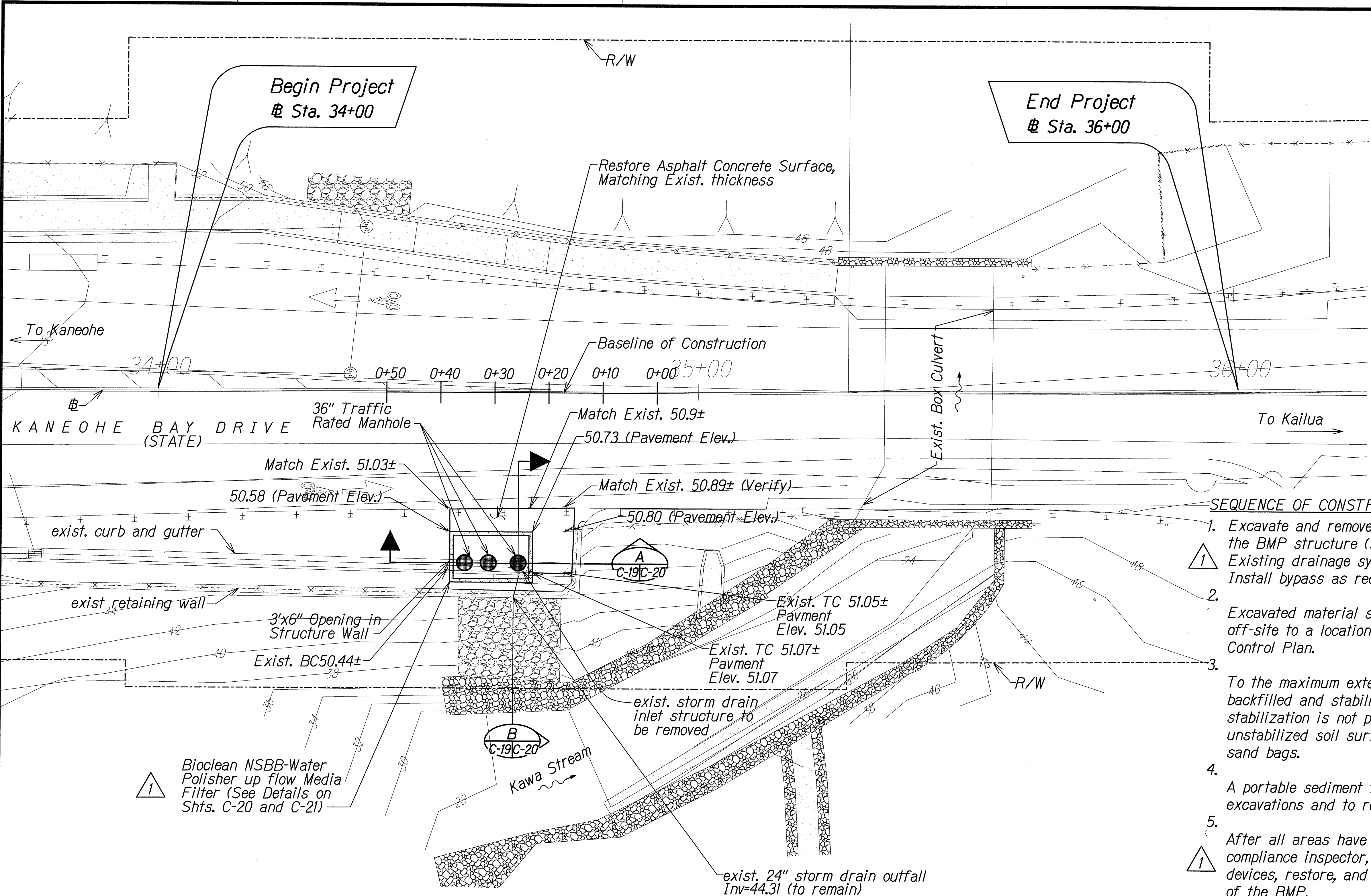
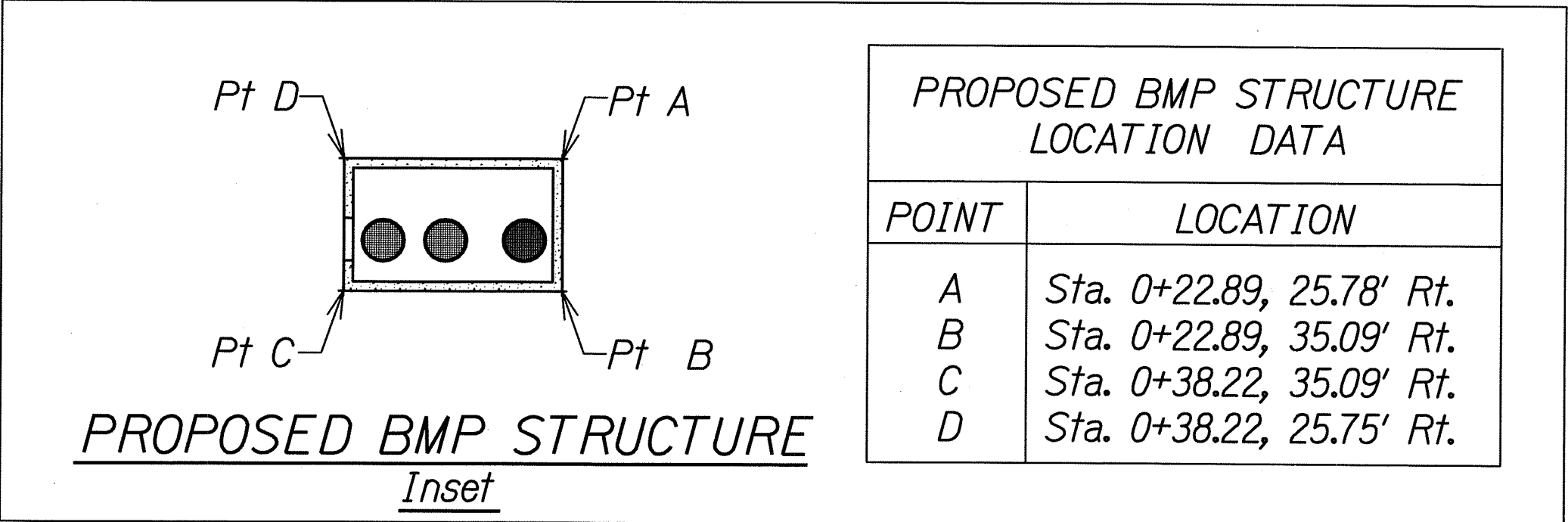


FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HWY-0-02-11	2012	ADD. 31	43

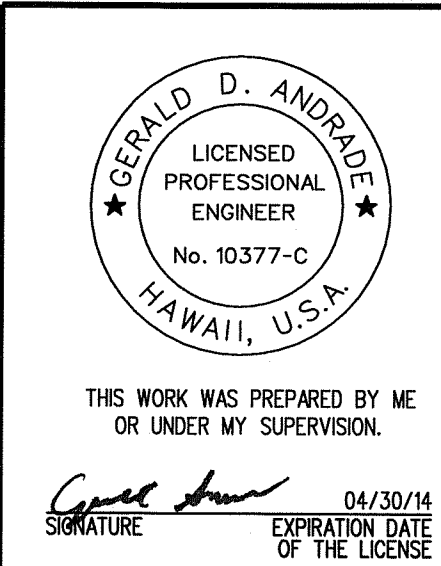


- SEQUENCE OF CONSTRUCTION:**
1. Excavate and remove existing structure as necessary to install the BMP structure (Storm Water Treatment Device). Existing drainage system must remain functional at all times. Install bypass as required.
 2. Excavated material shall not be stockpiled on-site but shall be taken off-site to a location with an approved Erosion and Sediment Control Plan.
 3. To the maximum extent possible the BMP Installation site shall be backfilled and stabilized at the end of each day. If same day stabilization is not possible, the contractor shall protect unstabilized soil surfaces with impermeable sheeting secured with sand bags.
 4. A portable sediment tank shall be used as necessary to dewater excavations and to remove sediment laden water.
 5. After all areas have been stabilized and with approval from the compliance inspector, remove erosion and sediment control devices, restore, and stabilize any areas disturbed by the installation of the BMP.

BASELINE CONTROL COORDINATES		
STATION	EASTING	NORTHING
0+00	7935.88	-5317.06
0+10	7936.64	-5327.04
0+20	7937.40	-5337.01
0+30	7938.16	-5346.98
0+40	7938.92	-5356.95
0+50	7939.68	-5366.92



PROPOSED BMP STRUCTURE LOCATION DATA	
POINT	LOCATION
A	Sta. 0+22.89, 25.78' Rt.
B	Sta. 0+22.89, 35.09' Rt.
C	Sta. 0+38.22, 35.09' Rt.
D	Sta. 0+38.22, 25.75' Rt.

