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CITY AND COUNTY OF HONOLULU

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CDD-BS 12-450550

January 30, 2012

Mr. Gary Hooser, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Hooser:

Subject: Draft Environmental Assessment (DEA) for Rock Slide
Potential Inspection and Mitigative Improvements along
Prospect Street, Honolulu, Island of Oahu, Hawaii

The City and County of Honolulu, Department of Design and Construction, has reviewed the DEA for the subject project, and anticipates a Finding of No Significant Impact. Please publish notice in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and one (1) copy of the document in pdf format on a CD and one (1) hardcopy of the DEA. Please call Ardalan Nikou at (808) 529-7223 or email Ardalan.Nikou@aecom.com, or Michael Yamasaki at the Department of Design and Construction, City and County of Honolulu, at (808) 768-8824 if you have any questions.

Your early attention on this matter will be appreciated.

Very truly yours,

Handwritten signature of Chris Takashige in black ink.

for Lori M. K. Kahikina, P.E.
Director

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Enclosures

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Project Name: Rockslide Potential Inspection and Mitigative Improvements along Prospect Street, Honolulu, Hawaii

**Publication Form
The Environmental Notice
Office of Environmental Quality Control**

Instructions: Please submit one hardcopy of the document along with the determination letter from the agency. On a compact disk, insert an electronic copy of this publication form in MS Word and a PDF of the EA. Please make sure that your PDF documents are ADA compliant. Mahalo.

Applicable Law: HRS Chapter 343
Type of Document: Environmental Assessment
Island: Oahu
District: Honolulu
TMK: 2-2-005:001
Permits Required: Special District Permit (Minor)
Applicant or Proposing Agency: City & County of Honolulu, Department of Design & Construction
Address: 650 South King Street, 15th Floor
Honolulu, Hawai'i 96813
Contact & Phone: Michael Yamasaki, 808-768-8824

Consultant: AECOM Technical Services, Inc.
Address: 1001 Bishop Street, Suite 1600
Honolulu, Hawai'i 96813-3920
Contact & Phone: Ardalan Nikou, 808-529-7223

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

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Project Summary: Summary of the direct, indirect, secondary, and cumulative impacts of the proposed action (less than 200 words). Please keep the summary brief and on this one page.

The City and County of Honolulu proposes the Rockslide Potential Inspection and Mitigative Improvements project to mitigate rockfall hazard along Prospect Street in order to reduce the threats to public health and safety by implementation of rockfall protection measures that would be installed within the City and County right-of-way. The existing slope has a multitude of potentially hazardous rocks, creating a high potential for rockfalls to reach the roadway. Rockfall mitigation is needed to reduce these identified risks to public health and safety for users along Prospect Street. The proposed action includes installing rockfall impact fences, concrete jersey barriers, draped wire mesh, and shoulder widening along Prospect Street.

To determine whether the Proposed Action would have a significant impact on the human, natural, or historic environments, the project, its anticipated direct and indirect effects, and the short-term, long-term, and cumulative impacts have been evaluated. Based on the discussion of impacts and mitigation measures contained in the EA and the evaluation of the significance criteria, it is anticipated that the proposed project would not have a significant adverse impact on the environment. Therefore, a Finding of No Significant Impact is anticipated.



**DRAFT
ENVIRONMENTAL ASSESSMENT
ROCKSLIDE POTENTIAL INSPECTION AND
MITIGATIVE IMPROVEMENTS ALONG
PROSPECT STREET
HONOLULU, HAWAI'I**

City & County of Honolulu
Department of Design & Construction
650 South King Street, 11th Floor
Honolulu, Hawai'i 96813

February 2012

**DRAFT
ENVIRONMENTAL ASSESSMENT
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PROSPECT STREET
HONOLULU, HAWAII**

City & County of Honolulu
Department of Design & Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

Prepared by:

AECOM Technical Services, Inc.
1001 Bishop Street, Suite 1600
Honolulu, Hawaii 96813-3698

February 2012

PROJECT SUMMARY

Project	Rockslide Potential Inspection and Mitigative Improvements along Prospect Street, Honolulu, Hawai'i
Proposing Agency/Applicant	City & County of Honolulu Department of Design & Construction 650 South King Street, 15th Floor Honolulu, Hawai'i 96813
TMK	2-2-005:001
Location	Honolulu, Island of O'ahu, Hawai'i
Project Area	Prospect Street The project area is divided into three zones: Zone 1: Zone 1 extends from Madeira Street to Huali Street and totals 0.20 acres. Zone 2: Zone 2 begins at Huali Street and ends just before the sharp turn where the wide unpaved shoulder disappears. Zone 2 is 0.20 acres. Zone 3: Zone 3 is approximately 0.57 acres, and lies in the vicinity of Pele Street and Miller Street.
Document Preparers	AECOM Technical Services, Inc. 1001 Bishop Street, Suite 1600 Honolulu, Hawai'i 96813-3920
County Zoning	A-2, Medium Density Apartment, and A-1, Low Density Apartment
State Land Use	Urban Land Use
Existing Land Use	The proposed area serves as a residential road in urban Honolulu.
Proposed Action	Rockfall mitigation along Prospect Street across three zones. Each zone will require different rockfall mitigation alternatives. All work will take place in the City and County right-of-way.
Permits that May be Required	Special District Permit (Minor), State Historic Preservation Review

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ACRONYMS AND ABBREVIATIONS

§	Section
AMP	Archaeological Monitoring Plan
BMP	best management practice
C&C	City and County of Honolulu
CDP	Census Designated Place
CFR	Code of Federal Regulations
CIA	cultural impact assessment
dB	decibel
dBA	decibel (A-weighted scale)
DLNR	Department of Land and Natural Resources, State of Hawai'i
DOH	Department of Health, State of Hawai'i
DOT	Department of Transportation, State of Hawai'i
DPP	Department of Permitting and Planning
EA	environmental assessment
FHWA	Federal Highways Administration
HAR	Hawai'i Administrative Rules
HIOSH	Hawai'i Occupational Safety and Health
HRS	Hawai'i Revised Statutes
IA	Implementing Actions
KJ	kilo joules
LUPD	Land Use Permit Division
NAAQS	National Ambient Air Quality Standards
no.	number
PCSI	Pacific Consulting Services, Inc.
ROH	Revised Ordinances of Honolulu
ROI	region of influence
rRK	Rock Land
SDD	Special District Permit
SHPD	State Historic Preservation Division
TCC	Tantalus Silty Clay Loam, 8–15% Slope
TCE	Tantalus Silty Clay Loam, 15–40% Slope
TMK	Tax Map Key
U.S.	United States
U.S.C.	United States Code
UIC	underground injection control

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 INTRODUCTION

The City and County of Honolulu (C&C) is proposing rockfall hazard mitigation to be undertaken upslope of Prospect Street between Miller and Madeira Streets, Honolulu, Hawai'i (Figure 1-1). The proposed project site is located within the C&C right-of-way and will use county funds; therefore, triggering the environmental review process mandated under Hawai'i Revised Statutes (HRS), Chapter 343.

This draft environmental assessment (EA) analyzes the potential environmental consequences of the Proposed Action and alternatives to determine whether there would be significant short-term, long-term, and/or cumulative impacts on the human, natural, or historic environments.

All activities conducted in support of this EA, including consultations, field investigations, technical studies, and public involvement are conducted in accordance with HRS Chapter 343, Environmental Impact Statements; the Hawai'i Administrative Rules (HAR) Title 11, Chapter 200, State of Hawai'i Department of Health (DOH) Implementing Rules for the Environmental Review Process; and Act 50, Session Laws of Hawai'i, 2000 requiring impacts to Hawai'i's culture, traditional cultural properties and practices, and customary rights be addressed in the environmental review process. As appropriate, mitigation measures are identified to address potential negative environmental impacts.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed project is to mitigate rockfall hazards along Prospect Street in order to reduce the threats to public health and safety by implementation of rockfall protection measures that would be installed within the C&C right-of-way. The existing slope has a multitude of potentially hazardous rocks, creating a high potential for rockfalls to reach the roadway. Rockfall mitigation is needed to reduce these identified risks to public health and safety for users along Prospect Street.

Recommendations for the Proposed Action took into consideration various factors including public safety, construction cost, and sound engineering principles.

1.3 PROJECT DESCRIPTION

1.3.1 Project Location and Site Characteristics

The proposed project would occur within the C&C right-of-way between 150 and 666 Prospect Street, Honolulu, Hawai'i, Tax Map Key (TMK) 2-2-005:001 (Figure 2-1). The proposed project site is located approximately 1.5 miles from downtown Honolulu and 2.0 miles from the Pacific Ocean.

The project area is presently characterized as having many loose boulders, overhangs, and unstable soil with a high potential for rockfalls. This potential for rockfalls presents a significant risk to public health and safety for users along Prospect Street.

Due to varying site conditions, it is difficult to identify a single alternative capable of mitigating the entire project site. Therefore, the project site was categorized into three zones based on site topography and right-of-way boundary locations, as shown on Figure 1-1.

- **Zone 1:** Zone 1 extends from Madeira Street to Huali Street and totals 0.20 acres (Figure 1-1). Zone 1 can be described as a high natural slope above a high cut slope and narrow shoulder. The right-of-way boundary is near the top of the cut slope.
- **Zone 2:** Zone 2 is approximately 540 linear feet long measured along the roadway beginning at Huali Street and ending just before the sharp turn where the wide unpaved shoulder disappears (Figure 1-1). Zone 2 consists of 0.20 acres and is described as a steep natural

slope above a roadside cut slope of varying heights. The shoulder is relatively wide and is regularly used for vehicle parking. The right-of-way limit is near the toe of the cut slope.

- **Zone 3:** Zone 3 is 0.57 acres and 540 linear feet measured along the roadway, and lies in the vicinity of Pele Street and Miller Street (Figure 1-1). This zone can be described as a natural slope above a short cut slope that varies in height from 0 feet to 40 feet, and a narrow shoulder that varies from 2 feet to 31 feet wide. The right-of-way boundary is upslope from top of the cut slope.

1.3.2 Proposed Construction and Maintenance Activities

Mitigation measures in Zone 1, Zone 2, and Zone 3 will be conducted concurrently. Construction activities would involve: installing a draped wire mesh system anchored above the existing cut slope, installing concrete jersey barriers and rockfall impact barrier systems along the roadway shoulder, and excavating the slope to widen the roadway shoulder.

Other activities include tree removal and vegetation clearing throughout the project area and in areas where the wire mesh would be installed.

Traffic control personnel would be present to regulate the flow of traffic through the area when construction activity occurs. Traffic control plans would be submitted to the Department of Transportation Services, with a copy to the Department of Permitting and Planning (DPP), to mitigate short-term traffic-related construction impacts. Clearing of trees and removal of loose debris on the slopes is needed prior to the construction of rockfall mitigation improvements to reduce the risk of falling materials and the potential occurrence of a rockfall event. A staging area would be located along the road shoulder in Zone 3.

After construction is complete, the C&C would inspect and maintain the rockfall fences, jersey barriers, and wire mesh system on a regular basis. Maintenance activities would include clean-up of rocks from behind the rockfall fences, and repairs to the fences, barriers, and wire mesh as needed.

1.3.3 Project Schedule and Source of Funding

Construction activities related to the Proposed Action would commence in late 2012 and would take approximately 6 months to complete. This project would be funded by the C&C.

1.4 ENVIRONMENTAL PERMITS, CONSULTATIONS, AND APPROVALS

In addition to the environmental disclosure requirements of HRS Chapter 343, implementation of the Proposed Action would require coordination and consultation with state and county agencies for permits or approvals as presented in Table 1-1 (see Appendix A for agency correspondence).

Table 1-1: Permits and Approvals for Implementation of the Proposed Action

Permit or Approval	Description	Regulation(s)	Administrative Authority
Special District Permit (Minor)	A minor or major SDD is required for development projects in any of the seven special districts.	Section 21-9.50 ROH	County of Honolulu DPP LUPD
State Historic Preservation Review	State projects that may affect a historic property must obtain a concurrence of "no affect" to historic properties from SHPD, prior to commencement.	HRS Chapter 6E-8; HAR 13-275	DLNR SHPD

DLNR Department of Land and Natural Resources
LUPD Land Use Permit Division
ROH Revised Ordinances of Honolulu
SDD Special District Permit
SHPD State Historic Preservation Division

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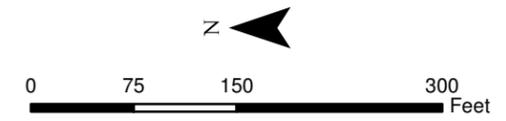
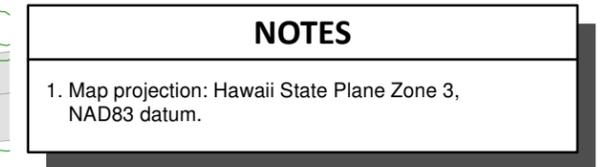
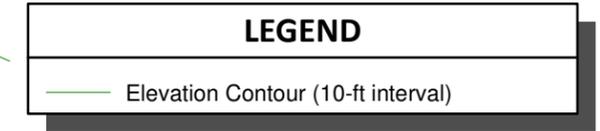
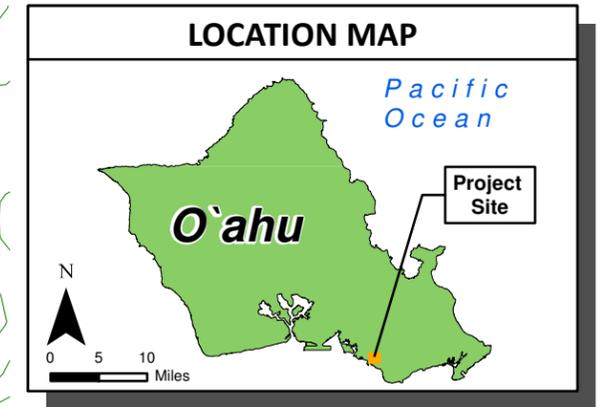
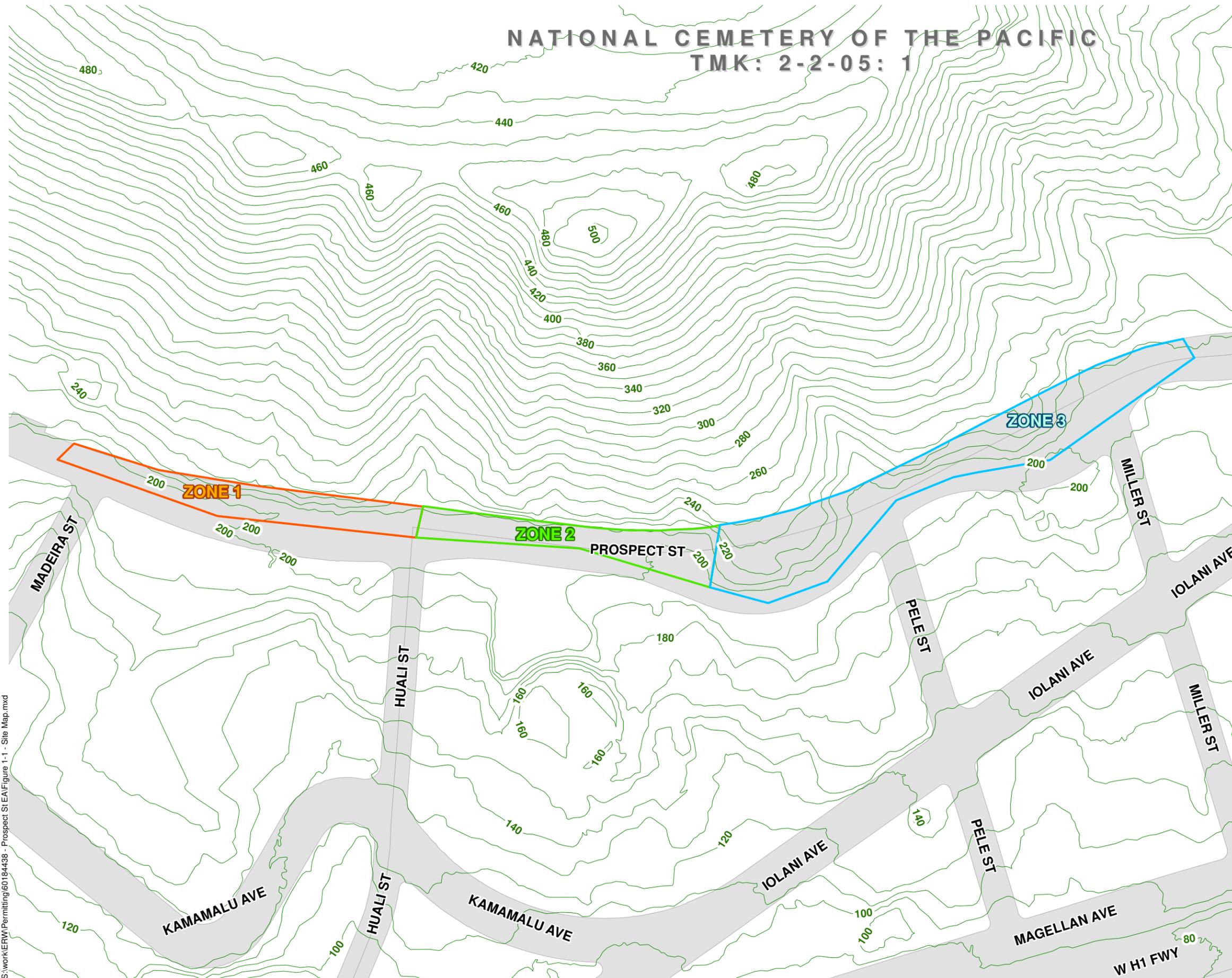


Figure 1-1
Site Location and Topographic Map
Prospect Street EA
Oahu, Hawaii

2.0 PROPOSED ACTION AND ALTERNATIVES TO THE PROPOSED ACTION

This section provides background information on the proposed project and a description of the Proposed Action, the No-Action Alternative, and alternatives considered but not carried forward for further analysis.

2.1 PROPOSED ACTION

2.1.1 Zone 1 – Rockfall Impact Fence and Concrete Jersey Barrier

The Proposed Action in Zone 1 includes a rockfall impact fence and concrete jersey barriers. Due to the varying degree of the slope along Zone 1, three fence systems would be necessary. Each fence would be constructed along the toe of the slope in the shoulder area that is currently used for vehicle parking. Due to the location of the existing property line, this is the only available location where the fences could be constructed without acquiring additional right-of-way. All of the fence components, including the posts and the tie back anchors, would be constructed within the existing C&C right-of-way. The work area in Zone 1 totals 0.20 acre.

The first fence system would extend 346 linear feet starting at Madeira Street. The fence would be 8 feet high with a minimum capacity of 100 kilo joules (KJ). The fence would have a reinforced concrete post foundation (Figure 2-2).

The second fence system in Zone 1 would extend 25 linear feet. This fence system would be 10 feet high with a minimum capacity of 100 KJ. The fence would have a reinforced concrete post foundation (Figure 2-3).

The third fence system would then continue 50 linear feet to the Zone 2 boundary of Huali Street. This fence system would be the same as the first fence system; it would be 8 feet high with a minimum capacity of 100 KJ (Figure 2-4).

Each impact fence system would reduce rockfall hazards by providing a protective barrier to intercept rolling and bouncing rocks. The fences would be constructed using heavy gauge steel posts atop concrete foundations, steel wire rope cables, and steel netting. The components would be galvanized coated and painted flat black for both corrosion protection and aesthetic purposes.

In addition, concrete jersey barriers would be installed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The jersey barriers would serve as a permanent divider preventing both vehicles and pedestrians from getting too close to the fence.

A large boulder exists on the shoulder of Prospect Street in Zone 1 that would be removed as part of the Proposed Action. The boulder would be removed from the project area using a front end loader and disposed of off-site.

2.1.2 Zone 2 – Rockfall Impact Fence and Concrete Jersey Barrier

The Proposed Action in Zone 2 proposes a rockfall impact fence and concrete jersey barriers. Due to the varying degree of the slope, three fence systems would be necessary along Zone 2.

The first fence system in Zone 2 would extend 278 feet from the beginning of Zone 2. This fence system would be a continuation of the third fence system in Zone 1. It would be 8 feet high with a minimum capacity of 100 KJ. The fence would have a reinforced concrete post foundation (Figure 2-4).

The second fence system in Zone 2 would extend 18 linear feet. This fence system would be 10 feet high with a minimum capacity of 100 KJ. The fence would have a reinforced concrete post foundation (Figure 2-3).

The third fence system would be the same fence type as the first fence in Zone 2. It would extend 114 linear feet to the Zone 3 boundary. This fence system would be 8 feet high with a minimum capacity of 100 KJ. The fence would have a reinforced concrete post foundation (Figure 2-4).

The impact fences would be constructed along the toe of the slope within the roadway shoulder that is currently used for vehicle parking. Due to the location of the existing property line, this is the only available location where a fence could be constructed without acquiring additional right-of-way. All of the fence components, including the foundations, the posts, and the tieback anchors, would be constructed within the existing C&C right-of-way. The fence would be effective for stopping potential rockfall from the cut slope only.

In addition, concrete jersey barriers would be installed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The jersey barriers would serve as a permanent divider protecting both vehicles and pedestrians from getting too close to the fence. The work area in Zone 2 totals 0.20 acre.

The Proposed Action for Zone 2 also includes removal of two kiawe trees (*Prosopis pallida*) from the C&C property as discussed in the Tree Survey (Appendix C). These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to vehicles and pedestrians on Prospect Street.

2.1.3 Zone 3 – Draped Wire Mesh and Rockfall Impact Fence

The Proposed Action in Zone 3 provides complete rockfall hazard reduction for the entire slope using a combination of draped wire mesh, rockfall impact fences, and shoulder widening.

A rockfall impact fence would be installed within the existing right-of-way limits above the top of the cut slope. The fences would stop rolling rocks from the upper natural slope.

The Zone 3 fence system would extend 510 linear feet. Due to the topography of the area, the fence cannot be installed continuously. The first fence segment would extend 150 linear feet. There would be a 10 linear feet break in the fence, and then the fence system would continue for 360 linear feet. This fence system would be 6 feet high with a minimum capacity of 500 KJ. The fence would have a reinforced concrete post foundation (Figure 2-5).

A draped wire mesh system would be installed over the cut slope downslope of the impact fence. Vegetation on the slope would be cleared using chain saws and weed eaters to cut the vegetation flush to the ground surface. Foundation anchors would then be drilled into the ground by a hydraulic/pneumatic drill mounted on a piece of tracked equipment, such as a small excavator. Anchors would be grouted using a hand held mixer and a small grout pump. After the anchors are tested, top support cables would be attached to the anchors and installed. The mesh would then be installed and attached to the top support cables.

Just north of Pele Street, the roadside shoulder would be widened to provide at least 7 feet of clear distance measured from the edge of the roadway to the toe of the slope. The slope would be cut back at a 45 degree angle for a distance of 250 feet measured along the roadway. The volume of excavated earth would be about 450 cubic yards, and the work would be done using a large track mounted excavator, a front end loader and dump truck.

The Proposed Action for Zone 3 also includes removal of seven kiawe trees (*Prosopis pallida*) from the C&C property as discussed in the Tree Survey (Appendix C). These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to vehicles and pedestrians on Prospect Street. The Tree Survey identifies a total of nine trees in Zones 2 and 3, and recommends seven for removal. However, due to construction and maintenance access issues, all nine trees would be removed. The work area in Zone 3 totals 0.57 acre.

2.2 ALTERNATIVES TO THE PROPOSED ACTION

2.2.1 No-Action Alternative

In addition to the Proposed Action, the No-Action Alternative will be analyzed in this EA. Under the No-Action Alternative, conditions at the site would be left as *status quo*. The C&C would not implement rockfall mitigation measures, and the risk to public health and safety from rockfalls along Prospect Street would remain.

2.2.2 Alternatives Considered But Not Carried Forward

In addition to the No-Action Alternative, several other mitigation measures were considered but not carried forward for various reasons as described below.

2.2.2.1 ZONE 1

Alternative 1 – Concrete Wall and Impact Fence System. Alternative 1 includes a combination of a concrete retaining wall and rockfall impact fence (Figure 2-6). The concrete retaining wall would be constructed in the road shoulder along the toe of the cut slope. The wall would safely retain the rockfall debris that exists on the weathered cut slope face. A rockfall impact fence would be constructed along the top of the wall, within the existing right-of-way (Figure 2-6).

This method would reduce rockfall hazards from all areas of the slope; however, the construction costs for this alternative are significantly higher. Therefore, this alternative was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

Alternative 2 – Shotcrete Slope Protection. This alternative provides for shotcrete slope protection for the cut slope face. Shotcrete is a type of concrete that uses small aggregate and is pneumatically sprayed onto a surface. The shotcrete would cover the existing cut slope creating a hardened concrete surface (Figure 2-7). The shotcrete would extend from the bottom of the cut slope to the right-of-way limit (near the top of the cut slope).

The slope would first be grubbed and scaled to remove debris and loose material. Rebar dowel bars would be drilled into competent material to provide additional adhesion between the shotcrete and the ground surface. A geocomposite sheet drain system would be installed over the ground surface prior to shotcreting to relieve hydrostatic pressures. Steel reinforcing would be installed over the ground. Lastly, the shotcrete would be sprayed onto the surface, typically about 8 inches thick.

It was determined that this alternative would have significant negative visual impacts to the area. Also, this alternative does not provide protection from rockfall hazards that exist above the shotcrete in this design; therefore, this alternative does not eliminate risks to public health and safety to the degree feasible. Furthermore, the location of the right-of-way boundary varies with respect to the top of the cut slope, so some areas of the cut slope would not receive shotcrete coverage. Additionally, shotcrete is an impermeable surface and would increase the amount of stormwater runoff to Prospect Street, requiring additional drainage improvements in order to control additional stormwater runoff. Therefore, this alternative was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

Alternative 3 – Rock Scaling. Rockfall hazards can be significantly reduced by removing hazardous rocks or rock outcroppings by means of scaling, trimming, or demolition. Rock scaling involves clearing a slope of loose rocks that are ready to fall by means of hand pry bars. Sometimes hydraulic jacks or airbags are used to scale larger blocks. Rock outcroppings and overhangs can be trimmed off flush to the slope surface, and large loose boulders can be demolished in place and removed from the slope (Figure 2-8).

After scaling, the rockfall hazard is generally maintained at a low level for a few years because the geological processes associated with natural production of rockfall are relatively slow requiring many years to generate a rock outcrop that is ready to fall. Scaling, however, is only a temporary means of rockfall risk reduction. Rockfall hazards would inevitably increase over time due to natural weathering of the slope. Furthermore, this method should also address rocks that are outside of the right-of-way and along the upper slopes to fully address the public health and safety hazards of the area; however, scaling rocks outside the C&C right of way is not an available option. Therefore, this alternative was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

2.2.2.2 ZONE 2

Alternative 4 – No Mitigation. The existing C&C right-of-way extends to the bottom of the cut slope. Based on field investigations, no rockfall hazards are identified within the C&C right-of-way. One option is to not provide rockfall mitigation for hazards that exist outside of the C&C public right-of-way. This alternative relies on the adjacent landowner to accept liability and responsibility for providing rockfall mitigation to reduce rockfall hazards to the public right-of-way.

The C&C would rely fully on the adjacent landowner to reduce potential rockfall hazards, thus creating an unacceptable risk to public health and safety. This alternative was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

2.2.2.3 ZONE 3

Alternative 5 – Rock Scaling and Rockfall Impact Fence. This alternative includes a combination of rock scaling and a rockfall impact fence. The rockfall impact fence would be installed above the top of the cut slope, and within the existing C&C right-of-way limits. The fence would consist of steel posts spaced at approximately 30 feet apart, steel wire mesh panels, and a ground tieback anchoring system (Figure 2-9).

Rock scaling would be performed for the rest of the area downslope of the impact fence, including the cut slope. Any loose rocks or outcrops identified as hazardous would be scaled and disposed of at an offsite location.

The rock scaling would only be a temporary fix. Natural weathering would inevitably increase the rockfall hazards over time. Therefore, this alternative was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

Alternative 6 – Shotcrete Slope Protection and Rockfall Impact Fence. This alternative includes a combination of shotcrete slope protection and a rockfall impact fence. A rockfall impact fence would be installed within the existing right-of-way limits above the top of the cut slope. The fence would stop rolling rocks from the upper slope.

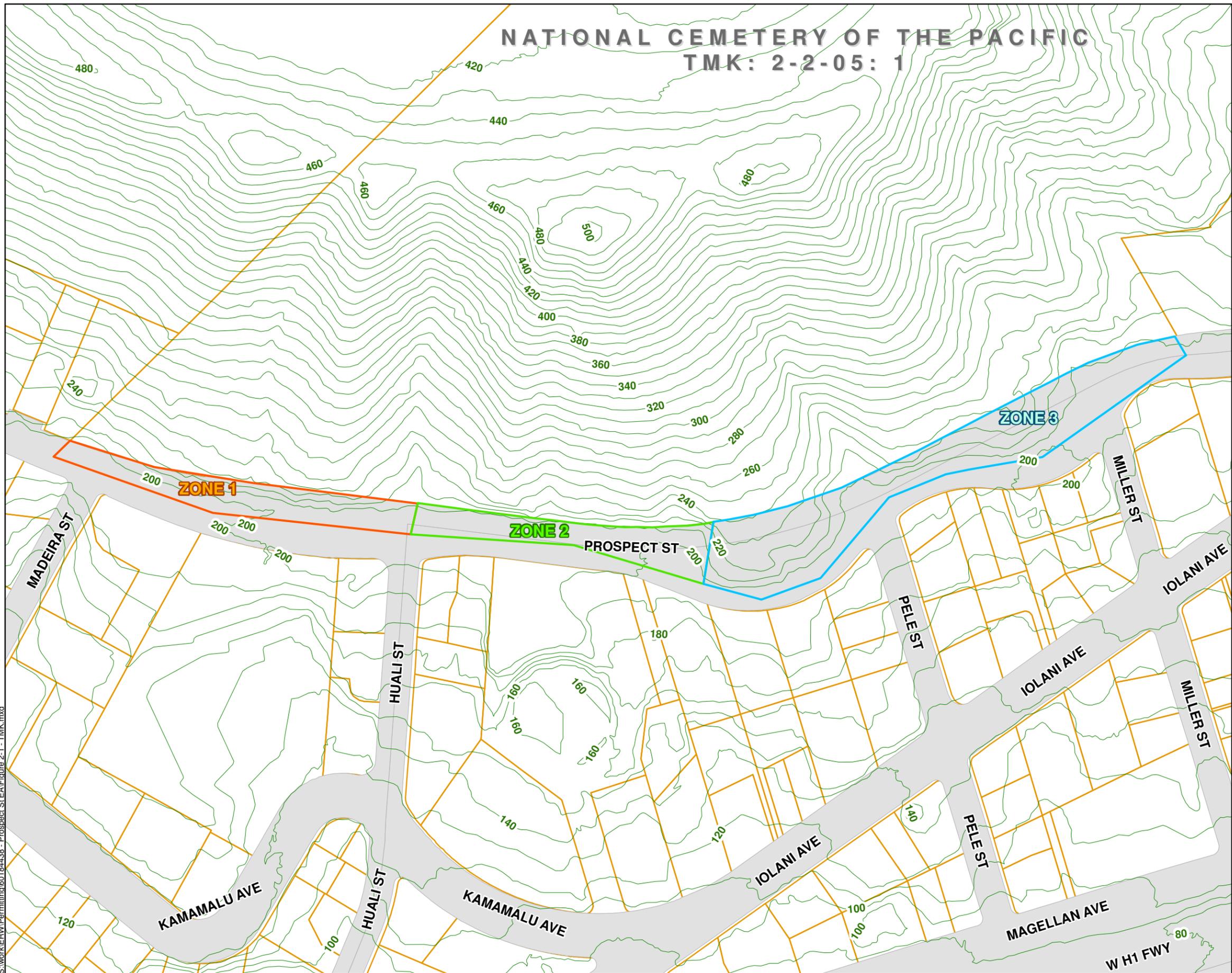
Shotcrete would be applied to the cut slope surfaces. Shotcrete application would extend from the bottom to the top of the cut slope. Shotcreting of the surfaces would protect the slope from weathering and erosion, and would retain the rock and soil in place (Figure 2-10). However, it was determined that this alternative would have significant negative visual impacts. This alternative would also increase the impervious surface of the area, which could increase the amount of stormwater run-off to Prospect Street. Additional roadway drainage improvements would then be required. Due to the significant cumulative effects of this alternative, it was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

Alternative 7 – Concrete Retaining Wall and Rockfall Impact Fence. This alternative includes a combination of a concrete retaining wall and a rockfall impact fence. A rockfall impact fence would be installed within the existing right-of-way limits above the top of the cut slope. The fence would stop

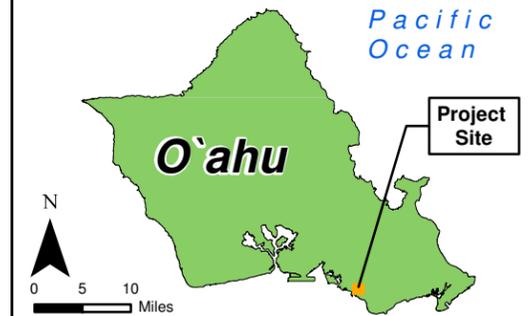
rolling rocks from the upper slope. The concrete retaining wall would be constructed within the roadside shoulder along the toe of the cut slope (Figure 2-11).

This alternative would involve high construction costs and negative visual impacts. Therefore, this alternative was determined to not meet the purpose and need for action, as well as C&C objectives, and was not carried forward.

NATIONAL CEMETERY OF THE PACIFIC
TMK: 2-2-05: 1



LOCATION MAP



LEGEND

- Orange outline: Tax Map Key Boundary
- Green line: Elevation Contour (10-ft interval)

NOTES

- Map projection: Hawaii State Plane Zone 3, NAD83 datum.

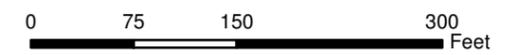


Figure 2-1
Tax Map Key
Prospect Street EA
Oahu, Hawaii

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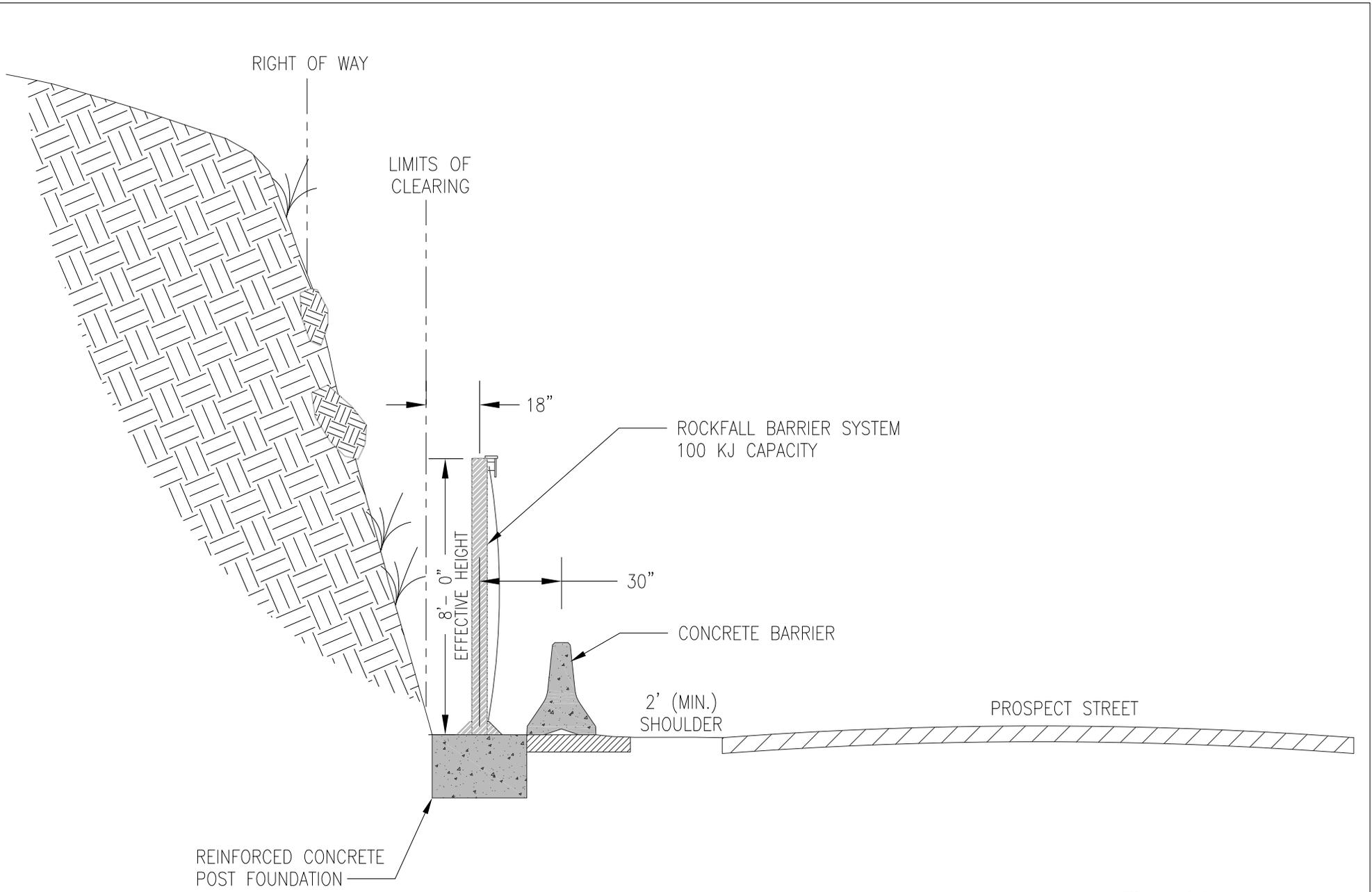


Figure Not to Scale

Figure 2-2
Proposed Action Zone 1
8-Foot Rockfall Impact
Fence System & Concrete Jersey Barrier

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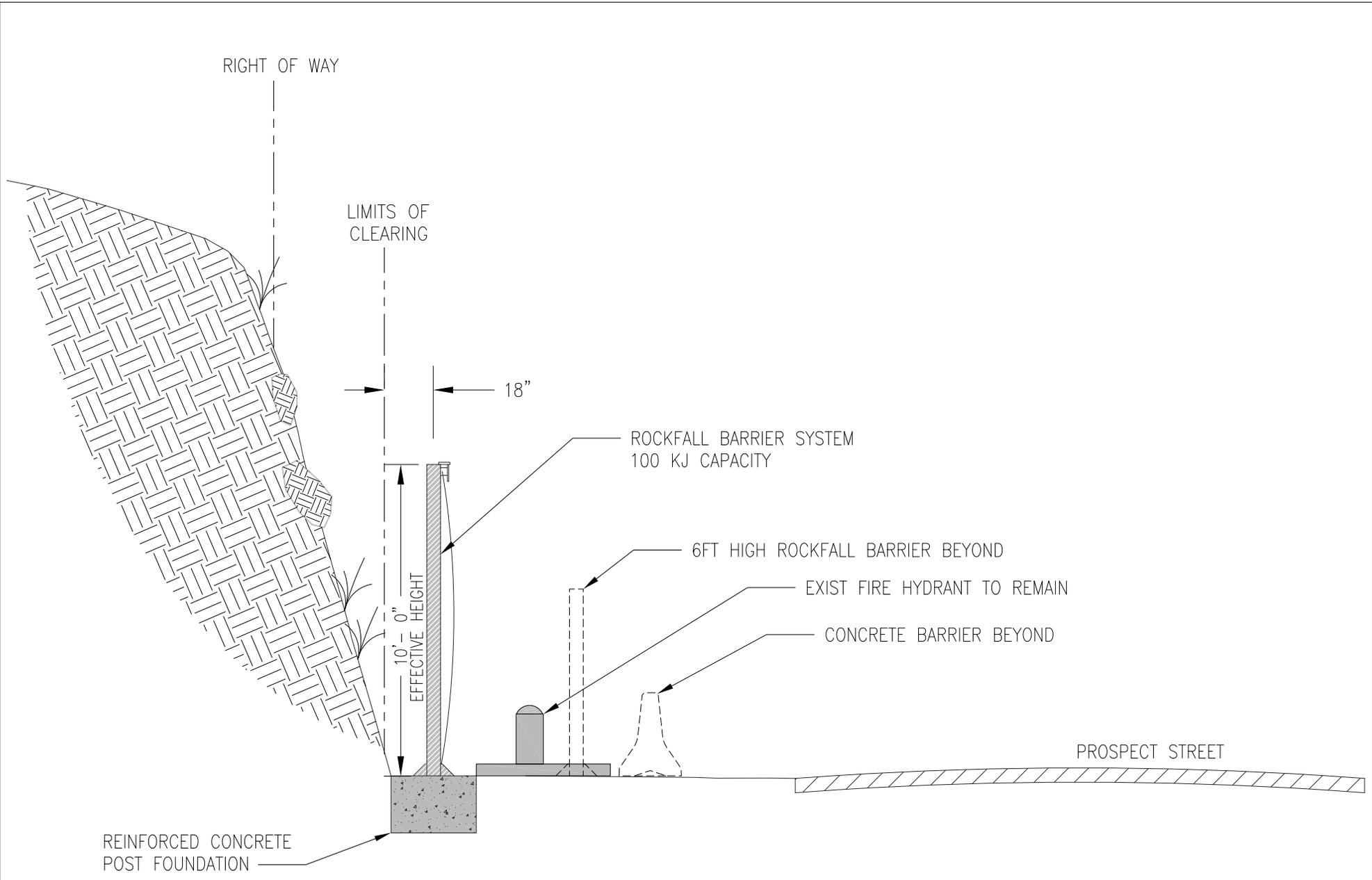


Figure Not to Scale

Figure 2-3
Proposed Action Zone 1 and 2
10-Foot Rockfall Impact
Fence System & Concrete Jersey Barrier

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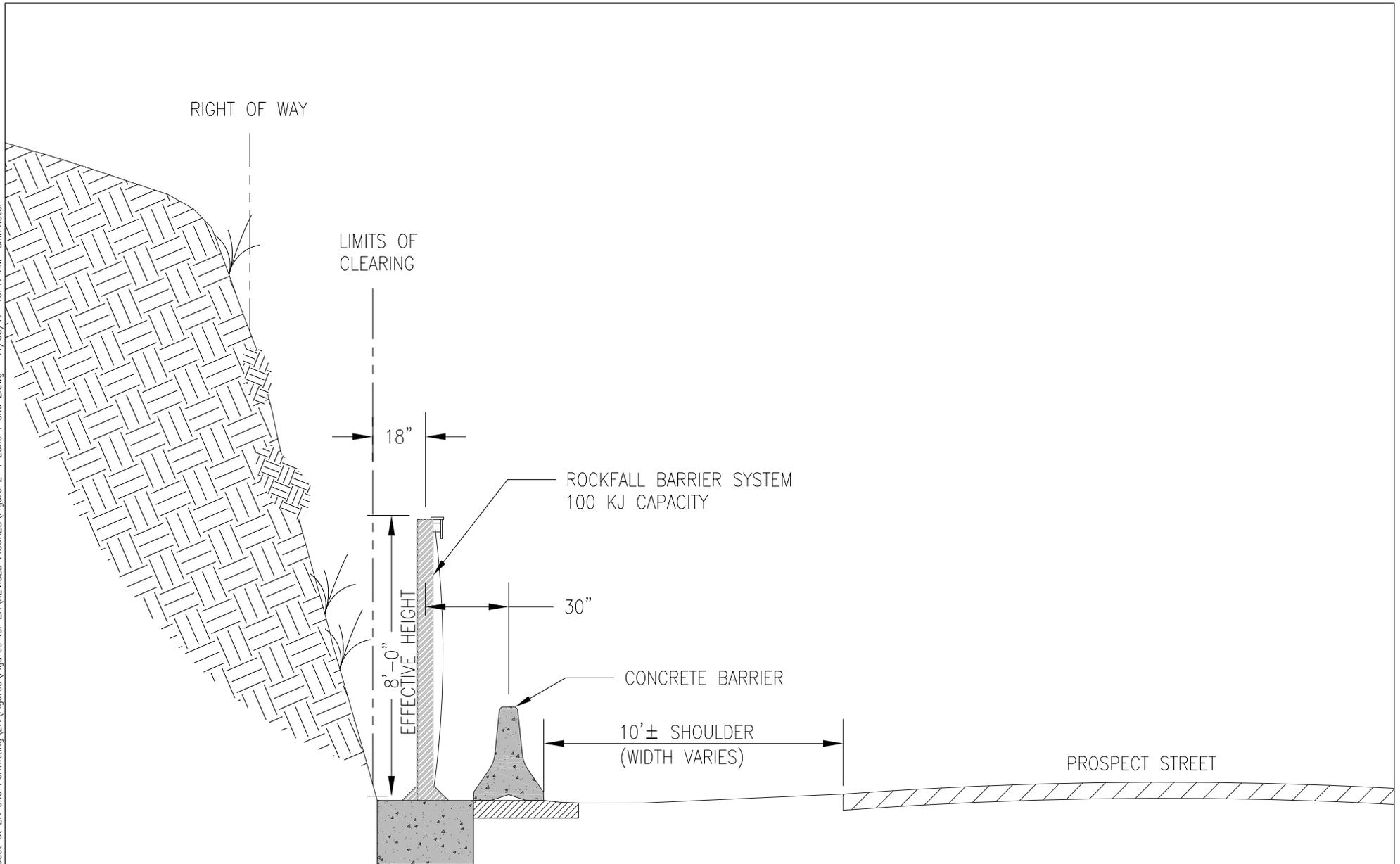


Figure Not to Scale

Figure 2-4
Proposed Action Zone 1 and 2
8-Foot Rockfall Impact
Fence System & Concrete Jersey Barrier

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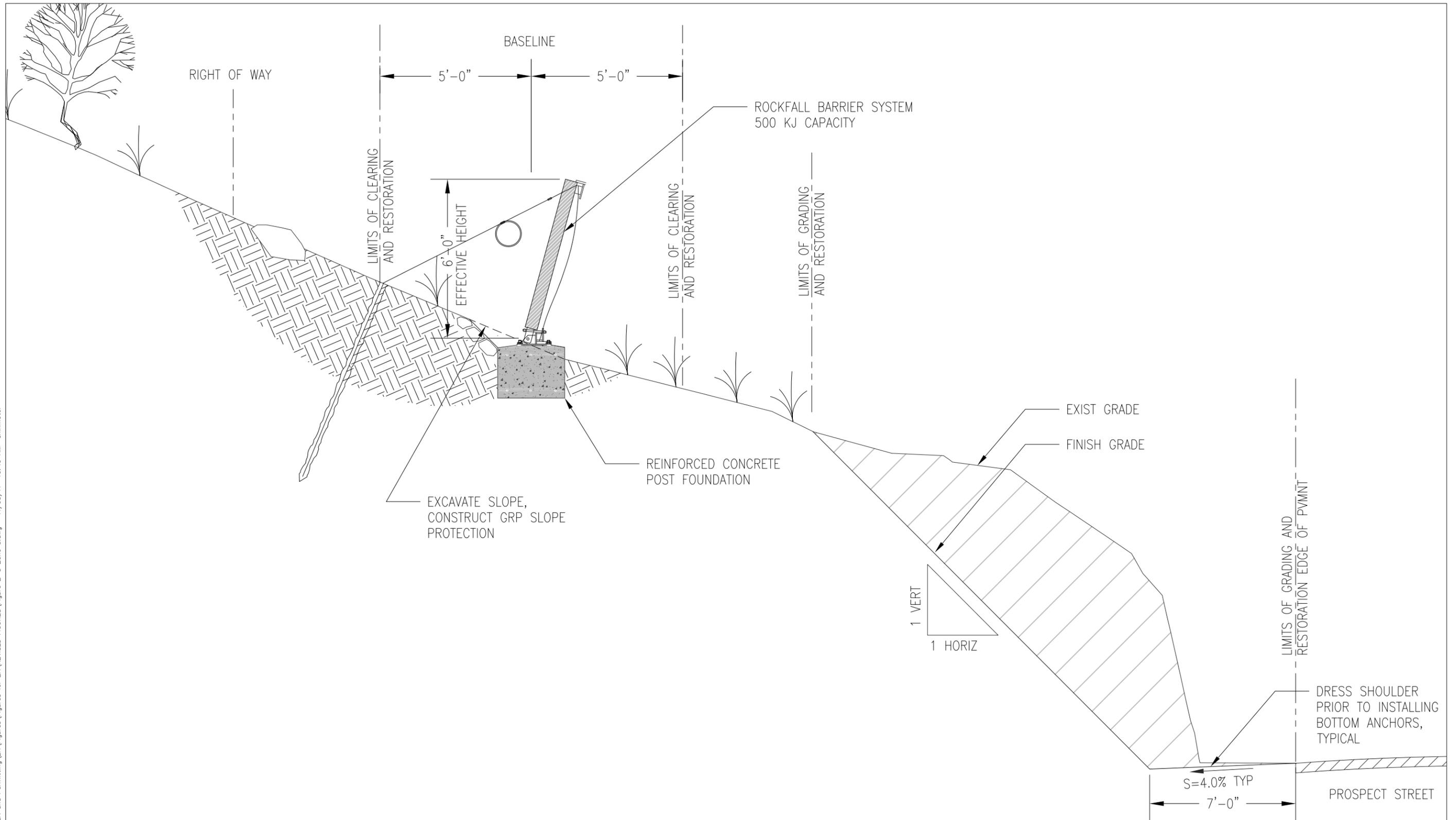


Figure 2-5
Proposed Action Zone 3
8 Foot Rockfall Impact
Fence System & Concrete Jersey Barrier

