	20,814	0.478	250	1%	0.89	15.8	1.0	1.3
105	13,880	0.319	1,550	11%	0.83	10.8	0.8	1.1
106	40,961	0.940	4,603	11%	0.83	14.1	1.9	2.6
107	80,037	1.837	14,554	18%	0.78	17.2	3.1	4.3
108	18,254	0.419	4,703	26%	0.73	10.5	0.9	1.3
109	73,471	1.687	36,365	49%	0.58	11.5	2.7	3.8
110	64,981	1.492	30,269	47%	0.60	11.3	2.5	3.5
TOTAL	484,398	11.120	154,303	32%	0.69	12.1	20.7	28.7
200	63,626	1.461	26,363	41%	0.63	11.2	2.6	3.6
300	187,206	4.298	96,531	52%	0.56	9.7	7.5	10.4
400	20,371	0.468	2,330	11%	0.83	8.6	1.3	1.8
401	18,701	0.429	1,561	8%	0.85	8.0	1.3	1.8
TOTAL	39,072	0.897	3,891	10%	0.84	8.3	2.6	3.6
500	10,274	0.236	1,105	11%	0.83	11.0	0.6	0.8
600	22,068	0.507	832	4%	0.88	7.7	1.6	2.2
601	5,650	0.130	660	12%	0.82	10.5	0.3	0.4
TOTAL	27,718	0.636	1,492	5%	0.87	8.1	1.9	2.6
700	72,631	1.667	6,052	8%	0.85	10.5	4.1	5.8
701	28,400	0.652	1,476	5%	0.87	9.6	1.8	2.4
TOTAL	101,031	2.319	7,528	7%	0.85	10.2	5.9	8.2
800	45,705	1.049	0	0%	0.90	6.0	4.0	5.5
801	24,020	0.551	0	0%	0.90	20.3	1.0	1.3
TOTAL	69,725	1.601	0	0%	0.90	8.3	4.9	6.9
900	51,890	1.191	10,517	20%	0.77	5.8	3.9	5.5
1000	239,778	5.505	140,000	58%	0.52	28.0	4.5	6.2
1100	62,001	1.423	35,809	58%	0.52	10.9	2.1	3.0
1200	54,537	1.252	43,634	80%	0.38	12.4	1.3	1.7
1300	63,000	1.446	41,067	65%	0.48	18.0	1.4	2.0
1400	67,638	1.553	51,851	77%	0.40	15.7	1.4	2.0
1500	42,236	0.970	32,011	76%	0.41	10.9	1.1	1.6
1600	66,928	1.536	42,210	63%	0.49	10.5	2.2	3.1
1700	12,197	0.280	12,197	100%	0.25	7.4	0.3	0.4
1800	82,487	1.894	16,052	19%	0.77	11.2	4.1	5.7



LEGEND

- PERVIOUS AREA
- STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
EXISTING HYDROLOGY MAP
SHEET 1 OF 5

Michael Baker INTERNATIONAL
5050 Avenida Encinas
Suite 260
Carlsbad, CA 92008
Phone: (760) 476-9193
MBAKERINTL.COM

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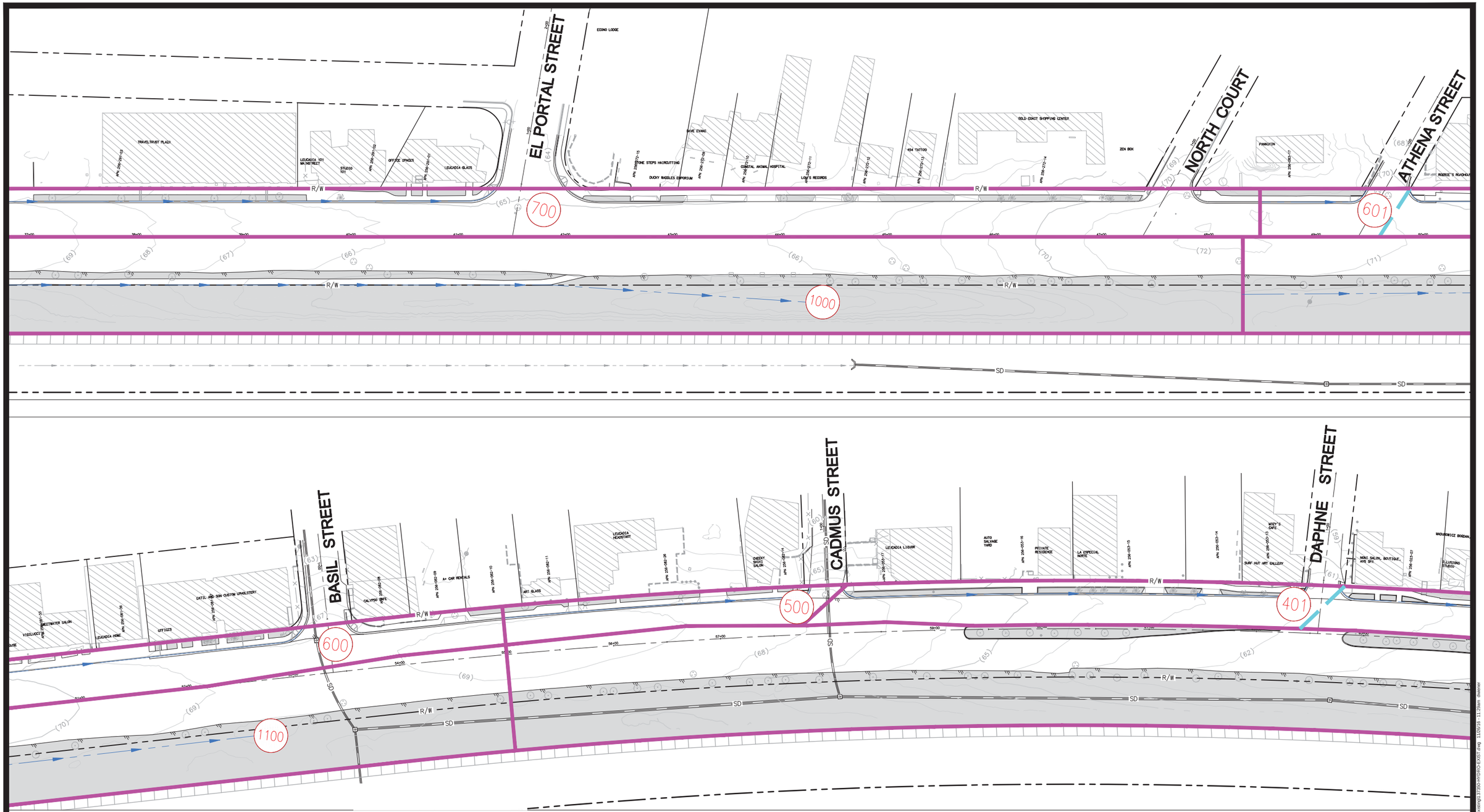

LEGEND

PERVIOUS AREA

STORM DRAIN — SD

DRAINAGE AREA

DRAINAGE SUBAREA

FLOWLINE

DRAINAGE NODE (X)

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
EXISTING HYDROLOGY MAP
SHEET 2 OF 5

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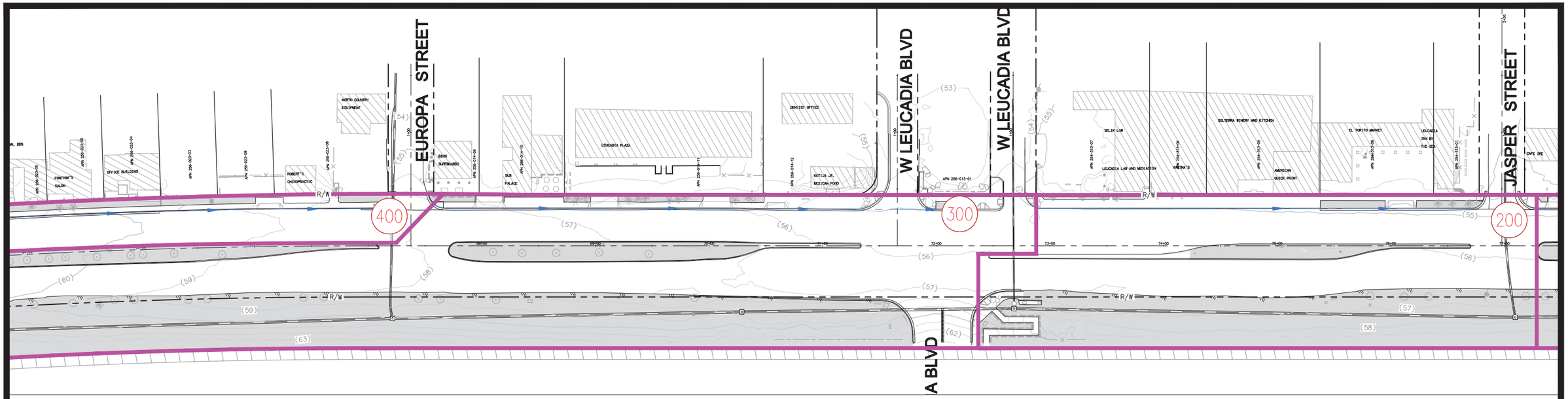

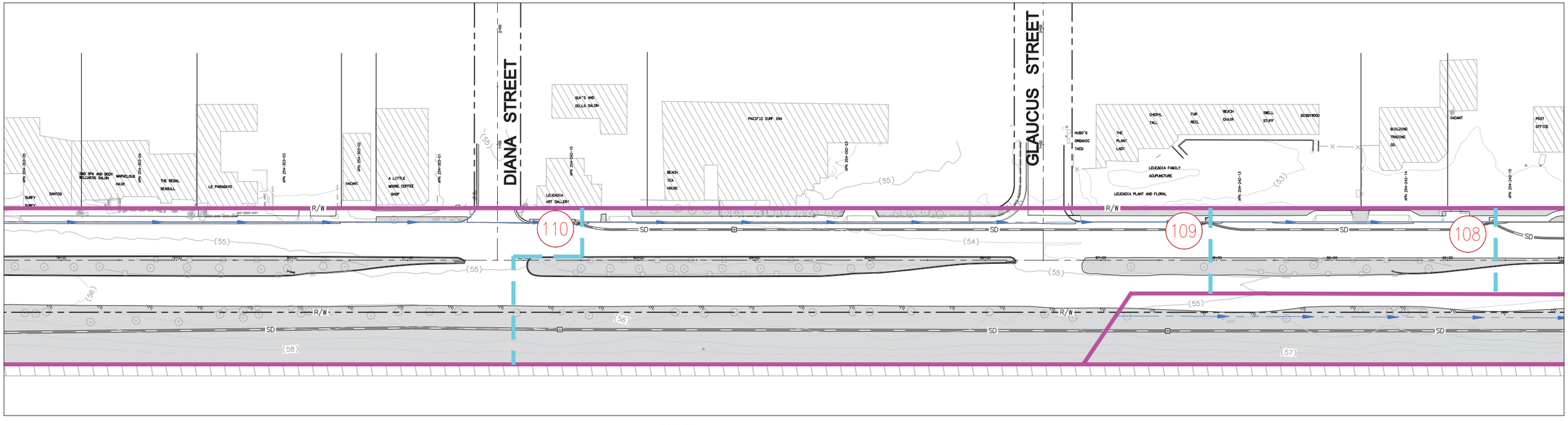

LEGEND

- PERVIOUS AREA
- STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
EXISTING HYDROLOGY MAP
SHEET 3 OF 5

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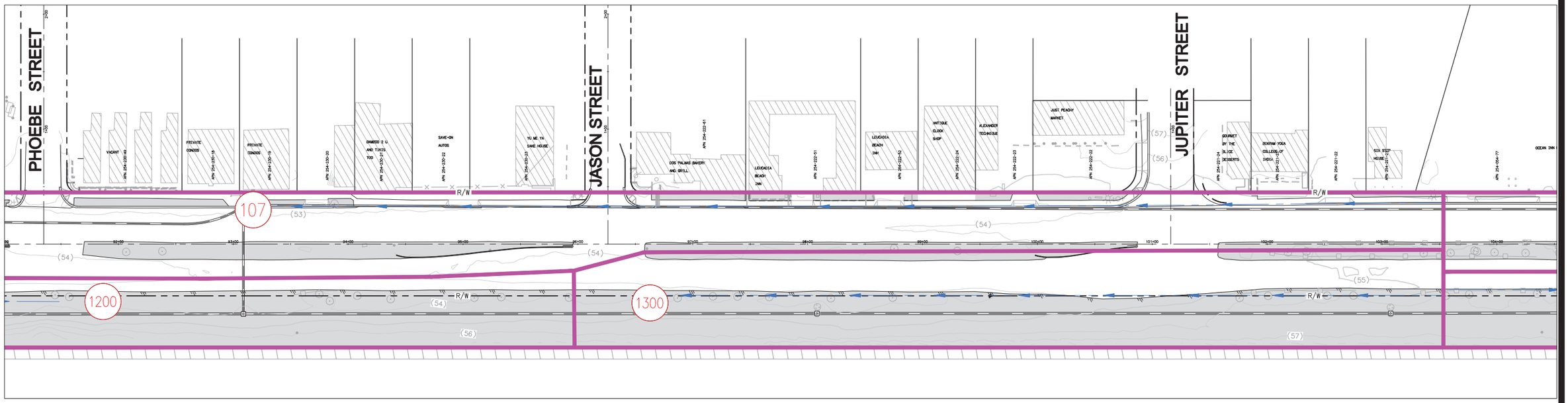

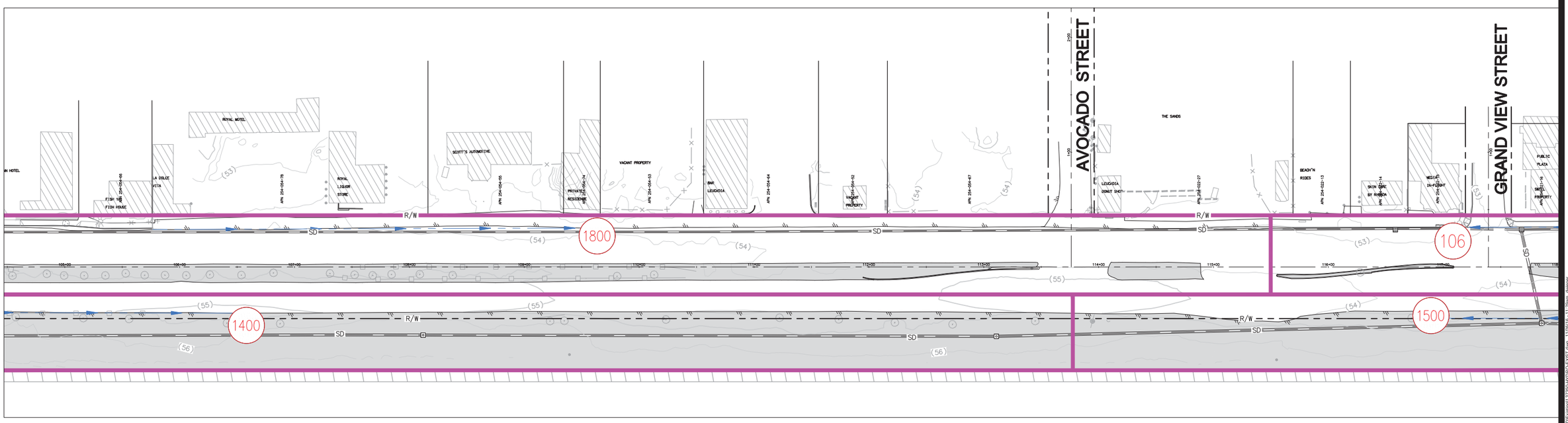

LEGEND

- PERVIOUS AREA
- STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
EXISTING HYDROLOGY MAP
SHEET 4 OF 5

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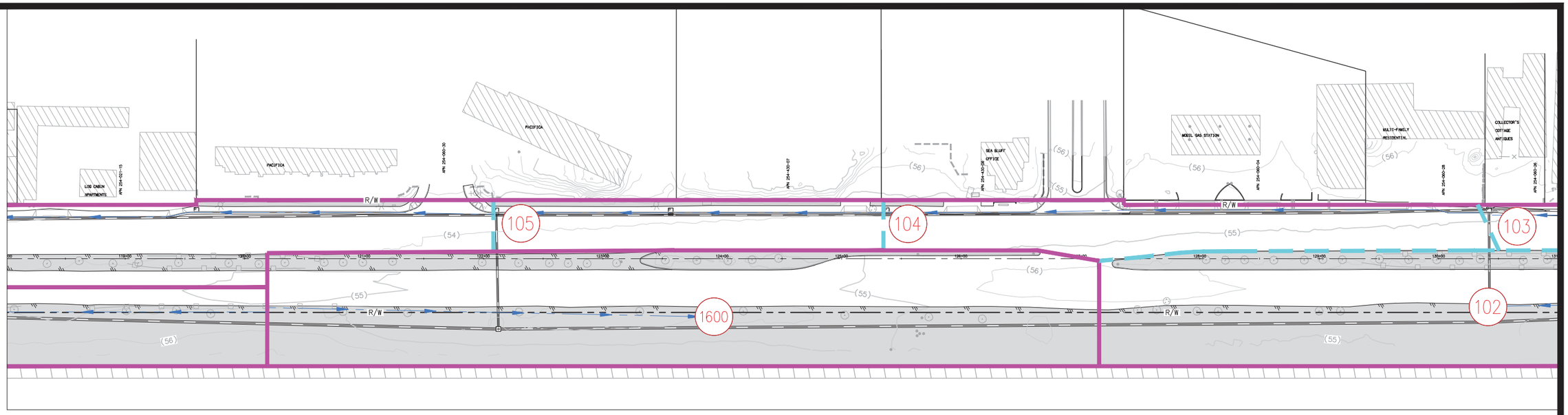

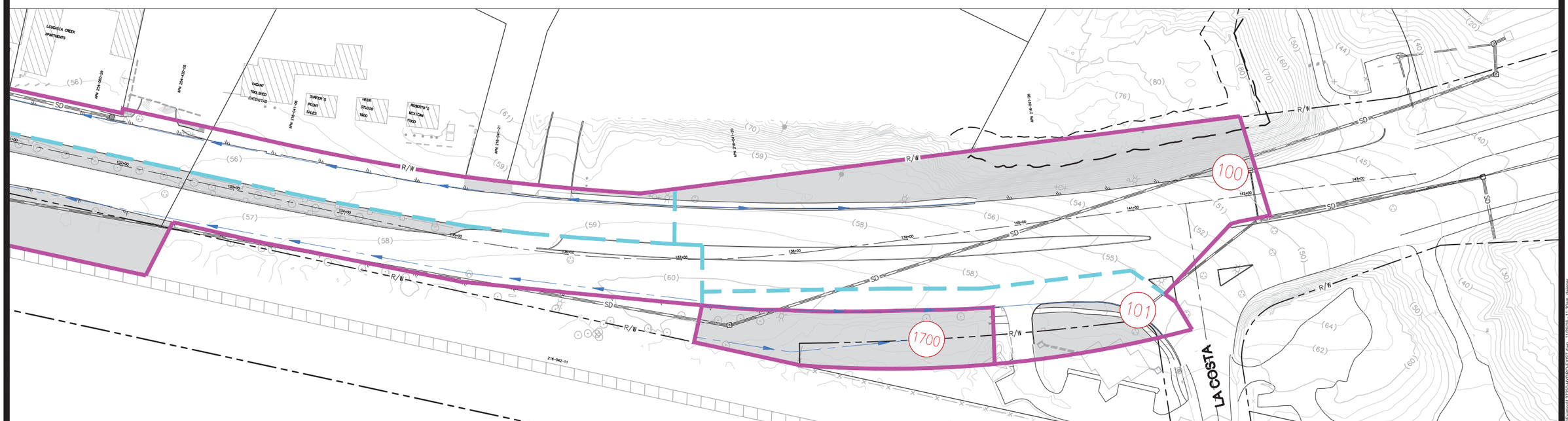

LEGEND

- PERVIOUS AREA
- STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
EXISTING HYDROLOGY MAP
SHEET 5 OF 5

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TIME OF CONCENTRATION CALCULATION - EXISTING CONDITION

Node	Q_{100} ESTIMATED (CFS) = 3 x A	Curb & Gutter		Natural Channel		Velocity (fps)	Tt (min)	Tc (min)
		Length (ft)	Slope	Length (ft)	Slope			
100	3.91	262	1.0%			2.5	1.7	6.7
101	1.01	415	1.6%			2.6	2.7	7.7
102	5.09			685	0.45%	1.5	7.9	12.9
103	1.83			638	0.5%	0.7	14.8	19.8
104	1.43	497	0.1%			0.8	10.8	15.8
105	0.96	311	0.2%			0.9	5.8	10.8
106	2.82	496	0.1%			0.9	9.1	14.1
107	5.51	1044	0.2%			1.4	12.2	17.2
108	1.26	240	0.1%			0.7	5.5	10.5
109	5.06	535	0.2%			1.4	6.5	11.5
110	4.48	511	0.2%			1.4	6.3	11.3
200	4.38	384	0.1%			1.0	6.2	11.2
300	12.90	462	0.50%	1740	0.80%	1.7	4.7	9.7
400	1.40	455	1%			2.1	3.6	8.6
401	1.29	438	1.30%			2.4	3.0	8.0
500	0.71	291	0.20%			0.8	6.0	11.0
600	1.52	335	0.90%			2.1	2.7	7.7
601	0.39	102	1.20%			1.5	1.1	10.5
602	0.30	68	0.75%			1.2	1.0	6.0
700	4.70	896	1.10%			2.7	5.5	10.5
701	1.96	578	0.8%			2.1	4.6	9.6
800	3.15	293	5.20%			4.9	1.0	6.0
801	1.65			450	0.10%	0.5	15.3	20.3
900	3.57	230	5.60%			5.0	0.8	5.8
1000	16.51			2265	0.70%	1.6	23.0	28.0
1100	4.27			439	0.46%	1.2	5.9	10.9
1200	3.76			436	0.37%	1.0	7.4	12.4
1300	4.34			681	0.3%	0.9	13.0	18.0
1400	4.66			290	0.1%	0.5	10.7	15.7
1500	2.91			330	0.45%	0.9	5.9	10.9
1600	4.61			375	0.4%	1.1	5.5	10.5
1700	0.84			205	2	1.4	2.4	7.4
1800	5.68			387	0.10%	1.0	6.2	11.2

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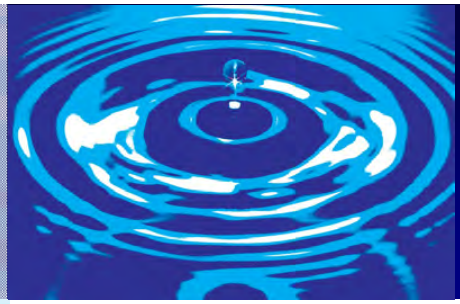


APPENDIX B

Proposed Conditions Hydrology

This Section Contains:

- Work Map
- Rational Method T_c Calculations

PROPOSED HYDROLOGY SUMMARY

SAN DIEGO COUNTY HYDROLOGY MANUAL

C = 0.9(%IMPERVIOUS) + 0.25(1-%IMP)

$T_C = T_I + T_T$
T_I = 5 MIN (ASSUMED)
T_T = GUTTER FLOW (SEE CALCS)

