State of Hawaii, Department of Health, Clean Water Branch
NPDES Form C
Application for HAR, Chapter 11-55 - NPDES Individual Permit Authorizing Discharges of Storm Water Associated With Construction Activities (as defined in 40 CFR §§122.26(b)(14)(x) and 122.26(b)(15)(i))

All sections of this form MUST be completed for National Pollutant Discharge Elimination System (NPDES) Permit compliance.

C.1 – General Information

You are required to fulfill all requirements and check the box below. If you do not check the box, your application will be considered incomplete, and the CWB may deny your request for NPDES permit coverage with prejudice.

☑ *I certify that:*

- *My Storm Water Pollution Prevention Plan (SWPPP) was prepared in accordance with HAR, Chapter 11-55, Appendix C, Section 7.*
- *I will comply with all terms, conditions, and requirements in HAR Chapter 11-55, Appendix C.*
- *I will implement, operate, and maintain my SWPPP to ensure that storm water discharges associated with construction activities will not violate HAR, Chapter 11-54; HAR, Chapter 11-55; and HAR, Chapter 11-55, Appendix C.*

C.2 - Existing Pollution Sources/ History of Land Use

Describe the history of land use at the existing Facility/Project site: The project is located along Kamehameha Highway (State Route 83) near Milepost 21 in the Hauʻula, Island of Oʻahu, Hawaiʻi, and includes replacing the existing 1932 Kaipapaʻu Stream Bridge with a new bridge and maintenance dredging and bank stabilization of the Kaipapaʻu Stream. The bridge serves northbound traffic (toward Kahuku) and southbound traffic (toward Kaneʻohe) on Kamehameha Highway. The bridge structure has two 40-foot spans and is constructed from reinforced concrete with a wooden pedestrian walkway attached to the mauka (west) side of the bridge. The bridge crosses Kaipapaʻu Stream approximately 300 feet upstream from coastal marine waters. Beneath and makai of the Kaipapaʻu Stream Bridge the stream is tidally influenced. Lands surrounding the bridge are single family residential and commercial in character and are privately owned. Parcels immediately surrounding Kaipapaʻu Stream Bridge are single family residential.

Determine if the existing Facility/Project site may contain any existing pollution source(s) by using the following references. Place a check next to all references you utilized to determine existing pollution source(s). You are required to check at least one reference.

- ☑ *a. DOH, Solid and Hazardous Waste Branch-Hawaii Underground Storage Tank- Leaking Underground Storage Tank database*
- ☑ *b. DOH, Hazard Evaluation and Emergency Response Office records*
- ❑ *c. Phase I and/or Phase II Environmental Site Assessments, as applicable*
- ❑ *d. Recent site inspections*
- ☑ *e. Past land use history*
- ❑ *f. Soil sampling data, if available*
- ❑ *g. Other (specify):* _____

Describe any existing pollution source(s) identified in the references you checked above:

There are no pre-existing conditions other than soils that would result in potential for adverse impacts due to construction storm water runoff. The following practices will be employed to prevent discharges due to erosion: (1) adherence to the Hawaii Department of Transportation (HDOT) Construction Best Management Plan; and (2) structural measures including the use of temporary BMPs shall be placed to divert storm flows around materials storage locations. PVC sheet plastic or similar material shall also be placed to prevent inadvertent mixing of stored materials with storm water. Where mixing of storm water with soils cannot be avoided use of silt fencing and/or vegetative controls including grassing and hydromulching will be employed.

Describe any corrective measures that have been undertaken for any existing pollution source(s): N/A

Note: You are required to contact the Department of Health, Office of Hazard Evaluation and Emergency Response at (808) 586-4249 if contaminated soil or groundwater is known to be present at your project site.

C.3 - Construction Site Estimates

Please provide the following estimates for the construction site.

Total project area including areas to be left undisturbed: 1.6 *acres*

Construction site area to be disturbed including storage and staging areas: 1.6 *acres*

Impervious area before construction: 0.78 *acres*

Impervious area after construction: 0.84 *acres*

C.4 - Quantity of Storm Water Runoff

Estimate the quantity of storm water runoff during construction when the greatest and/or maximum area of disturbance occurs. Provide the supporting calculations in an attachment or insert in this section. See **Attachment A-3, Quantity of Storm Water Discharge Calculations**

7.92 *Cubic Feet per Second (CFS)*

C.5 - Soil Characterization

Describe the nature of the soil on the project site (including the potential to encounter contaminated soil) and the nature of the fill material to be used:

The area surrounding Kaipapaʻu Stream as it empties into the Pacific Ocean belongs to four soil series: Jaucas, Kawaihapai, Lolekaa, and Waikane. See **Attachment A-1, Figure 3, Soil Classifications**.

The Jaucas series consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean.

JaC - Jaucas Sand, 0 to 15 percent slopes - Jaucas sand consists of excessively drained, calcareous soils. In most places the slope does not exceed 7%. Permeability is rapid. Runoff is slow to very slow. The hazard of water erosion is slight, however wind erosion is a severe hazard where vegetation has been removed. Jaucas sand deposits are associated with traditional Hawaiian burial practices and are commonly found to contain archaeological deposits.

The Kawaihapai series consists of well-drained soils in drainageways and on alluvial fans on the coastal plains of Oʻahu. These soils formed the alluvium derived from basic igneous rock in humid uplands.

KIA - Kawaihapai clay loam, 0 to 2 percent slopes - Kawaihapai soils consist of well drained soils in drainageways and on alluvial fans on the coastal plains. Permeability in this soil type is moderate, runoff is slow, and the erosion hazard is no more than slight.

KiaB - Kawaihapai stony clay loam, 0 to 2 percent slopes - runoff is slow and erosion hazard is slight. This soil type is prevalent on the banks of the Kaipapaʻu Stream.

KIB - Kawaihapai clay loam, 2 to 6 percent slopes - Kawaihapai soils consists of soils where runoff is slow and the erosion hazard is slight. This soil type is found to the north of the Kaipapaʻu Bridge, between Kamehameha Highway and the Pacific Ocean.

The Lolekaa series consists of well-drained soils on fans and terraces on the windward side of the island of Oʻahu. These soils developed in old, gravelly colluvium and alluvium.

LoB - Lolekaa silty clay, 3 to 8 percent slopes - This soil is found in terraces and fans. Runoff is slow, and erosion hazard is slight.

LoD - Lolekaa silty clay, 15 to 25 percent slopes - This soil is on side slopes of terraces and along drainageways. Runoff is medium, and the erosion hazard is moderate. This soil type is found in one area along the shoulder of Kaipapaʻu Stream.

The Waikane series consists of well-drained soils on the island of O‘ahu. These soils developed in alluvium and colluvium derived from igneous rock.

WpB - Waikane silty clay, 3 to 8 percent slopes - Runoff is slow and erosion hazard is slight.

WpC - Waikane silty clay, 8 to 15 percent slopes - On this soil, runoff is slow to medium and the erosion hazard is slight to moderate.

No areas of contaminated soil are expected to be encountered in the area.

C.6 - Nature and Sequence of Construction Activity

What is the function of the construction activity (Please check all applicable activity(ies))?

❑ *Residential* ❑ *Commercial* ❑ *Industrial* ☑ *Road Construction* ❑ *Linear Utility*
❑ *Other (please specify):*_____

What is being constructed? The existing Kaipapa‘u Stream Bridge is deficient due to age and dilapidation, and requires demolition and replacement. The project area required for construction would be approximately 1.6 acres. The project’s scope of work includes installation of erosion controls, clearing, grubbing, grading, temporary placement of sand bags to redirect the stream during construction relocation and installation of waterlines and electrical lines, construction and use of a temporary detour roadway and Acrow bridge, demolition of the existing bridge and construction of a new bridge, partial demolition and reconstruction of the abutments, removal of the existing center pier wall, excavation & construction of eight new drilled shafts outside the stream channel, maintenance dredging, and bank stabilization with shotcrete and dumped rip-rap. All excavated material (soils & dewatering effluent) will be placed in a temporary retention area for treatment and disposal. No excavated material will discharge to the stream.

The replacement of the Kaipapa‘u Stream Bridge and maintenance work will be completed through phased construction and demolition. Silt fences will be installed on down slope portions of the project site. A staging area, temporary dewatering basin, temporary concrete wash-out basin, and stabilized construction entrances will be prepared.

Sandbags will be used to divert normal-stream flow around the work area. The temporary placement of sandbags to redirect the stream during construction of the temporary detour road (sandbag diversion approximately 610 feet long) and new bridge (sandbag diversion approximately 600 feet long) and will be designed based on the Contractor’s means and methods. It is assumed that 7 sandbags (1-foot-wide each) will be placed at the base (4 sandbags on the side of the channel closer to the work area, and 3 sandbags on the other side of the temporary channel). Placement of the temporary sandbag diversion will require approximately 25 cubic yards (CY) of temporary fill placed within the Mean Higher High Water (MHHW) and 5 CY of temporary fill placed within the Ordinary High Water Mark (OHWM).

A temporary construction entrance ramp will be constructed on the mauka and makai portions of the stream comprised of dumped rip-rap. There will be no interruption of stream flow. In-stream work will be completed during the low rainfall season (August to October), and during fair weather conditions.

Approximately 270 CY of maintenance dredging will be performed to remove accumulated sediment and debris from under and around the bridge partially within the MHHW. Approximately 5 CY is located within the MHHW of Kaipapaʻu Stream. The excavated spoils and demolition debris will not be discharged into the stream. Spoils will be dewatered in a detention basin and dried debris will be disposed of off-site at a County-approved landfill. Removed material will be contained in a temporary stockpile site with implemented BMPs to contain and prevent material from comingling with storm water runoff and entering into State waters. A solid waste disclosure form will be submitted to the Department of Health (DOH) Solid Waste Branch.

The temporary Acrow bridge will be 90 feet long by 42 feet wide, or approximately 3,780 square feet, and constructed with pre-cast concrete pier columns supporting the steel deck. The bridge will be comprised of two lanes and a pedestrian walkway on the makai side of the Kaipapaʻu Stream Bridge to mitigate traffic impacts during construction. The Acrow bridge will be constructed and installed in two 45-foot spans and supported by five pre-cast concrete piers, one of which is located within the MHHW. Placement of the one pier in the MHHW will require 1 CY of temporary fill below the MHHW. Temporary dumped rip-rap will be placed around the Acrow bridge pier within the MHHW and be sized approximately 54 feet long by 15 feet wide by 2 feet deep, or 810 square feet, with a volume of 50 CY. A 6-foot temporary layer of filter rock will be placed under the rip-rap with a volume of approximately 13 CY. Upon completion of the bridge replacement, the Acrow bridge and piers will be removed and disturbed areas restored to their pre-construction condition.

Demolition of the existing Kaipapaʻu Stream Bridge will include the removal of the existing concrete center pier wall, of which approximately 5 CY is located within the MHHW(26 feet long by 4 feet wide or approximately 104 square feet).

The new replacement bridge will be 110 feet long by 57 feet wide, or approximately 6,270 square feet, and include two 12-foot travel lanes plus two 8.5-foot shoulders, two 5-foot pedestrian walkways/bicycle lanes, reinforced guardrails, and drainage features. The new bridge will be constructed using prestressed concrete planks and cast-in-place bridge decks. The new right-of-way (ROW) will be 66 feet wide. The project will involve partial demolition and reconstruction of the abutments requiring excavation and construction of eight new 4-foot drilled

shafts outside of the OHWM and MHHW. All work proposed for the reconstruction of the Kaipapaʻu Stream Bridge would be completed above and along the outer banks of the streams and no work is proposed within the stream. The new bridge would accommodate utilities currently attached to the existing bridge. No debris would be allowed to fall into or enter the stream.

The north bank makai of the bridge will be stabilized with dumped rip-rap outside of the MHHW. In addition to stabilization, the dumped rip-rap will provide construction access to the stream for mechanical equipment.

A section of the existing wall running along the northern bank mauka of the bridge collapsed during a major storm in 2008. Emergency repairs were conducted to create a wall of sandbags. The existing sandbag wall, located outside the OHWM, will be stabilized with the placement of basalt boulders at the toe of the sandbags. The existing sandbags will then be covered with shotcrete. Work for the stabilization of the wall will be performed above the OHWM. No debris would be allowed to fall into or enter the stream.

Portions of an existing 12-inch diameter waterline beneath Kaipapaʻu Stream will be repaired. The portions of the 12-inch waterline to be replaced are located outside the stream (see Attachment B, Construction Drawings, C-20, C-28) and will be repaired via open trench (approximately 85 linear feet). The existing 12-inch waterline under the stream will be temporarily removed from service during the repairs and then reconnected and placed back into service following completion of the 12-inch waterline work. During repairs a temporary 12-inch 125-foot-long or 125 square foot waterline will be placed on the existing pedestrian bridge.

The replacement of an existing 16-inch diameter will require the removal of the existing waterline, placement of a temporary waterline, and installation of the new 16-inch diameter waterline over the stream. The temporary 16-inch diameter 250-foot-long or 333 square foot waterline will be placed on the temporary detour bridge during construction. The new permanent 16-inch diameter 155 feet long or 207 square feet waterline will be installed over the stream within the new bridge 3.2-foot-wide concrete bridge encasement. Following the installation of the 16-inch permanent waterline the temporary waterline will be removed.

Above the MHHW and OHWM, the project will also include the reconstruction of the 6-foot-high concrete wall with wood fence panels on the northern side of the bridge, replacement of fencing, acquisition of two properties (Tax Map Keys (TMKs) 5-4-18: 3 and 5-4-11: 20), removal of an existing septic system and leaching field on TMK: 5-4-11: 20, and demolition of two buildings on TMK 5-4-18: 3 and one building on TMK 5-4-11: 20. Acquisition of property

and demolition of structures is required for construction access and for the installation of waterlines to be supported on the outside edges of the new bridge.

In-water work would only be required for the minor maintenance dredging, removal of the existing bridge center pier wall, temporary placement of sandbags to divert the steam around the open work area, and temporary placement of one Acrow bridge pier within Kaipapaʻu Stream.

Describe the scope of work and major construction activities you wish to be covered in this NPDES application, including baseyards and staging areas. You may only include project areas where the locations of impervious structures are known; project areas where the final grades are known; and work areas that will be performed by one (1) general contractor. A separate NPDES application will be required for all other project areas.

The existing 74-year-old Kaipapaʻu Stream bridge has been evaluated by HDOT as being structurally deficient and presently does not meet design standards. This proposed bridge project is needed to mitigate bridge maintenance concerns, increase traffic safety (for motorists and pedestrians) and meet the projected vehicle usage of the Kamehameha Highway. This project is one in a series of bridge replacements being implemented by the State Department of Transportation and Federal Highway Administration on Oʻahu.

The project's scope of work includes installation of erosion controls, clearing, grubbing, grading, temporary placement of sand bags to redirect the stream during construction relocation and installation of waterlines and electrical lines, construction and use of a temporary detour roadway and Acrow bridge, demolition of the existing bridge and construction of a new bridge, partial demolition and reconstruction of the abutments, removal of the existing center pier wall, excavation & construction of eight new drilled shafts outside the stream channel, maintenance dredging, and bank stabilization with shotcrete and dumped rip-rap. All excavated material (soils & dewatering effluent) will be placed in a temporary retention area for treatment and disposal. No excavated material will discharge to the stream.

The replacement bridge will measure approximately 110 feet long by 57 feet wide and will meet State and Federal roadway, bridge, and seismic standards. The design includes two 12-foot travel lanes plus two 8.5-foot shoulders, two 5-foot pedestrian walkways/bike lanes, reinforced guardrails, and drainage features. The approach and trailing guardrails will comply with the current standards of the HDOT. Shotcrete and dumped rip-rap will be installed on the banks of the stream to stabilize the embankment. The proposed bridge, temporary Acrow bridge, and approach roads shall conform to AASHTO and HDOT design criteria for roadway widths and safety features.

The sequencing of construction activity is as follows:

- Install best management practices (BMPs)/erosion control measures (see **Sheet C-18**).
- Install temporary 12" water line and relocate existing 12" water line (see **Sheets C-20, C-28,** and **C-29**).
- Relocate electrical utilities.
- Construct trial and load test drilled shafts and perform load test.
- Construct detour roadway and temporary Acrow bridge.
- Demolish existing Kaipapa'u Stream Bridge. Expose existing 16" water line jacket and concrete support system.
- Construct Phase 1 of new Kaipapa'u Stream Bridge (see **Sheets S0.7, S0.7A, S0.7B**).
- Partially remove detour roadway and temporary bridge. Construct temporary pavement transitions, signing and pavement markings.
- Construct Phase 2 of new Kaipapa'u Stream Bridge (see **Sheets S0.8, S0.8A, S0.8B**).
- Remove remainder of detour roadway and temporary bridge.
- Construct sand bags and shotcrete lining along north bank, upstream of Kaipapa'u Stream Bridge (see **Sheet C-18**).
- Construct dumped riprap along north and south bank, downstream of Kaipapa'u Stream Bridge (see **Sheets C-16** and **C-18**).
- Construct AC pavement (see **Sheet C-16**).
- Construct final signing and pavement markings.
- Remove temporary BMPs.

On-site staging areas will be used as designated areas where vehicles, supplies and construction equipment are positioned for access and use during the construction process. The locations of the staging and storage areas may be changed by the Contractor depending on his construction means and methods. Equipment may include, but is not limited to: bulldozers, excavators, drilling rig, loaders, grader, compaction rollers, backhoe, cranes, trucks delivering supplies, pneumatic hand-operated tools, dewatering pumps, asphaltic rock products and fill material, and related construction materials which will include the following: Concrete and shotcrete, asphaltic Concrete, precast structures, pipes, paints (enamel and latex), cleaning solvents, rebar, wood, tar, masonry block, steel sheet piles, rocks/boulders, sandbags, soil fill material, and acrow steel bridge deck.

C.7 - Existing or Pending Permits, Licenses, or Approvals

Place a check next to all applicable Federal, State, or County permits, Licenses, or approvals for the project and specify the permit number.

☑ *Other NPDES Permit or NGPC File No.:* NPDES Forms F (Hydrotesting Activities) and G (Dewatering Activities)

☑ *Department of the Army Permit (Section 404):* POH-2005-00342 (April 4, 2019)

If your project requires work in, above, under or adjacent to State waters, please contact the Army Corps of Engineers (COE) Regulatory Branch at (808) 438-9258 regarding their permitting requirements. Provide a copy of the COE permitting jurisdictional determination (JD) or the JD with COE Person's Name, Phone Number, and Date Contacted.

❑ *Facility on SARA 313 List (identify SARA 313 chemicals on project site:* _____

❑ *RCRA Permit (Hazardous Wastes):* _____

❑ *Section 401 Water Quality Certification:* The project is exempted from obtaining a Section 401 Water Quality Certification (WQC), as provided by Senate Bill 1016 SD1 HD1 (expires June 30, 2022).

☑ *Other (Specify):* Special Management Permit (Resolution 278-CD1); U. S. Coast Guard Clearance (obtained); Section 106, National Historic Preservation Act, Consultation (completed); Section 7, Endangered Species Act, Consultation (completed); Section 4(f) Department of Transportation Act, Consultation (completed); Stream Channel Alteration Permit (exempt per Senate Bill 1016 SD1 HD1); HDOT Plan Review (pending); Grading Permit (pending); Coastal Zone Management Federal Consistency Review (pending)

County-approved Erosion and Sediment Control Plan and/or Grading Permit

a. *Is a County-approved Erosion and Sediment Control Plan and/or Grading Permit, where applicable for the activity and schedule for implementing each control, required?*
   - ☑ *Yes. Please complete Section C.7.b below and skip Section C.7.c.*
   - ❑ *No. Please complete Section C.7.c below and skip Section C.7.b.*

b. *Is a copy County-approved Erosion and Sediment Control Plan and/or Grading Permit, as appropriate for the activity and schedule for implementing each control, attached?*
   - ❑ *Yes, see Attachment* _____
   - ☑ *No, the County-approved Erosion and Sediment Control Plan and/or Grading Permit, as appropriate for the activity and schedule for implementing each control, will be submitted at least 30 calendar days before the start of construction activities.*

c. *Please select and complete at least one (1) of the following items to demonstrate that a County-approved Erosion and Sediment Control Plan and/or Grading Permit, as appropriate for the activity and schedule for implementing each control, is not required.*
   - ❑ *See Attachment* _____ *for the County written determination.*
   - ❑ *Provide the County contact person information (Name, Department, Phone Number, and Date Contacted):* _____
   - ❑ *The project is a Federal Project and does not require County approval.*
   - ❑ *Other (specify):* _____

C.8 - Project Site Maps and Construction Plans/Drawings

Attach, title, and identify all maps (pdf - minimum 300 dpi) listed below, in Attachment A. Please reference which maps account for the features listed below.

a. *Island on which the project is located.* Oʻahu. See **Attachment A-1, Figure 1, Project Location**

b. *Vicinity of the project on the island.* See **Attachment A-1, Figure 1, Project Location**

c. *Legal boundaries of the project.* See **Attachment A-1, Figure 2, Boundary Map**

d. *Receiving State water(s) from Section 6 of e-Permitting form and receiving separate drainage system(s) from Section 7 of e-Permitting form, identified and labeled.* See **Attachment A-1, Figure 4, Discharge Points**

e. *Location of ALL discharge points from Section 6 of e-Permitting form with identification numbers.* See **Attachment A-1, Figure 4, Discharge Points**

f. *Boundaries of 100-Year flood plans.* See **Attachment A-1, Figure 5, Flood Zones**

g. *Areas of soil disturbance.* See **Attachment A-2, Construction Plans/Drawings**

h. *Location(s) of impervious structures (including buildings, roads, parking lots, etc.) after construction is completed.* See **Attachment A-2, Construction Plans/Drawings**

i. *Pre-Construction Topography including approximate slopes and drainage patterns for the entire Facility/Project site to the receiving storm water drainage system (if applicable) or to the receiving State water(s) (with flow arrows).* See **Attachment A-2, Construction Plans/Drawings**

j. *During-Construction Topography (after major grading activities) including approximate slopes and drainage patterns for the entire Facility/Project site to the receiving storm water drainage system (if applicable) or to the receiving State water(s) (with flow arrows).* See **Attachment A-2, Construction Plans/Drawings**

k. *Post-Construction Topography including approximate slopes and drainage patterns for the entire Facility/Project site to the receiving storm water drainage system (if applicable) or to the receiving State water(s) (with flow arrows).* See **Attachment A-2, Construction Plans/Drawings**

C.9 - Flow Chart or Line Drawing

Attach or insert in Attachment A, a flow chart showing the following (Check each item, as applicable):

See **Attachment A-4, Storm Water Flow Chart**

❑ a. *Storm water entering the project from off-site areas*

☑ b. *General route taken by storm water through the project (show the routes through different drainage areas)*

☑ c. *Treatment system(s) utilized for the reduction of sediment (e.g., silt fence, earth berm, detention basin, vegetated swale, etc.)*

☑ *d. Best Management Practices (BMPs) utilized to prevent erosion (e.g., erosion control mats, reduced open area, revegetation, etc.)*

☑ *e. Quantity of flow through each applicable route from upslope to the receiving State water*

☑ *f. Drainage system(s) receiving storm water from the project, as applicable (e.g., City and County of Honolulu Municipal Separate Storm Sewer System (MS4), etc.)*

☑ *g. State water name(s) receiving storm water from the project*

Indicate which item(s) are not identified and explain why the item(s) are not identified
No storm water is expected to enter the project from off-site or adjacent areas.