Figure Not to Scale

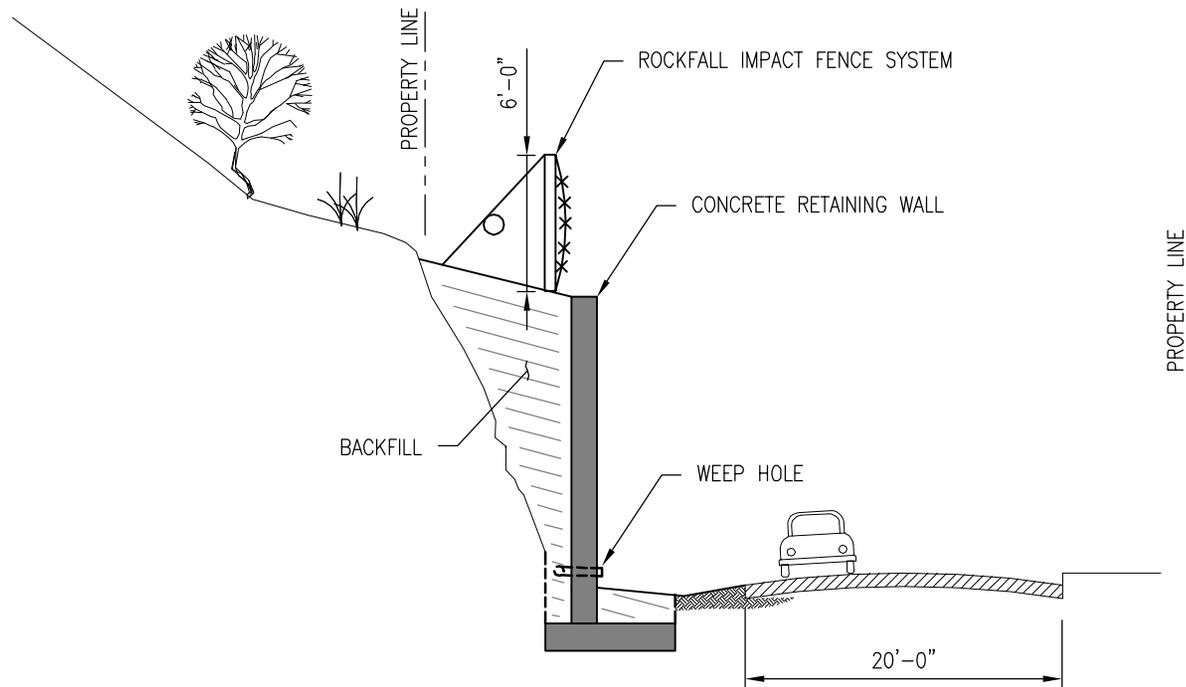


Figure 2-6
Alternative No. 1
Concrete Retaining Wall and Rockfall Impact Fence

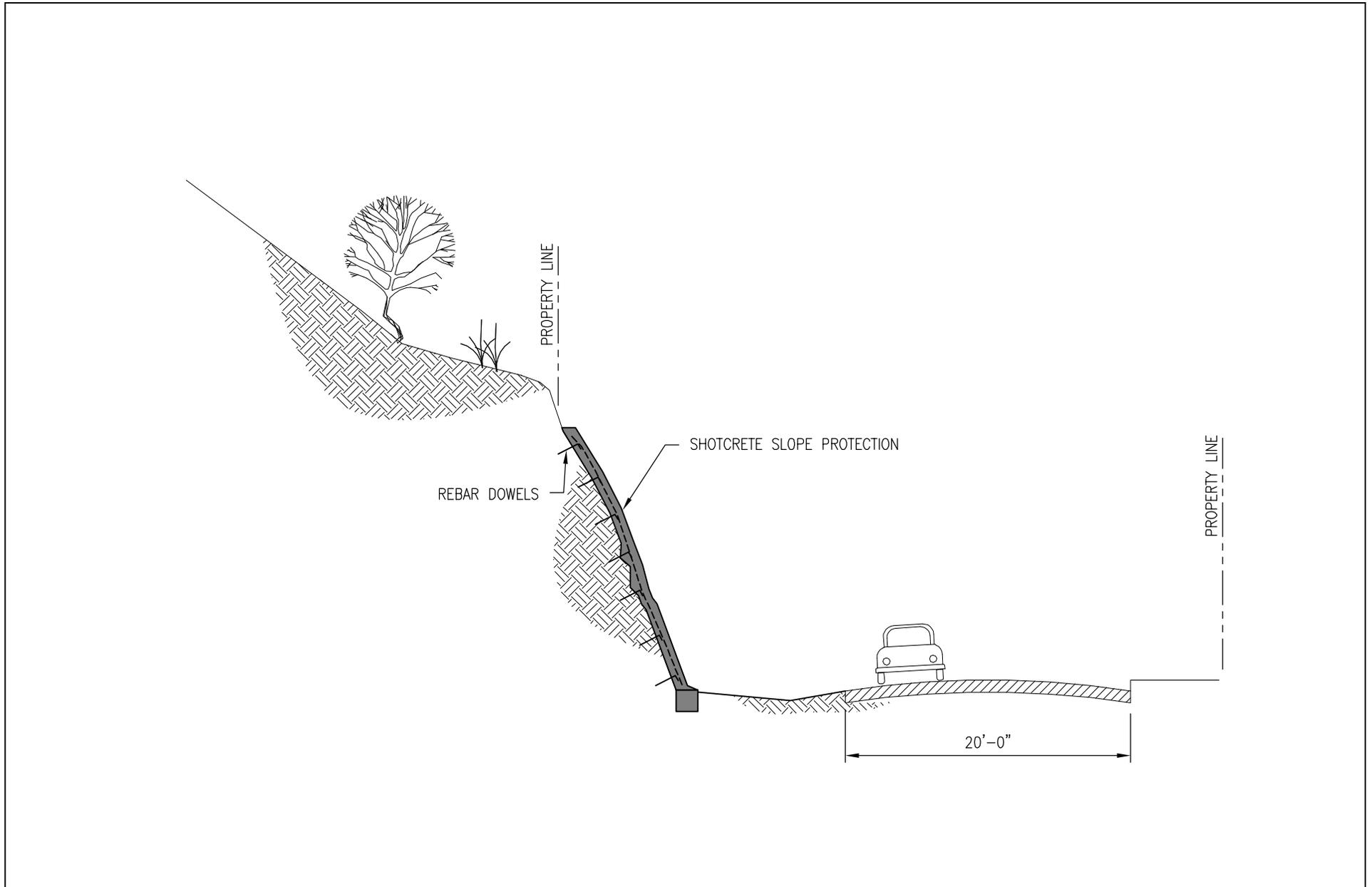


Figure 2-7
Alternative No. 2
Shotcrete Slope Protection

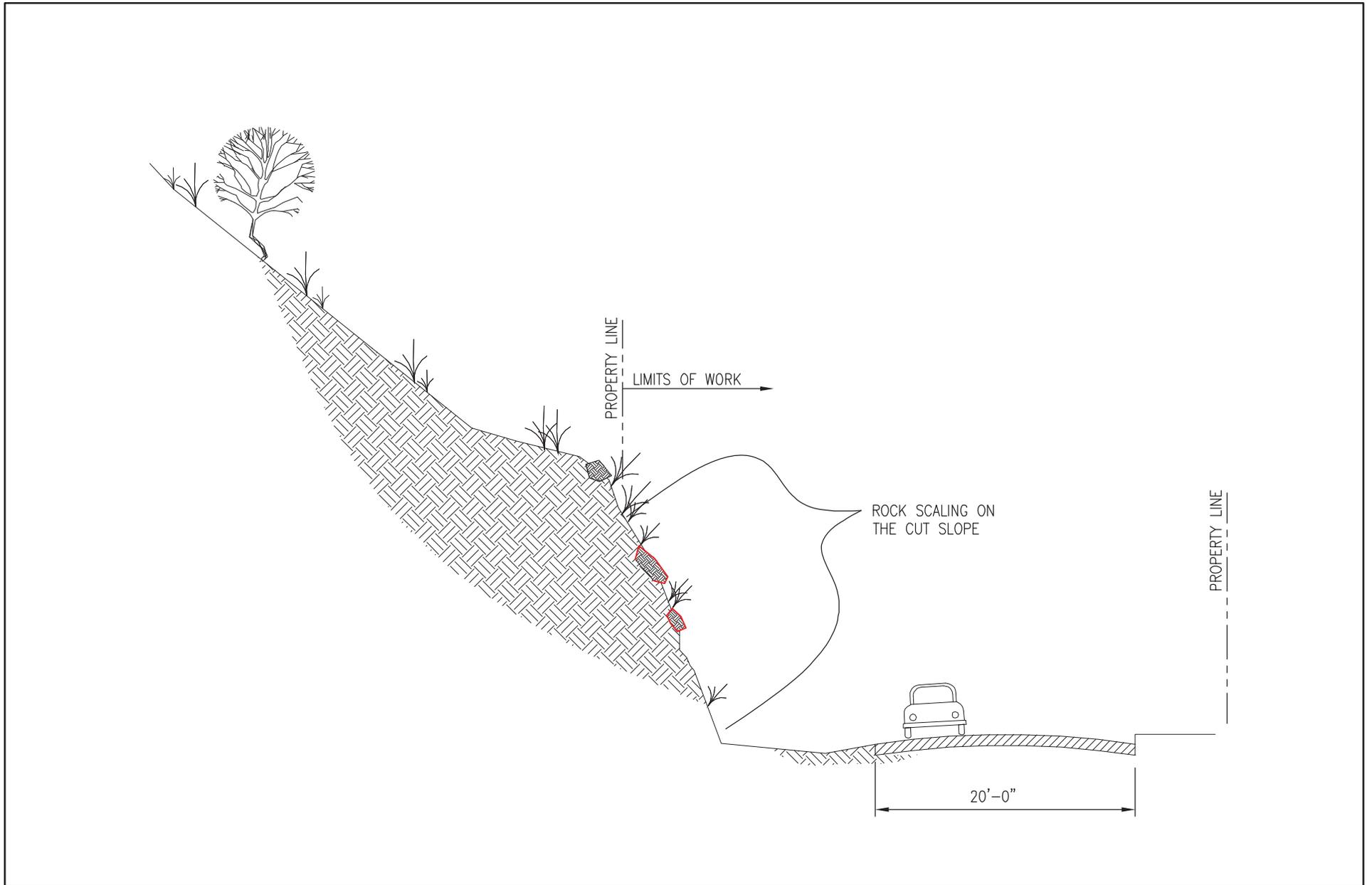


Figure 2-8
Alternative No. 3
Rock Scaling

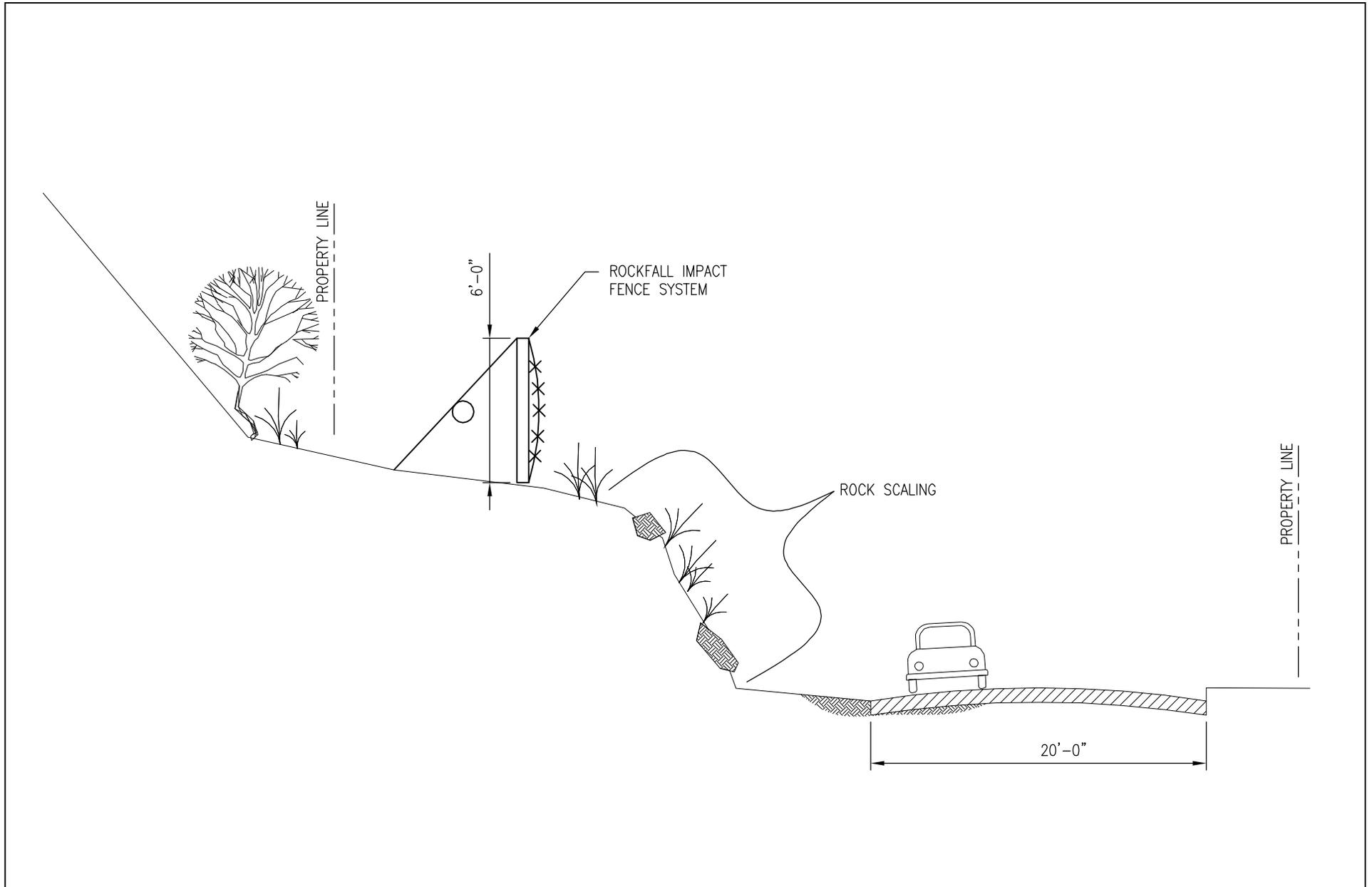


Figure 2-9
Alternative No. 5
Rock Scaling and Rockfall Impact Fence

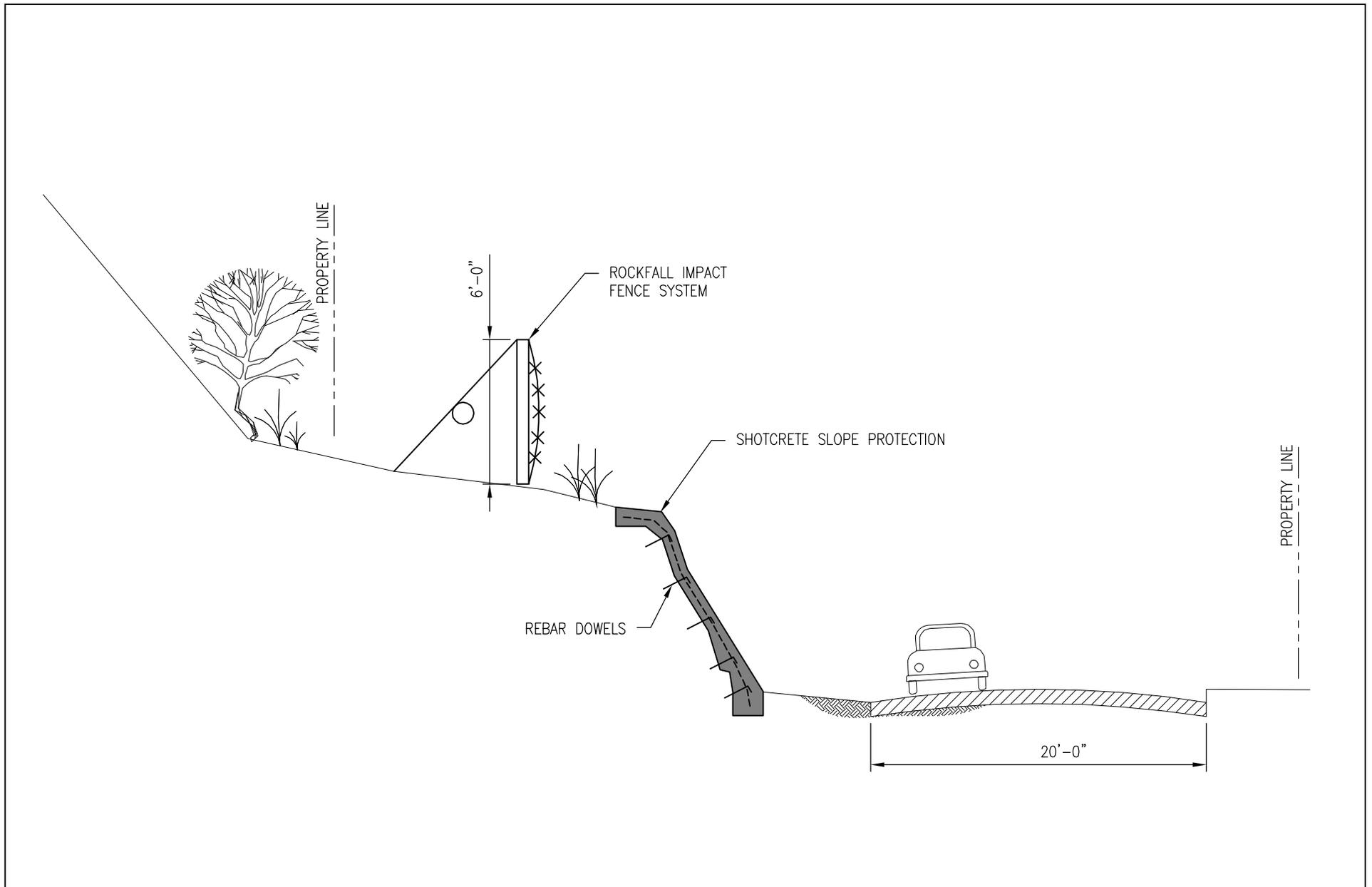


Figure 2-10
Alternative No. 6
Shotcrete Slope Protection and Rockfall Impact Fence System

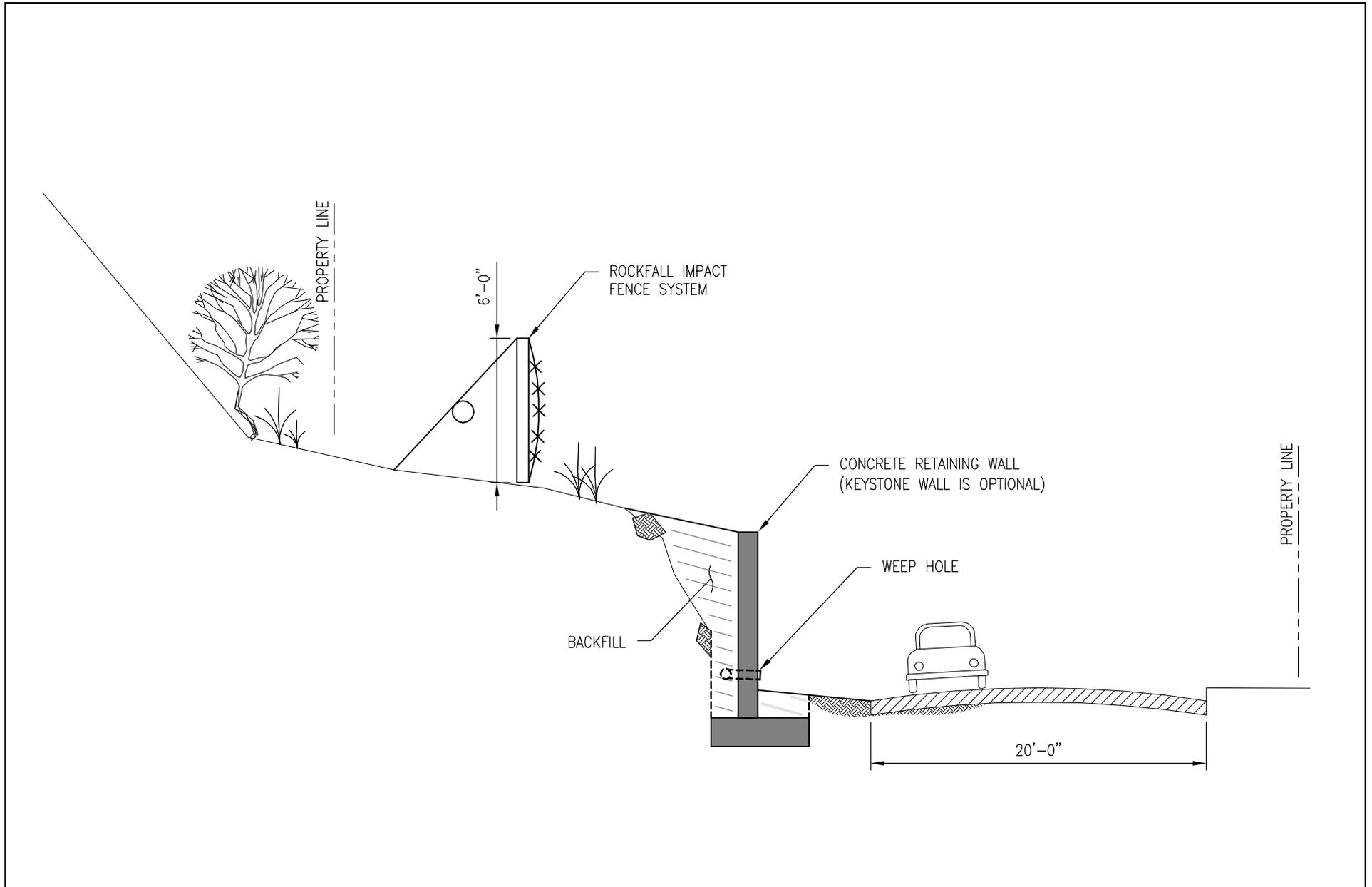


Figure 2-11
Alternative No. 7
Concrete Retaining Wall and Rockfall Impact Fence

3.0 ENVIRONMENTAL SETTING, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This chapter describes the environmental setting associated with the Proposed Action and the No-Action Alternative. The environmental setting describes the natural and man-made environments, which include air quality, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, land use, natural hazards, noise, safety and health, socioeconomics, transportation, utilities and infrastructure, visual resources, and water resources. The information provided serves as a baseline to identify and evaluate environmental changes resulting from implementation of the Proposed Action or the No-Action Alternative. The region of influence (ROI) is defined for each resource area affected by the Proposed Action and the No-Action Alternative. The ROI determines the geographical area to be addressed as the affected environment.

Project-related effects, both adverse and beneficial, include primary, secondary, and cumulative effects. Primary effects or direct impacts are caused by the action and occur at the same time and place. Secondary effects, or indirect impacts, are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable. Cumulative effects refer to impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor yet collectively significant actions taking place over a period of time.

Effects of the proposed project are divided into short-term and long-term effects. Short-term effects are related to construction activities. Long-term effects refer to the effects caused from implementation of the Proposed Action and are longer in duration. Anticipated environmental effects of the Proposed Action and No-Action Alternative, cumulative impacts, and proposed mitigation measures, where applicable, are also provided in this chapter.

3.1 AIR QUALITY

Ambient air quality, which refers to the purity of the general outdoor atmosphere, is regulated under the Clean Air Act and the United States (U.S.) Environmental Protection Agency National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] Part 50). The DOH also regulates air quality and established ambient air quality standards (HAR Title 11, Chapter 59-4) that are as strict or, in some cases, stricter than the NAAQS. The State of Hawai'i has also established standards for fugitive dust emissions emanating from construction activities (HAR Title 11, Chapter 60.1-33). These standards prohibit any visible release of fugitive dust from construction sources without taking reasonable precautions.

The State of Hawai'i monitors ambient air quality for six regulated pollutants including:

- Particulate matter less than 10 microns
- Particulate matter less than 2.5 microns
- Carbon monoxide
- Ozone
- Sulfur dioxide
- Nitrogen dioxide

Areas where ambient levels of a criteria pollutant are below the NAAQS are designated as being in "attainment." Areas where levels of a criteria pollutant equal or exceed the NAAQS are designated as being in "nonattainment." In 2009, the State of Hawai'i was in attainment for all criteria pollutants (DOH 2010).

3.1.1 Existing Air Quality

The ROI for air quality is the proposed project site and downwind areas. Downwind areas vary during the year and air quality is affected by the climate. The climate is characterized by two distinct seasons, primarily defined by the annual variation in persistence of the northeast trade winds. The summer months from May to September are typically drier and warmer, while the winter months from October to April are usually wetter and cooler.

Modeling of downwind areas was not completed as part of this EA. However, typical predominant downwind areas of the ROI would normally include places to the west or southwest. During Kona winds, downwind areas would typically be places to the north or east.

Emissions from motor vehicles are the primary source of air pollutants in the project vicinity. Vehicular traffic is generally light and concentrations of ambient pollutants are assumed to be well below the federal and state ambient air quality standards. No additional information on air quality was collected.

3.1.2 Potential Impacts and Mitigation

3.1.2.1 PROPOSED ACTION

Zone 1: Only short-term construction-related impacts to air quality are anticipated with implementation of the Proposed Action. During construction, potential emission sources that may affect air quality at the project site include the following:

- Diesel and/or gasoline-powered construction equipment and motor vehicles (additional sources of carbon monoxide and carbon dioxide).
- Fugitive dust emissions resulting from rock demolition, rock drilling, and grading.
- Construction vehicles traveling to and from the proposed project area and onsite construction equipment consisting of primarily diesel engines would contribute to local air pollution. Construction activities may also generate short-term fugitive dust particulate emissions.

Because levels of criteria pollutants in Hawai'i are consistently well below federal and state air quality standards (DOH 2010), and because the prevailing trade winds rapidly carry pollutants offshore limiting the effect on receptors, increases in levels of criteria pollutants at the project area from construction activities are not expected to be significant. It is not anticipated that federal or state ambient air quality standards would be exceeded during construction activities.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.1.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no construction activities would occur at the project area. No additional emission sources would be added; thus, there would be no change to air quality. No impact to air quality is anticipated from the No-Action Alternative.

3.1.2.3 MITIGATION MEASURES

Construction activities would be conducted in accordance with State of Hawai'i air pollution control regulations (HAR Section [§]11-60.1) and would employ the proper administrative and engineered controls to reduce air emissions. Dust control measures including a dust control (watering) program would be implemented.

3.2 NOISE

The ROI for noise effects is the project area and adjacent areas. Noise is often defined as unwanted sound and is one of the most common environmental issues of concern to the public. A number of factors affect sound, as it is perceived by the human ear. These include the actual level of the sound (or noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels during exposure.

The accepted unit of measure for noise levels is the decibel (dB) because it reflects the way humans perceive changes in sound amplitude. Sound levels are easily measured, but human response and perception of the wide variability in sound amplitudes is subjective.

The State of Hawai'i regulates noise exposure in the following statutes and rules: HRS §342F, *Noise Pollution*; HAR §11-46, *Community Noise Control*; and HAR §12-200.1, *Occupational Noise Exposure*. Maximum permissible sound levels for Class B zoning districts, including all areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type, is 60 decibel A-weighted scale (dBA) between the hours of 7:00 a.m. and 10:00 p.m. and 50 dBA between 10:00 p.m. and 7:00 a.m. (HAR §11-46-4).

3.2.1 Existing Noise Environment

The project area is located on urban land. Noise studies have not been performed at the project area for the purpose of this EA. Existing noise levels are consistent with urban, residential, and open space uses and are assumed to be within the State of Hawai'i community noise exposure guidelines for a Class A zoning district.

3.2.2 Potential Impacts and Mitigation

3.2.2.1 PROPOSED ACTION

Zone 1: Only short-term construction-related noise impacts are anticipated with implementation of the Proposed Action. Construction equipment employed to implement the Proposed Action may include trucks, a crane, a back hoe, sledge hammers, jack hammers, chain saws, pneumatic or hydraulic powered rock drills, and diesel powered generators and air compressors. Noise generated by construction equipment could produce localized noise events of 100 dBA or higher at the construction site. Noise levels at 50 feet typically range between 55 and 88 dBA for equipment such as pick-up or dump trucks, jackhammers, lift booms, bulldozers, and excavators (Table 3-1).

Table 3-1: Typical Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Air Compressor	81
Backhoe	80
Bulldozer	82
Chain Saw	85
Concrete/Grout Pumps	82
Crawler Service Crane (100-Ton)	83
Dump Truck	88
Drill Rigs	88
Excavator	85
Front End Loader	80
Generator	81
Jackhammer (Compressed Air)	85
Lift Booms	85

Type of Equipment	Noise Level at 50 feet (dBA)
Pick-Up Trucks	55
Power-Actuated Hammers	88
Water Pump	76
Water Truck	55

Source: HMMH 2006.

Construction noise would decrease with distance from the project area through divergence, atmospheric absorption, shielding by intervening structures, and absorption and shielding by ground cover. Implementation of the Proposed Action would not result in any long-term noise impacts.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.2.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no construction activities would occur at the project area, and there would be no change to the noise environment. Therefore, no impacts from noise are anticipated under the No-Action Alternative.

3.2.2.3 MITIGATION MEASURES

To minimize noise impacts, construction activities would be conducted in accordance with State of Hawai'i requirements set forth in HRS §342F, *Noise Pollution* and HAR §11-46, *Community Noise Control*, which establish maximum permissible sound levels from excessive noise sources, noise prevention, control, and abatement guidelines, and permit criteria.

The Hawai'i Occupational Safety and Health (HIOSH) Division has set the permissible occupational noise exposure at 90 dBA for a continuous 8-hour exposure. Permissible noise exposures for shorter periods are higher, with a maximum exposure of 115 dBA permissible for a duration of 15 minutes or less (HAR §12-200.1). Enforcement of HIOSH occupational noise exposure regulations would be the responsibility of the construction contractor. If workers experience noise exceeding HIOSH standards, administrative or engineering controls shall be implemented. Use of personal protective equipment such as earplugs or muffs may also be required.

To reduce nearby residential noise exposure, construction activities would be conducted on weekdays and in daytime hours in accordance with HRS §342-F-1. In the event that work occurs after normal working hours (i.e., at night or on weekends), or if permissible noise levels are exceeded, appropriate permitting and monitoring, as well as development and implementation of administrative and engineering controls shall be employed.

3.3 GEOLOGY AND SOILS

3.3.1 Geology

The island of O'ahu demonstrates four major geomorphic provinces divided according to geological setting: Koolau Range, Waianae Range, Schofield Plateau, and Coastal Plain (Stearns 1985, MacDonald et al. 1983). The Waianae Range on the west and the younger Koolau Range on the east both shield volcanoes, and comprise the largest geomorphic formations of O'ahu. The Koolau Range only represents the southwest part of the Koolau volcano; the northeast part of the volcano slid into the ocean during a giant landslide. As a result, the Koolau Range only consists of lava flows that dip broadly to the southwest; the northeast dipping lava flows to the northeast side of the volcano caldera slid into the ocean. The gently sloping Schofield Plateau was formed when lava

flows from the Koolau volcano banked against the older, already-eroded slope of the Waianae volcano.

After a long period of volcanic quiet during which extensive weathering and erosion developed and large valleys were cut into the Koolau, volcanic activity returned, and a series of lava flows, cinder cones, and tuff cones, called Honolulu Volcanic Series, were formed. Many of the eruptions were accompanied by violent explosions caused by hot lava contacting seawater (hydromagmatic eruption) that blasted through the coral reefs on the seaward slopes of Koolau Range.

The project site is located near Punchbowl crater, which is a tuff cone that was formed by hydromagmatic explosions. The tuff is mostly brown palagonitized vitric ash and lapilli with scattered fragments of coral limestone and Koolau basalt.

3.3.2 Soils

Soils in the project area consist of Rock Land (rRK). Surrounding soil types include Tantalus Silty Clay Loam 8–15% Slope (TCC) to the north, and Tantalus Silty Clay Loam 15–40% Slope (TCE) to the south. The soils are characterized as follows:

- **Rock Land (rRK).** rRK contains sections of 25 to 90 percent exposed rock. Soil may be only a few inches deep. Slopes are generally 40 to 70 percent. Stones are prevalent, and have a high chance rolling downslope (Ikawa et al. 1985).
- **Tantalus Silty Clay Loam, 8–15% Slope (TCC).** The Tantalus soil series is usually well-drained and located on upland areas of O'ahu at elevations from 100–2,200 feet. This soil is conducive to residential and recreation areas as runoff is slow and the risk of erosion is generally minor (USDA 1972).
- **Tantalus Silty Clay Loam, 15–40% Slope (TCE).** Erosion and runoff risk is moderate. This soil is also conducive to residential and recreation areas (USDA 1972).

A soil classification map reflecting the proposed project area and the soils described above is provided as Figure 3-1.

3.3.3 Potential Impacts and Mitigation

3.3.3.1 PROPOSED ACTION

Zone 1: The Proposed Action involves mitigation of the present slope condition using a rockfall impact fence and concrete jersey barrier. Implementation of these rockfall protection measures is not expected to have significant impact to geology and soils.

A large boulder exists on the shoulder of Prospect Street in Zone 1 that will be removed as part of the proposed action. The boulder will be removed from the project area using a frontend loader and disposed of off site.

Zone 2: Same as Zone 1. No boulder is located in Zone 2.

Zone 3: The Proposed Action involves mitigation of the present slope condition using anchored wire mesh to contain most of the potential slope failure and/or rockfall events. The mesh would blanket the hillside, thus containing soil and smaller rock particles. It would conform to the slope allowing regrowth of vegetation and providing erosion protection of the soft soil areas. This is expected to have positive long-term impacts to geology and soils.

The Proposed Action in Zone 3 also involves widening the shoulder to provide at least 7 feet of clear distance measured from the edge of the roadway to the toe of the slope. The volume of excavated

earth would be about 450 cubic yards. Soils in Zone 3 would be temporarily disturbed due to excavation associated with construction activities, but with the use of mitigation measures will not have a significant effect.

3.3.3.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be implemented at the project area. Structural deficiencies in the rock formations would not be addressed and erosion would continue to undermine the stability of rock formations. Therefore, the No-Action Alternative is anticipated to have long-term adverse impacts on geology and soils.

3.3.3.3 MITIGATION MEASURES

Disturbed areas would be properly managed using best management practices (BMPs) for erosion control. BMPs would include the installation of silt fence or filter socks along the limits of the disturbed area. A 10 foot × 20 foot stabilized construction ingress/egress of crushed rock would be in place for access to the staging area to reduce the amount of mud and debris transported off the project site by vehicles or surface run-on. Catch basin and drain filters would be installed at project affected catch basins throughout the disturbed area. These measures would be installed prior to ground disturbing activities and would be inspected and maintained throughout the construction period.

3.4 WATER RESOURCES

This section describes the availability and quality of water resources, including surface water and groundwater. Surface water includes lakes, perennial/intermittent streams, and drainage ways. Groundwater includes water present in aquifers (perched, unconfined, confined, or artesian). The ROI for water resources includes the surface water bodies, streams, and drainage features identified within the proposed project area and the underlying aquifer.

3.4.1 Existing Water Resources

3.4.1.1 SURFACE WATER

Generation of surface water in the project area typically begins in the mountains as rainfall. As surface water proceeds downgradient, it collects in streams and gulches. A portion infiltrates through the ground surface and streambeds, recharging the underlying aquifer. In addition to stormwater, other potential sources of surface water in the project vicinity are freshwater seeps or springs.

Surface water within the project area drains downslope via sheet flow. There are no lakes, streams, or drainage ways in the ROI.

3.4.1.2 GROUNDWATER

Groundwater beneath the proposed project area occurs within the Nuuanu Aquifer System of the Honolulu Aquifer Sector. The aquifer is classified as a basal aquifer containing fresh water in contact with seawater that is unconfined where the water table is the upper surface of the saturated aquifer. The groundwater status is reported as potentially usable for drinking. The groundwater within this aquifer is described as containing fresh water with a salinity of <250 milligrams per liter Cl⁻, and is irreplaceable with a high vulnerability to contamination (Mink and Lau 1990).

The State of Hawai'i underground injection control (UIC) program was established by the DOH Safe Drinking Water Branch to protect the quality of underground sources of drinking water. As part of this program, a UIC line was delineated on U.S. Geological Survey maps for each island. Groundwater inland of this line is considered by the State to be a potential source of drinking water. Groundwater in areas seaward of this line are not considered potential drinking water sources.

A review of the UIC map for the Island of O'ahu indicates the proposed project area is located above the UIC line.

3.4.2 Potential Impacts and Mitigation

3.4.2.1 PROPOSED ACTION

Zone 1: There are no lakes or streams in the ROI. Surface water, such as stormwater, within the project area drains downslope via sheet flow and leaves the site by sheet flow or drainage systems. There are several stormdrain inlets within the project vicinity. There would be no permanent changes to the drainage patterns with implementation of the proposed action.

Construction plans and specifications for the Proposed Action would include BMPs to minimize erosion on the project site during and after construction, as well as measures to contain runoff on site during construction. Temporary erosion control measures would be used during construction to prevent soil loss and to minimize surface runoff into adjacent areas. No impacts to surface water or groundwater resources are anticipated with the implementation of the Proposed Action.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.4.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be implemented and there would be no changes to surface water drainage patterns in the project area. Surface waters would continue to sheet flow across soft soil areas causing further erosion. Therefore, adverse impacts to surface water resources are anticipated with implementation of the No-Action Alternative.

3.4.2.3 MITIGATION MEASURES

As discussed in Section 3.3.3, BMPs would be utilized to minimize impacts from soil erosion, and therefore, impacts to water quality.

3.5 BIOLOGICAL RESOURCES

3.5.1 Existing Biological Resources

The ROI for biological resources is the proposed project area. A biological survey of the project area was conducted by AECOM Technical Services, Inc. in August 2011.

No state or federal listed species, candidate species, or species otherwise determined to be rare or of special concern were observed within the ROI. Forty-eight plant species were observed at the project site, and more than 97 percent are introduced, non-native species. Only one native species, *Waltheria indica*, was observed and is not considered rare, endangered, or otherwise protected.

The vegetation composition observed at the site is typical of lowland, dry, urban, disturbed roadside sites across the Hawaiian Islands. The slopes away from the roadway are dominated by a Guinea grass (*Panicum maximum*) ground cover interspersed with Haole koa (*Leucaena leucocephala*). Multiple kiawe trees (*Prosopis pallida*), some tipped over but still rooted and growing, line sections closer to the roadway. Ornamental species, such as Bougainvillea, are likely inadvertent releases over the years from adjacent properties and passersby. Parked vehicles likely have contributed to the introduction of many of the non-native introduced species along the road's edge.

Within the ROI, the terrain, hydrology, vegetative cover, and proximity to the roadway and urban areas is also not conducive as habitat for protected terrestrial fauna, including vertebrates and

invertebrates. No fauna, including seabirds, water birds, or other terrestrial fauna listed as Threatened, Endangered, or Species of Special Concern by the State of Hawai'i or by any federal jurisdictional agency, were observed during the biological survey.

A complete list of biological species recorded within the ROI is provided in the Biological Survey included in Appendix B.

A Tree Survey was conducted by Consulting Arborist LLC on November 15, 2009. The report identifies and assesses trees in the C&C property along Prospect Street. The report identified nine kiawe trees (*Prosopis pallida*) in the C&C right-of-way. The full report is provided in Appendix C.

3.5.2 Potential Impacts and Mitigation

3.5.2.1 PROPOSED ACTION

Zone 1: Only short-term construction-related impacts to biological resources are anticipated with implementation of the Proposed Action. The Proposed Action would include minor clearing along the shoulder of Prospect Street in Zone 1. No rare botanical species or species listed as endangered or threatened by the State of Hawai'i or the U.S. Fish and Wildlife Service have been identified within the project area, and no significant adverse impacts to biological resources are anticipated.

Zone 2: Only short-term construction-related impacts to biological resources are anticipated with implementation of the Proposed Action. The Proposed Action would include minor clearing along the shoulder of Prospect Street in Zone 2. The Proposed Action for Zone 2 also includes removal of two kiawe trees (*Prosopis pallida*) from the C&C property as discussed in the Tree Survey (Appendix C). These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to vehicles and pedestrians on Prospect Street. No rare botanical species or species listed as endangered or threatened by the State of Hawai'i or the U.S. Fish and Wildlife Service have been identified within the project area, and no significant adverse impacts to biological resources are anticipated.

Zone 3: The Proposed Action would clear approximately 0.4 acre to be covered with anchored wire mesh and ring net systems. Vegetation would be cut to ground level. Grubbing to remove roots below ground surface is not required. Temporary erosion control measures would be implemented.

Once installed, the anchored wire mesh and ring net systems would allow for the re-growth of vegetation cleared for construction. The roadside shoulder would be widened to provide at least 7 feet of clear distance measured from the edge of the roadway to the toe of the slope in Zone 3. The slope would be cut back at a 45 degree angle for a distance of 250 feet measured along the roadway. The volume of excavated earth would be about 450 cubic yards. This action would clear all vegetation in this area, but no rare botanical species or species listed as endangered or threatened by the State of Hawai'i or the U.S. Fish and Wildlife Service have been identified within the project area, thus significant impacts are not expected. Temporary erosion control measures would be implemented.

The Proposed Action for Zone 3 also includes removal of seven kiawe trees (*Prosopis pallida*) from the C&C property as discussed in the Tree Survey (Appendix C). These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to vehicles and pedestrians on Prospect Street. No rare botanical species or species listed as endangered or threatened by the State of Hawai'i or the U.S. Fish and Wildlife Service have been identified within the project area, and no significant adverse impacts to biological resources are anticipated.

3.5.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, rockfall mitigation measures would not be implemented and there would be no change to the biological resources of the project area. Therefore, no biological impacts are anticipated with implementation of the No-Action Alternative.

3.5.2.3 MITIGATION MEASURES

In Zone 3, proposed rockfall mitigation measures include installation of an anchored wire mesh. Removal of surface vegetation would be required to install the anchored wire mesh. Once installed, the anchored wire mesh would conform to the slope and new vegetation would grow through the mesh openings and revegetate the project site. Once installed, this system would result in little or no disturbance to the natural setting of the property.

Site-specific BMPs to control erosion and other pollutants, including filter socks, catch basin filter, and drain inlet protection, would be installed before construction takes places. The BMPs would be maintained throughout the entire construction period. The contractor would be responsible for inspecting the BMPs daily and repairing as necessary.

3.6 CULTURAL RESOURCES

3.6.1 Existing Cultural Resources

The ROI for cultural resources is the proposed project area. This resource encompasses prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. For the purpose of this EA, cultural resources are defined to include prehistoric and historic archaeological sites, traditional (i.e., native Hawaiian) sites, and cultural practices.

Per the *Guidelines for Assessing Cultural Impacts* (DOH 1997), the types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The cultural resources that support such cultural practices and beliefs are also subject to assessment. A cultural impact assessment (CIA) of the project area was conducted by Pacific Consulting Services, Inc. (PCSI) and is provided in Appendix D.

As part of the CIA, PCSI conducted a literature review and site reconnaissance of the ROI in the vicinity of Prospect Street to determine the presence or absence of surface archeological sites in the project area. The environment in the vicinity of Prospect Street has been impacted by urban development since Honolulu became a developing urban center in the late 1800s and early 1900s.

No archeological surface features were encountered during the survey within the ROI. Several other archaeological investigations have been conducted in various areas near, but not within, the project area. Details on the previous investigations and their findings can be found in Table 1 of the CIA (Appendix D).

As part of the CIA, PCSI also attempted to locate and consult with knowledgeable individuals and agencies concerning the present of cultural sites or the existence of ongoing cultural practices, but did not yield any results.

3.6.2 Potential Impacts and Mitigation

3.6.2.1 PROPOSED ACTION

Zone 1: The Proposed Action would stabilize the slope adjacent to Prospect Street. Construction activities would result in ground disturbance on the slope within the C&C right-of-way boundary. Implementation of the proposed rockfall mitigation measures would not alter the quality of Prospect

Street. The project area, consisting of the roadway that runs along the base of Punchbowl Crater, Prospect Street, has been subject to the presence of numerous archaeological sites and burial finds in the vicinity, though not directly within the parcel itself. Historic preservation review of the Proposed Action was initiated with the State Historic Preservation Division (SHPD) pursuant to HRS Chapter 6E-8 in a letter dated August 5, 2011; a determination from the SHPD dated January 06, 2012 that “no historic properties will be affected” was received on January 19, 2012 (Appendix A).

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.6.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be implemented and there would be no change to the cultural resources of the project area. Therefore, no cultural impacts are anticipated with implementation of the No-Action Alternative.

3.6.2.3 MITIGATION MEASURES

The project area, consisting of the roadway that runs along the base of Punchbowl Crater, Prospect Street, TMK (1) 2-2-005:001, has been subject to the presence of numerous archaeological sites and burial finds in the vicinity, though not directly within the parcel itself. During consultation, SHPD expressed concerns regarding physical characteristics (color and design) of two of the mitigation measures. C&C, however, has addressed these concerns and will use black wire mesh and fencing materials to lessen concern regarding visibility. Concrete jersey barriers will be stamped and colored to resemble the appearance of local stone walls in the neighborhood. Herbicide use will be limited to encourage vegetation growth that will eventually cover the wire mesh and road cuts. In the unlikely event that historic resources, including human skeletal remains, lava tubes, or lava blisters/bubbles are inadvertently discovered during construction activities, the construction contractor would cease all construction activities and immediately notify the SHPD.

3.7 SCENIC AND VISUAL RESOURCES

3.7.1 Existing Scenic and Visual Resources

Visual resources are the aggregate of characteristic features imparting visually aesthetic qualities to a natural, rural, or urban environment. The ROI for visual resources includes the viewsheds toward Prospect Street, and in both directions of travel along Prospect Street. This resource is assessed to determine whether the Proposed Action would be compatible with the existing landscape and development plans for the area.

The proposed project area is located within the Punchbowl Special District. The DPP, of the C&C, has established Special District Design Guidelines in order to protect and enhance the major viewsheds of this area, and protect the Punchbowl Monument as a dominant physical form. Regulations include the following: building height, front yard setback requirements, and minimizing views of parking, service areas, and driveways.

3.7.2 Potential Impacts and Mitigation

3.7.2.1 PROPOSED ACTION

Zone 1: The proposed impact fence would be constructed using heavy gauge steel posts atop concrete foundations, steel wire rope cables, and steel netting. The concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The Proposed Action would be in accordance with Punchbowl Special District Design

Guidelines. Therefore, no significant adverse impacts to visual resources are anticipated from the implementation of the Proposed Action.

Zone 2: Same as Zone 1.

Zone 3: Proposed rockfall mitigation measures include installation of an anchored wire mesh and a rockfall impact fence. Removal of surface vegetation would be required to install the anchored wire mesh, which would result in short-term adverse impacts to visual resources. Once installed, the anchored wire mesh would conform to the slope. New vegetation would grow through the mesh openings rendering a natural view along the project site. Once installed, this system would result in little or no disturbance to the natural setting of the property. Therefore, no significant long-term impacts to visual resources are anticipated. The Proposed Action would be in accordance with Punchbowl Special District Design Guidelines.

The roadside shoulder would be widened to provide at least 7 feet of clear distance measured from the edge of the roadway to the toe of the slope in Zone 3. The slope would be cut back at a 45 degree angle for a distance of 250 feet measured along the roadway. The shoulder widening would give more visual clearance to this area along Prospect Street and would enhance driving conditions and viewpoints in this area. Therefore, the Proposed Action would have a positive impact on visual resources.

3.7.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be implemented and there would be no change to the visual quality of the project area. However, in the event of a significant rockfall event or large landslide, the visual integrity of the area could be compromised. These impacts, however, would be temporary. Therefore, no significant adverse impacts to visual resources would be anticipated with implementation of the No-Action Alternative.

3.7.2.3 MITIGATION MEASURES

The components of the impact fences in Zones 1, 2, and 3 would be galvanized coated and painted flat black for both corrosion protection and also to improve the aesthetic quality of the fences.

In Zone 3, proposed rockfall mitigation measures include installation of an anchored wire mesh. Removal of surface vegetation would be required to install the anchored wire mesh. Once installed, the anchored wire mesh would conform to the slope and new vegetation would grow through the mesh openings rendering and revegetate the project site. Once installed, this system would result in little or no disturbance to the aesthetics of the project area.

3.8 ROCKFALL CONDITIONS

To assess potential rockfall hazards, the Federal Highways Administration (FHWA) and the U.S. Department of Transportation (DOT) have sponsored extensive research to develop a series of rockfall mitigation methods and a systematic procedure for rating rockfall conditions. The results of this research were presented in a series of publications and guidelines as follows: *Rockfall Hazard Mitigation Methods* (Publication No. FHWA SA-93-085, March 1994) and *Rockfall Hazard Rating System* (Publication No. FHWA SA-93-057, November 1993). These manuals introduce a multitude of up-to-date techniques and materials to mitigate each condition, thus providing a sense of uniformity during assessment, design, and maintenance. The basic concept behind the DOT/FHWA Rockfall Hazard Rating System is summarized below.

Rockfall rating groups the hazard conditions into three classes, as described below:

- Class A – High estimated potential for rockfall on adjacent property(ies) with high historical rockfall activity. A Class A rating means that the chances of rock falling in a site is moderate

to high, and that when the rockfall occurs, it will certainly reach adjacent property(ies). An example of a Class A condition is where rocks on the cut slope overhang the adjacent property(ies) and in areas between the rockfall property and adjacent property(ies), where little or no rock catchment ditch is present.

- Class B – Moderate estimated potential for a rock to fall on adjacent property(ies) with moderate historical rockfall activity. As the rockfall risk is reduced, a Class B rating indicates that although a rockfall is probable, the chances of it reaching the adjacent properties are low to moderate. A possible scenario for Class B is a condition where a rockfall from the slope is clearly possible, and the catchment ditch is large enough to prevent most of the rocks from reaching the adjacent property(ies).
- Class C – Low estimated potential for rockfall on adjacent property(ies) with low historical rockfall activity. Class C rating pertains to a condition in which there is a low chance for a rockfall event, but should one occur, there is low to no chance for the rocks to reach other properties.

To evaluate a rockfall condition for a given property, certain criteria must be evaluated. These criteria include the following and are discussed below in Section 3.8.1:

- Slope height
- Ditch effectiveness
- Structural condition, case one slopes (movement along discontinuities)
- Rock friction
- Structural condition, case two slopes (differential erosion or oversteepening leads to rockfall)
- Difference in erosion rates
- Volume of rockfall event
- Climate and the presence of water on slope
- Rockfall history
- Slope topography

3.8.1 Existing Rockfall Conditions

3.8.1.1 SLOPE HEIGHT

Slope Height evaluates the risk associated with the vertical height of a slope. Slope height represents the highest elevation from which a rock could roll down the slope. This value is reasonably estimated from existing topographic maps, through use of a global positioning system unit, or from trigonometric relationships. High slopes are associated with high rockfall hazard because they have more materials available for rockfall and higher potential energy for rock acceleration. A larger rockfall potential energy is associated with an increased hazard.

The slope height at the project site is about 300 feet with an overall slope angle of about 37 degrees. These high and steep slopes are fully capable of sending rocks onto the roadway.

3.8.1.2 DITCH EFFECTIVENESS

Ditch Effectiveness estimates the effectiveness of a catchment ditch or zone in restricting falling rocks from reaching adjacent property(ies). The risk related to a rockfall situation varies based on how effectively a catchment ditch or zone can avert the rocks from reaching the adjacent property(ies). The risk of rocks reaching other property(ies) is lower where a good catchment is in

place, regardless of the volume of rock that has fallen. Conversely, the risk heightens where there is limited or no catchment available to stop the falling rocks.

No catchment ditch exists at the project site.

3.8.1.3 STRUCTURAL CONDITION

For the purpose of the rockfall assessment, the geologic conditions of slopes are evaluated based on two distinct cases. Where both rockfall cases are present, the condition that is more severe should be considered.

- **Case 1.** Structural condition represents slopes for which discontinuities, bedding planes, and joints are the dominant features. Movement within the discontinuities of the slope is the major cause of rockfall for the Case 1 category. Movement occurs along these joints where the resistance to movement is significantly less than the intact strength of the rock itself. When the joints are oriented adversely to the slope, the potential for rockfall is greater. Adverse joints are those that singularly or in combination with other joints make planar, circular, block, wedge or topping failures kinematically possible” (Pierson and van Vickle 1993, p. 49).

Rockfall movement along structural joints is controlled by the roughness of the jointed rocks. The degree of roughness ranges from rough and irregular to slickensided. “Friction along a joint, bedding plane, or other discontinuity is governed by the macro and micro roughness of surfaces. Macro roughness is the degree of undulation of the joint relative to the direction of possible movement. Micro roughness is the texture of the surface. On slopes where the joints contain hydrothermally altered or weathered material, movement has occurred causing slickensides or fault gouge to form, or the joints are open or filled with water, the rockfall potential is greater” (Pierson and van Vickle 1993, p. 52).

- **Case 2.** This case represents slope conditions for which differential erosion and over-steepening are the dominant features that lead to rockfall. Over-steepening of slopes and unsupported rock overhangs increase the risk of rockfall. As described in the Rockfall Hazard Rating System manual, “Rockfall is commonly caused by erosion that leads to a loss of support either locally or throughout a slope. The types of slopes that may be susceptible to this condition are layered units containing more easily erodible units that undermine more durable rock; talus slopes; highly variable units, such as conglomerates, and mudflows, that weather differentially, allowing resistant rocks and blocks to fall; and rock/soil slopes that weather allowing rocks to fall as the soil matrix material is eroded” (Pierson and van Vickle 1993, p. 55).

Where the slope is composed of different rock/soil materials, which exhibit significant differences in composition and characteristics, the rate of erosion may vary within different layers and zones. Progress of soil erosion under these conditions could result in loss of support of portions of the slope, increasing the risk for rockfall.

Due to the adverse bedding orientation (the tuff and ash layers dip out of the slopes), Case 1 dominates at the project site.

3.8.1.4 BLOCK SIZE OR VOLUME OF ROCKFALL EVENT

Block size or volume of rockfall event is evaluated based on individual blocks of rock or a volume of rocks of various sizes. “Larger blocks or volumes of falling rock produce more total kinetic energy and greater impact force than smaller events ... the larger the blocks or volume the greater the hazard created ...” (Pierson and van Vickle 1993, p.62).

Due to the thin bedded layers, most rockfalls are of small sizes at the project site. Rockfalls from large blocks are possible due to the existence of thick tuff and ash layers, large overhangs, and potential wedge failures.

3.8.1.5 CLIMATE AND PRESENCE OF WATER ON SLOPE

This category evaluates the effects of climate including precipitation, and the presence of water on the slope surface. "Water ... contributes to the weathering and movement of rock materials and a reduction in overall slope stability. This category evaluates the amounts of precipitation ..." (Pierson and van Vickle 1993, p. 65).

The average annual rainfall at the project site is about 38 inches. No presence of water on slope was observed.

3.8.1.6 ROCKFALL HISTORY

Rockfall history at a site is a predictor of future rockfall activities. Sites with a history of frequent rockfall are more likely to experience future rockfall events. The magnitude of historical rockfalls is also an indicator of future rockfall behavior at a site.

From existing rockfall debris and a small recent rockfall at the time of field investigation, rockfall activities, especially small ones, are reasonably common at the project site.

Due to the high and steep slopes, the lack of catchment ditches or barriers, and the many existing rockfall features, the project area along Prospect Street is rated rockfall hazard Class A.

3.8.2 Potential Impacts and Mitigation

3.8.2.1 PROPOSED ACTION

Zone 1: The Proposed Action would mitigate for potential rockfalls, which would have long-term positive impacts on public safety and health by reducing the potential for rockfalls and landslides originating upslope of Prospect Street to affect residences, pedestrians, and vehicles along Prospect Street.

Short-term construction-related impacts to safety and health relate to worker safety during construction. Health and safety issues concerning workers include exposure to rockfalls within the project area, operation of construction equipment, traffic, occupational noise, fugitive dust, heavy lifting, slips, trips, and falls while working on uneven terrain, exposure to heat, and biological exposure (bites, stings, and allergens).

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.8.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be implemented. Identified risks to public health and safety from rockfall and landslide would not be mitigated. Therefore, adverse impacts to public safety and health are anticipated from implementation of the No-Action Alternative.

3.8.2.3 MITIGATION MEASURES

The safety and health of workers during construction would be the responsibility of the construction contractor and would conform to Occupational Safety and Health Administration requirements.

Mitigation measures addressing air quality at the construction site and occupational noise exposure are presented in Section 3.1 and Section 3.2, respectively.

3.9 OTHER NATURAL HAZARDS

3.9.1 Existing Conditions

Natural hazards that may affect the proposed project region include floods, tsunamis, hurricanes, earthquakes, and other natural events. The ROI for natural hazards is the proposed project area.

3.9.1.1 FLOODS

The Federal Emergency Management Agency Flood Insurance Rate Map flood zone designations are:

- A – Areas of 100-year flood, base flood elevations not determined
- AE – Areas of 100-year flood, base flood elevations determined
- XS – Areas of 500 year flood; areas of 100-year flood with average depths of less than 1 foot or within the drainage area less than 1 square mile, and areas protected by levees from 100-year flood
- X – Areas determined to be outside the 500-year flood plain
- D – Areas in which flood hazard is undetermined
- VE – Areas of 100-year coastal flood with velocity (wave action), base flood elevations determined (Coastal High Hazard District)

The 500-year floodplain is an area with a 0.2 percent chance of inundation in any given year. The project area is located within Zone X, indicating that it is outside the 500-year floodplain (Figure 3-4).

3.9.1.2 TSUNAMIS

Tsunamis are a series of destructive ocean waves generated by seismic activity that could affect shorelines of Hawai'i. Tsunamis affecting Hawai'i are typically generated in the waters off South America, the west coast of the U.S., Alaska, and Japan. Local tsunamis have also been generated by seismic activity on the Island of Hawai'i.

