PRELIMINARY STORM DRAINAGE REPORT

For

MOSS BEACH DEVELOPMENT

SAN MATEO COUNTY
CALIFORNIA

Prepared for:
Moss Beach Associates, LLC
612 Spring Street
Santa Cruz, CA 95060

Prepared by:
Mesiti-Miller Engineering, Inc.
224 Walnut Avenue, Suite B
Santa Cruz, CA 95060
831-426-3186

Project No. 15147-5
April 26, 2017

April 26, 2017

Owen Lawlor
Moss Beach Associates, LLC
612 Spring Street
Santa Curz, CA 95060

Re: Moss Beach Development - Four Lot Plan

Preliminary Drainage Report

MME Project No: 15147-5

Dear Owen:

We have prepared the enclosed report for the Moss Beach Development in accordance with our scope.

Respectfully yours,

Daniel Mays, E.I.T.
Engineer II

Reviewed by,

Rodney Cahill, C.E., LEED AP
Principal

Enclosures

cc: Project File

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Moss Beach Development - Four Lot Plan - Preliminary Drainage Report

1. Introduction

Purpose

Mesiti-Miller Engineering, Inc. (MME) prepared this report at the request of Owen Lawlor and Moss Beach Associates for the Moss Beach Development project. The purpose of this report is to provide preliminary hydrologic and hydraulic analyses of existing and proposed drainage conditions.

Project Description

The project is a residential development located on a 2.35 acre site in Moss Beach, California. The site consists of seven adjoining lots on the west side of the Vallemar Street and Juliana Avenue intersection.

The proposed development includes four two-story single-family residences and associated improvements.

2. Existing Drainage Conditions

Site Slope and Soils

The site slopes to the southwest at an average slope of approximately ten percent and range from about 26 percent near Vallemar Street to about 3 percent closer to the bluffs. The Geotechnical Investigation (Appendix D) reported surface soils as loose to very loose silty and clayey sands underlain by stiff to very stiff sandy clays. Groundwater was encountered at the southeast lots near Juliana Avenue. Measured depths to groundwater ranged from 17 feet near Vallemar Street to 13 feet closer to the bluffs.

Site Runoff and Calculations

The site is divided into four sub watershed areas corresponding to the lots for each of the proposed single-family residences (Figure 1, Appendix A). Preliminary hydrologic calculations for the drainage areas under pre and post-development conditions are presented in Appendix A.

We used the Rational Method to develop preliminary runoff rates for the 10-year storm events per San Mateo County Drainage Guidelines and calculated a weighted coefficient of runoff for each drainage area under post-development conditions for initial design sizing. Rainfall intensity calculations for this method were prepared using Rainfall Runoff Data for San Mateo County (Appendix A).

For detailed design, we prepared a detailed hydrologic and hydraulic model using unit hydrograph methods and HydroCAD 10 software to check our results and refine detention facility design. Resulting flow rates were higher than from simplified methods based in part on the Type C hydrologic soil group and a rainfall depth of four inches for the 10-year storm[i]. Other parameters that caused an increase in estimated runoff included the use of an SCS Type I rainfall pattern consistent with the Central Coast of California, and an Anetecedent Moisture Condition of 3 to account for the clay soils found at the site. A full report containing calculation paramenters, methods, and results including graphical charts is included in Appendix C.

Existing Drainage System

Runoff from the site currently flows over the bluffs to the southwest.

3. Proposed Drainage Conditions

Site Soils and Flow Dispersion

Based on recommendations from Jodi McGraw, the Project Biologist, the plan calls for utilizing infiltration trenches with overflow spreaders to disperse the runoff over wide areas and maintain existing hydrology and soil moisture distribution on the site (see Sheet C3.0, Appendix B). This will also help to prevent concentrated runoff from flowing over the bluffs and reduce the potential for soil erosion.

Proposed Impervious Area

The plan proposes the use of pervious pavers for driveways and parking areas to minimize impervious area on the site. The total proposed impervious area for the entire site is currently 17,070 square feet (0.39 acre). See Sheet C3.0, Appendix B, for a more detailed description of the impervious area for each lot. Infiltration trenches and detention systems are also proposed for mitigating runoff from the impervious surfaces.

Site Run-off and Calculations

Preliminary hydrologic calculations for the drainage areas for each lot under both pre and post-development conditions are presented in Appendix A. Rational method calculations for the entire lot do not account for the proposed infiltration and detention facilities and therefore show how the proposed development would increase flow without mitigation. Since mitigation is included in this project, runoff rates will be controlled to pre-development levels per County requirements. Preliminary calculations for the infiltration trenches are also included in Appendix A.

A detailed hydrologic and hydraulic model was prepared to examine proposed drainage conditions and determine the infiltration and detention facility details required to cause no net increase in flow off the site due to the project (Appendix C). Based on the model results, the net runoff from the site will decrease with the proposed drainage improvements (see Table 2 below). The model estimates the attenuation for the proposed detention systems is 11-13% with lag times ranging from 3.2 to 3.5 minutes. The infiltration trenches had much higher attenuation and lag times due to high rates of infiltration and additional storage volume.

Table 1 - Comparison of runoff from each lot for pre and post-development peak flow conditions.

	Pre-Development		Post-Development	
Lot	Q (cfs)	V (fps)	Q (cfs)	V (fps)
1	1.1	0.4	0.9	0.3
2	1.0	0.4	0.9	0.3
3	1.1	0.3	1.1	0.2
4	1.4	0.3	1.4	0.2
Total	4.6	-	4.3	-

Low Impact Design (LID)

The key Low Impact Design (LID) objectives of the drainage plan were to slow down and filter stormwater to reduce the impact of development on water resources.

LID drainage techniques we recommend for the project include the use of pervious pavers for driveways and parking areas, infiltration trenches with overflow spreaders to disperse runoff, and detention facilities. These systems will slow down and disperse runoff, provide storage, filtration, and remediation for pollutants.

Summary of LID Strategies included in design:

1. Minimizing disturbance of existing vegetation, including preserving cypress tree groves and native grasses throughout the site, and minimizing grading activities within the dripline of individual trees and groves
2. Using infiltration facilities to store and filter runoff from impervious rooftops
3. Using detention facilities to store peak runoff volumes from the rooftops and pervious pavers driveways
4. Reducing imported grading volumes through excavation of infiltration and detention facilities
5. Planning for construction-phase erosion control
6. Maintaining water quality devices through regular inspection and cleaning (see Appendix E for County maintenance plan templates)

4. Recommendations

We recommend the following drainage improvements:

1. Infiltration trenches for each lot with overflow spreaders to disperse runoff
2. Pervious pavers and detention areas to control peak runoff

The recommended pipe and inlet sizes, slopes, and configurations presented in the plans and this report are the result of preliminary engineering, not a final engineering design, and are therefore suitable for schematic plans, development permit application, and construction cost estimating. The presently proposed system will be further refined during the design development phase to minimize cost, maximize design efficiency, and refine drainage components. We recommend the design process include consideration of other detailed design parameters such as precise inlet and pipe location, ongoing coordination with other disciplines, depth of other utility crossings, spatial constraints, driveways, structure connection details, construction phasing, traffic considerations, and the economy of standardizing material types.

List of Appendices

Appendix A - Preliminary Hydrology and Hydraulic Calculations
Appendix B - Plans
Appendix C - HydroCAD Model Output
Appendix D - Geotechnical Investigation
Appendix E - County Maintenance Plan Templates
Appendix F - C3 and C6 Development Review Checklist

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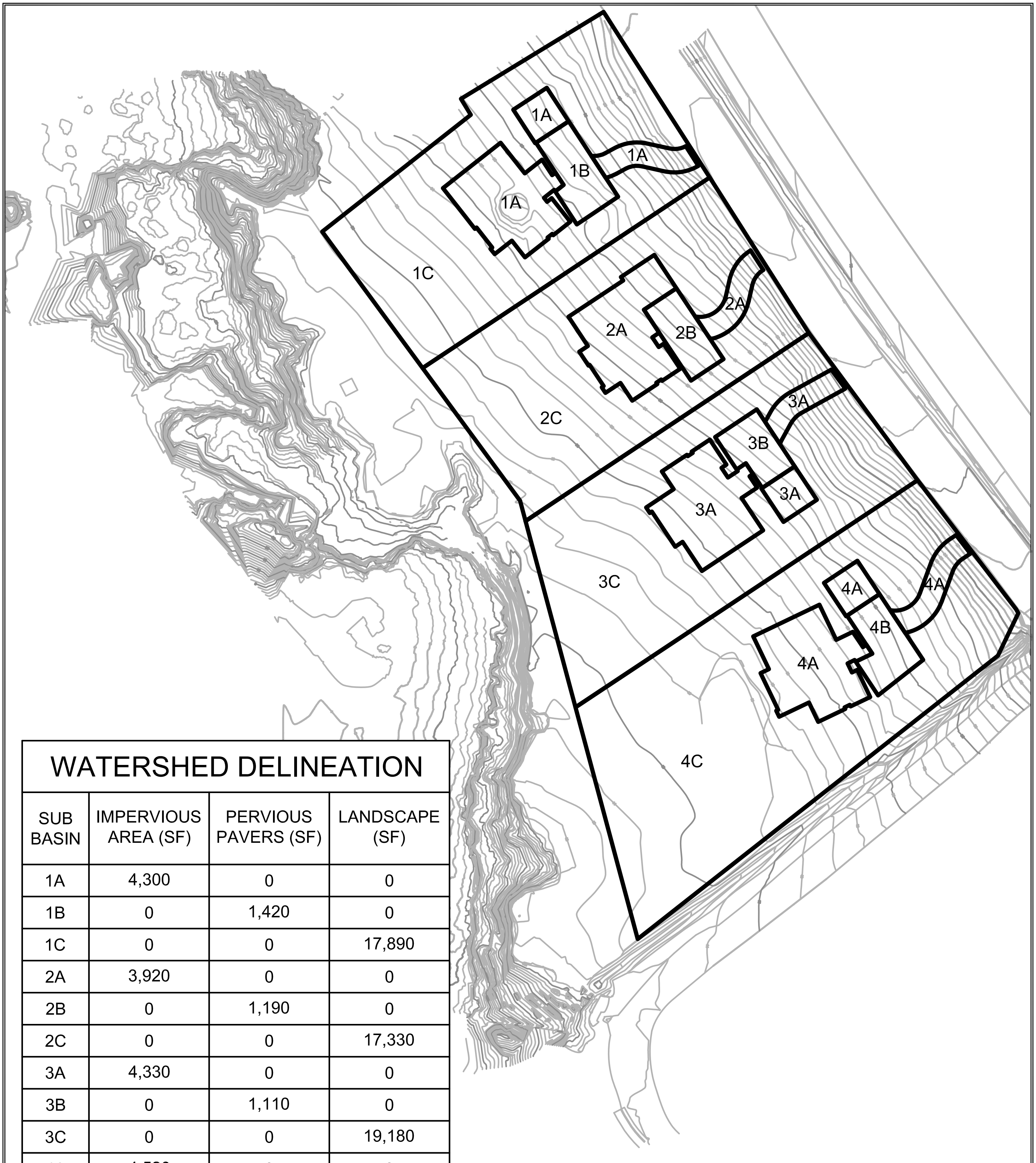
[i] National Weather Service, Precipitation Frequency Atlas of the Western United States, NOAA Atlas 2 Volume XI-California, 1973

APPENDIX A

Preliminary Hydrology and Hydraulic Calculations



WATERSHED DELINEATION

SUB BASIN	IMPERVIOUS AREA (SF)	PERVIOUS PAVERS (SF)	LANDSCAPE (SF)
1A	4,300	0	0
1B	0	1,420	0
1C	0	0	17,890
2A	3,920	0	0
2B	0	1,190	0
2C	0	0	17,330
3A	4,330	0	0
3B	0	1,110	0
3C	0	0	19,180
4A	4,520	0	0
4B	0	1,380	0
4C	0	0	27,570
TOT	17,070	5,100	81,970

SCALE: 1" = 80'

SHEET NO: FIGURE 1

DATE ISSUED: 4/26/17

VALLEMAR STREET AND JULIANA AVENUE
MOSS BEACH, CALIFORNIA

PREPARED AT THE REQUEST OF

MOSS BEACH ASSOCIATES
612 SPRING STREET
SANTA CRUZ, CA 95060

Mesiti-Miller Engineering, Inc.
Civil and Structural Engineering
224 Walnut Avenue, Suite B • Santa Cruz, CA 95060
Phone 831-426-3186 • Fax 831-426-6607

DRAWN BY: DM

CHECKED BY: RC

JOB NUMBER: 15147-5

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Job:	15147-5		
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Calc By	DM	**Date**	4/26/2017
Check By	RC	**Date**	4/26/2017

PRELIMINARY - Lot 1

Table 1 - Estimated Peak Runoff Rates

Method: San Mateo County Guidelines for Drainage Review

Q = C I A F

F =	1.2	Rainfall Runoff Data, San Mateo County
I_{10} =	2.45	Rainfall Runoff Data, San Mateo County
I_{100} =	3.60	Rainfall Runoff Data, San Mateo County

10-year - Pre and Post Development - Entire Lot

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
LOT 1 - Pre-Development	10.0	0.30	*2.94*	0.54	**0.48**
LOT 1 - Post-Development	10.0	0.42	*2.94*	0.54	**0.66**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	4300	0.90	3870
PERVIOUS PAVERS	1420	0.40	568
LANDSCAPE	17890	0.30	5367
TOTAL	23610		9805
WEIGHTED C		**0.42**	

Water Quality Treatment - 0.2 in/hr - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I (in/hr)	AREA (ac)	Q (cfs)
1A + 1B	10.0	0.78	*0.20*	0.13	**0.02**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	4300	0.90	3870
PERVIOUS PAVERS	1420	0.40	568
TOTAL	5720		4438
WEIGHTED C		**0.78**	

INFILTRATION AREA	A* (SF)	R* (in/hr)	Qmax (cfs)
Lot 1 Spreader	781	3.9	0.07

*A = Surface Area, R = Percolation Rate, per Geotechnical Engineer (HKA), Qmax = Max Exfiltration from Spreader

10-year - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
1A + 1B	10.0	0.78	*2.94*	0.13	**0.30**

SUMMARY
100% infiltration for 0.2 in/hr event
Approximately 0.23 cfs flows out of spreader in 10 year storm event. 0.07 cfs infiltrates

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PRELIMINARY - Lot 2

Table 1 - Estimated Peak Runoff Rates

Method: San Mateo County Guidelines for Drainage Review

Q = C I A F

F =	1.2	Rainfall Runoff Data, San Mateo County
I_{10} =	2.45	Rainfall Runoff Data, San Mateo County
I_{100} =	3.60	Rainfall Runoff Data, San Mateo County

10-year - Pre and Post Development - Entire Lot

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
LOT 2 - Pre-Development	10.0	0.30	*2.94*	0.52	**0.45**
LOT 2 - Post-Development	10.0	0.41	*2.94*	0.52	**0.62**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	3920	0.90	3528
PERVIOUS PAVERS	1190	0.40	476
LANDSCAPE	17330	0.30	5199
TOTAL	22440		9203
WEIGHTED C		**0.41**	

Water Quality Treatment - 0.2 in/hr - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I (in/hr)	AREA (ac)	Q (cfs)
2A + 2B	10.0	0.78	*0.20*	0.12	**0.02**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	3920	0.90	3528
PERVIOUS PAVERS	1190	0.40	476
TOTAL	5110		4004
WEIGHTED C		**0.78**	

INFILTRATION AREA	A* (SF)	R* (in/hr)	Qmax (cfs)
Lot 2 Spreader	965	1.4	0.03

*A = Surface Area, R = Percolation Rate, per Geotechnical Engineer (HKA), Qmax = Max Exfiltration from Spreader

10-year - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
2A + 2B	10.0	0.78	*2.94*	0.12	**0.27**

SUMMARY
100% infiltration for 0.2 in/hr event
Approximately 0.24 cfs flows out of spreader in 10 year storm event. 0.02 cfs infiltrates

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PRELIMINARY - Lot 3

Table 1 - Estimated Peak Runoff Rates

Method: San Mateo County Guidelines for Drainage Review

Q = C I A F

F =	1.2	Rainfall Runoff Data, San Mateo County
I_{10} =	2.45	Rainfall Runoff Data, San Mateo County
I_{100} =	3.60	Rainfall Runoff Data, San Mateo County

10-year - Pre and Post Development - Entire Lot

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
LOT 3 - Pre-Development	10.0	0.30	*2.94*	0.57	**0.50**
LOT 3 - Post-Development	10.0	0.41	*2.94*	0.57	**0.68**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	4330	0.90	3897
PERVIOUS PAVERS	1110	0.40	444
LANDSCAPE	19180	0.30	5754
TOTAL	24620		10095
WEIGHTED C		**0.41**	

Water Quality Treatment - 0.2 in/hr - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I (in/hr)	AREA (ac)	Q (cfs)
3A + 3B	10.0	0.80	*0.20*	0.12	**0.02**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	4330	0.90	3897
PERVIOUS PAVERS	1110	0.40	444
TOTAL	5440		4341
WEIGHTED C		**0.80**	

INFILTRATION AREA	A* (SF)	R* (in/hr)	Qmax (cfs)
Lot 3 Spreader	781	0.6	0.01

*A = Surface Area, R = Percolation Rate, per Geotechnical Engineer (HKA), Qmax = Max Exfiltration from Spreader

10-year - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
3A + 3B	10.0	0.80	*2.94*	0.12	**0.29**

SUMMARY
50% infiltration for 0.2 in/hr event. Approximately 0.01 cfs flows out of spreader
Approximately 0.28 cfs flows out of spreader in 10 year storm event. 0.01 cfs infiltrates

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Check By	RC	**Date**	4/26/2017

PRELIMINARY - Lot 4

Table 1 - Estimated Peak Runoff Rates

Method: San Mateo County Guidelines for Drainage Review

Q = C I A F

F =	1.2	Rainfall Runoff Data, San Mateo County
I_{10} =	2.45	Rainfall Runoff Data, San Mateo County
I_{100} =	3.60	Rainfall Runoff Data, San Mateo County

10-year - Pre and Post Development - Entire Lot

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
LOT 4 - Pre-Development	10.0	0.30	*2.94*	0.77	**0.68**
LOT 4 - Post-Development	10.0	0.39	*2.94*	0.77	**0.87**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	4520	0.90	4068
PERVIOUS PAVERS	1380	0.40	552
LANDSCAPE	27570	0.30	8271
TOTAL	33470		12891
WEIGHTED C		**0.39**	

Water Quality Treatment - 0.2 in/hr - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I (in/hr)	AREA (ac)	Q (cfs)
4A + 4B	10.0	0.78	*0.20*	0.14	**0.02**

Coefficient of Runoff

AREA	AREA (SF)	C	A*C
IMPERVIOUS	4520	0.90	4068
PERVIOUS PAVERS	1380	0.40	552
TOTAL	5900		4620
WEIGHTED C		**0.78**	

INFILTRATION AREA	A* (SF)	R* (in/hr)	Qmax (cfs)
Lot 4 Spreader	860	0	0.00

*A = Surface Area, R = Percolation Rate, per Geotechnical Engineer (HKA), Qmax = Max Exfiltration from Spreader

10-year - Flow to Infiltration Trench and Spreader

WATERSHED	Tc (min)	C	I_{10}*F (in/hr)	AREA (ac)	Q (cfs)
4A + 4B	10.0	0.78	*2.94*	0.14	**0.31**

SUMMARY
Infiltration trench volume retained. Excess runoff flows out of spreader
Approximately 0.31 cfs flows out of spreader in 10 year storm event

SAN MATEO COUNTY
GUIDELINES FOR DRAINAGE REVIEW

The following is intended to summarize the San Mateo County Policy on Storm Drainage to guide the applicant and the civil engineer when preparing a drainage analysis as a required "Condition of Approval" for proposed development.

SAN MATEO COUNTY DRAINAGE POLICY:

1. Post-development peak flow (runoff) and velocity must be less than or equal to pre-development peak flow and velocity in areas where there are no existing down stream storm drain systems. No additional runoff, caused by development, can cross property lines. In areas where there are existing storm drain systems, those systems must be of adequate size to accept the increased runoff, or, mitigation procedures must be taken. Mitigation procedures may include on-site storm drain detention or off-site storm drain improvements.

2. If permanent structures are to be built over existing drainage courses or drainage facilities courses or drainage facilities.

   a. adequate drainage facilities must be provided to protect the proposed development and existing downstream development.

   b. A means of adequate access must be provided for maintenance

   c. An alternate system for drainage must be provided in the event the primary system becomes plugged or otherwise inoperable.

3. The use of dry wells to dispose of surface runoff may be allowed.

4. Drainage systems that are designed to rely on pumps may not be allowed.

To comply with County Policy, the applicant's civil engineer must submit a drainage report, hydrologic study, hydraulic calculations, and drainage improvement plans. The following sections present general guidelines for these items.

DRAINAGE REPORT:

A drainage report (written narrative) must be submitted to the County for review and include the following:

1. Delineation of drainage basins and subbasins.
2. Description of proposed drainage system.
3. Discussion of rationale used to design system
4. Discussion of methods and/or calculations.
5. Description of how excess drainage will be detained.
6. Description of how discharge will be controlled to comply with County Policy.

HYDROLOGIC ANALYSIS:

The hydrologic calculations must be based on an appropriate design storm for the specific site conditions and project. For projects located within a floodplain or bounding an existing drainage course located on or adjacent to the property, the design shall be based upon a design storm of no less than a 100 year recurrence interval may be used.

The hydrologic analysis must include the following:

1. ANALYSIS/CALCULATIONS MUST BE SIGNED AND STAMPED BY A REGISTERED CIVIL ENGINEER. WITHOUT THIS REQUIREMENT BEING MET, NO FURTHER REVIEW OF THE DRAINAGE ANALYSIS WILL BE PEFORMED.

2. All drainage basins and/or subbasins clearly shown on a map plan.

3. A clear description of the method used to determine peak flows.

4. If the rational method (Q = C I A) is used;

   a. provide a clear statement of the basis for the runoff coefficient, (C) rainfall intensity (I), time of concentration (T), and duration, etc., and

   b. a clear description showing the areas used in the formula.

5. If another method is used, provide a statement of method, a clear description of the basis for all assumptions and the source of all information used in the particular method.

6. Calculations for pre-development peak flow AND velocity.

7. Calculations for post-development peak flow AND velocity.

8. Calculations for detention basin design and a determination of the required volume of storage to comply with a County Policy.

HYRAULIC ANALYSIS:

ANALYSIS/CALCULATIONS MUST BE SIGNED AND STAMPED BY A REGISTERED CIVIL ENGINEER. WITHOUT THIS REQUIREMENT BEING MET, NO FURTHER REVIEW OF THE DRAINAGE ANALYSIS WILL BE PERFORMED.

The hydraulic analysis must include calculations that clearly demonstrate:

1. that the post-development discharge will be controlled, and peak flow and velocity will not exceed pre-development values

2. that all storm drainage facilities have sufficient capacity to carry the anticipated peak flows. These facilities include, but are not necessarily limited to:
   a. pipes
   b. culverts
   c. swales
   d. ditches
   e. valley gutters, etc.

PLANS:

The plans must incorporate the following items:

1. PLANS MUST BE SIGNED AND STAMPED BY A REGISTERED CIVIL ENGINEER. WITHOUT THIS REQUIREMENT BEING MET, NO FURTHER REVIEW OF THE DRAINAGE ANALYSIS WILL BE PERFORMED.

2. All proposed storm drainage contours and/or spot elevations clearly indicated.

3. Existing and proposed contours and/or spot elevations clearly indicated.

4. All flow patterns clearly shown.

5. Profiles of all storm drain lines including all crossings of other utilities. A minimum one (1) foot clearance between utility lines is required.

6. Construction details must be shown, including but not necessarily limited to:

   a. specific locations of all storm drainage facilities specified (i.e. stations, dimensions from property lines, etc.),

   b. dimensions of all storm drainage facilities, including Standard County Drawings where applicable,

   c. pipe/swale slopes, pipe sizes, etc.,

   d. invert elevations, and

   e. construction materials must be specified (i.e. RCP, PVC, DIP, etc.).

SUMMARY:

The above is intended only to provide the applicant and the applicant's civil engineer with minimum guidelines when preparing a drainage analysis. The County does not specify the design method that the applicant's engineer uses to prepare the drainage analysis. It is incumbent on the engineer to select a design method that is appropriate for the specific project and site accepting responsibility for the design. The County reviews the design as to concept and to see that the design adequately reflects County policy. The County's review does not include checking the calculations for accuracy nor making assumptions regarding the analysis.

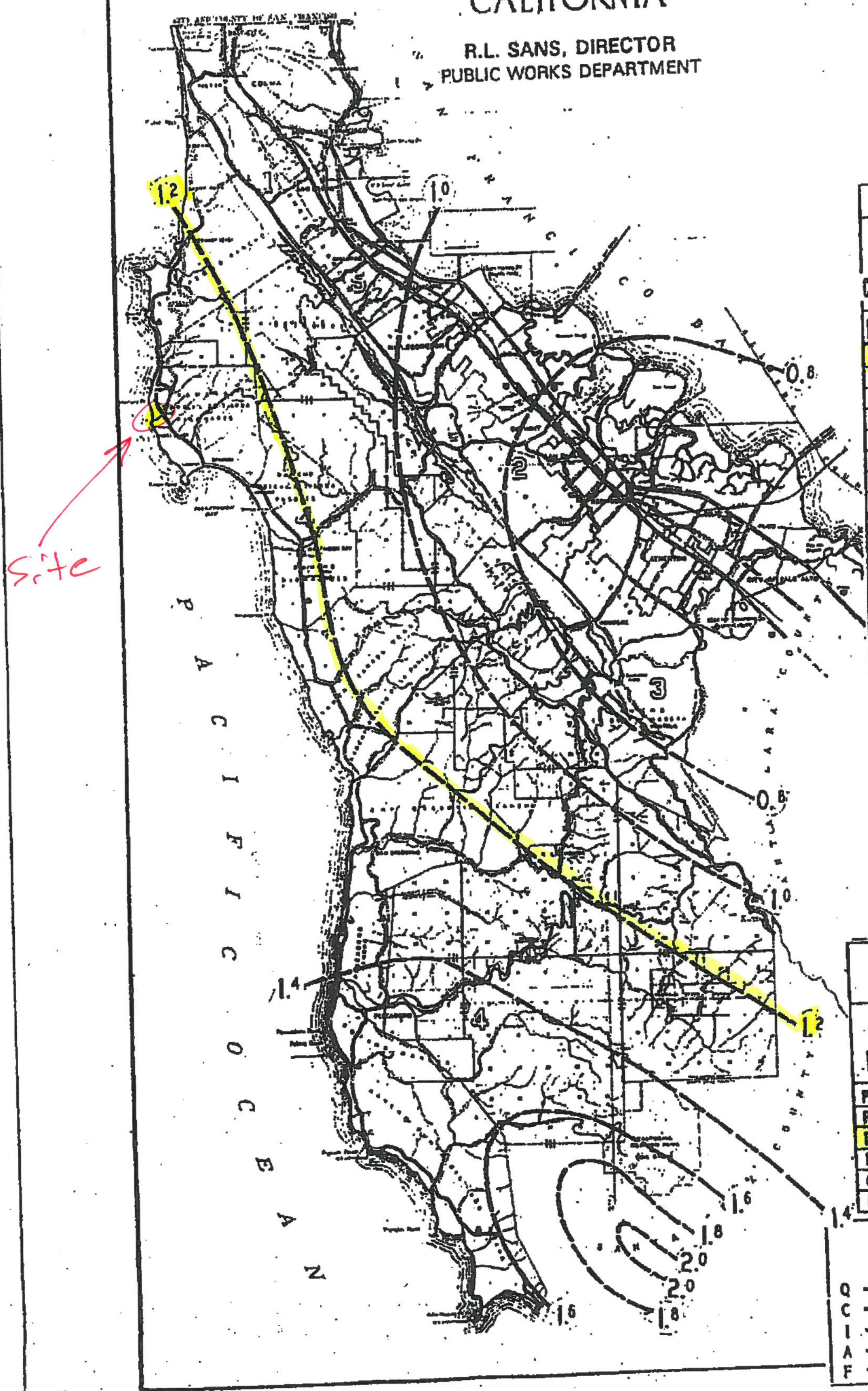
It is to the applicant's advantage to clearly show what is being recommended for construction. Mistakes, ambiguities, incomplete information, and poor preparation of the analysis only serve to delay the review and approval process.

RAINFALL RUNOFF DATA

SAN MATEO COUNTY

CALIFORNIA

R.L. SANS, DIRECTOR
PUBLIC WORKS DEPARTMENT



RAINFALL	
TIME OF CONCENTRATION	INTENSITY INCHES PER HOUR	
HRS. MIN.	10 YR.	100 YR.
0 — 10	2.45	3.60
0 — 15	2.05	3.00
0 — 20	1.73	2.55
0 — 25	1.50	2.22
0 — 30	1.33	1.95
0 — 35	1.20	1.75
0 — 40	1.10	1.61
0 — 45	1.02	1.49
0 — 50	0.95	1.37
0 — 55	0.90	1.28
1 — 00	0.86	1.21
1 — 15	0.75	1.07
1 — 30	0.67	0.95
1 — 45	0.61	0.87
2 — 00	0.56	0.80
2 — 30	0.49	0.70
3 — 00	0.44	0.63
3 — 30	0.40	0.57
4 — 00	0.37	0.53
4 — 30	0.34	0.49
5 — 00	0.32	0.45
6 — 00	0.29	0.41
7 — 00	0.26	0.38
8 — 00	0.24	0.35
9 — 00	0.23	0.33
10 — 00	0.21	0.30
12 — 00	0.19	0.27
24 — 00	0.13	0.18

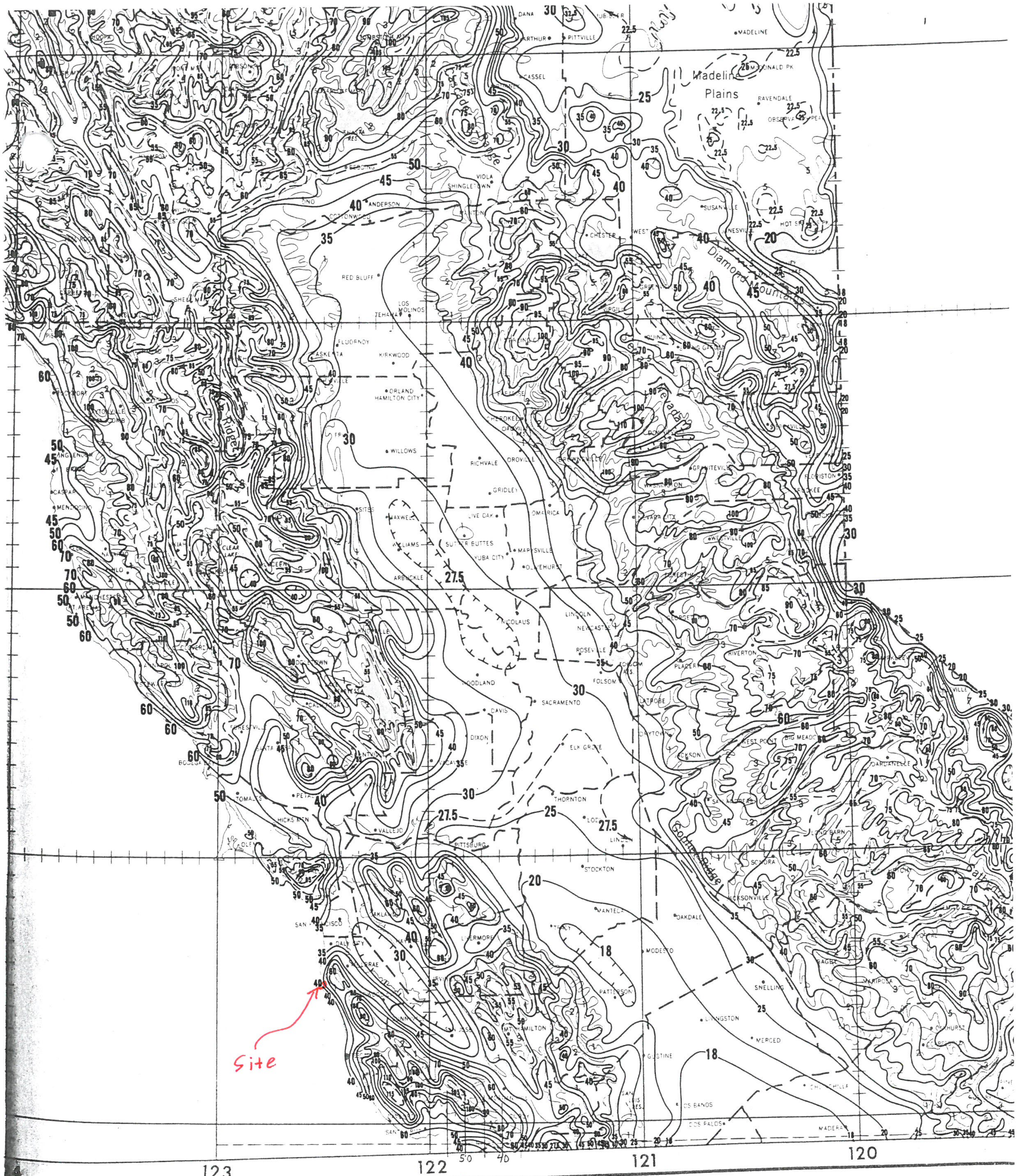
RUNOFF COEFFICIENTS	
TYPE OF DEVELOPMENT	COEF.
PARKS AND CEMETERIES	0.30
RESIDENTIAL - ACRES	0.40
RESIDENTIAL - REGULAR	0.50
INDUSTRIAL	0.65
COMMERCIAL	0.75
PAVED AREAS	0.85

RATIONAL FORMULA

Q = C. I. A. F.

- Q — RUNOFF - CUBIC FEET PER SECOND
- C — RUNOFF COEFFICIENT - PER CENT
- I — RAINFALL INTENSITY - INCHES PER HOUR
- A — DRAINAGE AREA - ACRES
- F — INTENSITY FACTOR (FROM MAP)

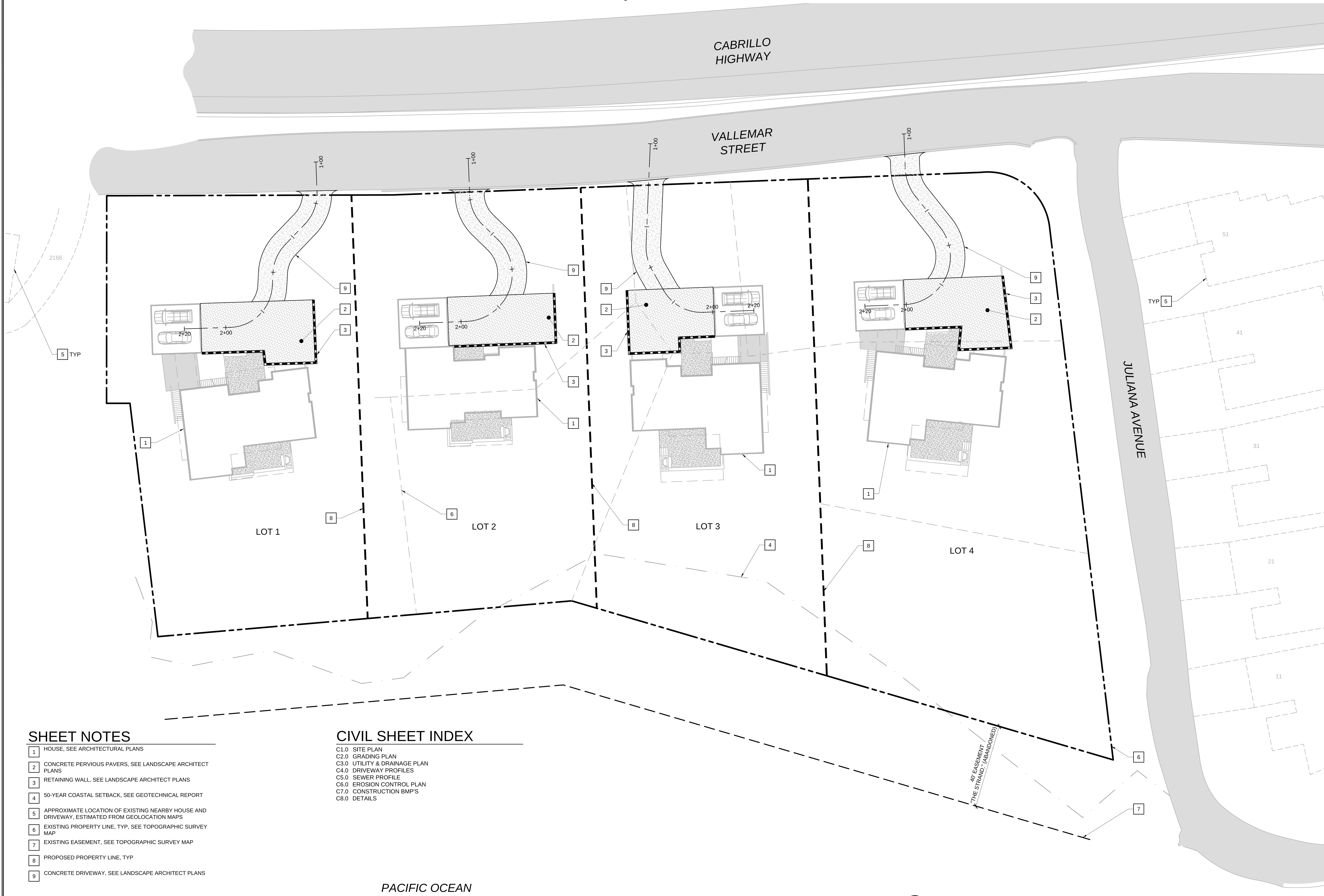
Dr. 22-1846


Madeline Plains
MADELINE
RAVENDALE
SUSANVILLE
Diamond Mountains
CHESTER
ANDERSON
COTTONWOOD
RED BLUFF
LOS MOLINOS
TEHAMA
KIRKWOOD
ORLAND
HAMILTON CITY
WILLOWS
RICHVALE
OROVILLE
GRIDLEY
LIVE OAK
SUTTER BUTTES
YUBA CITY
MARYSVILLE
OLIVEHURST
WILLIAMS
MAXWELL
ARBUCKLE
NICOLAUS
LINCOLN
NEWCASTLE
ROSEVILLE
FOLSOM
WOODLAND
DAVIS
SACRAMENTO
DIXON
ELK GROVE
THORNTON
LODI
VALLEJO
PITTSBURG
STOCKTON
MANTECA
OAKDALE
MODESTO
PATTERSON
LIVERMORE
SAN JOSE
MT HAMILTON
GUSTINE
LIVINGSTON
MERCED
LOS BANOS
DOS PALOS
MADERA
CHOWCHILLA
SNELLING
MARIPOSA
SONORA
JACKSON
WEST POINT
DARDANELLE
PLACERVILLE
GRANITEVILLE
FLORISTON
TRUCKEE
MENDOCINO
CASPAR
BODEGA BAY
TOMALES
PETALUMA
SANTA ROSA
CALISTOGA
HICKS MTN
OLEMA
SAN FRANCISCO
DALY CITY
Site
123
122
121
120

10 yr 24 hr

APPENDIX B

Plans



SHEET NOTES

1. HOUSE, SEE ARCHITECTURAL PLANS
2. CONCRETE PERVIOUS PAVERS, SEE LANDSCAPE ARCHITECT PLANS
3. RETAINING WALL, SEE LANDSCAPE ARCHITECT PLANS
4. 50-YEAR COASTAL SETBACK, SEE GEOTECHNICAL REPORT
5. APPROXIMATE LOCATION OF EXISTING NEARBY HOUSE AND DRIVEWAY, ESTIMATED FROM GEOLOCATION MAPS
6. EXISTING PROPERTY LINE, TYP, SEE TOPOGRAPHIC SURVEY MAP
7. EXISTING EASEMENT, SEE TOPOGRAPHIC SURVEY MAP
8. PROPOSED PROPERTY LINE, TYP
9. CONCRETE DRIVEWAY, SEE LANDSCAPE ARCHITECT PLANS

CIVIL SHEET INDEX

SITE PLAN

SCALE: 1" = 20'

20' 0 10' 20' 40'
1" = 20'

REV.	DESCRIPTION	BY	DATE
1	PLANNING PERMIT SUBMITTAL	RTC	9/1/2015
2	DESIGN REVIEW RESUBMITTAL	RTC	8/9/2016
3	FOUR LOT PLANNING RESUBMITTAL	RTC	4/26/2017

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PRELIMINARY NOT FOR CONSTRUCTION

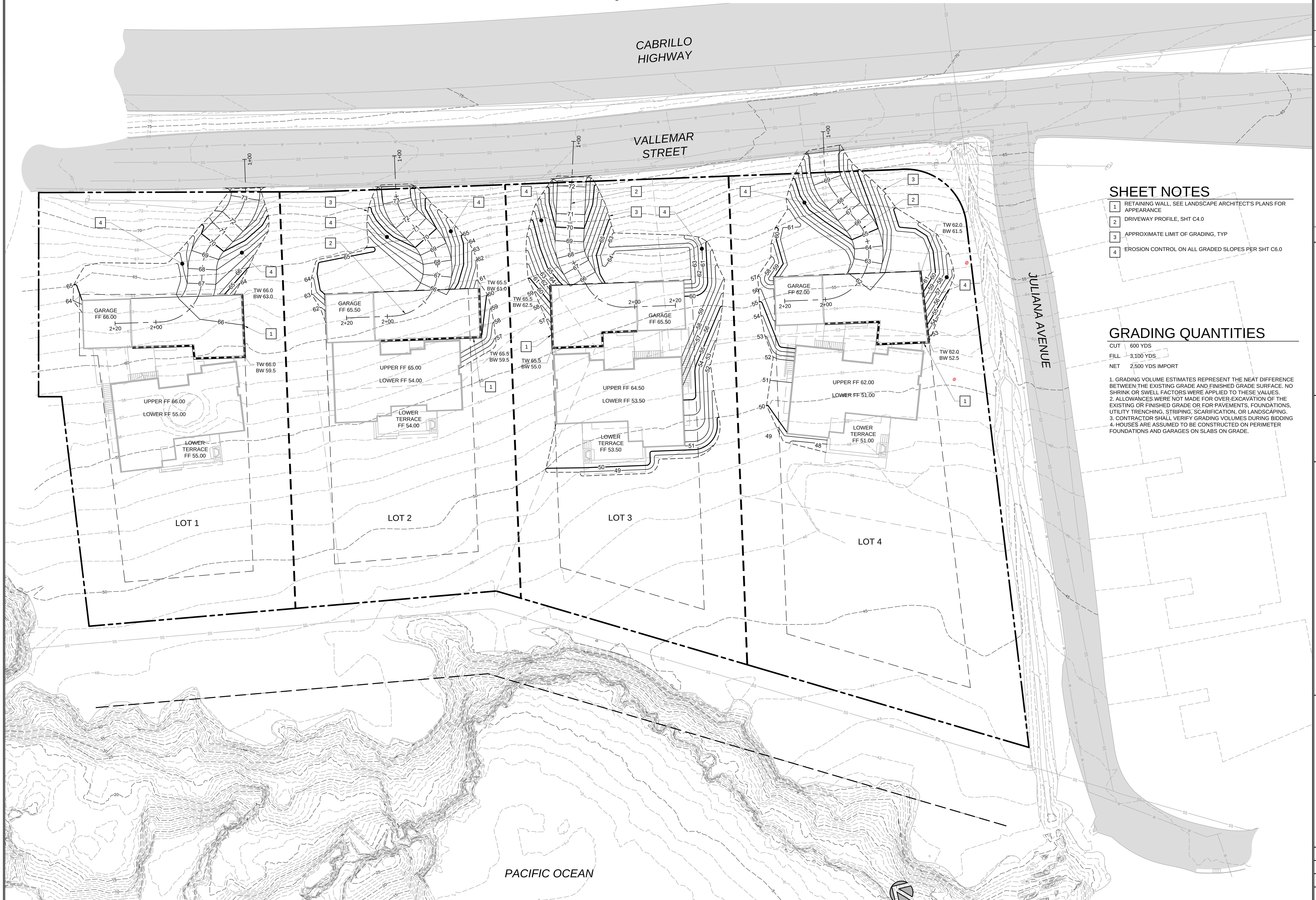
VALLEMAR STREET & JULIANA AVENUE
MOSS BEACH, CALIFORNIA

PREPARED AT THE REQUEST OF
MOSS BEACH ASSOCIATES
612 SPRING ST.
SANTA CRUZ, CA 95060

SITE PLAN

DRAWN BY: ALH, DAM
CHECKED BY: RTC
JOB NUMBER: 15147

SHEET
C1.0



SHEET NOTES

1. RETAINING WALL, SEE LANDSCAPE ARCHITECT'S PLANS FOR APPEARANCE
2. DRIVEWAY PROFILE, SHT C4.0
3. APPROXIMATE LIMIT OF GRADING, TYP
4. EROSION CONTROL ON ALL GRADED SLOPES PER SHT C6.0

GRADING QUANTITIES

CUT	600 YDS
FILL	3,100 YDS
NET	2,500 YDS IMPORT

1. GRADING VOLUME ESTIMATES REPRESENT THE NEAT DIFFERENCE BETWEEN THE EXISTING GRADE AND FINISHED GRADE SURFACE. NO SHRINK OR SWELL FACTORS WERE APPLIED TO THESE VALUES.
2. ALLOWANCES WERE NOT MADE FOR OVER-EXCAVATION OF THE EXISTING OR FINISHED GRADE OR FOR PAVEMENTS, FOUNDATIONS, UTILITY TRENCHING, STRIPING, SCARIFICATION, OR LANDSCAPING.
3. CONTRACTOR SHALL VERIFY GRADING VOLUMES DURING BIDDING
4. HOUSES ARE ASSUMED TO BE CONSTRUCTED ON PERIMETER FOUNDATIONS AND GARAGES ON SLABS ON GRADE.

GRADING PLAN

SCALE: 1" = 20'

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4			

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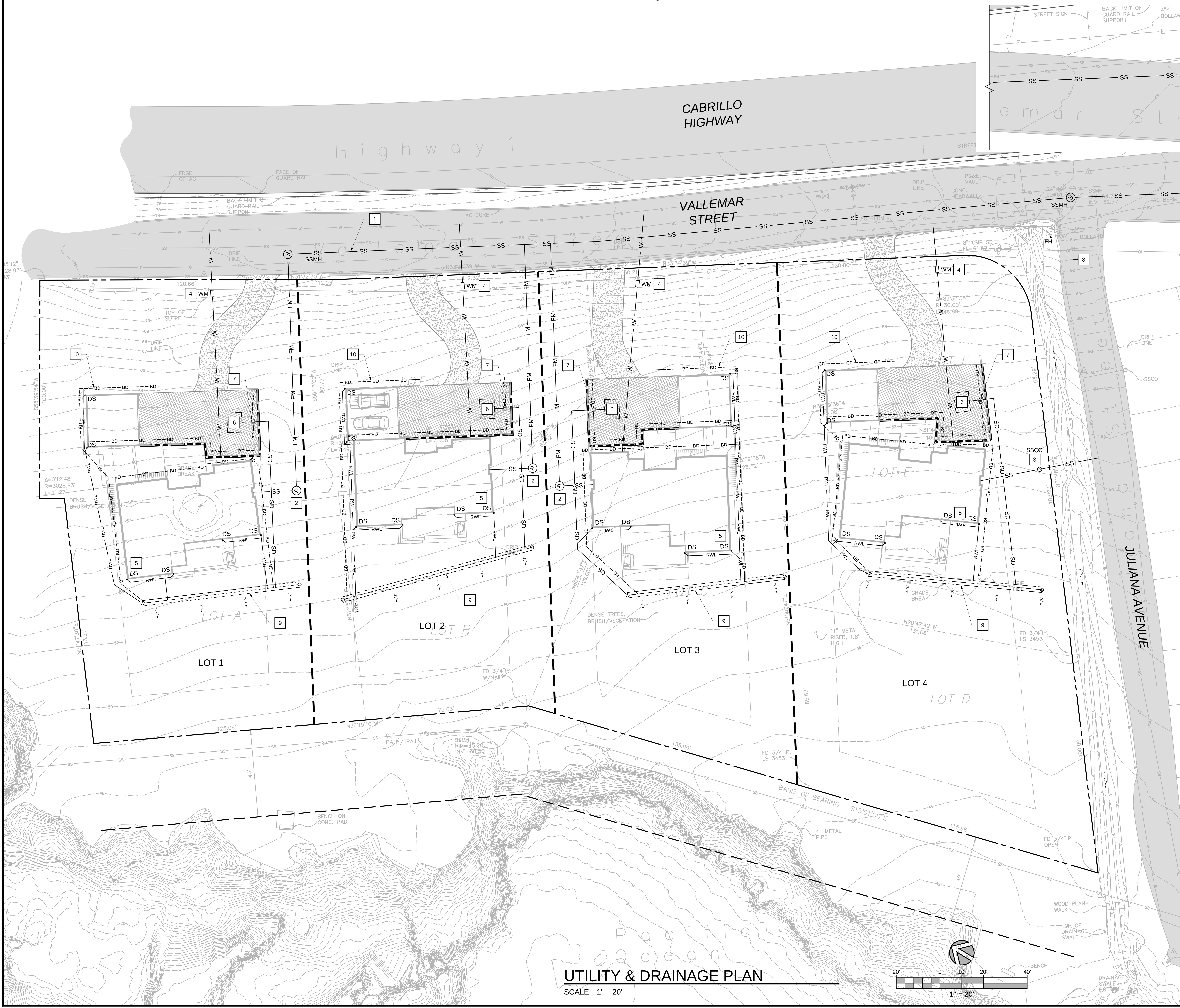
GRADING PLAN

DRAWN BY: DAM
CHECKED BY: RTC
JOB NUMBER: 15147
SHEET
C2.0



SHEET NOTES

1. GRAVITY SANITARY SEWER LINE PER PROFILE SHT C5.0
2. DOMESTIC SANITARY SEWER PUMP AND FORCE MAIN WITH BACKFLOW PREVENTION DEVICE, TYP
3. SANITARY SEWER CLEANOUT AND GRAVITY LATERAL, TYP
4. WATER METER AND WATER SERVICE LATERAL, TYP
5. RAINWATER LEADER DIRECTED TO BIO-RETENTION SWALE OR INFILTRATION SPREADER, TYP, DOWNSPOUT LOCATIONS APPROXIMATE, COORDINATE LOCATIONS WITH ARCHITECT
6. ECO RAIN DETENTION SYSTEM PER DETAIL 2/C8.0
7. STORM DRAIN CATCH BASIN PER DETAIL 6/C8.0, TYP
8. EXISTING FIRE HYDRANT
9. INFILTRATION SPREADER PERFORATED PIPE AND TRENCH PER DETAIL 1/C8.0
10. FOUNDATION CURTAIN DRAIN PER DETAIL 10/C8.0 OR RETAINING WALL BACKDRAIN, TYP

DRAINAGE AREAS

LOT	IMPERVIOUS AREAS* (SF)	PERVIOUS PAVER AREAS (SF)
LOT 1	4,300	1,420
LOT 2	3,920	1,190
LOT 3	4,330	1,110
LOT 4	4,520	1,380
TOTAL (SF)	17,070	5,100

*IMPERVIOUS AREAS INCLUDE ROOFS, TERRACES, AND CONCRETE DRIVEWAYS. IMPERVIOUS AREAS DO NOT INCLUDE DECKS OR ROOF OVERHANGS. PERVIOUS PAVER AREAS INCLUDE MOTORCOURTS.