C.10 - Construction Schedule

Provide the following estimated dates:

The date when construction activity will begin The estimated scheduled start time for construction is January 2021. The overall duration of the project is expected to be approximately three years. A detailed schedule of construction activity will be completed when a contractor is selected for the project and provided to DOH-CWB 30 days prior to the start of construction.

The date when each major construction activity begins Same as above.

The date when the Notice of Cessation form will be submitted Same as above.

C.11 – Storm Water Pollution Prevention Plan (SWPPP)

Include your SWPPP that complies with HAR, Chapter 11-55, Appendix C in Attachment A.

You are responsible for the design, implementation, operation, and maintenance of the SWPPP to ensure that storm water discharges associated with construction activities will not cause or contribute to a violation of HAR, Chapter 11-54, Chapter 11-55, and Chapter 11-55 Appendix C.

The contractor may augment or improve BMPs for discharges of storm water associated with construction activity after the NPDES permit is issued in accordance to HAR, Chapter 11-55, Appendix C. These amendments do not have to be submitted to the DOH-CWB, but shall be kept on-site and available upon request.

See **Attachment A-5, Storm Water Pollution Prevention Plan (SWPPP) and In-Water Pollution Prevention Plan (IWPPP).**

Attachments

Attachment A - Project Site Maps, Construction Plans/Drawings, Flow Chart, and SWPPP (Sections C.8, C.9, & C.11)

PROJECT SITE MAPS, CONSTRUCTION PLANS/DRAWINGS, FLOW CHART, AND SWPPP

Contents

Attachment A – 1: Project Site Maps

Figure 1, Project Location

Figure 2, Boundary Map

Figure 3. Soil Classifications

Figure 4. Discharge Locations

Figure 5. Flood Zones

Figure 1, Project Location

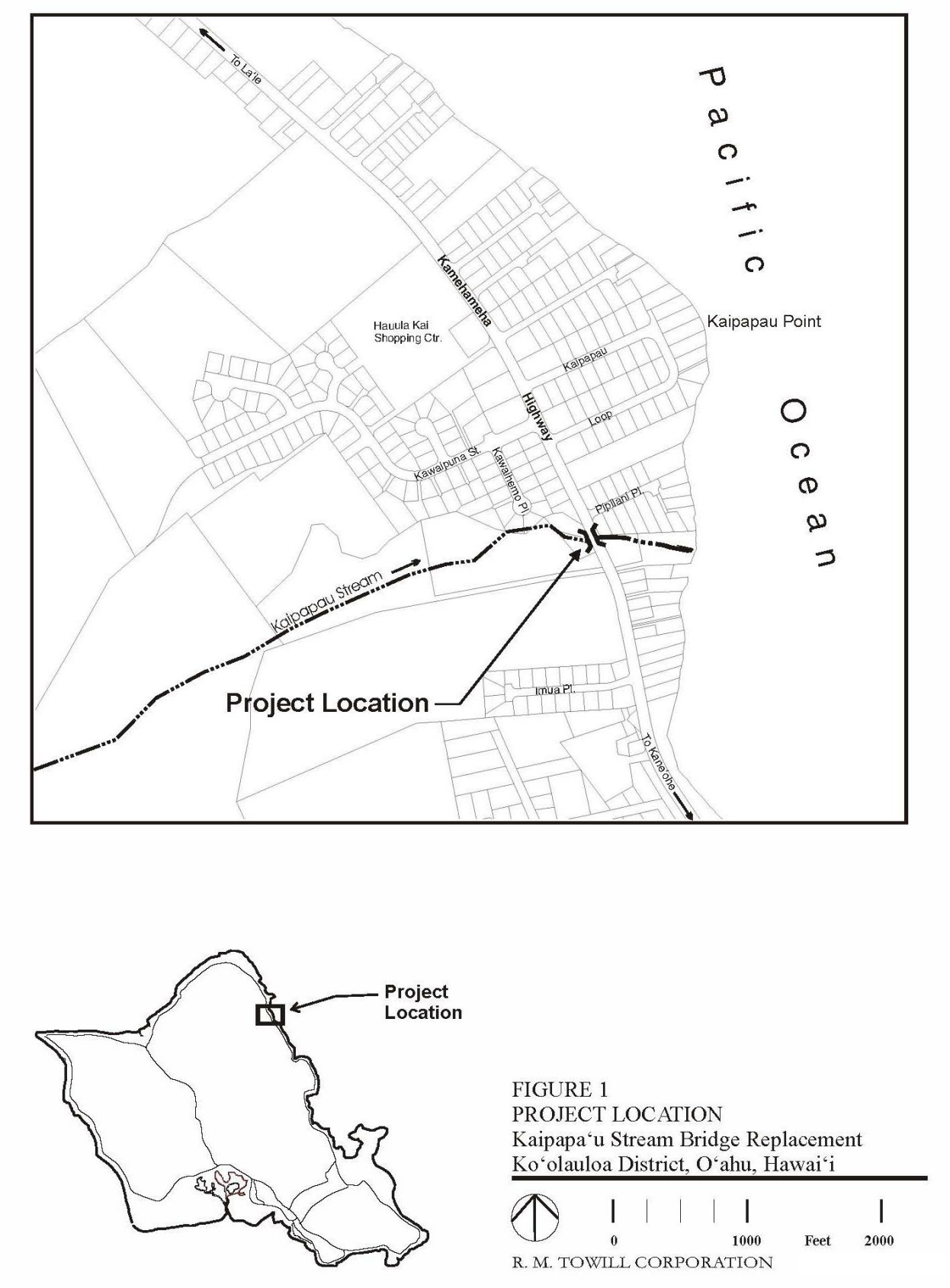
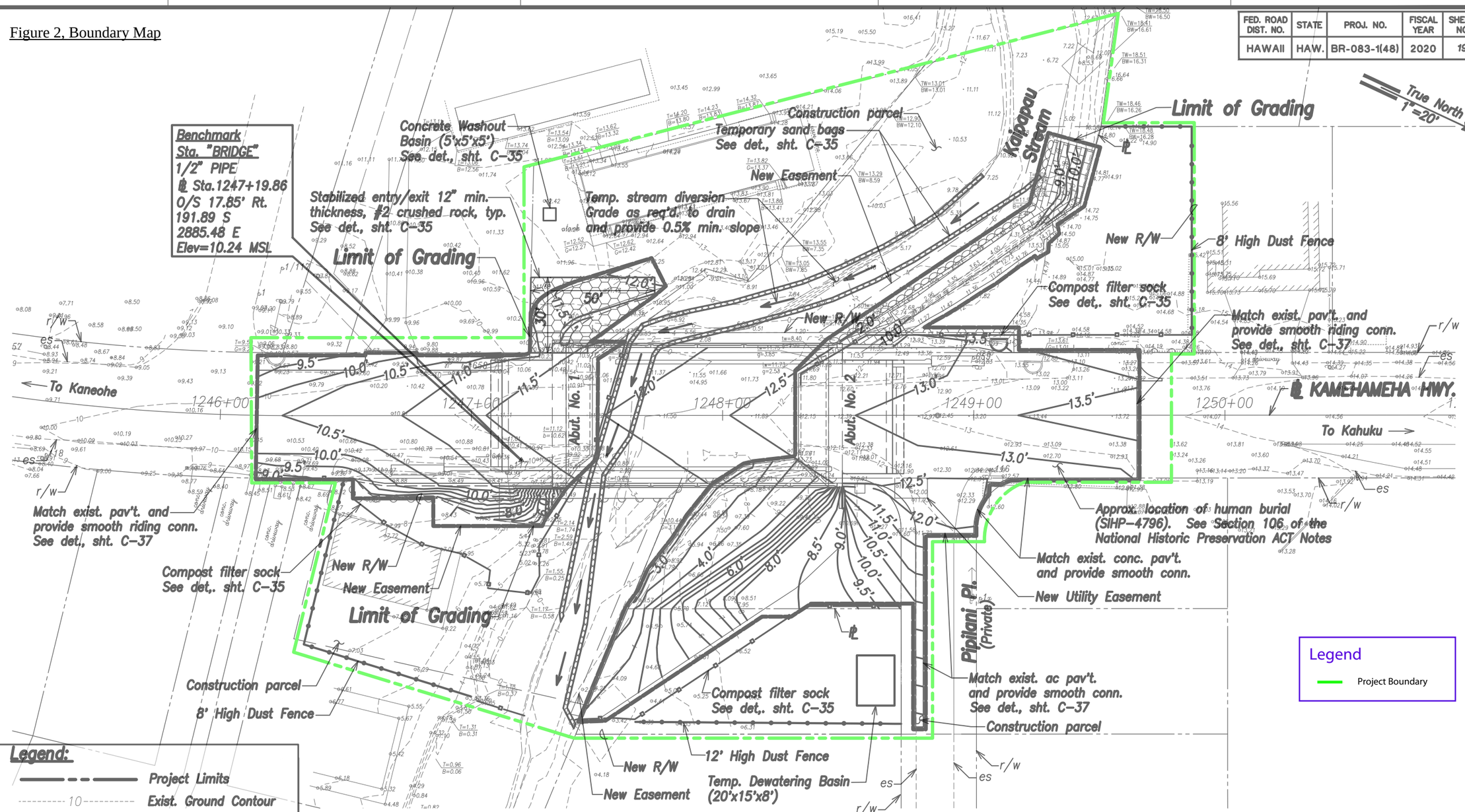


Figure 2, Boundary Map

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2020	19	149



Legend:

- Project Limits
- 10 — Exist. Ground Contour
- 10 — Finished Grade Contour
- Limit of Grading
- Dust Fence
- Compost Filter Sock
- Top of Bank
- Bottom of Bank
- Fill Condition / Cut Condition
- Drainage Flow Direction
- Stabilized Entry/Exit

ROADWAY GRADING, EROSION & SEDIMENT CONTROL PLAN

Scale: 1"=20'

Notes:

1. For additional finished grade elevations, see sht. C-20.
2. For bridge deck elevations, see structural drawings.
3. For grading work under bridge, see sht. C-19.
4. The contractor shall be responsible for obtaining grading permit from the City and County of Honolulu, Department of Planning and Permitting.

Graphic Scale:

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

Scale in Feet

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/20

SIGNATURE LIC. EXPIRATION

R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY GRADING, EROSION & SEDIMENT CONTROL PLAN

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2019

SHEET No. C-18 OF SHEETS

SURVEY PLOTTED BY DATE
DRAFT BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
ORIGINAL PLAN
WORK BOOK No.

RMTC JOB NO. : 1-19548-0E

Figure 3. Soil Classifications

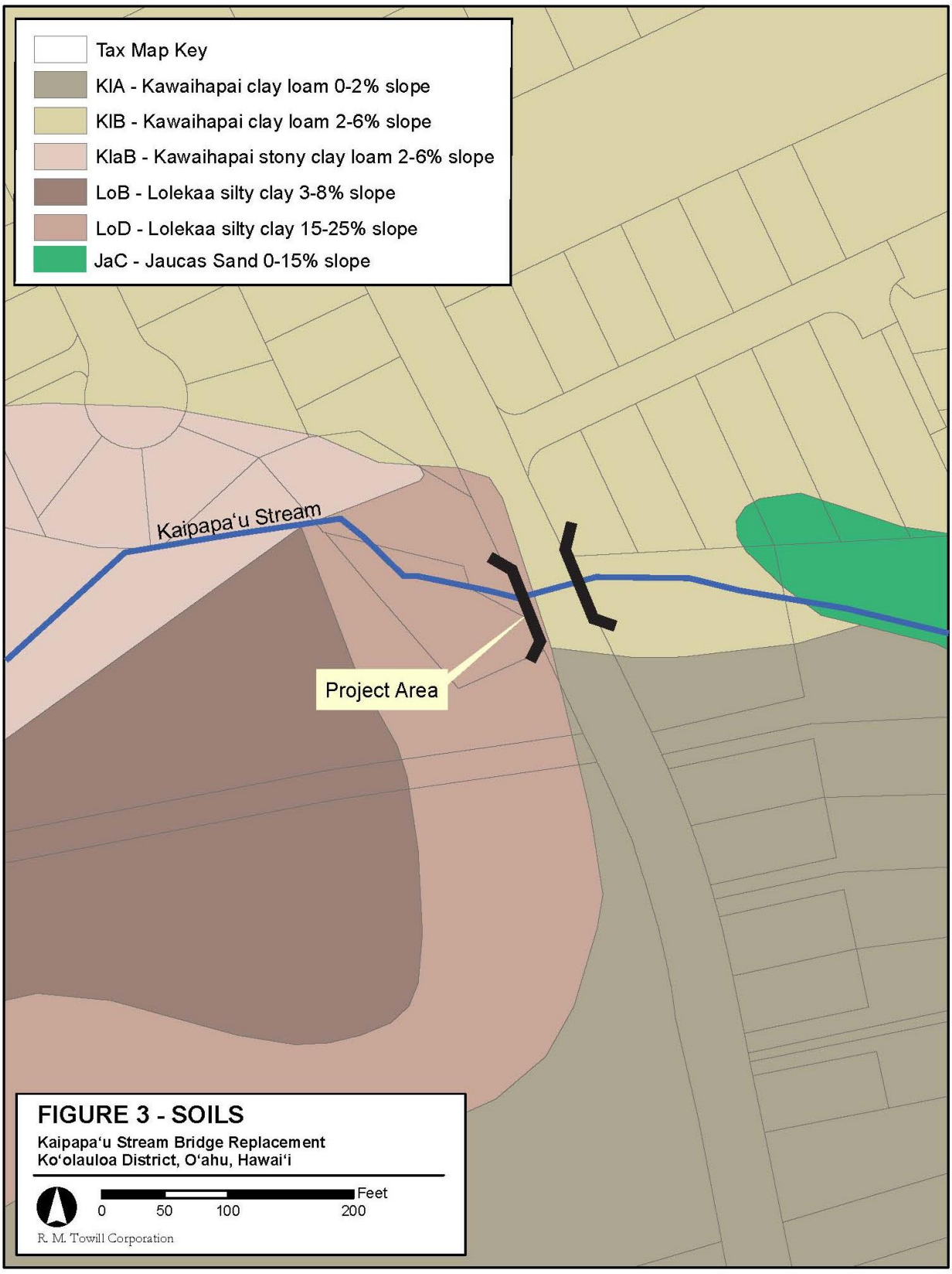


Figure 4. Discharge Locations

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2020	19	149

Discharge Point No. 1 (From)
Kaipapa'u Stream
Class 2 Inland Waters
Latitude 21.61717846380141
Longitude -157.9142857880188

Benchmark
Sta. "BRIDGE"
1/2" PIPE
℄ Sta.1247+19.86
O/S 17.85' Rt.
191.89 S
2885.48 E
Elev=10.24 MSL

Concrete Washout Basin (5'x5'x5') See det., sht. C-35

Stabilized entry/exit 12" min. thickness, #2 crushed rock, typ. See det., sht. C-35

Limit of Grading

Construction parcel

Temporary sand bags See det., sht. C-35

New Easement

Temp. stream diversion Grade as req'd. to drain and provide 0.5% min. slope

Kaipapau Stream

Limit of Grading

True North 1"=20'

New R/W

8' High Dust Fence

Compost filter sock See det,. sht. C-35

Match exist. pav't. and provide smooth riding conn. See det., sht. C-37

To Kaneohe

To Kahuku

℄ KAMEHAMEHA HWY.

1246+00 1247+00 1248+00 1249+00 1250+00

Abut. No. 1

Abut. No. 2

Approx. location of human burial (SIHP-4796). See Section 106 of the National Historic Preservation ACT Notes

Match exist. conc. pav't. and provide smooth conn.

New Utility Easement

Piipiani Pl. (Private)

Match exist. ac pav't. and provide smooth conn. See det., sht. C-37

Construction parcel

Compost filter sock See det,. sht. C-35

8' High Dust Fence

12' High Dust Fence

New R/W

New Easement

Temp. Dewatering Basin (20'x15'x8')

Discharge Point No. 2 (To)
Kaipapa'u Stream
Class 2 Inland Waters
Latitude 21.617151034652878
Longitude -157.91334701486358

Legend

- Discharge Point
- Project Boundary

Legend:

- Project Limits
- 10 — Exist. Ground Contour
- 10 — Finished Grade Contour
- Limit of Grading
- Dust Fence
- Compost Filter Sock
- Top of Bank
- Bottom of Bank
- Fill Condition / Cut Condition
- Drainage Flow Direction
- Stabilized Entry/Exit

ROADWAY GRADING, EROSION & SEDIMENT CONTROL PLAN

Scale: 1"=20'

Notes:

1. For additional finished grade elevations, see sht. C-20.
2. For bridge deck elevations, see structural drawings.
3. For grading work under bridge, see sht. C-19.
4. The contractor shall be responsible for obtaining grading permit from the City and County of Honolulu, Department of Planning and Permitting.

Graphic Scale:
1" = 20' 20' 10' 0 20' 40'
Scale in Feet

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/20
SIGNATURE LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY GRADING, EROSION & SEDIMENT CONTROL PLAN
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

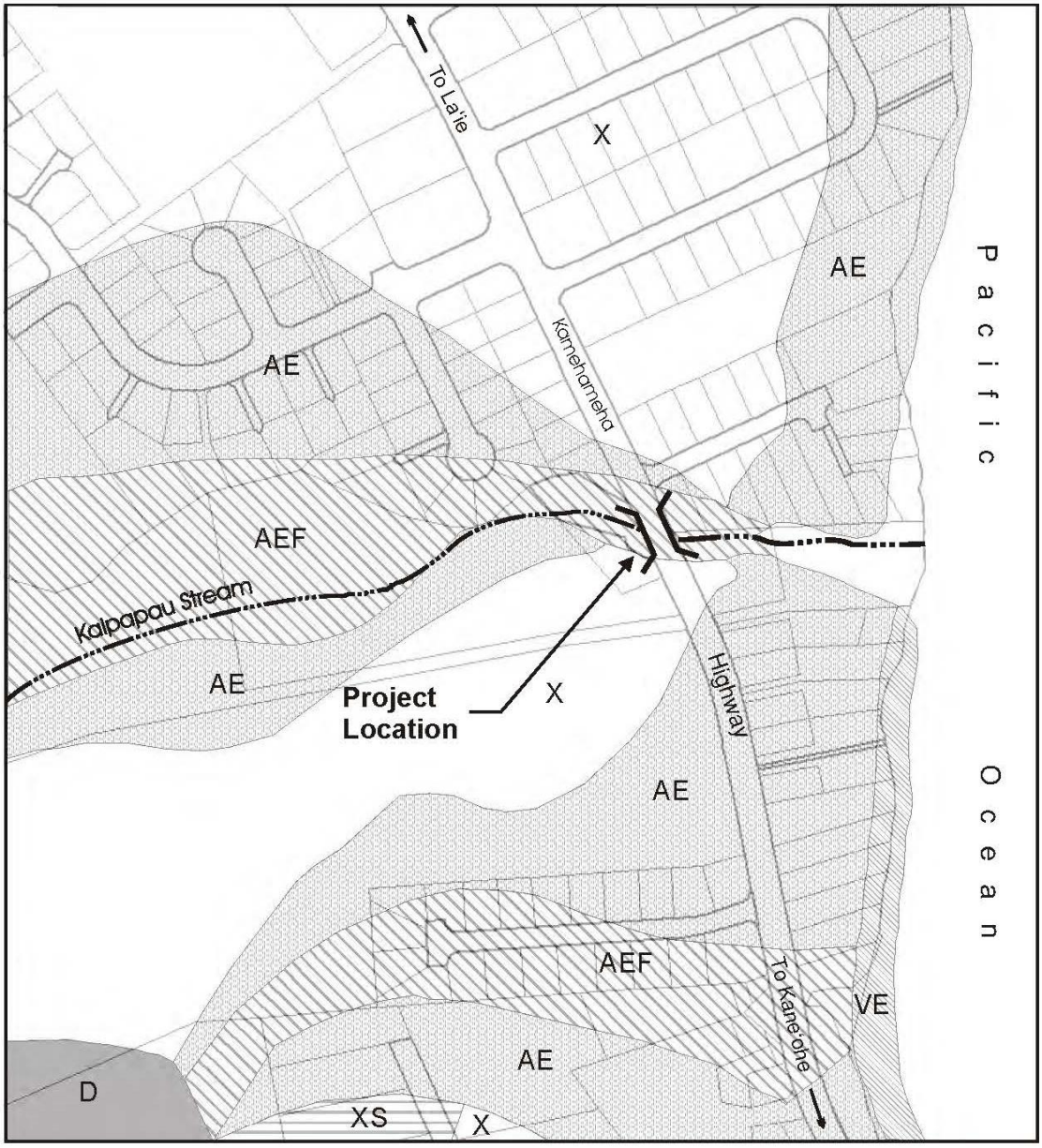
Scale: As Noted Date: April 2019

SHEET No. C-18 OF SHEETS

SURVEY PLOTTED BY DATE
DRAFT BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
ORIGINAL PLAN
WORK DONE BY No.

RMTC JOB NO. : 1-19548-0E

Figure 5. Flood Zones



LEGEND

X	Areas outside the 1% annual chance flood plain.
XS	Areas with 1% annual chance of flooding with average depths of less than 1 foot with drainage areas of less than 1 square mile.
D	Areas in which flood hazards are undetermined.
VE	1% annual chance of flooding that also have storm wave hazards.
AE	Areas with 1% annual chance of flooding.
AEF	The watercourse or portion of the flood plain which must be reserved in order to carry or discharge the regulatory flood without cumulatively increasing the flood elevation of the flood plain more than a foot at any given point.