The C&C Department of Emergency Management establishes tsunami evacuation zones and maps for all coastal areas on O'ahu. Tsunami maps for the inland areas of O'ahu indicate that the proposed project area is not within the tsunami evacuation zone.

3.9.1.3 HURRICANES

The Hawaiian Islands are seasonally affected by Pacific hurricanes from June to November. These storms generally travel toward the islands from a southerly or southeasterly direction and can deposit large amounts of rain with high winds on the Hawaiian Islands. The storms generally contribute to localized flooding and coastal storm surges. Coastal storm surges would not impact the proposed project area.

3.9.1.4 EARTHQUAKES

Seismic activity usually occurs on the Island of Hawai'i and has been felt as far away as O'ahu. O'ahu is listed in Seismic Zone 2A under the Uniform Building Code (USGS 2001). Zone 2A indicates a location that has moderate potential for ground motion created by seismic activity.

3.9.2 Potential Impacts and Mitigation

3.9.2.1 PROPOSED ACTION

Zone 1: The Proposed Action would reduce rockfall hazards to Prospect Street, thereby reducing the potential for rockfall and landslides impacts to occur as a result of natural hazards (i.e., earthquake, hurricane, or severe storm). Therefore, the Proposed Action would have positive impacts relative to natural hazards.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.9.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall reduction measures would be implemented, and the existing rockfall and landslide potential would remain. Structural deficiencies in the rock formations would not be addressed and erosion would continue to undermine the stability of the slope. Rapid surface water runoff from storm events and/or hurricanes would accelerate this process of erosion. Therefore, the No-Action Alternative is anticipated to have adverse impacts relative to natural hazards.

3.9.2.3 MITIGATION MEASURES

No impacts are expected from this resource, thus no mitigation measures would be required.

3.10 LAND USE AND OWNERSHIP

3.10.1 Existing Land Use

The land use and ownership ROI is the proposed project and adjacent areas. The project area has a state land use designation of Urban Land Use on the western, southern, and eastern sides, which include numerous residential parcels (Figure 3-2). Conservation Land Use District is located north of the proposed project area. The project will stay within the C&C right-of-way and will not enter into the Conservation District.

The project area is located in the Punchbowl Special District. The National Cemetery of the Pacific is located directly north of the project area (Figure 3-3).

3.10.2 Potential Impacts and Mitigation

3.10.2.1 PROPOSED ACTION

Zone 1: Implementation of the Proposed Action would result in no change to land use or ownership within the project area. All work to implement the proposed rockfall mitigation measures would take place within the existing C&C right-of-way. Therefore, no impacts to land use and ownership impacts are anticipated with implementation of the Proposed Action.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.10.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be undertaken, and there would be no change to land use or ownership within the project area. Therefore, no impacts to land use and ownership are anticipated with implementation of the No-Action Alternative.

3.10.2.3 MITIGATION MEASURES

No impacts are expected from this resource, thus no mitigation measures would be required.

3.11 SOCIOECONOMICS

3.11.1 Existing Socioeconomic Conditions

This section summarizes the demographic and income characteristics of residents in the vicinity of the proposed project area. Data summarized in Table 3-2 are taken from the 2010 U.S. Census (U.S. Census Bureau 2010). Census data are used to describe the existing social and economic characteristics of the ROI and to determine whether any minority or low-income population may experience disproportionately high adverse impact from the Proposed Action or alternatives. The ROI for socioeconomics is the Honolulu Census Designated Place (CDP), O‘ahu, Hawai‘i. The socioeconomics for the County of Honolulu is presented for reference, in which the proposed project area is located in close proximity.

Table 3-2: Demographic and Income Characteristics

Characteristic	County of Honolulu		Honolulu CDP	
	No.	Percent	No.	Percent
Population	953,207	—	374,359	—
Ethnicity				
Asian	418,410	43.9	201,757	53.9
Native Hawaiian and Other Pacific Islander alone	90,878	9.5	22,954	6.1
Black or African American	19,256	2.0	8,776	2.3
White	198,732	20.8	80,349	21.5
American Indian and Alaska Native alone	2,438	0.3	628	0.2
Some other race alone	10,457	2.3	2,764	0.7
Two or more races	213,036	22.3	57,041	15.2
Income				
Median Family Income	\$77,662	—	\$73,957	—
Per capita income	\$29,221	—	\$31,930	—
Poverty Status in 2009				
Families below poverty level	—	6.4	—	7.2
Individuals below poverty level	77,934	8.9	—	10.5

Source: U.S. Census Bureau, 2010 Census of Population and Housing (U.S. Census Bureau 2010).

In 2010, the County of Honolulu reported 953,207 residents, the Honolulu CDP reported 374,359 residents. Individuals of Asian and Caucasian ethnicities make up the largest percentage in both the County of Honolulu and Honolulu CDP. Minority populations identified as Native Hawai‘i and Other Pacific Islander, and Black or African American, generally represented a smaller percentage of the population within the Honolulu CDP compared to the general population of the County of Honolulu.

Median family income is higher within in the County of Honolulu, than the Honolulu CDP. However, the per capita income is higher in the Honolulu CDP. Poverty levels are slightly higher within the Honolulu CDP.

3.11.2 Potential Impacts and Mitigation

3.11.2.1 PROPOSED ACTION

Zone 1: No socioeconomic impacts are expected with implementation of the Proposed Action. The Proposed Action would not impact employment, income, or demographics within the ROI. Neither a minority nor low-income population has been identified within the ROI. Therefore, it is unlikely that adverse impacts from the Proposed Action would disproportionately affect a minority or low-income population.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.11.2.2 NO-ACTION ALTERNATIVE

No socioeconomic impacts are expected with implementation of the No-Action Alternative. The No-Action Alternative would not impact employment, income, or demographics within the ROI.

3.11.2.3 MITIGATION MEASURES

No impacts are expected from this resource, thus no mitigation measures would be required.

3.12 PUBLIC FACILITIES AND SERVICES

3.12.1 Transportation

The ROI for transportation is the project area and adjacent roadways. Access to the proposed project area is at Prospect Street from Madeira Street to Miller Street.

Prospect Street is a two-lane residential road that extends 1.35 miles. The roadway in the project vicinity consists of two paved travel lanes and unpaved shoulders. Average annual daily traffic data obtained from the State DOT indicate that approximately 2,600 vehicles per day travel on Prospect Street between Madeira Street to Miller Street (DOT 2010). The shoulder of Zone 1 and the unimproved sidewalk area of Zone 2 is relatively wide and currently used for vehicle parking.

There are no public transit bus stops along Prospect Street in the project area. Route 15 travels along adjacent roadways. Currently, pedestrian access is available along both sides of Prospect Street in the project area along the unpaved shoulder.

3.12.2 Utilities and Infrastructure

The ROI for utilities and infrastructure is the proposed project area. Existing utilities within the project area include waterlines for domestic use, fire hydrants, electrical lines, telephone lines, and storm drainage.

3.12.3 Potential Impacts and Mitigation

3.12.3.1 PROPOSED ACTION

Zone 1: The Proposed Action would reduce the potential for rockfall and landslide to reach the roadway, making the roadway safer for vehicular traffic. Therefore, long-term impacts to transportation resources are expected to be positive. Specific long-term impacts in Zone 1 include the elimination of the current on-street vehicle parking due to the placement of the jersey barriers. The jersey barriers are necessary to keep vehicles and pedestrians away from the impact fence.

Prospect Street is adjacent to the project area and provides the best access for construction vehicles and equipment required for implementation of the Proposed Action. Short-term effects of the

Proposed Action include minor changes to traffic patterns, traffic volume, pedestrian access, and travel times during the construction period. Required lane closures would cause minor disruptions to normal traffic patterns. The arrival and departure of construction crews, and the periodic movement of construction vehicles and materials for staging, may cause short-term increases in traffic volume and traffic delays. The need to reduce speed limits and contra flow traffic within the work zone may also cause traffic delays during construction. Pedestrians would be limited to the makai side of Prospect Street during construction. Public transit services would not be impacted by implementation of the Proposed Action.

Implementation of the Proposed Action would not disrupt service to the electric, water, telephone lines, or storm drainage. During construction, water valves and fire hydrants would be less accessible. Full access would be restored after construction is complete. Therefore, no significant adverse impacts to utilities are anticipated from the implementation of the Proposed Action.

Zone 2: Potential impacts in Zone 2 are generally the same as those for Zone 1. Specific long-term impacts in Zone 2 include the reduction of the currently available vehicle parking in the unimproved sidewalk area due to the placement of the jersey barriers. The jersey barriers are necessary to keep vehicles and pedestrians away from the impact fence.

Zone 3: Potential impacts are the same as Zone 1; however, on-street parking would not be impacted in Zone 3.

3.12.3.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no rockfall mitigation measures would be implemented. The existing rockfall condition and associated risk to drivers on Prospect Street would remain. Therefore, adverse impacts to transportation may result from implementation of the No-Action Alternative.

No impacts to utilities or infrastructure are anticipated with implementation of the No-Action Alternative.

3.12.3.3 MITIGATION MEASURES

On-street parking would be preserved as much as possible. On-street parking would continue to be available along Prospect Street on either side of Zone 1 and 2. Construction work on the city streets would only be performed between the hours of 8:30 a.m. to 3:30 p.m., Monday through Friday unless otherwise permitted by the Department of Transportation Services. Usage of the local street network by equipment, etc. to the site will be scheduled outside of peak traffic hours (6:00 a.m.–8:00 a.m. and 2:30 p.m.–7:00 p.m.) to minimize any traffic delays or obstructions to the local City roadways. Traffic Control Plans would be submitted to the Department of Transportation Services, with a copy to DPP, to mitigate short-term traffic-related construction impacts.

3.13 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

3.13.1 Existing Environment

The ROI for hazardous materials and hazardous wastes is the proposed project area. For the purpose of the following analysis, the term hazardous materials or hazardous wastes will mean those substances defined by the Comprehensive Environmental Response, Compensation, and Liability Act, 42 United States Code (U.S.C.) §§ 9601 et seq., and Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901–6992. In general, these include substances that, because of their quantity, concentration, or physical, chemical, or toxic characteristics, may present an unreasonable risk to health, safety, and the environment when released. Transportation of hazardous materials is regulated by the DOT regulations within Title 49 CFR.

Current and historic land uses within the areas proposed for rockfall mitigation are not associated with the use, transportation, or storage of hazardous materials.

3.13.2 Potential Impacts and Mitigation

3.13.2.1 PROPOSED ACTION

Zone 1: Construction equipment and vehicles contain hazardous materials such as gasoline, diesel, oil, and hydraulic and brake fluids. Accidental release of these materials into the environment is possible, but not anticipated, with implementation of the Proposed Action. No significant impacts related to hazardous materials or hazardous wastes are anticipated with implementation of the Proposed Action.

Zone 2: Same as Zone 1.

Zone 3: Same as Zone 1.

3.13.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no construction activities would occur at the project area. No hazardous materials would be brought to the project area. Therefore, no short-term or long-term impacts from hazardous materials are anticipated with implementation of the No-Action Alternative.

3.13.2.3 MITIGATION MEASURES

Site-specific BMPs, including procedures for hazardous material storage, handling and staging, spill prevention, control and response, waste disposal, and good housekeeping, would be developed and implemented by the construction contractor. These BMPs would greatly reduce the likelihood of hazardous materials being released into the environment. The construction contractor would be responsible for compliance with all applicable federal, state, and local regulations governing the transportation, use, storage, and/or disposal of hazardous material and hazardous wastes during construction. Spill control measures would entail minimization of hazardous materials on the project site, good housekeeping, and rapid spill response in the event of a release. Material management practices would be used to reduce the risk of spills or other accidental release of materials and substances into the environment.

3.14 CUMULATIVE IMPACTS

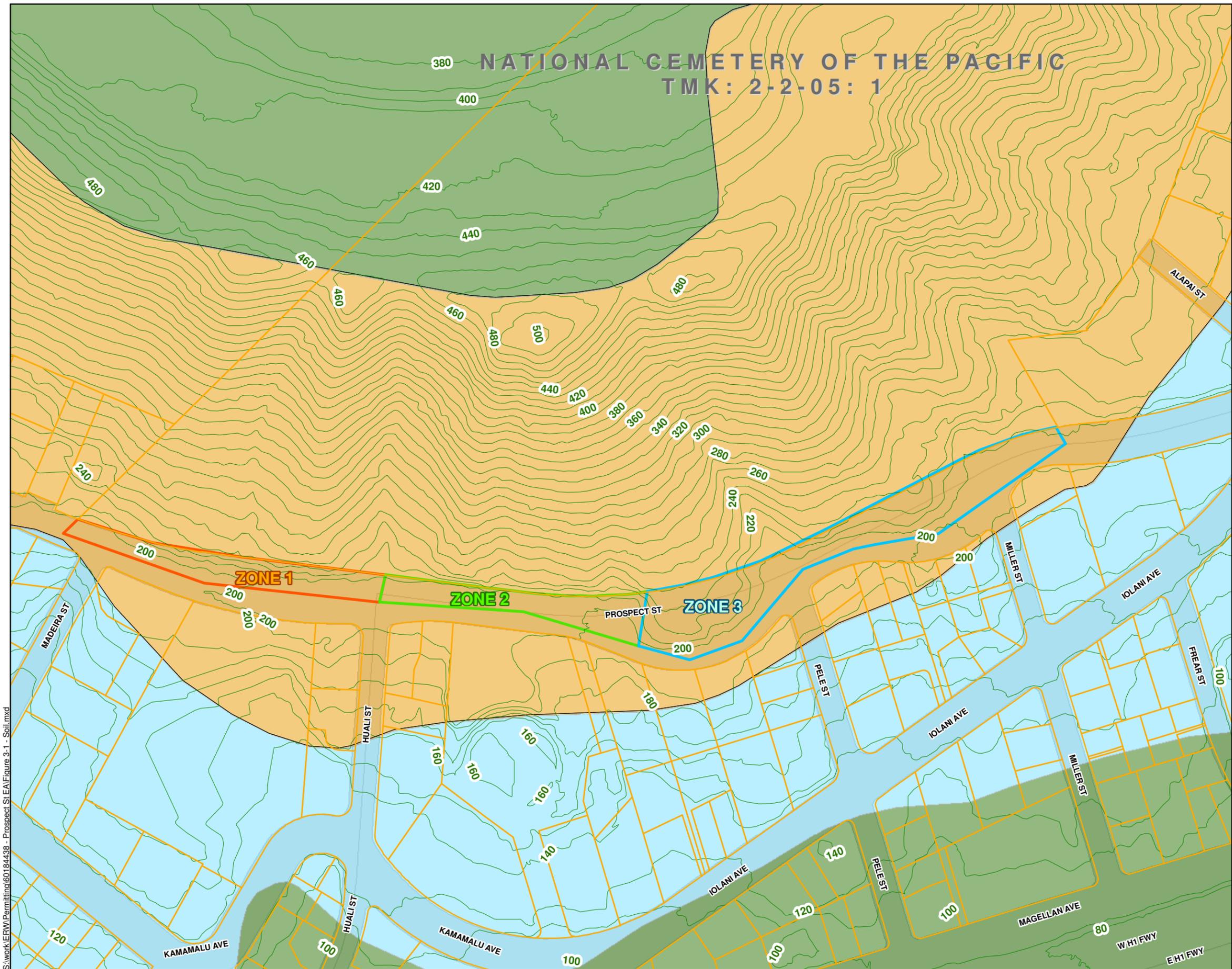
Cumulative impacts refer to impacts on the environment that result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor yet collectively significant actions taking place over a period of time. No other past, present, or planned actions associated with the surrounding land uses have been identified that would contribute to cumulative impacts for any of the resources considered in this EA. Based on this analysis, no significant cumulative impacts would be anticipated from implementation of either the Proposed Action or the No-Action Alternative.

3.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

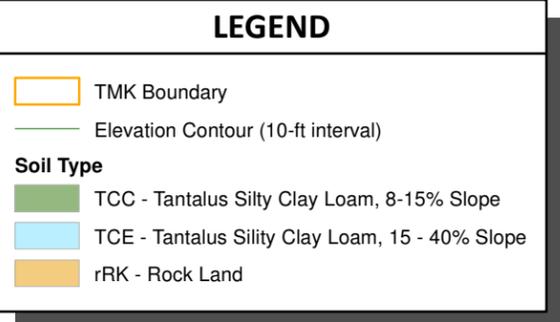
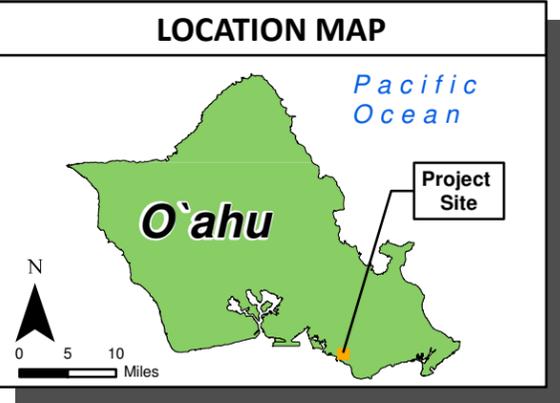
Implementation of the Proposed Action would not result in an irreversible or irretrievable commitment of resources, except for the financial resources, fuel, and other consumable materials required for construction.

3.16 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Construction of the Proposed Action may result in short-term adverse impacts to air quality, biological, noise, transportation, and visual resources. However, BMPs and other mitigation measures to be implemented during construction would reduce these impacts to a level of non-significance. The implementation of the Proposed Action would reduce the potential for rockfall and landslide adjacent to Prospect Street, resulting in long-term positive impacts for geology and soils, natural hazards, public health and safety, and transportation.



S:\work\ERW\Permitting\60184438 - Prospect S\EA\Figure 3-1 - Soil.mxd



NOTES

1. Map projection: Hawaii State Plane Zone 3, NAD83 datum.

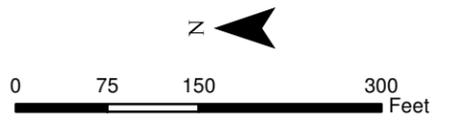


Figure 3-1
Soil Type Map
Prospect Street EA
Oahu, Hawaii



S:\work\ERW\Permitting\60184438 - Prospect St\EA\Figure 3-2 - LU.mxd

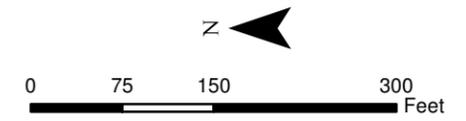
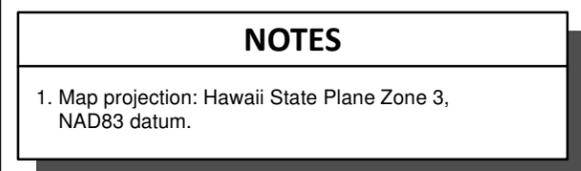
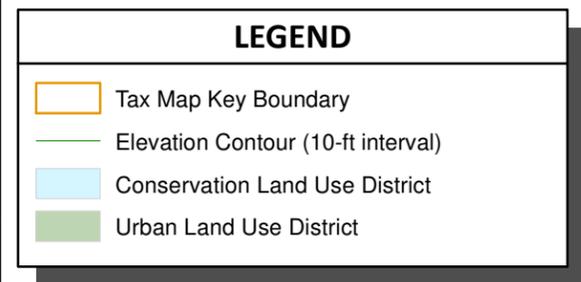
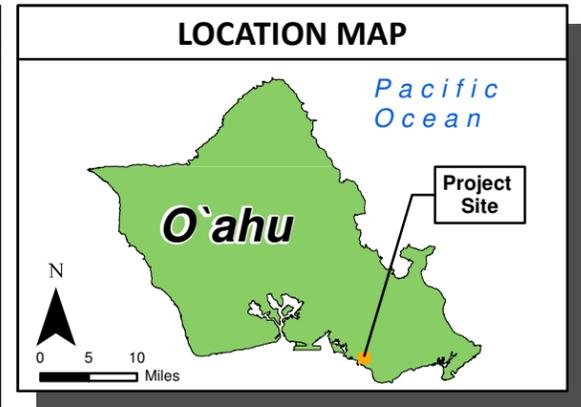
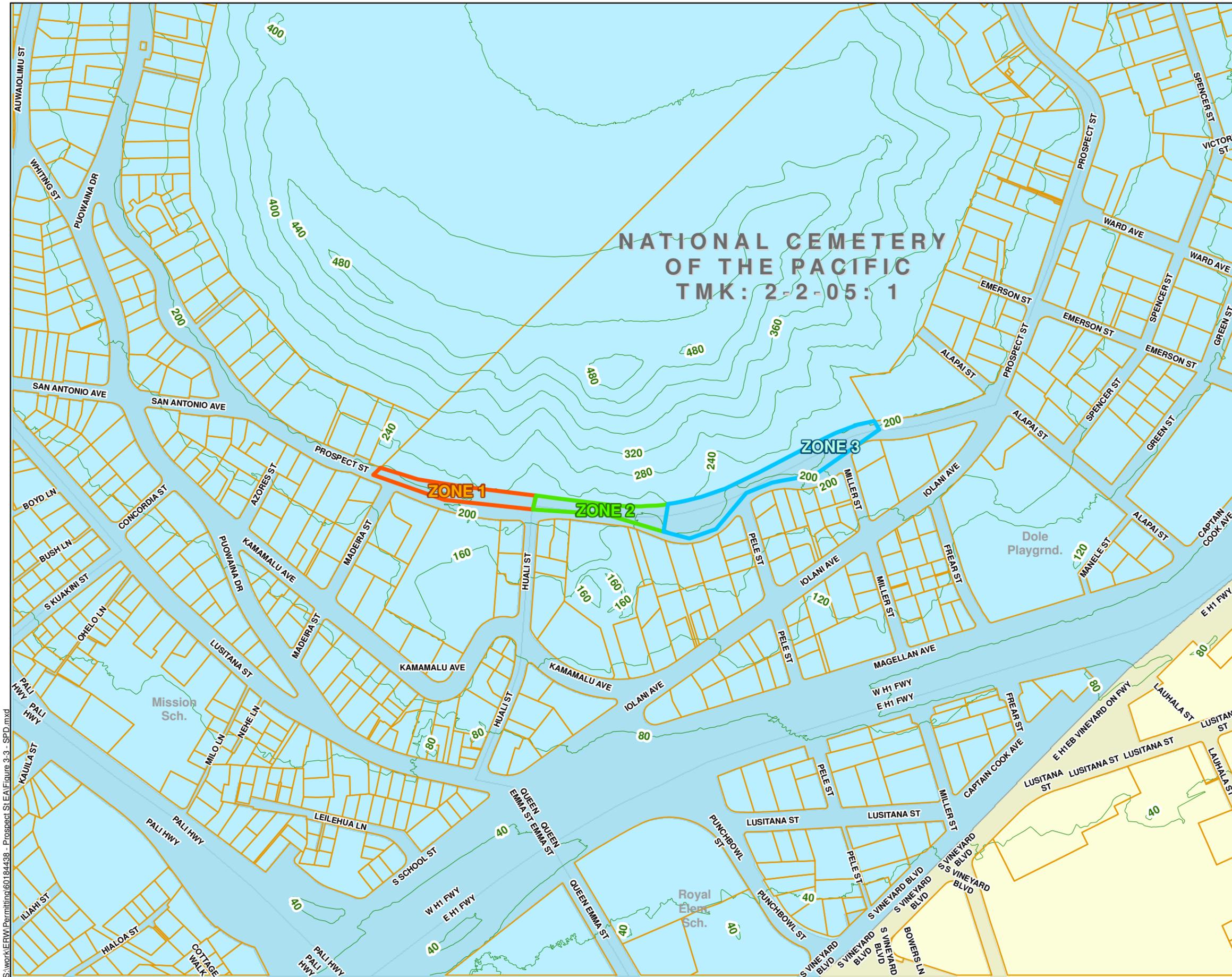


Figure 3-2
State Land Use Districts
Prospect Street EA
Oahu, Hawaii



S:\work\ERW\Permitting\60184438 - Prospect SLEA\Figure 3-3 - SPD.mxd

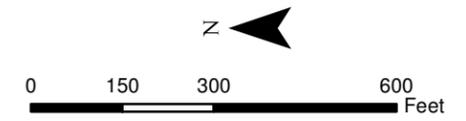
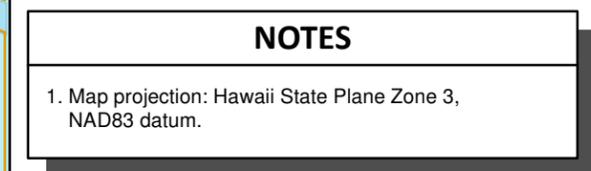
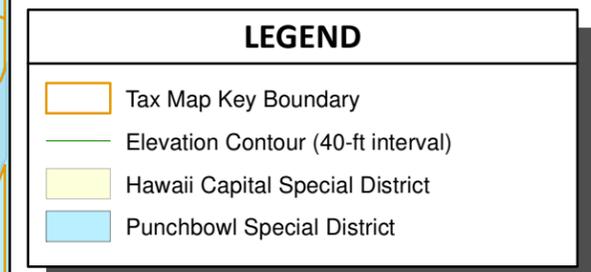
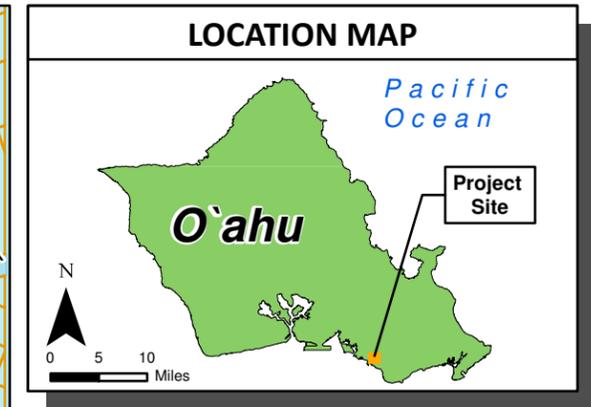
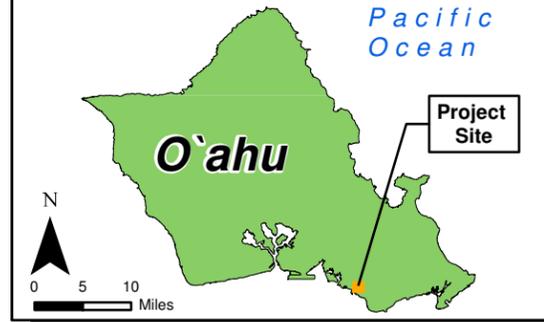


Figure 3-3
Special Design Districts
Prospect Street EA
Oahu, Hawaii

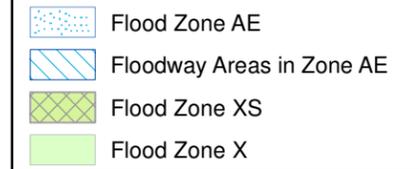
NATIONAL CEMETERY
OF THE PACIFIC
TMK: 2-2-05: 1

ZONE 1
ZONE 2
ZONE 3

LOCATION MAP



LEGEND



NOTES

1. Map projection: Hawaii State Plane Zone 3, NAD83 datum.
2. FEMA NFIP Flood Zones:
 Zone AE = Areas subject to inundation by the 1-percent-annual-chance flood event.
 Floodway in Zone AE = Channel of a stream plus adjacent floodplain areas that must be kept clear.
 Zone XS = Areas of 500-year flood; areas of 100-year flood with average depths of less than 1-foot or with drainage areas < 1 square mile.
 Zone X = Areas determined to be outside of the 500-year floodplain.



Figure 3-4
Flood Zone Map
Prospect Street EA
Oahu, Hawaii

S:\work\ERW\Permitting\60184438 - Prospect S\EA\Figure 3-4 - flood_map_w_aipphoto.mxd

4.0 COMPATIBILITY OF THE PROPOSED ACTION WITH OBJECTIVES OF STATE AND LOCAL LAND USE PLANS AND POLICIES

Compatibility of the Proposed Action with land use plans and policies is discussed below.

4.1 HAWAI'I STATE PLAN AND FUNCTIONAL PLANS

4.1.1 Hawai'i State Plan

The Hawai'i State Plan, Chapter 226 of HRS, adopted in 1978 and revised in 1988, establishes the overall theme, goals, objectives, and priority guidelines to guide the future long-range development of the State.

The proposed project supports and is consistent with the following State Plan objectives and policies:

Section 226-13: Objectives and policies for the physical environment, land, air, and water quality.

- (a) Planning for the State's physical environment with regards to land, air, and water quality shall be directed towards achievement of the following objectives:
 1. Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.
- (b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:
 1. Promote the proper management of Hawai'i's land and water resources.
 2. Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

The proposed project involves rockfall mitigation along Prospect Street. This project would reduce rockfall hazards to Prospect Street, thereby reducing the potential for rockfall and landslides impacts to occur as a result of natural hazards (i.e., earthquake, hurricane, or severe storm). The Proposed Action would mitigate for potential rockfalls, which would have long-term positive impacts on public safety and health and reduce threats to life and property from potential rockfalls and landslides originating upslope of Prospect Street to affect residences, pedestrians, and vehicles along Prospect Street.

4.1.2 State Functional Plans

The State Functional Plans are designed to implement the broader goals, objectives, and policies of the State Plan through specific actions identified as Implementing Actions (IA). While the proposed project is not specifically identified as an IA, the project maintains consistency with the Transportation Functional Plans through the following:

- State Transportation Functional Plan
- Objective I.F: Improving and Enhancing Transportation Safety

The proposed project involves rockfall mitigation along Prospect Street, which would have long-term positive impacts by reducing rockfall threats to residences, pedestrians, and vehicles along Prospect Street.

4.2 CITY AND COUNTY OF HONOLULU

4.2.1 General Plan

The General Plan for the City and County of Honolulu, as amended October 3, 2002, sets forth basic objectives and policies pursuant to the City Charter, which mandates preparation of a General Plan and area development plans to guide “the development and improvement of the city.” The General Plan and development plans provide a policy context for the land use and budgetary actions of the City across eight geographic regions, including the Primary Urban Center, Central O’ahu, Ewa, Waianae, North Shore, Koolauloa, Koolaupoko, and East Honolulu. The proposed project is consistent with the following objectives and policies of the General Plan:

- Objective B: To protect the people of O’ahu and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.

The proposed project involves rockfall mitigation along Prospect Street. This project would reduce rockfall hazards to Prospect Street, thereby reducing the potential for rockfall and landslides impacts to occur as a result of natural hazards (i.e., earthquake, hurricane, or severe storm). The Proposed Action would mitigate for potential rockfalls, which would have long-term positive impacts on public safety and health and reduce threats to life and property from potential rockfalls and landslides originating upslope of Prospect Street to affect residences, pedestrians, and vehicles along Prospect Street.

4.2.2 Special District Plans

The Punchbowl Special Design District Guidelines sets forth the objectives for the protection and enhancement of the Punchbowl Special District. Land development threatened views of Punchbowl’s slopes in the 1970s and reduced the tranquility of the Punchbowl National Monument. The regulations within the District contain various building heights and front yard setback requirements. The proposed project is consistent with the following objectives and policies of The Punchbowl Special Design District Guidelines:

- Objective B: Preserve and enhance the park-like character of the immediate slopes of Punchbowl and its major streets.

The proposed project involves rockfall mitigation along Prospect Street in the Punchbowl Special District. The Proposed Action would mitigate for potential rockfalls, which would have long-term positive impacts on public safety and health and reduce threats to life and property from potential rockfalls and landslides originating upslope of Prospect Street to affect residences, pedestrians, and vehicles along Prospect Street. All construction work will take place within the C&C right-of-way. Before construction begins, a Minor Special District Permit would be obtained from the County of Honolulu DPP Land Use Permit Division per Revised Ordinances of Honolulu Section 21-9.50, which states a minor or major SDD permit is required for development projects in any of the seven special districts.

5.0 SIGNIFICANCE CRITERIA AND DETERMINATION

The following sections summarize the significance criteria used to determine whether the Proposed Action would have a significant effect on the environment (Section 5.1) and the resulting determination (Section 5.2).

5.1 SIGNIFICANCE CRITERIA

In accordance with HAR §11-200-12, the proposing agencies have considered every phase of the Proposed Action, the expected consequences, both primary (direct) and secondary (indirect), and the cumulative as well as the short-term and long-term effects of the action, in order to determine whether the Proposed Action may have a significant effect on the environment. In making this determination, the Proposed Action has been evaluated with respect to the significance criteria established in HAR §11-200-12. These significance criteria are summarized below:

- **Involves an irrevocable commitment to, loss or destruction of any natural or cultural resources.** The Proposed Action would result in positive impacts for geology and soils. Only short-term construction-related impacts are anticipated for ambient air quality and biological resources. The Proposed Action would clear approximately 0.4 acres of existing vegetation in areas to be covered with anchored wire mesh and ring net systems (Zone 3 only). No special status species have been identified within the project area. Once installed, the anchored wire mesh and ring net systems would allow for the re-growth of vegetation cleared for construction. Seven Kiawe trees (*Prospis pallida*) in the C&C right-of-way are recommended for removal in Zone 2 and 3. *Prospis pallida* is not a special status species. These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to vehicles and pedestrians on Prospect Street. The Tree Survey identifies a total of nine trees in Zones 2 and 3, and recommends seven for removal. However, due to construction and maintenance access issues, all nine trees would be removed. SHPD concurrence that “no historic properties will be affected” by the Proposed Action was obtained in a letter dated January 06, 2012 (Appendix A). Therefore, implementation of the Proposed Action is not anticipated to result in the irrevocable commitment to, loss or destruction of any natural or cultural resource.
- **Curtails the range of beneficial uses of the environment.** There would be no change to the current or potential land use within the project area as a result of the Proposed Action. Management and use of the land would remain consistent with an urban district.
- **Conflicts with the State’s long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.** The Proposed Action is consistent with the state environmental policies, goals, and guidelines established in Chapter 344, HRS. In accordance with HRS §344-5, this EA is made available for public review and comment for a period of 30 days. All comments received during the public comment period will be responded to in the Final EA.
- **Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.** No socioeconomic impacts to the community are anticipated with implementation of the Proposed Action. A CIA of the proposed action was conducted (Appendix D). The project area, consisting of the roadway that runs along the base of Punchbowl Crater, Prospect Street has been subject to the presence of numerous archaeological sites and burial finds in the vicinity, though not directly within the parcel itself. No impacts to the cultural practices of the community are anticipated with implementation of the Proposed Action.
- **Substantially affects public health.** The Proposed Action would have long-term positive impacts on public safety and health by reducing the potential for rockfalls and landslides originating upslope of Prospect Street.

- **Involves substantial secondary impacts, such as population changes or effects on public facilities.** No adverse secondary impacts are anticipated with implementation of the Proposed Action.
- **Involves a substantial degradation of environmental quality.** No long-term adverse impacts to any resource evaluated in this EA are anticipated with implementation of the Proposed Action.
- **Is individually limited, but cumulatively has considerable effect on the environment, or involves a commitment for larger actions.** The Proposed Action does not involve a commitment for larger actions. Land use in the proposed project vicinity is comprised of Urban Land. No other past, present, or planned actions associated with these land uses have been identified that would contribute to adverse cumulative impacts for any of the resources considered in this EA.
- **Substantially affects a rare, threatened, or endangered species or its habitat.** No special status species have been identified within the project area. No adverse impacts to rare, threatened, or endangered species or its habitat are anticipated with implementation of the Proposed Action.
- **Detrimentially affects air or water quality or ambient noise levels.** Short-term adverse construction impacts to air quality and ambient noise levels are possible during implementation of the Proposed Action. However, BMPs to be implemented during construction would reduce these impacts. The Proposed Action would have no long-term impacts on air quality, noise, or surface water quality.
- **Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters.** The project area is not located in a flood plain, tsunami zone, or coastal area. The presence of steep slopes and rocky soils at the project area does make the area susceptible to erosion and presents geologic hazards such as rockfall and landslides. The purpose of the Proposed Action is to reduce the potential for rockfall and landslides originating from the project area.
- **Substantially affects scenic vistas and viewplanes identified in County or state plans or studies.** The Proposed Action would have no long-term adverse impacts on the scenic quality of the roadway corridor and is consistent with the Punchbowl Special District Design Guidelines.
- **Requires substantial energy consumption.** Implementation of the Proposed Action is not anticipated to require substantial energy consumption beyond what is required to operate equipment and tools during construction.

5.2 DETERMINATION

To determine whether the Proposed Action would have a significant impact on the human, natural, or historic environments, the project, its anticipated direct and indirect effects, and the short-term, long-term, and cumulative impacts have been evaluated. In making this determination, the Proposed Action has been evaluated with respect to the significance criteria established in HAR §11-200-12. Based on the discussion of impacts and mitigation measures contained in Section 3.0 of this EA and the evaluation of the significance criteria in Section 5.1, it is anticipated that the proposed project would not have a significant adverse impact on the environment. Therefore, a Finding of No Significant Impact is anticipated.

6.0 DISTRIBUTION LIST

Copies of the Draft EA are provided to the recipients listed below and are also available upon request.

Recipients	
Office of Environmental Quality Control 235 South Beretania Street, Suite 702 Honolulu, HI 96813	Mr. Loyal Mehrhoff U.S. Fish & Wildlife Service, Pacific Islands Office 300 Ala Moana Blvd., Rm. 3-122 Honolulu, HI 96850
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8.0 REFERENCES

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Appendix A
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August 5, 2011

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Subject: Chapter 6E-8 Historic Preservation Review for the Prospect Street Rockfall Mitigation, Honolulu, Hawaii, (TMK) 2-2-005:001

Mr. Stephenson,

The City and County (C&C) of Honolulu, Department of Design and Construction is proposing rockfall hazard mitigation to be undertaken upslope of Prospect Street between Miller and Madeira Streets, Honolulu, Hawaii (Figure 1-1).

The proposed project would occur within the C&C right-of-way between 150 and 666 Prospect Street, Tax Map Key (TMK) 2-2-005:001.

Due to varying site conditions, it is difficult to identify a single design alternative capable of mitigating the entire project site. Therefore, the project site was categorized into three zones based on site topography and right-of-way boundary locations.

Zone 1: Zone 1 extends from Madeira Street to Huali Street and totals 2.1 acres. Zone 1 can be described as a high natural slope above a high cut slope and narrow shoulder. The right-of-way boundary is near the top of the cut slope.

Zone 2: Zone 2 is approximately 540 linear feet long measured along the roadway beginning at Huali Street and ending just before the sharp turn where the wide unpaved shoulder disappears. Zone 2 consists of 1.9 acres and is described as a steep natural slope above a roadside cut slope of varying heights. The shoulder is relatively wide and is regularly used for vehicle parking. The right-of-way limit is near the toe of the cut slope.

Zone 3: Zone 3 is approximately 3.4 acres and 540 linear feet measured along the roadway, and lies in the vicinity of Pele Street and Miller Street. This zone can be described as a natural slope above a short cut slope that varies in height, and narrow shoulder that varies in width. The right-of-way boundary is upslope from top of the cut slope.

Recommendations for the proposed action took into consideration factors such as public safety, construction cost, sound engineering principles and land ownership. After considering various design alternatives, the C&C proposes to perform rockfall mitigation within each zone as follows:



For Zone 1, Design Alternative No. 2 – Rockfall Impact Fence and Concrete Jersey Barrier.
This design alternative provides rockfall protection for the cut slope only.

This design alternative prescribes a rockfall impact fence and concrete jersey barrier. The fence would be constructed along the toe of the slope in the shoulder area that is currently used for vehicle parking (Figure 2-2 and Figure 2-3). Due to the location of the existing property line, this is the only available location where a fence could be constructed without acquiring additional right-of-way. All of the fence components including the posts and the tie back anchors could be constructed within the existing C&C right-of-way.

In addition, a concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The rockfall impact fence is a dynamic system, and the fence netting will deflect when a large impact occurs. The jersey barrier would serve as a permanent divider preventing both vehicles and pedestrians from getting to close to the fence.

For Zone 2, Design Alternative No. 5 – Rockfall Impact Fence and Concrete Jersey Barrier.
This design alternative provides rockfall protection for the cut slope only.

This design alternative prescribes a rockfall impact fence and concrete jersey barrier. The impact fence would be constructed along the toe of the slope within the roadway shoulder that is currently used for vehicle parking (Figure 2-4 and Figure 2-5). Due to the location of the existing property line, this is the only available location where a fence can be constructed without acquiring additional right-of-way. All of the fence components, including the foundations, the posts, and the tieback anchors would be constructed within the existing C&C right-of-way. The fence would be effective for stopping potential rockfall from the cut slope only.

In addition, a concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The rockfall impact fence is a dynamic system, and the fence netting would deflect when a large impact occurs. The jersey barrier would serve as a permanent divider protecting both vehicles and pedestrians from getting to close to the fence.

For Zone 3, Design Alternative No. 8 – Draped Wire Mesh and Rockfall Impact Fence.

This design alternative provides for complete rockfall hazard reduction for the entire slope using a combination of draped wire mesh and a rockfall impact fence. A rockfall impact fence would be installed within the existing right-of-way limits above the top of the cut slope. The fence would stop rolling rocks from the upper slope.

A draped wire mesh system would be installed over the cut slope down slope of the impact fence. The drape system would be anchored at the top of the cut slope using rock anchors (Figure 2-6 and Figure 2-7).

Actions relevant to the State Historic Preservation Division for this project include historic preservation clearance. As the proposed work would be conducted in areas disturbed by rockfalls, the C&C is seeking concurrence that the proposed repairs will have no adverse effect on significant historic properties.



Attached for your use are the following:

1. Figure 1-1: Site Location and Topographic Map
2. Figure 2-2: Design Alternative No. 2
3. Figure 2-3: Design Alternative No. 2 Site Plan
4. Figure 2-4: Design Alternative No. 5
5. Figure 2-5: Design Alternative No. 5 Site Plan
6. Figure 2-6: Design Alternative No. 8
7. Figure 2-7: Design Alternative No. 8 Site Plan
8. Construction Plans
9. Photo Log

Thank you for your assistance, and should you have any questions please contact Ardalan Nikou of AECOM, at (808) 529-7223 or Ardalan.Nikou@aecom.com.

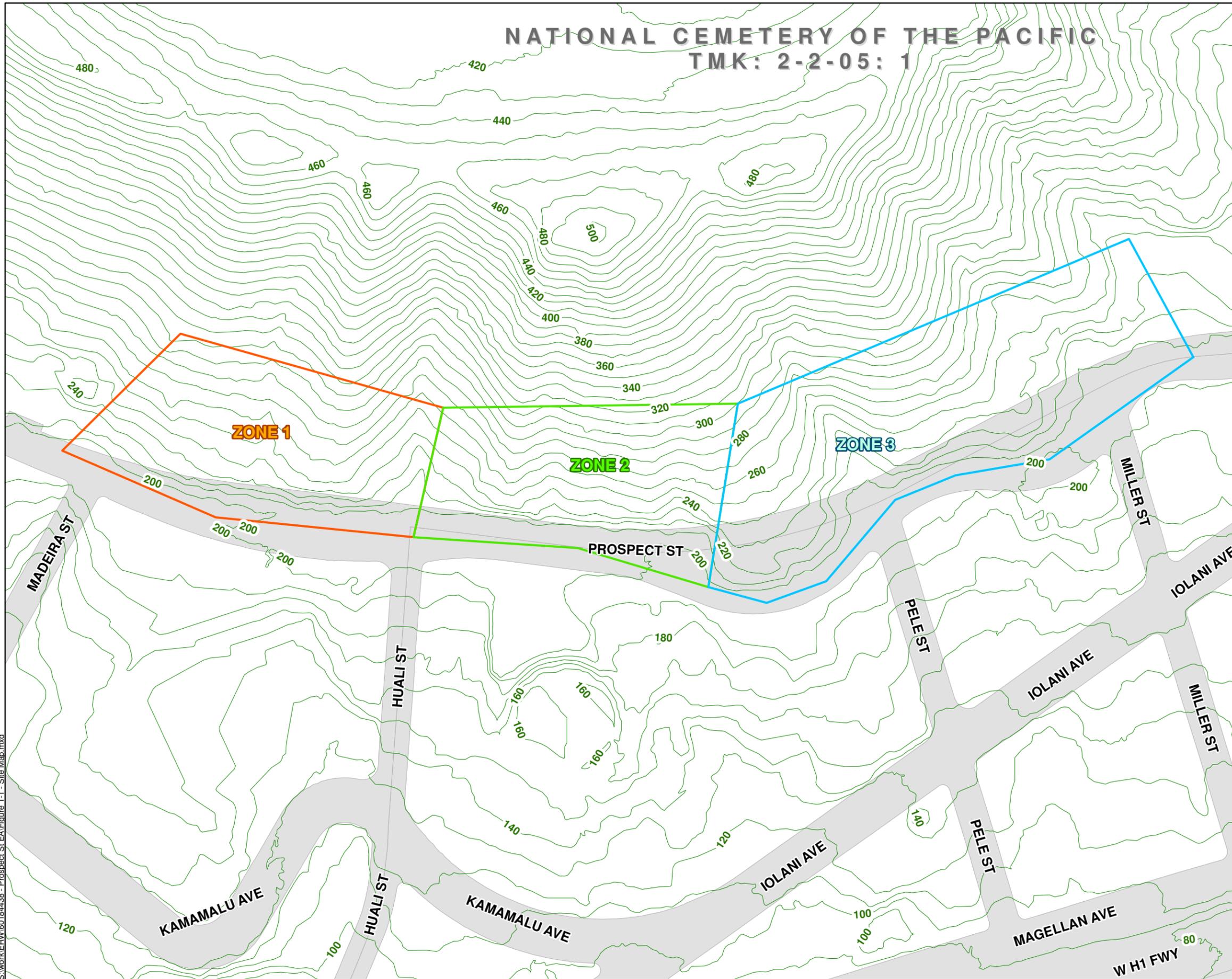
A handwritten signature in black ink, appearing to read "Ardalan Nikou", written over a horizontal line.

