



**LAND DEVELOPMENT DIVISION  
HYDROLOGY UNIT**

TO: B&E Engineers  
20 E. Foothill Blvd, Suite 230  
Arcadia, CA 91006  
ATTN: Ramy Awad

Date: 09/04/2019

**REVIEW OF HYDROLOGY STUDY**

TR NO. TR 82498

DATE OF REPORT 07/16/2019  
PLAN CHECK NO. 3  
PLAN CASE NO. ESTU2019000288

We have reviewed your Hydrology Study.

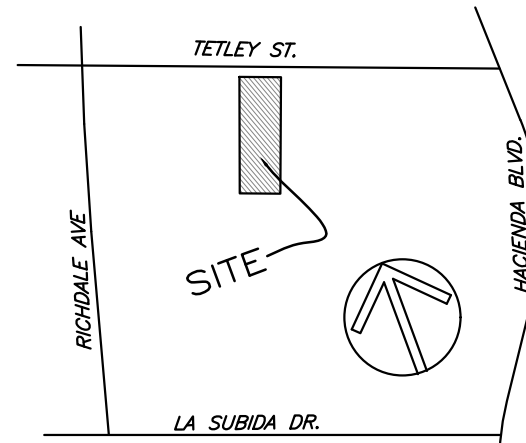
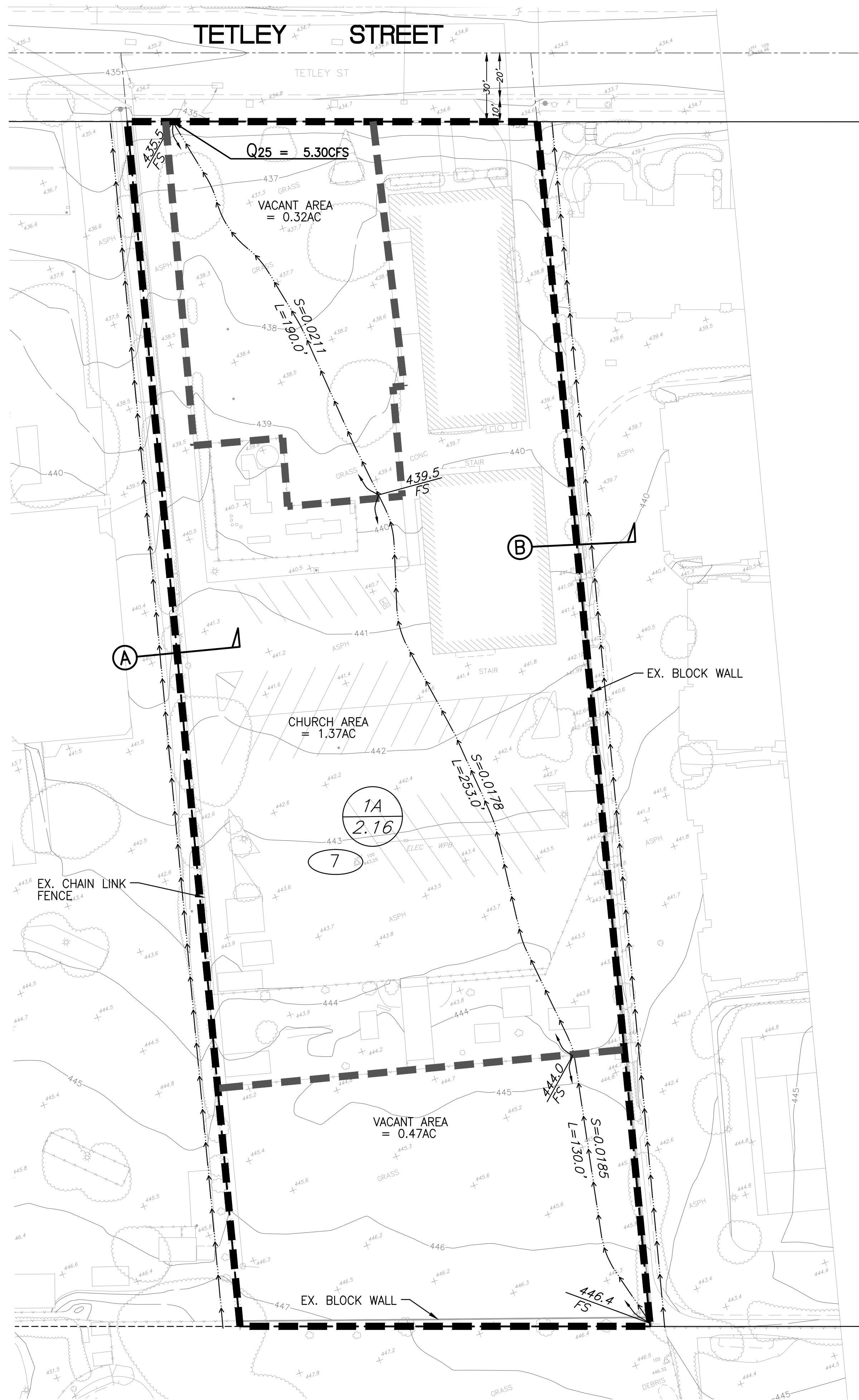
☒ The Hydrology Study has been approved.

AYM

REVIEWED BY M.D. Esfandi  
**DAVID ESFANDI** (626) 458-7130



APPROVED BY: Anacely C. Lasso



VICINITY MAP  
NOT TO SCALE

LEGEND

$Q_{25}$  RUNOFF IN CFS FOR 25 YR, FREQUENCY

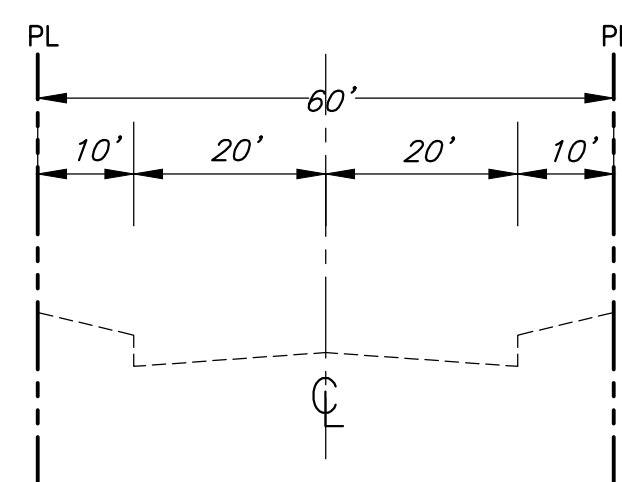
$\frac{1A}{2.16}$  SUBAREA NUMBER  
SUB AREA IN ACRES

$5.00$  TIME OF CONCENTRATION (FOR  $Q_{25}$ )

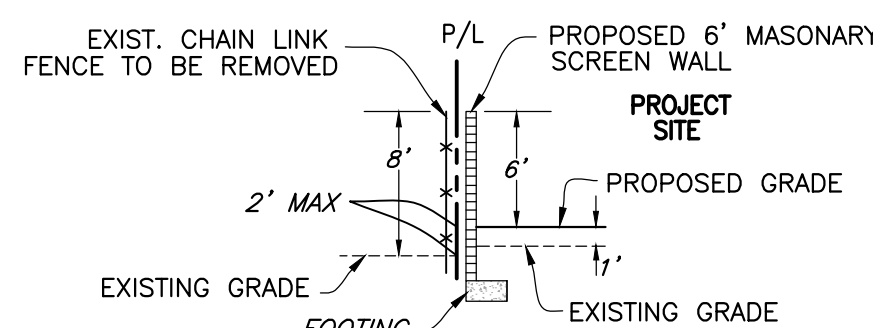
--- SUBAREA BOUNDARY

— FLOW LINE PATH

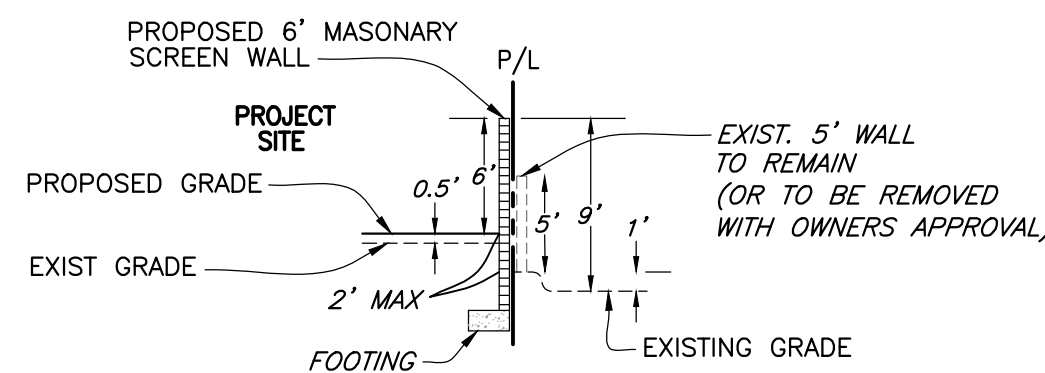
| HYDROLOGIC DESIGN DATA |         |
|------------------------|---------|
| STORM FREQUENCY        | 25-YEAR |
| SOIL TYPE              | 16      |
| PERCENT IMPERVIOUSNESS | 53%     |
| 50 YR, 24 HR, ISOHYET  | 6.3     |



TETLEY STREET SECTION  
SCALE: 1"=20'



SECTION "A-A"  
SCALE: 1"=10'



SECTION "B-B"  
SCALE: 1"=10'

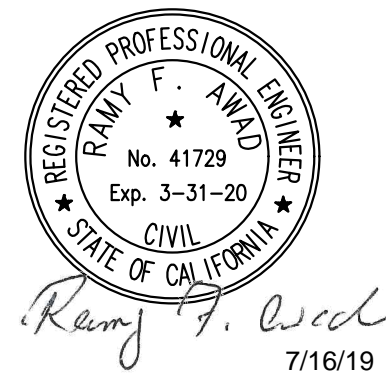
- NOTE:
- PROJECT IS NOT WITHIN COUNTY ADOPTED FLOODWAY
  - PROJECT IS NOT WITHIN FEMA FLOOD ZONE "A"

HYDROLOGY STUDY  
APPROVED

CHECKED BY: W. C. L. L. RCE NO. 43912 DATE 9/4/2019

APPROVED BY: Aracely C. Lasso DATE 9/4/2019

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS  
LAND DEVELOPMENT DIVISION



**B & E ENGINEERS** 20 E. FOOTHILL BLVD., STE 230  
CIVIL ENGINEERING, SURVEYING, & LAND PLANNING ARCADIA, CA 91006  
TEL. (626) 446-4449

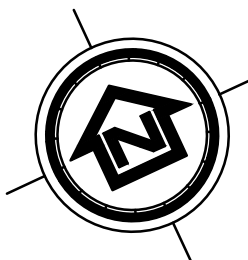
HYDROLOGY STUDY TRACT No. 82498  
PRE DEVELOPMENT CONDITION  
ESTU2019000288  
TETLEY STREET

WITHIN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

DATE: 07-09-19  
DESIGN/DRAWN: GG  
REVIEWED: RA

JN:2018505

SHT. 1 OF 1 SHTS.



SCALE: 1" = 30'

0 15' 30' 60' 120'







# HYDROLOGY STUDY

PLAN CASE NO. ESTU2019000288

TR No 82498  
15716 TETLEY STREET  
HACIENDA HEIGHTS, CA.  
COUNTY OF LOS ANGELES

PREPARED FOR:  
The Olson Company  
3010 Old Ranch Parkway, Ste 100  
Seal Beach, CA 90740

PREPARED BY:  
B & E Engineers  
20 E. Foothill Blvd, Ste 230  
Arcadia, CA 91006  
TEL. (626) 446-4449  
FAX. (626) 446-6566

July 2019  
JN. 2018505  
BY: BR

## HYDROLOGY STUDY APPROVED

CHECKED BY: MD. Esfand RCE NO. 43912 DATE 9/4/2019

APPROVED BY: Anacly C. Lasso DATE 9/4/2019

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS  
LAND DEVELOPMENT DIVISION



*Ramy F. Awad*  
7/16/19



B&E Engineers



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## INTRODUCTION

This report presents the hydrologic analysis for Tentative Tract 082498 which is located at 15716 Tetley Street, Hacienda Heights, California, in County of Los Angeles and is a residential subdivision of a 2.16 acres site that proposes 33 new condominium units that will be served by a “Private Driveway and Fire Lane” (Not a public road). The site currently exists as a “Hacienda Heights Christian Church” and is bound by Tetley Street to the north, single family residences to the south, multi-family residences to the east and “St. Thomas Episcopal Church to the west.

The purpose of this report is to study the flows from for both pre- and post-development conditions for the 25yr storm frequency and to determine 85<sup>th</sup> percentile rainfall volume which is required to be mitigated in order to comply with the Low Impact Development (LID) requirements.

## HYDROLOGY DESIGN CRITERIA

The following Hydrology Data criteria was provided by the LADPW online Hydrology Map 1-H1.11

provided at: <http://dpw.lacounty.gov/wrd/hydrologygis/>. These values are used as inputs into the Hydrocalc as shown in the calculations in Appendices B and C. In Pre-Development condition, there are areas that are either landscaped or vacant. 2% imperviousness are used for these areas. The rest of the site is existing church building and paved parking areas with an assigned imperviousness of 82%. To determine the total runoff for the site, a composite or average imperviousness is calculated as follows:

### 1. Landscape or Vacant areas

$$A = 0.47 + 0.32 = 0.79\text{ac}$$

### 2. Church Building and Parking areas

$$A = 1.32 + 0.05 = 1.37\text{ac}$$

### 3. Total Site area = 2.16ac

### Composite Imperviousness

$$(0.79 \times 0.02 + 1.37 \times 0.82)/2.16 = 0.53$$



**Runoff Calculation:** LADPW Hydrocalc

**Design 50-Year 24-Hour Isohyet:** 6.3"

**Soil Type:** 016

**85<sup>TH</sup> Percentile Isohyet:** 1.1"

**Pre-Development Imperviousness:** 53%

**Post-Development Imperviousness:** 86%

## **EXISTING DRAINAGE CONDITIONS**

The existing site condition is 2.16-acres which include the church area and the vacant areas as shown in the pre-development hydrology map in Appendix E. The following table summarizes the values found:

| <b>Condition</b>       | <b>Subarea Number</b> | <b>Area (Acres)</b> | <b>25-year Peak Flowrate (Q<sub>25</sub>)</b> |
|------------------------|-----------------------|---------------------|---|
| <b>Pre-Development</b> | 1A                    | 2.16                | 5.30cfs                                       |

## **PROPOSED DRAINAGE CONDITIONS**

The proposed development is a 33-unit condominium development and will generally maintain the existing drainage pattern with the site discharging to existing 6'W x 6'H RCB on Tetley Street. Stormwater runoff from the proposed development will be collected by an onsite catch basin. LADPW has provided an allowable Q (Q<sub>allowable</sub>) of 1.55cfs/acre with a resulting of 3.348cfs which can be discharged into the existing RCB Tetley Street.

The calculated post development Q<sub>25</sub> is 5.42cfs.

The following table provides a summary of the post-development hydrology values:

| <b>Condition</b>        | <b>Subarea Number</b> | <b>Area (Acres)</b> | <b>25-year Peak Flowrate (Q<sub>25</sub>)</b> |
|-------------------------|-----------------------|---------------------|---|
| <b>Post-Development</b> | 1A                    | 2.16                | 5.42cfs                                       |

As shown in the above tables, the difference in runoffs between the existing condition and the proposed condition is  $\Delta Q = 5.42 - 5.30 = 0.12$ cfs. The volume generated by this  $\Delta Q$  is 1715.7cf which can be accommodated in the storage tank for SWQDv.



Infiltration of storm water is not considered feasible with the use of drywell and the result of percolation rate of less than 0.3 in/hr. as indicated on the soils report.

Harvest and Reuse is also deemed infeasible as the site plan is dense, 86% impervious with only small areas that will be landscaped with drought tolerant plants. The Estimated Total Water Use for the project will not make a Harvest and Reuse system feasible.

Lastly, Biofiltration system was evaluated and found to be an appropriate solution for the mitigation of the required quality volume.

A bio-filtration system (WetlandMOD) will be utilized for this project to treat 150% of the required  $V_{LID}$  volume. The  $V_{LID}$  volume is calculated to be 6,740cf and the treated volume will be  $6,740 \times 1.5 = 10,110$  cf.