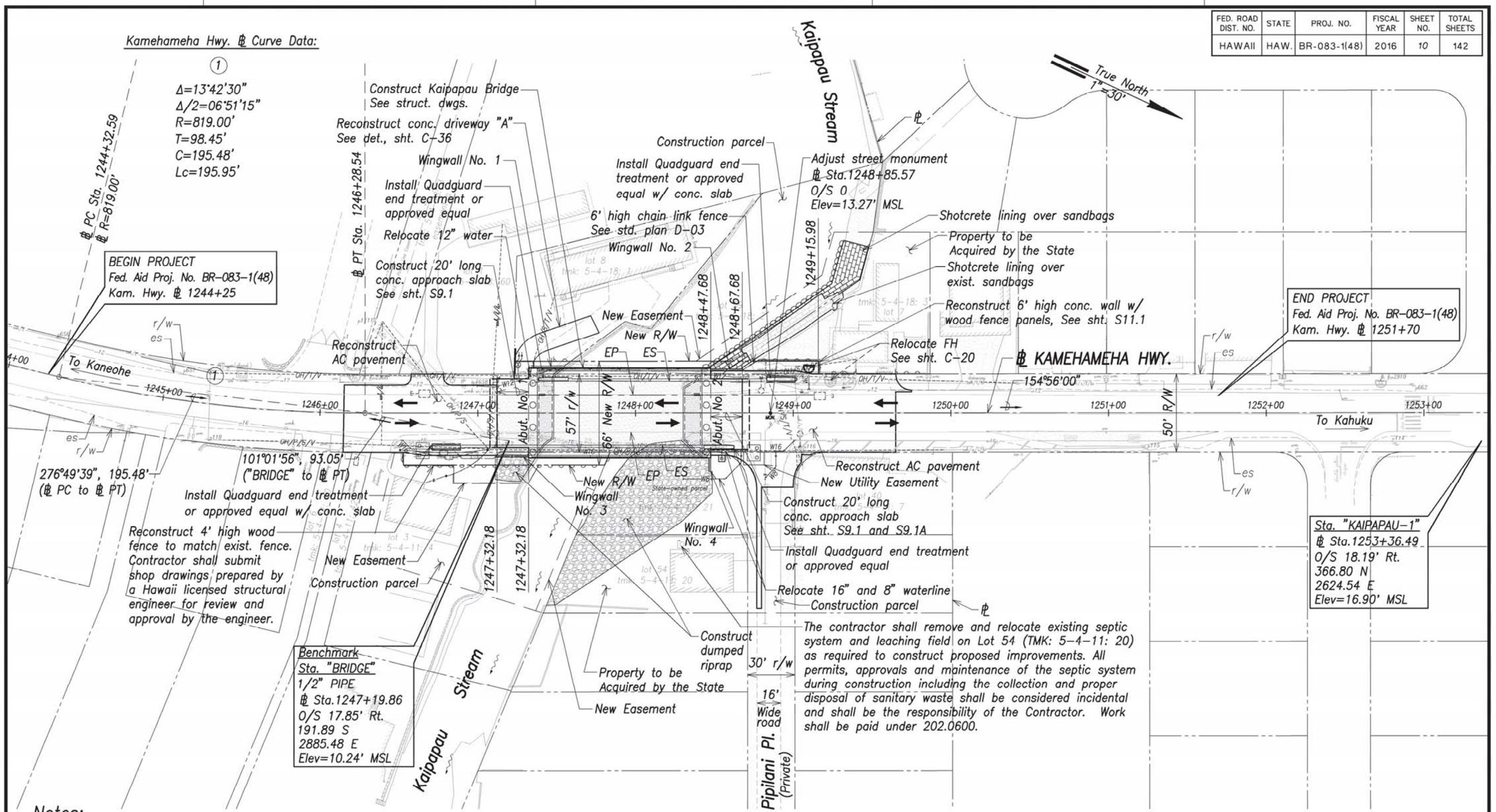
FIGURE 5
FLOOD ZONE MAP
Kaipapa'u Stream Bridge Replacement
Ko'olauloa District, O'ahu, Hawai'i

0 300 Feet 600

R. M. TOWILL CORPORATION

Attachment A – 2: Construction Plans/Drawings

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	10	142



Notes:

1. See sheet C-10 for construction phasing and sheet C-29 for 16" waterline phasing.
2. The Contractor shall comply with Environmental Permit Conditions.
3. Kaipapau Stream is able to convey a 2-year storm, 1-hour storm. The stream frequently overtops. It is critical that the Contractor shall ensure that the flow capacity of the Kaipapau Stream is not reduced during a storm event. Equipment and materials within the stream during a storm event shall be removed immediately. Final damages that occur due to the contractor equipment and materials blocking flow during a rain storm will be the contractor's responsibility.
4. The Contractor shall construct a temporary detour road, temporary detour waterline, and other temporary improvements. See sht. C-10.

GENERAL SITE PLAN

SCALE 1"=30'

Graphic Scale:

1" = 30' 30' 15' 0 30' 60'

Scale in Feet

APPROVED:

Manager and Chief Engineer, BWS (for work affecting BWS facilities State R/W & BWS easements only) DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16

SIGNATURE LIC. EXPIRATION

R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GENERAL SITE PLAN

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

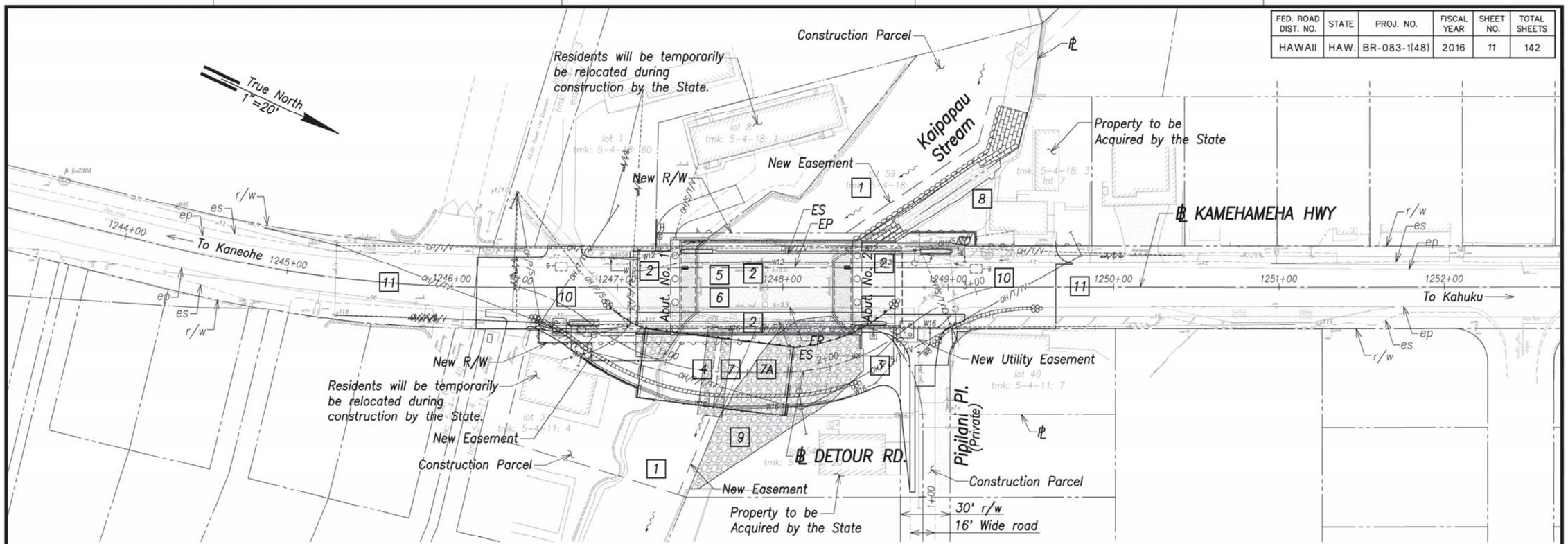
Scale: As Noted Date: April 2015

SHEET No. C-9 OF SHEETS

ORIGINAL PLAN
SURVEY PLOTTED BY DATE
DRAWN BY RST
TRACED BY
DESIGNED BY WC
NOTE BOOK
QUANTITIES BY
CHECKED BY
No.

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	11	142



OVERALL CONSTRUCTION PHASING PLAN

Scale: 1"=20'

Phasing Notes:

1. For electrical phasing see electrical drawings.
2. For structural phasing see structural drawings.
3. The Contractor shall perform work to ensure continuous traffic and pedestrian flow.
4. Phasing indicated shall not be modified unless approved in writing by the Engineer.
5. The Contractor shall ensure that water and other utility line construction are fully coordinated with Board of Water Supply and Private Utility Companies.
6. All temporary measures required shall be considered incidental to the various items of work.
7. For water line phasing see sht. C-28 and C-29.

Suggested Construction Sequence of Major Constuction Items:

1. Install best management practices/erosion control measures. See Notes sheets and sht. C-17.
2. Install temporary 12" waterline and relocate existing 12" water line. See 12" Waterline Plan and Profile, sht. C-20. Relocate electrical utilities. See electrical drawings for temporary and permanent electrical relocation phasing.
3. Construct trial and load test drilled shafts and perform load test. See structural drawings.
4. Construct detour roadway and temporary bridge. See sht. C-22 to C-27 and stuctural drawings.
5. Demolish existing Kaipapau Stream bridge. See sht. C-15 and structural drawings. Expose existing 16" water line jacket and concrete support system.
6. Construct Phase 1 new Kaipapau Stream bridge. See Construction Sequence, Phase 1 of structural drawings, shts. S0.7, S0.7A, and S0.7B.
7. Partially remove Detour roadway and temporary bridge. Construct temporary pavement transitions, signing and pavement markings. Temporary work shall be considered incidental to the various items of work. Construct Phase 2 of new Kaipapau Stream bridge. See Construction Sequence, Phase 2 of structural drawings, shts. S0.8, S0.8A, and S0.8B..

7A. Remove remainder of Detour roadway and temporary bridge.

8. Construct sand bags and shotcrete lining along north bank, upstream of Kaipapau Stream bridge. See sht. C-18.
9. Construct dumped riprap along north and south bank, downstream of Kaipapau Stream bridge. See sht. C-16 and C-18.
10. Construct AC pavement. See sht. C-16. The contractor shall submit a pavement phasing plan and schedule for Engineer's review and approval.
11. Construct final signing and pavement markings. See sht. C-21.

Graphic Scale:
1" = 20' 20' 10' 0 20' 40'
Scale in Feet

ORIGINAL PLAN
NOTE BOOK No.
SURVEY PLOTTED BY DATE
DRAWN BY RST
TRACED BY
DESIGNED BY WC
QUANTITIES BY
CHECKED BY

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

OVERALL CONSTRUCTION PHASING PLAN

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2015

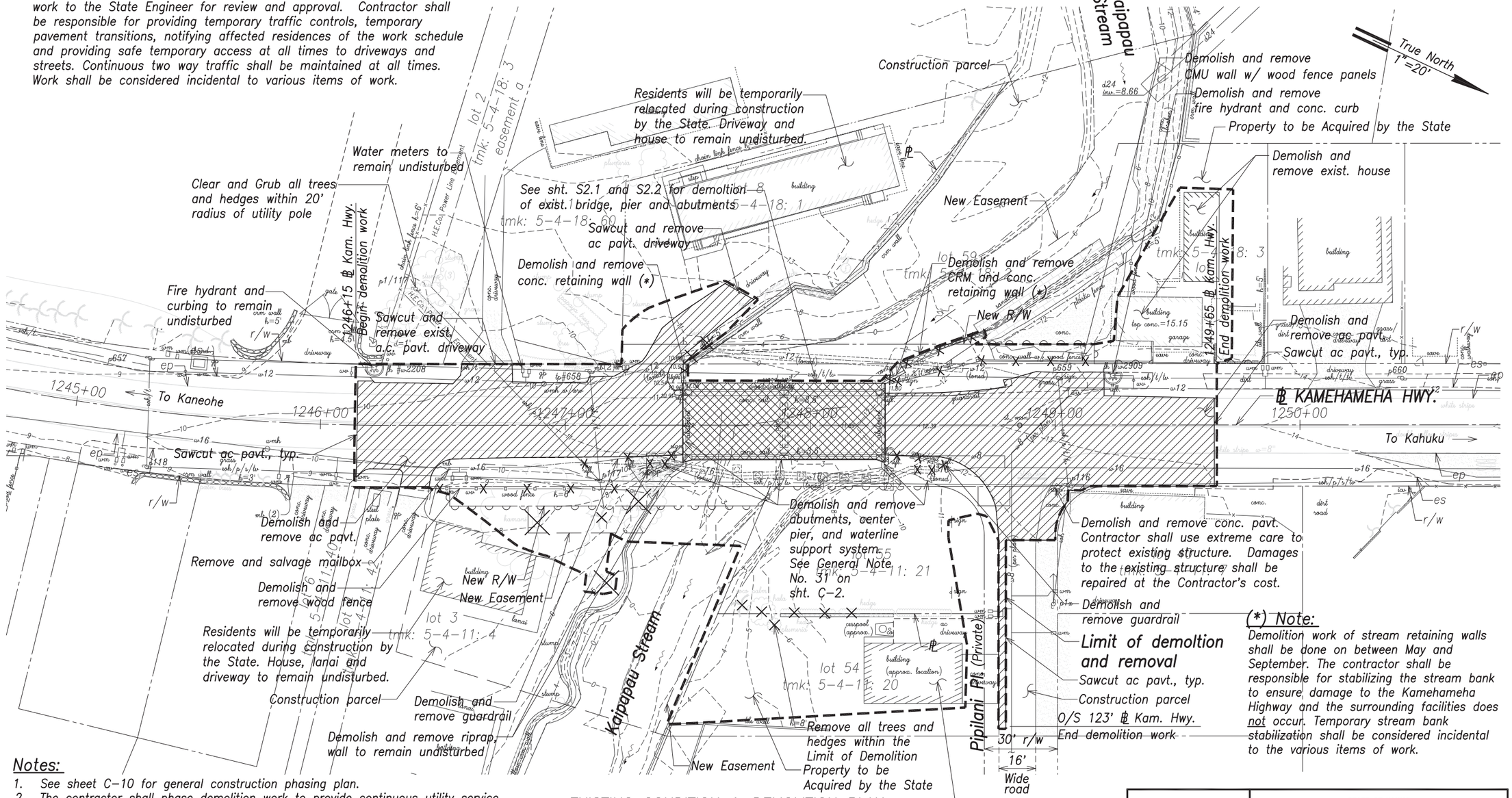
SHEET No. C-10 OF SHEETS

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	16	142

Phasing Note:

Contractor shall submit a phasing plan and schedule for demolition work to the State Engineer for review and approval. Contractor shall be responsible for providing temporary traffic controls, temporary pavement transitions, notifying affected residences of the work schedule and providing safe temporary access at all times to driveways and streets. Continuous two way traffic shall be maintained at all times. Work shall be considered incidental to various items of work.



Notes:

1. See sheet C-10 for general construction phasing plan.
2. The contractor shall phase demolition work to provide continuous utility service.
3. See C-20 and C-32 for waterline demolition work.
4. See C-21 for signing and striping demolition work.
5. See electrical drawings for electrical demolition and temporary relocation work.
6. See structural drawings for structural demolition work.
7. Traffic controls, detour, and best management practices shall be in place prior to the start of demolition work.
8. The contractor shall demolish and remove everything within the Limit of Demolition and Removal unless otherwise indicated to remain.
9. See General Note No. 30 on sht. C-2.

EXISTING CONDITION & DEMOLITION PLAN

Scale: 1"=20'

Bridge Note:

The contractor shall perform photographic documentation of the existing Kaipapau Stream bridge acceptable to the State Historic Preservation Division (SHPD) prior to the start of bridge demolition. Work shall be considered incidental to the various items of work.

Graphic Scale:

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

Scale in Feet

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY RSY	
NOTE BOOK	TRACED BY	
	DESIGNED BY WC	
No.	QUANTITIES BY	
	CHECKED BY	

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16

SIGNATURE LIC. EXPIRATION

R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

EXISTING CONDITION & DEMOLITION PLAN

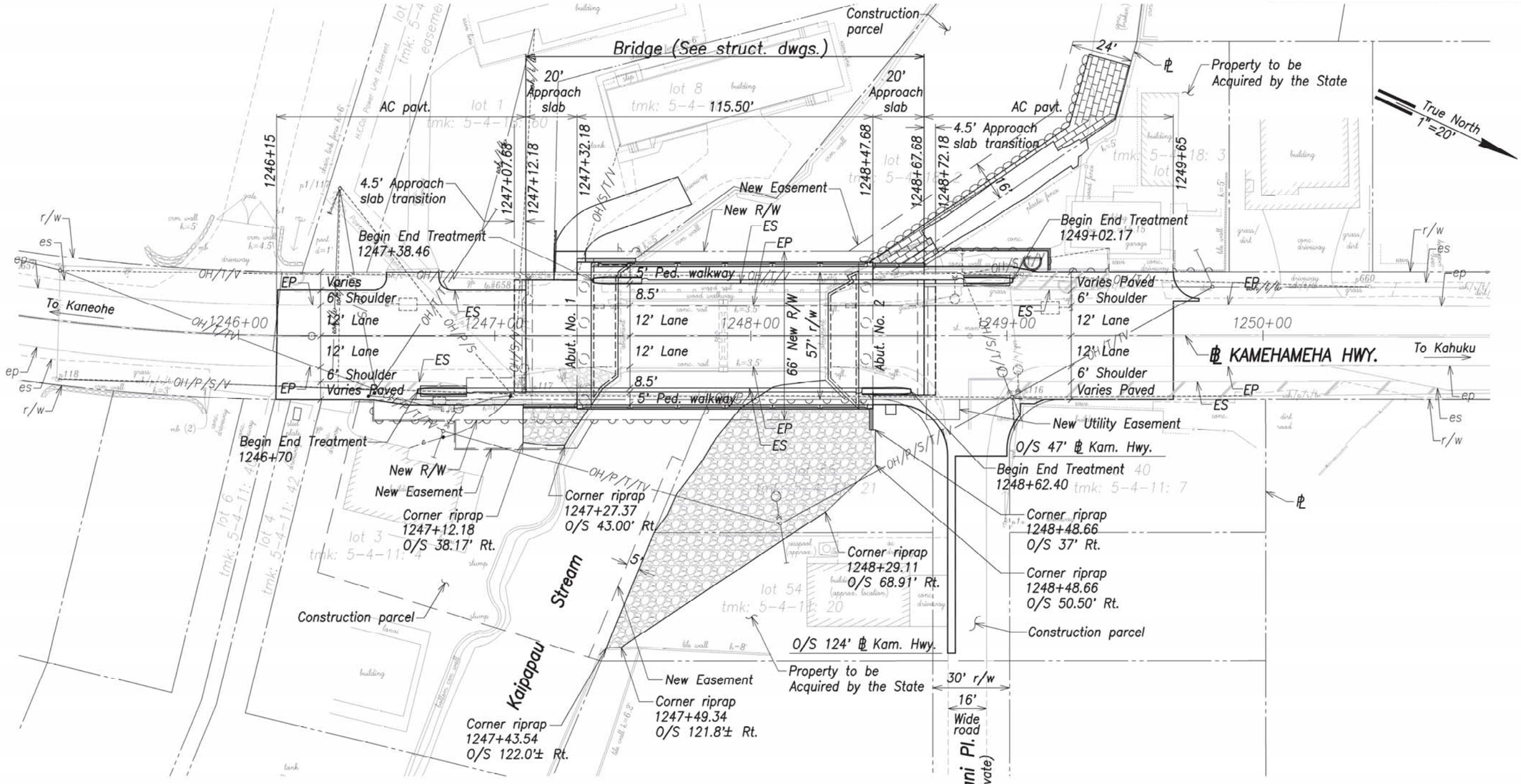
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2015

SHEET No. C-15 OF SHEETS

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	17	142



SITE LAYOUT PLAN
SCALE 1"=20'

Pavement Note:

Contractor shall submit a pavement phasing plan and schedule for the AC pavement work to the State Engineer for review and approval. Contractor shall be responsible for providing temporary traffic controls, temporary pavement transitions, notifying affected residences of the work schedule and providing safe temporary access at all times to driveways and streets. Continuous two way traffic shall be maintained at all times. Work shall be considered incidental to various items of work.

