Staff Report to the Zoning Administrator

Application Number: 141029

Applicant: County of Santa Cruz
Owner: Susanne and Jens Meyerhoff
APN: 043-094-13, 043-094-06

Agenda Date: March 21, 2014
Agenda Item #: 3
Time: After 9:00 a.m.

Project Description: Proposal to install 4,362 square feet of erosion control matting at the face of a coastal bluff. Requires an Amendment to Coastal Permits 131131 and 121252.

Location: Property located on the south side of Kingsbury Drive, about 1,000 feet east from the intersection with Rio Del Mar Blvd. (340 Kingsbury Drive)

Supervisorial District: 2nd District (District Supervisor: Zack Friend)

Permits Required: Amendment to Coastal Development Permit s131131 and 121252

Staff Recommendation:

- Certification that the proposal is exempt from further Environmental Review under the California Environmental Quality Act.
- Approval of Application 141029, based on the attached findings and conditions.

Exhibits

A. Categorical Exemption (CEQA determination)
B. Findings
C. Conditions
D. Project plans
E. Assessor's, Location, Zoning and General Plan Maps
F. Geologic Investigation prepared by Zinn Geology, dated April 15, 2013
G. Letter from Erik Zinn, dated January 27, 2014
H. Sample photos

Parcel Information

Parcel Size:	10,191 square feet
Existing Land Use - Parcel:	Vacant – unbuildable coastal bluff
Existing Land Use - Surrounding:	Single-family residential/coastal bluff
Project Access:	Kingsbury Drive
Planning Area:	Aptos
Land Use Designation:	O-U (Urban Open Space)

Zone District:	PR (Parks, Recreation and Open Space)
Coastal Zone:	_X_ Inside ___ Outside
Appealable to Calif. Coastal Comm.	_X_ Yes ___ No

Environmental Information

Geologic Hazards:	Not mapped/no physical evidence on site
Soils:	N/A
Fire Hazard:	Not a mapped constraint
Slopes:	In excess of 50%
Env. Sen. Habitat:	Not mapped/no physical evidence on site
Grading:	Overexcavation recompaction at the top of the bluff
Tree Removal:	No trees proposed to be removed
Scenic:	Mapped Scenic Resource – revegetation required for screening
Drainage:	No alteration to existing drainage patterns
Archeology:	Not mapped/no physical evidence on site

Services Information

Urban/Rural Services Line:	_X_ Inside __ Outside
Water Supply:	Public
Sewage Disposal:	Public
Fire District:	Aptos - La Selva Fire Protection District
Drainage District:	Zone 6

History

On December 20, 2013 the Santa Cruz County Zoning Administrator approved two Coastal Development Permits affecting the subject parcel. Permit 121252 recognized the placement of 600 square feet of emergency erosion control matting on a coastal bluff, and Permit 131131 authorized the construction of a 5,500 square foot replacement dwelling adjacent to the coastal bluff.

Following approval of both Coastal permits, a Final Local Action Notice was sent to the Coastal Commission. Coastal Commission staff noted that the placement of additional erosion control matting, shown on the plans (Exhibit D) for the replacement dwelling, had not been included in the project description or fully analyzed in the staff report for either of the approved Coastal permits.

Planning Department staff initiated this Coastal Development application in order to address the additional placement of 4,362 square feet of permanent erosion control matting.

Project Setting and Description

The project site is a coastal bluff in the Aptos Planning Area. The subject lot (APN 043-094-13) is vacant and is adjacent to and just south of APN 043-094-06, which is developed with an

existing dwelling and will contain the approved replacement dwelling. Both lots are under common ownership and will be combined into a single lot as a condition of approval of Permit 131131.

The Geologic Investigation prepared for the subject site and adjacent parcel 043-094-06 (Exhibit F) identifies unconsolidated materials in the upper portion of the coastal bluff. The location of this material has resulted in shallow debris flows impacting down slope properties along Beach Drive. An area of approximately 600 square feet near the top of the bluff was identified by the consulting geologist as posing an imminent threat of failure. To address the threat, reinforced erosion control matting was authorized for a section of the bluff under Coastal Permit 121252. The larger area encompassed by the subject application was not identified as an imminent threat; however the area was deemed to be "highly susceptible to erosion" by the project geologist.

As a result, the engineering geologist proposed the construction of permanent soils erosion control fabric in order to mitigate future impacts on down slope properties resulting from ongoing shallow bluff failures. The proposed erosion control matting will cover a 4,362 square foot section of the coastal bluff. The integrity of the bluff itself is intact and the purpose of the matting is not to provide protection for the replacement dwelling approved under Coastal Permit 131131.

The project will consist of removing and/or replacing unconsolidated fill at the top of the slope and placing an erosion control mat across the entire area. The mat will then be covered with a wire mesh, anchored by soil nails placed between 6 and 9 feet apart. The soil nails are driven through spike plates and extend 18 feet into the bluff. The entire area will then be hydroseeded with winter barley to provide additional stabilization, resistance to erosion, and visual screening (Exhibit H).

Zoning & General Plan Consistency

The subject property is a parcel of approximately 10,000 square feet, located in the PR (Parks, Recreation and Open Space) zone district. The proposed erosion control matting will protect the bluff from failure and furthers the use of the lot as open space, which is a principal permitted use within the zone district. The zoning is consistent with the site's (O-U) Urban Open Space General Plan designation.

Local Coastal Program Consistency

The proposed erosion control matting conforms to the County's certified Local Coastal Program, in that the area to be covered will be seeded in order to provide vegetative cover. The project site is located between the shoreline and the first public road, however there are no pedestrian or other access paths within or adjacent to the subject parcel. The site is not identified as a priority acquisition site in the County's Local Coastal Program. Consequently, the proposed matting will not interfere with public access to the beach, ocean, or other nearby body of water.

Design Review

The proposed erosion control matting complies with the requirements of the County Design Review Ordinance, in that the proposed project will incorporate hydroseeding by winter barley, which will provide natural vegetative screening and minimize the visual impact of the proposed erosion control on surrounding land uses and the natural landscape. Additionally, the vegetative growth will provide additional bluff stabilization and protect against the loss of topsoil due to erosion.

Environmental Review

This project qualifies for a Class 4 Categorical Exemption per Section 15304 (Minor Alterations to Land) of the California Environmental Quality Act, in that the project involves minimal earthwork, will not result in the removal of any mature trees, and will not negatively impact the scenic viewshed.

Conclusion

As proposed and conditioned, the project is consistent with all applicable codes and policies of the Zoning Ordinance and General Plan/LCP. Please see Exhibit "B" ("Findings") for a complete listing of findings and evidence related to the above discussion.

Staff Recommendation

- Certification that the proposal is exempt from further Environmental Review under the California Environmental Quality Act.
- **APPROVAL** of Application Number **141029,** based on the attached findings and conditions.

Supplementary reports and information referred to in this report are on file and available for viewing at the Santa Cruz County Planning Department, and are hereby made a part of the administrative record for the proposed project.

The County Code and General Plan, as well as hearing agendas and additional information are available online at: www.co.santa-cruz.ca.us

Report Prepared By: Robin Bolster-Grant
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CALIFORNIA ENVIRONMENTAL QUALITY ACT
NOTICE OF EXEMPTION

The Santa Cruz County Planning Department has reviewed the project described below and has determined that it is exempt from the provisions of CEQA as specified in Sections 15061 - 15332 of CEQA for the reason(s) which have been specified in this document.

Application Number: 141029
Assessor Parcel Number: 043-094-13
Project Location: 340 Kingsbury Drive

Project Description: Proposal to install 4,362 square feet of erosion control matting at the face of a coastal bluff. Requires an Amendment to Coastal Permit 131131. Property located on the south side of Kingsbury Drive, about 1,000 feet east from the intersection with Rio Del Mar Blvd.

Person or Agency Proposing Project: County of Santa Cruz

Contact Phone Number: (831) 454-5357

A. _____ The proposed activity is not a project under CEQA Guidelines Section 15378.
B. _____ The proposed activity is not subject to CEQA as specified under CEQA Guidelines Section 15060 (c).
C. _____ **Ministerial Project** involving only the use of fixed standards or objective measurements without personal judgment.
D. _____ **Statutory Exemption** other than a Ministerial Project (CEQA Guidelines Section 15260 to 15285).

E. __X__ Categorical Exemption

Specify type: Class 4 – Minor Alterations to Land (Section 15304)

F. Reasons why the project is exempt:

Erosion control protection, which involves minimal earthwork, no alteration to landforms, no removal of mature trees and vegetative screening to minimize impact to viewshed

In addition, none of the conditions described in Section 15300.2 apply to this project.

_____ Date: _____
Robin Bolster-Grant, Project Planner

EXHIBIT A

Coastal Development Permit Findings

1. That the project is a use allowed in one of the basic zone districts, other than the Special Use (SU) district, listed in section 13.10.170(d) as consistent with the General Plan and Local Coastal Program LUP designation.

This finding can be made, in that the property is zoned PR (Parks, Recreation and Open Space), a designation which allows open space uses. The proposed erosion control matting will help prevent shallow bluff failure, thereby protecting the existing open space. Therefore, the placement of the matting is a principal permitted use within the zone district, and the zoning is consistent with the site's (O-U) Urban Open Space General Plan designation.

2. That the project does not conflict with any existing easement or development restrictions such as public access, utility, or open space easements.

This finding can be made, in that no such easements or restrictions are known to encumber the project site.

3. That the project is consistent with the design criteria and special use standards and conditions of this chapter pursuant to section 13.20.130 et seq.

This finding can be made, in that the erosion control matting will be hydroseeded in order to promote dense vegetative cover. The vegetation will screen the wire mesh matting from view as well as protect against future loss of topsoil. The proposed installation is consistent with erosion control measures used to protect other portions of coastal bluff in the vicinity and throughout the County.

4. That the project conforms with the public access, recreation, and visitor-serving policies, standards and maps of the General Plan and Local Coastal Program land use plan, specifically Chapter 2: figure 2.5 and Chapter 7, and, as to any development between and nearest public road and the sea or the shoreline of any body of water located within the coastal zone, such development is in conformity with the public access and public recreation policies of Chapter 3 of the Coastal Act commencing with section 30200.

This finding can be made, in that while the project site is located between the shoreline and the first public road, the steep bluff does not provide and is not an appropriate location for, beach access. Consequently, the proposed matting will not interfere with public access to the beach, ocean, or any nearby body of water. Further, the project site is not identified as a priority acquisition site in the County Local Coastal Program.

5. That the proposed development is in conformity with the certified local coastal program.

This finding can be made, in that the erosion control matting is designed to be visually unobtrusive through the use of hydroseeding, which will provide effective vegetative cover. Bluff protection measures are allowed uses in the PR (Parks, Recreation and Open Space) zone district, as well as the General Plan and Local Coastal Program land use designation. The proposed matting system is consistent with protection measures used along many sections of coastal bluff.

Conditions of Approval

Exhibit D: Project Plans, 2 sheets, prepared by RI Engineering, Inc., dated April 2013

I. This permit authorizes the installation of approximately 4300 square feet of wire mesh erosion control, anchored with soil nails. This approval does not confer legal status on any existing structure(s) or existing use(s) on the subject property that are not specifically authorized by this permit. Prior to exercising any rights granted by this permit including, without limitation, any construction or site disturbance, the applicant/owner shall:

A. Sign, date, and return to the Planning Department one copy of the approval to indicate acceptance and agreement with the conditions thereof.

B. Obtain a Building Permit from the Santa Cruz County Building Official.

C. Submit proof that these conditions have been recorded in the official records of the County of Santa Cruz (Office of the County Recorder) within 30 days from the effective date of this permit.

II. Prior to issuance of a Building Permit the applicant/owner shall:

A. Submit final plans for review and approval by the Planning Department. The final plans shall be in substantial compliance with the plans marked Exhibit "D" on file with the Planning Department. Any changes from the approved Exhibit "D" for this development permit on the plans submitted for the Building Permit must be clearly called out and labeled by standard architectural methods to indicate such changes. Any changes that are not properly called out and labeled will not be authorized by any Building Permit that is issued for the proposed development. The final plans shall include the following additional information:

1. Grading, drainage, and erosion control plans.

2. Details showing compliance with all Environmental Planning requirements.

B. Submit three copies of the approved Discretionary Permit with the Conditions of Approval attached. The Conditions of Approval shall be recorded prior to submittal..

C. Meet all requirements of and pay Zone 6 drainage fees to the County Department of Public Works, Stormwater Management. Drainage fees will be assessed on the net increase in impervious area, if applicable.

D. Meet all requirements and pay any applicable plan check fee of the Aptos La-Selva Fire Protection District.

E. Submit 3 copies of a soils and/or engineering geology report prepared and stamped by a licensed Engineer.

EXHIBIT C

F. Complete and record a Declaration of Geologic Hazards for the work on the coastal bluff. Note that a single Declaration can be completed **You may not alter the wording of this declaration**. Follow the instructions to record and return the form to the Planning Department.

III. All construction shall be performed according to the approved plans for the Building Permit. Prior to final building inspection, the applicant/owner must meet the following conditions:

A. All site improvements shown on the final approved Building Permit plans shall be installed.

B. All inspections required by the building permit shall be completed to the satisfaction of the County Building Official.

C. The project must comply with all recommendations of the approved soils and/or geology reports.

D. Provide Environmental Planning staff with final observation letters from the project engineering geology and/or geotechnical engineers, if required.

E. Pursuant to Sections 16.40.040 and 16.42.080 of the County Code, if at any time during site preparation, excavation, or other ground disturbance associated with this development, any artifact or other evidence of an historic archaeological resource or a Native American cultural site is discovered, the responsible persons shall immediately cease and desist from all further site excavation and notify the Sheriff-Coroner if the discovery contains human remains, or the Planning Director if the discovery contains no human remains. The procedures established in Sections 16.40.040 and 16.42.080, shall be observed.

IV. Operational Conditions

A. In the event that future County inspections of the subject property disclose noncompliance with any Conditions of this approval or any violation of the County Code, the owner shall pay to the County the full cost of such County inspections, including any follow-up inspections and/or necessary enforcement actions, up to and including permit revocation.

V. As a condition of this development approval, the holder of this development approval ("Development Approval Holder"), is required to defend, indemnify, and hold harmless the COUNTY, its officers, employees, and agents, from and against any claim (including attorneys' fees), against the COUNTY, it officers, employees, and agents to attack, set aside, void, or annul this development approval of the COUNTY or any subsequent amendment of this development approval which is requested by the Development Approval Holder.

A. COUNTY shall promptly notify the Development Approval Holder of any claim, action, or proceeding against which the COUNTY seeks to be defended, indemnified, or held harmless. COUNTY shall cooperate fully in such defense. If COUNTY fails to notify the Development Approval Holder within sixty (60) days of any such claim, action, or proceeding, or fails to cooperate fully in the defense thereof, the Development Approval Holder shall not thereafter be responsible to defend, indemnify, or hold harmless the COUNTY if such failure to notify or cooperate was significantly prejudicial to the Development Approval Holder.

B. Nothing contained herein shall prohibit the COUNTY from participating in the defense of any claim, action, or proceeding if both of the following occur:

1. COUNTY bears its own attorney's fees and costs; and

2. COUNTY defends the action in good faith.

C. Settlement. The Development Approval Holder shall not be required to pay or perform any settlement unless such Development Approval Holder has approved the settlement. When representing the County, the Development Approval Holder shall not enter into any stipulation or settlement modifying or affecting the interpretation or validity of any of the terms or conditions of the development approval without the prior written consent of the County.

D. Successors Bound. "Development Approval Holder" shall include the applicant and the successor'(s) in interest, transferee(s), and assign(s) of the applicant.

Minor variations to this permit which do not affect the overall concept or density may be approved by the Planning Director at the request of the applicant or staff in accordance with Chapter 18.10 of the County Code.

EXHIBIT C

Application #: 141029
APN: 043-094-13
Owner: Susanne and Jens Meyerhoff

Please note: This permit expires three years from the effective date listed below unless a building permit (or permits) is obtained for the primary structure described in the development permit (does not include demolition, temporary power pole or other site preparation permits, or accessory structures unless these are the primary subject of the development permit). Failure to exercise the building permit and to complete all of the construction under the building permit, resulting in the expiration of the building permit, will void the development permit, unless there are special circumstances as determined by the Planning Director.