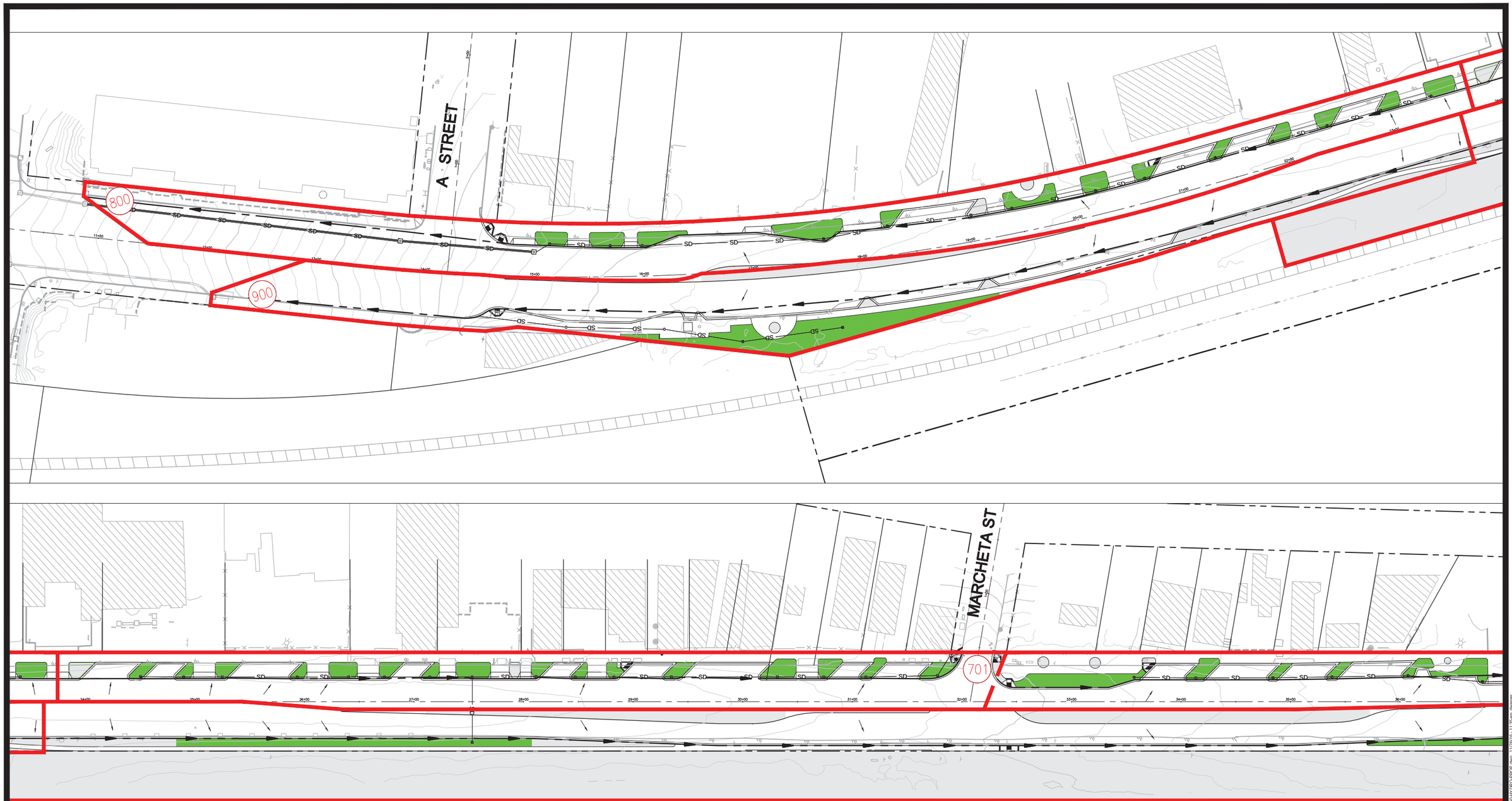
10-YEAR P_6 = 1.8 INCHES
100-YEAR P_6 = 2.5 INCHES

$I = (7.44 * P_6 * T_C^{-.645})$

$Q_{100} = CIA$

PROPOSED DRAINAGE AREAS

NODE	AREA (SF)	AREA (AC)	PERVIOUS (SF)	% PERVIOUS	C	Tc (min)	Q_{10} (cfs)	Q_{100} (cfs)	BIORETENTION (SF)
100	45,901	1.05	21,587	47%	0.59	7.2	2.3	3.3	4,691
101	43,759	1.00	25,816	59%	0.52	6.8	2.0	2.8	1,284
102	70,525	1.62	43,396	62%	0.50	13.5	2.0	2.8	3,233
103	46,904	1.08	11,493	25%	0.74	15.8	1.8	2.5	464
104	14,480	0.33	2,731	19%	0.78	10.0	0.8	1.1	450
105	18,557	0.43	3,416	18%	0.78	13.4	0.8	1.2	1,245
106	80,681	1.85	8,521	11%	0.83	32.4	2.2	3.0	5,938
107	43,791	1.01	5,126	12%	0.82	22.1	1.5	2.1	2,463
108	16,922	0.39	1077	6%	0.86	13.8	0.8	1.1	365
109	19,234	0.44	753	4%	0.87	10.8	1.1	1.5	614
110	19,964	0.46	2412	12%	0.82	11.5	1.0	1.4	558
TOTAL	420,718	9.66	126,328	30%	0.70	14.2	16.5	22.9	21,305
200	126,510	2.90	48,391	38%	0.65	18.5	3.9	5.4	5,465
300	171,241	3.93	92,653	54%	0.55	15.2	5.0	6.9	12,787
400	22,407	0.51	1,034	5%	0.87	9.0	1.5	2.0	911
401	21,425	0.49	1057	5%	0.87	8.4	1.4	2.0	884
TOTAL	43,832	1.01	2,091	5%	0.87	8.7	2.9	4.0	1,795
500	10,627	0.24	1,300	12%	0.82	7.1	0.8	1.1	417
600	31,626	0.73	4,912	16%	0.80	8.3	2.0	2.8	2,766
601	5,197	0.12	350	7%	0.86	6.8	0.4	0.6	0
602	4,877	0.11	757	16%	0.80	6.9	0.3	0.5	0
TOTAL	41,700	0.96	6,019	14%	0.81	7.9	2.7	3.8	2,766
700	74,651	1.71	12,174	16%	0.79	10.6	4.0	5.5	5,887
701	42,912	0.99	4,062	9%	0.84	12.8	2.1	3.0	3,495
TOTAL	117,563	2.70	16,236	14%	0.81	11.4	6.1	8.5	9,382
800	62,288	1.43	5,475	9%	0.84	11.1	3.4	4.7	4,291
900	58,915	1.35	9,622	16%	0.79	10.7	3.1	4.3	4,263
1000	220,432	5.06	147,537	67%	0.46	15.1	5.5	7.6	11,433
1100	62,333	1.43	38,303	61%	0.50	9.3	2.3	3.2	1,036
1200	123,562	2.84	80,587	65%	0.48	22.2	2.5	3.4	8,176
1300	66,946	1.54	43,809	65%	0.47	16.8	1.6	2.2	6,070
1400	88,690	2.04	61,595	69%	0.45	20.8	1.7	2.4	13,523
1500	56,836	1.30	37,283	66%	0.47	11.4	1.7	2.4	4,060
1600	60,940	1.40	42,810	70%	0.44	11.9	1.7	2.3	11,696



LEGEND

- PERVIOUS AREA
- BIORETENTION
- PROPOSED STORM DRAIN — SD
- EXISTING STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)
- DIRECTION OF FLOW

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
PROPOSED HYDROLOGY MAP
SHEET 1 OF 5

Michael Baker INTERNATIONAL
5050 Avenida Encinas
Suite 260
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Phone: (760) 476-9193
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H:\PA\A137350_North Coast Hwy 101\Admin\Reports\Drainage\CADD\Proposed\137350-HYDRO-PROP.dwg 11/26/18 - 11:50 am dwimer

LEGEND

- PERVIOUS AREA
- BIORETENTION
- PROPOSED STORM DRAIN — SD
- EXISTING STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)
- DIRECTION OF FLOW

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
PROPOSED HYDROLOGY MAP
SHEET 2 OF 5

Michael Baker INTERNATIONAL
5050 Avenida Encinas
Suite 260
Carlsbad, CA 92008
Phone: (760) 476-9193
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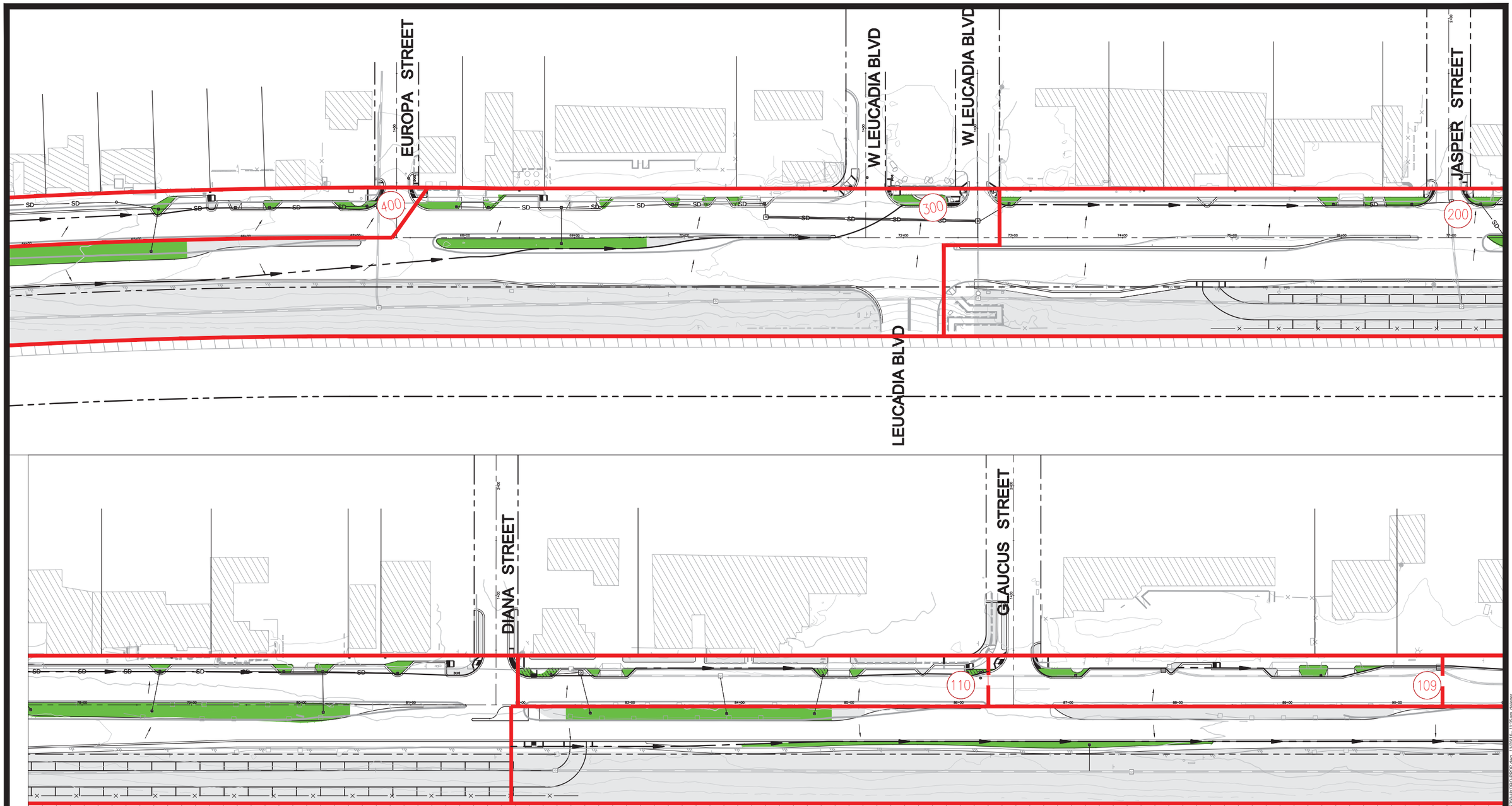
H:\PDA\A137350_North Coast Hwy 101\Admin\Reports\Drainage\CADD\Proposed\137350-HYDRO-PROP.dwg 11/28/16 - 11:35am dexter



LEGEND

- PERVIOUS AREA
- BIORETENTION
- PROPOSED STORM DRAIN — SD
- EXISTING STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)
- DIRECTION OF FLOW

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
PROPOSED HYDROLOGY MAP
SHEET 3 OF 5

Michael Baker INTERNATIONAL
5050 Avenida Encinas
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Carlsbad, CA 92008
Phone: (760) 476-9193
MBAKERINTL.COM

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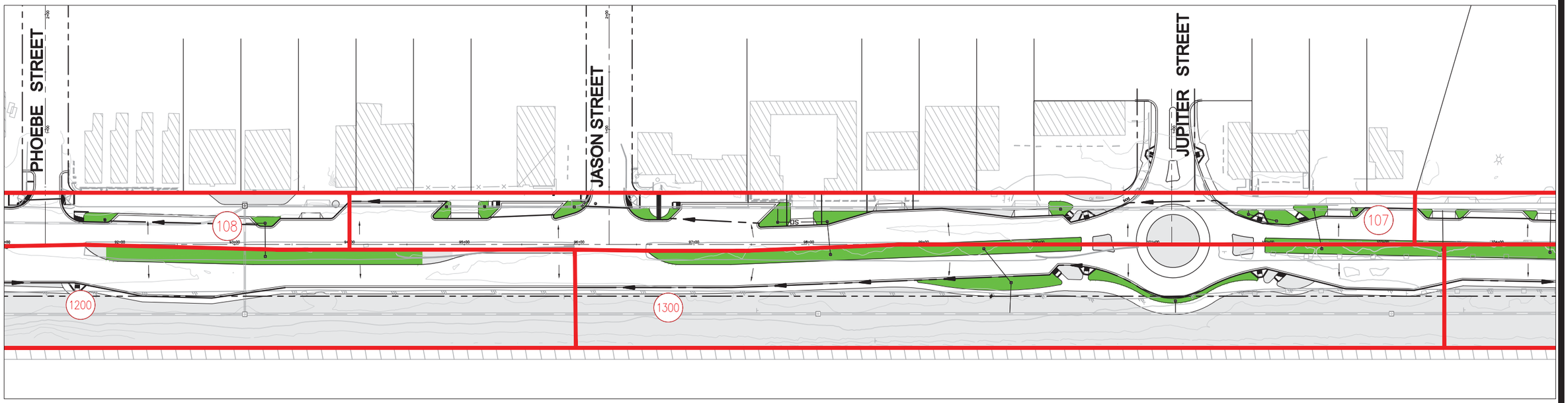

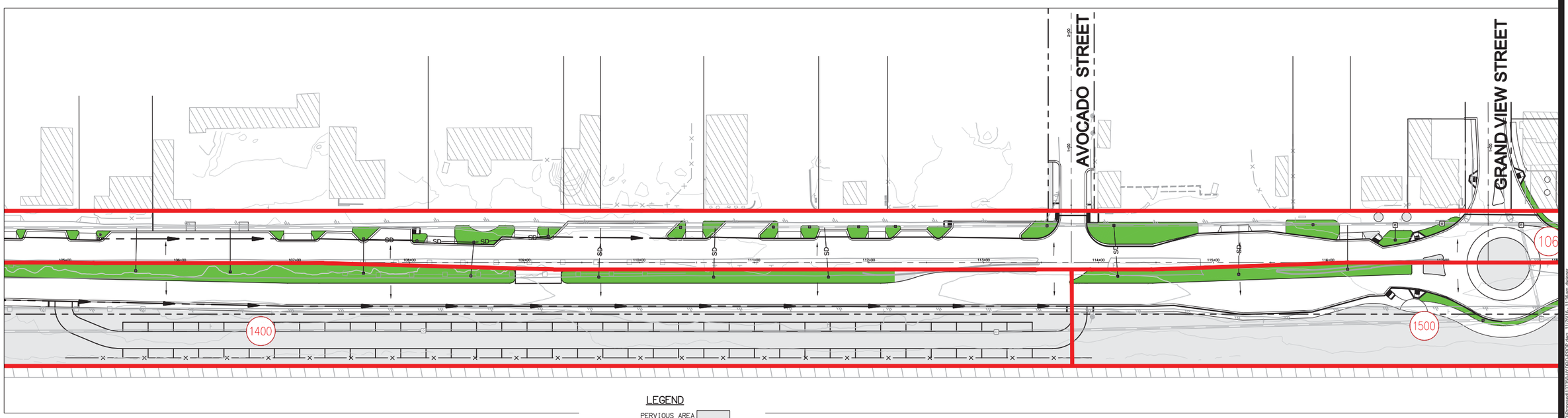

LEGEND

- PERVIOUS AREA
- BIORETENTION
- PROPOSED STORM DRAIN — SD
- EXISTING STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)
- DIRECTION OF FLOW

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
PROPOSED HYDROLOGY MAP
SHEET 4 OF 5

Michael Baker INTERNATIONAL
5050 Avenida Encinas
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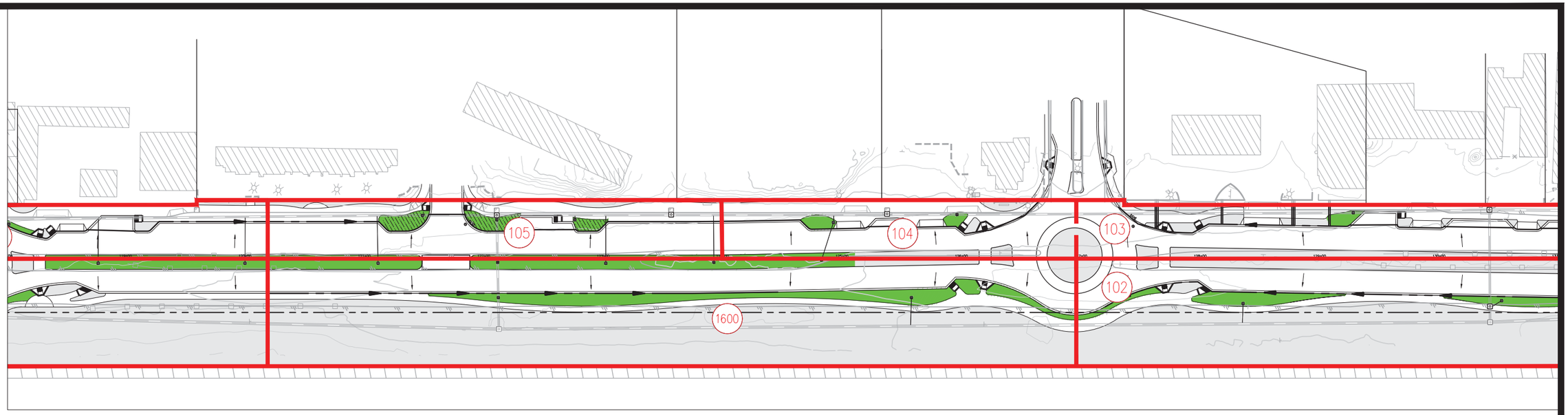
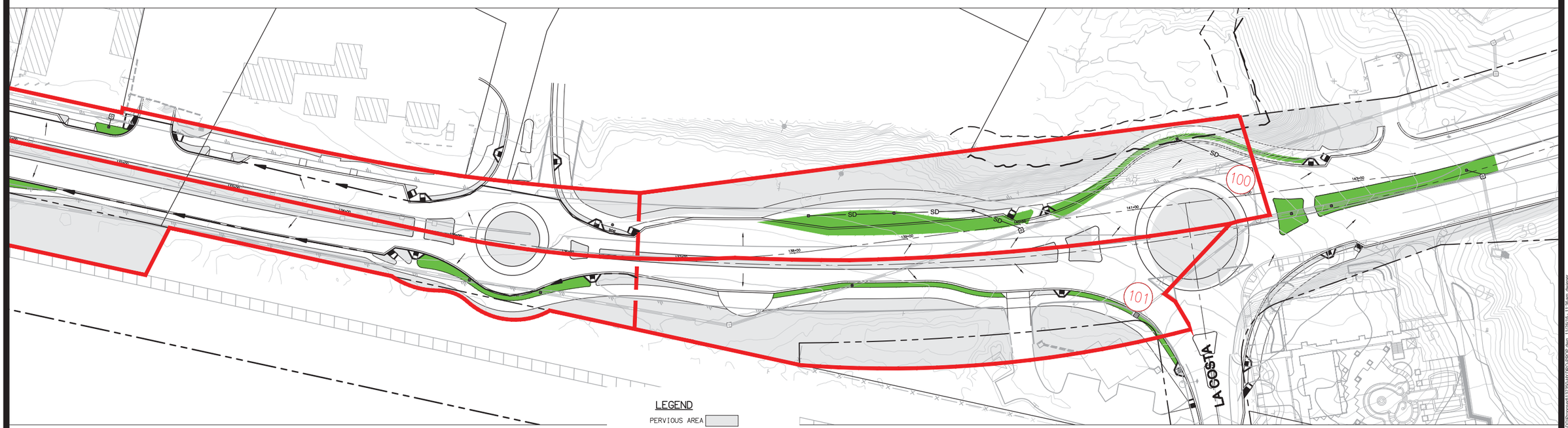
H:\PDATA\37350_North Coast Hwy 101\Admin\Reports\Drainage\CADD\Proposed\137350-HY DRO-PROP.dwg 12/26/16 - 11:35am dwenner





LEGEND

- PERVIOUS AREA
- BIORETENTION
- PROPOSED STORM DRAIN — SD
- EXISTING STORM DRAIN — SD
- DRAINAGE AREA
- DRAINAGE SUBAREA
- FLOWLINE
- DRAINAGE NODE (X)
- DIRECTION OF FLOW

40 20 0 40 80 120

SCALE: 1"=40'

HWY 101 STREETSCAPE
PROPOSED HYDROLOGY MAP
SHEET 5 OF 5

Michael Baker INTERNATIONAL
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TIME OF CONCENTRATION - PROPOSED CONDITION

Node	Q_{100} Estimated (cfs)	Length (ft)	Slope	Velocity (fps)	Tt (min)	Tc (min)
100	3.2	550	4.00%	4.1	2.2	7.2
101	3.0	450	4.00%	4.2	1.8	6.8
102	4.9	965	0.40%	1.9	8.5	13.5
103	3.2	976	0.31%	1.5	10.8	15.8
104	1.0	280	0.20%	0.9	5.0	10.0
105	1.3	400	0.10%	0.8	8.4	13.4
106	5.6	1773	0.10%	1.1	27.4	32.4
107	3.0	987	0.10%	1.0	17.1	22.1
108	1.2	381	0.10%	0.7	8.8	13.8
109	1.3	394	0.30%	1.1	5.8	10.8
110	1.4	438	0.25%	1.1	6.8	11.8
200	8.7	905	0.11%	1.1	13.5	18.5
300	11.8	1645	0.70%	2.7	10.2	15.2
400	1.5	476	0.84%	2.0	4.0	9.0
401	1.5	466	1.20%	2.3	3.4	8.4
500	0.7	228	0.80%	1.8	2.1	7.1
600	2.2	360	0.55%	1.8	3.3	8.3
601	0.4	125	0.60%	1.1	1.8	6.8
602	0.3	127	0.60%	1.1	1.9	6.9
700	5.1	930	1.10%	2.8	5.6	10.6
701	3.0	841	0.44%	1.8	7.8	12.8
800	4.3	1285	2.10%	3.5	6.1	11.1
900	4.1	1135	1.90%	3.3	5.7	10.7
1000	15.2	1811	0.80%	3.0	10.1	15.1
1100	4.3	569	0.62%	2.2	4.3	9.3
1200	8.5	1154	0.11%	1.1	17.2	22.2
1300	4.6	766	0.10%	1.1	11.8	16.8
1400	6.1	1023	0.10%	1.1	15.8	20.8
1500	3.9	385	0.10%	1.0	6.4	11.4
1600	4.2	427	0.10%	1.0	6.9	11.9

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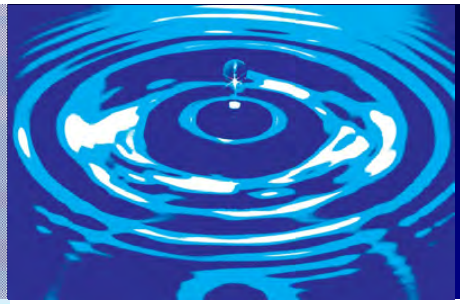

APPENDIX C

Proposed Peak Volume and BMP Storage Calculations

This Section Contains:

- Proposed BMP Volume Calculations
- Proposed 10-Year Rational Method Hydrographs
- Proposed 10-Year Peak Runoff Volume Calculation (Hydraflow Hydrographs)

BMP STORAGE VOLUME						
Node	BMP Area (sf)	Surface Ponding (in)	Bio Soil Depth (in)	Gravel Depth (in)	Void Storage (sf)= (ponding + 40%(bio + gravel)	**BMP Volume (cf)**
100	21,300	10	18	12	1.83	**38,979**
200	5,460	10	18	12	1.83	**9,992**
300	12,780	10	18	12	1.83	**23,387**
400	1,790	10	18	12	1.83	**3,276**
500	417	10	18	12	1.83	**763**
600	2,760	10	18	12	1.83	**5,051**
700	9,380	10	18	12	1.83	**17,165**
800	4,290	10	18	12	1.83	**7,851**
900	4,260	10	18	12	1.83	**7,796**
1000	11,430	10	18	12	1.83	**20,917**
1100	1,030	10	18	12	1.83	**1,885**
1200	8,170	10	18	12	1.83	**14,951**
1300	6,070	10	18	12	1.83	**11,108**
1400	13,520	10	18	12	1.83	**24,742**
1500	4,060	10	18	12	1.83	**7,430**
1600	11,960	10	18	12	1.83	**21,887**

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Proposed 10-year
Node 100

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 14 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 9.66 ACRES
RUNOFF COEFFICIENT 0.7
PEAK DISCHARGE 16.5 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 14	DISCHARGE (CFS) = 0.7
TIME (MIN) = 28	DISCHARGE (CFS) = 0.8
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TIME (MIN) = 168	DISCHARGE (CFS) = 1.5
TIME (MIN) = 182	DISCHARGE (CFS) = 1.6
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TIME (MIN) = 210	DISCHARGE (CFS) = 2.2
TIME (MIN) = 224	DISCHARGE (CFS) = 3.3
TIME (MIN) = 238	DISCHARGE (CFS) = 4.6
TIME (MIN) = 252	DISCHARGE (CFS) = 16.5
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TIME (MIN) = 280	DISCHARGE (CFS) = 1.8
TIME (MIN) = 294	DISCHARGE (CFS) = 1.4
TIME (MIN) = 308	DISCHARGE (CFS) = 1.1
TIME (MIN) = 322	DISCHARGE (CFS) = 1
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TIME (MIN) = 350	DISCHARGE (CFS) = 0.8
TIME (MIN) = 364	DISCHARGE (CFS) = 0.7
TIME (MIN) = 378	DISCHARGE (CFS) = 0

