

# STRUCTURAL GENERAL NOTES

## I. GENERAL

- A. GENERAL NOTES AND TYPICAL DETAILS SHOWN APPLY TO THE ENTIRE PROJECT AND ALL PHASES OF CONSTRUCTION UNLESS NOTED OTHERWISE.
- B. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AND SHALL REPORT ANY DISCREPANCIES IN WRITING TO THE ENGINEER BEFORE ORDERING MATERIALS OR COMMENCING WORK.
- C. DETAILS SHOWN ON DRAWINGS SHALL BE TYPICAL FOR ALL SIMILAR CONDITIONS. MODIFY DETAILS FOR SPECIAL CONDITIONS AS DIRECTED BY THE ENGINEER.
- D. COORDINATE ALL PENETRATIONS THROUGH STRUCTURAL MEMBERS WITH ENGINEER AND SUBCONTRACTORS.
- E. SEE CIVIL DRAWINGS FOR DETAILS NOT SHOWN.

## II. CONSTRUCTION

- A. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR MEANS AND METHODS OF CONSTRUCTION, WORKMANSHIP, AND JOB SAFETY INCLUDING BUT NOT LIMITED TO ALL DEWATERING, FALSEWORK, BRACINGS, MUD SILLS, AND OTHER TEMPORARY ITEMS USED FOR THE CONSTRUCTION OF THE PROJECT.
- B. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE FOR ALL CONDITIONS AT ALL STAGES OF CONSTRUCTION. THE DESIGN, ADEQUACY, AND SAFETY OF ERECTION BRACING, SHORING, SAFETY MEASURES, TEMPORARY SUPPORTS, ETC. IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND HAS NOT BEEN INCORPORATED BY THE STRUCTURAL ENGINEER. THE CONTRACTOR SHALL PROVIDE THE NECESSARY BRACING TO MAINTAIN STABILITY DURING CONSTRUCTION.
- C. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST 48 HOURS IN ADVANCE FOR REVIEW AND OBSERVATION OF PLACEMENT OF REINFORCING STEEL AND CONCRETE.
- D. CONSTRUCTION LOADING SHALL NOT EXCEED THE DESIGN LIVE LOADING UNLESS SHORES ARE USED. ALLOWABLE LOADING SHALL BE REDUCED IN AREAS WHERE THE STRUCTURAL ELEMENTS HAVE NOT ATTAINED FULL DESIGN STRENGTH.
- E. ANY DAMAGE TO EXISTING STRUCTURES SHALL BE RESTORED TO PRE-CONSTRUCTION CONDITIONS.

## III. FOUNDATION WORK:

- A. FOUNDATION REPORT TITLED "DRAFT GEOTECHNICAL ENGINEERING EXPLORATION, IAO VALLEY STATE MONUMENT FLOOD REPAIRS" HAS BEEN PREPARED BY GEOLABS, INC. DATED DECEMBER 1, 2016.
- B. AN ADDENDUM TO ITEM A TITLED "GEOTECHNICAL ENGINEERING EXPLORATION, IAO VALLEY STATE MONUMENT FLOOD REPAIRS, JOB NO. J45CM41A, INTERIM REMEDIAL MEASURES, WAILUKU, MAUI, HAWAII" HAS BEEN PREPARED BY GEOLABS, INC. DATED DECEMBER 20, 2016.

## IV. CONCRETE

- A. ALL CONCRETE SHALL DEVELOP A 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI, HAVE A MAXIMUM WATER TO CEMENT RATIO OF 0.45, AND A MAXIMUM CEMENT CONTENT OF 650 LBS/CYD.
- B. SEE SPECIFICATIONS FOR MATERIAL, MIXING, PLACEMENT, TESTING AND CURING OF CONCRETE.
- C. REINFORCING BARS SHALL BE DETAILED IN ACCORDANCE WITH THE LATEST EDITION OF THE AMERICAN CONCRETE INSTITUTE (ACI) DETAILING MANUAL.
- D. ALL CONCRETE SHALL BE CURED FOR A MINIMUM OF SEVEN CONSECUTIVE DAYS IMMEDIATELY AFTER PLACEMENT BY THE USE OF WET BURLAP, FOG SPRAYING, CURING COMPOUNDS, OR OTHER APPROVED METHODS. SEE SPECIFICATIONS FOR CURING OF VERTICAL SURFACES.
- E. PROVIDE SLEEVES FOR PLUMBING AND ELECTRICAL OPENINGS IN CONCRETE BEFORE PLACING. DO NOT CUT ANY REINFORCING WHICH MAY CONFLICT. CORING OF CONCRETE IS NOT PERMITTED. NOTIFY THE STRUCTURAL ENGINEER IN ADVANCE OF CONDITIONS NOT SHOWN ON THE DRAWINGS.
- F. ALL PHASES OF WORK PERTAINING TO THE CONCRETE CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF ACI 318.
- G. BONDING AGENT SHALL BE A THREE-COMPONENT, PREPROPORTIONED, ANTI-CORROSION, WATER-BASED, EPOXY MODIFIED PORTLAND CEMENT BONDING AGENT. BOND STRENGTH SHALL EXCEED 2,400 PSI IN ACCORDANCE WITH ASTM C882.

## V. REINFORCING STEEL

- A. UNLESS OTHERWISE NOTED ON PLAN. ALL REINFORCING BARS SHALL BE ASTM A615 GRADE 60, DEFORMED.
- B. WHERE WELDED CONNECTIONS ARE REQUIRED, REINFORCING STEEL SHALL BE ASTM A706 GRADE 60 DEFORMED BARS.
- C. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
- D. SPLICES:
  - 1. UNLESS OTHERWISE NOTED, MINIMUM SPLICE SHALL BE 48 BAR DIAMETERS OR 2'-0" WHICHEVER IS GREATER.
  - 2. W.W.R; LAP 12" OR ONE FULL MESH WHICHEVER IS GREATER.
- E. ALL REINFORCING BAR BENDS SHALL BE MADE COLD.
- F. BAR BEND, HOOKS, AND OFFSETS SHALL BE IN ACCORDANCE WITH THE ACI DETAILING MANUAL AND AS DETAILED IN DRAWINGS.
- G. CONCRETE CLEAR COVER SHALL BE AS FOLLOWS:
  - 1. FOOTINGS AND SLABS POURED AGAINST EARTH . . . . . 3"
  - 2. FOOTINGS AND SLABS POURED AGAINST FORMS AND LATER EXPOSED TO EARTH . . . . . 2"
  - 3. OTHERS . . . . . 2"
- H. PLASTIC TIPPED "CHAIRS" SHALL BE USED TO MAINTAIN MINIMUM CONCRETE CLEAR COVER FOR ALL SLAB AND FOOTING REINFORCING.
- J. REINFORCING STEEL, BOLTS, AND OTHER INSERTS SHALL BE POSITIVELY SECURED IN PLACE BEFORE PLACING CONCRETE. BAR PLACEMENT AND SUPPORTS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

## VI. STRUCTURAL STEEL

- A. MATERIAL:
  - 1. STRUCTURAL STEEL WIDE FLANGE SHAPES SHALL MEET THE REQUIREMENTS OF ASTM A992 WITH A MINIMUM YIELD STRENGTH OF 50,000 PSI.
  - 2. SHAPED STRUCTURAL PIPE SHALL CONFORM TO ASTM A500, GRADE B WITH A MINIMUM YIELD STRENGTH OF 42,000 PSI.
  - 3. STEEL PLATES, BAR, CHANNELS, AND ANGLES SHALL CONFORM TO ASTM A36 WITH A MINIMUM YIELD STRENGTH OF 36,000 PSI.
- B. WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE LATEST AISC AND AWS CODES.
- C. ALL WELDING, WHETHER SHOP OR FIELD, SHALL BE PERFORMED ONLY BY CERTIFIED WELDERS.
- D. ALL CONNECTIONS SHALL DEVELOP THE FULL STRENGTH OF MEMBERS CONNECTED UNLESS DETAILED OTHERWISE.
- E. PLATE INSERTS EMBEDDED IN CONCRETE SHALL HAVE THE ANCHORS WELDED TO DEVELOP THE FULL STRENGTH OF THE ANCHOR.
- F. UNLESS OTHERWISE NOTED ALL EMBEDDED BOLTS, ANCHORS, PLATES, INSERTS, ETC., SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
- G. UNLESS SHOWN OTHERWISE ALL STEEL TO STEEL CONNECTIONS SHALL USE 3/4" ASTM A325X BOLTS. PROVIDE DIRECT TENSION INDICATOR WASHERS FOR ALL HIGH-STRENGTH BOLTS.
- H. NO HOLES OTHER THAN THOSE SPECIALLY DETAILED SHALL BE ALLOWED THROUGH STRUCTURAL STEEL MEMBERS.
- J. ALL ANCHOR BOLTS SHALL BE ASTM F1554, GRADE 55.
- K. ALL ANCHOR BOLTS SHALL BE INSTALLED A MINIMUM 4" FROM THE CLOSEST FOUNDATION EDGE OR CONTROL JOINT AND TO THE DEPTH AS SHOWN ON THE PLANS.
- L. ALL POST-INSTALLED ANCHOR BOLT HOLES SHALL BE DRILLED USING "SAFE SET" TECHNOLOGY, OR EQUIVALENT. ANCHORS SHALL BE EMBEDDED 6" INTO THE CONCRETE SLAB USING HILTI HIT-HY 200 EPOXY RESIN, OR EQUIVALENT, UNLESS NOTED OTHERWISE.
- M. WELDS SHALL BE MADE WITH ASTM A233, E-70 SERIES ELECTRODES FOR STEEL TO STEEL CONNECTIONS.
- N. NON-SHRINK GROUT SHALL BE A PREMIXED COMPOUND CONSISTING OF NON-STAINING, NON-METALLIC AGGREGATE, CEMENT, WATER REDUCING AND PLASTICIZING AGENTS CAPABLE OF DEVELOPING MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI IN 3 DAYS AND 7,000 PSI IN 28 DAYS.

## VI. STRUCTURAL STEEL (CONT.)

- P. ALL BASE PLATES, BOLTS, ANCHOR RODS, NUTS, AND WASHERS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A153.
- Q. ALL DAMAGE DONE TO GALVANIZED SURFACE OF STRUCTURAL STEEL SHALL BE REPAIRED.

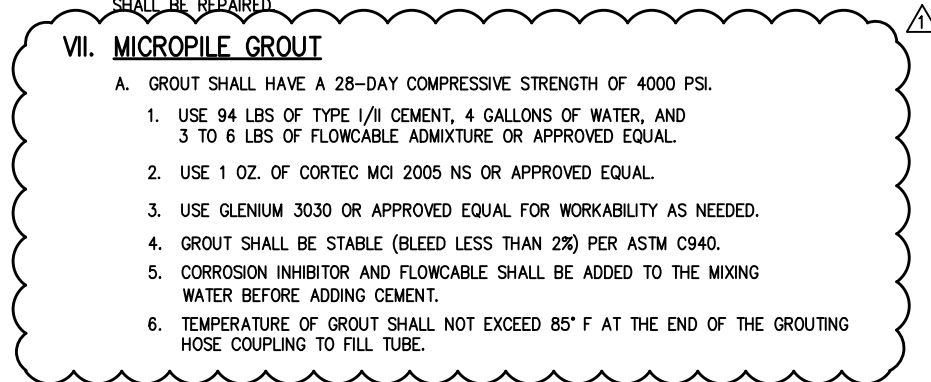
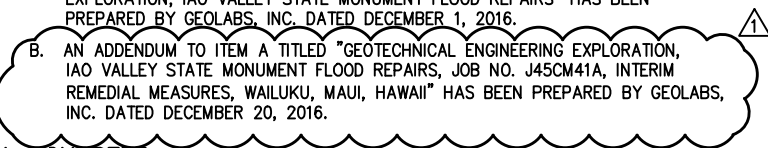
## VII. MICROPILE GROUT

- A. GROUT SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI.
  - 1. USE 94 LBS OF TYPE I/II CEMENT, 4 GALLONS OF WATER, AND 3 TO 6 LBS OF FLOWABLE ADMIXTURE OR APPROVED EQUAL.
  - 2. USE 1 OZ. OF CORTEC MCI 2005 NS OR APPROVED EQUAL.
  - 3. USE GLENIUM 3030 OR APPROVED EQUAL FOR WORKABILITY AS NEEDED.
  - 4. GROUT SHALL BE STABLE (BLEED LESS THAN 2%) PER ASTM C940.
  - 5. CORROSION INHIBITOR AND FLOWABLE SHALL BE ADDED TO THE MIXING WATER BEFORE ADDING CEMENT.
  - 6. TEMPERATURE OF GROUT SHALL NOT EXCEED 85° F AT THE END OF THE GROUTING HOSE COUPLING TO FILL TUBE.

## VIII. DESIGN DATA

- A. MINIMUM LIVE LOADS:
  - 1. PEDESTRIAN = 85 PSF
- B. DEAD LOADS:
  - 1. CONCRETE = 160 PCF
  - 2. STEEL = 490 PCF
- C. WIND LOADS
  - 1. 50 PSF ON EXPOSED VERTICAL FACE OF SUPERSTRUCTURE.
- D. BASIS OF DESIGN.
  - 1. INTERNATIONAL BUILDING CODE 2012.
  - 2. ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
  - 3. ACI 318-14 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.
  - 4. AISC 14TH EDITION - STEEL CONSTRUCTION MANUAL (LOAD AND RESISTANCE FACTOR DESIGN).
  - 5. AASHTO 1997 GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES.