Approval Date: _____

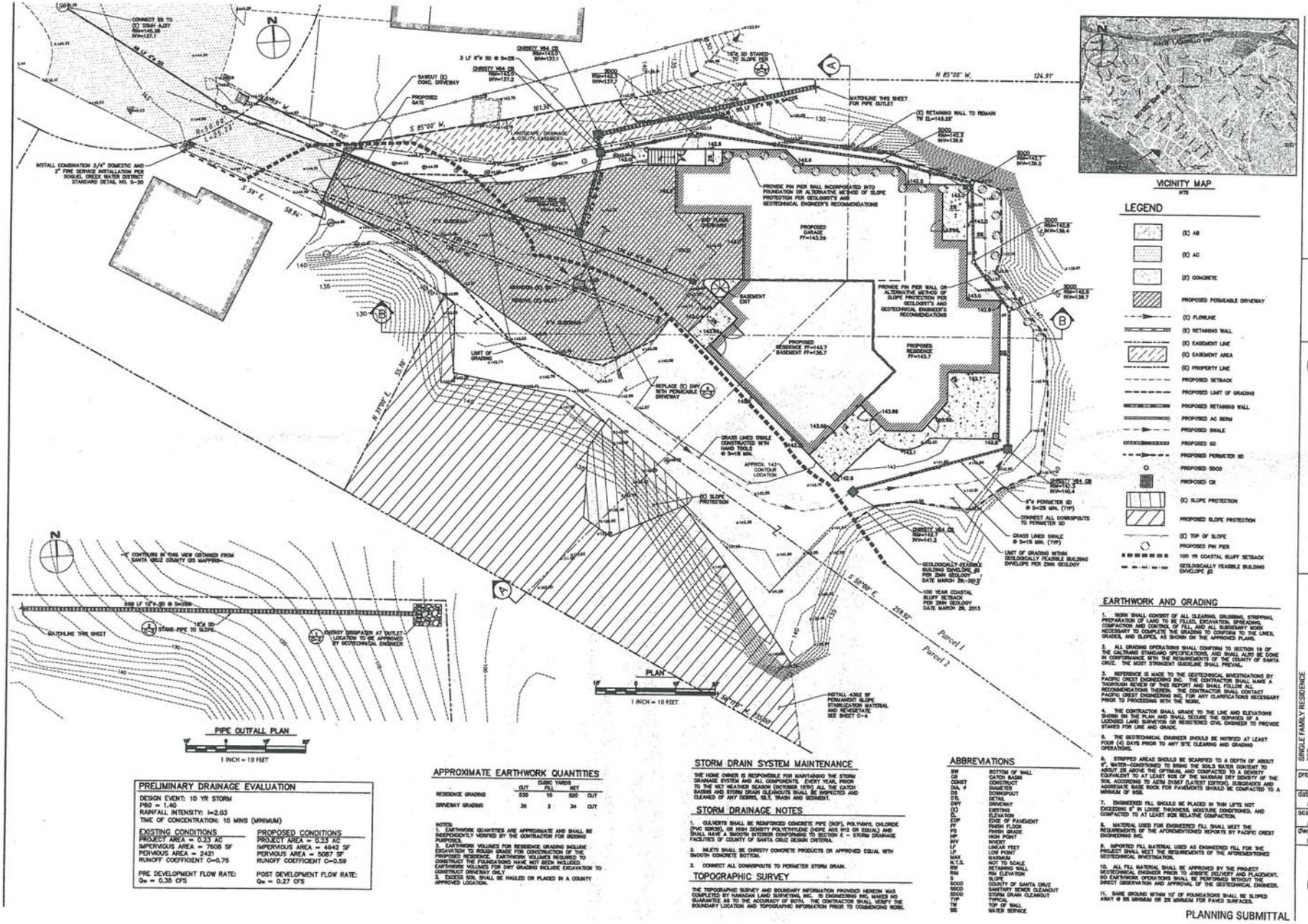
Effective Date: _____

Expiration Date: _____

Wanda Williams Deputy Zoning Administrator	Robin Bolster-Grant Project Planner

Appeals: Any property owner, or other person aggrieved, or any other person whose interests are adversely affected by any act or determination of the Zoning Administrator, may appeal the act or determination to the Planning Commission in accordance with chapter 18.10 of the Santa Cruz County Code.

EXHIBIT C



PRELIMINARY DRAINAGE EVALUATION

DESIGN EVENT: 10 YR STORM
P60 = 1.40
RAINFALL INTENSITY: I=2.03
TIME OF CONCENTRATION: 10 MINS (MINIMUM)

EXISTING CONDITIONS	PROPOSED CONDITIONS
PROJECT AREA = 0.33 AC	PROJECT AREA = 0.23 AC
IMPERVIOUS AREA = 7608 SF	IMPERVIOUS AREA = 4842 SF
PERVIOUS AREA = 2421	PERVIOUS AREA = 5087 SF
RUNOFF COEFFICIENT C=0.75	RUNOFF COEFFICIENT C=0.59
PRE DEVELOPMENT FLOW RATE: Qw = 0.35 CFS	POST DEVELOPMENT FLOW RATE: Qw = 0.27 CFS

APPROXIMATE EARTHWORK QUANTITIES

	CUBIC YARDS CUT	FILL	NET	
RESIDENCE GRADING	530	10	520	CUT
DRIVEWAY GRADING	36	2	34	CUT

NOTES:
1. EARTHWORK QUANTITIES ARE APPROXIMATE AND SHALL BE INDEPENDENTLY VERIFIED BY THE CONTRACTOR FOR BIDDING PURPOSES.
2. EARTHWORK VOLUMES FOR RESIDENCE GRADING INCLUDE EXCAVATION TO ROUGH GRADE FOR CONSTRUCTION OF THE PROPOSED RESIDENCE. EARTHWORK VOLUMES REQUIRED TO CONSTRUCT THE FOUNDATIONS HAVE NOT BEEN INCLUDED. EARTHWORK VOLUMES FOR DWY GRADING INCLUDE EXCAVATION TO CONSTRUCT DRIVEWAY ONLY.
3. EXCESS SOIL SHALL BE HAULED OR PLACED IN A COUNTY APPROVED LOCATION.

STORM DRAIN SYSTEM MAINTENANCE

THE HOME OWNER IS RESPONSIBLE FOR MAINTAINING THE STORM DRAINAGE SYSTEM AND ALL COMPONENTS. EVERY YEAR, PRIOR TO THE WET WEATHER SEASON (OCTOBER 15TH) ALL THE CATCH BASINS AND STORM DRAIN CLEANOUTS SHALL BE INSPECTED AND CLEANED OF ANY DEBRIS, SILT, TRASH AND SEDIMENT.

STORM DRAINAGE NOTES

1. CULVERTS SHALL BE REINFORCED CONCRETE PIPE (RCP), POLYVINYL CHLORIDE (PVC SDR35), OR HIGH DENSITY POLYETHYLENE (HDPE ADS N12 OR EQUAL) AND SHALL HAVE A SMOOTH INTERIOR CONFORMING TO SECTION E – STORM DRAINAGE FACILITIES OF COUNTY OF SANTA CRUZ DESIGN CRITERIA.
2. INLETS SHALL BE CHRISTY CONCRETE PRODUCTS OR APPROVED EQUAL WITH SMOOTH CONCRETE BOTTOM.
3. CONNECT ALL DOWNSPOUTS TO PERIMETER STORM DRAIN.

TOPOGRAPHIC SURVEY

THE TOPOGRAPHIC SURVEY AND BOUNDARY INFORMATION PROVIDED HEREON WAS COMPLETED BY HANAGAN LAND SURVEYING, INC. RI ENGINEERING INC. MAKES NO GUARANTEE AS TO THE ACCURACY OF BOTH. THE CONTRACTOR SHALL VERIFY THE BOUNDARY LOCATION AND TOPOGRAPHIC INFORMATION PRIOR TO COMMENCING WORK.

ABBREVIATIONS

BW	BOTTOM OF WALL
CB	CATCH BASIN
CONST	CONSTRUCT
DIA, ø	DIAMETER
DS	DOWNSPOUT
DTL	DETAIL
DWY	DRIVEWAY
(E)	EXISTING
EL	ELEVATION
EOP	EDGE OF PAVEMENT
FF	FINISH FLOOR
FG	FINISH GRADE
HP	HIGH POINT
INV	INVERT
LF	LINEAR FEET
LP	LOW POINT
MAX	MAXIMUM
N.T.S.	NOT TO SCALE
RW	RETAINING WALL
RIM	RIM ELEVATION
S	SLOPE
SCCO	COUNTY OF SANTA CRUZ
SDCO	SANITARY SEWER CLEANOUT
SDCO	STORM DRAIN CLEANOUT
TYP	TYPICAL
TW	TOP OF WALL
WS	WATER SERVICE

EARTHWORK AND GRADING

1. WORK SHALL CONSIST OF ALL CLEARING, GRUBBING, STRIPPING, PREPARATION OF LAND TO BE FILLED, EXCAVATION, SPREADING, COMPACTION AND CONTROL OF FILL, AND ALL SUBSIDIARY WORK NECESSARY TO COMPLETE THE GRADING TO CONFORM TO THE LINES, GRADES, AND SLOPES, AS SHOWN ON THE APPROVED PLANS.
2. ALL GRADING OPERATIONS SHALL CONFORM TO SECTION 19 OF THE CALTRANS STANDARD SPECIFICATIONS, AND SHALL ALSO BE DONE IN CONFORMANCE WITH THE REQUIREMENTS OF THE COUNTY OF SANTA CRUZ. THE MOST STRINGENT GUIDELINE SHALL PREVAIL.
3. REFERENCE IS MADE TO THE GEOTECHNICAL INVESTIGATIONS BY PACIFIC CREST ENGINEERING INC. THE CONTRACTOR SHALL MAKE A THOROUGH REVIEW OF THIS REPORT AND SHALL FOLLOW ALL RECOMMENDATIONS THEREIN. THE CONTRACTOR SHALL CONTACT PACIFIC CREST ENGINEERING INC. FOR ANY CLARIFICATIONS NECESSARY PRIOR TO PROCEEDING WITH THE WORK.
4. THE CONTRACTOR SHALL GRADE TO THE LINE AND ELEVATIONS SHOWN ON THE PLAN AND SHALL SECURE THE SERVICES OF A LICENSED LAND SURVEYOR OR REGISTERED CIVIL ENGINEER TO PROVIDE STAKES FOR LINE AND GRADE.
5. THE GEOTECHNICAL ENGINEER SHOULD BE NOTIFIED AT LEAST FOUR (4) DAYS PRIOR TO ANY SITE CLEARING AND GRADING OPERATIONS.
6. STRIPPED AREAS SHOULD BE SCARIFIED TO A DEPTH OF ABOUT 6", WATER-CONDITIONED TO BRING THE SOILS WATER CONTENT TO ABOUT 2% ABOVE THE OPTIMUM, AND COMPACTED TO A DENSITY EQUIVALENT TO AT LEAST 90% OF THE MAXIMUM DRY DENSITY OF THE SOIL ACCORDING TO ASTM D1557 (LATEST EDITION). SUBGRADES AND AGGREGATE BASE ROCK FOR PAVEMENTS SHOULD BE COMPACTED TO A MINIMUM OF 95%.
7. ENGINEERED FILL SHOULD BE PLACED IN THIN LIFTS NOT EXCEEDING 6" IN LOOSE THICKNESS, MOISTURE CONDITIONED, AND COMPACTED TO AT LEAST 90% RELATIVE COMPACTION.
8. MATERIAL USED FOR ENGINEERED FILL SHALL MEET THE REQUIREMENTS OF THE AFOREMENTIONED REPORTS BY PACIFIC CREST ENGINEERING INC.
9. IMPORTED FILL MATERIAL USED AS ENGINEERED FILL FOR THE PROJECT SHALL MEET THE REQUIREMENTS OF THE AFOREMENTIONED GEOTECHNICAL INVESTIGATION.
10. ALL FILL MATERIAL SHALL BE APPROVED BY THE PROJECT GEOTECHNICAL ENGINEER PRIOR TO JOBSITE DELIVERY AND PLACEMENT. NO EARTHWORK OPERATIONS SHALL BE PERFORMED WITHOUT THE DIRECT OBSERVATION AND APPROVAL OF THE GEOTECHNICAL ENGINEER.
11. BARE GROUND WITHIN 10' OF FOUNDATIONS SHALL BE SLOPED AWAY @ 5% MINIMUM OR 2% MINIMUM FOR PAVED SURFACES.

PLANNING SUBMITTAL

R.I Engineering, Inc.
303 Potrero St., Suite 42-202, Santa Cruz, CA 95060
831-425-3901 www.rlengineering.com

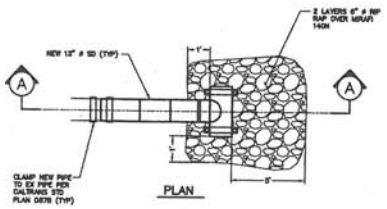
SINGLE FAMILY RESIDENCE
FOR
JENS AND SUSANNE MEYERHOFF
340 KINGSBURY DRIVE
APTOS, CA 95003
APN 043-094-66

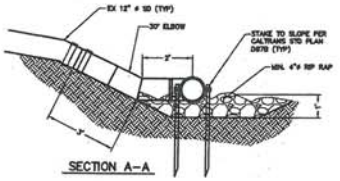
GRADING & DRAINAGE PLAN

project no. 12-028-1
date APRIL 2013
scale AS SHOWN
dwg name CIVIL1.DWG

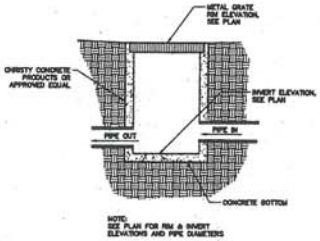
C-1

EXHIBIT D

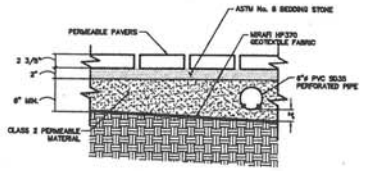




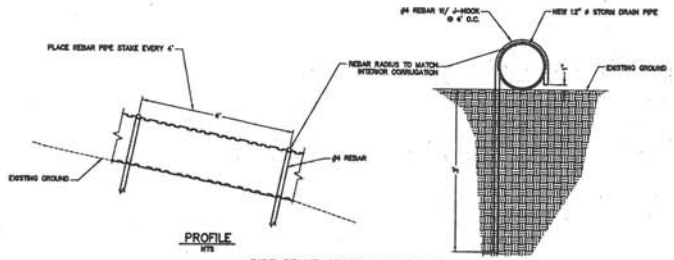
ENERGY DISSIPATER DETAIL
NTS
2-2

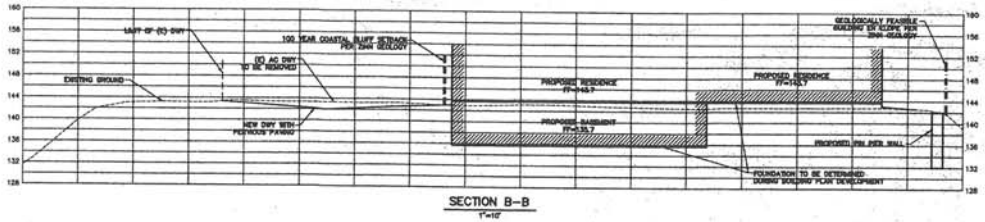


TYPICAL CATCH BASIN DETAIL
NTS
2-2

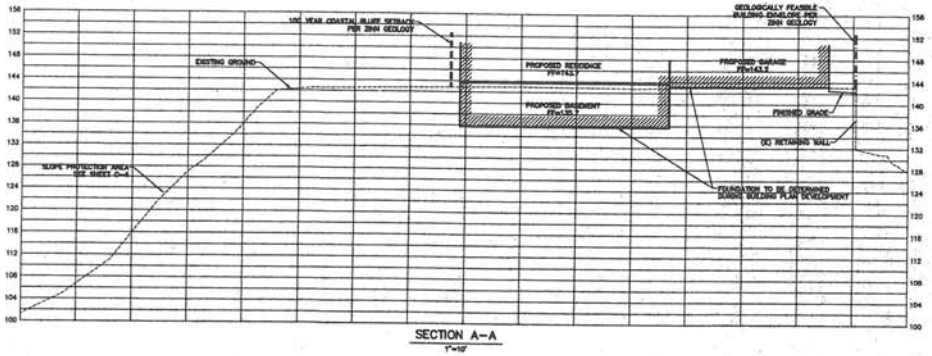


TYPICAL PERMEABLE PAVER SECTION
NTS
2-2





SECTION B-B
1"=10'



SECTION A-A
1"=10'

PLANNING SUBMITTAL

R.I Engineering, Inc.
303 Potrero St., Suite 42-202, Santa Cruz, CA 95060
831-425-3901 www.rieingineering.com

SINGLE FAMILY RESIDENCE
FOR
JESSE AND SUSANNE MEYERHOFF
340 KINGSBURY DRIVE
APTOS, CA 95003
APN 043-094-06

DETAILS

project no. 12-028-1
date APRIL 2013
scale AS SHOWN
dwg name CIVIL1.DWG

C-2

EXHIBIT D

EXHIBIT D

TOTAL AREA OF DISTURBANCE = 0.230 ACRES

SITE HOUSEKEEPING REQUIREMENTS

CONSTRUCTION MATERIALS

1. ALL LOOSE STOCKPILED CONSTRUCTION MATERIALS THAT ARE NOT ACTIVELY BEING USED (I.E. SOIL, SPOILS, AGGREGATE, FLY-ASH, STUCCO, HYDRATED LIME, ETC.) SHALL BE COVERED AND BERMED.

ALL CHEMICALS SHALL BE STORED IN WATERTIGHT CONTAINERS (WITH APPROPRIATE SECONDARY CONTAINMENT TO PREVENT ANY SPILLAGE OR LEAKAGE) OR IN A STORAGE SHED (COMPLETELY ENCLOSED).

EXPOSURE OF CONSTRUCTION MATERIALS TO PRECIPITATION SHALL BE MINIMIZED. THIS DOES NOT INCLUDE MATERIALS AND EQUIPMENT THAT ARE DESIGNED TO BE OUTDOORS AND EXPOSED TO ENVIRONMENTAL CONDITIONS (I.E. POLES, EQUIPMENT PADS, CABINETS, CONDUCTORS, INSULATORS, BRICKS, ETC.).

BEST MANAGEMENT PRACTICES TO PREVENT THE OFF-SITE TRACKING OF LOOSE CONSTRUCTION AND LANDSCAPE MATERIALS SHALL BE IMPLEMENTED.

LANDSCAPE MATERIALS

CONTAIN STOCKPILED MATERIALS SUCH AS MULCHES AND TOPSOIL WHEN THEY ARE NOT ACTIVELY BEING USED.

CONTAIN FERTILIZERS AND OTHER LANDSCAPE MATERIALS WHEN THEY ARE NOT ACTIVELY BEING USED.

DISCONTINUE THE APPLICATION OF ANY ERODABLE LANDSCAPE MATERIAL WITHIN 2 DAYS BEFORE A FORECASTED RAIN EVENT OR DURING PERIOD OF PRECIPITATION.

APPLY ERODABLE LANDSCAPE MATERIAL AT QUANTITIES AND APPLICATION RATES ACCORDING TO MANUFACTURE RECOMMENDATIONS OR BASED ON WRITTEN SPECIFICATIONS BY KNOWLEDGEABLE AND EXPERIENCED FIELD PERSONNEL.

STACK ERODABLE LANDSCAPE MATERIAL ON PALLETS AND COVERING OR STORING SUCH MATERIALS WHEN NOT BEING USED OR APPLIED.