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200

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 19 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 2.9 ACRES
RUNOFF COEFFICIENT 0.65
PEAK DISCHARGE 3.9 CFS

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TIME (MIN) = 228	DISCHARGE (CFS) = 0.7
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TIME (MIN) = 304	DISCHARGE (CFS) = 0.4
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TIME (MIN) = 342	DISCHARGE (CFS) = 0.3
TIME (MIN) = 361	DISCHARGE (CFS) = 0.2
TIME (MIN) = 380	DISCHARGE (CFS) = 0

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300

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 15 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 3.93 ACRES
RUNOFF COEFFICIENT 0.55
PEAK DISCHARGE 5 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 15	DISCHARGE (CFS) = 0.2
TIME (MIN) = 30	DISCHARGE (CFS) = 0.2
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 75	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
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TIME (MIN) = 120	DISCHARGE (CFS) = 0.3
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TIME (MIN) = 195	DISCHARGE (CFS) = 0.6
TIME (MIN) = 210	DISCHARGE (CFS) = 0.7
TIME (MIN) = 225	DISCHARGE (CFS) = 1
TIME (MIN) = 240	DISCHARGE (CFS) = 1.5
TIME (MIN) = 255	DISCHARGE (CFS) = 5
TIME (MIN) = 270	DISCHARGE (CFS) = 0.8
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400

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.01 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 2.9 CFS

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500

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 7 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 0.24 ACRES
RUNOFF COEFFICIENT 0.82
PEAK DISCHARGE 0.8 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
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TIME (MIN) = 98	DISCHARGE (CFS) = 0
TIME (MIN) = 105	DISCHARGE (CFS) = 0
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600

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 8 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 0.96 ACRES
RUNOFF COEFFICIENT 0.81
PEAK DISCHARGE 2.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
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TIME (MIN) = 352	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 368	DISCHARGE (CFS) = 0

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700

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 2.7 ACRES
RUNOFF COEFFICIENT 0.81
PEAK DISCHARGE 6.1 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.2
TIME (MIN) = 22	DISCHARGE (CFS) = 0.2
TIME (MIN) = 33	DISCHARGE (CFS) = 0.2
TIME (MIN) = 44	DISCHARGE (CFS) = 0.3
TIME (MIN) = 55	DISCHARGE (CFS) = 0.3
TIME (MIN) = 66	DISCHARGE (CFS) = 0.3
TIME (MIN) = 77	DISCHARGE (CFS) = 0.3
TIME (MIN) = 88	DISCHARGE (CFS) = 0.3
TIME (MIN) = 99	DISCHARGE (CFS) = 0.3
TIME (MIN) = 110	DISCHARGE (CFS) = 0.3
TIME (MIN) = 121	DISCHARGE (CFS) = 0.3
TIME (MIN) = 132	DISCHARGE (CFS) = 0.4
TIME (MIN) = 143	DISCHARGE (CFS) = 0.4
TIME (MIN) = 154	DISCHARGE (CFS) = 0.4
TIME (MIN) = 165	DISCHARGE (CFS) = 0.5
TIME (MIN) = 176	DISCHARGE (CFS) = 0.5
TIME (MIN) = 187	DISCHARGE (CFS) = 0.6
TIME (MIN) = 198	DISCHARGE (CFS) = 0.6
TIME (MIN) = 209	DISCHARGE (CFS) = 0.7
TIME (MIN) = 220	DISCHARGE (CFS) = 0.8
TIME (MIN) = 231	DISCHARGE (CFS) = 1.2
TIME (MIN) = 242	DISCHARGE (CFS) = 1.9
TIME (MIN) = 253	DISCHARGE (CFS) = 6.1
TIME (MIN) = 264	DISCHARGE (CFS) = 1
TIME (MIN) = 275	DISCHARGE (CFS) = 0.7
TIME (MIN) = 286	DISCHARGE (CFS) = 0.5
TIME (MIN) = 297	DISCHARGE (CFS) = 0.4
TIME (MIN) = 308	DISCHARGE (CFS) = 0.4
TIME (MIN) = 319	DISCHARGE (CFS) = 0.3
TIME (MIN) = 330	DISCHARGE (CFS) = 0.3
TIME (MIN) = 341	DISCHARGE (CFS) = 0.3
TIME (MIN) = 352	DISCHARGE (CFS) = 0.3
TIME (MIN) = 363	DISCHARGE (CFS) = 0.2
TIME (MIN) = 374	DISCHARGE (CFS) = 0

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800

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.43 ACRES
RUNOFF COEFFICIENT 0.84
PEAK DISCHARGE 3.4 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.1
TIME (MIN) = 22	DISCHARGE (CFS) = 0.1
TIME (MIN) = 33	DISCHARGE (CFS) = 0.1
TIME (MIN) = 44	DISCHARGE (CFS) = 0.1
TIME (MIN) = 55	DISCHARGE (CFS) = 0.1
TIME (MIN) = 66	DISCHARGE (CFS) = 0.2
TIME (MIN) = 77	DISCHARGE (CFS) = 0.2
TIME (MIN) = 88	DISCHARGE (CFS) = 0.2
TIME (MIN) = 99	DISCHARGE (CFS) = 0.2
TIME (MIN) = 110	DISCHARGE (CFS) = 0.2
TIME (MIN) = 121	DISCHARGE (CFS) = 0.2
TIME (MIN) = 132	DISCHARGE (CFS) = 0.2
TIME (MIN) = 143	DISCHARGE (CFS) = 0.2
TIME (MIN) = 154	DISCHARGE (CFS) = 0.2
TIME (MIN) = 165	DISCHARGE (CFS) = 0.3
TIME (MIN) = 176	DISCHARGE (CFS) = 0.3
TIME (MIN) = 187	DISCHARGE (CFS) = 0.3
TIME (MIN) = 198	DISCHARGE (CFS) = 0.3
TIME (MIN) = 209	DISCHARGE (CFS) = 0.4
TIME (MIN) = 220	DISCHARGE (CFS) = 0.5
TIME (MIN) = 231	DISCHARGE (CFS) = 0.7
TIME (MIN) = 242	DISCHARGE (CFS) = 1
TIME (MIN) = 253	DISCHARGE (CFS) = 3.4
TIME (MIN) = 264	DISCHARGE (CFS) = 0.5
TIME (MIN) = 275	DISCHARGE (CFS) = 0.4
TIME (MIN) = 286	DISCHARGE (CFS) = 0.3
TIME (MIN) = 297	DISCHARGE (CFS) = 0.2
TIME (MIN) = 308	DISCHARGE (CFS) = 0.2
TIME (MIN) = 319	DISCHARGE (CFS) = 0.2
TIME (MIN) = 330	DISCHARGE (CFS) = 0.2
TIME (MIN) = 341	DISCHARGE (CFS) = 0.2
TIME (MIN) = 352	DISCHARGE (CFS) = 0.1
TIME (MIN) = 363	DISCHARGE (CFS) = 0.1
TIME (MIN) = 374	DISCHARGE (CFS) = 0

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900

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.35 ACRES
RUNOFF COEFFICIENT 0.79
PEAK DISCHARGE 3.1 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.1
TIME (MIN) = 22	DISCHARGE (CFS) = 0.1
TIME (MIN) = 33	DISCHARGE (CFS) = 0.1
TIME (MIN) = 44	DISCHARGE (CFS) = 0.1
TIME (MIN) = 55	DISCHARGE (CFS) = 0.1
TIME (MIN) = 66	DISCHARGE (CFS) = 0.1
TIME (MIN) = 77	DISCHARGE (CFS) = 0.1
TIME (MIN) = 88	DISCHARGE (CFS) = 0.1
TIME (MIN) = 99	DISCHARGE (CFS) = 0.2
TIME (MIN) = 110	DISCHARGE (CFS) = 0.2
TIME (MIN) = 121	DISCHARGE (CFS) = 0.2
TIME (MIN) = 132	DISCHARGE (CFS) = 0.2
TIME (MIN) = 143	DISCHARGE (CFS) = 0.2
TIME (MIN) = 154	DISCHARGE (CFS) = 0.2
TIME (MIN) = 165	DISCHARGE (CFS) = 0.2
TIME (MIN) = 176	DISCHARGE (CFS) = 0.2
TIME (MIN) = 187	DISCHARGE (CFS) = 0.3
TIME (MIN) = 198	DISCHARGE (CFS) = 0.3
TIME (MIN) = 209	DISCHARGE (CFS) = 0.4
TIME (MIN) = 220	DISCHARGE (CFS) = 0.4
TIME (MIN) = 231	DISCHARGE (CFS) = 0.6
TIME (MIN) = 242	DISCHARGE (CFS) = 0.8
TIME (MIN) = 253	DISCHARGE (CFS) = 3.1
TIME (MIN) = 264	DISCHARGE (CFS) = 0.5
TIME (MIN) = 275	DISCHARGE (CFS) = 0.3
TIME (MIN) = 286	DISCHARGE (CFS) = 0.3
TIME (MIN) = 297	DISCHARGE (CFS) = 0.2
TIME (MIN) = 308	DISCHARGE (CFS) = 0.2
TIME (MIN) = 319	DISCHARGE (CFS) = 0.2
TIME (MIN) = 330	DISCHARGE (CFS) = 0.1
TIME (MIN) = 341	DISCHARGE (CFS) = 0.1
TIME (MIN) = 352	DISCHARGE (CFS) = 0.1
TIME (MIN) = 363	DISCHARGE (CFS) = 0.1
TIME (MIN) = 374	DISCHARGE (CFS) = 0

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1000

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 15 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 5.06 ACRES
RUNOFF COEFFICIENT 0.46
PEAK DISCHARGE 5.5 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 15	DISCHARGE (CFS) = 0.3
TIME (MIN) = 30	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 75	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
TIME (MIN) = 105	DISCHARGE (CFS) = 0.3
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 150	DISCHARGE (CFS) = 0.4
TIME (MIN) = 165	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.5
TIME (MIN) = 195	DISCHARGE (CFS) = 0.6
TIME (MIN) = 210	DISCHARGE (CFS) = 0.7
TIME (MIN) = 225	DISCHARGE (CFS) = 1.1
TIME (MIN) = 240	DISCHARGE (CFS) = 1.5
TIME (MIN) = 255	DISCHARGE (CFS) = 5.5
TIME (MIN) = 270	DISCHARGE (CFS) = 0.9
TIME (MIN) = 285	DISCHARGE (CFS) = 0.6
TIME (MIN) = 300	DISCHARGE (CFS) = 0.5
TIME (MIN) = 315	DISCHARGE (CFS) = 0.4
TIME (MIN) = 330	DISCHARGE (CFS) = 0.3
TIME (MIN) = 345	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 375	DISCHARGE (CFS) = 0

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1100

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.43 ACRES
RUNOFF COEFFICIENT 0.5
PEAK DISCHARGE 2.3 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0.3
TIME (MIN) = 18	DISCHARGE (CFS) = 0.1
TIME (MIN) = 27	DISCHARGE (CFS) = 0.1
TIME (MIN) = 36	DISCHARGE (CFS) = 0.1
TIME (MIN) = 45	DISCHARGE (CFS) = 0.1
TIME (MIN) = 54	DISCHARGE (CFS) = 0.1
TIME (MIN) = 63	DISCHARGE (CFS) = 0.1
TIME (MIN) = 72	DISCHARGE (CFS) = 0.1
TIME (MIN) = 81	DISCHARGE (CFS) = 0.1
TIME (MIN) = 90	DISCHARGE (CFS) = 0.1
TIME (MIN) = 99	DISCHARGE (CFS) = 0.1
TIME (MIN) = 108	DISCHARGE (CFS) = 0.1
TIME (MIN) = 117	DISCHARGE (CFS) = 0.1
TIME (MIN) = 126	DISCHARGE (CFS) = 0.1
TIME (MIN) = 135	DISCHARGE (CFS) = 0.1
TIME (MIN) = 144	DISCHARGE (CFS) = 0.1
TIME (MIN) = 153	DISCHARGE (CFS) = 0.1
TIME (MIN) = 162	DISCHARGE (CFS) = 0.1
TIME (MIN) = 171	DISCHARGE (CFS) = 0.2
TIME (MIN) = 180	DISCHARGE (CFS) = 0.2
TIME (MIN) = 189	DISCHARGE (CFS) = 0.2
TIME (MIN) = 198	DISCHARGE (CFS) = 0.2
TIME (MIN) = 207	DISCHARGE (CFS) = 0.2
TIME (MIN) = 216	DISCHARGE (CFS) = 0.3
TIME (MIN) = 225	DISCHARGE (CFS) = 0.3
TIME (MIN) = 234	DISCHARGE (CFS) = 0.5
TIME (MIN) = 243	DISCHARGE (CFS) = 0.7
TIME (MIN) = 252	DISCHARGE (CFS) = 2.3
TIME (MIN) = 261	DISCHARGE (CFS) = 0.4
TIME (MIN) = 270	DISCHARGE (CFS) = 0.2
TIME (MIN) = 279	DISCHARGE (CFS) = 0.2
TIME (MIN) = 288	DISCHARGE (CFS) = 0.2
TIME (MIN) = 297	DISCHARGE (CFS) = 0.1
TIME (MIN) = 306	DISCHARGE (CFS) = 0.1
TIME (MIN) = 315	DISCHARGE (CFS) = 0.1
TIME (MIN) = 324	DISCHARGE (CFS) = 0.1
TIME (MIN) = 333	DISCHARGE (CFS) = 0.1
TIME (MIN) = 342	DISCHARGE (CFS) = 0.1
TIME (MIN) = 351	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 369	DISCHARGE (CFS) = 0

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1200

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 22 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 2.84 ACRES
RUNOFF COEFFICIENT 0.48
PEAK DISCHARGE 2.5 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 22	DISCHARGE (CFS) = 0.3
TIME (MIN) = 44	DISCHARGE (CFS) = 0.2
TIME (MIN) = 66	DISCHARGE (CFS) = 0.2
TIME (MIN) = 88	DISCHARGE (CFS) = 0.2
TIME (MIN) = 110	DISCHARGE (CFS) = 0.2
TIME (MIN) = 132	DISCHARGE (CFS) = 0.2
TIME (MIN) = 154	DISCHARGE (CFS) = 0.2
TIME (MIN) = 176	DISCHARGE (CFS) = 0.3
TIME (MIN) = 198	DISCHARGE (CFS) = 0.3
TIME (MIN) = 220	DISCHARGE (CFS) = 0.5
TIME (MIN) = 242	DISCHARGE (CFS) = 0.7
TIME (MIN) = 264	DISCHARGE (CFS) = 2.5
TIME (MIN) = 286	DISCHARGE (CFS) = 0.4
TIME (MIN) = 308	DISCHARGE (CFS) = 0.3
TIME (MIN) = 330	DISCHARGE (CFS) = 0.2
TIME (MIN) = 352	DISCHARGE (CFS) = 0.2
TIME (MIN) = 374	DISCHARGE (CFS) = 0

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1300

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 17 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.54 ACRES
RUNOFF COEFFICIENT 0.47
PEAK DISCHARGE 1.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 17	DISCHARGE (CFS) = 0.1
TIME (MIN) = 34	DISCHARGE (CFS) = 0.1
TIME (MIN) = 51	DISCHARGE (CFS) = 0.1
TIME (MIN) = 68	DISCHARGE (CFS) = 0.1
TIME (MIN) = 85	DISCHARGE (CFS) = 0.1
TIME (MIN) = 102	DISCHARGE (CFS) = 0.1
TIME (MIN) = 119	DISCHARGE (CFS) = 0.1
TIME (MIN) = 136	DISCHARGE (CFS) = 0.1
TIME (MIN) = 153	DISCHARGE (CFS) = 0.1
TIME (MIN) = 170	DISCHARGE (CFS) = 0.2
TIME (MIN) = 187	DISCHARGE (CFS) = 0.2
TIME (MIN) = 204	DISCHARGE (CFS) = 0.2
TIME (MIN) = 221	DISCHARGE (CFS) = 0.3
TIME (MIN) = 238	DISCHARGE (CFS) = 0.4
TIME (MIN) = 255	DISCHARGE (CFS) = 1.6
TIME (MIN) = 272	DISCHARGE (CFS) = 0.2
TIME (MIN) = 289	DISCHARGE (CFS) = 0.2
TIME (MIN) = 306	DISCHARGE (CFS) = 0.1
TIME (MIN) = 323	DISCHARGE (CFS) = 0.1
TIME (MIN) = 340	DISCHARGE (CFS) = 0.1
TIME (MIN) = 357	DISCHARGE (CFS) = 0.1
TIME (MIN) = 374	DISCHARGE (CFS) = 0

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1400

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 21 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 2.04 ACRES
RUNOFF COEFFICIENT 0.45
PEAK DISCHARGE 1.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 21	DISCHARGE (CFS) = 0.1
TIME (MIN) = 42	DISCHARGE (CFS) = 0.1
TIME (MIN) = 63	DISCHARGE (CFS) = 0.1
TIME (MIN) = 84	DISCHARGE (CFS) = 0.1
TIME (MIN) = 105	DISCHARGE (CFS) = 0.1
TIME (MIN) = 126	DISCHARGE (CFS) = 0.2
TIME (MIN) = 147	DISCHARGE (CFS) = 0.2
TIME (MIN) = 168	DISCHARGE (CFS) = 0.2
TIME (MIN) = 189	DISCHARGE (CFS) = 0.2
TIME (MIN) = 210	DISCHARGE (CFS) = 0.3
TIME (MIN) = 231	DISCHARGE (CFS) = 0.5
TIME (MIN) = 252	DISCHARGE (CFS) = 1.7
TIME (MIN) = 273	DISCHARGE (CFS) = 0.3
TIME (MIN) = 294	DISCHARGE (CFS) = 0.2
TIME (MIN) = 315	DISCHARGE (CFS) = 0.1
TIME (MIN) = 336	DISCHARGE (CFS) = 0.1
TIME (MIN) = 357	DISCHARGE (CFS) = 0.1
TIME (MIN) = 378	DISCHARGE (CFS) = 0

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1500

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.3 ACRES
RUNOFF COEFFICIENT 0.47
PEAK DISCHARGE 1.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.1
TIME (MIN) = 22	DISCHARGE (CFS) = 0.1
TIME (MIN) = 33	DISCHARGE (CFS) = 0.1
TIME (MIN) = 44	DISCHARGE (CFS) = 0.1
TIME (MIN) = 55	DISCHARGE (CFS) = 0.1
TIME (MIN) = 66	DISCHARGE (CFS) = 0.1
TIME (MIN) = 77	DISCHARGE (CFS) = 0.1
TIME (MIN) = 88	DISCHARGE (CFS) = 0.1
TIME (MIN) = 99	DISCHARGE (CFS) = 0.1
TIME (MIN) = 110	DISCHARGE (CFS) = 0.1
TIME (MIN) = 121	DISCHARGE (CFS) = 0.1
TIME (MIN) = 132	DISCHARGE (CFS) = 0.1
TIME (MIN) = 143	DISCHARGE (CFS) = 0.1
TIME (MIN) = 154	DISCHARGE (CFS) = 0.1
TIME (MIN) = 165	DISCHARGE (CFS) = 0.1
TIME (MIN) = 176	DISCHARGE (CFS) = 0.1
TIME (MIN) = 187	DISCHARGE (CFS) = 0.2
TIME (MIN) = 198	DISCHARGE (CFS) = 0.2
TIME (MIN) = 209	DISCHARGE (CFS) = 0.2
TIME (MIN) = 220	DISCHARGE (CFS) = 0.2
TIME (MIN) = 231	DISCHARGE (CFS) = 0.3
TIME (MIN) = 242	DISCHARGE (CFS) = 0.5
TIME (MIN) = 253	DISCHARGE (CFS) = 1.7
TIME (MIN) = 264	DISCHARGE (CFS) = 0.3
TIME (MIN) = 275	DISCHARGE (CFS) = 0.2
TIME (MIN) = 286	DISCHARGE (CFS) = 0.1
TIME (MIN) = 297	DISCHARGE (CFS) = 0.1
TIME (MIN) = 308	DISCHARGE (CFS) = 0.1
TIME (MIN) = 319	DISCHARGE (CFS) = 0.1
TIME (MIN) = 330	DISCHARGE (CFS) = 0.1
TIME (MIN) = 341	DISCHARGE (CFS) = 0.1
TIME (MIN) = 352	DISCHARGE (CFS) = 0.1
TIME (MIN) = 363	DISCHARGE (CFS) = 0.1
TIME (MIN) = 374	DISCHARGE (CFS) = 0

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1600

RUN DATE 11/23/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 12 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 1.4 ACRES
RUNOFF COEFFICIENT 0.44
PEAK DISCHARGE 1.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 12	DISCHARGE (CFS) = 0.1
TIME (MIN) = 24	DISCHARGE (CFS) = 0.1
TIME (MIN) = 36	DISCHARGE (CFS) = 0.1
TIME (MIN) = 48	DISCHARGE (CFS) = 0.1
TIME (MIN) = 60	DISCHARGE (CFS) = 0.1
TIME (MIN) = 72	DISCHARGE (CFS) = 0.1
TIME (MIN) = 84	DISCHARGE (CFS) = 0.1
TIME (MIN) = 96	DISCHARGE (CFS) = 0.1
TIME (MIN) = 108	DISCHARGE (CFS) = 0.1
TIME (MIN) = 120	DISCHARGE (CFS) = 0.1
TIME (MIN) = 132	DISCHARGE (CFS) = 0.1
TIME (MIN) = 144	DISCHARGE (CFS) = 0.1
TIME (MIN) = 156	DISCHARGE (CFS) = 0.1
TIME (MIN) = 168	DISCHARGE (CFS) = 0.1
TIME (MIN) = 180	DISCHARGE (CFS) = 0.1
TIME (MIN) = 192	DISCHARGE (CFS) = 0.2
TIME (MIN) = 204	DISCHARGE (CFS) = 0.2
TIME (MIN) = 216	DISCHARGE (CFS) = 0.2
TIME (MIN) = 228	DISCHARGE (CFS) = 0.3
TIME (MIN) = 240	DISCHARGE (CFS) = 0.4
TIME (MIN) = 252	DISCHARGE (CFS) = 1.7
TIME (MIN) = 264	DISCHARGE (CFS) = 0.3
TIME (MIN) = 276	DISCHARGE (CFS) = 0.2
TIME (MIN) = 288	DISCHARGE (CFS) = 0.1
TIME (MIN) = 300	DISCHARGE (CFS) = 0.1
TIME (MIN) = 312	DISCHARGE (CFS) = 0.1
TIME (MIN) = 324	DISCHARGE (CFS) = 0.1
TIME (MIN) = 336	DISCHARGE (CFS) = 0.1
TIME (MIN) = 348	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 372	DISCHARGE (CFS) = 0

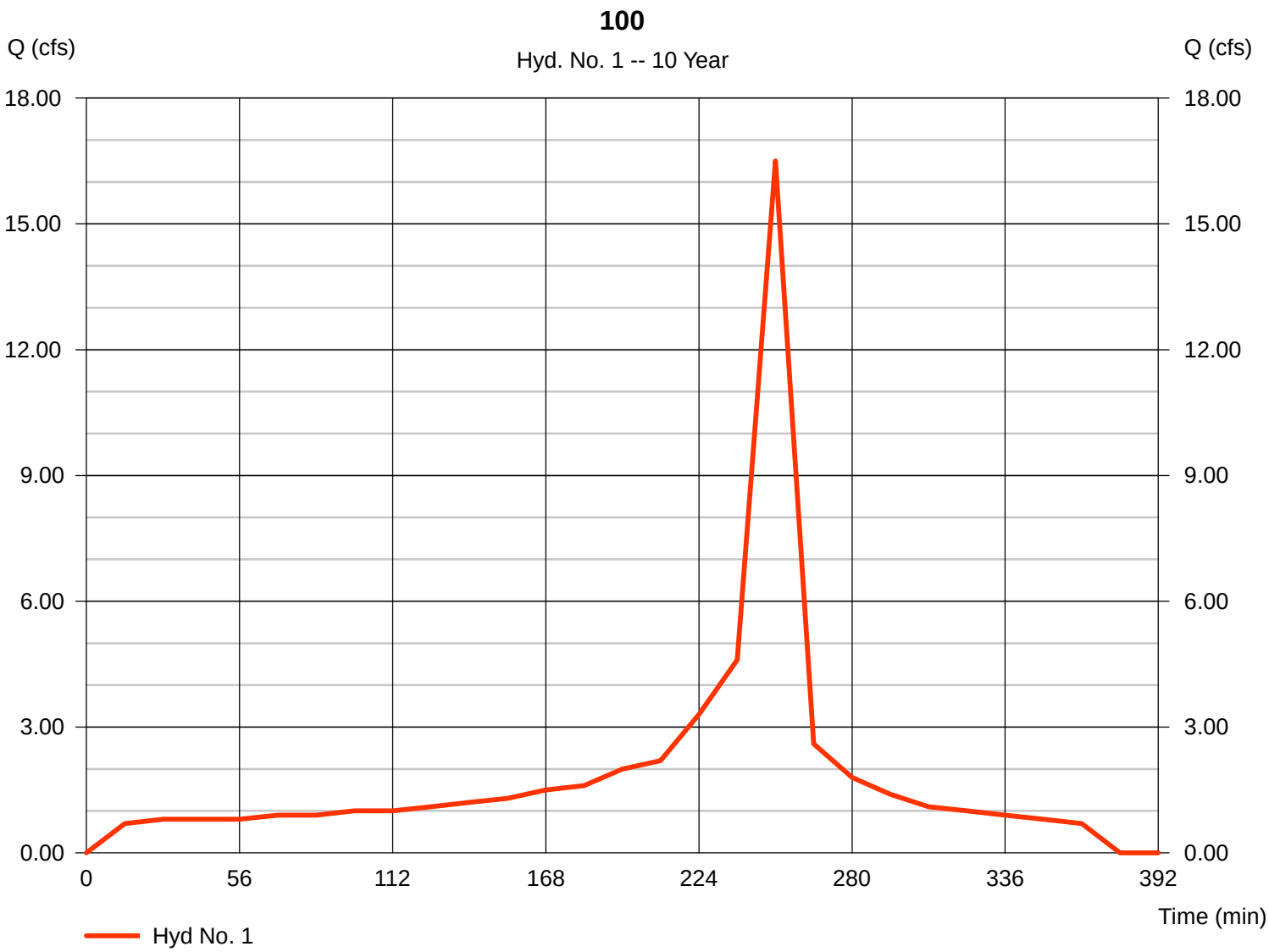
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 1