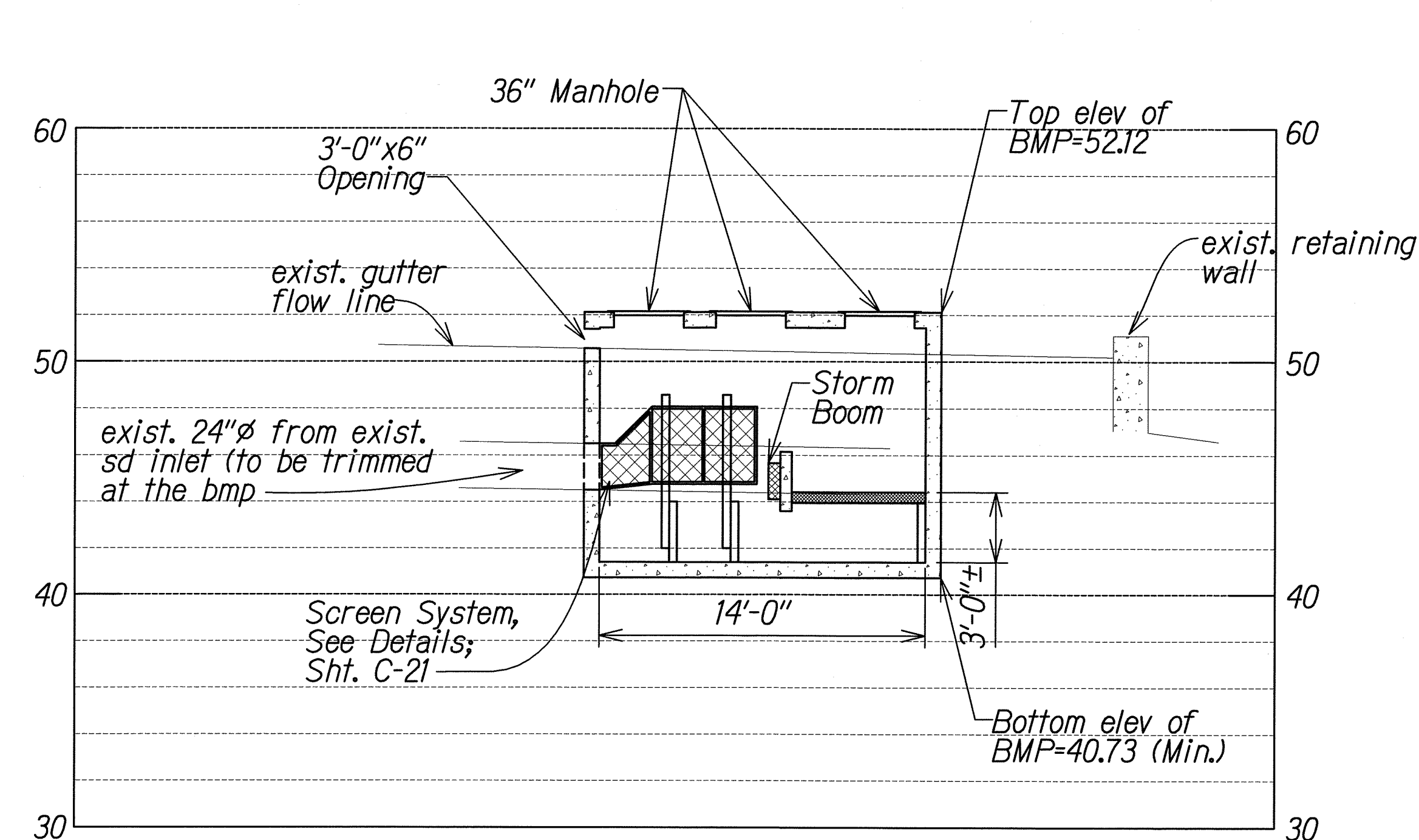


6/13/12	Revised notes.
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION KANEOHE BAY DRIVE BMP RETROFIT PLAN MISCELLANEOUS PERMANENT BEST MANAGEMENT PRACTICES ON OAHU PROJECT NO. HWY-0-02-11 Scale: 1"=10' Date: May, 2012	

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
NOTED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
DATE	

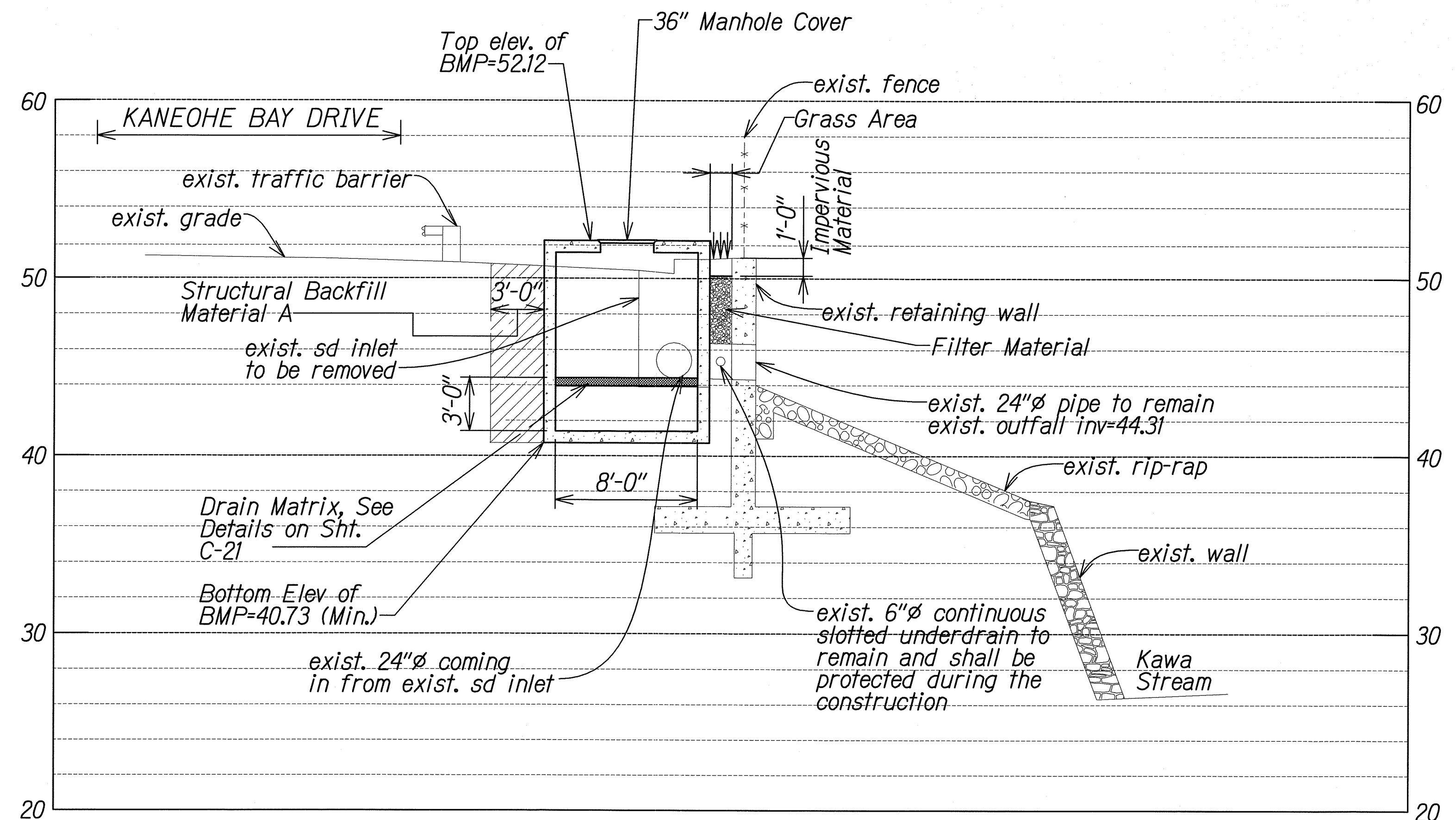
T-16523A-Permanent BMP/Cadd/ Sheets 01-Kawa-Plandon

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HWY-0-02-11	2012	ADD. 32	43



SECTION THROUGH NSBB-WATER POLISHER FLOW MEDIA FILTER

Scale: 1"=5' Horiz.
1"=5' Vert.



SECTION THROUGH NSBB-WATER POLISHER FLOW MEDIA FILTER

Scale: 1"=5' Horiz.
1"=5' Vert.

DATE	_____
DESIGNED BY	_____
TRACED BY	_____
NOTED BY	_____
CHECKED BY	_____
QUANTITIES BY	_____
NO.	_____

T:\16523A-Permanent BMP\Cadd\Sheets\Section\Kawa_Section_01.dgn

6/13/12	Revised titles.
Date	Revision

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

SIGNATURE: *Russ S. Miyahara* EXPIRATION DATE: 04/30/14

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**KANEOHE BAY DRIVE
BMP RETROFIT SECTION**

