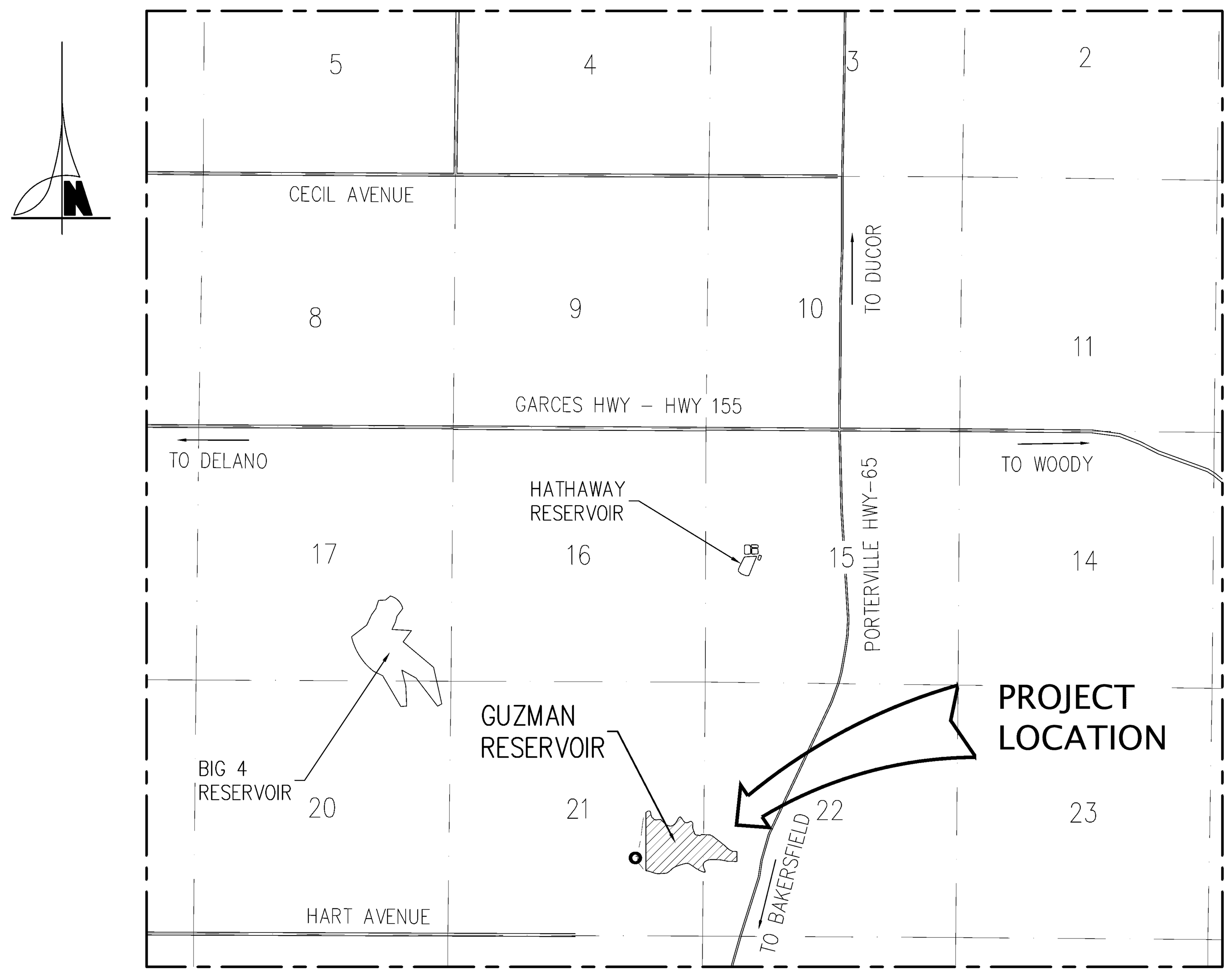
GUZMAN WATER RESERVOIR

KERN-TULARE WATER DISTRICT

SECTIONS 21 AND 22 - T.25S/R.27E

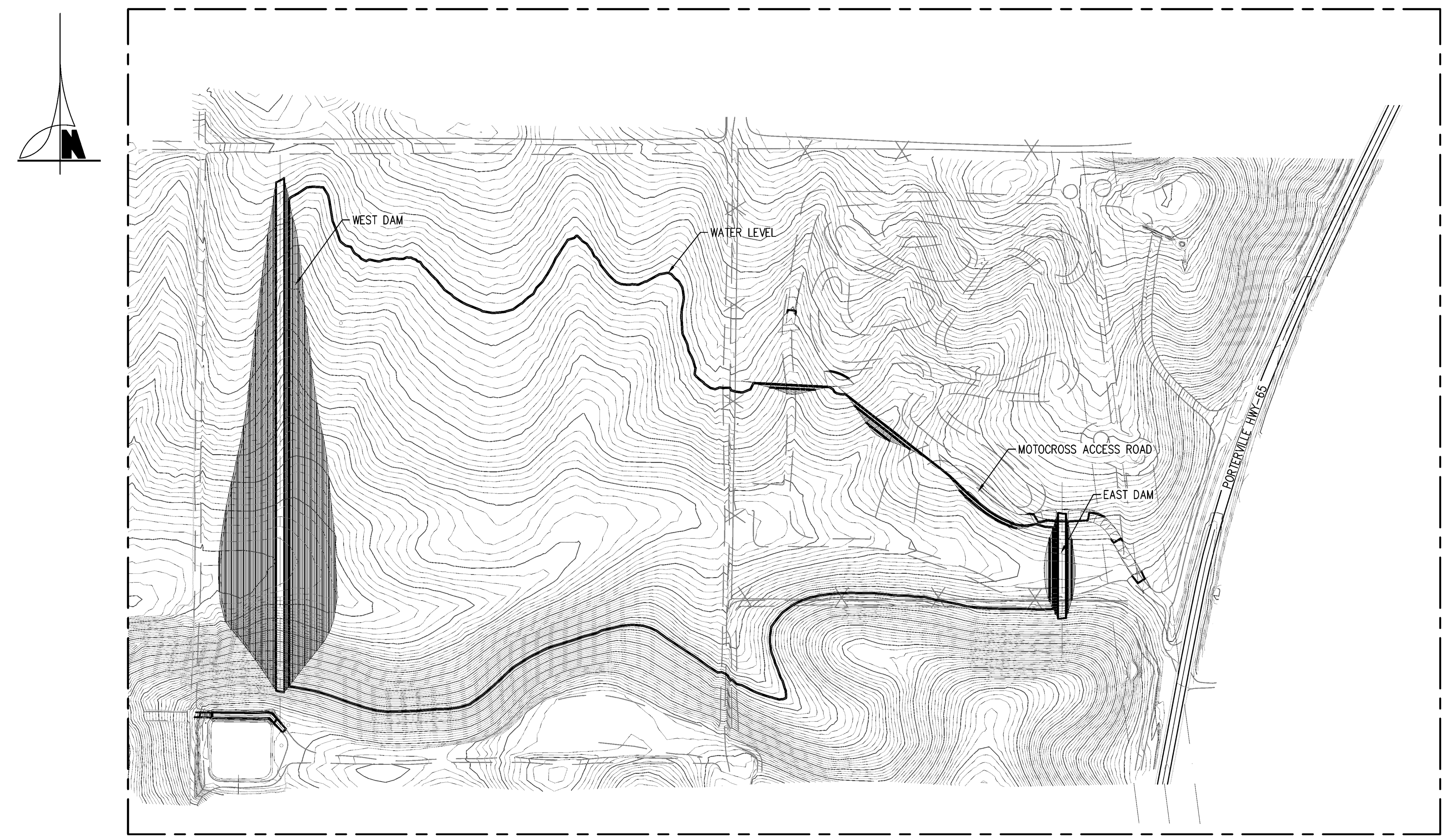
KERN COUNTY

STATE OF CALIFORNIA



LOCATION MAP

SCALE 1"=2000'-0"



PLAN OF RESERVOIR AND DAMS

SCALE 1"=200'-0"

MATERIAL TAKE-OFF

BERMS
- BERM EARTHWORK (EAST BERM)
  - OVER-EXCAVATION CUT = 10,000 CY
  - OVER-EXCAVATION FILL = 13,000 CY *
  - BERM CONSTRUCTION = 3,900 CY *
  - * 1.3 FACTOR INCLUDED
  - BALANCE = 6,900 CY (FILL)
- BERM EARTHWORK (WEST BERM)
  - OVER-EXCAVATION CUT = 108,400 CY
  - OVER-EXCAVATION FILL = 141,000 CY *
  - BERM CONSTRUCTION = 202,200 CY *
  - * 1.3 FACTOR INCLUDED
  - BALANCE = 234,800 CY (FILL)
  - DRAINAGE LAYER MATERIAL = 9,400 CY
  - SAND BLANKET = 9,400 CY
- PROTECTION BERM ON SW POND
  - BERM CONSTRUCTION 345 CY *
  - * 1.3 FACTOR INCLUDED

DSOD WILL BE PROMPTLY NOTIFIED OF ANY CHANGED CONDITIONS FROM THOSE SHOWN IN THIS PLAN AND SPECIFICATIONS.