Legend:

Dumped Riprap

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAFT BY RST	
	TRACED BY	
NOTE BOOK	DESIGNED BY MC	
	QUANTITIES BY	
No.	CHECKED BY	

THIS WORK WAS PREPARED BY ME, OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE, UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE — LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SITE LAYOUT PLAN

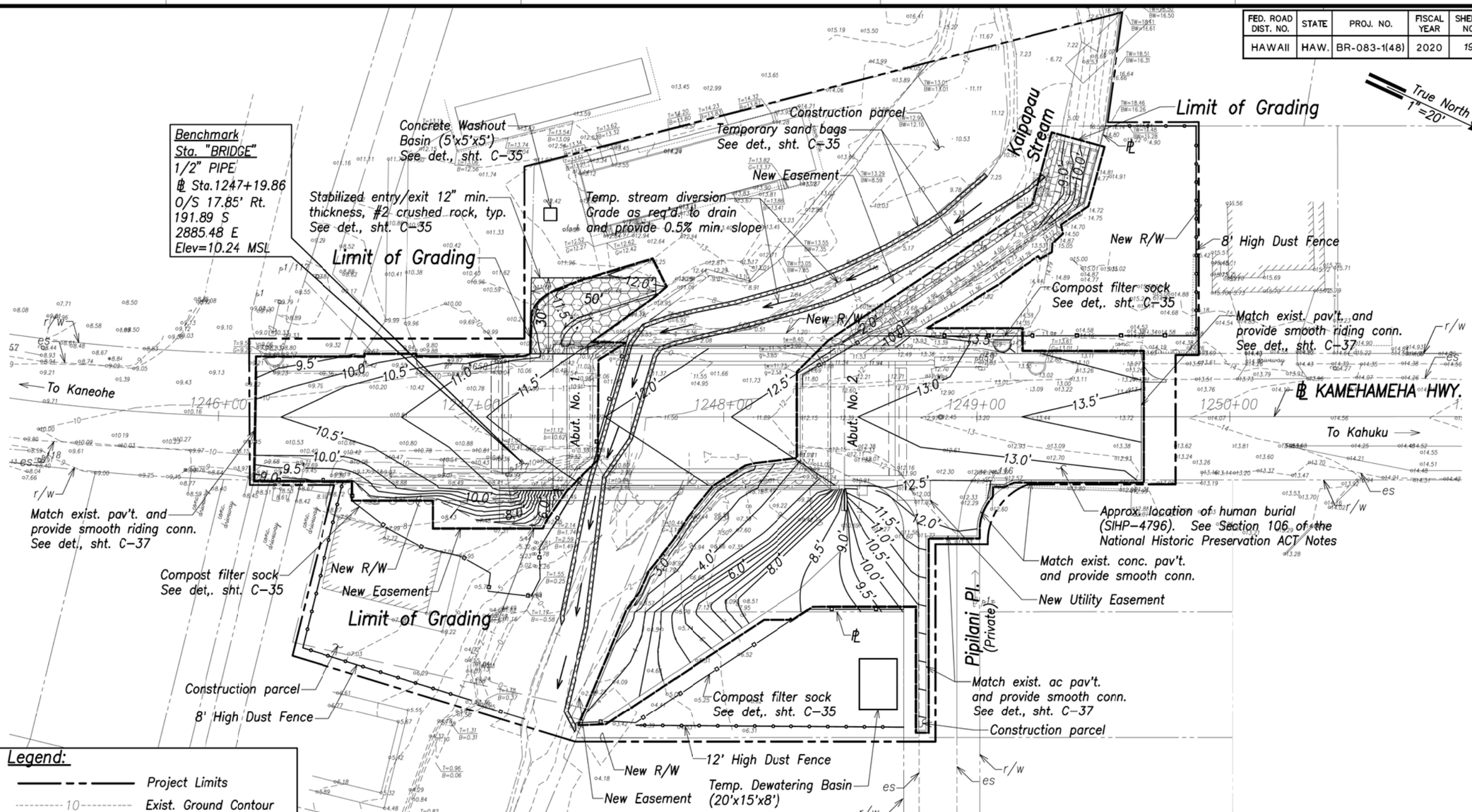
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2015

SHEET No. C-16 OF SHEETS

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2020	19	149



Legend:

- Project Limits
- 10 Exist. Ground Contour
- 10 Finished Grade Contour
- Limit of Grading
- Dust Fence
- Compost Filter Sock
- Top of Bank
- Bottom of Bank

Fill Condition Cut Condition

- Drainage Flow Direction
- Stabilized Entry/Exit

ROADWAY GRADING, EROSION & SEDIMENT CONTROL PLAN

Scale: 1"=20'

Notes:

1. For additional finished grade elevations, see sht. C-20.
2. For bridge deck elevations, see structural drawings.
3. For grading work under bridge, see sht. C-19.
4. The contractor shall be responsible for obtaining grading permit from the City and County of Honolulu, Department of Planning and Permitting.

Graphic Scale:

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

Scale in Feet

SURVEY PLOTTED BY ____ DATE
DRAWN BY ____ EST
TRACED BY ____
DESIGNED BY ____ WC
QUANTITIES BY ____
CHECKED BY ____
ORIGINAL PLAN
NOTE BOOK
No.____

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/20
SIGNATURE LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY GRADING, EROSION & SEDIMENT CONTROL PLAN

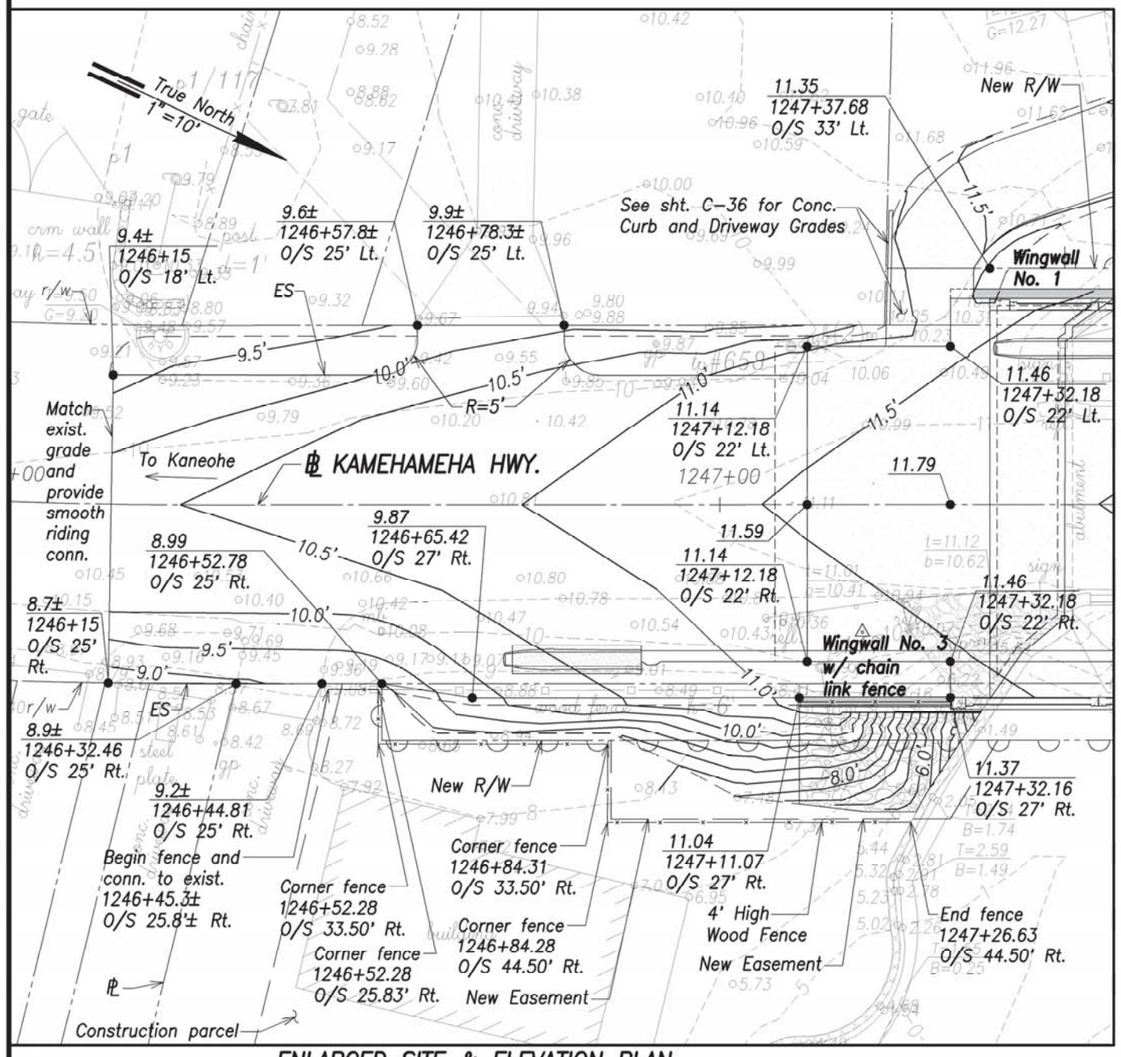
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2019

SHEET No. C-18 OF SHEETS

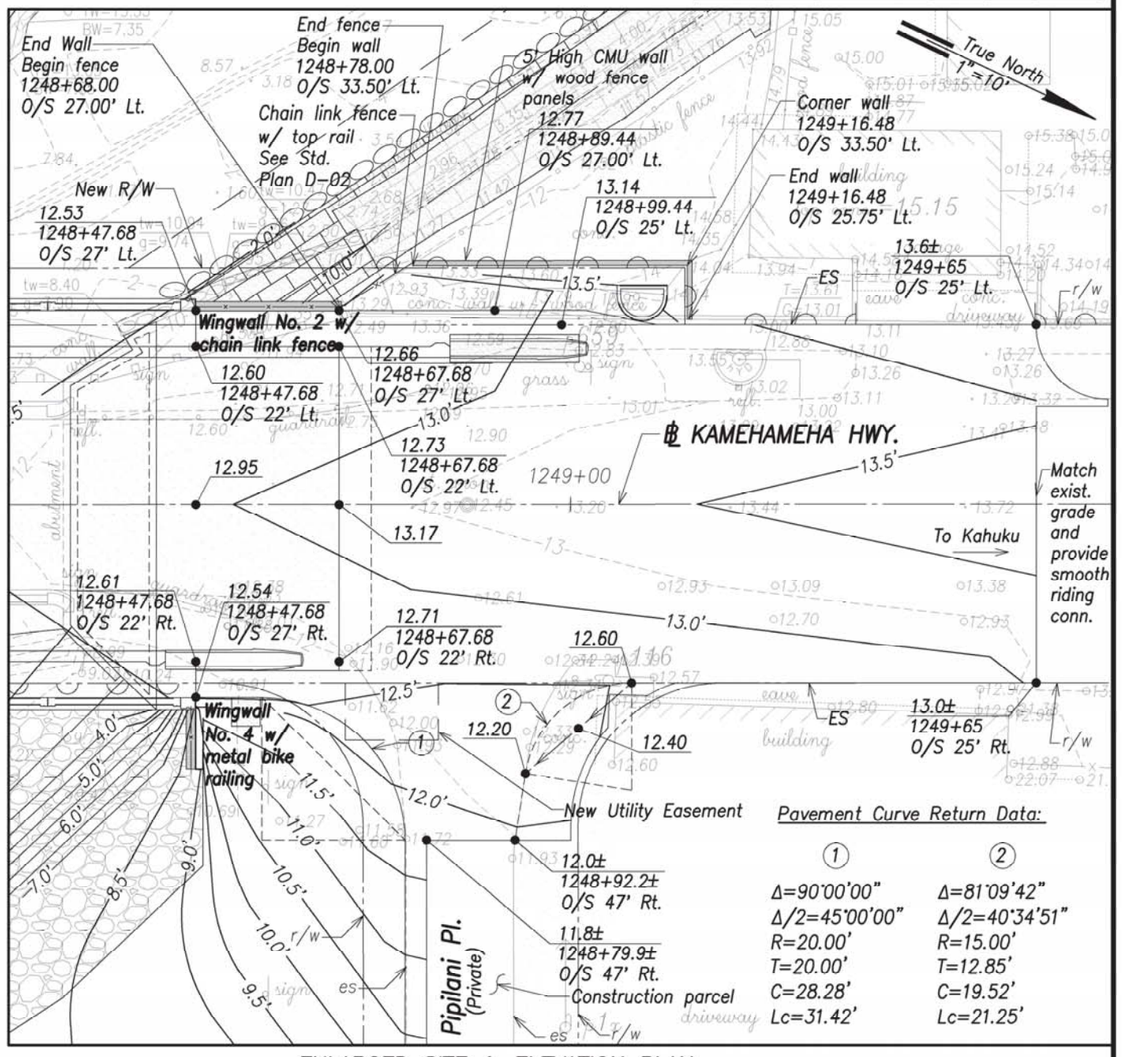
RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	20	142



ENLARGED SITE & ELEVATION PLAN (KANEOHE SIDE)

Scale: 1"=10'



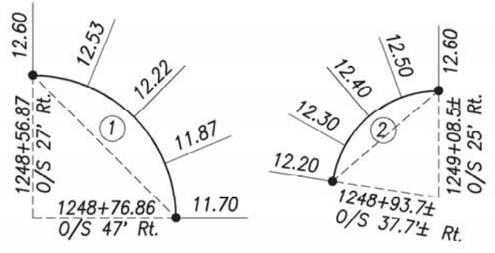
Pavement Curve Return Data:

①	②
Δ=90°00'00"	Δ=81°09'42"
Δ/2=45°00'00"	Δ/2=40°34'51"
R=20.00'	R=15.00'
T=20.00'	T=12.85'
C=28.28'	C=19.52'
Lc=31.42'	Lc=21.25'

ENLARGED SITE & ELEVATION PLAN (KAHUKU SIDE)

Scale: 1"=10'

Pipilani Place
Pavement Curve Return Grades:



Legend:

- Exist. Ground Contour
- Finished Grade Contour
- 10.00 / 2+37.40 / O/S 31.3' Rt. — Finished Grade Elevation
- ℄ Station / ℄ Offset

Graphic Scale:

1" = 10'

10' 5' 0 10' 20'

Scale in Feet

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAFT BY	RBY
	TRACED BY	
NOTE BOOK	DESIGNED BY	WC
	QUANTITIES BY	
No.	CHECKED BY	

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ENLARGED SITE & ELEVATION PLAN

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2015

SHEET No. C-19 OF SHEETS

RMTC JOB NO. : 1-19548-0E

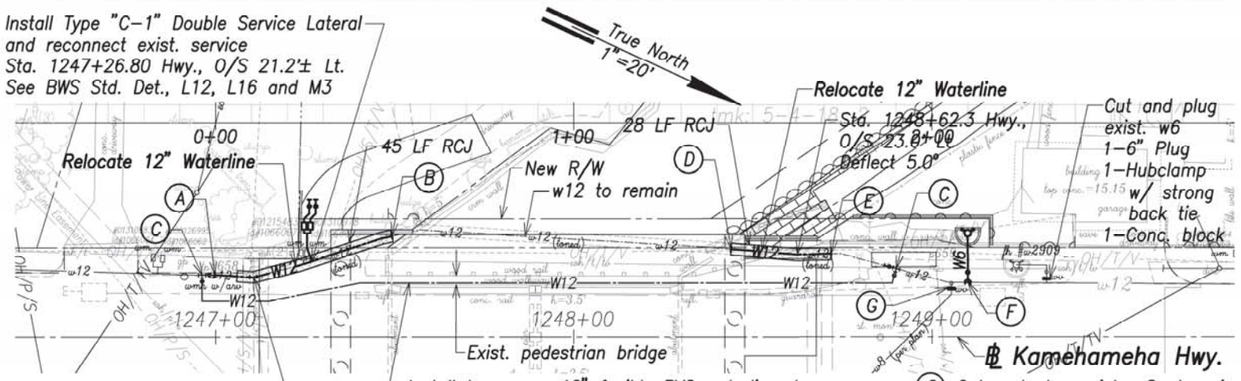
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	21	142

(A) Sta. 1246+99.7± Hwy.,
O/S 17.5'± Lt.
=Sta. 0+00.0± 12" W.L.
Deflect 4.0°

(B) Connect to exist. w12
Sta. 1247+49.3± Hwy.,
O/S 28.2'± Lt.
=Sta. 0+51.0± 12" W.L.
Materials for conn.
1–12" Sleeve, 12" long
8± LF 12" D.I.P., Cl. 52
Temp. for testing
1–12" Cap w/4" C.O.
1–Conc. block
Contractor to verify
invert and location

(C) Connect to exist. w12
Sta. 1246+96± Hwy.,
O/S 17.4'± Lt. and
Sta. 1248+90± Hwy.,
O/S 19.2'± Lt.
Materials for conn.
1–12" x 12" Tee
2–12" GV, 150#
2–Valve box w/ cover
1–Conc. block w/
struct. struts
Temp. for testing
1–12" Cap w/4" C.O.
1–Conc. block
Contractor to verify
invert and location

Install Type "C–1" Double Service Lateral and reconnect exist. service
Sta. 1247+26.80 Hwy., O/S 21.2'± Lt.
See BWS Std. Det., L12, L16 and M3



Sta. 1247+10.50 Hwy.,
O/S 16.70' Lt.
=Sta. 0+10.55 12" W.L.
1–12" 1/8 Bend (H & TV)
1–Conc. block

Install temporary 12" fusible PVC waterline. Lay temporary 12" waterline on existing pedestrian walkway. In areas outside of the existing pedestrian walkway and provide temporary ADA accessible route, place temporary waterline in shallow open trench and cover with steel plates. See Temporary Waterline Notes on this sheet.

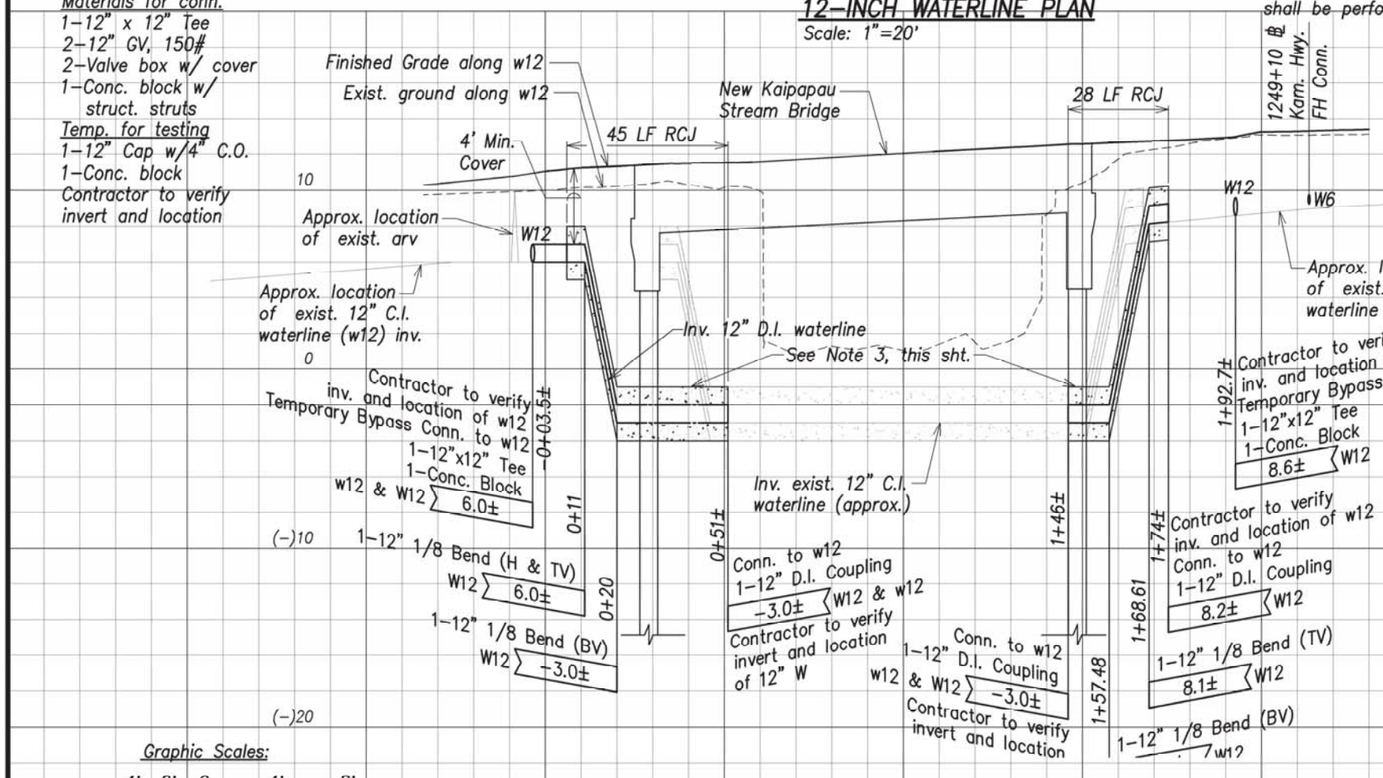
(D) Connect to exist. w12
Sta. 1248+43.9± Hwy.,
O/S 24.6'± Lt.
=Sta. 1+46.0± 12" W.L.
Materials for conn.
1–12" Sleeve, 12" long
8± LF 12" D.I.P., Cl. 52
Temp. for testing
1–12" Cap w/4" C.O.
1–Conc. block
Contractor to verify
invert and location

(E) Connect to exist. w12
Sta. 1248+71.9± Hwy.,
O/S 23.3'± Lt.
=Sta. 1+74± 12" W.L.
Materials for conn.
1–12" Sleeve, 12" long
8± LF 12" D.I.P., Cl. 52
1–12" 1/8 Bend (TV)
Temp. for testing
1–12" Cap w/4" C.O.
1–Conc. block
Contractor to verify
invert and location

(F) FH Connection
Sta. 1249+10 Hwy.
O/S 15.1'± Lt.
1–12" x 6" Tapping Tee (MJ x FE)
1–6" 1/4 Bend (BV)
1–6" GV (MJ x FE), Cl. 150
1–Valve box
1–FH (Ht.=6'–4")
1–FH Extension piece
1–FH Marker
1–FH Curb guard
14 LF 6" D.I.P. Cl. 52
1–Conc. block
1–Conc. block w/ struct. struts
See BWS Std. Det. FH4 and FH11
For Profile, see sht. C–37
Temp. for Testing
1–6" cap w/ 2–1/2" C.O.
1–Conc. block

(G) Cut and plug exist. w8 at main.
Remove valve and box. Salvage frame and cover.
1–8" Plug
1–Hubclamp w/ strong back tie
1–Conc. block
See sht. C–29 for Phase when work shall be performed.

12–INCH WATERLINE PLAN
Scale: 1"=20'



Graphic Scales:
1" = 4' 4' 2' 0 4' 8' Scale in Feet
1" = 20' 20' 10' 0 20' 40' Scale in Feet

12–INCH WATERLINE PROFILE
Scales: 1"=20' Horiz.
1"=4' Vert.

Notes:
1. The existing waterlines shown on these plans were located using record drawings and toning information from the Board of Water Supply. The contractor shall make an independent check by probing the waterlines and coordinating with the Board of Water Supply to ascertain the exact locations of the waterlines. Any discrepancies shall be immediately brought to the attention of the Engineer prior to any work on the water system.
2. Demolish and remove existing waterline as required to construct waterline.
3. Dewatering for removal of water system shall be considered inciental to Item No. 202.0520.
4. Dewatering for installation of the temporary and pernanent water system shall be considered incidental to Item No. 624.1003 Water Systems. No additional compensation will be provided for dewatering.

Temporary Waterline Notes:
1. The temporary waterline shall be constructed, tested and in–service prior to starting construction of permanent water system. The contractor shall coordinate with the Board of Water Supply (BWS) for shut–down of the 12–inch waterline. The maximum down time shall be six (6) hours unless otherwise approved by the BWS. The contractor shall be responsible for providing advanced notification to all users affected by the waterline shut–down.
2. The temporary waterline shall not be in–service for more than two (2) months unless otherwise approved by the BWS.
3. Contractor to provide all fittings, bends as required and install temporary 3/4" ARV in cage at high point of temporary waterline
4. The contractor shall be responsible for providing safe temporary pedestrian access at all times that meets ADA requirements.
5. The contractor shall be responsible for providing traffic controls during temporary waterline installation.