MISCELLANEOUS PERMANENT BEST
MANAGEMENT PRACTICES ON OAHU

PROJECT NO. HWY-0-02-11

Scale: As noted Date: May, 2012

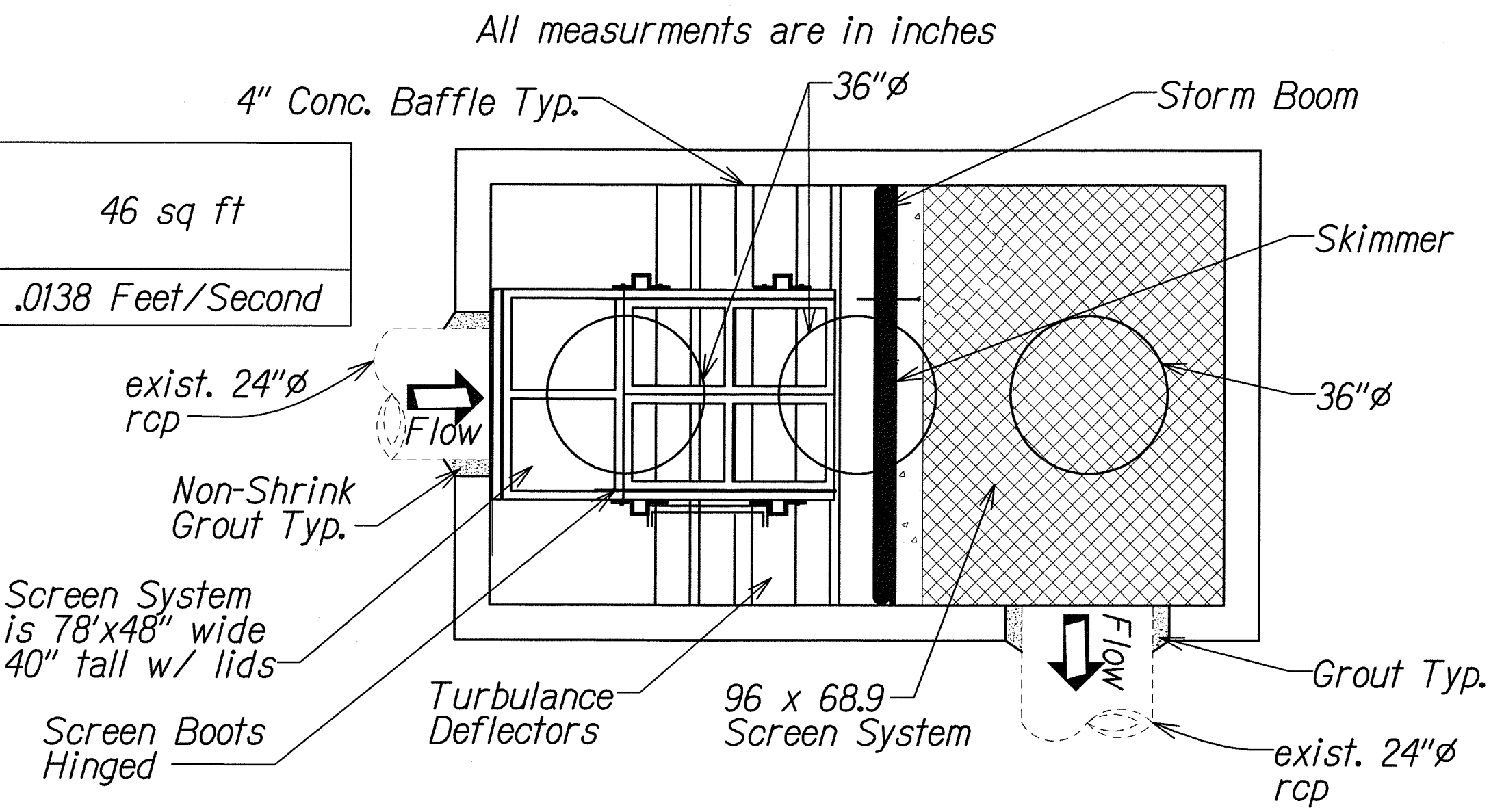
SHEET No. C-20 OF 23 SHEETS

ADD. 32