The on-site catch basin with splitter will intercept and split the total flow of 5.42cfs as follows:

- To a storage tank (8'Diameter x 202 LF) to store the required volume of 10,110cf of VLID. This volume of 10,110cf will be pumped from the storage tank to the proposed Bio-filtration system (WetlandMOD) and ultimately be discharged into the existing RCB in Tetley Street at a discharge rate of 0.029cfs and will drain down the LID volume within 96 hours.
- To a parkway drain to discharge 2.072cfs to Tetley Street. The 2.072cfs is part of the existing runoff that drains to Tetley Street. There is no added Q to the overall storm drain system.
- To the existing RCB in Tetley Street. A 3.319cfs will be directed to the existing RCB in Tetley St. for a total of  $0.029 + 3.319 = 3.348$ cfs (allowable flow) that will be connected to the existing RCB in Tetley St.

## **WATER QUALITY**

This project is a designated project as described in section 2 of LACDPW LID Manual. Using the LA County 85<sup>th</sup> Percentile Isohyet Map, the water quality design rainfall depth for the project was determined to be 1.1 inches (85<sup>th</sup> percentile, 24-Hr storm event). All water quality calculations were conducted using the Hydrocalc software shown in Appendix D and multiplied by a factor of 1.5. The total volume to be mitigated is 10,110 CF which will be stored in the storage tank. This volume will go to the pump, then to the WetlandMOD for biofiltration and then will drain to an existing storm drain system in Tetley Street.

| Condition                                   | Subarea Number | Area (Acres) | Clear Runoff Volume (24-Hr) |
|---|----------------|--------------|-----------------------------|
| Water Quality (85 <sup>th</sup> Percentile) | 1A             | 2.16         | 10,110 cf                   |

## **CONCLUSION**

The calculations provided within this report and within the enclosed Hydrology Map provide an understanding that the post-development conditions will generally maintain similar drainage patterns to the pre-development drainage conditions with practically no change in the amount of runoff between existing and proposed conditions. The allowable Q will be restricted to 3.348cfs as provided by LADPW. Therefore, it is concluded that the proposed condition will not impact the existing storm drain system.



## **Appendix A: Reference Material**



## Proportion Impervious Data

| Code    | Land Use Description  | % Impervious |
|---------|---|--------------|
| 1111    | High-Density Single Family Residential                              | 42           |
| 1112    | Low-Density Single Family Residential                               | 21           |
| 1121    | Mixed Multi-Family Residential                                      | 74           |
| 1122    | Duplexes, Triplexes and 2-or 3-Unit Condominiums and Townhouses     | 55           |
| 1123    | Low-Rise Apartments, Condominiums, and Townhouses                   | 86           |
| 1124    | Medium-Rise Apartments and Condominiums                             | 86           |
| 1125    | High-Rise Apartments and Condominiums                               | 90           |
| 1131    | Trailer Parks and Mobile Home Courts, High-Density                  | 91           |
| 1132    | Mobile Home Courts and Subdivisions, Low-Density                    | 42           |
| 1140    | Mixed Residential   | 59           |
| 1151    | Rural Residential, High-Density                                     | 15           |
| 1152    | Rural Residential, Low-Density                                      | 10           |
| 1211    | Low- and Medium-Rise Major Office Use                               | 91           |
| 1212    | High-Rise Major Office Use  | 91           |
| 1213    | Skyscrapers   | 91           |
| 1221    | Regional Shopping Center  | 95           |
| 1222    | Retail Centers (Non-Strip With Contiguous Interconnected Off-Street | 96           |
| 1223    | Modern Strip Development  | 96           |
| 1224    | Older Strip Development   | 97           |
| 1231    | Commercial Storage  | 90           |
| 1232    | Commercial Recreation   | 90           |
| 1233    | Hotels and Motels   | 96           |
| 1234    | Attended Pay Public Parking Facilities                              | 91           |
| 1241    | Government Offices  | 91           |
| 1242    | Police and Sheriff Stations   | 91           |
| 1243    | Fire Stations   | 91           |
| 1244    | Major Medical Health Care Facilities                                | 74           |
| 1245    | Religious Facilities  | 82           |
| 1246    | Other Public Facilities   | 91           |
| 1247    | Non-Attended Public Parking Facilities                              | 91           |
| 1251    | Correctional Facilities   | 91           |
| 1252    | Special Care Facilities   | 74           |
| 1253    | Other Special Use Facilities  | 86           |
| 1261    | Pre-Schools/Day Care Centers  | 68           |
| 1262    | Elementary Schools  | 82           |
| 1263    | Junior or Intermediate High Schools                                 | 82           |
| 1264    | Senior High Schools   | 82           |
| 1265    | Colleges and Universities   | 47           |
| 1266    | Trade Schools and Professional Training Facilities                  | 91           |
| 1271    | Base (Built-up Area)  | 65           |
| 1271.01 | Base High-Density Single Family Residential                         | 42           |
| 1271.02 | Base Duplexes, Triplexes and 2-or 3-Unit Condominiums and T         | 55           |



| Code    | Land Use Description                                       | % Impervious |
|---------|--|--------------|
| 1271.03 | Base Government Offices                                    | 91           |
| 1271.04 | Base Fire Stations   | 91           |
| 1271.05 | Base Non-Attended Public Parking Facilities                | 91           |
| 1271.06 | Base Air Field   | 45           |
| 1271.07 | Base Petroleum Refining and Processing                     | 91           |
| 1271.08 | Base Mineral Extraction - Oil and Gas                      | 10           |
| 1271.09 | Base Harbor Facilities                                     | 91           |
| 1271.10 | Base Navigation Aids                                       | 47           |
| 1271.11 | Base Developed Local Parks and Recreation                  | 10           |
| 1271.12 | Base Vacant Undifferentiated                               | 1            |
| 1272    | Vacant Area  | 2            |
| 1273    | Air Field  | 45           |
| 1274    | Former Base (Built-up Area)                                | 65           |
| 1275    | Former Base Vacant Area                                    | 2            |
| 1276    | Former Base Air Field                                      | 91           |
| 1311    | Manufacturing, Assembly, and Industrial Services           | 91           |
| 1312    | Motion Picture and Television Studio Lots                  | 82           |
| 1313    | Packing Houses and Grain Elevators                         | 96           |
| 1314    | Research and Development                                   | 91           |
| 1321    | Manufacturing  | 91           |
| 1322    | Petroleum Refining and Processing                          | 91           |
| 1323    | Open Storage   | 66           |
| 1324    | Major Metal Processing                                     | 91           |
| 1325    | Chemical Processing  | 91           |
| 1331    | Mineral Extraction - Other Than Oil and Gas                | 10           |
| 1332    | Mineral Extraction - Oil and Gas                           | 10           |
| 1340    | Wholesaling and Warehousing                                | 91           |
| 1411    | Airports   | 91           |
| 1411.01 | Airstrip   | 10           |
| 1412    | Railroads  | 15           |
| 1412.01 | Railroads-Attended Pay Public Parking Facilities           | 91           |
| 1412.02 | Railroads-Non-Attended Public Parking Facilities           | 91           |
| 1412.03 | Railroads-Manufacturing, Assembly, and Industrial Services | 91           |
| 1412.04 | Railroads-Petroleum Refining and Processing                | 91           |
| 1412.05 | Railroads-Open Storage                                     | 66           |
| 1412.06 | Railroads-Truck Terminals                                  | 91           |
| 1413    | Freeways and Major Roads                                   | 91           |
| 1414    | Park-and-Ride Lots   | 91           |
| 1415    | Bus Terminals and Yards                                    | 91           |
| 1416    | Truck Terminals  | 91           |
| 1417    | Harbor Facilities  | 91           |
| 1418    | Navigation Aids  | 47           |
| 1420    | Communication Facilities                                   | 82           |
| 1420.01 | Communication Facilities-Antenna                           | 2            |



| Code    | Land Use Description   | % Impervious |
|---------|--|--------------|
| 1431    | Electrical Power Facilities  | 47           |
| 1431.01 | Electrical Power Facilities-Powerlines (Urban)                           | 2            |
| 1431.02 | Electrical Power Facilities-Powerlines (Rural)                           | 1            |
| 1432    | Solid Waste Disposal Facilities  | 15           |
| 1433    | Liquid Waste Disposal Facilities   | 96           |
| 1434    | Water Storage Facilities   | 91           |
| 1435    | Natural Gas and Petroleum Facilities                                     | 91           |
| 1435.01 | Natural Gas and Petroleum Facilities-Manufacturing, Assembly, and In     | 91           |
| 1435.02 | Natural Gas and Petroleum Facilities-Petroleum Refining and Processing   | 91           |
| 1435.03 | Natural Gas and Petroleum Facilities-Mineral Extraction – Oil and Gas    | 10           |
| 1435.04 | Natural Gas and Petroleum Facilities-Vacant Undifferentiated             | 1            |
| 1436    | Water Transfer Facilities  | 96           |
| 1437    | Improved Flood Waterways and Structures                                  | 100          |
| 1440    | Maintenance Yards  | 91           |
| 1450    | Mixed Transportation   | 90           |
| 1460    | Mixed Transportation and Utility   | 91           |
| 1460.01 | Mixed Utility and Transportation-Improved Flood Waterways and Structures | 100          |
| 1460.02 | Mixed Utility and Transportation-Railroads                               | 15           |
| 1460.03 | Mixed Utility and Transportation-Freeways and Major Roads                | 91           |
| 1500    | Mixed Commercial and Industrial  | 91           |
| 1600    | Mixed Urban  | 89           |
| 1700    | Under Construction (Use appropriate value)                               | 91           |
| 1810    | Golf Courses   | 3            |
| 1821    | Developed Local Parks and Recreation                                     | 10           |
| 1822    | Undeveloped Local Parks and Recreation                                   | 2            |
| 1831    | Developed Regional Parks and Recreation                                  | 2            |
| 1832    | Undeveloped Regional Parks and Recreation                                | 1            |
| 1840    | Cemeteries   | 10           |
| 1850    | Wildlife Preserves and Sanctuaries                                       | 2            |
| 1850.01 | Wildlife-Commercial Recreation   | 90           |
| 1850.02 | Wildlife-Other Special Use Facilities                                    | 86           |
| 1850.03 | Wildlife-Developed Local Parks and Recreation                            | 10           |
| 1860    | Specimen Gardens and Arboreta  | 15           |
| 1870    | Beach Parks  | 10           |
| 1880    | Other Open Space and Recreation  | 10           |
| 2110    | Irrigated Cropland and Improved Pasture Land                             | 2            |
| 2120    | Non-Irrigated Cropland and Improved Pasture Land                         | 2            |
| 2200    | Orchards and Vineyards   | 2            |
| 2300    | Nurseries  | 15           |
| 2400    | Dairy, Intensive Livestock, and Associated Facilities                    | 42           |
| 2500    | Poultry Operations   | 62           |
| 2600    | Other Agriculture  | 42           |
| 2700    | Horse Ranches  | 42           |



| Code | Land Use Description                                     | % Impervious |
|------|--|--------------|
| 3100 | Vacant Undifferentiated                                  | 1            |
| 3200 | Abandoned Orchards and Vineyards                         | 2            |
| 3300 | Vacant With Limited Improvements (Use appropriate value) | 42           |
| 3400 | Beaches (Vacant)   | 1            |
| 4100 | Water, Undifferentiated                                  | 100          |
| 4200 | Harbor Water Facilities                                  | 100          |
| 4300 | Marina Water Facilities                                  | 100          |
| 4400 | Water Within a Military Installation                     | 100          |

## APPENDIX E: Proportion Impervious Values

### Residential

|               |       |
|---------------|-------|
| Single-Family | 0.418 |
| Two-Unit      | 0.418 |
| Three-Unit    | 0.682 |
| Four-Unit     | 0.819 |
| Five-Unit     | 0.855 |

### Commercial

|  |       |
|--|-------|
| Stores, Office Buildings, Manufacturing Outlets  | 0.909 |
| Shopping Centers (Regional), Restaurants, Service Shops,<br>Auto Equipment, Parking Lots                     | 0.946 |
| Shopping Centers (Neighborhood), Motels, Hotels, Kennels,<br>Professional Buildings, Banks, Service Stations | 0.958 |
| Supermarkets   | 0.976 |
| Department Stores  | 0.985 |

### Industrial

|  |       |
|--|-------|
| Mineral Processing                           | 0.473 |
| Open Storage                                 | 0.655 |
| Motion Picture, Radio, Television            | 0.819 |
| Manufacturing, Warehousing, Storage, Parking | 0.909 |
| Food Processing Plants, Lumber Yards         | 0.958 |

### Institutional Property

|   |       |
|---|-------|
| Colleges, Universities                        | 0.473 |
| Homes for the Aged                            | 0.682 |
| Hospitals, Cemeteries, Mausoleums, Mortuaries | 0.744 |
| Churches, Schools                             | 0.819 |



### Undeveloped Property

|       |      |
|-------|------|
| Rural | 0.01 |
|-------|------|



34° 00' 00"

PROJECT SITE

BALDWIN PARK 1-H1.21

-118° 00' 00"

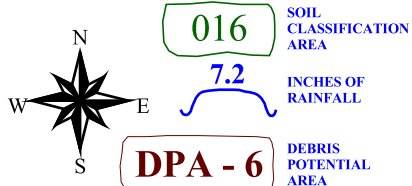
WHITTIER 1-H1.10

YORBA LINDA 1-H1.12

-117° 52' 30"

ANAHEIM

33° 52' 30"



1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878  
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

**LA HABRA**  
**50-YEAR 24-HOUR ISOHYET**

**1-H1.11**





## Hydrology Map

A GIS viewer application to view the data for the hydrology manual.

## LAYERS

- ☐ 50yr Two Tenths (Rainfall)
- ☐ DPA Zones
- ☐ Soils 2004
- ☒ Final 85th Percentile, 24-hr Rainfall
- ☐ Final 95th Percentile, 24-hr Rainfall
- ☐ 1-year, 1-hour Rainfall Intensity

## SEARCH

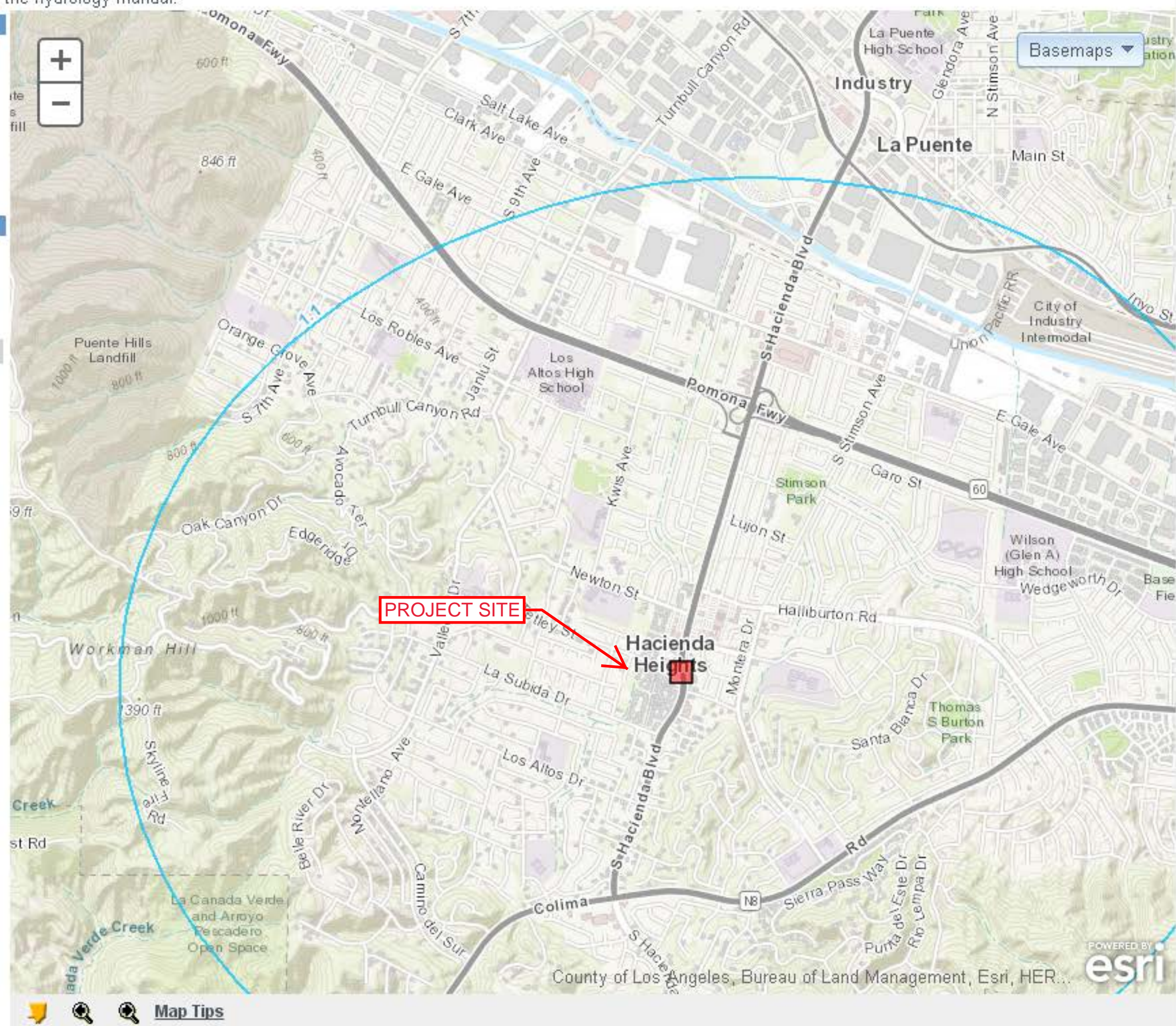
Enter Address, Cross Street, or Parcel No.:

(ex: 900 S. Fremont Ave., Fremont@Valley, 5342005904)

Search

Address Search Results:

hacienda hts and tetley





LOS ANGELES COUNTY  
DEPARTMENT OF PUBLIC WORKS  
DESIGN DIVISION □ HYDRAULIC ANALYSIS UNIT

INFORMATION REQUEST SUMMARY

INFORMATION REQUESTED BY

Requester's Name: Ramy Awad

Company: B&E Engineers

Phone Number: 626-446-4449

Fax Number:

Email: rawad@beeng.com

Method of Contact: ☐ Walk-in ☐ Phone ☐ Fax ☒ Email ☐ Prelim. Mtg. Date:

Intended Use: 33 Residential Condominium Units

Proposed Project Type: Tent TR No 82498

Acreage Involved: 2.2 Acres

Will information be used in any litigation? ☐ YES ☒ NO

Case Info Name:

No:

Location:

Requester's Signature:

*Ramy J. Awad*

INFORMATION REQUESTED (Attach site map if available)

LACFCD Facility Name: Tetley Street Drain

Unit:

Line:

Station:

City: Unincorporated Hacienda Heights - LA County

Street/Cross-street: Hacienda Blvd

Thomas Guide:

Page: 678

Grid: B-4

☒ Site Map/Plans Submitted

Info. Requested:

Allowable Q

BELOW SECTION TO BE COMPLETED BY THE HYDRAULIC ANALYSIS UNIT

INFORMATION PROVIDED: HYDROLOGY DATA, DRAINAGE MAP  
ALLOWABLE DISCHARGE FLOW, & AS BUILT DRAINING

REFERENCES SEARCHED: TETLEY STREET DRAIN FILES

COMMENTS, ETC: 1) ALLOWABLE DISCHARGE FLOW (SUBAREA 27A)  
LIMITED TO 1.55 CFS/ACRE.

2) WATER SURFACE ELEVATION/HGL AT PROPOSED CONNECTION  
STA. 4+15.00 ABOVE CURB FACE.

FOLLOW-UP REQUIRED:

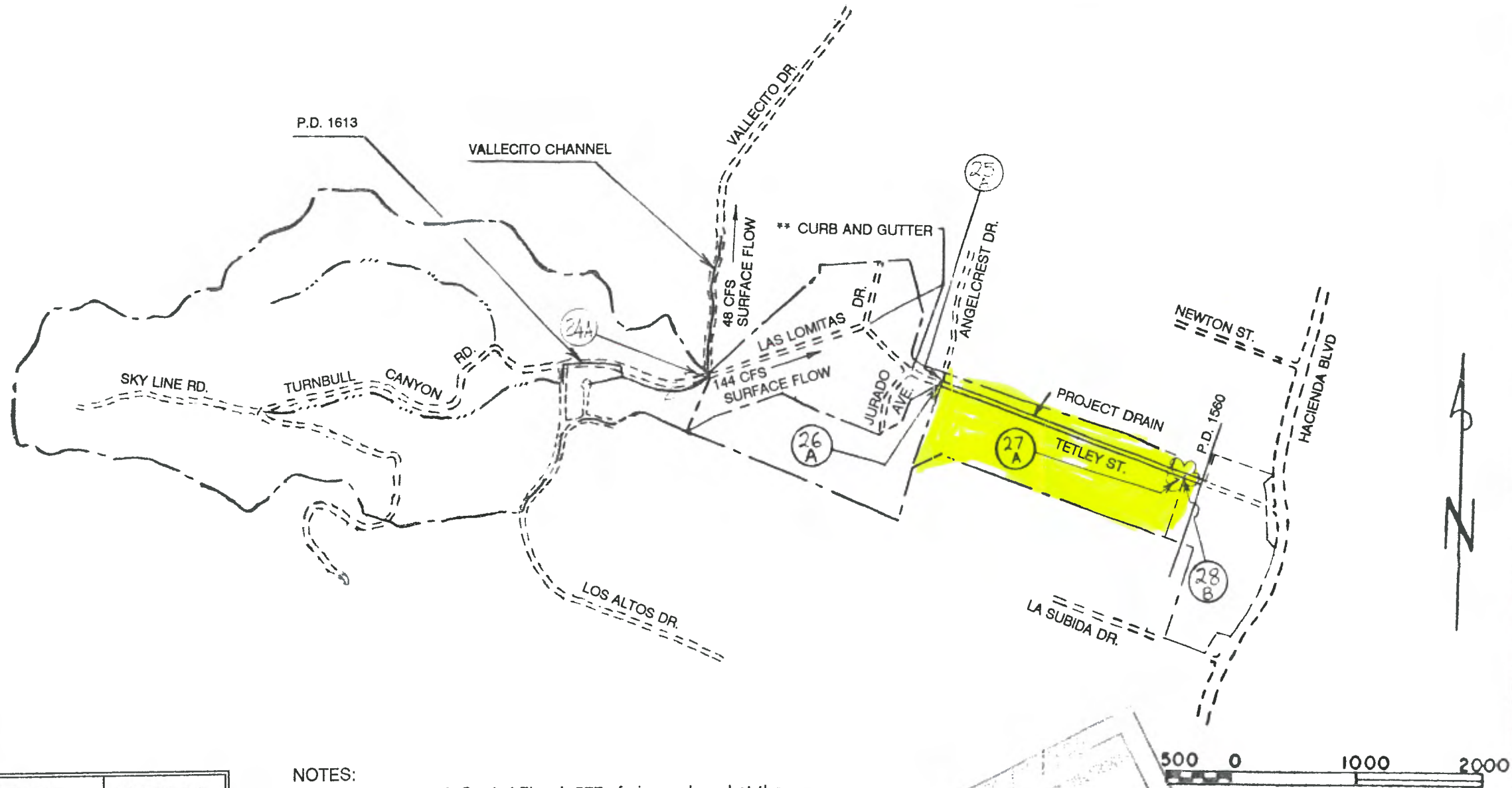
INFORMATION PROVIDED BY: George K. Aintablian

Date: 11/29/2018

INFORMATION REVIEWED BY:

Date:

ATTACHMENT A



| REACH            | PEAK Q's |
|------------------|----------|
| LINE A           |          |
| 25A - 26A        | 170      |
| 26A - 27A        | 210      |
| 27A - LINE B     | 210      |
| LINE A - sump    | 230      |
| sump - P.D. 1560 | 165      |
| LINE B           |          |
| 28B - LINE A     | 60       |

NOTES:

In A Capital Flood, 577 cfs is produced at the Vallecito Channel; however, the Channel can only intercept 385 cfs from the Turnbull Canyon Lateral watershed. In a Capital Flood excess surface flows of approximately 48 cfs will flow onto Vallecito Drive and 144 cfs will escape the Turnbull Canyon watershed and flow onto the Tetley Street watershed.

The reported peak Q's are based on a 50-year frequency rainfall on the Turnbull Canyon Lateral and the Tetley Street Lateral watershed. When adjusted by a scale-down factor of 0.72 , they are to be used for the design of the subject drain.

\*\* Curb and gutter are required in Tetley Street from Jurado Ave. to Las Lomitas Drive as shown on map.

DESIGN BY  
Hydraulic Analysis Unit  
Issued By: *GKA*  
Date: 11/29/93

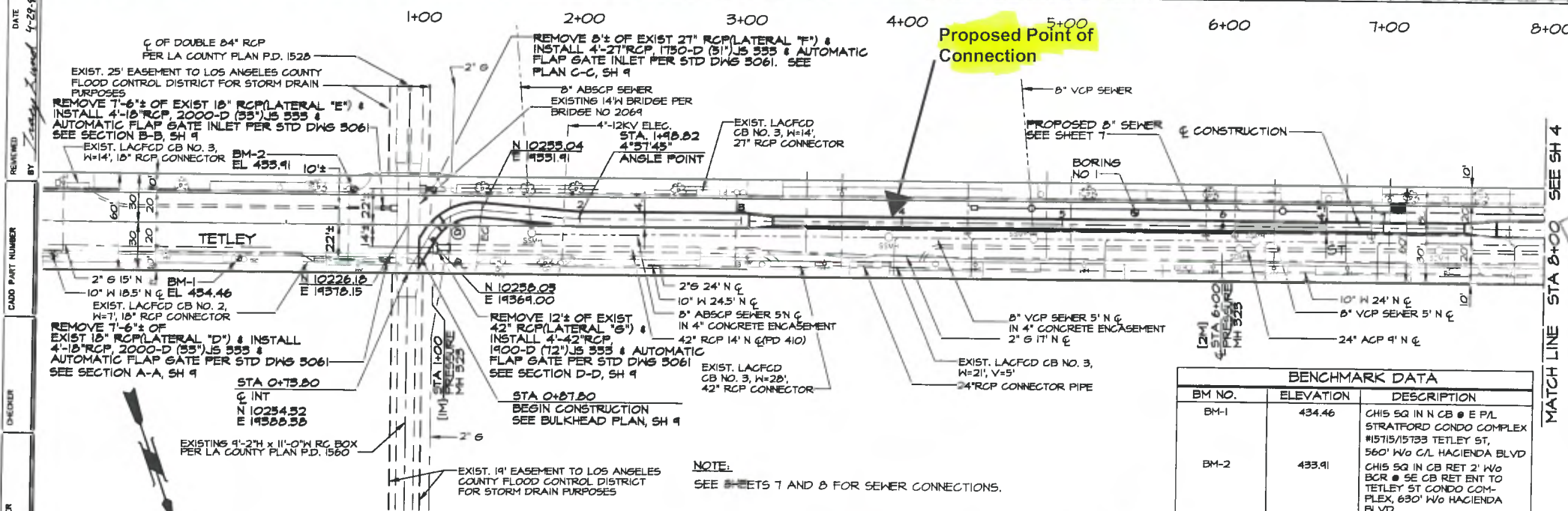
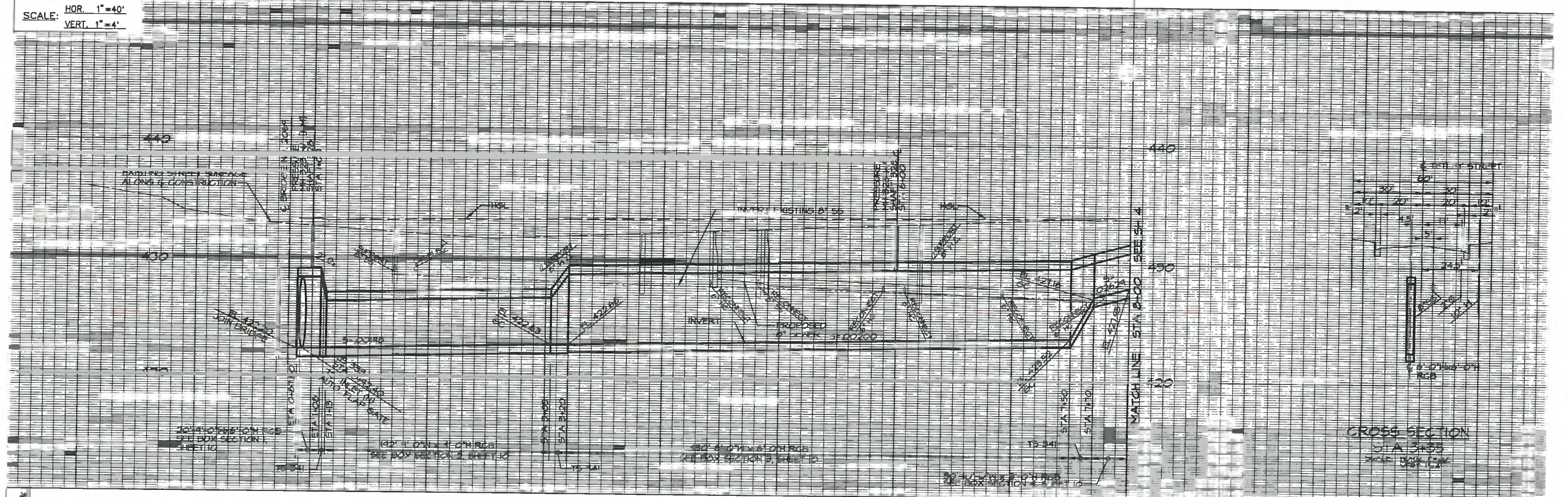
| LEGEND |                              |
|--------|------------------------------|
|        | SUMP                         |
|        | WATERSHED BOUNDARY           |
|        | PROJECT DRAIN                |
|        | EXISTING DRAIN               |
|        | SUBAREA AND COLLECTION POINT |
|        | PROBABLE FUTURE DRAIN        |
|        | STREETS                      |
|        | NATURAL WATERCOURSE          |

|                        |  |
|------------------------|--|
| PREPARED<br>M. MIRANDA | LOS ANGELES COUNTY<br>DEPARTMENT OF PUBLIC WORKS |
| DATE<br>9 - 22 - 93    | SAN JOSE CREEK<br>TETLEY STREET LATERAL          |
| SCALE<br>1" = 1000'    | 50-YEAR FREQUENCY RAINFALL Q's                   |



SCALE: HOR. 1"=40'  
VERT. 1"=4'

Q<sub>0</sub> = 165 cfs



PLAN  
SCALE: 1"=40'

| CURVE DATA |           |         |        |        |         |         |
|------------|-----------|---------|--------|--------|---------|---------|
| Curve      | Δ         | R       | T      | L      | BC Sta. | EC Sta. |
| 1          | 64°37'41" | R = 35' | 22.14' | 34.46' | 0+99.11 | 1+36.59 |

J5 333

| Lateral | A   | B   | C    | EL. S  |
|---------|-----|-----|------|--------|
| D       | 40° | 33' | 4'   | 423.71 |
| E       | 40° | 33' | 4'   | 423.76 |
| F       | 40° | 51' | 4.5' | 424.21 |
| G       | 60° | 72' | 6'   | 422.21 |

**LEE & RO**  
Consulting Engineers, Inc.



| DATE | BY | DESCRIPTION |
|------|----|-------------|
|      |    |             |
|      |    |             |

EDWARD S. DINGMAN 5/95  
PROJECT ENGINEER DATE

COUNTY OF LOS ANGELES  
DEPARTMENT OF PUBLIC WORKS  
DESIGN DIVISION  
Hydraulic Analysis Unit  
OFFICIAL  
RECORDED DOCUMENT  
Issued By: 62A  
Date: 11/29/2018  
Public Service That Works



COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS  
**TETLEY STREET DRAIN  
REINFORCED CONCRETE CONDUIT**

PLAN AND PROFILE  
STA 0+87.80 TO STA 8+00



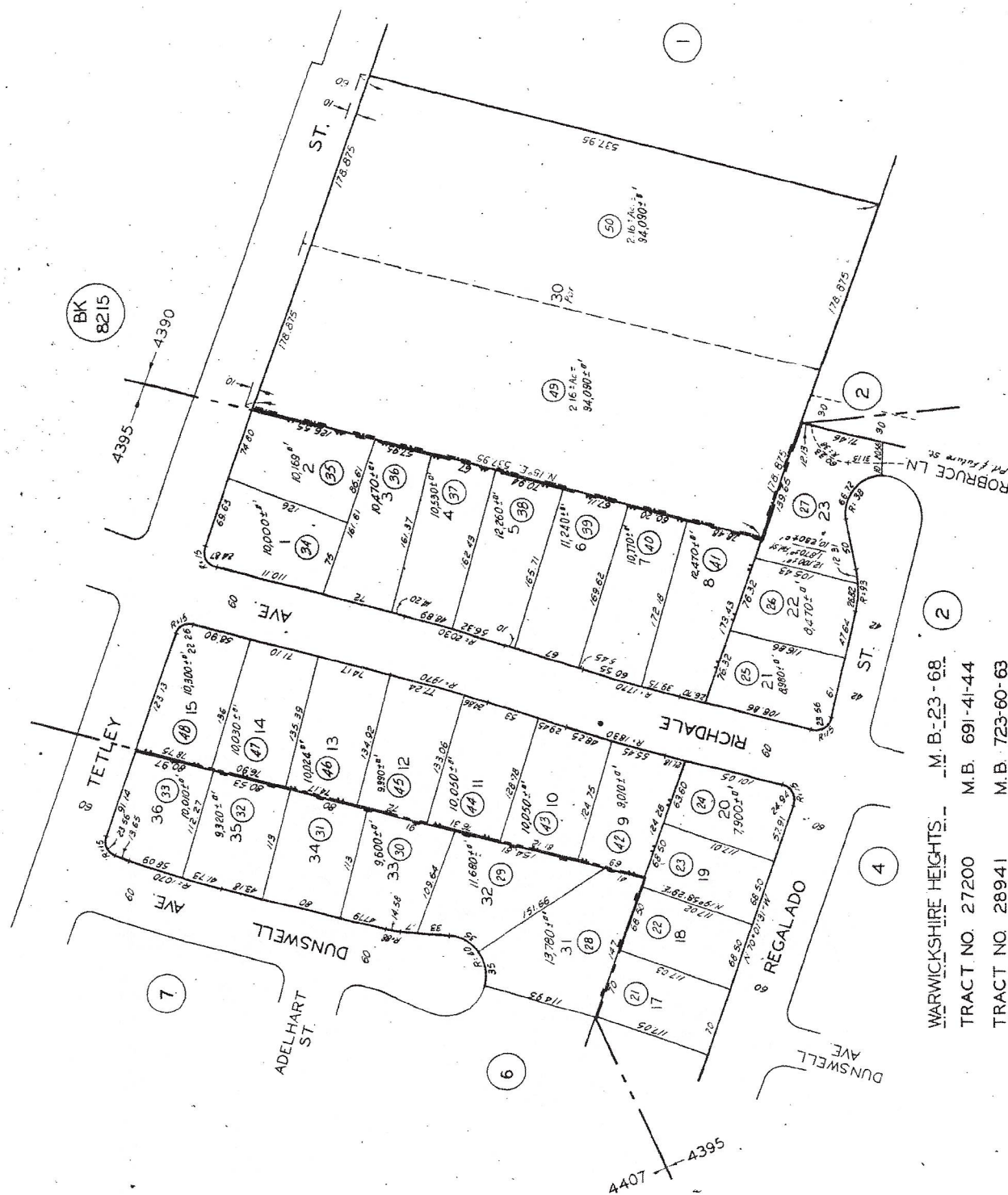
SCALE 1" = 100'

681104  
690925  
780128

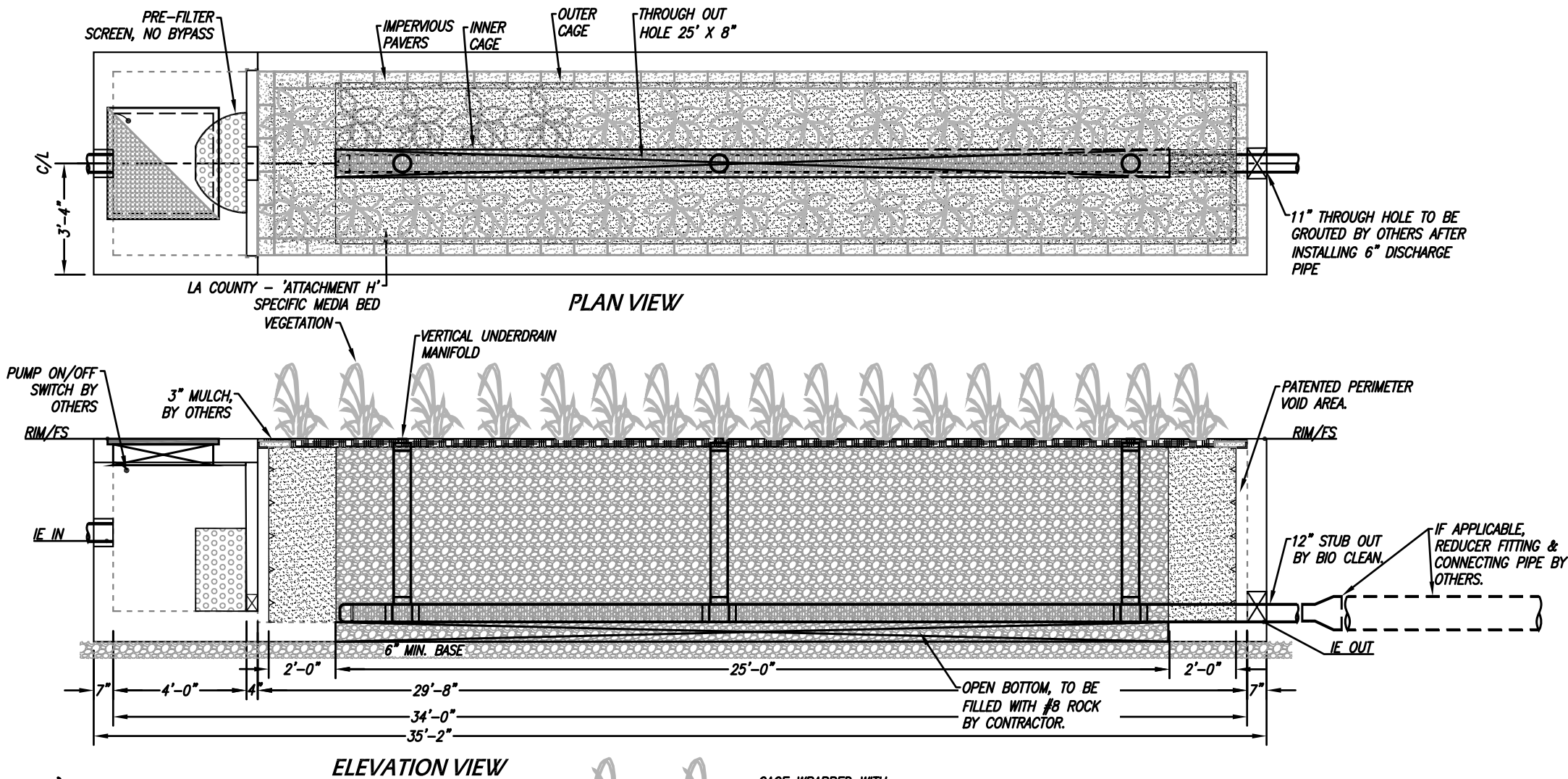
FOR PREV. ASSM'T SEE:  
8222 - 16817

| WARWICKSHIRE HEIGHTS |  | M. B. 23-68    |
|----------------------|--|----------------|
| TRACT NO. 27200      |  | M.B. 69-41-44  |
| TRACT NO. 28941      |  | M.B. 723-60-63 |
| TRACT NO. 29978      |  | M.B. 770-9-10  |

ASSESSOR'S MAP  
COUNTY OF LOS ANGELES, CALIF.



| SITE SPECIFIC DATA                         |              |                      |              |
|--|--------------|----------------------|--------------|
| PROJECT ID                                 |              | 8075.00              |              |
| PROJECT NAME                               |              | TRACT 082498         |              |
| PROJECT LOCATION                           |              | HACIENDA HEIGHTS, CA |              |
| STRUCTURE ID                               |              |                      |              |
| TREATMENT REQUIRED                         |              |                      |              |
| VOLUME BASED (CF)                          |              | FLOW BASED (CFS)     |              |
| 10110                                      |              | ---                  |              |
| TREATMENT HGL AVAILABLE (FT)               |              |                      |              |
| PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE |              |                      | OFFLINE      |
| PIPE DATA                                  | I.E.         | MATERIAL             | DIAMETER     |
| INLET PIPE                                 | N/K          | N/K                  | N/K          |
| INLET PIPE                                 |              |                      |              |
| OUTLET PIPE                                | –5.50        | PVC–SCH 40           | 6”           |
|  | PRETREATMENT | BIOFILTRATION        | N/A          |
| RIM ELEVATION                              | 0.00         | 0.00                 | N/A          |
| SURFACE LOAD                               | PARKWAY      | OPEN PLANTER         | N/A          |
| FRAME & COVER                              | 36” X 36”    | N/A                  | N/A          |
| LA COUNTY MEDIA MIX VOLUME (CY)            |              |                      | 24.00        |
| GRAVEL LAYER WITHIN MEDIA CHAMBER (CY)     |              |                      | 4.60         |
| WETLANDMEDIA DELIVERY METHOD               |              |                      | PER CONTRACT |
| NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.  |              |                      |              |



INSTALLATION NOTES

- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
- UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
- ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

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

| TREATMENT SURFACE AREA SIZING   |                             |                            |
|---|-----------------------------|----------------------------|
|   | INCOMING SURFACE AREA       | OUTGOING SURFACE AREA      |
| SIDE 1 SURFACE AREA   | 2(29' x 5.17') = 299.67 SF  | 2(25' x 5.17') = 258.33 SF |
| SIDE 2 SURFACE AREA   | 2(4.83' x 5.17') = 49.94 SF | 2(0.83' x 5.17') = 8.58 SF |
| TOTAL AREA  | 349.61 SF                   | 266.91 SF                  |
| ** OUTGOING SURFACE AREA IS SMALLEST, BASES FOR REQUIRED TREATMENT CALCULATION. |                             |                            |

|  |         |
|--|---------|
| REQUIRED MEDIA THICKNESS (INCHES)      | 24      |
| TREATMENT VOLUME (CF)                  | 10110   |
| TARGETED DRAINDOWN DURATION (HR)       | 96      |
| WETLANDMEDIA INFILTRATION RATE (IN/HR) | 5       |
| WETLANDMEDIA LOADING RATE (GPM/SF)     | OR 0.05 |
| DISCHARGE RATE (CFS)                   | 0.029   |
| REQUIRED TOTAL MEDIA SURFACE AREA (SF) | 262.58  |
| PROVIDED TOTAL MEDIA SURFACE AREA (SF) | 266.91  |
| NUMBER OF ROW(S)                       | 1.0     |

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL:  
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MODULAR WETLANDS SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.



WetlandMOD-5.5-34-5'-6"-V  
STORMWATER BIOFILTRATION SYSTEM  
STANDARD DETAIL

7/25/19CSNGCH

## WetlandMOD - 24" Media Thickness Volume Based

### Project Information

|                   |                     |
|-------------------|---------------------|
| Project ID:       | 8075                |
| Project Name:     | Tract No. 82496     |
| City, State, ZIP: | Hacienda Height, CA |
| Unit ID:          |                     |

|                             |                             |             |
|-----------------------------|-----------------------------|-------------|
|                             |                             | Unit 1      |
| Unit(s) Internal Dimensions | WetlandMOD Unit Size (I.D.) | WM-5.5-34-V |

|                                       |                                |       |
|---------------------------------------|--------------------------------|-------|
| Standard 4.4ft (or RIM to outlet).    | WM Depth (FT)                  | 5.50  |
| Standard Width, 4.34ft                | Media Chamber Cage Width (FT)  | 29.00 |
| Standard 3.52ft.[Max Cage height 4ft] | Media Chamber Cage Height (FT) | 5.25  |

|   |                                 |       |
|---|---------------------------------|-------|
| Value Provided by Site Engineer         | Required Treatment Volume (CF)  | 10110 |
| Value Provided by Site Engineer         | Trageted Drain Down Time (HR)   | 96    |
| LA County 5-12in/hr, Bay Area 5-10in/hr | Media Infiltration Rate (IN/HR) | 5.0   |
| Unit's Discharge Rate                   | Media Loading Rate (GPM/SF)     | 0.05  |

|                                       |                      |       |
|---------------------------------------|----------------------|-------|
| Unit's Discharge rate, ft3/Sec        | Discharge Rate (CFS) | 0.029 |
| Unit's Discharge rate, gallon per Min | Dicharge Rate (GPM)  | 13.13 |

|                                    |  |       |
|------------------------------------|--|-------|
| Media-mix provided in single foot  | Media Surface per Linear Foot (FT)     | 39.50 |
| Media-mix provided for entire unit | Required total Media Surface Area (SF) | 262.6 |

| Incoming Surface Area   |           | Outgoing Surface Area |           |
|---|-----------|-----------------------|-----------|
| 2(29' x 5.17') =  | 299.67 SF | 2(25' x 5.17') =      | 258.33 SF |
| 2(4.83' x 5.17') =  | 49.91 SF  | 2(0.83' x 5.17') =    | 8.58 SF   |
| Total Area =  | 349.58 SF | Total Area =          | 266.91 SF |
| Outgoing Surface Area < Incoming Surface Area, hence WM calcs based off 'Outgoing Surface Area' |           |                       |           |

|   |                          |      |
|---|--------------------------|------|
| Insert a value for desired row(s)         | Number of Row(s)         | 1.0  |
| Media row(s) length, [Cage length]        | Length of Row(s)         | 29   |
| Media chamber length with 4" baffle wall. | Media Chamber I.D. (FT)  | 30   |
| Max HGL height for the unit.              | Operating Head/ HGL (FT) | 5.17 |

Feel free to fax or email proposed sizing calculations to BioClean Environmental, for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

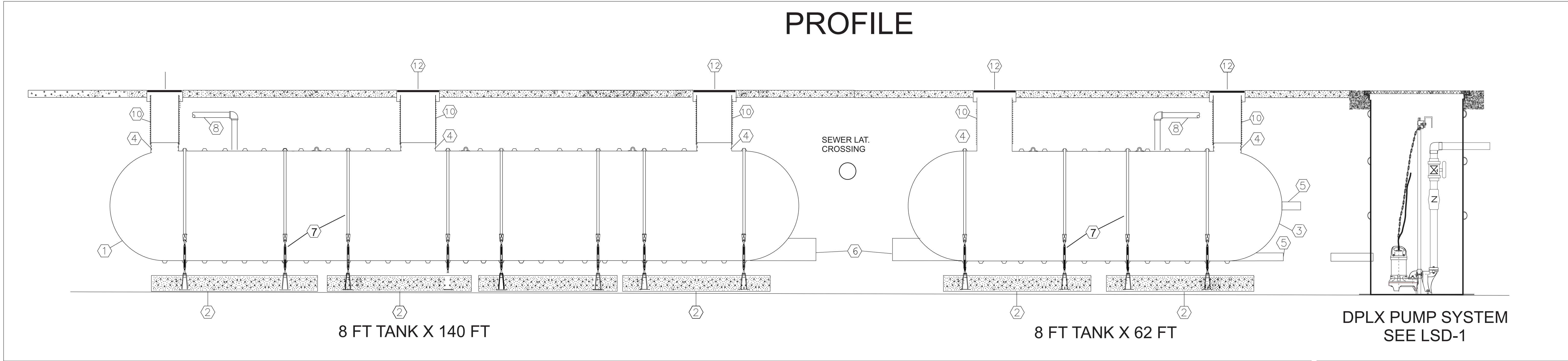
Email: [Info@modularwetlands.com](mailto:Info@modularwetlands.com)