APPROVED:

Manager and Chief Engineer, BWS DATE
(for work affecting BWS facilities
State R/W & BWS easements only)

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16–115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."
4/30/16
SIGNATURE LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

12–INCH WATERLINE PLAN & PROFILE

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR–083–1(48)

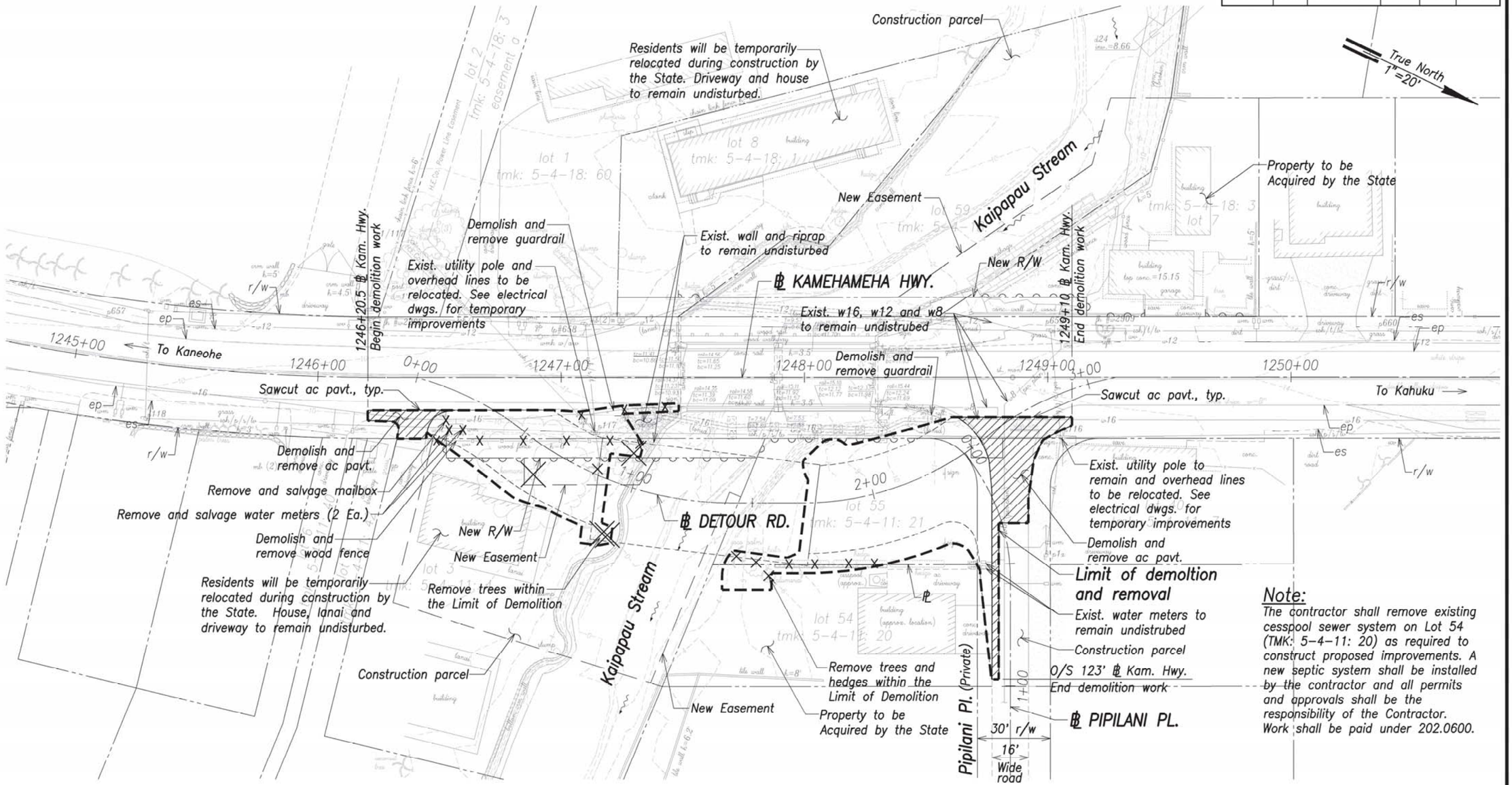
Scale: As Noted Date: April 2015

SHEET No. C–20 OF SHEETS

ORIGINAL PLAN | NOTE BOOK | No. | SURVEY PLOTTED BY RST | DRAWN BY | TRACED BY WC | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

RMTC JOB NO. : 1–19548–0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	25	142



Note:
The contractor shall remove existing cesspool sewer system on Lot 54 (TMK: 5-4-11: 20) as required to construct proposed improvements. A new septic system shall be installed by the contractor and all permits and approvals shall be the responsibility of the Contractor. Work shall be paid under 202.0600.

DETOUR ROAD – EXISTING CONDITION & DEMOLITION PLAN

Scale: 1"=20'

Graphic Scale:
1" = 20' 20' 10' 0 20' 40'
Scale in Feet

ORIGINAL PLAN	SURVEY PLOTTED BY ____ DATE
	DRAWN BY ____ RSY
NOTE BOOK	TRACED BY ____
	DESIGNED BY ____ WC
No.	QUANTITIES BY ____
	CHECKED BY ____

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE — LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETOUR RD. – EXISTING CONDITION & DEMOLITION PLAN

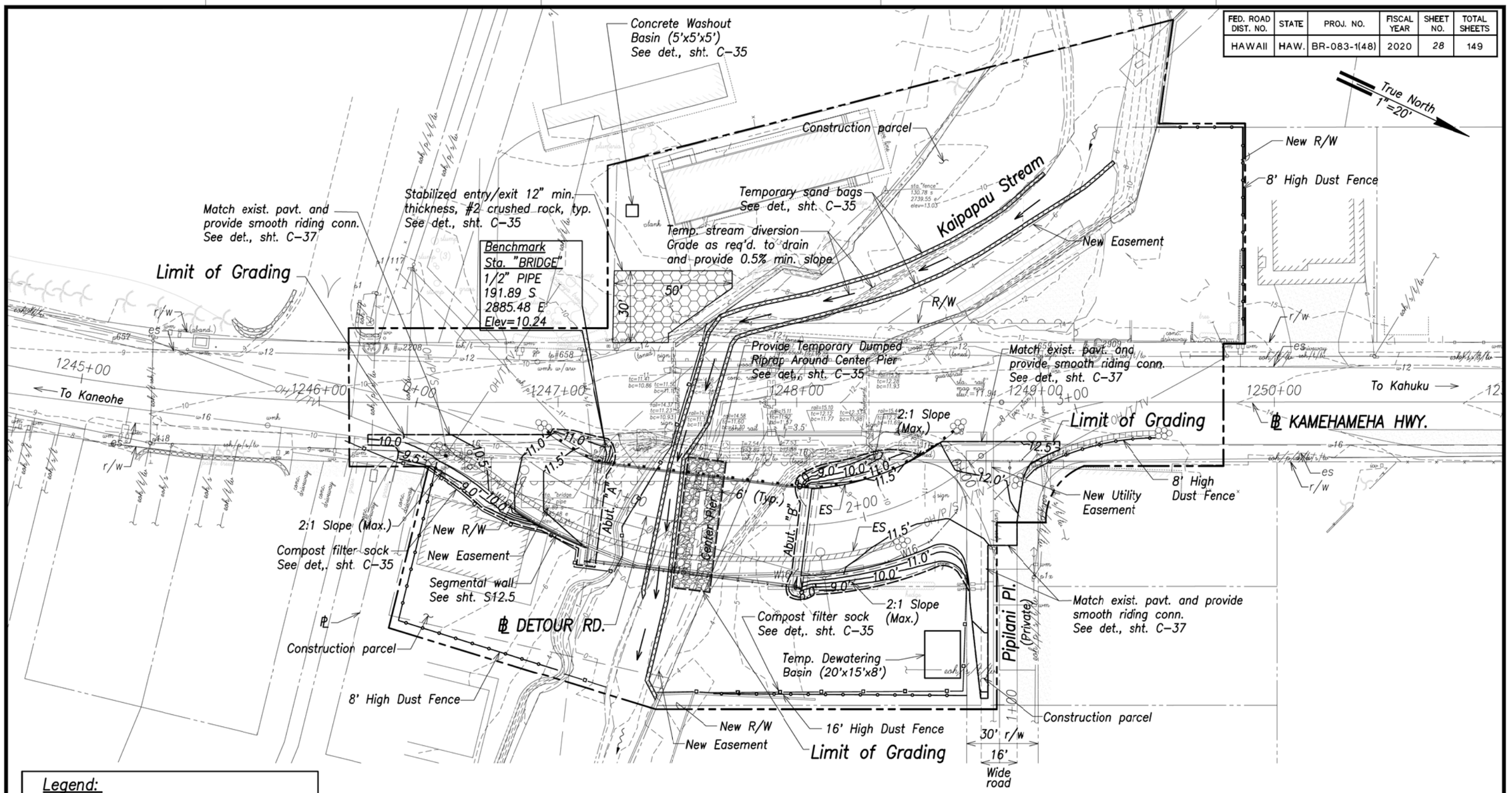
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2015

SHEET No. C-24 OF SHEETS

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2020	28	149



Legend:

- Project Limits
- 10 — Exist. Ground Contour
- 10.0' — Finished Grade Contour
- Limit of Grading
- Dust Fence
- Compost Filter Sock
- Drainage Flow Direction
- Stabilized Entry/Exit

DETOUR ROAD – GRADING, EROSION AND SEDIMENT CONTROL PLAN

Scale: 1"=20'

Graphic Scale:

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

Scale in Feet

SURVEY PLOTTED BY: DATE
DRAWN BY: EST
TRACED BY:
DESIGNED BY: WC
NOTE BOOK:
QUANTITIES BY:
CHECKED BY:
ORIGINAL PLAN
NOTE BOOK No.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/20
SIGNATURE LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETOUR ROAD-GRADING, EROSION AND SEDIMENT CONTROL PLAN

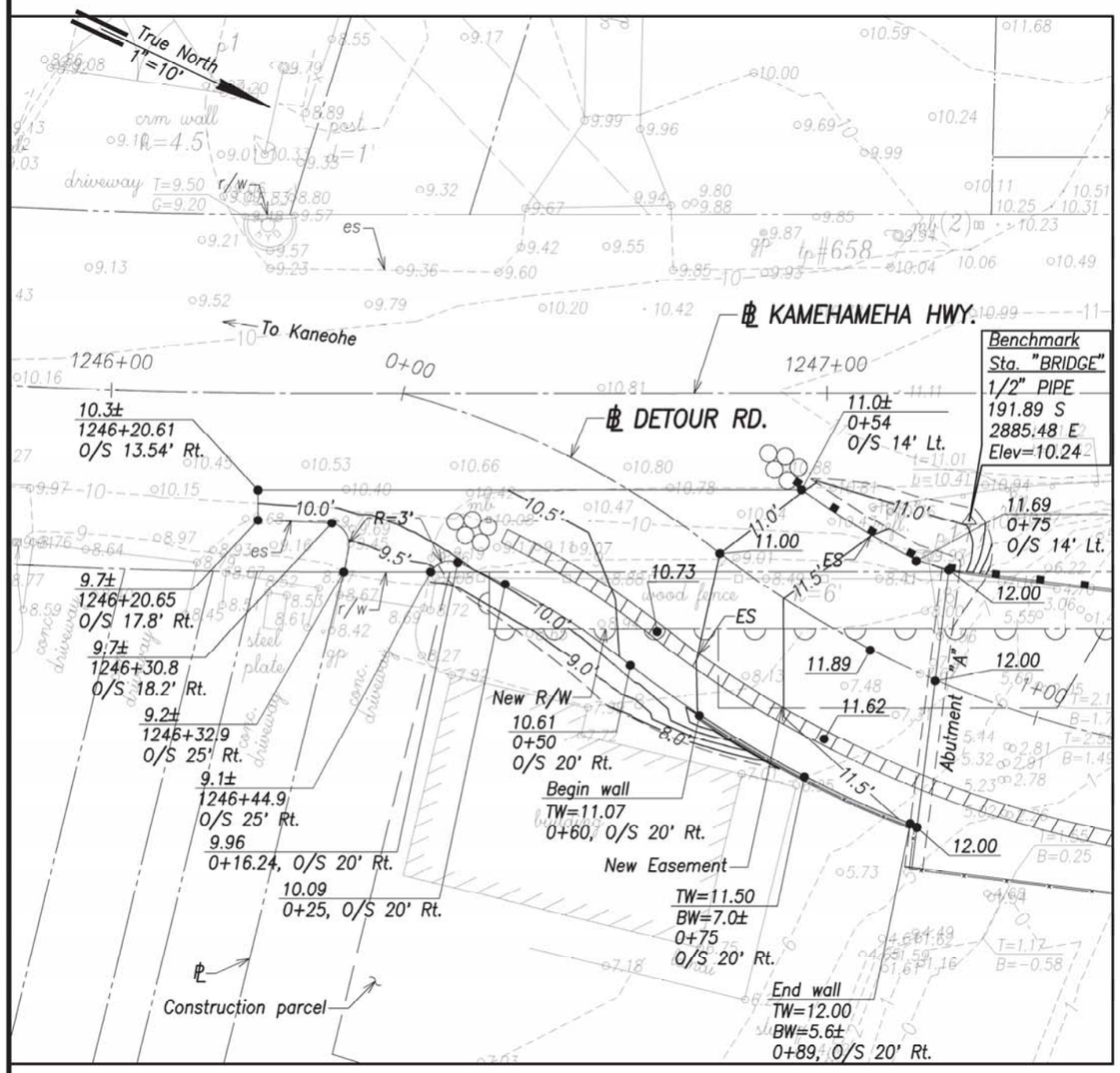
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted Date: April 2019

SHEET No. C-27 OF SHEETS

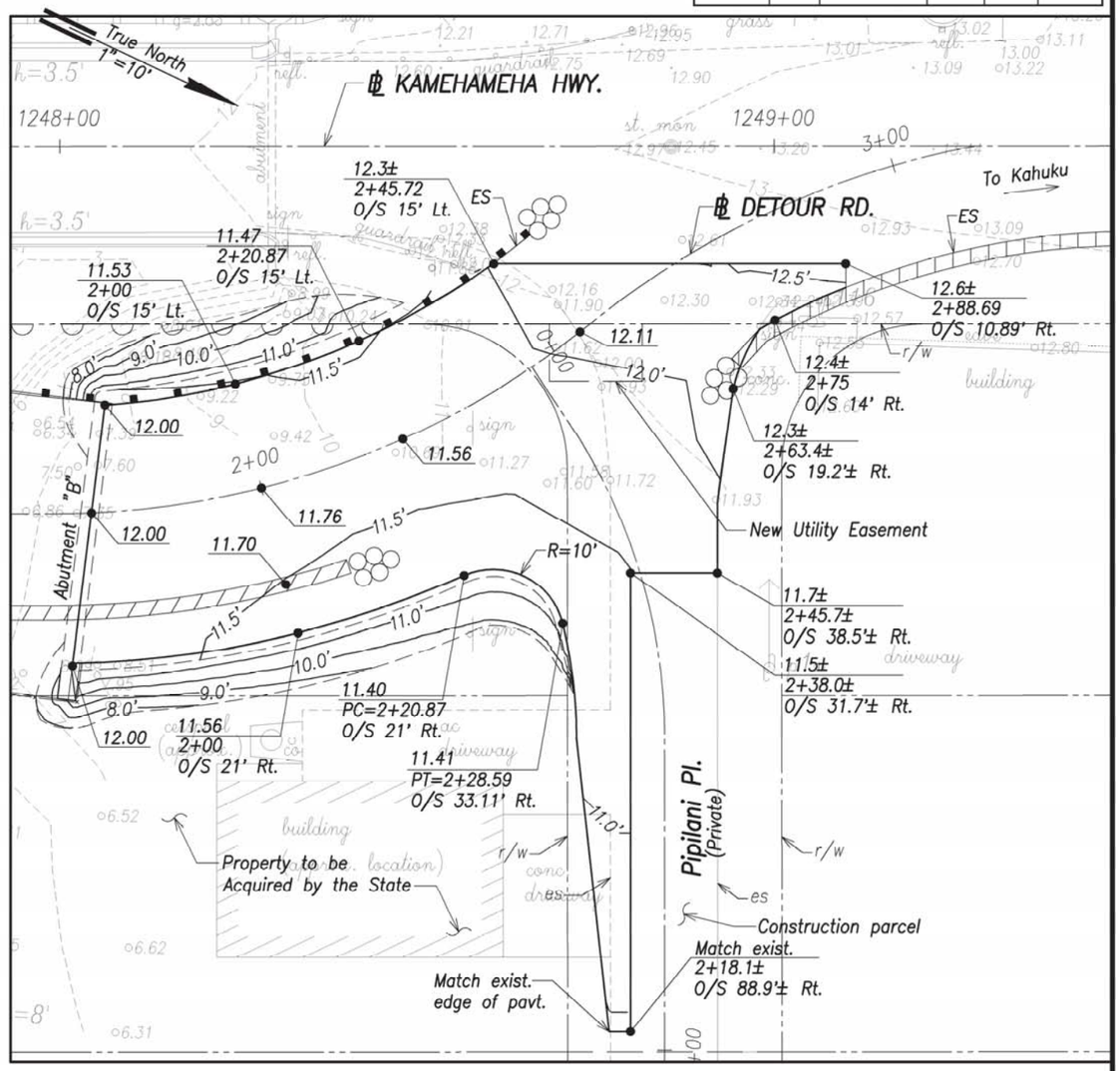
RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	28	142



DETOUR ROAD ENLARGED SITE & ELEVATION PLAN (KANEOHE SIDE)

Scale: 1"=10'



DETOUR ROAD ENLARGED SITE & ELEVATION PLAN (KAHUKU SIDE)

Scale: 1"=10'

Legend:

10	Exist. Ground Contour
10.0'	Finished Grade Contour
10.00 2+37.40 O/S 31.3' Rt.	Finished Grade Elevation ℄ Station ℄ Offset

Graphic Scale:

1" = 10' 10' 5' 0 10' 20'

Scale in Feet

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION, OBSERVATION OF CONSTRUCTION IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE L.C. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETOUR ROAD ENLARGED SITE & ELEVATION PLAN

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

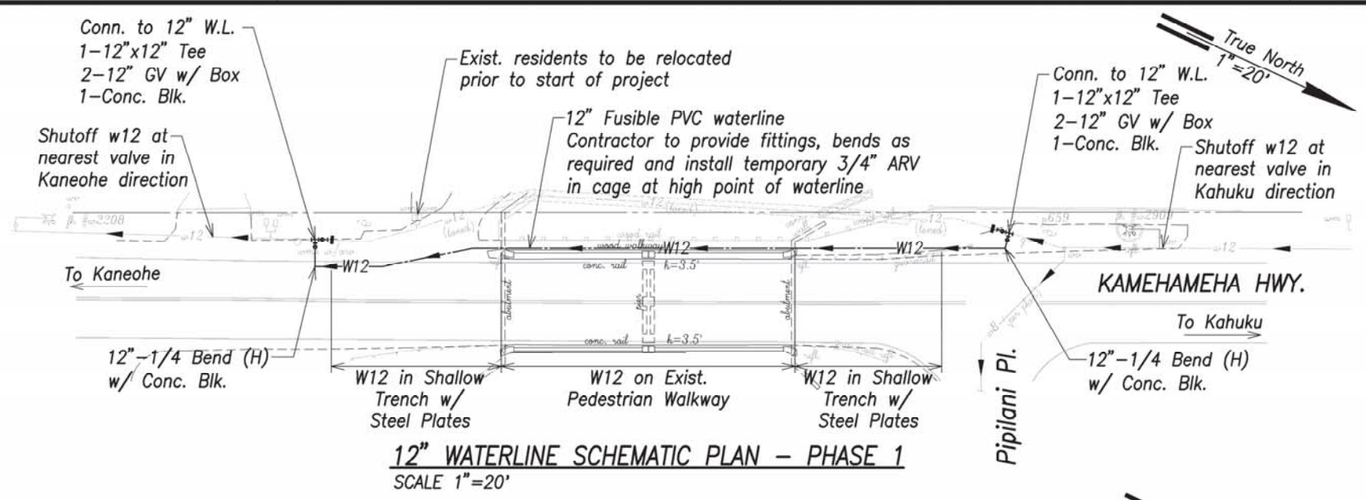
Scale: As Noted Date: April 2015

SHEET No. C-27 OF SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | RST | WC | No. | NOTE BOOK

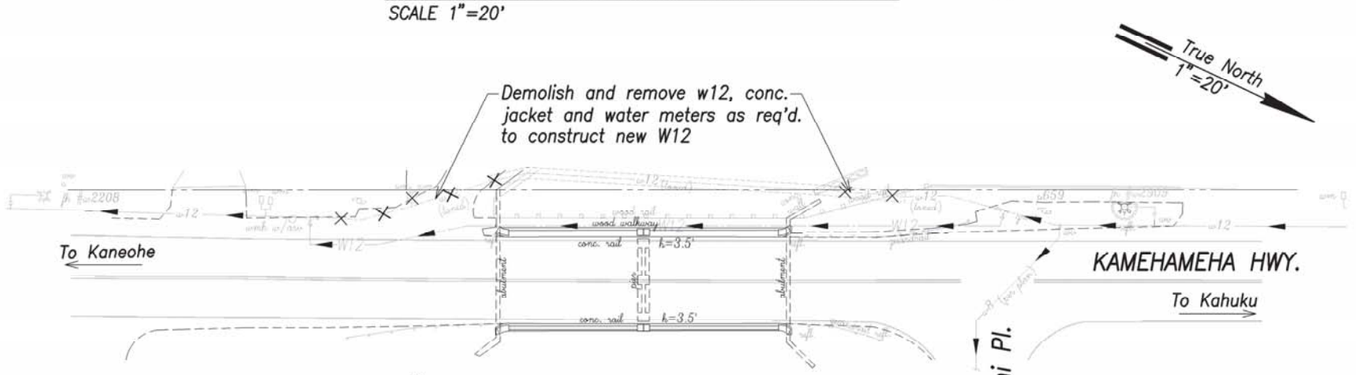
RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	29	142



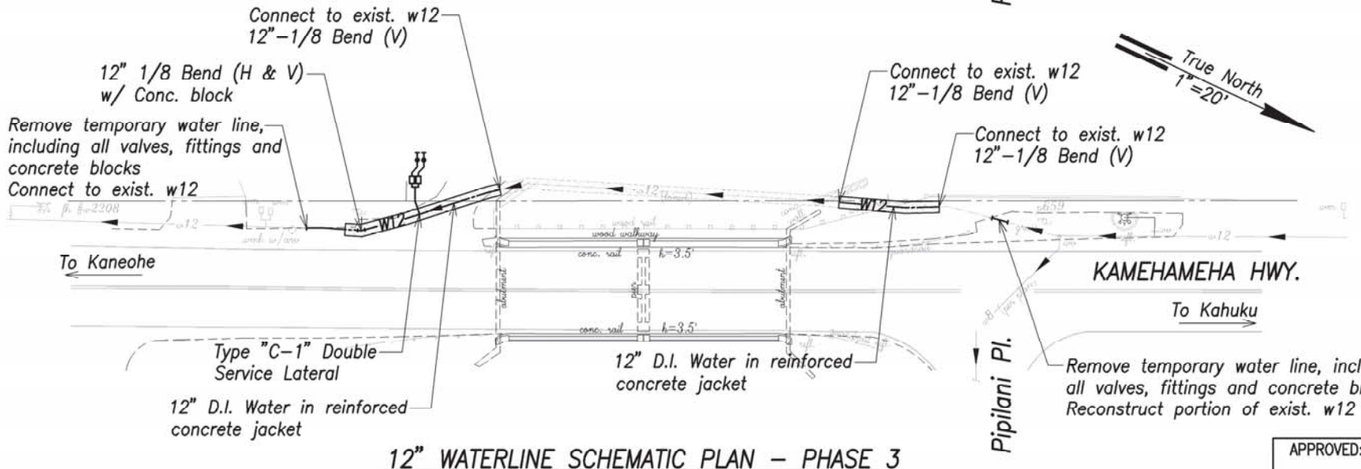
12" WATERLINE SCHEMATIC PLAN – PHASE 1

SCALE 1"=20'



12" WATERLINE SCHEMATIC PLAN – PHASE 2

SCALE 1"=20'



12" WATERLINE SCHEMATIC PLAN – PHASE 3

SCALE 1"=20'

Suggested Phasing for Work on 12" Waterline:

PHASE 1:

Construct temporary bypass waterline improvements shown on this sheet and perform pressure test and chlorination. Shutoff existing w12 by closing the nearest existing valves in the Kaneohe and Kahuku direction and make connections to the existing w12. (Note: Maximum allowable time for w12 shutdown is 6 hours.)