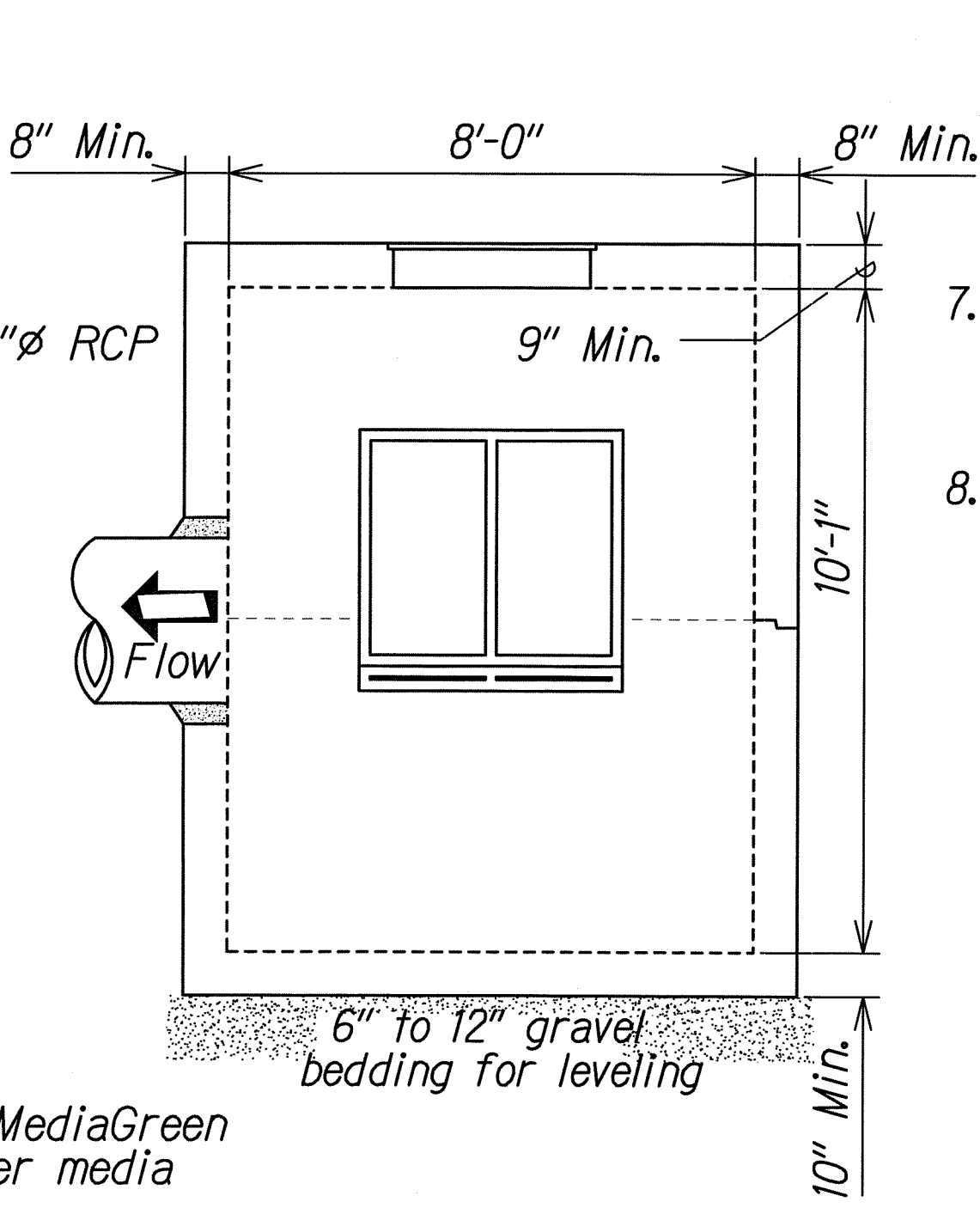
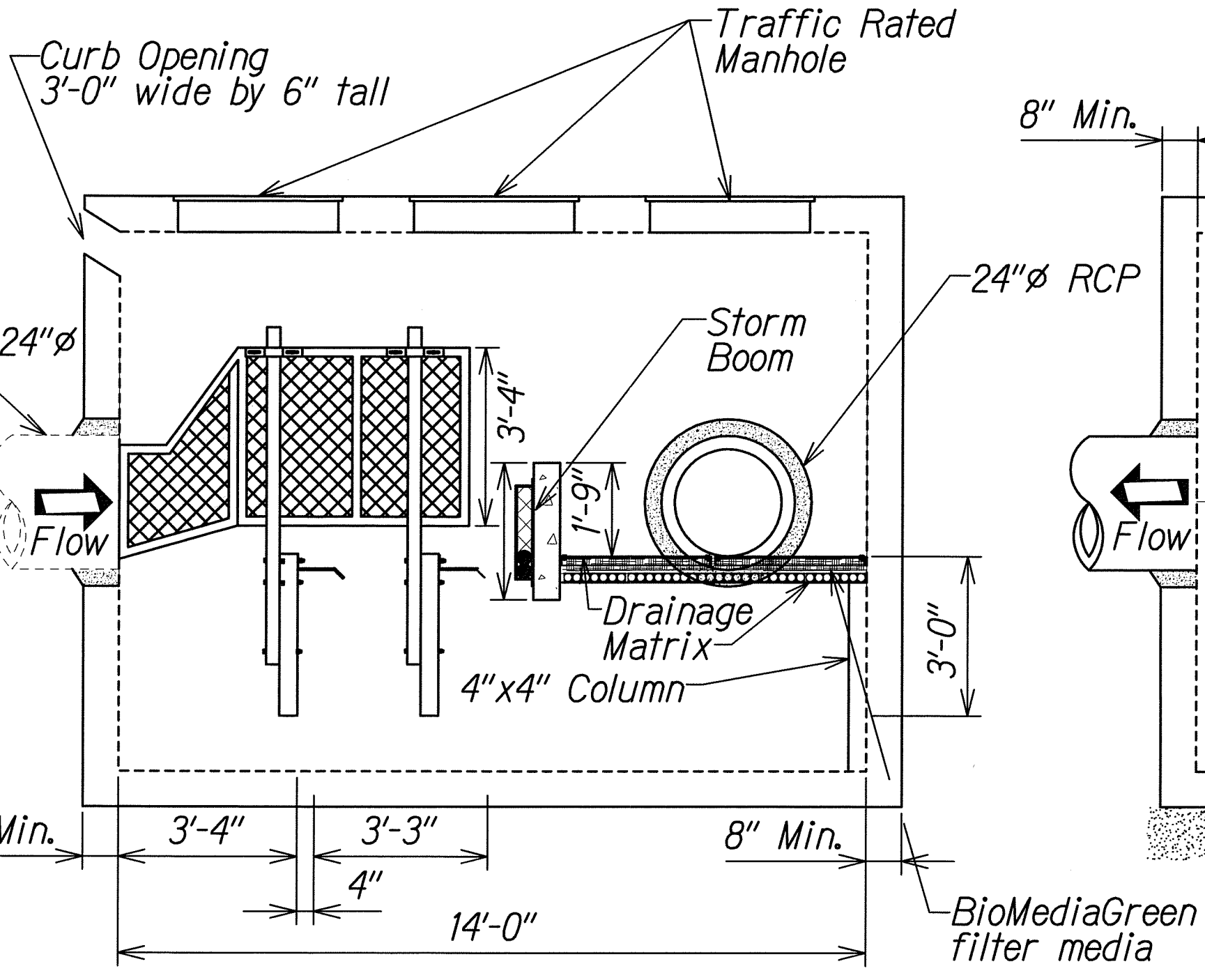
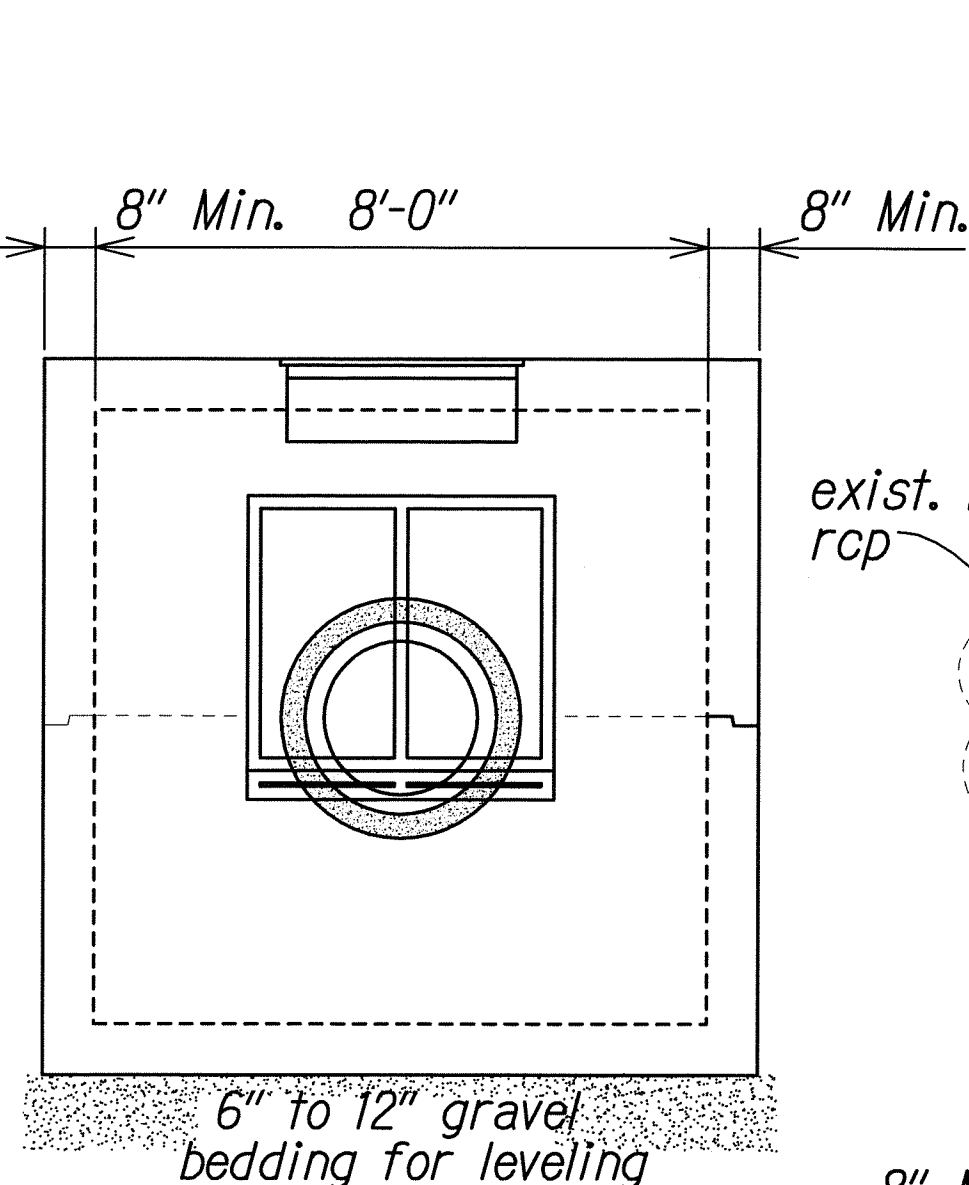
FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HWY-0-02-11	2012	ADD. 33	43

