Storm Water Control Plan

Peace Village

(Residential Development)
Santa Cruz, CA
APN 001-022-40

Revised: 03.27.23

Client:

Envision I, LLC
189 Walnut Ave
Santa Cruz, CA 95060

By:

C2G / Civil Consultants Group, Inc.
4444 Scotts Valley Drive, Suite 6
Scotts Valley, CA 95066
(831) 438-4420

Storm Water Control Plan

I. Project Information

a. Residential Development – Site Improvement Plans for "Peace Village"
Application No. TBD
APN 001-022-40
900 High Street, Santa Cruz, CA 95060

b. Attn: Envision I, LLC, 189 Walnut Ave, Santa Cruz, CA 95060

c. Project is not phased

d. The project proposes to construct new Community Housing Building.

II. Project Site Assessment Summary

a. The site is located northeast of the intersection of High Street and Moore Street. The majority of the lot is hillside, sloping between 10% and 30% from north to south. See Attachment A for site plan.

b. Total Project Site Area = 87,120.30 S.F. (1.999 Acres)

c. Watershed management zone = WMZ 1 (95th Percentile), WMZ 6 (85th Percentile) & WMZ 3 (No Retention Requirement)

d. Design storm intensity = 0.20 inches/hour (flow capacity) & 2.15 inches for 95th Percentile Storm (See Attachment D)

e. Geology and soil types.

Soil Type 177. Complete soil characteristics are provided in Attachment B for complete soil data and letter from Geologist recommending NOT to infiltrate..

f. Hydrologic Considerations: The nearest drinking water wells are owned by the City of Santa Cruz, and are more than 4,000 feet from the site, to the east and across the San Lorenzo River. The river is approx. 800 feet from the site at its nearest point.

Depth to bedrock exceeds 80 inches, and depth to seasonal high-water table exceeds 80 inches. Per the Geotechnical Report added to the appendix B, which shows the ground water level between 11 and 12-feet deep.

g. The existing lot is developed with asphalt roads and parking with existing buildings. The project area is north of these existing improvements and is currently not developed (impervious) other than a small area of existing concrete and asphalt.

h. The site currently drains north to south and is collected in an onsite storm drain system (via pipes, inlets and concrete swales) and then into the public storm drain system on High Street. The storm drain system exits the site from the southeasterly corner of the site.

No soil or groundwater contamination has been documented at the site. This project is being proposed to be split into 2 new lots. The southerly lot contains the majority of existing impervious area to remain which includes, but is not limited to, the existing buildings, fences, and an asphalt access road and parking with concrete walkways.

The site is currently zoned R110-Single Family Residence and the General Plan Designation is L – Low Density Residential, see City Zoning Map, provided as Attachment D. There are no known covenants associated with this site.

III. Project Storm Water Performance Criteria and Drainage Management

a. Development Area and BMP Requirement Tier
   i. The site encompasses 26,264 square feet (sf) of impervious area and is a Tier 2 multi-family apartment project.
   ii. Proposed Development Area and Impervious Area:

Pre-project impervious surface area:	9,147 sf
Post-project impervious surface area:	22,941 sf
Amount of impervious surface area that will be replaced:	9,147 sf
Amount of new impervious surface area that will be created:	13,794 sf
Reduced Impervious Area Credit:	0 sf
New and Replaced Impervious Area:	22,941 sf
Net Impervious Area:	22,941 sf

The site is not located within the Urban Sustainability Area (USA), per the City of Santa Cruz USA Map; included as Attachment C. The site is surrounded by Major Roads and is within the Coastal Zone, as shown within the USA Map. The project as proposed meets the more stringent stormwater management requirements for projects outside the USA.

b. One (1) Drainage Management Area (DMA) has been delineated for new construction on the site. A Media Filtration Vault and underground chambers are proposed for the DMA, which includes all the new and/or replaced impervious area. The Chamber bottom will be more than 3-feet above the seasonal high ground water level. The media filtration vault will provide the treatment method prior to storm water entering the chambers. The chambers will provide retention and peak management control.

IV. Site Design and SCMs

a. Due to the new and/or replaced impervious area of 22,941 square feet proposed, this project falls within the Tier 4 Post-Construction BMP Requirements.
   i. Tier 1 - Site Design and Runoff Reduction elements, intended to control runoff from the site, consist of the following:
      1. Disconnected downspouts.
      2. Disperse driveway runoff to landscape areas
      3. Groundwater Infiltration
      4. Implementation of Bio-filtration areas and flow-through planters
   ii. Tier 2 – Water Quality Treatment is achieved by implementing a Media Filtration Vault. Due to the space limitations this project has, a “flow-through” treatment method, as defined in Part-B 3-b-iii for non-retention based treatment of the “Technical Support Document for Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region”, is being implemented. The Media has been sized to capture and treat 0.20 inches per hour as directed on page 18 of the BMP manual.

iii. Tier 3 – Runoff Retention is Infeasible for this project site due to the Karst Formations identified within the Geologist Report. There is a significant concern that by collecting water onsite for the purposes of retention will likely cause sink holes to occur. Both C2G and Pacifica Crest Engineering has notified both the State and City of Santa Cruz regarding this concern. Alternates mentioned by the state were to either retain 10% of the EISA onsite or conduct the mitigation offsite. In speaking with Suzanne Healy with the City of Santa Cruz, she informed the design team that the City does not have anything in place for them to approve offsite mitigation.

The Project Equivalent Impervious Surface Area (EISA) has been calculated to determine 10% that will be directed to onsite SCMs.

See sheet C5.1, provided as Attachment A, for locations, areas, and DMA and SCMs.

V. Calculations

a. Tier 2 Sizing: The Bio-filtration areas and Flow Through Planters are at least 4% of the receiving Tributary Area.

b. Tier 3 Sizing: The Central Coast Region Stormwater Control Measure Sizing Calculator was used to determine the required retention volume within the chamber. Calculations have been included in Appendix H.

c. Tier 4 Sizing: Detention will require both storage calculations as well as restrictor calculations.

   i. Storage calculations – Hydrology Studios Hydrograph Report has been prepared to determine storage volume requirement for detention and the allowable release rate for a 10-year pre-development storm event.
   ii. Restrictor calculations – based on the maximum amount of head these calculations show that the designed orifice will not release more than a 10-year pre-development flow rate.

VI. BMP Operation and Maintenance Plan

a. Structural Storm Water Control Measures requiring maintenance are shown on sheet C5.1, provided in Attachment A, consisting of Bio-filtration areas, Flow-through Planters & Underground Stormwater Water Chambers.

b. O&M procedures for the SCMs consist of monthly inspection and removal of trash or other deleterious materials; annual inspection and replacement of any removed soils or vegetation, replanting as required, and repair of any structural damage. Annual inspections shall take place in September, prior to start of the rainy season. See Attachment E for specific requirements and maintenance checklist.

c. The Media Filtration Vault will require filters to be replaced per the manufacturer's recommendations.

d. After the medial filtration vault, an Isolator chamber row has been added to ensure additional protection of the chamber system and isolation area for potential sediment. The Isolator chamber should receive monthly and yearly inspections.

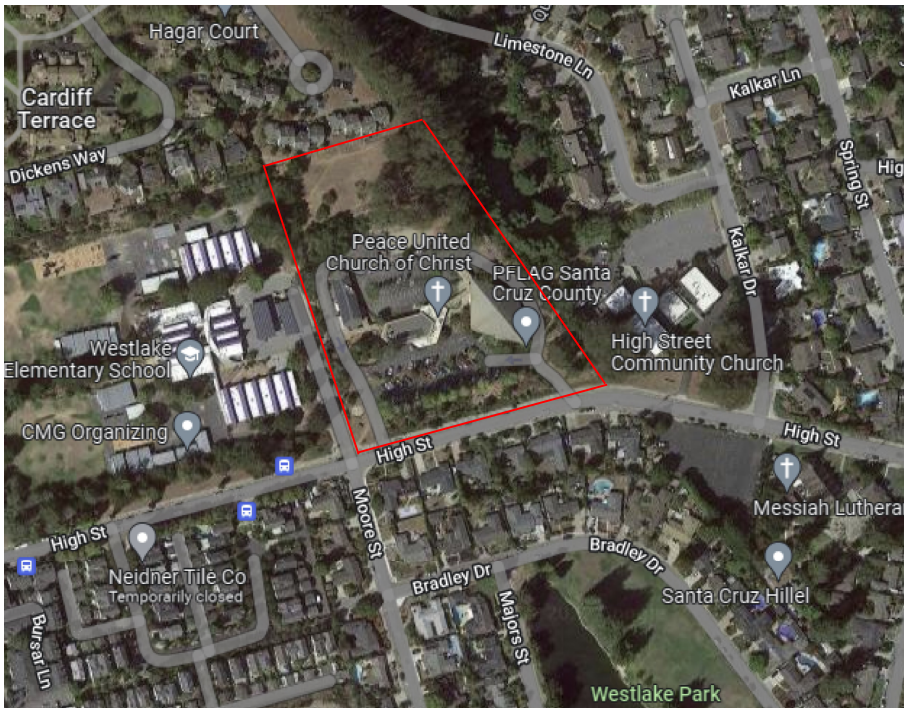
e. Maintenance will be performed by the property owner, and will include both monthly and annual inspections, maintenance, and repair as needed of the SCMs.

f. Maintenance Agreement included as Attachment E.

VII. Routine and Periodic SCM Maintenance and Inspections

a. Routine maintenance and inspection requirements and schedules are provided for in Attachment E.