Ardalan Nikou
AECOM

cc: Mr. Michael Yamasaki, City and County of Honolulu
Mr. Tobias Koehler, AECOM
Ms. Julie Zimmerman, AECOM

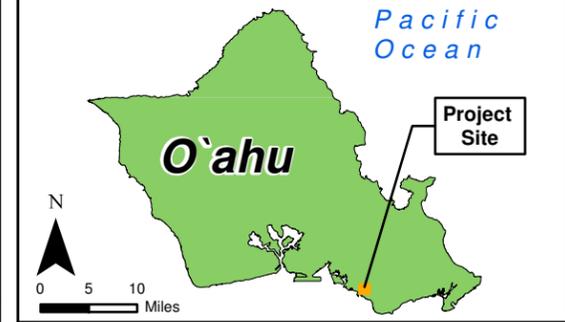
NATIONAL CEMETERY OF THE PACIFIC

TMK: 2-2-05: 1



S:\work\ERW\G0184438 - Prospect St EA\Figure 1-1 - Site Map.mxd

LOCATION MAP



LEGEND

Elevation Contour (10-ft interval)

NOTES

1. Map projection: Hawaii State Plane Zone 3, NAD83 datum.



0 75 150 300 Feet

Figure 1-1
Site Location and Topographic Map
Prospect Street EA
Oahu, Hawaii

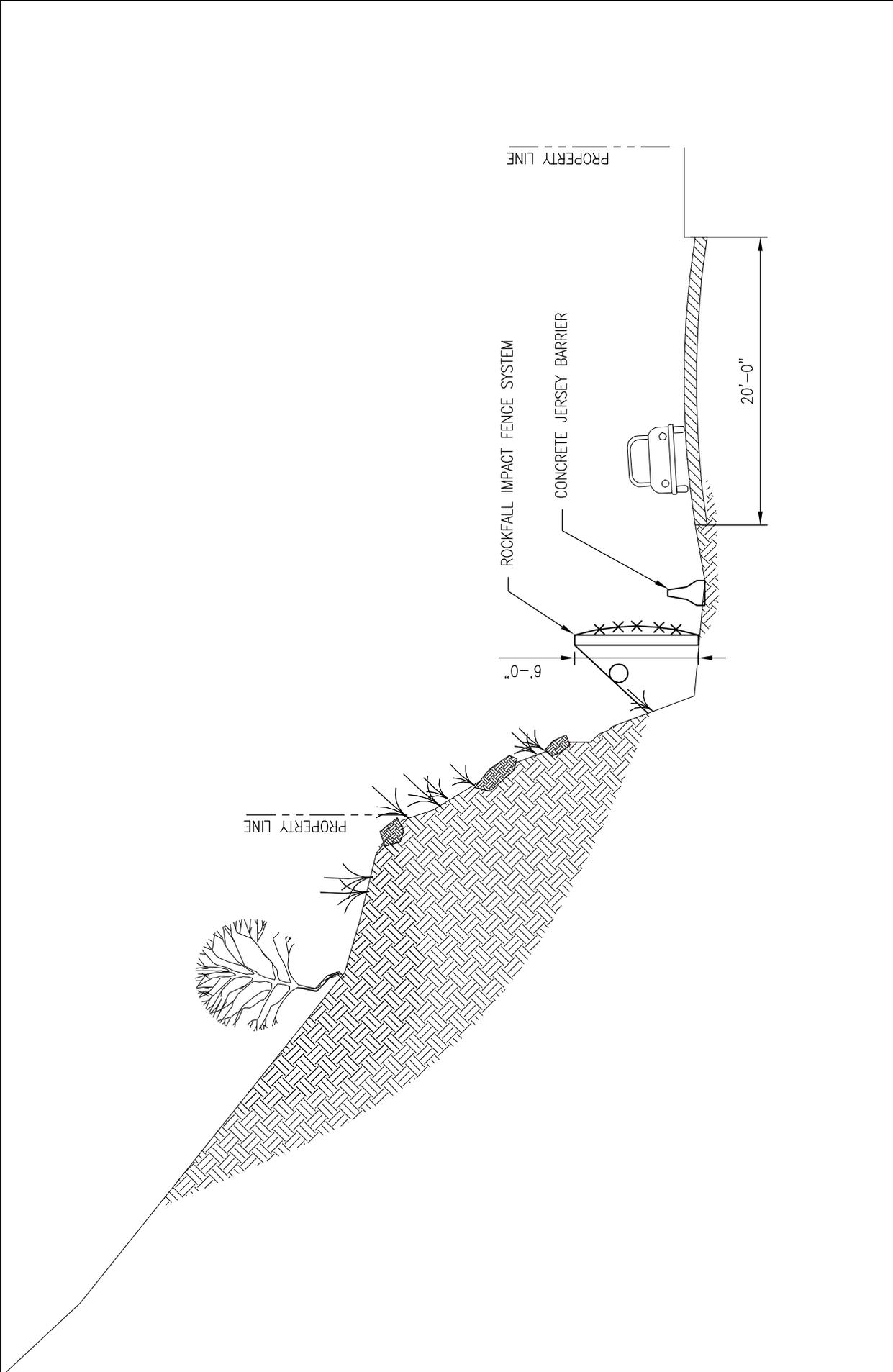


Figure 2-2
Design Alternative No. 2
Rockfall Impact Fence System and Concrete Jersey Barrier

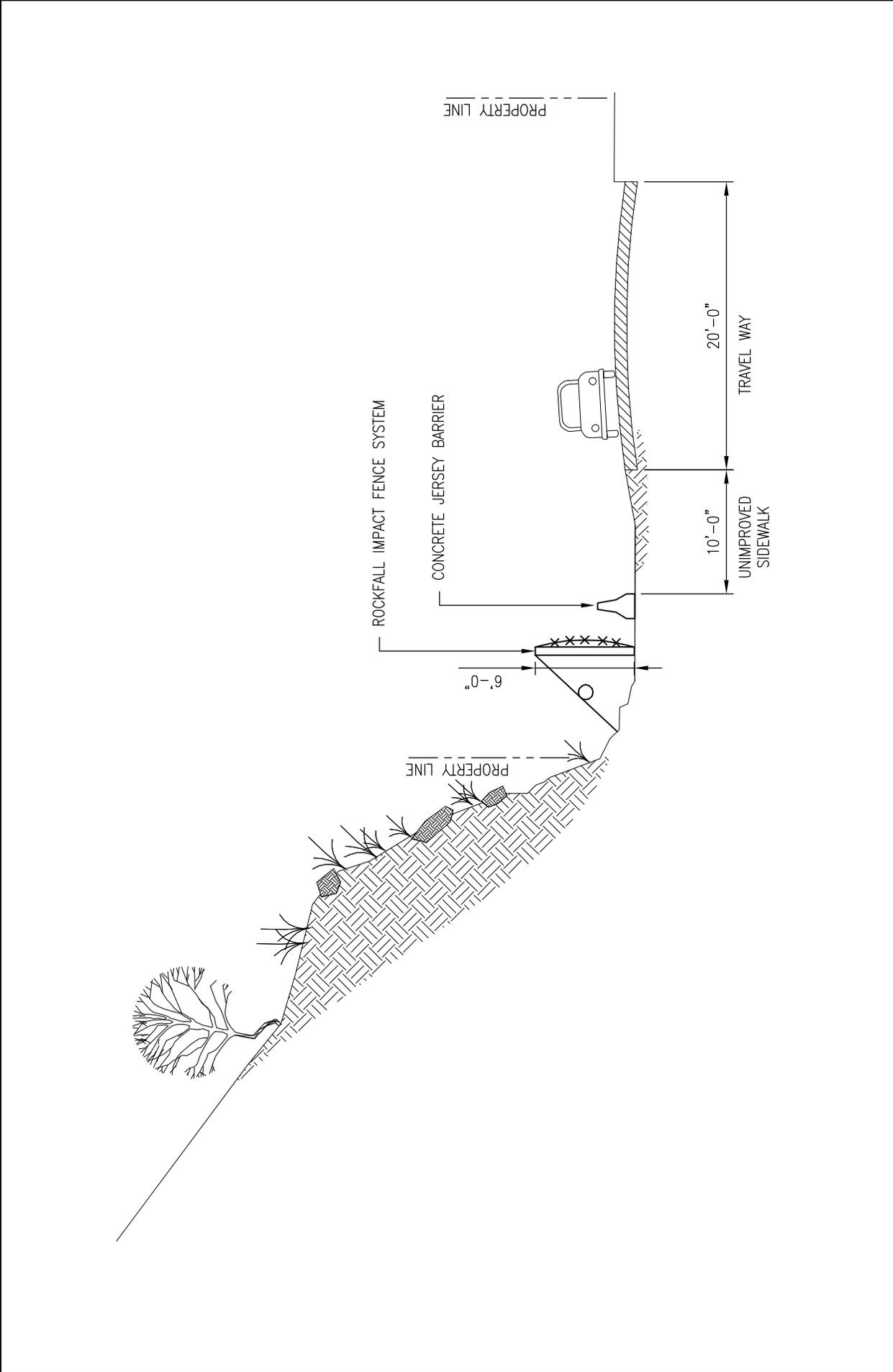


Figure 2-4
Design Alternative No. 5
Rockfall Impact Fence and Concrete Jersey Barrier



Figure 2-5
Design Alternative No. 5
Rockfall Impact Fence and Concrete Jersey Barrier

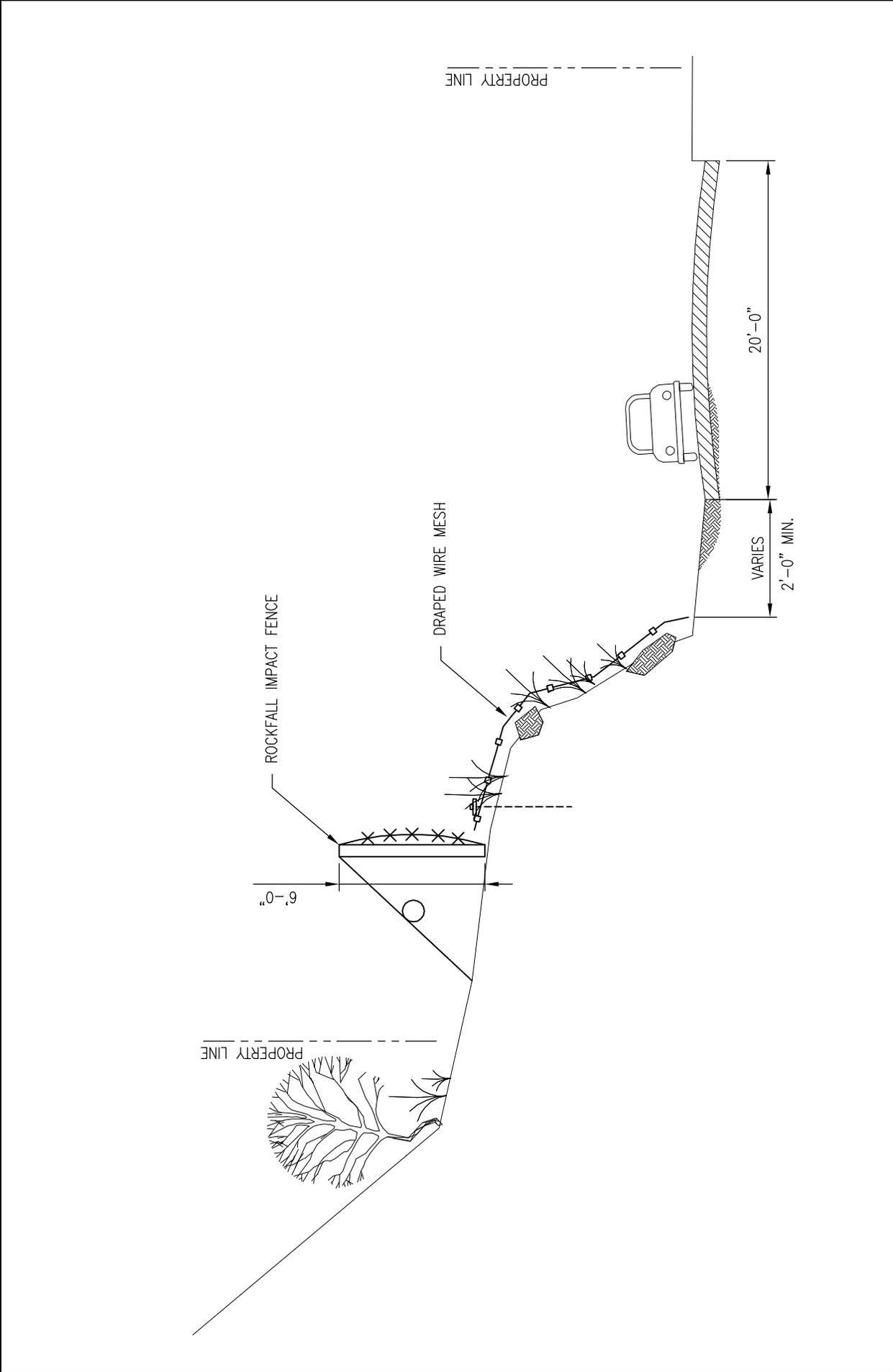


Figure 2-6
Design Alternative No. 8
Draped Wire Mesh and Rockfall Impact Fence

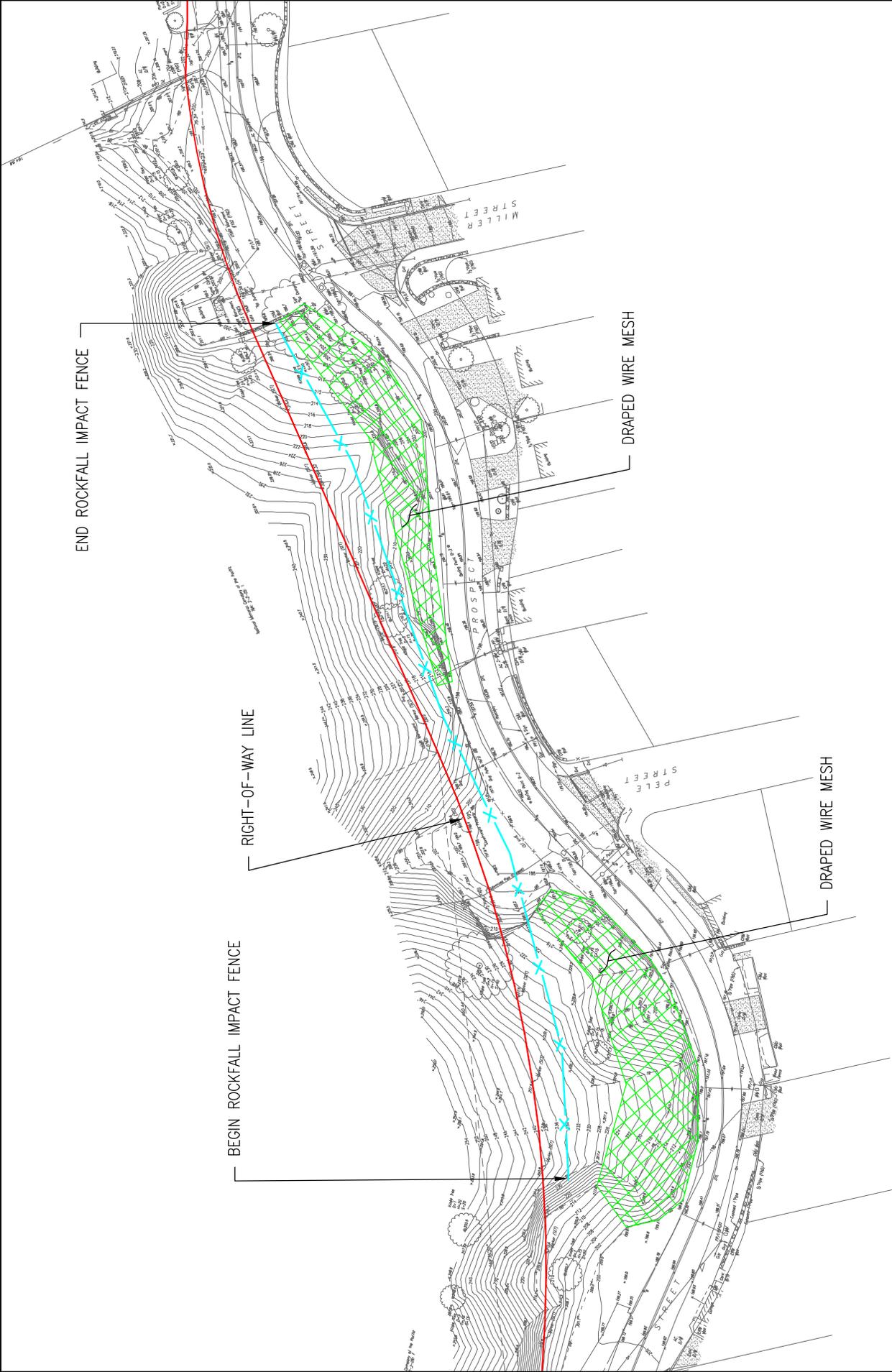


Figure 2-7
Design Alternative No. 8
Draped Wire Mesh System and Rockfall Impact Fence

JOB NO. _____

ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET

HONOLULU, OAHU, HAWAII

DEPARTMENT OF DESIGN AND CONSTRUCTION
CIVIL DIVISION
CITY AND COUNTY OF HONOLULU

Prepared By:



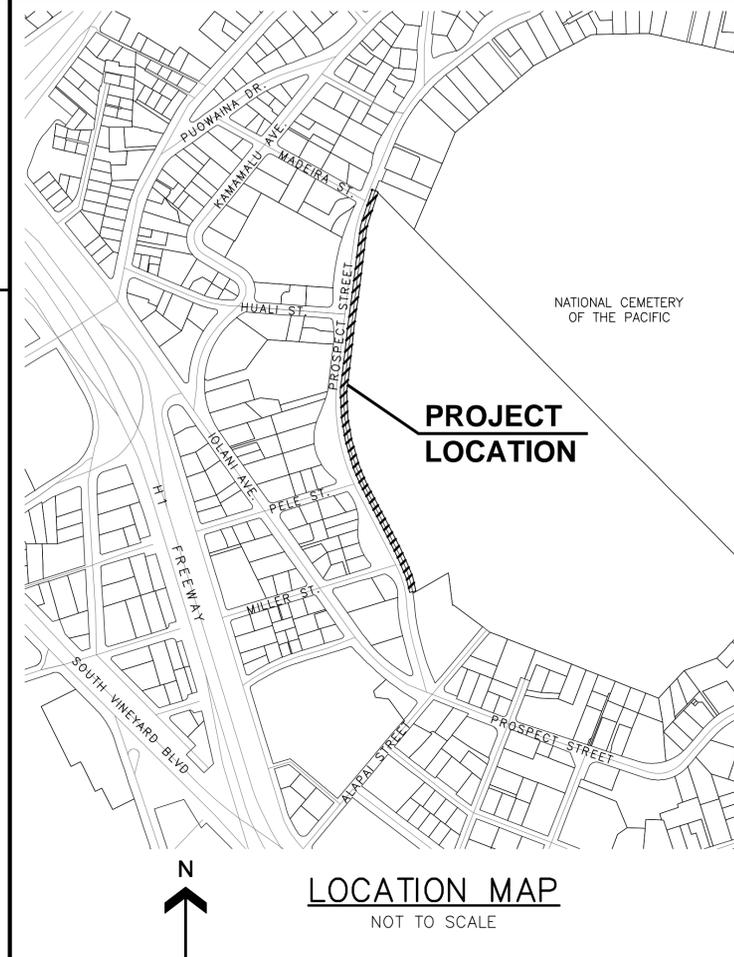
PRE-FINAL

VICINITY MAP

LOCATION MAP

INDEX OF DRAWINGS

APPROVED



SHT. No.	DWG. No.	DESCRIPTION
1	T-1	TITLE SHEET
2	C-1	GENERAL NOTES
3	C-2	ROCKFALL MITIGATION NOTES
4	C-3	SHEET LAYOUT
5	C-4	SITE PLAN 1
6	C-5	SITE PLAN 2
7	C-6	SITE PLAN 3
8	C-7	TYPICAL SECTIONS
9	C-8	TYPICAL SECTIONS
10	C-9	DRAPED WIRE MESH DETAILS
11	C-10	ROCKFALL BARRIER SYSTEM DETAILS
12	C-11	ROCKFALL BARRIER SYSTEM DETAILS
13	C-12	CONCRETE BARRIER DETAILS
14	C-13	INERTIAL BARRIER SYSTEM DETAILS
15	C-14	EROSION CONTROL PLAN
16	C-15	EROSION CONTROL DETAILS
17	C-16	TRAFFIC CONTROL PLAN
18	C-17	TRAFFIC CONTROL - TEMP LANE CLOSURE
19	C-18	BORING LOGS
20	C-19	BORING LOGS

APPROVED		DATE
DIRECTOR DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU		

GENERAL CONSTRUCTION NOTES

- ALL CONSTRUCTION WORK SHALL BE DONE IN ACCORDANCE WITH THE "STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION", SEPTEMBER 1984, AS AMENDED, AND THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" SEPTEMBER 1986, OF THE DEPARTMENT OF PUBLIC WORKS, CITY AND COUNTY OF HONOLULU, AND THE REVISED ORDINANCES OF HONOLULU, 1990, AS AMENDED.
- THE UNDERGROUND PIPES, CABLES OR DUCTILES KNOWN TO EXIST BY THE ENGINEER FROM HIS/HER SEARCH OF RECORDS ARE INDICATED ON PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS AND DEPTHS OF THE FACILITIES AND EXERCISE PROPER CARE IN EXCAVATING IN THE AREA. WHEREVER CONNECTIONS OF NEW UTILITIES TO EXISTING UTILITIES ARE SHOWN ON THE PLAN, THE CONTRACTOR SHALL EXPOSE THE EXISTING LINES AT THE PROPOSED CONNECTIONS TO VERIFY THEIR LOCATIONS AND DEPTHS PRIOR TO EXCAVATION FOR THE NEW LINES.
- NO CONTRACTOR SHALL PERFORM ANY CONSTRUCTION OPERATION SO AS TO CAUSE FALLING ROCKS, SOIL OR DEBRIS IN ANY FORM TO FALL, SLIDE OR FLOW INTO EXISTING CITY DRAINAGE SYSTEMS, OR ADJOINING PROPERTIES, STREETS OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATIONS OCCUR, THE CONTRACTOR MAY BE CITED AND THE CONTRACTOR SHALL IMMEDIATELY MAKE ALL REMEDIAL ACTIONS NECESSARY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE WATER QUALITY AND WATER POLLUTION CONTROL STANDARDS CONTAINED IN HAWAII ADMINISTRATIVE RULES, CHAPTER 11-54, "WATER QUALITY STANDARDS" AND CHAPTER 11-55, "WATER POLLUTION CONTROL", AS WELL AS CHAPTER 14 OF THE REVISED ORDINANCES OF HONOLULU, AS AMENDED. BEST MANAGEMENT PRACTICES SHALL BE EMPLOYED AT ALL TIMES DURING CONSTRUCTION.
- THE EXISTENCE AND LOCATION OF UNDERGROUND UTILITIES, APPURTENANCES AND STRUCTURES ARE BASED ON AVAILABLE RECORDS, VERIFIED WHENEVER POSSIBLE BY FIELD SURVEYS. NO GUARANTEE IS MADE ON THE ACCURACY OR COMPLETENESS OF SAID INFORMATION. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY THE LOCATION OF ALL EXISTING UTILITIES AND SHALL PROTECT SUCH UTILITIES AT ALL TIMES. DAMAGE TO EXISTING UTILITIES AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE. INJURY TO PERSONNEL RESULTING FROM CONTACT WITH THE EXISTING UTILITIES SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
- ALL DIMENSIONS AND DETAILS SHOWN ON THE DRAWINGS SHALL BE CHECKED AND VERIFIED PRIOR TO THE START OF CONSTRUCTION, AND ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION.
- PURSUANT TO CHAPTER 6E, HRS, IN THE EVENT ANY ARTIFACTS OR HUMAN REMAINS ARE UNCOVERED DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY SUSPEND WORK AND NOTIFY THE HONOLULU POLICE DEPARTMENT, THE STATE DEPARTMENT OF LAND AND NATURAL RESOURCES--HISTORIC PRESERVATION DIVISION (692-8015). IN ADDITION, THE CONTRACTOR SHALL INFORM THE RESPONSIBLE CITY AGENCY FOR CITY PROJECTS.
- CONFINED SPACE
 - FOR ENTRY BY CITY PERSONNEL, INCLUDING INSPECTORS, INTO A PERMIT REQUIRED CONFINED SPACE AS DEFINED IN 29 CFR PART 1910.146(B), THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING:
 - ALL SAFETY EQUIPMENT REQUIRED BY THE CONFINED SPACE REGULATIONS APPLICABLE TO ALL PARTIES OTHER THAN THE CONSTRUCTION INDUSTRY, TO INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING:
 - FULL BODY HARNESES FOR UP TO TWO PERSONNEL.
 - LIFELINE AND ASSOCIATED CLIPS.
 - INGRESS/EGRESS AND FALL PROTECTION EQUIPMENT.
 - TWO-WAY RADIOS (WALKIE-TALKIES) IF OUT OF LINE-OF-SIGHT.
 - EMERGENCY (ESCAPE) RESPIRATOR (10 MINUTE DURATION).
 - CELLULAR TELEPHONE TO CALL FOR EMERGENCY ASSISTANCE.
 - CONTINUOUS GAS DETECTOR (CALIBRATED) TO MEASURE OXYGEN, HYDROGEN SULFIDE, CARBON MONOXIDE AND FLAMMABLES (CAPABLE OF MONITORING AT A DISTANCE OF AT LEAST 20-FEET AWAY).
 - PERSONAL MULTI-GAS DETECTOR TO BE CARRIED BY INSPECTOR.
 - CONTINUOUS FORCED AIR VENTILATION ADEQUATE TO PROVIDE SAFE ENTRY CONDITIONS.
 - ONE ATTENDANT/RESCUE PERSONNEL TOPSIDE (TWO, IF CONDITIONS WARRANT IT).
- FOR BENCH MARK, SEE SHEET C-4.

NOTES FOR CONSTRUCTION WITHIN CITY RIGHT-OF-WAY

- THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS REQUIRED FOR THE PROTECTION OF PUBLIC HEALTH AND SAFETY AND ENVIRONMENTAL QUALITY.
- THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AND ITS SURROUNDING AREAS FREE FROM DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH. THE CITY AND COUNTY OF HONOLULU SHALL REQUIRE SUPPLEMENTARY MEASURES AS NECESSARY.

PUBLIC HEALTH, SAFETY, AND CONVENIENCE NOTES

- THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY CONSTRUCTION PERMITS.
- THE CONTRACTOR SHALL PROVIDE ACCESS TO AND FROM DRIVEWAYS AND PUBLIC STREETS DURING NON-WORKING HOURS.
- THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS REQUIRED FOR THE PROTECTION OF PUBLIC HEALTH AND SAFETY AND ENVIRONMENTAL QUALITY.
- ALL EXISTING UTILITIES SHALL BE PROTECTED AT ALL TIMES BY THE CONTRACTOR DURING CONSTRUCTION, AND ANY DAMAGE TO THEM SHALL BE REPAIRED AND PAID FOR BY THE CONTRACTOR.

TRAFFIC NOTES FOR WORK ON CITY AND COUNTY STREETS

- A PERMIT SHALL BE OBTAINED FROM THE DEPARTMENT OF TRANSPORTATION SERVICES BEFORE WORK ON ANY PORTION OF A PUBLIC STREET OR HIGHWAY MAY BEGIN. CONSTRUCTION TRAFFIC CONTROL PLANS APPROVED BY THE DEPARTMENT OF TRANSPORTATION SERVICES AND/OR THE DEPARTMENT OF PLANNING AND PERMITTING MUST BE PROVIDED WHEN APPLYING FOR THE PERMIT.
- THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS AND OTHER PROTECTIVE FACILITIES, WHICH SHALL CONFORM WITH THE "HAWAII ADMINISTRATION RULES GOVERNING THE USE OF TRAFFIC CONTROL DEVICES AT WORK SITES ON OR ADJACENT TO PUBLIC STREETS AND HIGHWAYS" ADOPTED BY THE DIRECTOR OF TRANSPORTATION, AND THE CURRENT U.S. FEDERAL HIGHWAYS ADMINISTRATION'S "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS, PART VI - TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS".
- WORK ON ANY CITY STREET AREA MAY BE PERFORMED ONLY BETWEEN THE HOURS OF 8:30 A.M. TO 3:30 P.M., MONDAY THROUGH FRIDAY, UNLESS OTHERWISE PERMITTED BY THE DEPARTMENT OF TRANSPORTATION SERVICES.
- DURING WORKING HOURS, THE CONTRACTOR SHALL PROVIDE FOR THROUGH TRAFFIC. DURING NON-WORKING HOURS, ALL TRENCHES SHALL BE COVERED WITH A SAFE NON-SKID BRIDGING MATERIAL AND ALL LANES SHALL BE OPEN TO TRAFFIC.
- AS REQUIRED BY THE DEPARTMENT OF TRANSPORTATION SERVICES, THE CONTRACTOR SHALL PROVIDE OFF-DUTY POLICE OFFICERS TO CONTROL THE FLOW OF TRAFFIC.
- WHERE PEDESTRIAN WALKWAYS EXIST, THEY SHALL BE MAINTAINED IN PASSABLE CONDITION IN ACCORDANCE WITH ADAAG 4.1.1(4) AND 4.3, OR OTHER FACILITIES FOR PEDESTRIANS SHALL BE PROVIDED. PASSAGE BETWEEN WALKWAYS AT INTERSECTIONS SHALL LIKEWISE BE PROVIDED.
- DRIVEWAYS SHALL BE KEPT OPEN UNLESS THE OWNERS OF THE PROPERTY USING THESE RIGHTS-OF-WAY ARE OTHERWISE PROVIDED FOR SATISFACTORILY.
- THE CONTRACTOR SHALL REFERENCE TO THE APPROVAL OF THE DEPARTMENT OF TRANSPORTATION SERVICES AND THE DEPARTMENT OF PLANNING AND PERMITTING, ALL EXISTING TRAFFIC SIGNS, POSTS AND PAVEMENT MARKINGS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR SHALL REPLACE OR REPAIR ALL TRAFFIC SIGNS, POSTS AND PAVEMENT MARKINGS DISTURBED BY HIS ACTIVITIES.
- THE CONTRACTOR SHALL NOTIFY THE DEPARTMENT OF PLANNING AND PERMITTING AT 768-8084 ONE (1) WEEK PRIOR TO ANY WORK TO BE DONE ON SIGNS, POSTS AND PAVEMENT MARKINGS.
- NO EQUIPMENT SHALL BE STORED WITHIN STREET RIGHTS-OF-WAY EXCEPT AT LOCATIONS DESIGNATED IN WRITING AND APPROVED BY THE DEPARTMENT OF TRANSPORTATION SERVICES.
- THE DEPARTMENT OF DESIGN AND CONSTRUCTION SHALL ENSURE THAT THE CONTRACTOR INSTALLS THE CONSTRUCTION TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH THE MUTCD AND HAWAII ADMINISTRATION RULES AS SPECIFIED IN TRAFFIC NOTE #2.

ABBREVIATIONS

- A.C. ASPHALT CONCRETE
- BC BOTTOM CURB
- BOT. BOTTOM
- BW BOTTOM WALL
- CMU CONCRETE MASONRY UNIT
- CONC. CONCRETE
- D DIAMETER OR DRAIN
- D.I. DRAIN INLET
- DWY. DRIVEWAY
- E, ELEC. ELECTRIC
- ELEV. ELEVATION
- EXIST EXISTING
- F.H. FIRE HYDRANT
- FL FLOW LINE
- FM FORCE MAIN
- FT FEET
- G GAS
- GMH GAS MANHOLE
- GND. GROUND
- G.P. GUARD POST, GUY POLE
- GV GATE POST GAS VALVE
- G.W. GUY WIRE
- H HEIGHT
- H.B. HOSE BIB
- IN INCH
- INV. INVERT
- L.P. LAMP POLE
- MH MANHOLE
- MIN MINIMUM
- O/H OVERHEAD
- OC ON CENTER
- PAV'T. PAVEMENT
- S SEWER OR SLOPE
- SDMH STORM DRAIN MANHOLE
- S.L. STREET LIGHT
- SLB STREET LIGHT BOX
- SMH SEWER MANHOLE
- STA. STATION
- TC TOP CURB
- TDC TOP DROP CURB
- T, TEL. TELEPHONE
- TMK TAX MAP KEY
- TV TOP VALVE
- TW TOP WALL
- TYP. TYPICAL
- U.P. UTILITY POLE
- W WATER
- WM WATER METER
- WMH WATER MANHOLE
- WV WATER VALVE BOX

LEGEND

-  18 INCH DRAIN LINE
-  8 INCH SEWER LINE
-  8 INCH WATER LINE
-  4 INCH GAS LINE
-  OVERHEAD UTILITY LINE
-  FIRE HYDRANT
-  SOIL BORING LOCATION
-  WIRE MESH
-  ROCKFALL BARRIER
-  CONCRETE BARRIER
-  PROPERTY LINE/RIGHT-OF-WAY

CITY PLANNING DEPARTMENT, PLS SEND MAIL TO: 1500 KALANOAULI DRIVE, HONOLULU, HI 96813
 CITY PLANNING DEPARTMENT, PLS SEND MAIL TO: 1500 KALANOAULI DRIVE, HONOLULU, HI 96813
 PLUT DATE: November 30, 2010 @ 12:49:07 pm

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET				
GENERAL NOTES				
DESIGN	ARN	APPROVED:	C-1 SHEET 2 OF 20 SHEETS	
DRAWN	BCW			
CHECKED	MXD			
DATE	NOVEMBER 2010	CHEF, CIVIL DIVISION, D.D.C.	DATE	
PROJECT NO.				



ARDAN R. NIRODI
 LICENSED PROFESSIONAL ENGINEER
 No. 6198-C
 HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

4/30/12
EXPIRATION DATE OF LICENSE

SIGNATURE



FILE	POCKET	FOLDER	NUMBER

DRAPED WIRE MESH SYSTEM

- TRIM ALL VEGETATION FLUSH TO THE GROUND, SCALE ALL LOOSE AND UNSTABLE ROCKS, DEBRIS, SOILS OR ANY OTHER MATERIAL ENCOUNTERED ON THE SLOPE, LEVEL SLOPE SURFACE, TRIM BACK OVERHANGS, AND SMOOTHEN SHARP GRADE BREAKS PRIOR TO INSTALLING THE WIRE MESH
- THE DISTANCE FROM THE WIRE MESH PANEL TO THE SLOPE FACE SHALL NOT BE GREATER THAN 1.5 FEET MEASURED PERPENDICULARLY TO THE MESH.
- ALL MATERIAL AND DEBRIS REMOVED FROM THE SLOPE SHALL BE THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF OFF-SITE AT AN APPROVED DISPOSAL LOCATION.
- STAKE-OUT THE TOP OF THE WIRE MESH SYSTEM AND THE ANCHOR LOCATIONS IN THE FIELD. DO NOT BEGIN DRILLING UNTIL THE ENGINEER HAS REVIEWED AND APPROVED THE LOCATION OF THE WIRE MESH SYSTEM. THIS WORK SHALL BE INCIDENTAL TO THE WIRE MESH SYSTEM.
- PROVIDE THE ENGINEER A SCHEDULE OF ANCHOR GROUTING AT LEAST 5 DAYS PRIOR TO GROUTING. ALL GROUTING OPERATIONS SHALL BE PERFORMED ACCORDING TO THE SCHEDULE AND SHALL BE OBSERVED BY THE ENGINEER. GROUTING PERFORMED NOT IN THE PRESENCE OF THE ENGINEER SHALL BE GROUNDS FOR REJECTION OF THE ANCHOR. NOTIFY THE ENGINEER IN WRITING AT LEAST 3 WORKING DAYS PRIOR OR ANY CHANGES TO THE SCHEDULED GROUTING OPERATION.
- TEST 25 PERCENT OF THE ANCHORS SELECTED BY THE ENGINEER. SHOULD 25 PERCENT OR MORE OF THE ANCHORS TESTED FAIL, TEST ALL ANCHORS AT NO INCREASE IN CONTRACT PRICE OR CONTRACT TIME. ALL ANCHORS THAT FAIL SHALL BE REPLACED BY THE CONTRACTOR AT NO INCREASE IN CONTRACT PRICE OR CONTRACT TIME. GIVE THE ENGINEER A MINIMUM OF 3 WORKING DAYS ADVANCE NOTICE PRIOR TO EACH LOAD TESTING.
- PLACE THE WIRE MESH PANELS ON THE SLOPE IN A MANNER THAT WILL FOLLOW THE CONTOURS OF THE SLOPE AND MINIMIZE GAPS AND LARGE VOIDS BETWEEN THE MESH AND THE GROUND SURFACE.
- WHEN PERMITTED BY THE ENGINEER, SUPPLEMENTAL ANCHORS MAY BE INSTALLED WITH A MINIMUM DEPTH OF 4 FEET IN STIFF SOIL OR 2 FEET IN BEDROCK, WITH A 1/8 INCH STAINLESS STEEL BREAK-AWAY CONNECTOR CABLE TO PULL DRAPED WIRE MESH DOWN WHERE A VOID UNDER THE MESH IS OVER 1.5 FEET HIGH OR OVER 8 CUBIC FOOT VOLUME.

CONCRETE BARRIER

- ASTM A-36 STEEL SHALL BE USED FOR THE CONNECTION PIN, CONNECTION LOOPS AND STABILIZATION PINS. A ONE PIECE PIN WITH A 3" ROUNDED TOP MAY BE USED IN PLACE OF THE DETAILED CONNECTION PIN IF THE ONE PIECE PIN MEETS ASTM A-36 REQUIREMENTS.
- A 4" WHITE PVC SLEEVE MAY BE USED TO FORM THE LIFTING HOLE AND IF USED THE SLEEVE IS TO BE LEFT IN PLACE.
- CONCRETE SHALL BE 6000 PSI AND REINFORCING SHALL BE GRADE 60.
- IDENTIFICATION AND DATE OF DESIGN WILL BE AS FOLLOWS:
PROPERTY OF
C&C OF HONOLULU
OCT 2001

ROCKFALL IMPACT BARRIER SYSTEM

- PRIOR TO ORDERING THE MATERIALS, STAKE-OUT THE PROPOSED BARRIER ALIGNMENT IN THE FIELD. DO NOT ORDER MATERIALS OR BEGIN CONSTRUCTION UNTIL THE BARRIER ALIGNMENT HAS BEEN REVIEWED IN THE FIELD AND APPROVED BY THE ENGINEER.
- THE CONTRACTOR SHALL FURNISH MATERIALS, LABOR AND EQUIPMENT NECESSARY TO INSTALL THE ROCKFALL PROTECTION SYSTEM AS SHOWN ON THE PLANS AND AS SPECIFIED BELOW, IN PLACE COMPLETE AND OPERATIONAL.
- THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL SHOP DRAWINGS, CALCULATIONS, AND TEST RESULTS FOR THE ROCKFALL IMPACT BARRIER SYSTEM TO BE USED. THE CONTRACTOR SHALL ALLOW THE ENGINEER FOURTEEN (14) CALENDAR DAYS AFTER RECEIPT OF THE SUBMITTAL TO REVIEW THE DOCUMENTS PRIOR TO ANY FABRICATION AND SECURING OF MATERIALS. FABRICATION OF IMPACT BARRIER SHALL COMMENCE ONLY AFTER THE REVIEW AND APPROVAL OF THE WORKING DRAWINGS BY THE ENGINEER.
- THE POST FOUNDATIONS SHALL BE DESIGNED BY A CIVIL ENGINEER FAMILIAR WITH THE PROPOSED ROCKFALL SYSTEM AND LICENSED IN THE STATE OF HAWAII AT THE CONTRACTOR'S EXPENSE. SUBMIT SHOP DRAWINGS OF THE POST FOUNDATIONS TO THE ENGINEER FOR REVIEW AND APPROVAL. POST FOUNDATIONS SHALL BE CONSTRUCTED OF STEEL REINFORCED CONCRETE AND SHALL BE DESIGNED BASED ON THE PROJECT GEOTECHNICAL REPORT BY HIRATA & ASSOCIATES, INC. DATED JANUARY 20, 2010.
- EFFECTIVE HEIGHT OF THE ROCKFALL IMPACT BARRIER IS DETERMINED AS THE OVERALL HEIGHT FROM THE KNOWN EXISTING GRADE TO THE TOP SUPPORTING ROPE OF THE BARRIER, MEASURED PERPENDICULARLY TO THE EXISTING SLOPE SURFACE. IF CONTRACTOR'S CONSTRUCTION OPERATIONS RESULT IN A LOWER FINISH GRADE AT POST LOCATION(S), THEN EFFECTIVE HEIGHT SHALL BE ASSUMED FROM THE PRE-EXISTING GRADE AT THE POST LOCATION TO TOP SUPPORTING ROPE.
- THE IMPACT FENCE SHALL MEET THE FOLLOWING:
 - MATERIALS AND FABRICATION SHALL BE TO INDUSTRY STANDARDS AND SHALL BE BY AN ESTABLISHED MANUFACTURER.
 - CAPABLE OF BEING INSTALLED ALONG A SLOPED SITE AND UP STEEP GRADES.
 - ROCKFALL IMPACT BARRIER SYSTEM MANUFACTURER SHALL PROVIDE WORKING LOADS FOR ALL ANCHORS. ANCHORS SHALL BE FIELD TESTED TO 133% OF SPECIFIED WORKING LOADS.
 - POST FOUNDATIONS SHALL BE CONSTRUCTED OF STEEL REINFORCED CONCRETE.
 - NO METAL PORTIONS OF THE FENCE SYSTEM SHALL BE IN CONTACT WITH EARTH.
 - ALL STEEL COMPONENTS SHALL BE HOT DIPPED GALVANIZED COATED.
 - ALL EXPOSED SURFACES SHALL BE POWDER COATED FLAT BLACK TO 3 MILS THICKNESS.
- ROCKFALL IMPACT BARRIER SYSTEM SHALL CONSIST OF, BUT NOT LIMITED TO, THE FOLLOWING MAIN COMPONENTS: STEEL REINFORCED CONCRETE POST FOUNDATIONS; GROUND PLATES; STEEL POSTS; STEEL NET; CHAIN LINK MESH NETTING; TOP AND BOTTOM SUPPORT ROPES, AND GROUND ANCHORS.
- ROCKFALL IMPACT BARRIER SYSTEM SHALL BE ASSEMBLED AND INSTALLED PER STRICT ADHERENCE TO THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.
- PROVIDE THE ENGINEER A SCHEDULE OF ANCHOR GROUTING AT LEAST 5 DAYS PRIOR TO GROUTING. ALL GROUTING OPERATIONS SHALL BE PERFORMED ACCORDING TO THE SCHEDULE AND SHALL BE OBSERVED BY THE ENGINEER. GROUTING PERFORMED NOT IN THE PRESENCE OF THE ENGINEER SHALL BE GROUNDS FOR REJECTION OF THE ANCHOR. NOTIFY THE ENGINEER IN WRITING AT LEAST 3 WORKING DAYS PRIOR OR ANY CHANGES TO THE SCHEDULED GROUTING OPERATION.

PLAN NUMBER: P15501-001-0100-PROTECTIVE ROCK MITIGATION
 FILED: November 30, 2010 @ 12:49:27 pm

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

4/30/12
EXPIRATION DATE OF LICENSE

AECOM

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

**ROCKSLIDE MITIGATIVE IMPROVEMENTS
ALONG PROSPECT STREET**

ROCKFALL MITIGATION NOTES

DESIGN	ARN	APPROVED:	C-2
DRAWN	BCW	_____ DATE CHIEF, CIVIL DIVISION, D.D.C.	SHEET 3
CHECKED	MXD		of 20 SHEETS
DATE	NOVEMBER 2010	PROJECT NO. _____	

FILE	POCKET	FOLDER	NUMBER

TRUE NORTH
SCALE: 1" = 20ft.

TMK: 2-2-005:001

BEGIN ROCKFALL BARRIER SYSTEM NO. 1
(6FT HIGH, 90 FT-TON MIN CAPACITY)

END ROCKFALL BARRIER SYSTEM NO. 1 (6FT
HIGH, 90 FT-TON MIN CAPACITY)
BEGIN ROCKFALL BARRIER SYSTEM NO. 2
(15FT HIGH, 365 FT-TON MIN CAPACITY)

DEMOLISH AND REMOVE
EXIST BOUNDER

ML SEE DWG. C-5

BENCHMARK
(1" CUT ON CURB)
677.710 N.
327.83 W.
ELEV.=197.73

BORING
LOCATION
B-6

BORING
LOCATION
B-5

INSTALL NCHRP 350 INERTIAL BARRIER
END TREATMENT SYSTEM (ACZ-350 TL-2
CRASH CUSHION BY ENERGY ABSORPTION
SYSTEMS INC., OR APPROVED EQUAL), SEE
SHEET C-13 FOR BARRIER DETAILS

BEGIN CONCRETE BARRIERS, SEE
SHEET C-12 FOR BARRIER DETAILS

SITE PLAN 1
SCALE: 1" = 20'-0"

0 20 40 60
SCALE: 1" = 20' FEET

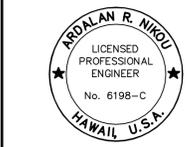
REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

**ROCKSLIDE MITIGATIVE IMPROVEMENTS
ALONG PROSPECT STREET**

SITE PLAN 1

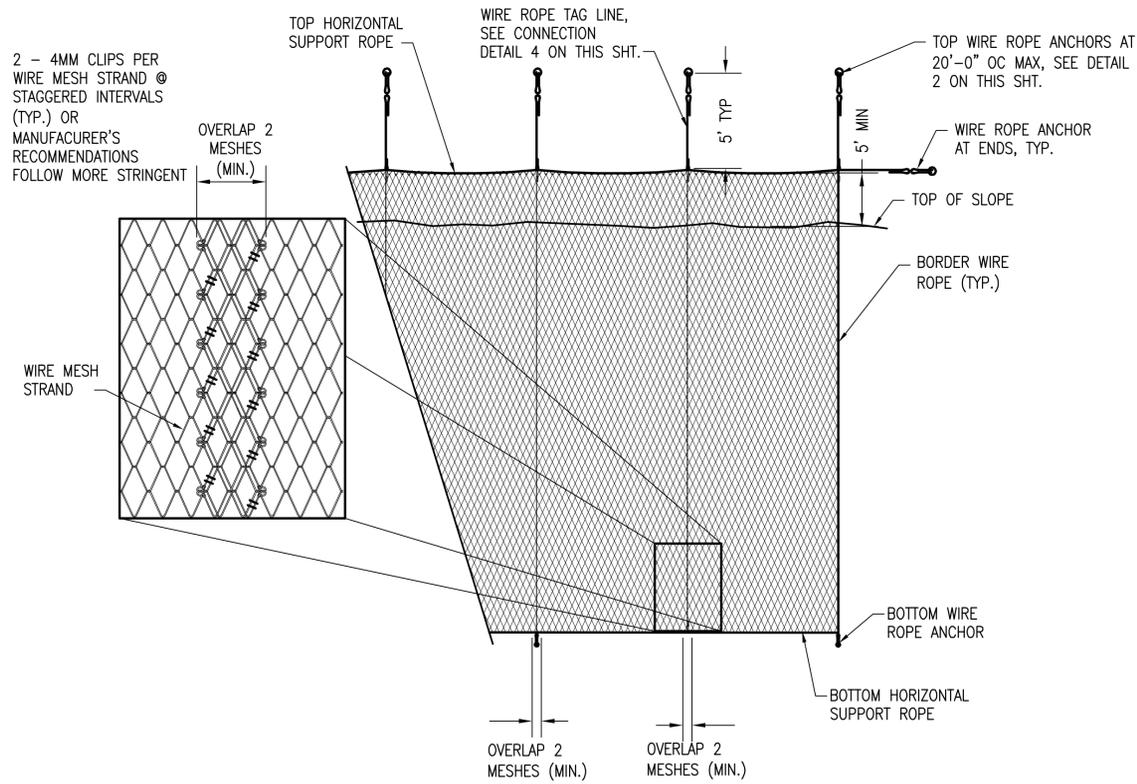
DESIGN	ARN	APPROVED:	C-4 SHEET 5 OF 20 SHEETS
DRAWN	BCW	CHEF, CIVIL DIVISION, D.D.C.	
CHECKED	MXD	DATE	
DATE	NOVEMBER 2010	PROJECT NO.	



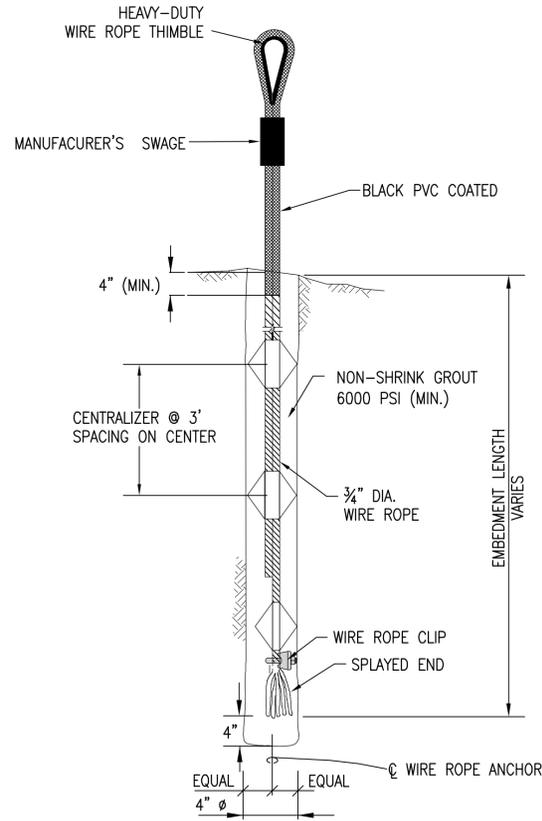
THIS WORK WAS PREPARED BY ME OR UNDER
MY SUPERVISION AND CONSTRUCTION OF THIS
PROJECT WILL BE UNDER MY OBSERVATION.

4/30/12
EXPIRATION DATE
OF LICENSE
AECOM

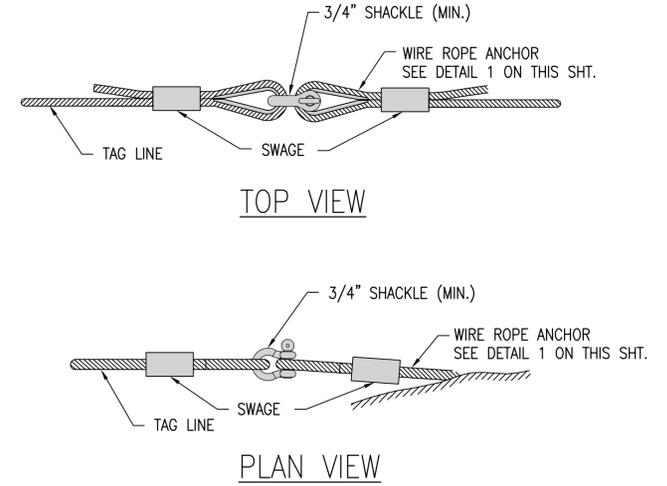
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 PLOT BY: [unreadable]
 PLOT SCALE: 1" = 20'
 PLOT SHEET: 5 OF 20
 PLOT PROJECT: ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET
 PLOT DRAWING: SITE PLAN 1



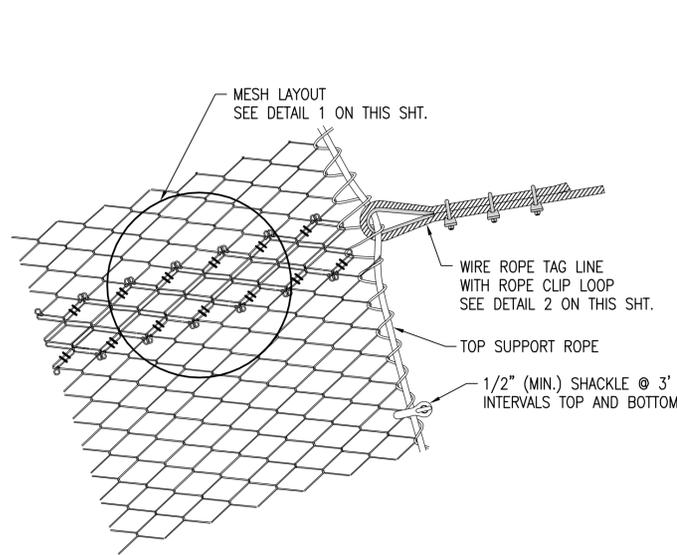
1 TYPICAL MESH LAYOUT
C-9 NOT TO SCALE



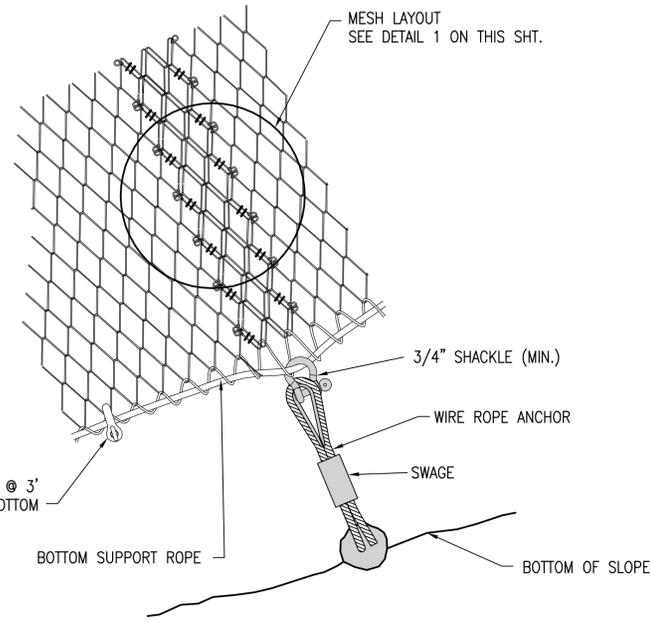
2 WIRE ROPE ANCHOR
C-9 NOT TO SCALE



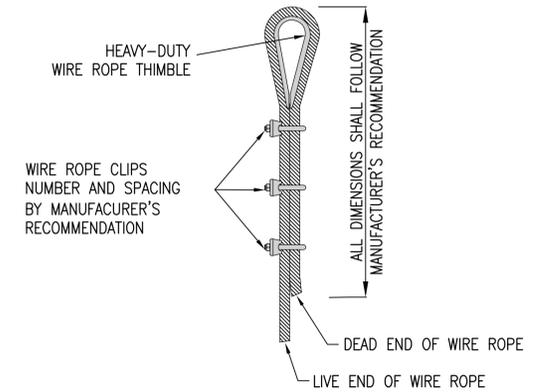
3 TOP WIRE ROPE ANCHOR TO TAG LINE CONNECTION
C-9 NOT TO SCALE



4 TAG LINE TO TOP WIRE ROPE
C-9 NOT TO SCALE



5 BOTTOM ANCHOR TO BOTTOM WIRE ROPE CONNECTION
C-9 NOT TO SCALE



6 WIRE ROPE CLIP LOOP
C-9 NOT TO SCALE

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

ARJALAN R. NIRODI
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

4/30/12
EXPIRATION DATE OF LICENSE

SIGNATURE: **AECOM**

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

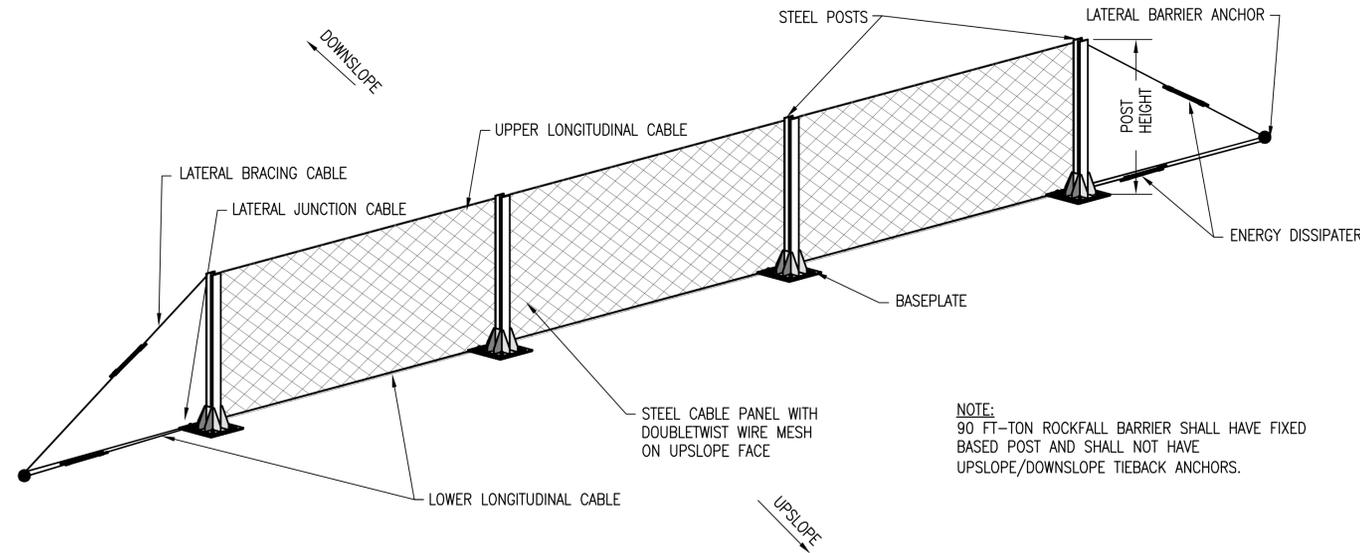
ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET

DRAPED WIRE MESH DETAILS

DESIGN: ARN	APPROVED:	C-9 SHEET 10 OF 20 SHEETS
DRAWN: BCW	CHEF, CIVIL DIVISION, D.D.C.	
CHECKED: MXD	DATE	
DATE: NOVEMBER 2010	PROJECT NO.	

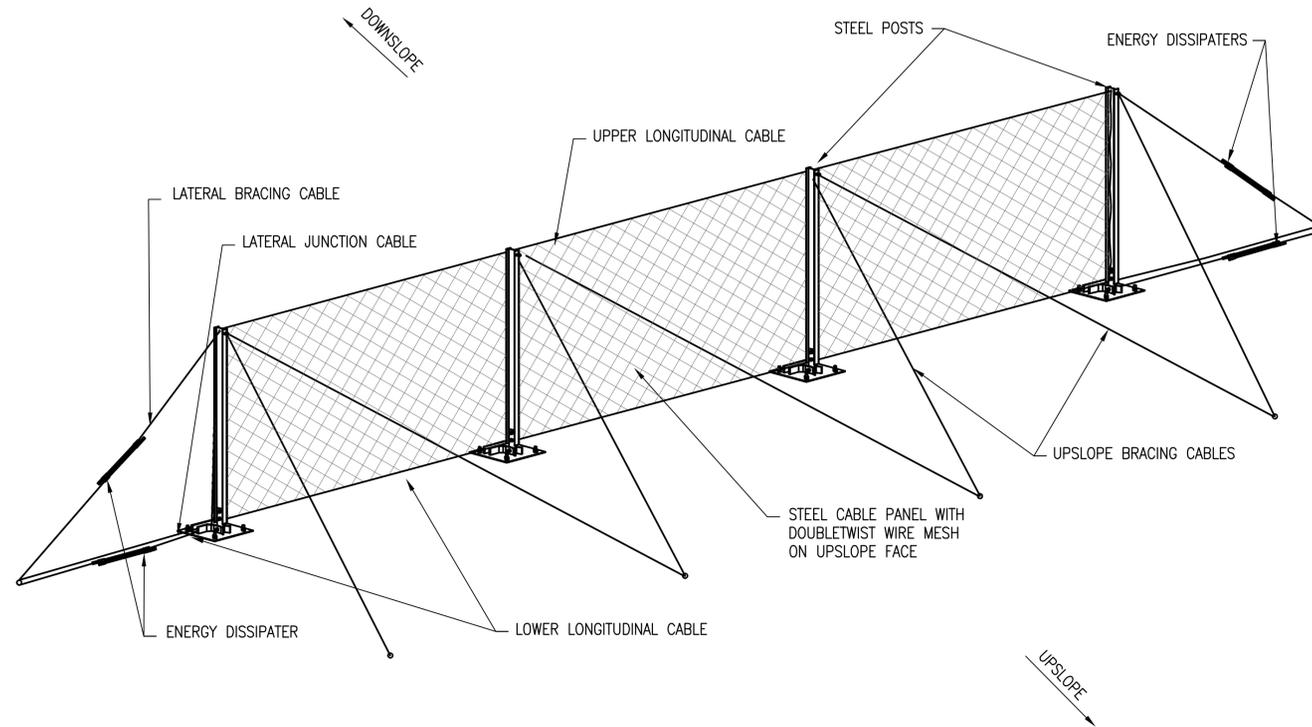
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 PLOT DATE: November 30, 2010 @ 1:26:21 pm

FILE	POCKET	FOLDER	NUMBER



NOTE:
90 FT-TON ROCKFALL BARRIER SHALL HAVE FIXED BASED POST AND SHALL NOT HAVE UPSLOPE/DOWNSLOPE TIEBACK ANCHORS.