FILTER FLOW CALCULATIONS

UP FLOW Media Surface Area (flat)	46 sq ft
Hydraulic Conductivity (BioMediaGREEN)	.0138 Feet/Second
Available Head	21"
MAX Media Filter Flow Rate (no clogging)	5.07 CFS
Safety Factor	2
Media Filter Flow Rate (accounts for clogging)	2.54 CFS
PEAK DESIGN FLOW	TBD



BIOMEDIA GREEN TESTED REMOVAL EFFICIENCIES	
Total Suspended Solids "Si-Co-Sil 106"	85%
Dissolved Phosphorus	69%
Fecal Coliform	68%
Dissolved Copper	79%
Dissolved Lead	98%
Dissolved Zinc	78%
Dissolved Mercury	71%
TPH	99%



NOTES:

1. Complies with ASTM C 858
2. The shop drawings provide information on the storm filter, filter media and accessory equipment including principle dimensions, filter placement, location of fittings and unit foundation.
3. This is a passive treatment system. Up flow vertical media filter.
4. Media cartridges easily replaceable and can incorporate a variety of filter media.
5. See manufacturer's representative regarding recommendations for specified equipment.
6. Manhole Frames and Covers shall be cast iron conforming to ASTM A48/A48M, Class No. 30, see standard Specs. These manhole covers are equipped with recesses lift handle and a locking latch. The manhole covers shall meet HL-93 loading requirements. Ladders shall be constructed of aluminum and steel reinforced copolymer conforming to ASTM D 4101. Ladder shall meet all ASTM C 497M. Steps shall conform with ASTM C 478.

LEFT END VIEW

FRONT VIEW

RIGHT END VIEW

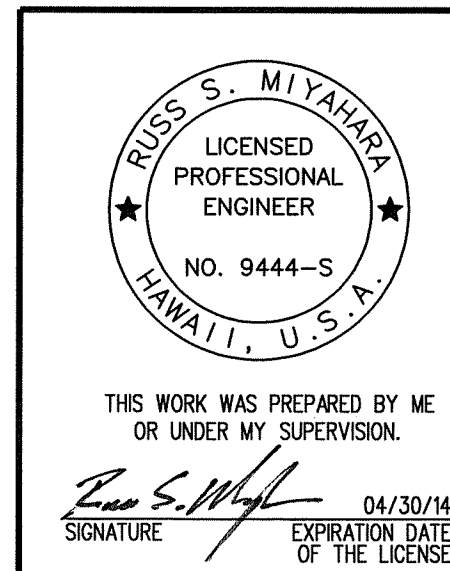
BIOCLEAN ENVIRONMENTAL NSBB-WATER POLISHER-UP FLOW MEDIA FILTER DESIGN DETAILS NTS

NOTES:

1. Concrete 28 day compressive strength $f_c=5,000$ psi
2. Reinforcing: ASTM A-615, grade 60, deformed bars.
3. Loads:
A: Dead load: Concrete weight=160 pcf
B: Live load: HL-93 as indicated by AASHTO LRFD specifications.
C: Soil properties:
Soil dry weight=120 pcf
At-Rest pressure=50 pcf
Passive pressure=300 pcf
Coefficient of friction=0.4
Allowable bearing pressure=3,000 psf
4. Joint sealant: Butyl rubber SS-S-00210.
5. Unless otherwise noted, all walls shall be 8" thick minimum. Top slab shall be 9" thick minimum. Bottom slab shall be 10" thick minimum.
6. Concrete cover reinforcement:
A: Top slab: 2 1/2" for reinforcement at exterior face; 2" for reinforcement at interior face.
B: Bottom slab 3" for reinforcement at exterior face; 2" for reinforcement at interior face.
C: Wall: 2" for reinforcement at exterior face and interior face.
7. Filter material and structural backfill material A shall conform with the requirements of 2005 HDOT Standards Specifications Subsections 206.03.
8. The BMP drawings and calculations shall be prepared, designed, stamped, and signed under the supervision of a civil and structural engineer licensed in the State of Hawaii as required in Section 627.

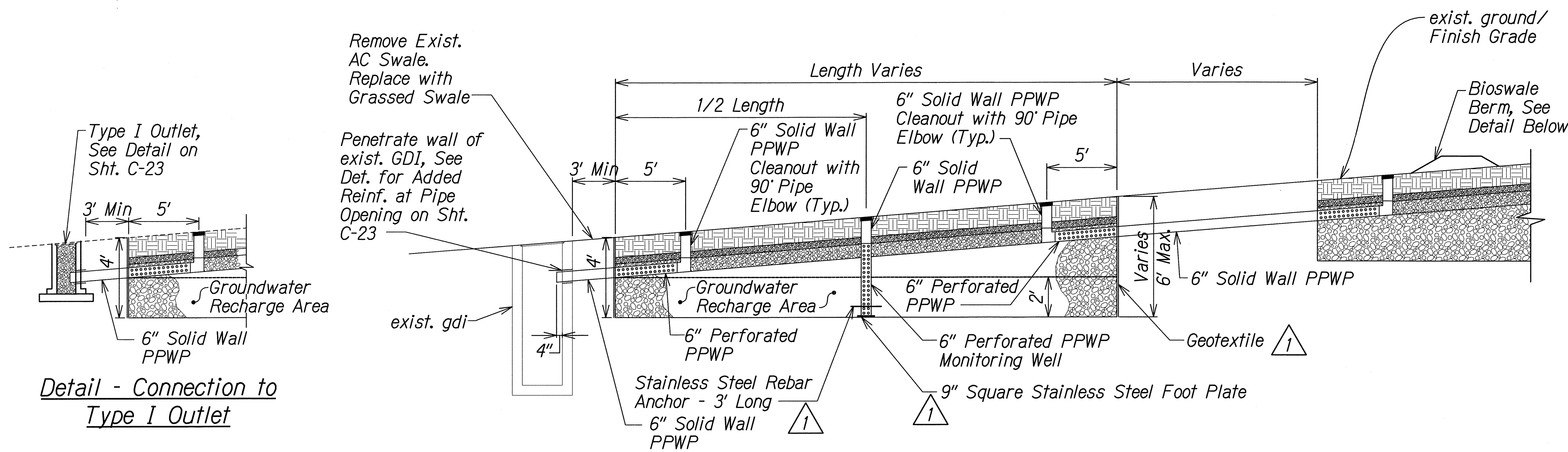
SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
NOTED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
NO.	