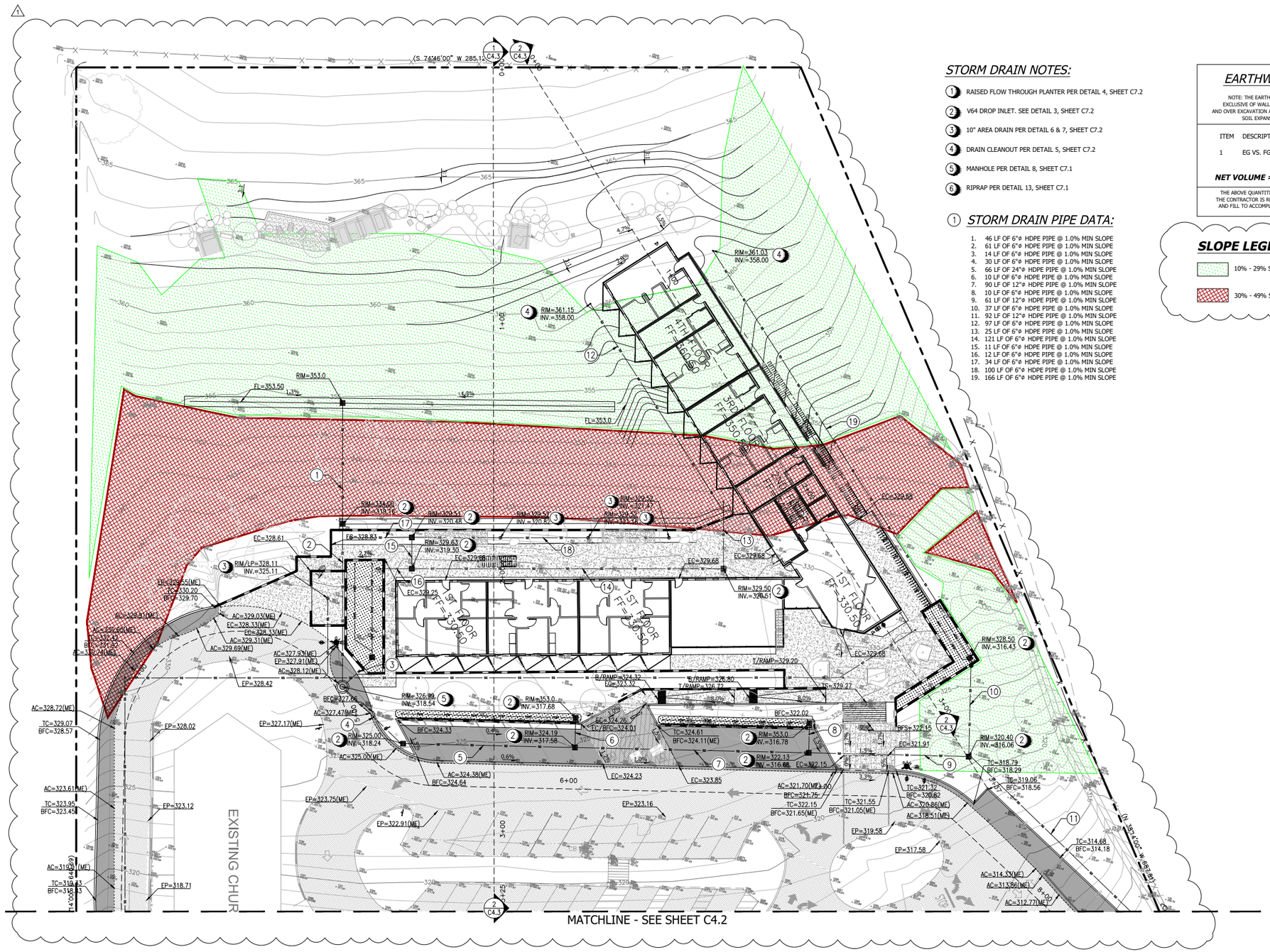
b. Each SCM will be inspected twice a year to ensure it is operating to designed specifications and per industry standards for the landscape BMPs. Semi-Annual inspections will conform to the same requirements as the monthly inspections and will be reviewed by a civil engineer registered in the state of California. The inspector or reviewing engineer may direct other inspections and/or maintenance to occur based on the findings. Annual reports will be submitted to the County as required and will include information generated during the Semi-Annual inspections.



Vicinity Map
scale = nts

ATTACHMENT "A"

- *Civil Plan sheet C4.1*
- *Civil Plan sheet C4.2*
- *Civil Plan sheet C5.1*



STORM DRAIN NOTES:

1. RAISED FLOW THROUGH PLANTER PER DETAIL 4, SHEET C7.2
2. V64 DROP INLET. SEE DETAIL 3, SHEET C7.2
3. 10" AREA DRAIN PER DETAIL 6 & 7, SHEET C7.2
4. DRAIN CLEANOUT PER DETAIL 5, SHEET C7.2
5. MANHOLE PER DETAIL 8, SHEET C7.1
6. RIPRAP PER DETAIL 13, SHEET C7.1

① STORM DRAIN PIPE DATA:

1. 46 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
2. 61 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
3. 14 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
4. 30 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
5. 66 LF OF 24"ø HDPE PIPE @ 1.0% MIN SLOPE
6. 10 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
7. 90 LF OF 12"ø HDPE PIPE @ 1.0% MIN SLOPE
8. 10 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
9. 61 LF OF 12"ø HDPE PIPE @ 1.0% MIN SLOPE
10. 37 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
11. 92 LF OF 12"ø HDPE PIPE @ 1.0% MIN SLOPE
12. 97 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
13. 25 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
14. 121 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
15. 11 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
16. 12 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
17. 34 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
18. 100 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE
19. 166 LF OF 6"ø HDPE PIPE @ 1.0% MIN SLOPE

EARTHWORK QUANTITIES

NOTE: THE EARTHWORK QUANTITIES SHOWN HEREON ARE EXCLUSIVE OF WALL FOOTINGS, EXISTING PAVEMENT REMOVAL AND OVER EXCAVATION AND RECOMPACTION. UTILITY TRENCH SPOILS & SOIL EXPANSION AND CONTRACTION FACTORS.

ITEM	DESCRIPTION	CUT (cu.yds)	FILL (cu.yds)
1	EG VS. FG	3,100	300

NET VOLUME = 2,800 CU.YDS. OF EXPORT

THE ABOVE QUANTITIES ARE FOR INFORMATION PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE THE NECESSARY CUT AND FILL TO ACCOMPLISH FINISH GRADE SHOWN ON THESE PLANS.

SLOPE LEGEND

10% - 29% SLOPE

30% - 49% SLOPE

NORTH

SCALE: 1"=20'

0 20 40 60

USA NORTH 811 Call 811 Before You Dig

workbench
189 WALNUT AVENUE
SANTA CRUZ, CA 95060
WORKBENCHBUILT.COM
P: 831.227.2217

C2G /CIVIL CONSULTANTS GROUP, INC.
Engineers/Planners
4444 Scotts Valley Drive / Suite 6
Scotts Valley, CA 95066
831.438.4420

PEACE VILLAGE

900 HIGH ST.
SANTA CRUZ, CA 95060

REGISTERED PROFESSIONAL ENGINEER
TODD R. CREAMER
No. C 64561
Exp. 6/30/23
CIVIL
STATE OF CALIFORNIA

ISSUES/ REVISIONS

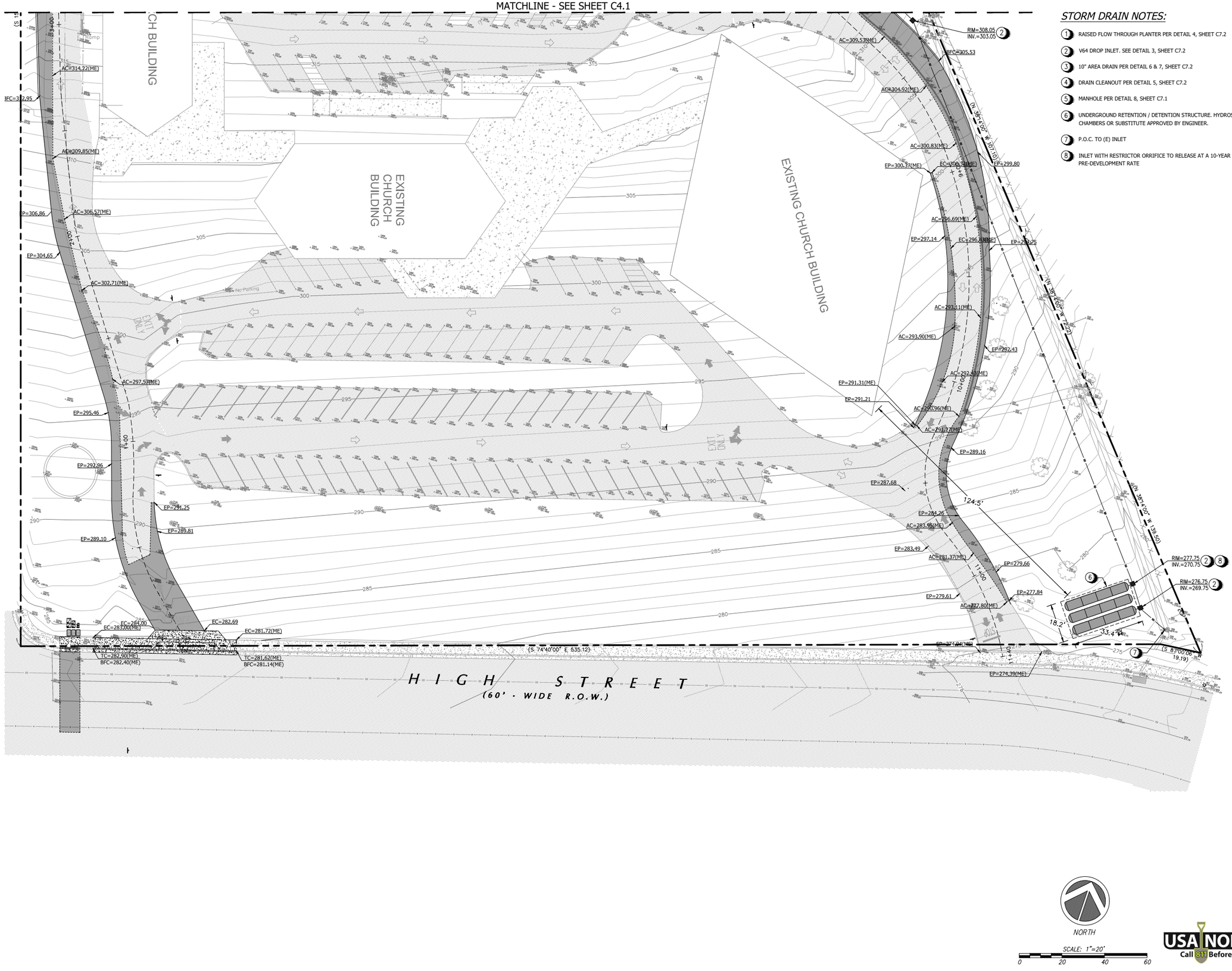
Issue	DESCRIPTION	DATE
1	PLANNING REVISION 01	02.23.23