NOTES

1. ALL INLETS SHALL READ, "NO DUMPING! FLOWS TO BAY" OR EQUIVALENT.

2. PLACE 3 FOOT CONCRETE PLUG IN EACH UTILITY TRENCH WHERE IT PASSES UNDER EXTERIOR FOUNDATIONS.

3. UTILITY TRENCHES SHOULD BE CAPPED WITH 1.5 FEET OF RELATIVELY IMPERMEABLE SOIL.

4. DRAINAGE SYSTEMS SHALL BE MAINTAINED IN ACCORDANCE WITH THE DRAINAGE MAINTENANCE AGREEMENT

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PREPARED AT THE REQUEST OF
MOSS BEACH ASSOCIATES
612 SPRING ST.
SANTA CRUZ, CA 95060

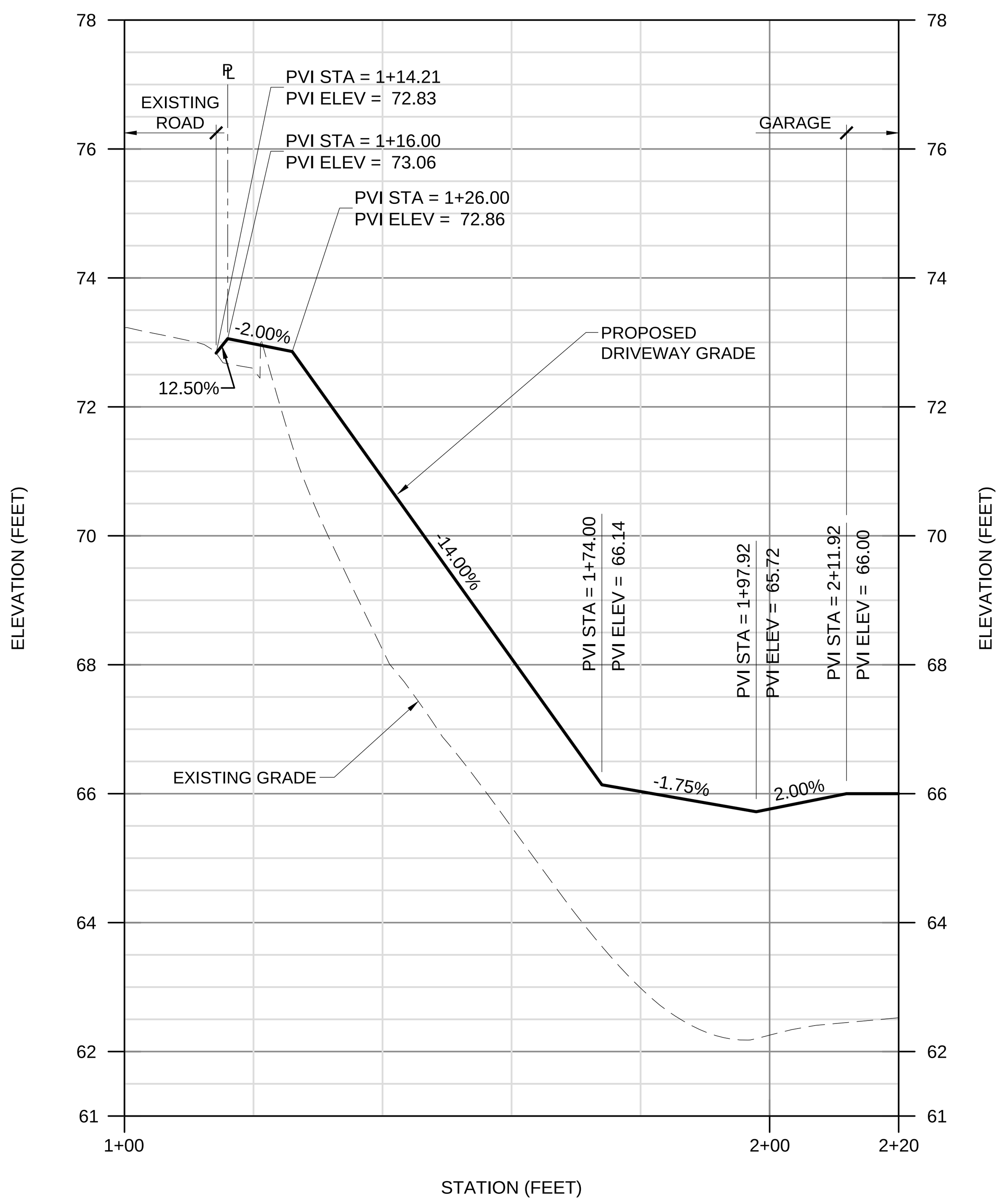
UTILITY & DRAINAGE PLAN

DRAWN BY: RTC, DAM
CHECKED BY: RTC
JOB NUMBER: 15147-5
SHEET
C3.0

I:\15147 Moss Beach Assoc - CE\dwg\C3.0 UTILITY AND DRAINAGE PLAN.dwg, 4/26/2017 12:24:19 PM, Daniel

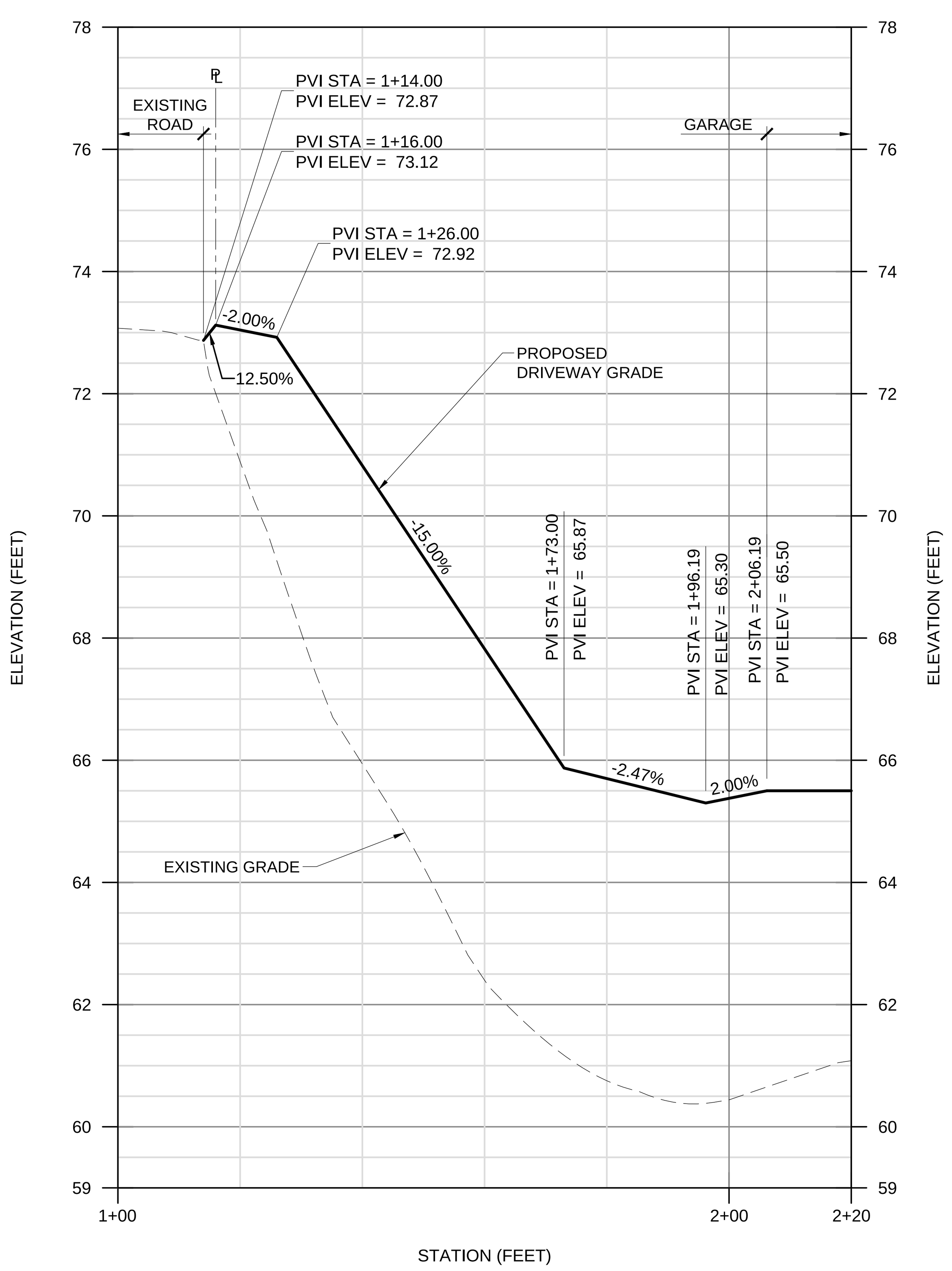
NOTES:

1. VERTICAL CURVES NOT SHOWN ON PRELIMINARY PROFILES.



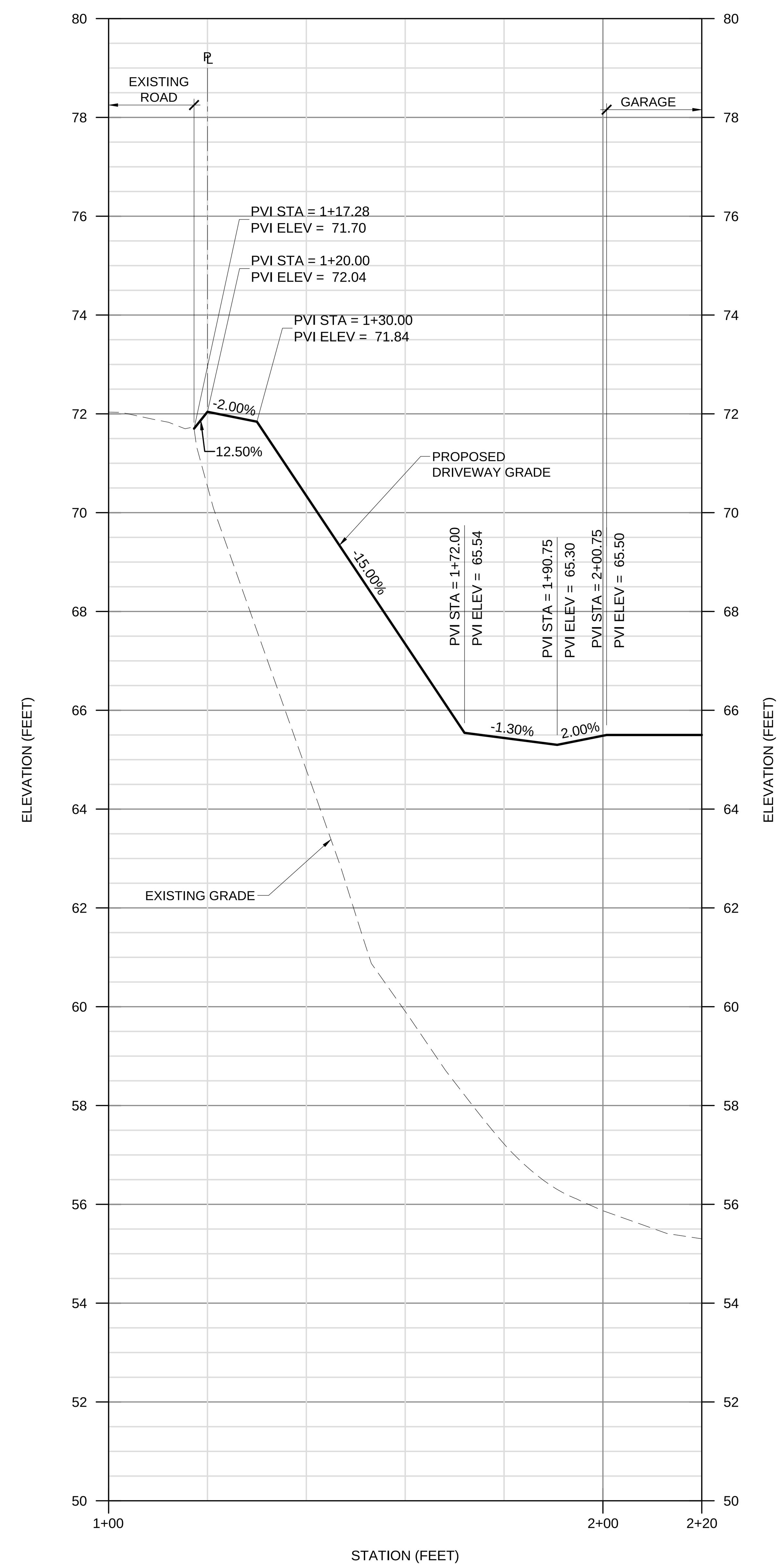
DRIVEWAY PROFILE 1

SCALE: H: 1" = 20' V: 1" = 2'



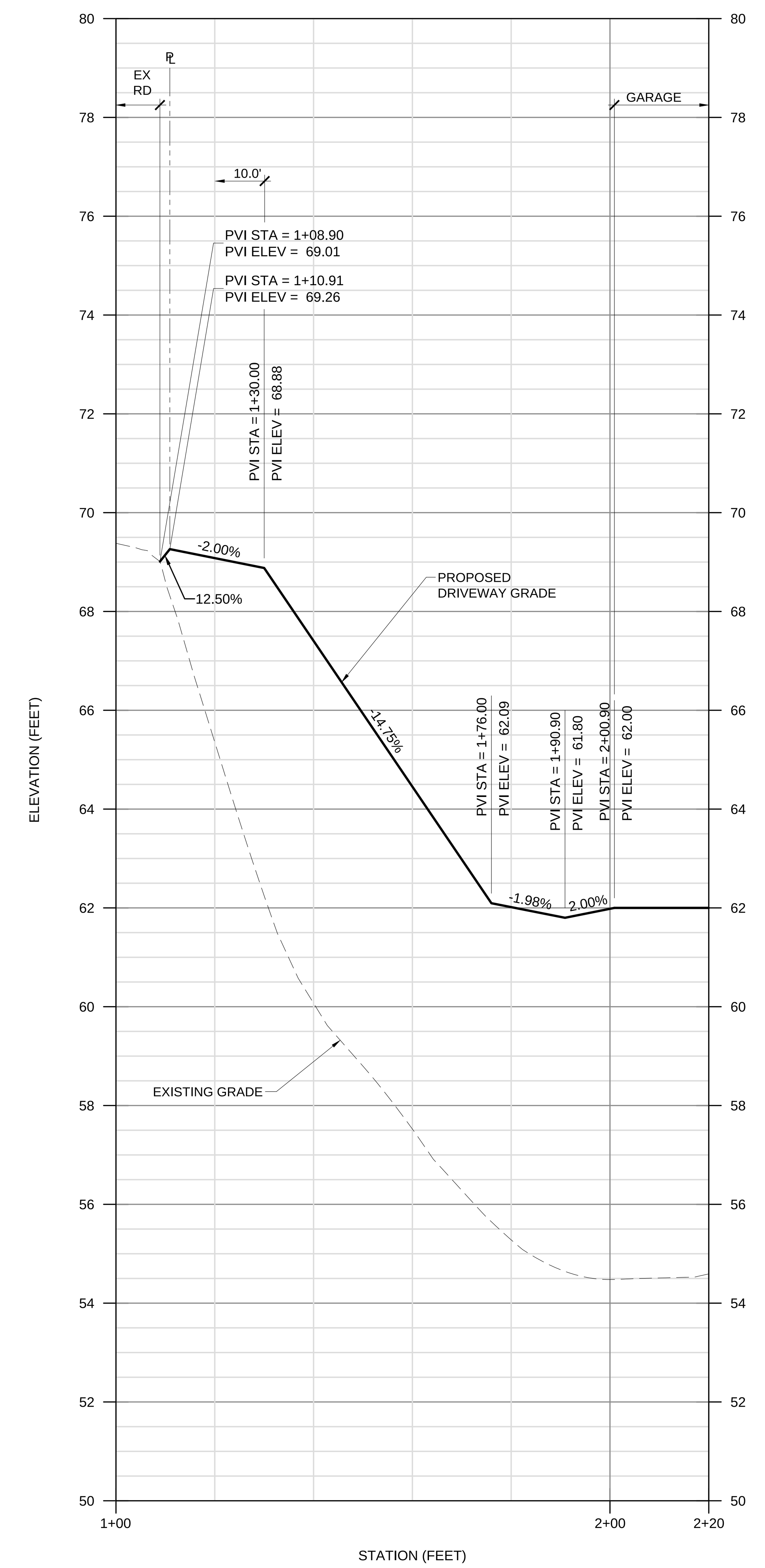
DRIVEWAY PROFILE 2

SCALE: H: 1" = 20' V: 1" = 2'



DRIVEWAY PROFILE 3

SCALE: H: 1" = 20' V: 1" = 2'



DRIVEWAY PROFILE 4

SCALE: H: 1" = 20' V: 1" = 2'

REV.	DESCRIPTION	BY	DATE
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3	FOUR LOT PLANNING RESUBMITTAL	RTC	4/26/2017

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SANTA CRUZ, CA 95060

DRIVEWAY PROFILES

DRAWN BY: DAM
CHECKED BY: RTC
JOB NUMBER: 15147

SHEET
C4.0

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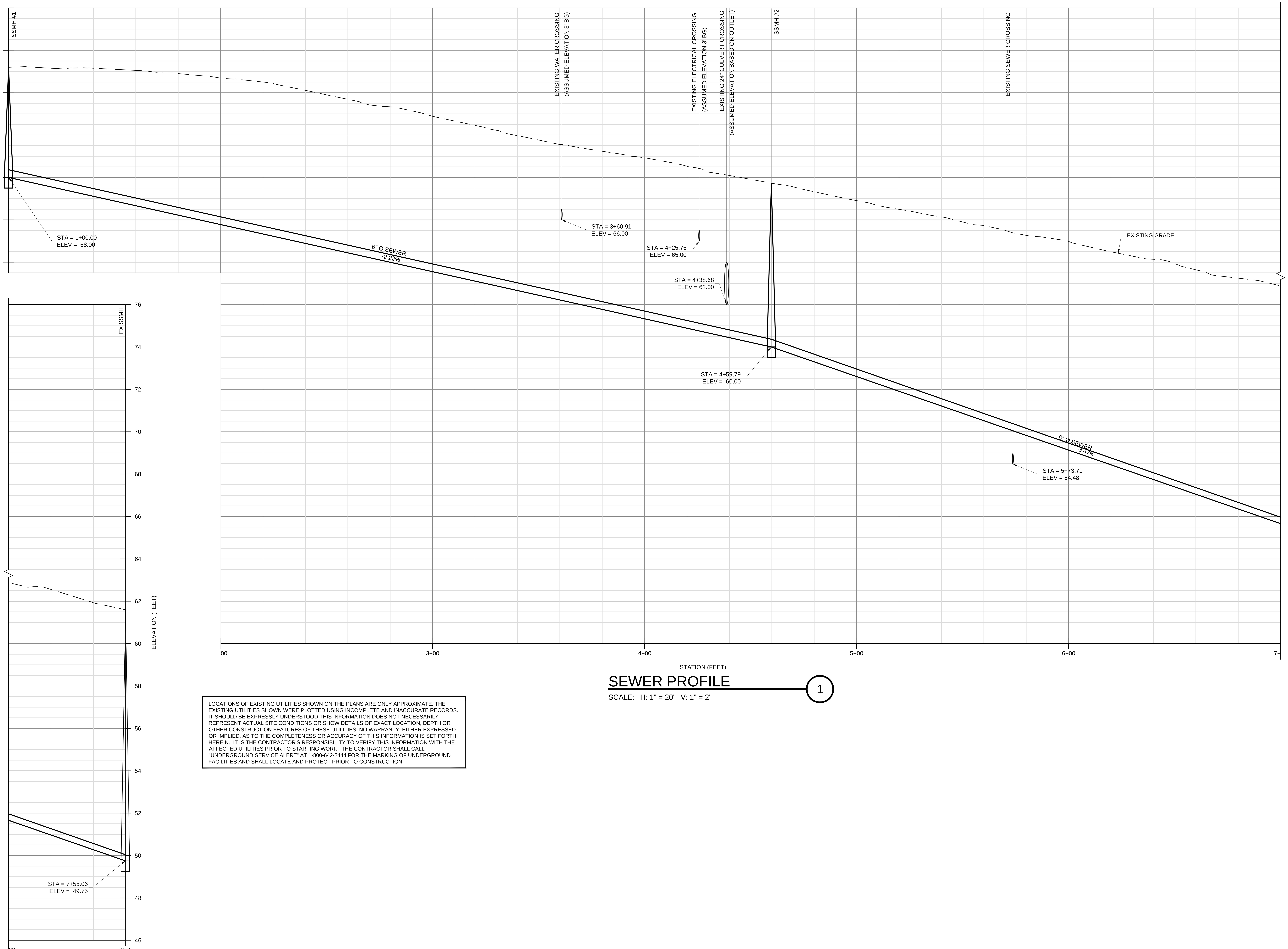

SEWER PROFILE

1

SCALE: H: 1" = 20' V: 1" = 2'

LOCATIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE ONLY APPROXIMATE. THE EXISTING UTILITIES SHOWN WERE PLOTTED USING INCOMPLETE AND INACCURATE RECORDS. IT SHOULD BE EXPRESSLY UNDERSTOOD THIS INFORMATION DOES NOT NECESSARILY REPRESENT ACTUAL SITE CONDITIONS OR SHOW DETAILS OF EXACT LOCATION, DEPTH OR OTHER CONSTRUCTION FEATURES OF THESE UTILITIES. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, AS TO THE COMPLETENESS OR ACCURACY OF THIS INFORMATION IS SET FORTH HEREIN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THIS INFORMATION WITH THE AFFECTED UTILITIES PRIOR TO STARTING WORK. THE CONTRACTOR SHALL CALL "UNDERGROUND SERVICE ALERT" AT 1-800-642-2444 FOR THE MARKING OF UNDERGROUND FACILITIES AND SHALL LOCATE AND PROTECT PRIOR TO CONSTRUCTION.

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SEWER PROFILE

DRAWN BY:	RTC
CHECKED BY:	RTC
JOB NUMBER:	15147

SHEET

C5.0

SHEET NOTES

1. PROTECT ALL CUT AND FILL SLOPES WITH EROSION CONTROL FABRIC AND OR MULCH
2. PROTECT ALL STORM DRAIN SYSTEMS AND BIOSWALES FROM SEDIMENT DURING CONSTRUCTION WITH FABRIC INLET COVERS AND OR GRAVEL BAG BERMS, TYP
3. PROTECT DITCH FROM SEDIMENT DURING CONSTRUCTION WITH SILT FENCES AND/OR FIBER ROLLS
4. PREVENT CONCENTRATED RUNOFF FROM FLOWING OVER SLOPE
5. TEMPORARY SILT FENCE
6. TREE PROTECTION, TEMPORARY FENCE (TYPE ESA) PER CALTRANS STANDARD PLAN T65, REMOVE FENCE FOLLOWING APPROVAL OF FINAL STABILIZATION

CONSTRUCTION BEST MANAGEMENT PRACTICES

GENERAL

1. CONTROL AND PREVENT THE DISCHARGE OF ALL POTENTIAL POLLUTANTS, INCLUDING PAVEMENT CUTTING WASTES, PAINTS, CONCRETE, PETROLEUM PRODUCTS, CHEMICALS, WASHWATER OR SEDIMENTS, RINSE WATER FROM ARCHITECTURAL COPPER, AND NON-STORMWATER DISCHARGES TO STORM DRAINS AND WATERCOURSES.
2. STORE, HANDLE, AND DISPOSE OF CONSTRUCTION MATERIALS/WASTES PROPERLY TO PREVENT CONTACT WITH STORMWATER.
3. DO NOT CLEAN, FUEL, OR MAINTAIN VEHICLES ON-SITE, EXCEPT IN A DESIGNATED AREA WHERE WASHWATER IS CONTAINED AND TREATED.
4. TRAIN AND PROVIDE INSTRUCTION TO ALL EMPLOYEES/SUBCONTRACTORS RE: CONSTRUCTION BMPS.
5. PROTECT ALL STORM DRAIN INLETS IN VICINITY OF SITE USING SEDIMENT CONTROLS SUCH AS BERMS, FIBER ROLLS, OR FILTERS.
6. LIMIT CONSTRUCTION ACCESS ROUTES AND STABILIZE DESIGNATED ACCESS POINTS.
7. PERFORM CLEARING AND EARTH MOVING ACTIVITIES ONLY DURING DRY WEATHER.
8. USE SEDIMENT CONTROLS OR FILTRATION TO REMOVE SEDIMENT WHEN DEWATERING AND OBTAIN ALL NECESSARY PERMITS.
9. TRAP SEDIMENT ON-SITE, USING BMPS SUCH AS SEDIMENT BASINS OR TRAPS, EARTHEN DIKES OR BERMS, SILT FENCES, CHECK DAMS, SOIL BLANKETS OR MATS, COVERS FOR SOIL STOCK PILES, ETC.
10. DIVERT ON-SITE RUNOFF AROUND EXPOSED AREAS; DIVERT OFF-SITE RUNOFF AROUND THE SITE (E.G., SWALES AND DIKES).
11. PROTECT ADJACENT PROPERTIES AND UNDISTURBED AREAS FROM CONSTRUCTION IMPACTS USING VEGETATIVE BUFFER STRIPS, SEDIMENT BARRIERS OR FILTERS, DIKES, MULCHING, OR OTHER MEASURES AS APPROPRIATE.
12. NO LAND CLEARING OPERATIONS OR GRADING OPERATIONS MAY TAKE PLACE BETWEEN OCTOBER 15 AND APRIL 15 UNLESS A SEPARATE WINTER EROSION CONTROL PLAN IS APPROVED PRIOR TO BEGINNING SUCH CONSTRUCTION.
13. EROSION IS TO BE CONTROLLED AT ALL TIMES. THE SPECIFIC MEASURES SHOWN ARE TO BE IMPLEMENTED AT ALL TIMES. ADDITIONAL MEASURES WILL BE REQUIRED FOR CONSTRUCTION BETWEEN OCTOBER 15 AND APRIL 15.
14. EROSION CONTROL MEASURES SHALL BE MONITORED, MAINTAINED, AND REPLACED AS NEEDED TO PREVENT ESCAPE OF SEDIMENT FROM THE SITE. NO TURBID RUNOFF SHALL BE ALLOWED TO LEAVE THE CONSTRUCTION SITE.

RESPONSIBILITY

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REGULARLY INSPECT THE EROSION AND SEDIMENT CONTROL MEASURES AND SUBMIT A WEEKLY REPORT TO THE OWNER THAT THEY ARE FUNCTIONING AS DESIGNED AND THAT PROPER MAINTENANCE IS BEING PERFORMED. DEFICIENCIES SHALL BE IMMEDIATELY CORRECTED BY THE CONTRACTOR.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SEE THAT ADDITIONAL MEASURES, NECESSARY TO CONTROL SITE EROSION AND PREVENT SEDIMENT TRANSPORT OFF-SITE ARE IMPLEMENTED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL SEDIMENTATION ONSITE OR OFF-SITE THAT IS GENERATED BY GRADING AND RELATED ACTIVITIES OF THE PROJECT.

PROTECTION OF DISTURBED AREAS:

1. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS SOON AS PRACTICAL SO THAT SUFFICIENT GROWTH WILL BE ESTABLISHED PRIOR TO INCLEMENT WEATHER CONDITIONS AND CONTINUALLY MAINTAINED TO MINIMIZE SURFACE EROSION.
2. ALL DISTURBED AREAS SHALL BE HYDROSEEDED USING A NATIVE SEED MIX AND MULCHED SO THAT THE DISTURBED AREAS ARE PROTECTED BY MATURE GRASS PRIOR TO OCTOBER 15. IN THE EVENT THAT IT IS NOT POSSIBLE TO ESTABLISH MATURE GRASS BY OCTOBER 15TH, ALL DISTURBED AREAS SHALL BE HYDROSEEDED, MULCHED, AND PROTECTED BY EROSION CONTROL BLANKETS INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS. EROSION CONTROL BLANKETS SHALL BE REED & GRAHAM WOVEN JUTE MESH 0.9 #/YD² OR EQUAL.
3. BETWEEN OCTOBER 15 AND APRIL 15, EXPOSED SOIL SHALL BE PROTECTED FROM EROSION AT ALL TIMES. DURING CONSTRUCTION ALL DISTURBED SLOPES NOT ACTIVELY USED FOR CONSTRUCTION WILL BE SEEDED, MULCHED, AND BLANKETED. HAY BALES, FILTER BERMS, SILT FENCE(S) SHALL BE EMPLOYED TO TRAP SEDIMENT BEFORE IT LEAVES THE SITE OF ANY CONSTRUCTION.
4. BETWEEN OCTOBER 15 AND APRIL 15, A STRAW BALE STOCKPILE SHALL REMAIN ON THE JOB SITE DURING THE COURSE OF CONSTRUCTION. CONTRACTOR SHALL USE STRAW BALES FOR CHECK DAMS AND FOR EROSION CONTROL PROTECTION DURING THE RAINY SEASON AS NECESSARY.
5. BETWEEN OCTOBER 15 AND APRIL 15, EROSION CONTROL MEASURES SHALL BE IN PLACE AT THE END OF EACH DAYS WORK.
6. BETWEEN OCTOBER 15 AND APRIL 15, VEGETATION REMOVAL SHALL NOT PRECEDE SUBSEQUENT GRADING OR CONSTRUCTION ACTIVITIES BY MORE THAN 15 DAYS. DURING THIS PERIOD, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE.
7. BEFORE COMPLETION OF THE PROJECT, ANY EXPOSED SOIL ON DISTURBED SLOPES SHALL BE PERMANENTLY PROTECTED FROM EROSION.
8. CONTRACTOR SHALL IDENTIFY AND MARK ALL EXISTING VEGETATION TO BE PROTECTED WITHIN THE DISTURBED AREA.

RUNOFF:

1. NO TURBID RUNOFF SHALL BE ALLOWED TO LEAVE THE SITE.
2. RUNOFF MUST BE PREVENTED FROM FLOWING OVER UNPROTECTED SLOPES.
3. KEEP RUNOFF AWAY FROM DISTURBED AREAS DURING GRADING AND RELATED ACTIVITIES.
4. SILT BARRIERS SHALL BE CONSTRUCTED ALONG THE BOTTOM OF ALL GRADED SLOPES.
5. SILT DEPOSITS SHALL BE REMOVED AS NECESSARY TO PREVENT MORE THAN 12 INCHES OF ACCUMULATION.
6. EQUIPMENT FUELING, MAINTENANCE, AND CLEANING SHALL OCCUR IN A CONTROLLED LOCATION. ALL SPILLS SHALL BE CLEANED UP IMMEDIATELY.

SPOILS:

1. SPOILS MUST BE REMOVED PROMPTLY AND STOCKPILING OF FILL MATERIALS MUST BE AVOIDED WHEN RAIN IS FORECAST. IF RAIN THREATENS, STOCKPILED SOILS AND OTHER MATERIALS SHALL BE COVERED WITH A TARP OR OTHER WATERPROOF MATERIAL.
2. EXCAVATED MATERIAL SHALL BE REMOVED TO AN APPROVED DISPOSAL SITE OR DISPOSED OF ON-SITE IN A MATTER THAT WILL NOT CAUSE EROSION.

SEEDING PROCEDURE:

1. TEMPORARY SEED MIX SHALL CONSIST OF NATIVE SEEDS AND SHALL BE APPLIED AT RATE OF 140 POUNDS PER ACRE. SEED SHALL BE SUBMITTED TO LANDSCAPE ARCHITECT FOR REVIEW & APPROVAL.
2. BEFORE SEEDING, REMOVE WOOD CHIPS, ROCKS, AND DEBRIS FROM THE DISTURBED AREA. RAKE OUT SCARP TO PROVIDE A SMOOTH TRANSITION FOR EROSION CONTROL BLANKETS.
3. SEEDING - APPLY SEED AND FERTILIZER BY HYDROSEEDING.
4. MULCHING - AFTER HYDROSEEDING, APPLY 2" OF STRAW MULCH.
5. INSTALL EROSION CONTROL BLANKETS ON EXPOSED SLOPES
6. INSTALL STRAW ROLLS.
7. IRRIGATION - SHALL BE USED SO THAT EFFECTIVE PLANT GROWTH IS ESTABLISHED AS SOON AS POSSIBLE. THE SOIL SHOULD BE KEPT CONTINUALLY MOIST UNTIL THE SEED GERMINATES (2-3 WEEKS) AND THE GRASS IS THREE INCHES (3") HIGH. THEN CONTINUE TO WATER ABOUT ONCE A WEEK OR AS REQUIRED UNTIL THE RAINY SEASON BEGINS. IRRIGATION SHALL BE CLOSELY MONITORED SO THAT IT WILL NOT CAUSE AN EROSION PROBLEM.
8. MAINTENANCE - THE CONTRACTOR SHALL COMMENCE WATERING THE COVERED AREAS WITHIN ONE WEEK AFTER SEEDING. THE WATERING WILL CONTINUE UNTIL THE GROUND COVER IS FULLY DEVELOPED AND AS REQUIRED. THE OWNER SHALL MONITOR, MAINTAIN, AND REPAIR ALL EROSION CONTROL MEASURES AS REQUIRED.
9. AUTOMATIC IRRIGATION IS NOT APPROVED.

EROSION CONTROL PLAN

SCALE: 1" = 20'

20' 0 10' 20' 40'
1" = 20'

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MOSS BEACH ASSOCIATES
612 SPRING ST.
SANTA CRUZ, CA 95060

EROSION CONTROL PLAN

DRAWN BY: DAM
CHECKED BY: RTC
JOB NUMBER: 15147

SHEET
C6.0

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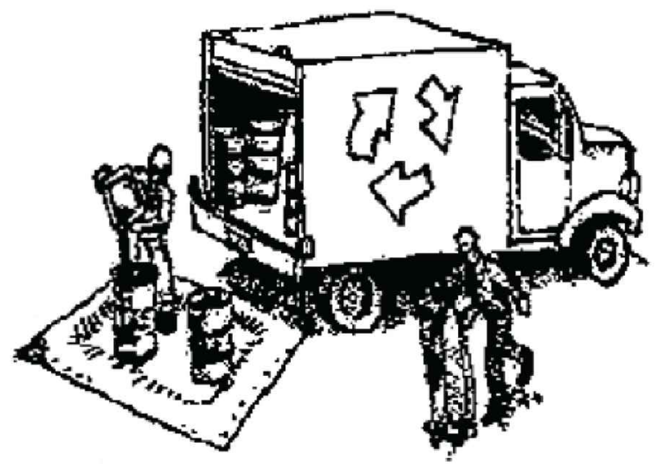
SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Construction Best Management Practices (BMPs)

Construction projects are required to implement the stormwater best management practices (BMP) on this page, as they apply to your project, all year long.

Materials & Waste Management



Non-Hazardous Materials

- ❑ Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.
- ❑ Use (but don't overuse) reclaimed water for dust control.

Hazardous Materials

- ❑ Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state and federal regulations.
- ❑ Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast.
- ❑ Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.
- ❑ Arrange for appropriate disposal of all hazardous wastes.

Waste Management

- ❑ Cover waste disposal containers securely with tarps at the end of every work day and during wet weather.
- ❑ Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site.
- ❑ Clean or replace portable toilets, and inspect them frequently for leaks and spills.
- ❑ Dispose of all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.)
- ❑ Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste.

Construction Entrances and Perimeter

- ❑ Establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from site and tracking off site.
- ❑ Sweep or vacuum any street tracking immediately and secure sediment source to prevent further tracking. Never hose down streets to clean up tracking.

Equipment Management & Spill Control

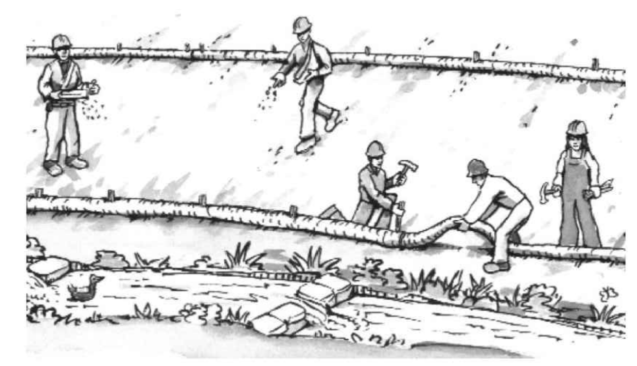
Maintenance and Parking

- ❑ Designate an area, fitted with appropriate BMPs, for vehicle and equipment parking and storage.
- ❑ Perform major maintenance, repair jobs, and vehicle and equipment washing off site.
- ❑ If refueling or vehicle maintenance must be done onsite, work in a bermed area away from storm drains and over a drip pan or drop cloths big enough to collect fluids. Recycle or dispose of fluids as hazardous waste.
- ❑ If vehicle or equipment cleaning must be done onsite, clean with water only in a bermed area that will not allow rinse water to run into gutters, streets, storm drains, or surface waters.
- ❑ Do not clean vehicle or equipment onsite using soaps, solvents, degreasers, or steam cleaning equipment.

Spill Prevention and Control

- ❑ Keep spill cleanup materials (e.g., rags, absorbents and cat litter) available at the construction site at all times.
- ❑ Inspect vehicles and equipment frequently for and repair leaks promptly. Use drip pans to catch leaks until repairs are made.
- ❑ Clean up spills or leaks immediately and dispose of cleanup materials properly.
- ❑ Do not hose down surfaces where fluids have spilled. Use dry cleanup methods (absorbent materials, cat litter, and/or rags).
- ❑ Sweep up spilled dry materials immediately. Do not try to wash them away with water, or bury them.
- ❑ Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
- ❑ Report significant spills immediately. You are required by law to report all significant releases of hazardous materials, including oil. To report a spill: 1) Dial 911 or your local emergency response number, 2) Call the Governor's Office of Emergency Services Warning Center, (800) 852-7550 (24 hours).

Earthmoving



- ❑ Schedule grading and excavation work during dry weather.
- ❑ Stabilize all denuded areas, install and maintain temporary erosion controls (such as erosion control fabric or bonded fiber matrix) until vegetation is established.
- ❑ Remove existing vegetation only when absolutely necessary, and seed or plant vegetation for erosion control on slopes or where construction is not immediately planned.
- ❑ Prevent sediment from migrating offsite and protect storm drain inlets, gutters, ditches, and drainage courses by installing and maintaining appropriate BMPs, such as fiber rolls, silt fences, sediment basins, gravel bags, berms, etc.
- ❑ Keep excavated soil on site and transfer it to dump trucks on site, not in the streets.

Contaminated Soils

- ❑ If any of the following conditions are observed, test for contamination and contact the Regional Water Quality Control Board:
  - Unusual soil conditions, discoloration, or odor.
  - Abandoned underground tanks.
  - Abandoned wells
  - Buried barrels, debris, or trash.

Paving/Asphalt Work

- ❑ Avoid paving and seal coating in wet weather or when rain is forecast, to prevent materials that have not cured from contacting stormwater runoff.
- ❑ Cover storm drain inlets and manholes when applying seal coat, tack coat, slurry seal, fog seal, etc.
- ❑ Collect and recycle or appropriately dispose of excess abrasive gravel or sand. Do NOT sweep or wash it into gutters.
- ❑ Do not use water to wash down fresh asphalt concrete pavement.

Sawcutting & Asphalt/Concrete Removal

- ❑ Protect nearby storm drain inlets when saw cutting. Use filter fabric, catch basin inlet filters, or gravel bags to keep slurry out of the storm drain system.
- ❑ Shovel, abosorb, or vacuum saw-cut slurry and dispose of all waste as soon as you are finished in one location or at the end of each work day (whichever is sooner!).
- ❑ If sawcut slurry enters a catch basin, clean it up immediately.

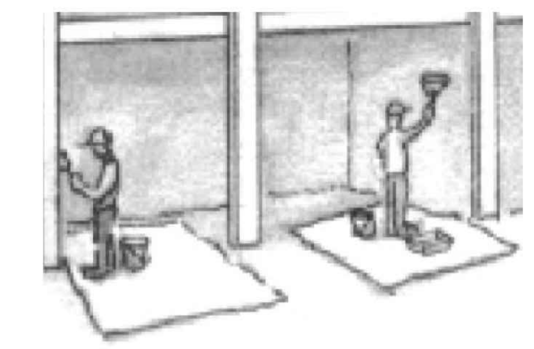
Concrete, Grout & Mortar Application

- ❑ Store concrete, grout, and mortar away from storm drains or waterways, and on pallets under cover to protect them from rain, runoff, and wind.
- ❑ Wash out concrete equipment/trucks offsite or in a designated washout area, where the water will flow into a temporary waste pit, and in a manner that will prevent leaching into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage.
- ❑ When washing exposed aggregate, prevent washwater from entering storm drains. Block any inlets and vacuum gutters, hose washwater onto dirt areas, or drain onto a bermed surface to be pumped and disposed of properly.

Landscaping

- ❑ Protect stockpiled landscaping materials from wind and rain by storing them under tarps all year-round.
- ❑ Stack bagged material on pallets and under cover.
- ❑ Discontinue application of any erodible landscape material within 2 days before a forecast rain event or during wet weather.

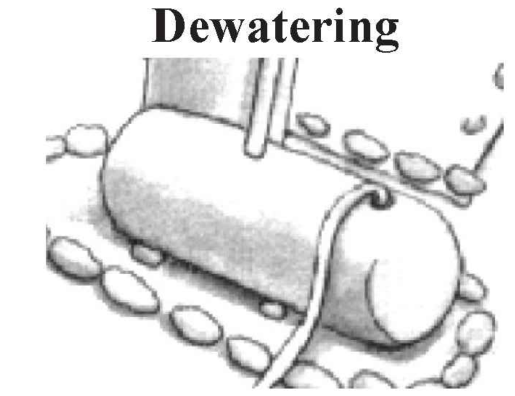
Painting & Paint Removal



Painting Cleanup and Removal

- ❑ Never clean brushes or rinse paint containers into a street, gutter, storm drain, or stream.
- ❑ For water-based paints, paint out brushes to the extent possible, and rinse into a drain that goes to the sanitary sewer. Never pour paint down a storm drain.
- ❑ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of excess liquids as hazardous waste.
- ❑ Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up or collected in plastic drop cloths and disposed of as trash.
- ❑ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead, mercury, or tributyltin must be disposed of as hazardous waste. Lead based paint removal requires a state-certified contractor.

Dewatering



- ❑ Discharges of groundwater or captured runoff from dewatering operations must be properly managed and disposed. When possible send dewatering discharge to landscaped area or sanitary sewer. If discharging to the sanitary sewer call your local wastewater treatment plant.
- ❑ Divert run-on water from offsite away from all disturbed areas.
- ❑ When dewatering, notify and obtain approval from the local municipality before discharging water to a street gutter or storm drain. Filtration or diversion through a basin, tank, or sediment trap may be required.
- ❑ In areas of known or suspected contamination, call your local agency to determine whether the ground water must be tested. Pumped groundwater may need to be collected and hauled off-site for treatment and proper disposal.

Storm drain polluters may be liable for fines of up to $10,000 per day!

REV.	DESCRIPTION	BY	DATE
1	PLANNING PERMIT SUBMITTAL	RTC	9/1/2015
2	DESIGN REVIEW RESUBMITTAL	RTC	8/9/2016
3	FOUR LOT PLANNING RESUBMITTAL	RTC	4/26/2017

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CIVIL AND STRUCTURAL DESIGN
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PRELIMINARY NOT FOR CONSTRUCTION

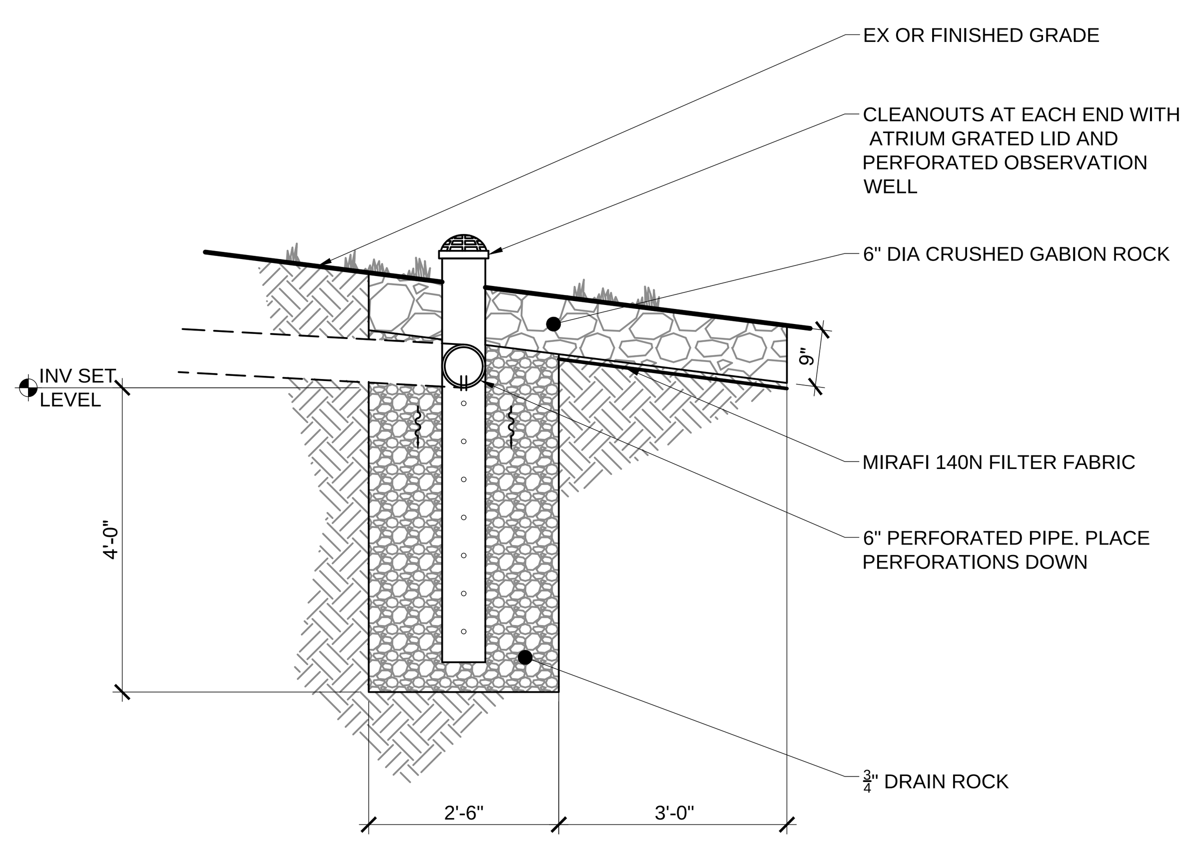
VALLEMAR STREET & JULIANA AVENUE
MOSS BEACH, CALIFORNIA

PREPARED AT THE REQUEST OF
MOSS BEACH ASSOCIATES
612 SPRING ST.
SANTA CRUZ, CA 95060

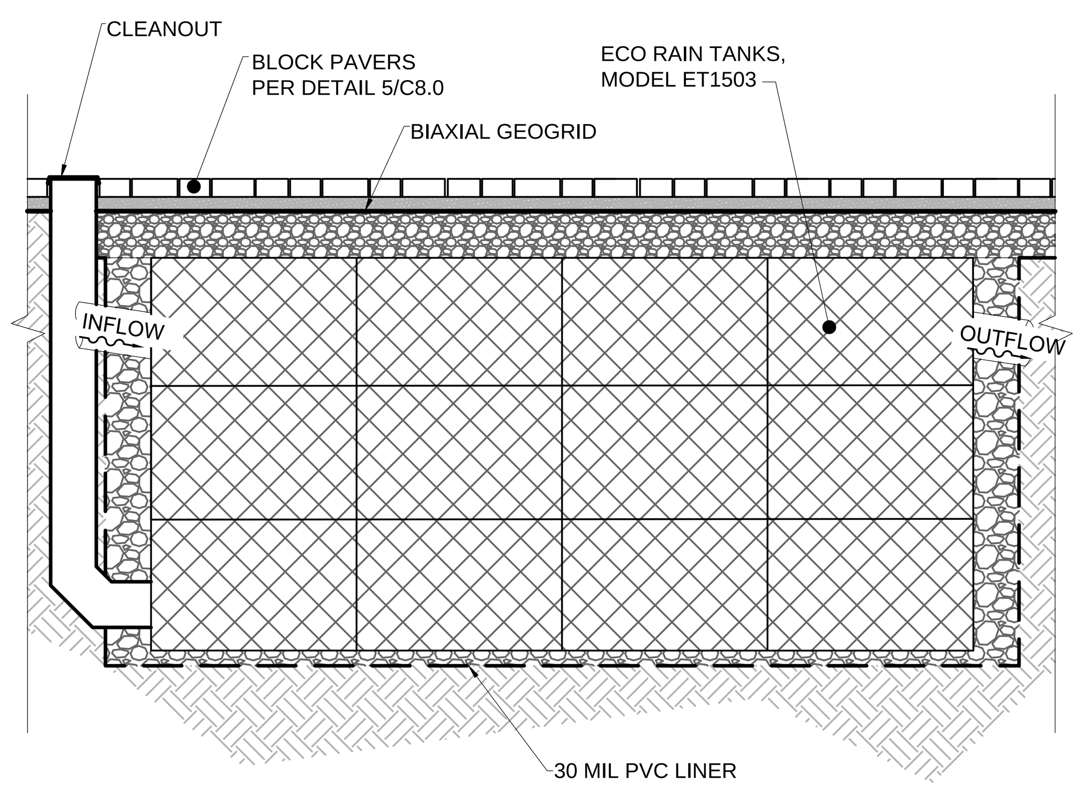
CONSTRUCTION BMP'S

DRAWN BY: RTC
CHECKED BY: RTC
JOB NUMBER: 15147
SHEET
C7.0

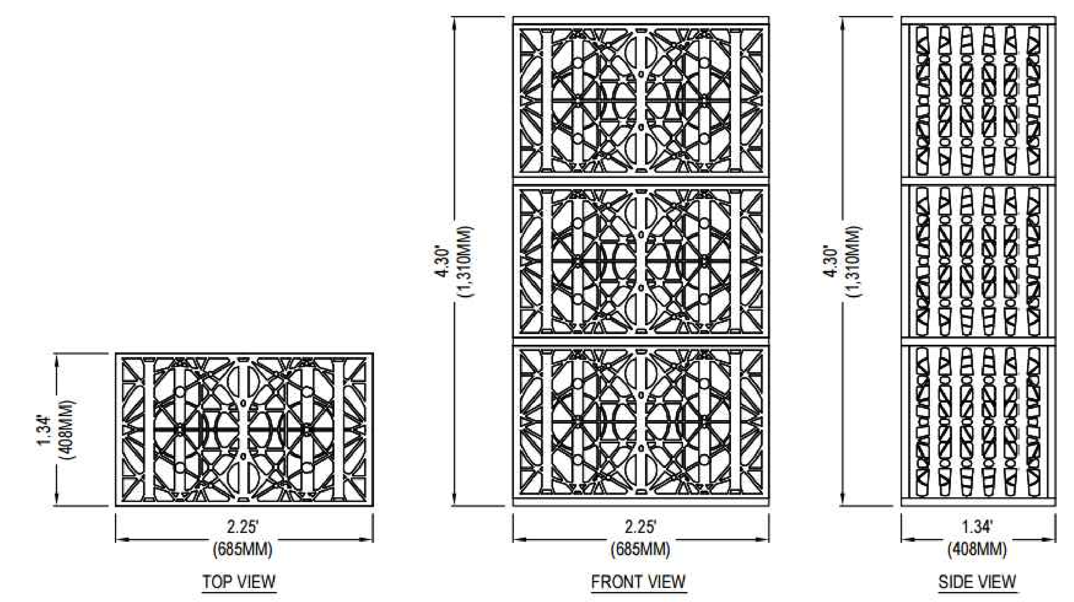
15147 Moss Beach Assoc - CE\dwg\C7.0 BMP PLAN SHEET.dwg, 4/26/2017 12:26:04 PM, Daniel



INFILTRATION SPREADER (1)
SCALE: NTS



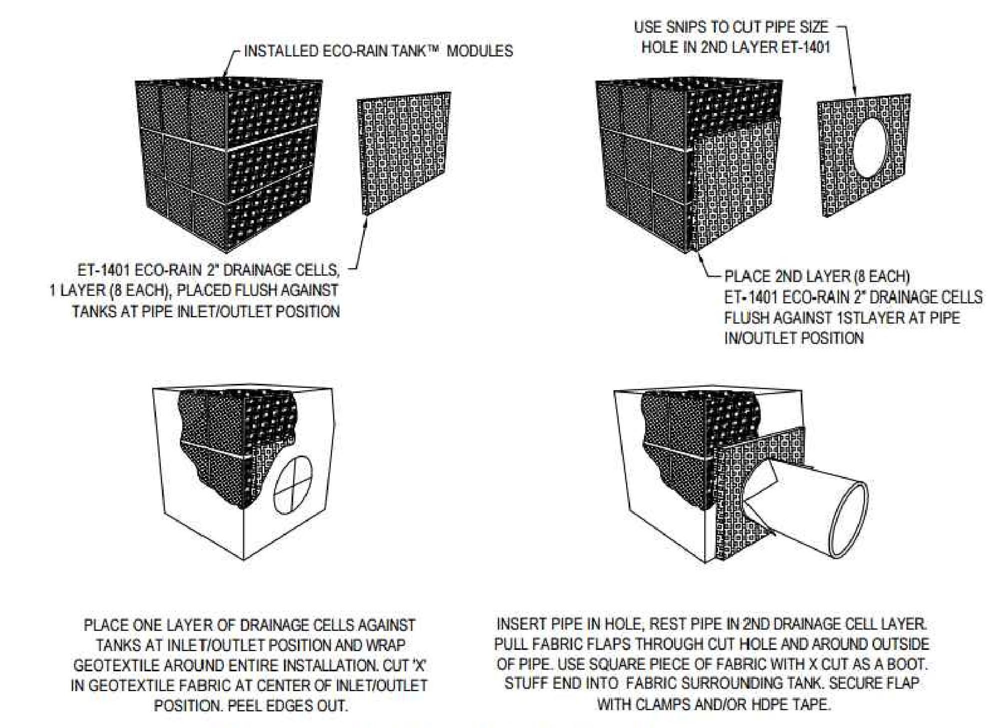
GRAVEL DETENTION SYSTEM (2)
SCALE: NTS



NOTES:
1. THIS IS A CONCEPTUAL TANK LAYOUT ONLY, THE PROJECT ENGINEER SHALL DETERMINE THE ACTUAL LAYOUT.
2. THE FINAL LAYOUT SHALL NOT RESULT IN VOIDS BETWEEN TANKS OR ROWS OF TANKS.
3. REFER TO DRAWING ET-1213 FOR ADDITIONAL INFORMATION.
4. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
5. ALL DIMENSIONS ARE CONSIDERED TRUE AND REFLECT MANUFACTURER'S SPECIFICATIONS.
6. DO NOT SCALE DRAWING.
7. THESE DRAWINGS ARE NOT FOR CONSTRUCTION PURPOSES AND ARE FOR INFORMATION PURPOSES ONLY. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.
8. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.CADdetails.com/info REFERENCE NUMBER 4830-093.

ECO-RAIN TANKS (3)
ET-1503 ECO-RAIN TRIPLE TANK

4830-093 REVISION DATE 04/14/2016

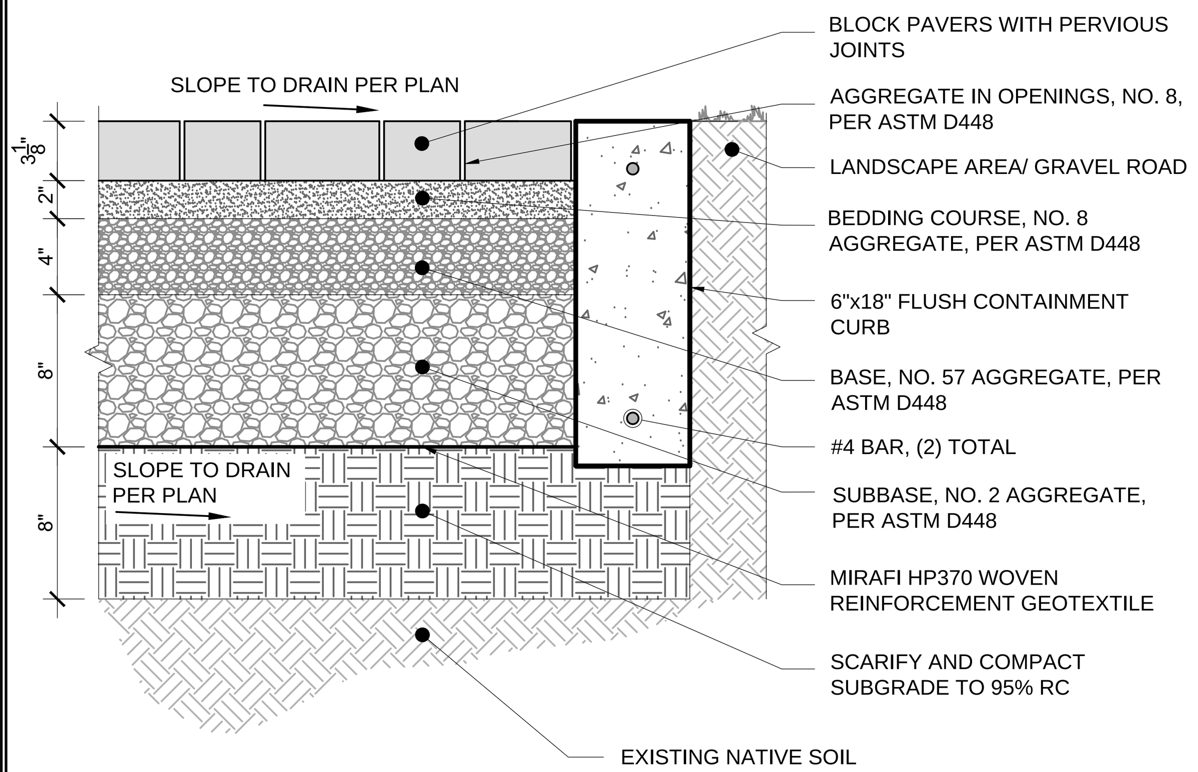


ECO-RAIN TANK™ INLET/OUTLET 8" AND LARGET PIPE ASSEMBLY DETAIL

NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. ALL DIMENSIONS ARE CONSIDERED TRUE AND REFLECT MANUFACTURER'S SPECIFICATIONS.
3. DO NOT SCALE DRAWING.
4. THESE DRAWINGS ARE NOT FOR CONSTRUCTION PURPOSES AND ARE FOR INFORMATION PURPOSES ONLY. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.
5. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.CADdetails.com/info REFERENCE NUMBER 4830-041.