T:\16523A-Permanent-BMP\Cadd\Sheet\Details\03_Kawa-Detail.dgn



6/13/12	Revised notes.
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
MISCELLANEOUS DETAIL KANEŌHE BAY DRIVE BMP RETROFIT MISCELLANEOUS PERMANENT BEST MANAGEMENT PRACTICES ON OAHU PROJECT NO. HWY-0-02-11 Scale: NTS Date: May, 2012	
SHEET No. C-21 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HWY-0-02-11	2012	ADD. 34	43

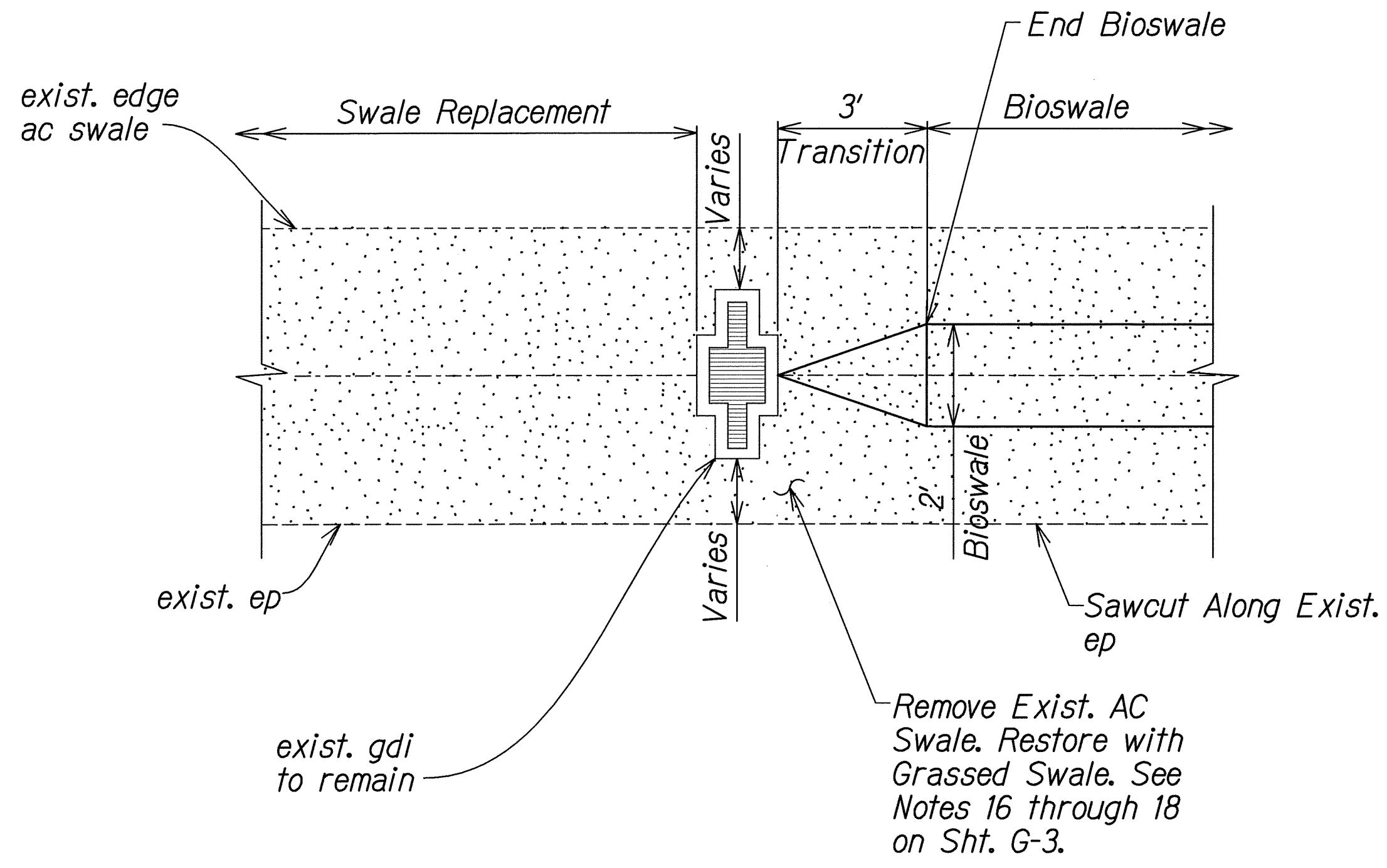


- NOTES:**
1. Bioswale trench shall be excavated when soil is dry and friable. Construction in wet soil will cause smearing and compaction which will decrease the soil's ability to absorb water.
 2. The sides and bottom of the trench shall be raked to depth of 1 inch to expose natural soil structure and to remove any smeared and compacted soil surface before filter media is installed.

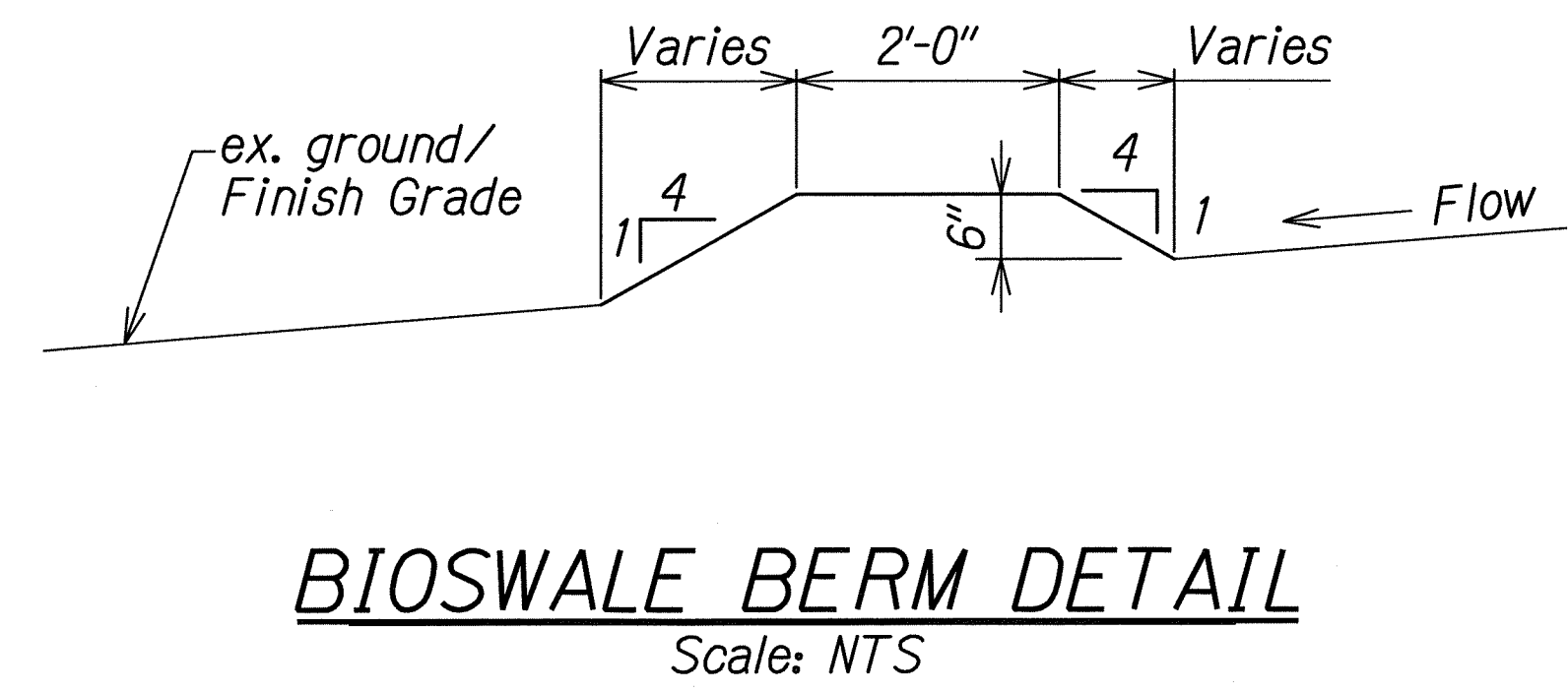
Biotrench Filter Media Legend

	Bioretention Soil Mixture (BSM)
	No. 7 Aggregate
	No. 57 Aggregate
	No. 2 Aggregate

TYPICAL PROFILE - BIOSWALE (IN SERIES)
Scale: NTS



TYPICAL SWALE RESTORATION @ BIOSWALE TO EXISTING INLET CONNECTION
Scale: NTS



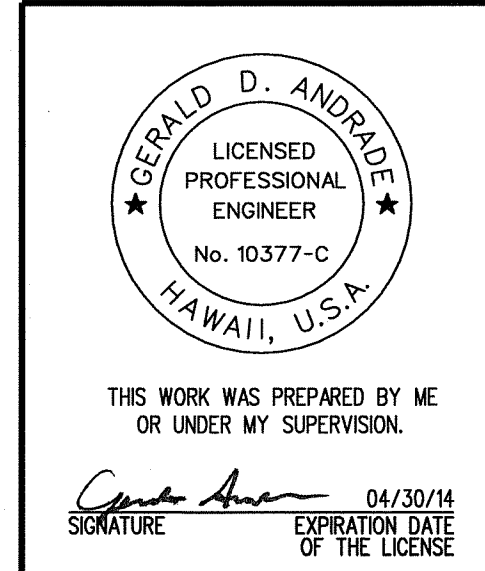
Note:
Install Bioswale Berm at 50 feet intervals along entire length of Bioswale.