APN number	001-022-40
Project number	2011.04
Print Date	08.15.2022
Drawn by	DD/JB
Checked by	TC
Scale	1" = 30'

GRADING PLAN

C4.1

Drawing: Z:\Shared\CAD\2011.04 - Peace Village Church Design\CAD Sheets\2011.04 - C4.1 - GRADING PLAN.dwg Layout: C4.1 - GRADING PLAN Last Saved: Fri Apr 24, 2023 - 2:33pm Last Plotted: Mon Apr 27, 2023 - 11:59am By: Dave



STORM DRAIN NOTES:

1. RAISED FLOW THROUGH PLANTER PER DETAIL 4, SHEET C7.2
2. V64 DROP INLET. SEE DETAIL 3, SHEET C7.2
3. 10" AREA DRAIN PER DETAIL 6 & 7, SHEET C7.2
4. DRAIN CLEANOUT PER DETAIL 5, SHEET C7.2
5. MANHOLE PER DETAIL 8, SHEET C7.1
6. UNDERGROUND RETENTION / DETENTION STRUCTURE. HYDROSTOR HS75 CHAMBERS OR SUBSTITUTE APPROVED BY ENGINEER.
7. P.O.C. TO (E) INLET
8. INLET WITH RESTRICTOR ORRIFICE TO RELEASE AT A 10-YEAR PRE-DEVELOPMENT RATE

NORTH

SCALE: 1"=20'

0 20 40 60

USA NORTH 811 Call 811 Before You Dig

workbench
189 WALNUT AVENUE
SANTA CRUZ, CA 95060
WORKBENCHBUILT.COM
P: 831.227.2217

C2G /CIVIL CONSULTANTS GROUP, INC.
Engineers/Planners
4444 Scotts Valley Drive / Suite 6
Scotts Valley, CA 95066
831.438.4420

PEACE VILLAGE

900 HIGH ST.
SANTA CRUZ, CA 95060

REGISTERED PROFESSIONAL ENGINEER
TODD R. CREAMER
No. C 64561
Exp. 6/30/23
CIVIL
STATE OF CALIFORNIA

ISSUES/ REVISIONS

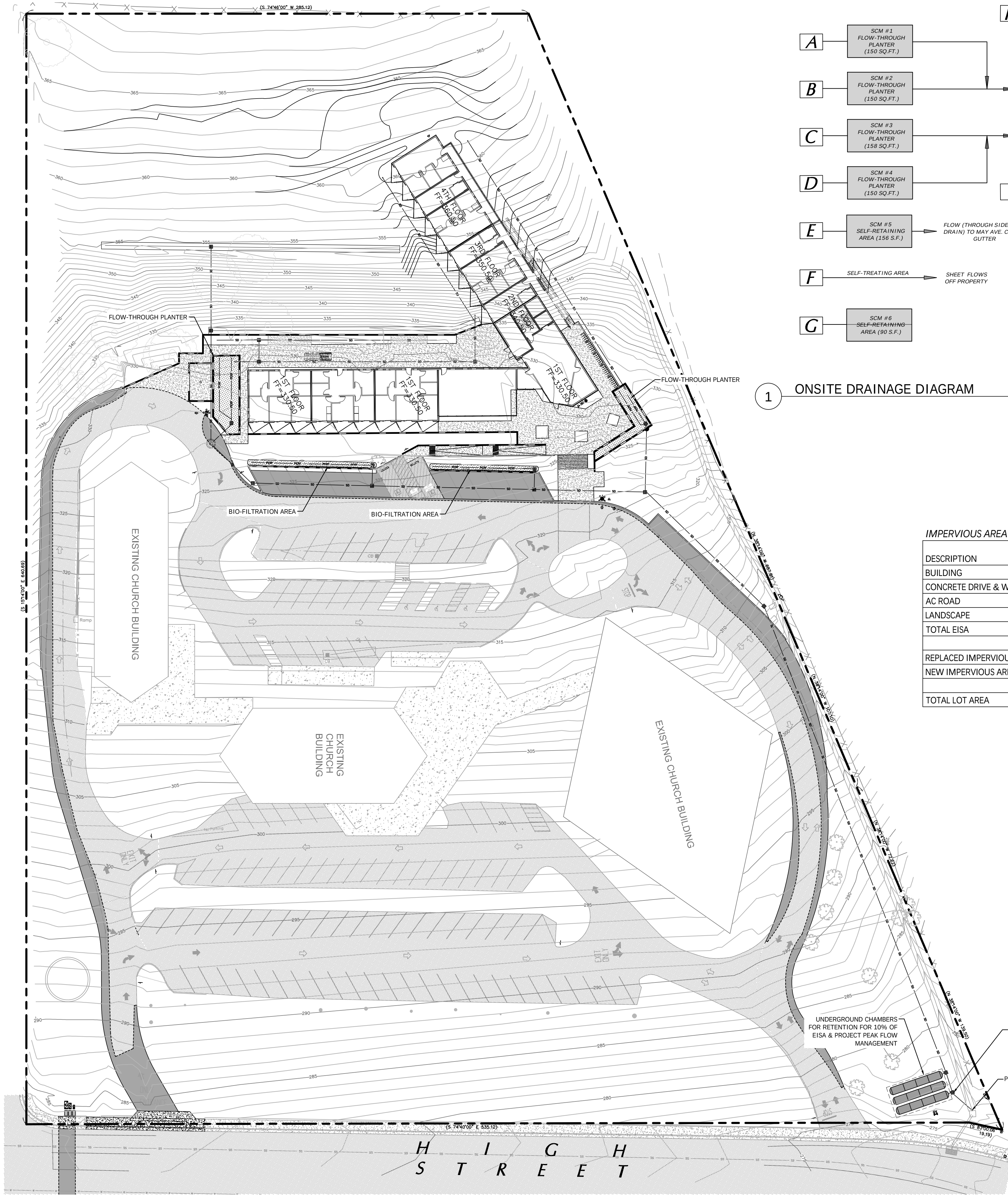
Issue	DESCRIPTION	DATE
1	PLANNING REVISION 01	02.23.23

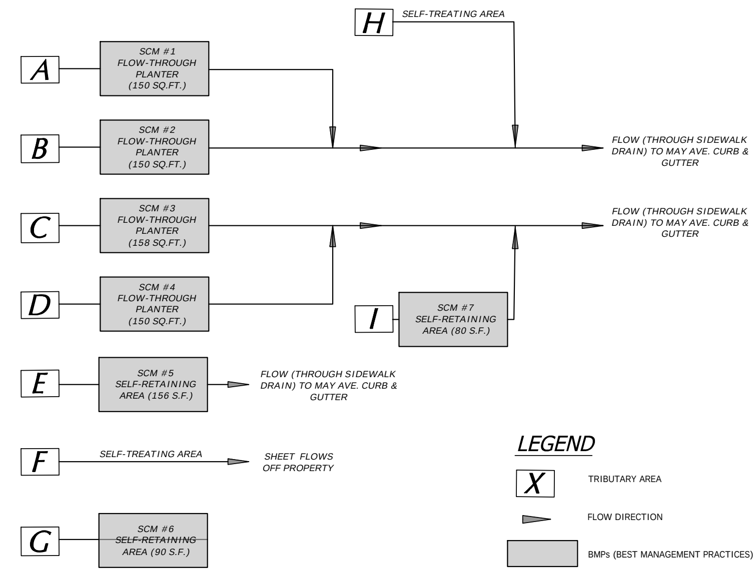
APN number	001-022-40
Project number	2011.04
Print Date	08.15.2022
Drawn by	DD/JB
Checked by	TC
Scale	1" = 30'

GRADING PLAN

C4.2

Drawing: S:\Shared\CAD\2011.04 - Peace Village Church\Design\CAD\Sheets\2011.04 - C4.2 - GRADING PLAN.dwg Layout: C4.2 - GRADING Last Saved: Fri Mar 24, 2023 - 2:53pm Last Plotted: Mon Mar 27, 2023 - 11:51am By: Dave





1 ONSITE DRAINAGE DIAGRAM

Scale: NTS

STORMWATER MITIGATION

DATA

SITE LOCATION P60 ISOPLETH:	1.50
RAINFALL INTENSITY FOR 10yr:	2.1 IN/HR
RATIONAL COEFFICIENT Cpre:	0.25
Cpost:	0.90
SITE INFILTRATION RATE (WEBSOIL SURVEY)	0.03 IN/HR

PROJECT REQUIREMENTS

TIER 4

MITIGATION REQUIRED
TOTAL ADDED /REPLACED IMPERVIOUS AREA = 22,947 sq.ft.