100

Hydrograph type	=	Manual	Peak discharge	=	16.50 cfs
Storm frequency	=	10 yrs	Time to peak	=	252 min
Time interval	=	14 min	Hyd. volume	=	44,100 cuft



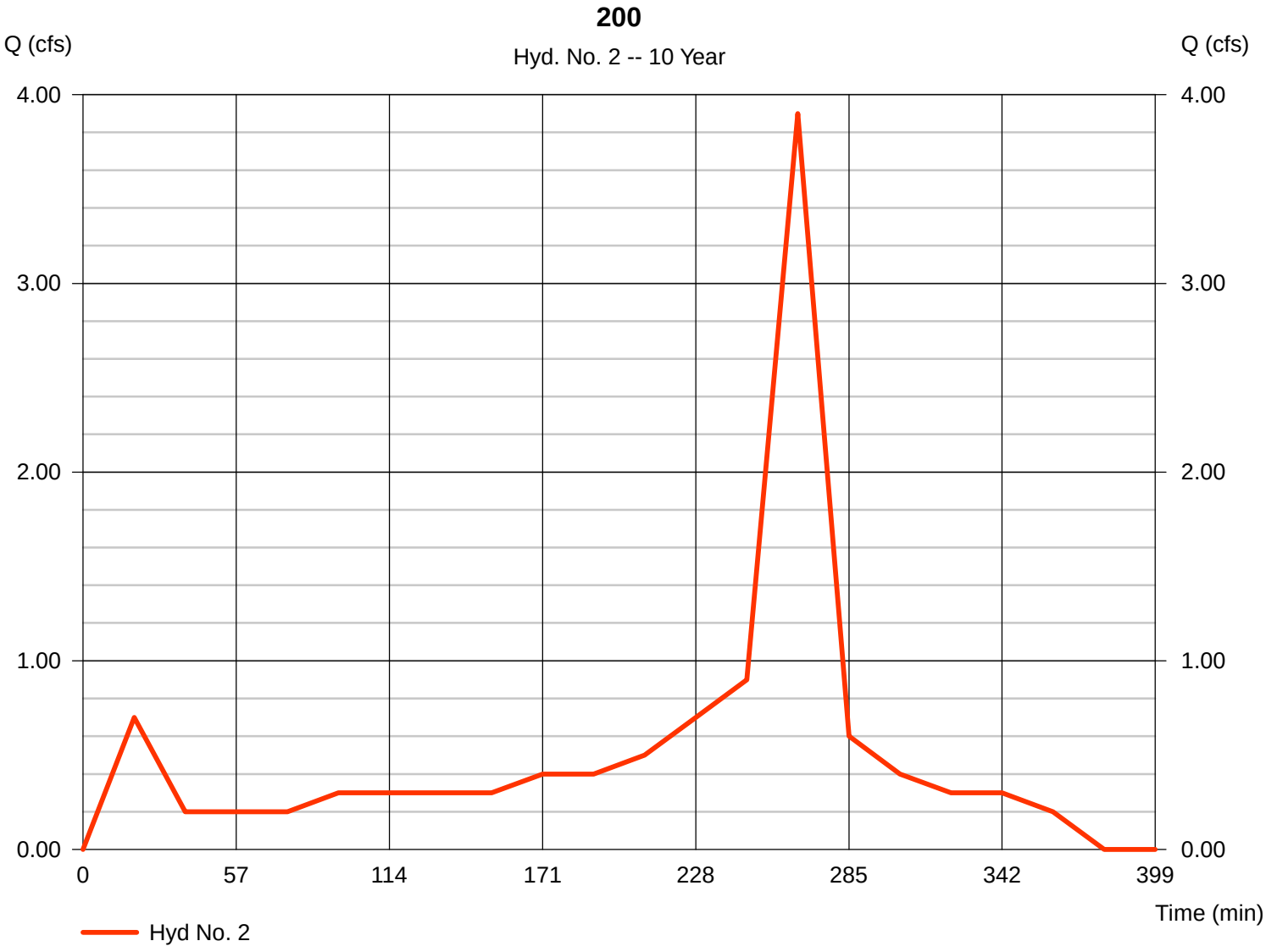
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 2

200

Hydrograph type	=	Manual	Peak discharge	=	3.900 cfs
Storm frequency	=	10 yrs	Time to peak	=	266 min
Time interval	=	19 min	Hyd. volume	=	12,654 cuft



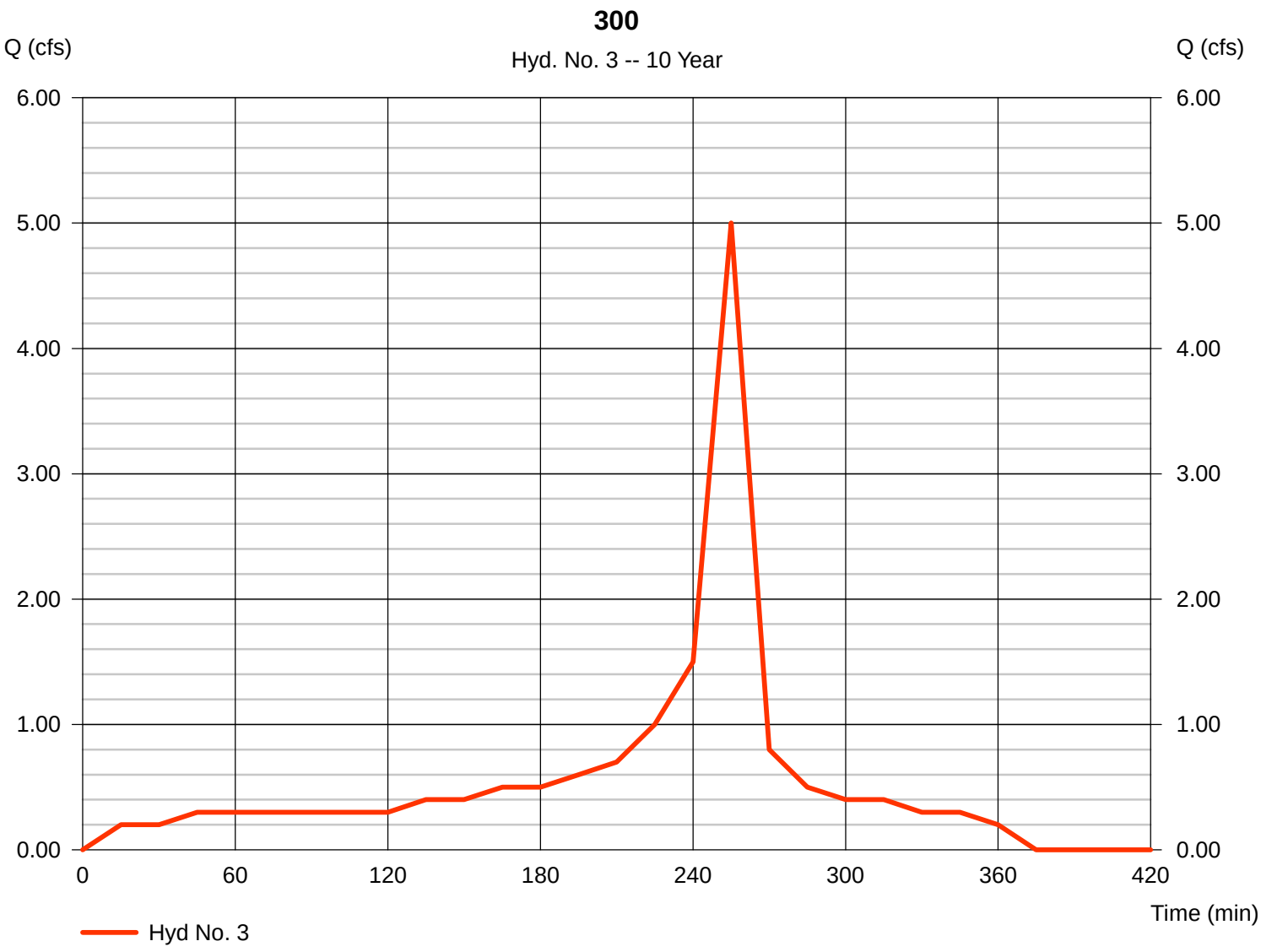
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 3

300

Hydrograph type	=	Manual	Peak discharge	=	5.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	255 min
Time interval	=	15 min	Hyd. volume	=	14,130 cuft



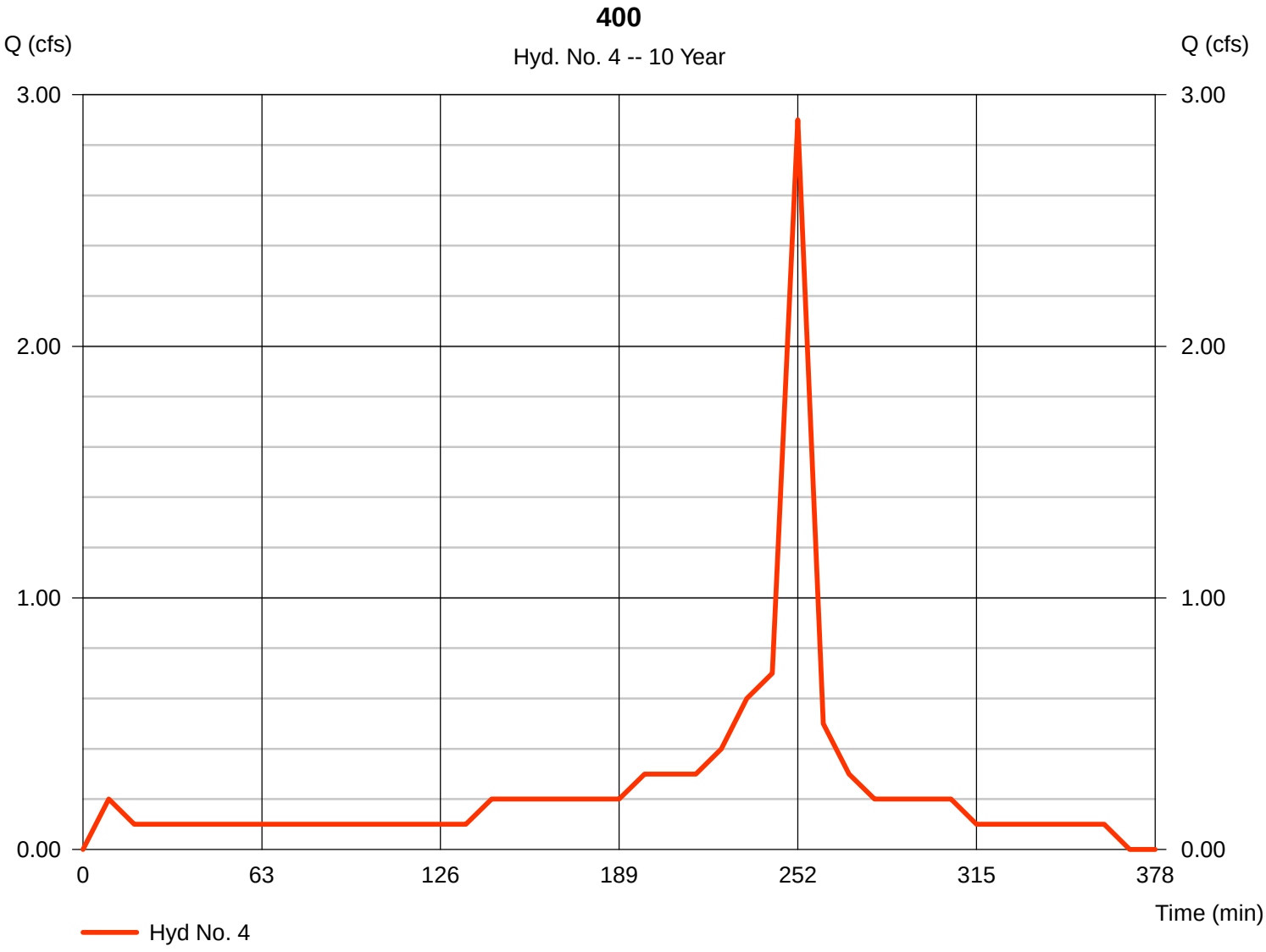
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 4

400

Hydrograph type	= Manual	Peak discharge	= 2.900 cfs
Storm frequency	= 10 yrs	Time to peak	= 252 min
Time interval	= 9 min	Hyd. volume	= 5,670 cuft



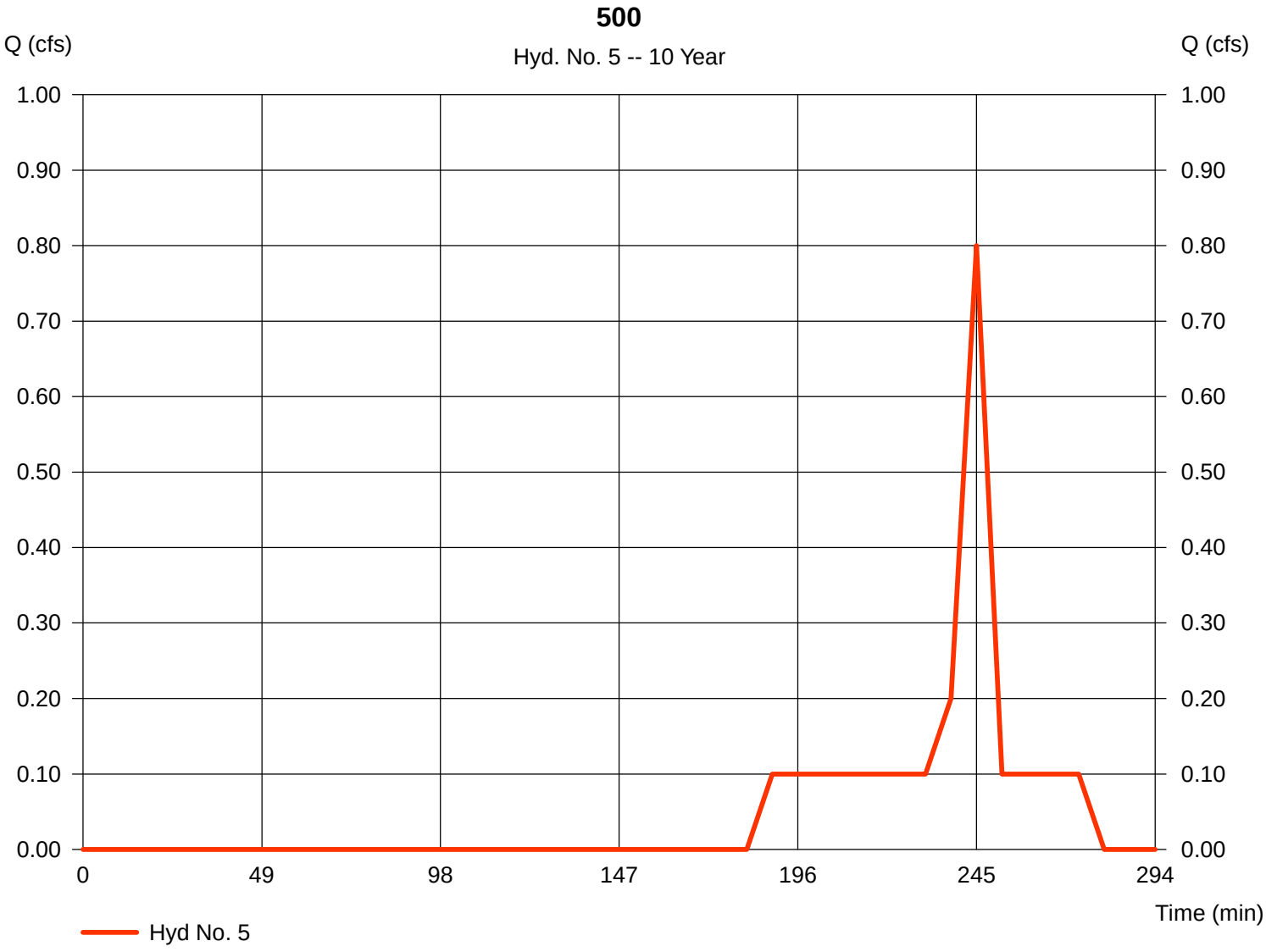
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 5

500

Hydrograph type	=	Manual	Peak discharge	=	0.800 cfs
Storm frequency	=	10 yrs	Time to peak	=	245 min
Time interval	=	7 min	Hyd. volume	=	882 cuft



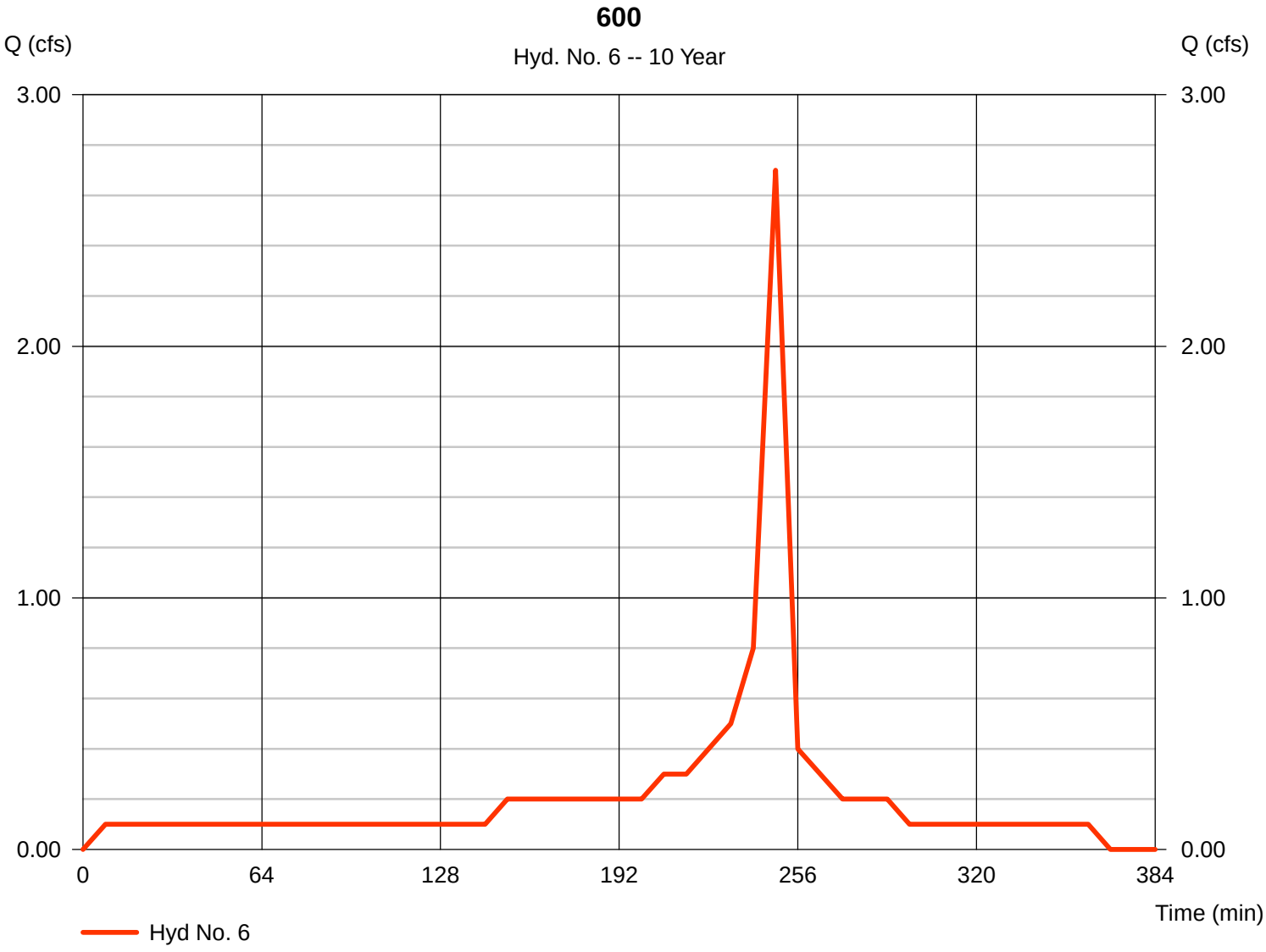
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 6

600

Hydrograph type	= Manual	Peak discharge	= 2.700 cfs
Storm frequency	= 10 yrs	Time to peak	= 248 min
Time interval	= 8 min	Hyd. volume	= 4,992 cuft



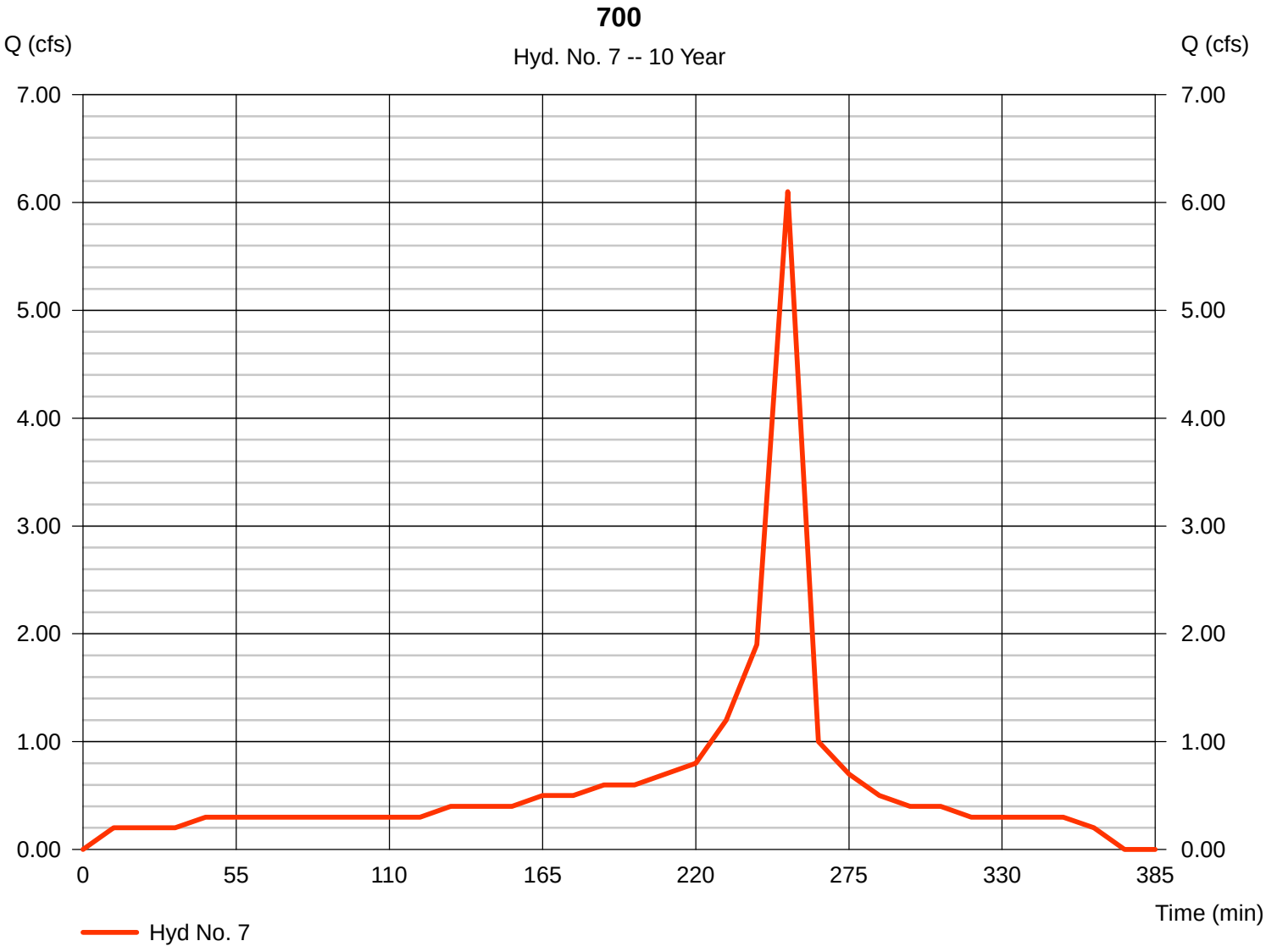
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 7