PHASE 2:

Excavate trench and construct shoring for new W12 improvements. Remove portions of existing w12 in concrete jacket required to construct new improvements.

PHASE 3:

Construct permanent waterline improvements shown on this sheet and perform pressure test and chlorination. Shutoff existing w12 by closing the nearest existing valves in the Kaneohe and Kahuku direction and make connections to the existing w12. Remove W12 bypass waterline, including all gate valves, fittings and concrete blocks on both sides of existing bridge. (Note: Maximum allowable time for w12 shutdown is 6 hours.)

Note:

The contractor shall check the invert and location of the existing 12–inch waterline prior to the start of waterline construction and adjust the invert of the new 12–inch waterline to match the existing invert for future connection.

Graphic Scale:

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

Scale in Feet

ORIGINAL PLAN	SURVEY PLOTTED BY: RST	DATE
	DRAWN BY:	
	TRACED BY:	
NOTE BOOK	DESIGNED BY: WC	
	QUANTITIES BY:	
No.	CHECKED BY:	

APPROVED:

Manager and Chief Engineer, BWS (for work affecting BWS facilities State R/W & BWS easements only) — DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16–115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16

SIGNATURE LIC. EXPIRATION

R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

12" WATERLINE PHASING PLAN

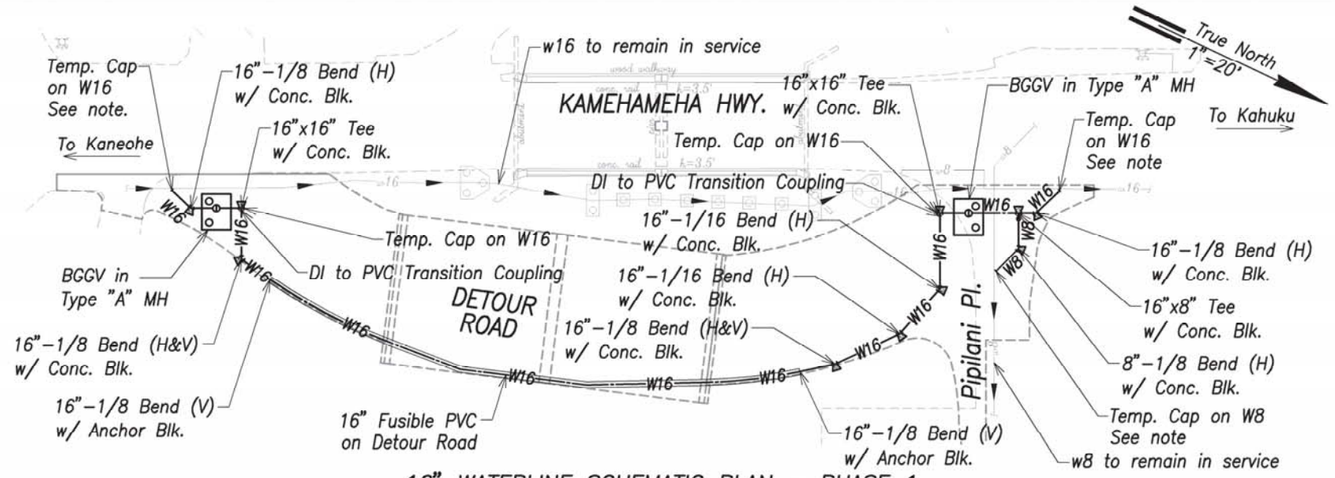
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR–083–1(48)

Scale: As Noted Date: April 2015

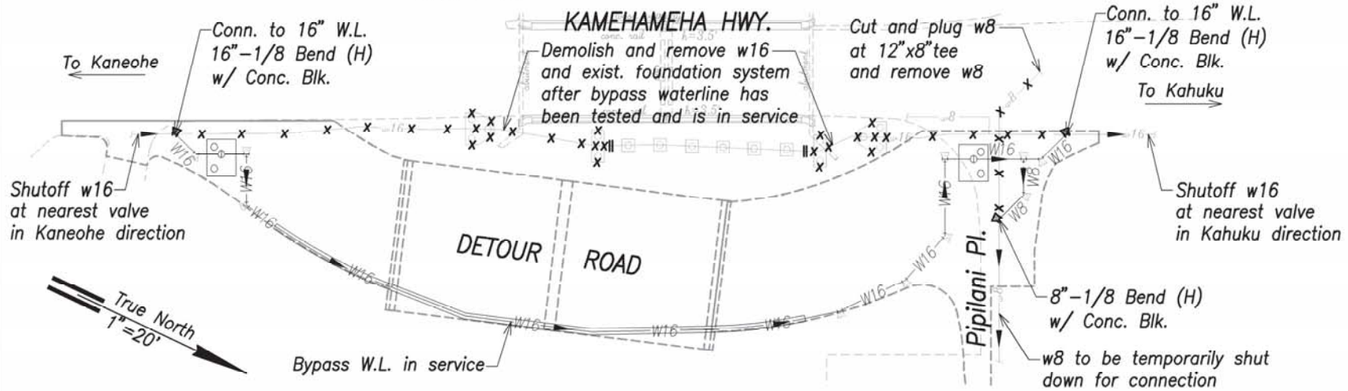
SHEET No. C-28 OF SHEETS

RMTC JOB NO. : 1–19548–0E

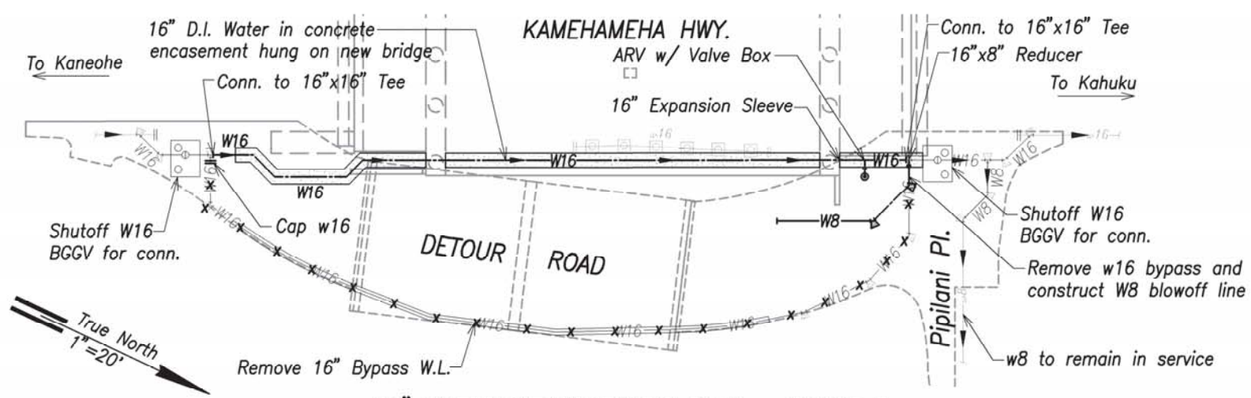
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	30	142



16" WATERLINE SCHEMATIC PLAN – PHASE 1
SCALE 1"=20'



16" WATERLINE SCHEMATIC PLAN – PHASE 2
SCALE 1"=20'



16" WATERLINE SCHEMATIC PLAN – PHASE 3
SCALE 1"=20'

Suggested Phasing for Work on 16" Waterline:

PHASE 1:
Existing w16 and w8 serving Pipilani Road shall remain in service at all times. Construct detour road and temporary bridge. Construct Phase 1 waterline improvements shown on this sheet and perform pressure test and chlorination.

PHASE 2:
Shutoff existing w16 by closing the nearest existing valves in the Kaneohe and Kahuku direction. Drain w16 using existing w8 blowoff line. Construct Phase 2 waterline improvements shown on this sheet. Open existing valves to restore water service. (Note: Maximum allowable time for w16 and w8 shutdown is 8 hours)

After temporary W16 waterline is in service, demolish and remove the existing w16 and existing foundation system shown in Phase 2 on this sheet. Abandon-in-place the existing w16 and existing foundation system under Kaipapau Stream. The contractor shall plug both ends of abandoned waterline.

PHASE 3:
Construct new bridge and Phase 3 waterline improvements, including W8 blowoff line and W16 encased in concrete between new bridge girders, as shown on this sheet. See structural drawings for details. Perform pressure test and chlorination. Shutoff W16 bypass waterline using bevel gear gate valves on both sides of new bridge. (Note: Maximum allowable time for W16 is 8 hours) Connect W16 on both sides of new bridge. Open bevel gear gate valves to restore water service.

After W16 waterline is in service, demolish and remove the bypass waterline.

Note:
The contractor shall check the invert and location of the existing 16-inch waterline prior to the start of waterline construction and adjust the invert of the new 16-inch waterline to match the existing invert for future connection.

Graphic Scale:
1" = 20' 20' 10' 0 20' 40'
Scale in Feet

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	RST
	TRACED BY	
NOTE BOOK	DESIGNED BY	WC
	QUANTITIES BY	
No.	CHECKED BY	

APPROVED:

Manager and Chief Engineer, BWS (for work affecting BWS facilities State R/W & BWS easements only) — DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION, OBSERVATION OF CONSTRUCTION, IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE — LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

16" WATERLINE PHASING PLAN

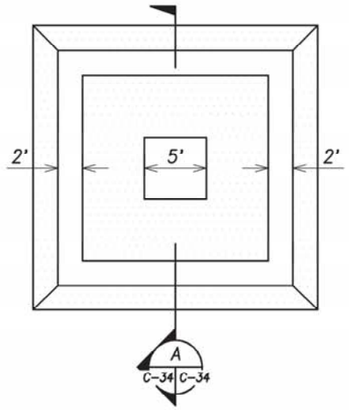
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted — Date: April 2015

SHEET No. C-29 OF SHEETS

RMTC JOB NO. : 1-19548-0E

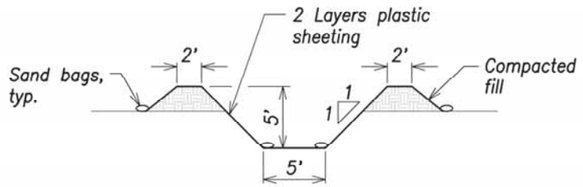
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	35	142



PLAN VIEW

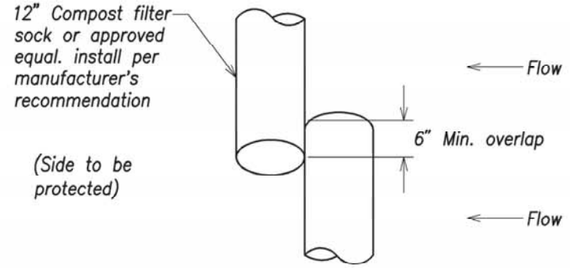
Notes:

1. Line basin with 2 layers of 4 mil. polyethylene plastic.
2. Place sand bags on top sheeting.
3. Clean out hardened concrete to maintain basin capacity.

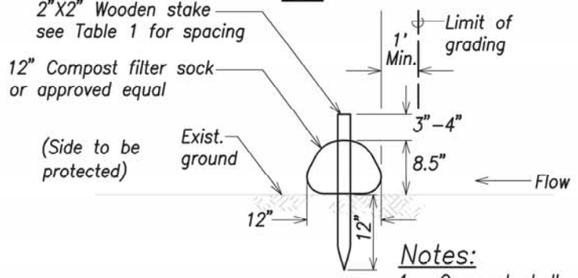


SECTION

CONCRETE WASH-OUT BASIN DETAIL
NOT TO SCALE



PLAN



SECTION

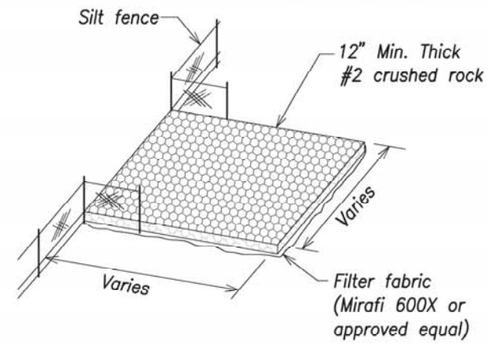
Notes:

1. Compost shall not contain biosolids and should be consistent with EPA guidelines as well as meet all local, state and federal quality requirements.
2. Contractor shall inspect compost filter socks when as required by the project SWPPP.

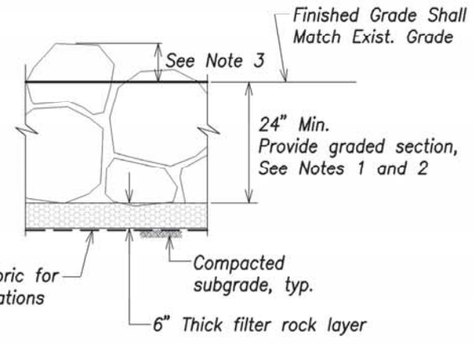
Table 1: Wooden stake anchor spacing

Slope	Anchor spacing
< 4:1	Not required
4:1 to 3:1	10' O.C.
> 3:1 to 2:1	5' to 10' O.C.
> 2:1	5' O.C.

COMPOST FILTER SOCK DETAIL
NOT TO SCALE



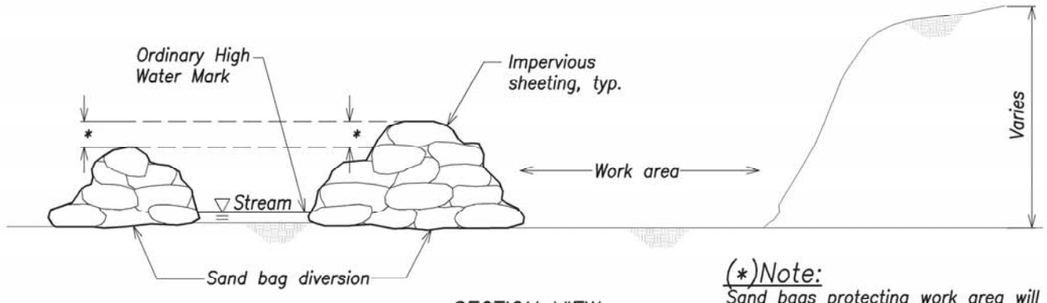
STABILIZED CONSTRUCTION ENTRANCE
Not To Scale



Notes:

1. Riprap shall be basalt rock and consist of 6"ø average stone size, 12"ø maximum stone size.
2. Riprap gradation:
   D_{85} = 9"
   D_{50} = 6"
   D_{15} = 4"
3. 6" Max. from highest adjacent rock finish top.

TEMPORARY DUMPED RIPRAP
Not to Scale



SECTION VIEW

SAND BAG DETAIL
Not To Scale

(*)Note:
Sand bags protecting work area will be constructed 1.5' higher than the opposite side to allow overflow of stream away from work area during high rainfall events.

ORIGINAL PLAN
SURVEY PLOTTED BY — DATE
DRAWN BY — RST
TRACED BY
DESIGNED BY — WC
NOTE BOOK
QUANTITIES BY
No. — CHECKED BY

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

4/30/16
SIGNATURE — LIC. EXPIRATION
R. M. TOWILL CORPORATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

EROSION & SEDIMENT CONTROL DETAILS
Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: As Noted — Date: April 2015

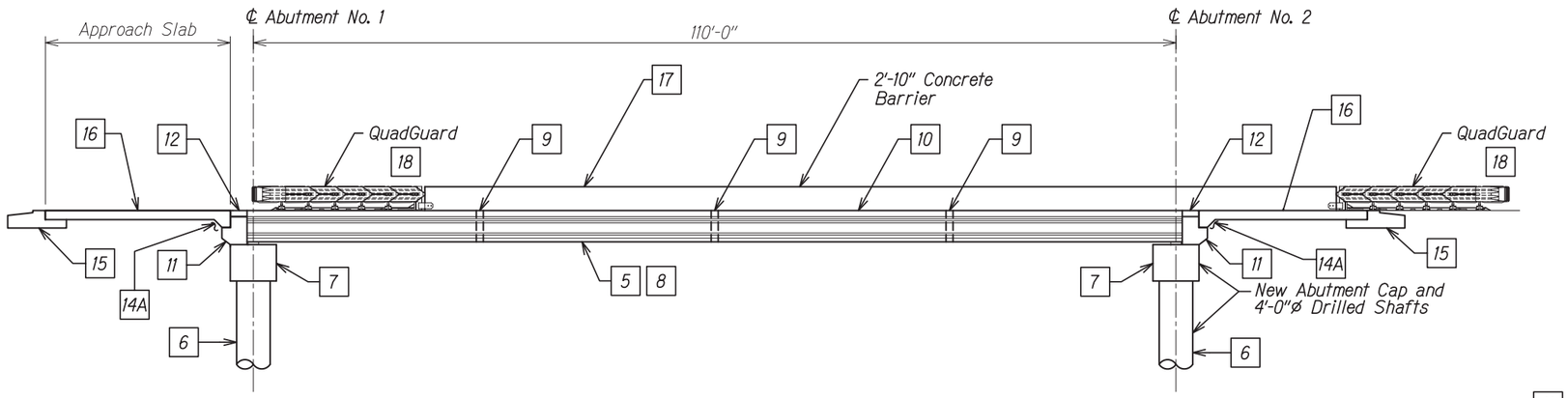
SHEET No. C-34 OF SHEETS

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	62	148

To Kaneohe ←

→ To Kahuku



CONSTRUCTION SEQUENCE

Scale: 1/8" = 1'-0"

CONSTRUCTION SEQUENCE NOTES:

1. Order of construction sequence shall not be changed.
2. Each sequence stage shall be completely finished before proceeding to the next stage unless otherwise noted. The Engineer will be the sole judge of whether the sequence stage is complete, and may direct the Contractor to stop work on a sequence stage to complete work on the preceeding sequence stage.
3. Contractor shall submit overweight vehicular details for approval prior to their use.

LEGEND:

[#] Phase 1 Stages

CONSTRUCTION SEQUENCE ELEVATION

[1] Relocate existing utility lines.

[2] Construct trial and load test shafts. Perform load test.

[3] Install detour road and temporary bridge.

[4] Demolish existing bridge.

[5] Construct precast girders. (May be done concurrently with Stages 1 through 4.)

[6] Construct 4 ft diameter drilled shafts. Shaft numbers 1, 2, 3, 5, 6, 7.

[7] Cast Phase 1 drilled shaft cap beams, girder seats, and corbels for concrete encased ducts at least 7 days after the final drilled shaft concrete pour in Stage 6 or until the concrete in Stage 6 has attained a compressive strength of 4,500 psi, whichever occurs later.

[8] Erect Phase 1 precast girders at least 15 days after the concrete pour in Stage 7 or until the concrete in Stage 7 has attained a compressive strength of 5,000 psi, whichever occurs later. Place slush grout immediately prior to placement of precast girders.

[9] Construct Phase 1 intermediate diaphragms.

[10] Pour Phase 1 cast-in-place deck except areas over end beams and electrical duct encasement.

[11] Pour Phase 1 corbel and end beams to top of precast girder at least 30 days after the concrete pour in Stage 10. The concrete pour shall occur between midnight and 3:00 AM (3 hour window).

[12] Pour remainder of Phase 1 deck concrete a minimum of 24 hours after the concrete pour in Stage 11.

[13] Construct Phase 1 wing walls at least 8 days after the concrete pour in Stage 12 or after the concrete in Stage 12 has attained a compressive strength of 5,000 psi, whichever occurs later.

[14A] Backfill to Phase 1 limits and to bottom of approach slab at least 14 days after the concrete pour in Stage 13 or until the concrete in Stage 13 has attained a compressive strength of 5,000 psi, whichever occurs later. Maximum height difference of backfill between abutments shall not exceed 2 feet. Install concrete encased ducts behind abutments when backfill height is at the elevation of the bottom of the concrete encased electrical ducts. Continue backfilling after concrete for encased electrical ducts has attained its 28 day compressive strength.