  
 A Forterra Company

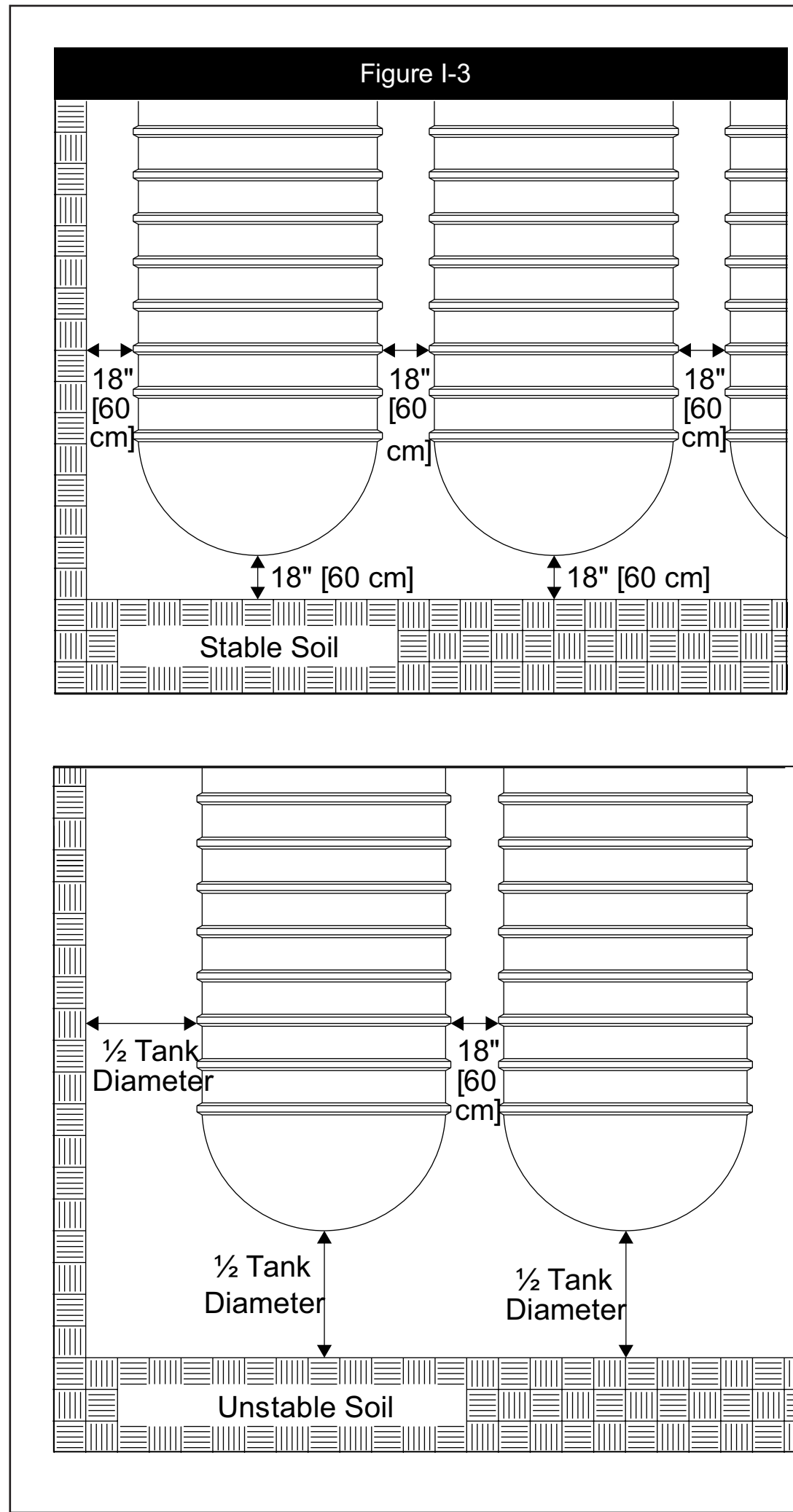








| STORM WATER   |  | NO. | DESCRIPTION  |
|---|--|-----|--|
| <div>This drawing is for illustrative purposes only. Consult with an engineer for specific applications.</div> <div><b>XERXES</b><sup>®</sup><br/>a zcl company</div> <div>TITLE<br/>STORM WATER<br/>DETENTION TANK</div> <div>DATE 9-13-18 DR. NO.</div> |  | 1   | XERXES SINGLE WALL FRP TANK  |
|   |  | 2   | XERXES PRECAST DEADMAN SYSTEM W/ HOLD DOWN STRAP AND TURNBUCKLE ASSEMBLY |
|   |  | 3   | XERXES SINGLE WALL FRP TANK  |
|   |  | 4   | 30" FRP OPENING  |
|   |  | 5   | 6" FRP INLET PIPE  |
|   |  | 6   | 1 1/2" TANGENTIAL FULL BOTTOM DRAIN NOZZLE                               |
|   |  | 7   | TURNBUCKLE AND STRAPS FOR 6 FT DIA TANK                                  |
|   |  | 8   | 4" VENT PIPE   |
|   |  | 9   | NOT USED   |
|   |  | 10  | 30" RIBBED PVC RISER W/ FRP LID  |
|   |  | 11  | NOT USED   |
|   |  | 12  | H2O LOAD RATED COVERS BY ALHAMBRA FOUNDRY LABELED STORM                  |



#### APPENDIX C

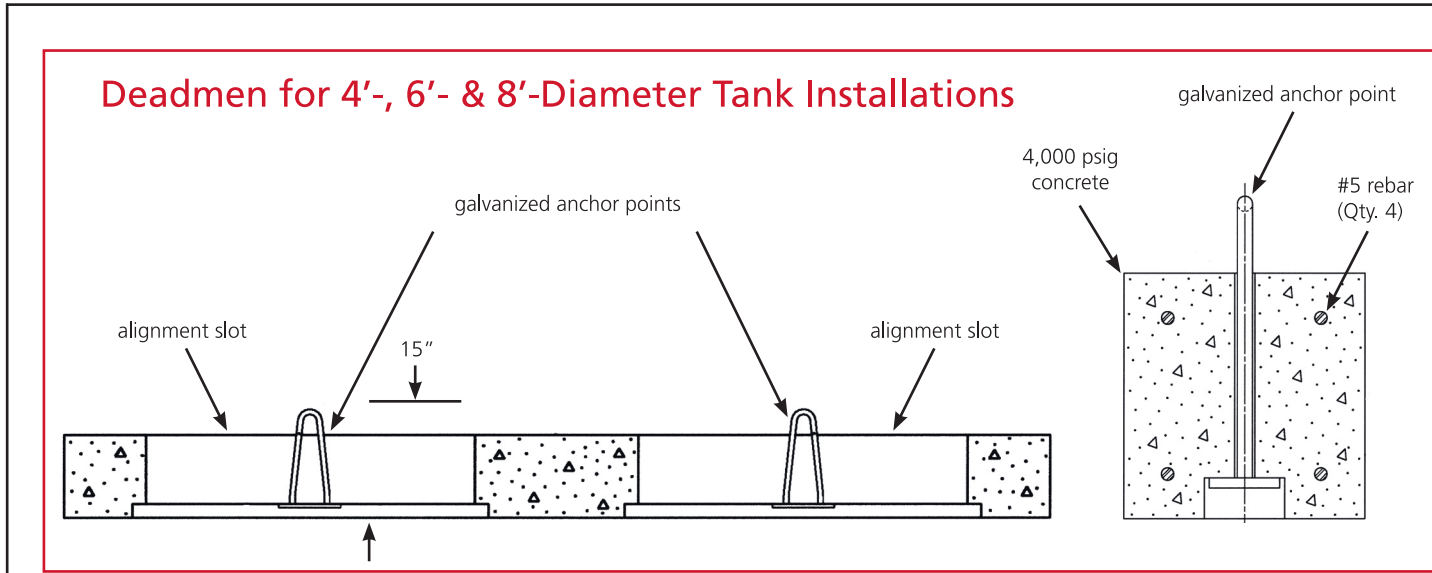
##### Primary Backfill Requirements

- The backfill material surrounding an underground storage tank (UST) is a critical part of a proper tank installation. This document gives guidelines for choosing the primary backfill material to use when installing our fiberglass underground storage tanks.
- The Installation Manual specifies that select rounded stones or crushed stones are to be used as primary backfill material.
- Primary backfill material is to be clean, free-flowing, and free of dirt, sand, large rocks, roots, organic materials, and debris.
- No backfill material shall be frozen or contain lumps of frozen material at any time during placement.
- Another important characteristic of backfill material is hardness or stability when exposed to water or loads. Most materials have no problem meeting the hardness requirement.
  - Materials like soft limestone, sandstone, sea shells or shale should not be used as backfill because they break down over time.
- Coarse aggregate is a technical term for the material (rounded stones and crushed stones) that meets our backfill size requirements.
- ASTM International and the American Association of State Highway and Transportation Officials have specifications for standard sizes of coarse aggregate.
  - Table C-1 gives the standard sizes of coarse aggregate that meet the backfill material specifications for rounded stones and crushed stones. It identifies standard sieve sizes used to grade aggregate material. For each aggregate size, the amount of material finer than each laboratory sieve (square openings) is given as a percentage of the total weight of the sample.
  - ASTM uses size numbers 6, 7 and 8 to describe specific gradation profiles for materials that pass through a series of sieves. Do not confuse these gradation profiles with sieve sizes.
  - C2.3.1 The percentages give an indication of the particle size distribution or gradation within a given aggregate size. With aggregate size number 6 of rounded stones, for example, 20—55 percent of the sample (measured by weight) should pass through a 1/2-inch sieve. And, with aggregate size number 7 of crushed stones, 0—15 percent of the sample (measured by weight) should pass through a No.4 sieve.
- Some material suppliers may produce materials that meet our requirements but are not identified by a standard coarse aggregate size number. The supplier should be able to provide a specification that identifies the size or gradation of the material.
  - If the material supplier is unable to supply a gradation report, an independent testing laboratory can perform a sieve analysis on a sample of the material according to the ASTM C 136 testing specifications. The test results can then be compared against the size requirements for rounded or crushed stones shown in Table C-1.
- When using select rounded stones, the material is to be a mix of rounded particles, sizes between 0.094 inch and 3/4 inch.
  - The rounded stones must conform to the specifications of ASTM C 33, sizes 6, 67 or 7.
  - No more than 5 percent (by weight) of the back fill may pass through a #8 sieve. See Table C-1 for additional information.
  - Generally, rounded stones that meet the gradation requirements are larger than allowable crushed stones.
- When using crushed stones, the material is to be a mix of angular particles, sizes between 0.094 inch and 1/2 inch.
  - The crushed stones must conform to the specifications of ASTM C 33, sizes 7 or 8.
  - No more than 5 percent (by weight) of the backfill may pass through a #8 sieve. See Table C-1 for additional information.

| Table C-1<br>PERCENTAGE OF STONES PASSING THROUGH SIEVE BY SIEVE SIZE |          |           |          |
|---|----------|-----------|----------|
| Rounded Stones  |          |           |          |
| ASTM C 33 Size #  | #6 Stone | #67 Stone | #7 Stone |
| 1 inch [25mm]   | 100%     | 100%      | —        |
| 3/4 inch [19mm]   | 90—100%  | 90—100%   | 100%     |
| 1/2 inch [12.5mm]   | 20—55%   | —         | 90—100%  |
| 3/8 inch [9.5mm]  | 0—15%    | 20—55%    | 40—70%   |
| No.4 [4.75mm]   | 0—5%     | 0—10%     | 0—15%    |
| No.8 [2.36mm]   | —        | 0—5%      | 0—5%     |
| Crushed Stone   |          |           |          |
| ASTM C 33 Size #  | #7 Stone | #8 Stone  |          |
| 1 inch [25mm]   | —        | —         |          |
| 3/4 inch [19mm]   | 100%     | —         |          |
| 1/2 inch [12.5mm]   | 90—100%  | 100%      |          |
| 3/8 inch [9.5mm]  | 40—70%   | 85—100%   |          |
| No.4 [4.75mm]   | 0—15%    | 10—30%    |          |
| No.8 [2.36mm]   | 0—5%     | 0—10%     |          |

APPENDIX C

43



##### Product Specifications

| Deadmen for 4'-, 6'- and 8'-Diameter Tanks |                       |                           | Turnbuckles<br>Jaw-to-Jaw Style               |
|--|-----------------------|---------------------------|---|
| Nominal length                             | Nominal width x depth | Approximate weight (lbs.) |   |
| 12'  | 12"x12"               | 1,800                     |   |
| 16'  | 12"x12"               | 2,400                     |   |
| 18'  | 12"x12"               | 2,700                     |   |
|  |                       |                           | 6'-Diameter Tanks                             |
|  |                       |                           | 3/4" X 9"<br>(17" closed, expanding to 26")   |
|  |                       |                           |   |
| Deadmen for 10'- and 12'-Diameter Tanks    |                       |                           | 8'-Diameter Tanks                             |
| Nominal length                             | Nominal width x depth | Approximate weight (lbs.) | 3/4" X 12"<br>(20" closed, expanding to 32 ") |
| 14'  | 18" X 8 3/4"          | 1,900                     |   |
| 18'  | 18" X 8 3/4"          | 2,400                     |   |
| 22'  | 18" X 8 3/4"          | 3,000                     | 10'- and 12'-Diameter Tanks                   |
| 30'  | 18" X 8 3/4"          | 5,000                     | 3/4" X 18"<br>(26" closed, expanding to 44")  |

- General Notes:**
- Deadmen requirements may vary with tanks 25,000 gallons or larger, and/or based on the number of containment sumps, access risers and burial depth.
  - Consult the Xerxes Installation Manual and Operating Guidelines or your Xerxes sales representative for more information.

zcl.com | xerxes.com  
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xas10/12h

## STORM WATER DETENTION DETAIL

PSI pacific southwest industries

ENGINEERED- PUMPS/FLUID HANDLING & DISPOSAL SYSTEMS  
30520 COPLASA ST. - LAKE ELSINORE, CA 92530 PH: 800 958-9095

|  |         |                   |  |             |          |            |
|--|---------|-------------------|--|-------------|----------|------------|
| LIFT STATION DETAILS<br>15716 TETLY ST. CONDOS<br>HACIENDA HEIGHTS, CA |         |                   |  | Date:       | 05/22/19 | Scale: NTS |
|  |         |                   |  | Drawn by:   | ZD       | Sheet No.  |
|  |         |                   |  | Checked by: | SR       | 1 OF 1     |
| No.  | Date    | Description       |  |             |          |            |
| 1  | 2/27/17 | ELEVATION CHANGES |  |             |          |            |
|  |         |                   |  |             |          |            |
|  |         |                   |  |             |          |            |
|  |         |                   |  |             |          |            |
|  |         |                   |  |             |          |            |

## **Appendix B: Pre-Development Hydrology Calculations**



## Peak Flow Hydrologic Analysis

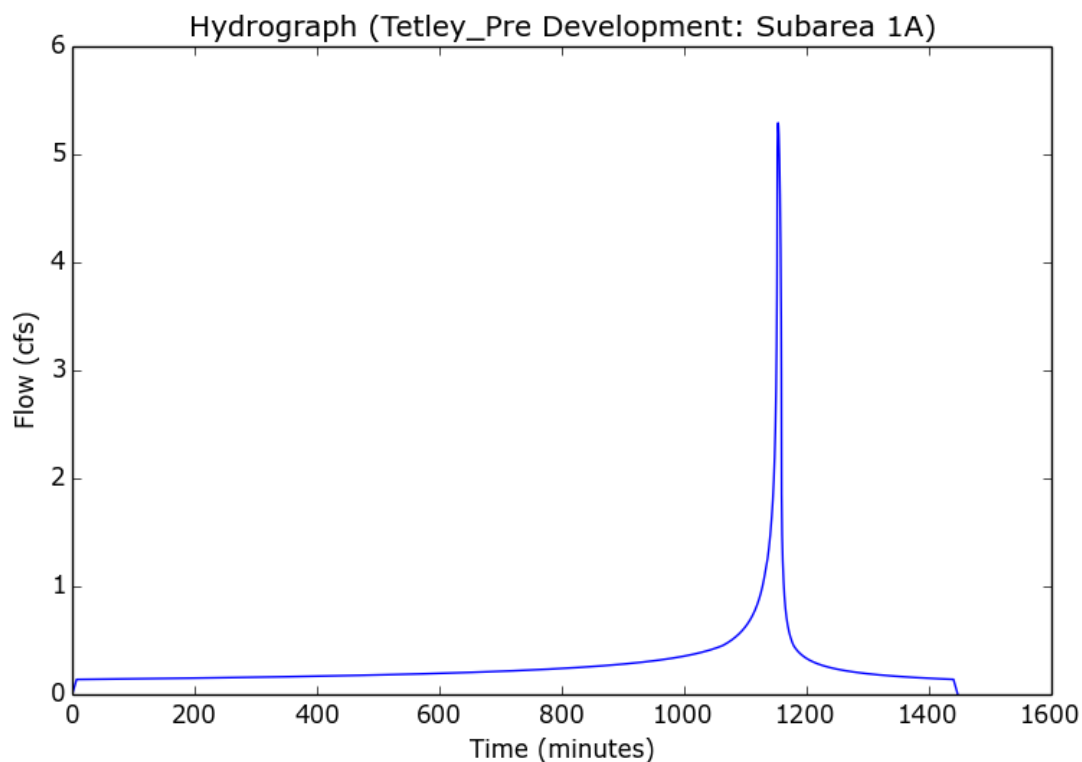
File location: C:/Users/ggiris/Desktop/tetly hydrology/Pre Development.pdf  
Version: HydroCalc 1.0.2