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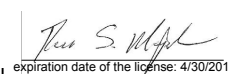


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REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION					
IAO VALLEY STATE MONUMENT FLOOD REPAIRS					
STRUCTURAL GENERAL NOTES					
DESIGNED: RM, KL		SUBMITTED:			
DRAWN: VT		DATE: DECEMBER 2, 2016			
CHECKED: RM		SCALE:			
APPROVED:		DRAWING NO.		S0.1	
CHIEF ENGINEER		DATE			

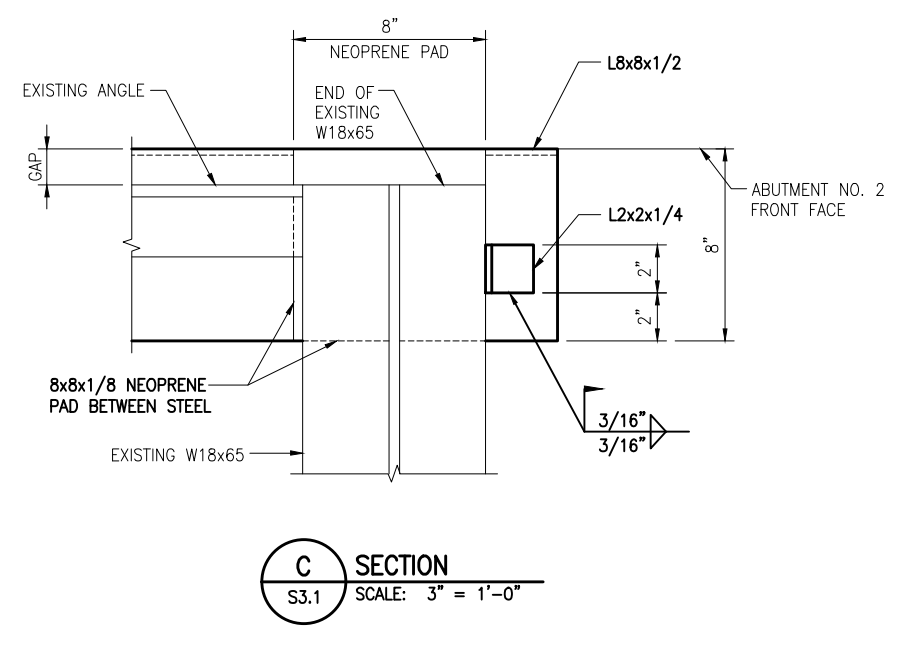
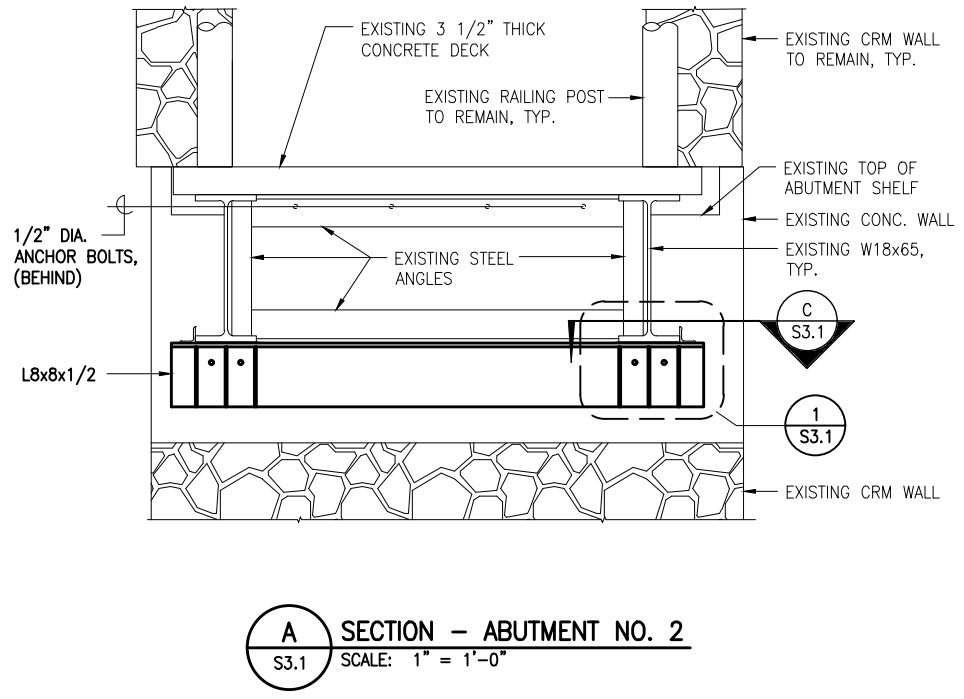
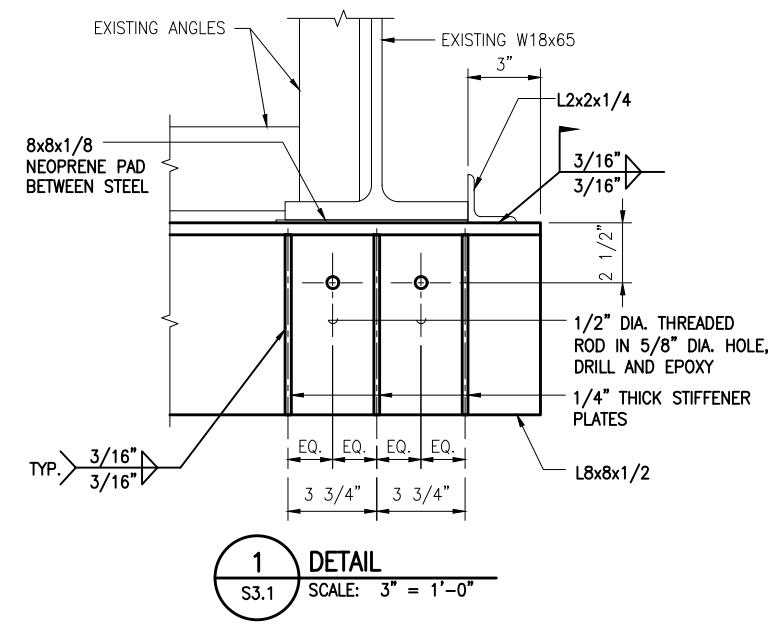
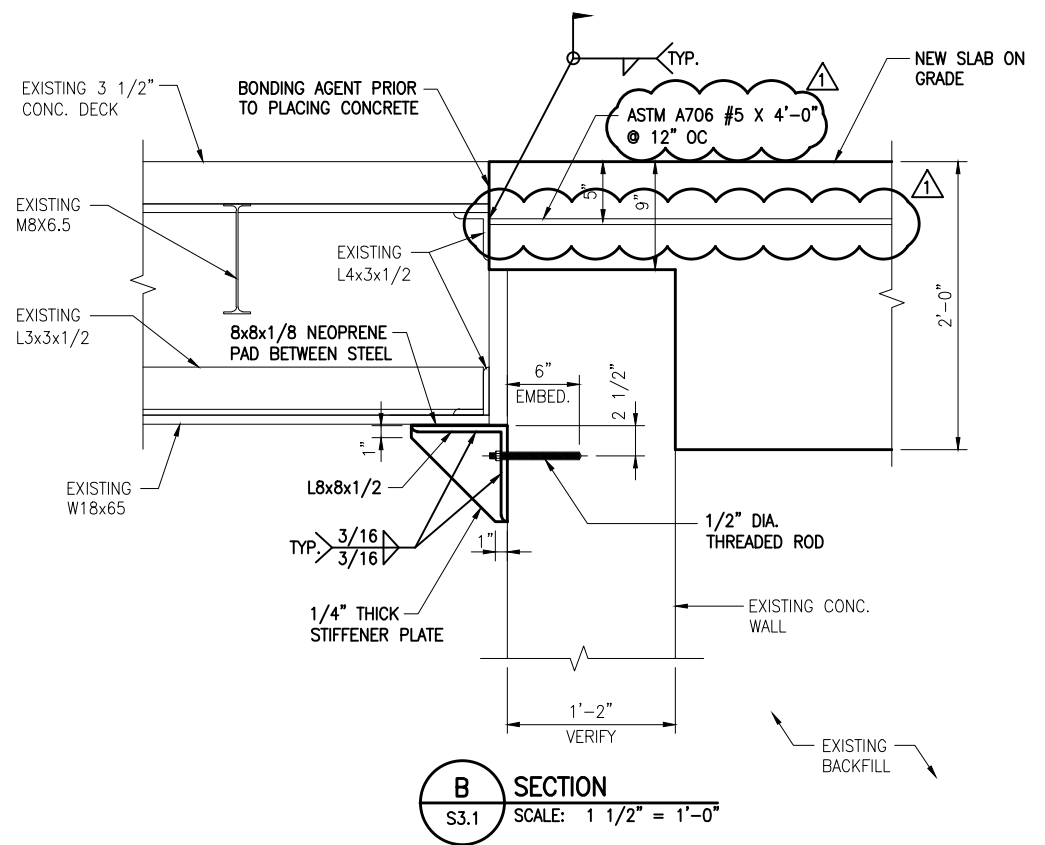
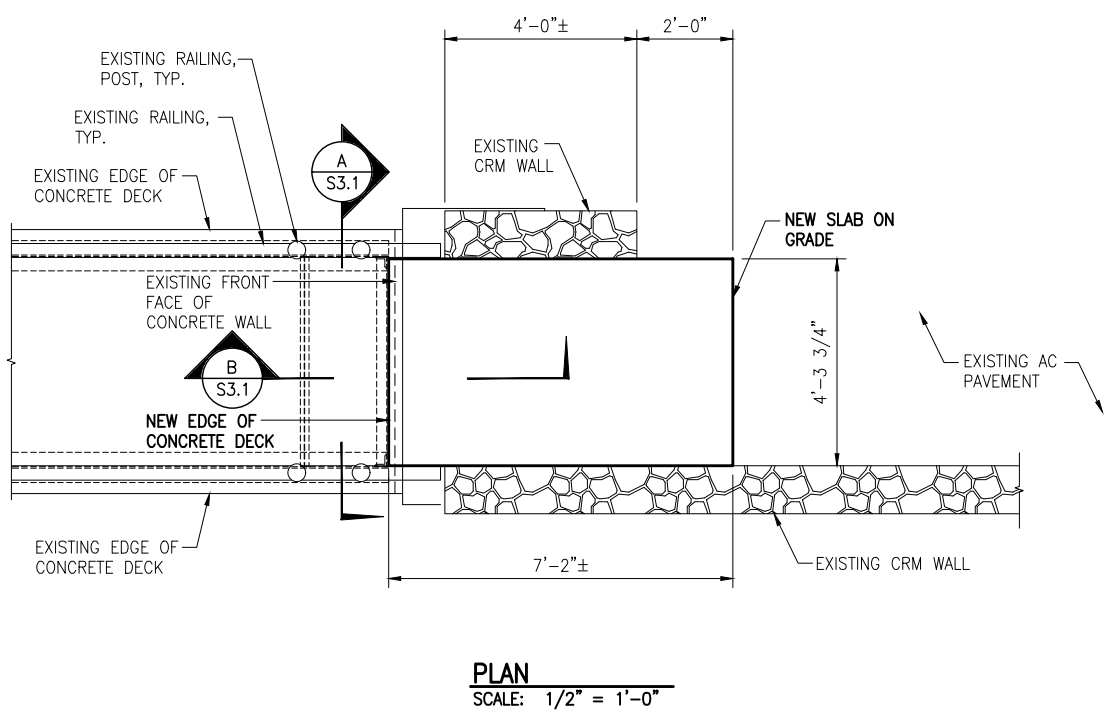
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expiration date of the license: 4/30/2018

**Carty Chang**  
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 carty.s.chang@hawaii.gov

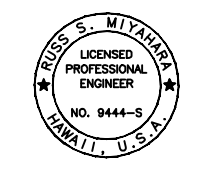


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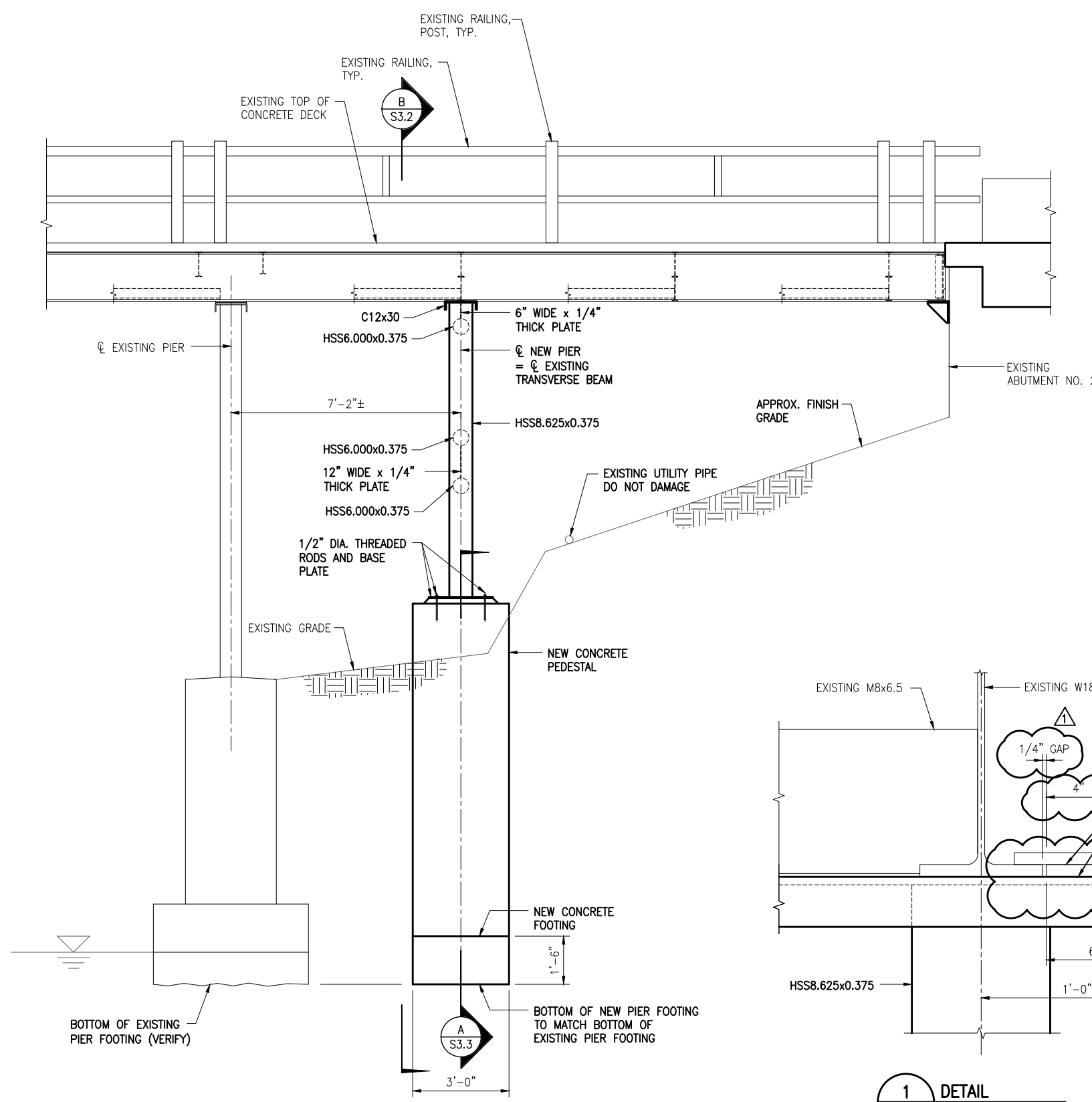
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IAO VALLEY STATE MONUMENT FLOOD REPAIRS					
ABUTMENT NO. 2 PLAN AND SECTIONS					
DESIGNED:	RM, KL	SUBMITTED:			
DRAWN:	VT	DATE:	DECEMBER 2, 2016		
CHECKED:	RM	SCALE:			
APPROVED:			DRAWING NO.		
				<b>S3.1</b>	
CHIEF ENGINEER		DATE			