[14B] Construct barrier wall.

[15] Construct Phase 1 sleeper slabs.

[16] Construct Phase 1 approach slabs.

[17] Construct mauka aesthetic railing, concrete barrier and fence wall.

[18] Install mauka quadguards.

[19] Install temporary barriers.

STEWART N. WILLIAMS
LICENSED PROFESSIONAL ENGINEER
No. 3908-S
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

4/30/16
SIGNATURE LIC. EXPIRATION
MITSUNAGA & ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONSTRUCTION SEQUENCE
PHASE 1

KAMEHAMEHA HIGHWAY
Kaipapau Stream Bridge Replacement
Federal Aid Proj. No. BR-083-1(48)

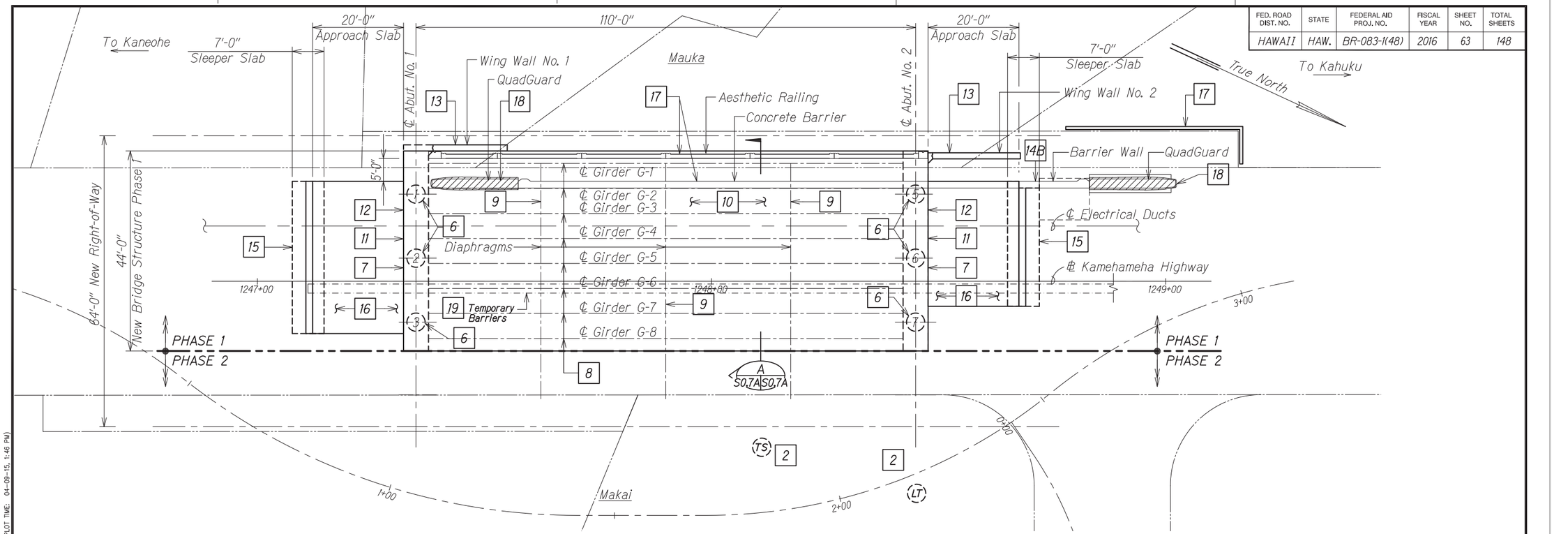
Scale: As Noted Date: April 2015

SHEET No. S0.7 OF 12 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK | No.

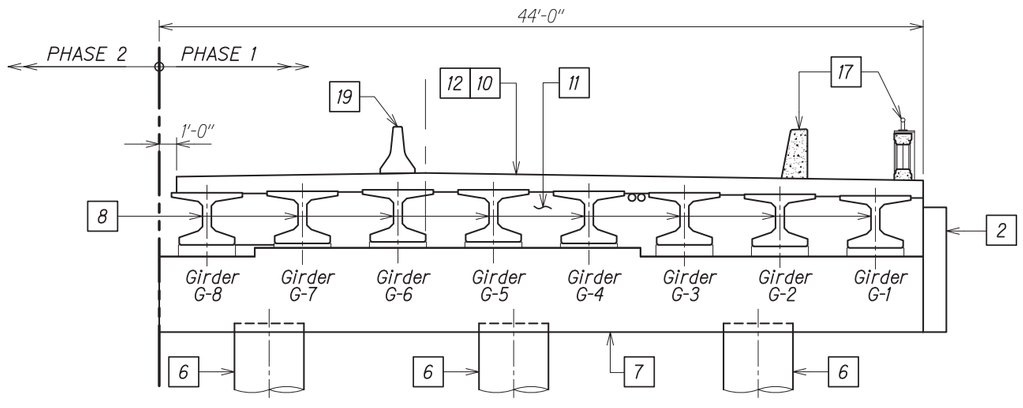
DRAWING NAME: K:\VERBATIM 12-10-14\B R I D G E\K A I 15-4-8\15-4-9 SW CADD PLOT\---1BI SW CADD 2015-04-10\KSB-S007.DWG PLOT TIME: 04-09-15, 10:52 AM)

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	63	148



PROPOSED CONSTRUCTION SEQUENCE PLAN (PHASE 1)

Scale: 3/32" = 1'-0"



CONSTRUCTION SEQUENCE (PHASE 1)

Scale: 1/4" = 1'-0"

A S0.7A S0.7A

LEGEND:

- # — Construction Sequence Stage
- (#) — Drilled Shaft ID
- (TS) — Trial Shaft
- (LT) — Load Test Shaft

STEWART N. WILLIAMS — LICENSED PROFESSIONAL ENGINEER — No. 3908-S — HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

4/30/16
SIGNATURE — LIC. EXPIRATION
MITSUNAGA & ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONSTRUCTION SEQUENCE PHASE 1

KAMEHAMEHA HIGHWAY
Kaipapau Stream Bridge Replacement
Federal Aid Proj. No. BR-083-1(48)

Scale: As Noted Date: April 2015

SHEET No. S0.7A OF 12 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK | No.

DRAWING NAME: K:\VERBATIM 12-10-14\B R I D G E\K A I 15-4-8\15-4-9 SW CADD PLOT\---1BI SW CADD 2015-04-10\KSB-S007A.DWG PLOT TIME: 04-09-15, 1:46 PM)

KAIPAPAU STREAM BRIDGE REPLACEMENT – OVERALL CONSTRUCTION SEQUENCE

	Structural Construction Stage	Description	References: Civil	Electrical	Geotech.	Structural	Waterline Work	Exist Bridge Open	Detour Open	Detour Off Peak Lane Closures Anticipated	Remarks
	Prior to Site Mobilization for Demolition	1. Prior to Site Mobilization, the Contractor shall submit required BMP's and other Municipal and National permit applications as indicated in the project Plans, Special Provisions and Specifications. 2. The Contractor shall submit Prefabricated Steel Beam Bridge Structural Computations and Erection drawings to the Owner for Review and Approval Prior to Fabrication.	Civil Sequence See C-10. See Civil 1			Structural Sequence S0.7,S0.7A, S0.8,S0.8A		Exist Bridge Open to Traffic			
	1	1. Install approved BMP measures. 2. Relocate Existing overhead utility lines. 3. Install temporary 12" fusible PVC waterline on existing (upstream) pedestrian walkway.	C-15,16,17, C-20, C-28, see Civil 2	E-8, E-9, E-10, E-11			Temporary 12" fusible PVC waterline				
	2	1. Construct Trial and Load Test shafts * 2. Perform Load Test. Demobilize drilled shaft equipment off site.	See Civil 3		Special drilling equipment*	S1.1, S8.3					*Special Provisions Section 511
	3	1. Install Detour Pier, Abutments and Temporary Bridge. Construct Civil Phase 1 waterline Improvements C-29; C-30. 2. Construct Detour Approach Retaining Wall, Fills and Roadway – chainlink fence see C-23. 3. Construct Civil Phase 2 waterline improvements–see C-29; C-31.	See Civil 4 C-23, C-29, C-30, C-31, C-32	E-10, E-11, E-15	Excavation Bracing–Spec. Prov. 205*	S12.1, S12.2 S12.3, S12.4 S12.5	Civil Phase 1 & 2 (W16) waterline work–see C-29, C-30.		Detour Open to Traffic		*Excavation Bracing anticipated upstream of detour.
	4	1. Relocate existing water line W12 (prior to existing bridge demolition) – see C-20, C-28. 2. Demolish existing bridge.	See Civil 5 C-20, C-28		Excavation Bracing–Spec. Prov. 205*	S2.1, S2.2	Relocate Exist W12 waterline C-20, C-28.	Exist Bridge Demolition			*Exc. Bracing upstream of existing.
	5	Construct precast girders. (May be done concurrently with stages 1 through 4.)	See Civil 6			S4.x series					
	6	Construct 4 ft. diameter drilled shafts. 1, 2, 3, 5, 6, 7. *			Special drilling equipment*	S1.1,S1.2,S6.1, S6.2,S8.1,S8.2					*Special Provisions Section 511
STRUCTURAL PHASE 1	7	Cast phase 1 drilled shaft cap beams, girder seats, and corbels for concrete encased ducts at least 7 days after the final drilled shaft concrete pour in stage 6 or until the concrete in stage 6 has attained a compressive strength of 4,500 psi, whichever occurs later.			Structure – Excavation Bracing per Spec Prov 205	S0.7, S0.7A, S6.x series					Marks 7 through 18 are PHASE 1. Structural see 20 for PHASE 2
	8	Erect phase 1 precast girders at least 15 days after the concrete pour in stage 7 or until the concrete in stage 7 has attained a compressive strength of 5,000 psi, whichever occurs later. Place slush grout immediately prior to placement of precast girders.			Required at Makai Limit	S0.7, S0.7A, S1.2, S1.3, S6.x series					
	9	Construct phase 1 intermediate diaphragms.				S0.7,S0.7A, S5.x series					
	10	Pour phase 1 cast-in-place deck except areas over end beams and duct encasement.				S0.7,S0.7A S1.6,S3.1,S3.2					
	11	Pour phase 1 end beams to top of precast girder and corbel at least 30 days after the concrete pour in Stage 10. The concrete pour shall occur between midnight and 3:00 AM (3 hours).				S0.7,S0.7A, S6.x series					Concrete Placement At Night
	12	Pour remainder of phase 1 deck concrete a minimum of 24 hours after the concrete pour in stage 11.									
	13	Construct phase 1 wing walls at least 8 days after the concrete pour in stage 12 or after the concrete in stage 12 has attained a compressive strength of 5,000 psi, whichever occurs later.				S0.7,S0.7A, S7.x series				Lane Closure Duration Approx 3 weeks each abutment with Further Lane Closure Duration Approx 2 weeks each approach	
	14	Backfill to phase 1 limits and to bottom of approach slab and at least 14 days after the concrete pour in Stage 13 or until the concrete in Stage 13 has attained a compressive strength of 5,000 psi, whichever occurs later. Maximum height difference of backfill between abutments shall not exceed 2 feet. Install concrete encased ducts when backfill height is at the elevation of bottom of concrete encased ducts. Continue backfilling after concrete for encased ducts has attained its 28 day compressive strength.		Signal Corps Work E-1, E-5 E-12, E-13, E-16		S0.7,S0.7A,S6.x S9.x					
	15	Construct phase 1 sleeper slabs.									
	16	Construct phase 1 approach slabs.		Signal Corps Work E-1, E-5 E-12,E-13,E-16							
	17	Construct mauka aesthetic railings and concrete barrier.									
	18	Install mauka quadguards.									
	19	Install Temporary Barriers and Temporary Striping on PHASE 1 of New Bridge.	See Civil for Barriers								

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	64	148

CONSTRUCTION SEQUENCE NOTES:

1. Order of construction sequence shall not be changed unless authorized in writing by the Engineer.
2. Each sequence stage shall be completely finished before proceeding to the next stage unless otherwise noted. The Engineer will be the sole judge of whether the sequence stage is complete, and may direct the Contractor to stop work on a sequence stage to complete work on the preceeding sequence stage.
3. Contractor shall submit overweight vehicular details for approval prior to their use.
4. Construction shall be conducted such that no construction debris, wash water or other contaminants shall enter the Stream Waters.
5. Closing of the Prefabricated Steel Beam Bridge Structure:
   (a) If for any reason or at any time, the Prefabricated Beam Bridge Structure's ability to safely carry traffic is in question, the Contractor shall be responsible for immediately taking the actions necessary to protect the public by closing, repairing and reopening the Prefabricated Steel Truss Bridge.
   (b) When the Contractor closes the Prefabricated Steel Beam Bridge Structure, the Contractor shall immediately notify the Engineer and the appropriate Law Enforcement Agency.
   (c) Closing of the Prefabricated Steel Beam Bridge shall be included as incidental to Maintenance of Traffic Control.
6. The Contractor shall phase 16 inch waterline (W16) to allow no more than 8 hours of down time. Liquidated Damages of $100,000 per day will be imposed if the Contractor exceeds the 8 hour restriction.

ORIGINAL PLAN
SURVEY PLOTTED BY ____ DATE
DRAWN BY BSY
TRACED BY
NOTE BOOK WC
DESIGNED BY
QUANTITIES BY
CHECKED BY
No.

STEWART N. WILLIAMS
LICENSED PROFESSIONAL ENGINEER
No. 3908-S
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

4/30/16
SIGNATURE LIC. EXPIRATION
MITSUNAGA & ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

OVERALL CONSTRUCTION SEQUENCE
STRUCTURAL PHASE 1

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: AS NOTED Date: April 2015

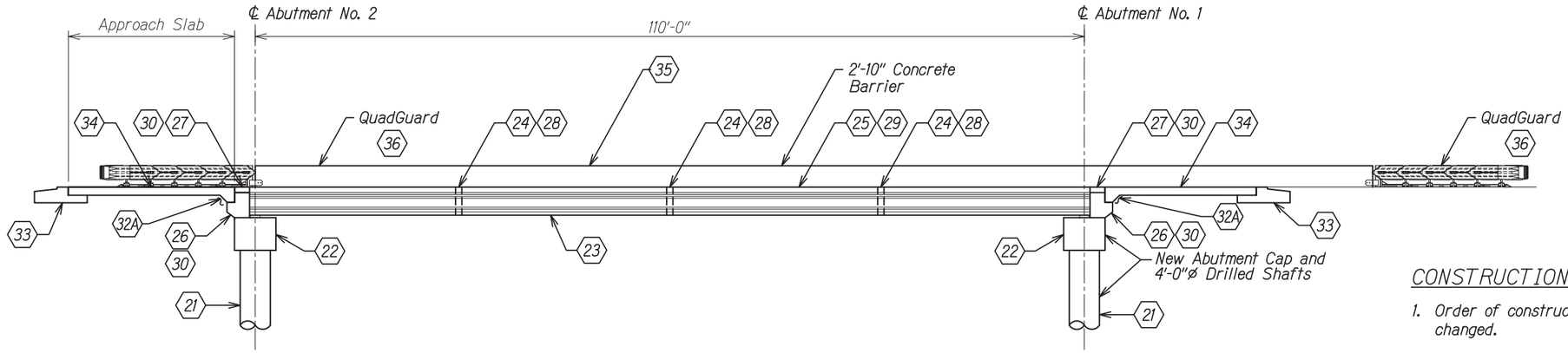
SHEET No. S0.7B OF 12 SHEETS

RMTC JOB NO. : 1-19548-0E

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	65	148

To Kaneohe ←

→ To Kahuku



CONSTRUCTION SEQUENCE

Scale: 1/8" = 1'-0"

CONSTRUCTION SEQUENCE NOTES:

1. Order of construction sequence shall not be changed.
2. Each sequence stage shall be completely finished before proceeding to the next stage unless otherwise noted. The Engineer will be the sole judge of whether the sequence stage is complete, and may direct the Contractor to stop work on a sequence stage to complete work on the preceeding sequence stage.
3. Contractor shall submit overweight vehicular details for approval prior to their use.

LEGEND:

(#) Phase 2 Stages

CONSTRUCTION SEQUENCE ELEVATION

(20) Partially remove temporary bridge as required to construct Phase 2 of Kaipapau Stream Bridge

(21) Construct 4 ft diameter shafts – Shaft nos. 4 and 8.

(22) Cast Phase 2 drilled shaft cap beams, girder seats, and corbels for concrete jacketed waterline at least 7 days after the final drilled shaft concrete pour in Stage 21 or until the concrete in Stage 21 has attained a compressive strength of 4,500 psi, whichever occurs later.

(23) Erect Phase 2 precast girders at least 15 days after the concrete pour in Stage 22 or until the concrete in Stage 22 has attained a compressive strength of 5,000 psi, whichever occurs later. Place slush grout immediately prior to placement of precast girders.

(24) Construct Phase 2 intermediate diaphragms between girders G-9 and G-10, install dowels connecting G-10 and G-11, and install W16 with light-weight concrete jacket between girders G-10 and G-11.

(25) Pour Phase 2 cast-in-place deck except areas over end beams and closure pour.

(26) Pour Phase 2 corbel and end beams (except at closure pour) to top of precast girder at least 30 days after the concrete pour in Stage 25. The concrete pour shall occur between midnight and 3:00 AM (3 hour window).

(27) Pour remainder of Phase 2 deck concrete (except at closure pour) a minimum of 24 hours after the concrete pour in Stage 26.

(28) Pour Phase 2 intermediate diaphragms between girders G-8 and G-9 at least 4 days after the concrete pour in Stage 27.

(29) Pour Phase 2 cast-in-place deck closure except over end beams. Material for cast-in-place deck closure pour shall be VESLMC. (See Special Provisions).

(30) Pour Phase 2 corbel and end beam closure from top of drilled shaft cap beam to top of deck. Material for end beam closure pour shall be VESLMC. (See Special Provisions).

(31) Construct Phase 2 wing walls at least 8 days after the concrete pour in Stage 30 or after the concrete in Stage 30 has attained a compressive strength of 5,000 psi, whichever occurs later.

(32A) Backfill to bottom of approach slab at least 14 days after the concrete pour in Stage 31 or until the concrete in stage 31 has attained a compressive strength of 5,000 psi, whichever occurs later. Maximum height difference of backfill between abutments shall not exceed 2 feet. Install jacketed waterline behind abutments when backfill height is at the elevation of the bottom of the jacketed waterline. Continue backfilling after concrete for jacketed waterline has attained its 28 day compressive strength.

(32B) Construct Barrier Wall.

(33) Construct Phase 2 sleeper slabs.

(34) Construct Phase 2 approach slabs.

(35) Constuct Makai aesthetic railing and concrete barrier.

(36) Install Makai quadguards.

(37) Remove remainder of temporary bridge.

STEWART N. WILLIAMS
LICENSED PROFESSIONAL ENGINEER
No. 3908-S
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

4/30/16
SIGNATURE LIC. EXPIRATION
MITSUNAGA & ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONSTRUCTION SEQUENCE
PHASE 2
KAMEHAMEHA HIGHWAY
Kaipapau Stream Bridge Replacement
Federal Aid Proj. No. BR-083-1(48)

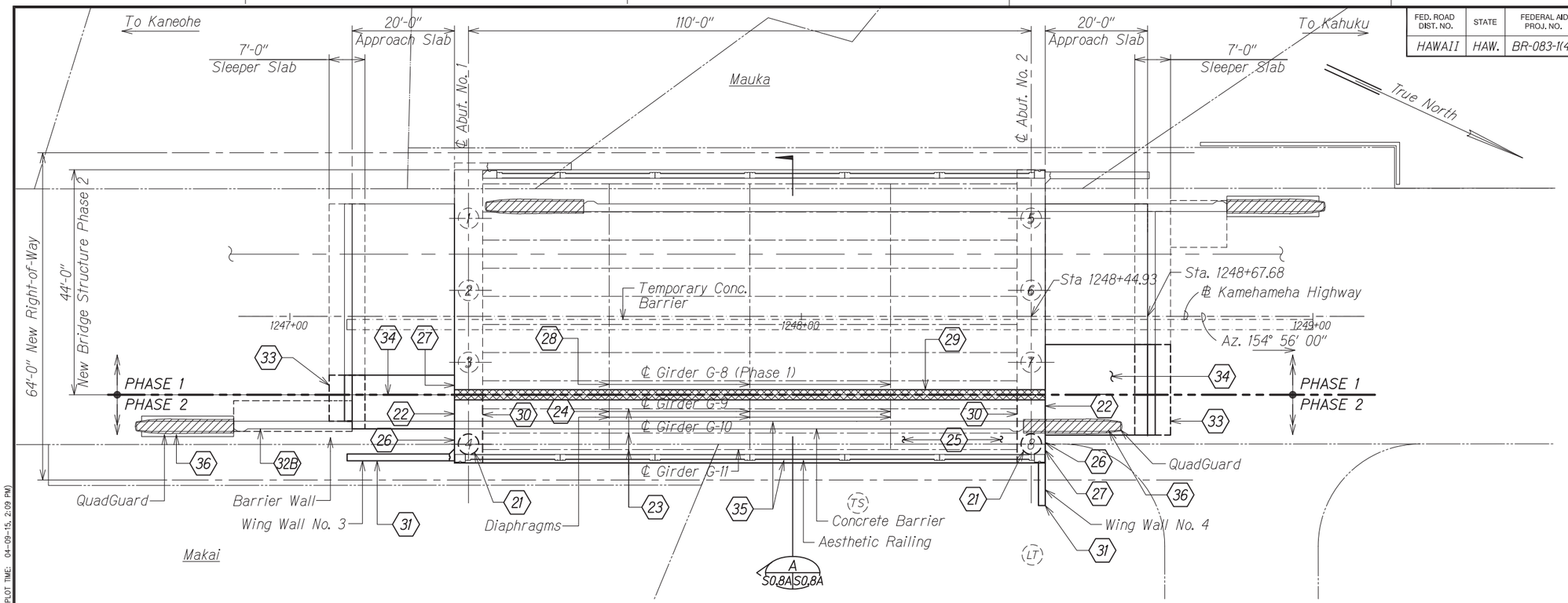
Scale: As Noted Date: April 2015

SHEET No. S0.8 OF 12 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

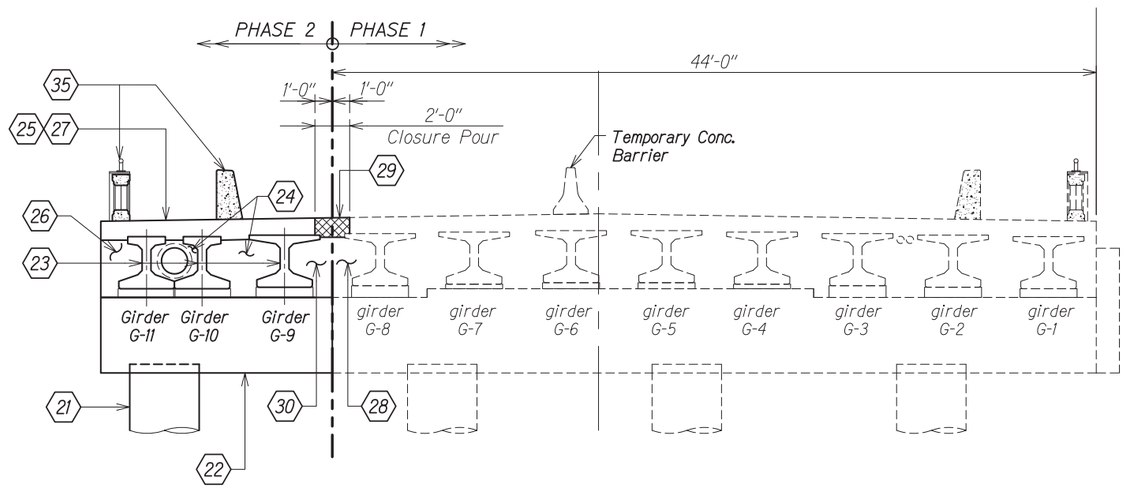
DRAWING NAME: K:\VERBATIM 12-10-14\B R I D G E\K A I 15-4-8\15-4-9 SW CADD PLOT\---1BI SW CADD 2015-04-10\KSB-S008.DWG PLOT TIME: 04-09-15, 11:03 AM)