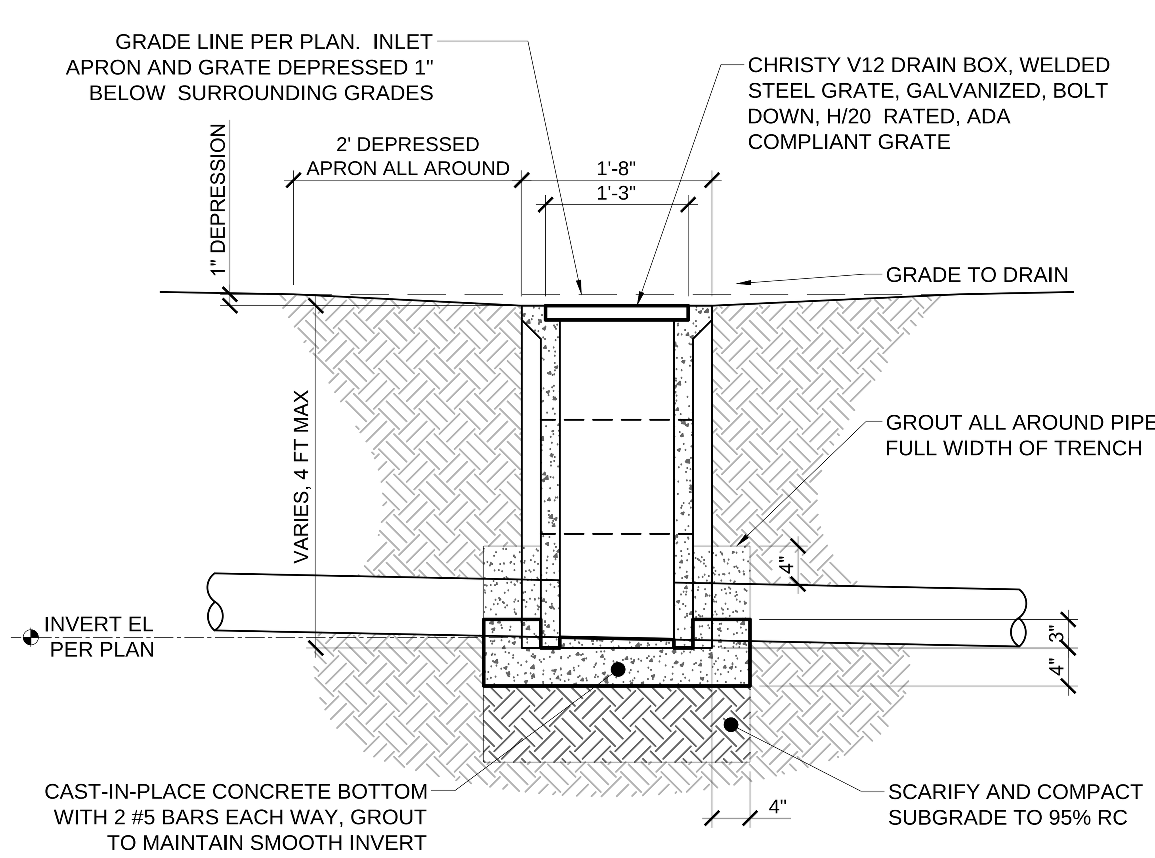
PIPE CONNECTIONS (4)
ET-1215: ECO-RAIN TANK™ INLET / OUTLET 8" AND LARGET PIPE ASSEMBLY DETAIL

4830-041 REVISION DATE 04/14/2016

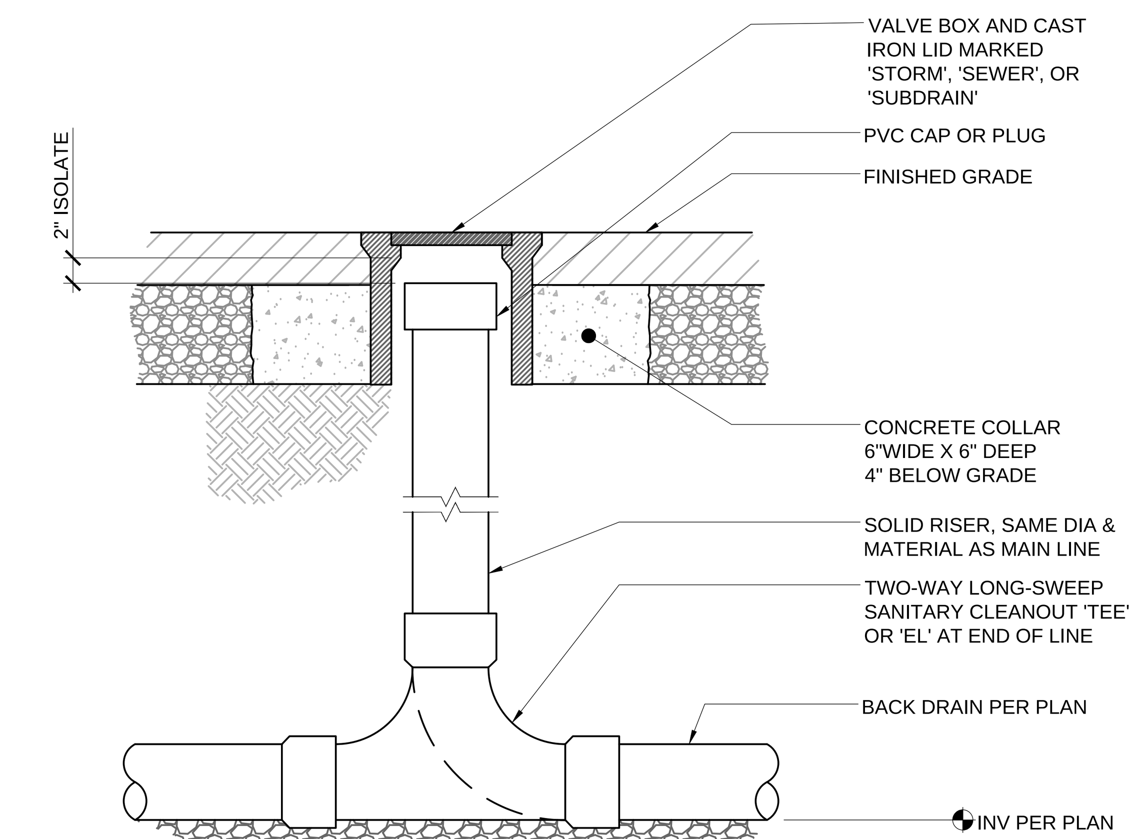


NOTES:
1. SUBMIT CUT SHEETS AND GRADATIONS FOR ALL MATERIALS TO OWNER FOR APPROVAL
2. 6"W X 18"D CONCRETE CONTAINMENT CURBS ARE REQUIRED AT PERIMETER, FLUSH WITH GRADE, OR OTHER TYPE OF CONCRETE CURB/WALL CONTAINMENT
3. SURFACE SHALL BE UNIFORM AND AT LEAST AS SLIP RESISTANT AS A MEDIUM SALTED FINISH WITH NO GAPS OR ABRUPT VERTICAL CHANGES IN GRADE GREATER THAN 1/4"

VEHICULAR PERVIOUS PAVERS (5)
SCALE: 1 1/2" = 1'-0"

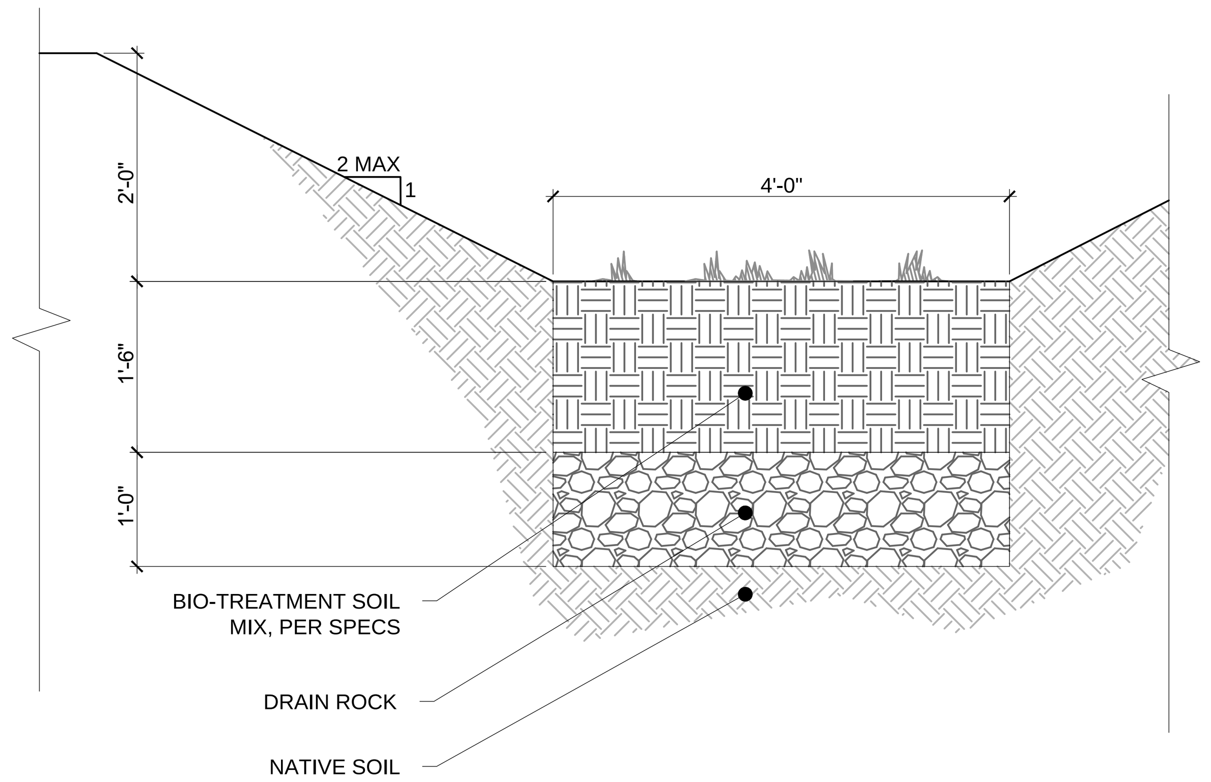


CATCH BASIN (6)
SCALE: 3/4" = 1'-0"

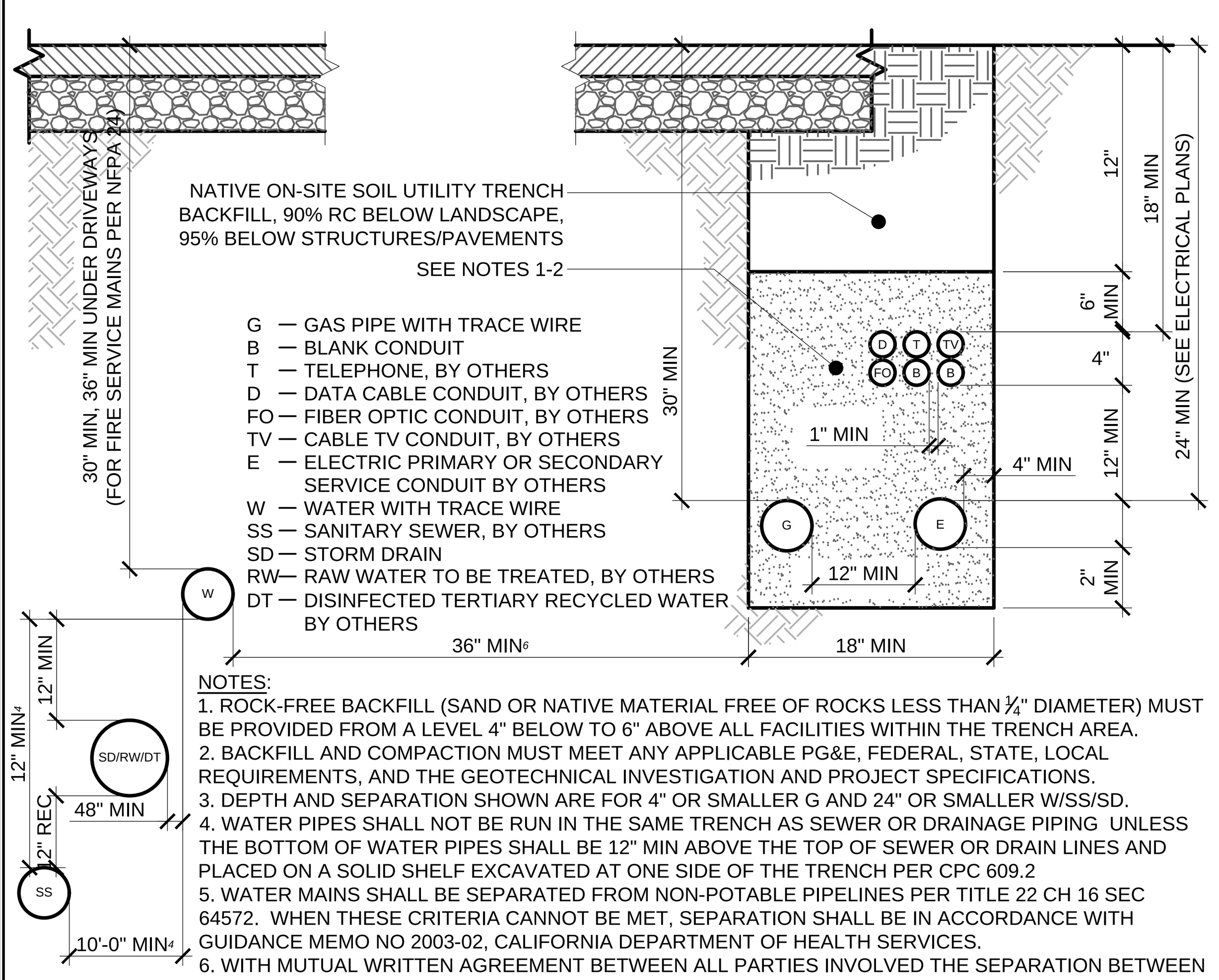


NOTES:
1. IN TRAFFIC AREAS USE CHRISTY G5 TRAFFIC VALVE BOX G5C CI LID
2. IN LANDSCAPE AREAS USE CHRISTY F1 CURB VALVE BOX BOX W/ F8C CI LID

CLEANOUT (7)
SCALE: NTS



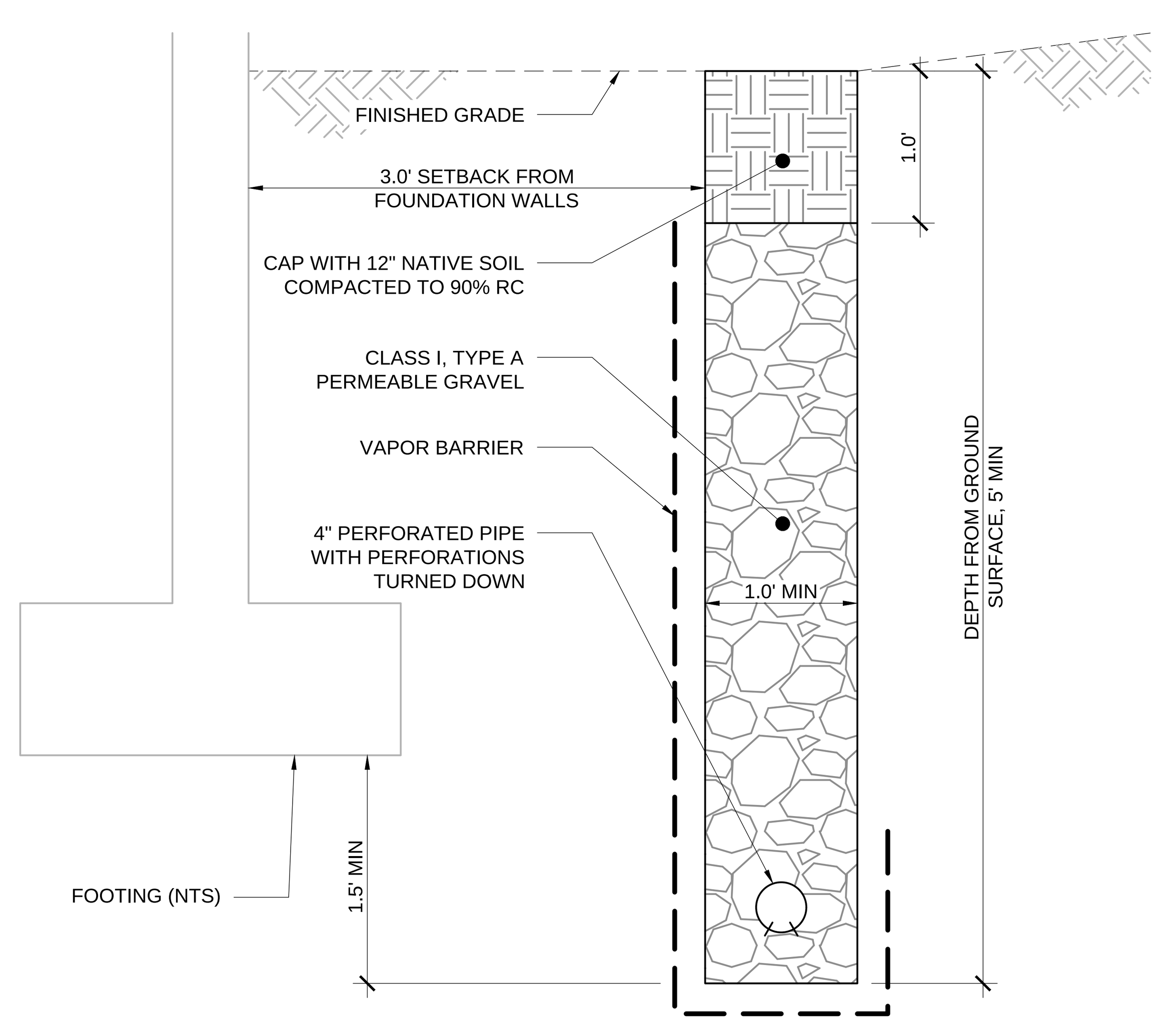
BIORETENTION SECTION (8)
SCALE: 3/4" = 1'-0"



NOTES:
1. ROCK-FREE BACKFILL (SAND OR NATIVE MATERIAL FREE OF ROCKS LESS THAN ½" DIAMETER) MUST BE PROVIDED FROM A LEVEL 4" BELOW TO 6" ABOVE ALL FACILITIES WITHIN THE TRENCH AREA.
2. BACKFILL AND COMPACTION MUST MEET ANY APPLICABLE PG&E, FEDERAL, STATE, LOCAL REQUIREMENTS, AND THE GEOTECHNICAL INVESTIGATION AND PROJECT SPECIFICATIONS.
3. DEPTH AND SEPARATION SHOWN ARE FOR 4" OR SMALLER G AND 24" OR SMALLER W/SS/SD.
4. WATER PIPES SHALL NOT BE RUN IN THE SAME TRENCH AS SEWER OR DRAINAGE PIPING UNLESS THE BOTTOM OF WATER PIPES SHALL BE 12" MIN ABOVE THE TOP OF SEWER OR DRAIN LINES AND PLACED ON A SOLID SHELF EXCAVATED AT ONE SIDE OF THE TRENCH PER CPC 609.2
5. WATER MAINS SHALL BE SEPARATED FROM NON-POTABLE PIPELINES PER TITLE 22 CH 16 SEC 64572. WHEN THESE CRITERIA CANNOT BE MET, SEPARATION SHALL BE IN ACCORDANCE WITH GUIDANCE MEMO NO 2003-02, CALIFORNIA DEPARTMENT OF HEALTH SERVICES.
6. WITH MUTUAL WRITTEN AGREEMENT BETWEEN ALL PARTIES INVOLVED THE SEPARATION BETWEEN WET AND DRY UTILITIES CAN BE REDUCED TO 12" OF UNDISTURBED EARTH, 4" OF MASONRY OR 3" OF CONCRETE. SPECIAL CONSTRUCTION AND JOINTS REQUIRED FOR NON-STANDARD SEPARATIONS.

JOINT UTILITY TRENCH (9)
SCALE: NTS

WATER MAIN SEPARATION REGULATION (TITLE 22 CHAPTER 16 § 64572)



FOUNDATION CURTAIN DRAIN (10)
SCALE: 1" = 1'-0"

REV.	DESCRIPTION	BY	DATE
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MOSS BEACH, CALIFORNIA

PREPARED AT THE REQUEST OF
MOSS BEACH ASSOCIATES
612 SPRING ST.
SANTA CRUZ, CA 95060

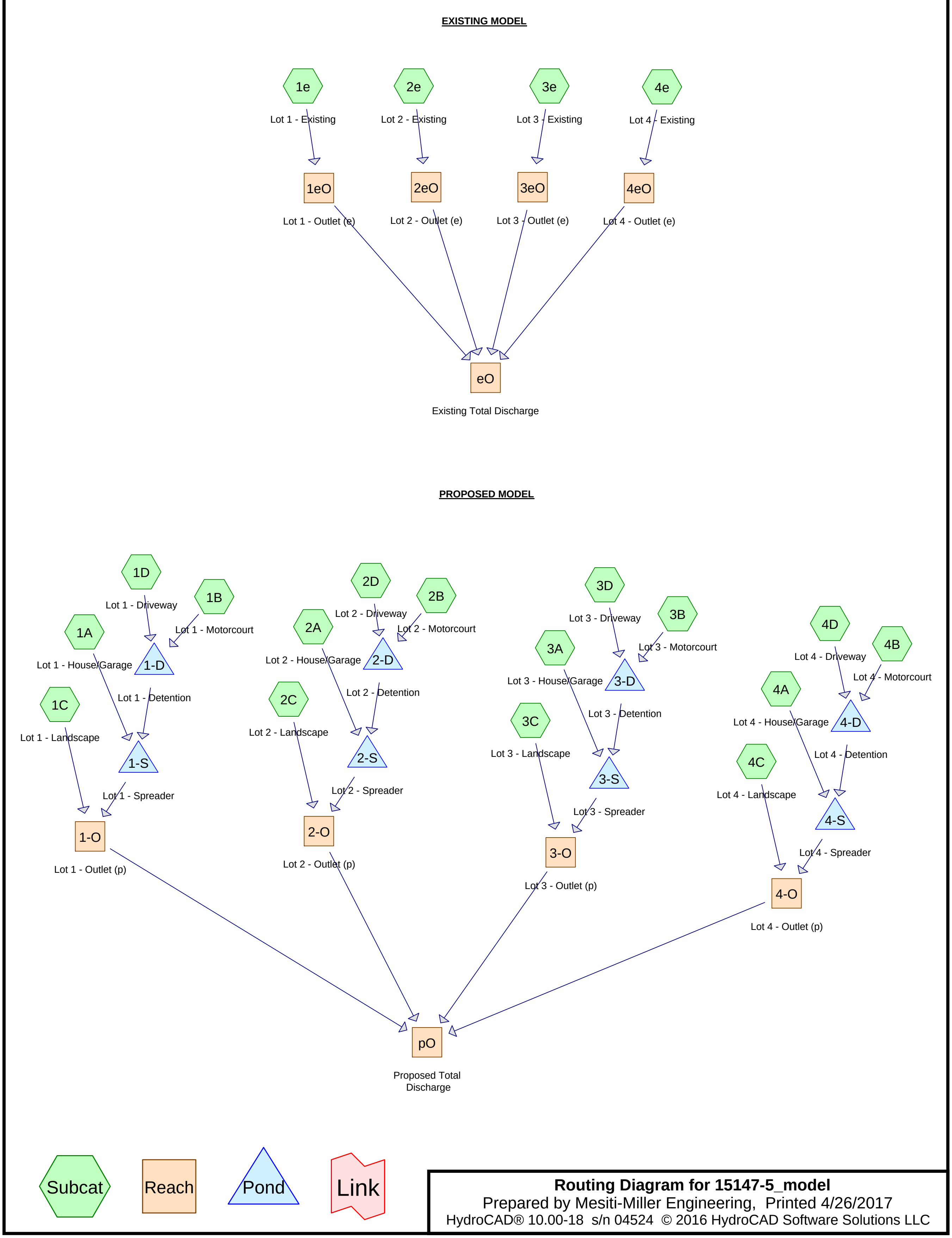
DETAILS

DRAWN BY: ALH, DAM
CHECKED BY: RTC
JOB NUMBER: 15147

SHEET
C8.0

APPENDIX C

HydroCAD Model Output



Routing Diagram for 15147-5_model
Prepared by Mesiti-Miller Engineering, Printed 4/26/2017
HydroCAD® 10.00-18 s/n 04524 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
186,110	74	>75% Grass cover, Good; HSG C (1C, 1e, 2C, 2e, 3C, 3e, 4C, 4e)
17,070	98	Impervious; HSG C (1A, 1D, 2A, 2D, 3A, 3D, 4A, 4D)
5,100	89	Pervious Pavers; HSG C (1B, 2B, 3B, 4B)
208,280	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
208,280	HSG C	1A, 1B, 1C, 1D, 1e, 2A, 2B, 2C, 2D, 2e, 3A, 3B, 3C, 3D, 3e, 4A, 4B, 4C, 4D, 4e
0	HSG D	
0	Other	
208,280		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Nu
0	0	186,110	0	0	186,110	>75% Grass cover, Good;	
0	0	17,070	0	0	17,070	Impervious;	
0	0	5,100	0	0	5,100	Pervious Pavers;	
0	**0**	**208,280**	**0**	**0**	**208,280**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1A: Lot 1 - House/Garage Runoff Area=3,480 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.21 cfs 1,123 cf

Subcatchment 1B: Lot 1 - Motorcourt Runoff Area=1,420 sf 0.00% Impervious Runoff Depth>3.53"
Tc=10.0 min AMC Adjusted CN=96 Runoff=0.08 cfs 418 cf

Subcatchment 1C: Lot 1 - Landscape Runoff Area=17,890 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=0.84 cfs 4,057 cf

Subcatchment 1D: Lot 1 - Driveway Runoff Area=820 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.05 cfs 265 cf

Subcatchment 1e: Lot 1 - Existing Runoff Area=23,610 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=1.11 cfs 5,355 cf

Subcatchment 2A: Lot 2 - House/Garage Runoff Area=3,140 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.19 cfs 1,014 cf

Subcatchment 2B: Lot 2 - Motorcourt Runoff Area=1,190 sf 0.00% Impervious Runoff Depth>3.53"
Tc=10.0 min AMC Adjusted CN=96 Runoff=0.07 cfs 350 cf

Subcatchment 2C: Lot 2 - Landscape Runoff Area=17,330 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=0.82 cfs 3,930 cf

Subcatchment 2D: Lot 2 - Driveway Runoff Area=780 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.05 cfs 252 cf

Subcatchment 2e: Lot 2 - Existing Runoff Area=22,440 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=1.06 cfs 5,089 cf

Subcatchment 3A: Lot 3 - House/Garage Runoff Area=3,590 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.22 cfs 1,159 cf

Subcatchment 3B: Lot 3 - Motorcourt Runoff Area=1,110 sf 0.00% Impervious Runoff Depth>3.53"
Tc=10.0 min AMC Adjusted CN=96 Runoff=0.07 cfs 327 cf

Subcatchment 3C: Lot 3 - Landscape Runoff Area=19,180 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=0.90 cfs 4,350 cf

Subcatchment 3D: Lot 3 - Driveway Runoff Area=740 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.05 cfs 239 cf

Subcatchment 3e: Lot 3 - Existing Runoff Area=24,620 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=1.16 cfs 5,584 cf

Subcatchment 4A: Lot 4 - House/Garage Runoff Area=3,620 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.22 cfs 1,168 cf

Subcatchment 4B: Lot 4 - Motorcourt Runoff Area=1,380 sf 0.00% Impervious Runoff Depth>3.53"
Tc=10.0 min AMC Adjusted CN=96 Runoff=0.08 cfs 406 cf

Subcatchment 4C: Lot 4 - Landscape Runoff Area=27,570 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=1.30 cfs 6,253 cf

Subcatchment 4D: Lot 4 - Driveway Runoff Area=900 sf 100.00% Impervious Runoff Depth>3.87"
Tc=10.0 min AMC Adjusted CN=99 Runoff=0.06 cfs 291 cf

Subcatchment 4e: Lot 4 - Existing Runoff Area=33,470 sf 0.00% Impervious Runoff Depth>2.72"
Tc=10.0 min AMC Adjusted CN=88 Runoff=1.58 cfs 7,591 cf

Reach 1-O: Lot 1 - Outlet (p) Avg. Flow Depth=0.03' Max Vel=0.32 fps Inflow=0.94 cfs 4,128 cf
n=0.100 L=62.5' S=0.0560 '/' Capacity=7.64 cfs Outflow=0.86 cfs 4,110 cf

Reach 1eO: Lot 1 - Outlet (e) Avg. Flow Depth=0.03' Max Vel=0.36 fps Inflow=1.11 cfs 5,355 cf
n=0.100 L=63.0' S=0.0635 '/' Capacity=8.14 cfs Outflow=1.08 cfs 5,334 cf

Reach 2-O: Lot 2 - Outlet (p) Avg. Flow Depth=0.03' Max Vel=0.31 fps Inflow=1.07 cfs 4,083 cf
n=0.100 L=63.0' S=0.0556 '/' Capacity=8.37 cfs Outflow=0.92 cfs 4,064 cf

Reach 2eO: Lot 2 - Outlet (e) Avg. Flow Depth=0.03' Max Vel=0.36 fps Inflow=1.06 cfs 5,089 cf
n=0.100 L=63.0' S=0.0794 '/' Capacity=10.00 cfs Outflow=1.02 cfs 5,070 cf

Reach 3-O: Lot 3 - Outlet (p) Avg. Flow Depth=0.04' Max Vel=0.24 fps Inflow=1.20 cfs 4,957 cf
n=0.100 L=75.0' S=0.0200 '/' Capacity=5.25 cfs Outflow=1.10 cfs 4,924 cf

Reach 3eO: Lot 3 - Outlet (e) Avg. Flow Depth=0.03' Max Vel=0.28 fps Inflow=1.16 cfs 5,584 cf
n=0.100 L=75.0' S=0.0333 '/' Capacity=6.77 cfs Outflow=1.08 cfs 5,551 cf

Reach 4-O: Lot 4 - Outlet (p) Avg. Flow Depth=0.04' Max Vel=0.22 fps Inflow=1.63 cfs 7,848 cf
n=0.100 L=109.0' S=0.0138 '/' Capacity=5.40 cfs Outflow=1.37 cfs 7,765 cf

Reach 4eO: Lot 4 - Outlet (e) Avg. Flow Depth=0.04' Max Vel=0.27 fps Inflow=1.58 cfs 7,591 cf
n=0.100 L=109.0' S=0.0275 '/' Capacity=7.64 cfs Outflow=1.38 cfs 7,524 cf

Reach eO: Existing Total Discharge Inflow=4.54 cfs 23,479 cf
Outflow=4.54 cfs 23,479 cf

Reach pO: Proposed Total Discharge Inflow=4.24 cfs 20,863 cf
Outflow=4.24 cfs 20,863 cf

Pond 1-D: Lot 1 - Detention Peak Elev=62.83' Storage=21 cf Inflow=0.13 cfs 683 cf
Discarded=0.01 cfs 292 cf Primary=0.11 cfs 390 cf Outflow=0.12 cfs 682 cf

Pond 1-S: Lot 1 - Spreader Peak Elev=52.21' Storage=242 cf Inflow=0.32 cfs 1,514 cf
Discarded=0.10 cfs 1,439 cf Primary=0.20 cfs 71 cf Outflow=0.30 cfs 1,510 cf

Pond 2-D: Lot 2 - Detention Peak Elev=62.20' Storage=19 cf Inflow=0.12 cfs 602 cf
Discarded=0.00 cfs 129 cf Primary=0.10 cfs 473 cf Outflow=0.10 cfs 602 cf

Pond 2-S: Lot 2 - Spreader Peak Elev=51.21' Storage=301 cf Inflow=0.29 cfs 1,486 cf
Discarded=0.04 cfs 1,327 cf Primary=0.25 cfs 152 cf Outflow=0.29 cfs 1,479 cf

Pond 3-D: Lot 3 - Detention Peak Elev=62.12' Storage=17 cf Inflow=0.11 cfs 566 cf
Discarded=0.00 cfs 60 cf Primary=0.10 cfs 506 cf Outflow=0.10 cfs 565 cf

Pond 3-S: Lot 3 - Spreader Peak Elev=47.21' Storage=242 cf Inflow=0.31 cfs 1,664 cf
Discarded=0.01 cfs 898 cf Primary=0.30 cfs 607 cf Outflow=0.31 cfs 1,505 cf

Pond 4-D: Lot 4 - Detention Peak Elev=59.01' Storage=24 cf Inflow=0.14 cfs 697 cf
Discarded=0.00 cfs 0 cf Primary=0.12 cfs 696 cf Outflow=0.12 cfs 696 cf

Pond 4-S: Lot 4 - Spreader Peak Elev=45.71' Storage=268 cf Inflow=0.33 cfs 1,864 cf
Discarded=0.00 cfs 2 cf Primary=0.33 cfs 1,595 cf Outflow=0.33 cfs 1,597 cf

Total Runoff Area = 208,280 sf Runoff Volume = 49,220 cf Average Runoff Depth = 2.84"
91.80% Pervious = 191,210 sf 8.20% Impervious = 17,070 sf

Summary for Subcatchment 1A: Lot 1 - House/Garage

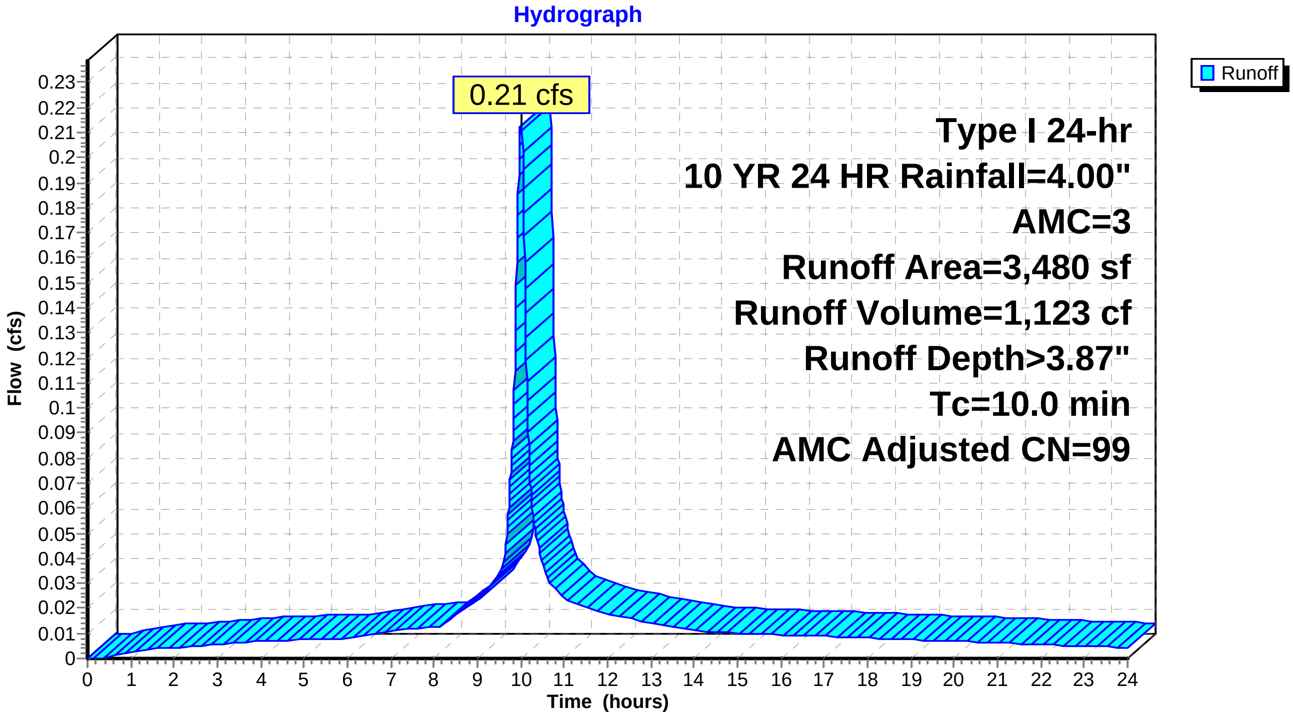
Runoff = 0.21 cfs @ 10.00 hrs, Volume= 1,123 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	3,480	98		Impervious; HSG C
*	0	89		Pervious Pavers; HSG C
	3,480	98	99	Weighted Average, AMC Adjusted
	3,480			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1A: Lot 1 - House/Garage



Summary for Subcatchment 1B: Lot 1 - Motorcourt

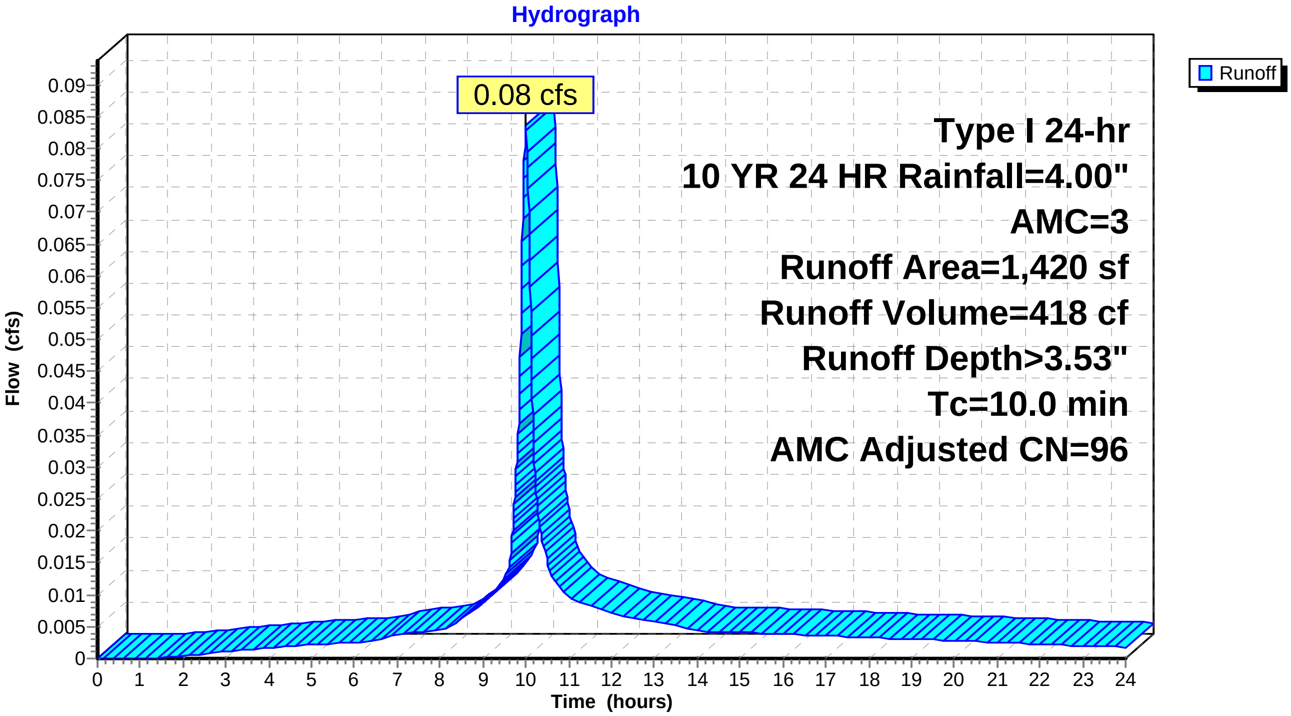
Runoff = 0.08 cfs @ 10.01 hrs, Volume= 418 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	0	98		Impervious; HSG C
*	1,420	89		Pervious Pavers; HSG C
	1,420	89	96	Weighted Average, AMC Adjusted
	1,420			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1B: Lot 1 - Motorcourt



Summary for Subcatchment 1C: Lot 1 - Landscape

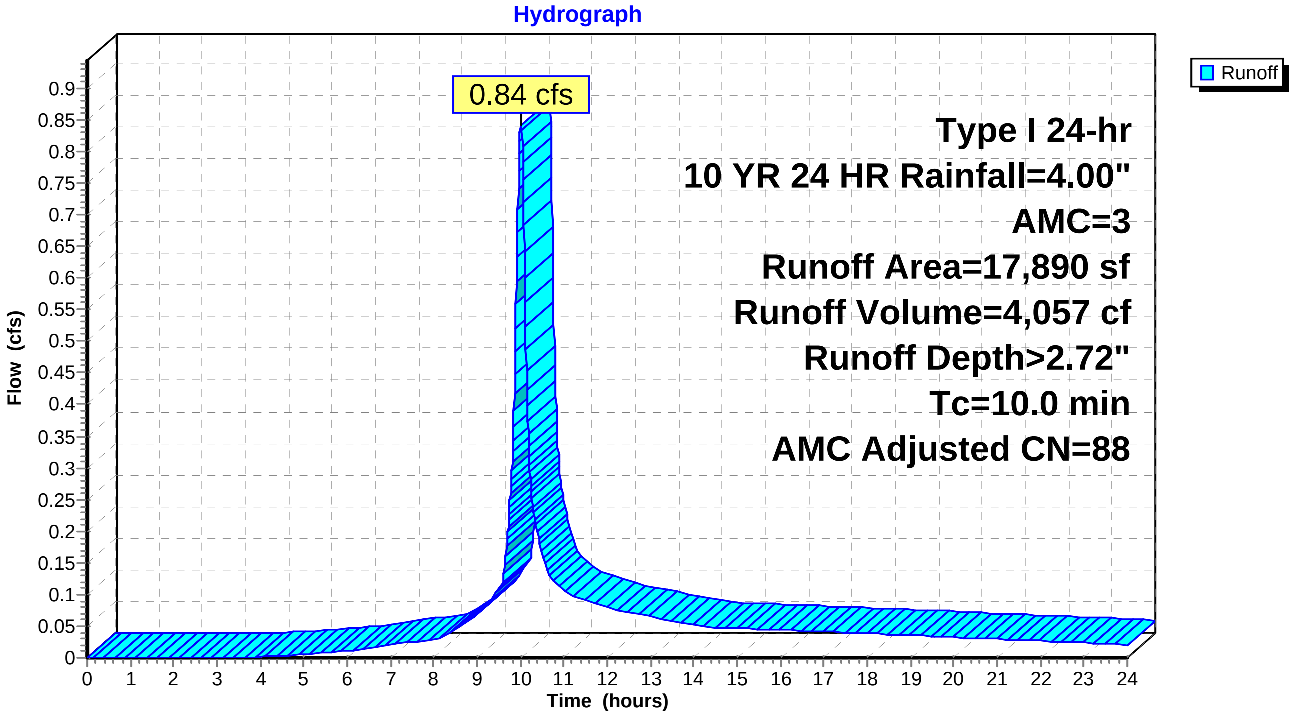
Runoff = 0.84 cfs @ 10.01 hrs, Volume= 4,057 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	17,890	74		>75% Grass cover, Good; HSG C
*	0	89		Pervious Pavers; HSG C
	17,890	74	88	Weighted Average, AMC Adjusted
	17,890			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1C: Lot 1 - Landscape



Summary for Subcatchment 1D: Lot 1 - Driveway

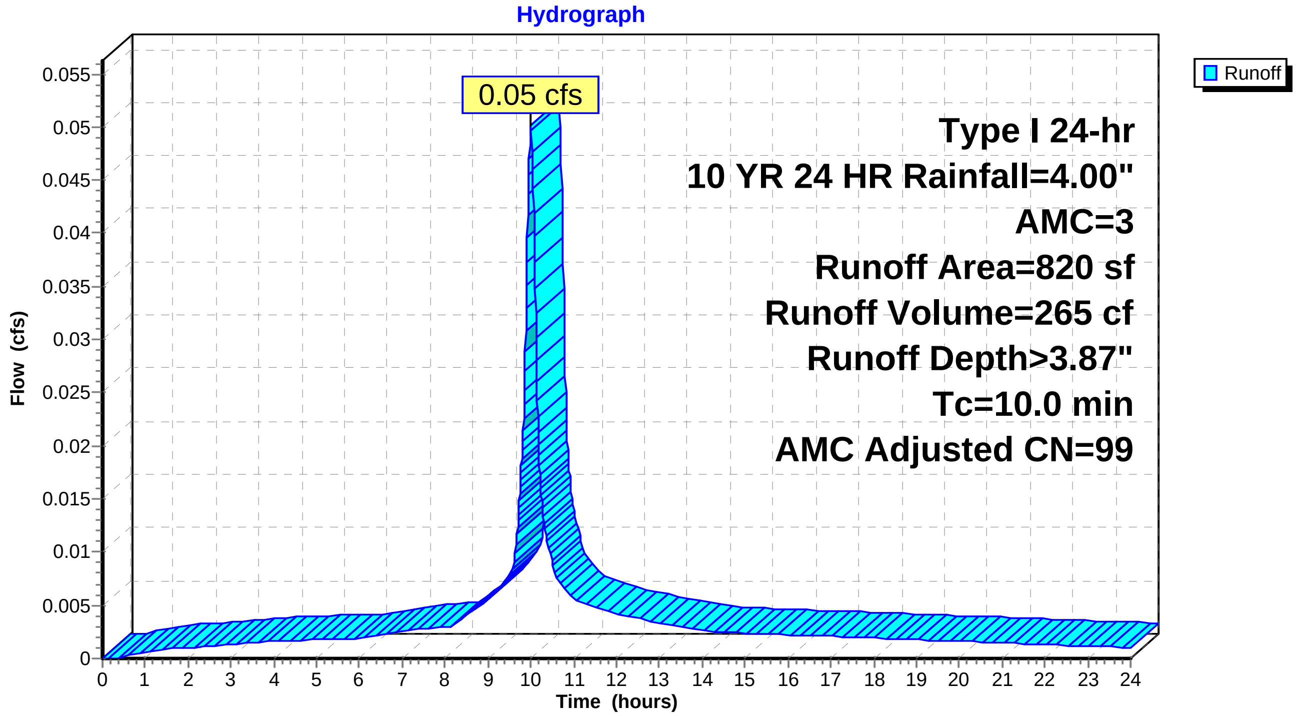
Runoff = 0.05 cfs @ 10.00 hrs, Volume= 265 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	820	98		Impervious; HSG C
*	0	89		Pervious Pavers; HSG C
	820	98	99	Weighted Average, AMC Adjusted
	820			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1D: Lot 1 - Driveway



Summary for Subcatchment 1e: Lot 1 - Existing

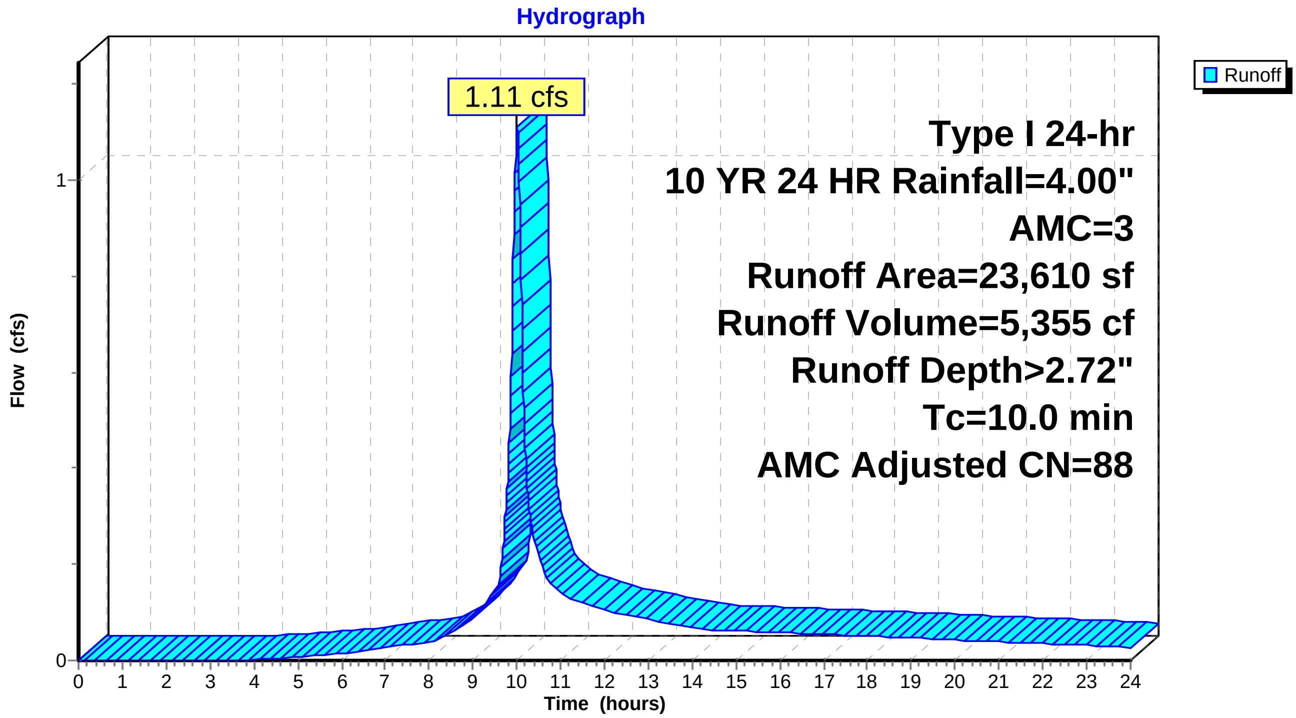
Runoff = 1.11 cfs @ 10.01 hrs, Volume= 5,355 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	23,610	74		>75% Grass cover, Good; HSG C
	23,610	74	88	Weighted Average, AMC Adjusted
	23,610			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1e: Lot 1 - Existing



Summary for Subcatchment 2A: Lot 2 - House/Garage

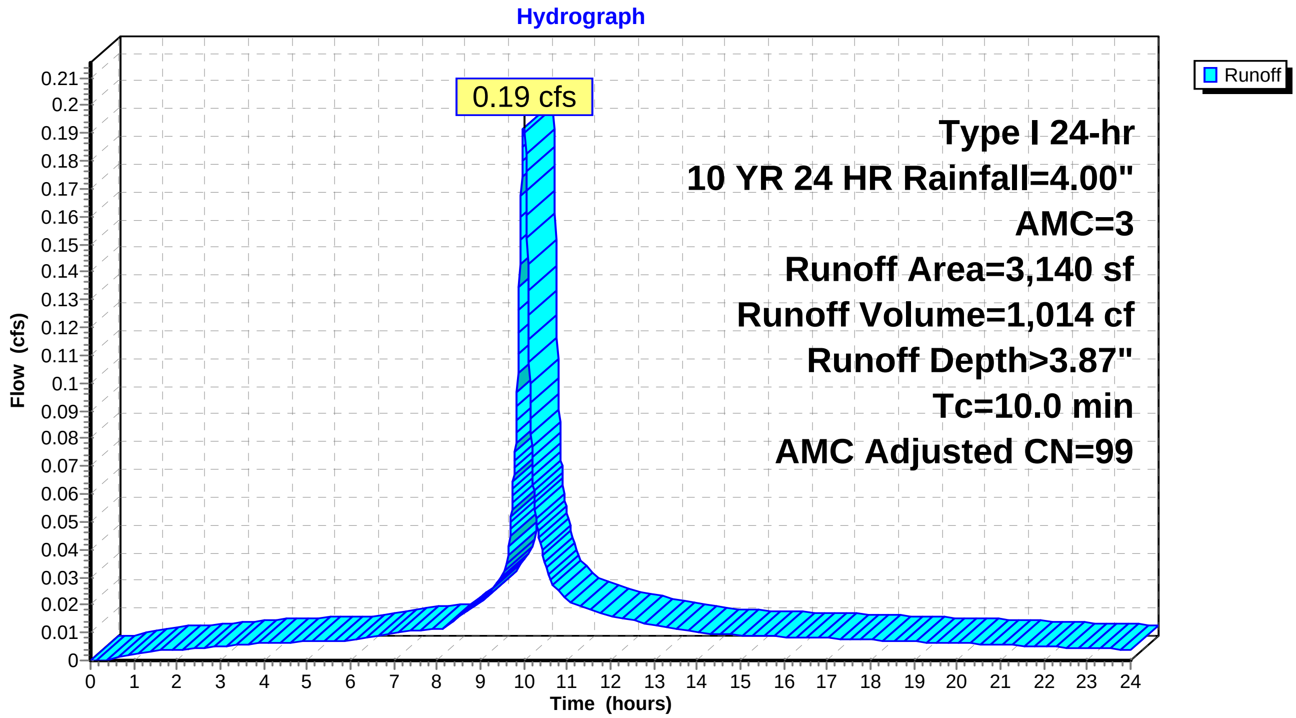
Runoff = 0.19 cfs @ 10.00 hrs, Volume= 1,014 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	3,140	98		Impervious; HSG C
	3,140	98	99	Weighted Average, AMC Adjusted
	3,140			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2A: Lot 2 - House/Garage



Summary for Subcatchment 2B: Lot 2 - Motorcourt

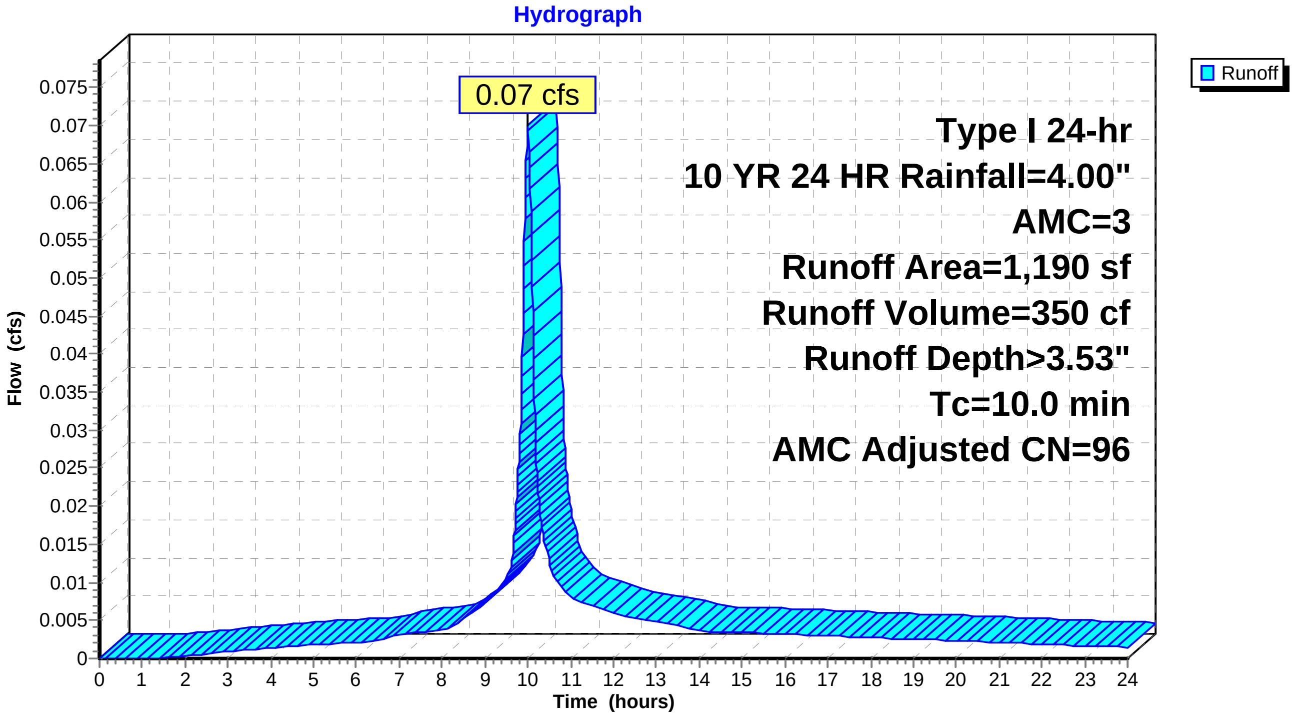
Runoff = 0.07 cfs @ 10.01 hrs, Volume= 350 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	0	98		Impervious; HSG C
*	1,190	89		Pervious Pavers; HSG C
	1,190	89	96	Weighted Average, AMC Adjusted
	1,190			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2B: Lot 2 - Motorcourt



Summary for Subcatchment 2C: Lot 2 - Landscape

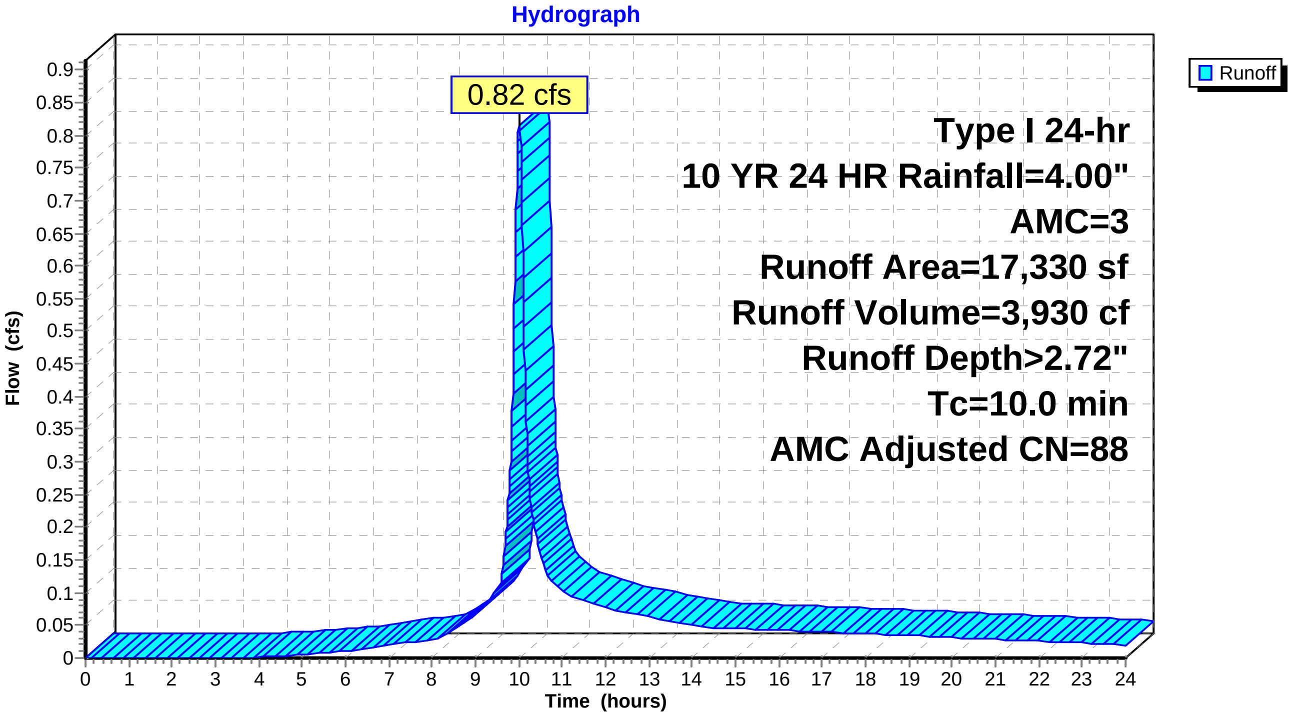
Runoff = 0.82 cfs @ 10.01 hrs, Volume= 3,930 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	17,330	74		>75% Grass cover, Good; HSG C
*	0	89		Pervious Pavers; HSG C
	17,330	74	88	Weighted Average, AMC Adjusted
	17,330			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2C: Lot 2 - Landscape



Summary for Subcatchment 2D: Lot 2 - Driveway

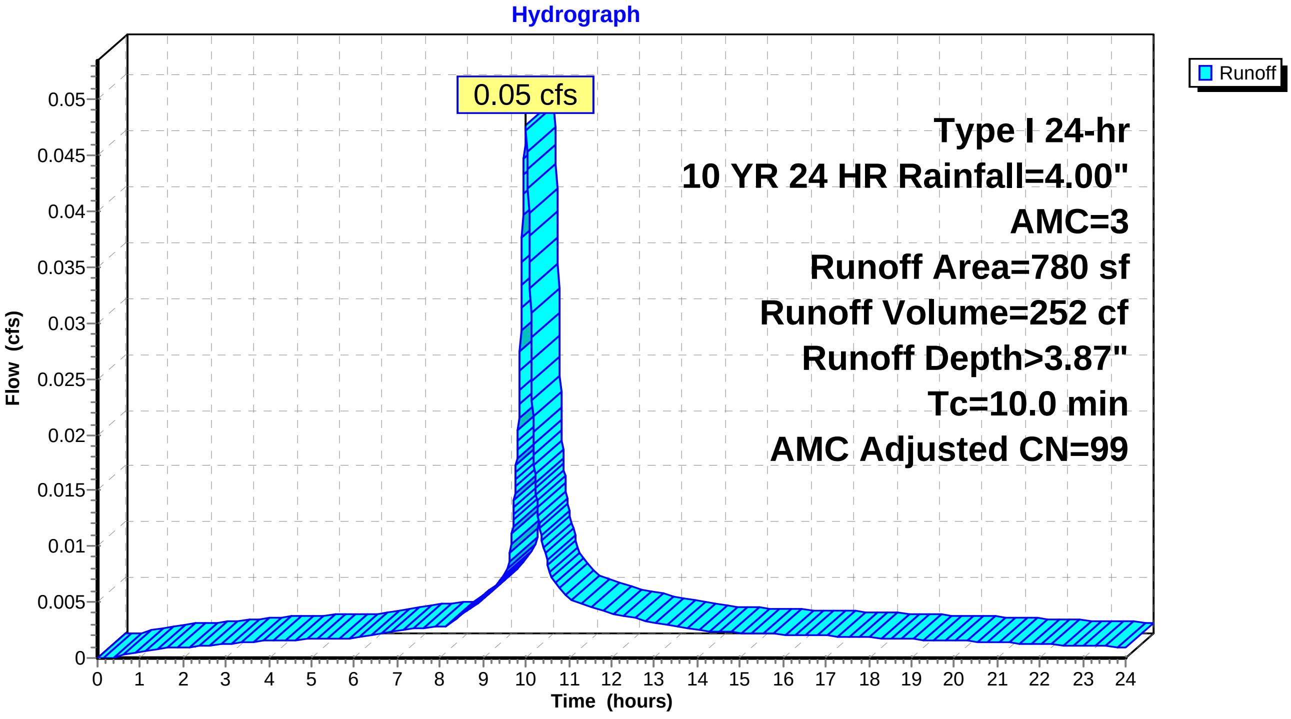
Runoff = 0.05 cfs @ 10.00 hrs, Volume= 252 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	780	98		Impervious; HSG C
*	0	89		Pervious Pavers; HSG C
	780	98	99	Weighted Average, AMC Adjusted
	780			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2D: Lot 2 - Driveway