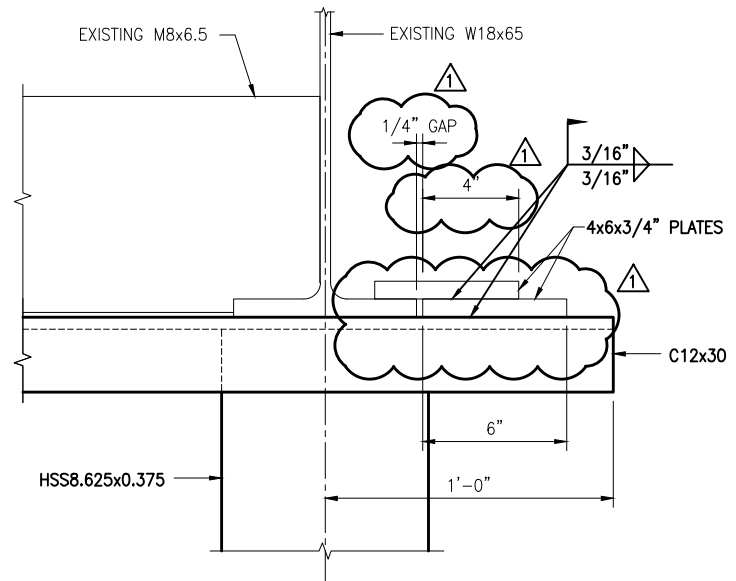
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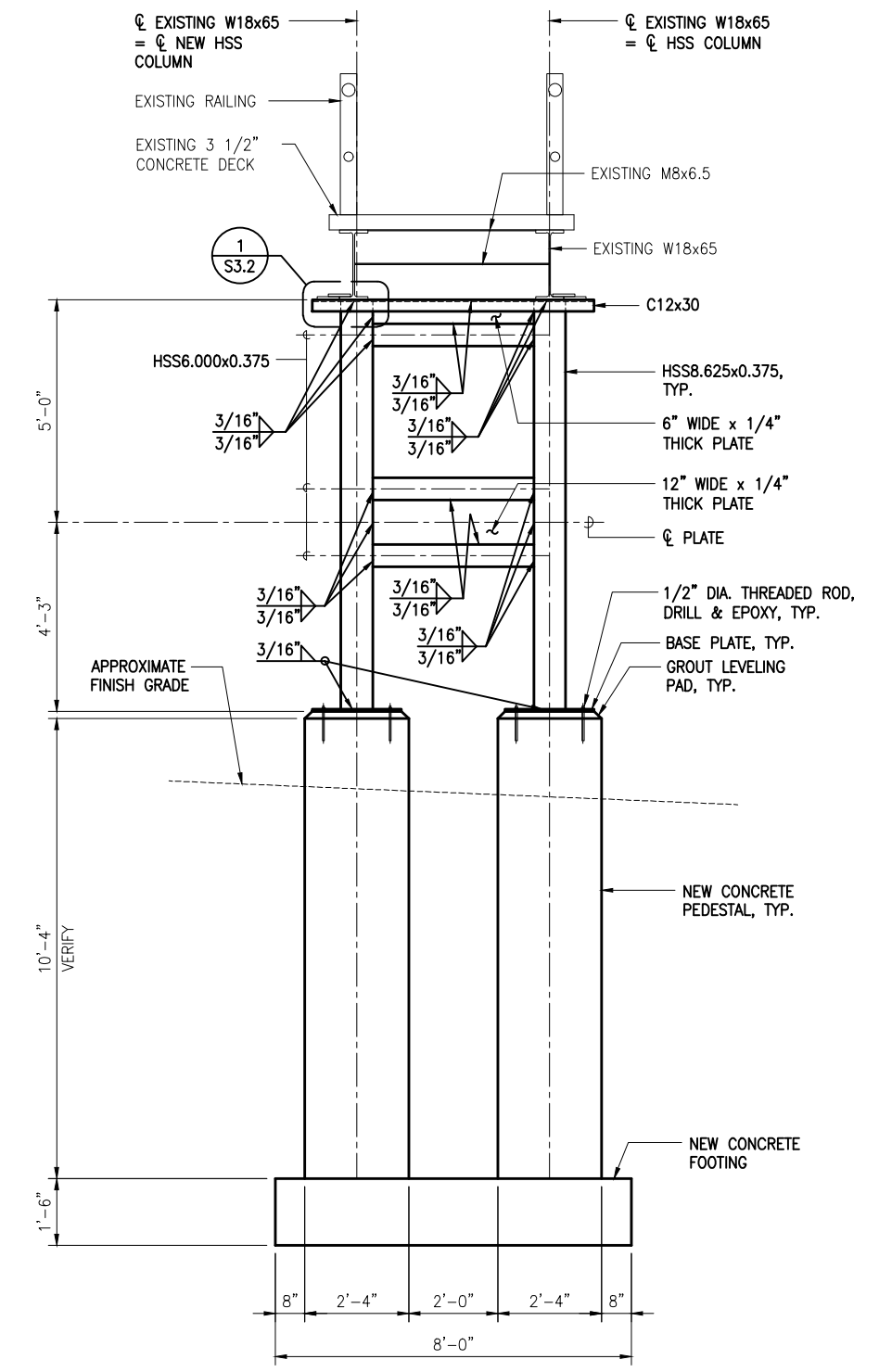
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**A** LONGITUDINAL SECTION  
S3.2 SCALE: 1/2" = 1'-0"



**1** DETAIL  
S3.2 SCALE: 3" = 1'-0"



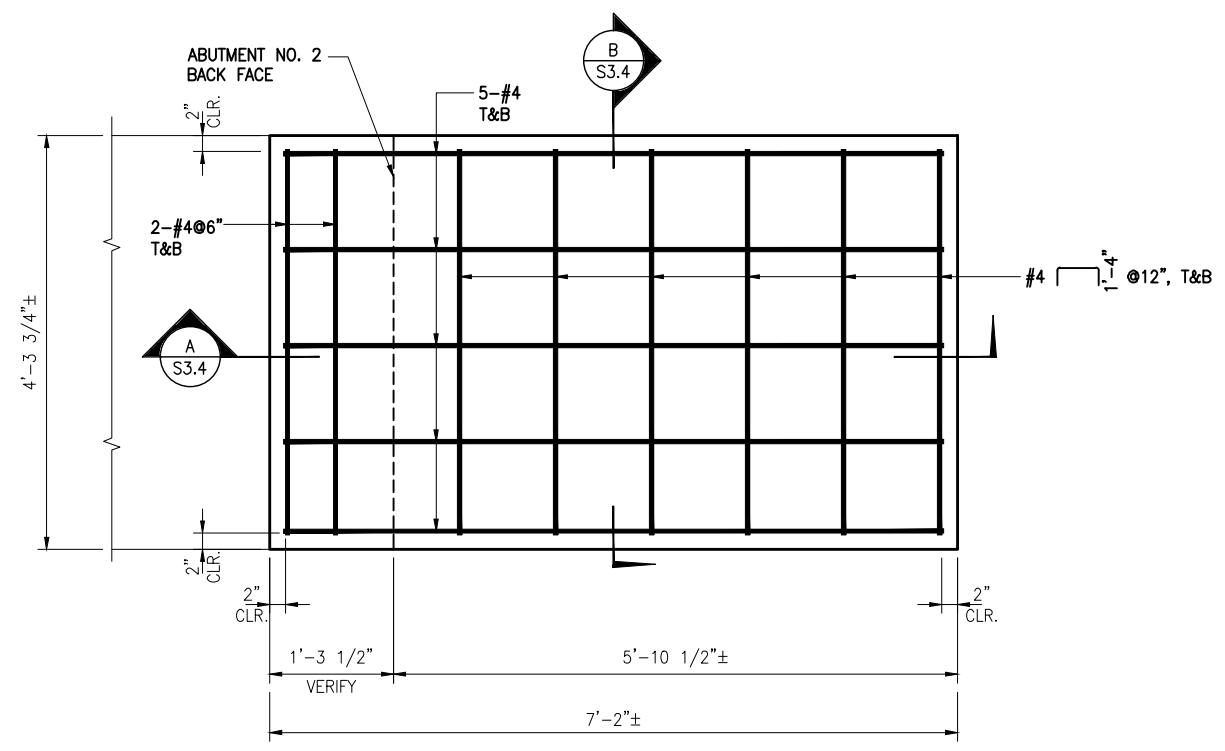
**B** SECTION  
S3.2 SCALE: 1/2" = 1'-0"

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ADDENDUM NO. 1						
Dec 23 2016						
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION						
IAO VALLEY STATE MONUMENT FLOOD REPAIRS						
PIER SECTIONS						
DESIGNED: RM, KL		SUBMITTED:				
DRAWN: VT		DATE: DECEMBER 2, 2016				
CHECKED: RM		SCALE:				
APPROVED:		DRAWING NO.				
CHIEF ENGINEER		DATE		<b>S3.2</b>		

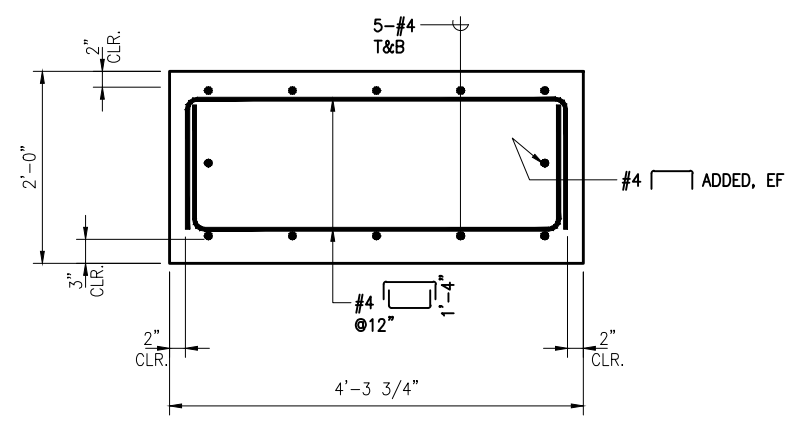
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expiration date of the license: 4/30/2018

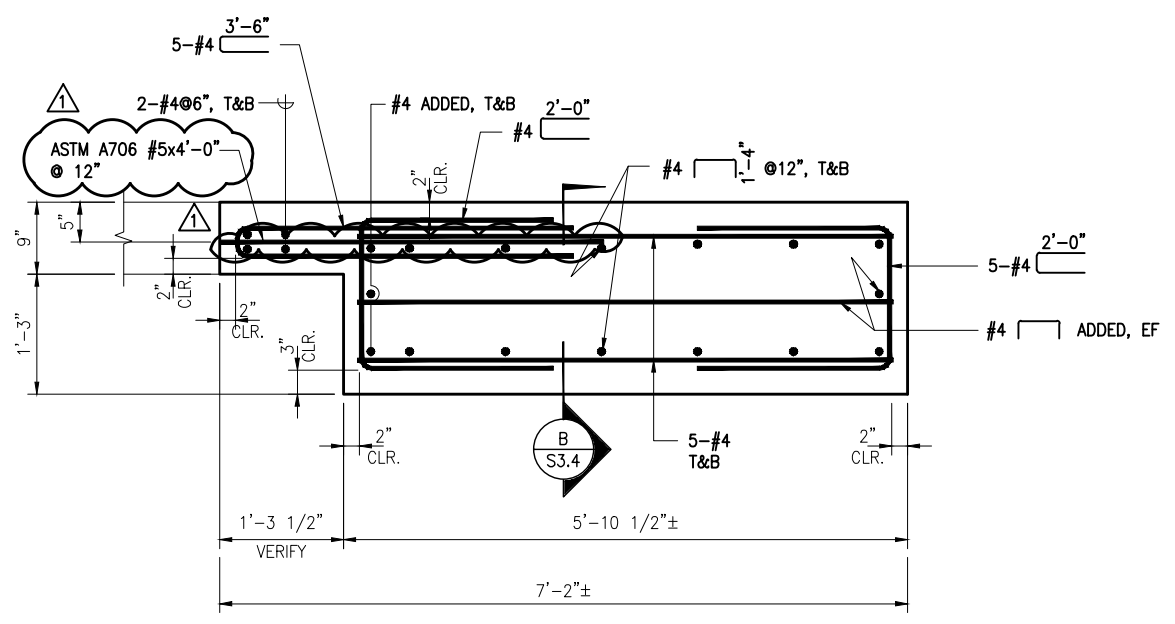
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**PLAN**  
SCALE: 1" = 1'-0"



**B SECTION**  
SCALE: 1" = 1'-0"



**A SECTION**  
SCALE: 1" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED
1		ADDENDUM NO. 1		Dec 23, 2016	
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION					
IAO VALLEY STATE MONUMENT FLOOD REPAIRS					
SLAB ON GRADE					
DESIGNED: RM, KL			SUBMITTED:		
DRAWN: VT			DATE: DECEMBER 2, 2016		
CHECKED: RM			SCALE:		
APPROVED:			DRAWING NO.		
CHIEF ENGINEER			DATE		
			<b>S3.4</b>		