MITIGATION SUMMARY

PROJECT MITIGATION FOR TIER 1

- DISCONNECT DOWNSPOUTS
- IMPLEMENT PERVIOUS PAVEMENT
- DRAIN HARDSCAPE RUNOFF TO LANDSCAPE AREAS
- IMPLEMENT BIO-FILTRATION & FLOW-THROUGH PLANTERS

PROJECT MITIGATION FOR TIER 2

- FLOW-THROUGH PLANTERS SIZED TO BE AT LEAST 4% OF THE RECEIVING TRIBUTARY AREA
- BIO-RETENTION AREAS SIZED TO BE AT LEAST 4% OF THE RECEIVING TRIBUTARY AREA

PROJECT MITIGATION FOR TIER 3

- DOCUMENTED TECHNICAL INFEASIBILITY
  - GEOLOGIST HAS IDENTIFIED KARST FORMATIONS THROUGH-OUT THE EXISTING PROPERTY AND HAS PREPARED A LETTER AGAINST INFILTRATING ONSITE
- EISA HAS BEEN CALCULATED TO PURSUE STEP 4 OF THE BMP MANUAL (DEDICATE 10% OF THE PROJECT'S EISA TO SCMs

PROJECT MITIGATION FOR TIER 4

- PEAK FLOW MANAGEMENT ACCOMPLISHED THROUGH UNDGERGROUND STORAGE CHAMBERS W/ RESTRICTOR TO MEET PRE-DEVELOPMENT FLOW RATES

IMPERVIOUS AREA CALCULATIONS

DESCRIPTION	AREA (SF)	AREA (ACRES)	Correction Factor (Table 4.1)	EISA (SF)	
BUILDING	10,464	0.240	1	10,464	
CONCRETE DRIVE & WALK	7,394	0.170	1	7,394	
AC ROAD	5,083	0.117	1	5,083	
LANDSCAPE	50,495	1.159	0.22	11,109	
TOTAL EISA				34,050	
				3,405	10% of EISA
REPLACED IMPERVIOUS AREA	9,147	0.210			
NEW IMPERVIOUS AREA	13,794	0.317			
TOTAL LOT AREA	73,436	1.686			

RETENTION CALC @ 10% OF EISA

3,405 SF (EISA) x 0.167 FT (RAINFALL) = 568.64 CU.FT.

- VOLUME CALCULATED ABOVE SHALL BE WITHIN THE VOID SPACE OF THE UNDERGROUND CHAMBERS AND BELOW THE RELEASE ORIFICE

I CERTIFY, THAT THE SELECTION, SIZING, AND DESIGN OF THE STORM WATER CONTROL MEASURES MEET THE CENTRAL COAST REGIONAL WATER QUALITY CONTROL BOARD (RWQCB) PCR REQUIREMENTS INCLUDING APPLICABLE PERFORMANCE REQUIREMENTS.

TODD R. CREAMER
RCE 64561
LICENSE EXPIRATION 06-30-23

NORTH

SCALE: 1"=30'
0 30 60 90

USA NORTH 811
Call 811 Before You Dig

workbench
189 WALNUT AVENUE
SANTA CRUZ, CA 95060
WORKBENCHBUILT.COM
P: 831.227.2217

C2G /CIVIL CONSULTANTS GROUP, INC.
Engineers/Planners
4444 Scotts Valley Drive / Suite 6
Scotts Valley, CA 95066
831.438.4420

PEACE VILLAGE
900 HIGH ST.
SANTA CRUZ, CA 95060

REGISTERED PROFESSIONAL ENGINEER
TODD R. CREAMER
No. C 64561
Exp. 6/30/23
CIVIL
STATE OF CALIFORNIA

ISSUES/ REVISIONS

Issue	DESCRIPTION	DATE
1	PLANNING REVISION 01	02.23.23

APN number	001-022-40
Project number	2011.04
Print Date	08.15.2022
Drawn by	DD/JB
Checked by	TC
Scale	

STORM WATER CONTROL PLAN

C5.1

Drawing: ...CAD\2011.04 – Peace United Church\Design\CAD\Sheets\2011.04 – C5.1 – SWCP.dwg Layout: C5.1 – SWCP Last Saved: Mon Mar 27, 2023 – 10:23am

ATTACHMENT "B"

- *Soil Map*
- *Soil Data*
- *Letter from Geologist*

Soil Map—Santa Cruz County, California
(Peace Village)

Map Scale: 1:5,050 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Santa Cruz County, California
Survey Area Data: Version 16, Sep 14, 2022

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

Date(s) aerial images were photographed: Apr 13, 2020—Apr 24, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
123	Cropley silty clay, 2 to 9 percent slopes, MLRA 14	49.8	41.8%
125	Danville loam, 2 to 9 percent slopes	11.8	9.9%
133	Elkhorn sandy loam, 2 to 9 percent slopes	19.2	16.1%
164	Pits-Dumps complex	8.8	7.4%
177	Watsonville loam, 2 to 15 percent slopes	6.5	5.5%
180	Watsonville loam, thick surface, 15 to 30 percent slope s	23.1	19.3%
Totals for Area of Interest		**119.2**	**100.0%**

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Santa Cruz County, California

177—Watsonville loam, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: h9g5
Elevation: 20 to 1,200 feet
Mean annual precipitation: 28 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 245 to 275 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Watsonville and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Watsonville

Setting

Landform: Marine terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 18 inches: loam
H2 - 18 to 39 inches: clay
H3 - 39 to 63 inches: sandy clay loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R014XD089CA - CLAYPAN
Hydric soil rating: Yes

Minor Components

Elkhorn, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Pinto, loam

Percent of map unit: 4 percent
Hydric soil rating: No

Watsonville, thick surface

Percent of map unit: 3 percent

Landform: Marine terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Hydric soil rating: Yes

Danville

Percent of map unit: 1 percent
Hydric soil rating: No

Elder

Percent of map unit: 1 percent
Hydric soil rating: No

Cropley, silty clay

Percent of map unit: 1 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Santa Cruz County, California
Survey Area Data: Version 16, Sep 14, 2022

13 October 2022 Proposal No. PR 22-168

Envision I, LLC
Attention: Sibley Simon
189 Walnut Ave
Santa Cruz, 95060
Sibley@envisionhousing.us
831-419-4091

Subject: Geological hazards and risks related to infiltration in karst
Proposed apartment housing
900 High Street
Santa Cruz, CA 95060
County of Santa Cruz APN 001-022-40

Dear Sibley,

This letter presents a summary of our geological findings as they pertain to storm water infiltration for the proposed development on the subject property. We are partially relying upon the body of work completed by the author (Erik Zinn) under the auspices of Zinn Geology. That work culminated in a geology report titled "PHASE I KARST AND SLOPE STABILITY HAZARDS INVESTIGATION" dated 2 July 2018 by Zinn Geology (Job #2018011-G-SC).

OVERVIEW

It is our understanding that Project Civil Engineer of Record, C2G, is in the process of coordinating the storm water mitigation approach with the manager of the City of Santa Cruz Stormwater Management Plan, Suzanne Healy. It is also our understanding that the current design scheme is trying to meet Tier 3 requirements from the City of Santa Cruz Mandatory Low Impact Development Requirements. Within the section that describes the steps for designing for Tier 3 (Chapter 4, section 4.3), there is an optional step described as "Step 3" that covers situations arising from infeasible runoff retention. One of the listed conditions for infeasibility is "Geotechnical Hazards", which in our opinion, applies to this project. The end paragraph for Step 3 is as follows:

> *Technical infeasibility must be clearly documented with supporting evidence such as geotechnical reports, hydrological analysis, documentation of pollutant concerns on the property, etc. Technical infeasibility determination will only be granted after demonstration that site layout has been optimized and all storm water retention options have been considered.*

Evidence of karst geology underlying the property and the proposed development area was encountered by Zinn Geology during their prior investigation in 2018 (Zinn Geology, 2018). Zinn Geology presented substantive evidence and findings in their

2018 report describing the hazards and risks related to the underlying karst geology at the site and issued recommendations that flowed from those findings.

The widely spaced gridded boring program pursued in 2018 by the Project Geotechnical Engineer of Record, Becky Dees of Dees and Associates, encountered marble bedrock at depth below the site, mantled by an inconsistent blanket of marble rubble, some soft soil and marine terrace deposits (see attached plates excerpted from the Zinn Geology 2018 report). This is consistent with the University of California at Santa Cruz (UCSC) campus geology that abuts the property to north, the exposure of marble in an old quarry to the east and the marble bedrock that is documented to underlie the City of Santa Cruz Bay Street Reservoir site.

The gently sloping portion of the marble surface that underlies the subject property appears to have been formed and sculpted as part of the creation of the ~213ka second emergent marine terrace. At least one infilled doline cuts the beveled marble surface, based on the morphology of the marble surface and distribution of marble rubble encountered by Zinn Geology (see Plates 1 and 2). It is likely far more complex than that and is probably one of a complex of dolines on the property. In the author's experience of having worked on karst projects on the UCSC campus for over 30 years, dolines and sinkholes typically develop along structural geological features overprinted onto the marble bedrock in the form of ancient fault and fracture zones. The marble bedrock is crushed in those zones and falls prey to the dissolution process that creates caves, voids, dolines and sinkholes within marble bedrock over geologic time.

The following recommendations regarding the handling of stormwater and landscape watering were issued in the 2018 Zinn Geology report:

3. We recommend that all of the storm water generated for this project be disposed in the City of Santa Cruz storm drains. Attenuating the storm flows by detaining the water in impervious structures is geologically acceptable, as long as the water is NOT allowed to infiltrate the soil.

4. Landscape watering for the project should NOT saturate the subgrade in an unnatural fashion. The natural distribution and application rate of rainfall should be emulated for landscaping irrigation, in order to avoid saturating the subgrade and triggering a doline collapse.

We have learned valuable lessons at the adjacent UCSC campus in the past with the reactivation of sinkholes in the vicinity of existing storm water treatment systems and bio swales/infiltration areas on campus (see Figure 1 below). Storm water infrastructure sited on karst and over dolines can create an elevated risk of triggering the reactivation of a doline because of the increase in the infiltration rate and volume of storm water. The resulting sinkholes that form can threaten important and expensive facilities. The subsequent repairs and rerouting of the storm water infrastructure also can cost significantly more than the original design and construction costs for the storm water system.

Figure 1 - 2015 photo of sinkhole developed within a reactivated doline under a stormwater treatment system on the UCSC campus

FINDINGS

The subject property is underlain by marble bedrock, marble rubble, doline fill and marine terrace deposits. At least one large, infilled doline cuts the marble surface under the proposed development area footprint and there are likely more infilled dolines on the property based on the experience with karst investigations adjacent to the property.

The potential hazard of doline reactivation and the development of a sinkhole at the surface in the proposed development area and on the property is already high and will be greatly increased if water is infiltrated at the site. Development of a sinkhole may undermine the existing and proposed structures, as well as existing and proposed utilities and infrastructure. Subsequently, if stormwater is infiltrated on the site, the risk to the existing and proposed structures and infrastructure is “greater than ordinary” as defined in Appendix A of this letter.