### Input Parameters

|                           |                        |
|---------------------------|------------------------|
| Project Name              | Tetley_Pre Development |
| Subarea ID                | Subarea 1A             |
| Area (ac)                 | 2.16                   |
| Flow Path Length (ft)     | 573.0                  |
| Flow Path Slope (vft/hft) | 0.019                  |
| 50-yr Rainfall Depth (in) | 6.3                    |
| Percent Impervious        | 0.53                   |
| Soil Type                 | 16                     |
| Design Storm Frequency    | 25-yr                  |
| Fire Factor               | 0                      |
| LID                       | False                  |

### Output Results

|                                     |            |
|-------------------------------------|------------|
| Modeled (25-yr) Rainfall Depth (in) | 5.5314     |
| Peak Intensity (in/hr)              | 2.8175     |
| Undeveloped Runoff Coefficient (Cu) | 0.8353     |
| Developed Runoff Coefficient (Cd)   | 0.8696     |
| Time of Concentration (min)         | 7.0        |
| Clear Peak Flow Rate (cfs)          | 5.292      |
| Burned Peak Flow Rate (cfs)         | 5.292      |
| 24-Hr Clear Runoff Volume (ac-ft)   | 0.5592     |
| 24-Hr Clear Runoff Volume (cu-ft)   | 24358.1083 |





## **Appendix C: Post Development Hydrology Calculations**



## Peak Flow Hydrologic Analysis

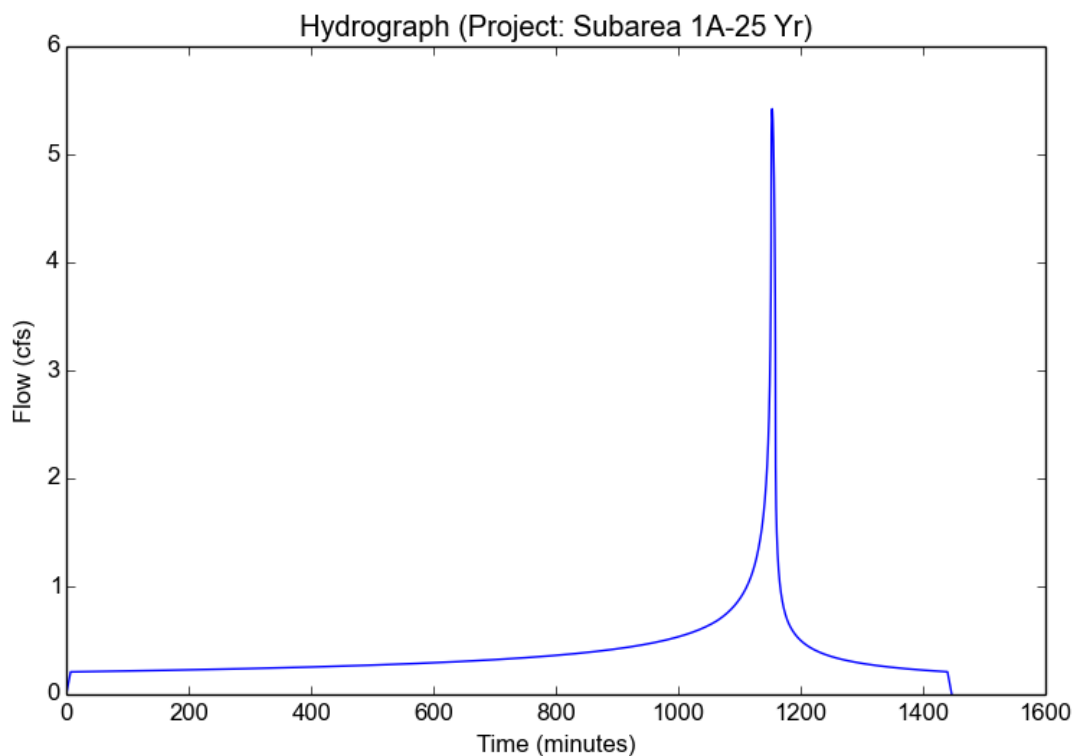
File location: C:/Documents and Settings/BeltiR/Desktop/Project - Subarea 1A-25 Yr.pdf  
Version: HydroCalc 0.3.0-beta

### Input Parameters

|                           |                  |
|---------------------------|------------------|
| Project Name              | Project          |
| Subarea ID                | Subarea 1A-25 Yr |
| Area (ac)                 | 2.16             |
| Flow Path Length (ft)     | 585.0            |
| Flow Path Slope (vft/hft) | 0.02022          |
| 50-yr Rainfall Depth (in) | 6.3              |
| Percent Impervious        | 0.86             |
| Soil Type                 | 16               |
| Design Storm Frequency    | 25-yr            |
| Fire Factor               | 0                |
| LID                       | False            |

### Output Results

|                                     |           |
|-------------------------------------|-----------|
| Modeled (25-yr) Rainfall Depth (in) | 5.5314    |
| Peak Intensity (in/hr)              | 2.8175    |
| Undeveloped Runoff Coefficient (Cu) | 0.8353    |
| Developed Runoff Coefficient (Cd)   | 0.8909    |
| Time of Concentration (min)         | 7.0       |
| Clear Peak Flow Rate (cfs)          | 5.422     |
| Burned Peak Flow Rate (cfs)         | 5.422     |
| 24-Hr Clear Runoff Volume (ac-ft)   | 0.7905    |
| 24-Hr Clear Runoff Volume (cu-ft)   | 34435.652 |



## Peak Flow Hydrologic Analysis

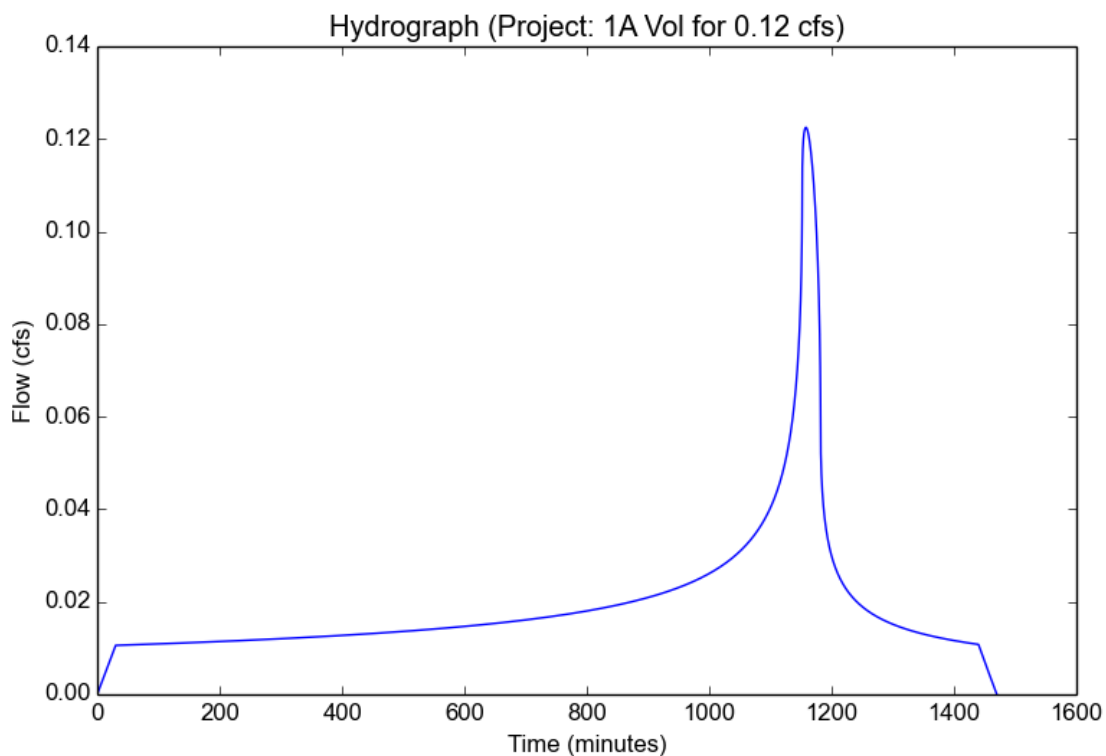
File location: C:/Documents and Settings/BeltiR/Desktop/Project - 1A Vol for 0.12 cfs.pdf  
Version: HydroCalc 0.3.0-beta

### Input Parameters

|                           |                     |
|---------------------------|---------------------|
| Project Name              | Project             |
| Subarea ID                | 1A Vol for 0.12 cfs |
| Area (ac)                 | 2.16                |
| Flow Path Length (ft)     | 587.0               |
| Flow Path Slope (vft/hft) | 0.02                |
| 50-yr Rainfall Depth (in) | 0.28                |
| Percent Impervious        | 0.86                |
| Soil Type                 | 16                  |
| Design Storm Frequency    | 50-yr               |
| Fire Factor               | 0                   |
| LID                       | False               |

### Output Results

|                                     |           |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 0.28      |
| Peak Intensity (in/hr)              | 0.072     |
| Undeveloped Runoff Coefficient (Cu) | 0.1       |
| Developed Runoff Coefficient (Cd)   | 0.788     |
| Time of Concentration (min)         | 30.0      |
| Clear Peak Flow Rate (cfs)          | 0.1225    |
| Burned Peak Flow Rate (cfs)         | 0.1225    |
| 24-Hr Clear Runoff Volume (ac-ft)   | 0.0394    |
| 24-Hr Clear Runoff Volume (cu-ft)   | 1715.7163 |





## **Hydraulics of Catch Basin**

The Proposed storm drain system is designed for 25year frequency. The total runoff to the onsite catch basin located near southeast corner of the project site calculated to be 5.42 cfs. The catch basin is in the grade area and will be built with 4 inches local depression.

Using chart page 28 and  $W=7'$  side opening catch basin, the total site runoff of 5.42 cfs is fully intercepted.

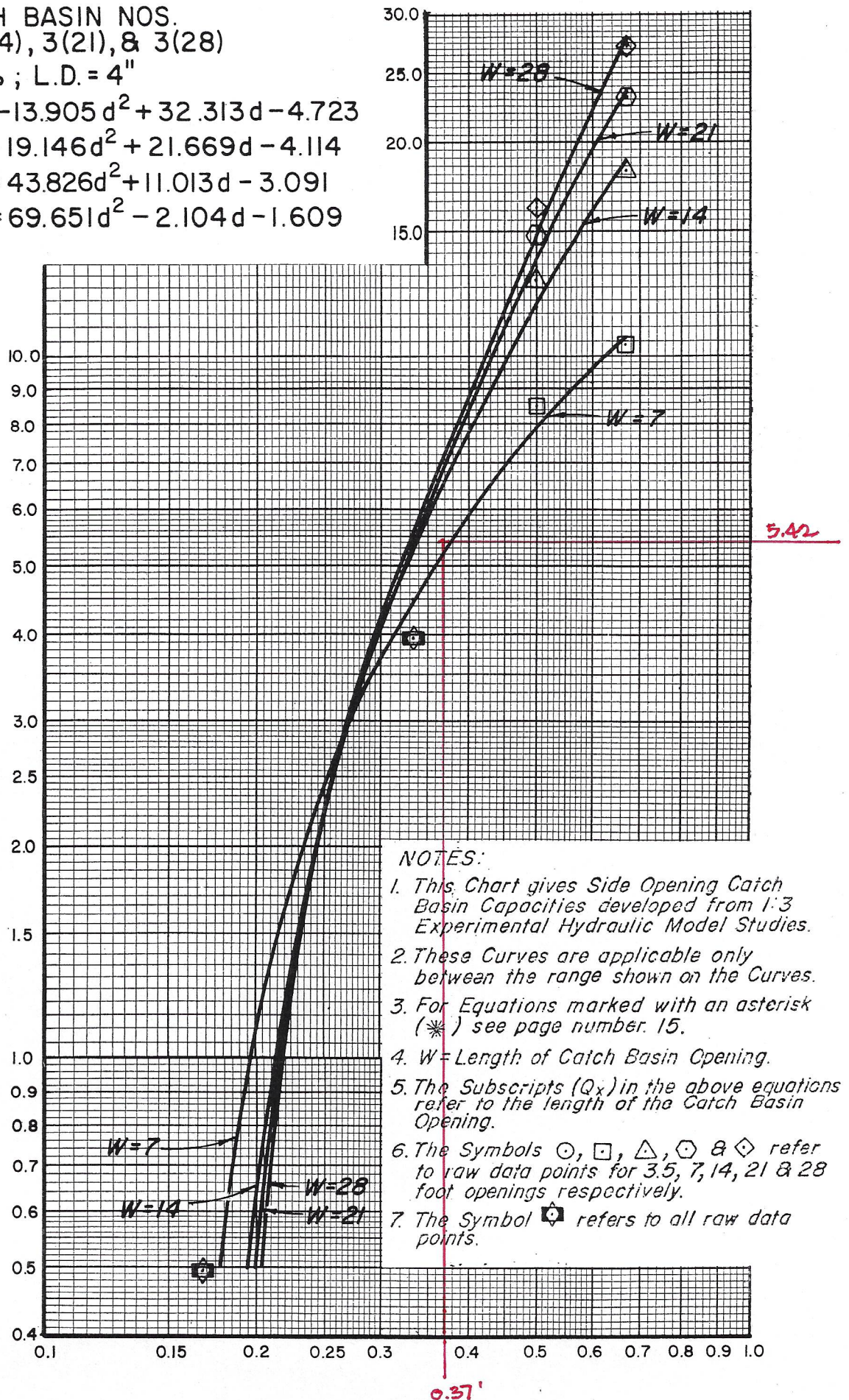
CATCH BASIN NOS.  
2, 3(14), 3(21), & 3(28)  
at 1% ; L.D. = 4"

$$*Q_7 = -13.905d^2 + 32.313d - 4.723$$

$$*Q_{14} = 19.146d^2 + 21.669d - 4.114$$

$$*Q_{21} = 43.826d^2 + 11.013d - 3.091$$

$$*Q_{28} = 69.651d^2 - 2.104d - 1.609$$



# Street Depth of Flow Worksheet for Irregular Channel

| Project Description |                                    |
|---------------------|------------------------------------|
| Project File        | c:\haestad\fmw\sample\project1.fm2 |
| Worksheet           | Street Flow                        |
| Flow Element        | Irregular Channel                  |
| Method              | Manning's Formula                  |
| Solve For           | Water Elevation                    |

| Input Data                               |                |                |             |           |
|--|----------------|----------------|-------------|-----------|
| Channel Slope                            |                | 0.013000 ft/ft |             |           |
| Elevation range: 100.00 ft to 100.66 ft. |                |                |             |           |
| Station (ft)                             | Elevation (ft) | Start Station  | End Station | Roughness |
| 0.00                                     | 100.66         | 0.00           | 21.00       | 0.013     |
| 8.00                                     | 100.50         |                |             |           |
| 8.00                                     | 100.00         |                |             |           |
| 10.00                                    | 100.17         |                |             |           |
| 21.00                                    | 100.39         |                |             |           |
| Discharge                                | 5.42           | cfs            |             |           |

| Results                   |          |                 |
|---------------------------|----------|-----------------|
| Wtd. Mannings Coefficient | 0.013    |                 |
| Water Surface Elevation   | 100.37   | ft              |
| Flow Area                 | 1.63     | ft <sup>2</sup> |
| Wetted Perimeter          | 12.63    | ft              |
| Top Width                 | 12.24    | ft              |
| Height                    | 0.37     | ft              |
| Critical Depth            | 100.43   | ft              |
| Critical Slope            | 0.004612 | ft/ft           |
| Velocity                  | 3.33     | ft/s            |
| Velocity Head             | 0.17     | ft              |
| Specific Energy           | 100.55   | ft              |
| Froude Number             | 1.61     |                 |
| Flow is supercritical.    |          |                 |



## CALCULATE FLOW SPLITTER

The DCV &  $Q_{LID}$  are calculated by using hydrocalc program. The DCV is calculated to be 10,110cf