700

Hydrograph type	=	Manual	Peak discharge	=	6.100 cfs
Storm frequency	=	10 yrs	Time to peak	=	253 min
Time interval	=	11 min	Hyd. volume	=	14,190 cuft



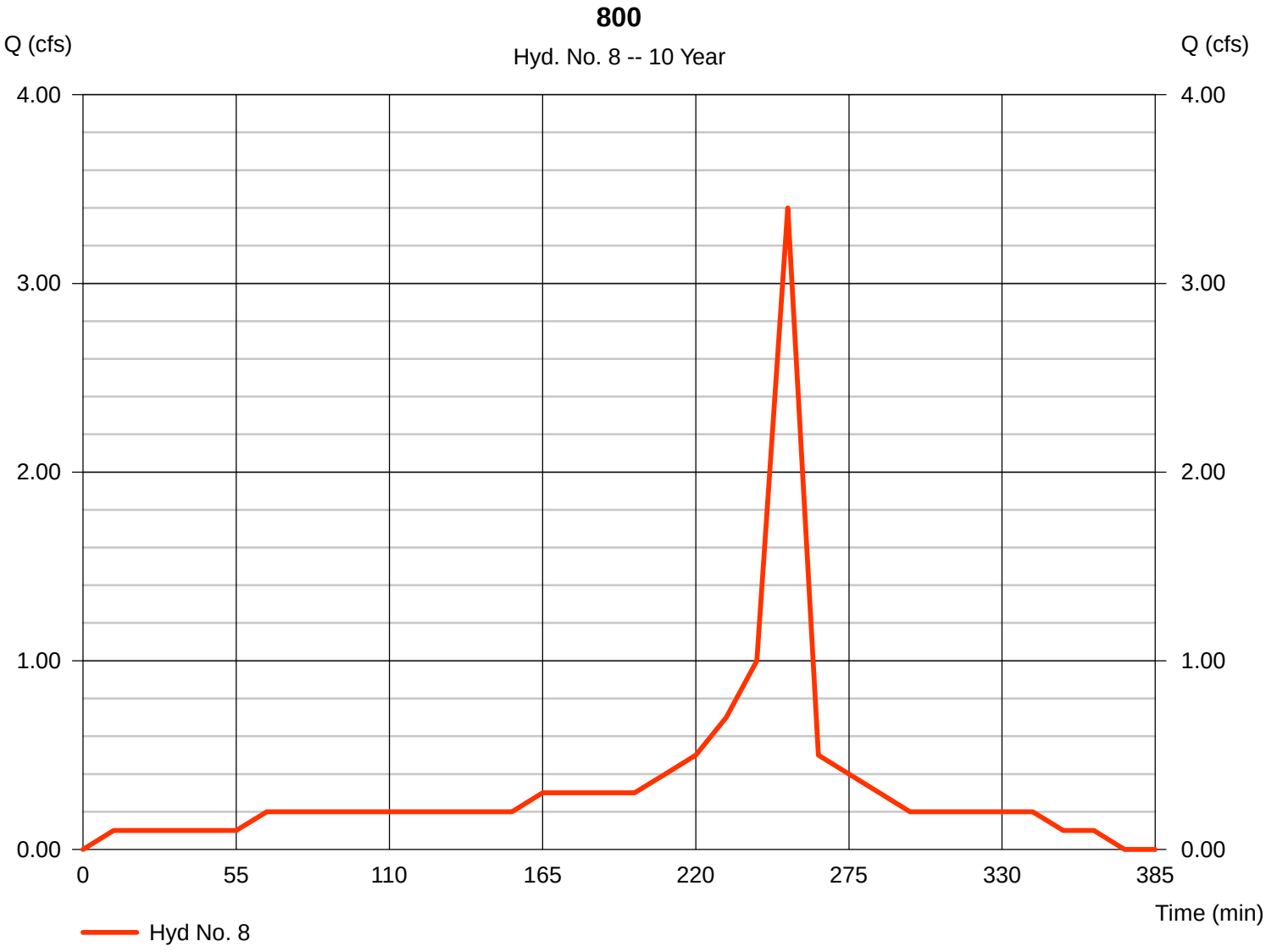
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 8

800

Hydrograph type	=	Manual	Peak discharge	=	3.400 cfs
Storm frequency	=	10 yrs	Time to peak	=	253 min
Time interval	=	11 min	Hyd. volume	=	7,854 cuft



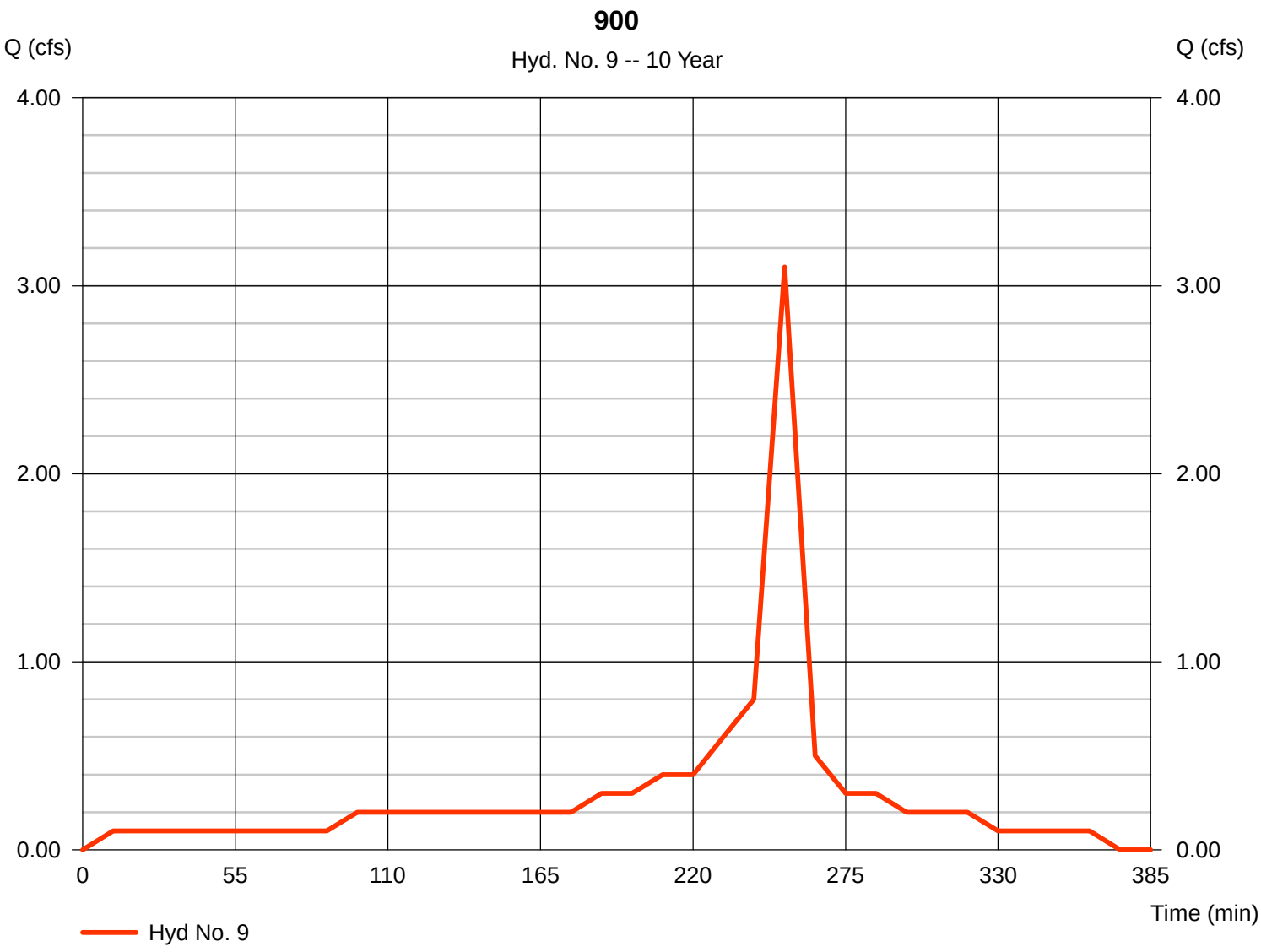
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 9

900

Hydrograph type	=	Manual	Peak discharge	=	3.100 cfs
Storm frequency	=	10 yrs	Time to peak	=	253 min
Time interval	=	11 min	Hyd. volume	=	6,864 cuft



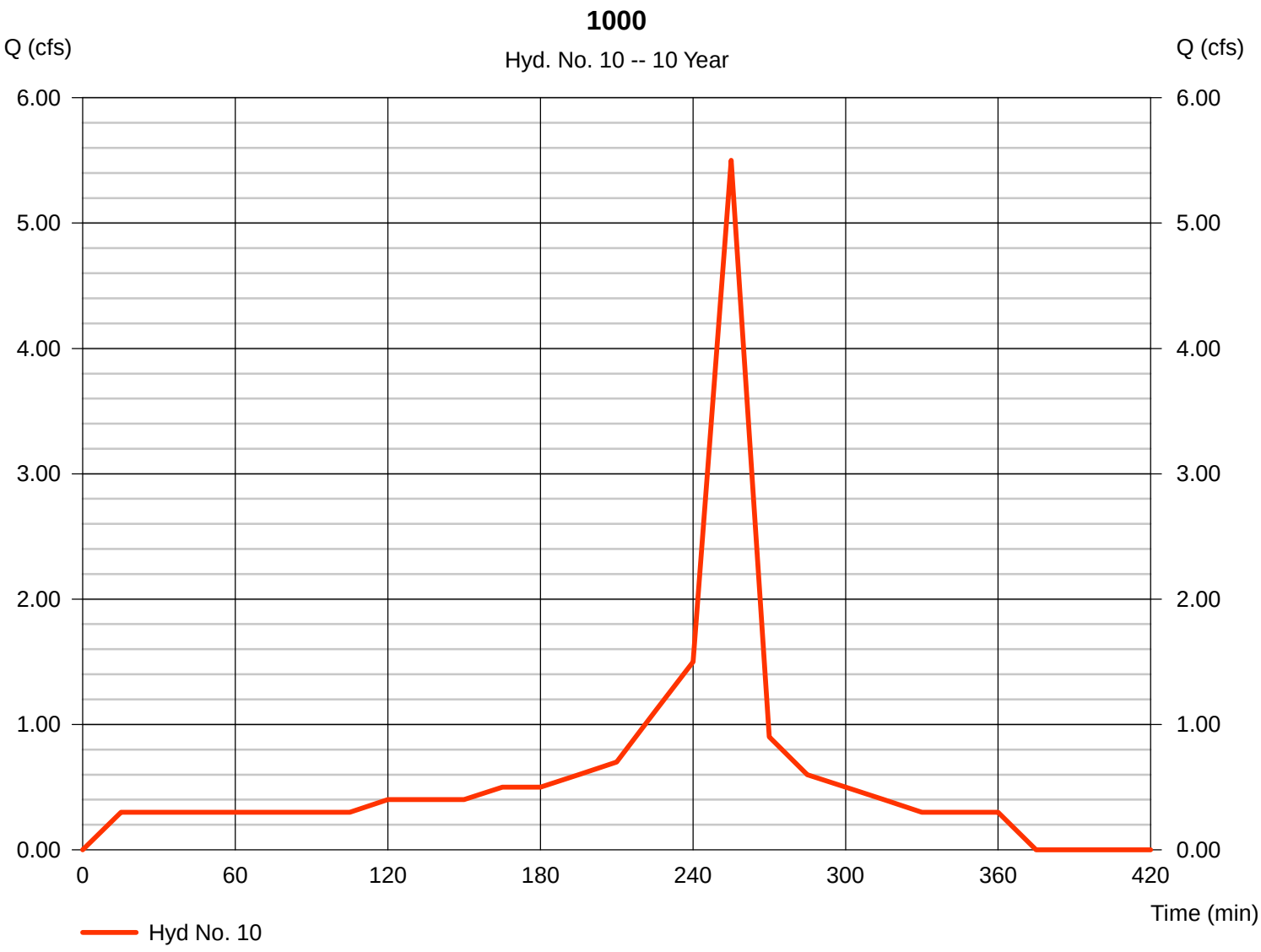
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 10

1000

Hydrograph type	=	Manual	Peak discharge	=	5.500 cfs
Storm frequency	=	10 yrs	Time to peak	=	255 min
Time interval	=	15 min	Hyd. volume	=	15,300 cuft



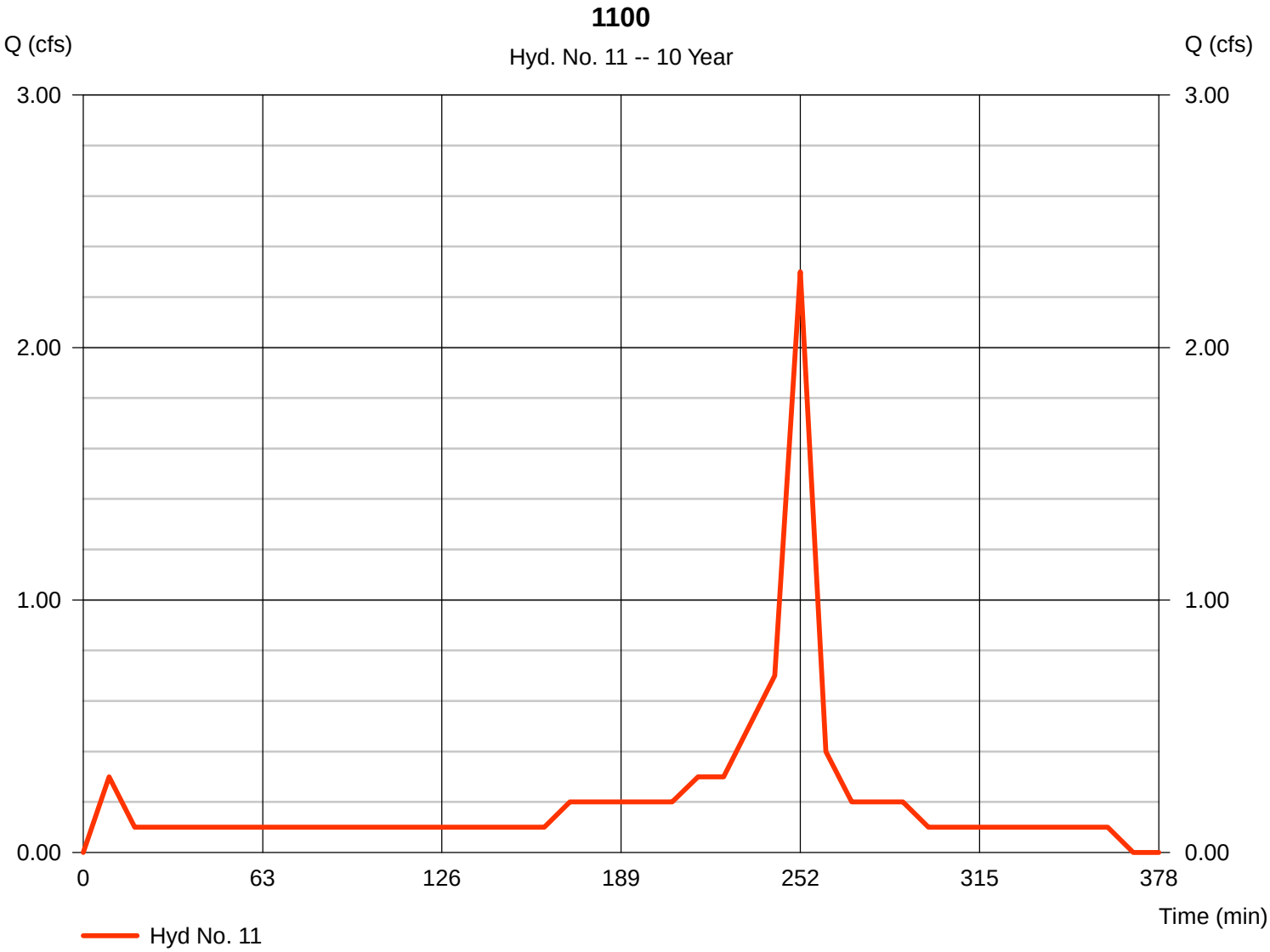
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 11

1100

Hydrograph type	= Manual	Peak discharge	= 2.300 cfs
Storm frequency	= 10 yrs	Time to peak	= 252 min
Time interval	= 9 min	Hyd. volume	= 4,806 cuft



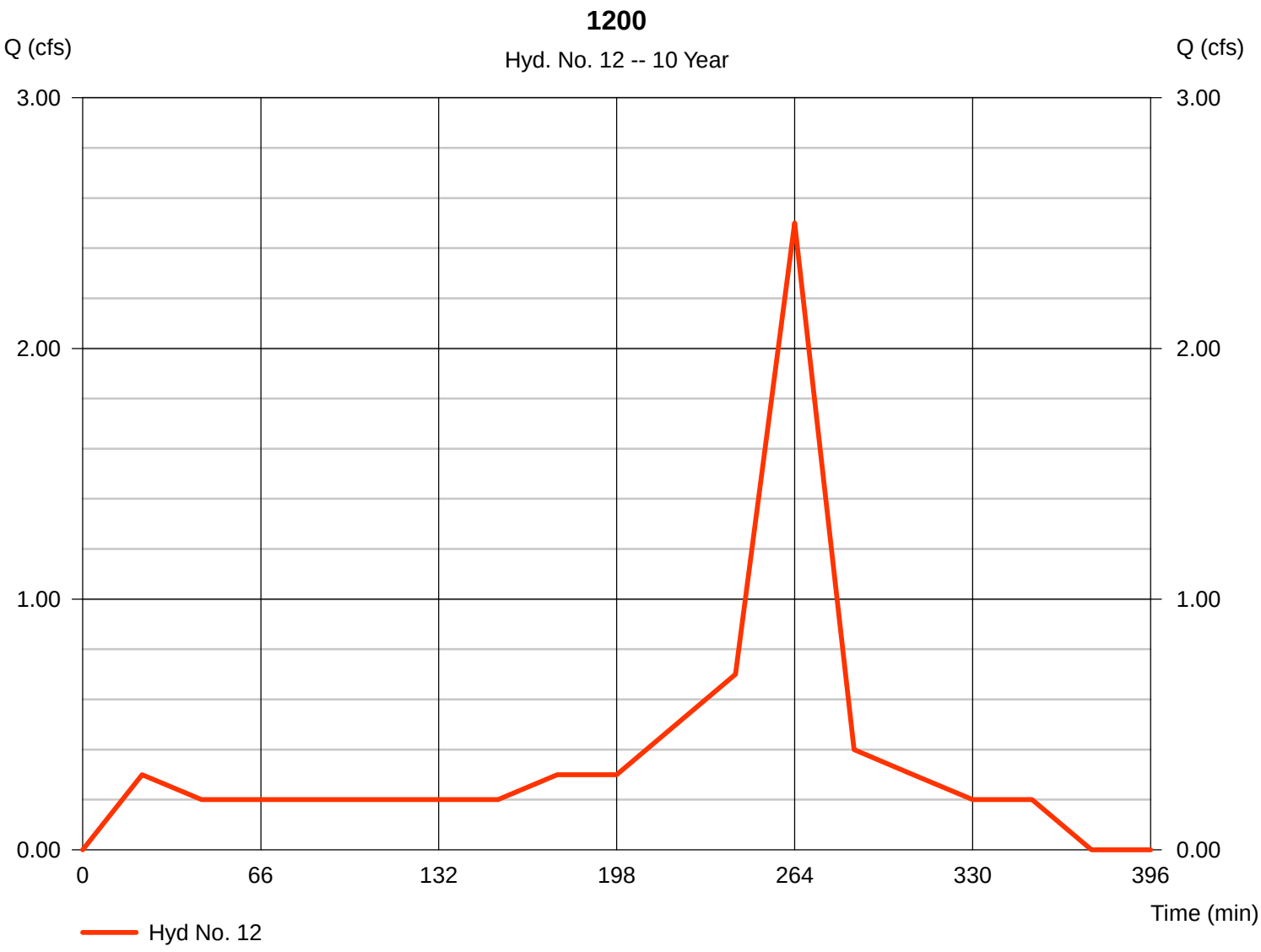
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 12

1200

Hydrograph type	=	Manual	Peak discharge	=	2.500 cfs
Storm frequency	=	10 yrs	Time to peak	=	264 min
Time interval	=	22 min	Hyd. volume	=	9,108 cuft



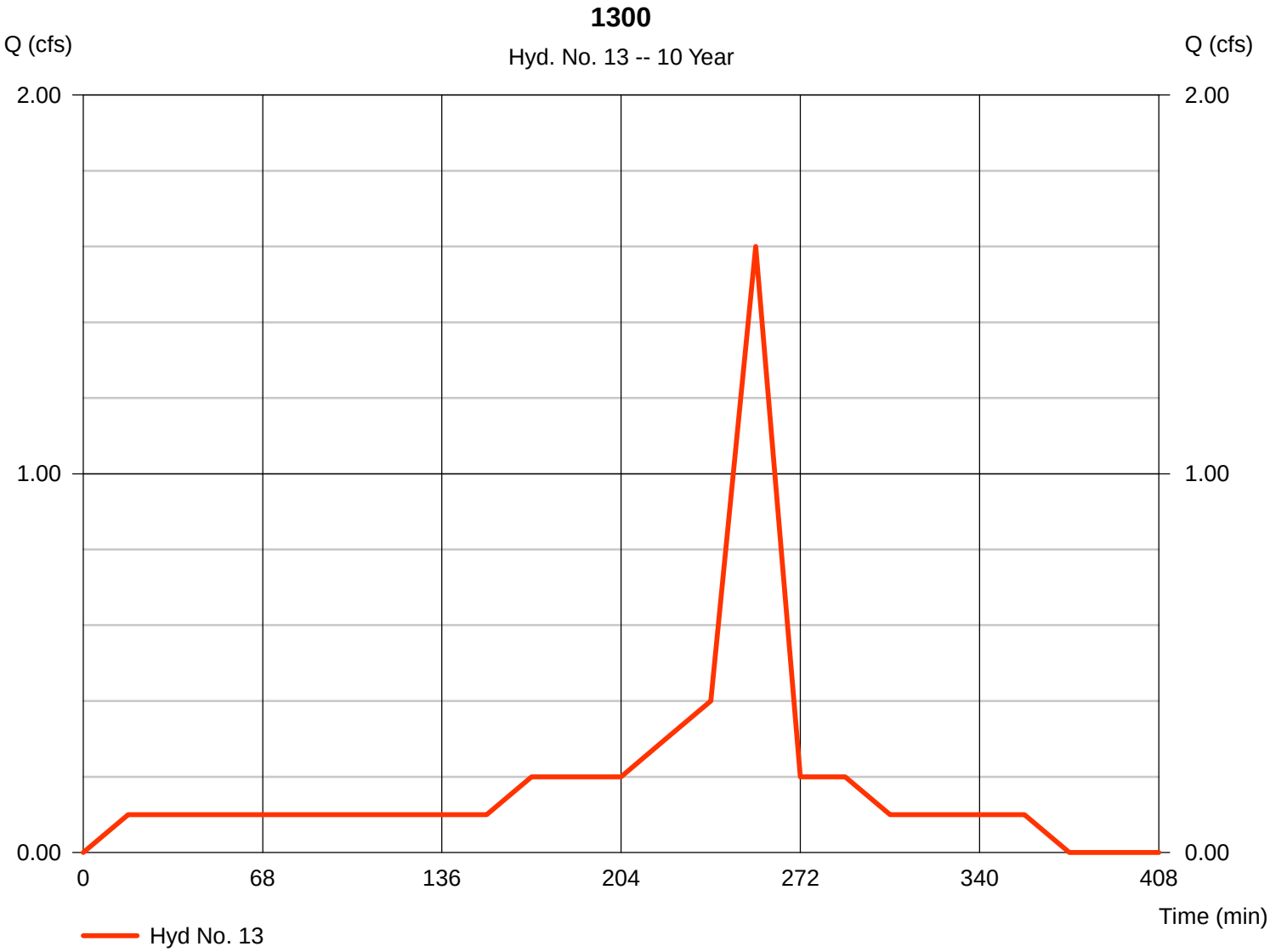
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 13

1300

Hydrograph type	=	Manual	Peak discharge	=	1.600 cfs
Storm frequency	=	10 yrs	Time to peak	=	255 min
Time interval	=	17 min	Hyd. volume	=	4,692 cuft