VEHICLE STORAGE AND MAINTENANCE

MEASURES SHALL BE TAKEN TO PREVENT OIL, GREASE, OR FUEL TO LEAK IN TO THE GROUND, STORM DRAINS OR SURFACES WATERS.

ALL EQUIPMENT OR VEHICLES, WHICH ARE TO BE FUELED, MAINTAINED AND STORED ONSITE SHALL BE IN A DESIGNATED AREA FITTED WITH APPROPRIATE BMPS.

LEAKS SHALL BE IMMEDIATELY CLEANED AND LEAKED MATERIALS SHALL BE DISPOSED OF PROPERLY.

WASTE MANAGEMENT

DISPOSAL OF ANY RINSE OR WASH WATERS OR MATERIALS ON IMPERVIOUS OR PERVIOUS SITE SURFACES OR INTO THE STORM DRAIN SYSTEM SHALL BE PREVENTED.

SANITATION FACILITIES SHALL BE CONTAINED (E.G., PORTABLE TOILETS) TO PREVENT DISCHARGES OF POLLUTANTS TO THE STORM WATER DRAINAGE SYSTEM OR RECEIVING WATER, AND SHALL BE LOCATED A MINIMUM OF 30 FEET AWAY FROM AN INLET, STREET OR DRAINAGE, STREAM, RIPARIAN AREA OR OTHER DRAINAGE FACILITY.

SANITATION FACILITIES SHALL BE INSPECTED REGULARLY FOR LEAKS AND SPILLS AND CLEANED OR REPLACED AS NECESSARY.

COVER WASTE DISPOSAL CONTAINERS AT THE END OF EVERY BUSINESS DAY AND DURING A RAIN EVENT.

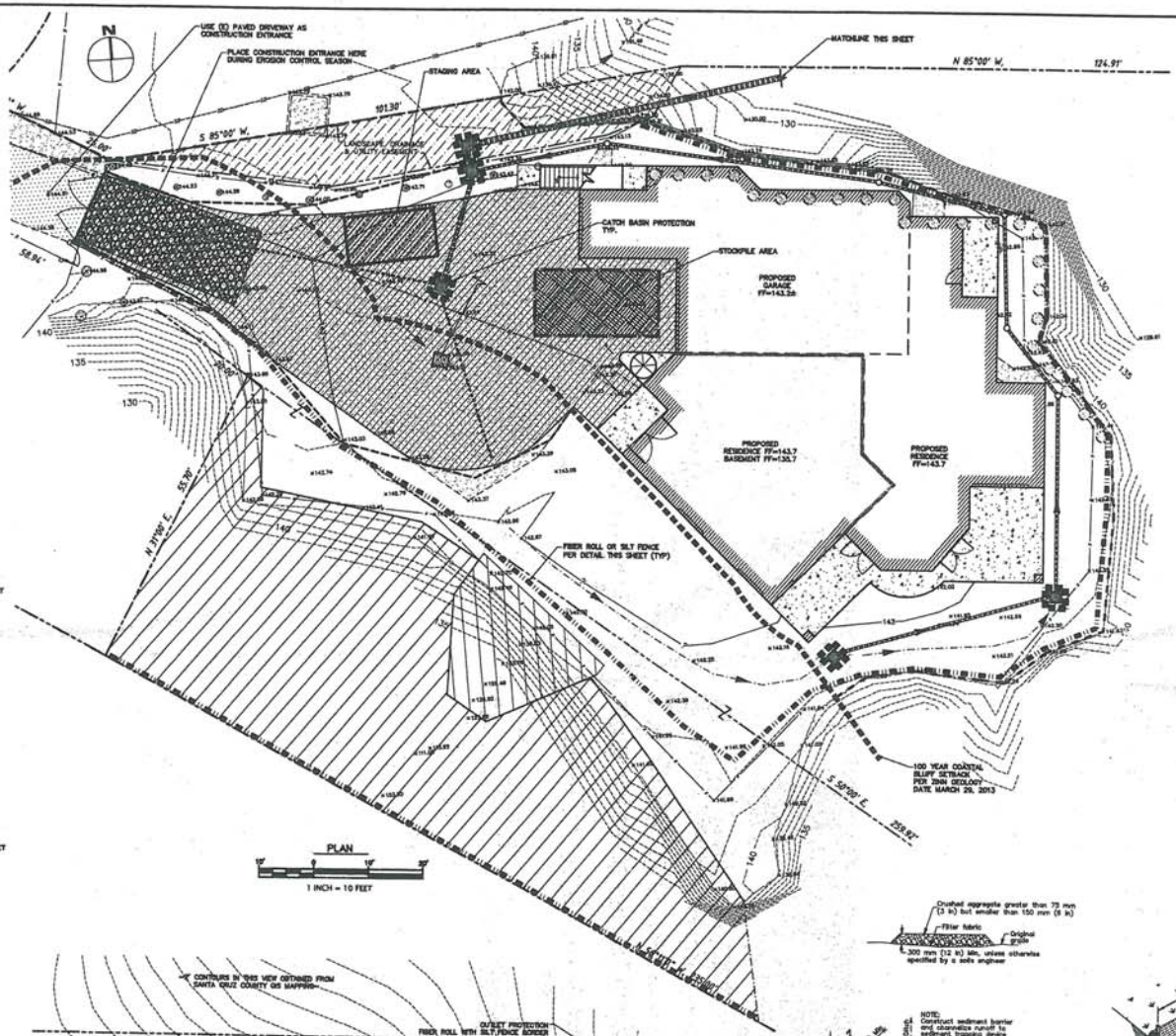
DISCHARGES FROM WASTE DISPOSAL CONTAINERS TO THE STORM WATER DRAINAGE SYSTEM OR RECEIVING WATER SHALL BE PREVENTED.

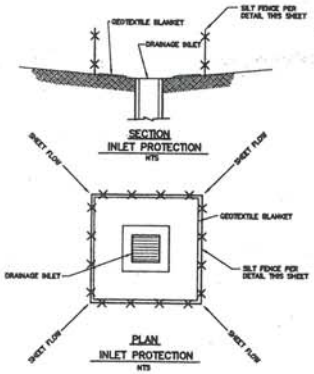
STOCKPILED WASTE MATERIAL SHALL BE CONTAINED AND SECURELY PROTECTED FROM WIND AND RAIN AT ALL TIMES UNLESS ACTIVELY BEING USED.

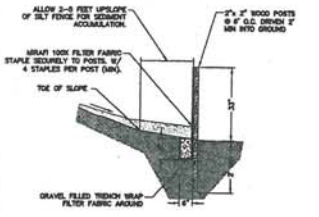
PROCEDURES THAT EFFECTIVELY ADDRESS HAZARDOUS AND NON-HAZARDOUS SPILLS SHALL BE IMPLEMENTED.

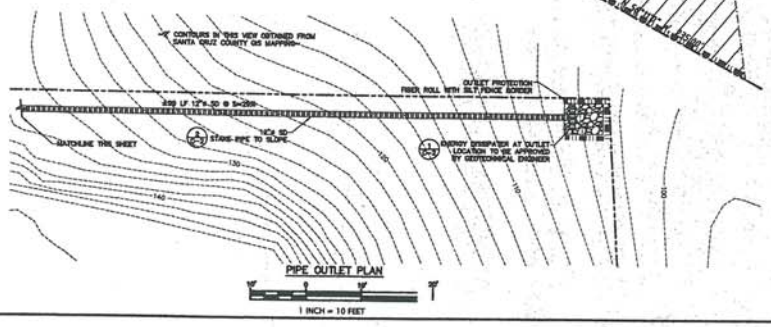
EQUIPMENT AND MATERIALS FOR CLEANUP OF SPILLS SHALL BE AVAILABLE ON SITE AND THAT SPILLS AND LEAKS SHALL BE CLEANED UP IMMEDIATELY AND DISPOSED ON PROPERLY AND

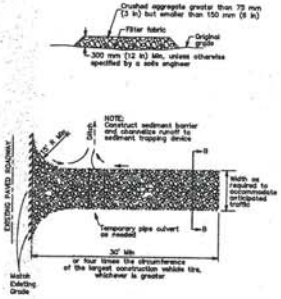
CONCRETE WASHOUT AREAS AND OTHER WASHOUT AREAS THAT MAY CONTAIN ADDITIONAL POLLUTANTS SHALL BE CONTAINED SO THERE IS NO DISCHARGE INTO THE UNDERLYING SOIL AND ONTO THE SURROUNDING AREAS.











EROSION CONTROL MEASURES

1. EROSION IS TO BE CONTROLLED AT ALL TIMES ALTHOUGH SPECIFIC MEASURES SHOWN ARE TO BE IMPLEMENTED AT A MINIMUM BY OCTOBER 15.
2. UNLESS SPECIFIC MEASURES ARE SHOWN OR NOTED ON THIS PLAN, ALL COLLECTED RUNOFF SHALL BE CARRIED TO DRAINAGE COURSES IN LINED CONDUITS. DISCHARGE SHALL BE IN THE LOCATIONS SHOWN ON THE PLANS.
3. THE DESIRED END RESULT OF THESE MEASURES IS TO CONTROL SITE EROSION AND PREVENT SEDIMENT TRANSPORT OFF THE SITE. IT SHALL BE THE DEVELOPER'S RESPONSIBILITY TO SEE THAT ANY ADDITIONAL MEASURES NECESSARY TO MEET THIS GOAL ARE IMPLEMENTED. IF FAILED INSPECTIONS BY COUNTY STAFF SHOW THIS GOAL IS NOT BEING MET, ADDITIONAL MEASURES MAY BE REQUIRED.
4. ALL DISTURBED AREAS NOT CURRENTLY BEING USED FOR CONSTRUCTION SHALL BE SEEDED WITH THE FOLLOWING SEED MIXTURE:

   WINTER BARLEY 25#/ACRE
5. AFTER SEEDING, STRAW MULCH WILL BE APPLIED IN 4" (AVG.) LAYERS.
6. AMMONIUM PHOSPHATE FERTILIZER, 0-3-3, SHALL BE APPLIED AT A RATE OF 30 LBS. PER ACRE. ON SLOPES GREATER THAN 20%. EROSION CONTROL BLANKET (NORTH AMERICAN GREEN) SHALL BE APPLIED.
7. SILT BARRIERS SHALL BE PLACED END TO END AND STAKED DOWN ALONG THE BOTTOM OF ALL GRADED SLOPES.

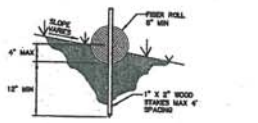
ALL EROSION CONTROL MEASURES INCLUDING BUT NOT LIMITED TO SILT FENCES, FIBER ROLLS AND SLOPE PROTECTION SHALL BE IN PLACE BY OCTOBER 15TH. THE ENGINEER OF RECORD SHALL INSPECT ONCE EROSION CONTROL MEASURES HAVE BEEN INSTALLED.

EXPOSED SLOPE MEASURES

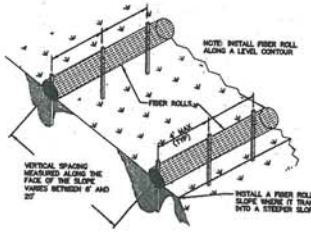
1. COVER ALL EXPOSED SLOPES
2. STRAW 2 TONS/ACRE ON SLOPES ≤ 20% WITH SOIL BINDER
3. USE NORTH AMERICAN GREEN C125 OR EQUAL ON SLOPES >20%

EROSION CONTROL LEGEND

- INSTALL FIBER ROLL PER DETAILS THIS SHEET
- INSTALL CATCH BASIN PROTECTION PER DETAIL THIS SHEET
- INSTALL STABILIZED CONSTRUCTION ENTRANCE PER DETAIL THIS SHEET
- PROPOSED SLOPE PROTECTION
- PROPOSED STOCKPILE AREA
- PROPOSED STAGING AREA



FIBER ROLL DETAIL IN SLOPE AREA
NTS



TYPICAL FIBER ROLL INSTALLATION
NTS

PLANNING SUBMITTAL

RICHARD J. ROSS No. 45630 Exp. 12-31-14 CIVIL
04/25/2013

R.I Engineering, Inc.
303 Potrero St., Suite 42-202, Santa Cruz, CA 95060
831-425-3901 www.rengineering.com

SINGLE FAMILY RESIDENCE FOR: JENS AND SUSANNE MEYERHOFF 340 KINGSBURY DRIVE APTOS, CA 95003 APN 043-094-06

EROSION CONTROL PLAN

project no. 12-028-1
date APRIL 2013
scale AS SHOWN
dwg name CIVIL1.DWG

C-3

CONTRACTOR SUBMITTALS

1. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL THE FOLLOWING INFORMATION:

A. A PLAN SHOWING THE CONFIGURATION OF THE WIRE MESH (SHOWING OVERLAPS AND CONNECTIONS) AND THE LOCATION AND DEPTH OF ALL SOIL NAILS.

B. DYWIDAG SOIL ANCHOR TYPE, ANCHOR DIAMETER, HOLE SIZE AND GROUT MATERIAL.

C. MANUFACTURERS SPECIFICATIONS AND LETTER OF AVAILABILITY FOR TECCO WIRE MESH, TECCO SYSTEM SPIKE PLATE, AND TECMAT EROSION CONTROL MAT (OR APPROVED EQUAL)

D. STAINLESS STEEL ROPE MATERIAL AND CORROSION RESISTANCE

SPECIFICATIONS

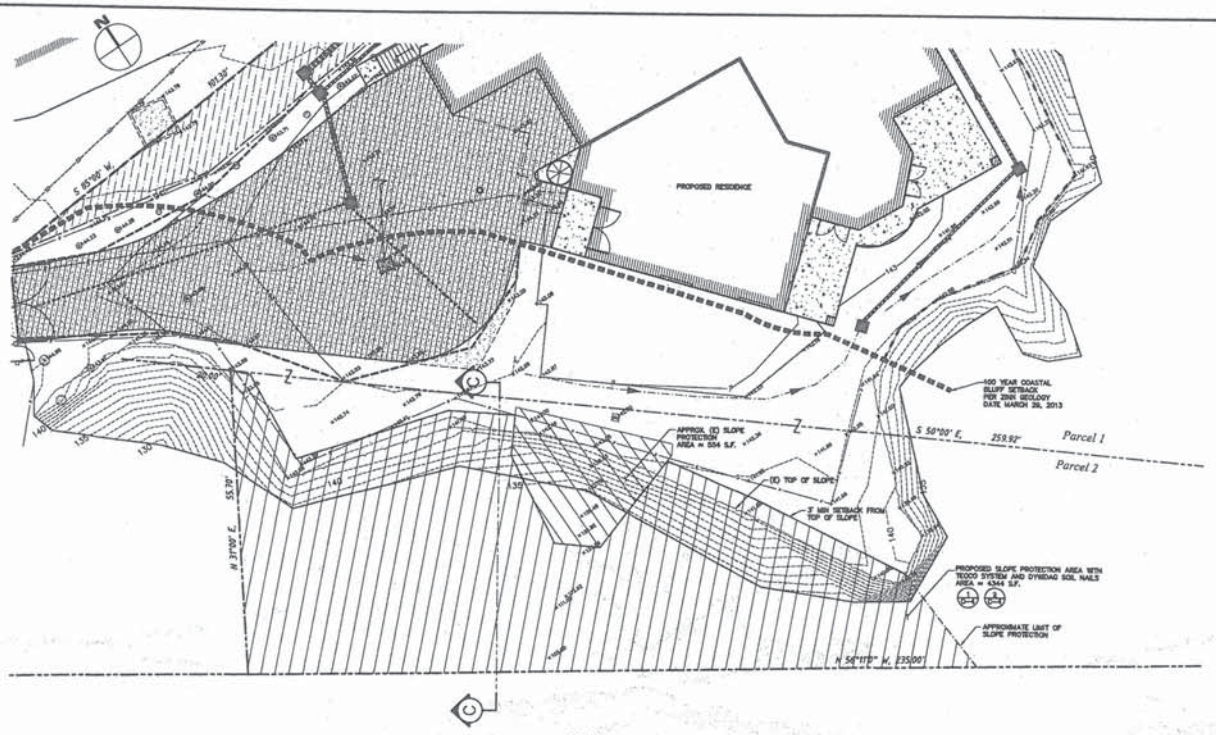
1. ALL WORK SHALL BE IN CONFORMANCE WITH THE 2010 CALIFORNIA BUILDING CODE.
2. VERIFY ALL DIMENSIONS PRIOR TO BEGINNING WORK.
3. WIRE MESH SHALL BE GEOBRUGG TECCO G65/3mm MESH.
4. EROSION CONTROL MAT SHALL BE GEOBRUGG TECMAT EROSION CONTROL MAT OR APPROVED EQUAL. INSTALLATION OF THE MAT SHALL CONFORM TO THE REQUIREMENTS OF THE MANUFACTURER AND AS SHOWN ON THESE PLANS.
5. RINGS, FASTENERS AND STEEL ROPE SHALL BE MANUFACTURER'S SPECIFICATIONS
6. SOIL NAILS SHALL BE PROVIDED WITH DOUBLE CORROSION PROTECTION.
7. SPACERS, CENTRALIZERS, SPLICES, SUPPORTS AND OTHER MATERIALS REQUIRED FOR THE TIEBACK CONSTRUCTION SHALL BE AS SPECIFIED BY THE TECCO SYSTEM MANUFACTURER.
8. CEMENT GROUT

A. CEMENT SHALL BE TYPE II CONFORMING TO ASTM C-150. THE 28-DAY COMPRESSIVE STRENGTH OF THE GROUT SHALL BE 4000 PSI.
B. ACCELERATING ADMIXTURES WHICH CAN BE SHOWN NOT TO CORRODE THE SPECIFIED STEEL AND WHICH PREVENT BLEED AND SHRINKAGE MAY BE SUBMITTED FOR APPROVAL FOR THE GROUT USED TO FILL BOND LENGTH ENCAPSULATING SHEATHS AND THE TRUMPETS.