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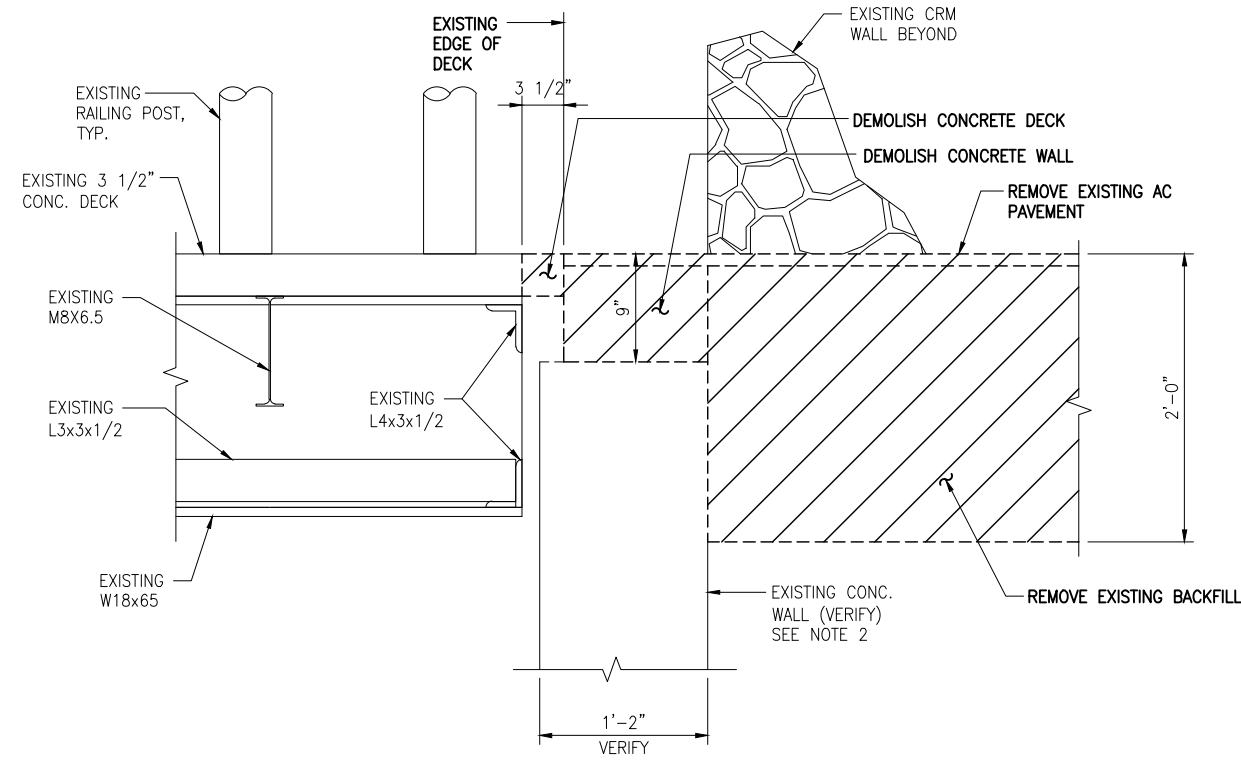
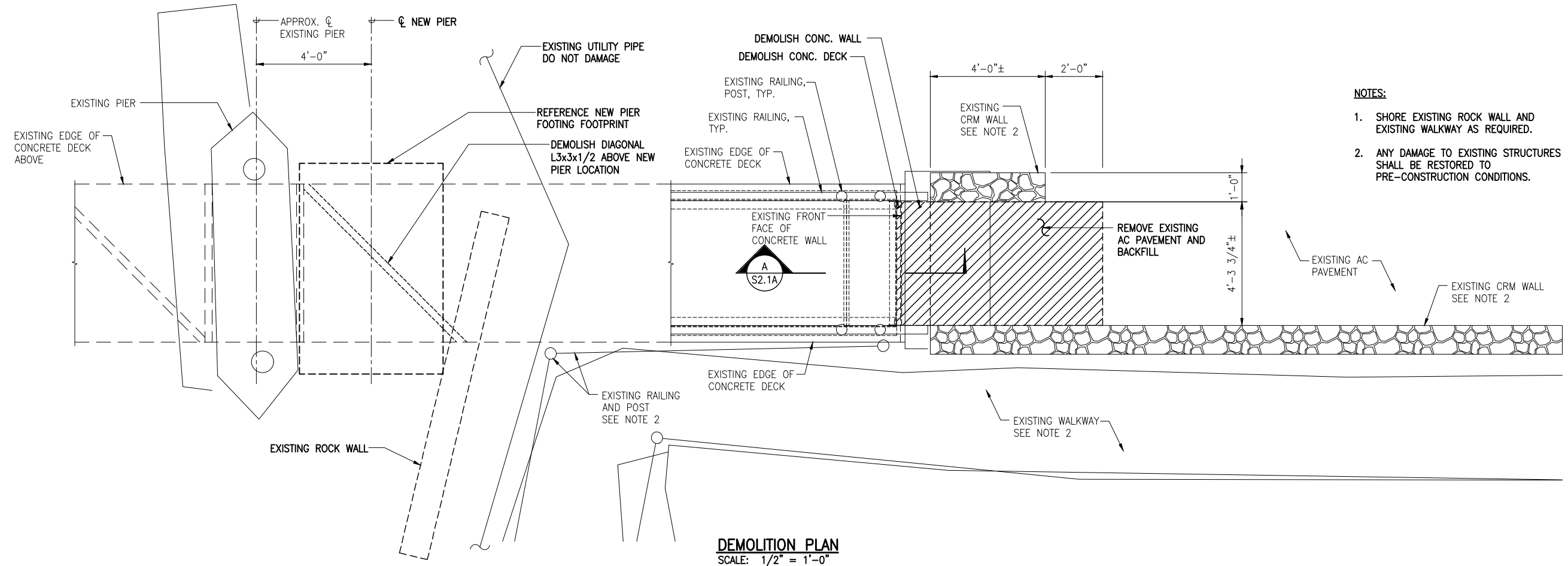
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*Russ S. Miyahara*  
CHIEF ENGINEER

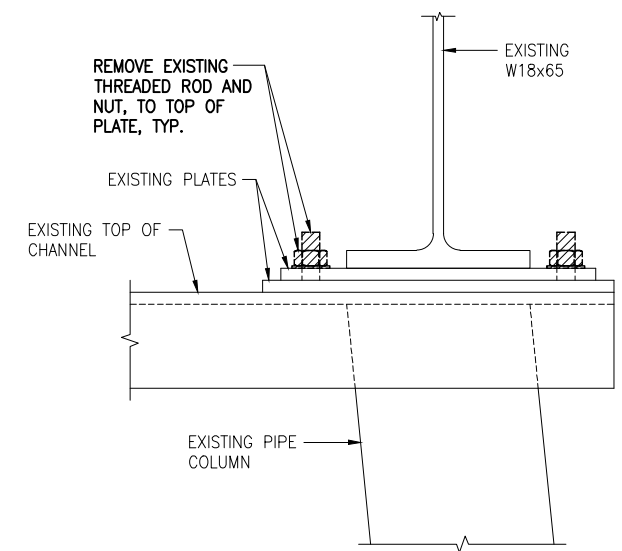
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**A** DEMOLITION SECTION  
S2.1A SCALE: 1 1/2" = 1'-0"



**B** DEMOLITION SECTION AT PIER  
S2.1A SCALE: 3" = 1'-0"

**Carty Chang**  
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NOTE:  
THIS SHEET SUPERCEDES S2.1 IF MICROPILE OPTION IS SELECTED.

REVISION NO.		SYMBOL	DESCRIPTION	SHEET NO.	DATE	APPROVED
ADDENDUM NO. 1						
Dec 23, 2016						
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION						
IAO VALLEY STATE MONUMENT FLOOD REPAIRS						
DEMOLITION PLAN AND SECTIONS						
DESIGNED: RM, KL			SUBMITTED:			
DRAWN: VT			DATE: DECEMBER 2, 2016			
CHECKED: RM			SCALE:			
APPROVED:			DRAWING NO.			
CHIEF ENGINEER			DATE			



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*Russ S. Miyahara*  
expiration date of the license: 4/30/2018

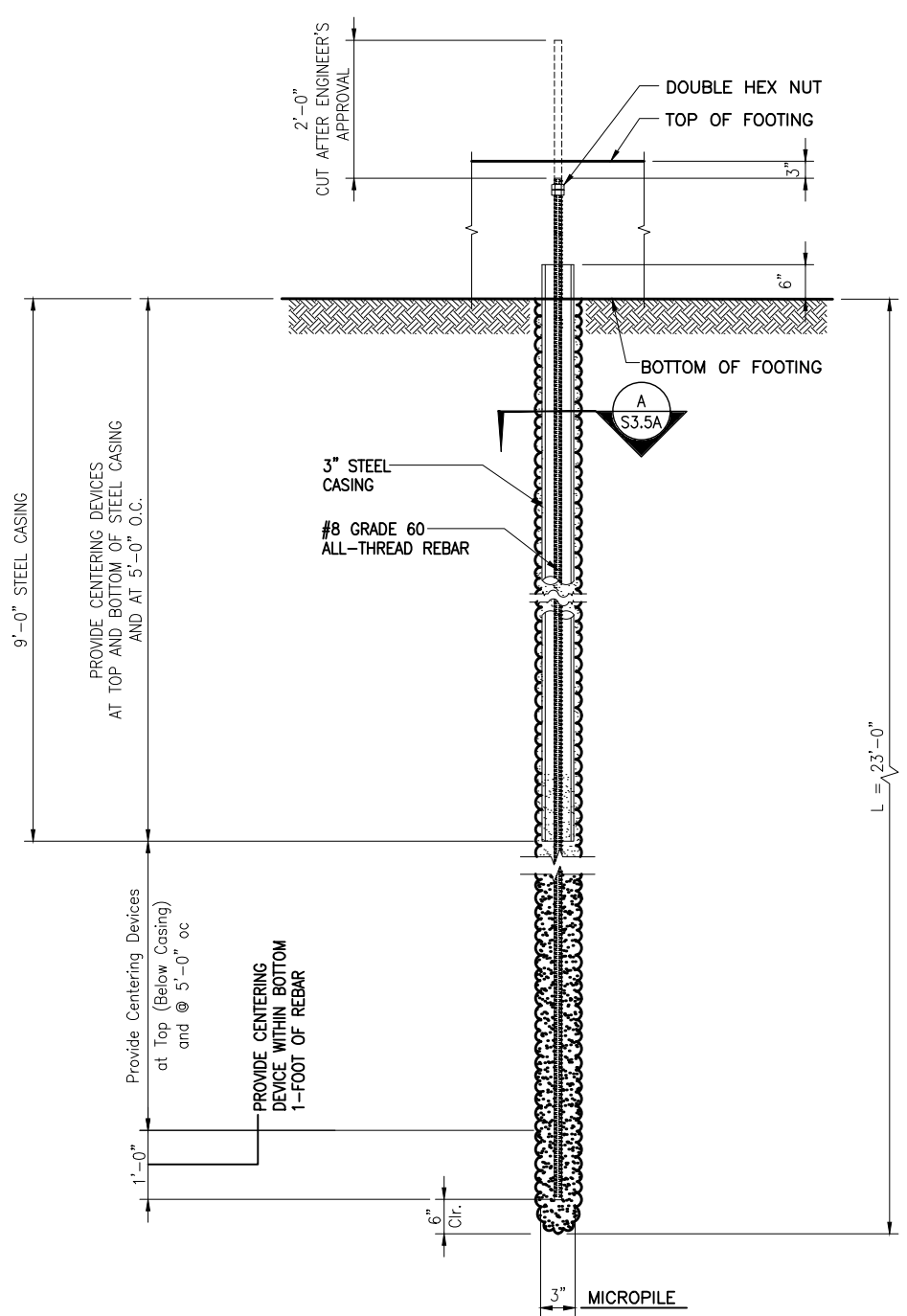
**S2.1A**



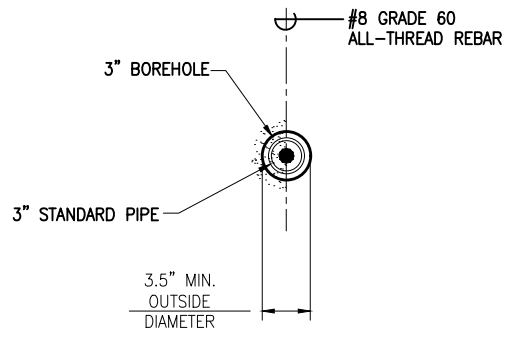




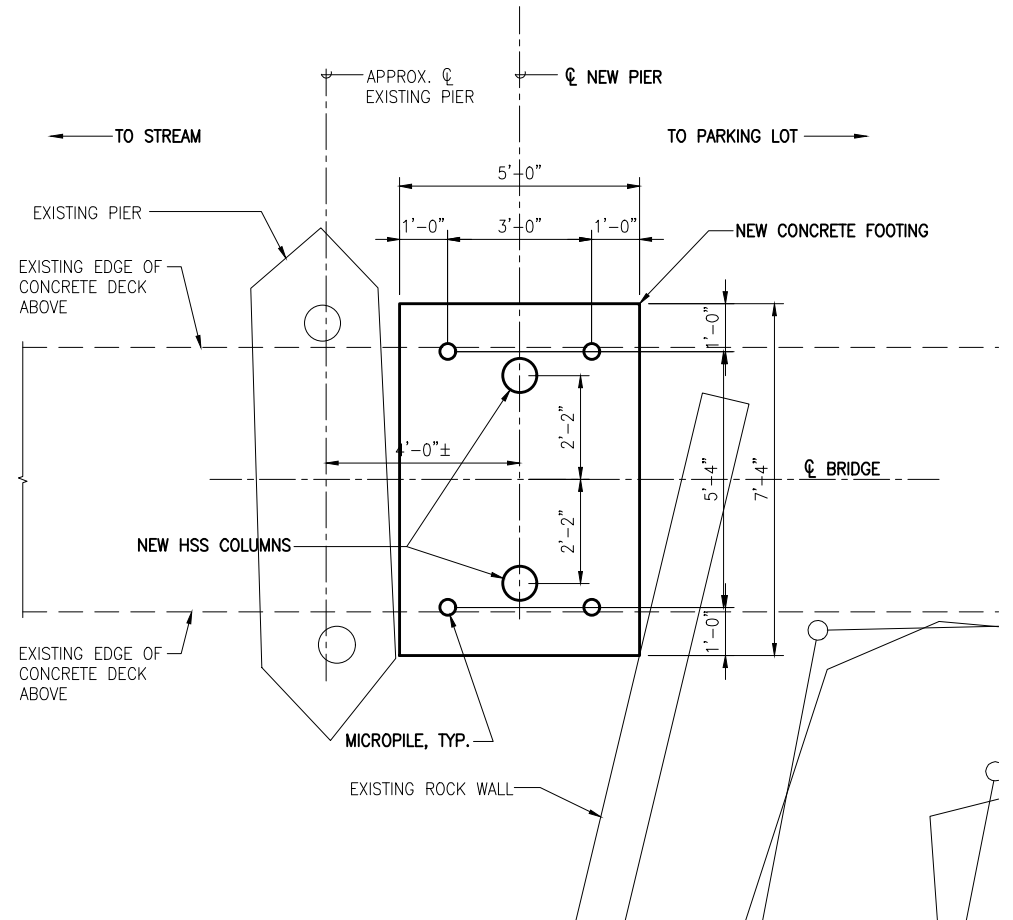
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**TYPICAL MICROPILE**  
SCALE: 3/4" = 1'-0"