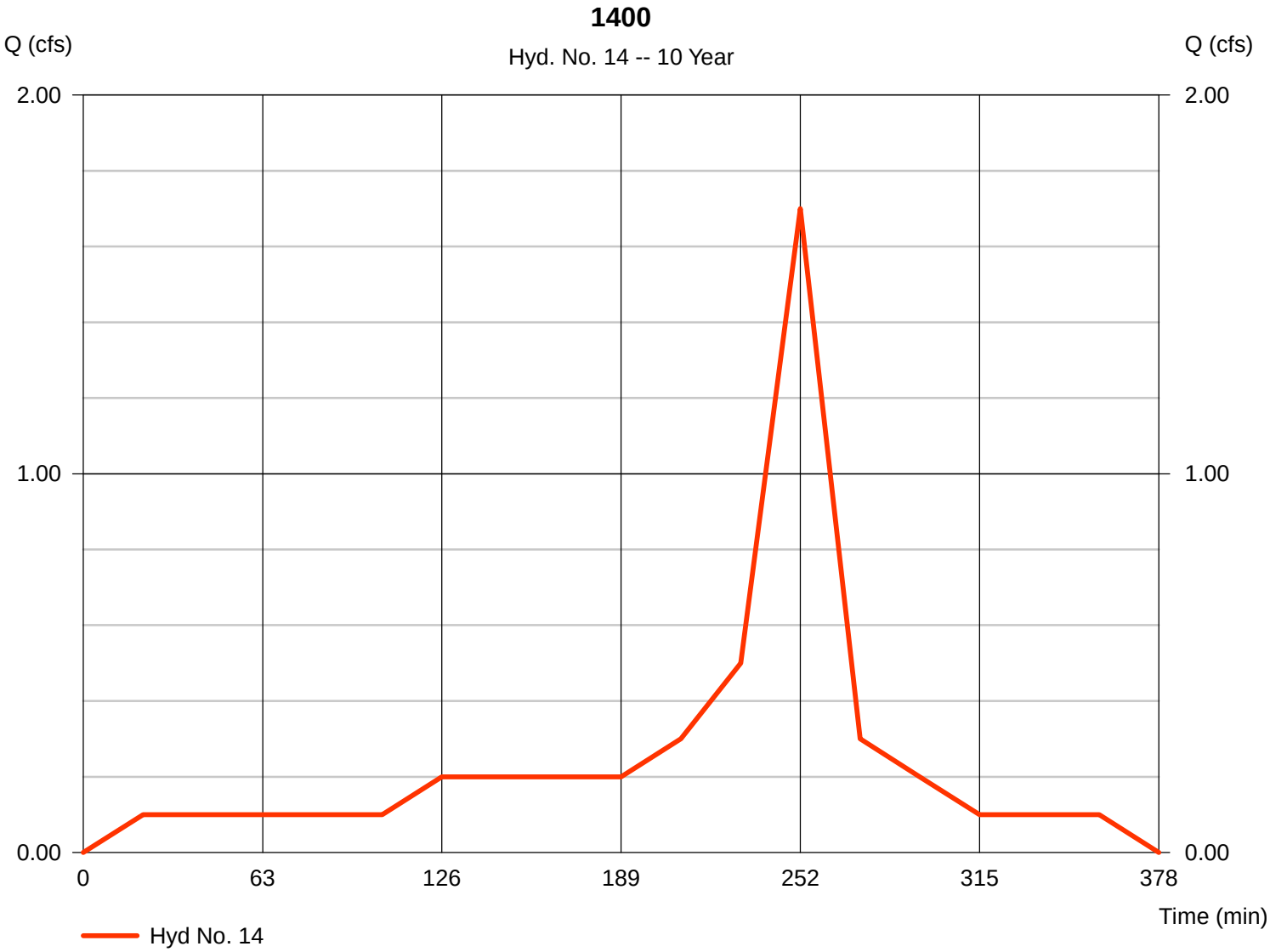
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 14

1400

Hydrograph type	=	Manual	Peak discharge	=	1.700 cfs
Storm frequency	=	10 yrs	Time to peak	=	252 min
Time interval	=	21 min	Hyd. volume	=	5,796 cuft



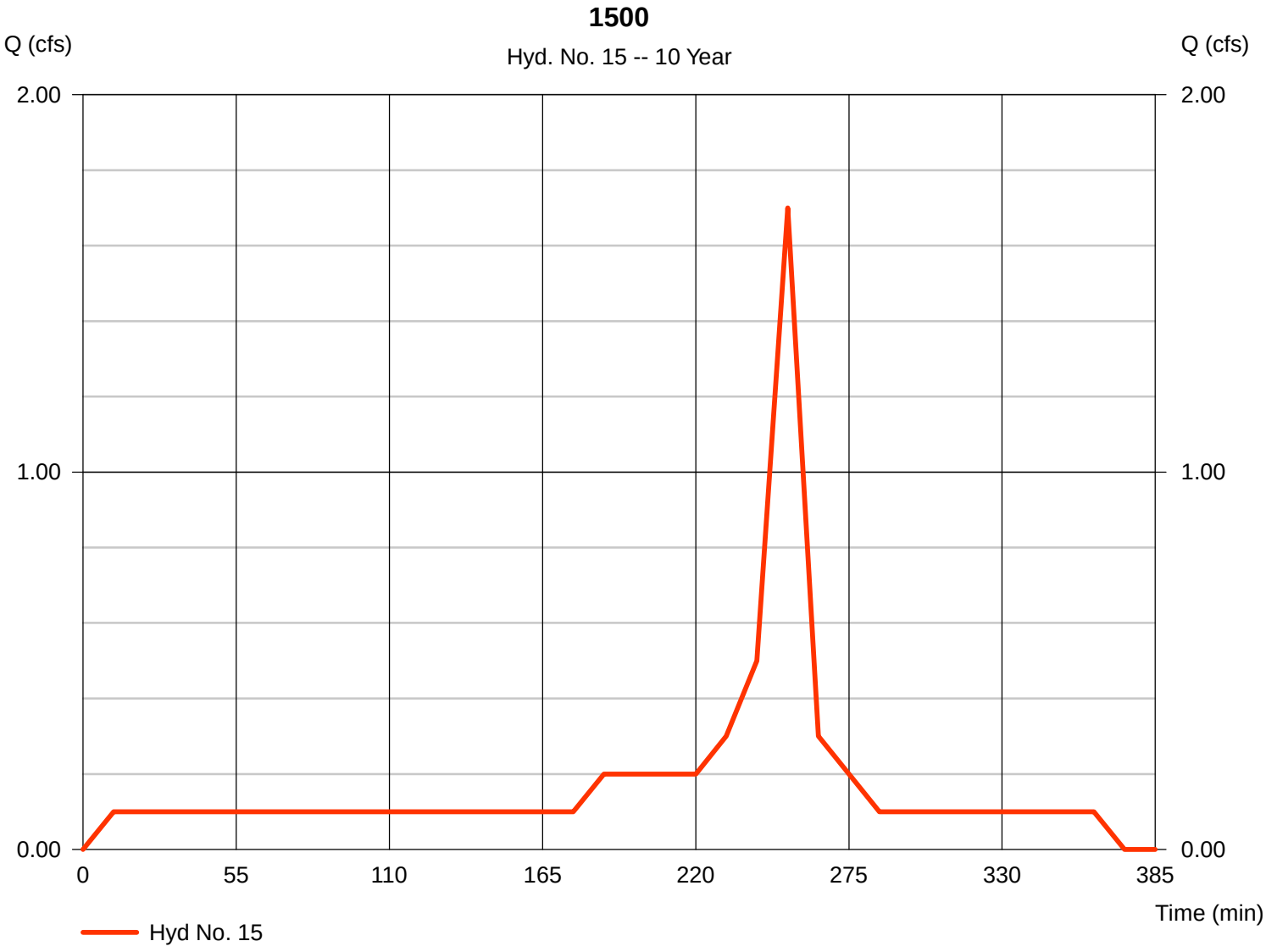
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 15

1500

Hydrograph type	=	Manual	Peak discharge	=	1.700 cfs
Storm frequency	=	10 yrs	Time to peak	=	253 min
Time interval	=	11 min	Hyd. volume	=	4,092 cuft



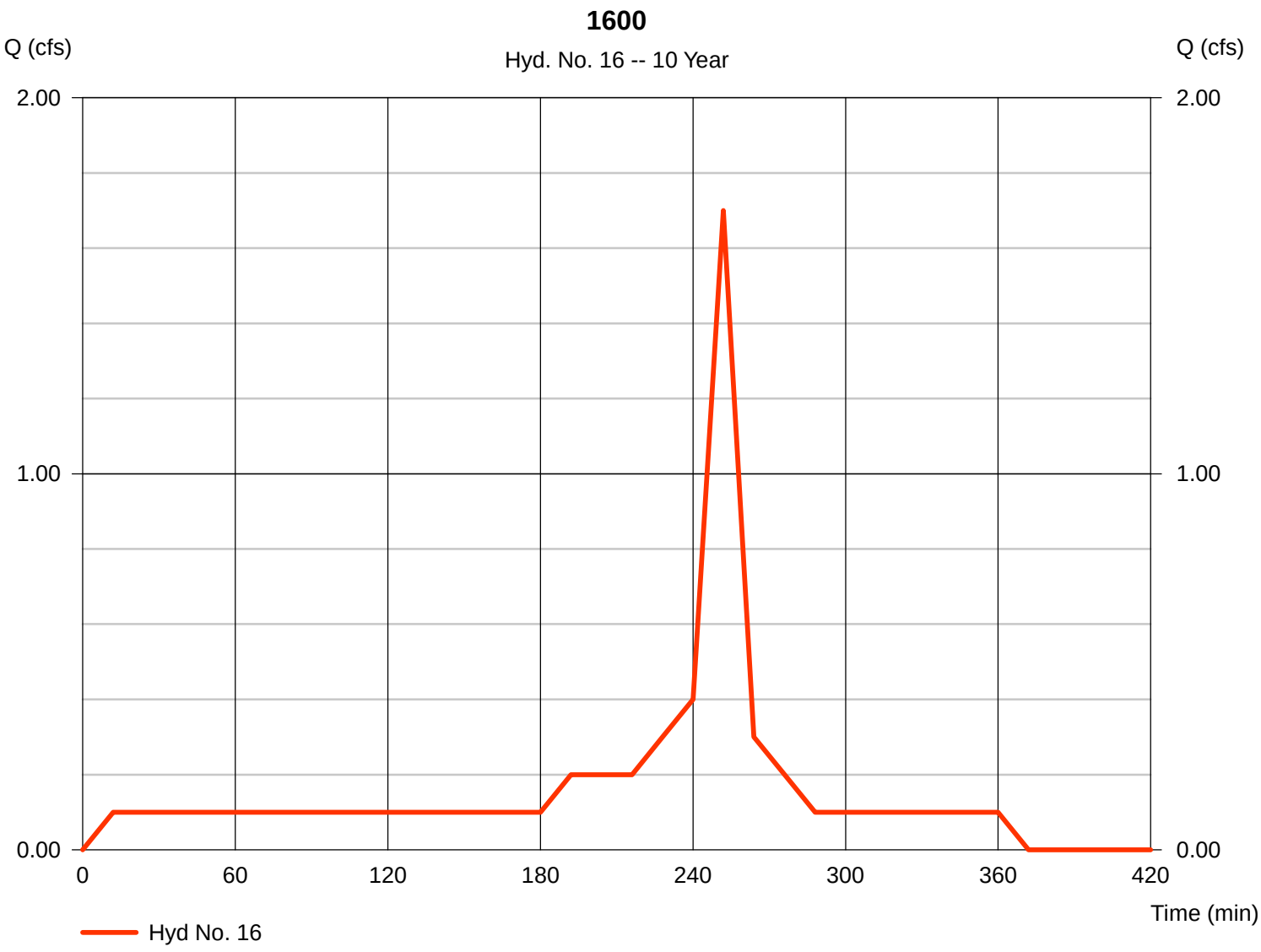
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Saturday, Nov 26, 2016

Hyd. No. 16

1600

Hydrograph type	=	Manual	Peak discharge	=	1.700 cfs
Storm frequency	=	10 yrs	Time to peak	=	252 min
Time interval	=	12 min	Hyd. volume	=	4,104 cuft



CITY OF ENCINITAS
STORMWATER INTAKE FORM AND PRIORITY DEVELOPMENT PROJECT
STORMWATER QUALITY MANAGEMENT PLAN (SWQMP)

FOR:

North Coast Highway 101 Streetscape
Project Number CS04D

PREPARED BY:

Michael Baker INTERNATIONAL
5050 Avenida Encinas, Suite 260
Carlsbad, California 92008
(760) 476-9193

PREPARED FOR:
City of Encinitas
505 South Vulcan Avenue
Encinitas, CA 92024

DATE OF SWQMP:
August 2014
Revision 1: May 13, 2015
Revision 2: October 26, 2016

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PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the Priority Development Project (PDP) requirements of the City of Encinitas BMP Design Manual, which is a design manual for compliance with local City of Encinitas and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP Storm Water Quality Management Plan (SWQMP) by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

RCE 77285

Engineer of Work's Signature, PE Number

David A. Wiener

Print Name

Michael Baker International

Company

10/26/2016

Date

Engineer's Seal

PROJECT OWNER'S CERTIFICATION

This PDP SWQMP has been prepared for City of Encinitas. The PDP SWQMP is intended to comply with the PDP requirements of the City of Encinitas BMP Design Manual, which is a design manual for compliance with local City of Encinitas and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

_____

Project Owner's Signature

_____

Print Name

_____

Company

_____

Date

SUBMITTAL RECORD

Use this table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In the fourth column, summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Submittal Number	Date	Project Status	Summary of Changes
1	August 20, 2014	☒ Preliminary Design / Planning/ CEQA ☐ Final Design	Initial Submittal
2	May 13, 2015	☒ Preliminary Design / Planning/ CEQA ☐ Final Design	New MS4 Permit
3	October 26, 2016	☒ Preliminary Design / Planning/ CEQA ☐ Final Design	New SWQMP Template
4		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	

PROJECT IDENTIFICATION

Project/Applicant Name: City of Encinitas	
Permit/Application Number: CS04D	Date: October 17, 2016
Site Address: Highway 101 Leucadia	APN:
Scope of work/project description: Streetscape improvements on Highway 101 between A Street and La Costa Avenue, including new median, sidewalk, curb & gutter, roundabouts, asphalt pavement, landscaping, lighting, and on-street parking.	

DETERMINATION OF PROJECT STATUS AND REQUIREMENTS

This form will identify permanent, post construction BMP requirements. Refer to City of Encinitas Stormwater BMP Design Manual for guidance.		
Step 1: Is the project a "development project"? Development projects are defined as "construction, rehabilitation, redevelopment, or reconstruction of any public or private projects". See Section 1.3 and Table 1-2 of the manual for guidance. For example, interior remodels, roof replacements, and electrical and plumbing work are not development projects.	☒ Yes	***Go to Step 2.***
	□ No	***Stop.*** Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
If "No", provide discussion / justification explaining why the project is not a "development project":		

Step 2: Complete questions below for Project Type Determination. The project is (select one): □New Development ☒ Redevelopment			
The total proposed, newly created and/or replaced impervious area is: 610,000 ft^2			
Is the project in any of the following categories, (a) through (f) below?			
Yes ☒	No □	(a)	New development projects or redevelopment projects that create and/or replaced 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects.
Yes ☒	No □	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects.
Yes ☒	No □	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support

			one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes ☐	No ☒	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharge directly to an Environmentally Sensitive Area (ESA). "Discharge directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and SDRWQCB; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and SDRWQCB; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See manual Section 1.4.2 for additional guidance.
Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets. This category includes retail gasoline outlets that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the PDP categories (a) through (f) listed above?

☒ Yes – **The project is a Priority Development Project, the applicant shall provide PDP Post Construction BMPs and *continue to Step 3*.**

☐No – **The project is a Standard or Basic Project. *Stop here and complete the "City of Encinitas Stormwater Intake Form for All Developments and Standard Projects SWQMP".***

The following is for *redevelopment PDPs* only:

The area of existing (pre-project) impervious area at the project site is: 14.7 acres (A)
The total proposed newly created or replaced impervious area is: 14.0 acres (B)
Percent impervious surface created or replaced (B/A)*100: 95%
The percent impervious surface created or replaced is (select one based on the above calculation):

☐ Less than or equal to fifty percent (50%) – only new and/or replaced impervious areas are considered PDP subject to treatment and HMP criteria
OR

☒ Greater than fifty percent (50%) – the entire site is a PDP; treatment and HMP criteria apply to entire site regardless of whether it is replaced		
Step 3 (PDPs only): Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual for guidance.	☒Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). ***Go to Step 4.***
	□ No	PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below. ***Go to "Site Information Checklist"***
Discussion / justification if hydromodification control requirements do not apply: Hydromodification control requirements do not apply to the portions of the project that discharges via storm drain piping directly to the Pacific Ocean. Refer to DMA Exhibit.		
Step 4 (PDPs subject to treatment and hydromodification controls): Does protection of critical coarse sediment yield areas apply based on review of City of Encinitas Potential Critical Coarse Sediment Yield Area Map? See Section 6.2 of the BMP Design Manual for guidance.	□ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). ***Go to "Site Information Checklist"***
	☒No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. ***Go to "Site Information Checklist"***
Discussion / justification if management measures not required for protection of critical coarse sediment yield areas: No critical coarse sediment yield areas exist within project area per County GIS map.		

SITE INFORMATION CHECKLIST

Project's Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	904.51 – Batiquitos HSA
Area to be Disturbed by the Project (Project Area)	30.8 Acres (_____ Square Feet)
Project Proposed Impervious Area (Subset of Project Area)	24.0 Acres (_____ Square Feet)
Project Proposed Pervious Area (Subset of Project Area)	6.8 Acres (_____ Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Description of Existing Site Condition

Current status of the site (select all that apply):

☒ Existing development

☐ Previously graded but not built out

☐ Demolition completed without new construction

☐ Agricultural or other non-impervious use

☐ Vacant, undeveloped/natural

Description / Additional Information:
Existing roadway

Existing Land Cover includes (select all that apply):

☒ Vegetative Cover

☒ Non-Vegetated Pervious Areas

☒ Impervious Areas

Description / Additional Information:
Existing asphalt road; with portions of concrete sidewalk, landscaping, and dirt shoulder

Underlying soil belongs to Hydrologic Soil Group (select all that apply):

☐ NRCS Type A

☒ NRCS Type B

☐ NRCS Type C

☐ NRCS Type D

Approximate Depth to Groundwater (GW):

☐ GW Depth < 5 feet

☐ 5 feet < GW Depth < 10 feet

☐ 10 feet < GW Depth < 20 feet

☐ GW Depth > 20 feet

☒ Not known – geotechnical testing has not been performed

Existing Natural Hydrologic Features (select all that apply):

☐ Watercourses

☐ Seeps

☐ Springs

☐ Wetlands

☒ None

Description / Additional Information:

Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1) Is existing drainage conveyance natural or urban?
2) Is runoff from offsite conveyed through the site? If yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site.
3) Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels. And
4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Describe existing site drainage patterns:

1. Existing drainage conveyance within the site is urban, consisting of curb, gutter, and storm drain piping. These conveyances discharge to natural systems, including Cottonwood Creek, Moonlight Beach, and South Ponto Beach.
2. Offsite flows entering the roadway drainage area come from portions of business frontages along Highway 101.
3. The drainage conveyance for the site is curb & gutter along portions of the corridor. North of Basil Street exists storm drain piping that conveys flow north to existing detention basins and Batiquitos Lagoon. South of Basil Street, curb & gutter conveys drainage offsite to storm drain that conveys flow south to Cottonwood Creek. There are several sump areas within the project vicinity, generally adjacent to the railroad tracks, in which runoff ponds and infiltrates.
4. Point of compliance (POC) A is located at the south end of the project, and where flow enters storm drain pipe that flows to Cottonwood Creek. POC B is located at Marcheta Street, where flow continues southwest via gutter surface flow to Cottonwood Creek and the Pacific Ocean. POC C is at El Portal Street, where flow continues southwest via gutter surface flow to Cottonwood Creek and the Pacific Ocean. POC D is located at existing detention basins northwest of La Costa Avenue, where runoff from the site outfalls from existing storm drain piping. POC E is located at Batiquitos Lagoon northeast of La Costa Avenue, where runoff from the site outfalls from existing storm drain piping.

Description of Proposed Site Development
Project Description / Proposed Land Use and/or Activities: The project proposes improvements on Highway 101 from A Street to La Costa Avenue. Proposed improvements include sidewalk, curb & gutter, angled and parallel parking, tree grates, new asphalt paving, roundabouts, median, and landscaped areas.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Concrete sidewalk, curb & gutter, and asphalt pavement.
List/describe proposed pervious features of the project (e.g., landscape areas): Landscaped parkway adjacent to curb & gutter, and landscaped median.
Does the project include grading and changes to site topography? ☒ Yes ☐ No Description / Additional Information: The project will maintain existing grades at the businesses along the west side of Highway 101 and the railroad tracks along the east side of Highway 101. However, roadway grades along the improved corridor will change in order to keep positive flow in proposed curb & gutter. Existing sump areas will be eliminated and drainage will be directed to proposed bioretention areas connected to proposed and existing storm drain piping.

Description of Proposed Site Drainage Patterns
Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)? ☒ Yes ☐ No If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations. Describe proposed site drainage patterns: Roadway drainage will be directed to proposed curb and gutter. Bioretention areas will be constructed in portions of the proposed landscaped areas adjacent to the roadway, and will receive runoff via curb cuts. The bioretention areas will serve as water-quality and flow-control BMPs. The proposed bioretention areas will flow to proposed storm drain piping that will either connect to existing storm drain piping or outlet to existing curb & gutter.

Identification and Narrative of Receiving Water and Pollutants of Concern
Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): Point of compliance (POC) A is located at the south end of the project, and where flow enters storm drain pipe that flows to Cottonwood Creek. POC B is located at Marcheta Street, where flow continues southwest via gutter surface flow to Cottonwood Creek and the Pacific Ocean. POC C is at El Portal Street, where flow continues southwest via gutter surface flow to Cottonwood Creek and the Pacific Ocean. POC D is located at existing detention basins northwest of La Costa Avenue, where runoff from the site outfalls from existing storm drain piping. POC E is located at Batiquitos Lagoon northeast of La Costa Avenue, where runoff from the site outfalls from existing storm drain piping.
List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
none	none	none

Identification of Project Site Pollutants*

***Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)**

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6):

Pollutant	Not Applicable to the Project Site	Expected from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment		X	
Nutrients		X	
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris		X	
Oxygen Demanding Substances			
Oil & Grease		X	

Bacteria & Viruses	X		
Pesticides		X	

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

☒ Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

For the purposes of this report it is assumed that hydromodification management is required throughout the project area. It may be determined later in the design phase that portions of the project area are exempt from hydromodification management, specifically areas that outfall directly to the Pacific Ocean and Batiquitos Lagoon.

Critical Coarse Sediment Yield Areas*   *This section only required if hydromodification management requirements apply
Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?   ☐ Yes   ☒ No, no critical coarse sediment yield areas to be protected based on WMAA maps   If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?   ☐ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite   ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment   ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite   ☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps   If optional analyses were performed, what was the final result?   ☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite   ☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the SWQMP.   ☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.   Discussion / Additional Information:

Flow Control for Post-Project Runoff*   *This section only required if hydromodification management requirements apply
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. Point of compliance (POC) A is located at the south end of the project, and where flow enters storm drain pipe that flows to Cottonwood Creek. POC B is located at Marcheta Street, where flow continues southwest via gutter surface flow to Cottonwood Creek and the Pacific Ocean. POC C is at El Portal Street, where flow continues southwest via gutter surface flow to Cottonwood Creek and the Pacific Ocean. POC D is located at existing detention basins northwest of La Costa Avenue, where runoff from the site outfalls from existing storm drain piping. POC E is located at Batiquitos Lagoon northeast of La Costa Avenue, where runoff from the site outfalls from existing storm drain piping.
Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is low flow threshold 0.1Q2 ☐ Yes, the result is low flow threshold 0.3Q2 ☐ Yes, the result is low flow threshold 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer: Discussion / Additional Information: (optional)
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements. As is typical with roadway projects, the constraint is available area within the right-of-way for proposed BMPs. Refer to the DMA Maps. The required bioretention BMP areas are shown on the maps. The challenge in final design will be grading the roadway in order to direct flow into the BMP areas.

Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

SOURCE CONTROL BMP CHECKLIST

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)	☒ Yes	☐ No	☐ N/A
☐ Onsite storm drain inlets	☐ Yes	☐ No	☒ N/A
☐ Interior floor drains and elevator shaft sump pumps drain to sewer	☐ Yes	☐ No	☒ N/A
☐ Interior parking garages drain to sewer	☐ Yes	☐ No	☒ N/A
☐ Need for future indoor & structural pest control	☒ Yes	☐ No	☐ N/A
☐ Landscape/outdoor pesticide use	☐ Yes	☐ No	☒ N/A
☐ Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
☐ Food service	☒ Yes	☐ No	☐ N/A
☐ Refuse/Trash areas must be covered	☐ Yes	☐ No	☒ N/A
☐ Industrial processes	☒ Yes	☐ No	☐ N/A
☐ Outdoor storage of equipment or materials must be covered	☐ Yes	☐ No	☒ N/A
☐ Vehicle and equipment cleaning	☐ Yes	☐ No	☒ N/A
☐ Vehicle/equipment repair and maintenance	☐ Yes	☐ No	☒ N/A
☐ Fuel dispensing areas	☐ Yes	☐ No	☒ N/A
☐ Loading docks	☐ Yes	☐ No	☒ N/A
☐ Fire sprinkler test water	☐ Yes	☐ No	☒ N/A
☐ Miscellaneous drain or wash water	☒ Yes	☐ No	☐ N/A
☐ Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A

Discussion / justification if SC-1 through SC-6 not implemented. Justification must be provided for ALL "No" answers shown above.