1 90 FT-TON ROCKFALL BARRIER SYSTEM
C-10 NOT TO SCALE



2 365 FT-TON ROCKFALL BARRIER SYSTEM
C-10 NOT TO SCALE

NOTES:

- FENCE DETAILS SHOWN HERE ARE FOR MINIMUM REQUIREMENTS AND GENERAL GUIDANCE. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S AUTHORIZED DESIGN DRAWINGS AND DETAILS.
- SUBMIT ROCK BARRIER FENCE SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL.
- SUBMIT POST FOUNDATION DESIGN TO THE ENGINEER FOR APPROVAL. POST FOUNDATIONS SHALL BE DESIGNED AND STAMPED BY A CIVIL ENGINEER LICENSED IN HAWAII.
- CONTRACTOR SHALL CONFIRM COLOR OF THE ROCK PROTECTION FENCE WITH THE ENGINEER IN WRITING PRIOR TO ORDERING AND PURCHASING OF THE FENCE.
- CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING PULL OUT REQUIREMENTS FOR ALL ANCHORS.

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

**ROCKSLIDE MITIGATIVE IMPROVEMENTS
ALONG PROSPECT STREET**

ROCKFALL BARRIER SYSTEM DETAILS

DESIGN	ARN	APPROVED:	C-10 SHEET 11 OF 20 SHEETS
DRAWN	BCW	DATE	
CHECKED	MXD	CHEF, CIVIL DIVISION, D.D.C.	
DATE	NOVEMBER 2010	DATE	
PROJECT NO.			

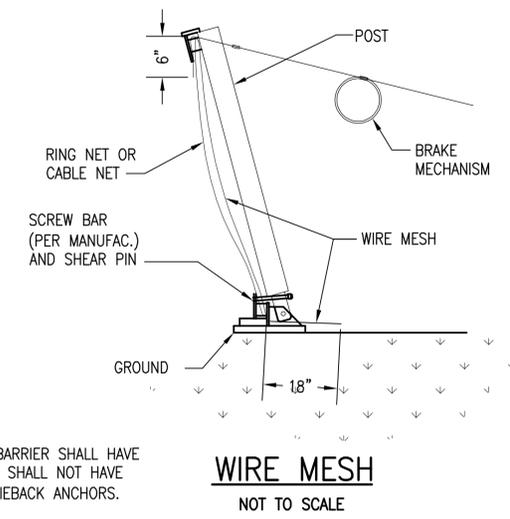
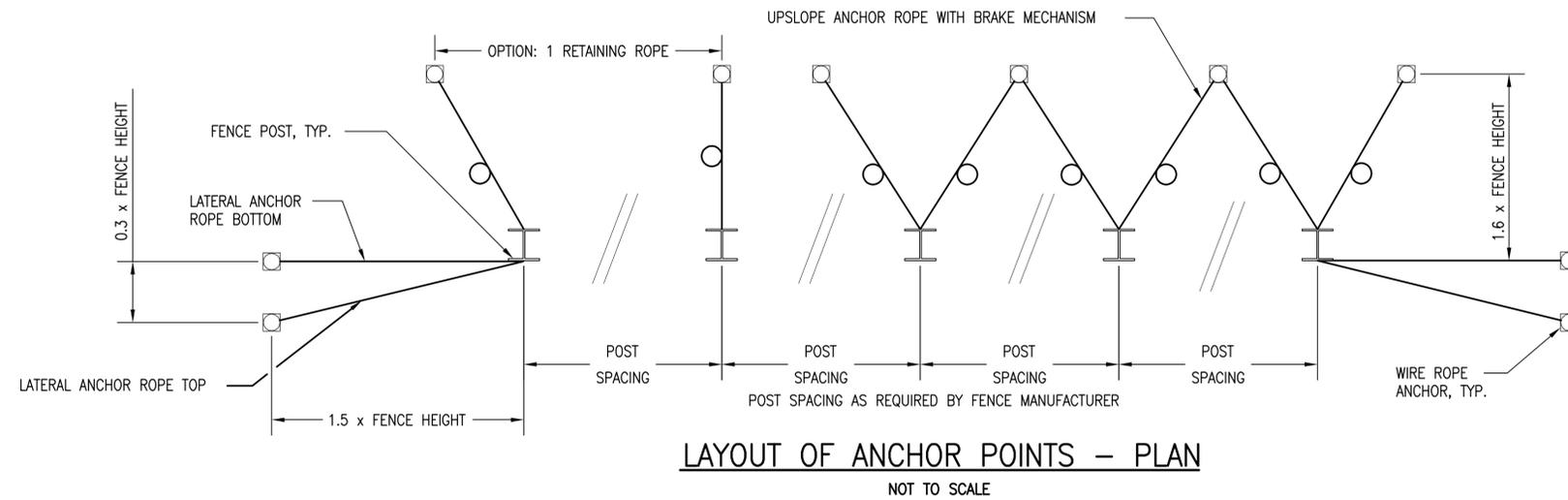
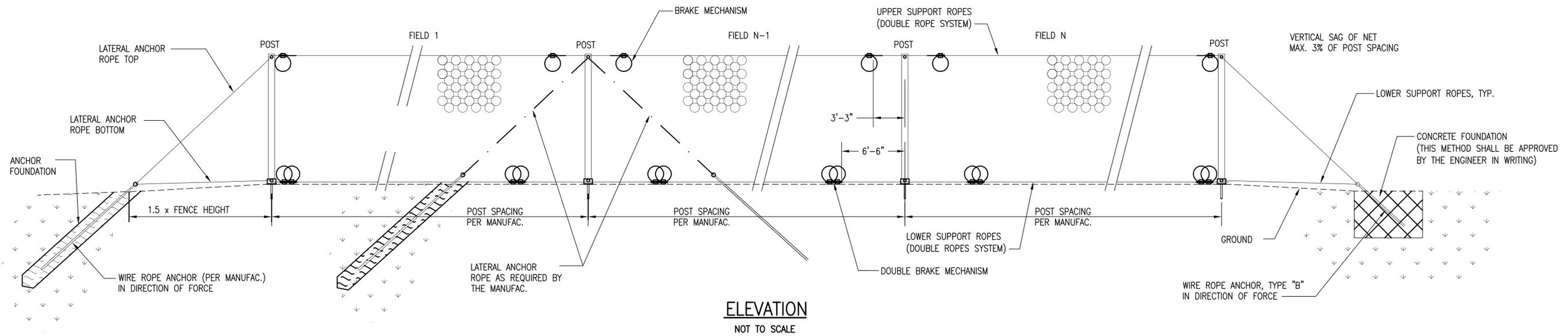


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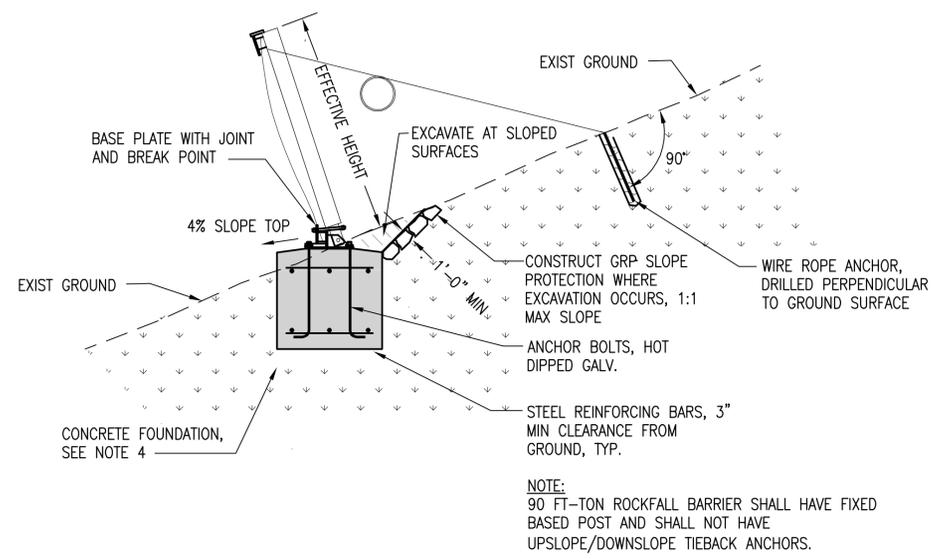
SIGNATURE: _____ EXPIRATION DATE OF LICENSE: 4/30/12



PLOT DATE: November 30, 2010 @ 1:25:04 pm
 PLOT DATE: November 30, 2010 @ 1:25:04 pm
 PLOT DATE: November 30, 2010 @ 1:25:04 pm



NOTE:
90 FT-TON ROCKFALL BARRIER SHALL HAVE FIXED BASED POST AND SHALL NOT HAVE UPSLOPE/DOWNSLOPE TIEBACK ANCHORS.



NOTE:
90 FT-TON ROCKFALL BARRIER SHALL HAVE FIXED BASED POST AND SHALL NOT HAVE UPSLOPE/DOWNSLOPE TIEBACK ANCHORS.

- NOTES:**
- FENCE DETAILS SHOWN HERE ARE FOR MINIMUM REQUIREMENTS AND GENERAL GUIDANCE. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S AUTHORIZED DESIGN DRAWINGS AND DETAILS.
 - 90 FT-TON ROCKFALL BARRIER SHALL HAVE FIXED BASED POST AND SHALL NOT HAVE UPSLOPE/DOWNSLOPE TIEBACK ANCHORS.
 - SUBMIT ROCK BARRIER FENCE SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL.
 - CONTRACTOR IS RESPONSIBLE TO PROVIDE A POST FOUNDATION DESIGN TO MEET THE REQUIREMENTS OF THE PROPOSED FENCE SYSTEM. SUBMIT POST FOUNDATION DESIGN TO THE ENGINEER FOR APPROVAL. POST FOUNDATIONS SHALL BE DESIGNED AND STAMPED BY A CIVIL ENGINEER LICENSED IN HAWAII.
 - CONTRACTOR SHALL CONFIRM COLOR OF THE ROCK PROTECTION FENCE WITH THE ENGINEER IN WRITING PRIOR TO ORDERING AND PURCHASING OF THE FENCE.
 - CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING PULL OUT REQUIREMENTS FOR ALL ANCHORS.
 - ALL ROCKFALL BARRIER FENCE COMPONENTS INCLUDING POST FOUNDATIONS AND GROUND ANCHORS, SHALL BE CONSTRUCTED WITHIN THE CITY RIGHT-OF-WAY.

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET ROCKFALL BARRIER SYSTEM DETAILS				
DESIGN	ARN	APPROVED:	C-11 SHEET 12 OF 20 SHEETS	
DRAWN	BCW			
CHECKED	MXD			
DATE	NOVEMBER 2010	CHEF, CIVIL DIVISION, D.D.C.		
PROJECT NO.				

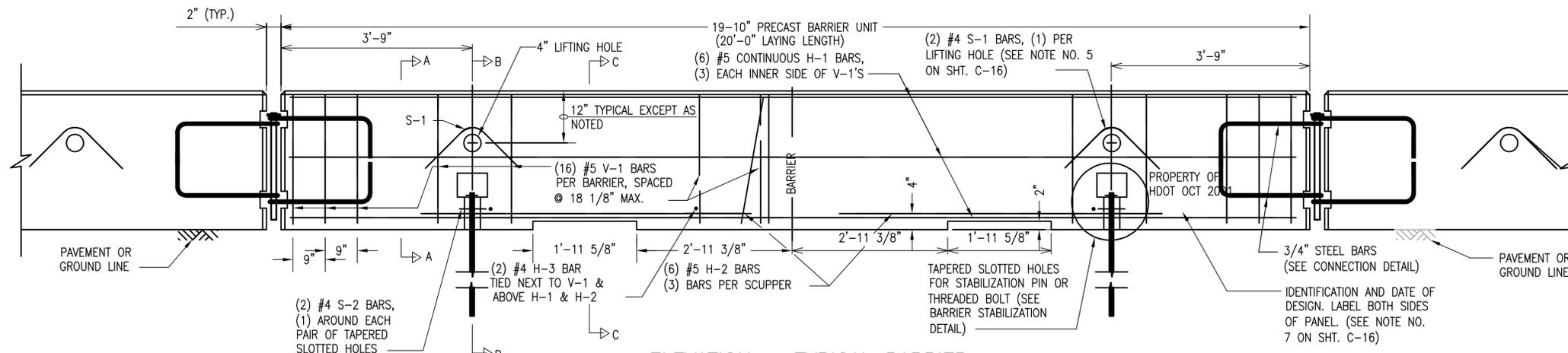
ARDALAN R. NIKRO
 LICENSED PROFESSIONAL ENGINEER
 No. 6198-C
 HAWAII, U.S.A.

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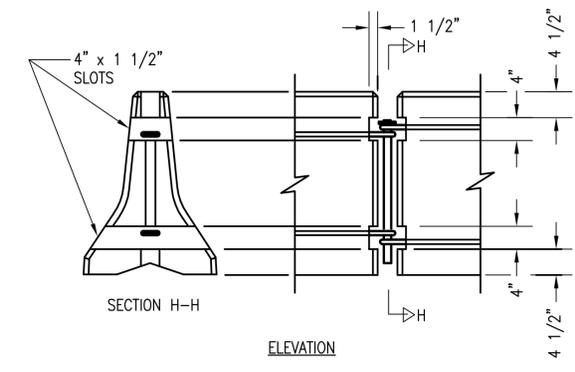
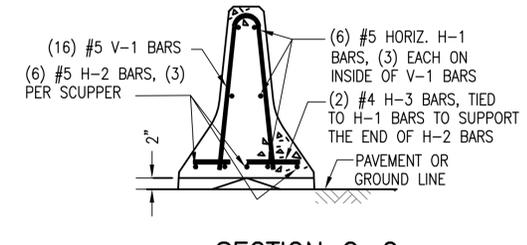
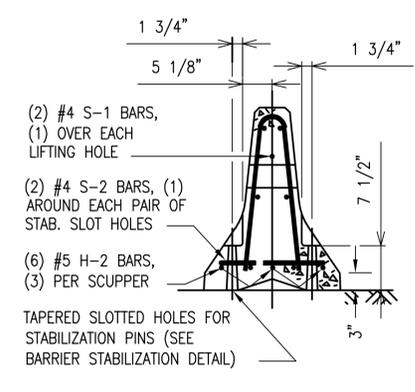
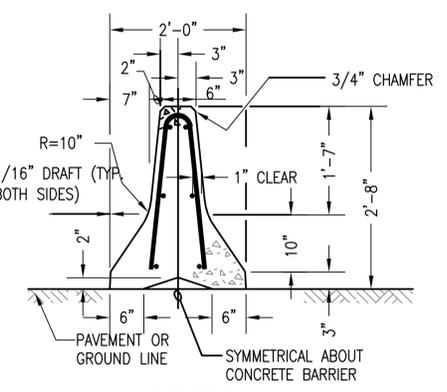
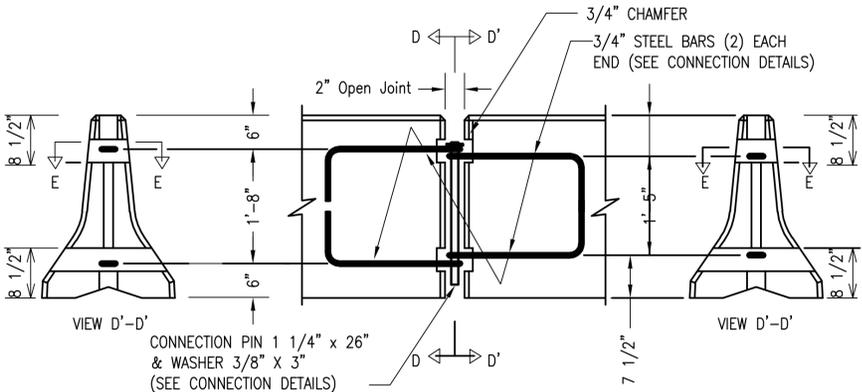
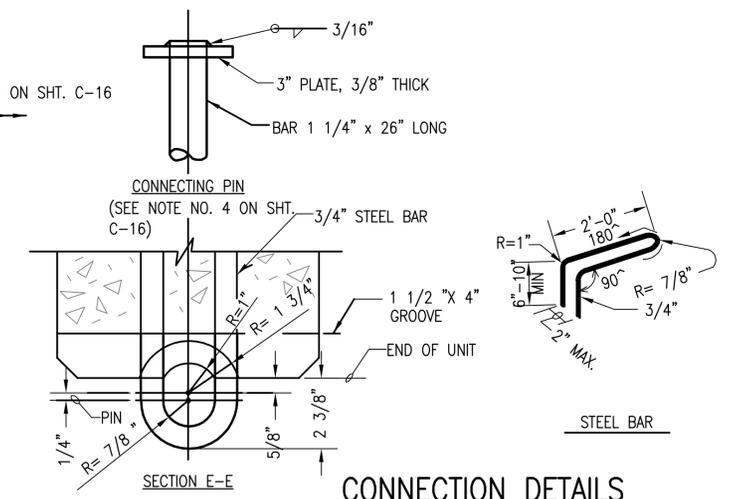
4/30/12
EXPIRATION DATE OF LICENSE

SIGNATURE: **AECOM**

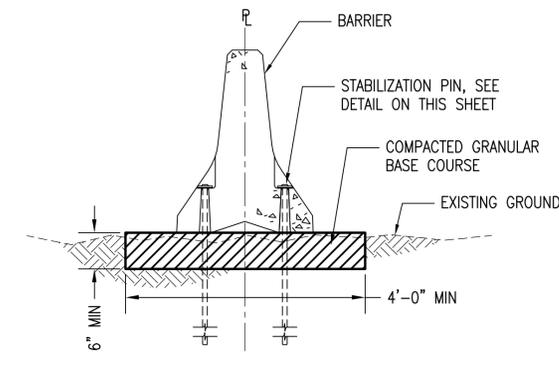
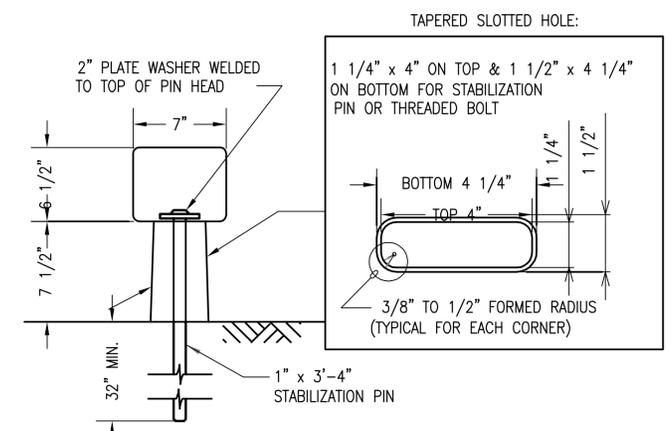
FILED: P:\DESIGN\2010\1006\10060001.dwg, PLOT DATE: November 30, 2010 @ 1:25:24 pm



ELEVATION - TYPICAL BARRIER



BARRIER REMOVAL SLOT DETAILS

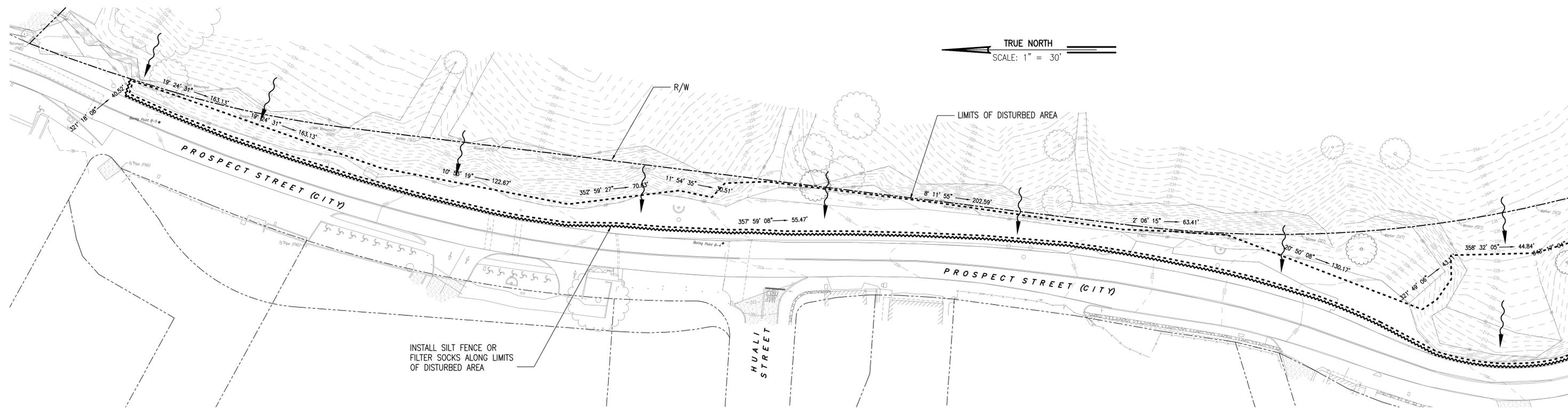


REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU				
ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET				
CONCRETE BARRIER DETAILS				
DESIGN	ARN	APPROVED:	C-12 SHEET 13 OF 20 SHEETS	
DRAWN	BCW	CHEF, CIVIL DIVISION, D.D.C.		
CHECKED	MXD	DATE		
DATE	NOVEMBER 2010	PROJECT NO.		

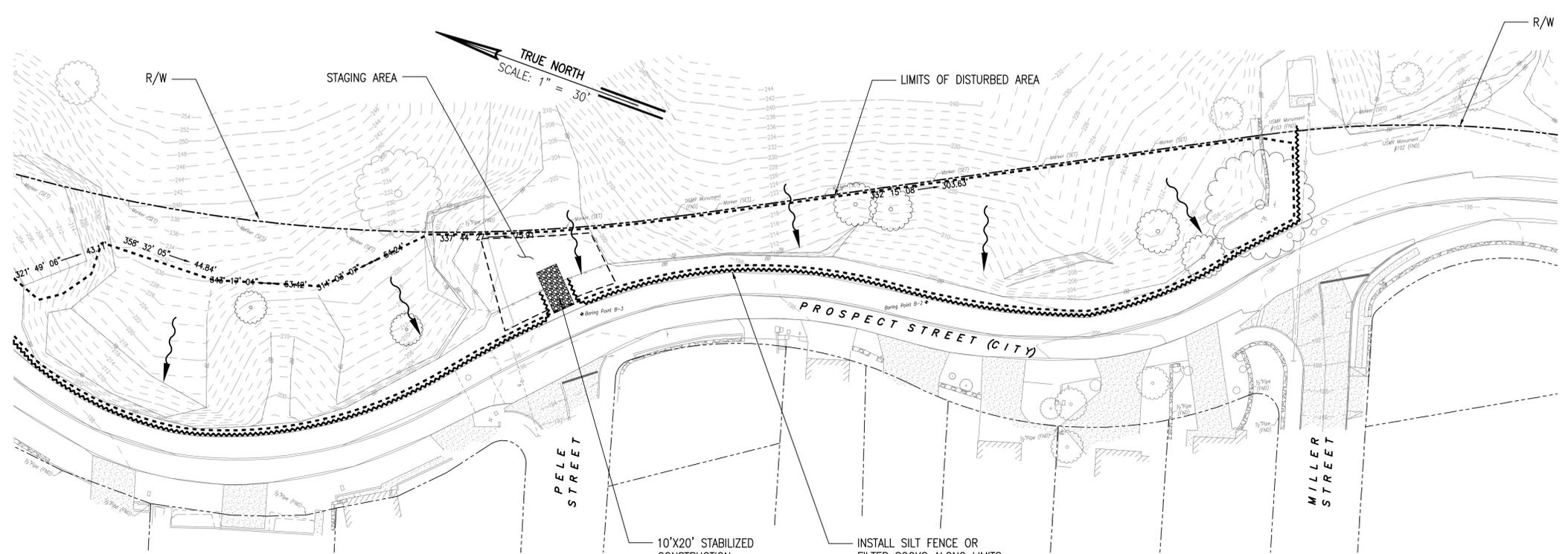
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE: **AECOM** EXPIRATION DATE OF LICENSE: 4/30/12

DRAWN BY: P. LEE, DATE: 11/10/10, PROJECT NO.: 10-00000000, SHEET NO.: 13, FILE NO.: 10-00000000, PLOT DATE: November 30, 2010 @ 1:23:45 pm



TRUE NORTH
SCALE: 1" = 30'

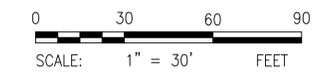


TRUE NORTH
SCALE: 1" = 30'

LEGEND

- FILTER SOCK
- LIMITS OF DISTURBED AREA
- DIRECTION OF FLOW
- PROPERTY LINE OR R/W LINE
- LIMITS OF STAGING AREA

NOTES:
1. SEE BEST MANAGEMENT PRACTICE (BMP) NOTES, SHEET C-1.



DATE PLOTTED: 11/15/2010 10:25:30 AM
 PLOT DATE: November 30, 2010 @ 1:25:30 pm

ARJALAN R. NIROD
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII, U.S.A.

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SIGNATURE: _____ EXPIRATION DATE OF LICENSE: 4/30/12

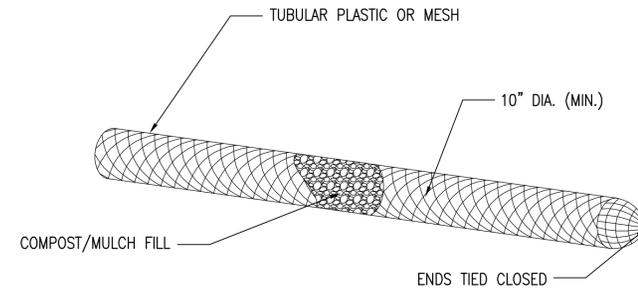
AECOM

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU				
ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET				
EROSION CONTROL PLAN				
DESIGN	ARN	APPROVED:	<div style="font-size: 2em; font-weight: bold; margin: 0;">C-14</div> <div style="font-size: 0.8em; margin: 0;">SHEET 15</div> <div style="font-size: 0.8em; margin: 0;">OF 20 SHEETS</div>	
DRAWN	BCW	CHEF, CIVIL DIVISION, D.D.C.		
CHECKED	MXD	DATE		
DATE	NOVEMBER 2010	DATE		
PROJECT NO.				

FILE	POCKET	FOLDER	NUMBER

EROSION CONTROL NOTES AND BEST MANAGEMENT PRACTICES (BMPs):

1. MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE ANY EARTH MOVING WORK IS INITIATED. THESE MEASURES SHALL BE PROPERLY CONSTRUCTED AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
2. ALL CONTROL MEASURES SHALL BE CHECKED DAILY AND REPAIRED AS NECESSARY.
3. CONTRACTOR SHALL BE RESPONSIBLE TO CONSTRUCT FACILITIES TO RETAIN ON-SITE WASTEWATER SUCH AS WASH WATER AFTER CLEANING CONCRETE TRUCKS, GROUTING EQUIPMENT, ETC., AND PREVENT WASH WATER FROM PENETRATING INTO THE SOIL.
4. PRE-CONSTRUCTION VEGETATIVE GROUND COVER SHALL NOT BE DESTROYED, REMOVED OR DISTURBED MORE THAN TWENTY (20) CALENDAR DAYS PRIOR TO SITE DISTURBANCE.
5. STORM WATER FLOWING TOWARD THE CONSTRUCTION AREA SHALL BE DIVERTED BY USING APPROPRIATE CONTROL MEASURES AS PRACTICAL.

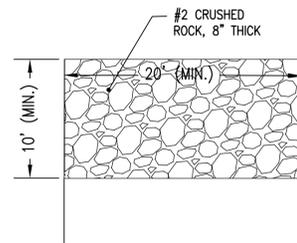


FILTER SOCK DETAIL

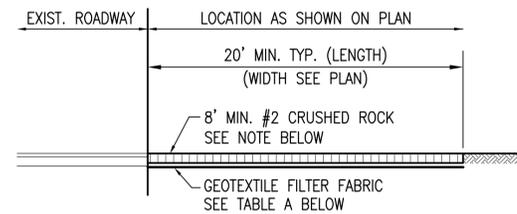
NOT TO SCALE

COMPOST FILTER SOCK NOTES:

1. INSTALLATION:
 - a. INSTALLATION SHALL BE DONE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
 - b. ASSEMBLE BY TYING A KNOT AT ONE ONE OF THE MESH SOCK, FILLING THE SOCK WITH COMPOST, AND KNOTTING THE OTHER END OF THE SOCK. A PNEUMATIC BLOWER MAY BE USED TO FILL THE SOCK WITH COMPOST.
 - c. FOR MULTI-SOCK USE, PLACE SOCKS END-TO-END AND INTERLOCK THE ENDS.
 - d. ANCHOR FILTER SOCKS TO GROUND; STAKES SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS. WHERE STAKING IS NOT POSSIBLE, HEAVY CONCRETE BLOCKS SHALL BE USED BEHIND THE FILTER SOCK FOR STABILIZATION DURING RAINFALL EVENTS.
 - e. TURN ENDS OF FILTER SOCK UP SLOPE TO PREVENT FLOW AROUND THE ENDS.
2. MATERIAL FOR COMPOST BERM MAY BE LEFT AT THE SITE AND USED AS A SOIL AMENDMENT.
3. INSPECTION & MAINTENANCE:
 - a. CONTRACTOR SHALL INSPECT THE FILTER SOCK(S) WEEKLY DURING DRY PERIODS, DAILY DURING PERIODS OF PROLONGED RAINFALL, AND WITHIN 24 HOURS OF ANY RAINFALL EVENT OF 0.5 INCH OR GREATER THAT OCCURS WITHIN A 24-HOUR PERIOD.
 - b. THE CONTRACTOR SHALL REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM VICINITY OF FILTER SOCK(S) AFTER EACH STORM EVENT. REMOVE SEDIMENT WHICH HAS ACCUMULATED TO WITHIN 1/3 OF THE BERM HEIGHT.



PLAN



SECTION

TABLE A GEOTEXTILE REQUIREMENTS	
PHYSICAL PROPERTY	REQUIREMENTS
GRAB TENSILE STRENGTH	220 LB (ASTM D1682)
ELONGATION FAILURE	60% (ASTM D1682)
MULLEN BURST STRENGTH	430 LB (ASTM D3768)
PUNCTURE STRENGTH	125 LB (ASTM D751, MODIFIED)
EQUIVALENT OPENING	SIZE 40-80 (U.S. STD SIEVE, CW-02215)

CONSTRUCTION INGRESS/EGRESS

NOT TO SCALE

PLOT FILENAME: P:\SECT\2010\201006\proj\201006.dwg
 PLOT DATE: November 30, 2010 @ 1:27:54 pm

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

ARDUAN R. NIRODI
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

4/30/12
EXPIRATION DATE OF LICENSE

SIGNATURE _____

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

**ROCKSLIDE MITIGATIVE IMPROVEMENTS
ALONG PROSPECT STREET**

EROSION CONTROL DETAILS

DESIGN ARN	APPROVED: _____	<div style="font-size: 2em; font-weight: bold;">C-15</div> SHEET 16 OF 20 SHEETS		
DRAWN BCW	DATE _____			
CHECKED MXD	CHEF, CIVIL DIVISION, D.D.C. _____			
DATE NOVEMBER 2010	DATE _____			
PROJECT NO. _____	FILE _____	POCKET _____	FOLDER _____	NUMBER _____

HIRATA & ASSOCIATES, INC.

DRAFT SUBJECT TO CHANGE

BORING LOG

W.O. 09-4837

BORING NO. B1 DRIVING WT. 140 lb. START DATE 11/9/09 SURFACE ELEV. 198±* DROP 30 in. END DATE 11/9/09

Table with columns: DEPTH, GRAPEL, SAMPLE, BLOWS PER FOOT, DRY DENSITY (PCF), MOIST. CONT. (%), DESCRIPTION. Includes soil descriptions like Sandy SILT (ML) and VOLCANIC TUFF (WM-WH).

Plate A4.1

HIRATA & ASSOCIATES, INC.

DRAFT SUBJECT TO CHANGE

BORING LOG

W.O. 09-4837

BORING NO. B2 DRIVING WT. 140 lb. START DATE 11/9/09 SURFACE ELEV. 199± DROP 30 in. END DATE 11/9/09

Table with columns: DEPTH, GRAPEL, SAMPLE, BLOWS PER FOOT, DRY DENSITY (PCF), MOIST. CONT. (%), DESCRIPTION. Includes soil descriptions like Clayey SILT (MH) and VOLCANIC TUFF (WS-WM).

Plate A4.2

HIRATA & ASSOCIATES, INC.

DRAFT SUBJECT TO CHANGE

BORING LOG

W.O. 09-4837

BORING NO. B3 DRIVING WT. 140 lb. START DATE 11/9/09 SURFACE ELEV. 196± DROP 30 in. END DATE 11/9/09

Table with columns: DEPTH, GRAPEL, SAMPLE, BLOWS PER FOOT, DRY DENSITY (PCF), MOIST. CONT. (%), DESCRIPTION. Includes soil descriptions like Silty SAND (SM) and Silty GRAVEL (GM).

Plate A4.3

HIRATA & ASSOCIATES, INC.

DRAFT SUBJECT TO CHANGE

BORING LOG

W.O. 09-4837

BORING NO. B4 DRIVING WT. 140 lb. START DATE 11/9/09 SURFACE ELEV. 199± DROP 30 in. END DATE 11/9/09

Table with columns: DEPTH, GRAPEL, SAMPLE, BLOWS PER FOOT, DRY DENSITY (PCF), MOIST. CONT. (%), DESCRIPTION. Includes soil descriptions like SAND (SW-SM) and VOLCANIC TUFF (WS-WM).

Plate A4.4

HIRATA & ASSOCIATES, INC.

DRAFT SUBJECT TO CHANGE

BORING LOG

W.O. 09-4837

BORING NO. B5 DRIVING WT. 140 lb. START DATE 11/10/09 SURFACE ELEV. 204± DROP 30 in. END DATE 11/10/09

Table with columns: DEPTH, GRAPEL, SAMPLE, BLOWS PER FOOT, DRY DENSITY (PCF), MOIST. CONT. (%), DESCRIPTION. Includes soil descriptions like VOLCANIC TUFF (WM-WS).

Plate A4.5

HIRATA & ASSOCIATES, INC.

DRAFT SUBJECT TO CHANGE

BORING LOG

W.O. 09-4837

BORING NO. B6 DRIVING WT. 140 lb. START DATE 11/10/09 SURFACE ELEV. 198± DROP 30 in. END DATE 11/10/09

Table with columns: DEPTH, GRAPEL, SAMPLE, BLOWS PER FOOT, DRY DENSITY (PCF), MOIST. CONT. (%), DESCRIPTION. Includes soil descriptions like VOLCANIC TUFF (WS).

Plate A4.6

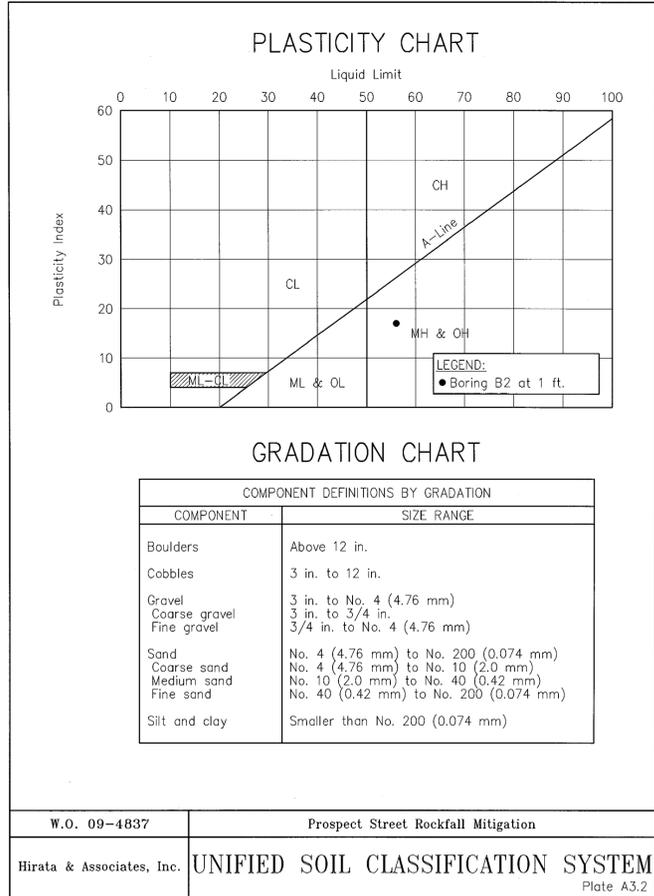
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DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU. ROCKSLIDE MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET BORING LOGS. DESIGN ARN, DRAWN BCW, CHECKED MXD, DATE NOVEMBER 2010. SHEET 19 OF 20 SHEETS.



Small table with columns: FILE, POCKET, FOLDER, NUMBER.

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of the material is larger than the No. 4 sieve size.)	GRAVELS (More than 50% of coarse fraction is larger than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.) GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines.) GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is smaller than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.) SW	Well graded sands, gravelly sands, little or no fines.
		SP	Poorly graded sands or gravelly sands, little or no fines.
	SM	Silty sands, sand-silt mixtures.	
	SC	Clayey sands, sand-clay mixtures.	
FINE GRAINED SOILS (More than 50% of the material is smaller than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50.)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils.	
		FRESH TO MODERATELY WEATHERED BASALT	
		VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT	
		CORAL	
SAMPLE DEFINITION			
<input checked="" type="checkbox"/> 2" O.D. Standard Split Spoon Sampler		<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> ROD Rock Quality Designation
<input type="checkbox"/> 3" O.D. Split Tube Sampler		<input checked="" type="checkbox"/> NX / 4" Coring	<input type="checkbox"/> Water Level
W.O. 09-4837	Prospect Street Rockfall Mitigation		
Hirata & Associates, Inc.	BORING LOG LEGEND Plate A3.1		



Grade	Symbol	Description
Fresh	F	No visible signs of decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	WS	Slight discoloration inwards from open fractures, otherwise similar to F.
Moderately Weathered	WM	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.
Completely Weathered	WC	Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.
Residual Soil	RS	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Reference: Soils Mechanics, NAVFAC DM-7.1, Department of the Navy, Naval Facilities Engineering Command, September, 1986.

W.O. 09-4837 Prospect Street Rockfall Mitigation

Hirata & Associates, Inc. ROCK WEATHERING CLASSIFICATION SYSTEM Plate A3.3

DATE PLOTTED: 11/15/2010 10:00 AM
 PLOT DATE: November 30, 2010 @ 1:29:02 pm

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

ROCKSLIDE MITIGATIVE IMPROVEMENTS
ALONG PROSPECT STREET

BORING LOGS

DESIGN ARN	APPROVED:	C-19 SHEET 20 OF 20 SHEETS
DRAWN BCW	DATE	
CHECKED MXD	CHEF, CIVIL DIVISION, D.D.C.	
DATE NOVEMBER 2010	DATE	
PROJECT NO.		



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE: _____ EXPIRATION DATE OF LICENSE: 4/30/12



FILE	POCKET	FOLDER	NUMBER

**Prospect Street Rockfall Mitigation Photo Log
Honolulu, Hawaii, (TMK) 2-2-005:001
City & County of Honolulu Department of Design & Construction**



Photo 1. Overview of the cut slope in Zone 1. Inside C&C's property.



Photo 2. Fractured rocks (pointed by the arrows) on the cut slope in Zone 1. Inside C&C's property.



Photo 3. Fractured rocks (pointed by the vertical arrows) on the top of the cut slope in Zone 1. The top horizontal arrow points to a stake on property line.



Photo 4. Overview of the cut slope in Zone 2. The arrows point to survey stakes or paintings on property line. This cut slope is relatively stable compared to other cut slopes partially due to the lack of extensive root wedging. Outside C&C's property.



Photo 5. Closer view of the cut slope in Zone 2. Major features with imminent rockfall potential were not observed. Outside C&C's property.



Photo 6. The cut slope in Zone 2. Notice the survey stake on property line. Notice the lack of rockfall debris at slope toe. Outside C&C's property.



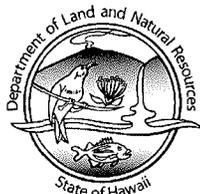
Photo 7. Overview of the cut slope in Zone 3. Inside C&C's property.



Photo 8. Fractured rocks on the small cut slope in Zone 3. Notice the rockfall debris on the unpaved shoulder. Inside C&C's property.



Photo 9. Close view of the recent small rockfall source (pointed by the arrow) at the top of the cut slope in Zone 3. Inside C&C's property.



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUIHEWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96707

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

DATE: August 06, 2011

LOG: 2011.2127

DOC: 1108RS14

TO: Julie Zimmerman
Environmental Planner
AECOM
1001 Bishop Street, Unit 1600
Honolulu, HI 96813

SUBJECT: **Section 6E-08 Historic Preservation Review**
Project: Rockfall Mitigation
Permit # (None)
Owner: City and County of Honolulu
Location: Prospect Street, approximately between Madeira and Miller Streets
Tax Map Key: (1) 2-2-005:001

This letter is in response to your letter of August 5, 2011, received via email the same date, regarding proposed remedial action to prevent possible rockfalls on Prospect Street roughly between Madeira and Miller Streets. The project proposes to split the work into three areas and erect rockfall impact fences, placing draped wire mesh, and imbedding Jersey barriers. The area of potential effect would be the Prospect Street roadway between the two points.

Prospect Street was part of a subdivision of government lands into private homesteads at the early part of the 20th century. The focus group that was given these homesteads were the Portuguese – reflected in street names from geographic and population centers within that country including Lisbon, Madeira, Azores, Concordia, and Lusitana. Another physical sign of the size of this development were the squared basalt rocks used for retaining walls throughout the area. While the neighborhood has undergone some increases in density the potential still exists to pursue a historic district in the area due to the large number of original houses remaining based upon both Criteria A (Events – Portuguese immigration) and C (Architecture).

The road cuts along Prospect Streets have been there for nearly a century. In sections the slope is not near the pavement and the extra space is used for perpendicular parking.

SHPD would like information:

1. Contact information for the party who requested this mitigation so we may contact them to better understand the concerns.
2. We also request any soil stability studies that have been undertaken. (We note that page 3/photo 5 states “Major features with imminent rock fall potential were not observed.”)

Other concerns include:

1. It is likely that the project will require an archaeological survey.
2. The Jersey barrier could be a graffiti magnet.
3. The fence would be more visually obtrusive than mesh on the upslope, which is adjacent to part of the National Memorial Cemetery of the Pacific (listed on the National Register of Historic Places).

We look forward to your response.

Any questions should be addressed to Ross W. Stephenson, SHPD Historian, at (808) 692-8028 (office), (808) 497-2233 (cell) or ross.w.stephenson@hawaii.gov.

Mahalo for the opportunity to comment.

A handwritten signature in black ink that reads "Angie Westfall". The signature is written in a cursive, flowing style.

Angie Westfall
Architecture Branch Chief, Hawaii Historic Preservation Division

In the event that historic resources, including human skeletal remains, lava tubes, and lava blisters/bubbles are identified during construction activities, all work should cease in the immediate vicinity of the find, the find should be protected from additional disturbance, and the State Historic Preservation Division should be contacted immediately at (808) 692-8015.

September 22, 2011

Ms. Angie Westfall
Architecture Branch Chief
Department of Land and Natural Resources
Hawaii State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd, Suite 555
Kapolei, Hawai`i, 96707

Subject: Response to SHPD Review of Chapter 6E-8 Historic Preservation Review for the Prospect Street Rockfall Mitigation, Honolulu, Hawaii, (TMK) 2-2-005:001

Ms. Westfall,

This letter is in response to your response letter received August 18, 2011 regarding consultation for proposed remedial action to prevent possible rockfalls on Prospect Street.

The City and County (C&C) of Honolulu, Department of Design and Construction is proposing rockfall hazard mitigation to be undertaken upslope of Prospect Street between Miller and Madeira Streets, Honolulu, Hawaii. The proposed project would occur within the C&C right-of-way between 150 and 666 Prospect Street, Tax Map Key (TMK) 2-2-005:001.

Your letter stated that SHPD would like information on the following items:

1. Contact information for the party who requested mitigation so we may contact them to better understand the concerns.
2. We also request any soil stability studies that have been undertaken. (We note that page 3/photo 5 states "Major features with imminent rock fall potential were not observed).

Responses:

1. *Michael Yamasaki is the Project Manager at the C&C you may contact regarding this project. He can be contacted at:*
City and County of Honolulu
Department of Design and Construction
Civil Division, Bridges and Structures Section
Honolulu Municipal Building
650 South King Street, 15th Floor
Honolulu, Hawaii 96813
(808) 768-8824
myamasaki1@honolulu.gov
2. *Soil stability studies have not been conducted in this area by the C&C. However, we are including the "Rockslide Potential Inspection and Mitigative Improvements along Prospect Street Honolulu, HI" assessment as an attachment to this letter. The purpose of the assessment was to evaluate*

rockfall potentials and hazards, and to recommend rockfall mitigation methods best suited for the site.

The caption that you note on page 3/photo 5, "Major features with imminent rock fall potential were not observed" is specific only to the area shown of the cut slope in Zone 2, which is outside of the C&C's property. This is not necessarily descriptive of all of Zone 2.

Your letter indicated that additional concerns included:

1. It is likely that the project will require an archaeological survey.
2. The jersey barrier could be a graffiti magnet.
3. The fence would be more visually obtrusive than mesh on the upslope, which is adjacent to part of the National Memorial Cemetery of the Pacific (listed on the National Register of Historic Places).

Response:

1. *An Archaeological Assessment for this project was conducted by Pacific Consulting Services, Inc in March 2011. This Assessment included an archaeological reconnaissance survey of the C&C property. The Assessment is included as an attachment to this letter. In addition to the Archaeological Assessment conducted for the project, AECOM is planning to conduct a Cultural Impact Assessment for the project.*
2. *We concur that the jersey barrier could be a possible graffiti magnet. If graffiti does occur, the C&C will mitigate the situation accordingly.*
3. *We concur that the fence would be more visually obtrusive than mesh on the upslope. However, this design alternative provides a high-level of rockfall protection as the fence would stop rolling rocks from the upper slope. Installing only mesh would provide lesser rockfall protection and increase the risk to public health and safety. All rockfall mitigation will take place within the C&C right-of-way.*

Attached for your use are the following:

1. *Rockslide Potential Inspection and Mitigative Improvements along Prospect Street Honolulu, HI" Assessment (CD)*
2. *Archaeological Assessment in Support of Rockslide Potential Inspection and Mitigative Improvements Along Prospect Street, Pauoa Ahupua`a, Kona District, Island of O`ahu, State of Hawai`i. Adjacent TMK: (1) 2-2-005:001 (CD)*

We hope that this letter addresses all of your questions and concerns. Actions relevant to the State Historic Preservation Division for this project include historic preservation clearance. The C&C is seeking concurrence that the proposed rockfall hazard mitigation will have no adverse effect on significant historic properties.

Thank you for your assistance, and should you have additional questions please contact Ardalan Nikou of AECOM, at (808) 529-7223 or Ardalan.Nikou@aecom.com.



Ardalan Nikou
AECOM

cc: Mr. Michael Yamasaki, City and County of Honolulu
Mr. Tobias Koehler, AECOM
Ms. Julie Zimmerman, AECOM



AECOM 808 523 8874 tel
1001 Bishop Street, Suite 1600 808 523 8950 fax
Honolulu, Hawaii 96813-3698
www.aecom.com

October 31, 2011

Ms. Angie Westfall
Architecture Branch Chief
Department of Land and Natural Resources
Hawaii State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd, Suite 555
Kapolei, Hawai'i, 96707

Subject: Chapter 6E-8 Historic Preservation Review for the Prospect Street Rockfall Mitigation, Honolulu, Hawaii, (TMK) 2-2-005:001_Revised Zone 3 Project Description

Mr. Westfall,

This letter is to inform you of an updated project description for Zone 3 of the Prospect Street Rockfall Mitigation project.

As described in our August 5, 2011 and September 22, 2011 letters, the City and County (C&C) of Honolulu, Department of Design and Construction is proposing rockfall hazard mitigation to be undertaken upslope of Prospect Street between Miller and Madeira Streets, Honolulu, Hawaii.

The proposed project would occur within the C&C right-of-way between 150 and 666 Prospect Street, Honolulu. The Tax Map Key (TMK) number of the nearest adjacent property is 2-2-005:001.

Due to varying site conditions, it is difficult to identify a single alternative capable of mitigating the entire project site. Therefore, the project site was categorized into three zones based on site topography and right-of-way boundary locations.

Zone 1: Zone 1 extends from Madeira Street to Huali Street and totals 0.20 acres. Zone 1 can be described as a high natural slope above a high cut slope and narrow shoulder. The right-of-way boundary is near the top of the cut slope.

Zone 2: Zone 2 is approximately 540 linear feet long measured along the roadway beginning at Huali Street and ending just before the sharp turn where the wide unpaved shoulder disappears. Zone 2 consists of 0.20 acres and is described as a steep natural slope above a roadside cut slope of varying heights. The shoulder is relatively wide and is regularly used for vehicle parking. The right-of-way limit is near the toe of the cut slope.

Zone 3: Zone 3 is approximately 0.57 acres and 540 linear feet measured along the roadway, and lies in the vicinity of Pele Street and Miller Street. This zone can be described as a natural slope above a short cut slope that varies in height, and narrow shoulder that varies in width. The right-of-way boundary is upslope from top of the cut slope.



Recommendations for the proposed action took into consideration factors such as public safety, construction cost, sound engineering principles and land ownership. After considering various design alternatives, the C&C proposes to perform rockfall mitigation within each zone as follows:

The updated project description for Zone 3 is as follows.

Zone 3 – Draped Wire Mesh, Rockfall Impact Fence, Shoulder Widening

The Proposed Action provides for complete rockfall hazard reduction for the entire slope using a combination of draped wire mesh, a rockfall impact fence, and shoulder widening. A rockfall impact fence would be installed within the existing right-of-way limits above the top of the cut slope. The fence would stop rolling rocks from the upper slope.

A draped wire mesh system would be installed over the cut slope down slope of the impact fence. Vegetation on the slope would be cleared using chain saws and weed eaters to cut the vegetation flush to the ground surface. Foundation anchors would then be drilled into the ground by a hydraulic/pneumatic drill mounted on a piece of tracked equipment, such as a small excavator. Anchors would be grouted using a hand held mixer and a small grout pump. After the anchors are tested, top support cable would be attached to the anchors and installed. The mesh would then be installed and attached to the top support cables.

Just north of Pele Street, the roadside shoulder would be widened to provide at least seven feet of clear distance measured from the edge of the roadway to the toe of the slope. The slope would have to be cut-back at a 45 degree angle for a distance of 250 feet measured along the roadway. The volume of excavated earth would be about 450 cubic yards, and the work would be done using a large track mounted excavator, a front end loader and dump truck.

The Proposed Action for Zone 3 also includes removal of seven kiawe trees (*Prosopis pallida*) from the C&C property. These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to cars and pedestrians on Prospect Street. The work area in Zone 3 totals 0.57 acres.

Actions relevant to the State Historic Preservation Division for this project include historic preservation clearance. As the proposed work would be conducted in areas disturbed by rockfalls, the C&C is seeking concurrence that the proposed repairs will have no adverse effect on significant historic properties.

Thank you for your assistance, and should you have any questions please contact Ardalan Nikou of AECOM, at (808) 529-7223 or Ardalan.Nikou@aecom.com.



Ardalan Nikou
AECOM

cc: Mr. Michael Yamasaki, City and County of Honolulu
Mr. Tobias Koehler, AECOM
Ms. Julie Zimmerman, AECOM

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUHIHEWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96707

DATE: October 26, 2011 **LOG:** 2011.2127
TO: Ardalan Nikou **DOC:** 1110RS40
AECOM
1001 Bishop Street, Unit 1600
Honolulu, HI 96813
Architecture and Archaeology

SUBJECT: Section 6E-8 Historic Preservation Review
Project: Prospect Street Rockfall Mitigation
Permit # (None)
Owner: City and County of Honolulu
Location: 150 through 666 Prospect Street (Prospect Between Miller and Madeira Streets),
Punchbowl District
Tax Map Key: (1) 2-2-005:001

This letter is in response to materials dated September 22, 2011, received on September 23, 2011, regarding a proposed rockfall mitigation project on the outer slopes of Punchbowl (Puowaina) Crater between 150 and 666 Prospect Street. A telephone call to Michael Yamasaki of the City Department of Design and Construction by SHPD Historian Ross W. Stephenson on October 26, 2011 yielded information that the project had been instigated by concerns of the Veterans Administration, owner of The National Cemetery of the Pacific (Punchbowl Cemetery) that rocks periodically might fall down slope and that the City was also concerned about its own liability.

Two documents were included: *Rockslide Potential Inspection and Mitigative Improvements along Prospect Street Honolulu, Hawaii*, prepared for the City & County of Honolulu Department of Design & Construction by AECOM Technical Services (2010) and *Draft Report Archaeological Assessment in Support of Rockslide Potential Inspection and Mitigative Improvements Along Prospect Street, Pauoa Ahupuaa, Kona District, Island of Oahu, State of Hawaii* prepared for AECOM Technical Services, Inc. by Pacific Consulting Services, Inc. (2011).

The *Rockslide Potential* report explored ten different design alternatives for the project: concrete wall and impact fence system, rockfall impact fence and concrete Jersey barrier, shotcrete slope protection, rock scaling, draped wire mesh and rockfall impact fence, shotcrete slope protection and rockfall impact fence, concrete retaining wall and rockfall impact fence, or do nothing. The report found three areas of concern and recommended the following: Zone 1, a rockfall impact fence and concrete Jersey barrier; Zone 2 a rockfall impact fence and concrete Jersey barrier and Zone 3 a draped wire mesh and rockfall impact fence. The Area of Potential Effect (APE) would be the right of way and areas mauka of Prospect Street between Miller and Madeira.

The urban area in question was developed by the 1920s and was initially occupied mostly by individuals of Portuguese descent, as illustrated by street names such as Lisbon, Lusitana, Madeira and Concordia. The area has historically been one of small houses and lots with open views of the city and Punchbowl itself. The community would be eligible for the Hawaii Register of Historic Places under Criterion A (Events – ethnic immigration to Hawaii) and C (Architecture). Placing visual barriers on the hillside would despoil the historic landscape.