**A SECTION**  
S3.5A SCALE: 1-1/2" = 1'-0"



**FOOTING PLAN**  
SCALE: 1/2" = 1'-0"

**NOTES:**

- CENTERING DEVICES (CENTRALIZERS) SHALL BE FABRICATED FROM PLASTIC OR MATERIAL NON-DETRIMENTAL TO THE REINFORCING STEEL.
- THE CENTRALIZER SHALL SUPPORT THE REINFORCING SUCH THAT A MINIMUM OF 5/8" OF GROUT COVER IS PROVIDED AND SHALL PERMIT GROUT FLOW FREELY UP THE DRILL HOLE.
- ALL NUTS AND BAR COUPLINGS SHALL DEVELOP 100% OF THE BAR'S ULTIMATE TENSILE STRENGTH.
- SPLICES WITHIN STEEL CASING SHALL DEVELOP 100% OF THE STEEL CASING'S ULTIMATE TENSILE STRENGTH.
- MATERIAL PROPERTIES:
  - STEEL PLATES - ASTM A36
  - HEX NUTS - ASTM A108
  - COUPLINGS - ASTM A108
  - WASHERS - ASTM F436

MICROPILE LOAD COMBINATION (DEMAND)	
	AXIAL LOAD (KIPS)
STRENGTH I	18 COMPRESSION
STRENGTH I	9 TENSION

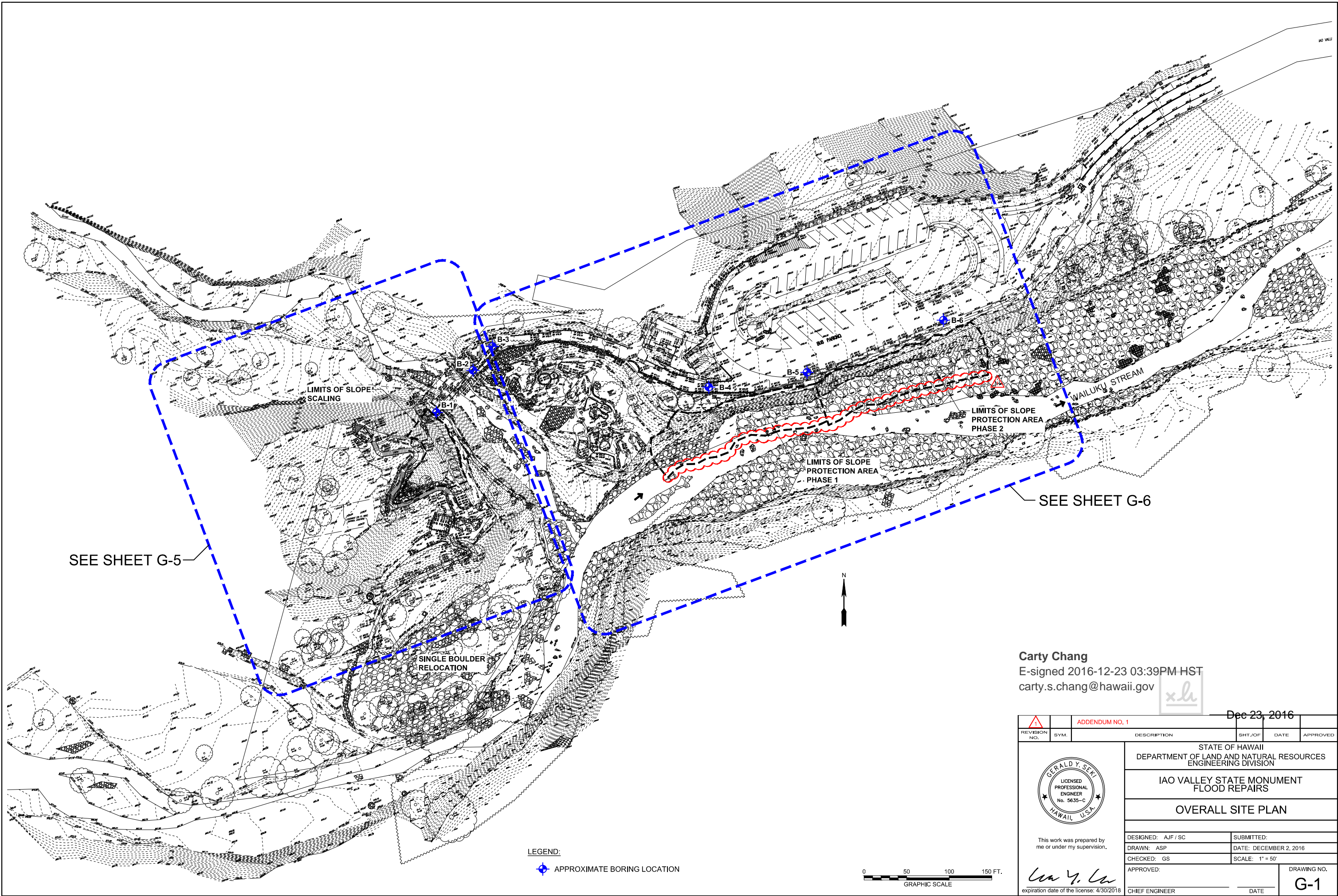
- MICROPILE TO BE PROOF TESTED WILL BE DETERMINED BY ENGINEER.
- THIS SHEET IS APPLICABLE IF MICROPILE OPTION IS SELECTED.

**Carty Chang**  
E-signed 2016-12-23 03:39PM HST  
carty.s.chang@hawaii.gov

*xlh*

Dec 23 2016

REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED
		ADDENDUM NO. 1			
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION					
IAO VALLEY STATE MONUMENT FLOOD REPAIRS					
MICROPILE DETAILS					
DESIGNED: RM, KL		SUBMITTED:			
DRAWN: VT		DATE: DECEMBER 2, 2016			
CHECKED: RM		SCALE:			
APPROVED:		DRAWING NO.			
This work was prepared by me or under my supervision.  <i>Russ S. Miyahara</i> expiration date of the license: 4/30/2018		CHIEF ENGINEER _____ DATE _____ SHEET NO. _____ OF 19 SHEETS			



SEE SHEET G-5

SEE SHEET G-6

LEGEND:  
 APPROXIMATE BORING LOCATION



**Carty Chang**  
 E-signed 2016-12-23 03:39PM HST  
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*xlh*

Dec 23, 2016

REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED
ADDENDUM NO. 1					
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION					
IAO VALLEY STATE MONUMENT FLOOD REPAIRS					
OVERALL SITE PLAN					
DESIGNED: AJF / SC			SUBMITTED:		
DRAWN: ASP			DATE: DECEMBER 2, 2016		
CHECKED: GS			SCALE: 1" = 50'		
APPROVED:			DRAWING NO.		
<i>Carty Chang</i> CHIEF ENGINEER			DATE		
JOB NO. J45CM41A			SHEET NO. 13 OF 19 SHEETS		

G-1

**GEOTECHNICAL NOTES**

- A GEOTECHNICAL ENGINEERING REPORT ENTITLED "GEOTECHNICAL ENGINEERING EXPLORATION, IAO VALLEY STATE MONUMENT REPAIRS, JOB NO. J45DM41A, INTERIM REMEDIAL MEASURES, WAILUKU, MAUI, HAWAII" DATED DECEMBER 1, 2016 HAS BEEN PREPARED BY GEOLABS, INC. A COPY OF THE REPORT IS ON FILE AT THE OFFICE OF THE ENGINEER FOR REVIEW BY THE CONTRACTOR.
- FOR BORING LOCATIONS, SEE SHEETS G-1, G-5, AND G-6.
- THE INFORMATION PRESENTED IN THE LOGS OF BORINGS DEPICT THE SUBSURFACE CONDITIONS ENCOUNTERED AT THAT SPECIFIED LOCATION AND AT THE TIME OF THE FIELD EXPLORATION ONLY. VARIATIONS OF SUBSOIL CONDITIONS FROM THOSE DEPICTED IN THE LOGS OF BORINGS MAY OCCUR BETWEEN AND BEYOND THE BORINGS.
- THE PENETRATION RESISTANCE SHOWN ON THE LOGS OF BORINGS INDICATE THE NUMBER OF BLOWS REQUIRED FOR THE SPECIFIC SAMPLER TYPE USED. THE BLOW COUNTS MAY NEED TO BE FACTORED TO OBTAIN THE STANDARD PENETRATION TEST (SPT) BLOW COUNTS.
- THE DATA GIVEN IS FOR GENERAL INFORMATION ONLY. BIDDERS SHALL EXAMINE THE SITE AND THE BORING DATA AND DRAW THEIR OWN CONCLUSIONS THEREFROM AS TO THE CHARACTER OF MATERIALS TO BE ENCOUNTERED. THE ENGINEER WILL NOT ASSUME RESPONSIBILITY FOR VARIATIONS OF SUBSOIL QUALITY OR CONDITIONS OTHER THAN AT THE BORING LOCATIONS SHOWN AND AT THE TIME THE BORINGS WERE TAKEN.

<b>GEOLABS, INC.</b> Geotechnical Engineering		<b>Soil Log Legend</b>			
<b>UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)</b>					
<b>MAJOR DIVISIONS</b>		<b>USCS</b>			
<b>COARSE-GRAINED SOILS</b>  MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE  MORE THAN 50% OF MATERIAL RETAINED ON NO. 200 SIEVE	<b>GRAVELS</b>  LESS THAN 5% FINES  GRAVELS WITH FINES MORE THAN 12% FINES	GW WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	GP POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES  GM SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES  GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		
		<b>SANDS</b>  LESS THAN 5% FINES  SANDS WITH FINES MORE THAN 12% FINES		SW WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	SP POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES  SM SILTY SANDS, SAND-SILT MIXTURES  SC CLAYEY SANDS, SAND-CLAY MIXTURES
				CL INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
	<b>FINE-GRAINED SOILS</b>  50% OR MORE OF MATERIAL PASSING THROUGH NO. 200 SIEVE	<b>SILTS AND CLAYS</b>  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	
			MH INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SILTS		CH INORGANIC CLAYS OF HIGH PLASTICITY
		<b>SILTS AND CLAYS</b>  LIQUID LIMIT 50 OR MORE	OH ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	PT PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	
<b>HIGHLY ORGANIC SOILS</b>					
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS					
<b>LEGEND</b>					
(2-INCH) O.D. STANDARD PENETRATION TEST		LL LIQUID LIMIT (NP=NON-PLASTIC)			
(3-INCH) O.D. MODIFIED CALIFORNIA SAMPLE		PI PLASTICITY INDEX (NP=NON-PLASTIC)			
SHELBY TUBE SAMPLE		TV TORVANE SHEAR (tsf)			
GRAB SAMPLE		UC UNCONFINED COMPRESSION OR UNIAXIAL COMPRESSION STRENGTH			
CORE SAMPLE		TXUU UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (ksf)			
WATER LEVEL OBSERVED IN BORING AT TIME OF DRILLING		Plate			
WATER LEVEL OBSERVED IN BORING AFTER DRILLING		A-0.1			
WATER LEVEL OBSERVED IN BORING OVERNIGHT		Plate			

<b>GEOLABS, INC.</b> Geotechnical Engineering		<b>Soil Classification Log Key</b> (with deviations from ASTM D2488)	
<b>GEOLABS, INC. CLASSIFICATION*</b>			
<b>GRANULAR SOIL (- #200 &lt;50%)</b>		<b>COHESIVE SOIL (- #200 ≥50%)</b>	
* PRIMARY constituents are composed of the largest percent of the soil mass. Primary constituents are capitalized and bold (i.e., GRAVEL, SAND)		* PRIMARY constituents are based on plasticity. Primary constituents are capitalized and bold (i.e., CLAY, SILT)	
* SECONDARY constituents are composed of a percentage less than the primary constituent. If the soil mass consists of 12 percent or more fines content, a cohesive constituent is used (SILTY or CLAYEY); otherwise, a granular constituent is used (GRAVELLY or SANDY) provided that the secondary constituent consists of 20 percent or more of the soil mass. Secondary constituents are capitalized and bold (i.e., SANDY GRAVEL, CLAYEY SAND) and precede the primary constituent.		* SECONDARY constituents are composed of a percentage less than the primary constituent, but more than 20 percent of the soil mass. Secondary constituents are capitalized and bold (i.e., SANDY CLAY, SILTY CLAY, CLAYEY SILT) and precede the primary constituent.	
* accessory descriptions compose of the following: with some: >12% with a little: 5 - 12% with traces of: <5%		* accessory descriptions compose of the following: with some: >12% with a little: 5 - 12% with traces of: <5%	
* accessory descriptions are lower cased and follow the Primary and Secondary Constituents (i.e., SILTY GRAVEL with a little sand)		* accessory descriptions are lower cased and follow the Primary and Secondary Constituents (i.e., SILTY CLAY with some sand)	
EXAMPLE: Soil Containing 60% Gravel, 25% Sand, 15% Fines. Described as: SILTY GRAVEL with some sand			
<b>RELATIVE DENSITY / CONSISTENCY</b>			
<b>Granular Soils</b>		<b>Cohesive Soils</b>	
N-Value (Blows/Foot)	Relative Density	N-Value (Blows/Foot)	PP Readings (tsf)
SPT	MCS	SPT	MCS
0 - 4	0 - 7	0 - 2	0 - 4
4 - 10	7 - 18	2 - 4	4 - 7
10 - 30	18 - 55	4 - 8	7 - 15
30 - 50	55 - 91	8 - 15	15 - 27
> 50	> 91	15 - 30	27 - 55
		> 30	> 55
			> 4.0
			Hard
<b>MOISTURE CONTENT DEFINITIONS</b>			
Dry: Absence of moisture, dry to the touch			
Moist: Damp but no visible water			
Wet: Visible free water, usually soil is below water table			
<b>GRAIN SIZE DEFINITION</b>			
Description		Sieve Number and / or Size	
Boulders		> 12 inches (305-mm)	
Cobbles		3 to 12 inches (75-mm to 305-mm)	
Gravel		3/8 to #4 (75-mm to 4.75-mm)	
Coarse Gravel		3/8 to 3/4-inch (75-mm to 19-mm)	
Fine Gravel		3/4-inch to #4 (19-mm to 4.75-mm)	
Sand		#4 to #200 (4.75-mm to 0.075-mm)	
Coarse Sand		#4 to #10 (4.75-mm to 2-mm)	
Medium Sand		#10 to #40 (2-mm to 0.425-mm)	
Fine Sand		#40 to #200 (0.425-mm to 0.075-mm)	
Plate			
A-0.2			
*Soil descriptions are based on ASTM D2488-09a, Visual-Manual Procedure, with the above modifications by Geolabs, Inc. to the Unified Soil Classification System (USCS).			