SITE DESIGN BMP CHECKLIST

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☒Yes	□ No	□ N/A
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒Yes	□ No	□ N/A
SD-3 Minimize Impervious Area	☒Yes	□ No	□ N/A
SD-4 Minimize Soil Compaction	☒Yes	□ No	□ N/A
SD-5 Impervious Area Dispersion - Directly Connected Impervious Areas (e.g. roof downspouts connected to street) are not allowed	☒Yes	□ No	□ N/A
SD-6 Runoff Collection	□ Yes	□ No	☒N/A
SD-7 Landscaping with Native or Drought Tolerant Species	☒Yes	□ No	□ N/A
SD-8 Harvesting and Using Precipitation	□ Yes	□ No	☒N/A

Discussion / justification if SD-1 through SD-8 not implemented. Justification must be provided for ALL "No" answers shown above.

PDP STRUCTURAL BMPS

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity (see Section 7 of the BMP Design Manual). The local jurisdiction will confirm the maintenance annually.

Use this section to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The structural BMPs for the project site are bioretention areas. The bioretention areas will serve as both pollutant control and flow control BMPs. Runoff from the proposed hardscape and roadway surface will be directed to the bioretention areas via curb cuts and surface sheet flow. The required BMP area for the site was determined using the hydromodification sizing factors as shown in the BMP Design Manual.

STRUCTURAL BMP SUMMARY INFORMATION

Copy this page as necessary to provide information on each individual proposed structural BMP

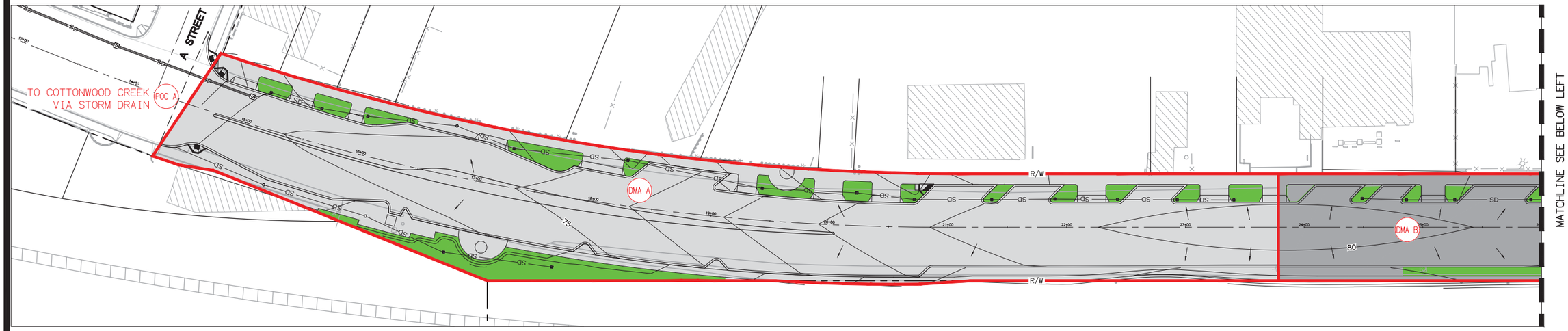
Structural BMP ID No: (all)	DMA No: A-E
Construction Plan Sheet No:	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☒ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will inspect and certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms required by the City Engineer (See Section 1.12 of the BMP Design Manual)	City of Encinitas
Who will be the final owner of this BMP?	City of Encinitas
Who will maintain this BMP into perpetuity?	City of Encinitas
What is the funding mechanism for maintenance?	City of Encinitas
Discussion (as needed):	

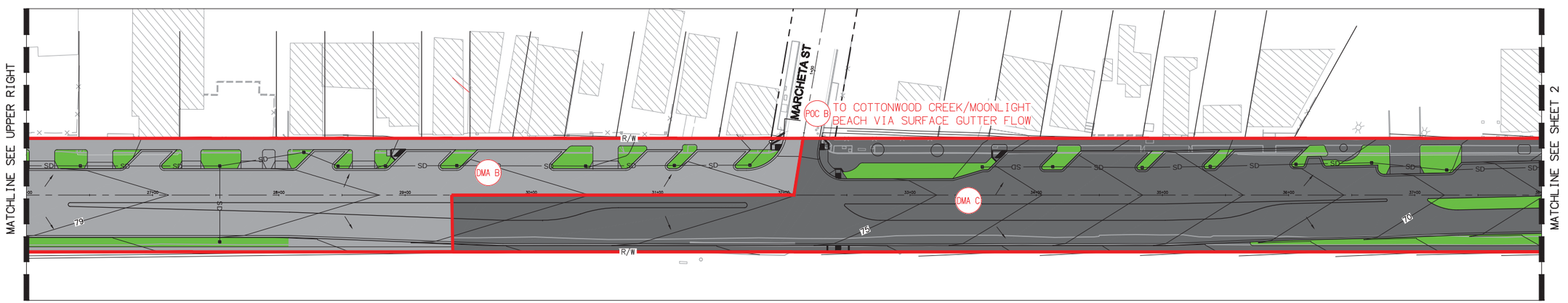
ATTACHMENT 1 - BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which items are included behind this cover sheet:

Attachment	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☐ Included on DMA Exhibit in Attachment 1a ☒Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☐ Included ☒Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☐ Included ☐ Not included because the entire project will use harvest and use BMPs ☒Not included because geotechnical investigation has not been performed
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☐ Included





LEGEND

- BIORETENTION WITH CURB CUTS
- EX. STORM DRAIN — SD —
- PROPOSED INLET — SD —
- DIRECTION OF FLOW
- DRAINAGE MANAGEMENT AREA (DMA) DMA X
- DMA BOUNDARY
- POINT OF COMPLIANCE (POC) POC X

40 20 0 40 80 120

SCALE: 1"=40'

NORTH COAST HIGHWAY IMPROVEMENTS
DMA MAP
SHEET 1 OF 6

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Suite 260
Carlsbad, CA 92008
Phone: (760) 476-9193
MBAKERINTL.COM

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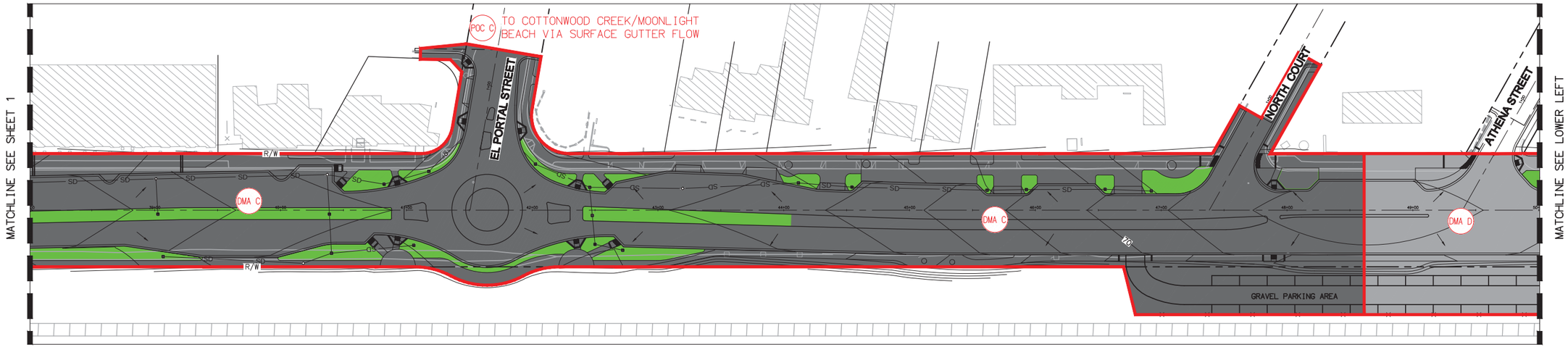

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- DIRECTION OF FLOW
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NORTH COAST HIGHWAY IMPROVEMENTS
DMA MAP
SHEET 2 OF 6

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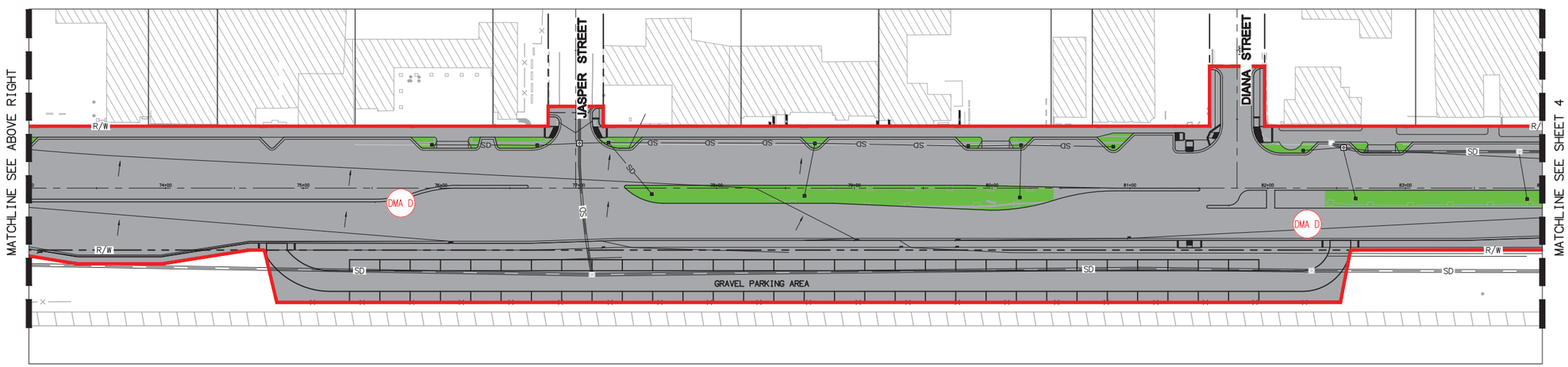

LEGEND

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NORTH COAST HIGHWAY IMPROVEMENTS
DMA MAP
SHEET 3 OF 6

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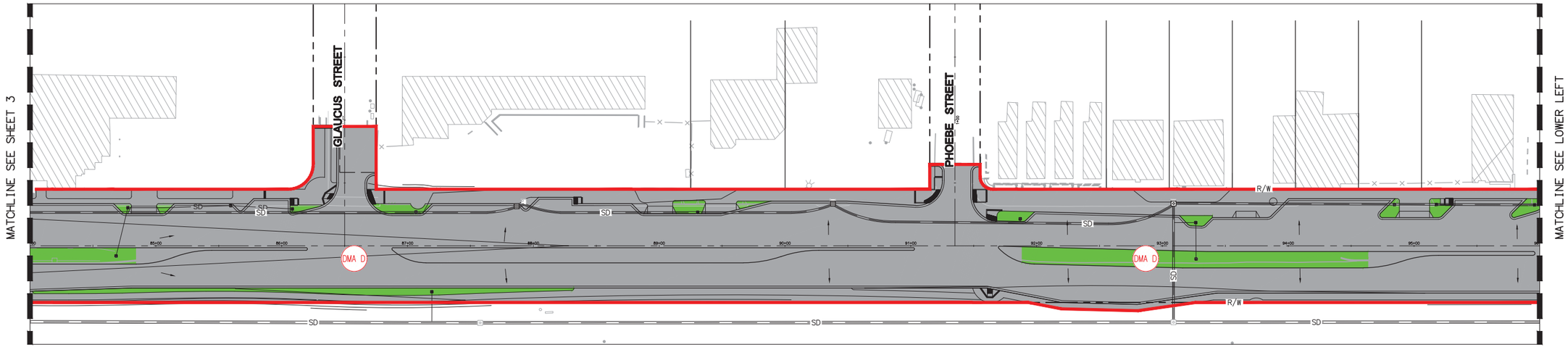

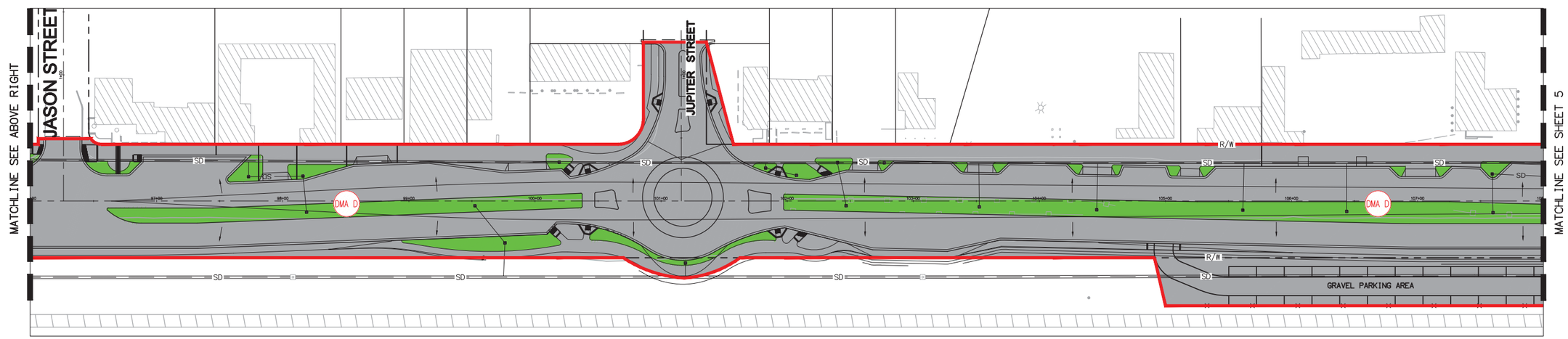

LEGEND

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- PROPOSED INLET — SD —
- DIRECTION OF FLOW
- DRAINAGE MANAGEMENT AREA (DMA) DMA X
- DMA BOUNDARY
- POINT OF COMPLIANCE (POC) POC X

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SCALE: 1"=40'

NORTH COAST HIGHWAY IMPROVEMENTS
DMA MAP
SHEET 4 OF 6

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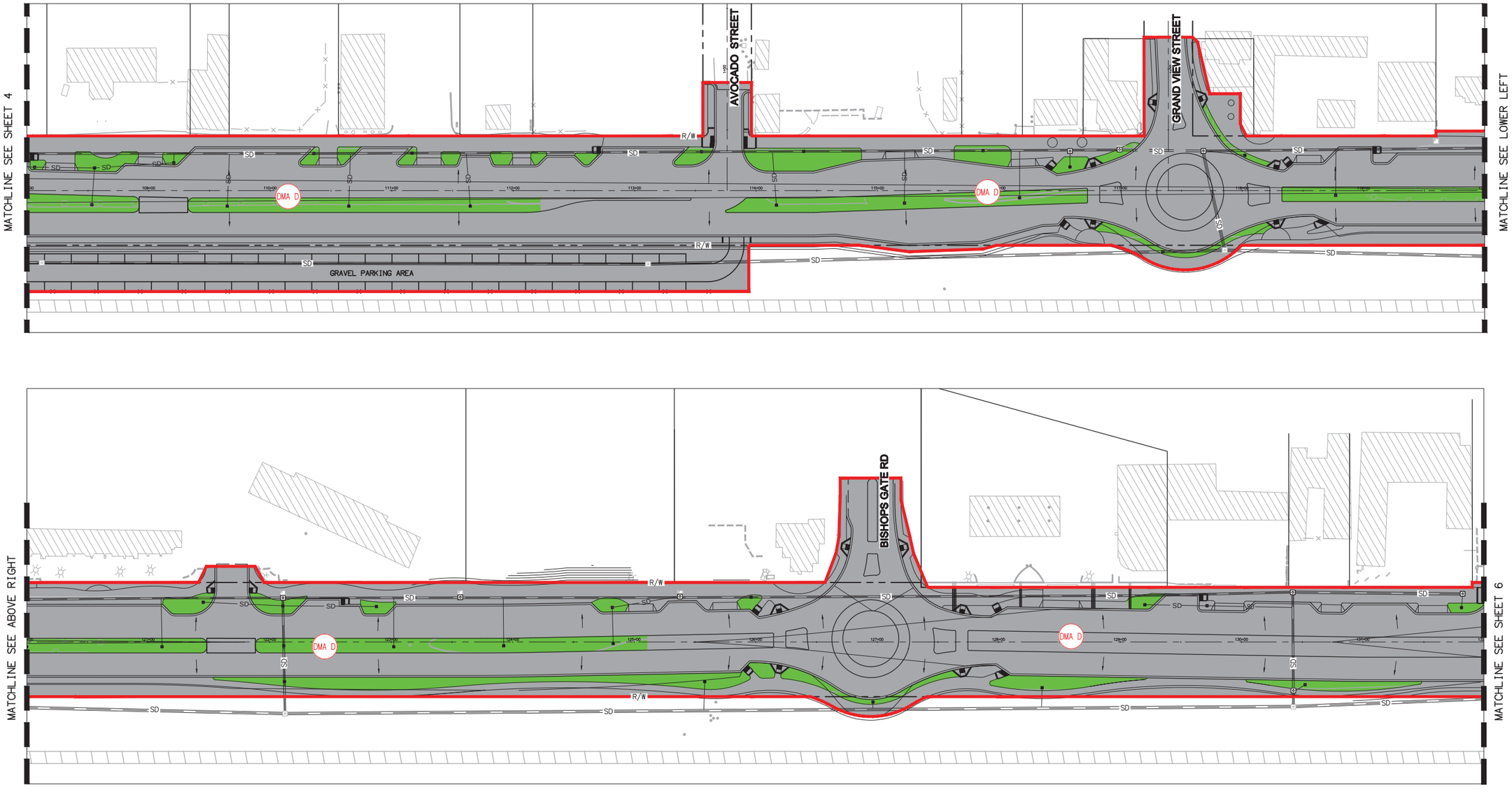

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SCALE: 1"=40'

NORTH COAST HIGHWAY IMPROVEMENTS
DMA MAP
SHEET 5 OF 6

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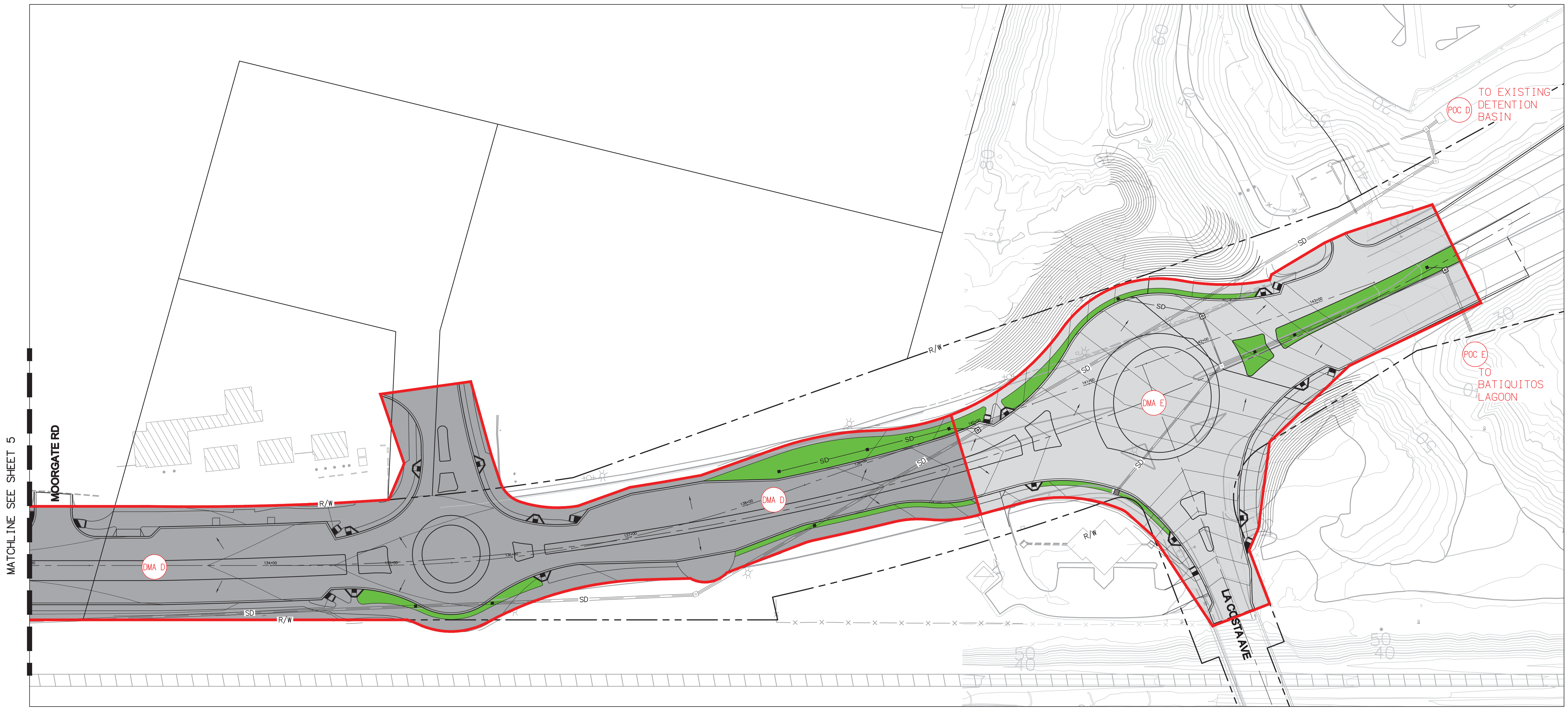

LEGEND

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- PROPOSED INLET
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SCALE: 1"=40'

NORTH COAST HIGHWAY IMPROVEMENTS
DMA MAP
SHEET 6 OF 6

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Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

- ☐ Underlying hydrologic soil group
- ☐ Approximate depth to groundwater
- ☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☐ Critical coarse sediment yield areas to be protected
- ☐ Existing topography and impervious areas
- ☐ Existing and proposed site drainage network and connections to drainage offsite
- ☐ Proposed demolition
- ☐ Proposed grading
- ☐ Proposed impervious features
- ☐ Proposed design features and surface treatments used to minimize imperviousness
- ☐ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ☐ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ☐ Structural BMPs (identify location, type of BMP, and size/detail)

Leucadia Hwy 101
DMA SUMMARY

DMA SUMMARY

DMA	Proposed Impervious (sf)	Total Area (sf)	BMP Type
A	79,900	94,000	Bioretention
B	53,250	62,650	Bioretention
C	150,500	177,000	Bioretention
D	710,500	944,350	Bioretention
E	52,475	63,700	Bioretention
Total (sf)	**1,046,625**	**1,341,700**	
(ac)	**24.03**	**30.80**	

Leucadia Hwy 101
DCV Calculation

Design Capture Volume						
		DMA Area				
Surface Type	**Runoff Factor**	**A**	**B**	**C**	**D**	**E**
Impervious	0.9	79,900	53,250	150,500	710,500	52,475
Landscape	0.1	14,100	9,400	26,500	233,850	11,225
	Tributary Area (sf)	94,000	62,650	177,000	944,350	63,700
85th % Storm (in)	**Adjusted Runoff Factor**	0.78	0.78	0.78	0.70	0.76
0.55	**DCV (cf)**	**3,361**	**2,240**	**6,330**	**30,380**	**2,216**

LEUCADIA HWY 101
DMA SUMMARY
BMP Size

DMA	DCV (cf)	Minimum Pollutant-Control BMP Size (sf)	Minimum Flow-Control BMP Size (sf)	Provided Biofiltration BMP Size (sf)
A	3,361	2,200	8,375	8,550
B	2,240	1,466	5,581	5,600
C	6,330	4,143	15,774	16,000
D	30,380	19,885	75,590	83,000
E	2,216	1,451	5,520	5,600
Total	44,526	29,144	110,840	118,750

DMA A

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	3,361	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.52	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	18.72	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	46.8	inches
7	Assumed surface area of the biofiltration BMP	8,550	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	14,621	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	-11,260	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	10	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	18	inches
19	Total Depth Treated [Line 17 + Line 18]	48	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	-16,890	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	-4,188	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	-8,445	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	-5,508	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	94,000	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.78	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	2,200	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	2,200	sq-ft

manual input, varies per DMA
manual input, same for each DMA
calculated
(no fill) constant per BMP Design Manual

DMA B

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	2,240	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.52	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	18.72	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	46.8	inches
7	Assumed surface area of the biofiltration BMP	5,600	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	9,576	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	-7,336	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	10	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	18	inches
19	Total Depth Treated [Line 17 + Line 18]	48	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	-11,005	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	-2,728	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	-5,502	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	-3,588	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	62,650	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.78	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	1,466	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	1,466	sq-ft

manual input, varies per DMA
manual input, same for each DMA
calculated
(no fill) constant per BMP Design Manual

DMA C

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	6,330	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.52	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	18.72	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	46.8	inches
7	Assumed surface area of the biofiltration BMP	16,000	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	27,360	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	-21,030	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	10	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	18	inches
19	Total Depth Treated [Line 17 + Line 18]	48	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	-31,546	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	-7,821	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	-15,773	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	-10,287	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	177,000	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.78	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	4,143	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	4,143	sq-ft

manual input, varies per DMA
manual input, same for each DMA
calculated
(no fill) constant per BMP Design Manual

DMA D

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	30,380	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.52	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	18.72	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	46.8	inches
7	Assumed surface area of the biofiltration BMP	83,000	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	141,930	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	-111,550	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	10	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	18	inches
19	Total Depth Treated [Line 17 + Line 18]	48	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	-167,325	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	-41,486	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	-83,663	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	-54,563	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	944,350	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.70	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	19,885	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	19,885	sq-ft

manual input, varies per DMA
manual input, same for each DMA
calculated
(no fill) constant per BMP Design Manual

DMA E

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	2,216	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.52	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	18.72	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	46.8	inches
7	Assumed surface area of the biofiltration BMP	5,600	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	9,576	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	-7,360	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	10	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	18	inches
19	Total Depth Treated [Line 17 + Line 18]	48	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	-11,040	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	-2,737	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	-5,520	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	-3,600	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	63,700	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.76	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	1,451	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	1,451	sq-ft

manual input, varies per DMA
manual input, same for each DMA
calculated
(no fill) constant per BMP Design Manual

ATTACHMENT 2 - BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is not included because the project is exempt from PDP hydromodification management requirements.