RECOMMENDATIONS

Based upon the findings listed above, we reiterate the stormwater and landscape watering recommendations from the 2018 Zinn Geology report as follows:

1. We recommend that the storm water generated for this project be disposed in the City of Santa Cruz storm drains. Attenuating the storm flows by detaining the water in impervious structures is geologically acceptable, as long as the water is NOT allowed to infiltrate the soil.

2. Landscape watering for the project should NOT saturate the subgrade in an unnatural fashion. The natural distribution and application rate of rainfall should be emulated for landscaping irrigation, to avoid saturating the subgrade and triggering a doline collapse and the formation of sinkhole.

This concludes our letter. Please do not hesitate to contact us if you have any questions or concerns about this letter.

Sincerely,

PACIFIC CREST ENGINEERING INC.

Erik N. Zinn
Principal Geologist
P.G. #6854, C.E.G. #2139

Attachments: References
Appendix A – Scale of acceptable risks from geologic hazards
Plates 1 and 2 excerpted from 2018 Zinn Geology report (back of letter)

REFERENCES

City of Santa Cruz, 2014, DEVELOPMENT AND REMODELING PROJECTS, Storm Water Best Management Practices For Private and Public Development Projects
Chapter 6B of the Best Management Practices Manual for the City's Storm Water Management Program, publically available at
https://www.cityofsantacruz.com/home/showpublisheddocument/36560/635418232770030000

Zinn Geology, 2018, PHASE I KARST AND SLOPE STABILITY HAZARDS INVESTIGATION - Peace United Church - Envision Housing, Proposed Housing Development, 900 High Street Santa Cruz, California, Job #2018011-G-SC, unpublished consultant report.

APPENDIX A

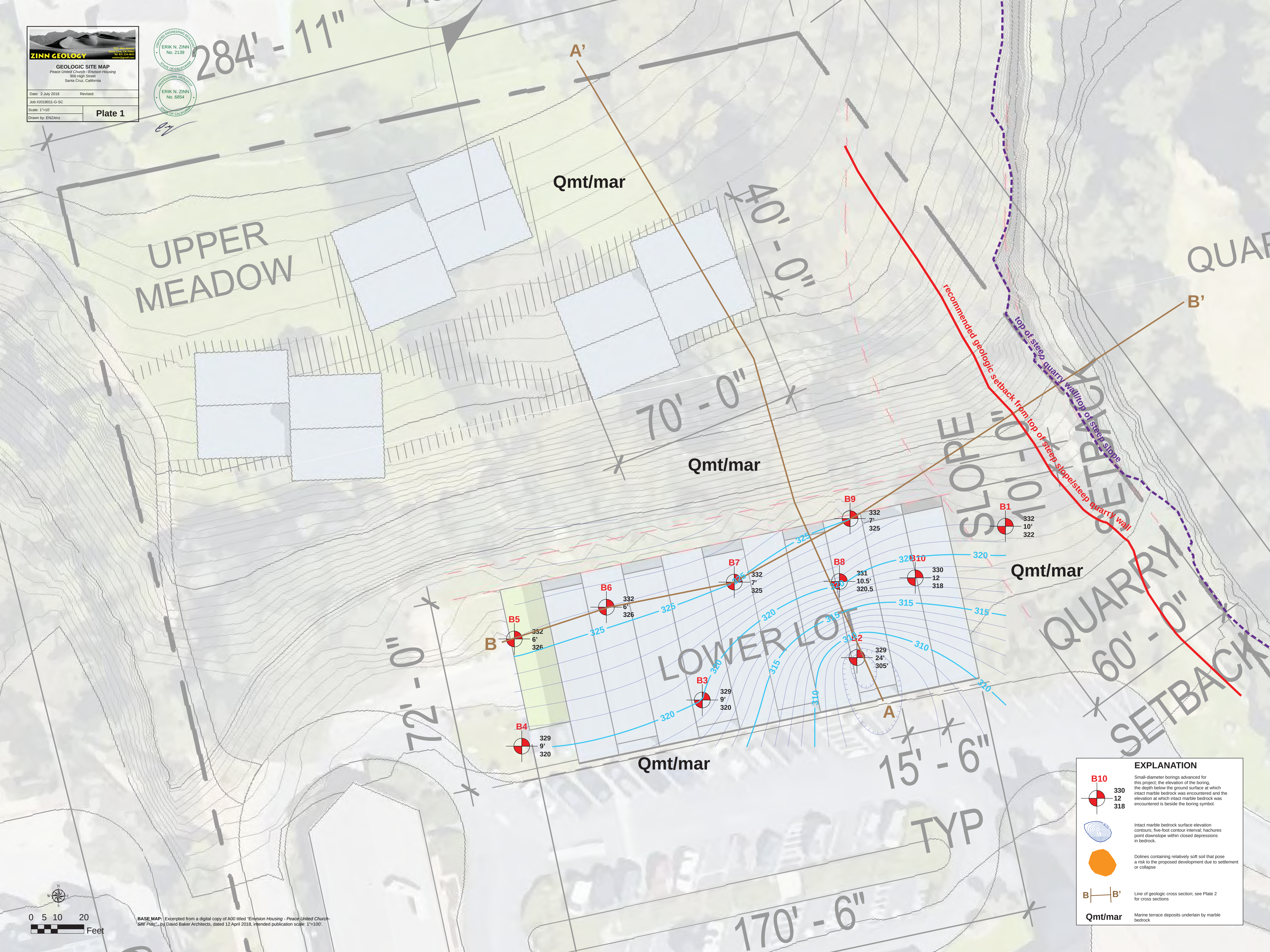
SCALE OF ACCEPTABLE RISKS FROM GEOLOGIC HAZARDS

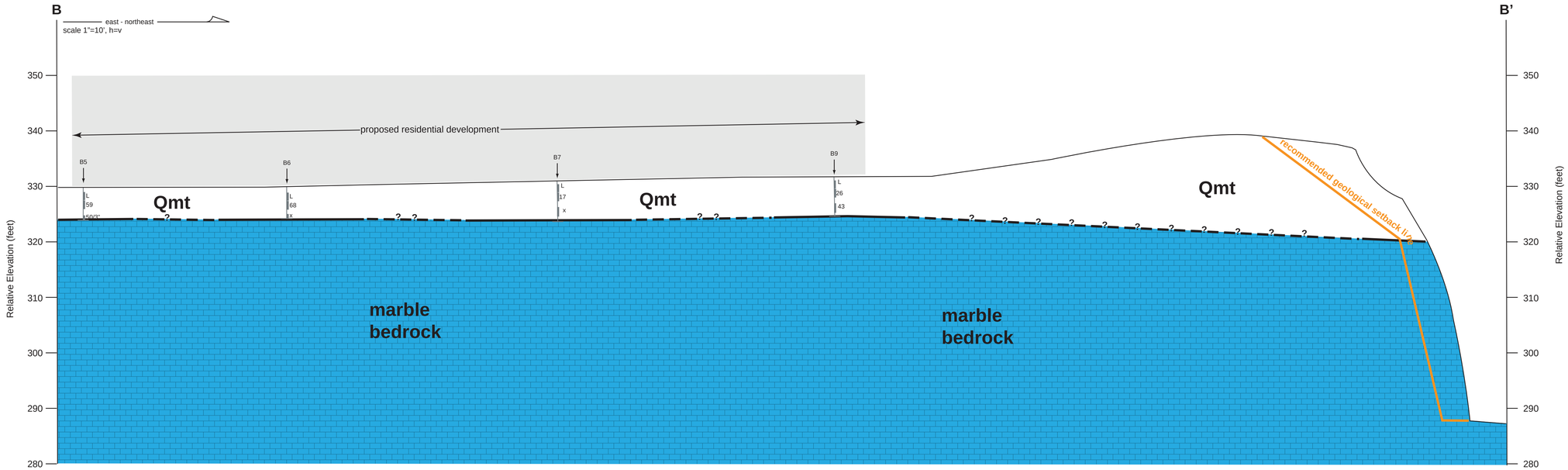
SCALE OF ACCEPTABLE RISKS FROM SEISMIC GEOLOGIC HAZARDS		
Risk Level	Structure Types	Extra Project Cost Probably Required to Reduce Risk to an Acceptable Level
Extremely low[1]	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intake systems, plants manufacturing or storing explosives or toxic materials.	No set percentage (whatever is required for maximum attainable safety).
Slightly higher than under "Extremely low" level.[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 dams.	5 to 25 percent of project cost.[2]
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.[4]
An "ordinary" level of 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]