Summary for Subcatchment 2e: Lot 2 - Existing

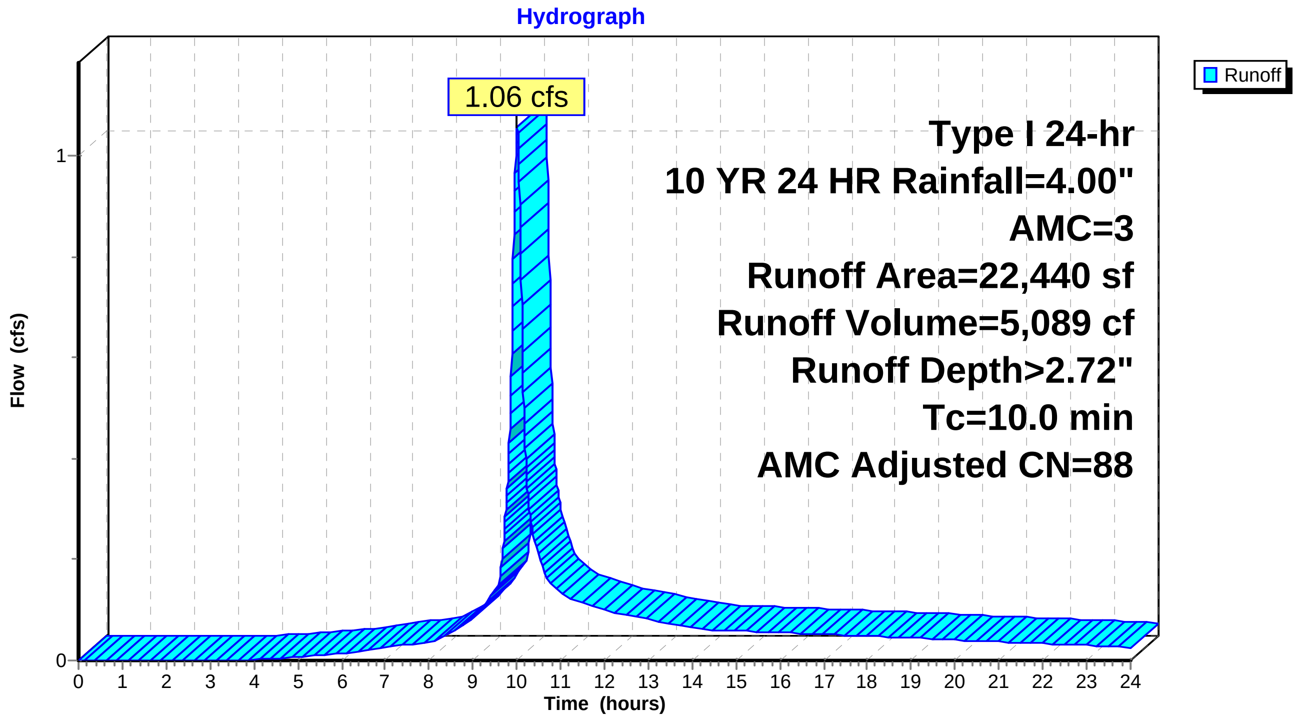
Runoff = 1.06 cfs @ 10.01 hrs, Volume= 5,089 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	22,440	74		>75% Grass cover, Good; HSG C
	22,440	74	88	Weighted Average, AMC Adjusted
	22,440			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2e: Lot 2 - Existing



Summary for Subcatchment 3A: Lot 3 - House/Garage

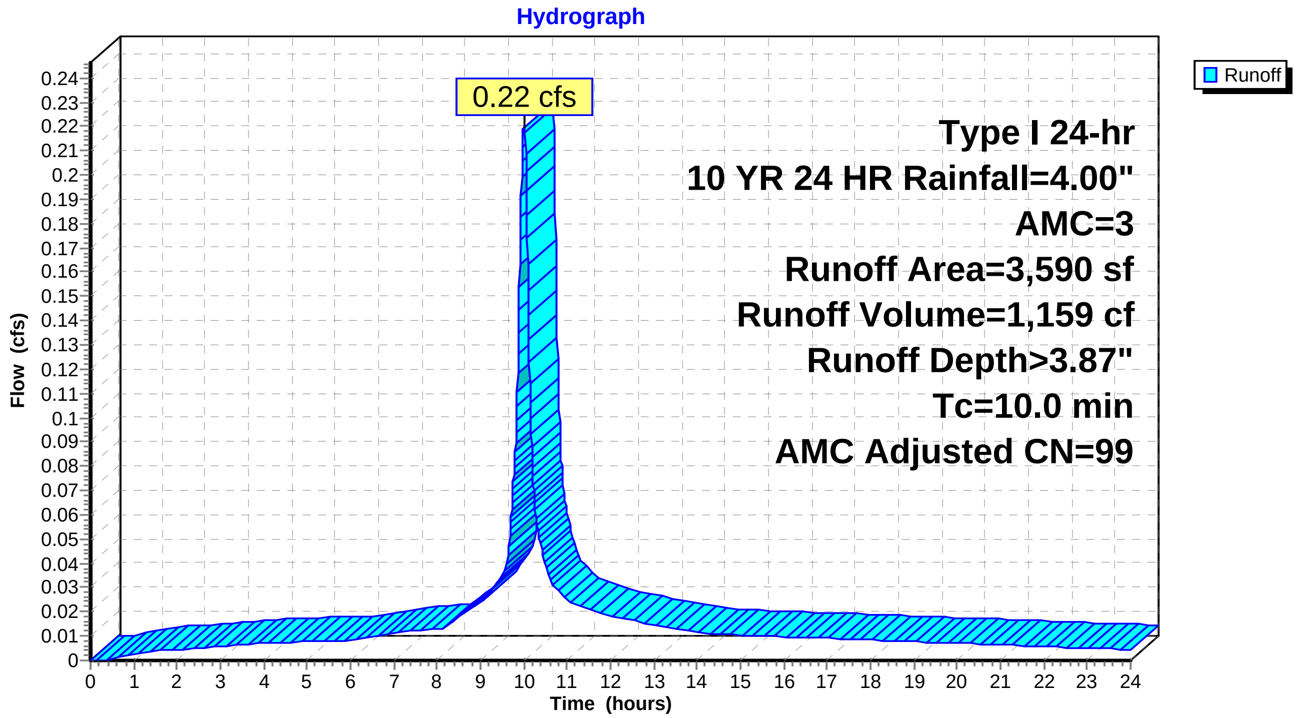
Runoff = 0.22 cfs @ 10.00 hrs, Volume= 1,159 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	3,590	98		Impervious; HSG C
	3,590	98	99	Weighted Average, AMC Adjusted
	3,590			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3A: Lot 3 - House/Garage



Summary for Subcatchment 3B: Lot 3 - Motorcourt

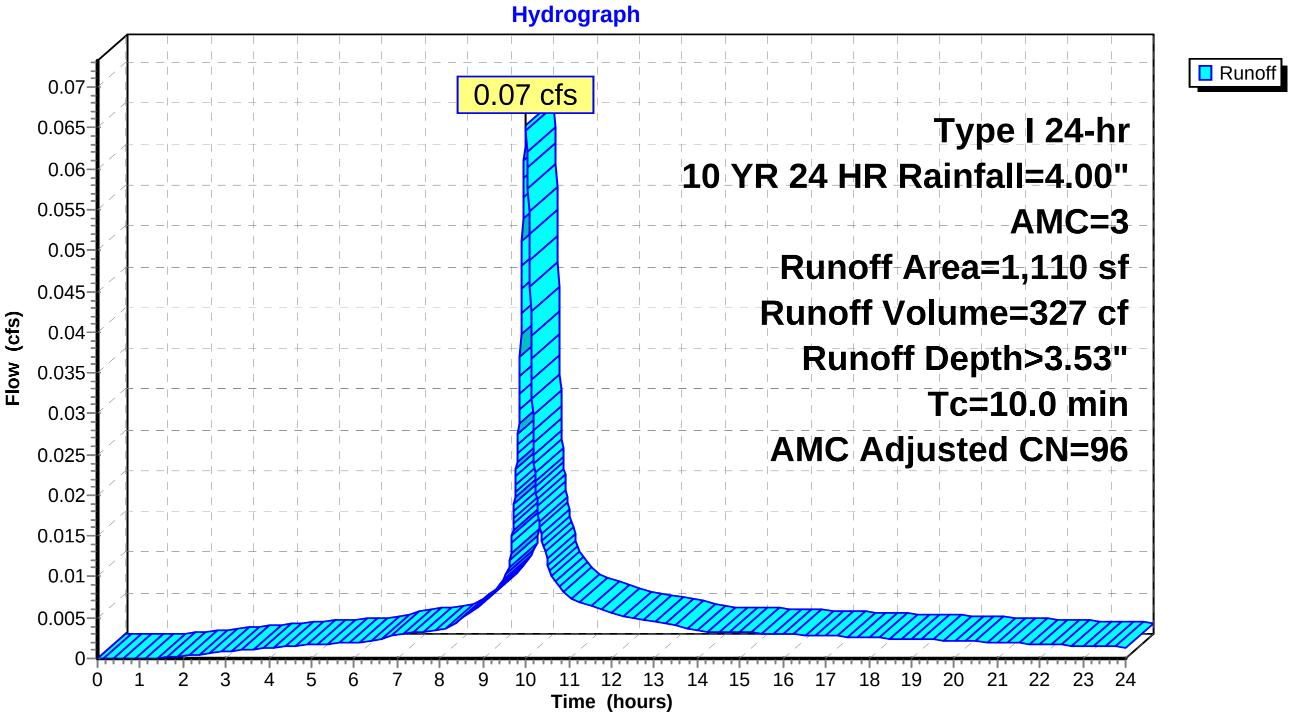
Runoff = 0.07 cfs @ 10.01 hrs, Volume= 327 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	0	98		Impervious; HSG C
*	1,110	89		Pervious Pavers; HSG C
	1,110	89	96	Weighted Average, AMC Adjusted
	1,110			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3B: Lot 3 - Motorcourt



Summary for Subcatchment 3C: Lot 3 - Landscape

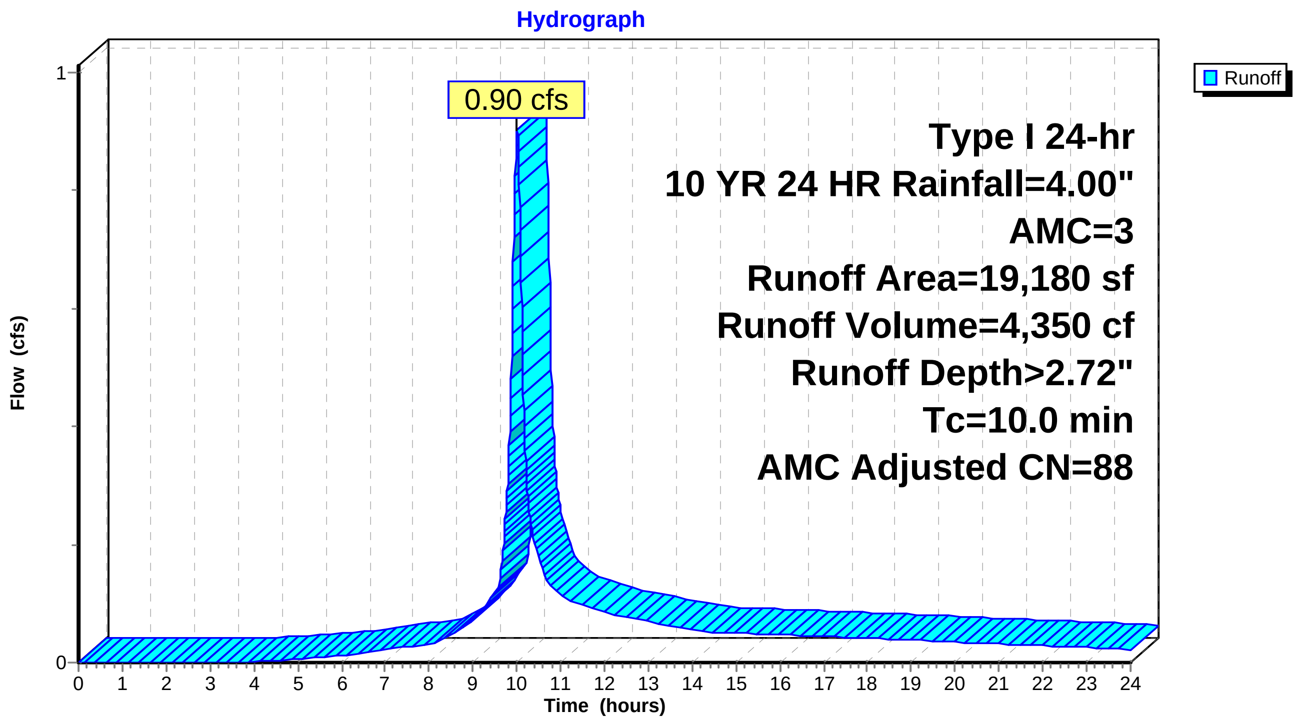
Runoff = 0.90 cfs @ 10.01 hrs, Volume= 4,350 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	19,180	74		>75% Grass cover, Good; HSG C
*	0	89		Pervious Pavers; HSG C
	19,180	74	88	Weighted Average, AMC Adjusted
	19,180			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3C: Lot 3 - Landscape



Summary for Subcatchment 3D: Lot 3 - Driveway

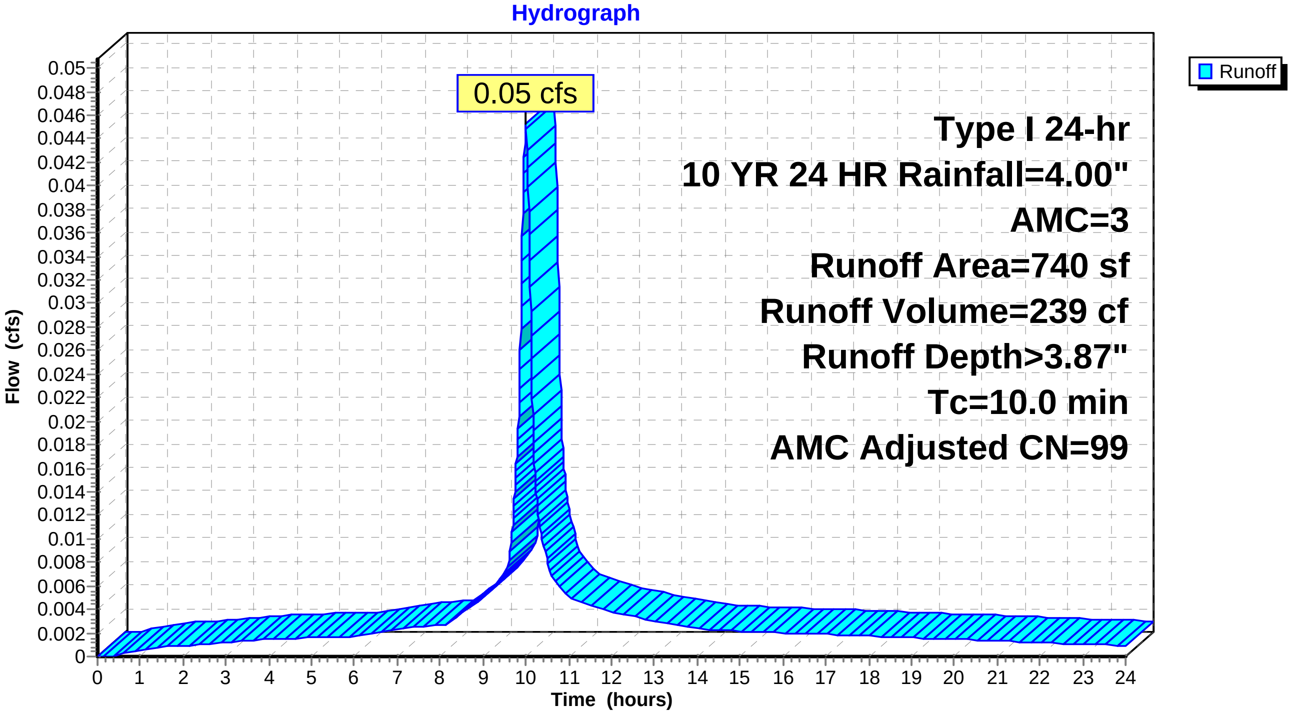
Runoff = 0.05 cfs @ 10.00 hrs, Volume= 239 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	740	98		Impervious; HSG C
*	0	89		Pervious Pavers; HSG C
	740	98	99	Weighted Average, AMC Adjusted
	740			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3D: Lot 3 - Driveway



Summary for Subcatchment 3e: Lot 3 - Existing

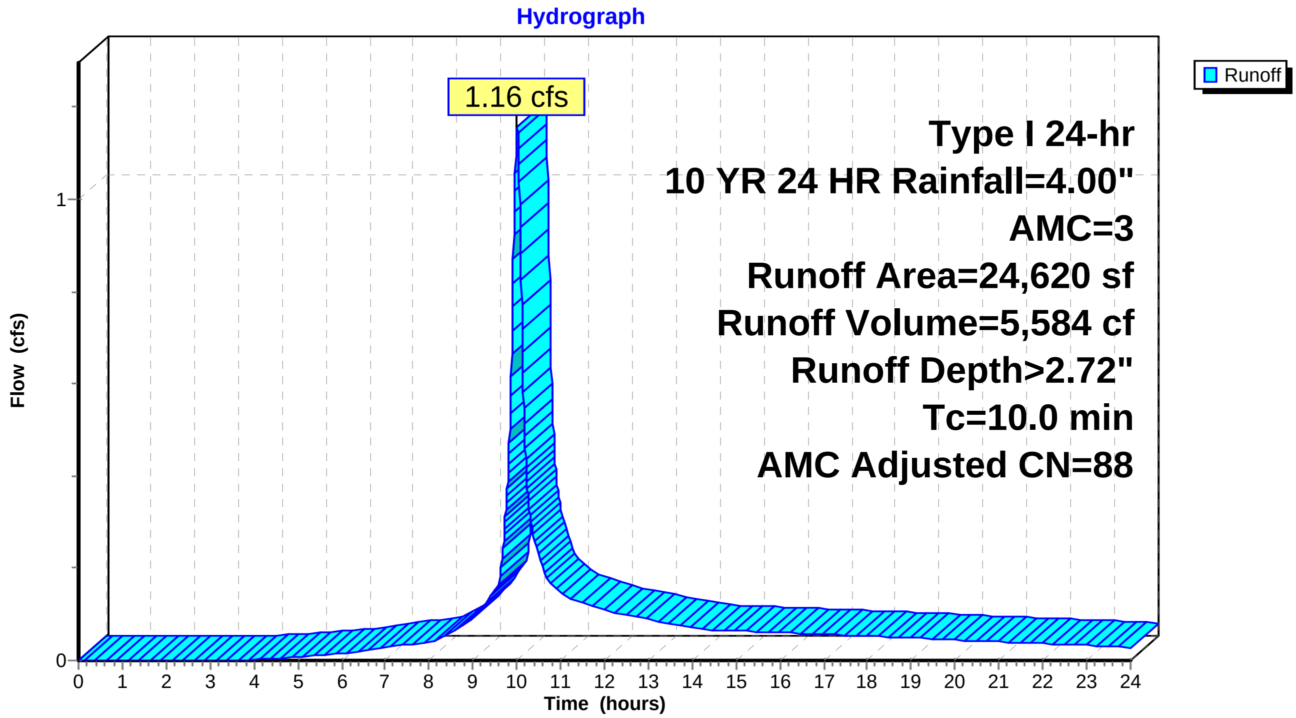
Runoff = 1.16 cfs @ 10.01 hrs, Volume= 5,584 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	24,620	74		>75% Grass cover, Good; HSG C
	24,620	74	88	Weighted Average, AMC Adjusted
	24,620			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3e: Lot 3 - Existing



Summary for Subcatchment 4A: Lot 4 - House/Garage

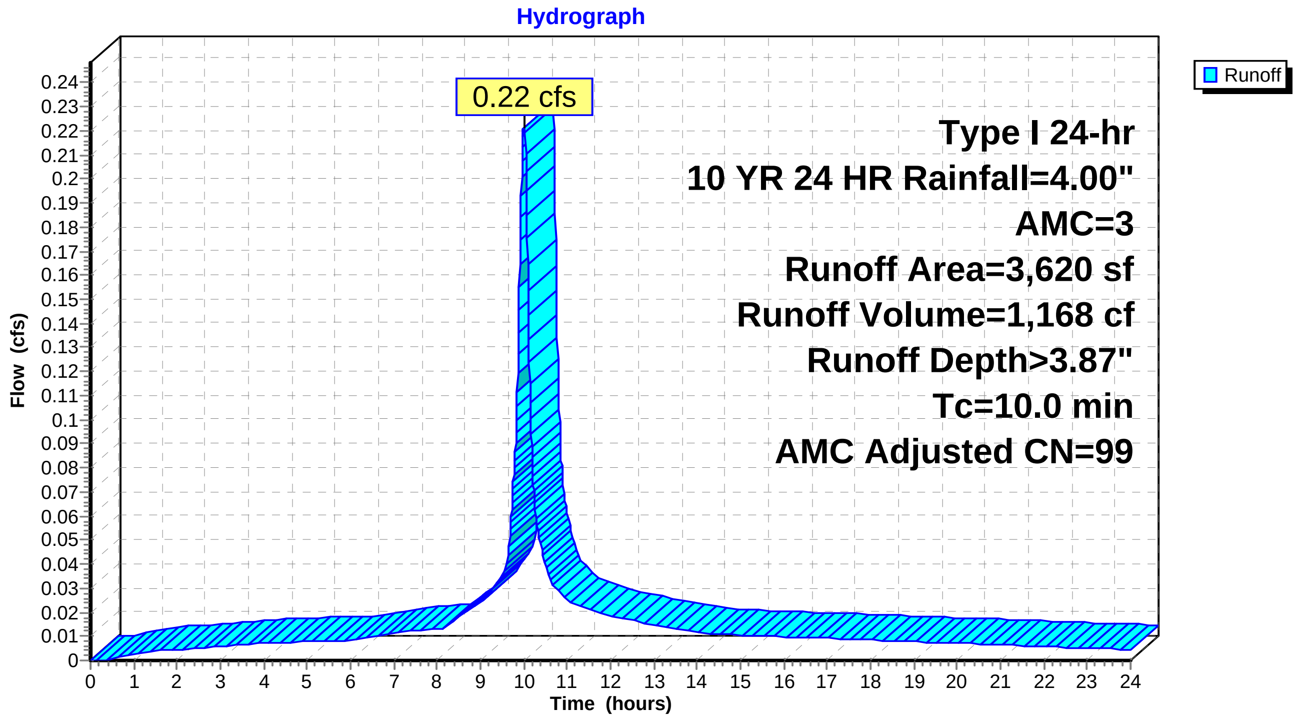
Runoff = 0.22 cfs @ 10.00 hrs, Volume= 1,168 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	3,620	98		Impervious; HSG C
	3,620	98	99	Weighted Average, AMC Adjusted
	3,620			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4A: Lot 4 - House/Garage



Summary for Subcatchment 4B: Lot 4 - Motorcourt

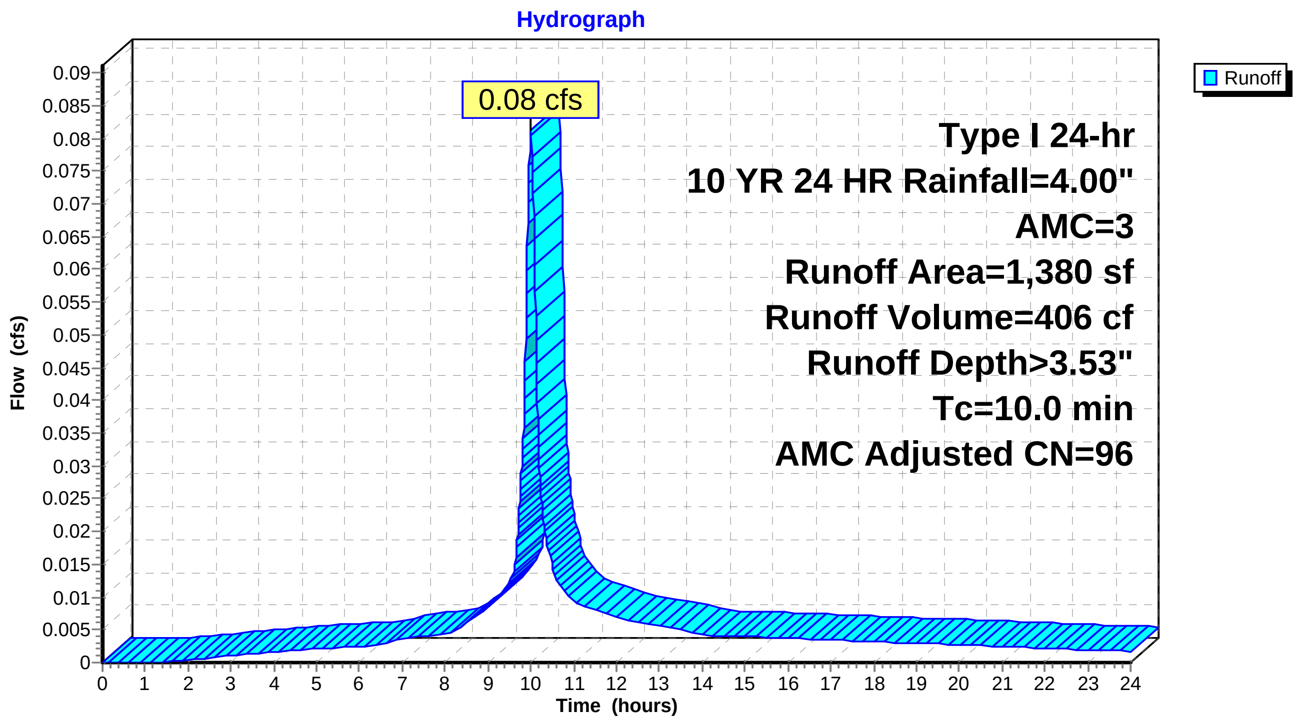
Runoff = 0.08 cfs @ 10.01 hrs, Volume= 406 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	0	98		Impervious; HSG C
*	1,380	89		Pervious Pavers; HSG C
	1,380	89	96	Weighted Average, AMC Adjusted
	1,380			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4B: Lot 4 - Motorcourt



Summary for Subcatchment 4C: Lot 4 - Landscape

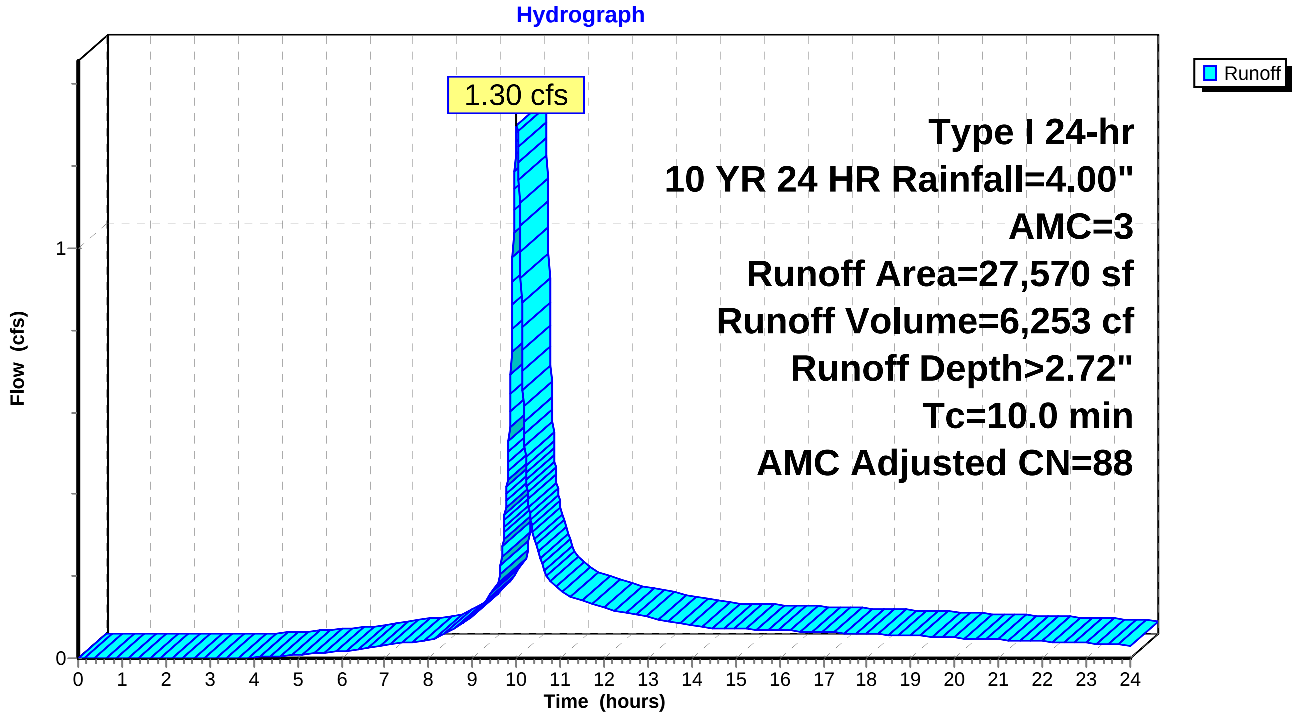
Runoff = 1.30 cfs @ 10.01 hrs, Volume= 6,253 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	27,570	74		>75% Grass cover, Good; HSG C
*	0	89		Pervious Pavers; HSG C
	27,570	74	88	Weighted Average, AMC Adjusted
	27,570			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4C: Lot 4 - Landscape



Summary for Subcatchment 4D: Lot 4 - Driveway

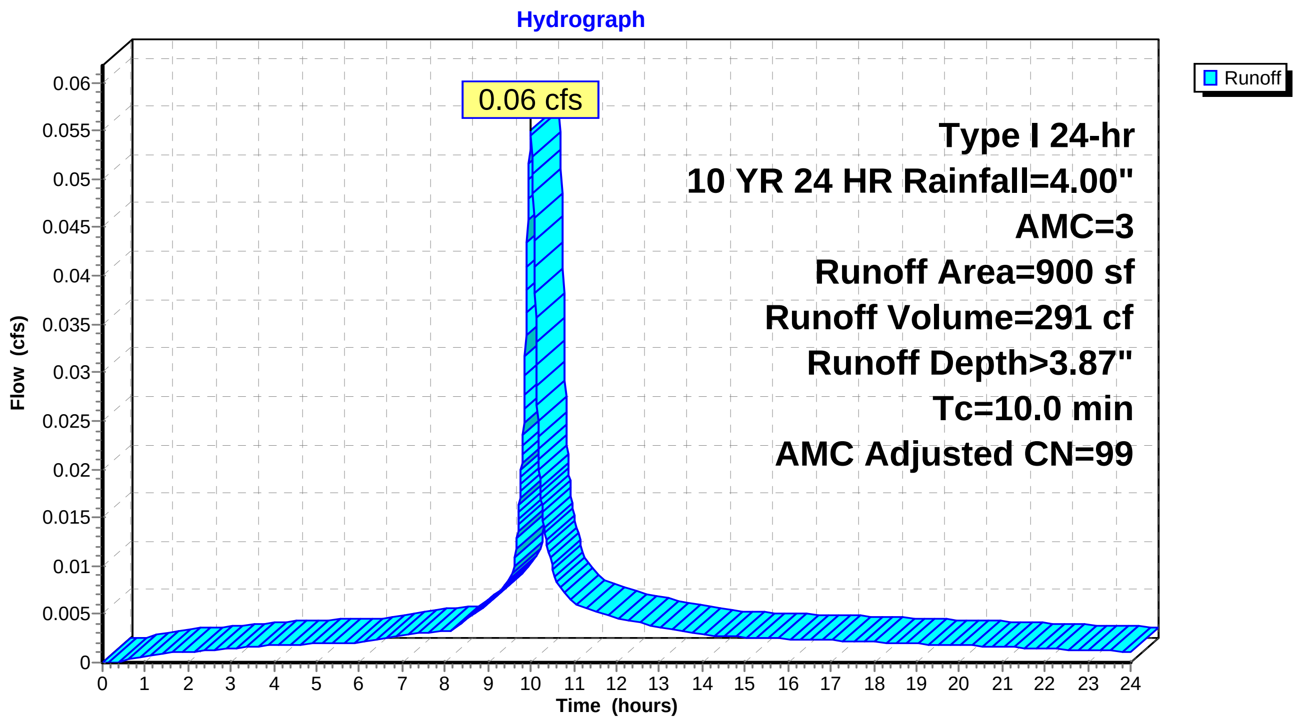
Runoff = 0.06 cfs @ 10.00 hrs, Volume= 291 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	900	98		Impervious; HSG C
*	0	89		Pervious Pavers; HSG C
	900	98	99	Weighted Average, AMC Adjusted
	900			100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4D: Lot 4 - Driveway



Summary for Subcatchment 4e: Lot 4 - Existing

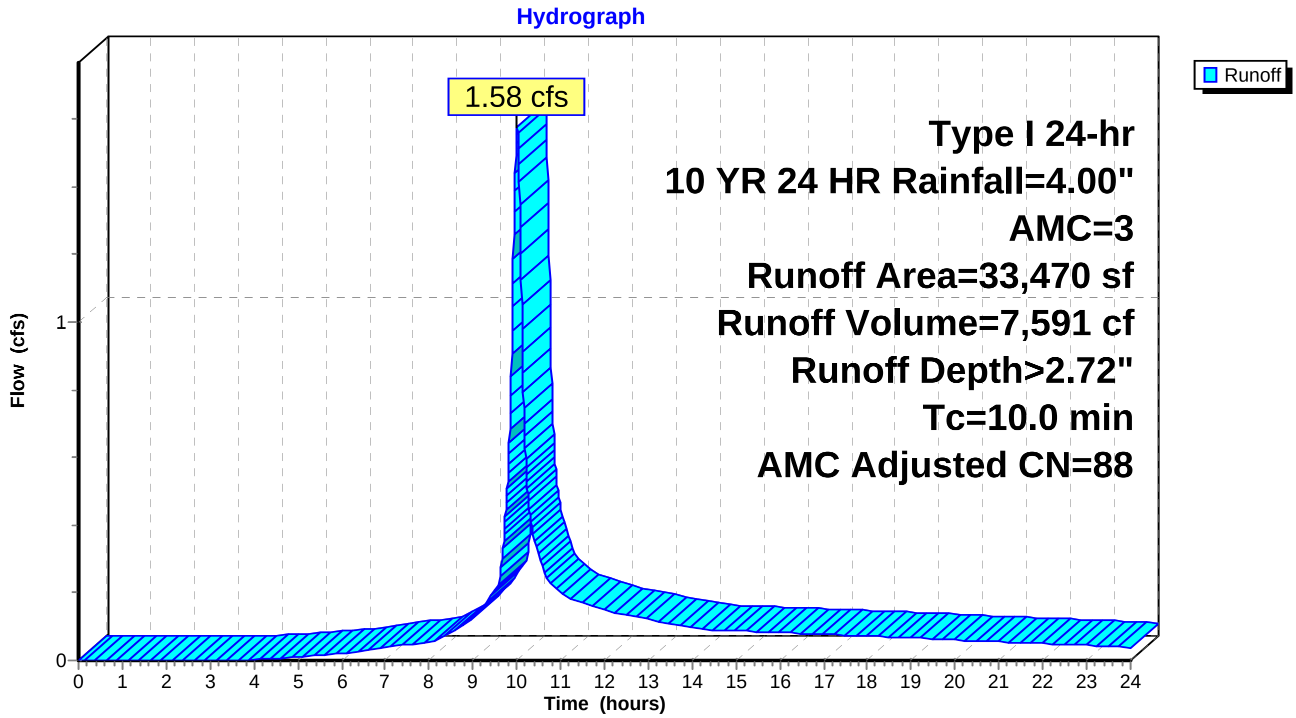
Runoff = 1.58 cfs @ 10.01 hrs, Volume= 7,591 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type I 24-hr 10 YR 24 HR Rainfall=4.00", AMC=3

	Area (sf)	CN	Adj	Description
*	33,470	74		>75% Grass cover, Good; HSG C
	33,470	74	88	Weighted Average, AMC Adjusted
	33,470			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4e: Lot 4 - Existing



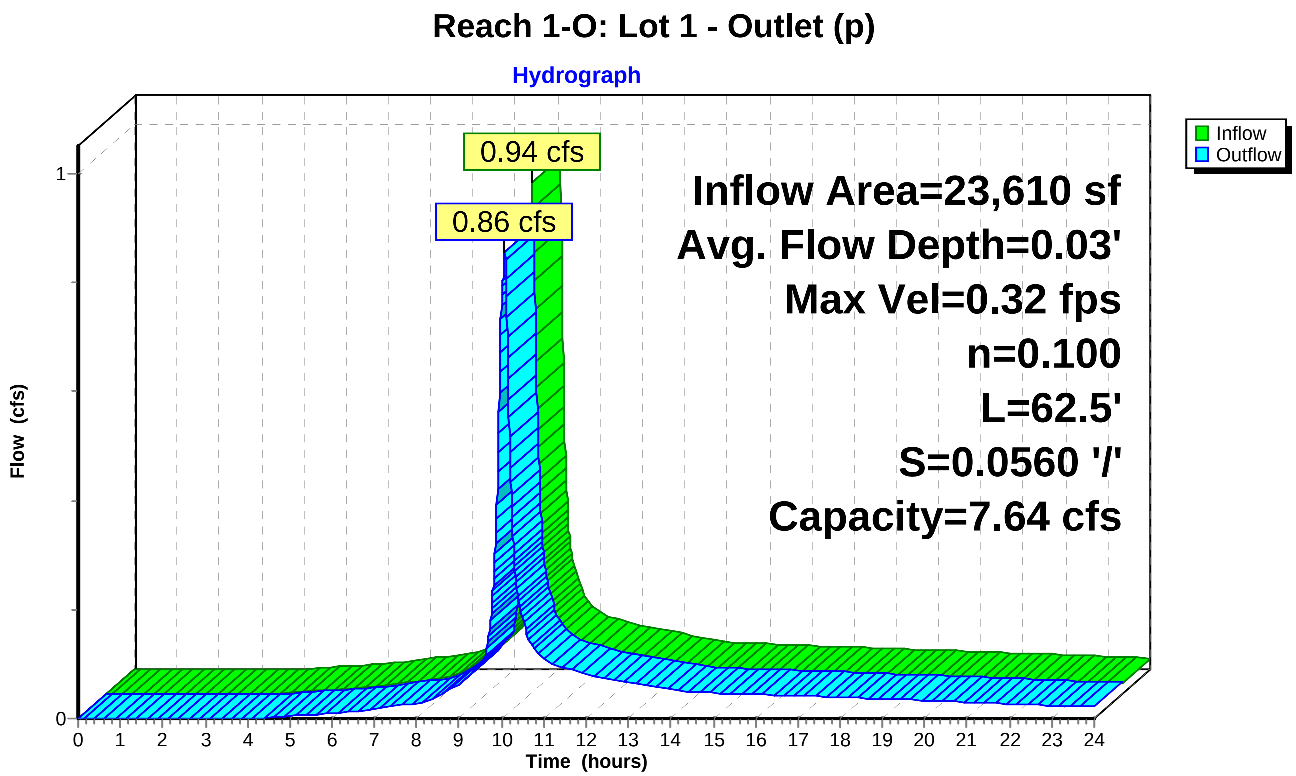
Summary for Reach 1-O: Lot 1 - Outlet (p)

Inflow Area = 23,610 sf, 18.21% Impervious, Inflow Depth > 2.10" for 10 YR 24 HR event
Inflow = 0.94 cfs @ 10.06 hrs, Volume= 4,128 cf
Outflow = 0.86 cfs @ 10.08 hrs, Volume= 4,110 cf, Atten= 9%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.32 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 11.0 min

Peak Storage= 170 cf @ 10.08 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 0.10' Flow Area= 10.1 sf, Capacity= 7.64 cfs

101.00' x 0.10' deep channel, n= 0.100
Length= 62.5' Slope= 0.0560 '/'
Inlet Invert= 52.00', Outlet Invert= 48.50'



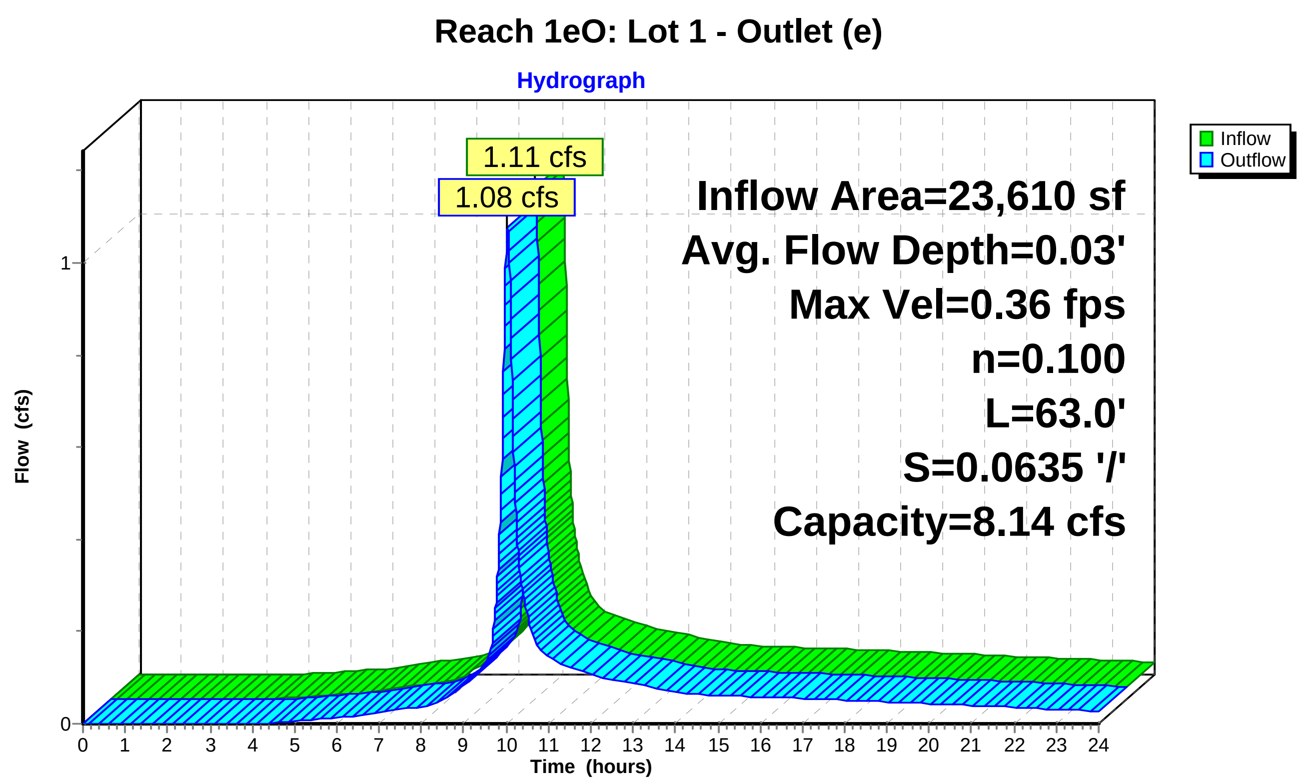
Summary for Reach 1eO: Lot 1 - Outlet (e)

Inflow Area = 23,610 sf, 0.00% Impervious, Inflow Depth > 2.72" for 10 YR 24 HR event
Inflow = 1.11 cfs @ 10.01 hrs, Volume= 5,355 cf
Outflow = 1.08 cfs @ 10.04 hrs, Volume= 5,334 cf, Atten= 3%, Lag= 1.7 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.36 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 9.6 min

Peak Storage= 189 cf @ 10.04 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 0.10' Flow Area= 10.1 sf, Capacity= 8.14 cfs

101.00' x 0.10' deep channel, n= 0.100
Length= 63.0' Slope= 0.0635 '/'
Inlet Invert= 53.00', Outlet Invert= 49.00'



Summary for Reach 2-O: Lot 2 - Outlet (p)

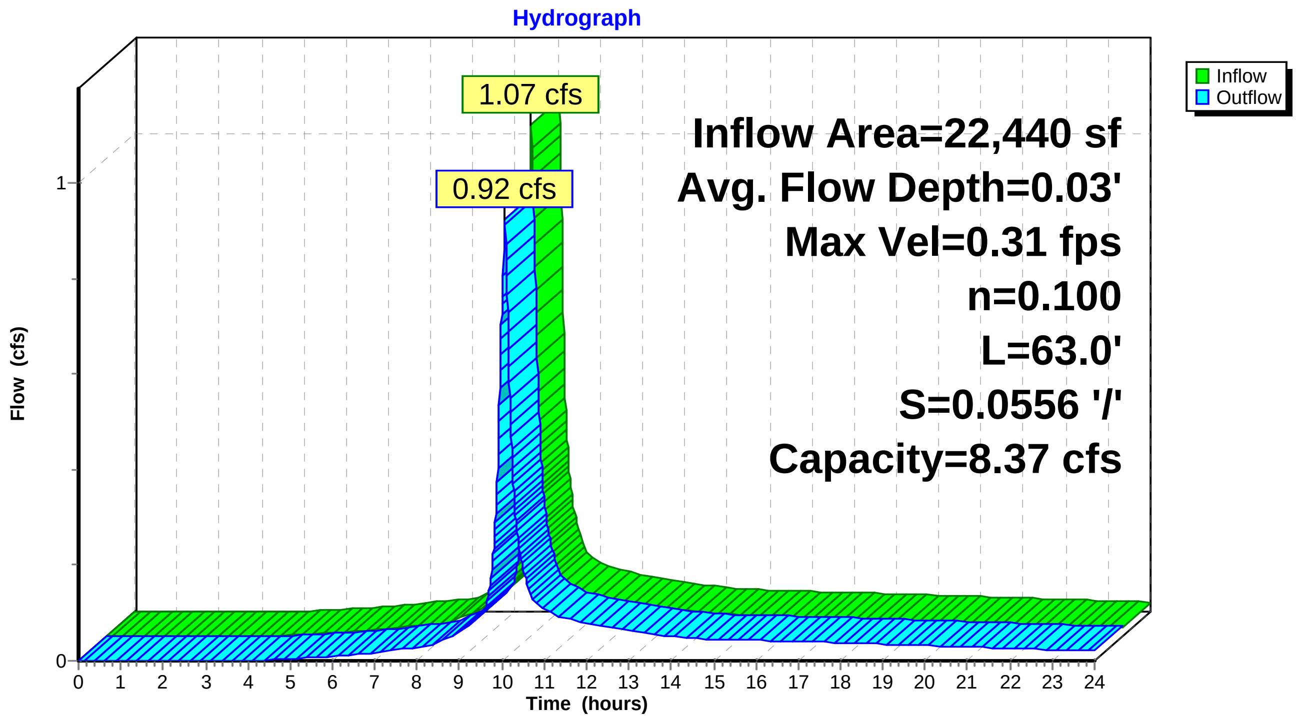
Inflow Area = 22,440 sf, 17.47% Impervious, Inflow Depth > 2.18" for 10 YR 24 HR event
Inflow = 1.07 cfs @ 10.03 hrs, Volume= 4,083 cf
Outflow = 0.92 cfs @ 10.07 hrs, Volume= 4,064 cf, Atten= 14%, Lag= 2.1 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.31 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 11.7 min

Peak Storage= 186 cf @ 10.07 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 0.10' Flow Area= 11.1 sf, Capacity= 8.37 cfs

111.00' x 0.10' deep channel, n= 0.100
Length= 63.0' Slope= 0.0556 '/'
Inlet Invert= 51.00', Outlet Invert= 47.50'

Reach 2-O: Lot 2 - Outlet (p)



Summary for Reach 2eO: Lot 2 - Outlet (e)

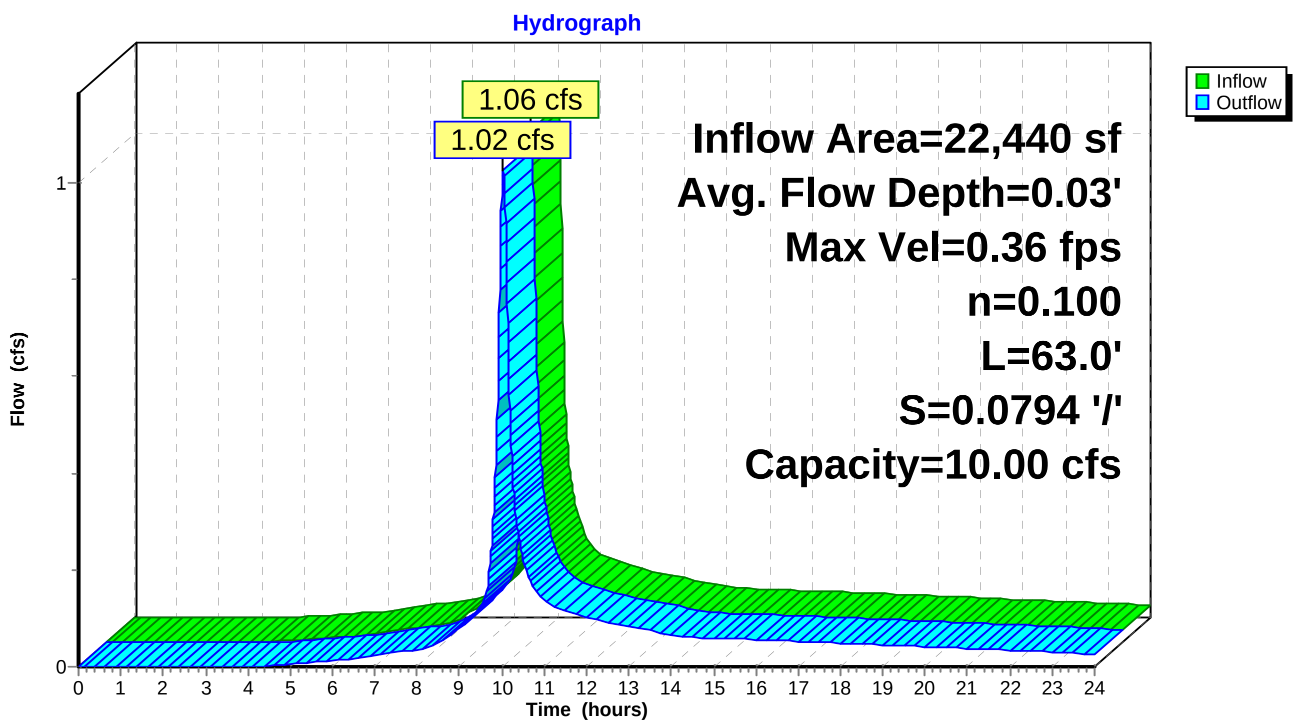
Inflow Area = 22,440 sf, 0.00% Impervious, Inflow Depth > 2.72" for 10 YR 24 HR event
Inflow = 1.06 cfs @ 10.01 hrs, Volume= 5,089 cf
Outflow = 1.02 cfs @ 10.04 hrs, Volume= 5,070 cf, Atten= 3%, Lag= 1.6 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.36 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 9.5 min

Peak Storage= 178 cf @ 10.04 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 0.10' Flow Area= 11.1 sf, Capacity= 10.00 cfs

111.00' x 0.10' deep channel, n= 0.100
Length= 63.0' Slope= 0.0794 '/'
Inlet Invert= 52.00', Outlet Invert= 47.00'

Reach 2eO: Lot 2 - Outlet (e)



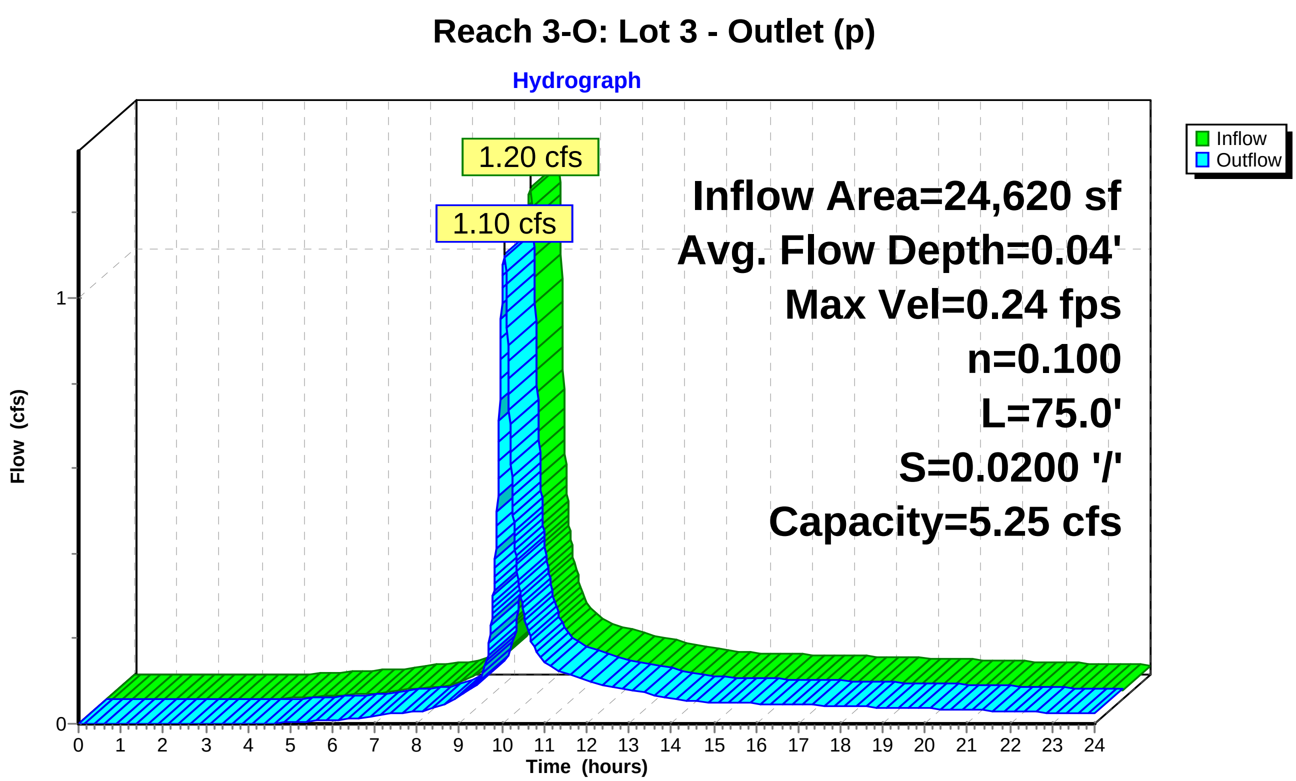
Summary for Reach 3-O: Lot 3 - Outlet (p)

Inflow Area = 24,620 sf, 17.59% Impervious, Inflow Depth > 2.42" for 10 YR 24 HR event
Inflow = 1.20 cfs @ 10.01 hrs, Volume= 4,957 cf
Outflow = 1.10 cfs @ 10.06 hrs, Volume= 4,924 cf, Atten= 8%, Lag= 2.7 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.24 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 18.3 min

Peak Storage= 341 cf @ 10.06 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.10' Flow Area= 11.6 sf, Capacity= 5.25 cfs

116.00' x 0.10' deep channel, n= 0.100
Length= 75.0' Slope= 0.0200 '/'
Inlet Invert= 47.00', Outlet Invert= 45.50'



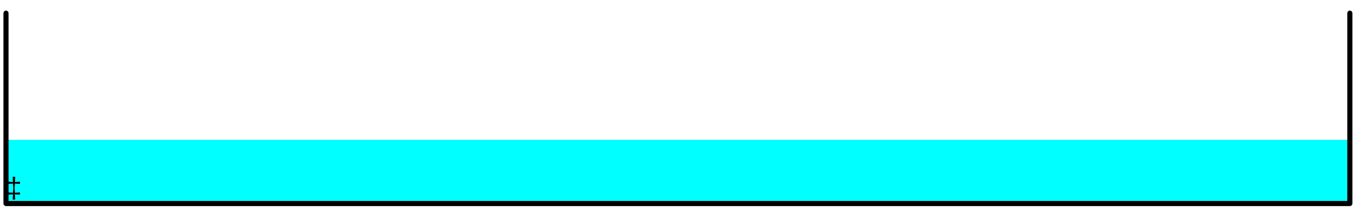
Summary for Reach 3eO: Lot 3 - Outlet (e)

Inflow Area = 24,620 sf, 0.00% Impervious, Inflow Depth > 2.72" for 10 YR 24 HR event
Inflow = 1.16 cfs @ 10.01 hrs, Volume= 5,584 cf
Outflow = 1.08 cfs @ 10.05 hrs, Volume= 5,551 cf, Atten= 7%, Lag= 2.4 min