9. CONTRACTOR SHALL TEST 10% OF ALL SOIL NAILS IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER TO AT LEAST 125% OF THEIR DESIGN CAPACITY. ANY NAIL THAT FAILS MUST BE REMOVED AND REINSTALLED AT THE CONTRACTOR'S EXPENSE.
10. ALL SOIL NAIL CONSTRUCTION MUST BE OBSERVED BY A REPRESENTATIVE OF PACIFIC CREST ENGINEERING INC.

DESIGN REQUIREMENTS:

1. SOIL NAILS INSTALLED SHALL PROVIDE A MINIMUM TENSION LOAD OF 8,000 LBS NORMAL TO THE SURFACE OF THE SLOPE.
2. CONTRACTOR MUST TEST 10% OF ALL SOIL NAILS IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER TO AT LEAST 125% OF THEIR DESIGN CAPACITY (10,000 LBS). ANY NAILS WHICH FAIL MUST BE REMOVED AND REINSTALLED AT THE CONTRACTOR'S EXPENSE. MORE NAILS MAY BE TESTED AT THE DISCRETION OF THE GEOTECHNICAL ENGINEER.
3. SOIL NAILS SHALL HAVE A MINIMUM EMBEDMENT LENGTH OF 18 FEET.
4. SOIL NAILS SHALL BE INSTALLED NORMAL TO THE SLOPE.
5. OVERLAP AND JOIN SHEETS OF MESH WITH MANUFACTURER'S CONNECTION CLIPS AND PER THEIR SPECIFICATIONS.



PLAN

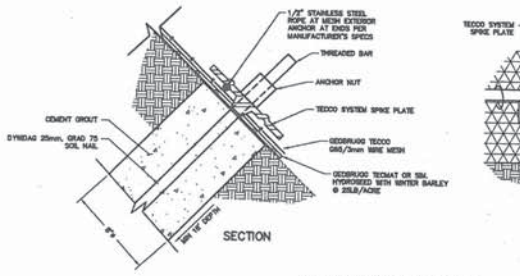
1 INCH = 10 FEET

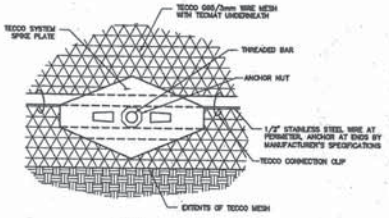
LEGEND

- (E) SLOPE PROTECTION
- PROPOSED SLOPE PROTECTION
- (E) TOP OF SLOPE
- PROPERTY LINE
- TECCO WIRE MESH

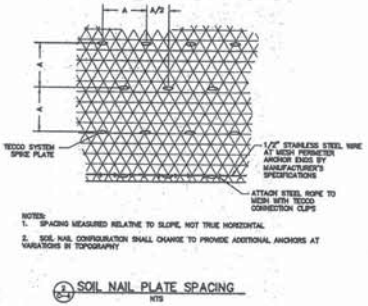
ABBREVIATIONS

BW	BOTTOM OF WALL
CB	CATCH BASIN
CONST	CONSTRUCT
DIA, ø	DIAMETER
DS	DOWNSPOUT
DTL	DETAIL
DWY	DRIVEWAY
(E)	EXISTING
EL	ELEVATION
EOP	EDGE OF PAVEMENT
FF	FINISH FLOOR
FG	FINISH GRADE
HP	HIGH POINT
INV	INVERT
LF	LINEAR FEET
LP	LOW POINT
MAX	MAXIMUM
N.T.S.	NOT TO SCALE
RW	RETAINING WALL
RIM	RIM ELEVATION
S	SLOPE
SCCO	COUNTY OF SANTA CRUZ
SSCO	SANITARY SEWER CLEANOUT
SDCO	STORM DRAIN CLEANOUT
TYP	TYPICAL
TW	TOP OF WALL
WS	WATER SERVICE





1 SOIL NAIL PLATE DETAIL
NTS

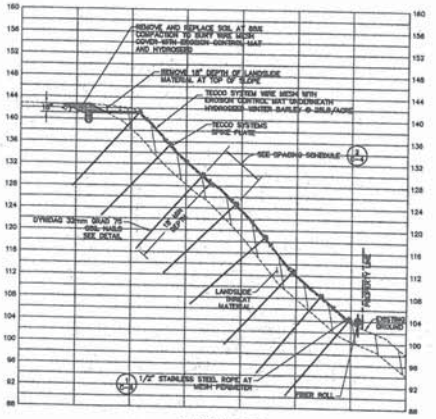


NOTES:
1. SPACING MEASURED RELATIVE TO SLOPE, NOT TRUE HORIZONTAL
2. SOIL NAIL CONFIGURATION SHALL CHANGE TO PROVIDE ADDITIONAL ANCHORS AT VARIATIONS IN TOPOGRAPHY

2 SOIL NAIL PLATE SPACING
NTS

SPACING SCHEDULE

MAXIMUM SLOPE	SPACING, A (ft)
30°	9
50°	8
70°	7
80°	6



SECTION C–C
1"=10'

PLANNING SUBMITTAL

SINGLE FAMILY RESIDENCE FOR: JENS AND SUSANNE MEYERHOFF 340 KINGSBURY DRIVE APTOS, CA 95003 APN 043-094-06

SLOPE PROTECTION PLAN

project no. 12-028-1
date APRIL 2013
scale AS SHOWN
dwg name CIVIL1.DWG

C-4

RI Engineering, Inc.
303 Potrero St., Suite 42-202, Santa Cruz, CA 95060
831-425-3901 www.rienginering.com

EXHIBIT D

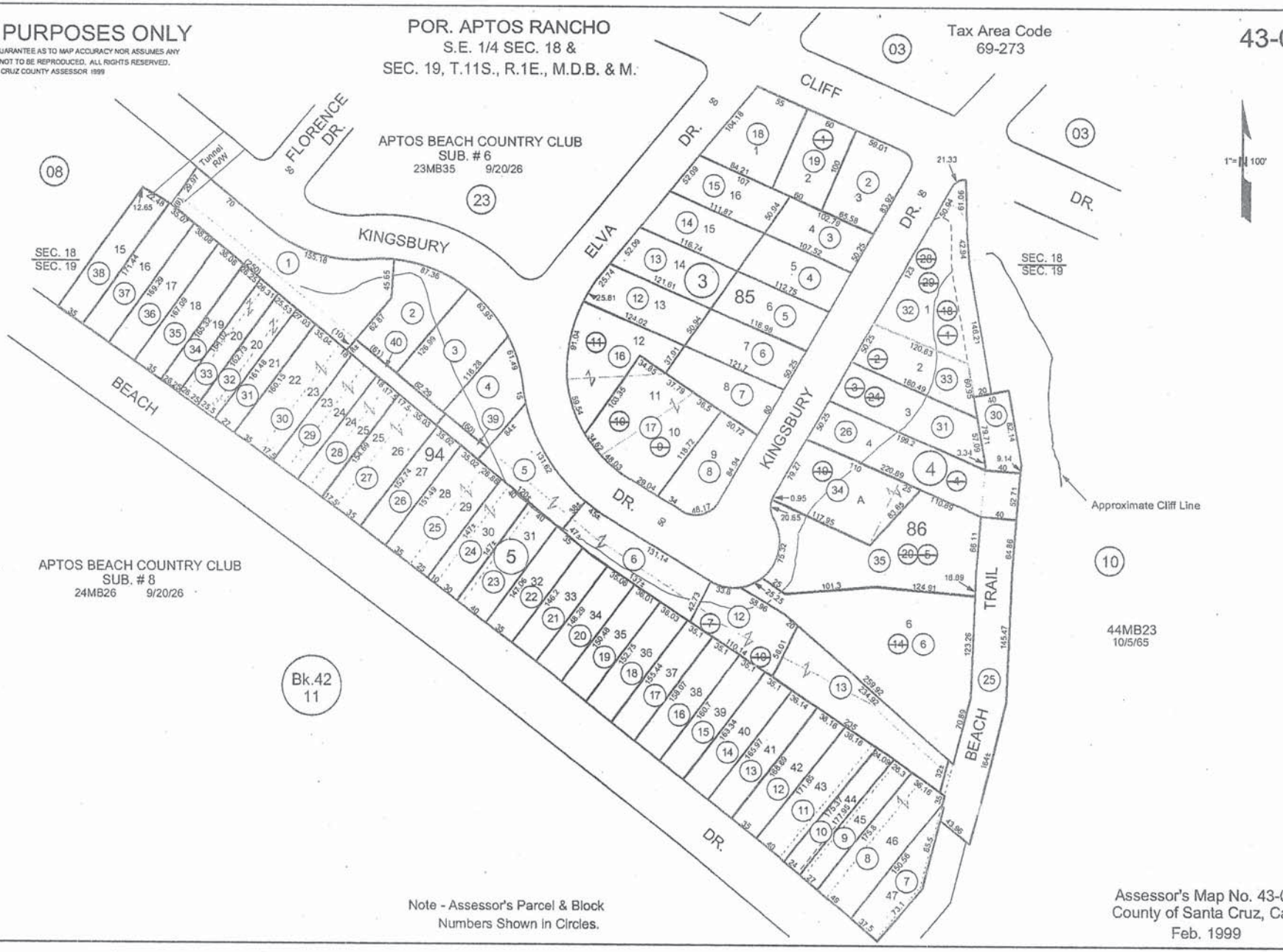
EXHIBIT E

FOR TAX PURPOSES ONLY

POR. APTOS RANCHO
S.E. 1/4 SEC. 18 &
SEC. 19, T.11S., R.1E., M.D.B. & M.

Tax Area Code
69-273

43-09



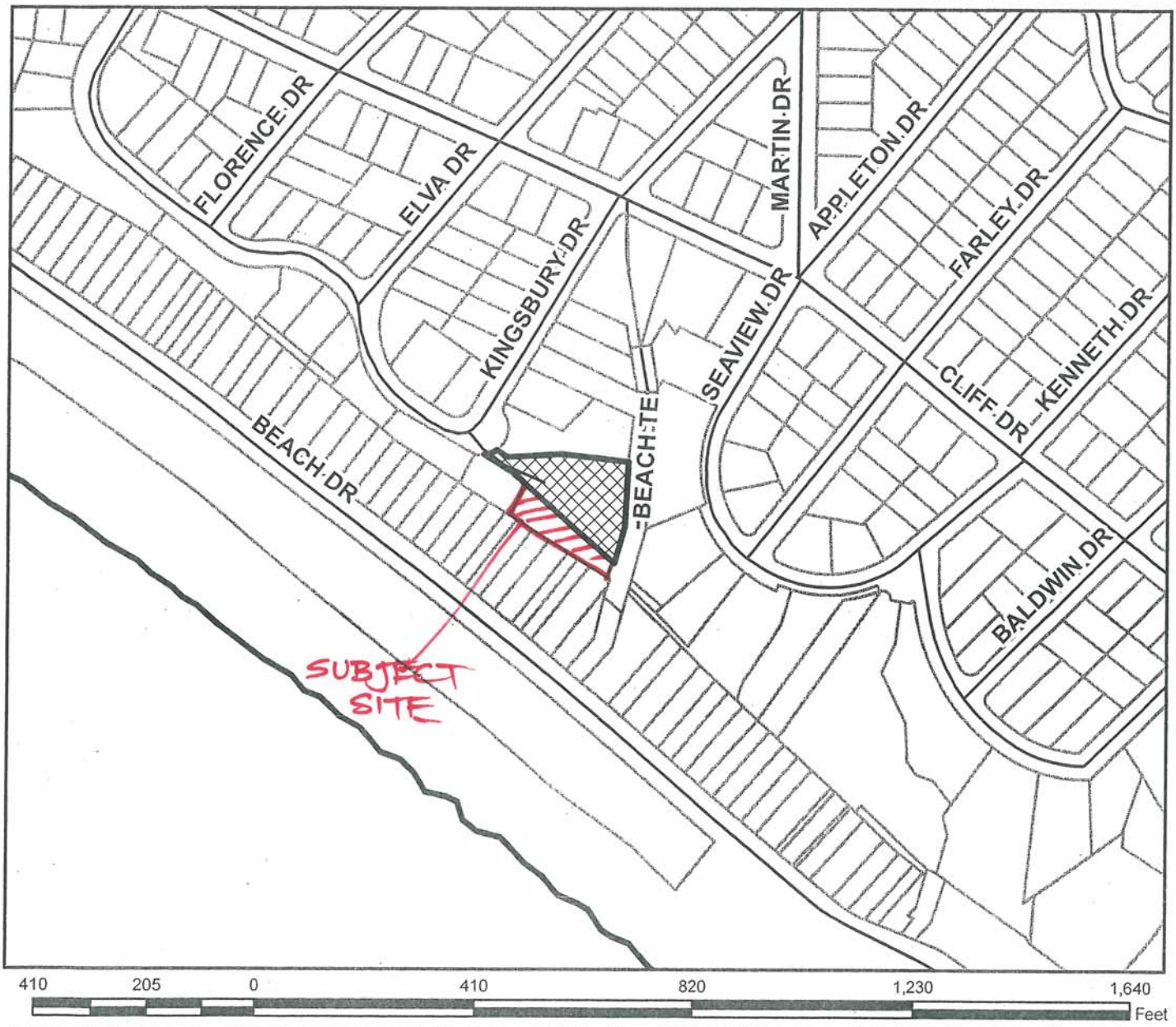
Note - Assessor's Parcel & Block Numbers Shown in Circles.

Assessor's Map No. 43-09
County of Santa Cruz, Calif.
Feb. 1999

Electronically Redrawn 2/10/99 rw
Rev. 2/10/99 (Por. lo pg. 23) rw
Rev. 5/4/99 CB (Added MB ref's)
Rev. 5/9/00 CB (Added Bk line)
Rev. 5/25/01 mvm (changed page refs.)
Rev 12/10/02 CB (2-0068226, Sp 4-32 & 33)
Rev 3/31/05 DD (4-0089640, bst 4-34 & 35)

15

Location Map



LEGEND

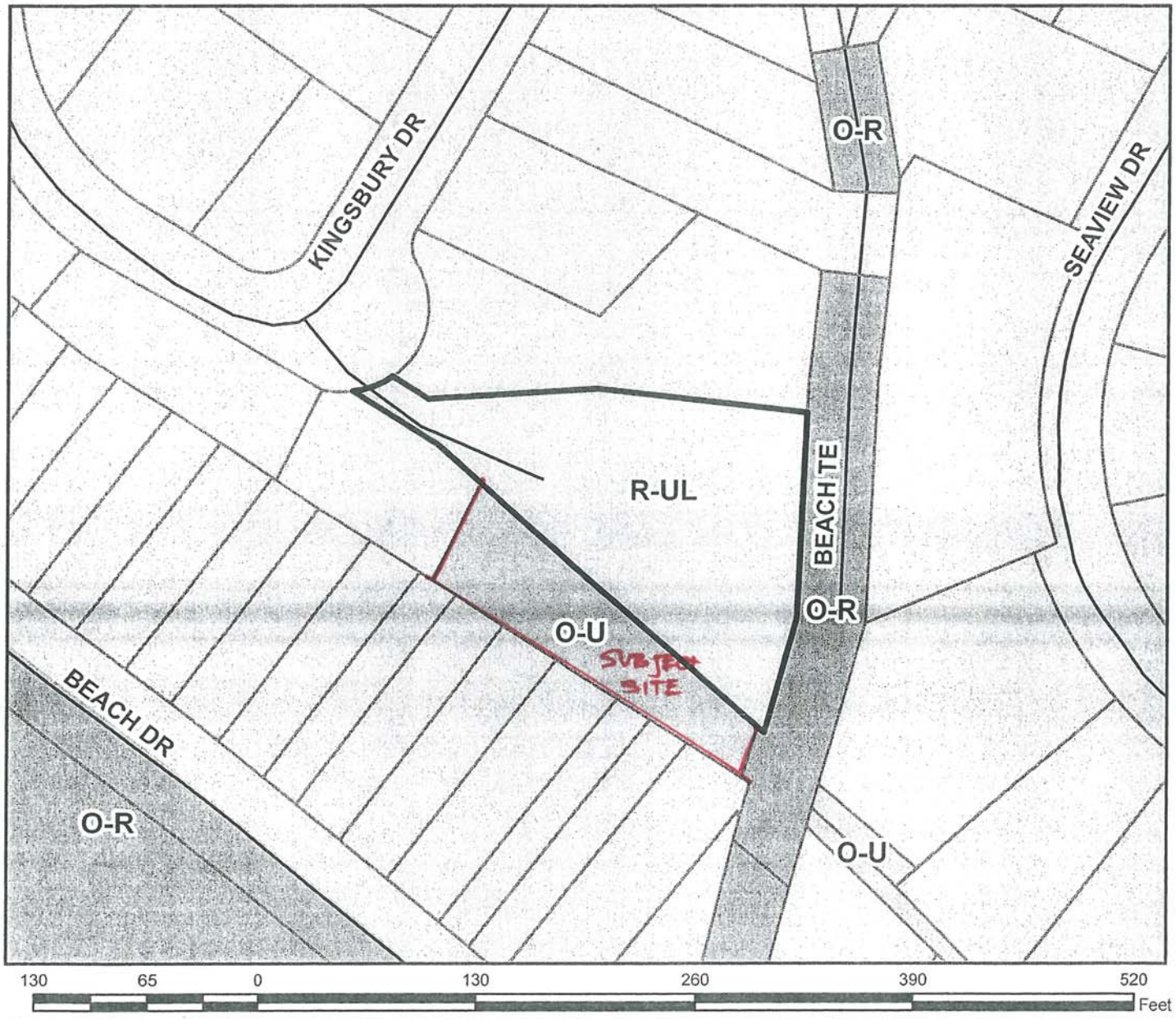
- APN: 043-094-06
- Assessors Parcels
- Streets
- County Boundary

N
W E
S

Map Created by
County of Santa Cruz
Planning Department
May 2013

EXHIBIT F

General Plan Designation Map



LEGEND

- APN: 043-094-06
- Assessors Parcels
- Streets
- Residential - Urban Low Density
- Urban Open Space
- Parks and Recreation

N
W E
S

Map Created by
County of Santa Cruz
Planning Department
May 2013

EXHIBIT E

Zoning Map

LEGEND

- APN: 043-094-06
- Assessors Parcels
- Streets
- RESIDENTIAL-SINGLE FAMILY
- PARK

N
W E
S

Map Created by
County of Santa Cruz
Planning Department
May 2013

EXHIBIT F

GEOLOGIC INVESTIGATION
Lands of Meyerhoff
340 Kingsbury Drive
Aptos, California
Santa Cruz County APN 043-094-06

Job #2012012-G-SC
15 April 2013

EXHIBIT F

15 April 2013 Job #2012012-G-SC

Jens and Susanne Meyerhoff
14539 East Edgewater Court
Fountain Hills, AZ 85268
jmsem@cox.net

Re: Geologic investigation
340 Kingsbury Drive
Aptos, California
County of Santa Cruz APN 043-094-06

Dear Mr. And Mrs. Meyerhoff:

Our geologic report on the property referenced above is attached. This report documents geologic conditions on the subject property and addresses potential hazards to the proposed construction of a single-family residence such as erosion, seismic shaking and landsliding.