The  $Q_{LID}$  is calculated to be 0.545 cfs

1. calculate Height of weir (H):

$$Q_{LID} = 0.54 \text{ cfs}$$

$$\text{Try } D = 6", A = 0.20 \text{ SF}$$

use orifice formula to calculate height of weir:

$$Q = CA\sqrt{2gh} \quad h = \left(\frac{Q}{CA}\right)^2 / 2g \quad \text{where } C = 0.60 \text{ \& } A = 0.20$$

$$h = \left(\frac{0.54}{0.6 \times 0.2}\right)^2 / (2 \times 32.2) = 0.31'$$

$$H = h + \frac{D}{2} = 0.31 + \frac{0.5}{2} = 0.56'$$

calculate length of weir for Peak Flow:

$$Q_{25} = 5.42 \text{ cfs} = Q_{\text{peak}}$$

use weir formula:

$$Q = 3.33 L H^{3/2}$$

$$H^{3/2} = \frac{Q}{3.33 L}$$

$$\text{Try } L = 3.17' \Rightarrow H = 0.63'$$

$$H = \left(\frac{5.42}{3.33 \times 3.17}\right)^{2/3} = 0.63'$$



# CALCULATIONS IN SIZING THE OUTLET PIPES:

1. FOR PIPE TO PARKWAY DRAIN:

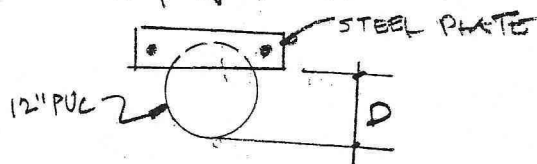
$$Q = 2.072 \text{ CFS}$$

$$\text{TRY } d = 12", A = 0.79'$$

$$h = 0.94 - 0.5 = 0.44'$$

$$Q = CA \sqrt{2gh} = 0.6 \times 0.79 \sqrt{64.4 \times 0.44} = 2.52 \text{ CFS} > 2.07 \text{ CFS} \quad \underline{\underline{NG}}$$

TRY  $d = 12"$  WITH STEEL PLATE AT UPPER PORTION OF PIPE



$$\text{TRY } D = 6.27" = 0.52', A = 0.45 \text{ SF}$$

$$h = 0.94 - 0.52/2 = 0.68'$$

$$Q = 0.6 \times 0.45 \sqrt{64.4 \times 0.68} = 1.65 \text{ CFS} < 2.072 \text{ CFS} \quad \underline{\underline{NG}}$$

$$\text{TRY } D = 7.93" = 0.66', A = 0.55 \text{ SF}$$

$$h = 0.94 - 0.66/2 = 0.61'$$

$$Q = 0.6 \times 0.55 \sqrt{64.4 \times 0.61} = 2.072 \text{ CFS} \quad \text{OK} \leftarrow$$

2. FOR PIPE TO EXISTING RCB IN TETLEY STREET:

$$Q = 3.319 \text{ CFS}$$

$$\text{TRY } d = 15" = 1.25', A = 1.23 \text{ SF}$$

$$h = \frac{\left(\frac{Q}{CA}\right)^2}{2g} = \frac{\left(\frac{3.319}{0.6 \times 1.23}\right)^2}{64.4}$$

$$= 0.31'$$

$$H = 1.25/2 + 0.31 = 0.94'$$

USE 15" PVC PIPE FOR DIRECT CONNECTION TO EXISTING RCB.

## **Appendix D: LID 85<sup>th</sup> Percentile Calculations**



## Peak Flow Hydrologic Analysis

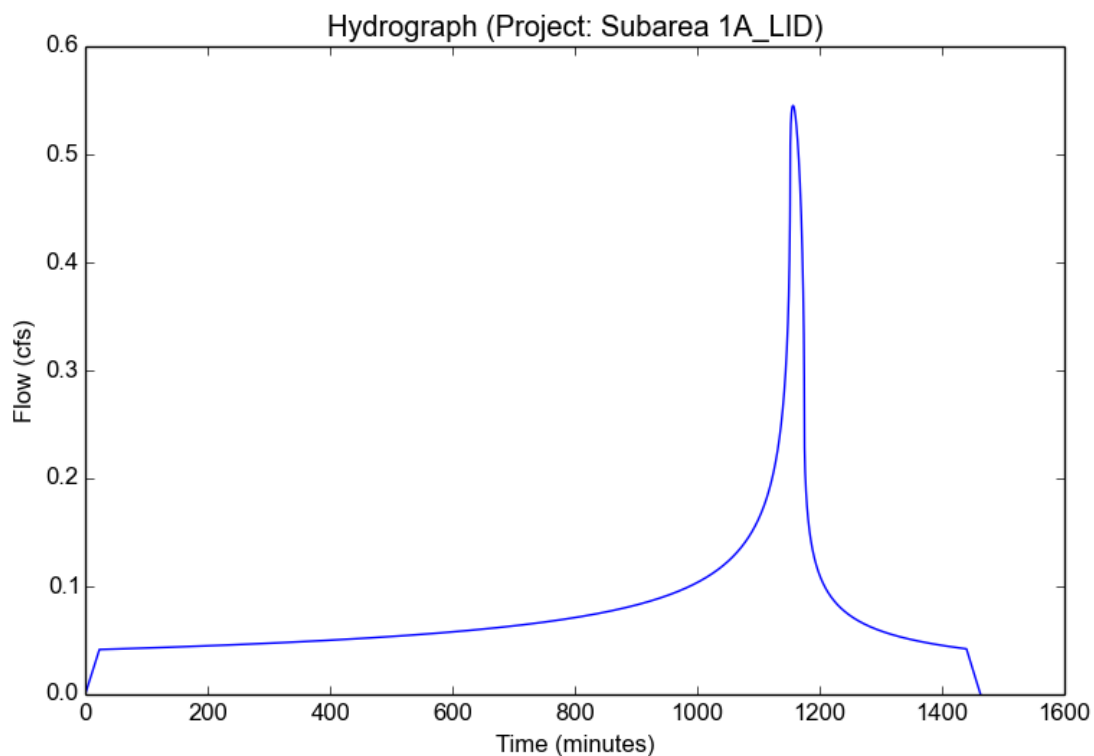
File location: C:/Documents and Settings/BeltiR/Desktop/Project - Subarea 1A\_LID.pdf  
Version: HydroCalc 0.3.0-beta

### Input Parameters

|                                     |                       |
|-------------------------------------|-----------------------|
| Project Name                        | Project               |
| Subarea ID                          | Subarea 1A_LID        |
| Area (ac)                           | 2.16                  |
| Flow Path Length (ft)               | 585.0                 |
| Flow Path Slope (vft/hft)           | 0.02022               |
| 85th Percentile Rainfall Depth (in) | 1.1                   |
| Percent Impervious                  | 0.86                  |
| Soil Type                           | 16                    |
| Design Storm Frequency              | 85th percentile storm |
| Fire Factor                         | 0                     |
| LID                                 | True                  |

### Output Results

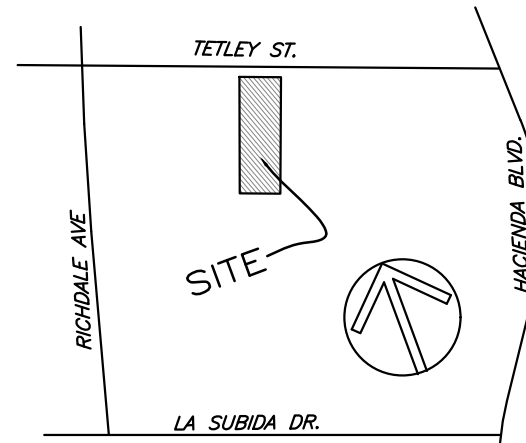
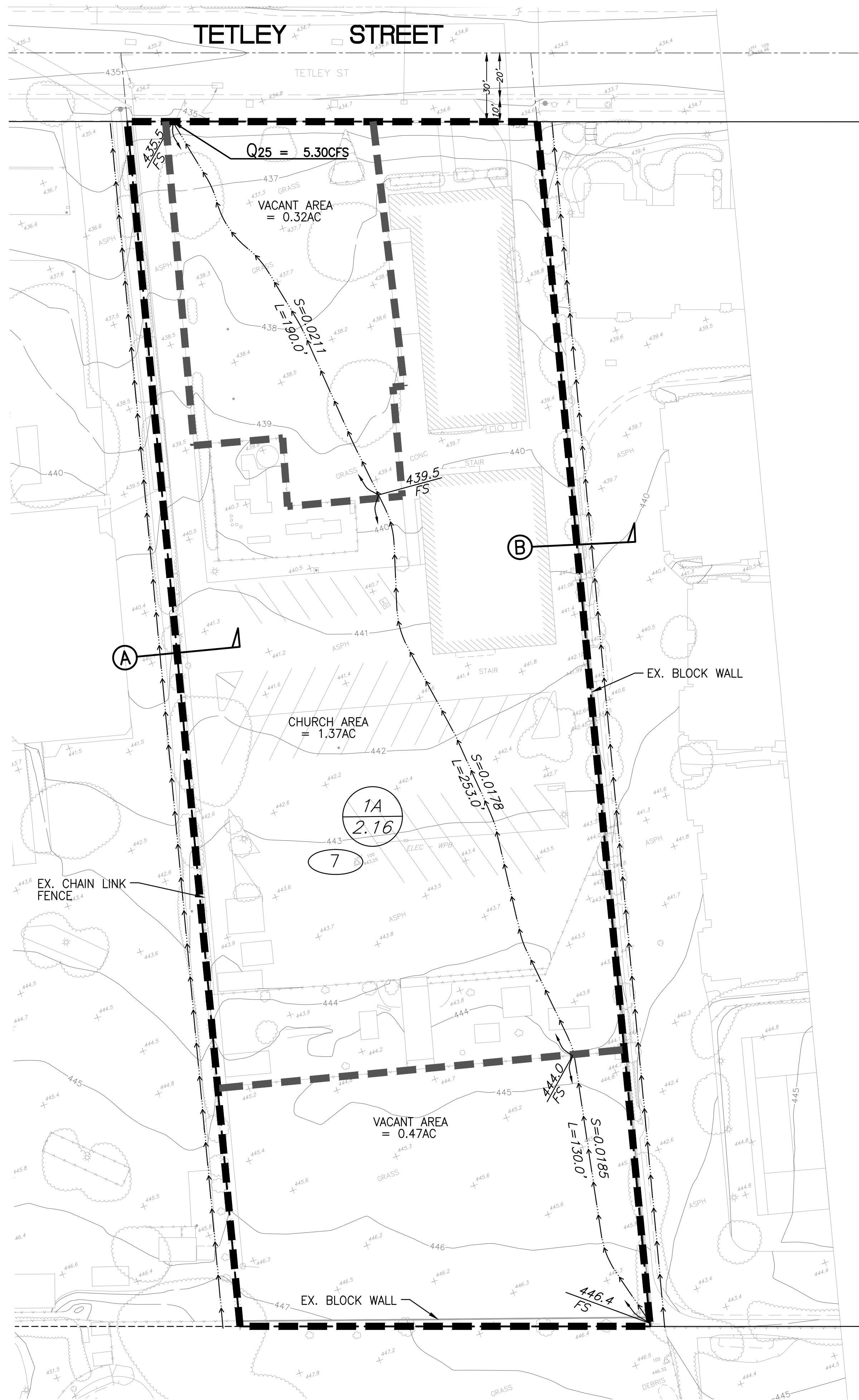
|   |           |
|---|-----------|
| Modeled (85th percentile storm) Rainfall Depth (in) | 1.1       |
| Peak Intensity (in/hr)                              | 0.3203    |
| Undeveloped Runoff Coefficient (Cu)                 | 0.1       |
| Developed Runoff Coefficient (Cd)                   | 0.788     |
| Time of Concentration (min)                         | 23.0      |
| Clear Peak Flow Rate (cfs)                          | 0.5452    |
| Burned Peak Flow Rate (cfs)                         | 0.5452    |
| 24-Hr Clear Runoff Volume (ac-ft)                   | 0.1547    |
| 24-Hr Clear Runoff Volume (cu-ft)                   | 6740.2821 |





## **Appendix E: Pre/Post Development Hydrology Maps**





VICINITY MAP  
NOT TO SCALE

LEGEND

$Q_{25}$  RUNOFF IN CFS FOR 25 YR, FREQUENCY

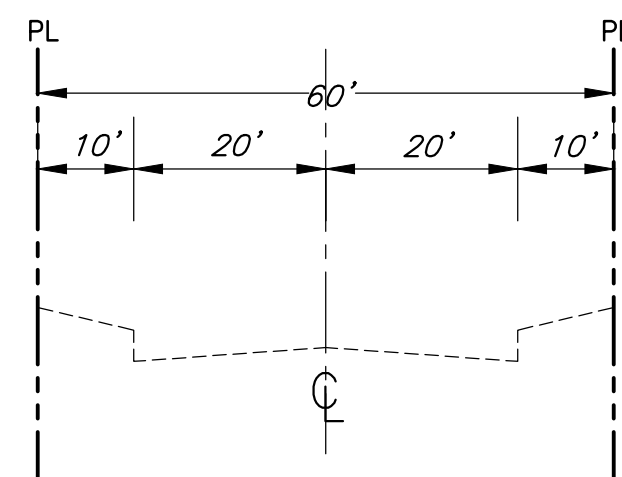
$\frac{1A}{2.16}$  SUBAREA NUMBER  
SUB AREA IN ACRES

$5.00$  TIME OF CONCENTRATION (FOR  $Q_{25}$ )

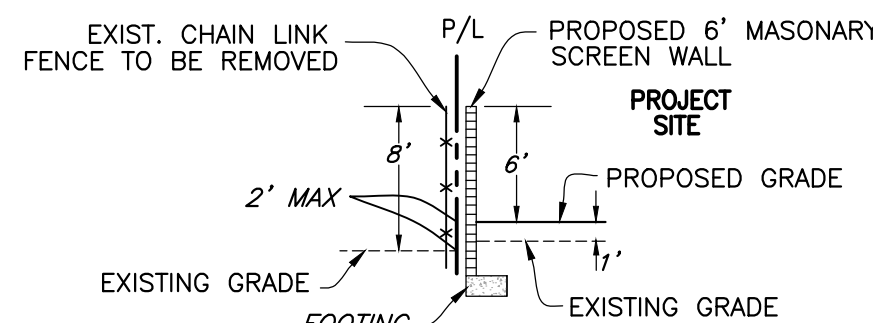
--- SUBAREA BOUNDARY

— FLOW LINE PATH

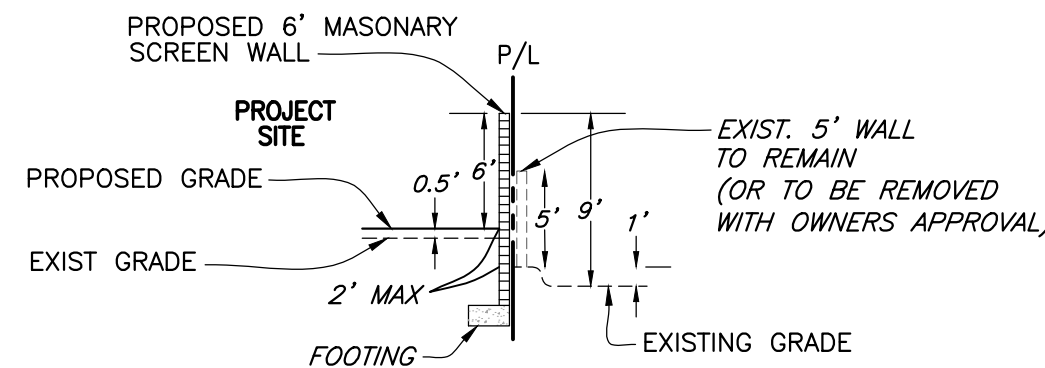
| HYDROLOGIC DESIGN DATA |         |
|------------------------|---------|
| STORM FREQUENCY        | 25-YEAR |
| SOIL TYPE              | 16      |
| PERCENT IMPERVIOUSNESS | 53%     |
| 50 YR, 24 HR, ISOHYET  | 6.3     |



TETLEY STREET SECTION  
SCALE: 1"=20'

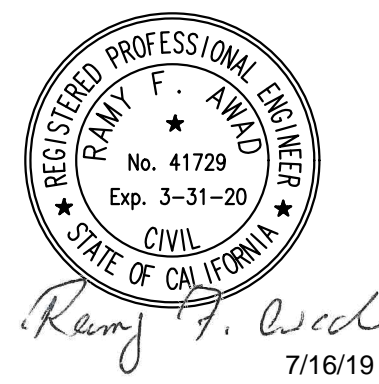
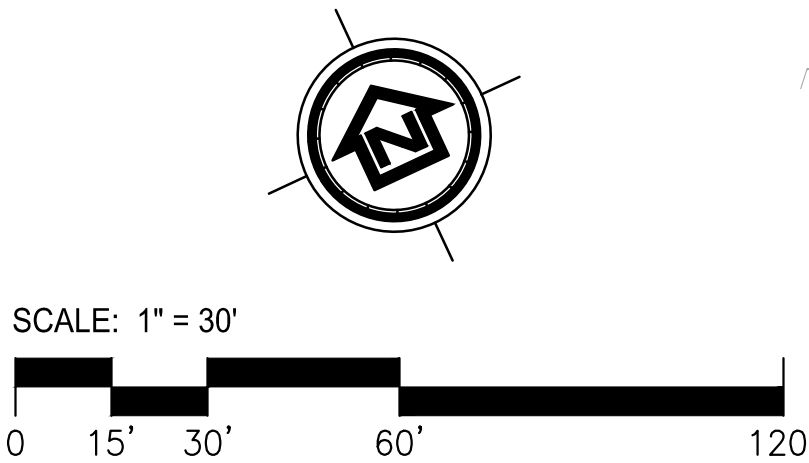