<b>GEOLABS, INC.</b> Geotechnical Engineering		<b>Rock Log Legend</b>	
<b>ROCK DESCRIPTIONS</b>			
BASALT	FINGER CORAL		
BOULDERS	LIMESTONE		
BRECCIA	SANDSTONE		
CLINKER	SILTSTONE		
COBBLES	TUFF		
CORAL	VOID/CAVITY		
<b>ROCK DESCRIPTION SYSTEM</b>			
<b>ROCK FRACTURE CHARACTERISTICS</b> The following terms describe general fracture spacing of a rock:			
Massive:	Greater than 24 inches apart		
Slightly Fractured:	12 to 24 inches apart		
Moderately Fractured:	6 to 12 inches apart		
Closely Fractured:	3 to 6 inches apart		
Severely Fractured:	Less than 3 inches apart		
<b>DEGREE OF WEATHERING</b> The following terms describe the chemical weathering of a rock:			
Unweathered:	Rock shows no sign of discoloration or loss of strength.		
Slightly Weathered:	Slight discoloration inwards from open fractures.		
Moderately Weathered:	Discoloration throughout and noticeably weakened though not able to break by hand.		
Highly Weathered:	Most minerals decomposed with some concretions present in residual soil mass. Can be broken by hand.		
Extremely Weathered:	Saprolite. Mineral residue completely decomposed to soil but fabric and structure preserved.		
<b>HARDNESS</b> The following terms describe the resistance of a rock to indentation or scratching:			
Very Hard:	Specimen breaks with difficulty after several "pinging" hammer blows. Example: Dense, fine grain volcanic rock.		
Hard:	Specimen breaks with some difficulty after several hammer blows. Example: Vesicular, vulgular, coarse-grained rock.		
Medium Hard:	Specimen can be broken by one hammer blow. Cannot be scraped by knife. SPT may penetrate by ~28 blows per inch with bounce. Example: Porous rock such as clinker, ocher, and coral reef.		
Soft:	Can be indented by one hammer blow. Can be scraped or peeled by knife. SPT can penetrate by ~100 blows per foot. Example: Weathered rock, chalk-like coral reef.		
Very Soft:	Crumbles under hammer blow. Can be peeled and carved by knife. Can be indented by finger pressure. Example: Saprolite.		
Plate			
A-0.3			

<b>GEOLABS, INC.</b> Geotechnical Engineering		IAO VALLEY STATE MONUMENT FLOOD REPAIRS JOB NO. J45CM41A INTERIM REMEDIAL MEASURES WAILUKU, MAUI, HAWAII		Log of Boring <b>1</b>
Laboratory		Field		
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	ROD (%)
	37	26	100	32
	26.3%	24	92	25/5" Ref. 20/0" Ref.
UC=	5830 psi		57	
UC=	6550 psi		90	
UC=	6350 psi		100	
UC=	2790 psi		67	
Description				
1-inch ASPHALTIC CONCRETE				
Brown SILTY SAND (BASALTIC) with some gravel, medium dense to dense, moist (fill)				
Gray COBBLY GRAVEL (BASALTIC), subangular, dense, moist (colluvium)				
Brown with trace orange SILTY SAND (BASALTIC) with some gravel, very dense, moist (older colluvium)				
Brownish gray COBBLES (BASALTIC), subangular, dense, moist (older colluvium)				
Grayish brown SANDY GRAVEL (BASALTIC) with traces of silt, very dense, moist (older colluvium)				
Brownish gray to gray GRAVELLY COBBLES (BASALTIC) with some boulders and brown cemented sand matrix, very dense, moist (older colluvium)				
Boring terminated at 21 feet				
* Elevations estimated from Preliminary Topographic Survey Plan received from Wilson Okamoto Corporation on November 16, 2016.				
Date Started: November 16, 2016		Water Level: Not Encountered		
Date Completed: November 17, 2016		Plate		
Logged By: S. Latronic		Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)		
Total Depth: 21 feet		Driving Method: 4" Solid Stem Auger & NQ Coring		
Work Order: 7417-00(A)		Driving Energy: 140 lb. wt., 30 in. drop		

<b>GEOLABS, INC.</b> Geotechnical Engineering		IAO VALLEY STATE MONUMENT FLOOD REPAIRS JOB NO. J45CM41A INTERIM REMEDIAL MEASURES WAILUKU, MAUI, HAWAII		Log of Boring <b>2</b>
Laboratory		Field		
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	ROD (%)
	14	8	100	5
	18.4%	3	63	20/0" Ref.
UC=	5770 psi		71	
UC=	5710 psi		33	
UC=	5790 psi		50	
UC=	2980 psi		75	
UC=	4760 psi		70	
UC=	3580 psi		42	
Description				
4-inch CONCRETE (BRIDGE DECK) SPACE BENEATH BRIDGE DECK				
Brown SILTY SAND (BASALTIC) with some gravel, loose to medium dense, moist (colluvium)				
Brownish gray to gray GRAVELLY COBBLES (BASALTIC) with some sand, dense to very dense, moist (older colluvium)				
grades with boulders (basaltic)				
grades more gravelly				
Boring terminated at 28 feet				
Date Started: November 17, 2016		Water Level: Not Encountered		
Date Completed: November 18, 2016		Plate		
Logged By: S. Latronic		Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)		
Total Depth: 28 feet		Driving Method: 4" Solid Stem Auger & NQ Coring		
Work Order: 7417-00(A)		Driving Energy: 140 lb. wt., 30 in. drop		

<b>GEOLABS, INC.</b> Geotechnical Engineering		IAO VALLEY STATE MONUMENT FLOOD REPAIRS JOB NO. J45CM41A INTERIM REMEDIAL MEASURES WAILUKU, MAUI, HAWAII		Log of Boring <b>3</b>
Laboratory		Field		
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	ROD (%)
	11	5	100	41
	26.3%	24	92	50/1" Ref.
UC=	5770 psi		71	
UC=	5710 psi		33	
UC=	5790 psi		50	
UC=	2980 psi		75	
Description				
2-inch ASPHALTIC CONCRETE Grayish brown SANDY GRAVEL (BASALTIC) with a little silt, dense, moist (fill)				
Brownish gray GRAVELLY COBBLES (BASALTIC) with some silty sand, subrounded, dense, moist (older colluvium) grades more sandy locally				
Gray SILTY SAND (BASALTIC) with some gravel and traces of clay, medium dense, moist (older colluvium)				
Gray GRAVELLY COBBLES (BASALTIC) with some sand, subrounded, dense, moist (older colluvium) grades more sand and gravel locally				
grades with boulders (basaltic)				
Boring terminated at 19 feet				
Date Started: November 15, 2016		Water Level: Not Encountered		
Date Completed: November 16, 2016		Plate		
Logged By: S. Latronic		Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)		
Total Depth: 19 feet		Driving Method: 4" Solid Stem Auger & NQ Coring		
Work Order: 7417-00(A)		Driving Energy: 140 lb. wt., 30 in. drop		