Based on the information gathered and analyzed in the steps outlined above, it is our opinion that the subject property is geologically suitable for the future proposed residential development, and will be subject to "ordinary" risks as defined in Appendix B, provided our recommendations are followed. Appendix B should be reviewed in detail by the developer and all property owners to determine whether an "ordinary" risk as defined in the appendix is acceptable. If this level of risk is unacceptable to the developer and the property owners, then the geologic hazards in question should be mitigated to reduce the corresponding risks to an acceptable level.

The subject property is located in an area of high seismic activity and will be subject to strong seismic shaking in the future.

Our historical bluff retreat analysis indicates that the top of the coastal bluff is variably retreating (in plan view) up to as much as 0.37 feet per year since 1928. We have drawn a bluff setback line on Plate 1 that reflects our aerial photograph measurements from the top of today's bluff, with the setback value being driven by the average historical retreat rate unless it results in a setback that is less then 25 feet (in which case the default setback is 25 feet as dictated by County of Santa Cruz ordinances).

EXHIBIT F

The slope above the arroyo is currently failing in a piecemeal fashion along the eastern portion of the property. We observed evidence of piecemeal erosion on the flank of the arroyo below the proposed residence, both on the historical aerial photographs and in the field. Subsequently, we have created a second sub-set building envelope, shaded darker brown and labeled "Geologically Feasible Building Envelope #2" on our Plate 1 that accompanies this report. This envelope is intended to identify an area on the property that may be subject to erosion or minor shallow landsliding in the long term, resulting in the grade of the arroyo flank laying back to a shallower angle. The setback from the top of the arroyo flank is variable and reflects the morphology of the arroyo flank and our assumption that the arroyo flank will eventually lay back to a slope gradient that will vary between 30 and 40 degrees.

Almost the entire portion of the coastal bluff on the property appears to have either episodically eroded or failed in the form of a shallow debris flow landslide. These are the predominant processes that are causing the bluff to retreat landward. There is no doubt whatsoever that the coastal bluff will continue to fail in a piecemeal fashion into the future, potentially jeopardizing the safety of the existing residences that are located below the subject property along Beach Drive. The owner has indicated that they would prefer to constrain sliding and erosion on their property, such that soil from the coastal bluff on their property will not strike the Beach Drive residents directly below. Furthermore it is our understanding that effective life and safety of existing structures on the property are NOT reliant upon either installation or continued maintenance of the fabric on the coastal bluff.

RECOMMENDATIONS

1. All habitable structures should be located within either of our "Geologically Feasible Building" envelopes graphically depicted on Plate 1.

2. Habitable structures located within the envelope labeled "Geologically Feasible Building Envelope #2" should be designed to withstand removal of soil from that zone. The reader should refer to our geological cross sections on Plate 1, where we have graphically depicted with red shading the portions of the soil that may fail in the future. It is important to note that structures placed in this zone must be designed to either pin the soil in place or must have foundations embedded deeply enough to prevent damage to the structures if the soil erodes or slides in the future.

3. We recommend that all drainage from improved surfaces such as walkways, patios, roofs, and driveways be collected and dispersed in the arroyo in such a way as to avoid ponding on the ground adjacent to a building site or spilling directly onto the steep coastal bluff. Gutters should be utilized on rooftops, channeling drainage down into the arroyo, or dispersed on the property in such a way as to avoid ponding or concentrated discharge on steep slopes.

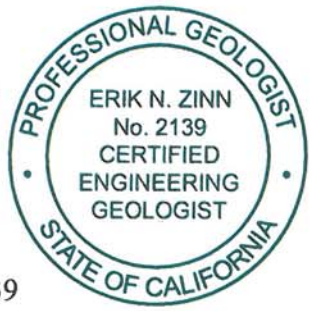
4. The portion of the coastal bluff that is on the Meyerhoff property should be protected from future erosion and landsliding through the installation of some form of permanent soil erosion control fabric. Design of the proposed permanent soil erosion control fabric should take our geological analysis into account, including but not limited to description of the geological processes that will eventually undermine the toe of the fabric. If at some point in the future the edge of the fabric is exposed, we recommend that the fabric be patched up and maintained with the guidance of a soils engineer and structural engineer.

5. Seismic shaking values for any structures designed on the property should at least adhere to the minimum prescriptive design values outlined in the 2010 California Residential Code. The seismic shaking values should be developed by the Project Geotechnical Engineer of Record as part of their soils report for the design of proposed structures.

6. We recommend that our firm be provided the opportunity for a review of any forthcoming reports, designs and specifications by the project geotechnical engineer, structural engineer, architect and landscaper, in order that our recommendations may be properly interpreted and implemented in the design and specification. If our firm is not accorded the privilege of making the recommended review we can assume no responsibility for misinterpretation of our recommendations.

If you have any questions or comments regarding this report, please contact us at your earliest convenience.

Sincerely,
ZINN GEOLOGY



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

EXHIBIT F

TABLE OF CONTENTS

NOTE: Plates must accompany text of report in order for report to be considered complete

INTRODUCTION

This report presents the results of our geologic investigation of the property located at 340 Kingsbury Drive, California (Figure 1). The purpose of our investigation was to evaluate the potential geologic hazards relevant to the construction of a single-family residence on the subject property. Our investigation focused on the hazards and attendant risks primarily associated with the long-term retreat of the coastal bluff seaward and south of the proposed development area, and the long-term retreat of the arroyo flank that abuts the eastern edge of the development area. Slope retreat for both the coastal bluff and the arroyos in this region of the Monterey Bay is typically driven by the geological processes of storm-related landsliding and erosion and intense seismic shaking during large magnitude earthquakes.

The currently proposed development will consist of a single-family residence on the property, served by existing sewer and water services (personal communication with Cove Britton of Matson-Britton Architects). Access to the proposed residence will be via a short paved driveway off of Kingsbury Drive.

There is an existing permitted residence on the property that was constructed sometime in the 1960's. It is our understanding that the existing residence will be demolished as part of this project. There is also an existing retaining wall near the northern periphery of the property - it is unclear to us at this stage of the investigation as to how the wall was designed and constructed precisely when it was constructed.

A portion of the upper coastal bluff, located just south of the existing residence, was repaired this past winter, during the course of this project and in the midst of an escrow deal for the property purchase by the Meyerhoffs. The slope was pinned in place with soil nails and a Macafferri MacMat system. This slope repair ostensibly had no impact on our coastal bluff retreat analysis or on the placement of the new residence, since the area of the repair was too small to have any meaningful effect on the shape of the slope retreat in the long term, due to overlap and flanking of the unprotected portions of the bluff. The slope repair did, however, lower the risk of injury or death due to landsliding to the residences below the landslide area on Beach Drive.

Select documents reviewed for this report include:

1. "Emergency Bluff Repair Recommendations - Imminent Landslide Hazard - 340 Kingsbury Drive - A.P.N. 043-094-06 - Aptos, Santa Cruz County, California", by Pacific Crest Engineering, dated 9 October 2012, Project No. 1256.1-SZ70-C47, unpublished consultant letter;

2. "Emergency landslide repair at 340 Kingsbury Drive - For Anny and Mark Corley - 340 Kingsbury Drive - Aptos, California - A.P.N. 043-094-06", Sheets C1 and C2, by R.I. Engineering, dated October 2012, unpublished consultant plans.

SCOPE OF INVESTIGATION

Work for this project was completed in two distinct phases under two separate contracts - a preliminary phase during escrow of the property (contract dated 1 August 2012) and then design-level work performed during escrow and after the close of escrow (contract dated 10 September 2012) . The aggregate scope of services for the two phases is presented below.

1. A review of readily available geologic maps, reports and historical stereo-pair aerial photographs pertinent to the property to assess the past effects of earthquakes and storms on the subject property, and to determine the long-term historical rate of retreat of the coastal bluff fronting the proposed development area and the flank of the arroyo that abuts the eastern side of the development area.
2. Multiple meetings with the clients, the design team, and County of Santa Cruz personnel.
3. Multiple site visits to the property with the client and various design team members.
4. Co-logging of the small-diameter exploratory borings and field location of all the borings advanced by the project geotechnical engineer, Pacific Crest Engineering, Inc. [PCEI].
5. Construction of a geologic map and cross sections for the property.
6. Discussions of site geologic parameters with the project geotechnical engineer, Elizabeth Mitchell of PCEI, as well as preliminary conclusions and recommendations with the project civil engineer, Richard Irish of R.I. Engineering and the project architect, Cove Britton of Matson-Britton Architects.
7. Analysis and interpretation of the geologic data and preparation of this report.

REGIONAL GEOLOGIC SETTING

The area of proposed development on the subject property is located upon the first-emergent coastal marine terrace in the Rio Del Mar region of Santa Cruz County (Figure 1). This is one of many such cliffs along the northern coast of Monterey Bay, characterized by gently dipping, late Tertiary marine sedimentary rocks that are overlain by nearly horizontal, Quaternary terrace deposits chiefly of marine and fluvial origins.

Although the subject property is located atop an uplifted marine terrace, the landscape on the subject property is currently being sculpted almost entirely by terrestrial processes, rather than an evenly distributed hybrid of coastal and terrestrial processes. We will return to the site-specific geologic setting of the subject property in our discussion below of the site geologic setting and potential geologic hazards.

The area of proposed development on the subject property is located atop the first-emergent coastal marine terrace, forming a very gentle (nearly flat) plane that is truncated by the coastal bluff to the southwest and an arroyo to the southeast (Figure 2 and Plate 1). The coastal bluff fronting the property is one of many such cliffs along the northern coast of Monterey Bay,

characterized by gently dipping, late Tertiary marine sedimentary rocks that are overlain by nearly horizontal, Quaternary terrace deposits, chiefly of marine and fluvial origins.

REGIONAL SEISMIC SETTING

California's broad system of strike-slip faulting has had a long and complex history. Some of these faults present a seismic hazard to the subject properties. The most important of these are the San Andreas, Zayante(-Vergeles) and Monterey Bay-Tularcitos fault zones (Figures 3 and 4). These faults are either active or considered potentially active (Petersen et al., 1996; Working Group On Northern California Earthquake Potential [NCEP], 1996). Each fault is discussed below. Locations of epicenters associated with the faults are shown in Figure 4.

San Andreas Fault

The San Andreas fault is active and represents the major seismic hazard in northern California (NCEP, 1996). The main trace of the San Andreas fault trends northwest-southeast and extends over 700 miles from the Gulf of California through the Coast Ranges to Point Arena, where the fault extends offshore.

Geologic evidence suggests that the San Andreas fault has experienced right-lateral, strike-slip movement throughout the latter portion of Cenozoic time (the past 20 to 30 million years), with cumulative offset of hundreds of miles. Surface rupture during historical earthquakes, fault creep, and historical seismicity confirm that the San Andreas fault and its branches, the Hayward, Calaveras, and San Gregorio faults, are all active today.

Historical earthquakes along the San Andreas fault and its branches have caused significant seismic shaking in the Monterey Bay area. The two largest historical earthquakes on the San Andreas to affect the area were the moment magnitude (M_w) 7.9 San Francisco earthquake of 18 April 1906 (actually centered near Olema) and the M_w 6.9 Loma Prieta earthquake of 17 October 1989. The San Francisco earthquake caused severe seismic shaking and structural damage to many buildings in the Monterey Bay area. The Loma Prieta earthquake appears to have caused more intense seismic shaking than the 1906 event in localized areas of the Santa Cruz Mountains, even though its regional effects were not as extensive. There were also significant earthquakes in northern California along or near the San Andreas fault in 1838, 1865 and possibly 1890 (Sykes and Nishenko, 1984; NCEP, 1996).

Geologists have recognized that the San Andreas fault system can be divided into segments with "characteristic" earthquakes of different magnitudes and recurrence intervals (Working Group on California Earthquake Probabilities [WG], 1988 and 1990). A study by NCEP in 1996 has redefined the segments and the characteristic earthquakes for the San Andreas fault system in northern and central California. Two "locked" overlapping segments of the San Andreas fault system represent the greatest potential hazard to the properties.

The first segment is defined by the rupture that occurred from Cape Mendocino to San Juan Bautista along the San Andreas fault during the great M_w 7.9 earthquake of 1906. The NCEP (1996) has hypothesized that this "1906 rupture" segment experiences earthquakes with comparable magnitudes at intervals of about two hundred years.

The second segment is defined by the rupture zone of the M_w 6.9 Loma Prieta earthquake. Although it is uncertain whether this "Santa Cruz Mountains" segment has a characteristic earthquake independent of great San Andreas fault earthquakes, the NCEP (1996) has assumed an "idealized" earthquake of M_w 7.0 with the same right-lateral slip as the 1989 Loma Prieta earthquake but having an independent segment recurrence interval of 138 years and a multi-segment recurrence interval of 400 years.

The 2002 WG (2003) segmentation model is largely similar to that adopted by NCEP in 1996, although they have added far more complexity to the model, and have reduced the forecasted magnitudes for the different segments. The 2002 California probabilistic seismic hazard maps issued by the California Geological Survey (Cao et al., 2003) appear to have largely adopted the earthquake magnitudes issued by the 2002 WG. The most significant change in modeling the San Andreas Fault Zone by Cao et al. (2003) is the elimination of a singular listing of the penultimate event, the 1906 Mw 7.9 earthquake (although such an event can be derived by looking at the aggregate probability of the individual segments rupturing together, as they did in 1906).

In spite of the increasing complexity of the models addressing different size earthquakes with different recurrence intervals on the sundry segments of this fault, it is undeniable that the 1906 M_w 7.9 earthquake still eclipses all the other events which have occurred on the San Andreas fault in this region. Keeping this in mind, it is important that any site-specific seismic analyses performed for development on the properties take the 1906 event into account, particularly since the empirical evidence presented by field researchers indicates the 1906 event recurs every several centuries.

Zayante (-Vergeles) Fault

The Zayante fault lies west of the San Andreas fault and trends about 50 miles northwest from the Watsonville lowlands into the Santa Cruz Mountains. The southern extension of the Zayante fault, known as the Vergeles fault, merges with the San Andreas fault south of San Juan Bautista.

The Zayante-Vergles fault has a long, well-documented history of vertical movement (Clark and Reitman, 1973), probably accompanied by right-lateral, strike-slip movement (Hall et al., 1974; Ross and Brabb, 1973). Stratigraphic and geomorphic evidence indicates the Zayante-Vergles fault has undergone late Pleistocene and Holocene movement and is potentially active (Buchanan-Banks et al., 1978; Coppersmith, 1979).

Some historical seismicity may be related to the Zayante-Vergles fault (Griggs, 1973). For instance, the Zayante-Vergles fault may have undergone sympathetic fault movement during the 1906 earthquake centered on the San Andreas fault, although this evidence is equivocal (Coppersmith, 1979). Seismic records strongly suggest that a section of the Zayante-Vergles fault approximately 3 miles long underwent sympathetic movement in the 1989 earthquake. The earthquake hypocenters tentatively correlated to the Zayante-Vergles fault occurred at a depth of 5 miles; no instances of surface rupture on the fault have been reported.

In summary, the Zayante-Vergles fault should be considered potentially active. The NCEP (1996) considers it capable of generating a magnitude 6.8 earthquake with an effective recurrence interval of 10,000 years. Alternatively, Cao et al. (2003) considers this fault capable of generating a maximum earthquake of Mw 7.0, with no stated recurrence interval.

Monterey Bay-Tularcitos Fault Zone

The Monterey Bay-Tularcitos fault zone is 6 to 9 miles wide, about 25 miles long, and consists of many en échelon faults identified during shipboard seismic reflection surveys (Greene, 1977). The fault zone trends northwest-southeast and intersects the coast in the vicinity of Seaside and Ford Ord. At this point, several onshore fault traces have been tentatively correlated with offshore traces in the heart of the Monterey Bay-Tularcitos fault zone (Greene, 1977; Clark et al., 1974; Burkland and Associates, 1975). These onshore faults are, from southwest to northeast, the Tularcitos-Navy, Berwick Canyon, Chupines, Seaside, and Ord Terrace faults. Only the larger of these faults, the Tularcitos-Navy and Chupines, are shown on Figure 2. It must be emphasized that these correlations between onshore and offshore portions of the Monterey Bay-Tularcitos fault zone are only tentative; for example, no concrete geologic evidence for connecting the Navy and Tularcitos faults under the Carmel Valley alluvium has been observed, nor has a direct connection between these two faults and any offshore trace been found.

Outcrop evidence indicates a variety of strike-slip and dip-slip movement associated with onshore and offshore traces. Earthquake studies suggest the Monterey Bay-Tularcitos fault zone is predominantly right-lateral, strike-slip in character (Greene, 1977). Stratigraphically, both offshore and onshore fault traces in this zone have displaced Quaternary beds and, therefore, are considered potentially active (Buchanan-Banks et al., 1978). One offshore trace, which aligns with the trend of the Navy fault, has displaced Holocene beds and is therefore active by definition (Buchanan-Banks et al., 1978).