Most of the hillside is also a distance from the roadway, is not steep sloped, and is actually used for the temporary storage of cars. Members of our staff's own families have parked along Prospect for years without any damage to their vehicles.

In order to have no effect, **SHPD's Architecture Branch recommends that the City and Veterans Administration protect this historic landscape by following either the "no action" or the "rock scaling" option and remove large loose rocks from the upper hillside.** We note that this has been successfully undertaken in several locations in eastern Honolulu recently. Should any of the other alternatives for the project be selected SHPD requests further consultation.

Any questions should be addressed to Ross W. Stephenson, SHPD Historian, at (808) 692-8028 (office), (808) 497-2233 (cell) or ross.w.stephenson@hawaii.gov.

Mahalo for the opportunity to comment.

A handwritten signature in black ink that reads "Westfall". The signature is written in a cursive, flowing style.

Angie Westfall
Architecture Branch Chief, Hawaii Historic Preservation Division

In the event that historic resources, including human skeletal remains, lava tubes, and lava blisters/bubbles are identified during construction activities, all work should cease in the immediate vicinity of the find, the find should be protected from additional disturbance, and the State Historic Preservation Division should be contacted immediately at (808) 692-8015.

January 3, 2012

Mr. Ross Stephenson
Historian
Department of Land and Natural Resources
Hawaii State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd, Suite 555
Kapolei, Hawai'i, 96707

Subject: Chapter 6E-8 Historic Preservation Review for the Prospect Street Rockfall Mitigation, Honolulu, Hawaii, (TMK) 2-2-005:001_Site Visit Follow-up

Dear Mr. Stephenson:

This is in response to a letter received from your office dated October 26, 2011 and a follow up site visit conducted on December 21, 2011 to address concerns regarding an upcoming rockfall hazard mitigation project proposed to occur upslope of Prospect Street between Miller and Madeira Streets, Honolulu, Hawaii. The City and County of Honolulu (C&CH), Department of Design and Construction, plans to conduct this work, between 150 and 666 Prospect Street, Tax Map Key (TMK) 2-2-005:001.

On behalf of C&CH, we would like to thank you for your time and participation in the site visit. The purpose of the site visit was to review the State Historic Preservation Division's (SHPD) concerns regarding the proposed design alternatives, and to discuss the project description and the preferred alternatives.

The preferred alternatives were described for each zone as follows:

- Zone 1- *Rockfall Impact Fence and Concrete Jersey Barrier*
- Zone 2- *Rockfall Impact Fence and Concrete Jersey Barrier*
- Zone 3- *Draped Wire Mesh, Rockfall Impact Fence, Cut Slope to Widen Shoulder*

A detailed summary of the site visit can be found in the attached meeting minutes.

As the meeting minutes state, SHPD recommendeds that if concrete jersey barriers are to be used, they be stamped and colorized to resemble appearance of a stone wall, as seen typically throughout the surrounding neighborhood. The proposed design alternatives for Zone 1 and Zone 2 both incorporate the use of concrete jersey barriers between the roadway and the fence line to keep vehicles and pedestrians away from the rockfall impact fence. The jersey barriers would serve as permanent safety dividers preventing both vehicles and pedestrians from getting too close to the fence. The C&CH agrees to stamp and colorize the concrete barriers to appear similar to a stone wall to mitigate this important visual impact.

An updated project description can be found attached to this letter.



An Archaeological Assessment for this project was conducted by Pacific Consulting Services, Inc (PCSI) in March 2011, and previously submitted to SHPD on September 22, 2011. This Assessment included an archaeological reconnaissance survey of the C&CH property. In addition to the Archaeological Assessment conducted for the project, a Cultural Impact Assessment is currently being conducted by PCSI.

Actions relevant to the State Historic Preservation Division for this project include historic preservation clearance. As the proposed work would be conducted in areas disturbed by rockfalls, the C&CH is seeking concurrence that the proposed repairs as described above will have no adverse effect on significant historic properties. C&CH respectfully requests a follow-up letter expressing concurrence.

Attached for your use are the following:

1. Updated Pre-Final Construciton Plans
2. Site Visit Meeting Minutes
3. Updated Project Description

Thank you for your assistance, and should you have any questions please contact Ardalan Nikou of AECOM, at (808) 529-7223 or Ardalan.Nikou@aecom.com.

A handwritten signature in blue ink, appearing to read 'Ardalan Nikou', written over a horizontal line.

Ardalan Nikou
AECOM

cc: Mr. Michael Yamasaki, City and County of Honolulu
Mr. Tobias Koehler, AECOM
Ms. Julie Zimmerman, AECOM

UPDATED PRE-FINAL CONSTRUCTION PLANS

JOB NO. _____

ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET

HONOLULU, OAHU, HAWAII

DEPARTMENT OF DESIGN AND CONSTRUCTION
CIVIL DIVISION
CITY AND COUNTY OF HONOLULU

Prepared By:



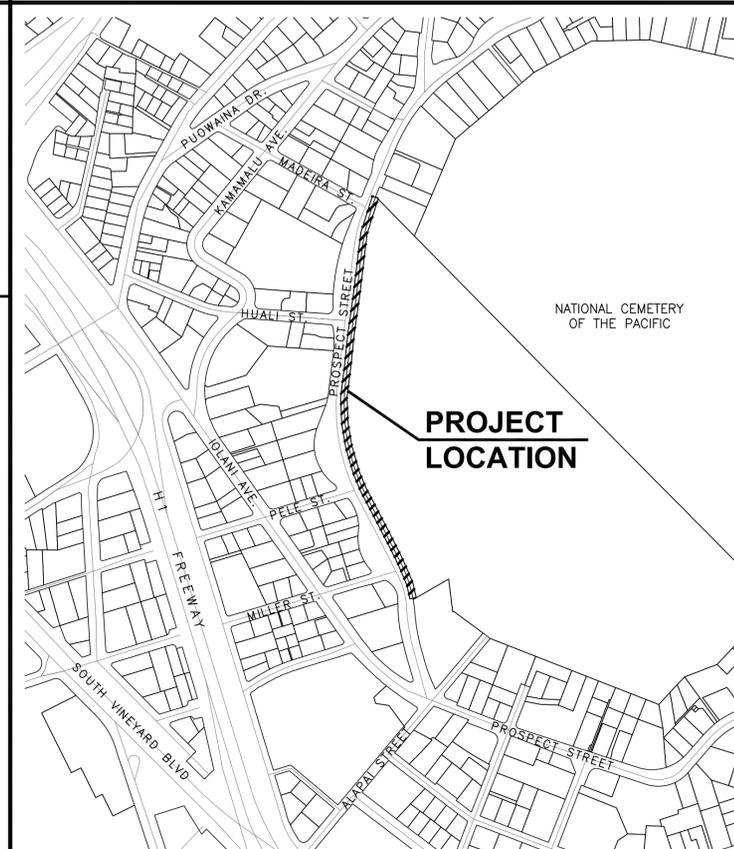
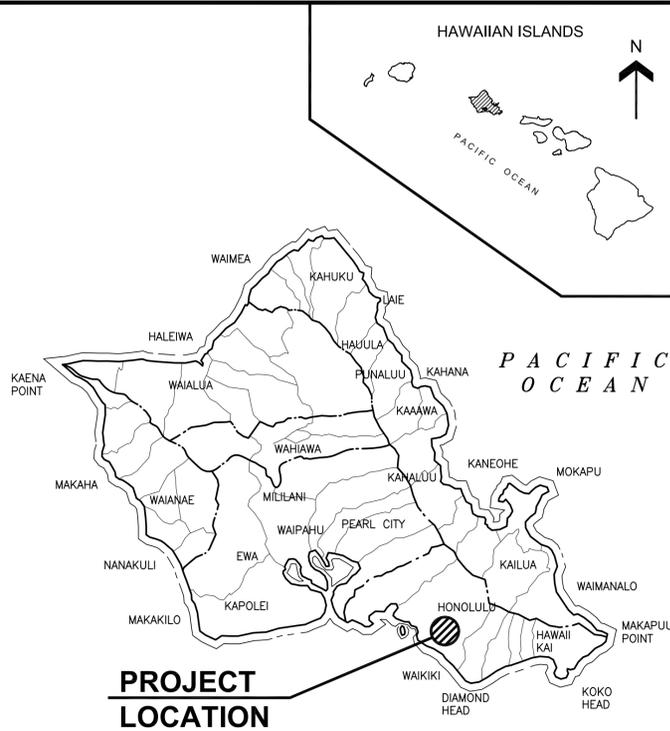
PRE-FINAL

VICINITY MAP

LOCATION MAP

INDEX OF DRAWINGS

APPROVED



SHT. No.	DWG. No.	DESCRIPTION
1	T-1	TITLE SHEET
2	C-1	GENERAL NOTES
3	C-2	ROCKFALL MITIGATION NOTES
4	C-3	SHEET LAYOUT
5	C-4	SITE PLAN 1
6	C-5	SITE PLAN 2
7	C-6	SITE PLAN 3
8	C-7	TYPICAL SECTIONS
9	C-8	TYPICAL SECTIONS
10	C-9	DRAPED WIRE MESH DETAILS
11	C-10	ROCKFALL BARRIER SYSTEM DETAILS 100 KJ CAPACITY
12	C-11	ROCKFALL BARRIER SYSTEM DETAILS 500 KJ CAPACITY
13	C-12	CONCRETE BARRIER DETAILS
14	C-13	INERTIAL BARRIER SYSTEM DETAILS
15	C-14	BORING LOGS
16	C-15	BORING LOGS
17	EC-1	EROSION CONTROL PLAN
18	EC-2	EROSION CONTROL DETAILS
19	TCP-1	TRAFFIC CONTROL PLAN

DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

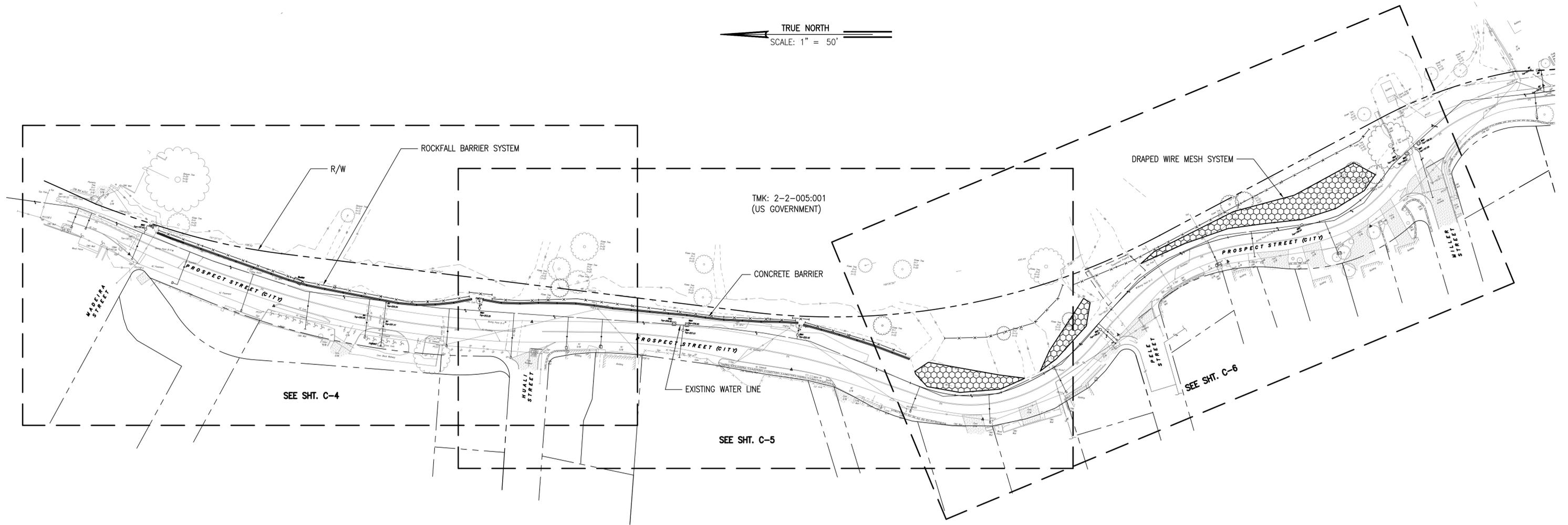
DATE

VICINITY MAP
NOT TO SCALE

LOCATION MAP
NOT TO SCALE

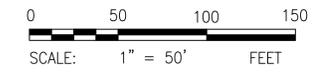
ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET DDC JOB NO. _____

TRUE NORTH
SCALE: 1" = 50'



SHEET LAYOUT
SCALE: 1" = 50'-0"

PLOT DATE: May 10, 2011 @ 10:18:59 am
 PLOT BY: [unreadable]
 PLOT SCALE: 1" = 50'-0"
 PLOT FILE: [unreadable]



REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET

SHEET LAYOUT

DESIGN	BCW/NMN	APPROVED:	C-3
DRAWN	NMN/BCW	DATE	
CHECKED	ARN	DATE	
DATE	MAY 2011	DATE	
PROJECT NO.			of 19 SHEETS



ARDALAN R. NIKED
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII, U.S.A.

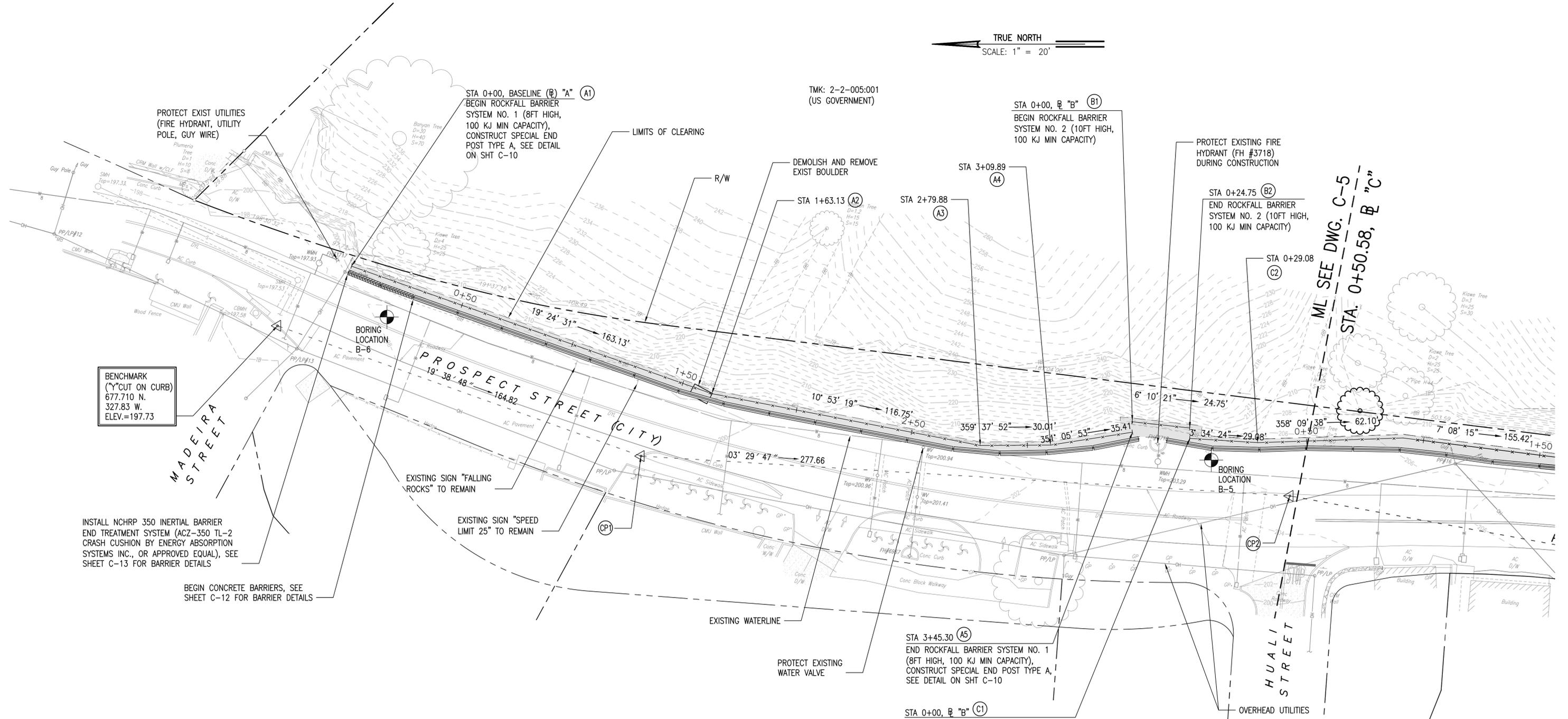
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE: _____ EXPIRATION DATE OF LICENSE: 4/30/12



FILE	POCKET	FOLDER	NUMBER

TRUE NORTH
SCALE: 1" = 20'



BENCHMARK
(Y-CUT ON CURB)
677.710 N.
327.83 W.
ELEV.=197.73

INSTALL NCHRP 350 INERTIAL BARRIER
END TREATMENT SYSTEM (ACZ-350 TL-2
CRASH CUSHION BY ENERGY ABSORPTION
SYSTEMS INC., OR APPROVED EQUAL), SEE
SHEET C-13 FOR BARRIER DETAILS

BEGIN CONCRETE BARRIERS, SEE
SHEET C-12 FOR BARRIER DETAILS

STA 0+00, BASELINE (B) "A" (A1)
BEGIN ROCKFALL BARRIER
SYSTEM NO. 1 (8FT HIGH,
100 KJ MIN CAPACITY),
CONSTRUCT SPECIAL END
POST TYPE A, SEE DETAIL
ON SHT C-10

TMK: 2-2-005:001
(US GOVERNMENT)

STA 0+00, B "B" (B1)
BEGIN ROCKFALL BARRIER
SYSTEM NO. 2 (10FT HIGH,
100 KJ MIN CAPACITY)

STA 0+24.75 (B2)
END ROCKFALL BARRIER
SYSTEM NO. 2 (10FT HIGH,
100 KJ MIN CAPACITY)

STA 3+45.30 (A5)
END ROCKFALL BARRIER SYSTEM NO. 1
(8FT HIGH, 100 KJ MIN CAPACITY),
CONSTRUCT SPECIAL END POST TYPE A,
SEE DETAIL ON SHT C-10

STA 0+00, B "B" (C1)
BEGIN ROCKFALL BARRIER SYSTEM NO. 3
(8FT HIGH, 100 KJ MIN CAPACITY),
CONSTRUCT SPECIAL END POST TYPE A,
SEE DETAIL ON SHT C-10

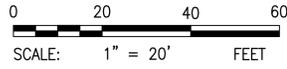
ML SEE DWG. C-5
STA. 0+50.58, B "C"

ROCKFALL SYSTEM CONTROLS

LOCATION	AZIMUTH	DISTANCE	END ELEVATION
BENCHMARK TO A1	321° 18' 08"	40.52'	200.81'
CP1 TO A2	318° 45' 17"	40.25'	202.04'
CP1 TO A3	358° 13' 41"	144.98'	202.36'
CP1 TO A4	358° 28' 07"	174.98'	202.63'
CP1 TO A5	357° 13' 48"	210.15'	203.79'
CP1 TO B1	356° 00' 59"	210.28'	206.16'
CP1 TO B2	357° 04' 55"	234.67'	207.47'
CP2 TO C1	209° 44' 56"	49.27'	204.00'
CP2 TO C2	238° 42' 49"	26.49'	205.65'

SITE PLAN 1

SCALE: 1" = 20'-0"



REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE
IMPROVEMENTS ALONG PROSPECT STREET

SITE PLAN 1

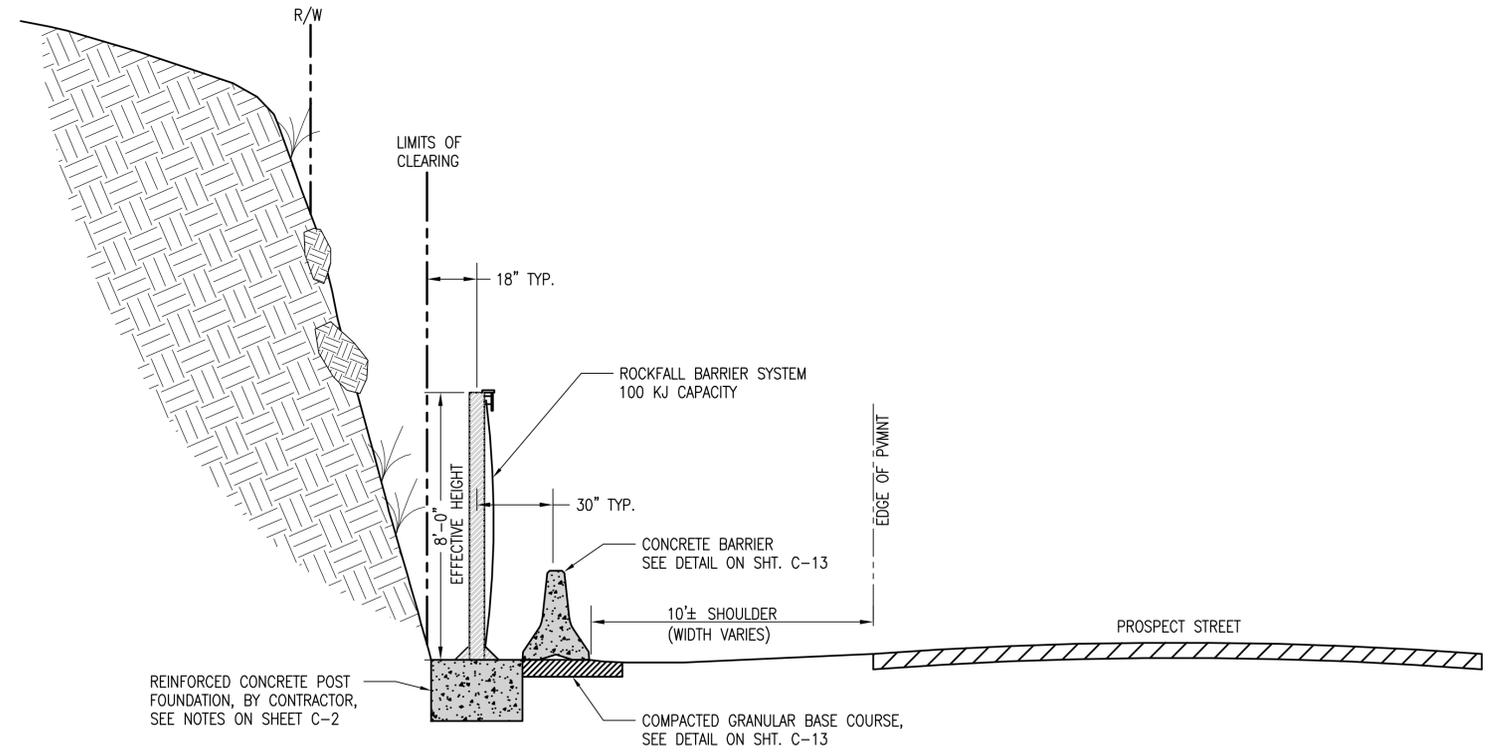
DESIGN BCW/MNM	APPROVED:	C-4
DRAWN NMN/BCW	CHEF, CIVIL DIVISION, D.D.C.	
CHECKED ARN	DATE	SHEET 5
DATE MAY 2011	DATE	OF 19 SHEETS
PROJECT NO.		



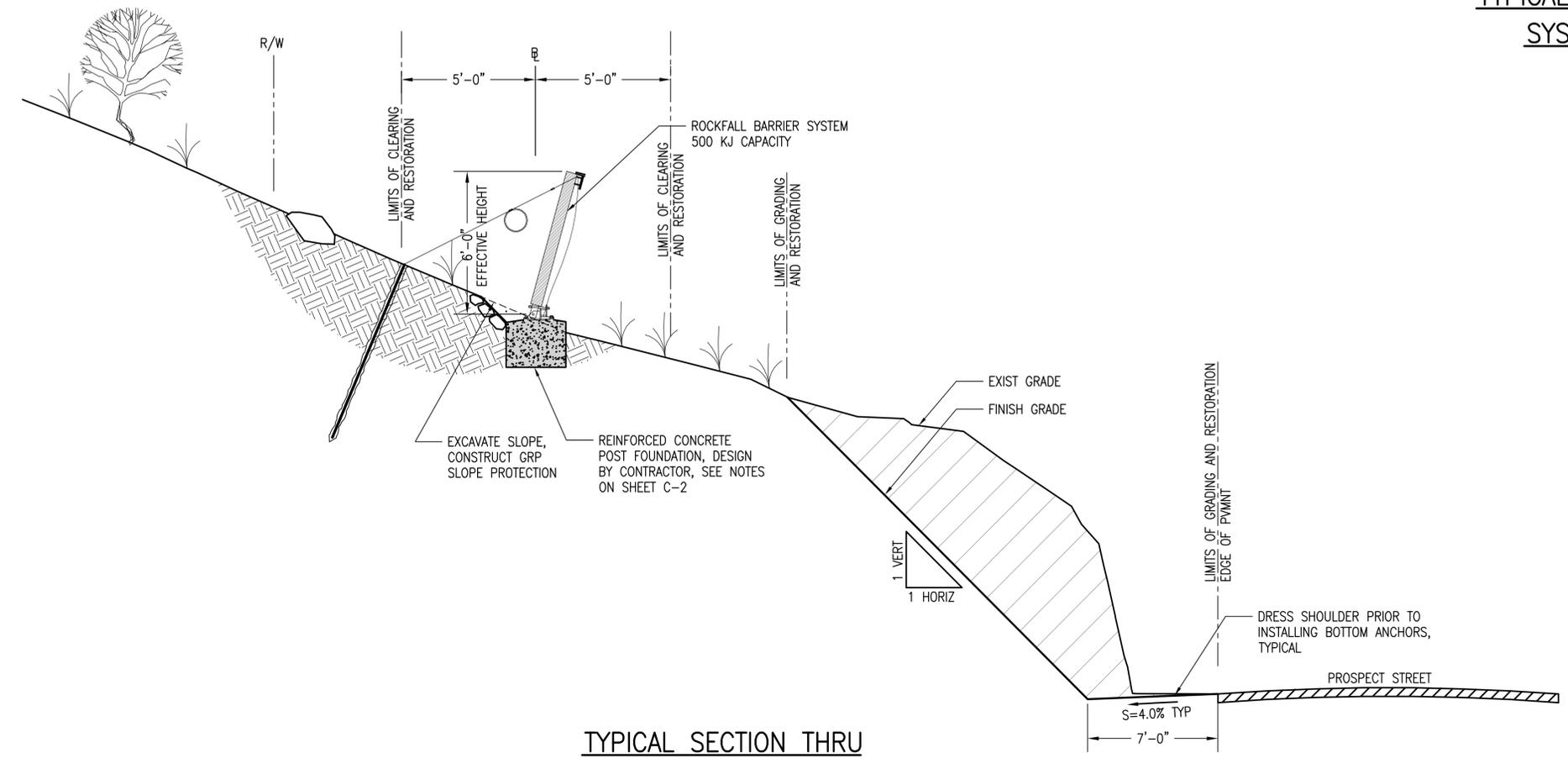
THIS WORK WAS PREPARED BY ME OR UNDER
MY SUPERVISION AND CONSTRUCTION OF THIS
PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE: **AECOM**
EXPIRATION DATE OF LICENSE: 4/30/12

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 PLOT DATE: May 09, 2011 10:02:45 am



TYPICAL SECTION THRU ROCKFALL BARRIER SYSTEM NO. 3 AND SYSTEM NO. 5
NOT TO SCALE



TYPICAL SECTION THRU ROCKFALL BARRIER SYSTEM NO. 6
NOT TO SCALE

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET

TYPICAL SECTIONS

DESIGN	BCW/NMN	APPROVED:	C-8 SHEET 9 OF 19 SHEETS
DRAWN	NMN/BCW		
CHECKED	ARN		
DATE	10/27/2011	CHEF, CIVIL DIVISION, D.D.C.	
PROJECT NO.			

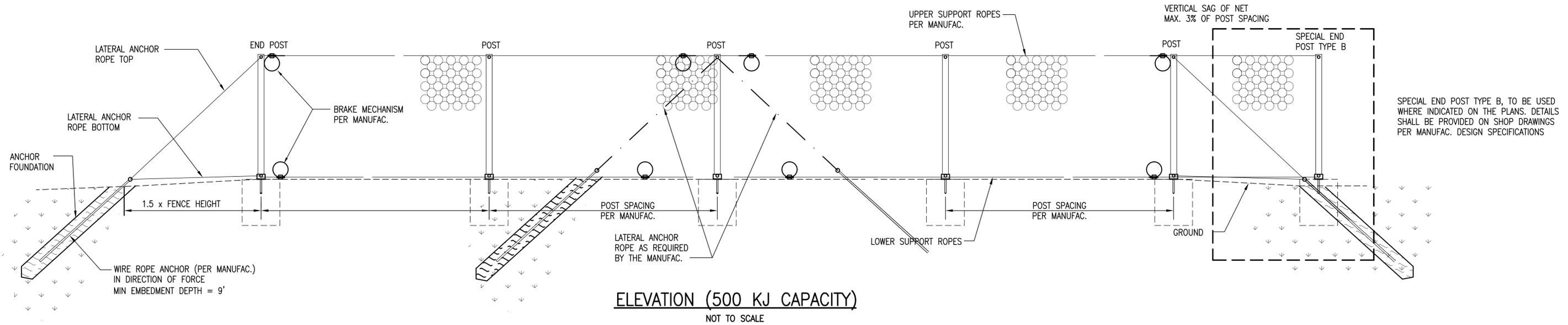
ARJALAN R. NIROD
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII, U.S.A.

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4/30/12
EXPIRATION DATE OF LICENSE

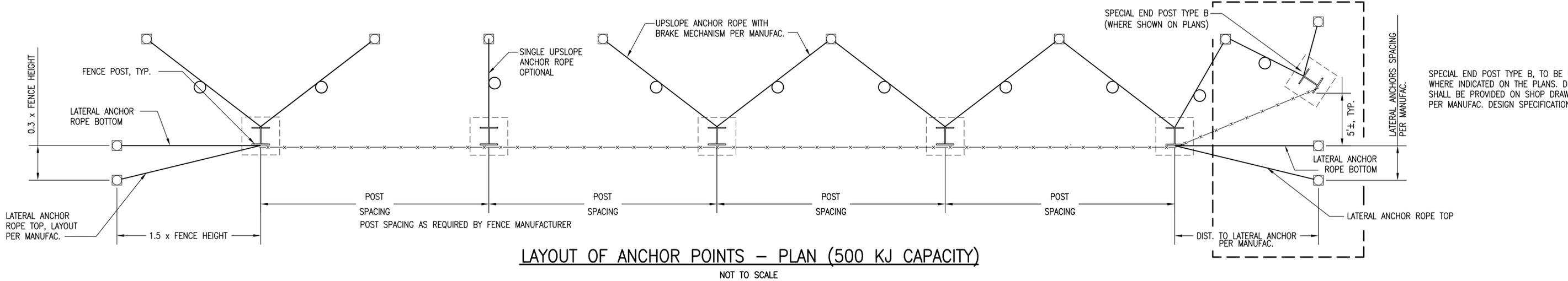
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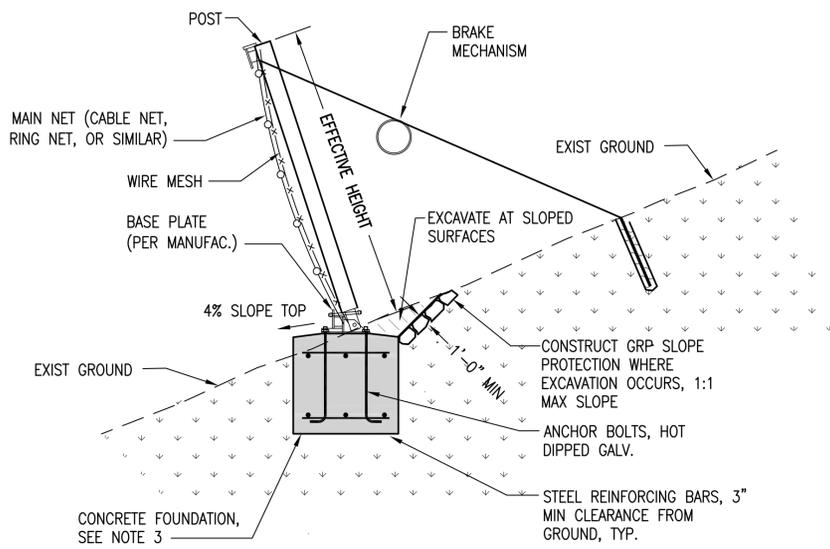
ELEVATION (500 KJ CAPACITY)
NOT TO SCALE

SPECIAL END POST TYPE B, TO BE USED WHERE INDICATED ON THE PLANS. DETAILS SHALL BE PROVIDED ON SHOP DRAWINGS PER MANUFAC. DESIGN SPECIFICATIONS



LAYOUT OF ANCHOR POINTS - PLAN (500 KJ CAPACITY)
NOT TO SCALE

SPECIAL END POST TYPE B, TO BE USED WHERE INDICATED ON THE PLANS. DETAILS SHALL BE PROVIDED ON SHOP DRAWINGS PER MANUFAC. DESIGN SPECIFICATIONS



TYPICAL POST DETAIL (500 KJ)
NOT TO SCALE

NOTES:

1. BARRIER DETAILS SHOWN HERE ARE FOR MINIMUM REQUIREMENTS AND GENERAL GUIDANCE FOR 500 KJ BARRIER DESIGN. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S AUTHORIZED DESIGN DRAWINGS AND DETAILS.
2. SUBMIT ROCK BARRIER FENCE SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL.
3. CONTRACTOR IS RESPONSIBLE TO PROVIDE A POST FOUNDATION DESIGN TO MEET THE REQUIREMENTS OF THE PROPOSED FENCE SYSTEM. SUBMIT POST FOUNDATION DESIGN TO THE ENGINEER FOR APPROVAL. POST FOUNDATIONS SHALL BE DESIGNED AND STAMPED BY A STRUCTURAL ENGINEER LICENSED IN HAWAII (SEE NOTES ON SHEET C-2).
4. CONTRACTOR SHALL CONFIRM COLOR OF THE ROCK PROTECTION FENCE WITH THE ENGINEER IN WRITING PRIOR TO ORDERING AND PURCHASING OF THE FENCE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING PULL OUT REQUIREMENTS FOR ALL ANCHORS. ANCHORS SHALL HAVE A MINIMUM PULLOUT CAPACITY OF 15 TONS (30 KIPS) OR AS SPECIFIED BY THE MANUFACTURER. THE TESTING SHALL CONSIST OF A PULLOUT TEST INCORPORATING 25 PERCENT OF THE TOTAL NUMBER OF ANCHORS. IF MORE THAN 25 PERCENT OF THE ANCHORS TESTED FAIL, ALL ANCHORS SHALL BE TESTED. THE CONTRACTOR SHALL REPLACE THE FAILED ANCHORS AT NO ADDITIONAL COST TO THE CITY.
6. ALL ROCKFALL BARRIER FENCE COMPONENTS INCLUDING POST FOUNDATIONS AND GROUND ANCHORS, SHALL BE CONSTRUCTED WITHIN THE CITY RIGHT-OF-WAY.

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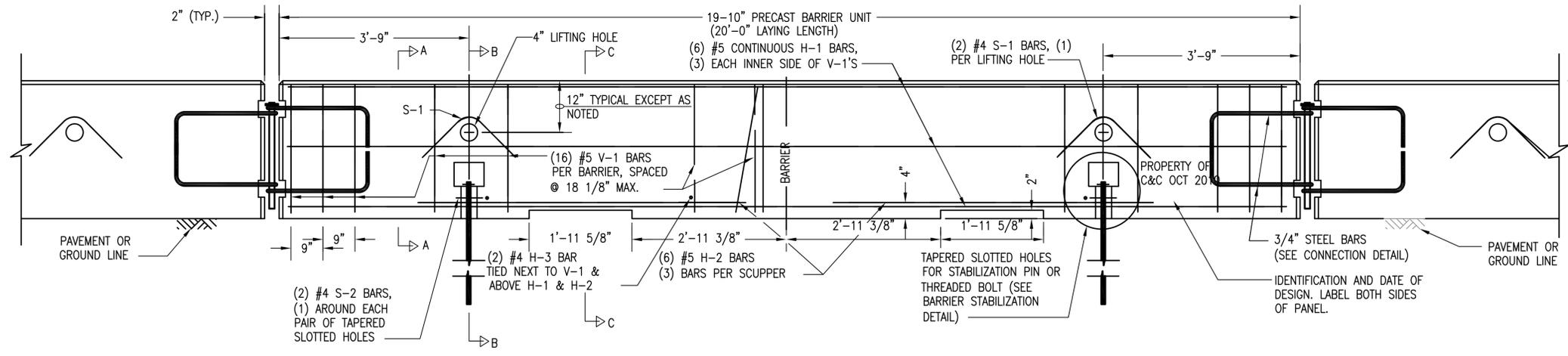
REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET ROCKFALL BARRIER SYSTEM DETAILS 500 KJ CAPACITY				
DESIGN	BCW/NMN	APPROVED:	C-11 SHEET 12 OF 19 SHEETS	
DRAWN	NMN/BCW	CHEF, CIVIL DIVISION, D.D.C.		
CHECKED	ARN	DATE		
DATE	MAY 2011	PROJECT NO.		

ARULAN R. NIROD
 LICENSED PROFESSIONAL ENGINEER
 No. 6198-C
 HAWAII U.S.A.

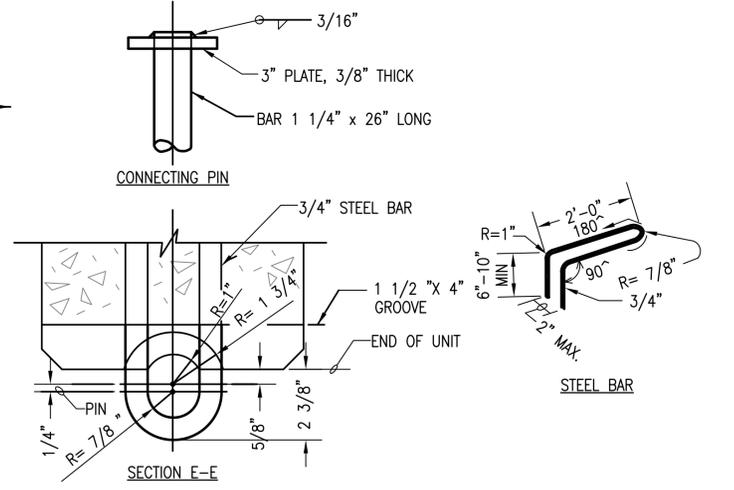
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SIGNATURE: _____ EXPIRATION DATE OF LICENSE: 4/30/12

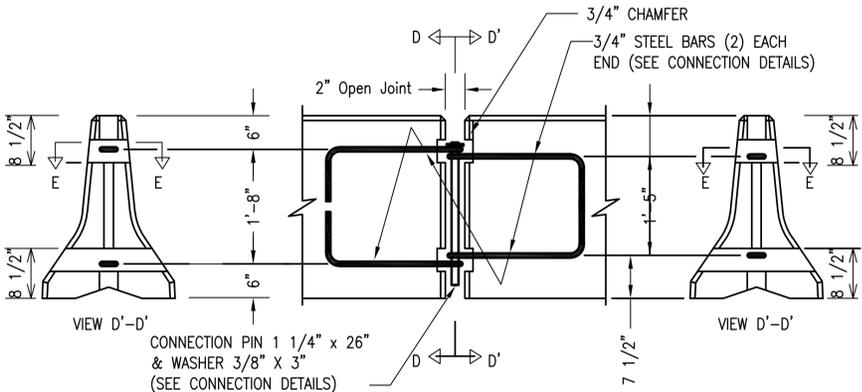
FILE	POCKET	FOLDER	NUMBER
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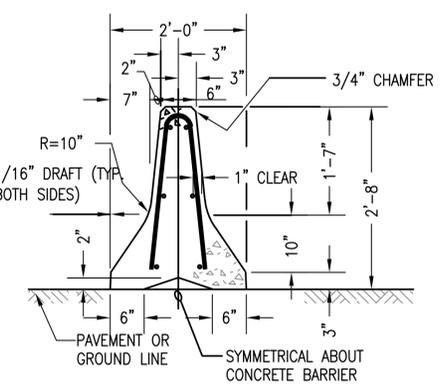
ELEVATION – TYPICAL BARRIER
NOT TO SCALE



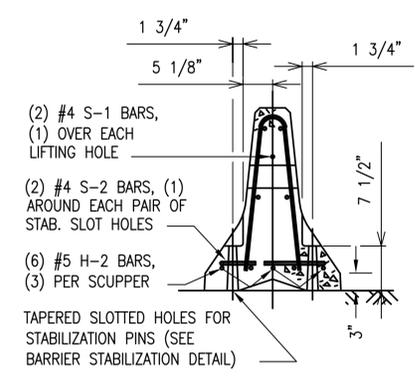
CONNECTION DETAILS
NOT TO SCALE



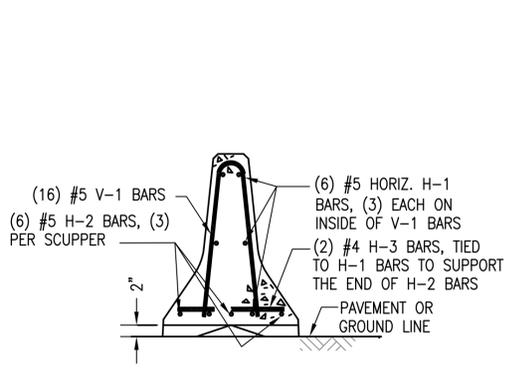
ELEVATION
NOT TO SCALE



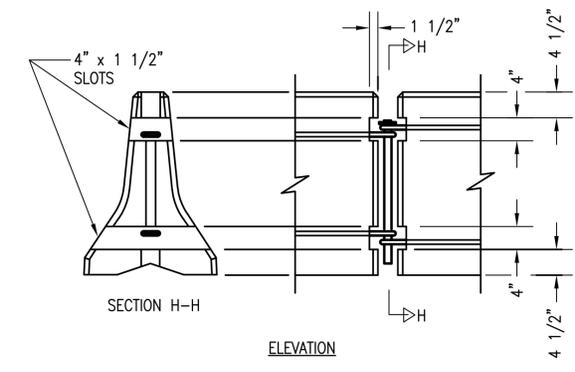
SECTION A-A
NOT TO SCALE



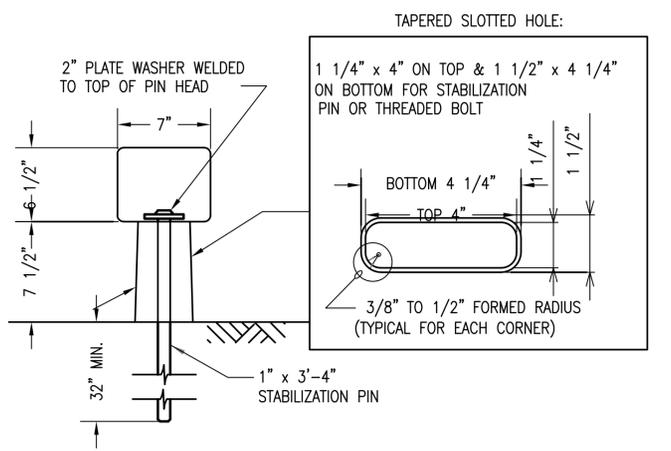
SECTION B-B
NOT TO SCALE



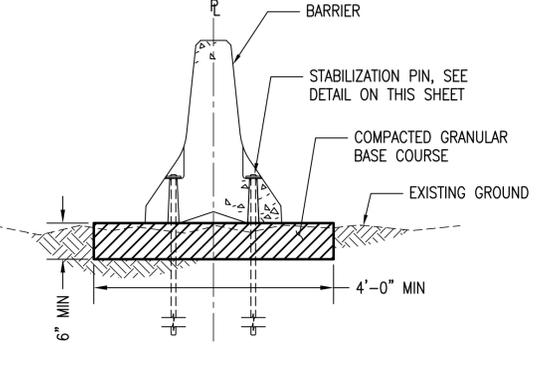
SECTION C-C
NOT TO SCALE



BARRIER REMOVAL SLOT DETAILS
NOT TO SCALE



BARRIER STABILIZATION DETAIL
NOT TO SCALE



BARRIER FOUNDATION DETAIL
NOT TO SCALE

DRAWN BY: J. B. BROWN, CIVIL ENGINEER, LICENSE NO. 100811
 CHECKED BY: J. B. BROWN, CIVIL ENGINEER, LICENSE NO. 100811
 DATE: MAY 09, 2011 @ 10:08:11 AM

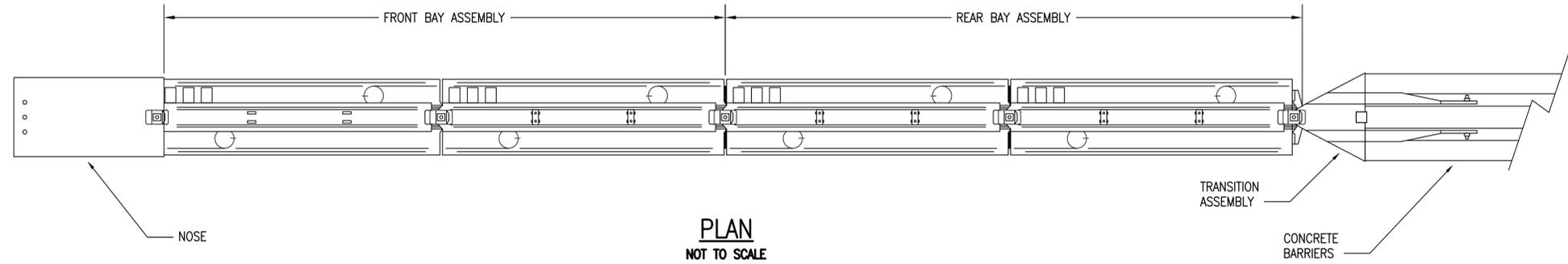
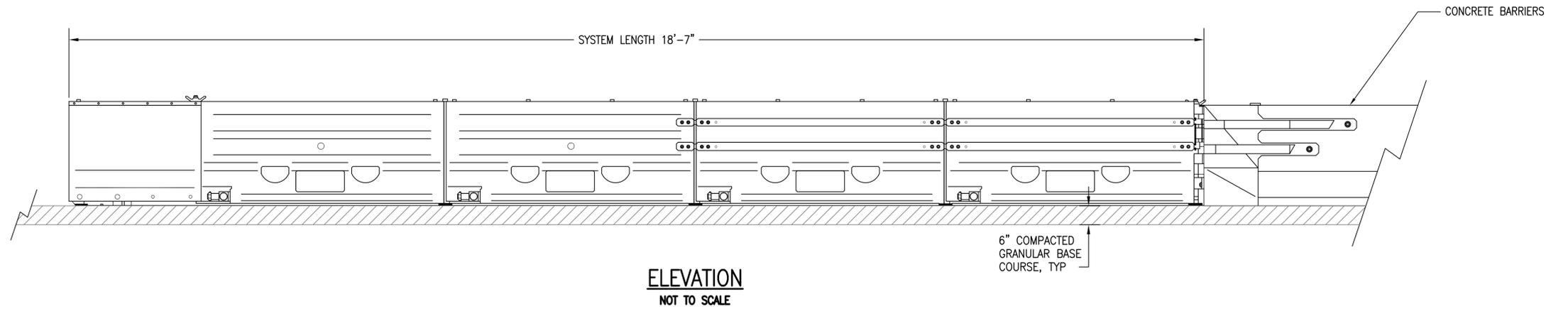
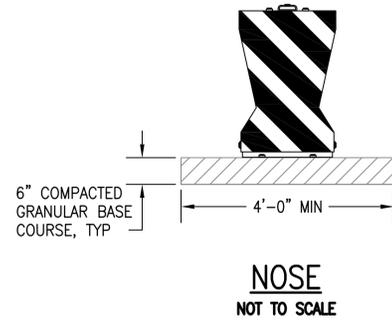
REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET CONCRETE BARRIER DETAILS				
DESIGN	BCW/MNM	APPROVED:	C-12 SHEET 13 OF 19 SHEETS	
DRAWN	MNM/BCW	CHEF, CIVIL DIVISION, D.D.C.		
CHECKED	ARN	DATE		
DATE	MAY 2011	PROJECT NO.		

ARDUAN R. NIROD
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

4/30/12
EXPIRATION DATE OF LICENSE

FILE	POCKET	FOLDER	NUMBER



NOTES:

1. INERTIAL BARRIER END TREATMENT SHALL BE ACZ 350 TL-2 OR APPROVED EQUAL SYSTEM.
2. REFER TO INSTALLATIONS MANUAL AND CONFIGURATION CHART FOR SPECIFIC SYSTEM ASSEMBLY AND ELEMENT ORIENTATION.
3. THE ACZ 350 SYSTEM CONSISTS OF FOUR MAJOR COMPONENTS, THE TRANSITION ASSEMBLY, REAR BAY ASSEMBLY, FRONT BAY ASSEMBLY, AND NOSE ASSEMBLY. SEE MANUFACTURER'S INSTALLATION MANUAL FOR DETAILS.
4. THE ACZ 350 SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR \perp OF MERGING BARRIER.

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 PLOT DATE: May 10, 2011 @ 12:22:34 PM

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET

INERTIAL BARRIER SYSTEM DETAILS

DESIGN	BCW/NMN	APPROVED:	C-13
DRAWN	NMN/BCW	DATE	
CHECKED	ARN	DATE	
DATE	MAY 2011	DATE	

PROJECT NO. _____

ARDUAN R. NIXED
 LICENSED PROFESSIONAL ENGINEER
 No. 6198-C
 HAWAII U.S.A.

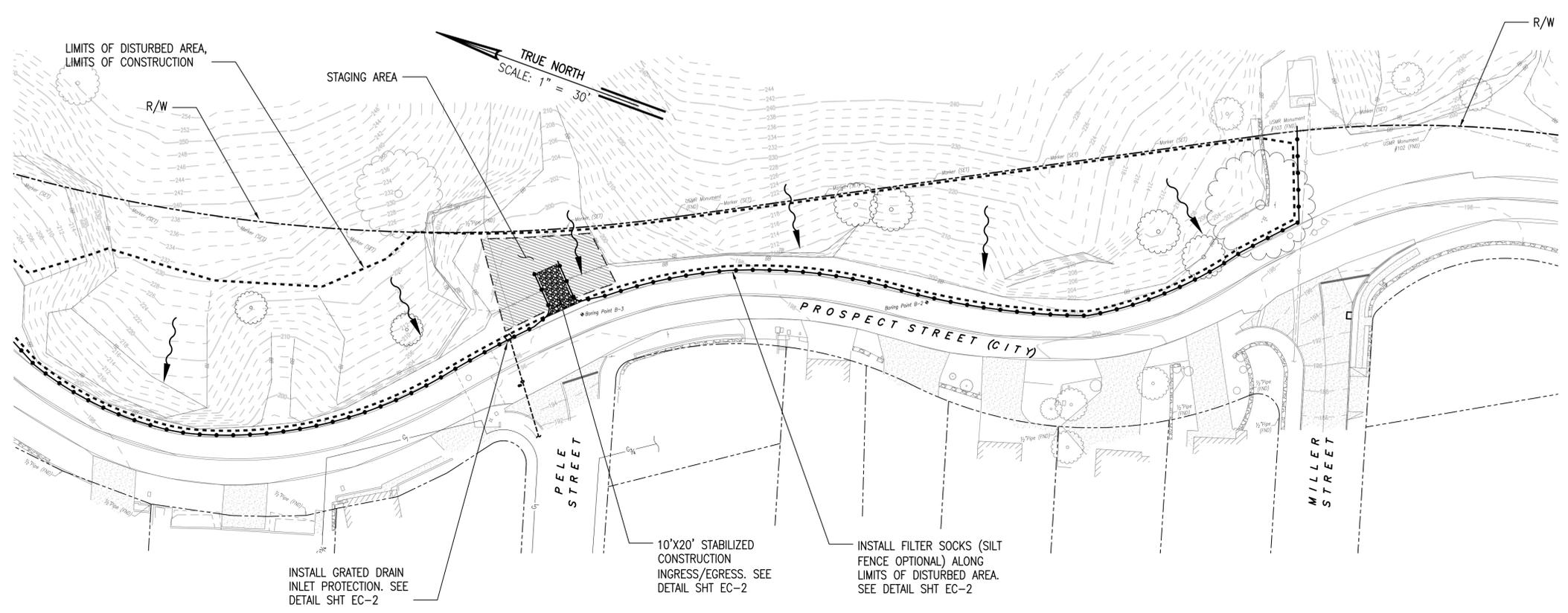
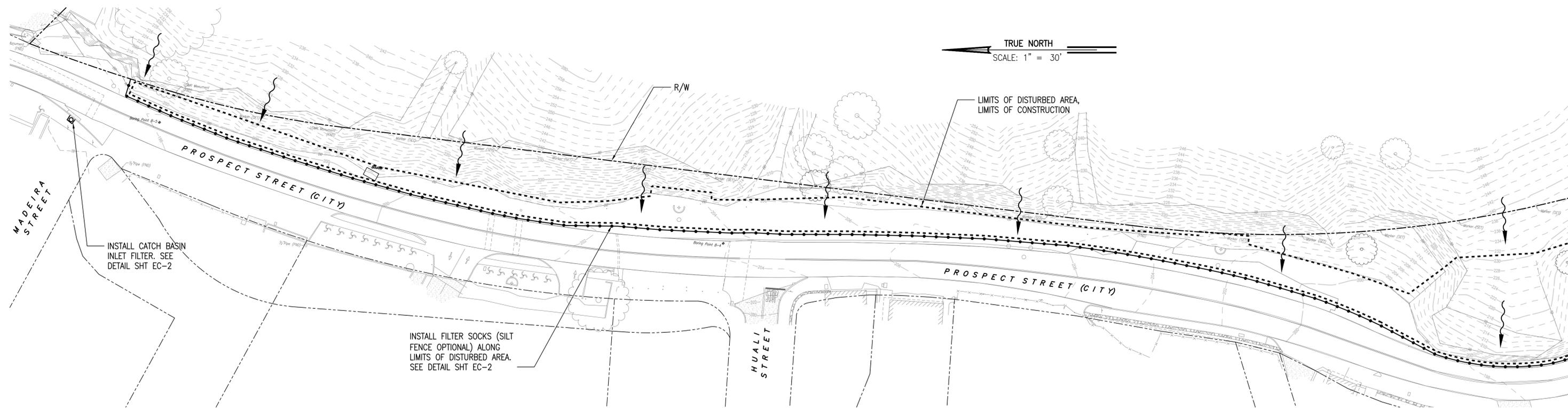
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4/30/12
EXPIRATION DATE OF LICENSE

SIGNATURE _____

AECOM

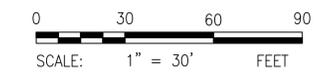
FILE	POCKET	FOLDER	NUMBER



LEGEND

- FILTER SOCK
- LIMITS OF DISTURBED AREA
- DIRECTION OF FLOW
- PROPERTY LINE OR R/W LINE
- LIMITS OF STAGING AREA

NOTES:
 1. SEE BEST MANAGEMENT PRACTICE (BMP) NOTES, SHEET EC-2.