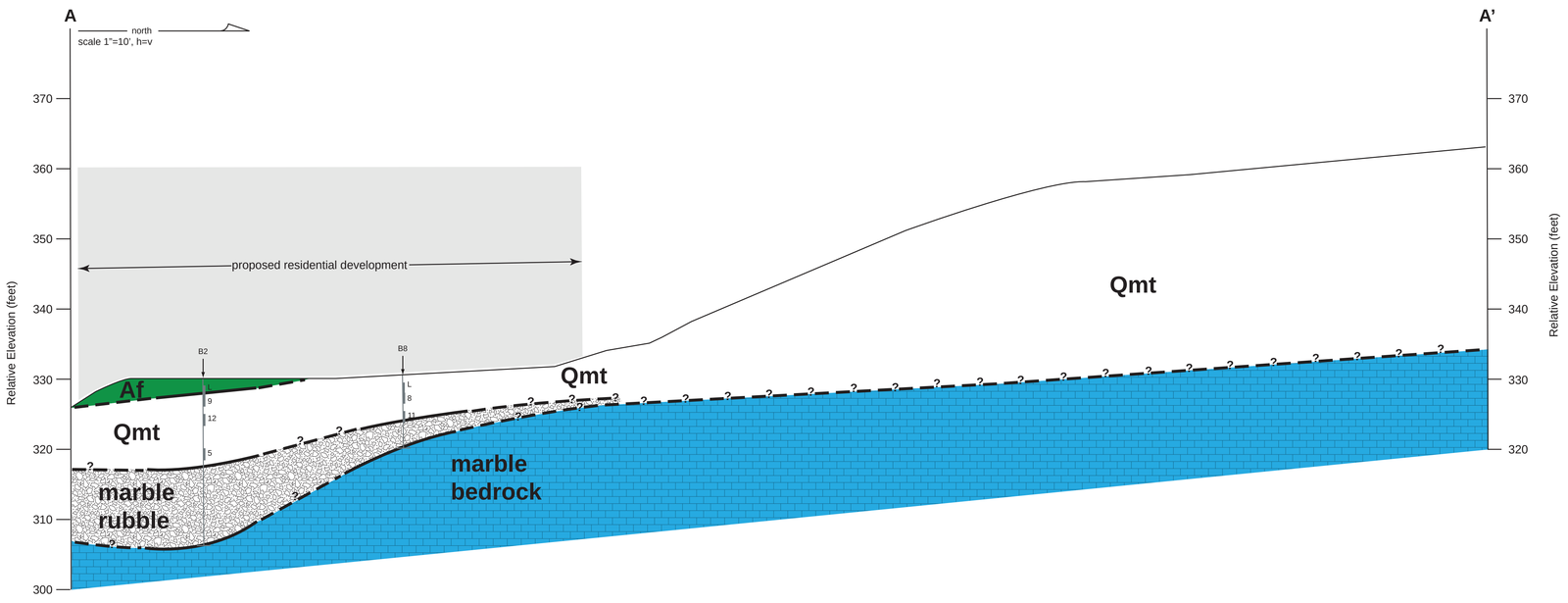
1 Failure of a single structure may affect substantial populations.
2 These additional percentages are based on the assumptions that the base cost is the total cost of the building or other facility when ready for occupancy. In addition, it is assumed that the structure would have been designed and built 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 a 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 damage 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: *Meeting the Earthquake,* Joint Committee on Seismic Safety of the California Legislature, Jan. 1974, p.9.

SCALE OF ACCEPTABLE RISKS FROM NON-SEISMIC GEOLOGIC HAZARDS[6]		
Risk Level	Structure Type	Risk Characteristics
Extremely low risk	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intake systems, plants manufacturing or storing explosives or toxic materials.	1. Failure affects substantial populations, risk nearly equals nearly zero.
Very low risk	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 dams.	1. Failure affects substantial populations. Risk slightly higher than 1 above.
Low risk	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.	1. Failure of a single structure would affect primarily only the occupants.
"Ordinary" risk	The vast majority of structures: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1. Failure only affects owners /occupants of a structure rather than a substantial population. 2. No significant potential for loss of life or serious physical injury. 3. Risk level is similar or comparable to other ordinary risks (including seismic risks) to citizens of coastal California. 4. 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 risk	Fences, driveways, non-habitable structures, detached retaining walls, sanitary landfills, recreation areas and open space.	1. Structure is not occupied or occupied infrequently. 2. Low probability of physical injury. 3. Moderate probability of collapse.
[6] Non-seismic geologic hazards include flooding, landslides, erosion, wave runup and sinkhole collapse		


ZINN GEOLOGY
2231 40th Avenue
Santa Cruz, CA 95062
Tel. 831.334.4833
enzinn@gmail.com
GEOLOGIC SITE MAP
Peace United Church - Envison Housing
900 High Street
Santa Cruz, California
Date: 2 July 2018
Revised:
Job #2018011-G-SC
Scale: 1"=10'
Drawn by: ENZ/enz
Plate 1
CERTIFIED ENGINEERING GEOLOGIST
ERIK N. ZINN
No. 2139
STATE OF CALIFORNIA
PROFESSIONAL GEOLOGIST
ERIK N. ZINN
No. 6854
STATE OF CALIFORNIA
284' - 11"
UPPER MEADOW
Qmt/mar
A'
A
B
B'
40' - 0"
70' - 0"
72' - 0"
60' - 0"
15' - 6"
170' - 6"
TYP
SLOPE SETBACK
QUARRY SETBACK
LOWER LOT
recommended geologic setback from top of steep slope/steep quarry wall
top of steep quarry wall/top of steep slope
B1
332
10'
322
B3
329
9'
320
B4
329
9'
320
B5
332
6'
326
B6
332
6'
326
B7
332
7'
325
B8
331
10.5'
320.5
B9
332
7'
325
B10
330
12
318
B12
329
24'
305'
325
320
315
310
EXPLANATION
Small-diameter borings advanced for this project; the elevation of the boring, the depth below the ground surface at which intact marble bedrock was encountered and the elevation at which intact marble bedrock was encountered is beside the boring symbol.
Intact marble bedrock surface elevation contours; five-foot contour interval; hachures point downslope within closed depressions in bedrock.
Dolines containing relatively soft soil that pose a risk to the proposed development due to settlement or collapse
Line of geologic cross section; see Plate 2 for cross sections
Qmt/mar
Marine terrace deposits underlain by marble bedrock
N
S
E
W
0 5 10 20
Feet
BASE MAP: Excerpted from a digital copy of A00 titled "Envision Housing - Peace United Church-Site Plan", by David Baker Architects, dated 12 April 2018, intended publication scale: 1"=100'.





B-10

49

SYMBOLS

Interpreted contact between earth material units; queried where uncertain

Exploratory boring advanced by Dees & Associates; Small filled rectangles indicate where samples were taken; integers next to rectangles are blow counts for that sample, normalized to a Terzaghi sampler.

EARTH MATERIALS

Af Artificial fill

Qmt Marine terrace deposits

Marble rubble Marble rubble - angular gravel to boulder sized fragments of marble that have collapsed into doline

Marble Intact marble bedrock

NOTES

1. Marble rubble are shown only on cross section.

2. The configuration of the marble surface portrayed on our geologic profile does not exactly match the marble surface portrayed on Geologic Site Map (Plate 1). The marble surface contour map was used as a general guideline for the profile constructions. The karst geometry is conservatively interpreted on the profile; hence, the marble surface shown on the profile varies slightly from the configuration portrayed on Plate 1.

3. Final location and foundation depth of proposed buildings has not been decided upon as of the publication of this report. Buildings shown on this cross are schematic and are intended only to aid the reader in understanding where the building might approximately lie upon the existing ground surface with respect to the underlying geologic structure.

CERTIFIED ENGINEERING GEOLOGIST
ERIK N. ZINN
No. 2139
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
ERIK N. ZINN
No. 6854
STATE OF CALIFORNIA

ZINN GEOLOGY
2211 30th Avenue
Santa Cruz, CA 95062
Tel. 831.334.4833
enzinn@gmail.com

GEOLOGIC CROSS SECTIONS

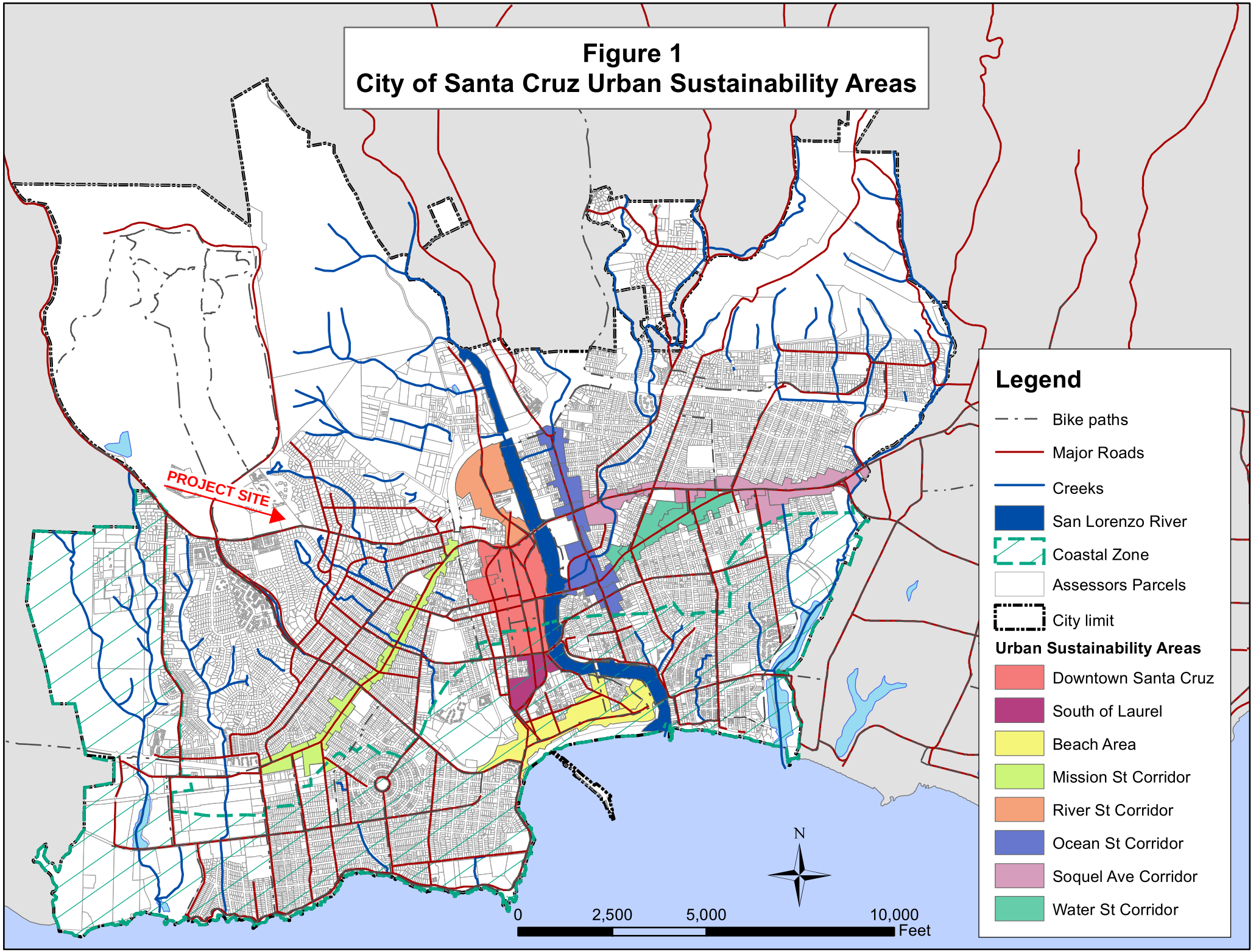
Peace United Church - Envison Housing
900 High Street
Santa Cruz, California

Date: 2 July 2018	Revised:
Job #2018011-G-SC	
Scale: 1"=10', h=v	**Plate 1**
Drawn by: ENZ/enz	

ATTACHMENT "C"

- City of Santa Cruz USA Map

Figure 1
City of Santa Cruz Urban Sustainability Areas



ATTACHMENT "D"

- *City of Santa Cruz Zoning Exhibit*

APPENDIX A
STORM WATER AND LOW-IMPACT DEVELOPMENT BMP REQUIREMENT WORKSHEET

How to Use This Worksheet

The City's Storm Water BMP requirements are based on project type, proposed impervious area, and location within the watershed. This worksheet was developed to help permit applicants determine and meet storm water BMP requirements applicable to a proposed development or redevelopment

1 - Download this fillable form online at **www.cityofsantacruz.com/LID**
2 - Fill out the Worksheet to determine what stormwater BMP requirements apply to a proposed project.
3 - Attach Worksheet and additional documentation required as listed in the City Storm Water Best Management Practices for Private and Public Development Projects to plans for review by the Department of Public Works
4 - Please contact the Public Works Environmental Project Analyst at 420-5160 if you have any questions on completing the worksheet.