Seismically, the Monterey Bay-Tularcitos fault zone may be historically active. The largest historical earthquakes *tentatively* located in the Monterey Bay-Tularcitos fault zone are two events, estimated at 6.2 on the Richter Scale, in October 1926 (Greene, 1977). Because of possible inaccuracies in locating the epicenters of these earthquakes, it is possible that they actually occurred on the nearby San Gregorio fault zone (Greene, 1977). Another earthquake in

April 1890 might be attributed to the Monterey Bay-Tularcitos fault zone (Burkland and Associates, 1975).

The NCEP (1996) has assigned an earthquake of M_w 7.1 with an effective recurrence interval of 2,600 years to the Monterey Bay-Tularcitos fault zone, based on Holocene offshore offsets. Petersen et al. (1996) have a similar earthquake magnitude, but for a recurrence interval of 2,841 years. Their earthquake is based on a composite slip rate of 0.5 millimeters per year (after Rosenberg and Clark, 1995).

Cao et al. (2003) has developed a model for the Monterey Bay fault zone that combines slip rates of the different segments, resulting in a composite slip rate of 0.5 mm per year and a forecasted earthquake of Mw 7.3, with no stated recurrence interval. The Cao et al. (2003) model adopted implicitly assumes that all the assessed segments in the Monterey Bay fault zone each have an independent slip rate of 0.1 mm per year (based upon the one slip rate developed by Rosenberg and Clark, 1995 for the Tularcitos segment), and essentially assigns the composite slip rate to the Tularcitos trace of the Monterey Bay fault zone.

SITE GEOLOGIC SETTING

The Geologic Site Map And Cross Sections (Plate 1) graphically depict relevant geologic information for the subject property. See also the Local Geology Map (Figure 5) for information of a more general nature.

Topography

The proposed development will be located atop the existing nearly flat marine terrace surface on the property (see spot elevations on surveyed base map used for our Plate 1). The marine terrace is truncated to the north and the east respectively by a swale and arroyo, as well as southwest of the development area where it intersects a coastal bluff.

The aforementioned truncations of the marine terrace have formed a peninsula that projects to the southeast, away from most of the Kingsbury Drive neighborhood. We observed the marine terrace surface of this peninsular area to be uneven and disturbed in historical aerial photographs that predated original development on the site in the 1960's. After the site was developed in the 1960's , the marine terrace appeared to be "smoothed" out and the truncated edges of the terrace surface appeared to have transgressed, expanding slightly to the north, east and south. We initially suspected that the site may have been subject to some mass grading, with some fill being pushed out beyond the original margins of the coastal bluff top and arroyo top. Our suspicion appeared to be correct during the slope repair earlier this winter, when the contractor encountered an old abandoned buried beam located slightly landward of the existing top of the coastal bluff. This indicated that there has been grading activities on the site near the margins of the coastal

bluff, and probably along the top of the arroyo too. This is important to note, because it indicates that there may be some legacy artificial fill pushed out beyond the original margins of the terrace.

Earth Materials

Brabb (1997, Figure 5; see also Plate 1) has mapped the subject property as straddling the contact between the Purisima Formation and lowest emergent marine terrace deposits of Quaternary age. This is partially consistent with our mapping and the results of the exploratory small-diameter boring program by PCEI.

The property lies on top of a blanket of marine terrace deposits that, which in turn overlie an ancestral wave cut platform in the underlying Purisima Formation sandstone bedrock. The coastal bluff is partially buttressed at its base (off the of the property, near Beach Drive) by a steeply-dipping wedge of colluvium that is likely an agglomeration of many years of mass wasting from coastal bluff. The arroyo flank appears to be similarly partially buttressed by a wedge of colluvium, although this is more difficult to observe, due to the density of the vegetation that covers the flank. See our geological map and cross section on Plate 1 for graphic portrayal of the distribution of the aforementioned earth materials.

The Purisima Formation (Tp) is described by Brabb (1997) as consisting of very thick bedded, yellowish gray, tuffaceous and diatomaceous siltstone containing thick interbeds of bluish-gray, semi-friable, andesitic sandstone. We have also noted that the site is located very near the area where the Aromas Formation is depicted as lapping up onto the Purisima Formation, and that the underlying bedrock might possibly be the Aromas Formation. The Aromas Formation in this area is described by Brabb (1997) as consisting of moderately well sorted eolian sand with a highly variable degree of consolidation owing to differential weathering. The outcrops of the lower portion of the bluff (south, southwest and southeast of the subject property) and the small-diameter borings advanced by PCEI exposed thinly to very thinly bedded, cross bedded at times, nearly flat-lying, dense to very dense, interbedded and interfingering, well rounded, predominantly well sorted (poorly graded) fine- to coarse-grained very fine grained sand and sandy silt. Based upon this observation, it is our opinion that the site is underlain by Purisima Formation bedrock at depth, beneath a blanket of marine terrace deposits. A predominant sub-vertical joint set on one- to two-foot spacing that is roughly parallel to the coastal bluff (on an azimuth of 395 degrees) was observed in outcrops upcoast and downcoast of the property. It appears that the orientation and geometry of the coastal bluff portion of the property has largely been controlled by the predominant joint set a time long ago (thousands of years?) when the formation of the bluff was driven predominantly by wave erosion.

Marine terrace deposits are deposited atop the Purisima Formation sandstone bedrock. We presume that the wave cut platform that marks the contact between the two units dips very gently seaward (several degrees) as it does elsewhere in this region, although it should be noted that we did not observe or measure it directly in outcrops below the site. This unit is composed of a flat-

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lying, sub-rounded, predominantly well sorted (poorly graded), fine- to coarse-grained sand and coarse pebbly sand. Total thickness of this unit is approximately 31 ½ feet, based upon our the soils encountered in PCE boring number five, as well as the morphology of the coastal bluff and arroyo flank.

The marine terrace deposits are overprinted by a weakly developed pedogenic soil, composed of an A-soil horizon (silty sand to sandy silt), underlain by a B-soil horizon (sand with clay). The geometry of the pedogenic soil appears to mirror the morphology of the site with an aggregate thickness of about five to eight feet. Please note that we did not map the distribution of the pedogenic soil on our map or sections, since it is not germane to any of our findings or recommendations regarding geological hazards..

A wedge of colluvium fronting the coastal bluff (off the property near Beach Drive below the property) currently buttresses the based of the coastal bluff. We did not excavate into the colluvium to ascertain its' composition, but it is likely composed of an unconsolidated mixture of sand of varying grain sizes, derived from mass wasting of marine terrace deposits and Purisima Formation sandstone out of the coastal bluff. We were unable to determine the exact configuration of the contact between the colluvium, the Purisima Formation bedrock and the beach sand.

Although we haven't mentioned it thus far, an extremely broad sandy beach, a seawall and several rows of houses currently fronts the coastal bluff. The beach appears to exceed several hundred feet in width, even during the winter time, based upon our aerial photo analysis. Although the presence of this broad beach will have no immediate impact upon the design of the proposed residence, its' existence has a profound impact on the geometry and long-term retreat rate of the coastal bluff. We will discuss this impact in subsequent sections of the report.

It appears that artificial fill was pushed out beyond the original margins of the marine terrace sometime in the 1960's, as previously stated earlier in the report. We have no way of mapping the contact between the artificial fill and marine terrace deposits without pursuing a more robust subsurface program. Since the artificial fill appears to have performed similar to the exposed marine terrace deposits over the last forty-plus years, though, it is our opinion that defining the precise location and configuration of the fill wedge that must lie along the periphery of the site is unnecessary at this juncture. It will suffice from the engineering geology perspective to ostensibly lump the mapping of the fill with the marine terrace deposits.

Drainage and Groundwater

Drainage in the development area is primarily by sheet flow north toward the drainage swale and to the east toward the arroyo. No erosional landforms such as gullies were observed as actively developing upon the marine terrace surface on the property. We did note the presence of gullies etched into both the coastal bluff and the flank of the arroyo, some of which pierce the top of the

coastal bluff and the arroyo, effectively creating scallops into the top of the slopes (see Figure 2 and Plate 1).

Groundwater was not encountered in any of the borings advanced by PCEI up to a depth of 33 ½ feet below the ground surface in the winter of 2012. Although no groundwater was encountered, it is reasonable, in our opinion, to assume that the groundwater perches atop the wave-cut platform, within the marine terrace deposits, as is commonly encountered along this stretch of coastline.

Based upon the above evidence, it is our opinion that it would be prudent to assume that a seasonal water table of several feet develops atop the bedrock for engineering design.

GEOLOGIC HAZARDS

In our opinion, the primary geologic hazards that could potentially affect the proposed development are: 1) intense seismic shaking; 2) slope retreat driven primarily by landsliding and terrestrial erosion.

In our opinion, the proposed development will be elevated too high and will be too far removed from coastal processes to warrant any concern regarding storm wave run-up or tsunamis.

Seismic Shaking Hazard

Seismic shaking on the subject property will be intense during the next major earthquake along local fault systems. Seismic shaking values for any structures designed on the property should at least adhere to the minimum prescriptive design values outlined in the 2010 California Residential Code. The seismic shaking values should be developed by the Project Geotechnical Engineer of Record as part of their soils report for the design of proposed structures.

Retreat Of The Outboard Edge Of The Terrace

The long-term retreat of the slopes and bluffs in the northern Monterey Bay results from long term erosion and episodic landsliding processes, associated with intense rainfall and seismic shaking. The following sub-sections address these issues.

Coastal Erosion

Erosion occurs at the base of sea cliffs by hydraulic impact and scour from wave action. The northwest swells that are predominant in this area are refracted into Monterey Bay, resulting in a loss of energy as they are redirected in a west-east direction, roughly paralleling the shoreline below the subject property. The shoreline-parallel swells result in littoral drift and transport of

sand from the San Lorenzo river downcoast, accumulating in pocket beaches until the coastline bends to the southeast at New Brighton State Beach, where a persistent broad beach begins.

Our analysis of the aerial photographs actually shows the top of the coastal bluff variably retreating at an ***average*** rate of up to 0.37 feet per year since 1928. Additionally, we also attempted to measure the change in the position of the colluvial wedge below the top of the coastal bluff. The contact between the bluff and the wedge, which can be clearly seen on stereo-pair aerial photographs, appears to retreat landward over the long term, along with the top of the coastal bluff, which isn't particularly surprising, since the wedge is being built upon by failures from the top of the bluff. Additionally, we noted that the colluvial wedge at the base of the bluff does not appear to have eroded or have been removed by coastal wave erosion.

Our best explanation for what appears to be low rates of coastal erosion and coastal bluff retreat at the base of the bluff is centered upon the broad sandy beach that fronts the coastal bluff. It is very likely that this broad beach absorbs most of the impact of the wave scour action, even during the winter when it is smaller. Additionally, the seawall fronting the rows of homes along Beach Drive (directly below the property) probably also deflects and absorbs most of the wave energy from waves that manage to make it across the large broad beach in this area. It seems to the be the most plausible explanation for a colluvial wedge that appears to have a relatively static toe and a very slowly failing coastal bluff face.

We ultimately utilized our calculated long-term average retreat rates of the coastal bluff to construct a "100-year Coastal Bluff Retreat Line" depicted on Plate 1.

Landslides

We noted that surficial earth materials exposed in the upper coastal bluff are creeping and have failed episodically through the process of terrestrial landsliding (see comments on bluff retreat rates in above section). Almost the entire portion of the coastal bluff on the subject property has been subject to some form of creeping or shallow landsliding at some point in the last 80-plus years, based upon our historical stereopair aerial photograph analysis.

In our opinion, the predominant form of landsliding that is occurring and has occurred on the coastal bluff on the subject property is shallow debris flows that mobilize several feet of soil per event.

Slope Erosion

We considered the fact that the marine terrace deposits, colluvium and landslide deposits comprising the upper coastal bluff are relatively unconsolidated and might be highly susceptible to erosion when exposed. Most of the time, uncontrolled erosion, if left unchecked, may impact developments by undermining the foundations.

The marine terrace deposits, colluvium and landslide deposits on the property appear to be predominantly sands with varying amounts of clay and silt within the matrix, based upon the results of the exploratory boring program, and the exposures on the property. These materials will likely have an "angle of internal friction" (φ) greater than approximately 35° (the typical angle of internal friction for clean sand). Erosion in the face of the coastal bluff and the arroyo flank will occur episodically in reaction to heavy rains and soils exposed in small landslide escarpments.

It is our opinion that the marine terrace deposits and fluvial terrace deposits exposed on the coastal bluff will likely "lay back" to a shallower gradient, at an angle no less than about 35°, but probably closer to 40°.

Summary And Overview For Coastal Bluff Retreat

The outcome of our historical bluff retreat analysis is that the top of the coastal bluff is variably retreating on average up to 0.37 feet per year since 1928. One of the primary objectives of this project was to establish the forecasted position of the top of the coastal bluff 100 years from today. Based upon the results listed above, the position of the top of the coastal bluff will be no farther then 37 feet from the top of today's bluff. It is also important to note that the County of Santa Cruz local ordinances dictate that new development along coastal bluffs should be setback 25 feet from the top of the coastal bluff, or behind the forecasted 100-year bluff retreat line, whichever is greater. It is important to note that the ordinance-driven 25-foot setback line appears to have no basis in geology, particularly when applied to this project. Nonetheless, we have adhered to this ordinance by drawing a bluff setback line on Plate 1 that is setback between 25 and 37 feet from the top of today's bluff, with the setback value being driven by the average historical retreat rate unless it results in a setback that is less then 25 feet (in which case the default setback is 25 feet).

In summary, it is our opinion that the proposed development will be subject to an ordinary risk (see Appendix B) related to the coastal bluff retreat hazard, provided that the development is located landward of the 100-year bluff retreat line/25-foot setback line portrayed upon Plate 1.

Caveats Regarding Bluff Retreat Calculations

We haven't thus far mentioned the impacts of rising sea levels and increasing intensity of coastal storms in our analysis. At this juncture, we know of no way of reliably or accurately inserting those predictions into the historical analysis we have utilized for this project. For example, it is widely known that sea levels are rising, potentially in an accelerated fashion, continuing a trend that begin roughly 18,000 years ago when sea levels were much lower. Although predictions of future sea level rise vary widely, the County of Santa Cruz Geologist is currently requiring that residential projects consider a 100-year sea level rise of 56 inches, which just slightly exceeds the uppermost forecasted value of 55 inches by the year 2100 issued in the December 2009

Proceedings of National Academy of Sciences publication by Vermeer and Rahmstorf (2009) (this paper can found at the following web address: http://www.pnas.org/content/106/51/21527.full.pdf+html) . The impact of this prediction on our calculations of bluff retreat rates is unknown at this stage. We would like to point out though, that prior to the toe of the coastal bluff being attacked, a seawall and row of houses, along with Beach Drive will have to be removed. It is unlikely that the development envelope we have depicted will be breached by erosion or landsliding within the 100-year design life, given the low likelihood of the aforementioned chain of events, heaped on top of the erosion that would then have to occur after the seawall, Beach Drive and the residents are destroyed and removed.

In summary, we did feel it prudent to mention that there are some unknown future variables which might increase the bluff retreat rates from the values presented in this report, and that there is no reliable way at this point that we are aware of to quantify these transient processes without resorting to shaky models and dicey assumptions and presumptions. The variables that might adversely impact our calculations are rising sea levels, intensity and magnitude of coastal storms, and fluctuations in the size of the large beach fronting the bluff. In the end, however, we have to form a competent opinion with the data available to us, and we feel we have done this while adhering to the standard of care for coastal geology investigations.

Mitigating Impacts Of Landsliding And Erosion To Residences Located Below The Property

The outcome of our coastal bluff retreat analysis is that the top of the coastal bluff has slowly retreated through episodic landslide and erosion events driven entirely by terrestrial processes. We have discussed this process with the current owners of the property and they have expressed some concern regarding the impacts that these processes may have on the residences and have asked us to present this issue in our report and recommend a mitigation scheme to lower the risk due to landslides and erosion emanating from the coastal bluff on their property and striking the existing residences below their property.

In our opinion, future movement of the soils exposed in the coastal bluff would be best arrested by the construction of some form of permanent soil erosion control fabric. We therefore recommend that a mitigation scheme of permanent soil erosion control fabric be designed and constructed on the entire coastal bluff face encompassed by the owners property.

It is important to note, however, that the owners do not own the entire coastal bluff, from top to bottom. Therefore, if the installation of the fabric is constrained by the property boundaries, the fabric will not entirely cover the portions of the bluff that are actively failing and eroding, and it is likely that toe of the fabric will be exposed over time as the scars below it deepen and work headward through time. When that occurs, we recommend that the fabric be patched up and maintained with the guidance of a soils engineer and structural engineer.

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Retreat Of The Top Of The Arroyo

Landslides

The arroyo flank that abuts the eastern edge of the development area has been subject to small localized shallow debris flow landslides throughout the decades, based upon our analysis of historical stereopair aerial photographs. Most of the scars left behind appear to have been modified by erosion after the landslide event, until they were revegetated by the thick low-lying scrub (composed of brambles, poison oak, chaparral, etc.) in the arroyo. We did map one relatively recent debris scar near the top of the arroyo, on the eastern edge of the development area.

None of the aforementioned observations are surprising considering the geological history of the arroyo. The arroyo had to have rapidly incised below the first-emergent marine terrace between the last major sea-level high stand approximately 80,000 years ago and the last major sea-level low stand approximately 18,000 years ago. The flanks of the arroyo are clearly too steep overall for the strength of the earth materials exposed in its sidewall, based upon the fact that the flank is still laying itself back through the process of terrestrial landsliding, as well as other terrestrial processes such as creep and erosion. The arroyo has been foreshortened and is now an underfit drainage, which explains why there is a wedge of colluvium that is developing near the bottom of the bottom of the arroyo (the drainage cannot "clean" itself out anymore, because it cannot capture enough water to develop scouring flows in the thalweg). In the long term the arroyo flanks will continue to lay back and deposit the resulting sediments upon the developing colluvial wedge, resulting in a building buttress of the lower flank.