**Carty Chang**  
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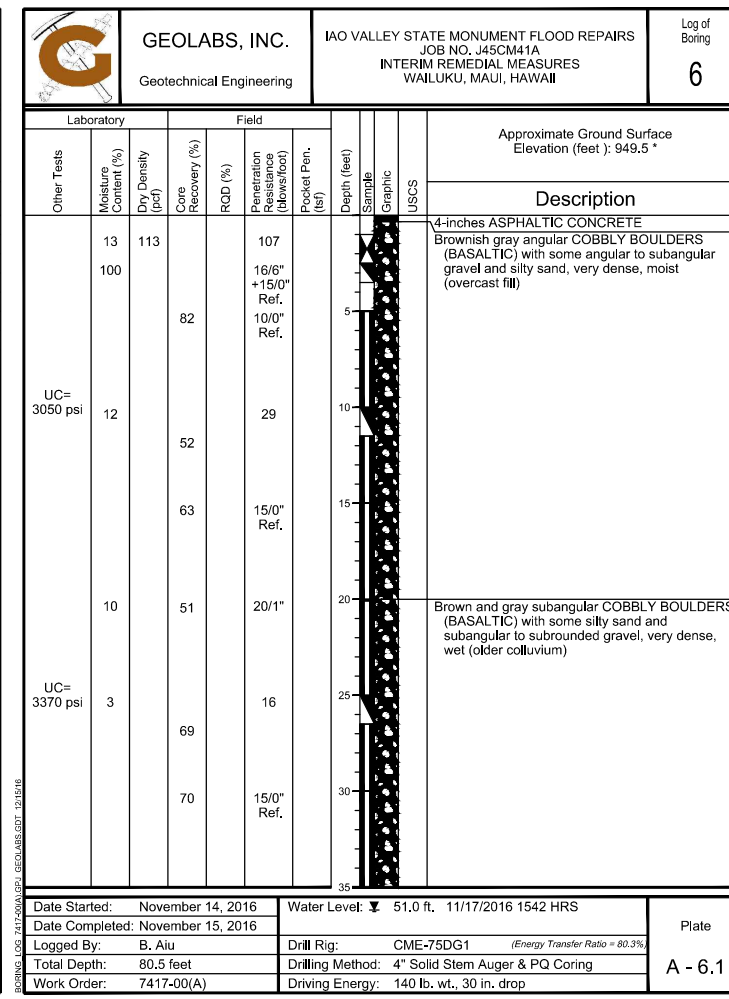
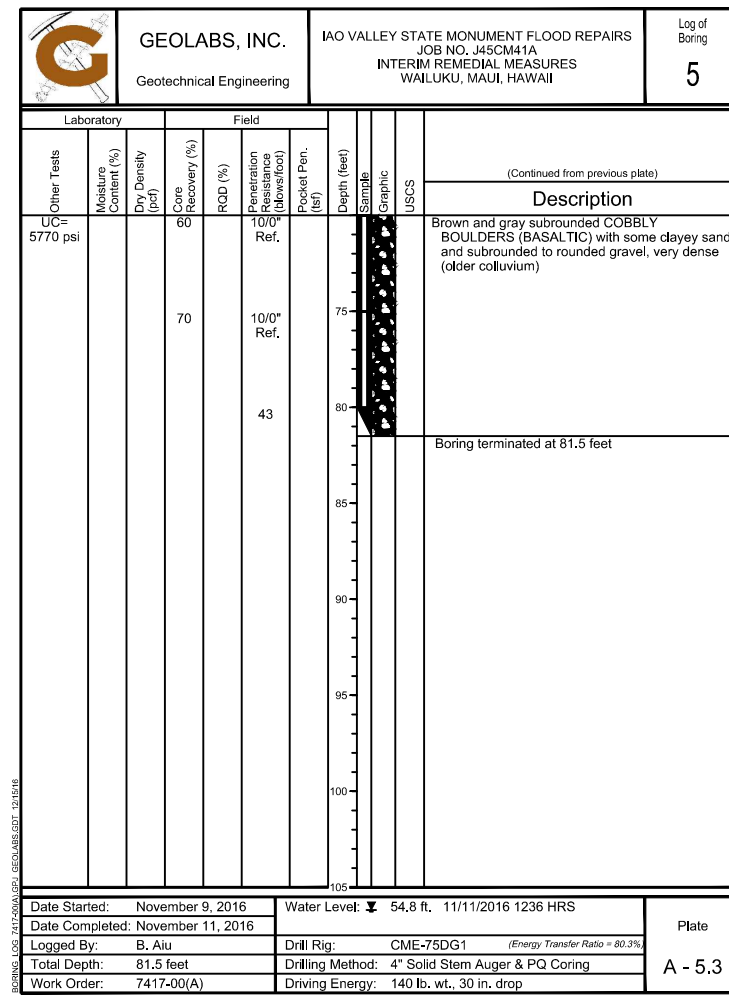
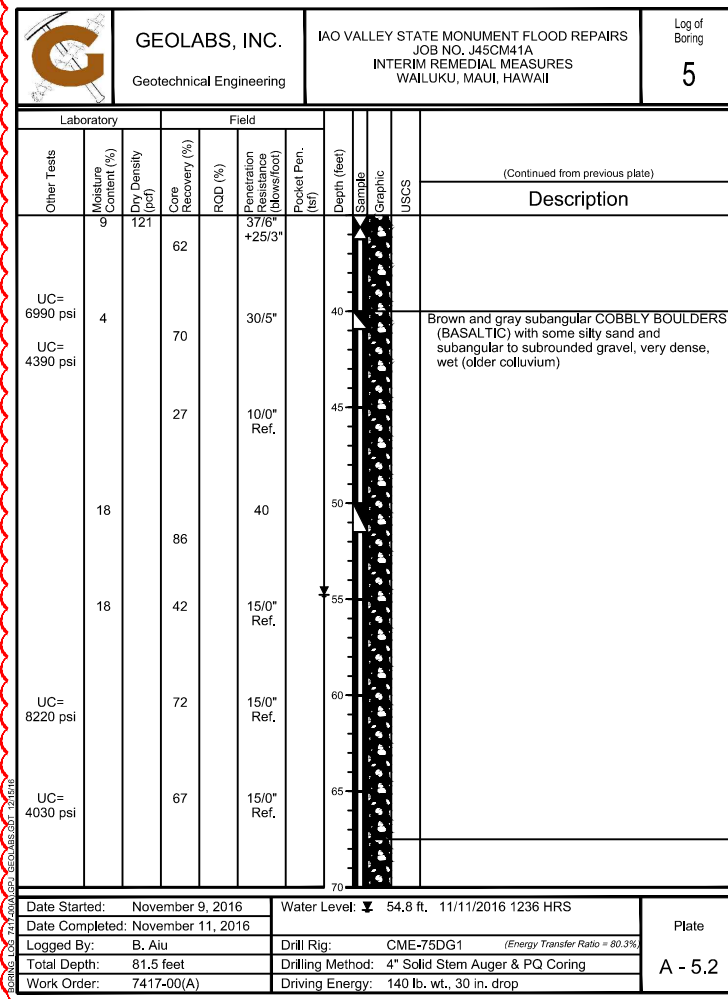
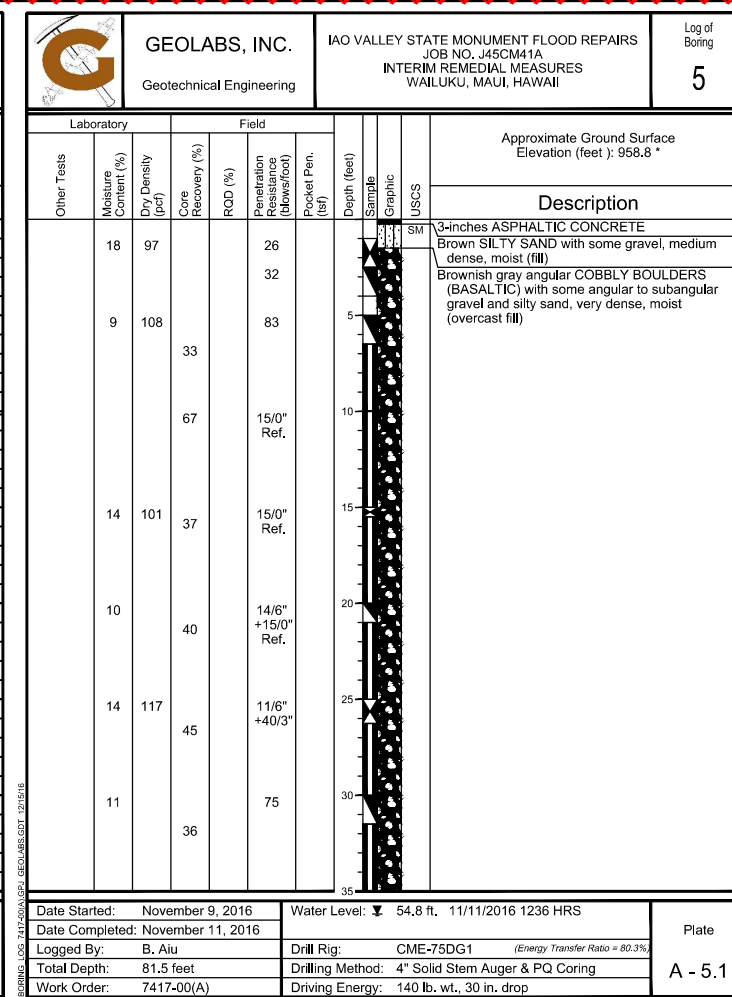
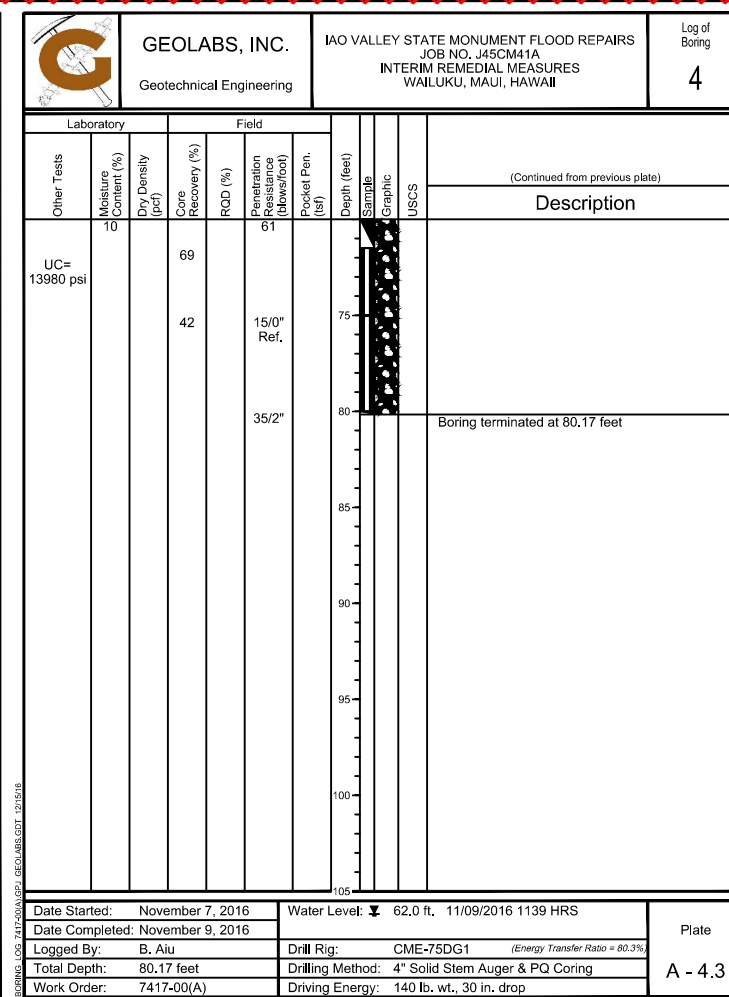
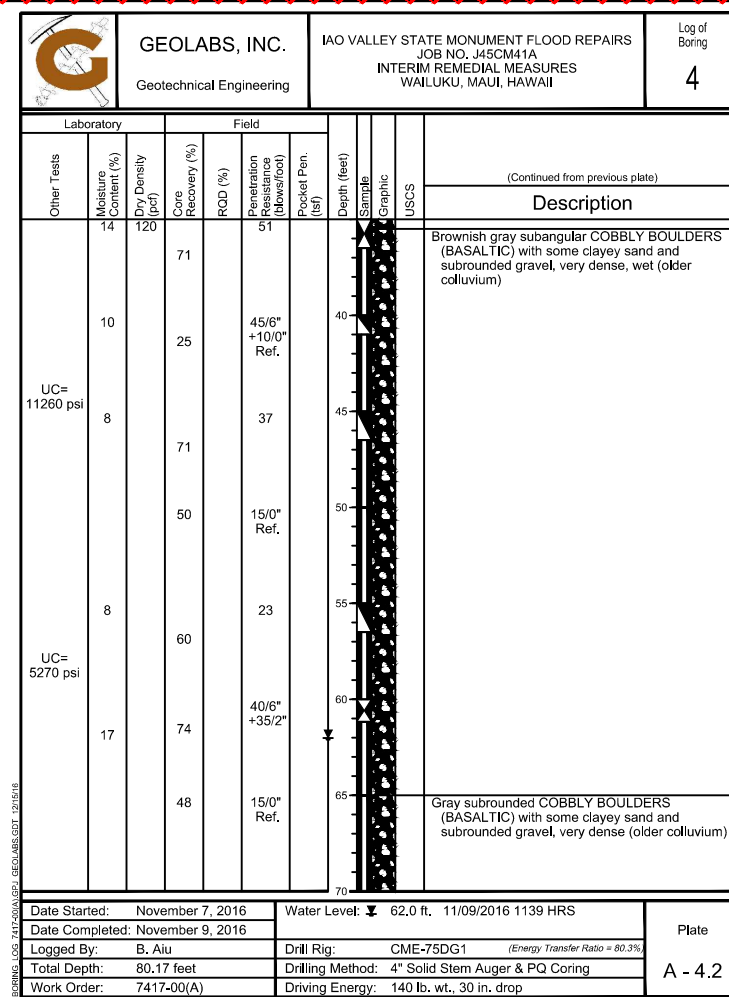
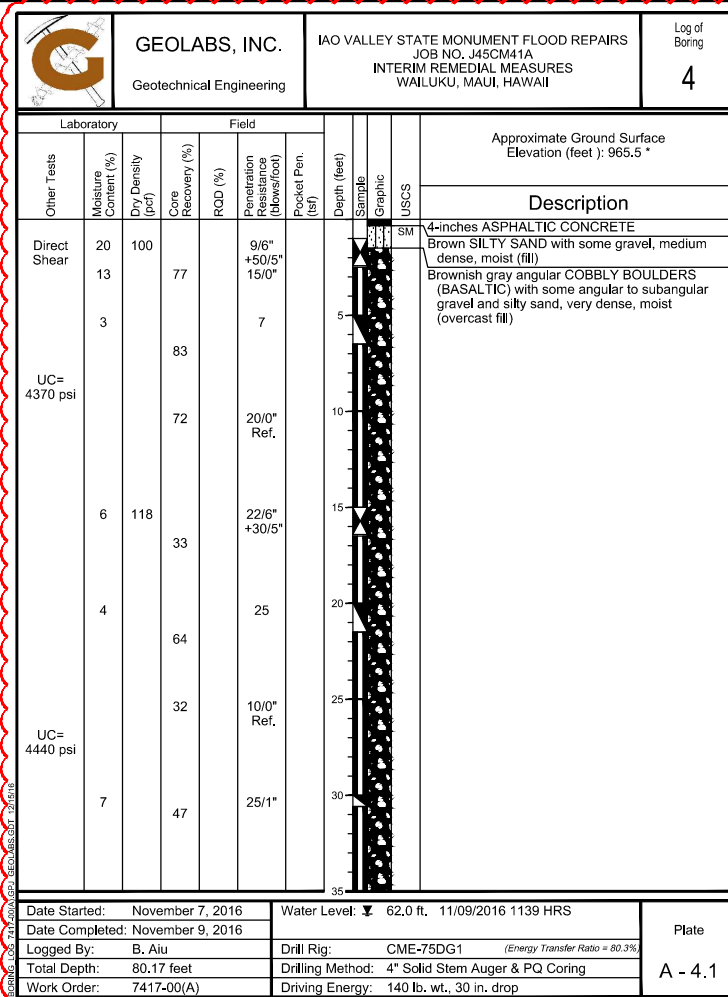
Dec 23, 2016

REVISION NO.	SYMBOL	DESCRIPTION	SHT. OF	DATE	APPROVED

STATE OF HAWAII  
 DEPARTMENT OF LAND AND NATURAL RESOURCES  
 ENGINEERING DIVISION  
**IAO VALLEY STATE MONUMENT FLOOD REPAIRS**  
**BORING LOGS 1**

DESIGNED: AJF / SC	SUBMITTED:
DRAWN: ASP	DATE: DECEMBER 2, 2016
CHECKED: GS	SCALE: NOT TO SCALE
APPROVED:	DRAWING NO.
CHIEF ENGINEER	<b>G-2</b>

This work was prepared by me or under my supervision.  
 expiration date of the license: 4/30/2018  
 JOB NO. J45CM41A SHEET NO. 14 OF 19 SHEETS



**Carty Chang**  
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Dec 23, 2016

REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED
		ADDENDUM NO. 1			

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
ENGINEERING DIVISION

IAO VALLEY STATE MONUMENT  
FLOOD REPAIRS

BORING LOGS 2

DESIGNED: AJF / SC  
DRAWN: ASP  
CHECKED: GS  
APPROVED: \_\_\_\_\_  
CHIEF ENGINEER

SUBMITTED: DATE: DECEMBER 2, 2016  
SCALE: NOT TO SCALE

DRAWING NO. **G-3**

This work was prepared by me or under my supervision.

expiraton date of the license: 4/30/2018

JOB NO. J45CM41A SHEET NO. 15 OF 19 SHEETS

Laboratory		Field					Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	ROD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	
	8		49		30/5"		(Continued from previous plate)
	7		81		49		
	27		17		30		
	16	114	45		26		
			33		15/0" Ref.		
	31	83	43		50		
					15/0" Ref.		
					50		

Date Started: November 14, 2016  
Date Completed: November 15, 2016  
Logged By: B. Aiu  
Total Depth: 80.5 feet  
Work Order: 7417-00(A)

Water Level: 51.0 ft. 11/17/2016 1542 HRS

Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)  
Drilling Method: 4" Solid Stem Auger & PQ Coring  
Driving Energy: 140 lb. wt., 30 in. drop

Plate  
**A - 6.2**

Laboratory		Field					Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	ROD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	
			77		15/0" Ref.		(Continued from previous plate)
	14		60		30/3"		
	38				20/0" Ref.		
							Boring terminated at 80.5 feet

Date Started: November 14, 2016  
Date Completed: November 15, 2016  
Logged By: B. Aiu  
Total Depth: 80.5 feet  
Work Order: 7417-00(A)

Water Level: 51.0 ft. 11/17/2016 1542 HRS

Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)  
Drilling Method: 4" Solid Stem Auger & PQ Coring  
Driving Energy: 140 lb. wt., 30 in. drop

Plate  
**A - 6.3**

Brown and gray subrounded COBBLY BOULDERS (BASALTIC) with some clayey sand and subrounded to rounded gravel, very dense (older colluvium)