Project Address: 900 High Street **Bldg Permit #:** TBD

A - Project Type

Check project type that applies:

☐ Single Family Home ☑ Multi-family, Commercial, Industrial, Public facilities

Check development type that applies:

☑ New Development ☐ Redevelopment / Remodel

B - Proposed Development Area and Impervious Area:

Pre-project impervious surface area:	9147	sq ft
Post-project impervious surface area:	22941	sq ft
Amount of impervious surface area that will be **replaced**:	9147	sq ft
Amount of new impervious surface area that will be **created**:	13794	sq ft
Reduced Impervious Area Credit:	0	sq ft
New and Replaced Impervious Area =	**22941**	**sq ft**
Net Impervious Area =	**22941**	**sq ft**

(Net Impervious Area = Impervious Area created + Impervious Area replaced - Reduced Impervious Area Credit)

C - Post-Construction BMP Tier requirement:

Check Project Type and Impervious Area (from calculations above) that applies.
BMP requirements are cumulative (e.g. a project subject to BMP Tier 3 is also subject to Tiers 1 and 2), permit review fees are not cumulative.
Projects requiring a Stormwater Control Plan will need to involve a civil engineer.

SINGLE-FAMILY HOMES	BMP TIER	Permit Review Fee	Stormwater Control Plan required?
☐ Single-family Home with Net Impervious Area **< 15,000 sf**, **please consult Chapter 6A, BMPs for Single-Family Homes on Small Lots**	**N/A**	$0	No
☐ Net Impervious Area **≥ 15,000 sf**; New and replaced impervious area **< 22,500 sf**	**3**	$330	Yes
☐ New and replaced impervious area **≥ 22,500 sf**	**4**	$550	Yes

MULTI-FAMILY, COMMERCIAL, INDUSTRIAL, PUBLIC FACILITIES	BMP TIER	Permit Review Fee	Stormwater Control Plan Required?
☐ New and Replaced Impervious Area **≥ 2,500 sf**; Net Impervious Area **< 5,000 sf**	**1**	$0	No
☐ Net Impervious Area **≥ 5,000 sf**; New and Replaced Impervious Area **< 15,000 sf**	**2**	$330	Yes
☐ New and Replaced Impervious Area **≥ 15,000 sf** but **< 22,500 sf**	**3**	$550	Yes
☑ New and replaced impervious area **≥ 22,500 sf**	**4**	$550	Yes

If the proposed project is only subject to BMP Tiers 1 or 2, skip to Step F.

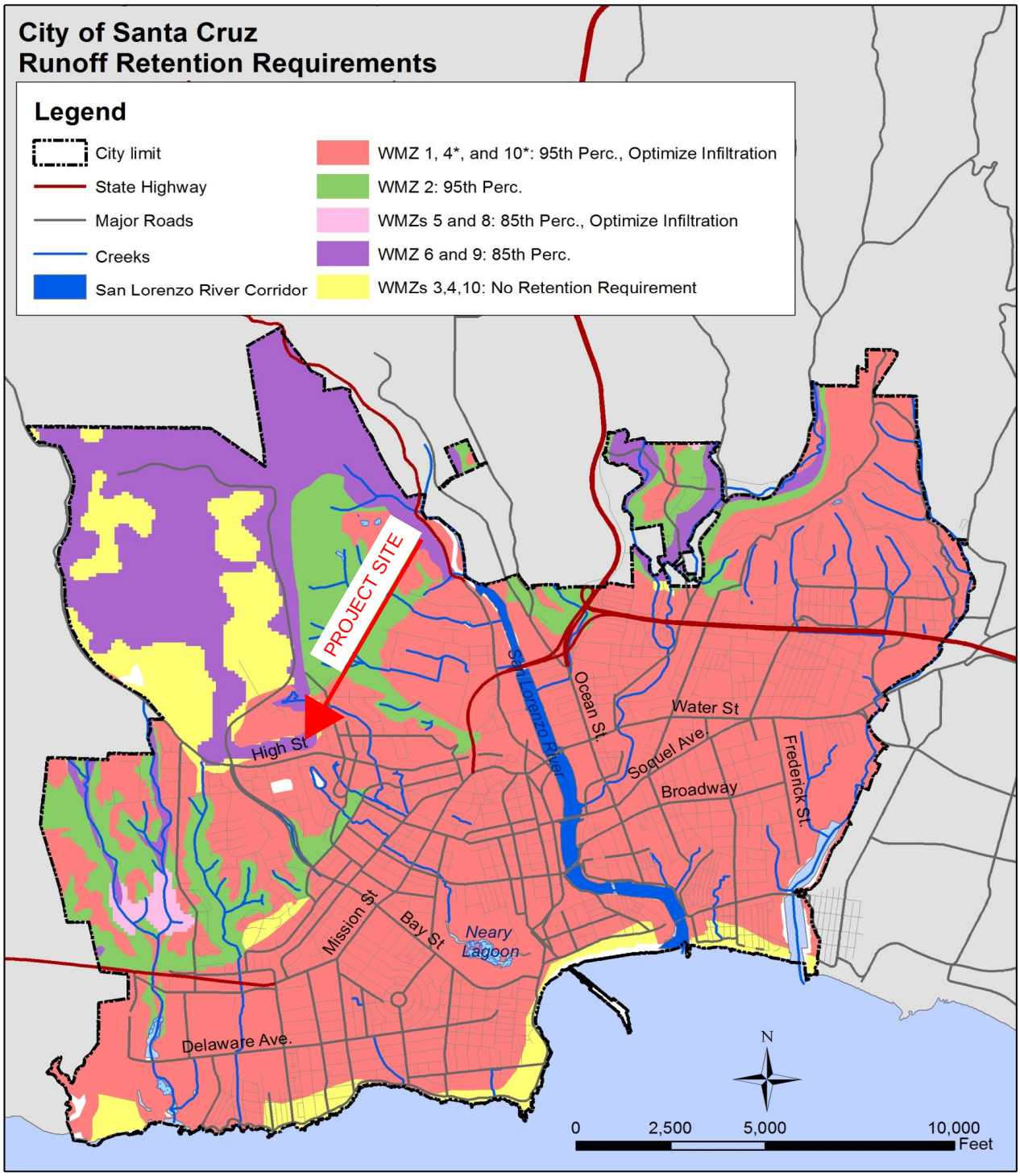
D - Watershed Management Zones - For projects subject to Tiers 3 Post-Construction BMP requirements only.

Watershed Management Zones are viewable online on the City of Santa Cruz GIS website at: http://gis.cityofsantacruz.com/gis/index.html

Watershed Management Zones and associated Tier 3 (Runoff Retention) Post-Construction BMP requirements

If Tier 3 BMP requirements are applicable to the project, check the watershed management zone area where the project is located.

- ☑ WMZ 1, and portions of 4, and 10 overlying groundwater basin
- ☐ WMZ 2
- ☐ WMZ 5 and 8
- ☑ WMZ 6 and 9
- ☑ WMZ 3, 4 and 10



E - Special Circumstances - For projects subject to Tiers 3 and 4 Post-Construction BMP requirements only.
Check if special circumstance applies to the project

- ☐ Highly Altered Channel and Intermediate Flow Control Facility
- ☐ Urban Sustainability Area

F - Additional Stormwater BMP Requirements for Multi-family, Commercial and Industrial projects
Check if additional BMP requirements apply to the project

a) State Construction Activities Storm Water General Permit

- ☐ Construction activity resulting in land disturbance of one acre or more, or part of a larger common plan of development

b) Additional Source Control BMP requirements for specific facilities

- ☐ Commercial or industrial facility
- ☐ Material Storage Areas
- ☐ Vehicle fueling, maintenance and wash areas
- ☐ Equipment and accessory wash areas
- ☐ Interior and parking garage floor drains
- ☑ Parking areas
- ☐ Pools, spas and other water features
- ☑ Trash Storage Areas
- ☐ Restaurants and food processing or manufacturing facilities
- ☐ Miscellaneous drain or wash water

G - Complete if your project is <u>only</u> subject to Tier 1 Requirements - Site planning and LID design measures.
LID design measures shall be clearly marked on site plans

Check applicable boxes and provide short description of measure and location

- ☐ Conserve natural areas, riparian areas and wetlands
  Description: _____
- ☑ Concentrate improvements on the least-sensitive portions of the site and minimize grading
  Description: minimizing grading by stepping building to match existing slopes
- ☐ Direct roof runoff into cisterns or rain barrels
  Description: _____
- ☑ Direct roof downspouts to landscaped areas or rain gardens
  Description: downspouts are disconnected and drain across landscaped areas prior to entering storm drain system
- ☑ Use pervious pavement (pervious concrete or asphalt, turf block, crushed aggregate, etc.)
  Description: Access drive and portions of individual driveways are proposed to be pervious pavers
- ☐ Disperse runoff from paved areas to adjacent pervious areas
  Description: _____