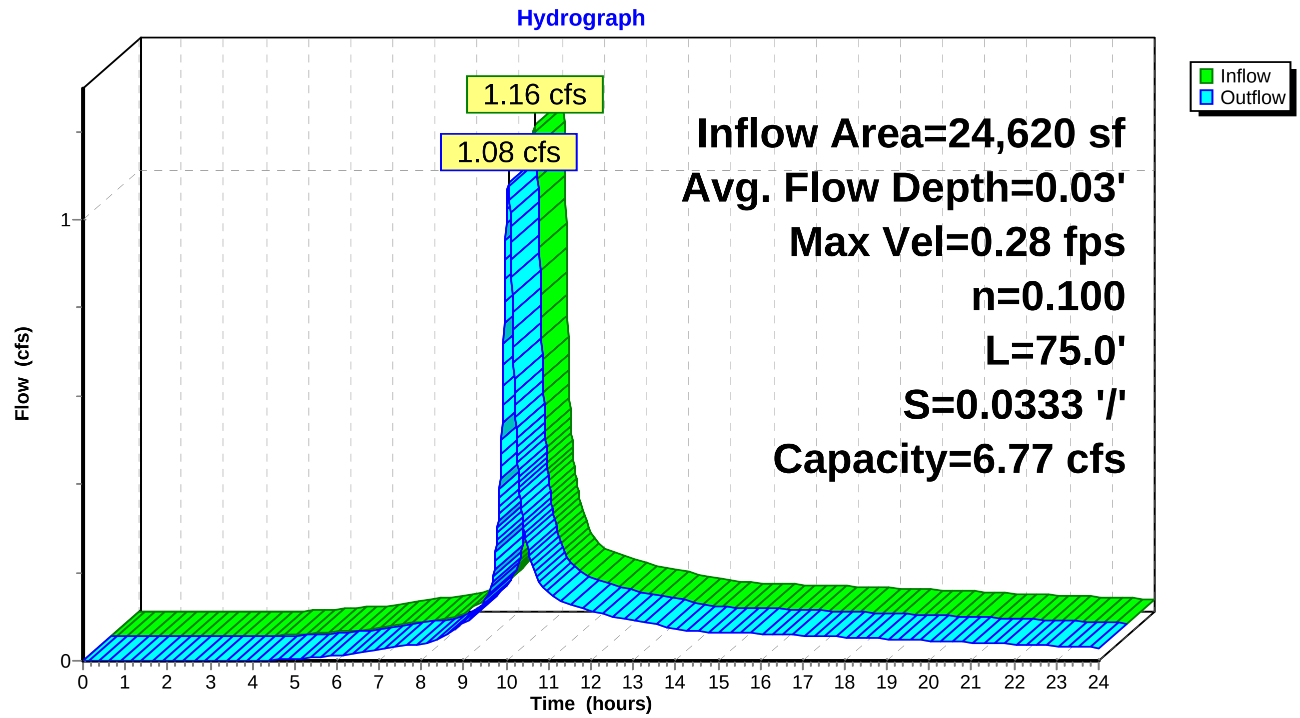
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.28 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 14.5 min

Peak Storage= 289 cf @ 10.05 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 0.10' Flow Area= 11.6 sf, Capacity= 6.77 cfs

116.00' x 0.10' deep channel, n= 0.100
Length= 75.0' Slope= 0.0333 '/'
Inlet Invert= 48.00', Outlet Invert= 45.50'



Reach 3eO: Lot 3 - Outlet (e)



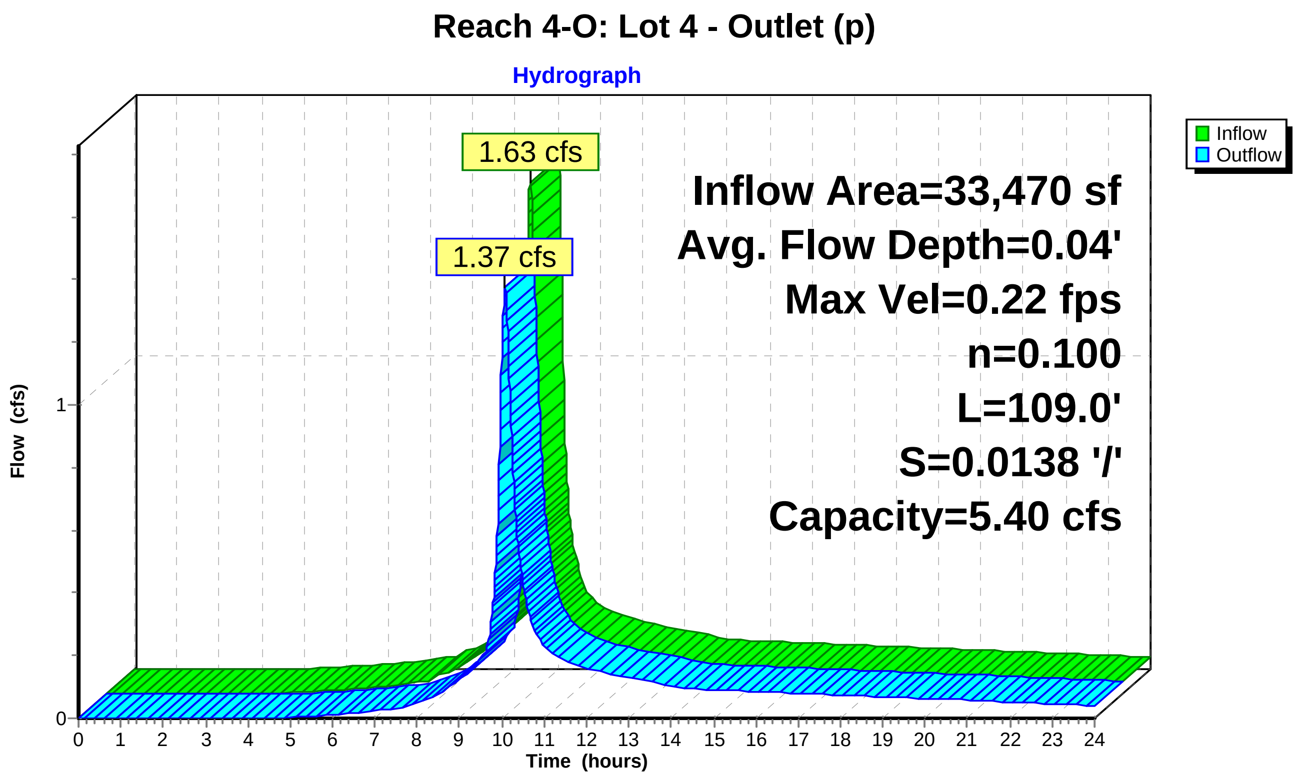
Summary for Reach 4-O: Lot 4 - Outlet (p)

Inflow Area = 33,470 sf, 13.50% Impervious, Inflow Depth > 2.81" for 10 YR 24 HR event
Inflow = 1.63 cfs @ 10.01 hrs, Volume= 7,848 cf
Outflow = 1.37 cfs @ 10.08 hrs, Volume= 7,765 cf, Atten= 16%, Lag= 3.9 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.22 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 26.6 min

Peak Storage= 690 cf @ 10.08 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.10' Flow Area= 14.4 sf, Capacity= 5.40 cfs

144.00' x 0.10' deep channel, n= 0.100
Length= 109.0' Slope= 0.0138 '/'
Inlet Invert= 45.50', Outlet Invert= 44.00'



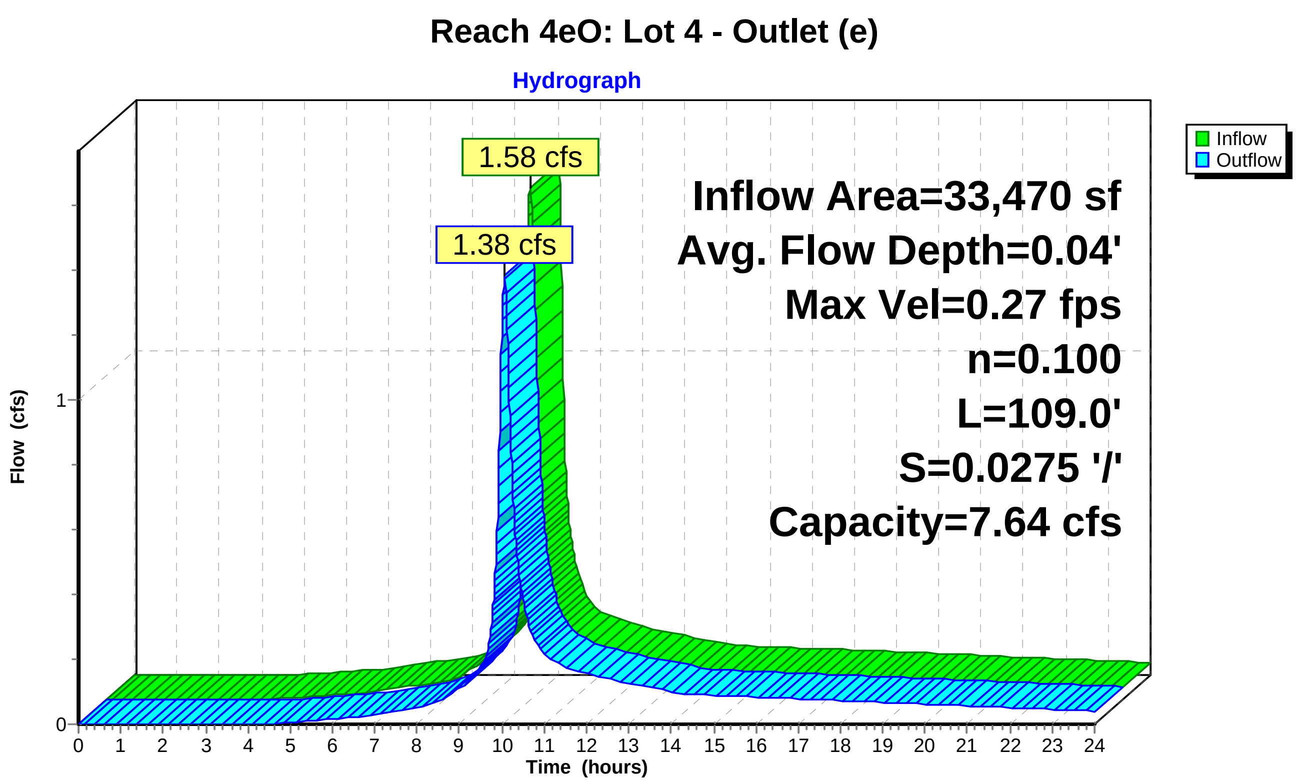
Summary for Reach 4eO: Lot 4 - Outlet (e)

Inflow Area = 33,470 sf, 0.00% Impervious, Inflow Depth > 2.72" for 10 YR 24 HR event
Inflow = 1.58 cfs @ 10.01 hrs, Volume= 7,591 cf
Outflow = 1.38 cfs @ 10.06 hrs, Volume= 7,524 cf, Atten= 12%, Lag= 3.4 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.27 fps, Min. Travel Time= 6.8 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 21.6 min

Peak Storage= 562 cf @ 10.06 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.10' Flow Area= 14.4 sf, Capacity= 7.64 cfs

144.00' x 0.10' deep channel, n= 0.100
Length= 109.0' Slope= 0.0275 '/'
Inlet Invert= 47.00', Outlet Invert= 44.00'

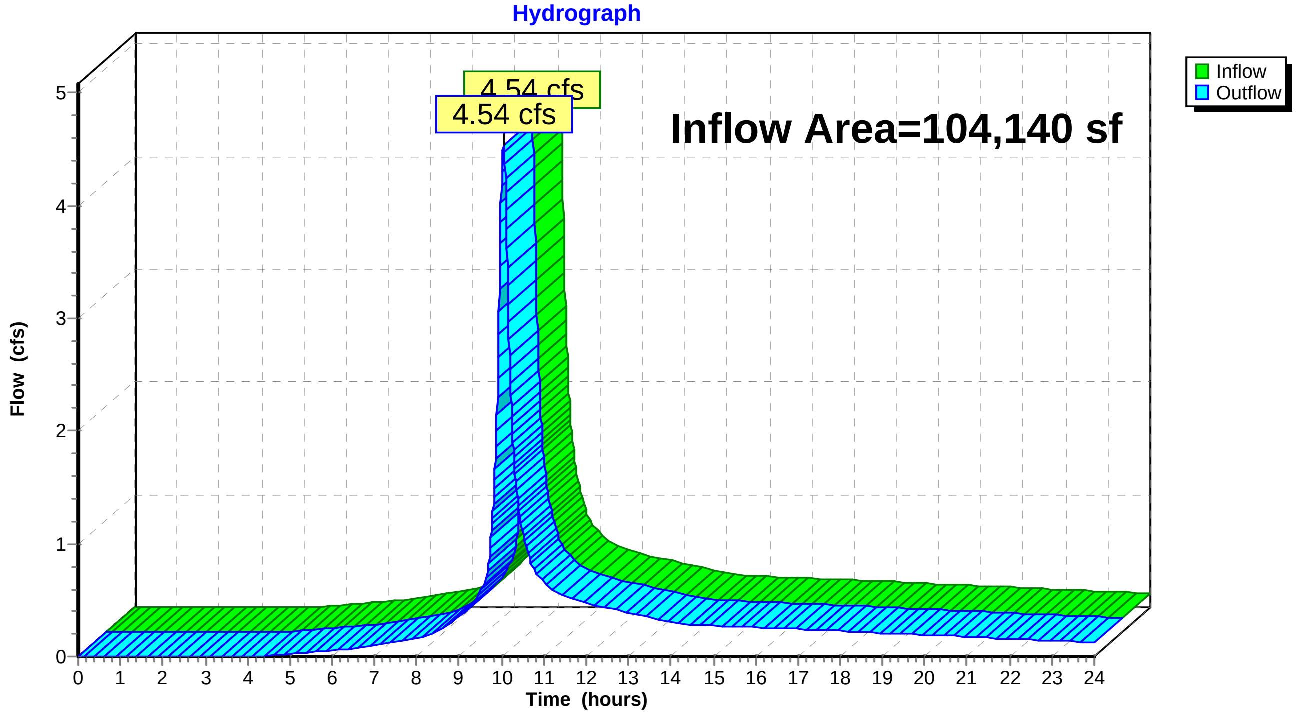


Summary for Reach eO: Existing Total Discharge

Inflow Area =	104,140 sf,	0.00% Impervious,	Inflow Depth > 2.71"	for 10 YR 24 HR event		
Inflow =	4.54 cfs @	10.05 hrs,	Volume=	23,479 cf		
Outflow =	4.54 cfs @	10.05 hrs,	Volume=	23,479 cf,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

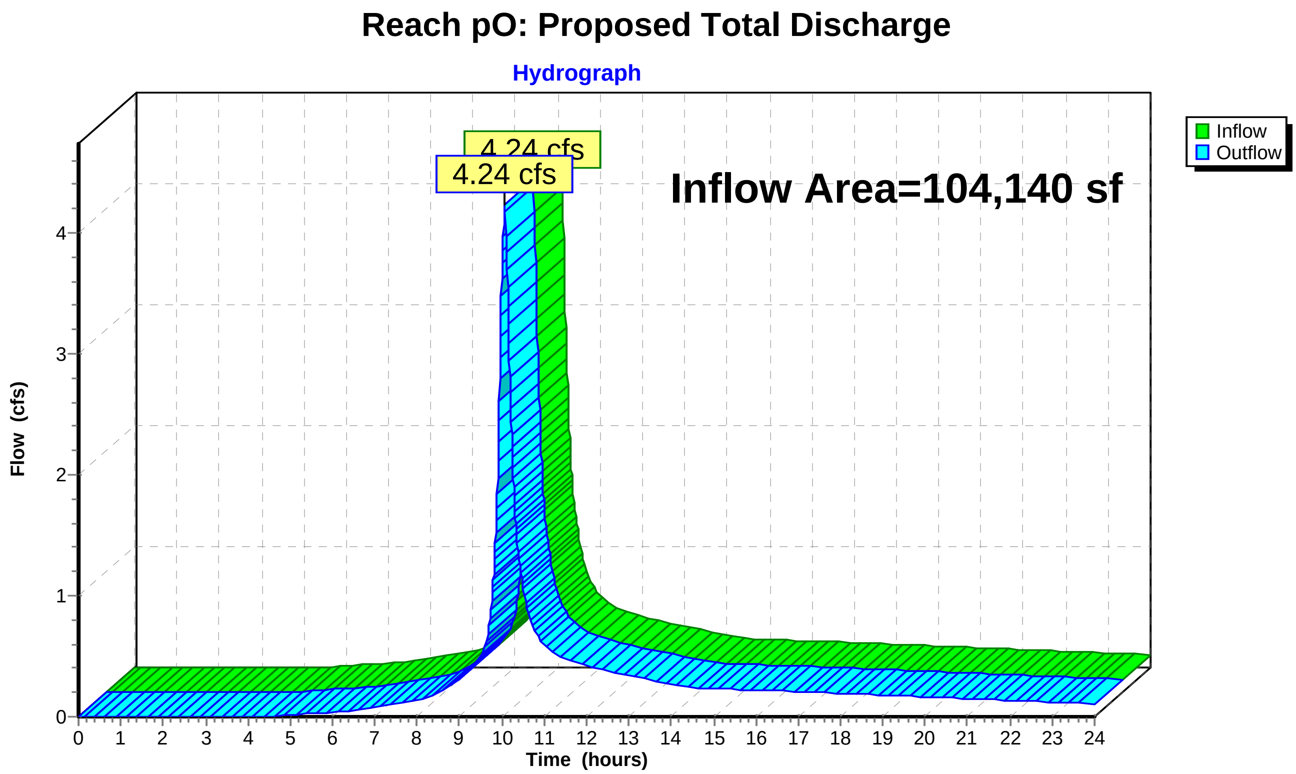
Reach eO: Existing Total Discharge



Summary for Reach pO: Proposed Total Discharge

Inflow Area = 104,140 sf, 16.39% Impervious, Inflow Depth > 2.40" for 10 YR 24 HR event
Inflow = 4.24 cfs @ 10.07 hrs, Volume= 20,863 cf
Outflow = 4.24 cfs @ 10.07 hrs, Volume= 20,863 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Summary for Pond 1-D: Lot 1 - Detention

Inflow Area = 2,240 sf, 36.61% Impervious, Inflow Depth > 3.66" for 10 YR 24 HR event
Inflow = 0.13 cfs @ 10.00 hrs, Volume= 683 cf
Outflow = 0.12 cfs @ 10.06 hrs, Volume= 682 cf, Atten= 12%, Lag= 3.3 min
Discarded = 0.01 cfs @ 10.06 hrs, Volume= 292 cf
Primary = 0.11 cfs @ 10.06 hrs, Volume= 390 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 62.83' @ 10.06 hrs Surf.Area= 60 sf Storage= 21 cf

Plug-Flow detention time= 1.7 min calculated for 682 cf (100% of inflow)
Center-of-Mass det. time= 1.4 min (709.0 - 707.6)

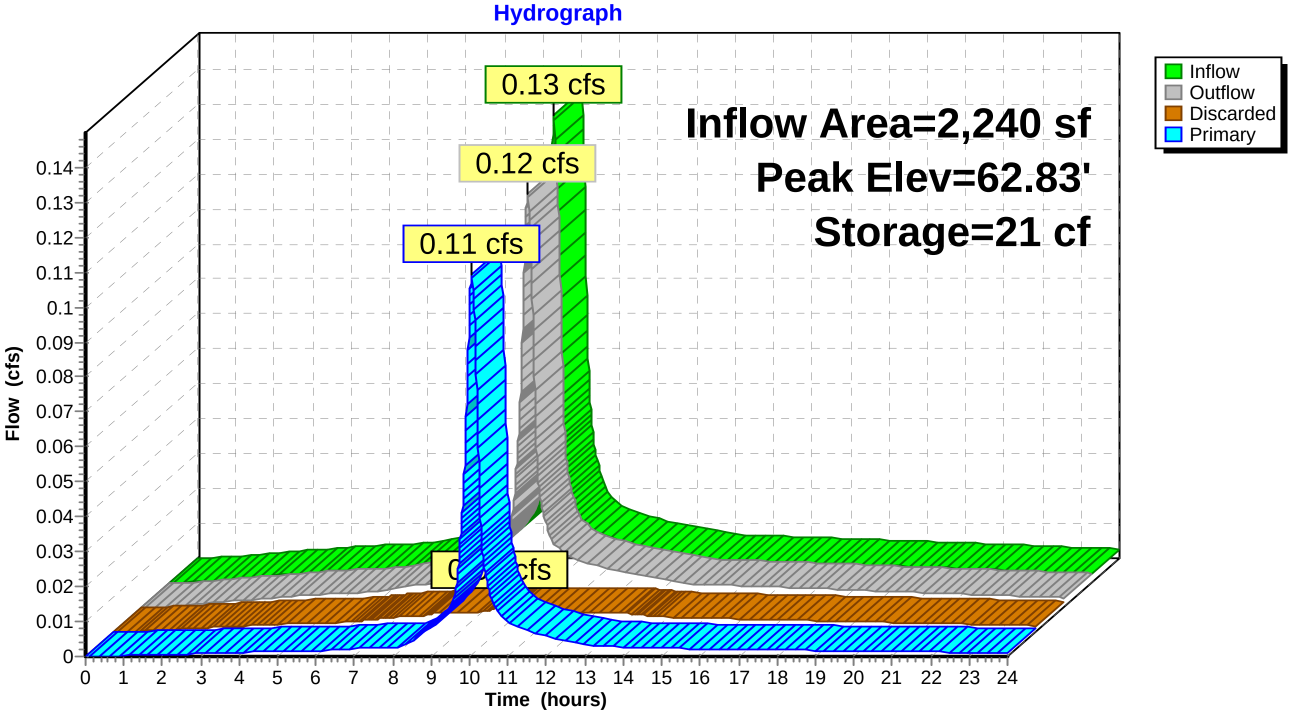
Volume	Invert	Avail.Storage	Storage Description
#1	61.67'	78 cf	**6.70'W x 9.00'L x 4.33'H Detention Tank 9'L x 6.7'W x 4.33'H Prismatoid** 261 cf Overall x 30.0% Voids
#2	64.83'	498 cf	**26.30'W x 54.00'L x 1.17'H Pervious Pavers, 1420 sf** 1,662 cf Overall x 30.0% Voids
		577 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	61.67'	**2.0" Vert. Orifice - Bottom Outlet Pipe** C= 0.600
#2	Primary	65.99'	**2.0" x 2.0" Horiz. Grate - Overflow to Inlet** C= 0.600 Limited to weir flow at low heads
#3	Discarded	61.67'	**3.900 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 46.00'

Discarded OutFlow Max=0.01 cfs @ 10.06 hrs HW=62.83' (Free Discharge)
└─**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.11 cfs @ 10.06 hrs HW=62.83' (Free Discharge)
├─**1=Orifice - Bottom Outlet Pipe** (Orifice Controls 0.11 cfs @ 5.00 fps)
└─**2=Grate - Overflow to Inlet** (Controls 0.00 cfs)

Pond 1-D: Lot 1 - Detention



Summary for Pond 1-S: Lot 1 - Spreader

Inflow Area =	5,720 sf,	75.17% Impervious,	Inflow Depth > 3.18"	for 10 YR 24 HR event
Inflow =	0.32 cfs @	10.01 hrs, Volume=	1,514 cf	
Outflow =	0.30 cfs @	10.07 hrs, Volume=	1,510 cf,	Atten= 6%, Lag= 3.4 min
Discarded =	0.10 cfs @	10.07 hrs, Volume=	1,439 cf	
Primary =	0.20 cfs @	10.07 hrs, Volume=	71 cf	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 52.21' @ 10.07 hrs Surf.Area= 181 sf Storage= 242 cf

Plug-Flow detention time= 21.2 min calculated for 1,509 cf (100% of inflow)
Center-of-Mass det. time= 19.4 min (703.8 - 684.4)

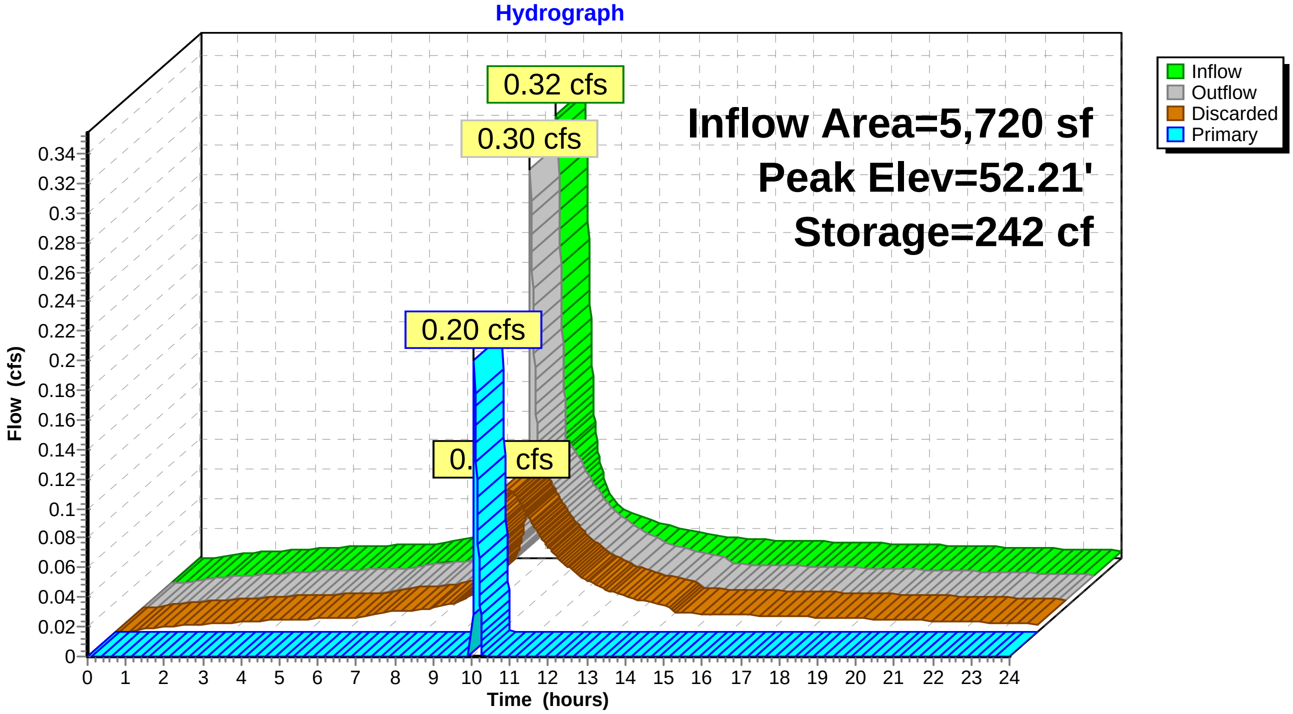
Volume	Invert	Avail.Storage	Storage Description
#1	47.75'	245 cf	**2.50'W x 72.50'L x 4.50'H 72.5'L x 2.5'W x 4'D Gravel Trench Prismatoid** 816 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	52.20'	**72.5' long x 3.0' breadth Spreader - Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	47.75'	**3.900 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 38.00'

Discarded OutFlow Max=0.10 cfs @ 10.07 hrs HW=52.21' (Free Discharge)
└─**2=Exfiltration** (Controls 0.10 cfs)

Primary OutFlow Max=0.13 cfs @ 10.07 hrs HW=52.21' (Free Discharge)
└─**1=Spreader - Broad-Crested Rectangular Weir**(Weir Controls 0.13 cfs @ 0.22 fps)

Pond 1-S: Lot 1 - Spreader



Summary for Pond 2-D: Lot 2 - Detention

Inflow Area = 1,970 sf, 39.59% Impervious, Inflow Depth > 3.67" for 10 YR 24 HR event
Inflow = 0.12 cfs @ 10.00 hrs, Volume= 602 cf
Outflow = 0.10 cfs @ 10.06 hrs, Volume= 602 cf, Atten= 11%, Lag= 3.2 min
Discarded = 0.00 cfs @ 10.06 hrs, Volume= 129 cf
Primary = 0.10 cfs @ 10.06 hrs, Volume= 473 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 62.20' @ 10.06 hrs Surf.Area= 60 sf Storage= 19 cf

Plug-Flow detention time= 2.3 min calculated for 602 cf (100% of inflow)
Center-of-Mass det. time= 1.8 min (708.5 - 706.7)

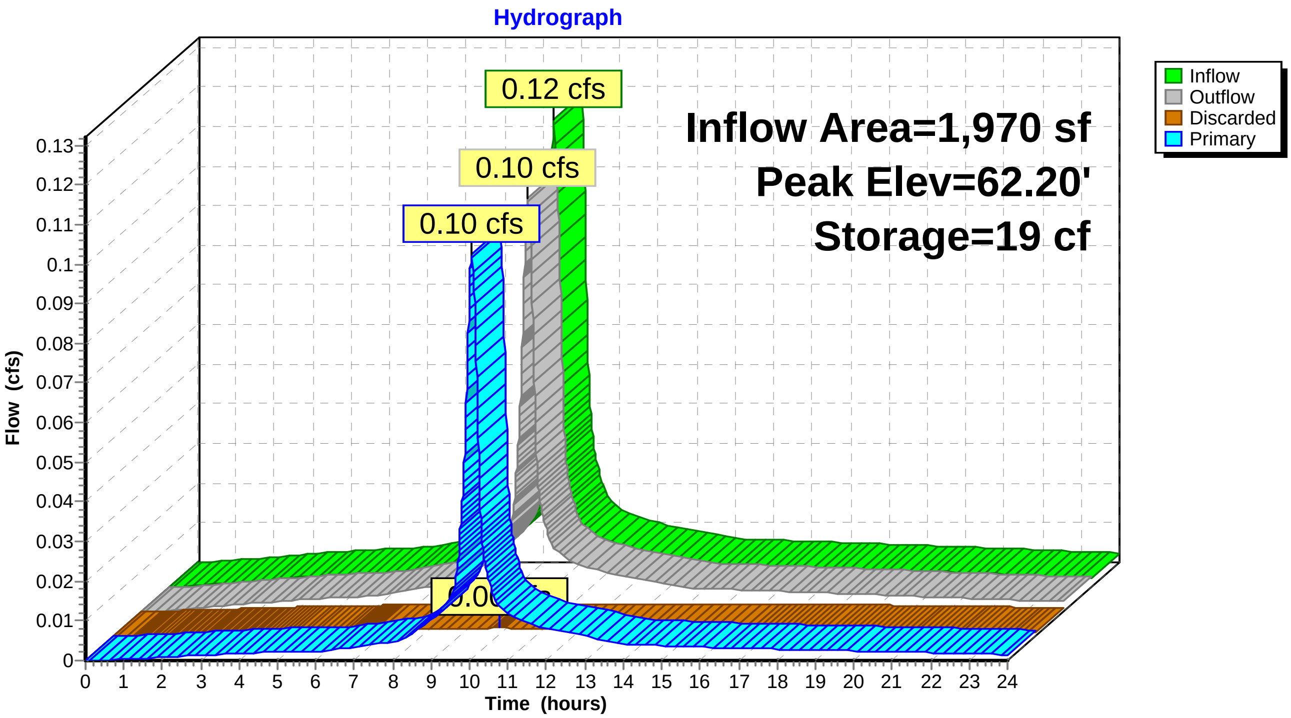
Volume	Invert	Avail.Storage	Storage Description
#1	61.17'	78 cf	**6.70'W x 9.00'L x 4.33'H Detention Tank 9'L x 6.7'W x 4.33'H Prismatoid** 261 cf Overall x 30.0% Voids
#2	64.33'	418 cf	**23.33'W x 51.00'L x 1.17'H Pervious Pavers, 1190 sf** 1,392 cf Overall x 30.0% Voids
		496 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	61.17'	**2.0" Vert. Orifice - Bottom Outlet Pipe** C= 0.600
#2	Primary	65.49'	**2.0" x 2.0" Horiz. Grate - Overflow to Inlet** C= 0.600 Limited to weir flow at low heads
#3	Discarded	61.17'	**1.400 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'

Discarded OutFlow Max=0.00 cfs @ 10.06 hrs HW=62.20' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.10 cfs @ 10.06 hrs HW=62.20' (Free Discharge)
├─**1=Orifice - Bottom Outlet Pipe** (Orifice Controls 0.10 cfs @ 4.69 fps)
└─**2=Grate - Overflow to Inlet** (Controls 0.00 cfs)

Pond 2-D: Lot 2 - Detention



Summary for Pond 2-S: Lot 2 - Spreader

Inflow Area = 5,110 sf, 76.71% Impervious, Inflow Depth > 3.49" for 10 YR 24 HR event
Inflow = 0.29 cfs @ 10.02 hrs, Volume= 1,486 cf
Outflow = 0.29 cfs @ 10.03 hrs, Volume= 1,479 cf, Atten= 0%, Lag= 0.9 min
Discarded = 0.04 cfs @ 10.03 hrs, Volume= 1,327 cf
Primary = 0.25 cfs @ 10.03 hrs, Volume= 152 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 51.21' @ 10.03 hrs Surf.Area= 225 sf Storage= 301 cf

Plug-Flow detention time= 77.4 min calculated for 1,478 cf (99% of inflow)
Center-of-Mass det. time= 73.6 min (762.5 - 688.9)

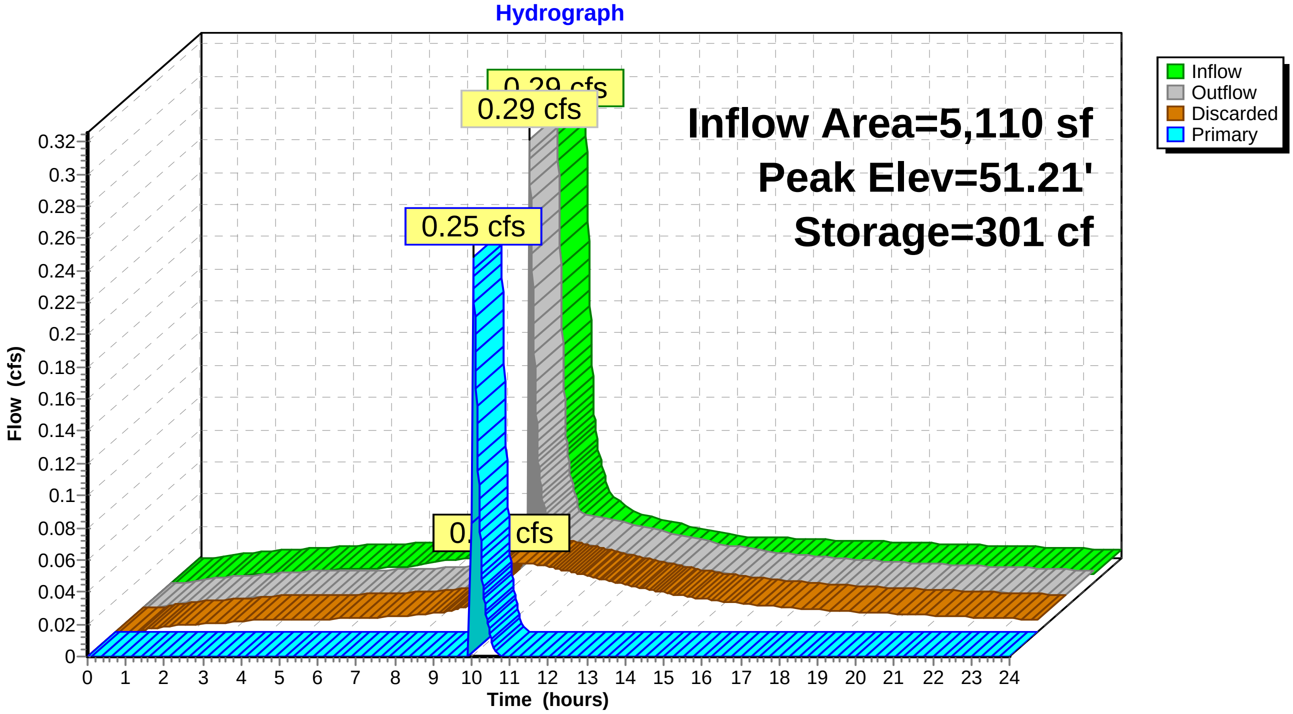
Volume	Invert	Avail.Storage	Storage Description
#1	46.75'	304 cf	**2.50'W x 90.00'L x 4.50'H 90'L x 2.5'W x 4'D Gravel Trench Prismatoid** 1,013 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	51.20'	**90.0' long x 3.0' breadth Spreader - Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	46.75'	**1.400 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 37.00'

Discarded OutFlow Max=0.04 cfs @ 10.03 hrs HW=51.21' (Free Discharge)
└─**2=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=0.16 cfs @ 10.03 hrs HW=51.21' (Free Discharge)
└─**1=Spreader - Broad-Crested Rectangular Weir**(Weir Controls 0.16 cfs @ 0.22 fps)

Pond 2-S: Lot 2 - Spreader



Summary for Pond 3-D: Lot 3 - Detention

Inflow Area =	1,850 sf,	40.00% Impervious,	Inflow Depth > 3.67"	for 10 YR 24 HR event
Inflow =	0.11 cfs @	10.00 hrs, Volume=	566 cf	
Outflow =	0.10 cfs @	10.06 hrs, Volume=	565 cf,	Atten= 11%, Lag= 3.2 min
Discarded =	0.00 cfs @	10.06 hrs, Volume=	60 cf	
Primary =	0.10 cfs @	10.06 hrs, Volume=	506 cf	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 62.12' @ 10.06 hrs Surf.Area= 60 sf Storage= 17 cf

Plug-Flow detention time= 2.6 min calculated for 565 cf (100% of inflow)
Center-of-Mass det. time= 2.0 min (708.5 - 706.5)

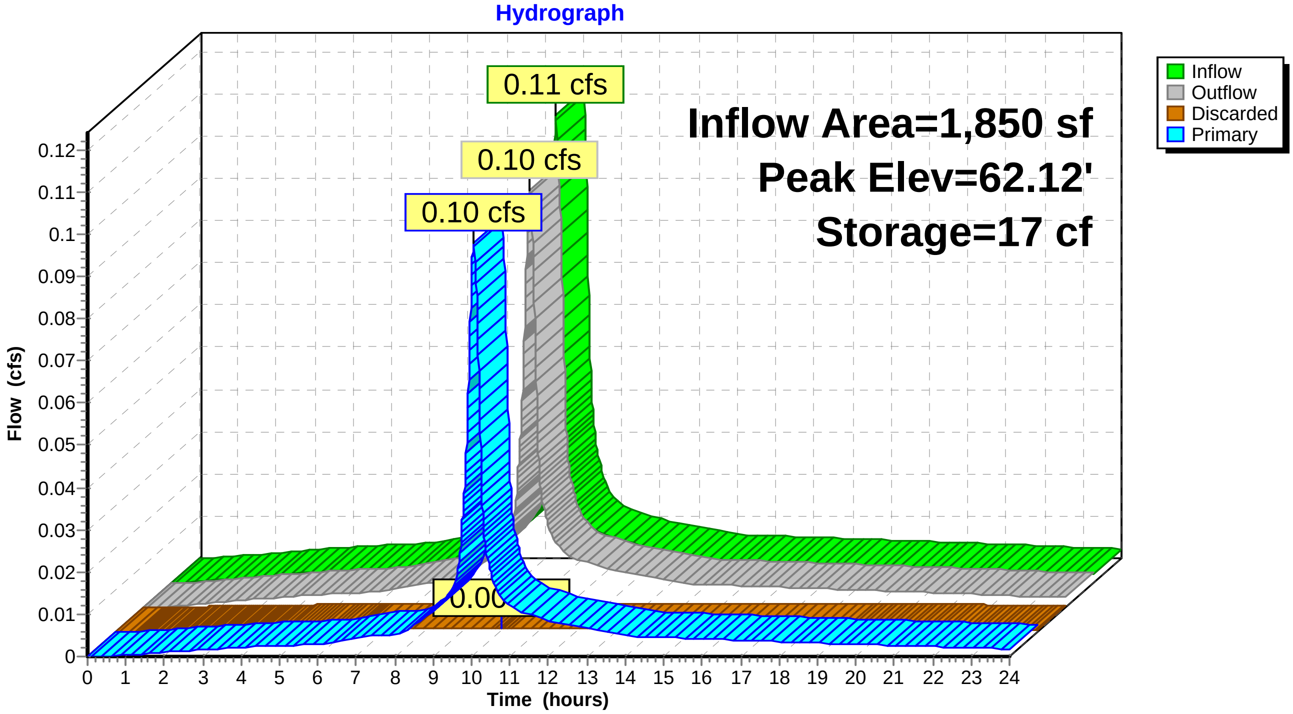
Volume	Invert	Avail.Storage	Storage Description
#1	61.17'	78 cf	**6.70'W x 9.00'L x 4.33'H Detention Tank 9'L x 6.7'W x 4.33'H Prismatoid** 261 cf Overall x 30.0% Voids
#2	64.33'	390 cf	**27.07'W x 41.00'L x 1.17'H Pervious Pavers, 1110 sf** 1,299 cf Overall x 30.0% Voids
		468 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	61.17'	**2.0" Vert. Orifice - Bottom Outlet Pipe** C= 0.600
#2	Primary	65.49'	**2.0" x 2.0" Horiz. Grate - Overflow to Inlet** C= 0.600 Limited to weir flow at low heads
#3	Discarded	61.17'	**0.600 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'

Discarded OutFlow Max=0.00 cfs @ 10.06 hrs HW=62.12' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.10 cfs @ 10.06 hrs HW=62.12' (Free Discharge)
├─**1=Orifice - Bottom Outlet Pipe** (Orifice Controls 0.10 cfs @ 4.48 fps)
└─**2=Grate - Overflow to Inlet** (Controls 0.00 cfs)

Pond 3-D: Lot 3 - Detention



Summary for Pond 3-S: Lot 3 - Spreader

Inflow Area = 5,440 sf, 79.60% Impervious, Inflow Depth > 3.67" for 10 YR 24 HR event
Inflow = 0.31 cfs @ 10.01 hrs, Volume= 1,664 cf
Outflow = 0.31 cfs @ 10.01 hrs, Volume= 1,505 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 10.01 hrs, Volume= 898 cf
Primary = 0.30 cfs @ 10.01 hrs, Volume= 607 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 47.21' @ 10.01 hrs Surf.Area= 181 sf Storage= 242 cf

Plug-Flow detention time= 135.6 min calculated for 1,504 cf (90% of inflow)
Center-of-Mass det. time= 74.2 min (766.0 - 691.9)

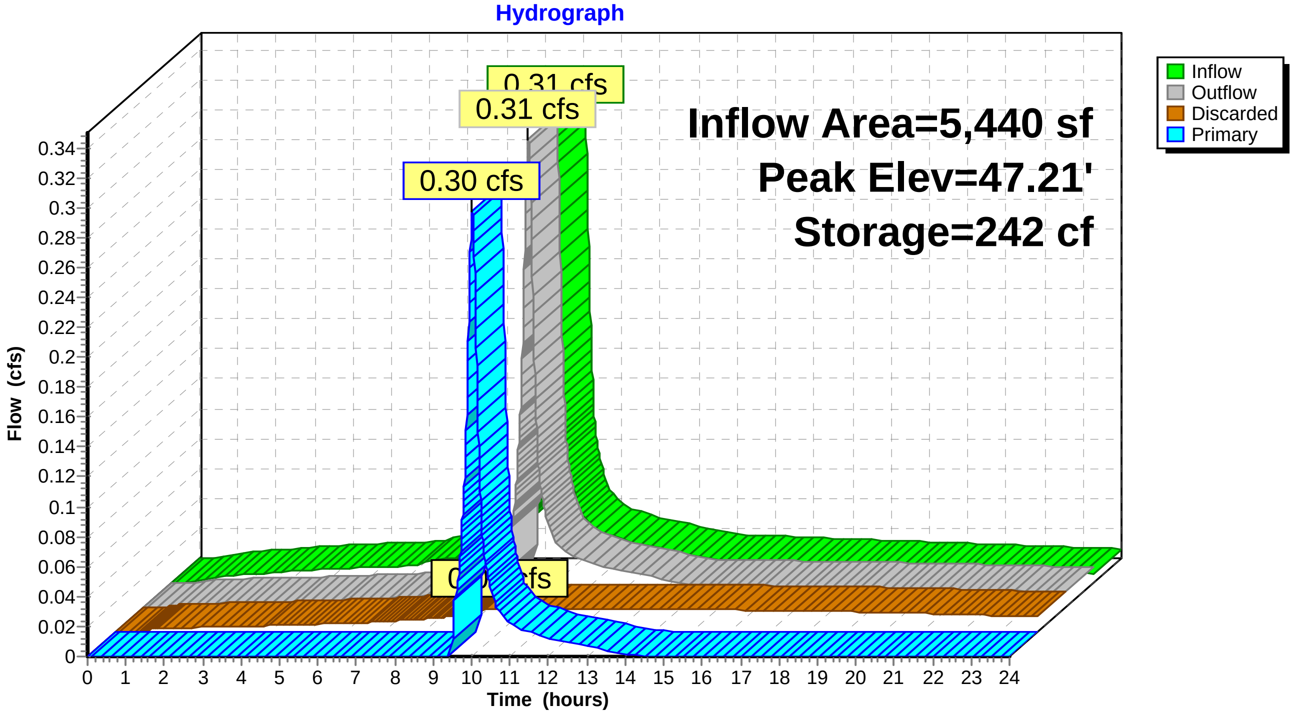
Volume	Invert	Avail.Storage	Storage Description
#1	42.75'	245 cf	**2.50'W x 72.50'L x 4.50'H 72.5'L x 2.5'W x 4'D Gravel Trench Prismatoid** 816 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	47.20'	**90.0' long x 3.0' breadth Spreader - Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	42.75'	**0.600 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 33.00'

Discarded OutFlow Max=0.01 cfs @ 10.01 hrs HW=47.21' (Free Discharge)
└─**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.19 cfs @ 10.01 hrs HW=47.21' (Free Discharge)
└─**1=Spreader - Broad-Crested Rectangular Weir**(Weir Controls 0.19 cfs @ 0.23 fps)

Pond 3-S: Lot 3 - Spreader



Summary for Pond 4-D: Lot 4 - Detention

Inflow Area = 2,280 sf, 39.47% Impervious, Inflow Depth > 3.67" for 10 YR 24 HR event
Inflow = 0.14 cfs @ 10.00 hrs, Volume= 697 cf
Outflow = 0.12 cfs @ 10.06 hrs, Volume= 696 cf, Atten= 14%, Lag= 3.5 min
Discarded = 0.00 cfs @ 10.06 hrs, Volume= 0 cf
Primary = 0.12 cfs @ 10.06 hrs, Volume= 696 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 59.01' @ 10.06 hrs Surf.Area= 60 sf Storage= 24 cf

Plug-Flow detention time= 2.7 min calculated for 696 cf (100% of inflow)
Center-of-Mass det. time= 2.0 min (708.7 - 706.7)

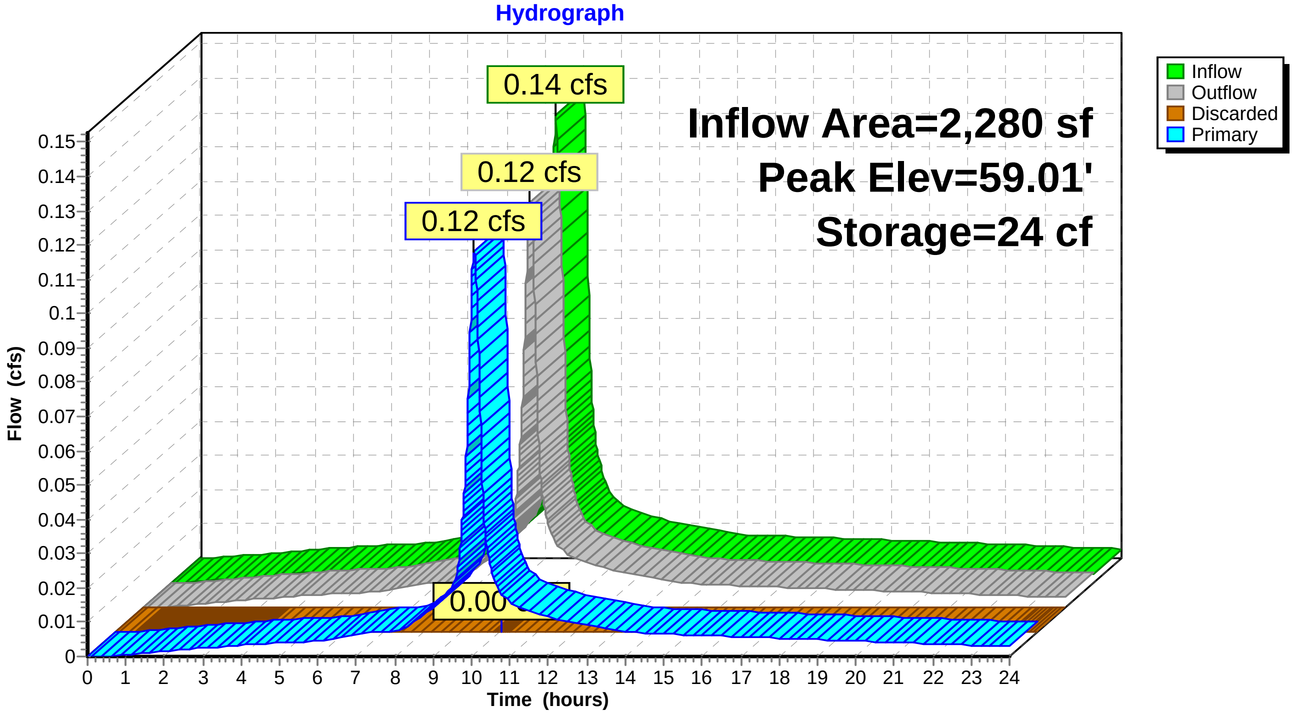
Volume	Invert	Avail.Storage	Storage Description
#1	57.67'	78 cf	**6.70'W x 9.00'L x 4.33'H Detention Tank 9'L x 6.7'W x 4.33'H Prismatoid** 261 cf Overall x 30.0% Voids
#2	60.83'	485 cf	**29.20'W x 47.30'L x 1.17'H Pervious Pavers, 1380 sf** 1,616 cf Overall x 30.0% Voids
		563 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	57.67'	**2.0" Vert. Orifice - Bottom Outlet Pipe** C= 0.600
#2	Primary	61.99'	**2.0" x 2.0" Horiz. Grate - Overflow to Inlet** C= 0.600 Limited to weir flow at low heads
#3	Discarded	57.67'	**0.001 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'

Discarded OutFlow Max=0.00 cfs @ 10.06 hrs HW=59.01' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.12 cfs @ 10.06 hrs HW=59.01' (Free Discharge)
├─**1=Orifice - Bottom Outlet Pipe** (Orifice Controls 0.12 cfs @ 5.40 fps)
└─**2=Grate - Overflow to Inlet** (Controls 0.00 cfs)

Pond 4-D: Lot 4 - Detention



Summary for Pond 4-S: Lot 4 - Spreader

Inflow Area = 5,900 sf, 76.61% Impervious, Inflow Depth > 3.79" for 10 YR 24 HR event
Inflow = 0.33 cfs @ 10.02 hrs, Volume= 1,864 cf
Outflow = 0.33 cfs @ 10.02 hrs, Volume= 1,597 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 10.02 hrs, Volume= 2 cf
Primary = 0.33 cfs @ 10.02 hrs, Volume= 1,595 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 45.71' @ 10.02 hrs Surf.Area= 200 sf Storage= 268 cf

Plug-Flow detention time= 152.6 min calculated for 1,597 cf (86% of inflow)
Center-of-Mass det. time= 65.9 min (761.9 - 695.9)

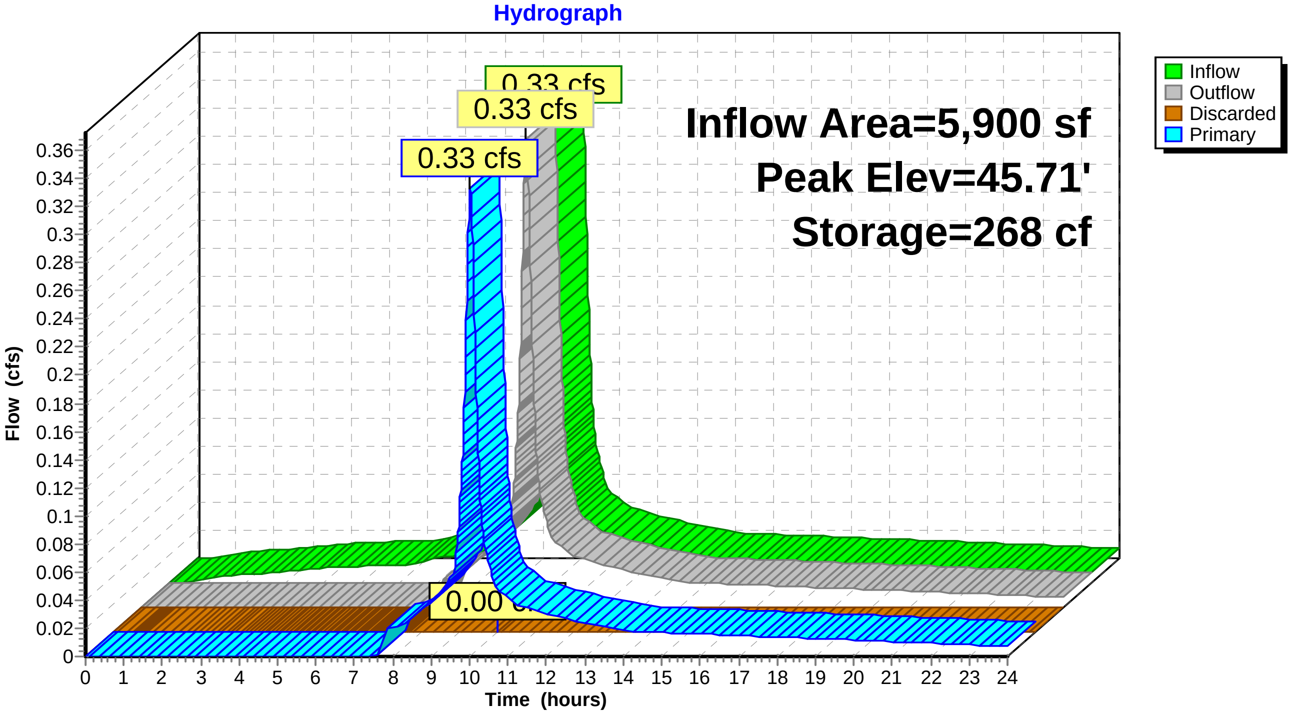
Volume	Invert	Avail.Storage	Storage Description
#1	41.25'	270 cf	**2.50'W x 80.00'L x 4.50'H 80'L x 2.5'W x 4'D Gravel Trench Prismatoid** 900 cf Overall x 30.0% Voids

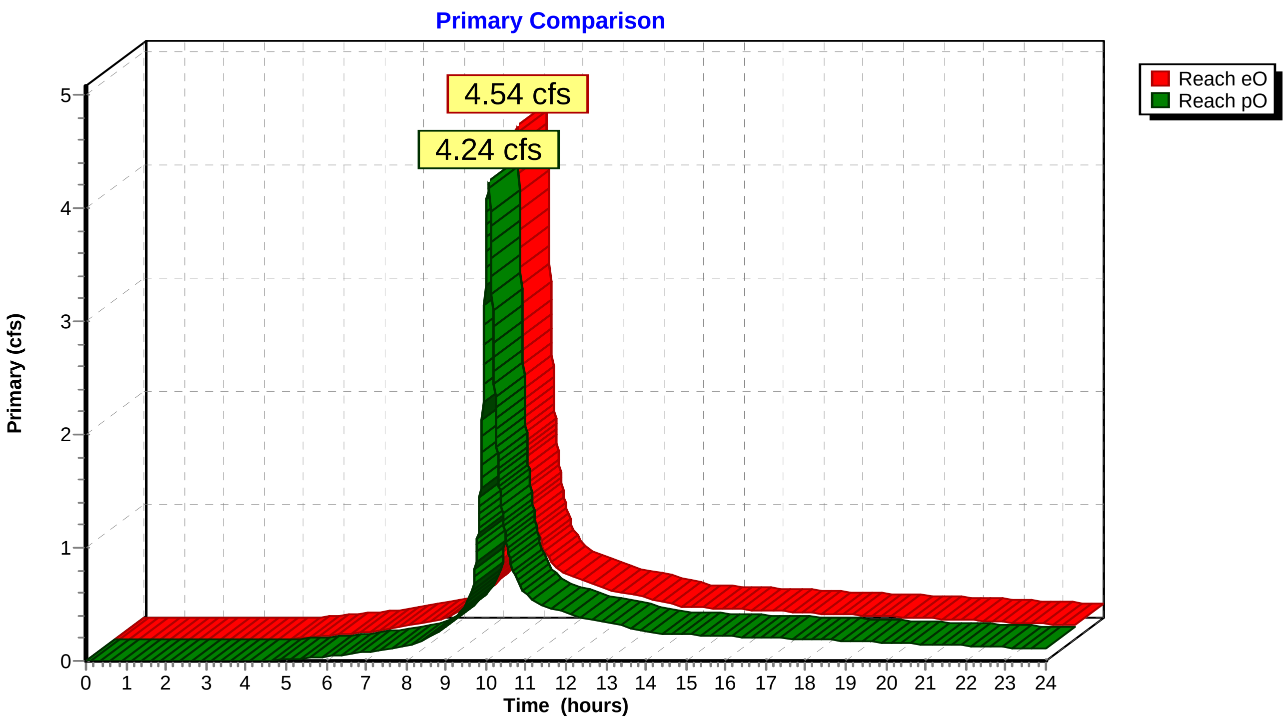
Device	Routing	Invert	Outlet Devices
#1	Primary	45.70'	**90.0' long x 3.0' breadth Spreader - Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	41.25'	**0.001 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 31.50'

Discarded OutFlow Max=0.00 cfs @ 10.02 hrs HW=45.71' (Free Discharge)
└─**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.21 cfs @ 10.02 hrs HW=45.71' (Free Discharge)
└─**1=Spreader - Broad-Crested Rectangular Weir**(Weir Controls 0.21 cfs @ 0.24 fps)

Pond 4-S: Lot 4 - Spreader




Primary Comparison
4.54 cfs
4.24 cfs
Reach eO
Reach pO
Primary (cfs)
0
1
2
3
4
5
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

APPENDIX D

Geotechnical Investigation

GEOTECHNICAL INVESTIGATION
For
Five Home Residential Development
Vallemar Street and Juliana Avenue
APN 037-086-23, -26, -27, -28, -29
Lots A, D, E, F, G
Moss Beach, California

Prepared For
Moss Beach Associates, LLC
c/o Lawlor LandUse Manager, Santa Cruz, California

Prepared By
HARO, KASUNICH & ASSOCIATES, INC.
Geotechnical & Coastal Engineers
Project No. SM10391.2
August 2016

Project No. SM10391.2
12 August 2016

MR. OWEN LAWLOR
Moss Beach Associates LLC
c/o Lawlor LandUse
612 Spring Street
Santa Cruz, CA 95060-2030

Subject: Geotechnical Investigation

Reference: Five Home Residential Development
Vallemar Street and Juliana Avenue
APN's 037-086-23, -26, -27, -28, & -29
Moss Beach, California

Dear Mr. Lawlor:

In accordance with your authorization, we have performed a Geotechnical Investigation for the referenced property in Moss Beach, California. This investigation was completed with consideration to the Coastal Bluff Recession Map prepared by our firm for the referenced property. The Coastal Bluff Recession Map is included in the appendix of this report and should be reviewed as part of this document.