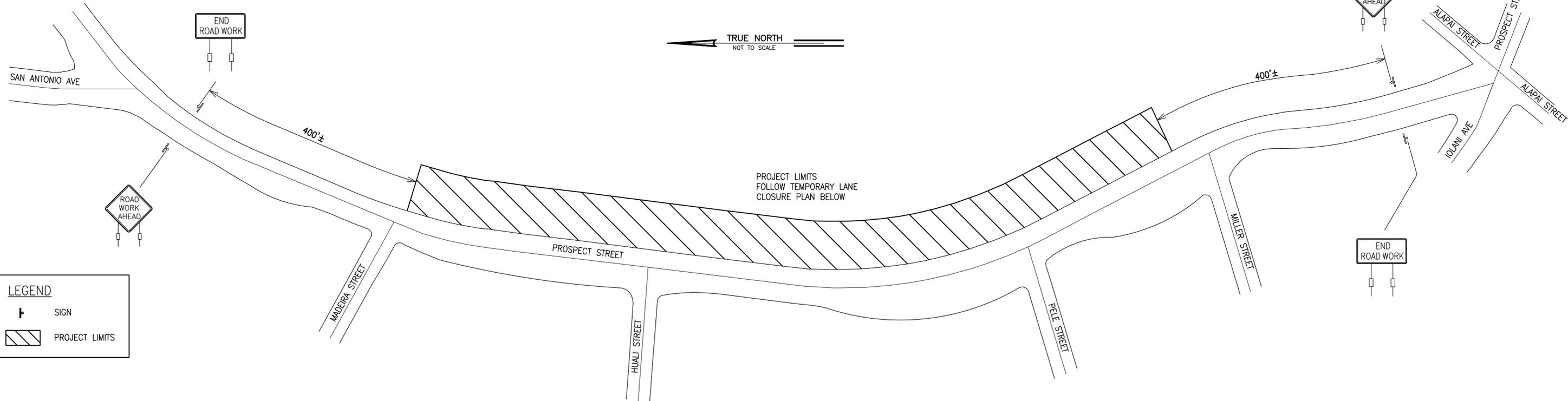


PLOT DATE: May 10, 2011 @ 02:46:41 pm
 PLOT SCALE: 1" = 30'
 PLOT SIZE: 11.00 x 17.00
 PLOT AREA: 187.00 sq ft
 PLOT PERIMETER: 100.00 ft
 PLOT CENTER: 56.25, 56.25

ARULAN R. NIKED
 LICENSED PROFESSIONAL ENGINEER
 No. 6198-C
 HAWAII U.S.A.

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AECOM

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET EROSION CONTROL PLAN				
DESIGN	BCW/NMN	APPROVED:	EC-1 SHEET 17 OF 19 SHEETS	
DRAWN	NMN/BCW	DATE		
CHECKED	ARN	DATE		
DATE	MAY 2011	DATE		
PROJECT NO.		FILE FOLDER NUMBER		

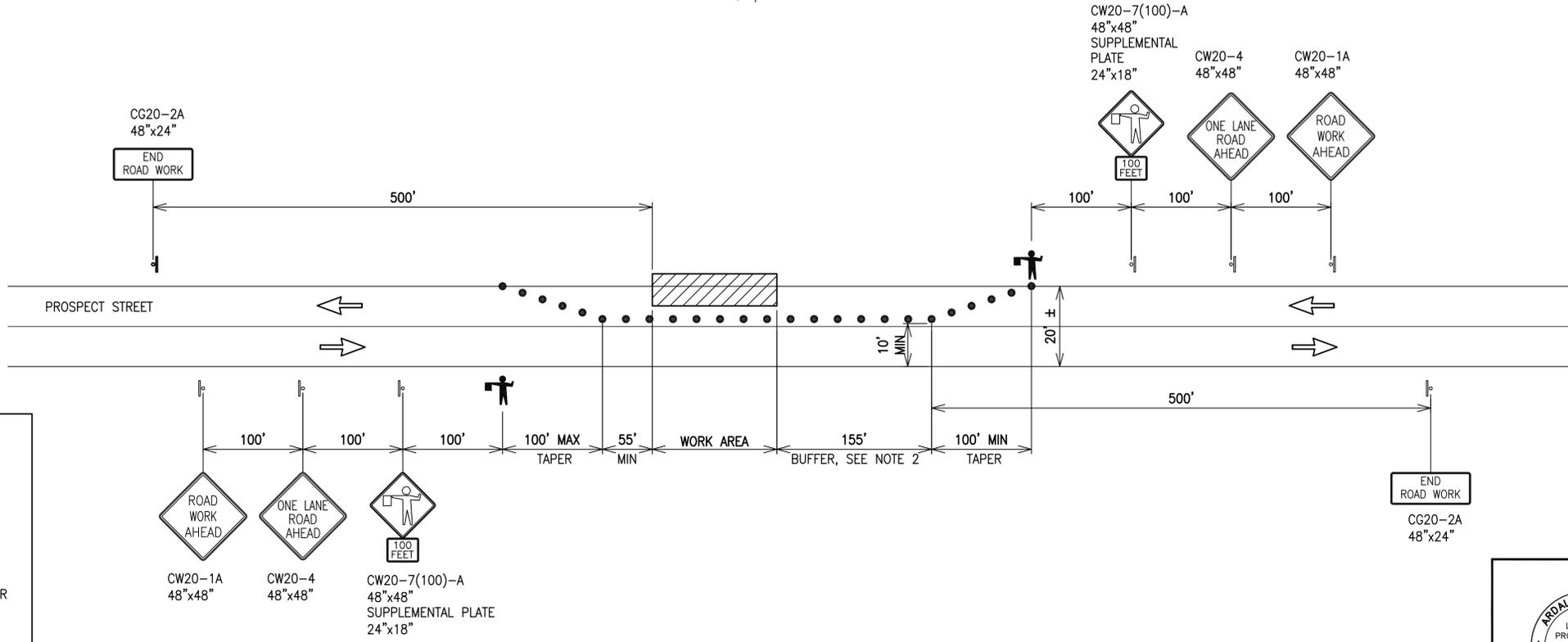


TRUE NORTH
NOT TO SCALE

LEGEND

┆ SIGN

▨ PROJECT LIMITS



- NOTES:**
- "ONE LANE ROAD" (CW20-4) AND "FLAGGER AHEAD" (CW20-7) SIGNS SHALL BE REMOVED OR COVERED WHEN NO WORK IS BEING PERFORMED AND LANE IS NOT CLOSED.
 - THE BUFFER SPACE SHOULD BE EXTENDED SO THAT THE TWO-WAY TRAFFIC TAPER IS PLACED BEFORE A HORIZONTAL (OR CREST VERTICAL) CURVE TO PROVIDE ADEQUATE SIGHT DISTANCE FOR THE FLAGGER AND A QUEUE OF STOPPED VEHICLES.
 - CONES OR DELINEATORS SHALL BE INSTALLED AT 20' O.C. MAX. ON TAPERS AND 25' O.C. MAX. FOR BUFFER AND WORK AREAS.
 - 'BE PREPARED TO STOP' SIGN SHOULD BE LOCATED BETWEEN THE FLAGGER SIGN AND THE 'ONE LANE ROAD' SIGN.
 - EXCEPT IN EMERGENCIES, ILLUMINATE FLAGGER STATIONS AT NIGHT.
 - WORK ON ANY CITY STREET AREA MAY BE PERFORMED ONLY BETWEEN THE HOURS OF 8:30 A.M. TO 3:30 P.M., MONDAY THROUGH FRIDAY, UNLESS OTHERWISE PERMITTED BY THE DEPARTMENT OF TRANSPORTATION SERVICES.

LEGEND

┆ SIGN

• CONE OR DELINEATOR

➔ DIRECTION OF TRAFFIC

┆ FLAGGER / POLICE OFFICER

▨ WORK AREA

LANE CLOSURE ON 2-LANE ROAD USING FLAGGERS
NOT TO SCALE

APPROVED: _____ DATE _____
CHIEF, TRAFFIC REVIEW BRANCH, D.P.P.
CITY AND COUNTY OF HONOLULU

ARJALAN R. NIHOI
LICENSED PROFESSIONAL ENGINEER
No. 6198-C
HAWAII U.S.A.

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4/30/12
EXPIRATION DATE OF LICENSE

AECOM

REVISION	DATE	DESCRIPTION	SHT. NO.	APPROVED
DEPARTMENT OF DESIGN AND CONSTRUCTION CITY AND COUNTY OF HONOLULU				
ROCK SLIDE POTENTIAL INSPECTIONS AND MITIGATIVE IMPROVEMENTS ALONG PROSPECT STREET				
TRAFFIC CONTROL PLAN				
DESIGN	BCW/NMN	APPROVED:	TCP-1 SHEET 19 of 19 SHEETS	
DRAWN	NMN/BCW	DATE		
CHECKED	ARN	DATE		
DATE	MAY 2011	DATE		
PROJECT NO.				

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 PLOT DATE: May 09, 2011 @ 10:14:17 am

SITE VISIT MEETING MINUTES

MEETING MINUTES

PROSPECT STREET ROCKFALL MITIGATION SITE VISIT

Date: December 21, 2011
Time: 11:00 am
Place: Prospect Street Project Site
Attendees:

Michael Yamasaki- Project Manager (DDC)
Ross Stephenson-Historian (SHPD)
Sara Collins- Senior Archaeologist (PCSI)
Ardalan Nikou- Project Manager (AECOM)
Brandon Weaver- Project Engineer (AECOM)
Julie Zimmerman- Environmental Planner (AECOM)
Tobias Koehler-Environmental Planner (AECOM)

Purpose: Review State Historic Preservation Division's (SHPD) concerns regarding the proposed design alternatives, and discuss the project description and the preferred alternatives.

Remarks:

1. The Attendees walked the project area and discussed the proposed action and preferred alternatives. The preferred alternatives were described for each zone as follows:
 - Zone 1- *Rockfall Impact Fence and Concrete Jersey Barrier*
 - Zone 2- *Rockfall Impact Fence and Concrete Jersey Barrier*
 - Zone 3- *Draped Wire Mesh, Rockfall Impact Fence, Cut Slope to Widen Shoulder*
2. Mr. Stephenson asked why rock scaling was dismissed from the recommended design alternatives. Mr. Nikou explained that rock scaling is a temporary fix, which does not fully mitigate the long term public health and safety concerns to the fullest extent possible. Mr. Yamasaki also explained that the project must stay within the C&CH right-of-way limits, and that any rock scaling of the upper slopes would encroach on Federal property. Therefore, rock scaling is not considered a valid design alternative for this particular project.
3. Mr. Stephenson asked about the visual impact of a rockfall impact fence on the hillside. It was explained that after the rockfall fences are in place, the surrounding vegetation would generally be allowed to regrow to its natural state and would effectively hide the fence from viewpoints on Prospect Street and the surrounding area. This approach has been used in several other projects such as the Department of Transportation (DOT) project on Kailua Road just before entering Kailua Town, and the Department of Land and Natural Resources (DLNR) at Puunui Quarry. These rockfall impact fences are virtually unseen from surrounding areas.

4. Concern was expressed by SHPD that the proposed jersey barriers would be a graffiti magnet and would not be visually conducive to the surrounding environment. The C&CH concurs with this concern. SHPD recommends that if concrete jersey barriers are to be used, they be stamped and colorized to give the appearance of a stone wall, as can be typically found throughout the surrounding neighborhood. Mr. Nikou indicated that concrete jersey barriers are locally produced with rock wall patterns. This approach has been undertaken at other C&CH projects and has successfully reduced graffiti and visual impacts.

Action Items:

1. AECOM to submit letter to SHPD with site visit summary and request for concurrence that the proposed project will have no adverse effect on significant historic properties.
2. AECOM to send SHPD updated construction plans.
3. SHPD to send AECOM letter with decision on concurrence request.

**PROSPECT STREET ROCKFALL MITIGATION
UPDATED PROJECT DESCRIPTION**

PROSPECT STREET ROCKFALL MITIGATION

UPDATED PROJECT DESCRIPTION

The City and County of Honolulu (C&CH), Department of Design and Construction, plans to conduct a rockfall hazard mitigation project, between 150 and 666 Prospect Street, Tax Map Key (TMK) 2-2-005:001.

Due to varying site conditions, it is difficult to identify a single design alternative capable of mitigating the entire project site. Therefore, the project site was categorized into three zones based on site topography and right-of-way boundary locations:

Zone 1: Zone 1 extends from Madeira Street to Huali Street and totals 0.20 acres. Zone 1 can be described as a high natural slope above a high cut slope and narrow shoulder. The right-of-way boundary is near the top of the cut slope.

Zone 2: Zone 2 is approximately 540 linear feet long measured along the roadway beginning at Huali Street and ending just before the sharp turn where the wide unpaved shoulder disappears. Zone 2 consists of 0.20 acres and is described as a steep natural slope above a roadside cut slope of varying heights. The shoulder is relatively wide and is regularly used for vehicle parking. The right-of-way limit is near the toe of the cut slope.

Zone 3: Zone 3 is approximately 0.57 acres and 540 linear feet measured along the roadway, and lies in the vicinity of Pele Street and Miller Street. This zone can be described as a natural slope above a short cut slope that varies in height, and narrow shoulder that varies in width. The right-of-way boundary is upslope from top of the cut slope.

Recommendations for the proposed action took into consideration factors such as public safety, construction cost, sound engineering principles and land ownership. After considering various design alternatives, the C&CH proposes to perform rockfall mitigation within each zone as follows:

For Zone 1- *Rockfall Impact Fence and Concrete Jersey Barrier*

This Proposed Action for Zone 1 prescribes a rockfall impact fence and concrete jersey barrier. The fence would be constructed along the toe of the slope. Due to the location of the existing property line, this is the only available location where a fence could be constructed without acquiring additional right-of-way. All of the fence components including the posts and the tie back anchors could be constructed within the existing C&CH right-of-way. The fence would be effective for stopping potential rockfall from the cut slope only.

In addition, a concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The rockfall impact fence is a dynamic system, and the fence netting will deflect when a large impact occurs. The jersey barrier would serve as a permanent divider preventing both vehicles and pedestrians from getting too close to the fence.

For Zone 2- *Rockfall Impact Fence and Concrete Jersey Barrier*

This Proposed Action for Zone 2 prescribes a rockfall impact fence and concrete jersey barrier. The impact fence would be constructed along the toe of the slope. Due to the location of the existing property line, this is the only available location where a fence can be constructed without acquiring additional right-of-way. All of the fence components, including the foundations, the posts, and the tieback anchors would

be constructed within the existing C&CH right-of-way. The fence would be effective for stopping potential rockfall from the cut slope only.

In addition, a concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence.

The Proposed Action for Zone 2 also includes removal of two kiawe trees (*Prosopis pallida*) from the C&CH property. These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to cars and pedestrians on Prospect Street.

For Zone 3– Draped Wire Mesh, Rockfall Impact Fence, Cut Slope to Widen Shoulder

The Proposed Action for Zone 3 allows for complete rockfall hazard reduction for the entire slope due to availability of space within C&CH right-of-way. It uses a combination of draped wire mesh, a rockfall impact fence, and moving the cut slope slightly back to accommodate widening of the shoulder. A rockfall impact fence would be installed within the existing right-of-way limits above the top of the cut slope. The fence would stop rolling rocks from the upper slope.

A draped wire mesh system would be installed over the cut slope down slope of the impact fence. Vegetation on the slope would be cleared flush to the ground surface. Foundation anchors for the draped wire mesh would then be drilled into the ground by a hydraulic/pneumatic drill mounted on a piece of tracked equipment, such as a small excavator. Anchors would be grouted using a hand held mixer and a small grout pump. After the anchors are tested, top support cable would be attached to the anchors and installed. The mesh would then be installed and attached to the top support cables.

Just north of Pele Street, the roadside shoulder would be widened to provide at least seven feet of clear distance measured from the edge of the roadway to the toe of the slope. The slope would have to be cut-back at about 45 degree angle for a distance of 250 feet measured along the roadway. The volume of excavated earth would be about 450 cubic yards, and the work would be done using a large track mounted excavator, a front end loader, and dump truck.

The Proposed Action for Zone 3 also includes removal of seven kiawe trees (*Prosopis pallida*) from the C&CH property. These trees pose a risk to public health and safety as many are uprooting and at risk of rolling down the slope and causing harm to cars and pedestrians on Prospect Street.

From: Zimmerman, Julie
To: Ross.W.Stephenson@hawaii.gov
Cc: Nikou.Ardalan; [Brandon Weaver \(Brandon.Weaver@aecom.com\)](mailto:Brandon.Weaver@aecom.com); [Steve Clark](mailto:Steve.Clark); myamasaki1@honolulu.gov
Subject: Prospect Street Rockfall Mitigation Project Follow-Up Email
Date: Thursday, January 05, 2012 3:10:00 PM
Importance: High

Aloha Ross,

This email is in response to our phone conversation on 05 January 2012 at 1:15 pm. You stated that SHPD has two additional items of concern regarding the Prospect Street Rockfall Mitigation Project.

1. SHPD requests all the wire mesh/fencing to be black in order to be less visible.
2. SHPD requests that the concrete jersey barriers be stamped and colorized to resemble the appearance of a stone wall, as seen typically throughout the surrounding neighborhood. The stamping and colorization should be of the rectangular shape/structure as the other walls in the area. SHPD also requests that the top (cap) of the jersey barrier be approximately a foot wide, as are the other walls in the area.

The City and County of Honolulu (C&CH) agrees to comply with the above stated requests for the Prospect Street Rockfall Mitigation Project.

As the proposed work would be conducted in areas disturbed by rockfalls, the C&CH is seeking concurrence that the proposed repairs will have no adverse effect on significant historic properties. C&CH respectfully requests a follow-up letter expressing concurrence.

Thank you,
Julie

Julie M. Zimmerman
Environmental Planner
Environment
Direct 808.356.5392 Fax 808.523.8950
Julie.Zimmerman@aecom.com

AECOM
1001 Bishop Street, Suite 1600, Honolulu, HI 96813
www.aecom.com

Please consider the environment before printing this e-mail

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUIHEWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96707

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

DATE: January 06, 2012

LOG: 2012.0028

DOC: 1201RS10

TO: Department of Planning and Permitting
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

SUBJECT: **Section 6E-8 Historic Preservation Review**
Project: Prospect Street Rockfall Mitigation
Permit # (None)
Owner: City and County of Honolulu
Location: 150 through 166 Prospect Street (Prospect between Miller and Madeira Streets),
Punchbowl district, Oahu
Tax Map Key: (1) 2-2-005:001

This letter is in response to a telephone conversation on January 06, 2012 between Julie Zimmerman of AECOM and Ross W. Stephenson of SHPD, regarding the installation of rockfall barriers on Prospect Street between Miller and Madeira Streets. The project would place a series of barriers on City and County of Honolulu (C&C) owned land on the mauka side of Prospect Street between 150 and 166 Prospect. The Area of Potential Effect (APE) would be C&C property mauka of the Prospect Street pavement between the two addresses.

The area in question was developed by the 1920s and was initially occupied mostly by individuals of Portuguese descent (as illustrated by street names such as Lisbon, Lusitana, Madeira and Concordia). The area has historically been one of small houses and lots with open views of the city and Punchbowl itself. The community would be eligible for the Hawaii Register of Historic Places under Criteria A (Events – ethnic immigration to Hawaii) and C (Architecture).

In a letter dated October 26, 2011 (LOG 2011.2127 DOC 1110RS40), SHPD had determined that the project could have effect and recommended that no action or rock scaling be undertaken. A site visit was held on December 21, 2011. Rock scaling was determined to be impossible without the permission of the Veterans Administration. Subsequently, we have the following agreement:

1. wire mesh and fencing materials are to be colored black in order to lessen visibility;
2. concrete Jersey barriers are to be stamped and colorized to resemble the appearance of a stone wall. This includes stamping a rectangular shape, colorizing the “stone” surfaces brown and creating a barrier top approximately one foot wide, all to copy the original subdivision street facing walls; and
3. the future use of herbicides for weed control in the project area is to be limited in order to allow foliage to regenerate to cover road cuts and the wire mesh/fencing.

Based upon these mutually agreed upon conditions, **the project is determined to have no effect on historic property.**

Any questions should be addressed to Ross W. Stephenson, SHPD Historian, at (808) 692-8028 (office), (808) 497-2233 (cell) or ross.w.stephenson@hawaii.gov.

Mahalo for the opportunity to comment.

A handwritten signature in black ink that reads "Westfall". The signature is written in a cursive, flowing style.

Angie Westfall
Architecture Branch Chief, Hawaii Historic Preservation Division

In the event that historic resources, including human skeletal remains, lava tubes, and lava blisters/bubbles are identified during construction activities, all work should cease in the immediate vicinity of the find, the find should be protected from additional disturbance, and the State Historic Preservation Division should be contacted immediately at (808) 692-8015.

Appendix B
Biological Survey



BIOLOGICAL RESOURCE SURVEY FOR PROSPECT STREET ROCKFALL MITIGATION

City & County of Honolulu
Department of Design & Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

November 2011

BIOLOGICAL RESOURCE SURVEY FOR PROSPECT STREET ROCKFALL MITIGATION

Prepared for:

City & County of Honolulu
Department of Design & Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

Prepared by:

AECOM Technical Services, Inc.
1001 Bishop Street, Suite 1600
Honolulu, HI 96813-3698

November 2011

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1.0 INTRODUCTION

AECOM Technical Services, Inc. (AECOM) completed a Biological Resource Survey for the proposed Prospect Street Rockfall Mitigation on 04 August 2011. The project area is located upslope of Prospect Street on the west-southwest side of the Punchbowl Crater extending between Miller and Madeira Streets in Honolulu, Hawaii on the island of O'ahu. This report was written for inclusion in the Rockslide Potential Inspection and Mitigative Improvements along Prospect Street environmental assessment. The environmental assessment will become part of the public record.

The City and County of Honolulu is proposing to implement rockfall mitigation measures to reduce the potential for rockfall hazards adjacent to Prospect Street. The existing slope has a multitude of potentially hazardous rocks, creating a high potential for rockfalls and landslides to reach the roadway. Rockfall mitigation measures are needed to reduce these identified risks to public health and safety for users of the road corridor.

The purpose of this survey is to determine the presence of state and federally listed wildlife and plant species (herein "listed species") and to document the terrestrial flora and fauna found within the proposed project area. No streams or other water bodies are located within the project area, thus aquatic flora and fauna are not part of this survey. Lists of species observed and their relative abundance are included in this report. Potential mitigation measures are not provided in this report.

2.0 METHODOLOGY

AECOM biologists reviewed standard literature sources for potentially present listed species and conducted searches as listed below:

- The United States Fish and Wildlife Service's (USFWS) online database of listed species and occurrences for Hawaii.
- The Hawai'i Biodiversity and Mapping Program at the University of Hawai'i at Manoa Center for Conservation Research and Training.

On 04 August 2011, AECOM biologists conducted terrestrial surveys of the Prospect Street Rockfall Mitigation project area. The investigation consisted of a site walk of the entire extent of the three zones of the proposed rockfall mitigation project area at the toe of the slopes of Punchbowl Crater along Prospect Street. Particular attention was given to detecting the presence of listed species such that while transecting the site, frequent stops were made to survey the surrounding area for signs (i.e., tracks, nests, vocalizations) of listed species. Biologists recorded the presence of all plants and animals identified during the terrestrial survey. Species lists are provided in Section 3.0.

3.0 RESULTS

The project area varies between three terrain types: (1) level, graded roadside; (2) vegetated areas with varying slope; and (3) near-vertical road cuts and rock outcrops. While the roadside sections had the highest relative species diversity per area, they are also subjected to frequent disturbance (vehicular traffic and parking). The rock outcrops and road cuts are also subject to frequent disturbance, but slope and substrate result in little/no vegetative cover. The vegetated areas with varied slopes are dominated by a near-monotypic grass ground cover with occasional trees.

The investigation took place during the summer following a relatively wet winter, and the site appeared to be in a relatively "natural" state (e.g., unaltered by recent fire or significant ground disturbance).

Of the 48 plant species observed at the project site, greater than 97% are introduced, non-native species. Only one native species was observed, *Waltheria indica*, which is not considered rare, endangered, or otherwise protected. Table 1 lists the plants observed in the project area.

Table 1: Species List of Plants (Flora) Observed at the Site

Scientific Name ^{ab}	Common Name	Location & Abundance ^c			Status ^d
		Zone 1	Zone 2	Zone 3	
FLOWERING PLANTS					
<i>Dicotyledons</i>					
ACANTHACEAE					
<i>Asystasia gangetica</i>	Chinese Violet	C	C	C	nat
AMARANTHACEAE					
<i>Amaranthus viridis</i>	Slender amaranth	O		O	nat
<i>Althernanthera caracasana</i>	Mat chaff flower	O			nat
<i>Althernanthera pungens</i>	Khaki weed	O			nat
ANACARDIACEAE					
<i>Schinus terebinthifolius</i>	Christmas Berry			O	nat
APOCYNACEAE					
<i>Stapelia gigantea</i>	Carrion Flower		O		nat
ASTERACEAE					
<i>Tridax procumbens</i>	Coat Buttons		O	O	nat
<i>Emilia sonchifolia</i> (or <i>Emilia fosbergii</i>)	Emilia	O		O	nat
BIGNONIACEAE					
<i>Spathodea campanulata</i>	African tulip	U			nat
BRASSICACEAE					
<i>Lepidium bonariense</i>	Lepidium	U			nat
CACTACEAE					
<i>Opuntia ficus-indica</i>	Prickly Pear Cactus	O	O	O	nat
<i>Hylocereus undatus</i>	Night Blooming Cereus		O	O	nat
CLUSIACEAE					
<i>Clusia rosea</i>	Autograph Tree		U		nat
CONVOLVULACEAE					
<i>Ipomea obscura</i>	Morning Glory	O		O	nat
CRASSULACEAE					
<i>Bryophyllum pinnatum</i>	Air Plant	O	O	O	nat
CUCURBITACEAE					
<i>Momordica charantia</i>	Bitter melon			O	nat
EUPHORBIACEAE					
<i>Euphorbia hirta</i>	Garden Spurge	O	O	O	nat
<i>Euphorbia prostrata</i>	Prostrate Spurge	O	O	O	nat
FABACEAE					
<i>Prosopis pallida</i>	Kiawe, mesquite	O	O	O	nat
<i>Leucaena leucocephala</i>	Koa Haole	C	C	C	nat
<i>Desmanthus virgatus</i>		O			nat
<i>Crotalaria pallida</i>	Smooth rattle pod	O			nat
LAMIACEAE					
<i>Leonotis leonurus</i>	Lion's Ear	O	O	O	nat
MALVACEAE					
<i>Sida cordifolia</i>		O			nat
<i>Sida ciliaris</i>	Red ilima	O			nat
<i>Sida acuta</i>		O			nat
<i>Sida rhombifolia</i>		O			nat
<i>Waltheria Indica</i>	Uhaloa		O		ind

Scientific Name ^{ab}	Common Name	Location & Abundance ^c			Status ^d
		Zone 1	Zone 2	Zone 3	
<i>Abutilon grandifolium</i>	False Mallow	O	O		nat
Dicotyledons (cont'd)					
MORACEAE					
<i>Ficus microcarpa</i>	Chinese Bayan	U			nat
NYCTAGINACEAE					
<i>Bougainvillea spectabilis</i>	Bougainvillea			U	orn
OXALIDACEAE					
<i>Oxalis corniculata</i>	Yellow wood sorrel	U			nat
PLUMBAGNACEAE					
<i>Plumbago auriculata</i>	Plumbago		O		nat
POLYGONACEAE					
<i>Antigonon leptopus</i>	Mexican creeper			O	nat
RUTACEAE					
<i>Murraya paniculata</i>	Mock Orange			O	nat
SOLANACEAE					
<i>Nicotiana glauca</i>	Tree Tobacco			U	nat
<i>Solanum lycopersicum var cerasiforme</i>	Cherry Tomato	O	O		nat
Monocotyledons					
ASPARAGACEAE					
<i>Furcraea foetida</i>	Mauritius hemp		U		nat
<i>Sansevieria trifasciata</i>	Mother-in-law's tongue	O	O		orn
COMMELINACEAE					
<i>Tradescantia fluminensis</i>	White flowered wandering jew	O			nat
<i>Commelina diffusa</i>	Honohono	O	O	O	nat
<i>Callisia repens</i>	Inch plant		O		nat
POACEAE					
<i>Panicum maximum</i>	Guinea Grass	C	C	C	nat
<i>Digitaria insularis</i>	Sourgrass	C			nat
<i>Setaria verticillata</i>	Bristly foxtail	C	O	O	nat
XANTHORRHOEACEAE					
<i>Aloe Vera</i>	Aloe Vera			O	nat

^a Plant names follow *Hawaii's Fern and Fern Allies* (Palmer 2003) and the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 1999).

^b All plants observed at the site are flowering plants.

^c Abundance ratings:

R: Rare. Only one or two plants at the project site.

U: Uncommon. Two to five plants are at the project site.

O: Occasional. Found five to ten times but not abundant anywhere at the project site.

C: Common. Occurs regularly throughout the project site.

A: Abundant. A dominant species and defining vegetation type at the project site.

^d Distributional Status (listed species indicated with **bold** font):

End.: Endemic. Native to Hawai'i and found naturally nowhere else.

Ind.: Indigenous. Native to Hawai'i but not unique to the Hawaiian Islands.

Nat.: Naturalized. An exotic plant introduced to the Hawaiian Islands since the arrival of the Cook Expedition in 1778 that has escaped cultivation.

Orn.: Ornamental. An exotic, ornamental plant that has not naturalized in the Hawaiian Islands.

Pol.: Polynesian. Introduced to the Hawaiian Islands prior to 1778.

The vegetation composition observed at the site is typical of lowland, dry, urban, disturbed roadside sites across the Hawaiian Islands. The slopes away from the roadway are dominated by Guinea grass (*Panicum maximum*) ground cover interspersed with Haole koa (*Leucaena leucocephala*). Multiple kiawe trees (*Prosopis pallida*), some tipped over but still rooted and growing, line sections

closer to the roadway. Ornamental species, such as Bougainvillea (*Bougainvillea spectabilis*), are likely inadvertent releases over the years from adjacent properties and passersby. Parked cars likely have contributed to the introduction of many non-native introduced species along the road's edge.

None of the plant species observed in the project area are listed as Threatened, Endangered, or Species of Special Concern by the State of Hawai'i or by any federal jurisdictional agency.

3.1 TERRESTRIAL FAUNA

No terrestrial fauna was observed within the proposed project area. Within the area of potential impact, the terrain, hydrology, vegetative cover and proximity to the roadway and urban area is also not conducive as habitat for protected terrestrial fauna including vertebrates and invertebrates. No fauna including, seabirds, water birds, or terrestrial fauna listed as Threatened, Endangered, or Species of Special Concern by the State of Hawai'i or by any federal jurisdictional agency were observed during the site visit.

3.2 LISTED SPECIES DATA SEARCH

The USFWS's online database of listed species and occurrences within the State of Hawai'i was searched to develop a list of potentially present species. None of the potentially present species identified by researching the USFWS database of 61 listed species for the State of Hawai'i were observed during the site visit.

An inquiry was sent to the Hawai'i Biodiversity and Mapping Program. An e-mailed response was received on 31 October 2011 stating that a search of the database indicated that no listed plants or animals were recorded within the project site.

4.0 CONCLUSIONS

None of the species produced by the query of the USFWS's online database of listed species and occurrences within the State of Hawai'i was observed during AECOM's field visit. Additionally, at the time of the field visit, no state or federally listed species were observed within or near the proposed project area. Given the local urbanization and general degradation of the Prospect Street environment, it is unlikely that the resources within the project area would support any listed species. Therefore, the implementation of the proposed rockfall mitigation measures at Prospect Street would not have significant adverse impacts to biological resources within and adjacent to the project area.

Due to the temporal nature of biological survey results, conclusions contained herein do not preclude the potential for future listed species occurrences in the project vicinity based on known species ranges and habitat preferences.

5.0 REFERENCES

- Federal Register. 2005. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. *Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petition; Annual Description of Progress on Listing Actions*. Federal Register, 70 No. 90 (Wednesday, May 11, 2005): 24870-24934.
- Palmer, D.D. 2003. *Hawaii's Ferns and Fern Allies*. University of Hawai'i Press, Honolulu, HI.
- United States Fish and Wildlife Service (USFWS). 2010. URL: http://ecos.fws.gov/tess_public/.
- Wagner, W.L. and D.R. Herbst. 1999. *Supplement to the Manual of the Flowering Plants of Hawai'i*. Revised edition. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.

**Appendix A
Photo Log**

Photo No.	Description
1	The view from Prospect Street facing north.
2	The view from Prospect Street facing south.
3	A portion of the proposed Prospect Street project area in Zone 2.
4	<i>Prosopis pallida</i> in Zone 2.



Photo 1: The view from Prospect Street facing north.



Photo 2: The view from Prospect Street facing south.



Photo 3: A portion of the proposed Prospect Street project area in Zone 2.



Photo 4: *Prosopis pallida* in Zone 2.

Appendix C
Tree Survey

**Tree Survey
For
Rockfall Mitigation
At
Prospect Street**

**Prepared For:
AECOM, INC.
841 Bishop Street
Suite 1900
Honolulu, Hawaii 96813**

**Prepared By:
Robert . Midkiff, Jr.
Consulting Arborist LLC
P.O. Box 931
Haleiwa, Hawaii 96712
Ph: (808) 393-7123**

November 15, 2009

The scope of my report is to identify and assess any trees that may be of significance in the city property along the mauka side of Prospect Street from the end of the Madeira Street corridor, to the intersection of Prospect Street and Miller Street. There are nine trees in the city zone as signified on the maps. The following descriptions refer to trees marked by number on the maps.

1. Tree #1 is a Kiawe opposite 303 Prospect Street. It has a diameter of 2 ft., a height of 20 ft., and a crown spread of 20 ft. Tree #1 uprooted and fell over some years ago, but has continued to grow. As they grow the branches will become heavier and could cause the uprooted trunk to roll. This could pose a future hazard to parked cars and pedestrians. I recommend removal.
2. Tree #2 is a Kiawe opposite 407 A & B Prospect Street. It has a diameter of 1 ft., a height of 15 ft., and a crown spread of 20 ft. Tree #2 uprooted and fell over some years ago, but has continued to grow. The weight of the growing branches could eventually cause the tree to roll posing a hazard to pedestrians and cars parked nearby. I recommend removal.
3. Tree #3 is a Kiawe opposite 421 Prospect Street. It has a diameter of 2 ft., a height of 15 ft., and a crown spread of 15 ft. Tree #3 uprooted and fell over some years ago, but has continued to grow. It is well away from pedestrians, parking, and the road and poses no hazard.
4. Tree #4 is a Kiawe opposite 1598 Pele Street at the intersection of Pele Street and Prospect Street. It has a diameter of 2 ft., a height of 15 ft., and a crown spread of 15 ft. Tree #4 uprooted and fell over some years ago, but has continued to grow. The weight of the growing branches could eventually cause the trunk to roll and fall down the cliff posing a hazard to pedestrians, parked cars and the roadway. I recommend removal.
5. Tree #5 is a Kiawe opposite 509 & 513 Prospect St. It has a diameter of 3 ft., a height of 15 ft., and a crown spread of 20 ft. Tree #5 appears to be in a healthy state at this time.
6. Tree #6 is a Kiawe opposite 509 & 513 Prospect Street. It has a diameter of 2 ft., a height of 20 ft., and a crown spread of 20 ft. Tree #6 uprooted and fell over some years ago, but has continued to grow. The weight of the growing branches could eventually cause the tree to slide down the hill posing a hazard for pedestrians and parked cars. I recommend removal.
7. Tree #7 is a Kiawe opposite 525 Prospect Street. It has a diameter of 3 ft., a height of 20 ft., and a crown spread of 20 ft. Tree #7 uprooted and fell over some years ago, but has continued to grow. The weight of the growing branches could cause the trunk to roll posing a hazard for pedestrians, parked cars and the roadway. I recommend removal.

8. Tree #8 is a Kiawe opposite 525 Prospect Street. It has a diameter of 1 ft., a height of 20 ft., and a crown spread of 20 ft. Tree #8 uprooted and fell over some years ago, but continued to grow. The weight of the growing branches could cause the tree to roll posing a hazard to pedestrians, parked cars and the roadway. I recommend removal.

9. Tree #9 is a Kiawe opposite 525 Prospect Street. It has a diameter of 3.5 ft., a height of 40 ft., and a crown spread of 50 ft. Tree #9 appears to be in a healthy condition at this time. However there is erosion around the roots. Also, the tree is in close proximity to parking areas and the roadway. If this tree were to uproot and fall over it would pose a hazard to pedestrians, parked cars and the roadway. Because of the obvious propensity for larger Kiawe trees to uproot and fall over in the shallow soil found on Punchbowl, and considering the size of the tree and the erosion near the roots, I feel that this tree poses a threat to public safety. I recommend removal.



Fig. 1. Tree #1-Opposite 303 Prospect Street.



Fig. 2. Tree #2-Opposite 407 Prospect Street.



Fig. 3. Tree #3-Opposite 421 Prospect Street.



Fig. 4. Tree #4-Opposite 1598 Pele Street.



Fig. 5. Trees #5 & #6-Opposite 509 & 513 Prospect Street.



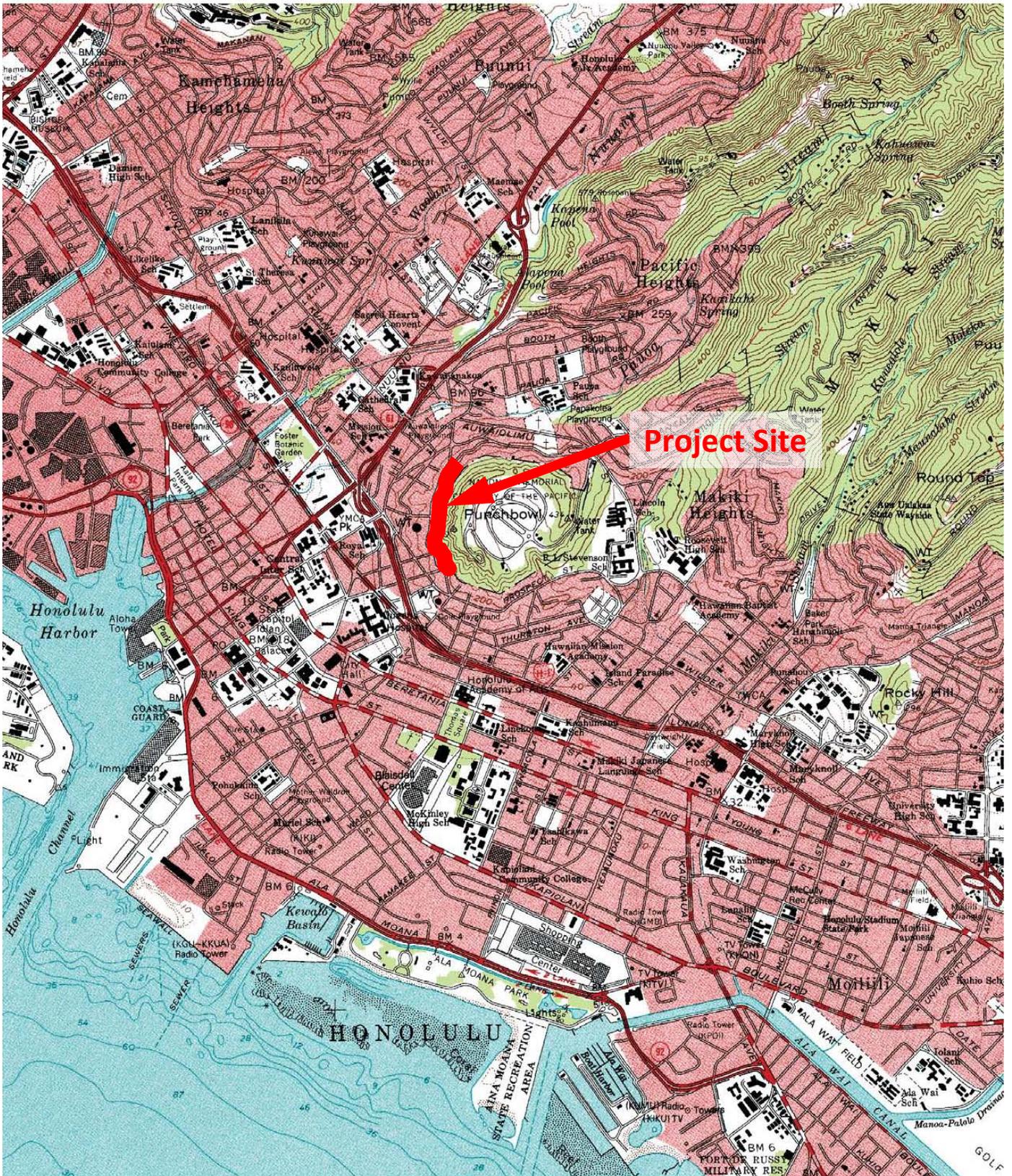
Fig. 6. Trees #5 & #6.



Fig. 7 & 8. Trees #7 & #8-Opposite 525 Prospect Street.



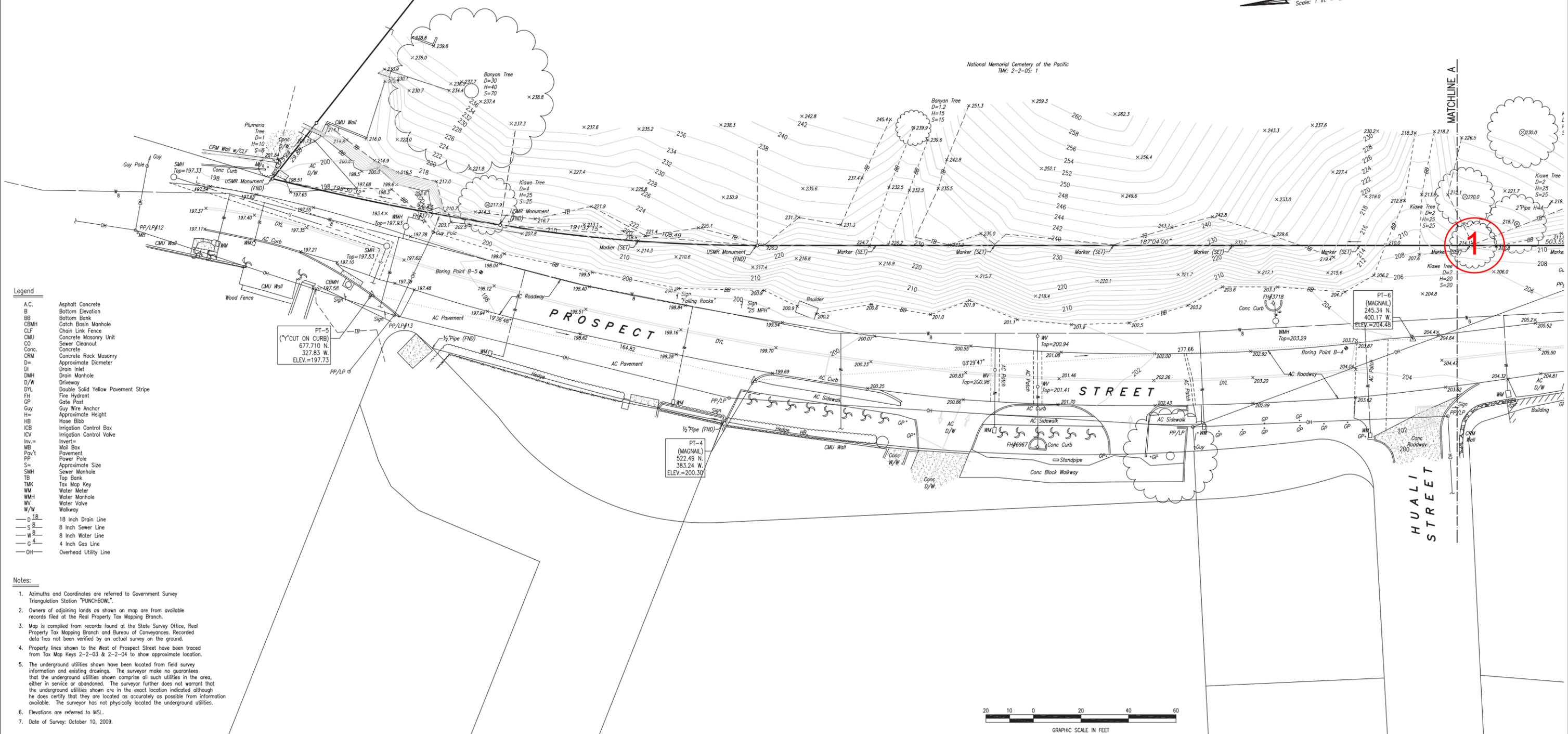
Fig. 9. Tree #9-Opposite 525 Prospect Street.



PRELIMINARY TOPOGRAPHIC SURVEY

PROSPECT STREET ROCKFALL MITIGATION AREA

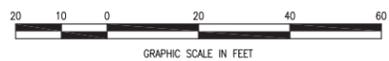
AUWAIOLIMU, HONOLULU, OAHU, HAWAII
TAX MAP KEY: (1ST DIV.) 2-2-03, 05, 06



Legend

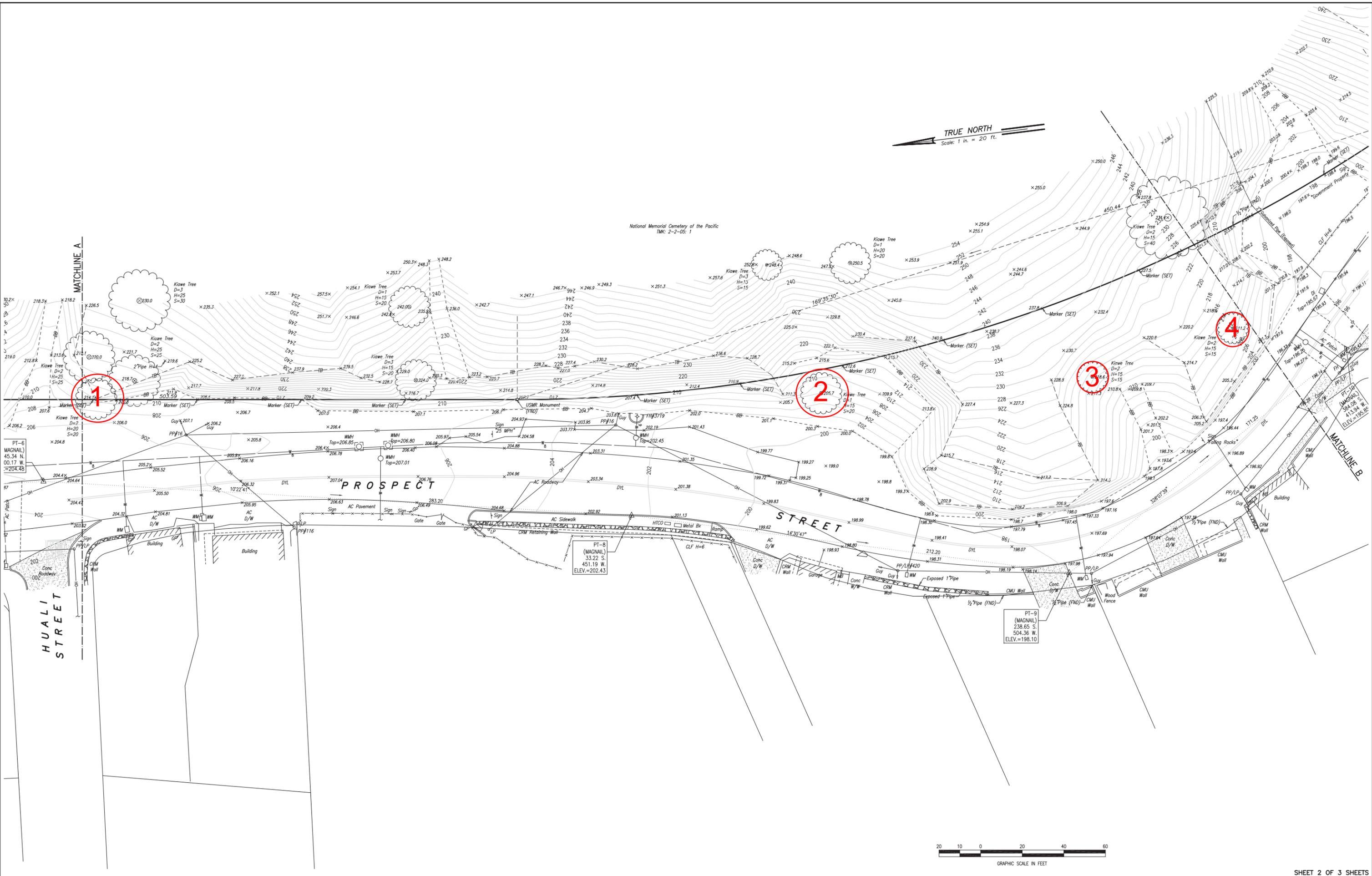
AC.	Asphalt Concrete
B	Bottom Elevation
BB	Bottom Bank
CBMH	Catch Basin Manhole
CLF	Chain Link Fence
CMU	Concrete Masonry Unit
CO	Sewer Cleanout
Conc.	Concrete
CRM	Concrete Rock Masonry
D=	Approximate Diameter
DMH	Drain Manhole
D/W	Driveway
DYL	Double Solid Yellow Pavement Stripe
FH	Fire Hydrant
GP	Gate Post
Guy	Guy Wire Anchor
H=	Approximate Height
HB	Hose Bib
ICB	Irrigation Control Box
ICV	Irrigation Control Valve
Inv.=	Invert
MB	Mail Box
Pav't	Pavement
PP	Power Pole
S=	Approximate Size
SMH	Sewer Manhole
TB	Top Bank
TMK	Tax Map Key
WM	Water Meter
WMH	Water Manhole
WV	Water Valve
W/W	Walkway
D 18	18 Inch Drain Line
S 8	8 Inch Sewer Line
W 8	8 Inch Water Line
G 4	4 Inch Gas Line
OH	Overhead Utility Line

- Notes:**
1. Azimuths and Coordinates are referred to Government Survey Triangulation Station "PUNCHBOWL".
 2. Owners of adjoining lands as shown on map are from available records filed at the Real Property Tax Mapping Branch.
 3. Map is compiled from records found at the State Survey Office, Real Property Tax Mapping Branch and Bureau of Conveyances. Recorded data has not been verified by an actual survey on the ground.
 4. Property lines shown to the West of Prospect Street have been traced from Tax Map Keys 2-2-03 & 2-2-04 to show approximate location.
 5. The underground utilities shown have been located from field survey information and existing drawings. The surveyor makes no guarantee that the underground utilities shown comprise all such utilities in the area, either in service or abandoned. The surveyor further does not warrant that the underground utilities shown are in the exact location indicated although he does certify that they are located as accurately as possible from information available. The surveyor has not physically located the underground utilities.
 6. Elevations are referred to MSL.
 7. Date of Survey: October 10, 2009.