In our opinion, the predominant form of landsliding that is occurring and has occurred on the arroyo flank on the subject property is shallow debris flows that mobilize several feet of soil per event. The slope at the top of the arroyo flank that abuts the development area will continue to lay back through time, until it achieves slope gradients ranging from 30° to 40°. We have developed a development envelope zone that ranges from the top of the arroyo to a setback distance from the top of the arroyo that reflects our analysis of the variable terrain of the flank (see the area labeled "Geologically Feasible Building Envelope #2" on Plate 1). Any habitable structures located atop this portion of the building envelope should take into account our predicted loss of ground. We have depicted this loss of ground as a red-shaded zone labeled "Suggested failure mode" on geological cross sections on Plate 1. It is important to note that the configuration of our recommended failure zone is variable, based upon the morphology of the slope below the top of the arroyo. During later phases of the design work, after the envelope and house footprint have been accepted and memorialized by the peer reviewing agencies, we will construct more geological cross sections in conjunction with the final foundation design work by the soils engineer and civil engineer. For the time being, there is no compelling logistical reason to draw a multitude of geological cross sections for proposed house footprint that is not approved yet.

Slope Erosion

We considered the fact that the marine terrace deposits, colluvium and landslide deposits comprising the arroyo flank are relatively unconsolidated and might be highly susceptible to erosion when exposed. Most of the time, uncontrolled erosion, if left unchecked, may impact developments by undermining the foundations.

The marine terrace deposits, colluvium and landslide deposits on the property appear to be predominantly sands with varying amounts of clay and silt within the matrix, based upon the results of the exploratory boring program, and the exposures on the property. These materials will likely have an "angle of internal friction" (φ) greater than approximately 35° (the typical angle of internal friction for clean sand). Erosion in the face of the coastal bluff and the arroyo flank will occur episodically in reaction to heavy rains and soils exposed in small landslide escarpments.

The setback from the top of the arroyo flank is variable and reflects the morphology of the arroyo flank and our assumption that the arroyo flank will eventually lay back to a slope gradient that will vary between 30 and 40 degrees.

CONCLUSIONS

Based on the information gathered and analyzed in the steps outlined above, it is our opinion that the subject property is geologically suitable for the future proposed residential development, and will be subject to "ordinary" risks as defined in Appendix B, provided our recommendations are followed. Appendix B should be reviewed in detail by the developer and all property owners to determine whether an "ordinary" risk as defined in the appendix is acceptable. If this level of risk is unacceptable to the developer and the property owners, then the geologic hazards in question should be mitigated to reduce the corresponding risks to an acceptable level.

The subject property is located in an area of high seismic activity and will be subject to strong seismic shaking in the future.

Our historical bluff retreat analysis indicates that the top of the coastal bluff is variably retreating (in plan view) up to as much as 0.37 feet per year since 1928. We have drawn a bluff setback line on Plate 1 that reflects our aerial photograph measurements from the top of today's bluff, with the setback value being driven by the average historical retreat rate unless it results in a setback that is less then 25 feet (in which case the default setback is 25 feet as dictated by County of Santa Cruz ordinances).

The slope above the arroyo is currently failing in a piecemeal fashion along the eastern portion of the property. We observed evidence of piecemeal erosion on the flank of the arroyo below the proposed residence, both on the historical aerial photographs and in the field. Subsequently, we

have created a second sub-set building envelope, shaded darker brown and labeled "Geologically Feasible Building Envelope #2" on our Plate 1 that accompanies this report. This envelope is intended to identify an area on the property that may be subject to erosion or minor shallow landsliding in the long term, resulting in the grade of the arroyo flank laying back to a shallower angle. The setback from the top of the arroyo flank is variable and reflects the morphology of the arroyo flank and our assumption that the arroyo flank will eventually lay back to a slope gradient that will vary between 30 and 40 degrees.

Almost the entire portion of the coastal bluff on the property appears to have either episodically eroded or failed in the form of a shallow debris flow landslide. These are the predominant processes that are causing the bluff to retreat landward. There is no doubt whatsoever that the coastal bluff will continue to fail in a piecemeal fashion into the future, potentially jeopardizing the safety of the existing residences that are located below the subject property along Beach Drive. The owner has indicated that they would prefer to constrain sliding and erosion on their property, such that soil from the coastal bluff on their property will not strike the Beach Drive residents directly below. Furthermore it is our understanding that effective life and safety of existing structures on the property are NOT reliant upon either installation or continued maintenance of the fabric on the coastal bluff.

RECOMMENDATIONS

1. All habitable structures should be located within either of our "Geologically Feasible Building" envelopes graphically depicted on Plate 1.

2. Habitable structures located within the envelope labeled "Geologically Feasible Building Envelope #2" should be designed to withstand removal of soil from that zone. The reader should refer to our geological cross sections on Plate 1, where we have graphically depicted with red shading the portions of the soil that may fail in the future. It is important to note that structures placed in this zone must be designed to either pin the soil in place or must have foundations embedded deeply enough to prevent damage to the structures if the soil erodes or slides in the future.

3. We recommend that all drainage from improved surfaces such as walkways, patios, roofs, and driveways be collected and dispersed in the arroyo in such a way as to avoid ponding on the ground adjacent to a building site or spilling directly onto the steep coastal bluff. Gutters should be utilized on rooftops, channeling drainage down into the arroyo, or dispersed on the property in such a way as to avoid ponding or concentrated discharge on steep slopes.

4. The portion of the coastal bluff that is on the Meyerhoff property should be protected from future erosion and landsliding through the installation of some form of permanent soil erosion control fabric. Design of the proposed permanent soil erosion control fabric

EXHIBIT F

should take our geological analysis into account, including but not limited to description of the geological processes that will eventually undermine the toe of the fabric. If at some point in the future the edge of the fabric is exposed, we recommend that the fabric be patched up and maintained with the guidance of a soils engineer and structural engineer.

5. Seismic shaking values for any structures designed on the property should at least adhere to the minimum prescriptive design values outlined in the 2010 California Residential Code. The seismic shaking values should be developed by the Project Geotechnical Engineer of Record as part of their soils report for the design of proposed structures.

6. We recommend that our firm be provided the opportunity for a review of any forthcoming reports, designs and specifications by the project geotechnical engineer, structural engineer, architect and landscaper, in order that our recommendations may be properly interpreted and implemented in the design and specification. If our firm is not accorded the privilege of making the recommended review we can assume no responsibility for misinterpretation of our recommendations.

INVESTIGATIVE LIMITATIONS

1. Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology principles and practices. No warranty, expressed or implied including any implied warranty of merchantability or fitness for the purpose is made or intended in connection with our services or by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.

2. The analysis and recommendations submitted in this report are based on the geologic information derived from the steps outlined in the scope of services section of this report. The information is derived from necessarily limited natural and artificial exposures. Consequently, the conclusions and recommendations should be considered preliminary.

3. The conclusions and recommendations noted in this report are based on probability and in no way imply the site will not possibly be subjected to ground failure or seismic shaking so intense that structures will be severely damaged or destroyed. The report does suggest that building structures at the subject site, in compliance with the recommendations noted in this report, is an "ordinary" risk as defined in Appendix B.

4. 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 architect and engineer 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.

5. The findings of this report are valid as of the present date. However, changes in the conditions of properties and its environs can occur with the passage of time, whether they be due to natural processes or to the works of man. 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, the conclusions and recommendations contained in this report cannot be considered valid beyond a period of two years from the date of this report without review by a representative of this firm.

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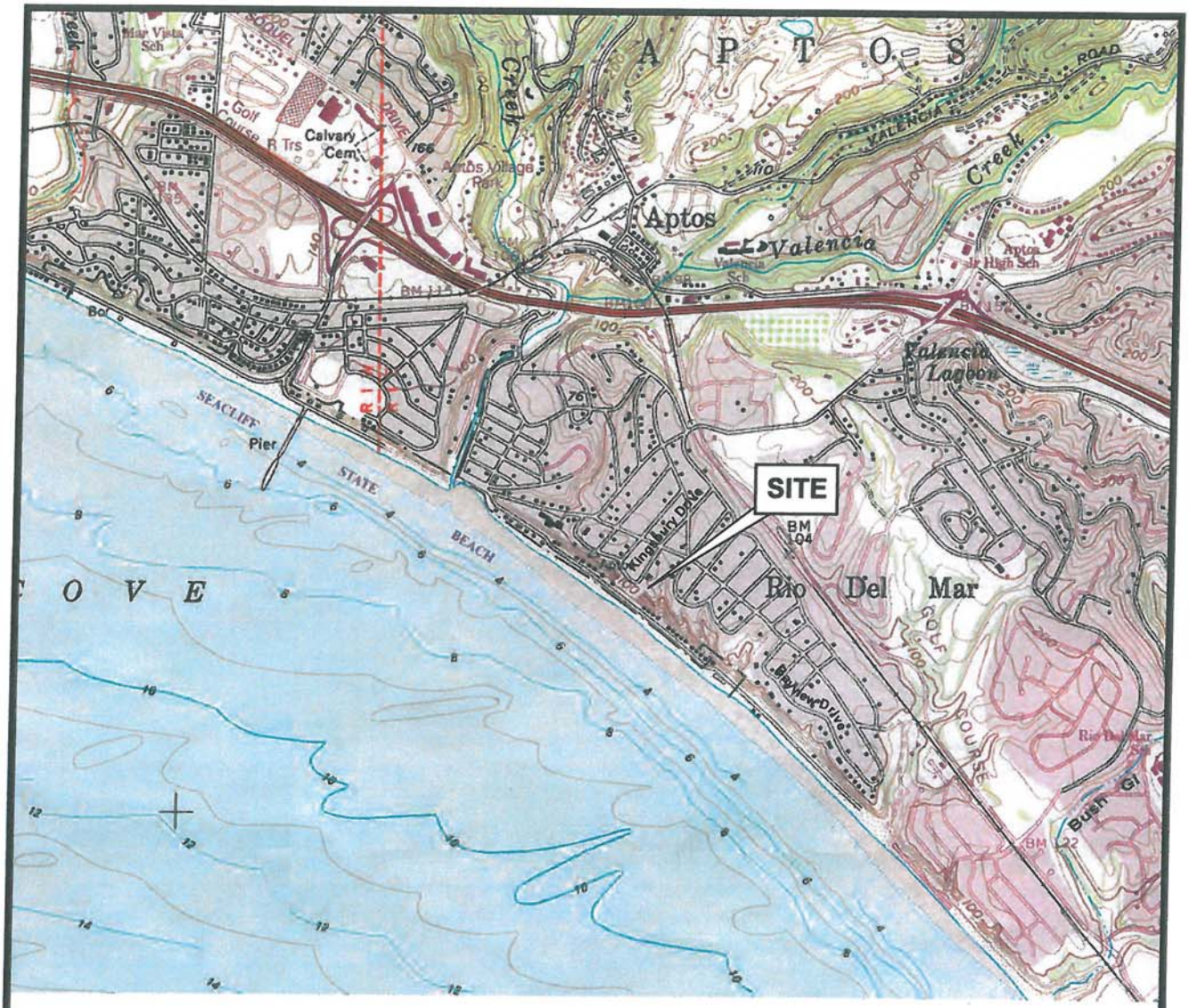
APPENDIX A

FIGURES



BASE MAP: U.S. Geological Survey, 1954 (photorevised 1980), Soquel quadrangle, California, 7.5' topographic series, scale 1:24,000.

ZINN GEOLOGY

Topographic Index Map
Lands Of Meyerhoff
340 Kingsbury Drive
Aptos, California

FIGURE #
1
JOB #
2012012-G-SC

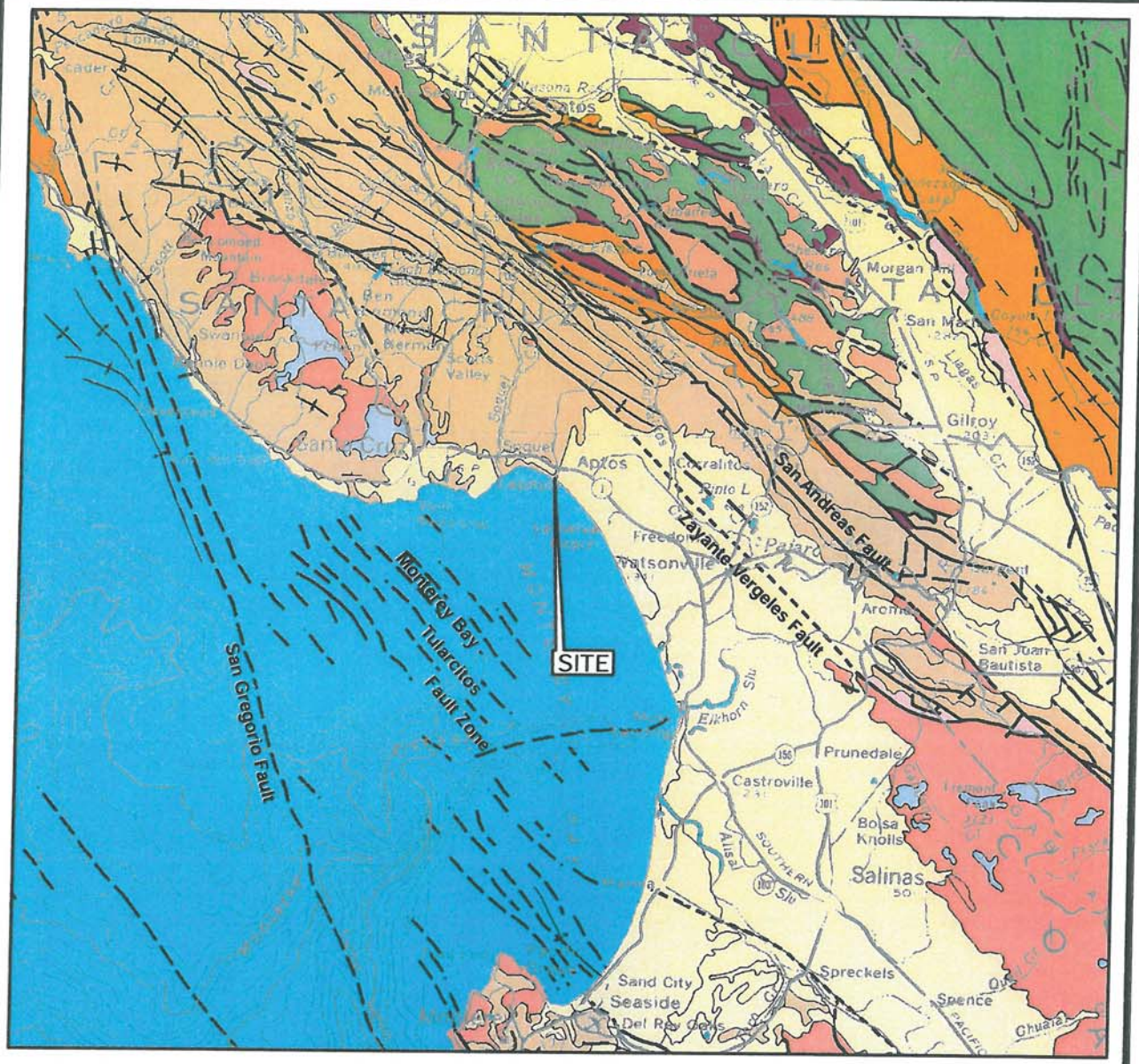
EXHIBIT F

ZINN GEOLOGY

Local Topographic Index Map
Lands Of Meyerhoff
340 Kingsbury Drive
Aptos, California

FIGURE #
2
JOB #
2012012-G-SC

EXHIBIT F



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EXPLANATION

Geologic Units

- Quaternary Deposits
- Quaternary Volcanics
- Tertiary Sedimentary Rocks
- Tertiary Volcanic Rocks
- Pre-Tertiary Sedimentary Rocks
- Pre-Tertiary Volcanic Rocks
- Grantic Intrusive Rocks
- Franciscan Complex
- Ultramafic Rocks
- Pre-Tertiary Metamorphic Rock
- Pre-Cambrian Metamorphic and Igneous Rocks

Symbols

- contact
- fault, certain
- fault,approx. located
- fault, concealed or inferred
- anticline
- monocline
- syncline