The accompanying report presents our geotechnical recommendations and design criteria, along with the results and methodology of our investigation. If the recommendations in our geotechnical report are followed during project design and construction, the project will be subject to "ordinary risks" as defined in the Scale of Acceptable Risks From Geologic Hazards" in Appendix E of this report. If this level of risk is unacceptable, more extensive mitigation of the hazards can be recommended. In brief we have recommended the new residences be situated landward of the estimated 50 year coastal bluff recession setback and supported by conventional spread foundations embedded into an earthen mat of engineered fill.

If you have any questions concerning our conclusions or recommendations, presented in this report please contact our office.

Respectfully Submitted,

HARO, KASUNICH AND ASSOCIATES, INC.

Moses Cuprill
C.E. 78904

REGISTERED PROFESSIONAL ENGINEER
MOSES E. CUPRILL
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Project No. SM10391.2
12 August 2016

GEOTECHNICAL INVESTIGATION

Introduction

This report presents the results of our Geotechnical Investigation for the proposed construction of five (5) new single family dwellings on five separate parcels. The five parcels are designated on preliminary maps as lots A, D, E, F, & G. Lots B and C are designated as open space. We have also prepared an estimated 50 year future coastal bluff recession map for the bluff that borders Lots A, B, C, & D. The recession map should be reviewed in conjunction with this geotechnical investigation.

Purpose and Scope

The purpose of the geotechnical investigation is to develop geotechnical design parameters for design and construction of the new residences at the referenced site. We performed slope stability analysis on a critical cross section selected by HKA and developed from a topographic map prepared for this site. The critical cross section is cut through one of the steepest portions of the coastal bluff and area of the proposed home site to estimate for potential of bluff failures. This information also corroborated the slope stability portion of the estimated 50 year future coastal bluff recession setback.

Specifically we did the following:

A. Document review of information provided by property owner in our files pertinent to the site and region, including:

- Coastal Bluff Recession Map and Cross Sections, prepared by Haro, Kasunich and Associates Inc., dated 9 March 2015.
- Architectural plan sheets A3.1 – A3.4, prepared by Pearson Design Group, Undated.
- Site sections L4.1 – L4.3, prepared by Verde Design, dated 28 July 2015.
- Civil plan sheets C1.0 – C8.0 dated 5 August 2016, prepared by Mesiti-Miller Engineering.
- Conferred with and discussed scope and requirements with San Mateo County Public Works department, Diana Shu and County Geologist Jean Demouthe.

B. Met at the site with the Project Biologist to review environmental constraints at the project site. HKA placed wood stakes at each of the test boring locations and contacted USA Underground as mandated by law within 48 hours of scheduled drill date.

C. HKA obtained a geotechnical soil boring permit for this project site from San Mateo County Health Services Division (SMCHSD). A soil boring location map and

Drilling Notification Form was submitted to SMCHSD a minimum 48 hours prior to the scheduled drill date.

D. Subsurface exploration consisting of logging and interval sampling of soils encountered in five (5) exploratory test bore holes advanced in the area of the proposed residences between 13.5 to 25.0 feet deep. The exploratory test bore holes were advanced using portable drilling equipment that was hand carried onto the site in parts and built in place of each test boring location. The soil samples obtained were sealed and returned to our laboratory for testing. After completion of each test boring the drilled shaft was infilled with a cement grout mixture specified by SMCHSD. The mixing and placement of the grout was performed by a drilling contractor with a C-57 license. Pictures were taken during this operation and forwarded to Lawlor Land Use see Appendix F of this report. Soil cuttings were hauled off site for proper disposal.

E. A total of five (5) percolation test holes were advanced near the areas of the proposed drain fields between 2.15 to 4.04 feet deep. The holes were advanced using hand auger gear. Percolation tests were performed within the drilled shafts following an EPA and San Mateo County procedures for determining percolation test rate within soils. The holes were backfilled with soil cuttings.

F. Laboratory testing of select samples obtained. Moisture content and dry density tests of selected samples was performed to evaluate the consistency of the in situ soils. Soil strength parameters were derived from in-situ field penetration tests (SPT), an unconfined compression test, and a laboratory direct shear test on select samples under saturated and in-situ moisture contents. Atterberg limits tests were performed on select clay soil samples to qualify its expansion potential. Corrosion testing was performed on bulk samples of site soil.

G. Quantitative slope stability analysis was performed on a critical cross section (Section 3) cut through on one of the steepest portions of the coastal bluff and the area where one of the proposed home sites is nearest the bluff. The location of the critical cross section was selected by HKA from site observations and review of a topographic map prepared for this site. The analysis were run under static and pseudo static (seismic) loading conditions.

H. Geotechnical analysis with consideration to our laboratory test results, slope stability results, the estimated 50-year future coastal bluff recession setback, our experience in the area, and engineering judgement. Our analysis developed geotechnical design parameters for building foundations, grouted soil anchors, retaining walls, and concrete slab-on-ground.

l. Preparation of this report summarizing our findings, conclusions, and recommendations.

Site Location and Project Description

The project site consists of five privately owned parcels on the seaward side of California State Highway 1. The parcels make up an undeveloped field bound by Vallemar Street to the east and Juliana Avenue to the south. The project site is a relatively flat, elevated marine terrace that sits approximately 45 feet above sea level. The project site is covered with grasses, ice plant, trees, and shrubs. There is evidence of historical grading, associated with the construction of Vallemar Street and possibly Highway 1. A fill wedge descends from the seaward side of Vallemar Street down to the landward side of the project site. The coastal bluffs that line the seaward side of the project site are steeply cut from years of wave attack. A drainage swale which appears to be part of the construction of Juliana Avenue runs along the southeast side of the project side and discharges into a small ravine descending to the beach below.

Based on interaction with Lawlor LandUse and review of conceptual drawings, HKA understands the proposed improvements consists of the following. Grading of building pads on each site by means of cut and fill construction methods. A new single family dwelling and driveway is shown to be constructed on each parcel. The parcels are designated by lot lettering. Lot A on the north corner of the site and Lot G to its east. Lot

D, E, and F are located on the southeast side of the project site adjacent to Juliana Avenue. Lot D is the seaward most, Lot F Is adjacent to Vallemar Street, and Lot E is between the two. The new homes are referred to as the "Home A, D, E, F, and G" respective to the lot letter for this project and within this report.

Home A and Home G are shown to have frontage onto Vallemar Street. The driveway and parking area for Home A is shown to be built up with 2 to 5 feet of engineered fill and the 2 story house is shown to be cut into the fill embankment with its upper level even with the parking area. Home G is shown to be cut into the site up to five feet and fill placed on the down slope side of the access driveway. Retaining or basement walls are anticipated on the upslope side of the Home A and Home G.

Home D, Home E, and Home F are shown to have frontage onto Juliana Avenue. Each of these home will require construction of a small bridge to cross the drainage swale adjacent Juliana Street. Starting at home F, a cut is shown on the upslope side on the order of 2 to 4 feet and a fill on the order of 4 feet shown the downslope side. Home E is shown to have significantly less grading with cut and fills on the order of 1 to 3 feet. Home D is shown to have minimal grading with cut and fills 1 foot thick or less.

Field Exploration

On 22 and 24 March 2016 a total of five (5) exploratory test bore holes were advanced at the project site. One test boring near the location of each home site. On 30 March 2016 we returned to the site and advanced five (5) percolation test bore holes near the area of the proposed drain fields for the homes.

The exploratory test boring in the area of the new homes were advanced to depths of 13.5 to 25 feet below the ground surface (bgs). The exploratory test bore holes were advanced using solid flight auger portable drilling equipment that was hand carried onto the site in parts and built at the locations of each test borings. The soil samples obtained were sealed and returned to our laboratory for testing. After completion of each test boring the drilled shaft was infilled with a cement grout mixture specified by SMCHSD. The mixing and placement of the grout was performed by a drilling contractor with a C-57 license. Pictures were taken during this operation and forwarded to the Lawlor Land Use. Soil cuttings were placed into 5 gallon buckets and hand carried to a waiting truck. The packed soil was transferred off site for proper disposal See Appendix F of this report for pictures of drilling operation.

A total of five (5) percolation test holes were advanced near the areas of the proposed drain fields between 2.15 to 4.04 feet deep. The holes were advanced using hand auger gear. Percolation tests were performed within the drilled shafts following an EPA procedure for determining percolation test rate within soils. The holes were backfilled with soil cuttings.

To provide extra protection against disturbance of the site a large tarp was laid over the work areas. Each exploratory and percolation test boring was advanced through the tarp and all buckets, drilling parts, soils cuttings etc. were carefully handled over the tarp. After the work area was cleared the tarp was folded up and the plants were replaced.

In-situ samples were collected from within the exploratory test borings. Samples were obtained by driving a California Sampler (3 inch outside diameter) or split spoon sampler (2 inch outside diameter) up to18 inches in depth at select elevations using a standard 140-pound hammer over a 30-inch drop. The amount of blows to drive the sampler 1 foot were recorded and presented on our logs of borings attached to this letter (Figures 4 to 13). The logs also include profiles of the percolation test bore holes.

The approximate location of test bore holes are shown on our Test Boring Location Map (Figure 2). The soil encountered in the borings was continuously logged in the field and described in accordance with the Unified Soil Classification System (ASTM D2487).

Laboratory Testing

The laboratory testing program was directed toward determining pertinent soil engineering, corrosion, and index properties.

The natural moisture content was determined on select samples and is recorded on the Logs of Test Borings at the appropriate depths. Since water has a significant influence on soil, the natural moisture content provides a rough indicator of the soil's compressibility, strength, and potential expansion characteristics.

A saturated moisture direct shear tests and an in-situ moisture unconfined compression test were completed to determine strength properties for coastal terrace. Density tests were also performed to aid in the assignment of soil properties to each soil type.

Atterberg limits tests were performed on select clay soil samples to qualify its expansion potential. The Atterberg limits were run on a select near surface sample collected from within the exploratory test boring advanced on each of the home sites.

The results of the field and laboratory testing appear on the "Logs of Test Borings" opposite the samples tested (Figures 4 through 13).

Subsurface Conditions

In general within test bore holes advanced in the area of the home sites the soil profile encountered consisted of clay soil over either silty sand, clayey sand, sand with silt or a combination of thereof all overlying a hard bedrock formation. The overburden soils are interpreted as coastal terrace and were loose near the surface and became mostly medium dense and occasionally dense with depth. The coastal terrace was mixed with organics and roots within the upper 1 to 2 feet as a result of top soil development. The upper 6 to 8 feet of the coastal terrace was stiff to very stiff sandy clay or clay. In the area of Home G the clay layer was 15 feet thick. The silt clay sand mixtures extended below the clay layer to a depth of approximately 25 feet bgs where drilling refusal was encountered. We interpret this contact as hard bedrock.

In the percolation test bore holes advanced in the area of the proposed drain fields for Home A, Home F, and Home G consisted of top soil in the top foot and silty sand below that. These locations had low to moderately low percolation rates. In the locations of the drain fields for Home D and Home E the soil encountered consisted of 1 foot of top soil over clay. These locations had zero percolation.

Expansive Soils

Based on the measured Atterberg Limits, the clay soil collected within the foundation zone of the home sites was qualified to have moderately high potential for expansion and in the upper 2 to 3 feet at Home D and Home E it has a high potential for expansion. There was a large standing puddle observed in this area for several weeks during the course of our field exploration phase of this study. The clay soil with moderately high potential for expansion (Homes A, F, & G) can be mitigated for foundation support if the recommendations in this report are carefully followed during development of project plans and during construction. The clay soil with high potential for expansion in foundation zones (Homes D & E) should be removed and replaced with select granular fill.

Groundwater

Groundwater was encountered within our test bore holes advanced at Homes D, E, & F adjacent to Juliana Avenue. The groundwater was encountered at 17 feet bgs near Vallemar Street and 13 feet at Home D closer to the bluff. The groundwater appears to be perched upon the bedrock and seeping through the terrace near the contact. That being said saturated soils and active seeps in the coastal terrace soils should be anticipated and planned for by designers and contractors. Retaining wall back drains and under slab blanket drains will be essential for the design of this structure. It is recommended to relieve drainage collected in these subsurface systems through a gravity flow if possible.

Liquefaction Potential

Liquefaction is a phenomenon where loose to medium dense soils with low to zero cohesion that are submerged and subject to seismic shaking can temporarily lose their shear strength. This is most common in young alluvial soils near sloughs, rivers, and flood plains. Although medium dense sand and silt was encountered just above the bedrock formation it was relatively thin and more than 15 feet bgs. Based on the lack of evidence of ground effects related to liquefaction occurring within coastal terrace the potential for liquefaction at the site is low.

Soil Properties

Based on our field exploration and results of laboratory tests the soils encountered were simplified into two soil types. Soil Type 1: Clay Soil Coastal Terrace and Soil Type 2: Silt Sand Clay Mixture Terrace Deposit, Soil type 3: Bedrock Formation. The geotechnical strength parameters of the soil types are summarized in the table below.

Table 1: Geotechnical Design Values

Soil Stratum	γ_t (lbs/ft^3)	$^\circ$(degrees)	Cohesion (lbs/ft^2)
Soil 1	123	10	1000
Soil 2	113	43	200
Soil 3	135	45	1000

Erosion

Surficial soils at the site are prone to erosion which can be severe where there are steep slopes and uncontrolled runoff, particularly where the natural drainage is modified by the works of man and not properly controlled. Typically, once the upper surface of the material is breached by a rill or a gully, erosion proceeds at an accelerated rate, and the rills and gullies deepen and migrate headward (upslope). This process may contribute to the initiation of debris flows if rills and gullies are not mitigated or maintained and if surface drainage controls are not adequately designed and constructed.

Surface Drainage

The project site is located near a coastal bluff comprised partially of coastal terrace deposits that are susceptible to erosion, particularly by concentrated uncontrolled runoff of surface drainage. The proposed improvements will increase the runoff flow rate shedding away from the site. Collection of surface runoff into drain lines with single discharge points will further concentrate it relative to the sheet flow type drainage prior to improving the site. Development of an engineered drainage plan that conveys surface runoff to multiple discharge locations and promotes sheet type flow of collected drainage is recommended for this site. Level drainage spreaders are an example of this type of system.

Geotechnical Related Seismicity

The improvements should be designed in conformance with the most current California Building Code (2013 CBC). For seismic design, the soil properties at the site are classified as **Site Class "D"** based on definitions presented in Table 1613.5.2 in the 2013 CBC. The longitude and latitude were determined using a satellite image generated by Google Earth. These coordinates were taken from the approximate middle of the area of the proposed improvements:

Longitude = -122.5169, Latitude = 37.5300

The coordinates listed above were used as inputs in the Java Ground Motion Parameter Calculator created by the USGS to determine the ground motion associated with the maximum considered earthquake (MCE) SM and the reduced ground motion for design SD. The results are as follows:

Site Class D

SM_s= 2.269 g

SM_1= 1.439 g

SD_s= 1.512 g

SD_1= 0.960 g

A maximum considered earthquake geometric mean (MCE_G) peak ground acceleration (PGA) was estimated using the Figure 22-7 of the ASCE Standard 7-10. The mapped

PGA was 0.89 g and the site coefficient F_{PGA} for Site Class D is 1.0. The MCE_G peak ground acceleration adjusted for Site Class effects is $PGA_M = F_{PGA} * PGA$

$$PGA_M = 1.0 * 0.89 \text{ g} = 0.89 \text{ g}$$

Quantitative Slope Stability Analysis

Stability analysis was performed on the worst case or critical cross section cut through the coastal bluff and Lot D. The critical section (Cross Section 3) was selected by HKA and developed using a topographical map prepared by Gary Ifland surveyor, Inc. A copy of the cross section is included with this report (Appendix C). The slope stability analysis was performed to quantify the potential for bluff failure that could impact the proposed building site. It also corroborated the development of the recommended 50-year future coastal bluff recession slope stability setback line.

General Methodology

Slope failures or landslides can cause problems including encroachment and undermining of engineered structures. Failures of slopes occur when stress acting on the soil mass is greater than its internal strength (shear strength). A slope is considered stable when the strength of its soil mass is greater than the stress field acting within it.

Some common variables influencing stress are gravity (steeper slopes), hydrostatic pressure (perched groundwater), bearing pressures (proposed structures), and seismic surcharge (earthquake shaking).

Various methods of analyzing stability of slopes yield a factor of safety. A factor of safety is determined by dividing the resisting forces within the slope soils by the driving forces within the slope (stress field). A factor of safety (FS) greater than or equal to 1.0 is considered to be in equilibrium. A FS less than 1.0 is a potentially un-stable slope condition. HKA considers the potential for instability of a slope or hillside with a FS against sliding greater than or equal to 1.10 under seismic loading conditions and 1.50 under static loading conditions to be low.

Quantitative Analysis with GSTABL7

The analysis was completed with the aid of GSTABL7 software. A model for the section was defined with the input parameters consisting of slope geometry, soil properties, loading conditions, and pore water pressure ratio. Each model was evaluated under static and seismic loading. The analysis calculates the factor of safety against sliding for the failure surface(s).

Circular failure surfaces were assumed for this model. GSTABL7 program uses the Simplified Bishop Method of Slices to determine normal and resistive forces in each slice.

The forces in each slice are then summed up for total force acting on the mass. The computer program assumes many failure surfaces using initiation and termination points on the ground surface selected by the user. These chosen points represent the toe and scarp of each potential landslide in relation to the assumed failure surfaces. The critical trial failure surface from the pseudo static analysis condition was selected as the projected failure surface in the development of design parameters.

Seismic Coefficient

The ground motion parameter used in pseudo static analysis is referred to as the seismic coefficient "k". The selection of a seismic coefficient has relied heavily on engineering judgment, local building code, and professional publications. Current version of the California Building Code contains reference to maps of peak ground acceleration (PGA) based on site latitude and longitude. For this project the mapped PGA is 0.89g. The PGA is multiplied by a factor related to the seismicity of the site to obtain the seismic coefficient. The factor was estimated to be 0.58 by using Figure 1 of Chapter 5 Analysis of Earthquake-Induced Landslide Hazards in CGS *Special Publication 117 Guidelines For Analyzing and Mitigating Seismic Hazards in California 2008.*

The multiplying factor was developed as part of a screen analysis procedure for seismic slope stability by Stewart, Blake, and Hollingsworth. The multiplier results in a percentage of the peak which represents the more repeatable ground motion. The assumption is the site can tolerate at least 2 inches of displacement during a design seismic event. The higher the multiplying factor the less displacement during a design seismic event is assumed to be tolerable by site improvements. For example if the full peak ground acceleration is used in the analysis (multiplier of 1.0) it is assumed 0 inches of displacement is tolerated during a design seismic event. For this project we assumed 2 inches of ground displacement is tolerable resulting a horizontal seismic coefficient of 0.51g.

Geometric Assumptions

For our analysis, failure surfaces were focused within Soil 1 "Unclassified Fill and Coastal Terrace Deposits" due to its vulnerability to bluff failures relative to Soil 2 "Bedrock Formation" which is much more resistance to erosional processes and slope failures. The trial failure surfaces used in the analysis were selected using engineering judgment as well as the software's ability to generate many random surfaces.

Slope Stability Conclusions

The computed factors of safety for the trial failure surfaces are greater than 1.50 under static loading conditions and 1.10 for pseudo-static conditions. The results of our analysis indicate that the portion of the coastal bluff comprised of terrace deposits is stable at slope gradients of 1.5:1 (H:V) or flatter. Based on these results the potential for instability of the coastal bluff impacting the proposed home sites is low. However, portions of the coastal bluff that have slope gradients steeper than 1.5:1 (H:V) are predicted to have bluff failures until the slope gradient recesses to 1.5:1 (H:V). A portion of the coastal terrace deposit portion of the bluff along Cross Section 1 and 4 are flatter than 1.5:1 (H:V). These slope gradients are estimated to be stable and therefore slope stability analysis was not performed on these cross sections. Section 2 is similar to Section 3 but a little flatter and qualitatively would have a higher factor of safety against sliding compared to Section 3. The results of the slope stability analyses are summarized in the following table as well as presented graphically in Appendix B of this report.

Table 2: Slope Stability Analysis Results

Bluff Recession Section	Loading Condition	Minimum Factor of Safety Against Sliding	Meet or Exceed Required FS
3	Static	2.48	Yes
3	Pseudo Static	1.27	Yes

Limitations of Analysis

It must be cautioned that slope stability analysis is an inexact science; and that the mathematical models of the slopes and soils contain many simplifying assumptions, not the least of which is homogeneity. Density, moisture content and shear strength may vary within a soil type. There may be localized areas of low strength or perched ground water within a soil. Slope stability analyses and the generated factors of safety should be used as indicating trend lines. A slope with a safety factor less than one will not necessarily fail, but the probability of slope movement will be greater than a slope with a higher safety factor. Conversely, a slope with a safety factor greater than one may fail, but the probability of stability is higher than a slope with a lower safety factor.

Percolation Testing Set-Up

HKA performed percolation tests near the proposed drain field areas. The exact areas of the proposed drain fields could not be tested due to presence of trees, bushes, and other sensitive plants. Based on interaction with the project Civil Engineer Mesiti Miller Engineering (MME), HKA understand the drain fields will consist of pits on the order of 2 to 4 feet deep infilled with drain rock. Depths and locations of the percolation test holes were also worked out with MME.

On 30 March 2016 five (5) percolation test borings were drilled using a 6 inch diameter hand auger. After drilling to the selected depth, a layer of 1/4" angular gravel approximately 2 to 3 inches thick was placed at the bottom of each percolation test boring. Three (3) inch diameter NDS pipe was prepared for each test hole by cutting slots with a hacksaw along the bottom 6 inches of the pipe sections. The slotted pipe sections were placed in each test hole with additional gravel placed between the pipe and the borehole sidewall to secure the pipe in place. The bottom 12 inches of the test bore holes were filled with clear water 4 times within 24 hours prior to commencing the percolation test.

Percolation Testing

On 31 March 2016, HKA returned to the site after the 24 hour soaking period to conduct the percolation tests.

The percolation test holes were inspected and all but P-4 and P-5 were completely drained. Percolation test holes P-4 (Lot 4) and P-5 (Lot 5) still had 12 inches of standing water in the bottom of the test holes. These percolation test were advanced into a layer of clay soil and near the standing puddle.

On the same day the 6-inch falling head percolation tests were performed as follows:

- Clear water was placed within the bottom 6 inches of each test hole.
- A water level reading was taken every 30 minutes and the percolation test hole was refilled with clear water to 6 inches above the bottom of the hole.
- Up to eight (8) water level readings were taken in each percolation test hole. If 3 consecutive readings were within 1/16 of an inch of each other the EPA test method recommends to stop the test.
- The percolation rate in inches per hour was calculated by dividing the change in height of the water level in inches by the interval between readings in hours.
- The last change in the water level reading and consideration to the set of readings was used to report the percolation rate for the respective test hole.

Percolation Test Results

Test Hole ID	Percolation Zone (feet)	Percolation Rate (in/hr)
P-1	1.146 to 2.146	3.9
P-2	1.146 to 2.146	1.4
P-3	3.042 to 4.042	0.6
P-4	1.958 to 2.958	0.0
P-5	1.958 to 2.958	0.0

Graphical and tabulated results are included in the Appendix D of this report.

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our investigation, the proposed improvements at the referenced site will be subject to "ordinary risks", as defined in the "Scale of Acceptable Risks From Geologic Hazards" in Appendix D of this report provided the design criteria and recommendations presented in this report as well as those in our geologic report for this project are incorporated into the design and construction of the proposed project and maintained for the life of the development.

The primary geotechnical considerations at the site include strong seismic shaking, adequate foundation support of new buildings, temporary cut slopes during construction, expansive clay soil in foundation zone, subsurface seepage, coastal bluff erosion, and control of concentrated surface runoff,.

Based on our analysis of site soils conditions and consideration to the recommended 50 year future coastal bluff recession setback, the proposed Home A, Home B, and Home F should be supported by conventional spread foundations embedded into an earthen mat of moisture conditioned on-site soils prepared in accordance with this report. Home D and Home E should be supported by conventional spread foundations embedded into an earthen mat of select granular engineered fill prepared in accordance with this report.

Groundwater was encountered within our test bore holes at the time they were drilled. Saturated soils and active seeps in the coastal terrace soils should be anticipated and planned for by designers and contractors. Retaining wall back drains and under slab blanket drains will be essential for the design of these structures. It is recommended to relieve drainage collected in these subsurface systems through perforated collection pipes tied to solid drain lines that are conveyed to a discharge location by gravity flow if possible.

Based on our interaction with the project design team HKA understands a partial basement is proposed below Home A and Home G. The basement is not shown along the seaward perimeter of these homes. Excavations for the partial basements are shown to create cut slopes on the order of 5 to 10 feet tall into coastal terrace deposits. The cut slopes should be laid back to safe slope gradients or temporary cantilever or tied back shoring utilizing top down construction methods should be employed. As an alternative the basement wall could be constructed and then backfilled. Once this decision is made HKA should be consulted to make supplement recommendations as needed that are compatible with the project goals. The pier criteria can be used for the basement wall or for Home D and Home E as an alternative design. The architect, civil engineer, and structural designer should assume wet to saturated coastal terrace will be encountered within the cut face of the excavation. Criteria for drilled shaft, grouted, post tensioned soil anchors are included for use in the temporary shoring system or permanent basement retaining walls if needed.

The following recommendations should be used as guidelines for preparing project plans and specifications, and assume that **Haro, Kasunich & Associates** will be commissioned to review project grading and foundation plans before construction and to observe, test and advise during earthwork and foundation construction. This additional opportunity to examine the site will allow us to compare subsurface conditions exposed during construction with those inferred from this investigation. Unusual or unforeseen soil conditions may require supplemental evaluation by the geotechnical engineer.

General Site Grading

1. The geotechnical engineer should be notified **at least four (4) working days prior to any grading or excavating foundations** so the work in the field can be coordinated with the grading contractor and arrangements for testing and observation can be made. The recommendations of this report are based on the assumption that a representative from HKA will perform the required testing and observation during grading and construction. It is the owner's responsibility to make the necessary arrangements for these required services.

2. Where referenced in this report, Percent Relative Compaction and Optimum Moisture Content shall be based on ASTM Test Designation D1557.

3. Areas to be graded or to receive proposed improvements should be cleared of all obstructions and fill materials, including trees not designated to remain and other unsuitable material. Existing depressions or voids created during site clearing should be backfilled with engineered fill. Any surface or subsurface obstructions, or questionable material encountered during grading, should be brought immediately to our attention for proper exposure, removal, and processing as directed.

4. Cleared areas should then be stripped of organic-laden topsoil. Stripping depth is anticipated to be from 2 to 4 inches, although the actual depth of stripping should be determined in the field by a representative from HKA. Strippings should be wasted off-site or stockpiled for use in landscaped areas if desired.

5. On-site soils reused as engineered fill and imported select granular fill should be placed in thin lifts not exceeding 8 inches in loose thickness. On-site clay soil approved for re-use by HKA should be, water conditioned to a moisture content about 3 to 6 percent above optimum, and compacted to 87 to 89 percent relative compaction back up to the ground surface. Imported select granular fill should be, water conditioned to a moisture content about 2 to 4 percent above optimum, and compacted to at least 90 percent

relative compaction. The upper 8 inches of subgrade should be compacted to at least 95 percent relative compaction. Aggregate base below pavements should likewise be compacted to at least 95 percent relative compaction.

6. If grading is performed during or shortly after the rainy season, the grading contractor may encounter compaction difficulty with the wet soils. If compaction cannot be achieved after adjusting the soil moisture content, it may be necessary to use imported fill or gravel and stabilize the bottom of the excavation with stabilization fabric.

7. Provided they can be adequately moisture conditioned (or dried back) prior to use, the on-site soils appear generally suitable for use as engineered fill, however clay soils with intermediate or high plasticity may be unsuitable. Materials used for engineered fill which must be imported should be free of organic and deleterious material, contain no rocks or clods over 4 inches in dimension, and should contain no more than 15 percent by weight of rocks larger than 2½ inches. Imported fill should also be granular, have a Plasticity Index of less than 18, and should have sufficient binder to allow excavations to stand without caving. Prior to delivery to the site, a representative sample of proposed import should be sent to our laboratory for evaluation.

8. We estimate shrinkage factors of about 17 percent for the on-site materials when used in engineered fills.

Cut and Fill Slopes

9. Temporary excavations should be properly shored and braced during construction to prevent sloughing and caving at sidewalls. The contractor should be aware of all CAL OSHA and local safety requirements and codes dealing with excavations and trenches.

10. The excavation along the northeast side of Home A and Home G is shown to be on the order of 5 to 10 feet deep bgs. Designers should assume the cut slope to be comprised of stiff or medium dense coastal terrace deposit.

11. It should be anticipated that perched ground water will be actively seeping from the face of the cut slope excavated into the coastal terrace deposits. The thickness of the seepage layer will depend upon the time of year the excavation is made. Designers and contractors should plan accordingly.

12. Temporary cut slopes excavated into the coastal terrace deposits should be inclined at a slope gradient of 1:1 (H:V) or flatter where no seepage is observed from face of cut slope and 2:1 (H:V) or flatter where seepage is observed. Depending on the amount of seepage from the face of the cut slope shoring may be required. Temporary cut slopes excavated for the project are considered those that are to remain from 24 hours up to the start of the rain season.

13. For design of lateral earth support systems used for temporary shoring or permanent retaining walls a lateral earth pressure equivalent to a fluid weighing (EFW) 40 pcf should be used under drained conditions (i.e. gravel drain) for an active condition. For at rest or restrained condition use 30H psf uniform load. For 2:1 back slope gradients add 15 pcf and 10H psf respectively. If the shoring is to be designed without a drain or "undrained condition" Add 45 pcf or 30H respectively.

14. Compacted fill slopes should be constructed at a slope inclination not steeper than 2:1 (horizontal to vertical) at 90 percent relative compaction. Fill slopes with these recommended gradients may require periodic maintenance to remove minor soil sloughing. All fills must be adequately benched into firm native soil, and keys for stability will be required at the toe of the fill slope. The toe key should be at least 8 feet wide and should extend at least 2 feet into firm native soil. The bottom of the toe key should be sloped downward at about 2 percent toward the back of the key.

15. There should be a minimum of 10 feet horizontal separation between the top of supporting soil that will be used for skin friction and the face of slope.

16. In order to maintain stable slopes at the recommended gradients, it is important that seepage forces and accompanying hydrostatic pressure be relieved by adequate drainage. Adequate backdrains in keyways and benches should be provided as

determined necessary by HKA. The locations of backdrains and outlets would be determined by a representative of HKA in the field during grading.

17. Following grading, exposed soil should be planted as soon as possible with erosion-resistant vegetation.

18. After the earthwork operations have been completed and HKA has made the required observations of the work, no further earthwork operations shall be performed without the direct observation of HKA.

Conventional Spread Foundations

19. The new homes should be supported by conventional spread foundations that are embedded into an earthen mat of engineered fill that extends a minimum of 18 inches below bottom of foundations elements and 6 horizontal feet beyond the outer most edge of foundation. For Home A, B, and F the earthen mat should be comprised of re-used on-site soils. For Home D and Home E the earthen mat should be comprised of select import granular fill.

20. Foundations should be embedded into an earthen mat of engineered fill a minimum 2 feet deep. Actual footing depths should be determined in accordance with anticipated use and applicable design standards. Conventional footings should be reinforced as

required by the structural designer based on the actual loads transmitted to the foundation.

21. Foundations designed in accordance with the above may be designed for an allowable soil bearing pressure of 1,700 psf for dead plus live loads. The allowable bearing capacity may be increased by one-third to include short-term seismic and wind loads.

22. Deep foundation elements (piers) may be used as an alternative foundation. See the section titled “Skin Friction Pier Foundations”.

23. Lateral load resistance for structures supported on spread footings may be developed in friction between the foundation bottom and the supporting subgrade. A friction coefficient of 0.30 is considered applicable.

24. Footings located adjacent to other footings or utility trenches should have their bearing surfaces founded below an imaginary 2:1 plane projected upward from the bottom edge of the adjacent footings or utility trenches.

25. Total and differential settlements across the new homes are anticipated to be less than 1 inch.

26. All footing excavations should be thoroughly cleaned and observed by HKA prior to placing forms and steel. Observation of foundation excavations allows anticipated soil conditions to be correlated to those inferred from our investigation and to verify that the footings are in accordance with our recommendations

Skin Friction Pier Foundation

27. Drilled pier foundations can be used where the structural designer determines deep foundation are necessary to resist lateral overturning forces, concentrated axial loads, or simply as an alternative to the earthen mat construction. Drilled piers may also be considered for foundation support of temporary shoring to support cut slopes.

28. Actual pier depth will depend upon a force analysis by the project design professional; however the piers should have a minimum diameter of 18 inches and minimum spacing of 4 feet on center. The piers should be embedded into the coastal terrace a minimum of 10 feet. Based on our recent exploratory boring we were able to drill through the coastal terrace and hit drill refusal on the bedrock at a depth of 25 feet bgs. It should be noted we drilled with a 4 inch diameter solid flight auger portable drill rig.

29. The upper 3 foot of the pier should be neglected for passive resistance and skin friction. The piers should be designed to withstand an uplift pressure of 450 psf in the upper 4 feet.

30. For vertical bearing capacity in the upper 10 feet of the pier an allowable skin friction of 600 psf should be applied to the surface of the pier below the neglect depth. For resistance to uplift forces, an allowable skin friction of 300 psf should be applied to the surface of the pier below the neglect depth. For each additional foot of pier depth below 10 feet deep add 15 psf of skin friction for vertical bearing and 7.5 psf to resist uplift. Maximum allowable skin friction is 700 psf for vertical being and 350 for uplift resistance. The increased value should be applied to the full depth of the pier.

31. A passive lateral earth pressure with an equivalent fluid weight of 300 pcf acting over 2.0 pier diameters should be applied to the pier below the depth of neglect.

32. Reinforcing vertical steel for the concrete piers should extend the full depth of the excavation to a point 3 inches above the bottom of the pier hole.

Perched Groundwater Drainage

33. Seepage should be collected from behind retaining walls and beneath slabs-on-ground in gravel drains with perforated pipe. The collected drainage is recommended if possible to be relieved by gravity flow to a discharge area approved by a representative from HKA. It is imperative to waterproof the exterior basement retaining walls and floor slab of the new homes to protect against moisture intrusion from perched groundwater seepage.

34. The drainage systems should be a minimum 12 inches wide behind walls or 12 inches deep beneath slabs and comprised of Class 1 Type A gravel with a perforated pipe placed near the bottom of the drain a thin bedding of gravel.

35. A representative from HKA should observe the drainage system just after the pipes have been placed over the gravel bedding.

Concrete Slab-On-Ground

36. Concrete slab floors should be constructed with an under slab drain comprised of a 12 inch thick blanket of gravel that has been set with a vibratory plate. The bottom of the subexcavation should be scarified, moisture conditioned or dried back as needed, and compacted to a minimum 95 percent.

37. For construction of the under slab drain use¾ inch nominal drain rock (or equivalent) wrapped in filter fabric. Furthermore, a 14 mil vapor barrier should be placed below the slab and wrapped under the footings and up to the side of exterior of the building. A perforated pipe should be embedded into the blanket drain that conveys collected drainage by gravity flow to a discharge location seaward from improvements, but preferably landward of the coastal bluff setback. Drainage from basement retaining wall back drains or surface drainage should not be allowed to enter into the under slab blanket drain.

38. To reduce the potential for cracking and curling as well as other undesirable defects the concrete slab-on-grade design, placement, and curing should be done in accordance with the most recent version of ACI 302.1R-04.

39. If floor wetness would be unacceptable for the buildings for reasons such as moisture sensitive floor covering or interior humidity control a vapor barrier should be placed below the slab. Vapor barriers should be overlapped a minimum of 6 inches at the joints and carefully fitted around service openings.

40. Whether to locate the vapor barrier in direct contact with the slab or beneath a blotter layer of granular fill should be made with careful considerations to many factors directly and indirectly related to concrete construction. Such factors include but are not limited to; whether a water tight roof membrane is in place prior to slab construction, sequence of slab construction in relation to other construction activities requiring water, and the floor covering manufacturer's recommendations. Proposed installation should be independently evaluated as to the moisture-related sensitivity of subsequent floor finishes, project conditions, schedule, and the potential effects of slab curling and cracking. We also recommend that a qualified experienced waterproofing specialist be included on the design team and these recommendations and any revised or supplemental recommendations they make be included in the final design construction documents and implemented during construction.

41. If placement of concrete in direct contact with the vapor barrier is selected measures to minimize potential for shrinkage related defects such as but not limited to slab curling, dominant joints, and plastic or drying shrinkage cracking will be required. Measures would include selection of concrete mixtures with low potential for shrinkage and/or tighter joint spacing.

42. If a blotter layer of granular fill over the vapor barrier is selected it should be a minimum of 4 inches thick, trimmable, and compactible at low moisture content (4 to 5 percent). The use of cushion or clean sand with uniform particle size is not recommended for use as a blotter layer of granular fill. Crusher run material graded from 3/4 inch down to rock dust is suitable. The blotter layer of granular fill should be compacted to a minimum 95 percent relative compaction in accordance with ASTM D1557 To prevent the granular fill from becoming a water reservoir (contributing to floor wetness) it will be imperative to keep it dry after preparation has been completed.

Retaining Walls and Lateral Pressures

43. For design of retaining walls up to 20 feet in height and fully drained, the following design criteria may be used:

A. Active earth pressure for walls allowed to yield (up to ½ percent of their height) is that exerted by an equivalent fluid weighing 40 pcf for a level back slope gradient; 55 pcf for a 2:1 backslope gradient, and 48 pcf for backslope gradients between 3:1 and 6:1. This is assuming a fully drained condition. For un-drained conditions add an additional 40 pcf to the respective active earth pressure.

B. Where walls are restrained from moving at the top, design for uniform wall pressure of 30H psf/ft for level backfill and 40H psf/ft for 2:1 backfill slope gradient, and 36H psf/ft for backslope gradients between 3:1 and 6:1 where H is the height of the wall. This is assuming a fully drained condition. For un-drained conditions add an additional 30H psf/ft to the respective active earth pressure.

C. Site retaining walls should be supported by conventional spread footings embedded into firm coastal terrace or pier and grade beam foundations. The foundations should be designed and constructed in accordance with the recommendations of this report.

D. For seismic design of critical structures, a nominal earthquake load equal to 10 H^2 lbs/horizontal foot of wall may be assumed to act at 0.6H above the heel of the wall base (where H is the height of the wall).

E. In addition, the walls should be designed for a surcharge loads for adjacent live or dead surcharge loads which will exert a force on the wall. Contact HKA for a detailed evaluation of lateral surcharge loads acting against retaining walls.

F. For fully drained conditions as delineated above, we recommend that permeable material meeting the State of California Standard Specifications, Section 68-1.025, Class 1, Type A, or an approved equivalent be placed behind the wall, with a minimum continuous width of 12 inches, and extend the full height of the wall to within 1-foot of the ground surface. A 4-inch diameter perforated drain pipe (with perforations placed downward) should be installed within 4 inches of the bottom of the granular backfill and be discharged to a suitable location. Surface drainage should not be allowed to enter retaining back drains, nor should back drains be tied to under slab blanket drains.

G. Wall backfill should be compacted to a minimum of 90 percent relative compaction. The backfill material should be approved by HKA

H. HKA should observe foundation excavations during to observe anticipated soil conditions and excavation depths.

Retaining Wall Tie Backs

44. Where the structural designer deems tie backs necessary, drilled shaft and grouted tie backs should be used in conjunction with the selected foundation system for the retaining wall.

45. Tie backs should be constructed out of steel reinforcement that extends the entire length of the tie back and concrete grout in the bonded zone (stressing zone). Tie backs

should be designed and constructed, and tested in accordance with the Post Tensioning Manual by the Post Tensioning Institute.

46. Tie backs should be a minimum 6 to 8 inches in diameter. If larger diameter tie backs are needed HKA should be notified to make appropriate adjustments to the recommendations.

47. Tie backs should be a minimum 30 feet in length and installed between 20 to 30 degrees below an imaginary level horizontal line.

48. Tie backs should have a minimum un-bonded length of 15 feet and minimum bonded (stressing) length of 15 feet.

49. The structural designer should use a bond stress between the surface area of the grouted portion of the tie back and the drilled shaft. For non-pressure grouting applications a bond stress of 2000 psf should be applied and for pressure grouting applications 3000 psf should be applied.

50. The bonding strata is fine to medium sands and gravels. This will require either a cased drilled shaft or hollow stem drill augers to keep the shaft from collapsing in the bonded length of the tie back.

Utility Trenches

51. Trenches must be properly shored and braced during construction or laid back at an appropriate angle to prevent sloughing and caving at sidewalls. The project plans and specifications should direct the attention of the contractor to all CAL OSHA and local safety requirements and codes dealing with excavations and trenches.

52. Utility trenches that are parallel to the sides of buildings should be placed so that they do not extend below an imaginary line sloping down and away at a 2:1 (horizontal to vertical) slope from the bottom outside edge of footing elements. The structural design professional should coordinate this requirement with the utility layout plans for the project

53. Trenches should be backfilled with granular-type material and uniformly compacted by mechanical means to the relative compaction as required by county specifications, but not less than 95 percent under paved areas and 90 percent elsewhere. The relative compaction will be based on the maximum dry density obtained from a laboratory compaction curve run in accordance with ASTM Procedure #D1557.

54. We strongly recommend placing a three-foot (3') concrete plug in each trench where it passes under the exterior foundations. Care should be taken not to damage utility lines.

55. Trenches should be capped with 1.5 feet of relatively impermeable soil.

Surface Drainage

56. An engineered drainage plan to handle surface runoff should be developed for this site. Site drainage should be adequately controlled both during and after construction.

57. Surface runoff should be collected into level spreaders to result in sheet flow type discharge.

58. The collected runoff should be discharged in at least two locations to minimize impact. The specific discharge locations should be selected by the engineer who prepares the drainage. As an alternative a single level spreader can be used that promotes sheet type flow. The level spreaders should be located as from the bluff edge as possible. Landward of the 50 year future coastal bluff recession setback is recommended.

59. On-site retention is not recommended within the 50 year future coastal bluff recession setback.

60. All exposed soil should be landscaped and permanently protected against erosion as soon as possible after grading.

61. We recommend that full gutters be used along all roof down eaves to collect storm runoff water and channel it through closed rigid conduits to a suitable discharge point a minimum 10 feet away from all structural improvements.

62. Surface runoff should **not** be allowed to flow onto graded or natural slopes with gradients equal to or steeper than 3:1 (H:V). Consideration should be given to catch basins, berms, concrete v-ditches, or drainage swales at the top of all slopes to intercept runoff and direct it to a suitable discharge point.

63. Surface drainage should include provisions for positive gradients so that surface runoff is not permitted to pond adjacent to foundations and on pavements. Surface drainage should be directed away from the building foundations, at a minimum gradient of 2 percent for a distance of at least 10 feet to an adequate discharge point. Concentrations of surface water runoff should be handled by providing necessary structures, such as paved ditches, catch basins, etc.

64. Irrigation activities at the site should be done in a controlled and reasonable manner. Planter areas should not be sited adjacent to walls; otherwise, measures should be implemented to contain irrigation water and prevent it from seeping into walls and under foundations.

65. The migration of water or spread of extensive root systems below foundations, slabs, or pavements may cause undesirable differential movements and subsequent damage to these structures. Landscaping should be planned accordingly.

66. Drainage patterns approved at the time of fine grading should be maintained throughout the life of proposed structures.

Curtain Drain

67. Groundwater seeping through the terrace deposits perched upon the bedrock formation was encountered at this site. Pervious pavements are also proposed adjacent to some of the new homes. To protect the homes from moisture intrusion through seepage curtain drains should be constructed on the upslope side of the homes extending beyond the footprint a minimum 10 horizontal feet. The curtain drains should also wrap around the sides of the homes where pervious pavement is placed adjacent to the building. Where basement retaining walls with back drains are proposed such as Home A the curtain drain is not required.

68. The curtain drains should be a minimum 12 inches wide and extend to a minimum depth of 18 inches below bottom of foundation elements. The curtain drains should be placed within 3 horizontal feet of the outer most edge of the building foundation. For this project we anticipate curtain drains to be on the order of 4 to 6 feet deep.

69. The trench for the curtain drain should be lined on the side adjacent to the home with a vapor barrier, a 4 inch diameter perforated pipe with holes placed down should be set on a thin bed of gravel along the bottom of the drain, and the trench infilled with drain rock wrapped in filter fabric. The perforated pipe should be connected to a solid drain pipe that conveys the collected drainage away from the trench and discharges it into a level spreader down slope from the home.

Pavement Design

70. R-Value tests have not been performed for this project.

71. To have the selected pavement sections perform to their greatest efficiency, it is very important that the following items be considered:

a. Scarify and moisture condition the top 8 inches of subgrade and compact to a minimum relative compaction of 95 percent, at a moisture content which is about 4 percent above laboratory optimum value.

b. Provide sufficient gradient to prevent ponding of water.

c. Use only quality materials of the type and thickness (minimum) specified. All baserock (R=78 minimum) must meet CALTRANS Standard Specifications for Class 2 Untreated Aggregate Base

(Section 26). All subbase (R=50 minimum) must meet CALTRANS Standard Specifications for Class 2 Untreated Aggregate Subbase, (Section 25). Angular gravel (ASTM D448) or Class II permeable aggregate base (Caltrans Spec) should be used below pervious pavements.

d. Compact the baserock and subbase uniformly to a minimum relative compaction of 95 percent. Gravel or permeable aggregate baserock should be placed in 8 inch lifts and set using a vibratory plate under observation of HKA.

e. Place the asphaltic concrete only during periods of fair weather when the free air temperature is within prescribed limits.

f. Maintenance should be undertaken on a routine basis.

Plan Review, Construction Observation and Testing

72. Our firm should be provided the opportunity for a general review of the project plans prior to construction so that our geotechnical recommendations may be properly interpreted and implemented. The purpose is to determine if this preliminary report is adequate and complete for the final planned grading and construction. It is not intended that the geotechnical engineer approve or disapprove the plans, but to provide an opportunity to update the preliminary report and include additions or qualifications as

necessary. If our firm is not accorded the opportunity of making the recommended review, we can assume no responsibility for misinterpretation of our recommendations.

73. We recommend that our office review the project plans prior to submittal to public agencies, to expedite project review. The recommendations presented in this report require our review of final plans and specifications prior to construction and upon our observation and, where necessary, testing of the earthwork and foundation excavations. Observation of grading and foundation excavations allows anticipated soil conditions to be correlated to those actually encountered in the field during construction.

IMITATIONS AND UNIFORMITY OF CONDITIONS

1. The conclusions and recommendations noted in this report are based on probability and in no way imply that the proposed improvements will not possibly be subjected to ground failure or seismic shaking so intense they will be severely damaged or destroyed.

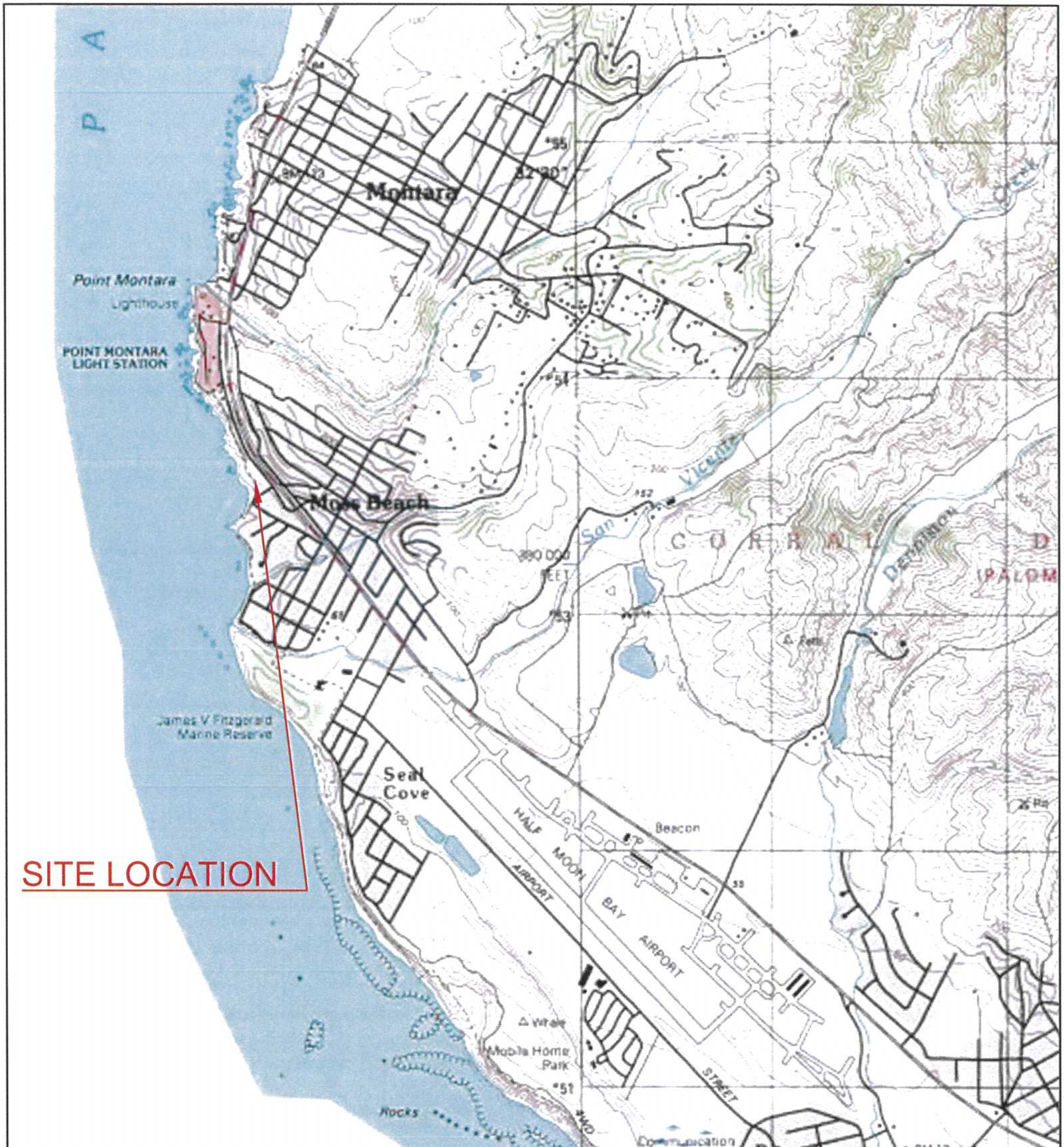
2. This report is issued with the understanding that it is the duty and responsibility of the owner or his representative or agent to ensure that the recommendations contained in this report are brought to the attention of the architects and engineers and contractors for the project, incorporated into the plans and specifications, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice in the Santa Cruz County area. No other warranty, expressed or implied, is made.

4. If any unexpected variations in soil conditions, or if adverse soil conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, Haro, Kasunich and Associates should be notified so that supplemental recommendations can be given.

5. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by changes outside our control. Therefore, this report should not be relied upon after a period of three years without being reviewed by a geotechnical engineer.