SECTION "A-A"  
SCALE: 1"=10'



SECTION "B-B"  
SCALE: 1"=10'

- NOTE:
- PROJECT IS NOT WITHIN COUNTY ADOPTED FLOODWAY
  - PROJECT IS NOT WITHIN FEMA FLOOD ZONE "A"



**B & E ENGINEERS**  
CIVIL ENGINEERING, SURVEYING, & LAND PLANNING

20 E. FOOTHILL BLVD., STE 230  
ARCADIA, CA 91006  
TEL: (626) 446-4449

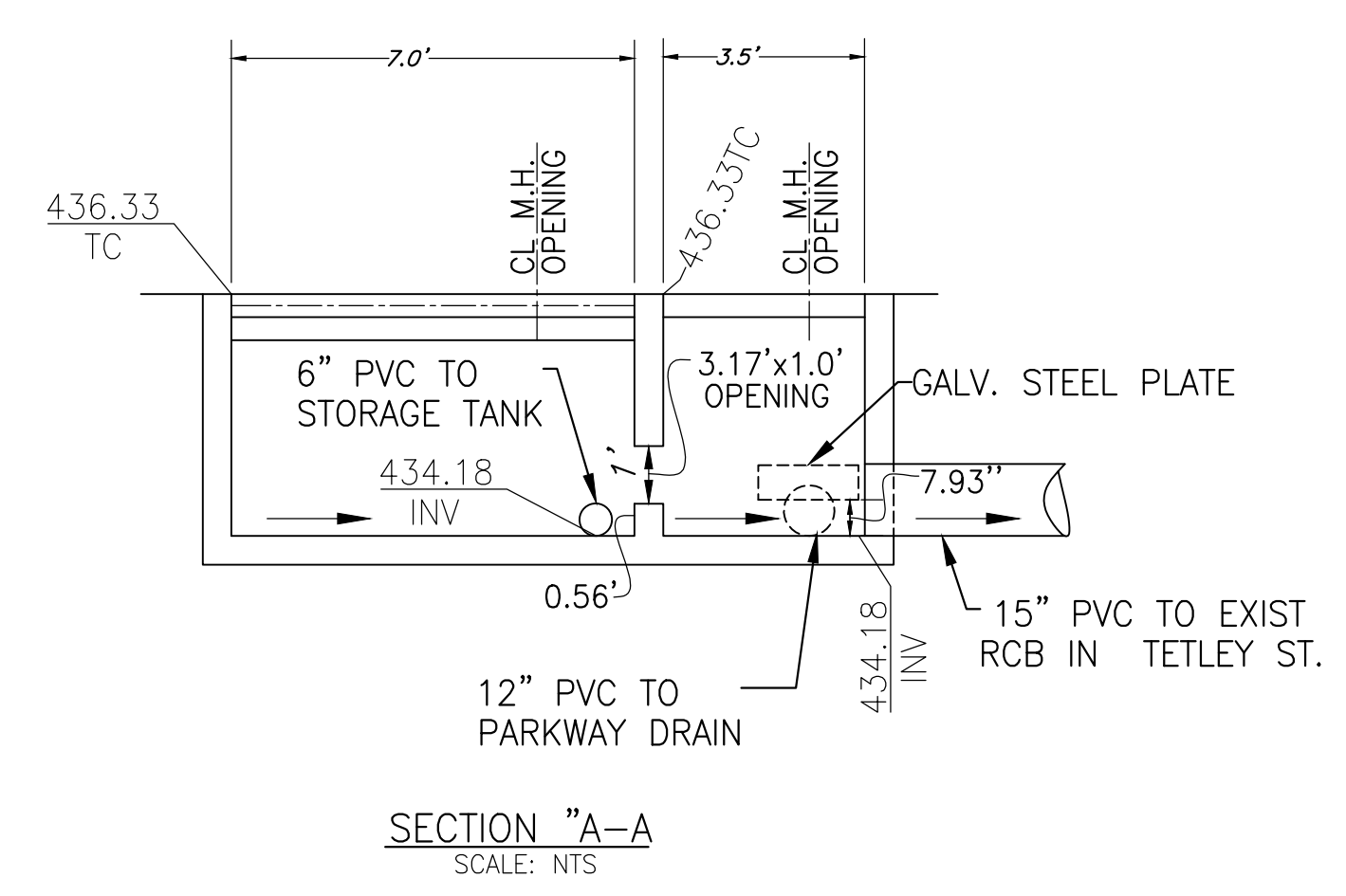
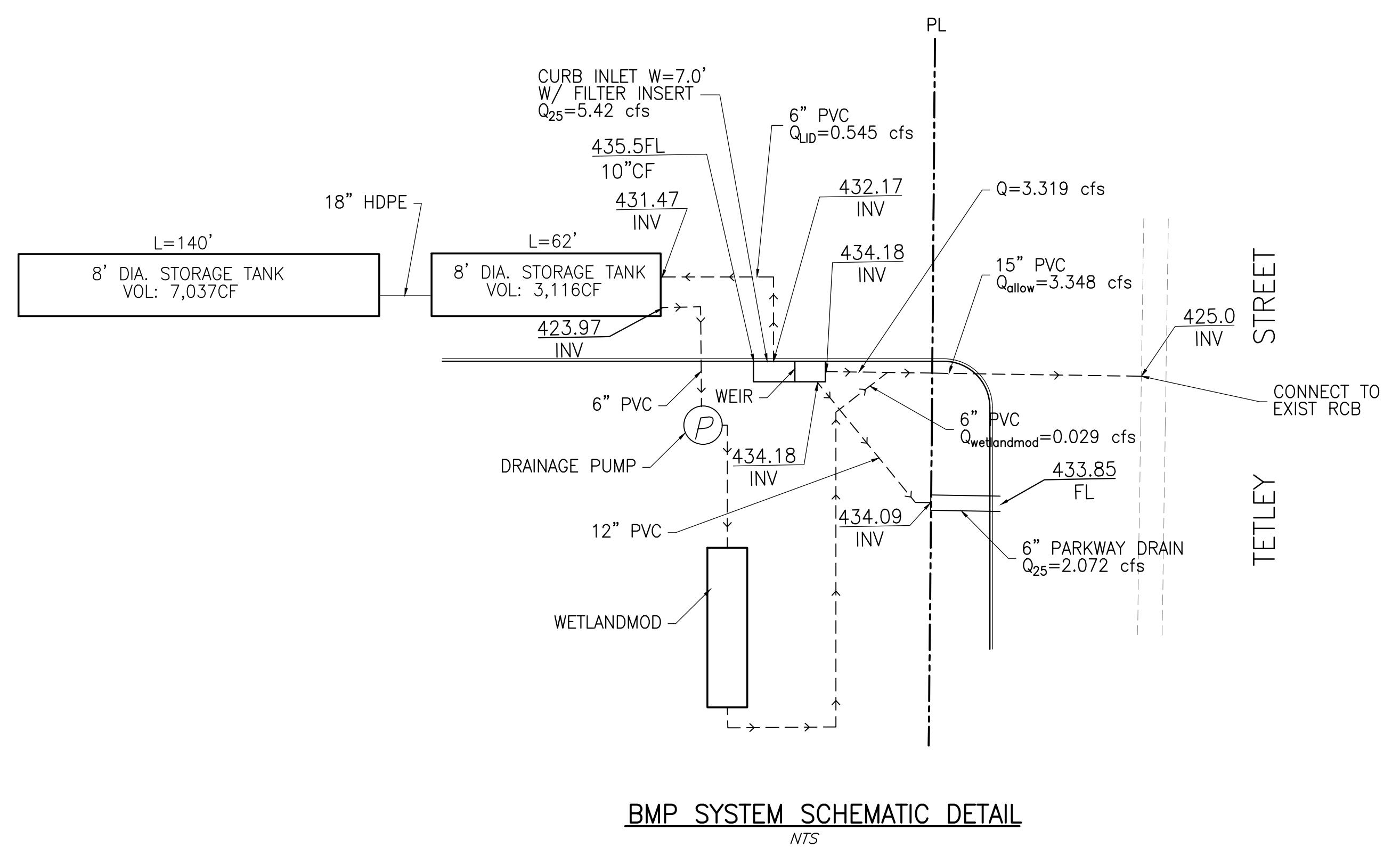
**HYDROLOGY STUDY TRACT No. 82498**  
**PRE DEVELOPMENT CONDITION**  
**ESTU2019000288**  
TETLEY STREET  
WITHIN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

DATE: 07-09-19  
DESIGN/DRAWN: GG  
REVIEWED: RA

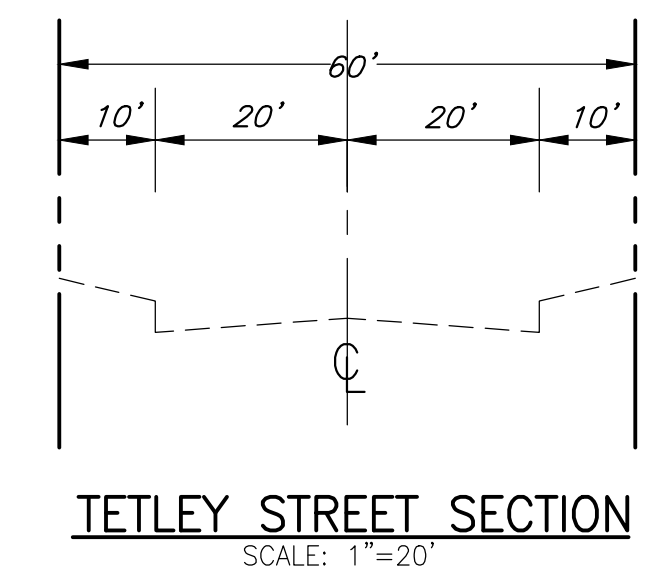
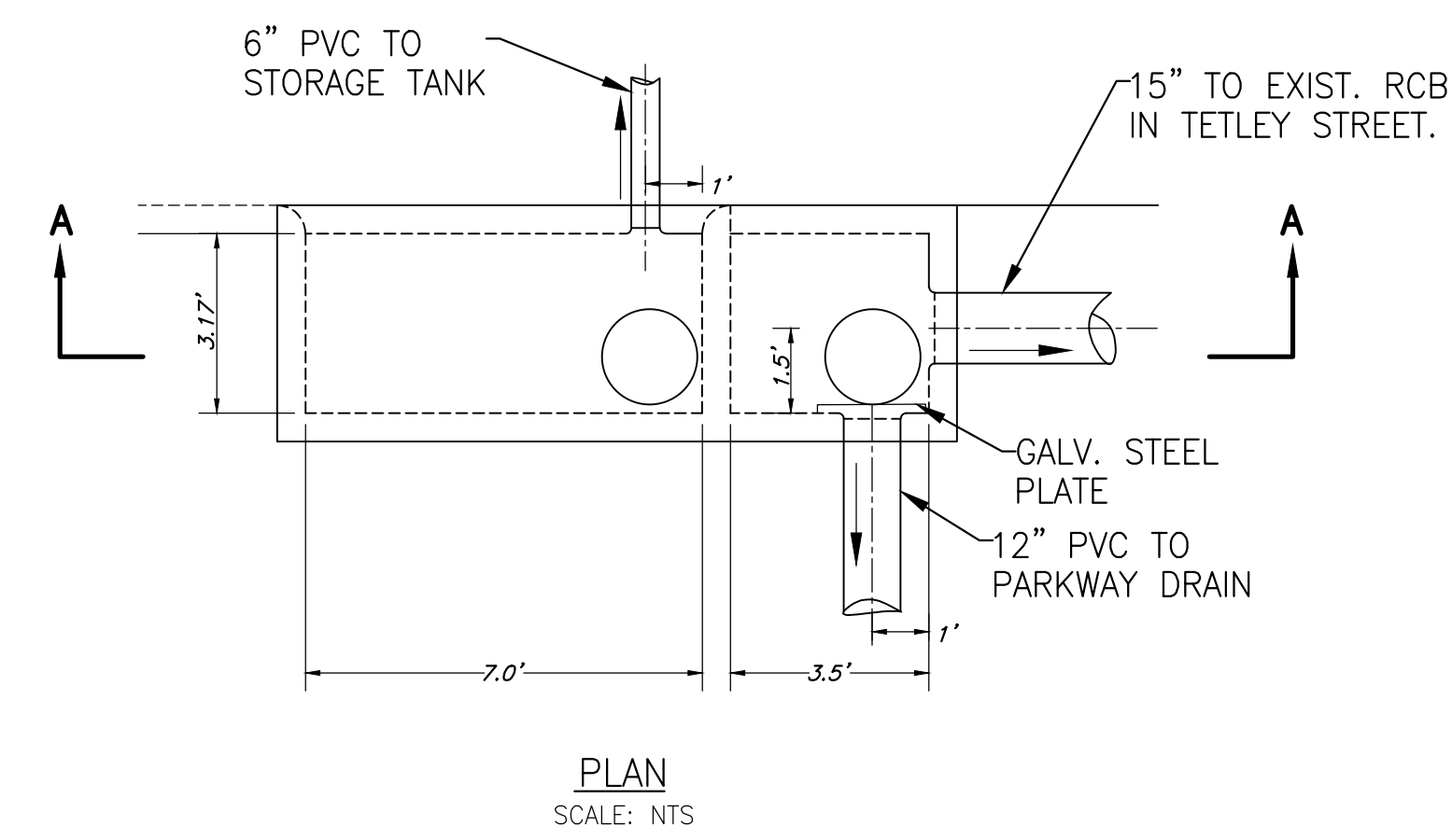
JN:2018505

SHT. 1 OF 1 SHTS.

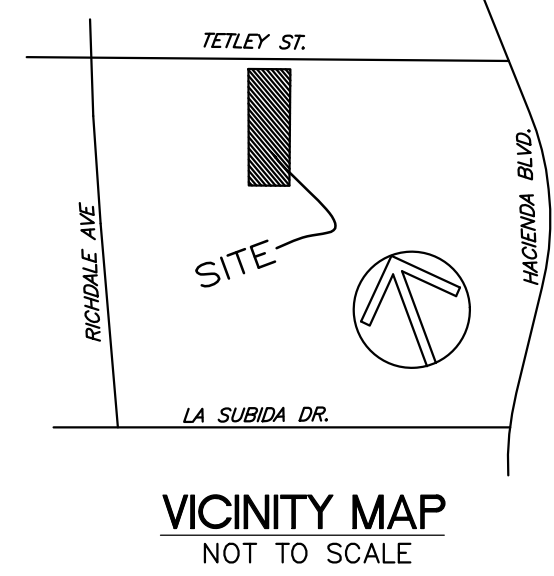




CATCH BASIN WITH SPLITTERS DETAIL  
SCALE: NTS



TETLEY STREET SECTION  
SCALE: 1"=20'



NOTE:  
ONSITE DRAINAGE SYSTEM AND BMP WILL  
BE MAINTAINED BY HOME OWNER ASSOCIATION

| HYDROLOGIC DESIGN DATA |         |
|------------------------|---------|
| STORM FREQUENCY        | 25-YEAR |
| SOIL TYPE              | 16      |
| PERCENT IMPERVIOUSNESS | 86%     |
| 50 YR, 24 HR, ISOHYET  | 6.2     |

LEGEND

$Q_{25}$  RUNOFF IN CFS FOR 25 YR, FREQUENCY

1A  
2.16  
SUBAREA NUMBER  
SUB AREA IN ACRES

7.00  
TIME OF CONCENTRATION (FOR  $Q_{25}$ )

--- SUBAREA BOUNDARY

--- FLOW LINE PATH

- NOTE:
- PROJECT IS NOT WITHIN COUNTY ADOPTED FLOODWAY
  - PROJECT IS NOT WITHIN FEMA FLOOD ZONE "A"



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**HYDROLOGY STUDY TRACT No. 82498**  
**POST DEVELOPMENT CONDITION**  
**ESTU2019000288**  
TETLEY STREET  
WITHIN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

DATE: 07-16-19  
DESIGN/DRAWN: JA  
REVIEWED: RA

JN:2018505

SHT. 1 OF 1 SHTS.