BORING LOG 7417-00(A) - GEOLABS-GIT-201618

BORING LOG 7417-00(A) - GEOLABS-GIT-201618



Dec 23, 2016

REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED
		ADDENDUM NO. 1			

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DEPARTMENT OF LAND AND NATURAL RESOURCES  
ENGINEERING DIVISION

IAO VALLEY STATE MONUMENT  
FLOOD REPAIRS

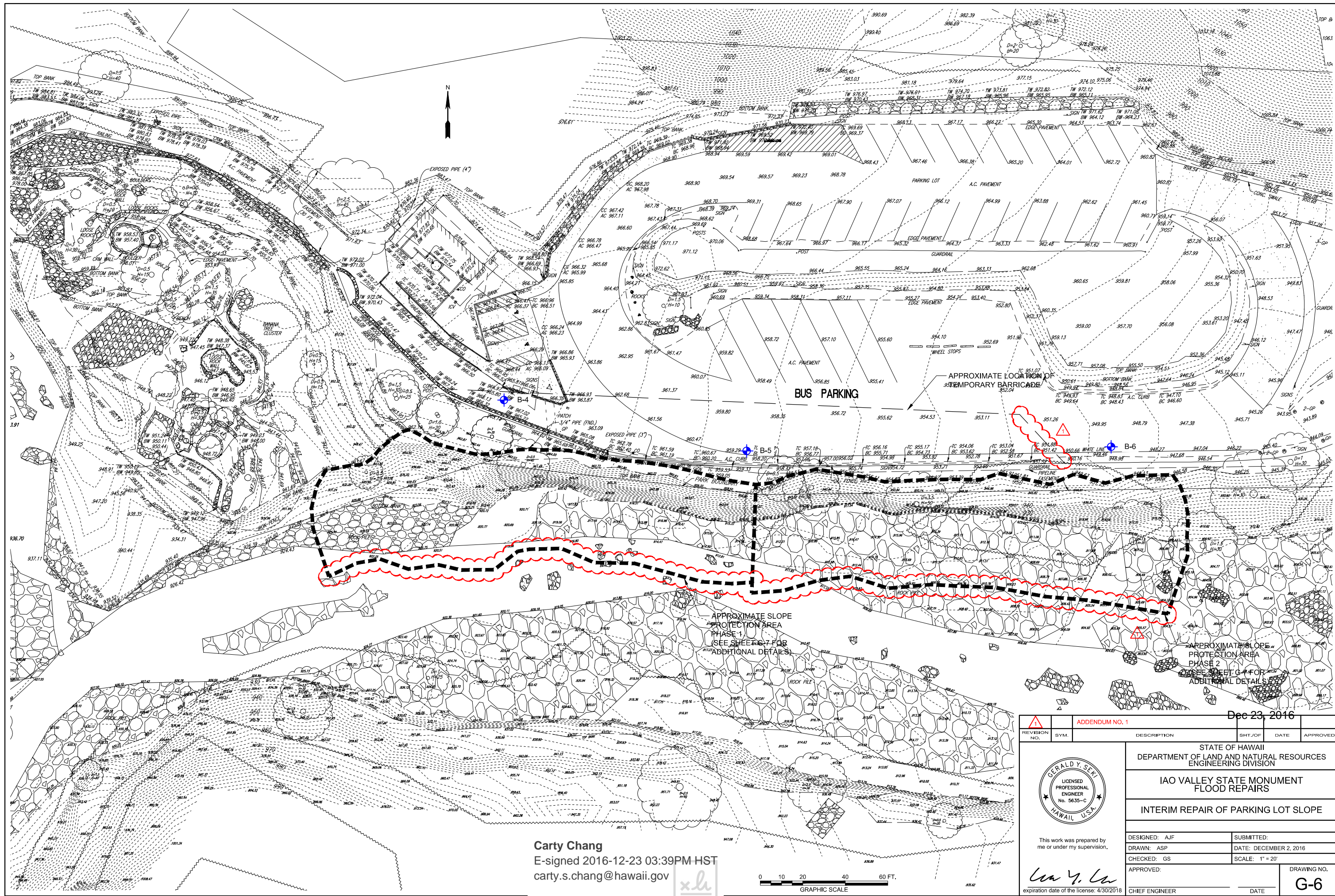
BORING LOGS 3

DESIGNED: AJF / SC	SUBMITTED:
DRAWN: ASP	DATE: DECEMBER 2, 2016
CHECKED: GS	SCALE: NOT TO SCALE
APPROVED:	DRAWING NO.
CHIEF ENGINEER	<b>G-4</b>

SHEET NO. 16 OF 19 SHEETS

**Carty Chang**  
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*Gerald Y. Seki*  
expiration date of the license: 4/30/2018



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 E-signed 2016-12-23 03:39PM HST  
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ADDENDUM NO. 1					
REVISION NO.	SYM.	DESCRIPTION	SHT. OF	DATE	APPROVED

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*Gerald Y. Seki*  
 expiration date of the license: 4/30/2018

STATE OF HAWAII  
 DEPARTMENT OF LAND AND NATURAL RESOURCES  
 ENGINEERING DIVISION

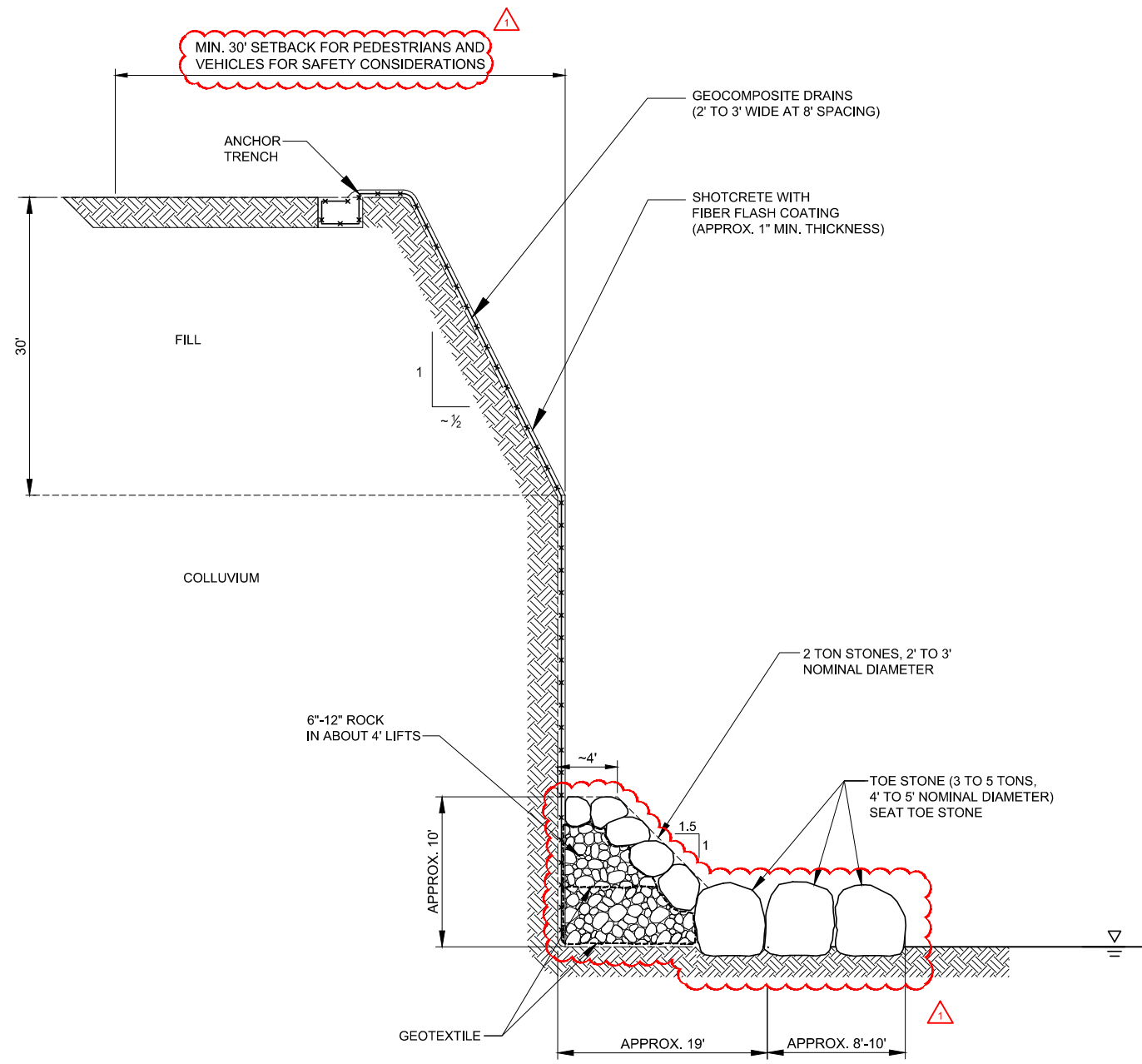
**IAO VALLEY STATE MONUMENT  
 FLOOD REPAIRS**

**INTERIM REPAIR OF PARKING LOT SLOPE**

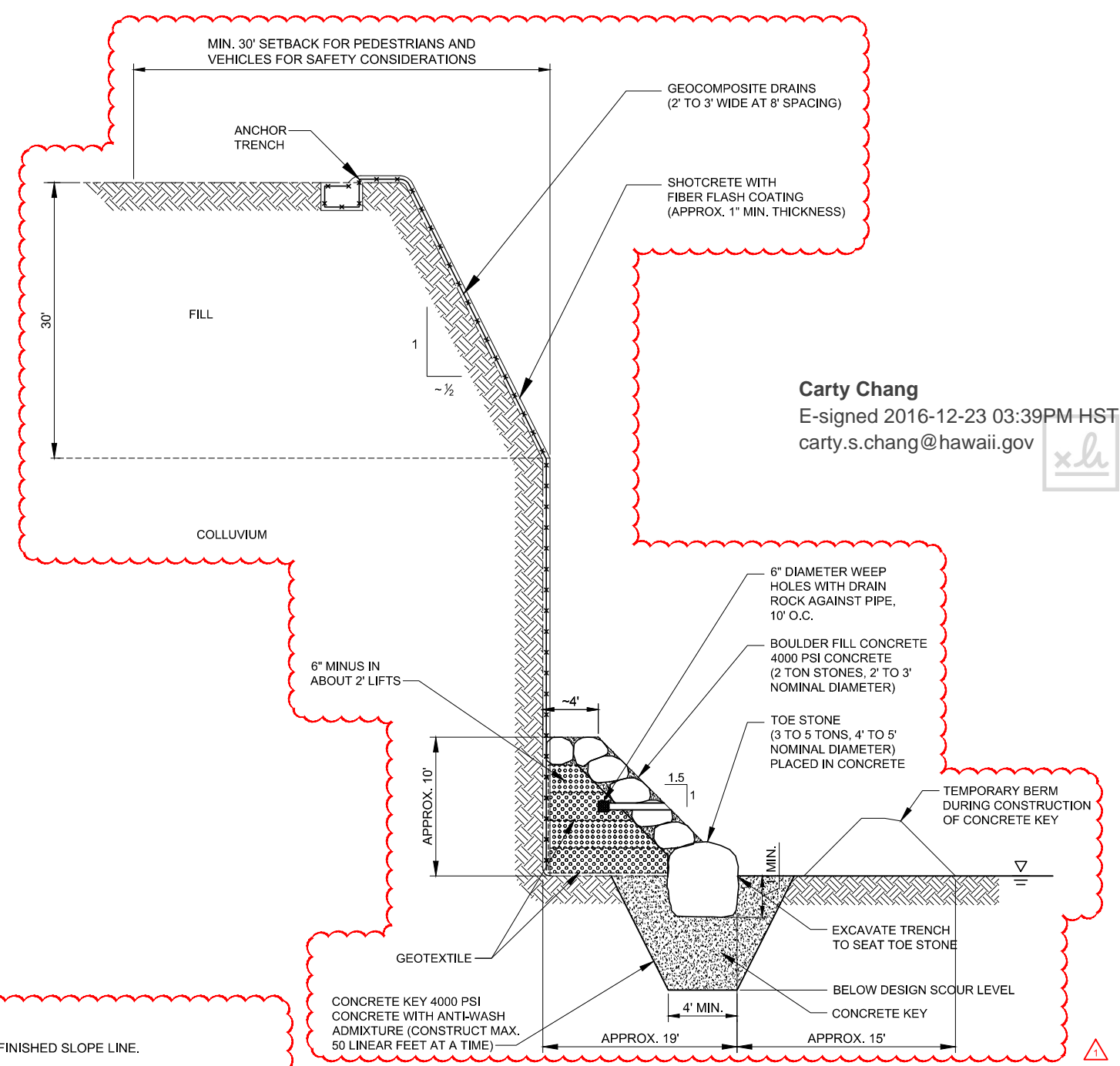
DESIGNED: AJF	SUBMITTED:
DRAWN: ASP	DATE: DECEMBER 2, 2016
CHECKED: GS	SCALE: 1" = 20'
APPROVED:	DRAWING NO.
CHIEF ENGINEER	<b>G-6</b>

JOB NO. J45CM41A      SHEET NO. 18 OF 19 SHEETS

Dec 23, 2016



**1 PHASE 1 - SLOPE TOE PROTECTION**  
G-7 NOT TO SCALE



**2 PHASE 2 - SLOPE TOE PROTECTION**  
G-7 NOT TO SCALE

- NOTES:**
- EXCAVATE EXISTING SLOPE FACE TO FINISHED SLOPE LINE.
  - PERFORM SLOPE SCALING ON FINISHED SLOPE TO REMOVE LOOSE MATERIALS PRIOR TO PLACEMENT OF GEOCOMPOSITE DRAINS AND SHOTCRETE.
  - SHOTCRETE PLACEMENT SHALL BE PERFORMED PRIOR TO TOE PROTECTION INSTALLATION.
  - SHOTCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,000 PSI AND HAVE A MAXIMUM 0.45 WATER TO CEMENT RATIO. A SHRINKAGE REDUCING ADMIXTURE, SUCH AS ECLIPSE OR MASTER LIFE AS20 OR APPROVED EQUAL SHALL BE ADDED AT A DOSAGE OF 128 OZ. PER CUBIC YARD AS RECOMMENDED BY THE MANUFACTURER. SHOTCRETE SHALL CONTAIN 7.5 LBS. OF STRUX 90/40 SYNTHETIC STRUCTURAL FIBER OR EQUIVALENT.
  - SHOTCRETE SHALL BE CURED USING SINAK LITHIUM CURE OR APPROVED EQUAL AT A COVERAGE RATE OF NO MORE THAN 200 SQ. FT. PER GALLON FOR THE SHOTCRETE.
  - CONCRETE KEY SHALL BE CONSTRUCTED AT A MAXIMUM OF 50 LINEAR FEET AT ONE TIME.
  - CONCRETE KEY SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,000 PSI AND SHALL HAVE ANTI-WASH ADMIXTURE ADDED TO THE MIX.

**Carty Chang**  
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REVISION NO.		SYMBOL	DESCRIPTION	SHEET OF	DATE	APPROVED
1			ADDENDUM NO. 1		Dec 23, 2016	
STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION						
IAO VALLEY STATE MONUMENT FLOOD REPAIRS						
TYPICAL DETAILS						
DESIGNED: GS			SUBMITTED:			
DRAWN: ASP			DATE: DECEMBER 2, 2016			
CHECKED: GS			SCALE: NOT TO SCALE			
APPROVED:			DRAWING NO.		G-7	
CHIEF ENGINEER			DATE			

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expiration date of the license: 4/30/2018  
 JOB NO. J45CM41A  
 SHEET NO. 19 OF 19 SHEETS