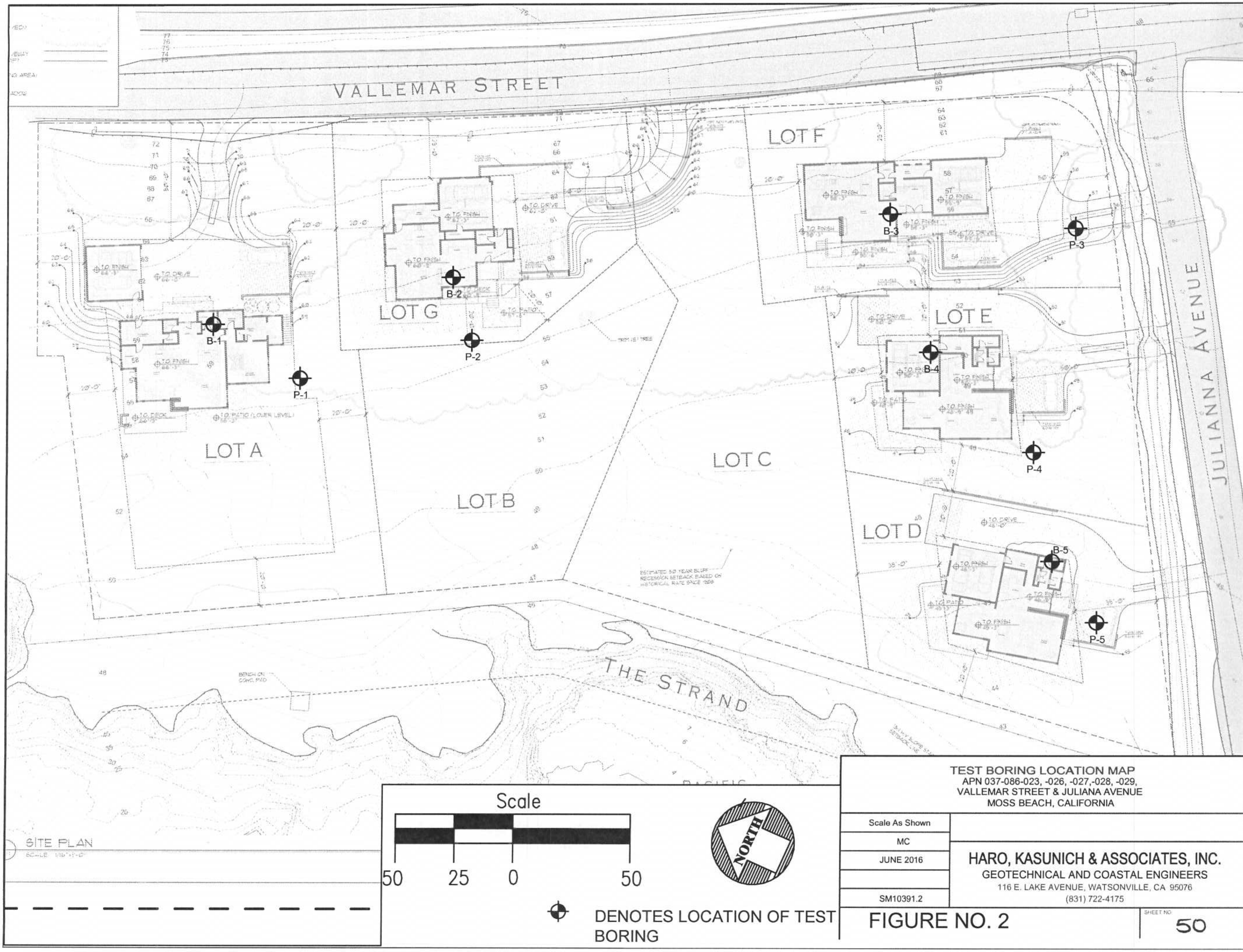
APPENDIX A



SITE VICINITY MAP
APN 037-086-023, -026, -027,-028, -029,
VALLEMAR STREET & JULIANA AVENUE
MOSS BEACH, CALIFORNIA

SCALE No Scale	
DRAWN BY MC	
DATE JUNE 2016	HARO, KASUNICH & ASSOCIATES, INC. GEOTECHNICAL AND COASTAL ENGINEERS 116 E. LAKE AVENUE, WATSONVILLE, CA 95076 (831) 722-4175
REVISED	
JOB NO SM10391.2	

FIGURE NO. 1 SHEET NO 49



DENOTES LOCATION OF TEST BORING

TEST BORING LOCATION MAP
APN 037-086-023, -026, -027,-028, -029,
VALLEMAR STREET & JULIANA AVENUE
MOSS BEACH, CALIFORNIA

Scale As Shown	
MC	
JUNE 2016	HARO, KASUNICH & ASSOCIATES, INC. GEOTECHNICAL AND COASTAL ENGINEERS 116 E. LAKE AVENUE, WATSONVILLE, CA 95076 (831) 722-4175
SM10391.2	

FIGURE NO. 2

SHEET NO 50

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

	200	40	10	4	3/4"	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS PER FOOT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH (TSF)**	BLOWS PER FOOT*
VERY SOFT	0 - ¼	0 - 2
SOFT	¼ - ½	2 - 4
FIRM	½ - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

SAMPLING METHOD

STANDARD PENETRATION TEST	T	
MODIFIED CALIFORNIA	L or M	
PITCHER BARREL	P	
SHELBY TUBE	S	
BULK	B	

H_2O

Final	▽
Initial	▼
Water level designation	

*Number of blows of 140 lb hammer falling 30 inches to drive a 2" O.D. (1⅜" I.D.) split spoon sampler (ASTM D-1586)
**Unconfined compressive strength in tons/ft² as determined by laboratory testing or approximated by the Standard Penetration Test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

Haro Kasunich & Associates	KEY TO LOGS VALLEMAR STREET & JULIANA AVENUE MOSS BEACH, CALIFORNIA	Project No. SM10391.2 JUNE 2016	Figure No. 3

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Street

PROJECT NO. SM10391.2

LOGGED BY MC **DATE DRILLED** 3-22-16 **BORING DIAMETER** 4" **BORING NO.** B-1

Depth, ft.	Sample No. and type	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0		Iceplant/roots	SM-CL					
	1-1-1 (L)	Brown Silty SAND with CLAY bindfer fine to medium grain, 1/4 inch clasts, wet, loose		19		113	12.7	(1-1) Atterberg Limits PI = 9 LL = 18.4%
	1-2 (T)	Brown orange Sandy CLAY, fine to medium grain, moist, very stiff	CL	21			17.2	
5	1-3-1 (L)	Same as above		36				(1-2) PI = 25 LL = 36.8
	1-4 (T)	Grading to a brown orange Clayey SAND, fine to medium grain, damp to moist, medium dense	SC	28				
10	1-5-1 (L)	Brown tan grey Silty SAND, fine to medium grain, damp to dry, cemented, very dense terrace deposit		50/6"				
	1-6 (T)	harder drilling at 11 feet		49				
		Brown Silty SAND with CLAY binder, fine to medium grain, damp, very dense						
15		Boring terminated at 13.5 feet						

SuperLog CivilTech Software, USA www.civiltech.com File: C:\superlog4\HKALOGS\SM10391.2 Vallemar Street.log Date: 6/27/2016

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr FIGURE NO. 4

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Street

PROJECT NO. SM10391.2

LOGGED BY MC | DATE DRILLED 3-22-16 | BORING DIAMETER 4" | BORING NO. B-2

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Topsoil/roots						
	2-1-1 (L)		Dark brown Clayey SAND, fine to medium grain, wet, loose	SC	20			15.3	Atterberg Limits PI = 22 LL = 31.5%
	2-2 (T)		Mottled brown orange grey Sandy CLAY, fine grain, moist, very stiff	CL	24				
5	2-3- (L)		Same as above		32				
	2-4 (T)		Same as above		26				
10	2-5-1 (L)		Grey with orange mottling Sandy CLAY, fine to medium grain, moist, very stiff coastal terrace	CL	38				
	2-6 (T)				22				
15	2-7 (T)		Grey with orange and rust mottling Silty SAND, fine to medium grain, damp, dense, terrace	SM	48				
20	2-8 (T)		Grey fine to medium SAND, wet to saturated, dense	SW	35				
			Boring terminated at 21.5 feet						
25									
30									
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 5

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Street

PROJECT NO. SM10391.2

LOGGED BY MC | DATE DRILLED 3-22-16 | BORING DIAMETER 4" | BORING NO. B-3

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Roots/topsoil						
	3-1-1 (L)		Black Sandy CLAY, fine to medium grain, wet, firm	CL	19		110	17.2	Atterberg Limits PI = 18 LL = 30.3%
	3-2 (T)				19				
5	3-3-1 (L)		Brown orange grey Sandy CLAY, fine to medium grain, moist, stiff, terrace deposit	CL	35			15.5	PI = 28 LL = 37.9%
	3-4 (T)		Brown orange grey Clayey SAND, fine to coarse grain, moist to damp, medium dense	SC	28				
10	3-5- (L)		Same as above		53				
15									
			Grey fine SAND with SILT, saturated	SP-ML					
20	3-6 (T)				10				
			Boring terminated at 21.5 feet						
25									
30									
35									

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HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 6

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Street

PROJECT NO. SM10391.2

LOGGED BY MC **DATE DRILLED** 3-24-16 **BORING DIAMETER** 4" **BORING NO.** B-4

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Sandy CLAY, fine to medium grain, saturated, very loose	CL	6				
	4-1-1 (L)							18.8	Atterberg Limits Pi = 38 LL = 48.3%
			Brown CLAY, wet, firm	CL					
	4-2 (T)		Grey light brown sandy Lean CLAY, fine to medium grain, moist, very stiff, terrace	CL	12			15.5	
5	4-3-1 (L)		Same as above		34				(4-2) PI = 27 LL = 36.6%
	4-4 (T)		Same as above		22				(4-3) Unconfined Compression Test Qu = 8003 psf C = 2000 psf ϕ = 10°
			Grey Clayey SAND interbedded, moist with orange Clayey SILT, saturated	SC-ML					
10	4-5-1 (L)		Grey with light orange mottling Clayey SAND, fine to medium grain, moist, medium dense	SC	25				
15	4-6-1 (L)		Blue grey SAND with SILT, fine to medium grain, wet to saturated, weathered rock, medium dense to dense	SW-ML	53				
20									
			Harder drilling at 22 feet then broke through to soft gain						
25			Drill auger refusal at 25 feet Boring terminated at 25.01 feet						
30									
35									

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HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr FIGURE NO. 7

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Street

PROJECT NO. SM10391.2

LOGGED BY MC **DATE DRILLED** 3-24-16 **BORING DIAMETER** 4" **BORING NO.** B-5

Depth, ft.	Sample No. and type	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0		Iceplant and topsoil						
	5-1-1 (L)	Dark brown Clayey SAND, fine to medium grain, saturated, very loose	SC	7				
	5-2 (T)	Dark brown CLAY, moist, firm	CL	8				
		Brown Sandy CLAY, fine to medium grain, moist, medium dense, terrace	CL					
5	5-3-1 (L)	Grey orange mottling, Sandy CLAY, fine to coarse, grain, moist, very stiff	CL	36				
	5-4 (T)			20				
		Brown orange SAND, fine to medium grain, wet, medium dense	SW					
10	5-5-1 (L)			50		97	15.6	Saturated Direct Shear Test C = 0 psf $\phi = 43^{\circ}$
		Blue grey fine to medium SAND, saturated, dense	SW					
15	5-6 (T)			29				
		Boring terminated at 16.5 feet						
20								
25								
30								
35								

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr FIGURE NO. 8

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Bluff

PROJECT NO. SM10391.2

LOGGED BY JD | DATE DRILLED March 30, 2016 | BORING DIAMETER 6" | BORING NO. P-1

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND with Clay and Organics, roots, moist, loose (Topsoil)	TP					
			Dark brown Silty SAND, fine to medium grain, moist (Terrace)	SM					
2			Boring terminated at 2.1 feet						
4									
6									
8									
10									
12									
14									

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\HKALOGS\SM10391.2 Vallemar Bluff.log Date: 6/27/2016

HARO, KASUNICH AND ASSOCIATES, INC.

BY: dk | FIGURE NO. 9

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Bluff

PROJECT NO. SM10391.2

LOGGED BY JD | DATE DRILLED March 30, 2016 | BORING DIAMETER 6" | BORING NO. P-2

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND with Clay and Organics, roots, moist, loose (Topsoil)	TP					
			Dark brown Silty SAND, fine to medium grain, moist (Terrace)	SM					
2			Boring terminated at 2.1 feet						
4									
6									
8									
10									
12									
14									

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\HKALOGS\SM10391.2 Vallemar Bluff.log Date: 6/27/2016

HARO, KASUNICH AND ASSOCIATES, INC.

BY: dk | FIGURE NO. 10

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Bluff

PROJECT NO. SM10391.2

LOGGED BY JD | DATE DRILLED March 30, 2016 | BORING DIAMETER 6" | BORING NO. P-3

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND, fine grain, roots, moist, loose (Topsoil)	TP					
			Dark brown Silty SAND, fine to medium grain, damp to moist, loose to medium dense	SM					
4			Boring terminated at 4.0 feet						

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14

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HARO, KASUNICH AND ASSOCIATES, INC.

BY: dk | FIGURE NO. 11

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Bluff

PROJECT NO. SM10391.2

LOGGED BY	JD	DATE DRILLED	March 30, 2016	BORING DIAMETER	6"	BORING NO.	P-4

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND, fine grain, moist, roots, loose, topsoil	TP					
			Orange tan Sandy CLAY, moist, terrace	CL					
2		▼							
			Boring terminated at 2.9 feet						
4									
6									
8									
10									
12									
14									

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\HKALOGS\SM10391.2 Vallemar Bluff.log Date: 6/27/2016

HARO, KASUNICH AND ASSOCIATES, INC.

BY: dk | FIGURE NO. 12

Haro, Kasunich & Associates, Inc.
Coastal and Geotechnical Engineers

Vallemar Bluff

PROJECT NO. SM10391.2

LOGGED BY JD **DATE DRILLED** March 30, 2016 **BORING DIAMETER** 6" **BORING NO.** P-5

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND, fine grain, moist, roots, loose, topsoil	TP					
			Orange tan Sandy CLAY, moist, terrace	CL					
2									
4									
			Boring terminated at 4.5 feet						
6									
8									
10									
12									
14									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: dk **FIGURE NO.** 13

Direct Shear

Project:	Vallemar Bluff
Sample #	5-5-1
Description	Orange Brown Silty Sand

Date	4/7/2016
Tested By:	MA

Test Number	1	2	3	4
Normal Pressure (PSF)	530	1030	2030	4030
Max Shear Stress	13.4	33.5	64.7	
Shear Stress (PSF)	394.6	986.4	1902.2	

Equation of Trendline	
Intercept	Slope
0	0.9312

C (PSF)	PHI
0	43

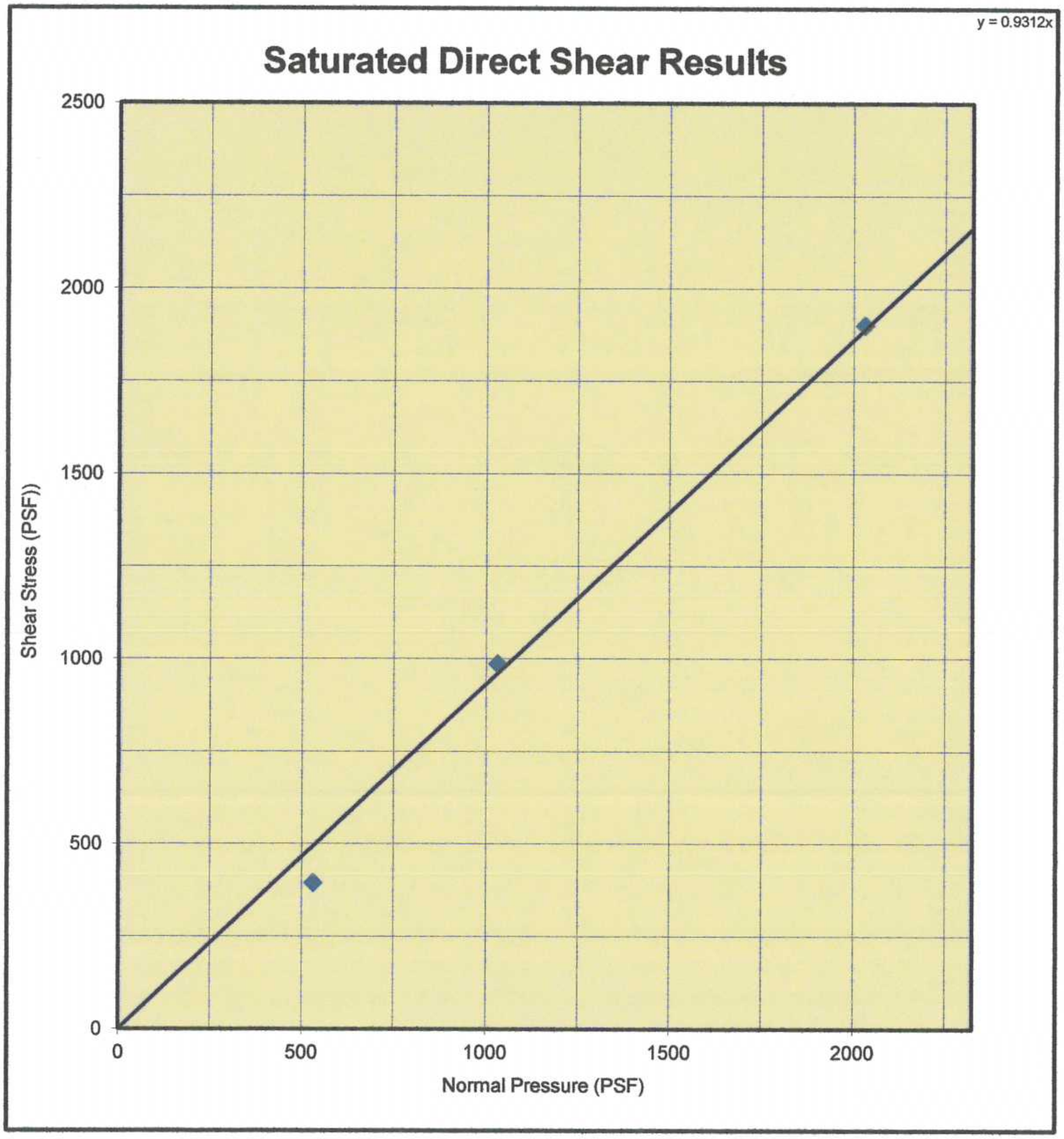
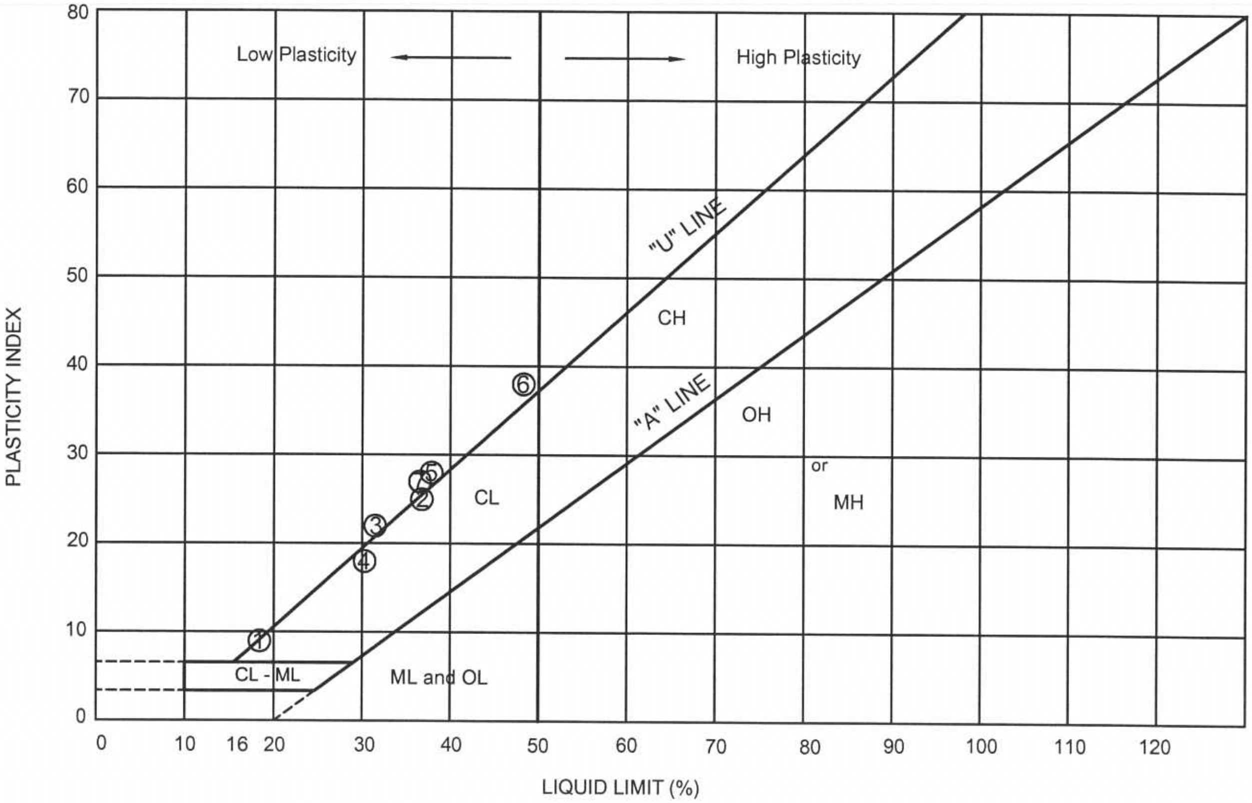


Figure No.	14

PLASTICITY CHART



PLASTICITY DATA

Key Symbol	Sample Number	Depth (feet)	Natural Water Content W(%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index	Liquidity Index (W - PL)/(LL - PL)	Unified Soil Classification Symbol
①	1-1	2.0	12.7	10.3	18.4	9	+0.2667	CL
②	1-2	3.5	17.2	12.6	36.8	25	+0.1840	CL
③	2-1	2.0	15.3	9.9	31.5	22	+0.2455	CL
④	3-1	2.0	17.2	17.1	30.3	18	+0.0056	CL
⑤	3-3	5.0	15.5	10.2	37.9	28	+0.1893	CL
⑥	4-1	2.5	18.8	10.8	48.3	38	+0.2105	CL
⑦	4-2	3.5	15.5	9.7	36.6	27	+0.2148	CL

ATTERBERG LIMITS TEST RESULTS
APN 037-086-023, -026, -027,-028, -029,
VALLEMAR STREET & JULIANA AVENUE
MOSS BEACH, CALIFORNIA

SCALE: No Scale
DRAWN BY: MC
DATE: JUNE 2016
REVISED:
JOB NO: SM10391.2

HARO, KASUNICH & ASSOCIATES, INC.
GEOTECHNICAL AND COASTAL ENGINEERS
116 E. LAKE AVENUE, WATSONVILLE, CA 95076
(831) 722-1475

FIGURE NO. 15

SHEET NO. 63

ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

TEL: 831-724-5422
FAX: 831-724-3188

Work Order #: 6040263
Account #: 2953
Date Received: April 7, 2016
Date Reported: April 11, 2016

Haro - Kasunich and Assoc.
116 East Lake Avenue
Watsonville, CA 95076

Reporting Date: April 11, 2016

Date Received: April 7, 2016
Project#/Name: SM 10391.2 / Vallemar Bluff
Matrix: Soil

Sample Identification	pH (units)	Chloride (mg/Kg)	Sulfate (mg/Kg)	Resistivity (ohms x cm)
LOT A	4.4	470	130	240
LOT E	5.8	540	290	240
	Method CalTest 643 June 2007	**Method** CalTest 422 April 2000	**Method** CalTest 417 March 1999	**Method** CalTest 643 June 2007

Mike Galloway

Figure No. 16

APPENDIX B

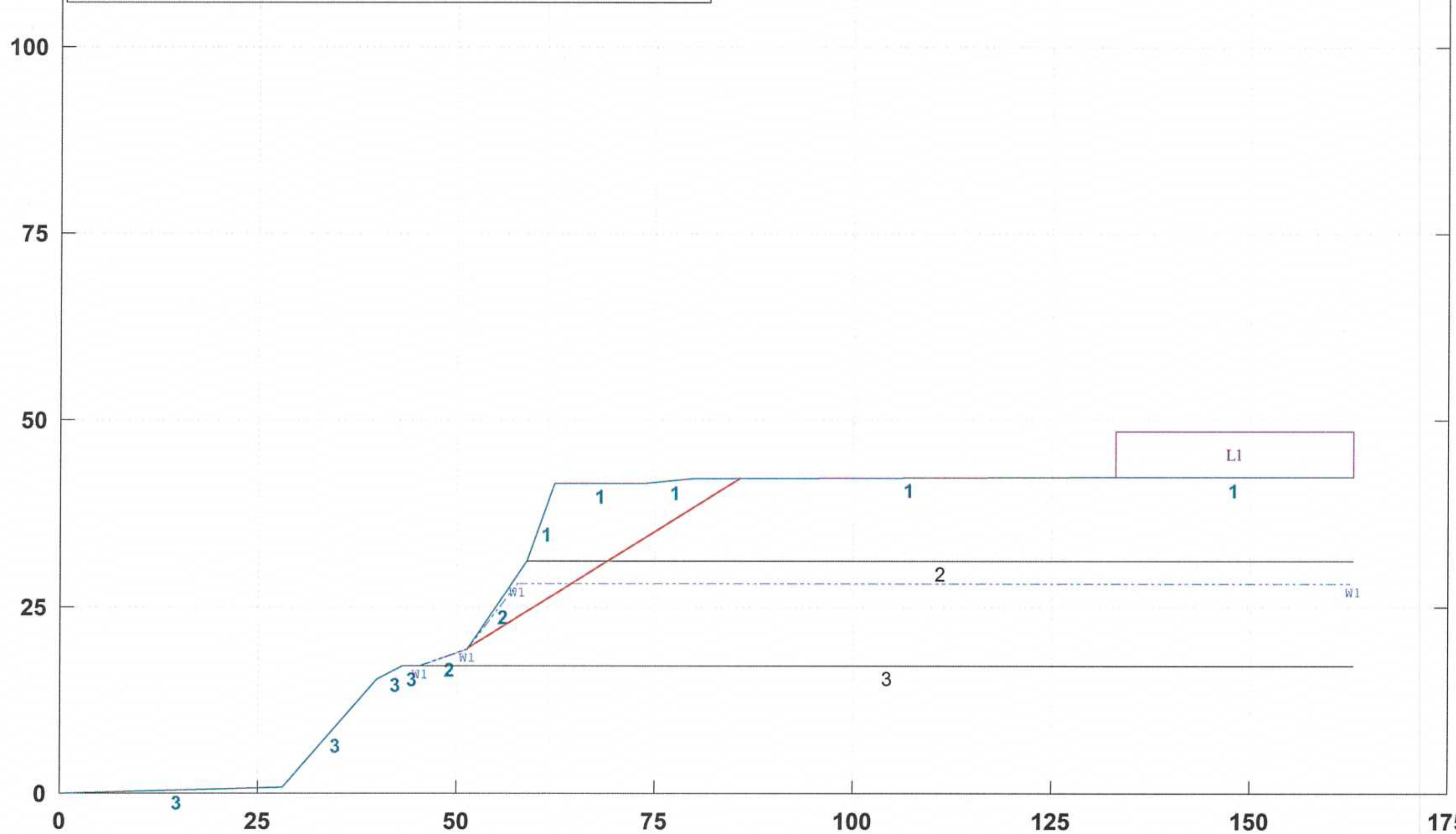
Slope Stability Analysis Results

VALLEMAR ST AND JULIANA AVE SLOPE ST ABILITY ANALYSIS SECTION 3 STATIC

c:\users\moses\documents\projects\san mateo\coastal bluff\vallemar bluff\slope stability\stability section 3 stc.plt Run By: Moses Cuprill, P.E. 6/25/2016 06:14PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Piez. Surface No.
CLAY	1	123.0	133.0	1000.0	10.0	0.00	W1
SOIL MIX	2	113.0	120.0	200.0	43.0	0.00	W1
BEDROCK	3	135.0	140.0	1000.0	45.0	0.00	0

Load	Value
L1	500 psf



GSTABL7 v.2 FSmin=2.48

Factor Of Safety Is Calculated By The Simplified Janbu Method

Haro, Kasunich & Associates, Inc.

66

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **

****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/25/2016
Time of Run: 06:14PM
Run By: Moses Cuprill, P.E.
Input Data Filename: C:\Users\Moses\Documents\Projects\San Mateo\Coastal Bluff\Vallemar Bluff\sLOPE sTABILITY\stability section 3 stc.in
Output Filename: C:\Users\Moses\Documents\Projects\San Mateo\Coastal Bluff\Vallemar Bluff\sLOPE sTABILITY\stability section 3 stc.OUT
Unit System: English
Plotted Output Filename: C:\Users\Moses\Documents\Projects\San Mateo\Coastal Bluff\Vallemar Bluff\sLOPE sTABILITY\stability section 3 stc.PLT
PROBLEM DESCRIPTION: VALLEMAR ST AND JULIANA AVE SLOPE ST
ABILITY ANALYSIS SECTION 3 STATIC

BOUNDARY COORDINATES
11 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	0.00	28.20	0.80	3
2	28.20	0.80	40.00	15.20	3
3	40.00	15.20	43.20	17.10	3
4	43.20	17.10	45.40	17.20	3
5	45.40	17.20	51.40	19.30	2
6	51.40	19.30	58.80	31.20	2
7	58.80	31.20	62.30	41.50	1
8	62.30	41.50	73.70	41.50	1
9	73.70	41.50	79.80	42.20	1
10	79.80	42.20	132.70	42.30	1
11	132.70	42.30	163.00	42.30	1
12	58.80	31.20	163.00	31.20	2
13	45.40	17.20	163.00	17.20	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	123.0	133.0	1000.0	10.0	0.00	0.0	1
2	113.0	120.0	200.0	43.0	0.00	0.0	1
3	135.0	140.0	1000.0	45.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 4 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	45.40	17.20
2	51.40	19.30
3	57.60	28.20
4	163.00	28.20

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)

```
  1          133.00        163.00         500.0            0.0
NOTE - Intensity Is Specified As A Uniformly Distributed
       Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) =   0.890(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.510(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
EARTHQUAKE DATA HAS BEEN SUPPRESSED
Janbu's Empirical Coef. is being used for the case of  c & phi both > 0
Trial Failure Surface Specified By  2 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         51.500       19.461
    2         85.720       42.211
Janbu's Empirical Coefficient (fo) =  1.000
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface =  2.481
     ***Table 1 - Individual Data on the    9 Slices***
```

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.1	2049.2	0.0	707.5	0.0	0.0	0.0	0.0	0.0
3	1.2	893.0	0.0	385.3	0.0	0.0	0.0	0.0	0.0
4	3.5	4547.0	0.0	714.0	0.0	0.0	0.0	0.0	0.0
5	2.3	3985.3	0.0	137.0	0.0	0.0	0.0	0.0	0.0
6	4.5	6481.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	4.5	4911.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	6.1	4203.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	5.9	1428.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2 - Base Stress Data on the 9 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	33.62	51.51	0.03	193.22	0.66
2	33.62	54.56	7.30	407.38	186.67
3	33.62	58.20	1.44	619.31	411.99
4	33.62	60.55	4.20	1203.90	719.26
5	33.62	63.47	2.82	1671.16	940.88
6	33.62	66.90	5.42	1479.07	795.25
7	33.62	71.43	5.45	1365.25	598.58
8	33.62	76.75	7.33	1285.98	381.50
9	33.62	82.76	7.11	1195.46	133.63

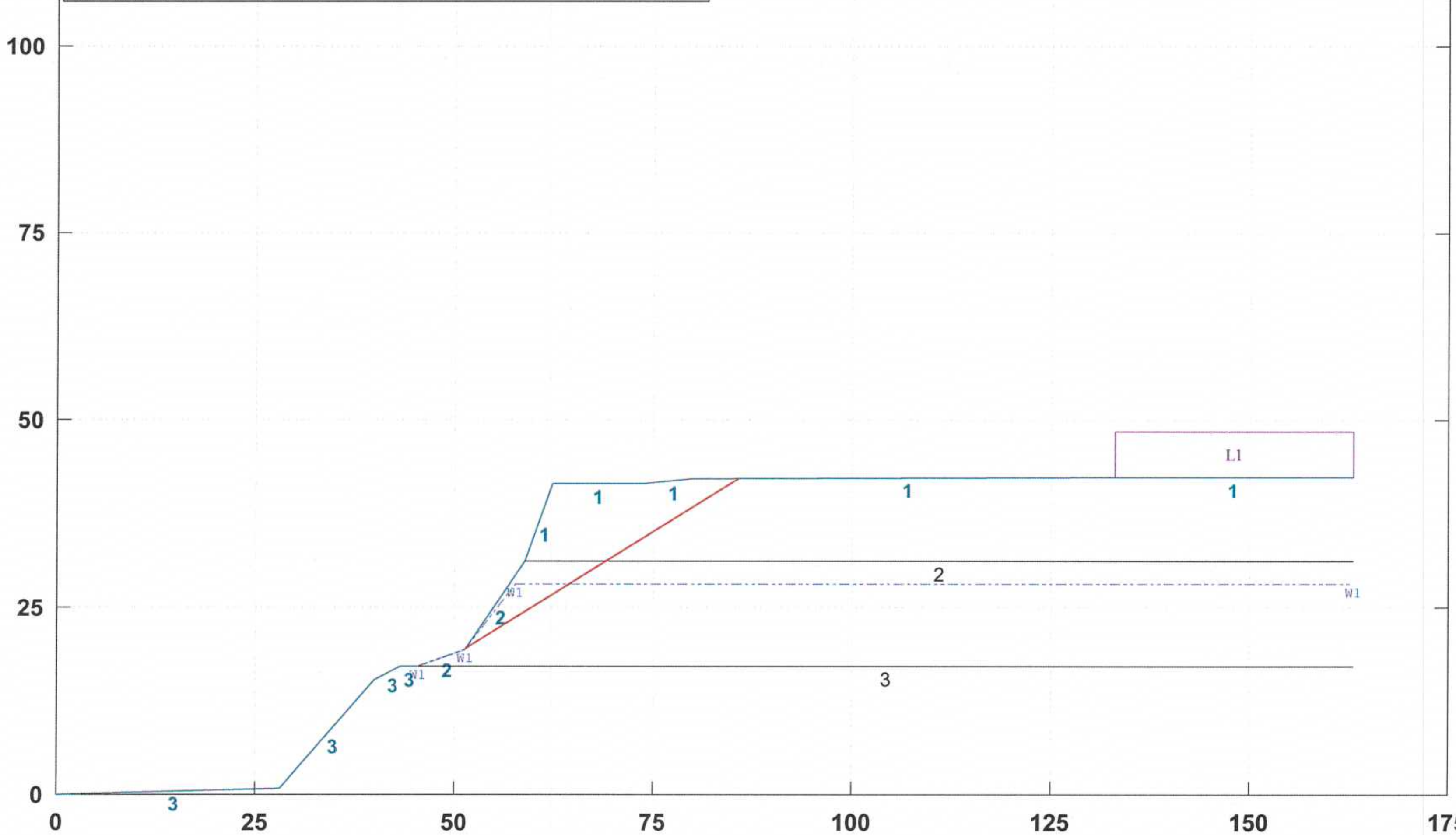
```
Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) =   47011.89 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =   1144.05(psf)
Sum of the Driving Forces =     18947.37 (lbs)
Average Mobilized Shear Stress =      461.09(psf)
Total length of the failure surface =      41.09(ft)
              **** END OF GSTABL7 OUTPUT ****
```

VALLEMAR ST AND JULIANA AVE SLOPE ST ABILITY ANALYSIS SECTION 3 SEISMIC

c:\users\moses\documents\projects\san mateo\coastal bluff\vallemar bluff\slope stability\stability section 3 smc.plt Run By: Moses Cuprill, P.E. 6/25/2016 06:13PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Piez. Surface No.
CLAY	1	123.0	133.0	1000.0	10.0	0.00	W1
SOIL MIX	2	113.0	120.0	200.0	43.0	0.00	W1
BEDROCK	3	135.0	140.0	1000.0	45.0	0.00	0

Load	Value
L1	500 psf
Peak(A)	0.890(g)
kh Coef.	0.510(g)<



GSTABL7 v.2 FSmin=1.27

Factor Of Safety Is Calculated By The Simplified Janbu Method

Haro, Kasunich & Associates, Inc.

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **

** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/25/2016
Time of Run: 06:13PM
Run By: Moses Cuprill, P.E.
Input Data Filename: C:\Users\Moses\Documents\Projects\San Mateo\Coastal Bluff\Vallemar Bluff\sLOPE sTABILITY\stability section 3 smc.in
Output Filename: C:\Users\Moses\Documents\Projects\San Mateo\Coastal Bluff\Vallemar Bluff\sLOPE sTABILITY\stability section 3 smc.OUT
Unit System: English
Plotted Output Filename: C:\Users\Moses\Documents\Projects\San Mateo\Coastal Bluff\Vallemar Bluff\sLOPE sTABILITY\stability section 3 smc.PLT
PROBLEM DESCRIPTION: VALLEMAR ST AND JULIANA AVE SLOPE ST
ABILITY ANALYSIS SECTION 3 SEISMIC

BOUNDARY COORDINATES
11 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	0.00	28.20	0.80	3
2	28.20	0.80	40.00	15.20	3
3	40.00	15.20	43.20	17.10	3
4	43.20	17.10	45.40	17.20	3
5	45.40	17.20	51.40	19.30	2
6	51.40	19.30	58.80	31.20	2
7	58.80	31.20	62.30	41.50	1
8	62.30	41.50	73.70	41.50	1
9	73.70	41.50	79.80	42.20	1
10	79.80	42.20	132.70	42.30	1
11	132.70	42.30	163.00	42.30	1
12	58.80	31.20	163.00	31.20	2
13	45.40	17.20	163.00	17.20	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	123.0	133.0	1000.0	10.0	0.00	0.0	1
2	113.0	120.0	200.0	43.0	0.00	0.0	1
3	135.0	140.0	1000.0	45.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 4 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	45.40	17.20
2	51.40	19.30
3	57.60	28.20
4	163.00	28.20

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)

```
  1         133.00        163.00        500.0          0.0
NOTE - Intensity Is Specified As A Uniformly Distributed
       Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) =   0.890(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.510(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
Janbu's Empirical Coef. is being used for the case of  c & phi both > 0
Trial Failure Surface Specified By  2 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        51.500      19.461
    2        85.720      42.211
Janbu's Empirical Coefficient (fo) =  1.000
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface =  1.270
     ***Table 1 - Individual Data on the    9 Slices***
```

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.1	2049.2	0.0	707.5	0.0	0.0	1045.1	0.0	0.0
3	1.2	893.0	0.0	385.3	0.0	0.0	455.4	0.0	0.0
4	3.5	4547.0	0.0	714.0	0.0	0.0	2319.0	0.0	0.0
5	2.3	3985.3	0.0	137.0	0.0	0.0	2032.5	0.0	0.0
6	4.5	6481.7	0.0	0.0	0.0	0.0	3305.7	0.0	0.0
7	4.5	4911.2	0.0	0.0	0.0	0.0	2504.7	0.0	0.0
8	6.1	4203.4	0.0	0.0	0.0	0.0	2143.7	0.0	0.0
9	5.9	1428.9	0.0	0.0	0.0	0.0	728.7	0.0	0.0

Table 2 - Base Stress Data on the 9 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	33.62	51.51	0.03	162.26	1.17
2	33.62	54.56	7.30	342.11	329.87
3	33.62	58.20	1.44	520.08	728.04
4	33.62	60.55	4.20	1011.01	1271.02
5	33.62	63.47	2.82	1403.40	1662.64
6	33.62	66.90	5.42	1242.09	1405.29
7	33.62	71.43	5.45	1308.90	1057.76
8	33.62	76.75	7.33	1232.89	674.16
9	33.62	82.76	7.11	1146.11	236.14

```
Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) =  42507.43 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =  1034.43(psf)
Sum of the Driving Forces =   33482.20 (lbs)
Average Mobilized Shear Stress =    814.80(psf)
Total length of the failure surface =    41.09(ft)
       *** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) =  0.7575(g)
Calculated Newmark Seismic Displacement =   0.119(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
              **** END OF GSTABL7 OUTPUT ****
```

Project No. SM10391.2
12 August 2016

APPENDIX C

Coastal Bluff Recession Map and Sections

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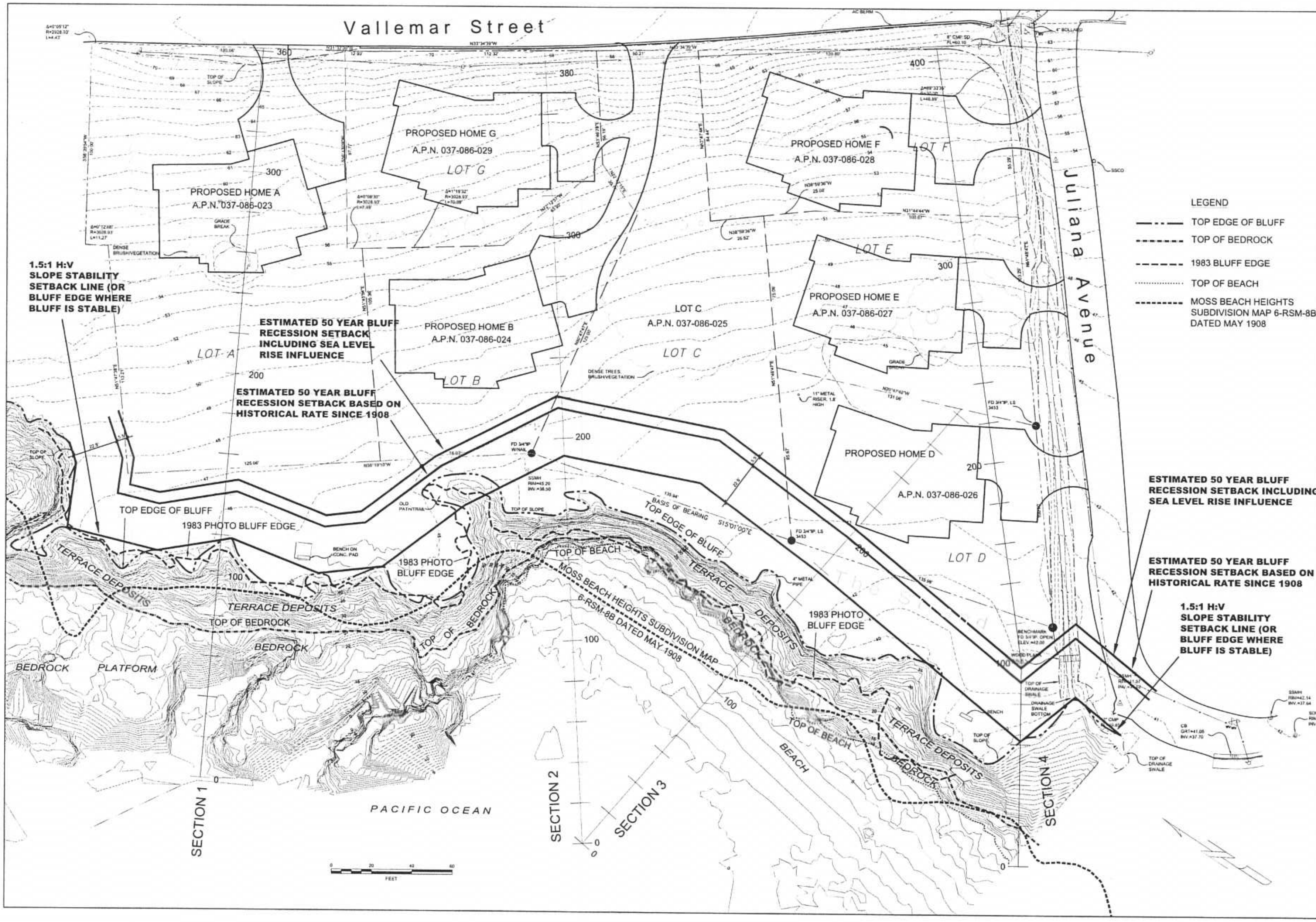

REVISIONS	BY

COASTAL BLUFF RECESSION MAP
MOSS BEACH ASSOCIATES, LLC
VALLEMAR STREET & JULIANA AVENUE, MOSS BEACH, CA
SAN MATEO COUNTY A.P.N.'S 037-086-023, 024, 025, 026, 027, 028 & 029

HARO, KASUNICH AND ASSOCIATES, INC.
CONSULTING CIVIL, GEOTECHNICAL & COASTAL ENGINEERS
116 EAST LAKE AVE., WATSONVILLE, CA 95076 (831) 722-4175

Date	3/9/2015
Scale	AS SHOWN
Drawn	MF
Job	
Sheet	1 OF 2 SHEETS

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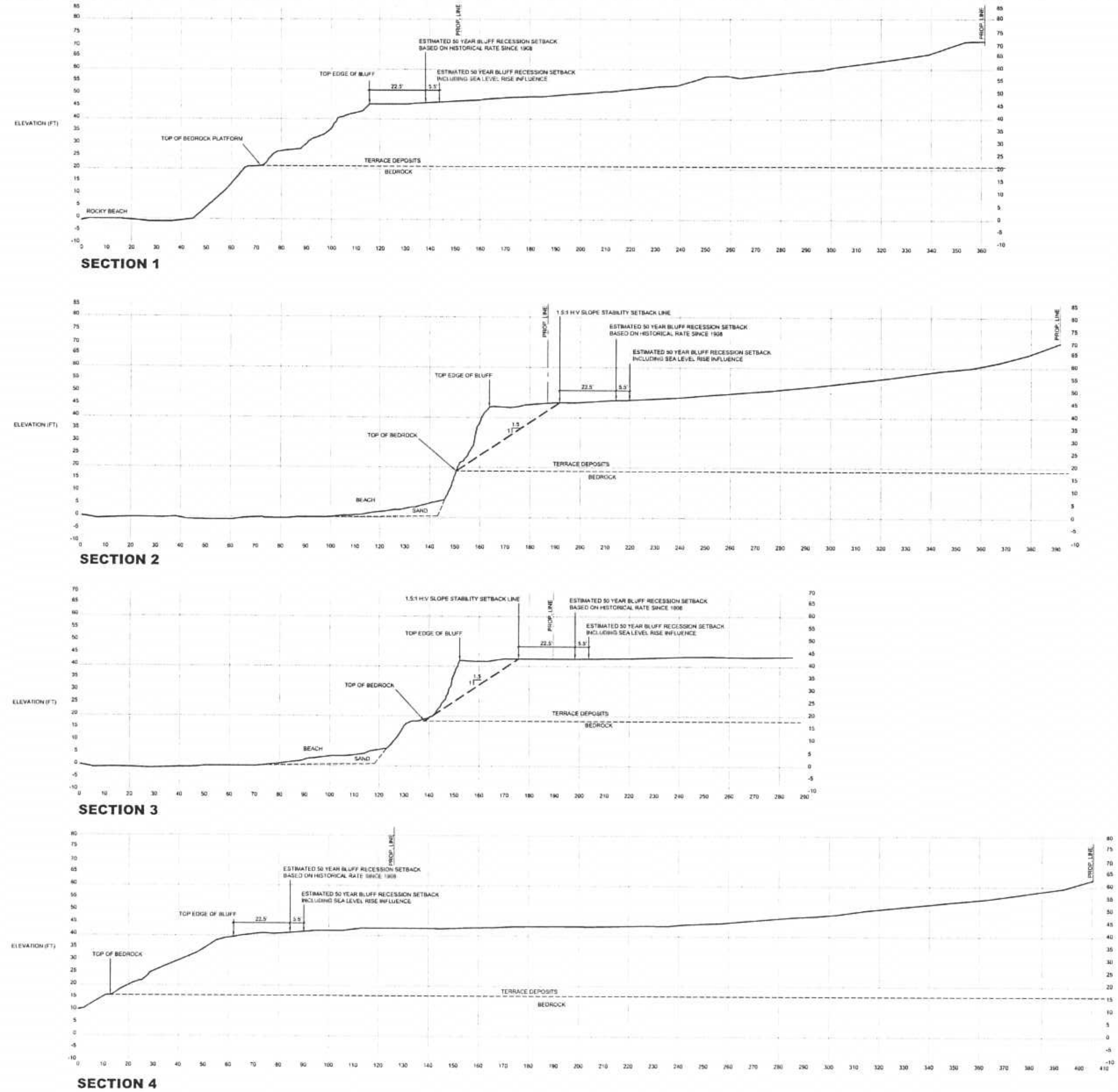


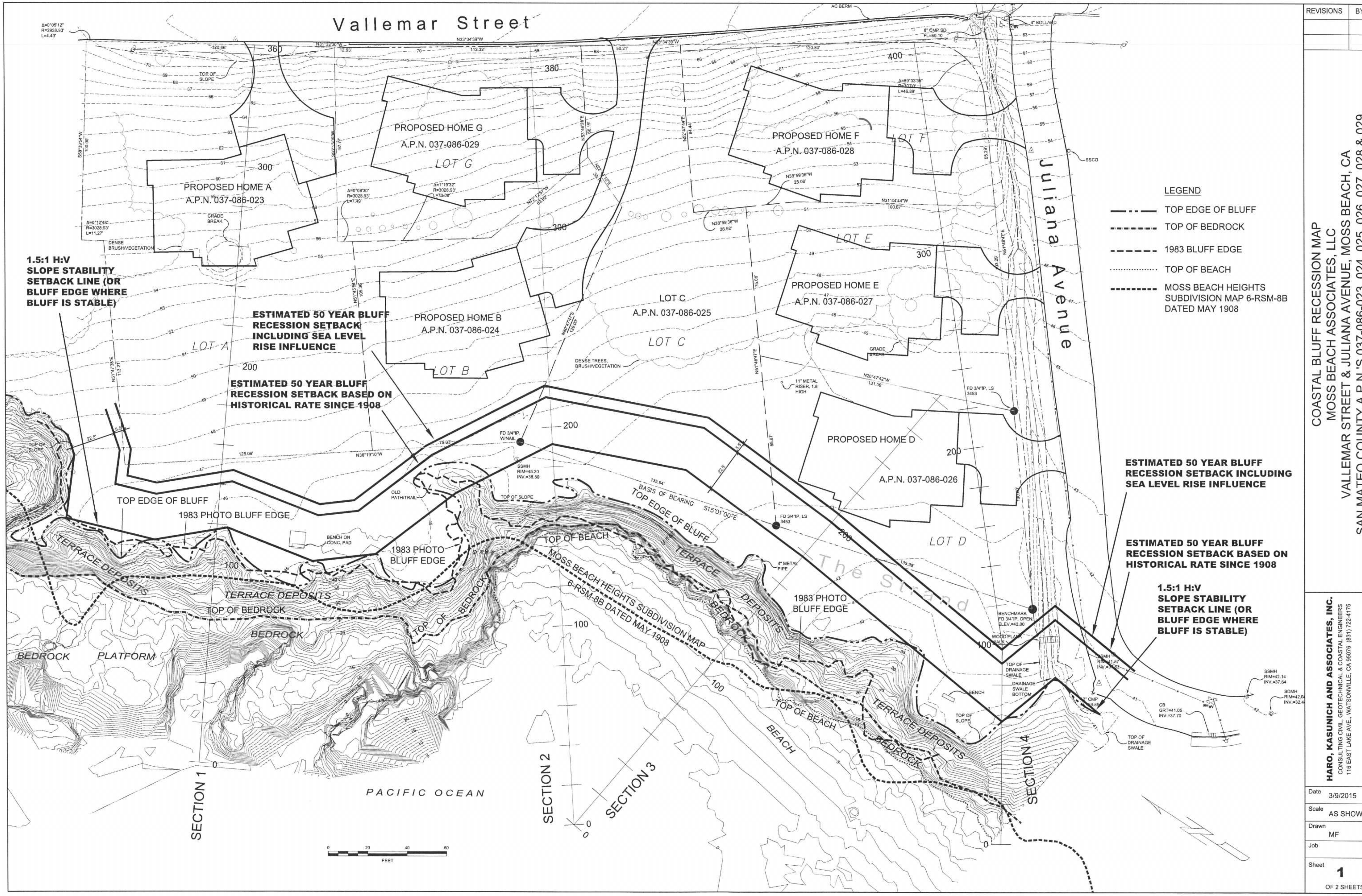
COASTAL BLUFF RECESSION CROSS SECTIONS

MOSS BEACH ASSOCIATES, LLC
VALLEMAR STREET & JULIANA AVENUE, MOSS BEACH, CA
SAN MATEO COUNTY A.P.N.'S 037-086-023, 024, 025, 026, 027, 028 & 029

REVISIONS	BY

HARO, KASUNICH AND ASSOCIATES, INC.
CONSULTING CIVIL, GEOTECHNICAL & COASTAL ENGINEERS
116 EAST LAKE AVE., WATSONVILLE, CA 95076 (831) 722-4175

Date	3/9/2015
Scale	AS SHOWN
Drawn	MF
Job	
Sheet	2 OF 2 SHEETS



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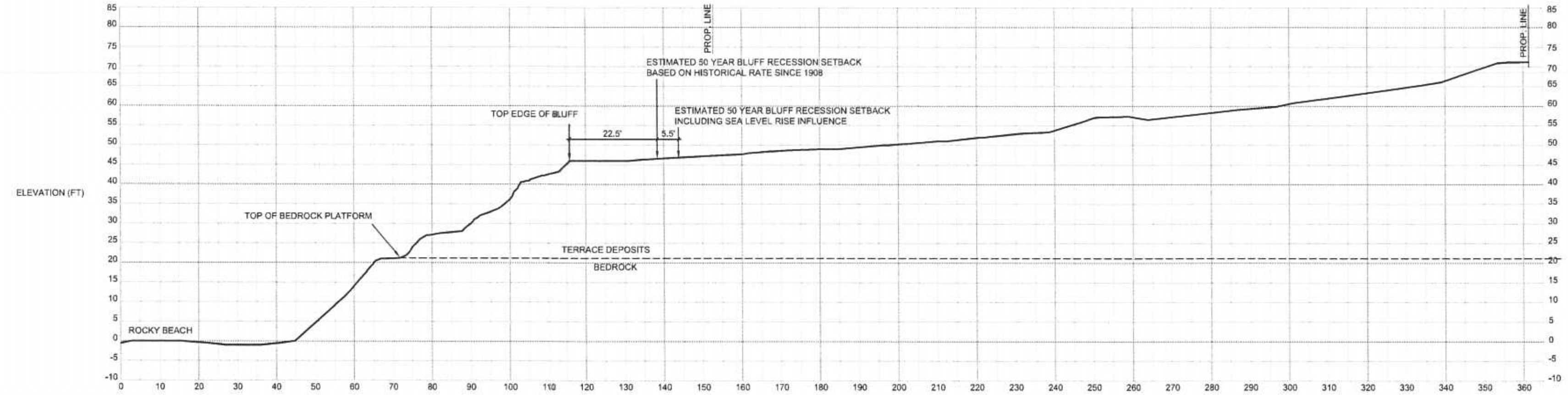

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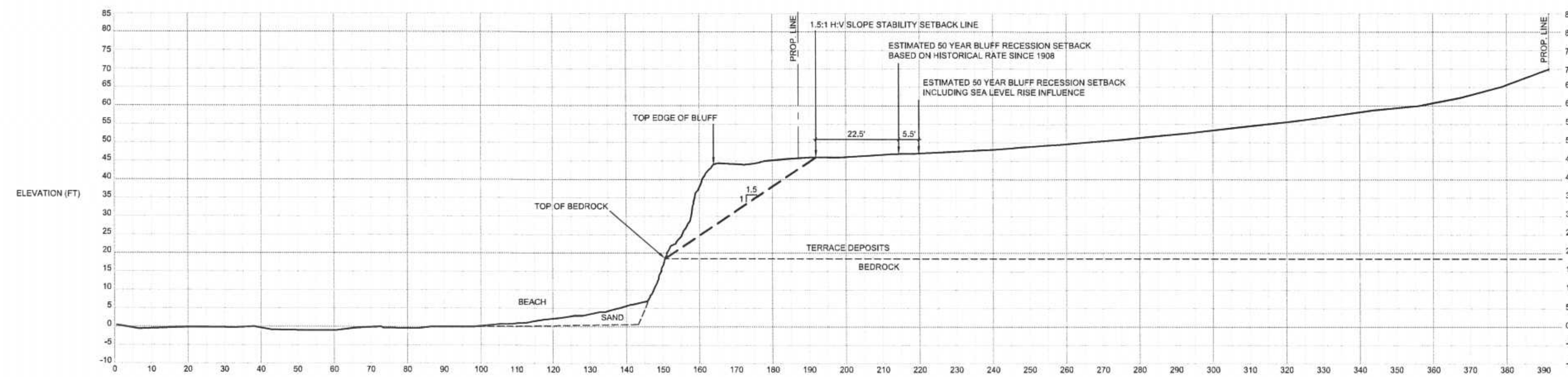

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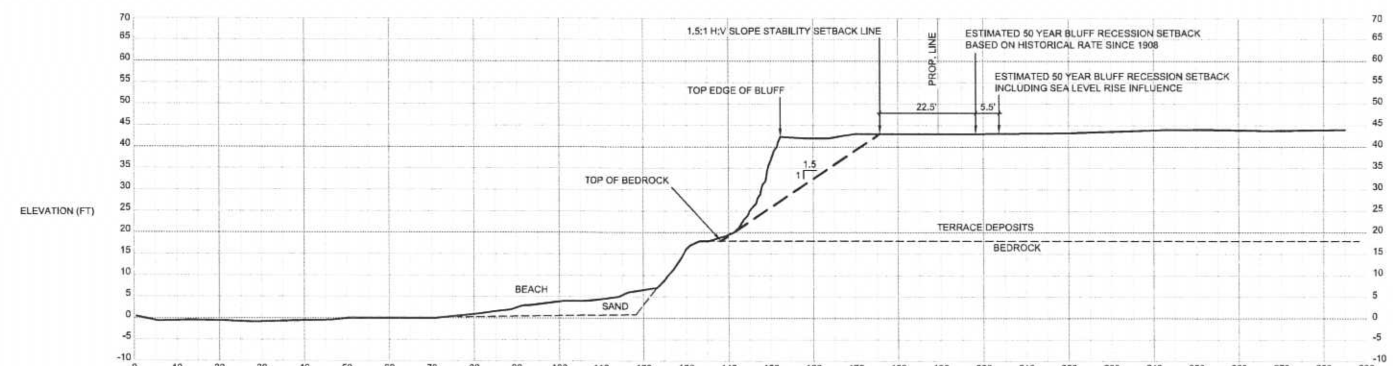

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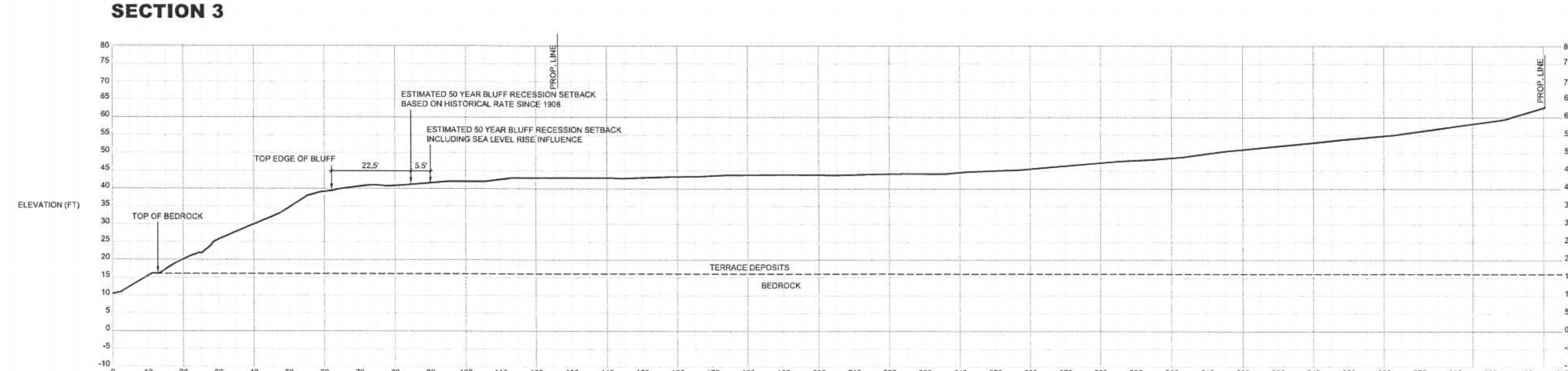

SECTION 4

REVISIONS	BY

COASTAL BLUFF RECESSION CROSS SECTIONS
MOSS BEACH ASSOCIATES, LLC
VALLEMAR STREET & JULIANA AVENUE, MOSS BEACH, CA
SAN MATEO COUNTY A.P.N.'S 037-086-023, 024, 025, 026, 027, 028 & 029

HARO, KASUNICH AND ASSOCIATES, INC.
CONSULTING CIVIL, GEOTECHNICAL & COASTAL ENGINEERS
116 EAST LAKE AVE., WATSONVILLE, CA 95076 (831) 722-4175