N W E S

SCALE 1:500,000

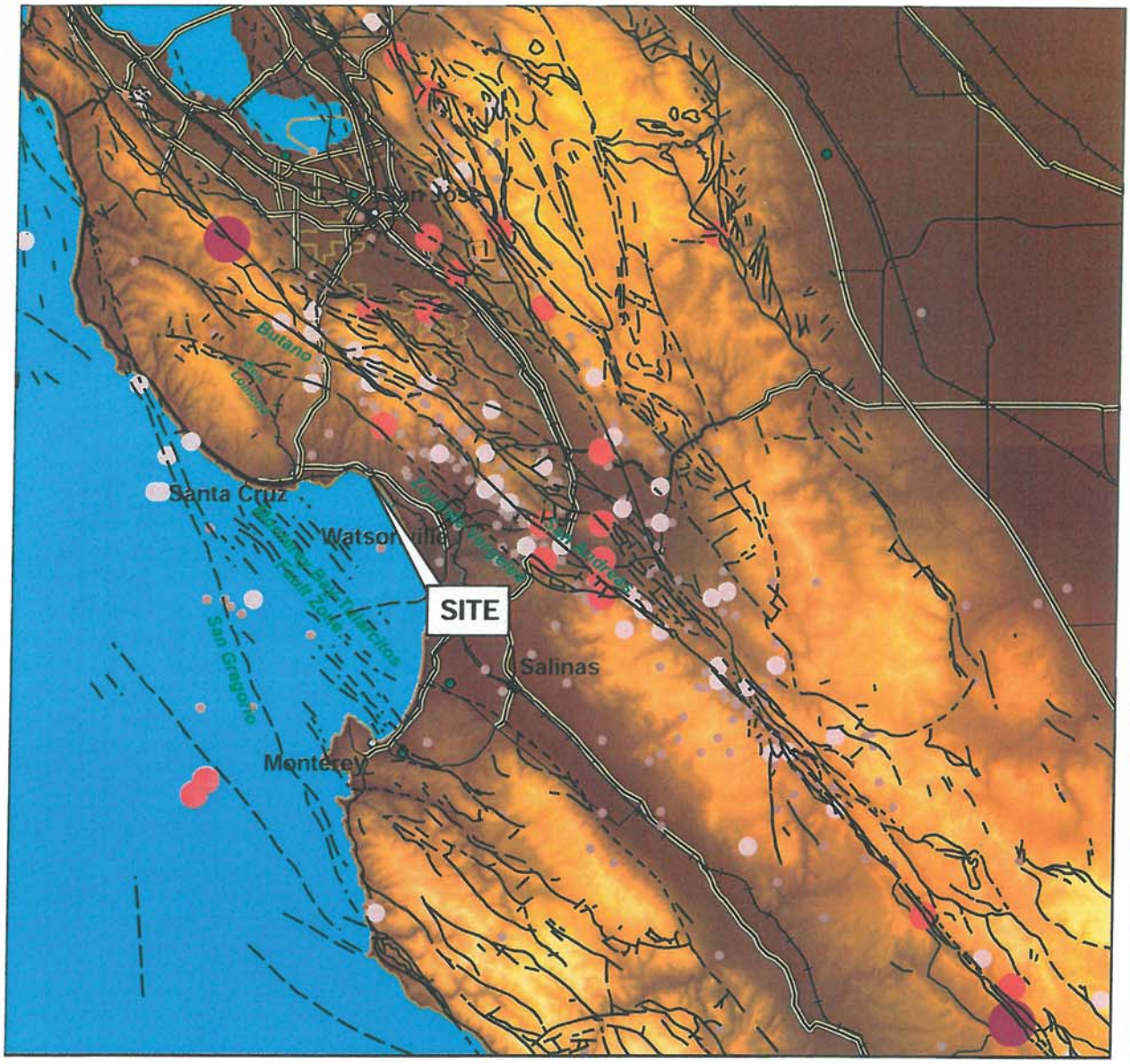
10 Miles 0

ZINN GEOLOGY

Regional Geologic Map
Lands Of Meyerhoff
340 Kingsbury Drive
Aptos, California

FIGURE # 3
JOB # 2012012-G-SC

EXHIBIT F



Seismicity Information: Magnitude 4 and greater earthquakes, compiled from various sources, 1769 to 2000; available at www.consrv.cagov/CGS/rghm/quakes/cgs2000_fnl.txt
Fault Information: Jennings, C.W., 1977, Geologic map of California: California Department of Conservation, Division of Mines and Geology, scale 1:750,000

EXPLANATION

Symbols

- fault, certain
- fault,approx. located
- fault, concealed or inferred

Earthquake Magnitude

- 4.0 to 4.99
- 5.0 to 5.99
- 6.0 to 6.99
- 7.0 +

N
W E
S

SCALE 1:1,000,000

10 5 0 10

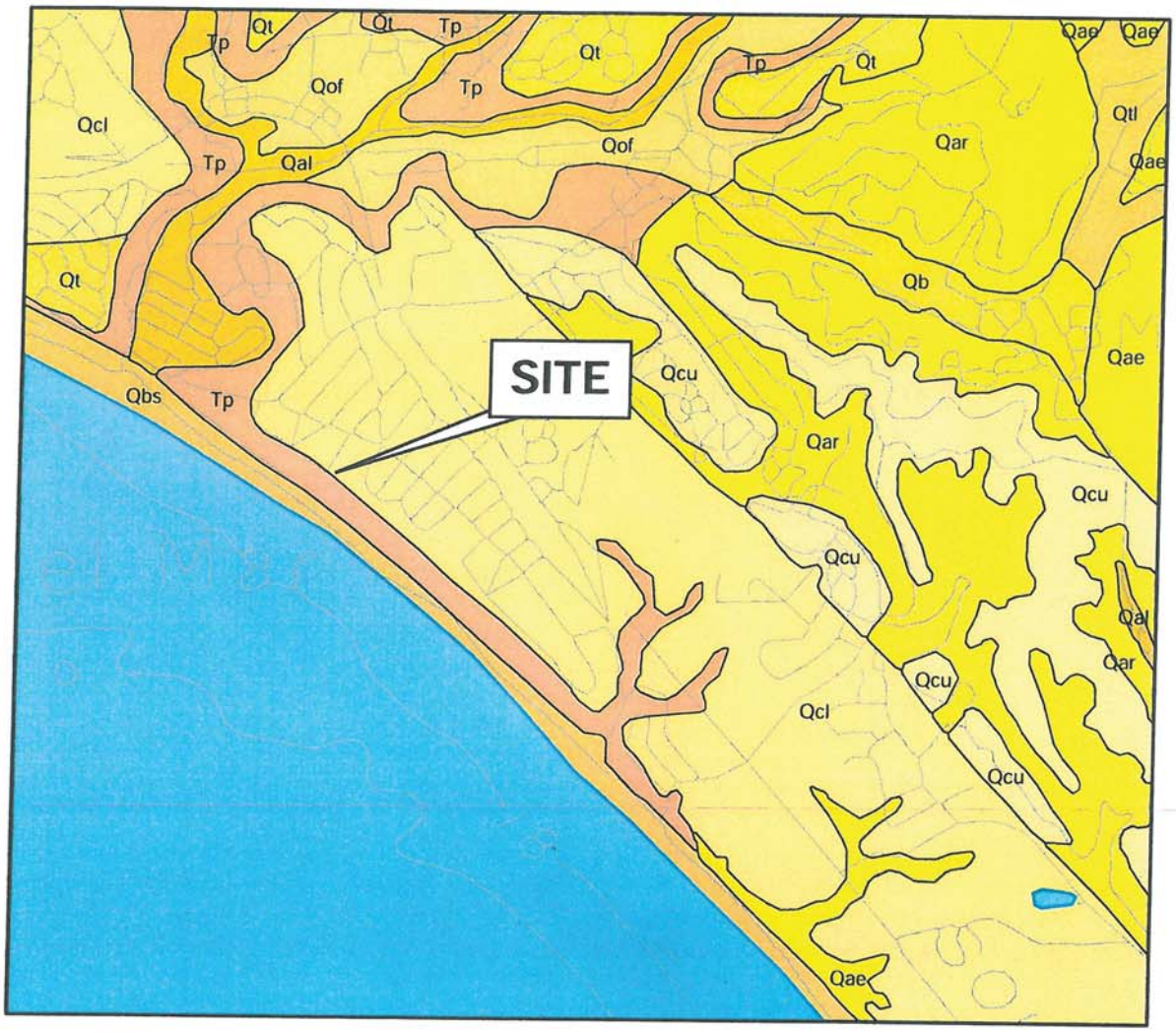
Miles

ZINN GEOLOGY

Regional Seismicity Map
Lands Of Meyerhoff
340 Kingsbury Drive
Aptos, California

FIGURE #
4
JOB #
2012012-G-SC

EXHIBIT F



BASE MAP: Brabb, E.E., 1997, Geologic map of Santa Cruz County, California: a digital database: U.S. Geological Sruvey, Open-File Report 97-489, scale 1:62,500.

Explanation

UNITS

- Qbs - Beach Sand
- Qal - Alluvium
- Qof - Older flood-plain deposits
- Qcl - First emergent coastal terrace deposits
- Qcu - Undifferentiated coastal terrace deposits
- Qt - Undifferentiated terrace deposits
- Qar - Undivided Aromas Sand
- Tp - Purisima Formation
- Water

SYMBOLS

- contact, certain
- water boundary

N
W E
S

SCALE 1:24,000

1000 0 1000 2000 feet

ZINN GEOLOGY

Local Geologic Index Map
Lands Of Meyerhoff
340 Kingsbury Drive
Aptos, California

FIGURE #
5
JOB #
2012012-G-SC

EXHIBIT F

APPENDIX B

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

27 January 2014

Job #2012012-G-SC

Jens and Susanne Meyerhoff
14539 East Edgewater Court
Fountain Hills, AZ 85268
jmsem@cox.net

Re: Clarification of recommendation regarding upper bluff protection
340 Kingsbury Drive
Aptos, California
County of Santa Cruz APN 043-094-06

Dear Mr. And Mrs. Meyerhoff:

This letter is in response to a request for clarification by your Project Architect Of Record, Cove Britton of Matson-Britton Architects, which was in turn triggered by the same request for clarification by the County of Santa Cruz Planning Department (personal communication on 27 January 2014).

The stipulated 100-year coastal bluff retreat line depicted on Plate 1 accompanying our original geology report, dated 15 April 2013, forms the seaward boundary of our geologically feasible building envelopes for the proposed residence. The position of the 100-year coastal bluff retreat line is based upon our geological analysis of the long term retreat of the bluff, including analysis of historical stereopair aerial photographs that go back as far as 1928. The position of the 100-year coastal bluff retreat line did NOT take into account the establishment of any proposed coastal bluff armoring whatsoever.

Our original geological report discusses the principal issue and impacts if the portion of the bluff owned by the Meyerhoffs is simply left unprotected and allowed to fail in the future. On page 17 of our 15 April 2013 report we state:

> *The outcome of our coastal bluff retreat analysis is that the top of the coastal bluff has slowly retreated through episodic landslide and erosion events driven entirely by terrestrial processes. We have discussed this process with the current owners of the property and they have expressed some concern regarding the impacts that these processes may have on the residences and have asked us to present this issue in our report and recommend a mitigation scheme to lower the risk due to landslides and*

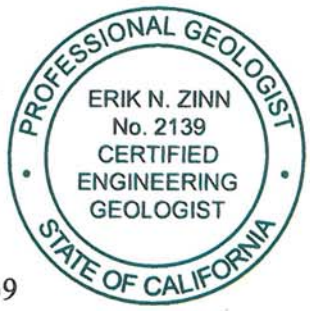
EXHIBIT G

erosion emanating from the coastal bluff on their property and striking the existing residences below their property.

In summation, the proposed upper coastal bluff protection for the Meyerhoff property is being recommended to lessen the relative risk of injury and death from potential debris flows to the neighboring residences below the Meyerhoff property.

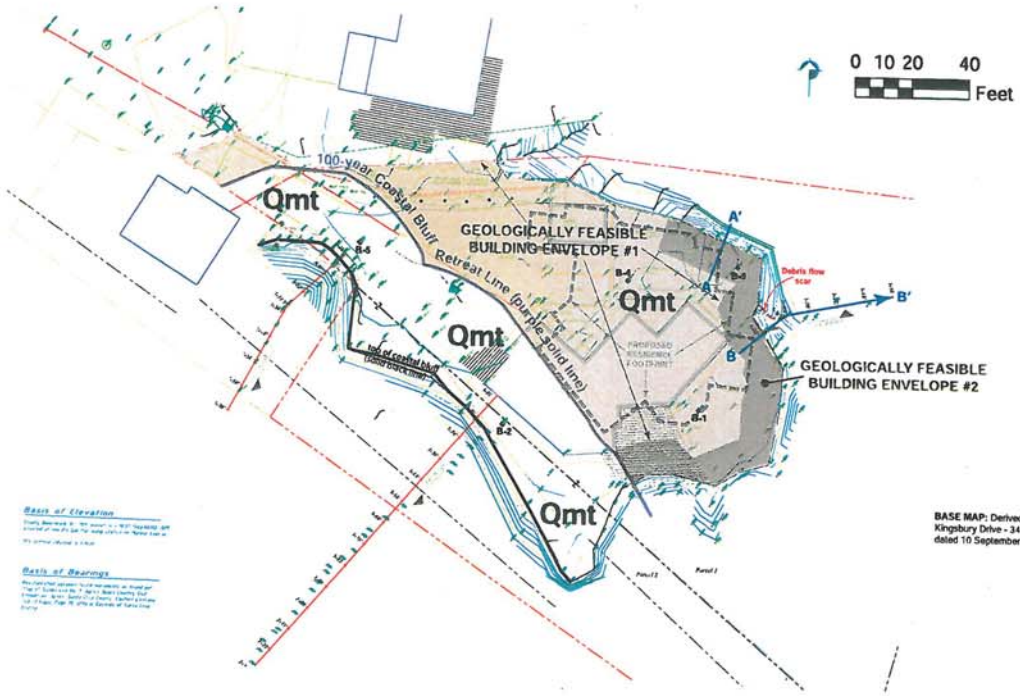
If you have any questions or comments regarding this letter, please contact us at your earliest convenience.

Sincerely,
ZINN GEOLOGY



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

ec: Cove Britton - Matson-Britton Architects
Elizabeth Mitchell - Pacific Crest Engineering
Richard Irish - R.I. Engineering
Robin Bolster-Grant - County of Santa Cruz
Karen Geisler - California Coastal Commission



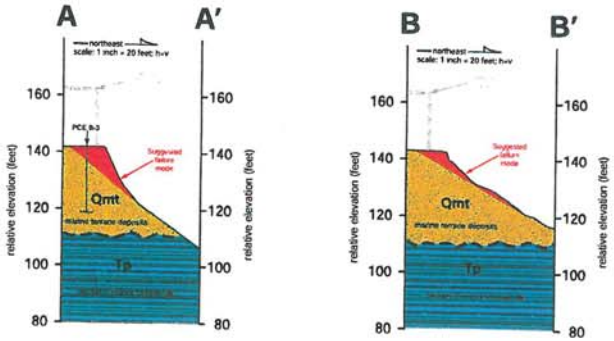
BASE MAP: Derived from digital map titled "Boundary & Topographic Survey Map, The Lands Of: 340 Kingsbury Drive - 340 Kingsbury Drive, Aptos, CA 95033", prepared by Hanagan Land Surveying, dated 10 September 2012. Intended scale of for publication 1"=10'.

ZINN GEOLOGY

GEOLOGIC SITE MAP AND CROSS SECTIONS
Lands of Meyerhoff
340 Kingsbury Drive
Aptos, California

Date: 15 April 2013	Revised:
Job #2012012-G-SC	
Scale: 1"=20'	Plate 1
Drawn by: ENZ/enz	

ERIN R. ZINN — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA



EXPLANATION

EARTH MATERIALS

Qmt	Marine terrace deposit - includes undifferentiated artificial fill capping marine terrace deposits across the site
Tp	Purisma Formation

SYMBOLS

B — B'	Location of geologic cross sections
——?——?	Earth materials contact - dashed where approximate, queried where uncertain
B-5	Location of small diameter exploratory test borings advanced by Pacific Crest Engineering

EXHIBIT G

EXHIBIT G

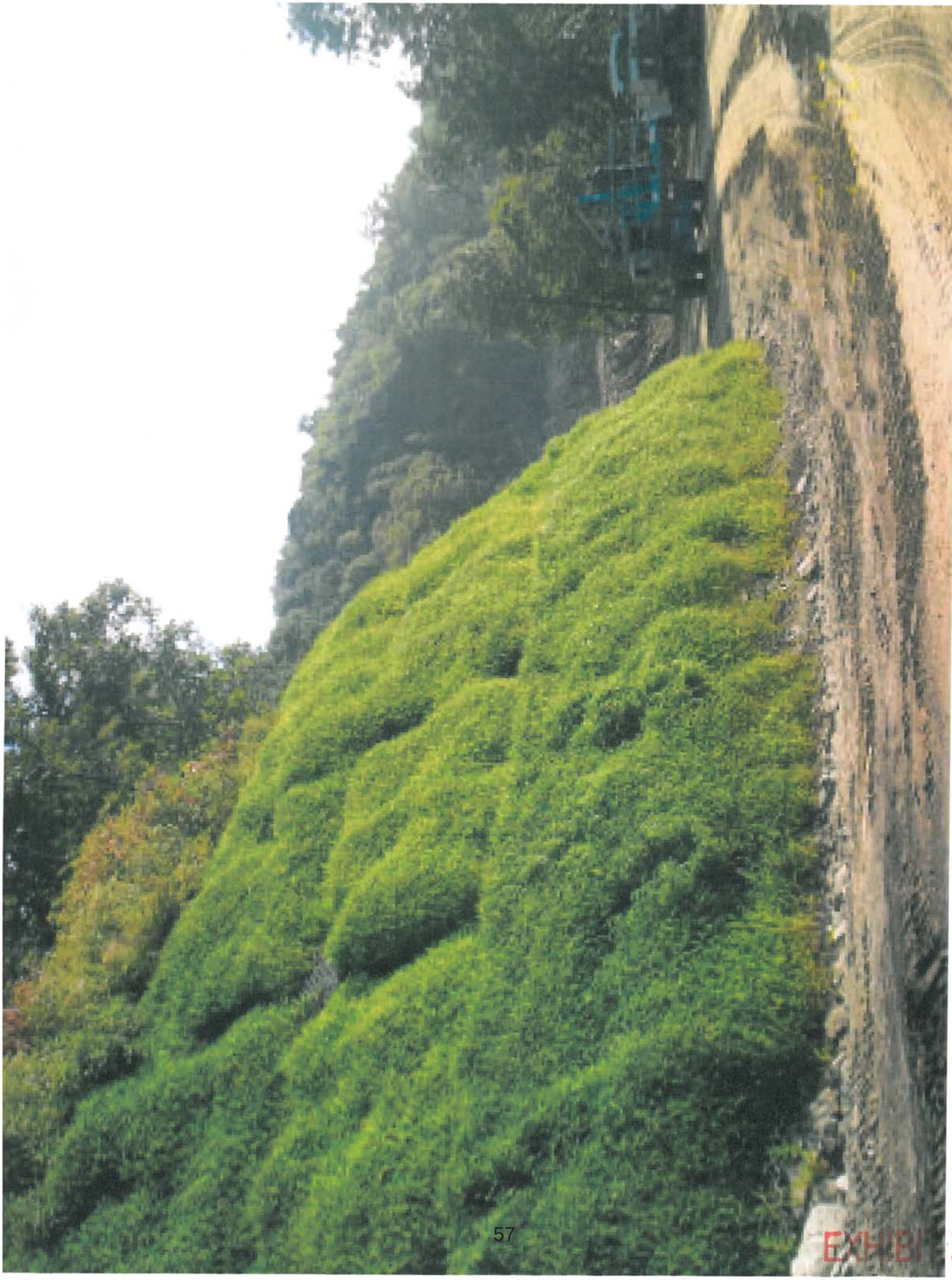


EXHIBIT H

EXHIBIT H

Fully.

EXHIBIT H