BIOSWALE BERM DETAIL
Scale: NTS

SURVEY PLOTTED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
NO.	

T-16522A-Permanent BMP/Cadd/Sheets/Details/D-34.dgn

6/13/12	Revised typical profile.
Date	Revision

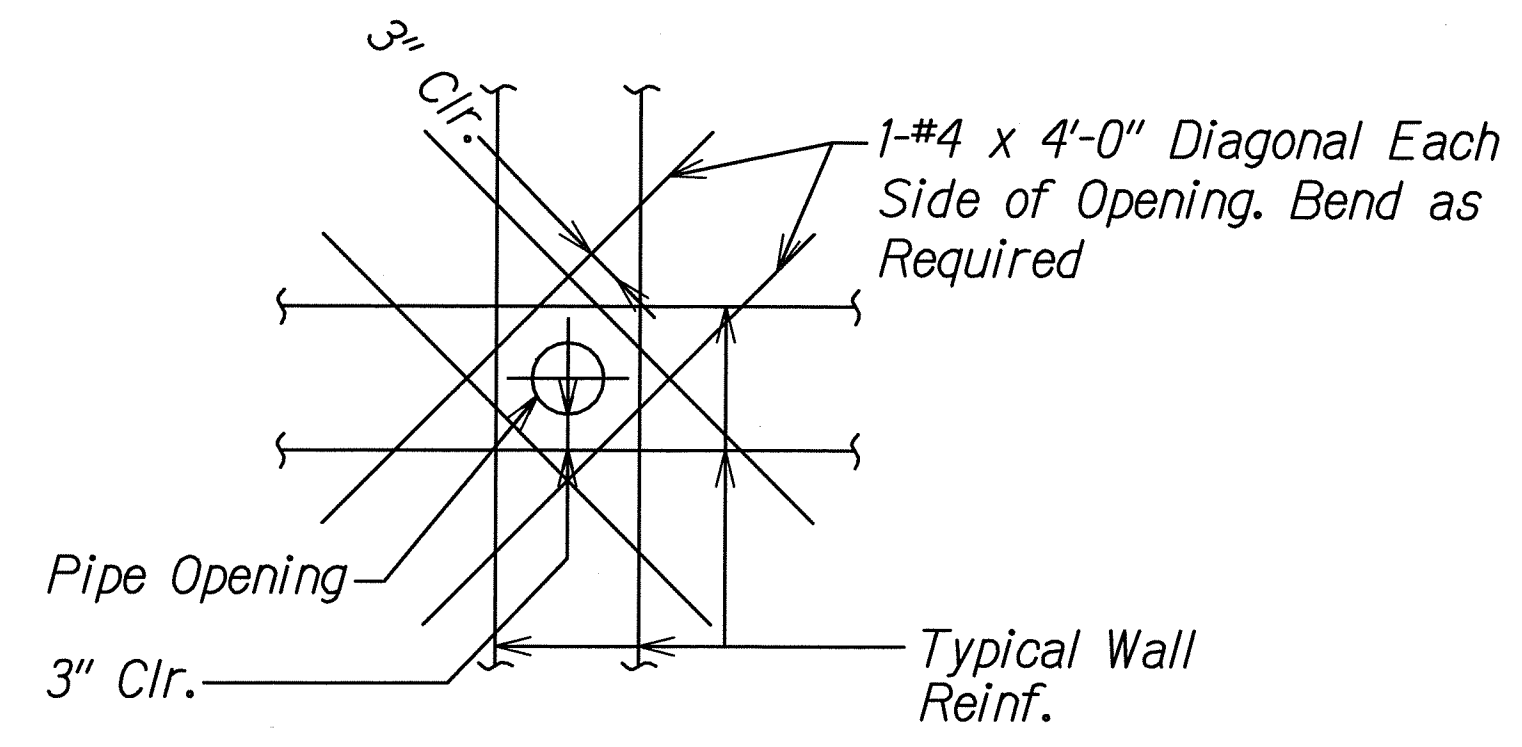


STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BIOSWALE DETAILS

MISCELLANEOUS PERMANENT BEST
MANAGEMENT PRACTICES ON OAHU
PROJECT NO. HWY-0-02-11
Scale: NTS Date: May, 2012

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HWY-0-02-11	2012	ADD. 35	43

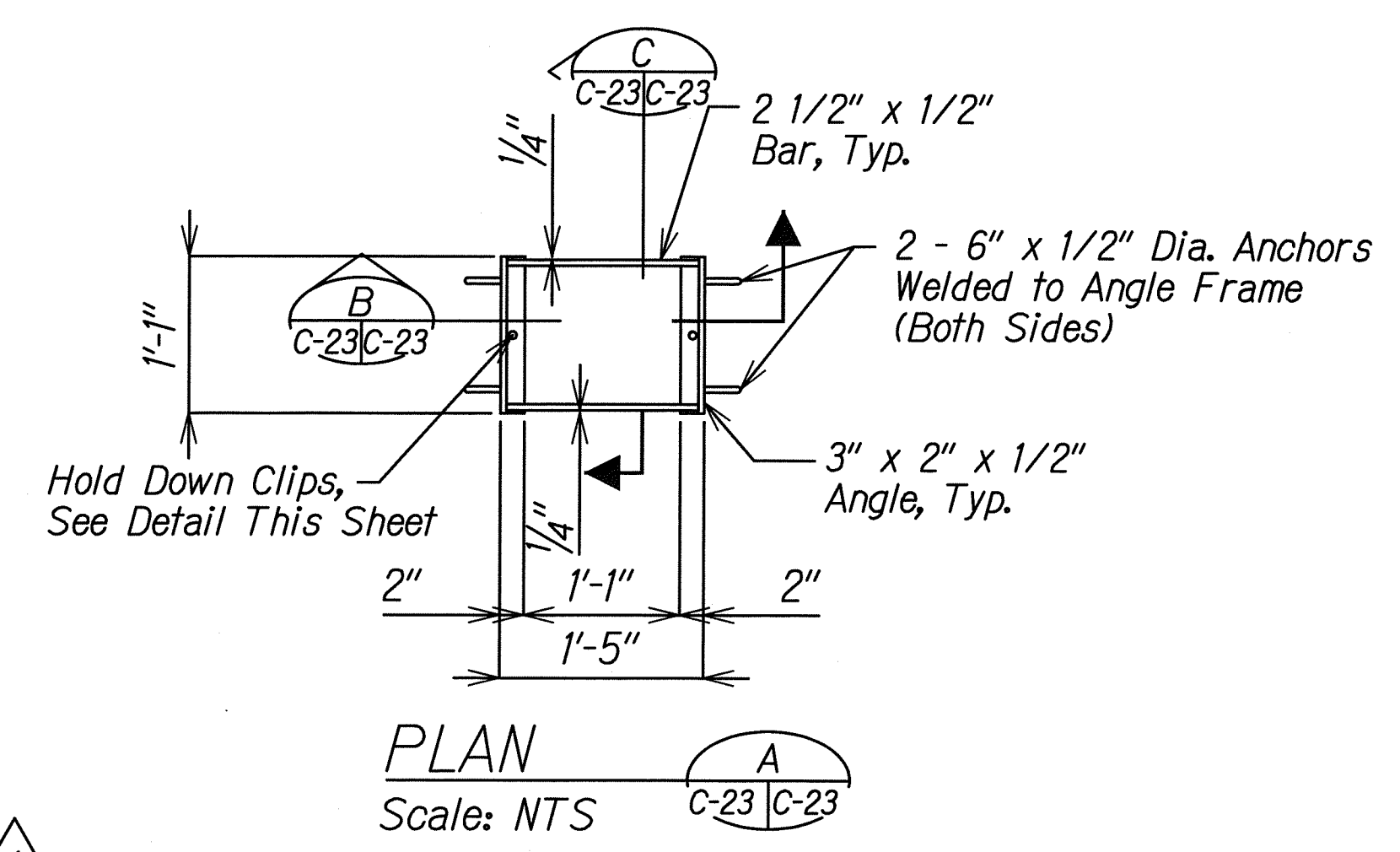


ADDED REINF. AT PIPE OPENING DETAIL

Scale: NTS

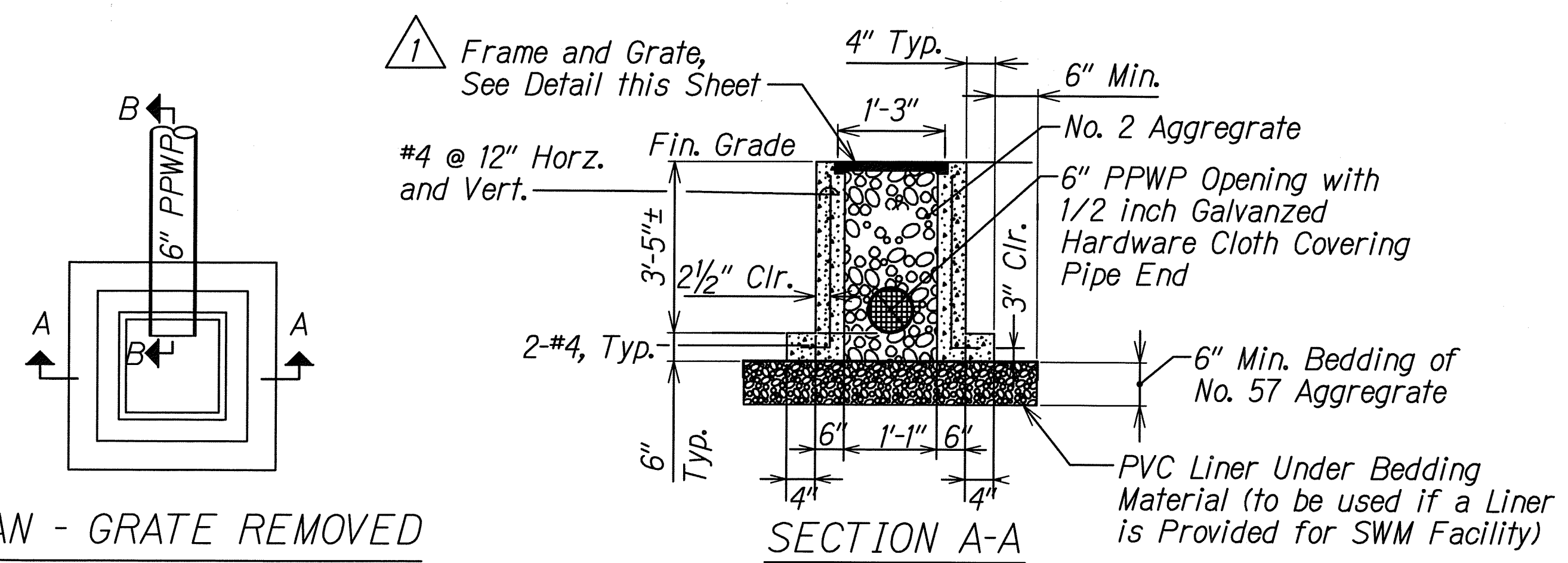
TYP. 1 OUTLET NOTES:

- 15"x15" Grate inlet with angle frame shall be cast iron, light duty (Neenah R-4550/R-4899 or approved equal.)
- Concrete 28 Day Compressive Strength shall be $f'c=4,000$ psi.
- Reinforcing steel shall be ASTM A-615, Grade 60 deformed bars.
- Cost of the Type I Outlet shall be incidental to the various individual Bioswales.



STEEL GRATING NOTES:

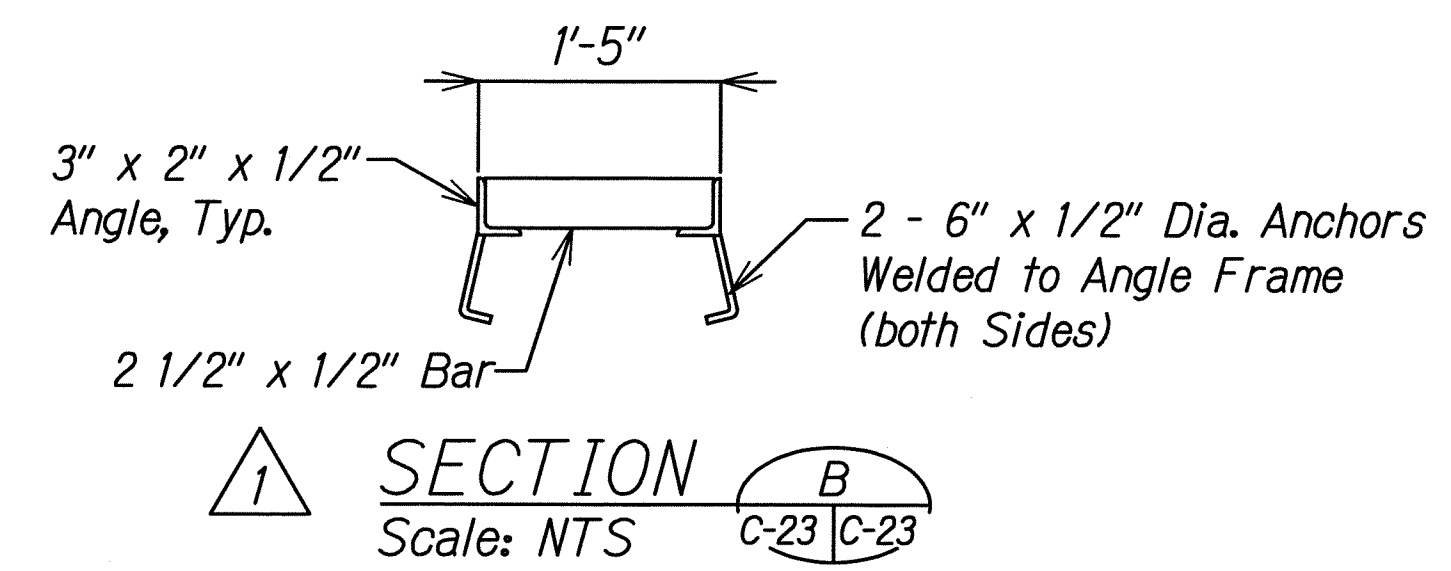
- Frames and Gratings, including Bolts, Nuts and Washers, shall be Hot-Dip Galvanized after fabrication.
- All Welds for the Frame shall be $\frac{3}{8}$ ", unless otherwise noted.
- Grind corners of Bearing Bar as required to ensure complete contact between Bearing Bars and Angle Frame.