Date 3/9/2015
Scale AS SHOWN
Drawn MF
Job
Sheet **2** OF 2 SHEETS

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APPENDIX D

Percolation Test Results

Percolation Test Results For Vallemar Street and Jullaina APN 037-086-023

Project No: SM10391.2

Date: 31 APRIL 2016

By: Haro, Kasunich and Associates

HOLE NO.:	P-1		TEST DATE:3/31/16 DRILL DATE: 3/30/16			
WATER LEVEL AFTER PRE-SOAK:	Dry		DEPTH OF BORING (feet) 2.146			
TESTED BY:	JD		PERCOLATION ZONE (feet):		1.146	2.146
READING	ELAPSED TIME (min)	WATER DEPTH (feet)	REFILL TO (feet)	Incremental Change (in.)	PERCOLATION RATE (min/inch)	PERC (in/hr)
Start	0	1.6250	-	-	-	-
1	40	1.7917	1.6302	2.0000	20.00	3.0000
2	80	1.7708	1.6250	1.6875	23.70	2.5313
3	115	1.7917	1.6250	2.0000	17.50	3.4286
4	145	1.7813	1.6250	1.8750	16.00	3.7500
5	175	1.7760	1.6250	1.8125	16.55	3.6250
6	205	1.7813	1.6250	1.8750	16.00	3.7500
7	235	1.7865	1.6250	1.9375	15.48	3.8750
8	265	1.7917	1.6250	2.0000	15.00	4.0000

Average Of Reading's (in/hr)= 3.4950

Reported Percolation Rate (in/hr) = 3.9

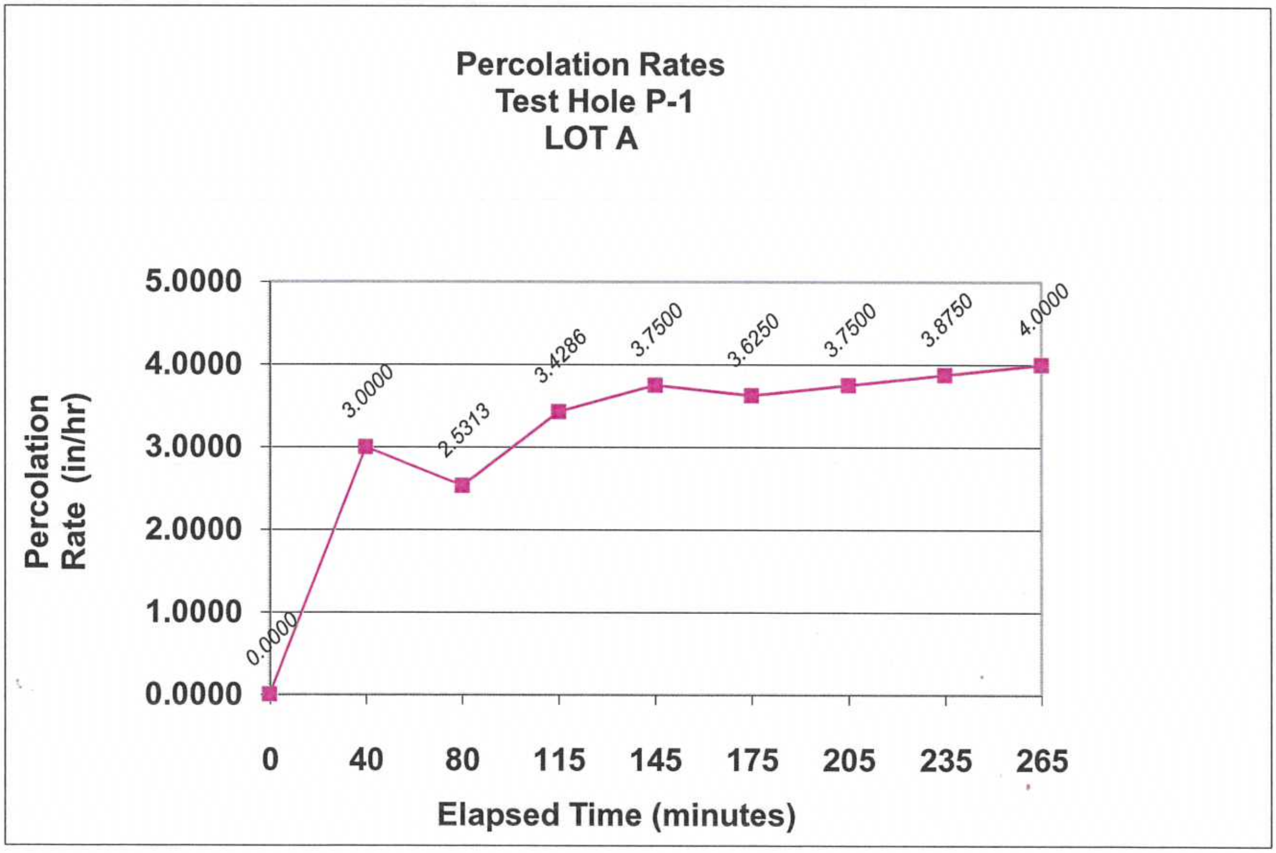


Figure No. ______

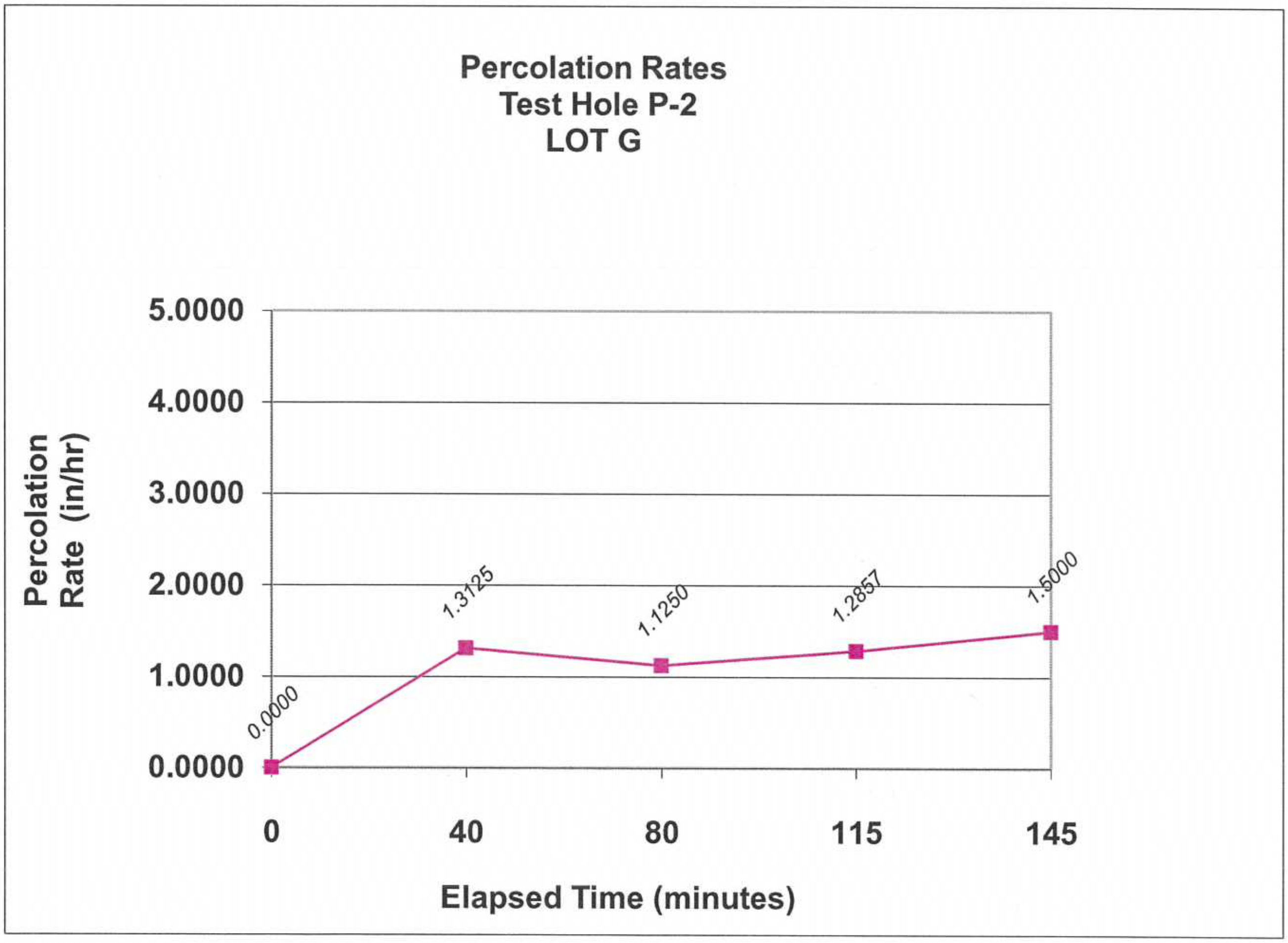
Percolation Test Results For Vallemar Street and Jullaina APN 037-086-029

Project No: SM10391.2
Date: 31 APRIL 2016
By: Haro, Kasunich and Associates

HOLE NO.:	P-2		TEST DATE:3/31/16 DRILL DATE: 3/30/16			
WATER LEVEL AFTER PRE-SOAK: Dry			DEPTH OF BORING (feet) 2.146			
TESTED BY:	JD		PERCOLATION ZONE (feet):		1.146	2.146
READING	ELAPSED TIME (min)	WATER DEPTH (feet)	REFILL TO (feet)	Incremental Change (in.)	PERCOLATION RATE (min/inch)	PERC (in/hr)
Start	0	1.6458	-	-	-	-
1	40	1.7188	1.6458	0.8750	45.71	1.3125
2	80	1.7083	1.6458	0.7500	53.33	1.1250
3	115	1.7083	1.6458	0.7500	46.67	1.2857
4	145	1.7083	1.6458	0.7500	40.00	1.5000
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	-	-	-	-	-	-
8	-	-	-	-	-	-

Average Of Reading's (in/hr)= 1.3058

Reported Percolation Rate (in/hr) = 1.4



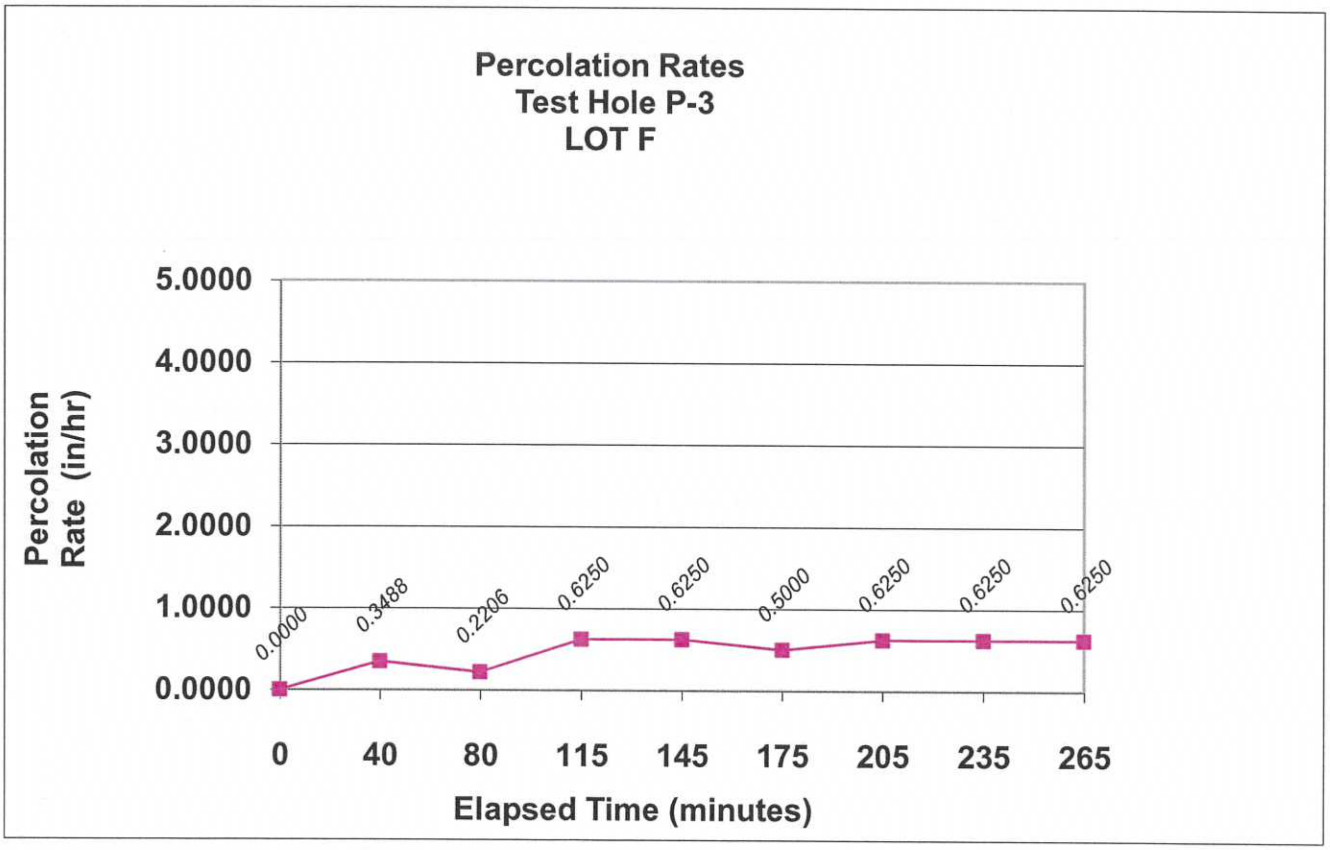
Percolation Test Results For Vallemar Street and Jullaina APN 037-086-028

Project No: SM10391.2
Date: 31 APRIL 2016
By: Haro, Kasunich and Associates

HOLE NO.:	P-3		TEST DATE:3/31/16 DRILL DATE: 3/30/16			
WATER LEVEL AFTER PRE-SOAK: 3.708			DEPTH OF BORING (feet) 4.042			
TESTED BY: JD			PERCOLATION ZONE (feet):		3.042	4.042
READING	ELAPSED TIME (min)	WATER DEPTH (feet)	REFILL TO (feet)	Incremental Change (in.)	PERCOLATION RATE (min/inch)	PERC (in/hr)
Start	0	3.5417	-	-	-	-
1	43	3.5625	3.5417	0.2500	172.00	0.3488
2	77	3.5521	3.5417	0.1250	272.00	0.2206
3	107	3.5677	3.5417	0.3125	96.00	0.6250
4	137	3.5677	3.5417	0.3125	96.00	0.6250
5	167	3.5625	3.5417	0.2500	120.00	0.5000
6	197	3.5677	3.5417	0.3125	96.00	0.6250
7	227	3.5677	3.5417	0.3125	96.00	0.6250
8	257	3.5677	3.5417	0.3125	96.00	0.6250

Average Of Reading's (in/hr)= 0.5243

Reported Percolation Rate (in/hr) = 0.6



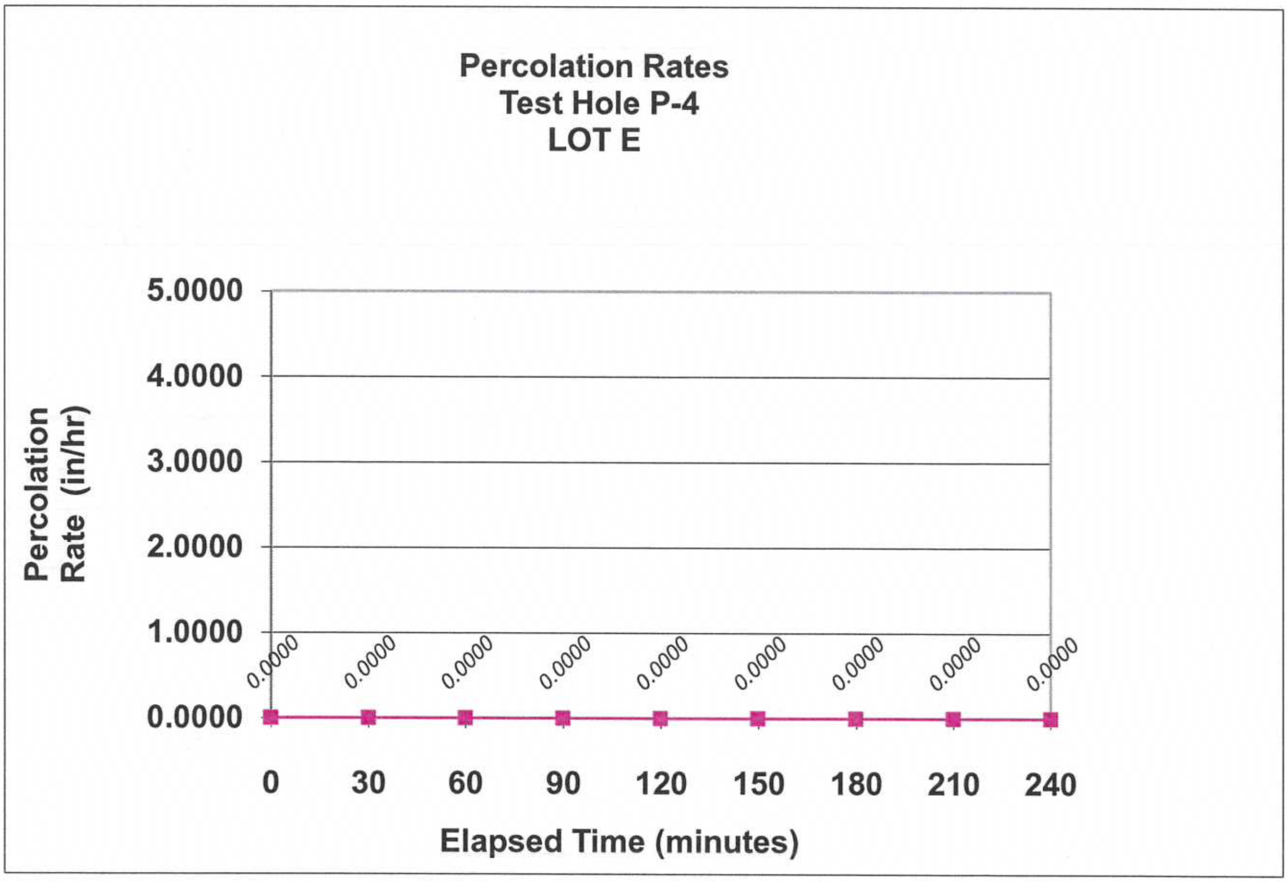
Percolation Test Results For Vallemar Street and Jullaina APN 037-086-027

Project No: SM10391.2
Date: 31 APRIL 2016
By: Haro, Kasunich and Associates

HOLE NO.:	P-4		TEST DATE:3/31/16 DRILL DATE: 3/30/16			
WATER LEVEL AFTER PRE-SOAK: 1.958			DEPTH OF BORING (feet) 2.958			
TESTED BY:	JD		PERCOLATION ZONE (feet):		1.958	2.958
READING	ELAPSED TIME (min)	WATER DEPTH (feet)	REFILL TO (feet)	Incremental Change (in.)	PERCOLATION RATE (min/inch)	PERC (in/hr)
Start	0	1.9583	-	-	-	-
1	30	1.9583	0.0000	0.0000	-	0.0000
2	60	1.9583	0.0000	0.0000	-	0.0000
3	90	1.9583	0.0000	0.0000	-	0.0000
4	120	1.9583	0.0000	0.0000	-	0.0000
5	150	1.9583	0.0000	0.0000	-	0.0000
6	180	1.9583	0.0000	0.0000	-	0.0000
7	210	1.9583	0.0000	0.0000	-	0.0000
8	240	1.9583	0.0000	0.0000	-	0.0000

Average Of Reading's (in/hr)= 0.0000

Reported Percolation Rate (in/hr) = 0.0

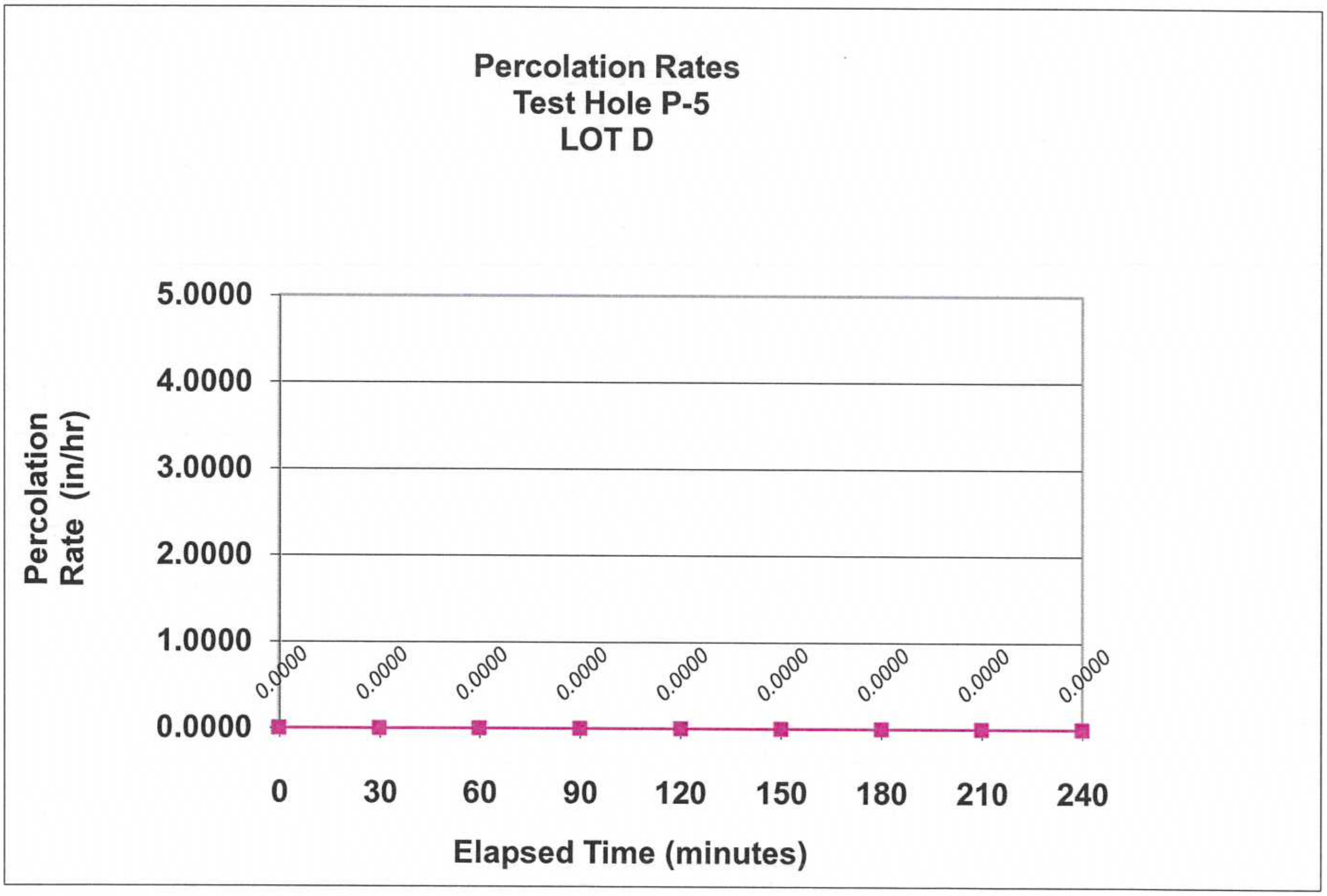


Percolation Test Results For Vallemar Street and Jullaina APN 037-086-026
Project No: SM10391.2
Date: 31 APRIL 2016
By: Haro, Kasunich and Associates

HOLE NO.:	P-4		TEST DATE:3/31/16 DRILL DATE: 3/30/16			
WATER LEVEL AFTER PRE-SOAK: 1.958			DEPTH OF BORING (feet) 2.958			
TESTED BY:	JD		PERCOLATION ZONE (feet):		1.958	2.958
READING	ELAPSED TIME (min)	WATER DEPTH (feet)	REFILL TO (feet)	Incremental Change (in.)	PERCOLATION RATE (min/inch)	PERC (in/hr)
Start	0	1.9583	-	-	-	-
1	30	1.9583	0.0000	0.0000	-	0.0000
2	60	1.9583	0.0000	0.0000	-	0.0000
3	90	1.9583	0.0000	0.0000	-	0.0000
4	120	1.9583	0.0000	0.0000	-	0.0000
5	150	1.9583	0.0000	0.0000	-	0.0000
6	180	1.9583	0.0000	0.0000	-	0.0000
7	210	1.9583	0.0000	0.0000	-	0.0000
8	240	1.9583	0.0000	0.0000	-	0.0000

Average Of Reading's (in/hr)= 0.0000

Reported Percolation Rate (in/hr) = 0.0



APPENDIX E

Scale of Acceptable Risks from Geologic Hazards

APPENDIX E
SCALE OF ACCEPTABLE RISKS FROM NON-SEISMIC GEOLOGIC HAZARDS*

RISK LEVEL	STRUCTURE TYPE	RISK CHARACTERISTICS
EXTREMELY LOW RISKS	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intently systems, plants manufacturing or storing explosive or toxic materials.	Failure affects substantial populations risk equals nearly zero.
VERY LOW RISKS	Structures whose use is critically needed after a disaster: important utility centers: hospitals: fire, police, and emergency communication facilities; fire stations; and critical transportation elements such as bridges and overpasses; also smaller dams.	Failure affects substantial populations.
LOW RISKS	Structures of high occupancy, or whose use after a disaster: important utility centers; hospitals; fire, police, and emergency communication facilities; fire stations; and critical transportation elements such as bridges and overpasses; also smaller dams.	Failure of a single structure would affect primary only the occupants.
"ORDINARY RISKS"	The vast majority of structures: most commercial and industrial buildings; small hotels and apartment buildings, and single-family residences.	Failure only affects owners/occupants of a structure rather than a substantial population. No significant potential for loss of life of serious physical injury. Risk level is similar or comparable to other ordinary risks (including seismic risks) to citizens of coastal California. No collapse of structures; structural damage limited to repairable damage in most cases. This degree of damage is unlikely as a result of storms with a repeat time of 50 years or less.
MODERATE RISKS	fences, driveways, non-habitable structures, detached retaining walls, sanitary landfills, recreation areas and open space.	Structure is not occupied or occupied infrequently. Low probability of physical injury. Moderate probability of collapse.

***Non-seismic geologic hazards include flooding, landslides, erosion, wave run-up and sinkhole collapse.**

APPENDIX E SCALES OF ACCEPTABLE RISKS FROM SEISMIC GEOLOGIC HAZARDS		
LEVEL OF ACCEPTABLE RISK	**KINDS OF STRUCTURES**	**EXTRA PROJECT COST PROBABLY REQUIRED TO REDUCE RISK TO AN ACCEPTABLE LEVEL**
Extremely Low	Structures whose continued functioning is critical, or whose failure might be catastrophic nuclear reactors, large dams, power intently systems, plants manufacturing or storing explosives to toxic materials.	No set percentage (whatever is required for maximum attainable safety).
Slightly higher than under level 1[1]	Structures whose use is critically needed after a disaster; important utility centers; hospitals; fire, police, and emergency communication facilities; fire station; and critical transportation elements such as bridges and overpasses; also smaller dams.	5 to 25 percent of project cost.
Lowest possible risk to occupants of the structure [3]	Structures of high occupancy or whose use after a disaster would be particularly convenient; schools, churches, theaters, large hotels, and other high-rise buildings housing large numbers of people, other places normally attracting large concentrations of people civic buildings such as fire stations, secondary utility structures, extremely large commercial enterprises, most roads,alternative or non-critical bridges and overpasses.	5 to 15 percent of project cost.
An "ordinary" level or risk to occupants of the structure [3.5]	The vast majority of structures; most commercial and industrial buildings, small hotels and apartment buildings and single-family residences.	1 to 2 percent of project cost in most cases (2 to 10 percent of project cost in a minority of cases)[4]

1. Failure of a single structure may affect substantial populations.

2. These additional percentages are based on the assumption that the base cost is the total cost of the building or other facility when ready for occupancy. In addition, it is assumed that the structure would have been designed and built in accordance with current California practice. Moreover, the estimated additional cost presumes that structures in this acceptable-risk category are to embody sufficient safety to remain functional following an earthquake.

3. Failure of single structure would affect primarily only the occupants.

4. These additional percentages are based on the assumption that the base cost is the total cost of the building or facility when ready for occupancy. In addition, it is assumed that the structures would have been designed and built in accordance with current California Practice. Moreover, the estimated additional cost presumes that structures in this acceptable-risk category are to be sufficiently safe to give reasonable assurance of preventing injury or loss of life during and following an earthquake, but otherwise not necessarily to remain functional.

5. "Ordinary Risk": Resist minor earthquakes without damage; resist moderate earthquakes without structural damage but with some non-structural damage; resist major earthquakes of the intensity or severity of the strongest experienced in California, without collapse, but with some structural, as well as non-structural damage. In most structures, it is expected that structural damage, even in a major earthquake, could be limited to repairable damage. (Structural Engineers Association of California).

Source:<u>Meeting The Earthquake Challenge,</u> Joint Committee on Seismic Safety of the California Legislature, January 1974, p.9.

APPENDIX F

Photographs

Drilling operations at test bore hole B1

Collection of spoils and mixing of grout at test bore hole B1

Grouting of test bore hole B1

Ground surface after drilling operation at test bore hole B1

Drill setup test bore hole B4

Ground surface after drilling operation test bore hole B4

Location of test bore hole B5

Drilling operation test bore hole B5

Grouting test bore hole B2

Drilling operation test bore hole B2

Grouting of test bore hole B3

APPENDIX E

County Maintenance Plan Templates

Infiltration Trench Maintenance Plan for Moss Beach Development

8/19/16

An infiltration trench is a long, narrow, excavated trench backfilled with a stone aggregate, and lined with a filter fabric. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix.

Project Address and Cross Streets___________

Vallemar Street and Juliana Avenue

Assessor's Parcel No.: ___________________

Property Owner: _________________________

Phone No.:_____________________

Designated Contact: _____________________

Phone No.:_____________________

Mailing Address:_________________________

____

The property contains infiltration trench(es), as shown on the attached plans.

- **Refer to Utility & Drainage Plan (Appendix B) for locations and details.**

I. Routine Maintenance Activities

The principal maintenance objective is to prevent sediment buildup and clogging, which reduces pollutant removal efficiency and may lead to trench failure. Routine maintenance activities, and the frequency at which they will be conducted, are shown in Table 1.

Table 1
Routine Maintenance Activities for Infiltration Trenches

No.	Maintenance Task	Frequency of Task
1	Remove obstructions, debris and trash from infiltration trench and dispose of properly.	Monthly, or as needed after storm events
2	Inspect trench to ensure that it drains between storms, and within 5 days after rainfall. Check observation well 2-3 days after storm to confirm drainage.	Monthly during wet season, or as needed after storm events
3	Inspect filter fabric for sediment deposits by removing a small section of the top layer.	Annually
4	Monitor observation well to confirm that trench has drained during dry season.	Annually, during dry season
5	Mow and trim vegetation around the trench to maintain a neat and orderly appearance.	As needed
6	Remove any trash, grass clippings and other debris from the trench perimeter and dispose of properly.	As needed
7	Check for erosion at inflow or overflow structures.	As needed
8	Confirm that cap of observation well is sealed.	At every inspection
9	Inspect infiltration trench using the attached inspection checklist.	Monthly, or after large storm events, and after removal of accumulated debris or material

II. Prohibitions

Trees and other large vegetation shall be prevented from growing adjacent to the trench to prevent damage.

Standing water shall not remain in the treatment measures for more than five days, to prevent mosquito generation. Should any mosquito issues arise, contact the San Mateo County Mosquito Abatement District (SMCMAD), as needed for assistance. Mosquito larvicides shall be applied only when absolutely necessary, as indicated by the SMCMAD, and then only by a licensed professional or contractor. Contact information for SMCMAD is provided below.

III. Mosquito Abatement Contact Information

San Mateo County Mosquito Abatement District
1351 Rollins Road
Burlingame,CA 94010
PH:(650) 344-8592
FAX: (650) 344-3843
Email: info@smcmad.org

IV. Inspections

The attached Infiltration Trench Inspection and Maintenance Checklist shall be used to conduct inspections monthly (or as needed), identify needed maintenance, and record maintenance that is conducted.

Infiltration Trench
Inspection and Maintenance Checklist

Property Address: ____ Property Owner: ____________________________

Treatment Measure No.: ___________ Date of Inspection: __________ Type of Inspection: ☐ Monthly -Wet Season ☐ Pre
☐ After heavy runoff ☐ End of Wet Season

Inspector(s): _______________________________ ☐ Other: _______________

Defect	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	**Results Expected When Maintenance Is Performed**
1. Standing Water	When water stands in the infiltration trench between storms and does not drain within 5 days after rainfall.			There should be no areas of standing water once inflow has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from head to foot of infiltration trench, removed clogging at check dams, or added underdrains.
2. Trash and Debris Accumulation	Trash and debris accumulated in the infiltration trench.			Trash and debris removed from infiltration trench and disposed of properly.
3. Sediment	Evidence of sedimentation in trench. Less than 50% storage volume remaining in sediment traps, forebays or pretreatment swales.			Material removed and disposed of properly so that there is no clogging or blockage.
4. Inlet/Outlet	Inlet/outlet areas clogged with sediment or debris, and/or eroded.			Material removed and disposed of properly so that there is no clogging or blockage in the inlet and outlet areas.
5. Overflow Spillway	Clogged with sediment or debris, and/or eroded.			Material removed and disposed of properly so that there is no clogging or blockage, and trench is restored to design condition.
6. Filter Fabric	Annual inspection, by removing a small section of the top layer, shows sediment accumulation that may lead to trench failure.			Replace filter fabric, as needed, to restore infiltration trench to design condition.
7. Observation Well	Routine monitoring of observation well indicates that trench is not draining within specified time or observation well cap is missing.			Restore trench to design conditions. Observation well cap is sealed.
8. Miscellaneous	Any condition not covered above that needs attention in order for the infiltration trench to function as designed.			Meet the design specifications.

APPENDIX F

C3 and C6 Development Review Checklist

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

CITY/COUNTY OF San Mateo

Planning and Building **Dept.**

C.3 and C.6 Development Review Checklist

Address	455 County Center, 2nd Floor
Phone	Redwood City, CA 94063
Website	650-363-1825

Project Information

I.A Enter Project Data (For "C.3 Regulated Projects," data will be reported in the municipality's stormwater Annual Report.)

Project Name:	Moss Beach Ocean Development	Case Number:	
Project Address & Cross Street:	Juliana Ave and Vallemar St		
Project APN:		Project Watershed:	
Applicant Name:	Owen Lawlor	Project Phase No.	
Applicant Phone:	831-457-1331	Applicant E-mail:	owen.lawlor@gmail.com

Development Type:
(check all that apply)

- [ ] Single Family Residential: A stand-alone home that is not part of a larger project.
- [x] Single Family Residential: Two or more lot residential development.[1] # of units: 4
- [ ] Multi-Family Residential # of units:
- [ ] Commercial
- [ ] Industrial, Manufacturing
- [ ] Mixed-Use # of units:
- [ ] Streets, Roads[2], etc.
- [ ] 'Redevelopment' as defined by MRP: creating, adding and/or replacing exterior existing impervious surface on a site where past development has occurred.

I.A.1

- [ ] 'Special land use categories' as defined by MRP: (1) auto service facilities[3], (2) retail gasoline outlets, (3) restaurants, (4) uncovered parking area (stand-alone or part of a larger project)
- [ ] Institutions: schools, libraries, jails, etc.
- [ ] Parks and trails, camp grounds, other recreational
- [ ] Agricultural, wineries
- [ ] Kennels, Ranches
- [ ] Other, Please specify

Project Description (Also not any past or future phases of the project.)[4]: Residential development with four 2-story buildings

I.A.2 Total Area of Site: 2.35 acres

I.A.3 Total Area of land disturbed during construction : 0.84 acres
(include clearing, grading, excavating and stockpile area)

I.A.4 Site slope: %

I.A.5 Certification:
I certify that the information provided on this form is correct and acknowledge that, should the project exceed the amount of new and/or replaced impervious surface provided in this form, the as-built project may be subject to additional improvements.

- [ ] Attach Preliminary Calculations
- [ ] Attach Final Calculations
- [ ] Attach copy of site plan showing areas

Name of person completing the form:	Daniel Mays	Title:	Engineer II
Signature:	Daniel Mays	Date:	4/26/2017
Phone Number:	831-426-3186 x105	E-mail:	daniel@m-me.com

1 Common Plans of Development (subdivisions or contiguous, commonly owned lots, for the construction of two or more homes developed within 1 year of each other) are not considered single family projects by the MRP.
2 Roadway projects creating 10,000 sq.ft. or more of contiguous impervious surface are subject to C.3 requirements if the roadway is new or being widened with additional traffic lanes.
3 See Standard Industrial Classification (SIC) codes here: www.flowstobay.org/documents/business/new-development/Notice_to_Applicants-LID_FINAL.doc
4 Project description examples: 5-story office building, industrial warehouse, residential with five 4-story buildings for 200 condominiums, etc.

I.B Is the project a "C.3 Regulated Project" per MRP Provision C.3.b?

I.B.1 Enter the amount of Impervious surface Retained, Replaced and/or Created by the project:

Table I.B.1 Impervious[5] and Pervious Surfaces

	I.B.1.a	I.B.1.b	I.B.1.c	I.B.1.d	I.B.1.e
Type of Impervious Surface	Pre-Project Impervious Surface (sq.ft.)	Existing Impervious Surface to be Retained[6] (sq.ft.)	Existing Impervious Surface to be Replaced[6] (sq.ft.)	New Impervious Surface to be Created[6] (sq.ft.)	Post-Project Impervious Surface (sq.ft.) (=b+c+d)
Roof area(s)	0	0	0	13830	13830
Impervious[5] sidewalks, patios, paths, driveways, streets	0	0	0	3240	3240
Impervious[5] uncovered parking[7]	0	0	0	0	0
Totals:	0	0	0	17070	17070
I.B.1.f - Total Impervious Surface Replaced and Created: ***(sum of totals for columns I.B.1.c and I.B.1.d):***			**17070**		
Type of Pervious Surface	Pre-Project Pervious Surface (sq.ft.)				Post-project Pervious Surface(sq.ft.)
Landscaping	102200				80030
Pervious Paving	0			**I.B.1.e.1**	5100
Green Roof	0				0
Totals:	102200				85130
Total Site Area (Total Impervious + Total Pervious)	102200				102200

I.B.2 Please review and attach additional worksheets as required below using the Total Impervious Surface (IS) Replaced and Created in cell **I.B.1.f** from Table **I.B.1** above and other factors:

	Review Steps	**Check One: Yes**	**Check One: No**	**Attach Worksheet**
I.B.2.a	Does this project involve any earthwork? If YES, then Check Yes, and Complete Worksheet A. If NO, then go to I.B.2.b	☑	☐	A
I.B.2.b	Is **I.B.1.f** greater than or equal to 2,500 sq.ft? If YES, then the Project is subject to Provision C.3.i. - complete Worksheets B, C & go to I.B.2.c. If NO, then Stop here - go to I.A.5 and complete Certification or ask municipal staff for Small Project Checklist.	☑	☐	B, C
I.B.2.c	Is the total Existing IS to be Replaced (column **I.B.1.c**) 50 percent or more of the total Pre-Project IS (column **I.B.1.a**)? If YES, site design, source control and treatment requirements apply to the whole site. Continue to I.B.2.d If NO, these requirements apply only to the impervious surface created and/or replaced. Continue to I.B.2.d	☐	☑	
I.B.2.d	Is this project a Special Land Use Category (**I.A.1**) and is **I.B.1.f** greater than or equal to 5,000 sq.ft? If YES, project is a C.3 Regulated Project. Fill out Worksheet D. Then continue to I.B.2.f. If NO, go to I.B.2.e	☐	☑	D
I.B.2.e	Is **I.B.1.f** greater than or equal to 10,000 sq.ft? If YES, project is a C.3 Regulated Project - complete Worksheet D. Then continue to I.B.2.f. If NO, then skip to I.B.2.g.	☑	☐	D
I.B.2.f	Is **I.B.1.f** greater than or equal to 43,560 sq.ft? If YES, project may be subject to Hydromodification Management requirements - complete Worksheet E then go to I.B.2.g. If NO, then go to I.B.2.g.	☐	☑	E
I.B.2.g	Is **I.A.3** greater than or equal to 1 acre? If YES, check box, obtain coverage under CA Const. General Permit & submit Notice of Intent to municipality - go to I.B.2.h. If NO, then go to I.B.2.h. For more information see: www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml	☐	☑	
I.B.2.h	Is this a Special Project or does it have the potential to be a Special Project? If YES, complete Worksheet F - then continue to I.B.2.i. If NO, go to I.B.2.i.	☐	☑	F
I.B.2.i	Is this project a High Priority Site? (Determined by the Municipality. High Priority Sites can include those located within 100 ft. of a sensitive habitat, an Area of Special Biological Significance, a body of water, or **starting 7/1/16** on sites disturbing >=5,000 sq.ft. with slopes >=15% **(see I.A.4)** [or per municipal criteria/map.] Subject to monthly inspections from Oct 1 to April 30.) If YES, complete section G-2 on Worksheet G - then continue to I.B.2.j. If NO, then go to I.B.2.j	☑	☐	G
I.B.2.j	For Municipal Staff Use Only: Are you using Alternative Certification for the project review? If YES, then fill out section G-1 on Worksheet G. Fill out other sections of Worksheet G as appropriate. See cell **I.B.1.e.1** above - Is the project installing 3,000 square feet or more of pervious paving? If YES, then fill out section G-3 on Worksheet G. Add to Municipal Inspection Lists (C.3 and C.3.h)	☐ ☐	☐ ☐	G

5 Per the MRP, pavement that meets the following definition of pervious pavement is NOT an impervious surface. Pervious pavement is defined as pavement that stores and infiltrates rainfall at a rate equal to immediately surrounding unpaved, landscaped areas, or that stores and infiltrates the rainfall runoff volume described in Provision C.3.

6 "Retained" means to leave existing impervious surfaces in place; "Replaced" means to install new impervious surface where existing impervious surface is removed anywhere on the same property; and "Created" means the amount of new impervious surface being proposed which exceeds the total existing amount of impervious surface at the property.

7 Uncovered parking includes the top level of a parking structure.

Worksheet A

C6 – Construction Stormwater BMPs

Identify Plan sheet showing the appropriate construction Best Management Practices (BMPs) used on this project:
(Applies to all projects with earthwork)

Yes	Plan Sheet	Best Management Practice (BMP)
☑	C6.0	Control and prevent the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, rinse water from architectural copper, and non-stormwater discharges to storm drains and watercourses.
☑	C6.0	Store, handle, and dispose of construction materials/wastes properly to prevent contact with stormwater.
☑	C6.0	Do not clean, fuel, or maintain vehicles on-site, except in a designated area where wash water is contained and treated.
☑	C6.0	Train and provide instruction to all employees/subcontractors re: construction BMPs.
☑	C6.0	Protect all storm drain inlets in vicinity of site using sediment controls such as berms, fiber rolls, or filters.
☑	C6.0	Limit construction access routes and stabilize designated access points.
☑	C7.0	Attach the San Mateo Countywide Water Pollution Prevention Program's construction BMP plan sheet to project plans and require contractor to implement the applicable BMPs on the plan sheet.
☑	C6.0	Use temporary erosion controls to stabilize all denuded areas until permanent erosion controls are established.
☑	C6.0	Delineate with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.
☑	C6.0, L3.3	Provide notes, specifications, or attachments describing the following: ■ Construction, operation and maintenance of erosion and sediment controls, include inspection frequency; ■ Methods and schedule for grading, excavation, filling, clearing of vegetation, and storage and disposal of excavated or cleared material; ■ Specifications for vegetative cover & mulch, include methods and schedules for planting and fertilization; ■ Provisions for temporary and/or permanent irrigation.
☑	C6.0	Perform clearing and earth moving activities only during dry weather.
☑	C6.0	Use sediment controls or filtration to remove sediment when dewatering and obtain all necessary permits.
☑	C6.0	Trap sediment on-site, using BMPs such as sediment basins or traps, earthen dikes or berms, silt fences, check dams, soil blankets or mats, covers for soil stock piles, etc.
☑	C6.0	Divert on-site runoff around exposed areas; divert off-site runoff around the site (e.g., swales and dikes).
☑	C6.0	Protect adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.

Worksheet B

C3 – Source Controls

Select appropriate source controls and identify the detail/plan sheet where these elements are shown.

Yes	Detail/Plan Sheet No.	Features that require source control measures	Source Control Measures (Refer to Local Source Control List for detailed requirements)
☑	C3.0	Storm Drain	Mark on-site inlets with the words "No Dumping! Flows to Bay" or equivalent.
☐		Floor Drains	Plumb interior floor drains to sanitary sewer [or prohibit].
☐		Parking garage	Plumb interior parking garage floor drains to sanitary sewer.[8]
☑	L3.3	Landscaping	■ Retain existing vegetation as practicable. ■ Select diverse species appropriate to the site. Include plants that are pest- and/or disease-resistant, drought-tolerant, and/or attract beneficial insects. ■ Minimize use of pesticides and quick-release fertilizers. ■ Use efficient irrigation system; design to minimize runoff.
☐		Pool/Spa/Fountain	Provide connection to the sanitary sewer to facilitate draining.[8]
☐		Food Service Equipment (non-residential)	Provide sink or other area for equipment cleaning, which is: ■ Connected to a grease interceptor prior to sanitary sewer discharge.[8] ■ Large enough for the largest mat or piece of equipment to be cleaned. ■ Indoors or in an outdoor roofed area designed to prevent stormwater run-on and run-off, and signed to require equipment washing in this area.
☐		Refuse Areas	■ Provide a roofed and enclosed area for dumpsters, recycling containers, etc., designed to prevent stormwater run-on and runoff. ■ Connect any drains in or beneath dumpsters, compactors, and tallow bin areas serving food service facilities to the sanitary sewer.[8]
☐		Outdoor Process Activities[9]	Perform process activities either indoors or in roofed outdoor area, designed to prevent stormwater run-on and runoff, and to drain to the sanitary sewer.[8]
☐		Outdoor Equipment/ Materials Storage	■ Cover the area or design to avoid pollutant contact with stormwater runoff. ■ Locate area only on paved and contained areas. ■ Roof storage areas that will contain non-hazardous liquids, drain to sanitary sewer[8], and contain by berms or similar.
☐		Vehicle/ Equipment Cleaning	■ Roofed, pave and berm wash area to prevent stormwater run-on and runoff, plumb to the sanitary sewer8, and sign as a designated wash area. ■ Commercial car wash facilities shall discharge to the sanitary sewer.[8]
☐		Vehicle/ Equipment Repair and Maintenance	■ Designate repair/maintenance area indoors, or an outdoors area designed to prevent stormwater run-on and runoff and provide secondary containment. Do not install drains in the secondary containment areas. ■ No floor drains unless pretreated prior to discharge to the sanitary sewer.[8] ■ Connect containers or sinks used for parts cleaning to the sanitary sewer.[8]
☐		Fuel Dispensing Areas	■ Fueling areas shall have impermeable surface that is a) minimally graded to prevent ponding and b) separated from the rest of the site by a grade break. ■ Canopy shall extend at least 10 ft. in each direction from each pump and drain away from fueling area.
☐		Loading Docks	■ Cover and/or grade to minimize run-on to and runoff from the loading area. ■ Position downspouts to direct stormwater away from the loading area. ■ Drain water from loading dock areas to the sanitary sewer.[8] ■ Install door skirts between the trailers and the building.
☐		Fire Sprinklers	Design for discharge of fire sprinkler test water to landscape or sanitary sewer.[8]
☐		Miscellaneous Drain or Wash Water	■ Drain condensate of air conditioning units to landscaping. Large air conditioning units may connect to the sanitary sewer.[8] ■ Roof drains from equipment drain to landscaped area where practicable. ■ Drain boiler drain lines, roof top equipment, all wash water to sanitary sewer.[8]
☐		Architectural Copper Rinse Water	■ Drain rinse water to landscaping, discharge to sanitary sewer[8], or collect and dispose properly offsite. See flyer "Requirements for Architectural Copper."

8 Any connection to the sanitary sewer system is subject to sanitary district approval.
9 Businesses that may have outdoor process activities/equipment include machine shops, auto repair, industries with pretreatment facilities.

Worksheet C

Low Impact Development – Site Design Measures

Select Appropriate Site Design Measures *(Required for C.3 Regulated Projects; all other projects are encouraged to implement site design measures, which may be required at municipality discretion.) Projects that create and/or replace 2,500 – 10,000 sq.ft. of impervious surface, and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface, must include* ***one of Site Design Measures a through f*** *(Provision C.3.i requirements).*[10] *Larger projects must also include applicable Site Design Measures g through i. Consult with municipal staff about requirements for your project.*

Select appropriate site design measures and Identify the Plan Sheet where these elements are shown.

Yes	Plan Sheet No.	
☐		a. Direct roof runoff into cisterns or rain barrels and use rainwater for irrigation or other non-potable use.
☑	C3.0	b. Direct roof runoff onto vegetated areas.
☑	C3.0	c. Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
☑	C3.0	d. Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
☑ ☑	C1.0, L4.2	e. Construct sidewalks, walkways, and/or patios with pervious or permeable surfaces.Use the specifications in the C3 Technical Guidance (Version 4.1) downloadable at www.flowstobay.org/newdevelopment.
☑	C1.0, L4.2	f. Construct bike lanes, driveways, and/or uncovered parking lots with pervious surfaces.Use the specifications in the C3 Technical Guidance (Version 4.1) downloadable at www.flowstobay.org/newdevelopment.
	C3.0	g. Limit disturbance of natural water bodies and drainage systems; minimize compaction of highly permeable soils; protect slopes and channels; and minimize impacts from stormwater and urban runoff on the biological integrity of natural drainage systems and water bodies;
☑	C1.0, L3.2	h. Conserve natural areas, including existing trees, other vegetation and soils.
☑	C1.0, C3.0	i. Minimize impervious surfaces.

Regulated Projects can also consider the following site design measures to reduce treatment system sizing:

Yes	Plan Sheet No.	
☑	C3.0	j. Self-treating area (see Section 4.2 of the C.3 Technical Guidance)
☑	C3.0	k. Self-retaining area (see Section 4.3 of the C.3 Technical Guidance)
☐		l. Plant or preserve interceptor trees (Section 4.1, C.3 Technical Guidance)

10 See MRP Provision C.3.a.i.(6) for non-C.3 Regulated Projects, C.3.c.i.(2)(a) for Regulated Projects, C.3.i for projects that create/replace 2,500 to 10,000 sq.ft. of impervious surface and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface.

Worksheet D

C3 Regulated Project - Stormwater Treatment Measures

Check all applicable boxes and indicate the treatment measure(s) included in the project.

Yes	
☐ Attach Worksheet F and Calculations	Is the project a **Special Project**?[11] If yes, consult with municipal staff about the need to evaluate the feasibility and infeasibility of 100% LID treatment. Indicate the type of non-LID treatment to be used, the hydraulic sizing method , and percentage of the amount of runoff specified in Provision C.3.d that is treated: Non-LID Treatment Measures: / Hydraulic sizing method[12] / % of C.3.d amount of runoff treated ☐ Media Filter — ☐ 2.a ☐ 2.b ☐ 2.c — ____ % ☐ Tree well Filter — ☐ 2.a ☐ 2.b ☐ 2.c — ____ %
☑	Is the project using infiltration systems? The MRP no longer requires the use or analysis of the feasibility of infiltration, but infiltration systems are encouraged and may be beneficial depending on the project. Indicate the infiltration measures to be used, and hydraulic sizing method: Infiltration Measures: / Hydraulic sizing method[12] ☑ Bioinfiltration[13] — ☐ 1.a ☐ 1.b ☑ 2.c ☐ 3 ☐ Infiltration Trench — ☐ 1.a ☐ 1.b ☐ Other (specifiy): (SEE ATTACHED)
☐	Is the project harvesting and using rainwater? The MRP no longer requires the use or analysis of the feasibility of rainwater harvesting, but it rainwater harvesting and use is encouraged and may be beneficial depending on the project. Rainwater Harvesting/Use Measures: / Hydraulic sizing method[12] ☐ Rainwater Harvesting for indoor non-potable water use — ☐ 1.a ☐ 1.b ☐ Rainwater Harvesting for landscape irrigation use — ☐ 1.a ☐ 1.b
☐	Is the project installing biotreatment measures? Indicate the measures to be used, and the hydraulic sizing method: Biotreatment Measures: / Hydraulic sizing method[12] ☐ Bioretention area — ☐ 2.c ☐ 3 ☐ Flow-through planter — ☐ 2.c ☐ 3 ☐ Other (specifiy): ____

A copy of the long term Operations and Maintenance (O&M) Agreement and Plan for this project will be required. Please contact the NPDES Representative of the applicable municipality for an agreement template and consult the C.3 Technical Guidance at www.flowstobay.org for maintenance plan templates for specific facility types.

11 Special Projects are smart growth, high density, or transit-oriented developments with the criteria defined in Provision C.3.e.ii.(2), (3) or (4) (see Worksheet F).
12 Indicate which of the following Provision C.3.d.i hydraulic sizing methods were used. Volume based approaches: 1(a) Urban Runoff Quality Management approach, or 1(b) 80% capture approach (recommended volume-based approach). Flow-based approaches: 2(a) 10% of 50-year peak flow approach, 2(b) 2 times the 85th percentile rainfall intensity approach, or 2(c) 0.2-Inch-per-hour intensity approach (recommended flow-based approach - also known as the 4% rule). Combination flow and volume-based approach: 3.
13 See Section 6.1 of the C.3 Technical Guidance for conditions in which bioretention areas provide bioinfiltration.

Moss Beach, C.3 and C.6 Development Review Checklist Calculations

WORKSHEET D

Size bioinfiltration and bioretention facilities:

Lot	Roof Area (sf)	Required Bioinfiltration/ Bioretention Area* (sf)	Bioinfiltration Area** (sf)
1	4,300	172	181
2	3,920	157	225
3	4,330	173	181
4	4,520	181	200
Total	17,070	683	787

*Simplified Bioretention Sizing Method: 4% of Impervious Surface area per C.3 Stormwater Technical Guidance, San Mateo Countywide Water Pollution Prevention Program.

**See utility & drainage plan.

Worksheet G
(For municipal staff use only)

G-1 **Alternative Certification:** Were the treatment and/or HM control sizing and design reviewed by a qualified third-party professional that is not a member of the project team or agency staff?

☐ Yes ☐ No Name of Reviewer: ______________________________

G-2 **High Priority Site:** High Priority Sites can include those located in or within 100 feet of a sensitive habitat, an Area of Special Biological Significance (ASBS), a body of water, or **starting 7/1/16** on "hillside projects" disturbing >=5,000 sq.ft. of land and with steep slopes (of >=15% - see cell **I.A.4** - or as identified by municipal criteria or map). These sites are subject to monthly inspections from Oct 1 to April 30. See MRP Provision C.6.e.ii.(2).

☐ Yes ☐ No If yes, then add site to Staff's Monthly Rainy Season Construction Site Inspection List

G-3 **Inspections of Sites with Pervious Paving**: **Starting 7/1/16**, Regulated projects that are installing 3,000 sq.ft. or more of pervious paving (see cell **I.B.1.e.1**) (excluding private-use patios in single family homes, townhomes, or condominiums) must have the paving system inspected by the jurisdiction upon completion of the installation and the site must be added to the jurisdiction's list of sites needing inspections at least once every five years – see provision C.3.h. Pervious pavement systems include pervious concrete, pervious asphalt, pervious pavers and grid pavers etc. and are described in the C3 Technical Guidance (Version 4.1) downloadable at: www.flowstobay.org/newdevelopment.

☐ Yes ☐ No If yes, then add site to Staff's Lists for Construction and O&M inspections (C.3 and C.3.h)

Operations and Maintenance (O&M) Submittals

G-4 Stormwater Treatment Measure and/HM Control Owner or Operator's Information:

Name: ______________________________

Address: ______________________________

Phone: ____________________ Email: ______________________________

► Applicant must call for inspection and receive inspection within 45 days of installation of treatment measures and/or hydromodification management controls.

The following questions apply to C.3 Regulated Projects and Hydromodification Management Projects.

		Yes	No	N/A
G-4.1	Was maintenance plan submitted?	☐	☐	☐
G-4.2	Was maintenance plan approved?	☐	☐	☐
G-4.3	Was maintenance agreement submitted? (Date executed: ____________________)	☐	☐	☐

► *Attach the executed maintenance agreement as an appendix to this checklist.*

G-5 **Annual Operations and Maintenance (O&M) Submittals (for municipal staff use only):**

For C.3 Regulated Projects and Hydromodification Management Projects, indicate the dates on which the Applicant submitted annual reports for project O&M:

____

G-6 **Comments (for municipal staff use only):**

G-7 **NOTES (for municipal staff use only):**

Project Info Notes: ______________________

Worksheet A Notes: ______________________

Worksheet B Notes: ______________________

Worksheet C Notes: ______________________

Worksheet D Notes: ______________________

Worksheet E Notes: ______________________

Worksheet F Notes: ______________________

G-8 **Project Close-Out (for municipal staff use only):**

		Yes	No	N/A
8.1	Were final Conditions of Approval met?	☐	☐	
8.2	Was initial inspection of the completed treatment/HM measure(s) conducted? (Date of inspection: ______________)	☐	☐	☐
8.3	Was maintenance plan submitted? (Date executed: ______________)	☐	☐	☐
8.4	Was project information provided to staff responsible for O&M verification inspections? (Date provided to inspection staff: ______________)	☐	☐	☐

G-9 **Project Close-Out (Continued -- for municipal staff use only):**

Name of staff confirming project is closed out: ______________________

Signature: ______________________ Date: ______________

Name of O&M staff receiving information: ______________________

Signature: ______________________ Date: ______________