National Memorial Cemetery of the Pacific
TMK: 2-2-05: 1



MATCHLINE A

MATCHLINE B

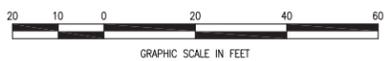
PROSPECT STREET

STREET

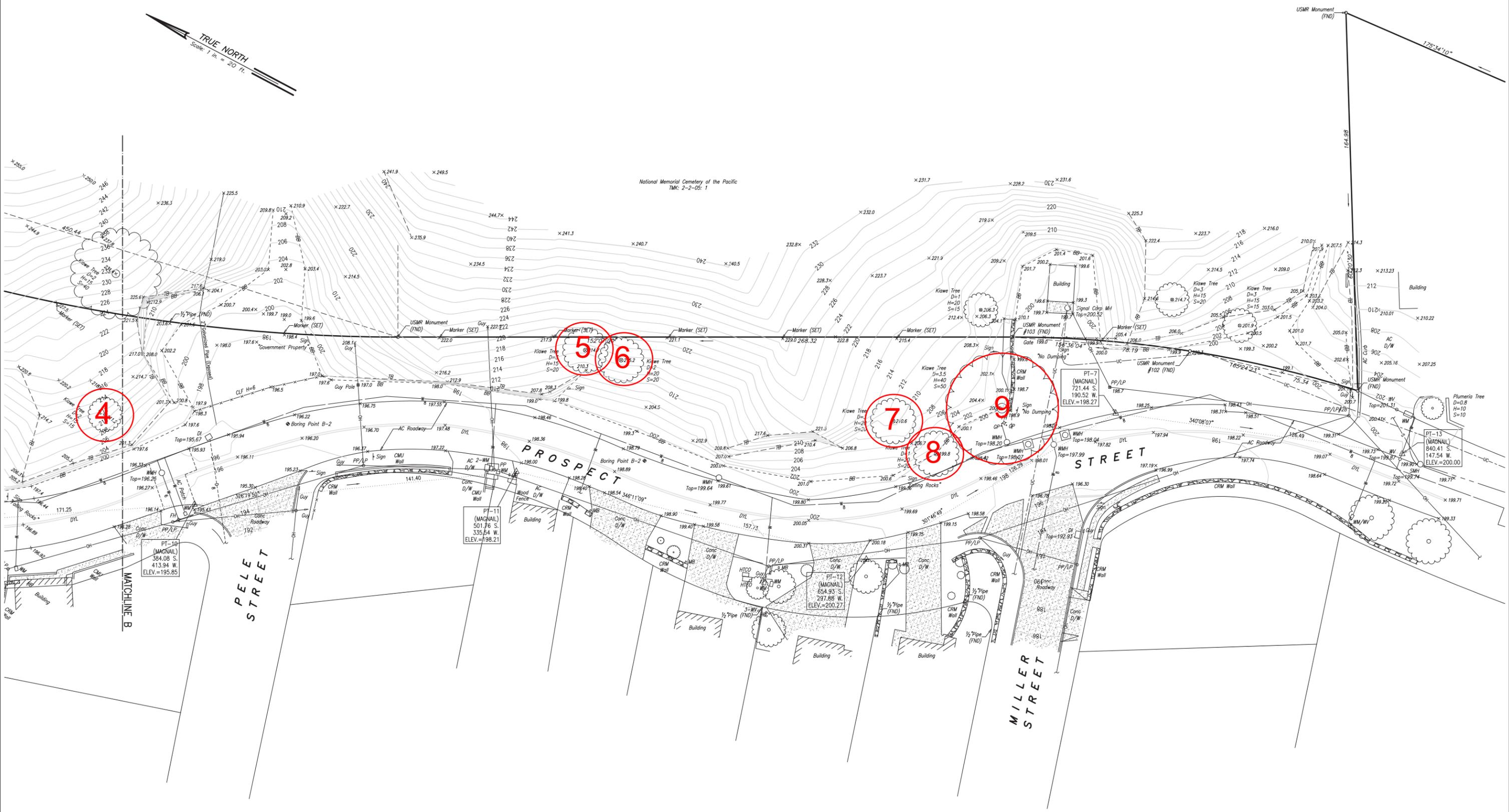
HUALI STREET

PT-8
(MAGNAIL)
33.22 S.
451.19 W.
ELEV.=202.43

PT-9
(MAGNAIL)
238.65 S.
504.36 W.
ELEV.=198.10



PT-6
(MAGNAIL)
45.34 N.
00.17 W.
ELEV.=204.48



National Memorial Cemetery of the Pacific
TMC: 2-2-05: 1

USMR Monument (FND)
175°34'10"

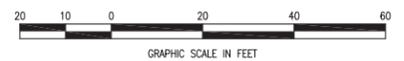
PT-10
(MAGNAIL)
384.08 S.
413.94 W.
ELEV.=195.85

PT-11
(MAGNAIL)
501.76 S.
335.64 W.
ELEV.=198.21

PT-12
(MAGNAIL)
654.93 S.
737.88 W.
ELEV.=200.27

PT-7
(MAGNAIL)
721.44 S.
190.52 W.
ELEV.=198.27

PT-13
(MAGNAIL)
840.41 S.
147.54 W.
ELEV.=200.00



Appendix D
Cultural Impact Assessment

DRAFT REPORT
**Cultural Impact Assessment in Support of the
Rockslide Potential Inspection and Mitigative
Improvements along Prospect Street in
Honolulu, Pauoa Ahupua'a, Honolulu District,
Island of O'ahu, Hawai'i.**

TMK: (1) 2-2-005:001

Prepared for:

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January 2012

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DRAFT REPORT
Cultural Impact Assessment in Support of the
Rockslide Potential Inspection and Mitigative Improvements along Prospect Street in
Honolulu, Pauoa Ahupua'a, Honolulu District, Island of O'ahu, State of Hawai'i
TMK (1) 2-2-005:001

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INTRODUCTION

At the request of AECOM Technical Services, Inc., Pacific Consulting Services, Inc. (PCSI) has prepared this Cultural Impact Assessment in support of Rockslide Potential Inspection and Mitigative Improvements along Prospect Street, Island of O‘ahu, State of Hawai‘i (Figure 1). This Cultural Impact Assessment has been prepared in compliance with Hawaii Revised Statutes (HRS), Chapter 6E, and Title 13 of the Hawai‘i Administrative Rules (HAR), Subtitle 13 (State Historic Preservation Division Rules), Chapter 275 (Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-8, Hawaii Revised Statutes).

PROJECT AREA LOCATION AND DESCRIPTION

The City and County of Honolulu (CCH), Department of Design and Construction (DDC) is tasked with ensuring the safety of motor vehicle and pedestrian traffic along Prospect Street. Situated at the base of Punchbowl Crater, the project will entail rockfall mitigation within the CCH Right of Way (ROW). The proposed rockfall mitigation project boundaries are shown in Figure 2. As roadways are not assigned Tax Map Key (TMK) parcel numbers, the TMK reference for the adjacent property is 2-2-005:001.

The project area is oriented roughly north/south, and is situated along the east side of Prospect Street, between Miller and Madeira Streets, along the western base of Punchbowl Crater. The distance between Miller and Madeira Streets is approximately 470.0 meters (m), and the width of the project area along this length varies from approximately 6.0 to 14.0 m. The CCH ROW is adjacent to the U.S. Military Reservation parcel. The CCH is the registered land owner of the project area.

ENVIRONMENTAL BACKGROUND

TOPOGRAPHY AND SOILS

The project area lies within a wet, mountain zone at the base of Punchbowl Crater, an extinct volcano tuff cone. The elevation of the project area is around 500 feet above mean sea level (amsl). Soils in the project area consist of Tantalus Silty Clay Loam (TCE) and Rock Land (rRK). TCE is described as a well-drained soil developed in volcanic ash and weathered from cinder with 8 to 15% slopes, runoff is slow and the erosion hazard is slight. This soil type is described as being used for home-sites, water supply, and recreation. rRK is described as an area where exposed rock (basalt and andesite) makes up 25 to 90% of the surface. This soil type is described as being used for pasture, wildlife, and water supply. Generally, the soils in the project area are described as very sticky and plastic, with a high shrink-swell potential; buildings built on these steep slopes are susceptible to sliding, while rock walls and foundations are susceptible to cracking (Foote *et al.* 1972:119, 121).

RAINFALL AND VEGETATION

The project area receives a fair amount of rainfall due to the strong uplifting of trade winds along the steep windward Ko‘olau mountain range. Rainfall data for O‘ahu Island indicates that the Pauoa / Makiki Ahupua‘a (a traditional land division unit, typically running from the mountain to the sea) have a total average annual rainfall in the range of 118.11 inches (in), with a higher monthly rainfall in winter months (Giambelluca *et al.* 1986).

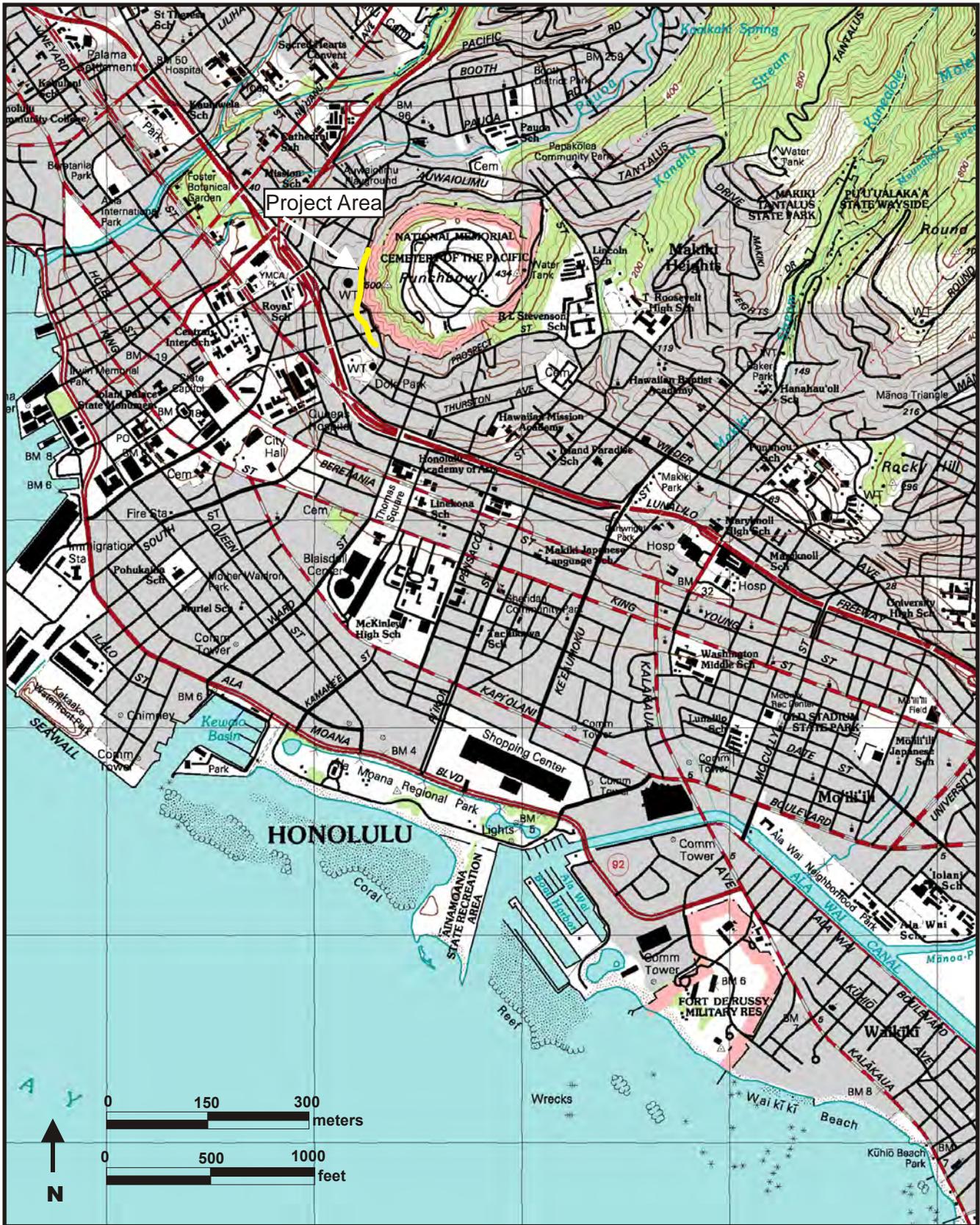


Figure 1. Map of Project Area Location on U.S.G.S Honolulu Quadrangle (2002).

Vegetation in the project area is quite dense in most areas upslope from Prospect Street. Figure 3 shows an overview photograph of the vegetation on the western slopes of Punchbowl Crater in the project area. Figure 4 shows several close-up photographs of dense project area vegetation. Based on identifications from Wagner *et al.* (1990), vegetation includes *kiawe* (*Prosopis pallida*), *koa haole* (*Leucaena leucocephala*), night blooming cereus (*Hylocereus undatus*), guinea grass (*Panicum maximum*) and a variety of exotic trees, shrubs and grasses.

HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

TRADITIONAL LAND USE HISTORY

Punchbowl Crater is located along the ridge between Pauoa and Makiki Ahupua'a. Punchbowl Crater, known by Hawaiians as Puowaina, was created by hot lava rising up through cracks in the coral reefs located at the base of the Ko'olau Mountains approximately 75,000 to 100,000 years ago. Puowaina means "hill of placing" (Pukui *et al.* 1974:195), a contraction from sacrifice (*puu o waiho ana*), or the spot for placing (*pu-o-waihoana*). Ethnographic and ethnohistoric literature yielded a number of references to the sacrifices that took place at Punchbowl Crater. Oral history describes a great stone and a fire oven (*imu ahi*) for burning men on the hill, and people were also brought from Maui, Kauai, and O'ahu for sacrifice, but not from Hawai'i. People were sacrificed for violating various *kapu* (taboo system). It was also noted that a natural flue existed by the triangulation station. Other victims of human sacrifices were said to have been drowned at Kewalo then taken to Kanela'au Heiau (temple) located near the southeast base of Punchbowl Crater (this location is not confirmed, as there is more than one description of the site). Afterward, they were brought to the top of Punchbowl Crater to an alter and a cross in order to appease the gods of the ruling chief (Sterling and Summers 1978).



Figure 3. View of Vegetation along Western Slope of Punchbowl Crater.



Looking down to Prospect Street from Zone 2; view to south.



Vegetation in Zone 1; view to northwest.

Figure 4. Photographs of Vegetation in the Project Area.

Heiau formerly located on and around Punchbowl Crater were described by E.M. Nakuina (1909). These sites included: Ka'akopua Heiau, situated at the location of Central Intermediate School; Mana Heiau, located near Queen's Hospital; Kanela'au Heiau, located near the present day intersection of Alapa'i, Kinau, and Lunaliho Street; Kahehuna Heiau, believed to have been located at the present day site of Royal Elementary School; and finally Puhikanaka Heiau, located on the southeastern side of the Punchbowl Crater summit (*Ibid.*:317).

The Battle of Nu'uaniu is said to have started on the southwest ridge of Punchbowl Crater. E.M. Nakuina stated in the Pacific Commercial Advertiser on June 29, 1909: The Battle of Nu'uaniu commenced at the heiau of Kanelaau just below the old flagstaff station on Punchbowl about where Alapai joins Kinau and Lunaliho Streets, and raged along a series of heiaus that formed the guard or outposts of the Puowiana sacred heiau (*Ibid.*:292).

Auwaiolimu Stream is located within Pauoa Valley, contributing to the richness of this area. The meaning of Auwaiolimu is "The long hair of a *mo'o* (lizard) (some say she was Kahalapuna), bathing there at a ditch, resembled moss" (Pukui *et al.* 1974:14). The inner and outer slopes of Punchbowl were known for growing sweet potato and other dry land crops, especially on the eastern side (Sterling and Summers 1978). However, the 1817 map below by Russian explorer Otto von Kotzebue illustrates the number of taro fields within Pauoa Valley (Figure 5). Dole (1903:50) stated that 6.55 acres of wetland taro land in Pauoa Valley were leased between the years of 1891 to 1909. The diary of James Macrae describes the land surrounding Punchbowl Crater as:

...the taro ponds with other provisions cultivated in a large valley well watered by two rivers which run on each side till they meet in one behind the town (Macrae 1922:18).



Figure 5. 1817 Map of Taro Fields in Pauoa Valley.

Pauoa Valley, land that belonged to Queen Liliokalani, was also the location for the Royal Garden (*Uluhaimalama*), which was located on the northeastern side of Punchbowl Crater just below the Chinese cemetery. The newspaper *Ka Makaainana* described the garden vegetation in detail on October 15, 1894:

Prince Kawanakoa planted a lehua tree...surrounded by ohaiwai...Prince Kalaniana`ole planted a lehua`ahihi...The following is a list of plants...Kou, Hala Polapola, Kukui, `Awa lau, Pap`a sugar cane, Kea sugar cane, Uhaloa, Popolo, Hawaiian `ape and Pilimai sugar cane (Sterling and Summers 1978:293).

Finally, ethnographic and ethnohistoric literature describes a *holua* (sled) slide on the southern side of Punchbowl. The season for sledding is documented as occurring during the raining months, with people sledding down the steepest slopes, towards the city (*Ibid.*:291).

HISTORIC AND RECENT LAND USE HISTORY

In the late 1800's and early 1900's, Honolulu was a developing urban center. The population was growing, and after the Mahele traditional land use began to change rather dramatically. The *ahupua`a* surrounding Punchbowl became an area where residential areas were beginning to be established. The land within the project area was developed into a subdivision named Auwaiolimu Lots. In 1912, the Territory of Hawai`i held an auction and sold a preference right to purchase sale for the subdivision Auwaiolimu Lots. Most of the sales occurred within the years 1912 – 1916. The 1914 and 1927 Sanborn maps show the structures that existed near the vicinity of the project area (Figures 6 and 7).

During this time, there were a number of Executive Orders (EOs) from the President of the United States and the Governor of Hawai`i pertaining to Punchbowl. Executive Order No. 5693 by President Herbert Hoover (dated August 24, 1931) described the boundaries for the Punchbowl Hill Military Reservation. This EO redefined the previous Presidential EOs and Governor Orders (GO). EO 6166 by Franklin Roosevelt (dated June 1933) reorganized military reservations within the Office of National Parks, renamed The National Park Service in 1934.

Punchbowl National Cemetery of the Pacific was built in 1948. On January 13, 1975, Puowaina, or "Hill of Sacrifice" (Punchbowl National Cemetery of the Pacific), was placed on the Hawai`i State Register of Historic Places. It was placed on the National Register of Historic Places on January 11, 1976. Today it serves as the National Cemetery of the Pacific and as a memorial park that is open to the public.

PREVIOUS ARCHAEOLOGICAL STUDIES

This section describes previous archaeological research conducted within the Pauoa and Makiki Ahupua`a. During research, it was found that several archaeological investigations have been conducted in various areas near, but not within, the project area.

Table 1 lists relevant archaeological investigations conducted in the vicinity of the current project area. The locations of selected previous archaeological surveys, as well as selected archaeological site locations, are illustrated in Figure 8.

Burial Finds

Most of the burials listed in Table 1 were inadvertently discovered during house construction activities or other earth-moving projects. Most burials date to the pre-contact period.

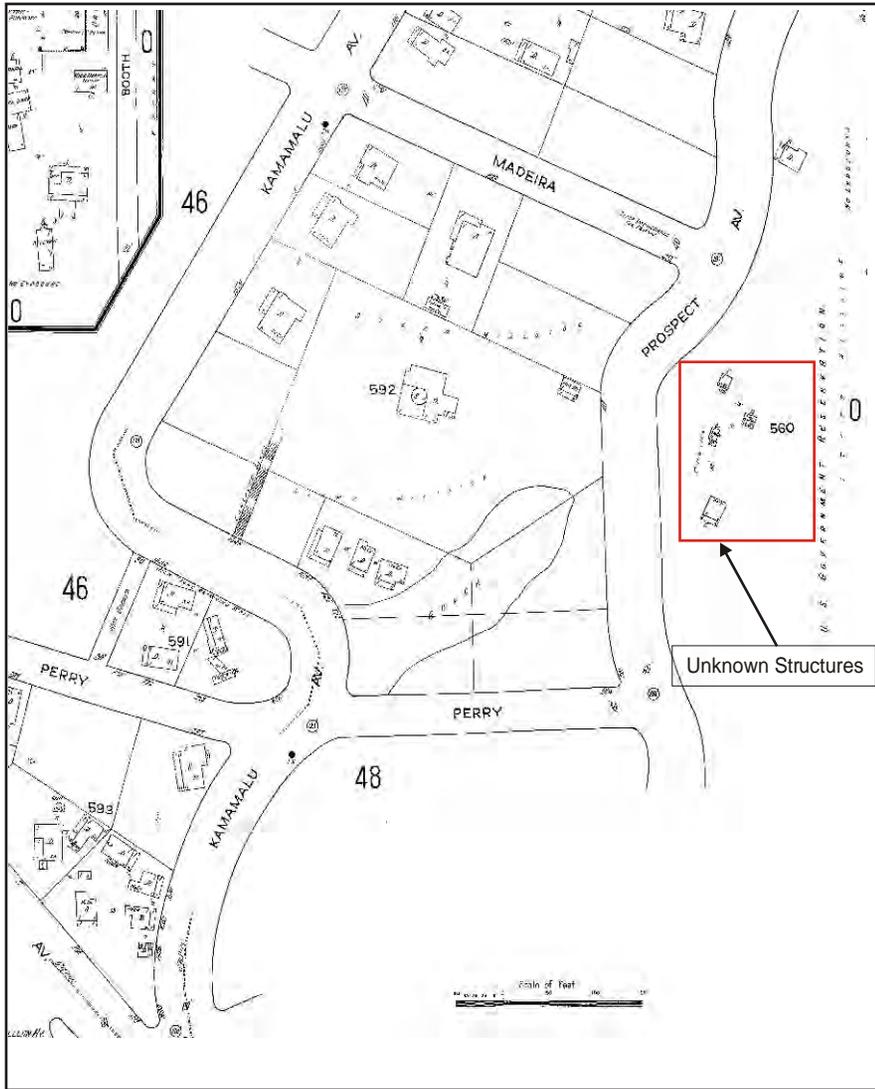


Figure 6. 1914 Sanborn Map Showing Project Location.

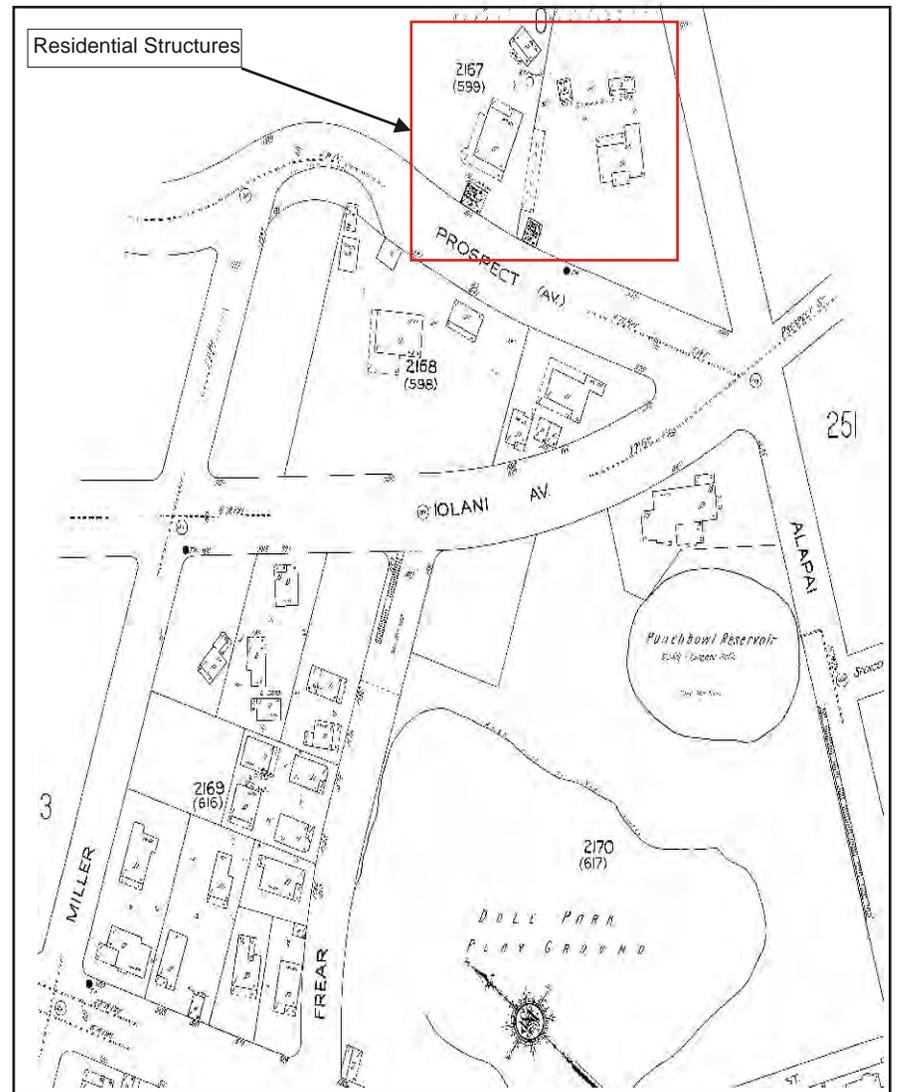


Figure 7. 1927 Sanborn Map Showing Project Location.

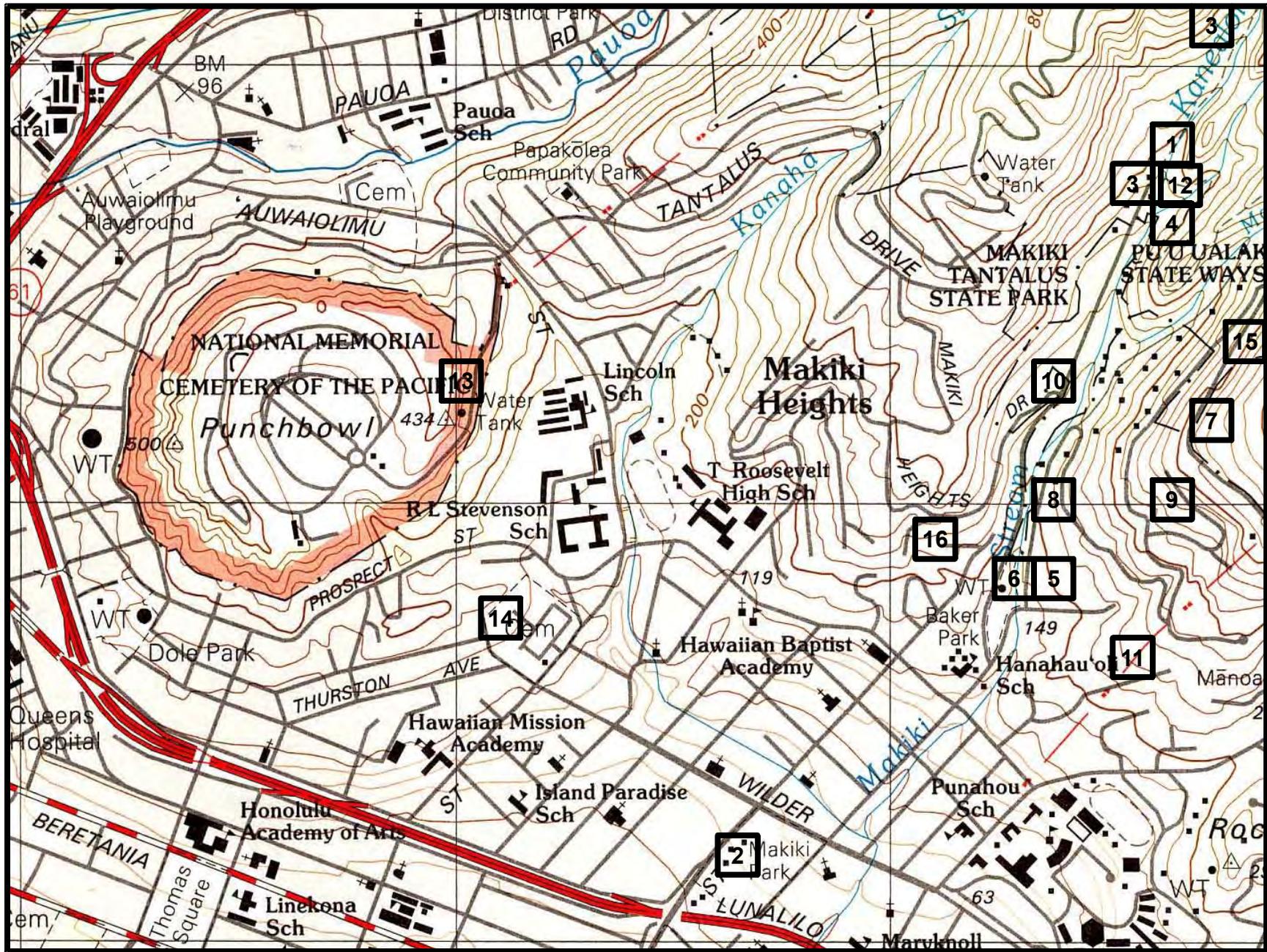


Figure 8. Locations of Previous Archaeological Studies Near the Project Area.

The remaining burials date to the historic period and time period information for the other burials is not available.

Table 1. Previous Archaeological Studies in the Vicinity of the Project Area.

MAP KEY	REFERENCE	TMK(s)	SIHP 50-80-14-	FINDINGS
1	McCoy 1971	2-5-019:008	2297	1-2 burials in cave shelter
2	Sinoto 1979	2-4-022:001	2298	2 disturbed, historic burials
3	Yent and Ota 1980	2-5-019,020	3985	Agricultural features & rockshelters; historic Herring residence & dump site
4	Yent 1982	2-5-020	3985	Historic wall & enclosure
5	Bath and Smith 1988	2-5-007:043	3743	1 disturbed burial, pre-Contact
6	Bath 1989	2-5-007:007	4134	2-3 burials, pre-Contact
7	Kawachi 1988	2-5-006:014	No sites	No sites
8	Kawachi 1991	2-5-007:039	1603	1 burial, left in situ
9	Pietrusewsky 1992a	2-5-005:008	4530	1 burial, pre-Contact
10	Pietrusewsky 1992b	2-2-024:024	4648	1 burial
11	Dagher 1993	2-5-003:014	4666	1 burial, pre-Contact
12	Nagata 1999	2-5-019:008	5759	Historic carriage road
13	Shideler <i>et al.</i> 2003	2-2-005:035	6529	Historic rock alignment & house foundation
14	Leu Cordy and Hammatt 2006	2-1-039; 2-4-015; 2-4-016; 2-4-031; 2-4-033	No sites	No sites
15	Collins <i>et al.</i> 2008	2-5-019:008	6864 & 6865	2 burials, over 50 years old
16	Collins 2008	2-5-020:002	6961	2 burials, over 50 years old

Taken in chronological order of discovery, the earliest burial site (SIHP 50-80-14-2297) recorded in the State Historic Preservation Division's (SHPD) files was discovered by local hikers in a moderately-sized cave shelter 0.5 miles (mi) from the current project area (McCoy 1971). The cave shelter contained at least one burial, with another possible *in situ* burial

adjacent to the disturbed one. Both likely date to the historic period. No further skeletal information is available.

The next burial site to be recorded (Site 2298) was found during construction work at Makiki District Park. Two burials were discovered at this site. Both were extremely disturbed by trenching activities. Although very little information is available in the letter report, both burials were likely found in the southwest quadrant of the park and are believed to date to the early historic period (Sinoto 1979) (personal communication, Aki Sinoto, April 16, 2008). No further burial information is available. Three burials were discovered mostly *in situ*, but with some minor disturbance, one burial (Site 1603) on Round Top Drive was left *in situ* at the time of discovery, pending landowner consultation (current status unknown). Further data about this burial is unavailable (Kawachi 1991). The other two nearby burials were Hawaiian (or part-Hawaiian) males.

One burial (Site 4530) discovered on Round Top Drive probably dates to the pre-contact period (Pietrusewksy 1992a) while the time period of the other burial (Site 4648) discovered at Maunalaha Road is unknown (Pietrusewksy 1992b). Skeletal analysis reports are the only accessible record of these two burials; general archaeological reports are not available.

The following burials (Sites 3743, 4134 and 4666) were discovered during house construction projects in lower Mānoa Valley and Makiki. Nearly all were at least moderately disturbed. The remains were of Hawaiian adult females and males that likely dated to the pre-Contact period (Bath 1989, Bath and Smith 1988, and Dagher 1993).

In mid 2000, burials were inadvertently discovered during public works projects. In 2006, two burials (Sites 6864 and 6865), thought to be over 50 years old and possibly Native Hawaiian (due to manner and context of burial), were found inadvertently during emergency slope mitigation work along a section of Round Top Drive in Makiki near Maunalaha. SHPD recommended relocation of both burials due to their precarious condition in loose cinder deposits on steep slopes (Collins *et al.* 2008).

In mid-2007, a single historic burial (Site 6917) interred in cinder was found while excavating holes for the support posts of a debris fence, on the Mānoa Valley side of Round Top. Ethnicity could not be determined, there was no evidence of grave goods nor was a burial position evident. SHPD requested the disarticulated remains be placed in an excavation pit near the *in situ* remains (Collins 2008).

Given the inadvertent discovery of all these burials, there is, often, limited information on the depths below surface at which the remains were found in the recorded cases. Some burials were visible near the base of the cut bank of a slope 12 – 15 ft in height (Bath 1989). Seven burials were interred in the cinder, while at least two were in loam deposits above the cinder but near the boundary, between the two soil types.

Non-Burial Finds

Four archaeological surveys were conducted near the project area, three of which took place in or near the Makiki State Recreation Area (Nagata 1999; Yent 1982; Yent and Ota 1980). These surveys reported a variety of cultural features, including terraces, retaining walls, walled enclosures, segments of a carriage road, and a circular platform, among others (see Table 1). These features both prehistoric and historic have been designated as Sites 3985 and 5759. No cultural features were identified during two other survey projects in the area (Kawachi 1988).

An archaeological assessment and an archaeological monitoring project took place in the Punchbowl area (Leu Cordy and Hammatt 2006; Shideler *et al.* 2003). Only two cultural features, designated as Site 6529, were reported by Shideler *et al.* (2003): a historic road alignment and house foundation, which were recommended as not being historically significant. No cultural features were reported by Leu Cordy and Hammatt (2006).

In early 2011, an archaeological assessment was conducted for the Prospect Street Rockslide Potential Inspection and Mitigative Improvements project (Walden *et al.* 2011). This study included archival background research and an archaeological reconnaissance field survey conducted to determine the presence/absence of archaeological surface structures and/or surface scatters of cultural materials (structure/artifacts/faunal remains) within the project area.

The archaeological reconnaissance survey revealed no traditional or historical surface archaeological materials or features. It should be noted that the structures shown on the 1914 and 1927 Sanborn maps (Figures 6 and 7) were not encountered; they may have been destroyed. The steepness of the hillside in the parcel vicinity appears to have precluded traditional and historical residential or agricultural pursuits. The survey encountered no surface archaeological sites or other historic properties within the project area.

GEO-TECHNICAL STUDY WITHIN PROSPECT STREET ROCKFALL PROJECT AREA

A recent geo-technical study (Hirata and Associates 2010) was conducted within the project area in 2009. In order to observe existing conditions within the project area Hirata and Associates conducted a visual reconnaissance of the area and drilled six (6) borings to depths ranging from about 9.0 to 14.0 ft (see Figure 9). While the engineering analysis presented in their report is not relevant to this archaeological assessment, the soil descriptions they documented in the upper 1.0 to 5.0 ft of the borings are pertinent to this assessment. Table 2 summarizes the soil descriptions reported by Hirata and Associates (2010).

As can be seen by the soil borings results, yellowish brown sandy silts, brown clayey silts, mottled brown silty sands, and gray sands were present in upper proveniences in locales B1, B2, B3 and B4. Figure 9 shows the location of the soil boring locales within the project area. Locales for soil borings B5 and B6 identified volcanic tuff very near the ground surface. Volcanic tuff is defined by Macdonald and Abbot (1977:17) as volcanic ash, (fragments less than 0.25 inches in diameter), that have become cemented very quickly to form a firm rock. Punchbowl crater is a good example of an ash and tuff cone (*Ibid.*:20). Thus, in the areas where sediments and soils occur on the surface (locales B1, B2, B3 and B4), there is a potential for subsurface archaeological materials and features.

Table 2. Soil Description Summary in Soil Borings 1-6 (from Hirata & Associates 2010).

Boring No.	Soil Color and Texture	Depth	Comments
B1	Yellowish brown sandy silt with weathered volcanic tuff	To 3.0 ft	Volcanic tuff underlies the sandy silts to a depth of 10.0 ft
B2	Brown clayey silt	To 3.0ft	Volcanic tuff underlies the clayey silts to a depth of 9.0 ft
B3	Mottled brown silty sand with volcanic tuff fragments	To 5.0 ft	Mottled brown silty gravels underlie silty sands to a depth of 12.0 feet; volcanic tuff underlies silty gravels to a depth of 14.0 ft

Table 2. Soil Description Summary in Soil Borings 1-6 (from Hirata & Associates 2010).

Boring No.	Soil Color and Texture	Depth	Comments
B4	Gray sand with silt, partially cemented (volcanic cinder)	To 5.0 ft	Volcanic tuff underlies the sand with silt to a depth of 9.0 ft
B5	Yellowish brown volcanic tuff	To 10.0 ft	Covered by 1.0 to 2.0 in of brown clayey silt
B6	Mottled brown volcanic tuff	To 9.0 ft	Covered by 4.0 in of asphaltic concrete and 4 in of base course

CULTURAL IMPACT ASSESSMENT

This cultural impact assessment presents a detailed description of the proposed development project, the methods used for consultation, the results of the consultation, and the results of the assessment. The scope of work (SOW) for this cultural impact assessment included the following tasks:

- Archival background research on the cultural history and previous land uses of the project area.
- Reconnaissance Survey
- Literature review of previous archaeological studies within the project area and in areas near the current project area.
- Written consultation with the following interested parties:
 - Office of Hawaiian Affairs (OHA)
 - State Historic Preservation Division (SHPD)
 - Honolulu Hawaiian Civic Club (HHCC)
 - Hui Malama I Na Kupuna 'O Hawai'i Nei,

DESCRIPTION OF THE PROJECT

The proposed project will occur within the CCH ROW between 150 and 666 Prospect Street, Honolulu, Hawai'i, TMK 2-2-005:001. The proposed project site is located approximately 1.5 miles from downtown Honolulu and 2.0 miles from the Pacific Ocean. Figure 9 shows the project area location and the location of the various mitigation measures proposed.

The proposed project area occupies approximately 0.97 acres. The project area is presently characterized as having many loose boulders, overhangs, and unstable soil with a high potential for rock falls. This potential for rock falls presents a significant risk to public health and safety for users along Prospect Street.

Due to varying site conditions, it is difficult to identify a single alternative capable of mitigating the entire project site. Therefore, the project site was categorized into three zones based on site topography and ROW boundary locations, as shown on Figure 9.

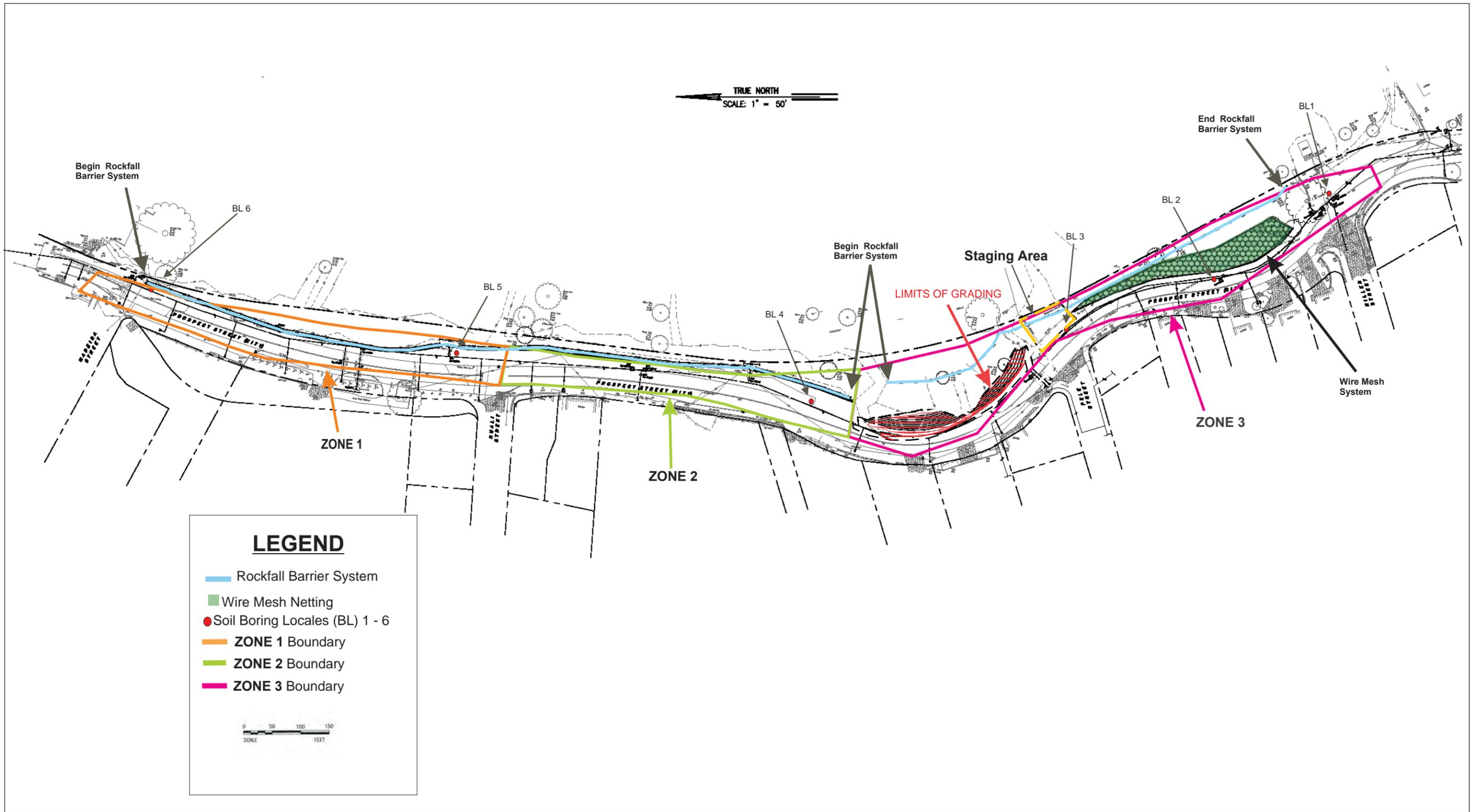


Figure 9. Project Design Plan Showing Zones 1 through 3 and Rockslide Mitigation Measures along Prospect Street.

- **Zone 1:** Zone 1 extends from Madeira Street to Huali Street and totals 0.20 acres (see Figure 9). Zone 1 can be described as a high natural slope above a high cut slope and narrow shoulder. The ROW boundary is near the top of the cut slope.
- **Zone 2:** Zone 2 is approximately 540 linear feet long measured along the roadway beginning at Huali Street and ending just before the sharp turn where the wide unpaved shoulder disappears (see Figure 9). Zone 2 consists of 0.20 acres and is described as a steep natural slope above a roadside cut slope of varying heights. The shoulder is relatively wide and is regularly used for vehicle parking. The ROW limit is near the toe of the cut slope.
- **Zone 3:** Zone 3 is approximately 0.57 acres and 540 linear feet measured along the roadway, and lies in the vicinity of Pele Street and Miller Street (see Figure 9). This zone can be described as a natural slope above a short cut slope that varies in height from zero feet to 40 feet, and a narrow shoulder that varies from two feet to 31 feet wide. The ROW boundary is upslope from top of the cut slope.

PROPOSED CONSTRUCTION AND MAINTENANCE ACTIVITIES

Zone 1: Rockfall Impact Fence and Concrete Jersey Barrier-This alternative includes a rockfall impact fence and concrete jersey barrier. The fence would be constructed along the toe of the slope in the shoulder area that is currently used for vehicle parking (see Figure 9). Due to the location of the existing property line, this is the only available location where a fence could be constructed without acquiring additional ROW. All of the fence components including the posts and the tie back anchors could be constructed within the existing CCH ROW.

In addition, a concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The jersey barrier would serve as a permanent divider preventing both vehicles and pedestrians from getting too close to the fence.

Zone 2: Rockfall Impact Fence and Concrete Jersey Barrier- Similar to Zone 1, this alternative includes a rockfall impact fence and concrete jersey barrier. The impact fence would be constructed along the toe of the slope within the roadway shoulder that is currently used for vehicle parking. Due to the location of the existing property line, this is the only available location where a fence can be constructed without acquiring additional ROW. All of the fence components, including the foundations, the posts, and the tieback anchors would be constructed within the existing CCH ROW. The fence would be effective for stopping potential rockfall from the cut slope only.

In addition, a concrete jersey barrier would be constructed between the roadway and the fence line to keep vehicles and pedestrians away from the impact fence. The jersey barrier would serve as a permanent divider protecting both vehicles and pedestrians from getting too close to the fence.

Zone 3: Draped Wire Mesh, Rockfall Impact Fence, and Shoulder Widening- This alternative provides for complete rockfall hazard reduction for the entire slope using a combination of draped wire mesh, a rockfall impact fence, and shoulder widening. A rockfall impact fence would be installed within the existing ROW limits above the top of the cut slope. The fence would stop rolling rocks from the upper natural slope.

A draped wire mesh system would be installed over the cut slope down slope of the impact fence (see Figure 9). Vegetation on the slope would be cleared using chain saws and weed eaters to cut the vegetation flush to the ground surface. Foundation anchors would then be drilled into the ground by a hydraulic/pneumatic drill mounted on a piece of tracked equipment, such as a small excavator. Anchors would be grouted using a hand held mixer and a small grout pump. After the anchors are tested, top support cable would be attached to the anchors and installed. The mesh would then be installed and attached to the top support cables.

Just north of Pele Street, the roadside shoulder would be widened to provide at least seven feet of clear distance measured from the edge of the roadway to the toe of the slope. The slope would be cut-back at a 45 degree angle for a distance of 250 ft measured along the roadway. The volume of excavated earth would be about 450 cubic yards, and the work would be done using a large track mounted excavator, a front end loader and dump truck.

METHODS

Prior to contacting the interested parties, a literature review was conducted on the land use history and previous archaeological studies completed in this area. Based on this research, the potential for historic properties within the project area is considered to be minimal. Review of archival literature and historic documents revealed that this portion of Pauoa Valley was used primarily as an agricultural area. Archaeological sites are not anticipated within the project area, as this area has been heavily developed and any agricultural evidence would likely have been destroyed or heavily disturbed.

Letter contact was then made with Office of Hawaiian Affairs (OHA), Hui Malama I Na Kupuna 'O Hawai'i Nei, the State Historic Preservation Division (SHPD), and Honolulu Hawaiian Civic Club (HHCC). Formal letters were sent out to these organizations/agencies on September 11, 2011, requesting information concerning their views on this project, including any effects it might have on historic or cultural sites that they might know about in the area. Likewise, they were asked to share any information about legends, cultural properties, or traditional practices associated with this area. A follow up e-mail requesting a response from SHPD and HHCC was sent out on January 19, 2011.

RESULTS OF CONSULTATION

The responses from the four agencies/organizations invited to participate in the CIA consultation were as follows:

- OHA: The written response by OHA indicated that they recognize the need for this project in order to ensure public health and safety, especially for residents and commuters in the area, and that they were unaware of any historic properties of significance to or customary practices and beliefs of the Hawaiian people which may be adversely affected by the project at this time. OHA also concurred with the recommendations (see Appendix A).
- SHPD: Dr. Ross Stephenson of SHPD responded to the consultation package and met with representatives of the CCH, and AECOM Technical Services, Inc. at the

project area site on Prospect Street on December 21, 2011 to discuss SHPD's concerns. Dr. Stephenson's concerns included the following: (1) the wire mesh to be used would be too visible and needed to be colored black to lessen visibility, and (2) the concrete Jersey barriers would be too visible and despoil the historic landscape. The CCH agreed to use black wire mesh and to stamp and colorize the barriers to resemble the appearance of a stone wall, as seen typically throughout the surrounding neighborhood. The stamping and colorization of the barriers would be of the rectangular shape/structure as the other walls in the area, and that the top (cap) of the jersey barrier be approximately a foot wide, as are the other walls in the area. The CCH and SHPD also agreed that the future use of herbicides for weed control in the project area would be limited in order to allow foliage to regenerate and cover road cuts and wire mesh. Once the CCH agreed to SHPD's concerns, SHPD agreed that the project would have no effect on historic properties (see Appendix B).

- Hui Malama I Na Kupuna 'O Hawai'i Nei; They did not respond to the consultation letter.
- HHCC: They did not respond to the consultation letter.

ASSESSMENT AND RECOMMENDATIONS

No archaeological sites have been recorded within the project area, which consists of the roadway and shoulders along the base of Punchbowl Crater on Prospect Street, TMK (1) 2-2-005:001. The archaeological reconnaissance survey did not reveal surface historic properties.

During consultation, SHPD had concerns regarding physical characteristics (color and design) of two of the mitigation measures. CCH, however, has addressed these concerns by agreeing to use black mesh and stamp and colorize the Jersey barriers to resemble the appearance of local stone wall in the neighborhood, and limit the use of herbicides to encourage vegetation growth that will eventually cover the wire mesh and road cuts. Once CCH agreed to these conditions, SHPD provided concurrence that no effect to historic properties would result from this project. The other consulting parties either did not raise additional concerns (OHA) or did not respond to the letter (Hui Malama I Na Kupuna 'O Hawai'i Nei and HHCC).

Because of the findings of this assessment, in particular the absence of historic properties within the project area, a finding that the project would have no effect on historic properties is recommended. No further work (e.g. archaeological monitoring) is recommended at this time; however, should the scope or nature of the project change, this recommendation will need to be re-evaluated in light of these changes.

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APPENDIX A: RESPONSE TO CONSULTATION LETTER BY OFFICE OF HAWAIIAN AFFAIRS



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

HRD11/6009

November 21, 2011

Stephan D. Clark, Vice-President
Pacific Consulting Services, Inc.
720 Iwilei Road, Suite 424
Honolulu, Hawai'i 96817

**Re: Cultural Impact Assessment Consultation
Prospect Street Rock Fall Mitigation Project
Island of O'ahu**

Aloha e Stephan D. Clark,

The Office of Hawaiian Affairs (OHA) is in receipt of your November 7, 2011 letter with enclosures seeking comments ahead of a cultural impact assessment (CIA) which will be prepared as a technical document to support a draft environmental assessment for a rock fall mitigation project (project) proposed by the City and County of Honolulu-Department of Design and Construction. It is our understanding project activities will be confined to the existing City and County of Honolulu road right of way. A range of alternative actions to address the potential for rock falls within the 0.97 acre project area are described in your letter.

OHA recognizes the need for this project in order to ensure public health and safety, especially for residents and commuters in the area and we look forward to seeing it completed. We are unaware of any historic properties of significance to or customary practices and beliefs of the Hawaiian people which may be adversely affected by this project at this time. We look forward to reviewing the completed CIA and the opportunity to provide comments at that time.

The overview of previous archaeological investigations surrounding the project area which are detailed in your letter and include several burial finds support your proposal for on-site archaeological monitoring during project activities and OHA concurs with your proposal.

OHA notes that the last sentence of your letter suggests that "*if we do not hear from your office within 30 days of receipt of this letter, we shall assume concurrence with our findings*". We have no objections to your firm providing thirty (30) days to review and provide comments, as this is an appropriate and adequate amount of time. We are opposed to your firm asserting that no response to your letter translates to OHA's concurrence with your findings and we caution you in using this approach. In the future, your firm should describe no response as exactly that as claiming anything else would be incorrect.

Thank you for initiating consultation and for the opportunity to provide comments at this early stage. Should you have any questions, please feel free to contact Keola Lindsey at 594-0244 or keolal@oha.org.

‘O wau iho nō me ka ‘oia‘i‘o,

A handwritten signature in black ink, appearing to read 'Clyde W. Nāmu‘o', written in a cursive style.

Clyde W. Nāmu‘o
Chief Executive Officer

CWN:kl

**APPENDIX B: LETTER FROM STATE HISTORIC PRESERVATION DIVISION CONCURRING WITH
RECOMMENDATIONS**

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUIHEWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96707

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

DATE: January 06, 2012

LOG: 2012.0028

DOC: 1201RS10

TO: Department of Planning and Permitting
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

SUBJECT: **Section 6E-8 Historic Preservation Review**
Project: Prospect Street Rockfall Mitigation
Permit # (None)
Owner: City and County of Honolulu
Location: 150 through 166 Prospect Street (Prospect between Miller and Madeira Streets),
Punchbowl district, Oahu
Tax Map Key: (1) 2-2-005:001

This letter is in response to a telephone conversation on January 06, 2012 between Julie Zimmerman of AECOM and Ross W. Stephenson of SHPD, regarding the installation of rockfall barriers on Prospect Street between Miller and Madeira Streets. The project would place a series of barriers on City and County of Honolulu (C&C) owned land on the mauka side of Prospect Street between 150 and 166 Prospect. The Area of Potential Effect (APE) would be C&C property mauka of the Prospect Street pavement between the two addresses.

The area in question was developed by the 1920s and was initially occupied mostly by individuals of Portuguese descent (as illustrated by street names such as Lisbon, Lusitana, Madeira and Concordia). The area has historically been one of small houses and lots with open views of the city and Punchbowl itself. The community would be eligible for the Hawaii Register of Historic Places under Criteria A (Events – ethnic immigration to Hawaii) and C (Architecture).

In a letter dated October 26, 2011 (LOG 2011.2127 DOC 1110RS40), SHPD had determined that the project could have effect and recommended that no action or rock scaling be undertaken. A site visit was held on December 21, 2011. Rock scaling was determined to be impossible without the permission of the Veterans Administration. Subsequently, we have the following agreement:

1. wire mesh and fencing materials are to be colored black in order to lessen visibility;
2. concrete Jersey barriers are to be stamped and colorized to resemble the appearance of a stone wall. This includes stamping a rectangular shape, colorizing the “stone” surfaces brown and creating a barrier top approximately one foot wide, all to copy the original subdivision street facing walls; and
3. the future use of herbicides for weed control in the project area is to be limited in order to allow foliage to regenerate to cover road cuts and the wire mesh/fencing.

Based upon these mutually agreed upon conditions, **the project is determined to have no effect on historic property.**

Any questions should be addressed to Ross W. Stephenson, SHPD Historian, at (808) 692-8028 (office), (808) 497-2233 (cell) or ross.w.stephenson@hawaii.gov.

Mahalo for the opportunity to comment.

A handwritten signature in black ink that reads "Westfall". The signature is written in a cursive, flowing style.

Angie Westfall
Architecture Branch Chief, Hawaii Historic Preservation Division

In the event that historic resources, including human skeletal remains, lava tubes, and lava blisters/bubbles are identified during construction activities, all work should cease in the immediate vicinity of the find, the find should be protected from additional disturbance, and the State Historic Preservation Division should be contacted immediately at (808) 692-8015.