Indicate which items are included behind this cover sheet:

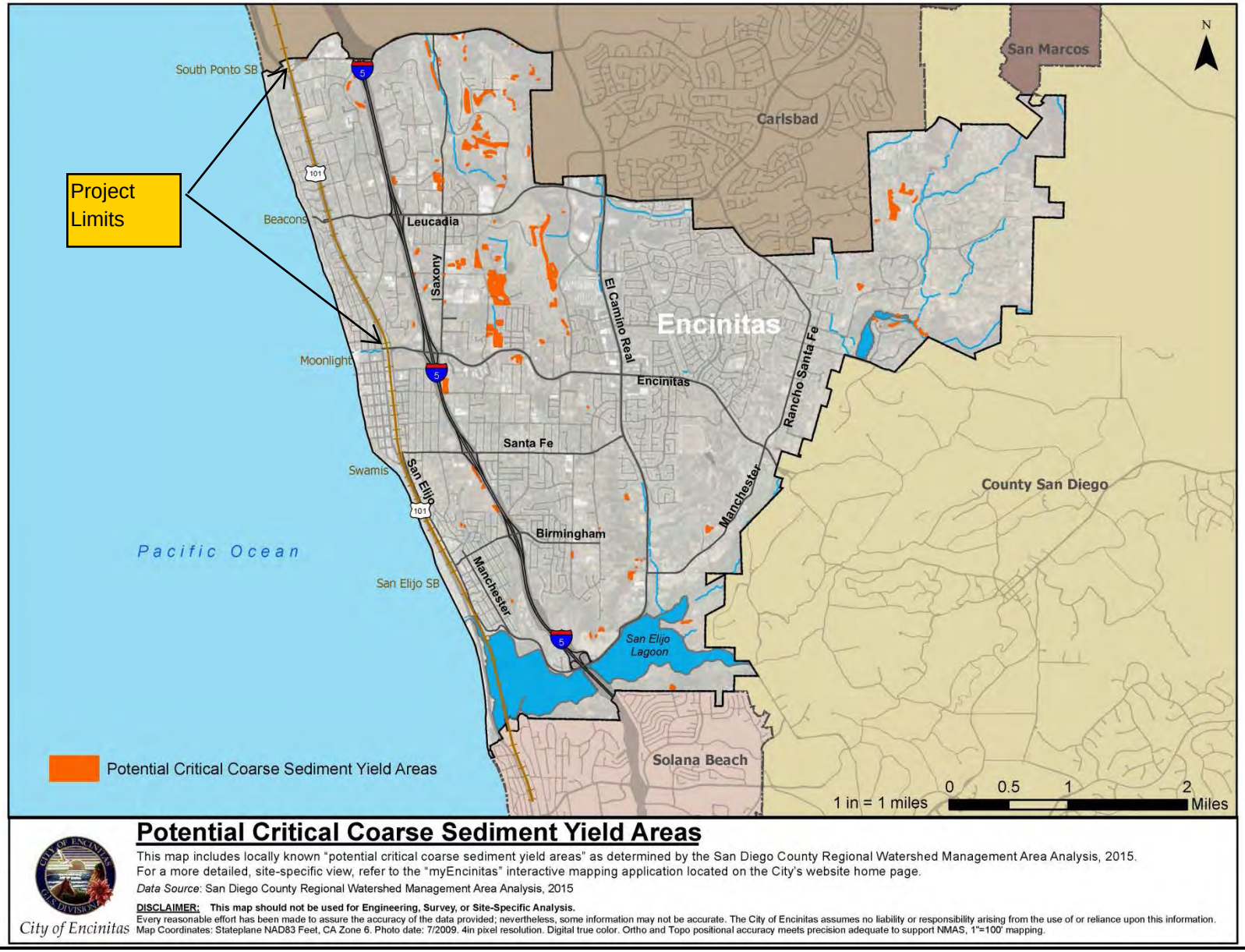
Attachment	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included: see DMA Exhibit in Attachment 1a See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

- ☐ Underlying hydrologic soil group
- ☐ Approximate depth to groundwater
- ☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☐ Critical coarse sediment yield areas to be protected
- ☐ Existing topography
- ☐ Existing and proposed site drainage network and connections to drainage offsite
- ☐ Proposed grading
- ☐ Proposed impervious features
- ☐ Proposed design features and surface treatments used to minimize imperviousness
- ☐ Point(s) of Compliance (POC) for Hydromodification Management
- ☐ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
- ☐ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

Figure H-1: Potential Critical Coarse Sediment Yield Areas within the City of Encinitas



BMP Sizing Spreadsheet V1.04

Project Name:	Leucadia Hwy 101 Streetscape
Project Applicant:	City of Encinitas
Jurisdiction:	City of Encinitas
Parcel (APN):	
Hydrologic Unit:	904.51
Rain Gauge:	Oceanside
Total Project Area (sf):	893,000
Channel Susceptibility:	High

BMP Sizing Spreadsheet V1.04			
Project Name:	Leucadia Hwy 101 Streetscape	Hydrologic Unit:	904.51
Project Applicant:	City of Encinitas	Rain Gauge:	Oceanside
Jurisdiction:	City of Encinitas	Total Project Area:	893000
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	A	BMP Type:	Bioretention
BMP Native Soil Type:	B	BMP Infiltration Rate (in/hr):	0.52

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
A	79900	B	Flat	Impervious	1.0	0.103	0.0854	N/A	8230	6823	N/A
A	14100	B	Flat	Landscape	0.1	0.103	0.0854	N/A	145	120	N/A
Total BMP Area	94000										

Minimum BMP Size	8374.93	6944	
Proposed BMP Size*	8550	7125	5130
Soil Matrix Depth		18.00	in
Minimum Ponding Depth		9.75	in
Maximum Ponding Depth		N/A	in
Selected Ponding Depth		10.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This Sizing Calculator has been developed in compliance with the Countywide Model SUSMP. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V1.04			
Project Name:	Leucadia Hwy 101 Streetscape	Hydrologic Unit:	904.51
Project Applicant:	City of Encinitas	Rain Gauge:	Oceanside
Jurisdiction:	City of Encinitas	Total Project Area:	893000
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	B	BMP Type:	Bioretention
BMP Native Soil Type:	B	BMP Infiltration Rate (in/hr):	0.52

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
B	53250	B	Flat	Impervious	1.0	0.103	0.0854	N/A	5485	4548	N/A
B	9400	B	Flat	Landscape	0.1	0.103	0.0854	N/A	97	80	N/A
Total BMP Area	62650										

Minimum BMP Size	5581.57	4628	
Proposed BMP Size*	5600	4667	3360
Soil Matrix Depth		18.00	in
Minimum Ponding Depth		9.92	in
Maximum Ponding Depth		N/A	in
Selected Ponding Depth		10.00	in

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BMP Sizing Spreadsheet V1.04			
Project Name:	Leucadia Hwy 101 Streetscape	Hydrologic Unit:	904.51
Project Applicant:	City of Encinitas	Rain Gauge:	Oceanside
Jurisdiction:	City of Encinitas	Total Project Area:	893000
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	C	BMP Type:	Bioretention
BMP Native Soil Type:	B	BMP Infiltration Rate (in/hr):	0.52

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
C	150500	B	Flat	Impervious	1.0	0.103	0.0854	N/A	15502	12853	N/A
C	26500	B	Flat	Landscape	0.1	0.103	0.0854	N/A	273	226	N/A
Total BMP Area	177000										

Minimum BMP Size	15774.45	13079	
Proposed BMP Size*	16000	13333	9600
Soil Matrix Depth		18.00	in
Minimum Ponding Depth		9.81	in
Maximum Ponding Depth		N/A	in
Selected Ponding Depth		10.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V1.04			
Project Name:	Leucadia Hwy 101 Streetscape	Hydrologic Unit:	904.51
Project Applicant:	City of Encinitas	Rain Gauge:	Oceanside
Jurisdiction:	City of Encinitas	Total Project Area:	893000
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	D	BMP Type:	Bioretention
BMP Native Soil Type:	B	BMP Infiltration Rate (in/hr):	0.52

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
D	710500	B	Flat	Impervious	1.0	0.103	0.0854	N/A	73182	60677	N/A
D	233850	B	Flat	Landscape	0.1	0.103	0.0854	N/A	2409	1997	N/A
Total BMP Area	944350							Minimum BMP Size	75590.155	62674	
								Proposed BMP Size*	83000	69167	49800
								Soil Matrix Depth		18.00	in
								Minimum Ponding Depth		9.06	in
								Maximum Ponding Depth		N/A	in
								Selected Ponding Depth		10.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This Sizing Calculator has been developed in compliance with the Countywide Model SUSMP. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V1.04			
Project Name:	Leucadia Hwy 101 Streetscape	Hydrologic Unit:	904.51
Project Applicant:	City of Encinitas	Rain Gauge:	Oceanside
Jurisdiction:	City of Encinitas	Total Project Area:	893000
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	E	BMP Type:	Bioretention
BMP Native Soil Type:	B	BMP Infiltration Rate (in/hr):	0.52

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
E	52475	B	Flat	Impervious	1.0	0.103	0.0854	N/A	5405	4481	N/A
E	11225	B	Flat	Landscape	0.1	0.103	0.0854	N/A	116	96	N/A
Total BMP Area	63700										

Minimum BMP Size	5520.5425	4577	
Proposed BMP Size*	5600	4667	3360
Soil Matrix Depth		18.00	in
Minimum Ponding Depth		9.81	in
Maximum Ponding Depth		N/A	in
Selected Ponding Depth		10.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
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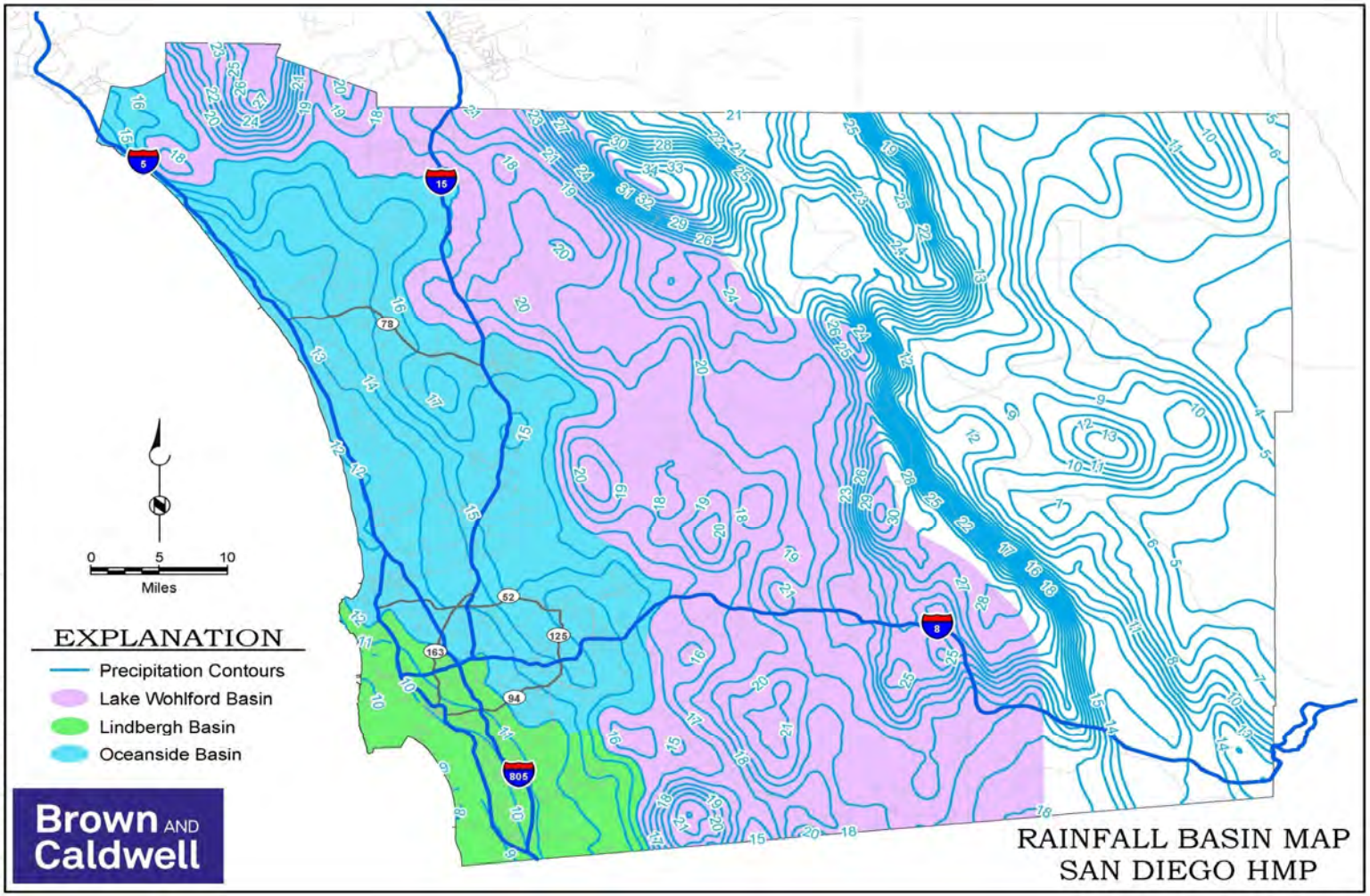

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Table 7-1. Sizing Factors for Bioretention Facilities						
Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A	V_1	V_2
$0.5Q_2$	A	Flat	Lindbergh	0.06	0.05	N/A
$0.5Q_2$	A	Moderate	Lindbergh	0.055	0.0458	N/A
$0.5Q_2$	A	Steep	Lindbergh	0.045	0.0375	N/A
$0.5Q_2$	B	Flat	Lindbergh	0.093	0.0771	N/A
$0.5Q_2$	B	Moderate	Lindbergh	0.085	0.0708	N/A
$0.5Q_2$	B	Steep	Lindbergh	0.065	0.0542	N/A
$0.5Q_2$	C	Flat	Lindbergh	0.1	0.0833	0.06
$0.5Q_2$	C	Moderate	Lindbergh	0.1	0.0833	0.06
$0.5Q_2$	C	Steep	Lindbergh	0.075	0.0625	0.045
$0.5Q_2$	D	Flat	Lindbergh	0.08	0.0667	0.048
$0.5Q_2$	D	Moderate	Lindbergh	0.08	0.0667	0.048
$0.5Q_2$	D	Steep	Lindbergh	0.06	0.05	0.036
$0.5Q_2$	A	Flat	Oceanside	0.07	0.0583	N/A
$0.5Q_2$	A	Moderate	Oceanside	0.065	0.0542	N/A
$0.5Q_2$	A	Steep	Oceanside	0.06	0.05	N/A
$0.5Q_2$	B	Flat	Oceanside	0.098	0.0813	N/A
$0.5Q_2$	B	Moderate	Oceanside	0.09	0.075	N/A
$0.5Q_2$	B	Steep	Oceanside	0.075	0.0625	N/A
$0.5Q_2$	C	Flat	Oceanside	0.075	0.0625	0.045
$0.5Q_2$	C	Moderate	Oceanside	0.075	0.0625	0.045
$0.5Q_2$	C	Steep	Oceanside	0.06	0.05	0.036
$0.5Q_2$	D	Flat	Oceanside	0.065	0.0542	0.039
$0.5Q_2$	D	Moderate	Oceanside	0.065	0.0542	0.039
$0.5Q_2$	D	Steep	Oceanside	0.05	0.0417	0.03
$0.5Q_2$	A	Flat	Lake Wohlford	0.05	0.0417	N/A
$0.5Q_2$	A	Moderate	Lake Wohlford	0.045	0.0375	N/A
$0.5Q_2$	A	Steep	Lake Wohlford	0.04	0.0333	N/A
$0.5Q_2$	B	Flat	Lake Wohlford	0.048	0.0396	N/A
$0.5Q_2$	B	Moderate	Lake Wohlford	0.045	0.0375	N/A
$0.5Q_2$	B	Steep	Lake Wohlford	0.04	0.0333	N/A
$0.5Q_2$	C	Flat	Lake Wohlford	0.065	0.0542	0.039
$0.5Q_2$	C	Moderate	Lake Wohlford	0.065	0.0542	0.039
$0.5Q_2$	C	Steep	Lake Wohlford	0.05	0.0417	0.03
$0.5Q_2$	D	Flat	Lake Wohlford	0.055	0.0458	0.033
$0.5Q_2$	D	Moderate	Lake Wohlford	0.055	0.0458	0.033
$0.5Q_2$	D	Steep	Lake Wohlford	0.045	0.0375	0.027
$0.3Q_2$	A	Flat	Lindbergh	0.06	0.05	N/A
$0.3Q_2$	A	Moderate	Lindbergh	0.055	0.0458	N/A
$0.3Q_2$	A	Steep	Lindbergh	0.045	0.0375	N/A
$0.3Q_2$	B	Flat	Lindbergh	0.098	0.0813	N/A
$0.3Q_2$	B	Moderate	Lindbergh	0.09	0.075	N/A
$0.3Q_2$	B	Steep	Lindbergh	0.07	0.0583	N/A
$0.3Q_2$	C	Flat	Lindbergh	0.11	0.0917	0.066
$0.3Q_2$	C	Moderate	Lindbergh	0.11	0.0917	0.066
$0.3Q_2$	C	Steep	Lindbergh	0.085	0.0708	0.051
$0.3Q_2$	D	Flat	Lindbergh	0.1	0.0833	0.06
$0.3Q_2$	D	Moderate	Lindbergh	0.1	0.0833	0.06

$0.3Q_2$	D	Steep	Lindbergh	0.07	0.0583	0.042
$0.3Q_2$	A	Flat	Oceanside	0.07	0.0583	N/A
$0.3Q_2$	A	Moderate	Oceanside	0.065	0.0542	N/A
$0.3Q_2$	A	Steep	Oceanside	0.06	0.05	N/A
$0.3Q_2$	B	Flat	Oceanside	0.098	0.0813	N/A
$0.3Q_2$	B	Moderate	Oceanside	0.09	0.075	N/A
$0.3Q_2$	B	Steep	Oceanside	0.075	0.0625	N/A
$0.3Q_2$	C	Flat	Oceanside	0.1	0.0833	0.06
$0.3Q_2$	C	Moderate	Oceanside	0.1	0.0833	0.06
$0.3Q_2$	C	Steep	Oceanside	0.08	0.0667	0.048
$0.3Q_2$	D	Flat	Oceanside	0.085	0.0708	0.051
$0.3Q_2$	D	Moderate	Oceanside	0.085	0.0708	0.051
$0.3Q_2$	D	Steep	Oceanside	0.065	0.0542	0.039
$0.3Q_2$	A	Flat	Lake Wohlford	0.05	0.0417	N/A
$0.3Q_2$	A	Moderate	Lake Wohlford	0.045	0.0375	N/A
$0.3Q_2$	A	Steep	Lake Wohlford	0.04	0.0333	N/A
$0.3Q_2$	B	Flat	Lake Wohlford	0.06	0.05	N/A
$0.3Q_2$	B	Moderate	Lake Wohlford	0.055	0.0458	N/A
$0.3Q_2$	B	Steep	Lake Wohlford	0.045	0.0375	N/A
$0.3Q_2$	C	Flat	Lake Wohlford	0.075	0.0625	0.045
$0.3Q_2$	C	Moderate	Lake Wohlford	0.075	0.0625	0.045
$0.3Q_2$	C	Steep	Lake Wohlford	0.06	0.05	0.036
$0.3Q_2$	D	Flat	Lake Wohlford	0.065	0.0542	0.039
$0.3Q_2$	D	Moderate	Lake Wohlford	0.065	0.0542	0.039
$0.3Q_2$	D	Steep	Lake Wohlford	0.05	0.0417	0.03
$0.1Q_2$	A	Flat	Lindbergh	0.06	0.05	N/A
$0.1Q_2$	A	Moderate	Lindbergh	0.055	0.0458	N/A
$0.1Q_2$	A	Steep	Lindbergh	0.045	0.0375	N/A
$0.1Q_2$	B	Flat	Lindbergh	0.1	0.0833	N/A
$0.1Q_2$	B	Moderate	Lindbergh	0.095	0.0792	N/A
$0.1Q_2$	B	Steep	Lindbergh	0.08	0.0667	N/A
$0.1Q_2$	C	Flat	Lindbergh	0.145	0.1208	0.087
$0.1Q_2$	C	Moderate	Lindbergh	0.145	0.1208	0.087
$0.1Q_2$	C	Steep	Lindbergh	0.12	0.1	0.072
$0.1Q_2$	D	Flat	Lindbergh	0.16	0.1333	0.096
$0.1Q_2$	D	Moderate	Lindbergh	0.16	0.1333	0.096
$0.1Q_2$	D	Steep	Lindbergh	0.115	0.0958	0.069
$0.1Q_2$	A	Flat	Oceanside	0.07	0.0583	N/A
$0.1Q_2$	A	Moderate	Oceanside	0.065	0.0542	N/A
$0.1Q_2$	A	Steep	Oceanside	0.06	0.05	N/A
$0.1Q_2$	B	Flat	Oceanside	0.103	0.0854	N/A
$0.1Q_2$	B	Moderate	Oceanside	0.09	0.075	N/A
$0.1Q_2$	B	Steep	Oceanside	0.075	0.0625	N/A
$0.1Q_2$	C	Flat	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	C	Moderate	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	C	Steep	Oceanside	0.11	0.0917	0.066
$0.1Q_2$	D	Flat	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	D	Moderate	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	D	Steep	Oceanside	0.065	0.0542	0.039

ATTACHMENT 3 - STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

Indicate which items are included behind this cover sheet:

Attachment	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐ Included ☒Not Applicable

Inspection and Maintenance Checklist

BIORETENTION

Permit no. _____

BMP location _____

Responsible party _____

Phone number (____) _____ Email _____

Responsible party address _____

Date of inspection _____

Defect	Conditions when maintenance is needed	Maintenance needed?	Date and description of maintenance conducted[a]	Results expected when maintenance is performed
1. Standing water	Water stands in the bioretention area between storms and does not drain within 24 hours after rainfall.			There should be no areas of standing water once inflow has ceased. Any of the following could apply: sediment or trash blockages removed, grade from head to foot of bioretention area improved, media surface scarified, underdrains flushed in manner that does not cause an illegal discharge.
2. Trash and debris	Trash and debris accumulated in the bioretention area and around the inlet and outlet.			Trash and debris removed from the bioretention area and disposed of properly.
3. Sediment	Evidence of accumulated sediment in the bioretention area.			Material removed so that there is no clogging or blockage. Material is disposed of properly.
4. Erosion	Channels have formed around inlets, there are areas of bare soil, or there is other evidence of erosion.			Obstructions and sediment removed so that water flows freely and disperses over a wide area. Obstructions and sediment are disposed of properly.
5. Vegetation	Vegetation is dead, diseased or overgrown.			Vegetation is healthy and attractive. Grass is maintained at least 3 inches in height.
6. Mulch	Mulch is missing or patchy. Areas of bare earth are exposed or mulch layer is less than 3 inches deep.			All bare earth is covered, except mulch is kept 6 inches away from trunks of trees and shrubs. Mulch is even at a depth of 3 inches.
7. Inlet/outlet	Sediment accumulations.			Inlet/outlet is clear of sediment and debris and allows water to flow freely.
8. Miscellaneous	Any condition not covered above that needs attention for the bioretention area to function as designed.			The design specifications are met.

a. Attach copies of available supporting documents (photographs, copies of maintenance contracts, and/or maintenance records).

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

☐ **Preliminary Design / Planning / CEQA level submittal:**

Attachment 3a must identify:

☐ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

☐ **Final Design level submittal:**

Attachment 3a must identify:

☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)

☐ How to access the structural BMP(s) to inspect and perform maintenance

☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)

☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable

☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)

☐ Recommended equipment to perform maintenance

☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

ATTACHMENT 4 - COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- ☐ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☐ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- ☐ Details and specifications for construction of structural BMP(s)
- ☐ Signage indicating the location and boundary of structural BMP(s) as required by the [City Engineer]
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
- ☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
- ☐ All BMPs must be fully dimensioned on the plans
- ☐ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number shall be provided. Photocopies of general brochures are not acceptable.

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