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	66	148



PROPOSED CONSTRUCTION SEQUENCE PLAN (PHASE 2)

Scale: 3/32" = 1'-0"



CONSTRUCTION SEQUENCE (PHASE 2)

Scale: 1/4" = 1'-0"

A S6.3 S6.3

LEGEND:

- (#) Construction Sequence Stage
- (#) Drilled Shaft ID
- (TS) Trial Shaft
- (LT) Load Test Shaft
- Closure Pour

STEWART N. WILLIAMS LICENSED PROFESSIONAL ENGINEER No. 3908-S HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

4/30/16
SIGNATURE LIC. EXPIRATION
MITSUNAGA & ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONSTRUCTION SEQUENCE
PHASE 2

KAMEHAMEHA HIGHWAY
Kaipapau Stream Bridge Replacement
Federal Aid Proj. No. BR-083-1(48)

Scale: As Noted Date: April 2015

SHEET No. S0.8A OF 12 SHEETS

ORIGINAL PLAN	DATE
	SURVEY PLOTTED BY
NOTE BOOK	DRAWN BY
	TRACED BY
	DESIGNED BY
No.	QUANTITIES BY
	CHECKED BY

DRAWING NAME: K:\VERBATIM 12-10-14\BRIDGE\K A I 15-4-8\15-4-9 SW CADD PLOT\---1BI SW CADD 2015-04-10\KSB-S008A.DWG PLOT TIME: 04-09-15, 2:09 PM)

KAIPAPAU STREAM BRIDGE REPLACEMENT – OVERALL CONSTRUCTION SEQUENCE

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-083-1(48)	2016	67	148

Structural Construction Stage		Description	References: Civil	Electrical	Geotech.	Structural	Waterline Work	Exist Bridge Open	Detour Open	Detour Off Peak Lane Closures Anticipated	Remarks
	20	1. Open PHASE I of New Bridge to traffic. Close Temporary Bridge and Detour Roadway to traffic. 2. Remove Mauka portion of Temporary Bridge Only (Remainder to remain in place to support construction equipment for construction of PHASE 2 portion of New Bridge and to support temporary W16 until Final W16 is constructed).				S0.8, S0.8A		PHASE I of New Bridge Open to Traffic to allow Detour Closure	Close Detour and Remove Limited Portion of Temporary Bridge	Not Applicable	Close Detour; Open PHASE 1 of New Bridge: Start Construction of PHASE 2 of New Bridge
STRUCTURAL PHASE 2	21	Construct 4 ft. diameter drilled shafts – Shaft nos. 4 and 8.	See Civil 6		Special drilling equipment*	S1.1, S1.2, S6.1, S6.2, S8.1, S8.2			Detour Closed		*Special Provisions Section 511
	22	Cast Phase 2 drilled shaft cap beams, girder seats, and corbels for concrete jacketed waterline at least 7 days after the final drilled shaft concrete pour in stage 21 or until the concrete in stage 21 has attained a compressive strength of 4,500 psi, whichever occurs later.			Structure Excavation Bracing per Spec for 205 Required at Approaches.	S0.8, S0.8A, S6.x series					Special Provisions Section 205
	23	Erect Phase 2 precast girders at least 15 days after the concrete pour in stage 22 or until the concrete in stage 22 has attained a compressive strength of 5,000 psi, whichever occurs later. Place slush grout immediately prior to placement of precast girders.				S0.8, S0.8A, S1.2, S1.3, S6.x series	Civil Phase 3 (W16) waterline improvements seeC-29,C32				
	24	Construct Phase 2 intermediate diaphragms between girders G-9 and G-10 and light-weight W16 concrete jacket between girders G-10 and G-11.	C-29, C-30			S0.8,S0.8A, S5.x series					
	25	Pour Phase 2 cast-in-place deck except areas over end beams and closure pour.				S0.8,S0.8A S1.6,S3.1,S3.2					
	26	Pour Phase 2 end beams (except at closure pour) to top of precast girder and corbel at least 30 days after the concrete pour in Stage 25. The concrete pour shall occur between midnight and 3:00 AM (3 hours).				S0.8,S0.8A, S6.x series					Concrete Placement At Night
	27	Pour remainder of Phase 2 deck concrete (except at closure pour) a minimum of 24 hours after the concrete pour in stage 25.									
	28	Pour Phase 2 intermediate diaphragms between girders G-8 and G-9 at least 4 days after the concrete pour in stage 27.									
	29	Pour Phase 2 cast-in-place deck closure except over end beams. Material for cast-in-place deck closure pour shall be VESLMC.									
	30	Pour Phase 2 end beams closure from top of drilled shaft cap beam to top of deck. Material for end beam closure pour shall be VESLMC.									
	31	Construct Phase 2 wing walls at least 8 days after the concrete pour in stage 30 or after the concrete in stage 30 has attained a compressive strength of 5,000 psi, whichever occurs later.				S0.8,S0.8A, S7.x series					
	32	Backfill to bottom of approach slab at least 14 days after the concrete pour in Stage 31 or until the concrete in Stage 31 has attained a compressive strength of 5,000 psi, whichever occurs later. Maximum height difference of backfill between abutments shall not exceed 2 feet. Install jacketed waterline when backfill height is at the elevation of bottom of the jacketed waterline. Continue backfilling after concrete for jacketed waterline has attained its 28 day compressive strength.				S0.8,S0.8A,S6.x S9.x					
	33	Construct Phase 2 sleeper slabs.									
	34	Construct Phase 2 approach slabs.									
	35	Construct Makai aesthetic railings and concrete barrier.									
	36	Install Makai guadguards. Remove Detour; construct stream hardening. Remove Temporary Barriers at New Bridge. Open Phase 1 and Phase 2 of New Bridge to traffic.	See Civil 7 thru 12	Permanent Electrical Plan See E-12,E-13, E-14			Remove temp W16 at Closed Detour	PHASE I and PHASE 2 of New Bridge Open	Remove Remainder of Detour		

CONSTRUCTION SEQUENCE NOTES:

1. Order of construction sequence shall not be changed unless authorized in writing by the Engineer.
2. Each sequence stage shall be completely finished before proceeding to the next stage unless otherwise noted. The Engineer will be the sole judge of whether the sequence stage is complete, and may direct the Contractor to stop work on a sequence stage to complete work on the preceeding sequence stage.
3. Contractor shall submit overweight vehicular details for approval prior to their use.
4. Construction shall be conducted such that no construction debris, wash water or other contaminants shall enter the Stream Waters.
5. Closing of the Prefabricated Steel Beam Bridge Structure:
   (a) If for any reason or at any time, the Prefabricated Beam Bridge Structure's ability to safely carry traffic is in question, the Contractor shall be responsible for immediately taking the actions necessary to protect the public by closing, repairing and reopening the Prefabricated Steel Truss Bridge.
   (b) When the Contractor closes the Prefabricated Steel Beam Bridge Structure, the Contractor shall immediately notify the Engineer and the appropriate Law Enforcement Agency.
   (c) Closing of the Prefabricated Steel Beam Bridge shall be included as incidental to Maintenance of Traffic Control.
6. The Contractor shall phase 16 inch waterline (W16) to allow no more than 8 hours of down time. Liquidated Damages of $100,000 per day will be imposed if the Contractor exceeds the 8 hour restriction.

ORIGINAL PLAN | SURVEY PLOTTED BY | DATE
NOTE BOOK | DRAWN BY | BSY
No. | TRACED BY | WC
DESIGNED BY
QUANTITIES BY
CHECKED BY

STEWART N. WILLIAMS
LICENSED PROFESSIONAL ENGINEER
No. 3908-S
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

4/30/16
SIGNATURE | LIC. EXPIRATION
MITSUNAGA & ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

OVERALL CONSTRUCTION SEQUENCE
STRUCTURAL PHASE 2

Kamehameha Highway
Kaipapau Stream Bridge Replacement
Federal Aid Project No. BR-083-1(48)

Scale: AS NOTED | Date: April 2015

SHEET No. S0.8B OF 12 SHEETS

RMTC JOB NO. : 1-19548-0E

Attachment A – 3: Quantity of Storm Water Discharge Calculations

KAIPAPAU STREAM BRIDGE REPLACEMENT (PROJECT NO. BR-083-1(48))
KAMEHAMEHA HIGHWAY, STATE ROUTE 83

Storm Event: 10-year, 1-Hr. rainfall recurrence interval

Hydrologic Criteria: The hydrologic criteria established in the City and County of Honolulu, Department of Planning and Permitting, Storm Drainage Standards (2000), will be utilized in calculating design flows.

Method of Determining Existing Design Flows

Design flows for the developed areas will be based on the Rational Method (for drainage areas less than 100 acres):

Q	=	Flow rate (cfs), where
C	=	Runoff coefficient
I	=	Rainfall intensity in inches per hour for a duration equal to the time of concentration (inches/hr)
A	=	Drainage area in acres

Hydrologic Calculations

Rational Method (Drainage Areas Less Than 100 Acres):

Runoff Coefficient, C

C = 0.90 for flat paved areas

Average Rainfall Intensity, I

I = 2.2 in/hr (Plate 1: Intensity of 10-year, 1-Hr. Rainfall)

Time of Concentration, Tc

Tc = 7.5 min. (Plate 3: Overland Flow Chart)

Correction Factor, F

F = 2.50 (Plate 4: Correction Factor)

Drainage Area, A

A = 1.6 acres

Q = (0.90)(2.2 in/hr)(2.50)(1.6 acres) = 7.92 cfs

REFERENCES

Rules Relating to Storm Drainage Standards, Department of Planning and Permitting, City & County of Honolulu, January 2000.

Table 2

MINIMUM RUNOFF COEFFICIENTS FOR BUILT-UP AREAS

RESIDENTIAL AREAS:	C = 0.55 to 0.70
HOTEL-APARTMENT AREAS:	C = 0.70 to 0.90
BUSINESS AREAS:	C = 0.80 to 0.90
INDUSTRIAL AREAS:	C = 0.80 to 0.90

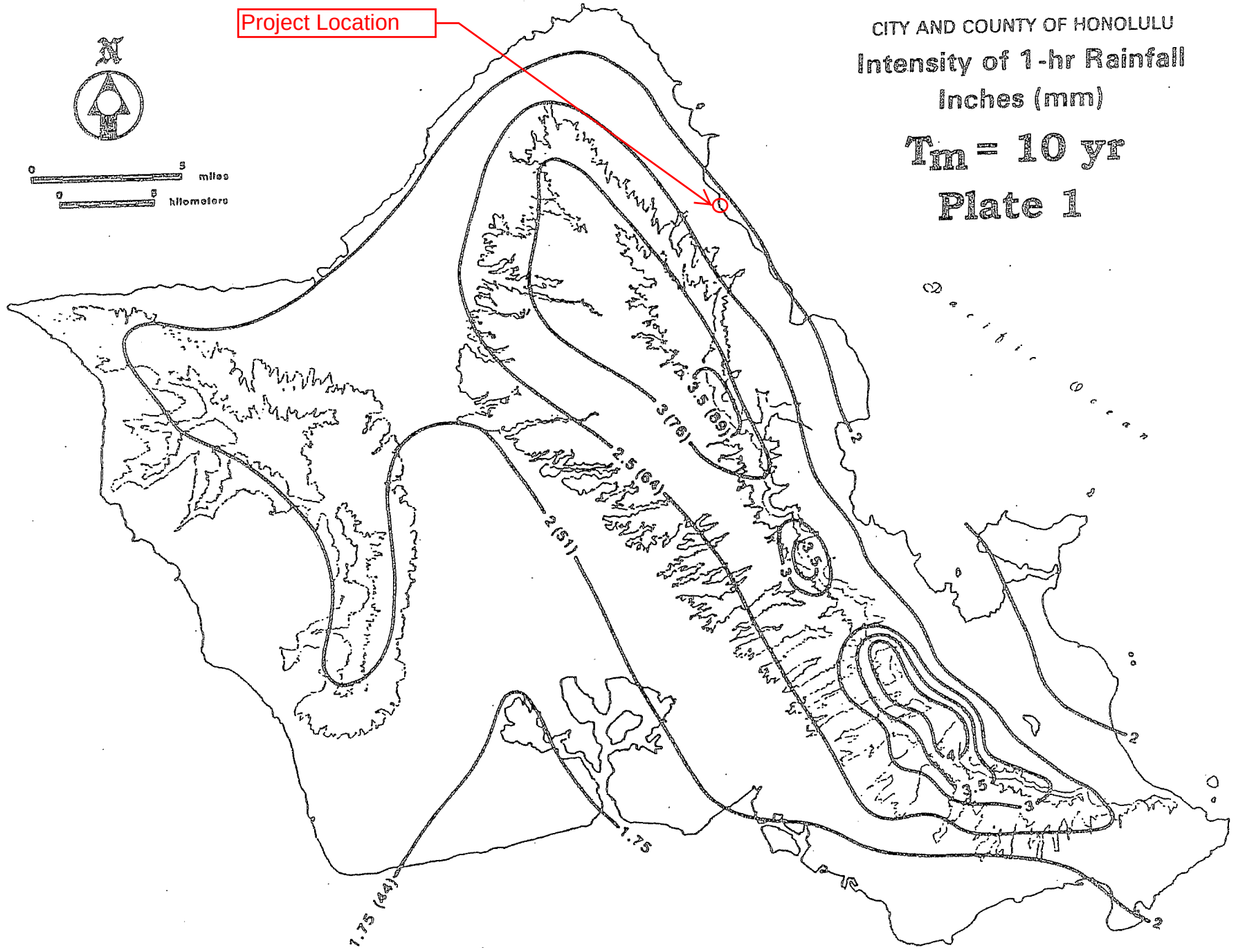
The type of soil, the type of open space, and ground cover and the slope of the ground shall be considered in arriving at reasonable and acceptable runoff coefficients.

Table 3

APPROXIMATE AVERAGE VELOCITIES OF RUNOFF FOR CALCULATING TIME OF CONCENTRATION

TYPE OF FLOW	VELOCITY IN fps FOR SLOPES (in percent) INDICATED			
	0-3%	4-7%	8-11%	12-15%
OVERLAND FLOW:				
Woodlands	1.0	2.0	3.0	3.5
Pastures	1.5	3.0	4.0	4.5
Cultivated	2.0	4.0	5.0	6.0
Pavements	5.0	12.0	15.0	18.0
OPEN CHANNEL FLOW:				
Improved Channels	Determine Velocity by Manning Formula			
Natural Channel*	1.0	3.0	5.0	8.0
(not well defined)				

* *These values vary with the channel size and other conditions so that the ones given are averages of a wide range. Wherever possible, more accurate determinations should be made for particular conditions by Manning Formula or from Plate 5.*



SOURCE: DEPARTMENT OF LAND AND NATURAL RESOURCES STATE OF HAWAII

Plate 3

Overland Flow Chart

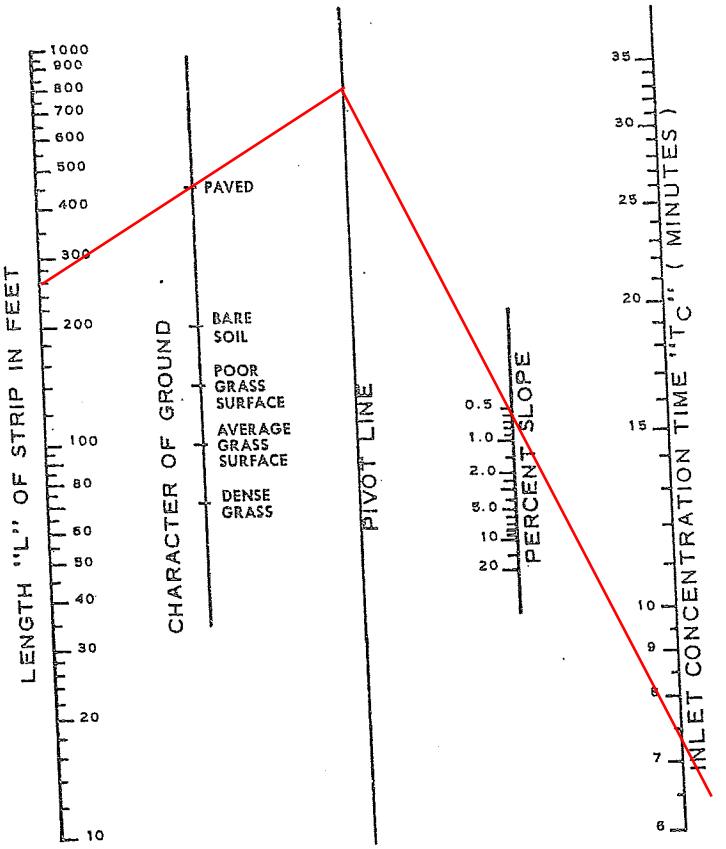
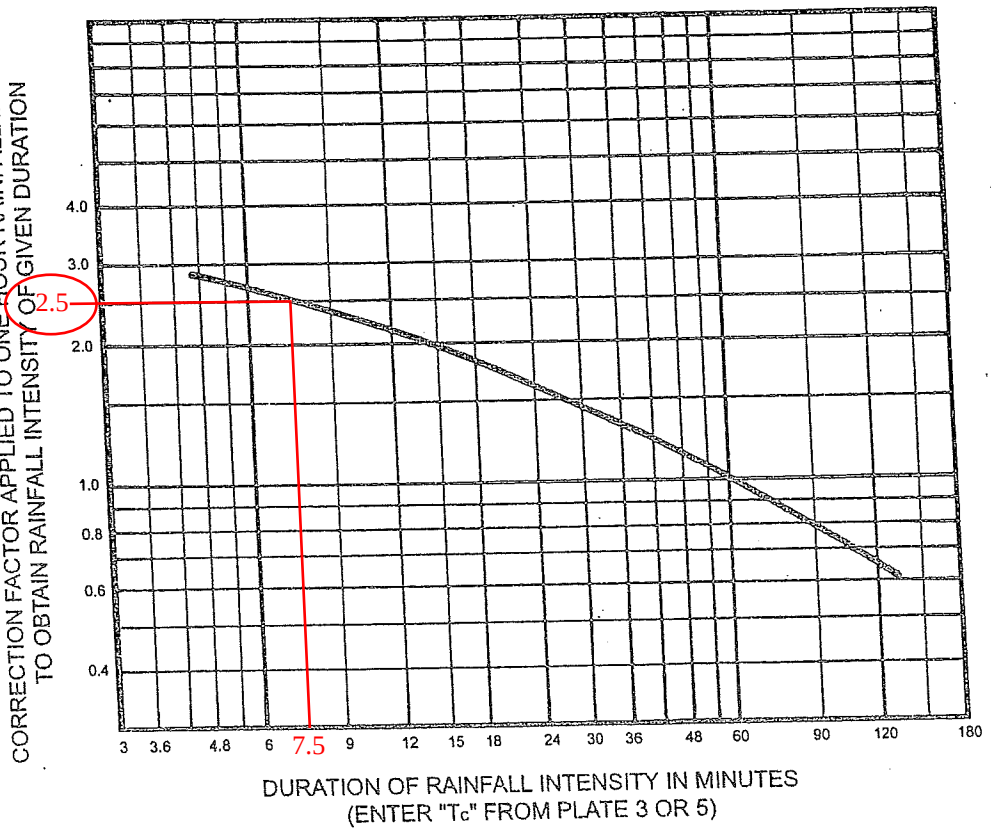


Plate 4



CORRECTION FACTOR

FOR CONVERTING 1 HR. RAINFALL TO RAINFALL INTENSITY OF VARIOUS DURATIONS

TO BE USED FOR AREA LESS THAN 100 ACRES

(See Plate 6 for area more than 100 acres)

Attachment A – 4: Storm Water Flow Chart

Total Runoff:

Storm Water Runoff — 7.92 cfs
(See **Attachment A-3: Quantity of Strom Water Discharge Calculations**)

Site-Specific Best Management Practices (BMPs) Plan — 7.92 cfs
(See **Attachment A-2: Construction Plans/Drawings**)

A. Management Controls
- Good housekeeping practices
- Keep adjacent road area free of dirt and mud
- Cover construction material and debris as applicable

B. Structural Controls
- Stream diversion
- Wall makai of bridge for slope protection
- Rip-rap or CRM slope protection at the abutment walls
- Dewatering basin
- Concrete wash-out basin

C. Vegetative Controls
- Grass/mulch all slopes and exposed areas

Receiving State Waters — 7.92 cfs

Discharge Point 1 & 2
Kaipapa‘u Stream
Class 2 Inland — 7.92 cfs