ATTACHMENT "E"

- *Operations and Maintenance Agreement*

Appendix G

Maintenance Agreement Regarding Maintenance of Structural or Treatment Control Best Management Practices (BMPs)

for: *Address* 900 High Street *APN#* 001-022-40

I, _____, being the owner of the real property, APN No. 001-022-40, which is located at 900 High Street, Santa Cruz, California, consent and agree to inspect and maintain any and all structural or treatment control Best Management Practices (BMPs) a minimum of once per year prior to **October 1** on the subject property. The structural or treatment control BMPs on the subject property include(s):

_____

_____.

I agree to send a letter that provides proof of inspection and maintenance to the City of Santa Cruz Department of Public Works prior to December 1 of each year. Proof of inspection and maintenance shall include a log of inspection and maintenance dates for the past year, and receipts if conducted by a hired service. The log should also indicate any significant observations or repairs made. **The proof of inspection and maintenance should be sent to: Environmental Projects Analyst, Department of Public Works, City of Santa Cruz, 809 Center Street, Room 201, Santa Cruz, CA 95060.**

In the event that the property is sold, transferred, or leased, the obligations hereby imposed on the property owner shall be assumed by subsequent property owners and lessees. To this end, property owner, in any deed transferring an ownership interest in the property or in any lease agreement for the property, shall include a term by which the subsequent property owner or lessee acknowledges his or her understanding of the obligations imposed by this agreement and expressly agrees to accept and assume responsibility for complying with all said obligations imposed by this agreement.

In addition, I will provide printed information to the new property owner or lessee regarding proper BMP inspection and maintenance frequency and methods. The information shall accompany the first deed transfer. This information shall include the following:

(1) a description of any and all storm water structural or treatment control BMPs;
(2) a map of the property indicating the BMP locations; and
(3) a description of how inspections and necessary maintenance can be performed.

The transfer of this information shall also be required with any subsequent sale of the property.

Failure to comply with the provisions of this Maintenance Agreement may result in enforcement actions including assessment of civil penalties as allowed by the City's Municipal Code, Chapter 16.19.190 Administrative Remedies.

I have read the above agreement and understand it.

Owner Name: _____ Signature: _____

Date: _____

Owner Address: _____

Phone: _____ Email: _____

ATTACHMENT "F"

- *Todd Creamer's Resume*

Todd R. Creamer, PE

Position: Principal Engineer, C2G/Civil Consultants Group, Inc.
Scotts Valley, California

Education: Marquette University, BS/Civil Engineering

Registration: California: RCE 64561
California: QSP/QSD No. 00439
National: CESC No. 2752

Experience: Mr. Creamer serves as President of C2G/Civil Consultants Group, Inc. and as Principal Engineer on assignments for both public and private sector clients. His design experience in California has primarily been located in the South Bay counties of Santa Clara, Santa Cruz and Monterey Counties. Mr. Creamer has also worked in Illinois, Wisconsin and Minnesota.

Recently, Mr. Creamer has been involved with multiple projects associated with school construction within the South Bay area. He has been the project manager for utility infrastructure improvements, road improvements, and offsite improvements for the K-12 schools and community college. Mr. Creamer has also been the civil consultant associated with multiple water distribution system designs throughout the Santa Cruz County area.

Much of Mr. Creamer's professional career has been devoted to site development for public and private sector building complexes, as well as roadway and utility system improvements. His knowledge of municipal and land development engineering is based on consulting work in California, Northern Illinois as well as public works employment with the Cities of Fridley, Minnesota and Franklin, Wisconsin.

Mr. Creamer breadth of experience in land development has also exposed him to various storm water quality and erosion control requirements throughout the country. This experience has allowed Mr. Creamer to create numerous Storm Water Pollution Prevention Plans (SWPPP's) as well as inspection for erosion and sediment control associated with improvement projects. Mr. Creamer's devotions to storm water quality has resulted in his pursuit of Certification by the Soil and Water Conservation Society and International Erosion Control Association in Erosion and Sediment Control.

Affiliations: American Society of Civil Engineers (ASCE)
Exchange Club of Scotts Valley – President Elect 05-06
President 06-07
Treasure 07-08

Certifications:
Certified Professional in Erosion and Sediment Control - CESC No. 2752
Certified Master WaterCAD modeler – Haestad Methods

ATTACHMENT "G"

- *Stormwater calculations*

PROJECT: Peace Village / 900 High Street, Santa Cruz, CA **Calc by:** DD **Date:** 3/27/2023

RUNOFF DETENTION BY THE MODIFIED RATIONAL METHOD

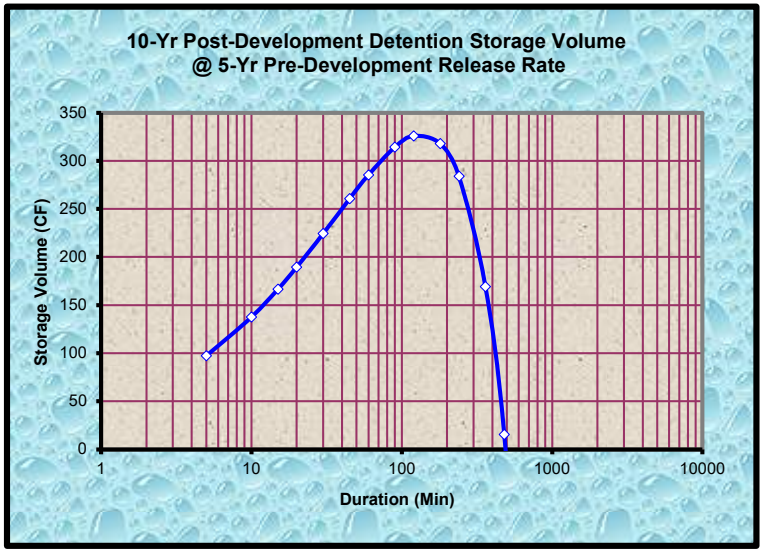
Data Entry: PRESS TAB & ENTER DESIGN VALUES Ver: 6.14.21

Site Location P60 Isopleth:	1.50		Fig. SWM-2 in County Design Criteria
Rational Coefficients Cpre:	0.25		See note # 2
Cpost:	0.90		See note # 2
Impervious Area:	22941	ft^2	See note # 2 and # 4

STRUCTURE DIMENSIONS FOR DETENTION

1091	ft^3 storage volume calculated			
100	% void space assumed			
1091	ft^3 excavated volume needed			
Structure	Length	Width*	Depth*	*For pipe, use the square
Ratios	25.00	2.00	2.00	root of the sectional area
Dimen. (ft)	**55.45**	**4.44**	**4.44**	

10 - YEAR DESIGN STORM				DETENTION @ 15 MIN.	
Storm Duration (min)	10 - Year Intensity (in/hr)	10 - Yr. Release Qpre (cfs)	10 - Year Qpost (cfs)	Detention Rate To Storage (cfs)	Specified Storage Volume (cf)
1440	0.26	0.034	0.123	-0.113	-12244
1200	0.28	0.037	0.133	-0.104	-9315
960	0.31	0.041	0.146	-0.090	-6504
720	0.34	0.046	0.165	-0.071	-3857
480	0.41	0.054	0.196	-0.041	-1459
360	0.46	0.061	0.221	-0.015	-409
240	0.55	0.073	0.262	0.026	473
180	0.62	0.082	0.297	0.060	815
120	0.74	0.098	0.352	0.116	1044
90	0.83	0.111	0.398	0.162	**1091**
60	0.99	0.131	0.472	0.236	1063
45	1.12	0.148	0.534	0.298	1004
30	1.33	0.176	0.634	0.398	895
20	1.57	0.209	0.753	0.516	775
15	1.78	**0.236**	0.850	0.614	691
10	2.11	0.280	1.010	0.774	580
5	2.83	0.376	**1.355**	1.118	419



Notes & Limitations on Use:

1) The modified rational method, and therefore the standard calculations are applicable in watersheds up to 20 acres in size.
2) Required detention volume determinations shall be based on all net new impervious areas, both on and off-site, resulting from the proposed project. Pervious areas shall not be included in detention volume sizing; an exception may be made for incidental pervious areas less than 10% of the total area.
3) Gravel packed detention chambers shall specify on the plans, aggregate that is washed, angular, and uniformly graded (of single size), assuring void space not less than 35%.
4) A map showing boundaries of both regulated impervious areas and actual drainage areas routed to the hydraulic control structure of the detention facility is to be provided, clearly distinguishing between the two areas, and noting the square footage.
5) The EPA defines a class V injection well as any bored, drilled, or driven shaft, or dug hole that is deeper than its widest surface dimension, or an improved sinkhole, or a subsurface fluid distribution system. Such storm water drainage wells are "authorized by rule". For more information on these rules, contact the EPA. A web site link is provided from the County DPW Stormwater Management web page.
6) Refer to the County of Santa Cruz Design Criteria, for complete method criteria.

This method is available from the County Public Works web site in a computerized Excel spreadsheet format to simplify usage. http://www.dpw.co.santa-cruz.ca.us/drainage.htm

C2G /CIVIL CONSULTANTS GROUP, INC.
Engineers/Planners

Restrictor Description: Orifice @ Chamber Outlet
Project Name: **Peace Village**
Job Number: 2011.04
Date: March 27, 2023

RESTRICTOR SIZE, ORIFICE METHOD (Circular Opening)

	Value
1. HIGHWATER ELEVATION	277.50
2. INVERT ELEVATION	272.00
3. DIAMETER OF RESTRICTOR IN INCHES	2.00
4. CROSS SECTIONAL AREA, SQ. FT.	0.02
5. HEAD, FT.	5.42
6. DISCHARGE COEFFICIENT	0.50

SQUARE EDGE 0.79 - 0.82
ROUND EDGE 0.93 - 0.98
SHARP EDGE 0.58 - 0.64
PROJECTING 0.50

7. DISCHARGE, Q, CFS	***0.204***
8. ALLOWABLE RELEASE RATE, Q, CFS	0.236