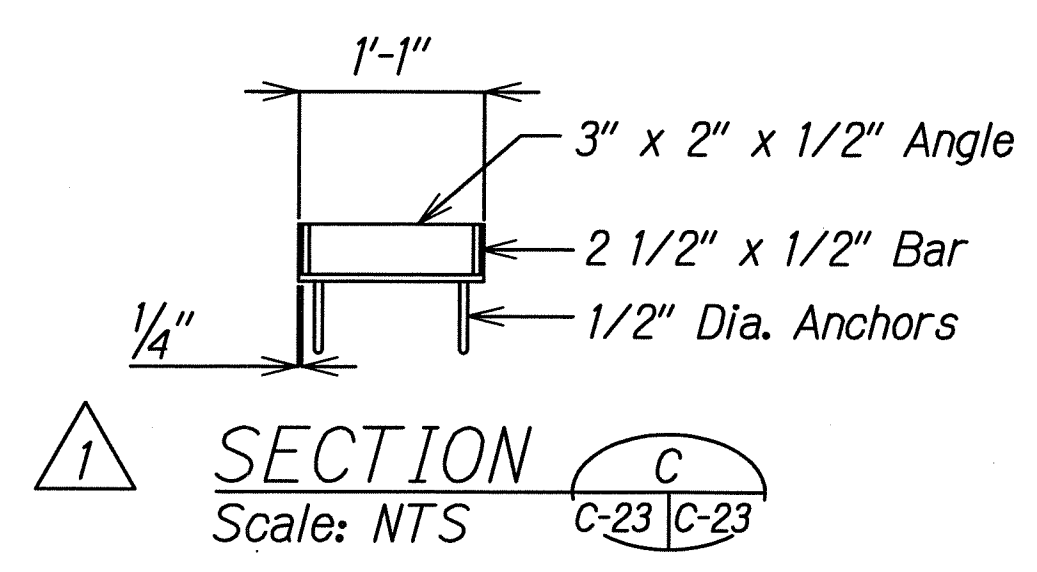
PLAN - GRATE REMOVED

BIOSWALE TO TYPE I OUTLET CONNECTION DETAILS

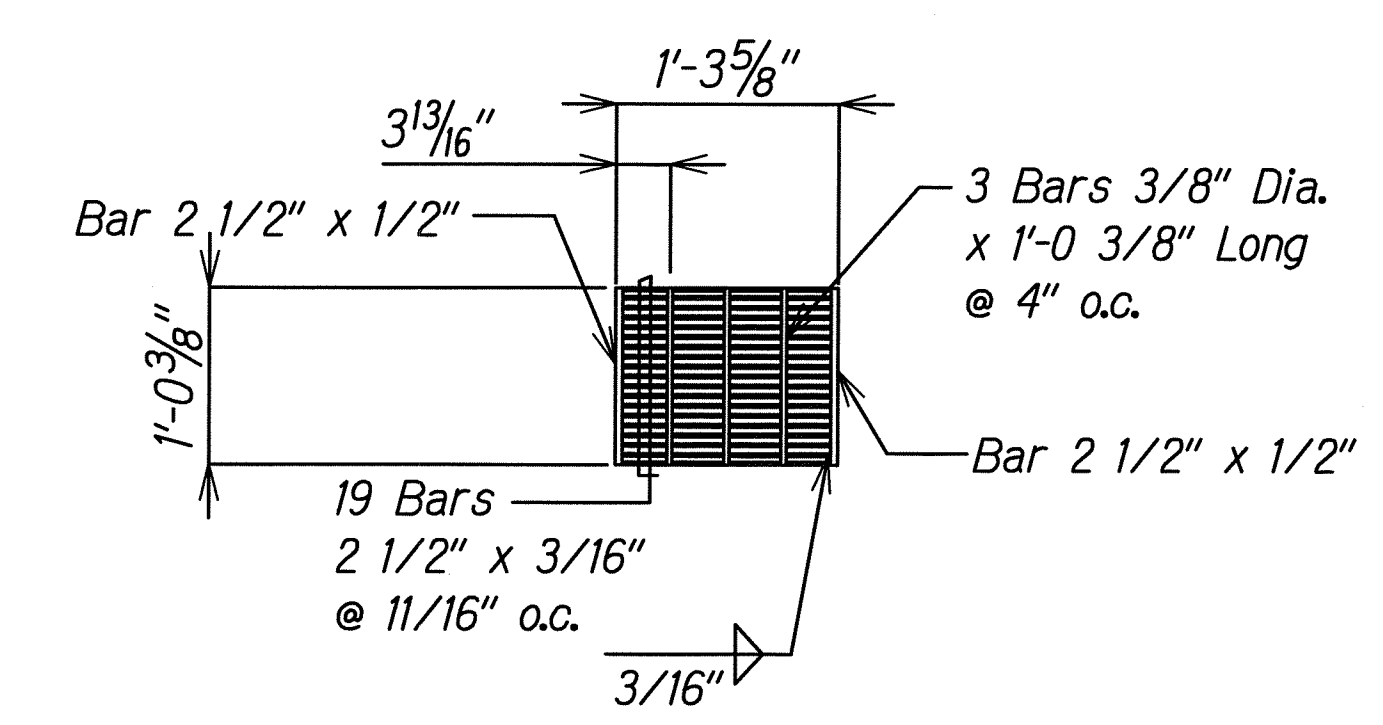
Scale: NTS



SECTION B-B
Scale: NTS



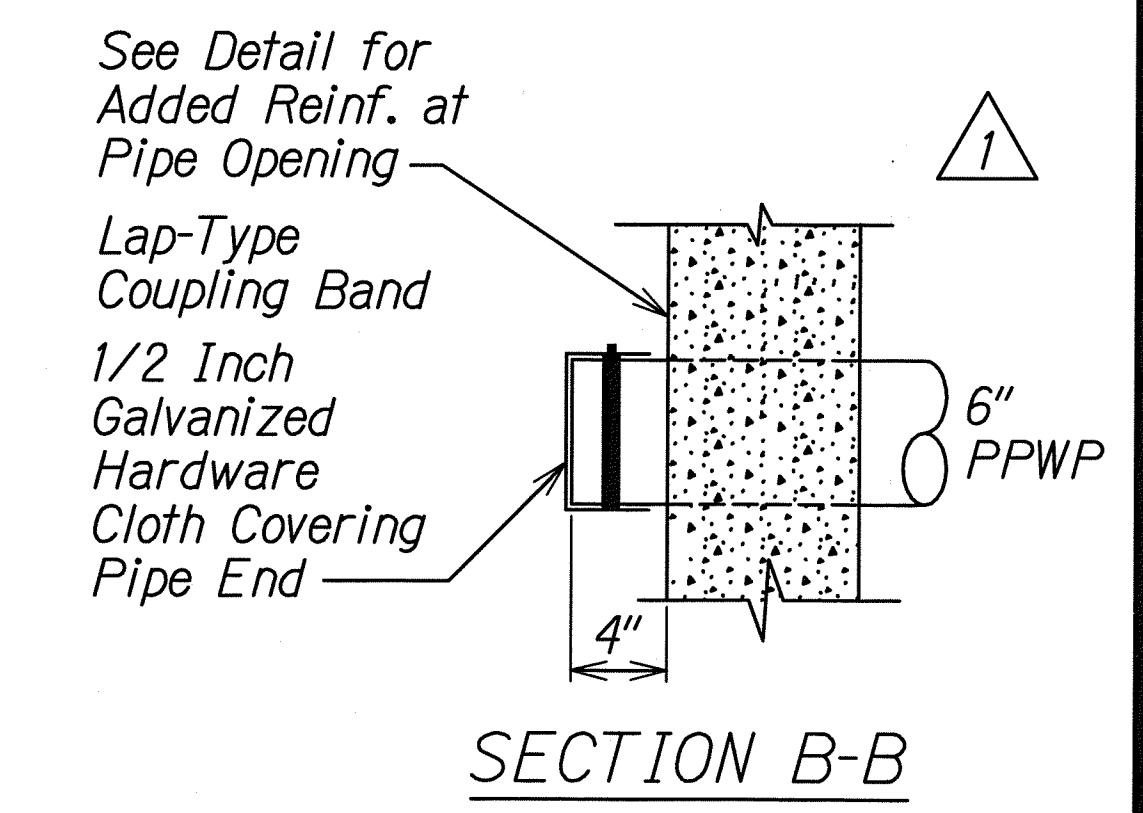
SECTION C-C
Scale: NTS



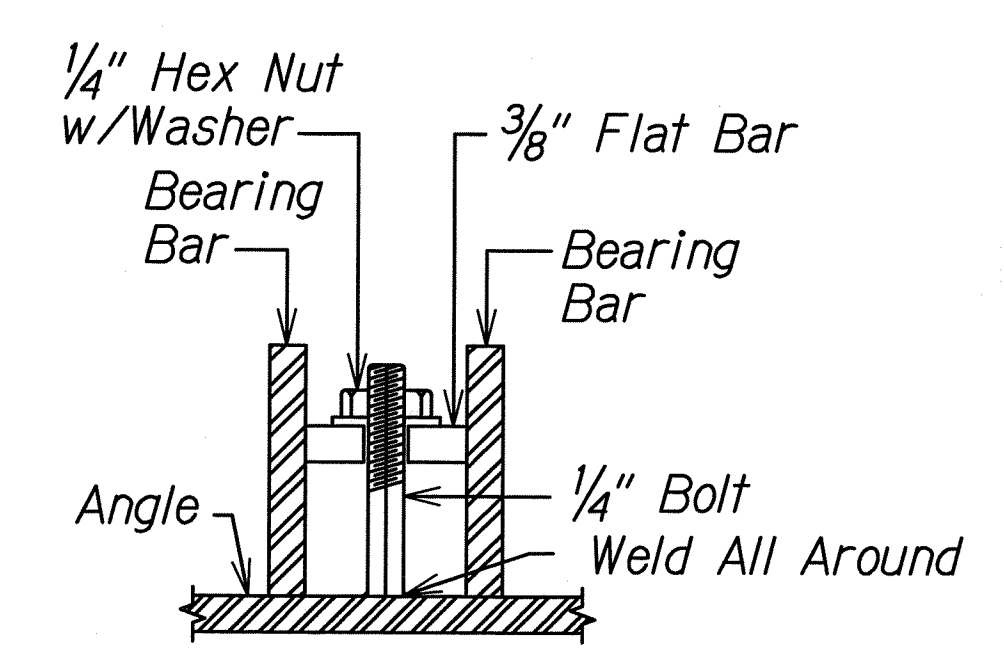
GRATE - PLAN
Scale: NTS

BIOSWALE TO TYPE I OUTLET FRAME AND CRATE

Scale: NTS

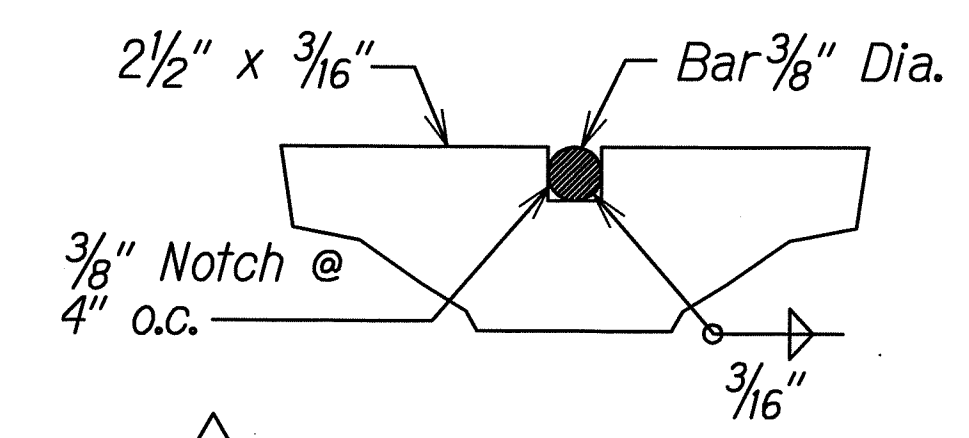


SECTION E-E



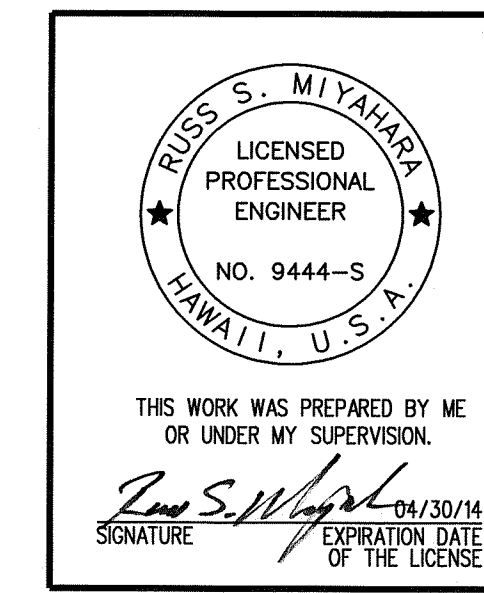
Note: 2 Clips Per Grating Panel

HOLD DOWN CLIP DETAIL
Scale: NTS



DETAIL
Scale: NTS

Date	Revision
6/13/12	1 Revised outlet details. Added Frame and Grate details.



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BIOSWALE DETAILS

MISCELLANEOUS PERMANENT BEST MANAGEMENT PRACTICES ON OAHU
PROJECT NO. HWY-0-02-11
Scale: NTS Date: May, 2012

SHEET No. C-23 OF 23 SHEETS

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NOTE BOOK	
NO.	

T-16523A-Permanent BMP/Cadd/Sheets/D-4.dgn