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF SAFETY OF DAMS
APPLICATION NO. 737-2
APPROVED AS TO SAFETY
APPLICATION DATE 09/23/2016

CHIEF, DIV. OF SAFETY OF DAMS, C.E. NO. 51781

DRAWING INDEX

811

Know what's below. Call before you dig.

CONTRACTOR SHALL CONTACT 811 FOR LOCATION OF ALL UTILITIES, AT LEAST 72 HOURS PRIOR TO BEGINNING CONSTRUCTION

BASIS OF BEARING:

BEARINGS SHOWN HEREON ARE GRID BEARINGS BASED UPON NGS STATION WITH DESIGNATION "JASMIN" AND PID FU3525 LOCATED AT THE NORTHWEST CORNER OF FAMOSO-PORTERVILLE HIGHWAY AND STATE HIGHWAY 155. THE 1991.35 EPOCH DATE SHOWN ON THE NGS DATA SHEET WAS UPDATED TO A DATE OF JULY 16. 2009 VIA AN ONLINE CONVERSION USING HORIZONTAL TIME DEPENDENT POSITIONING SOFTWARE AND THE NEW NAD83 CA STATE PLANE ZONE 5 COORDINATES ARE AS FOLLOWS:

N - 2465446.25
E - 6225527.38

* THE GRID SCALE FACTOR USED TO CONVERT TO GROUND DISTANCES IS 1.00005958516

NPDES NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING COMPLIANCE WITH ALL APPLICABLE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) REQUIREMENTS FOR THIS SITE. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

A CURRENT COPY OF THE SITE SPECIFIC STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE KEPT ON-SITE AT ALL TIMES DURING CONSTRUCTION ACTIVITIES.

UPDATING THE SWPPP AS REQUIRED

CONSTRUCTION, MAINTENANCE, AND MONITORING OF ALL SITE-SPECIFIC BEST MANAGEMENT PRACTICES (BMP'S) AS CALLED FOR IN THE SWPPP.

PERFORMANCE OF ALL REQUIRED TESTING, MONITORING, AND TRAINING AND THE KEEPING OF THE APPROPRIATE RECORDS ASSOCIATED WITH THESE ACTIVITIES.

ENGINEER'S STATEMENT:

THESE PLANS AND SPECIFICATIONS WERE PREPARED BY ME OR UNDER MY DIRECTION AND TO THE BEST OF MY KNOWLEDGE AND BELIEF COMPLY WITH CITY OF DELANO ORDINANCES, STANDARDS, AND DESIGN CRITERIA, AND INCLUDE ALL IMPROVEMENT REQUIREMENTS OF THE ADVISORY AGENCY OR OTHER REVIEW BOARD.

ANY ERRORS, OMISSIONS OR OTHER VIOLATIONS OF THOSE ORDINANCES, STANDARDS OR DESIGN CRITERIA ENCOUNTERED DURING CONSTRUCTION SHALL BE CORRECTED AND SUCH CORRECTIONS REFLECTED ON CORRECTED PLANS SUBMITTED TO THE CITY ENGINEER.

REGISTERED PROFESSIONAL ENGINEER — CLAUDE ALAN WHITTEN — No. C-63332 — CIVIL — STATE OF CALIFORNIA

CLAUDE ALAN WHITTEN, C-63332 — 6/19/2019 DATE

UNAUTHORIZED CHANGES & USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF DESIGN PROFESSIONAL.

BASIS OF ELEVATIONS:

THE BASIS OF ELEVATIONS SHOWN HEREON ARE BASED ON NGS STATION WITH DESIGNATION K 455 USBR AND PID FU1137 BEING A U.S. BUREAU OF RECLAMATION B.C. IN THE WEST END OF THE FRIANT-KERN CANAL OVERPASS @ MI. 118.96 ALONG STATE HIGHWAY 155. 1991.35 EPOCH DATE ELEVATION = 408.2 FEET.

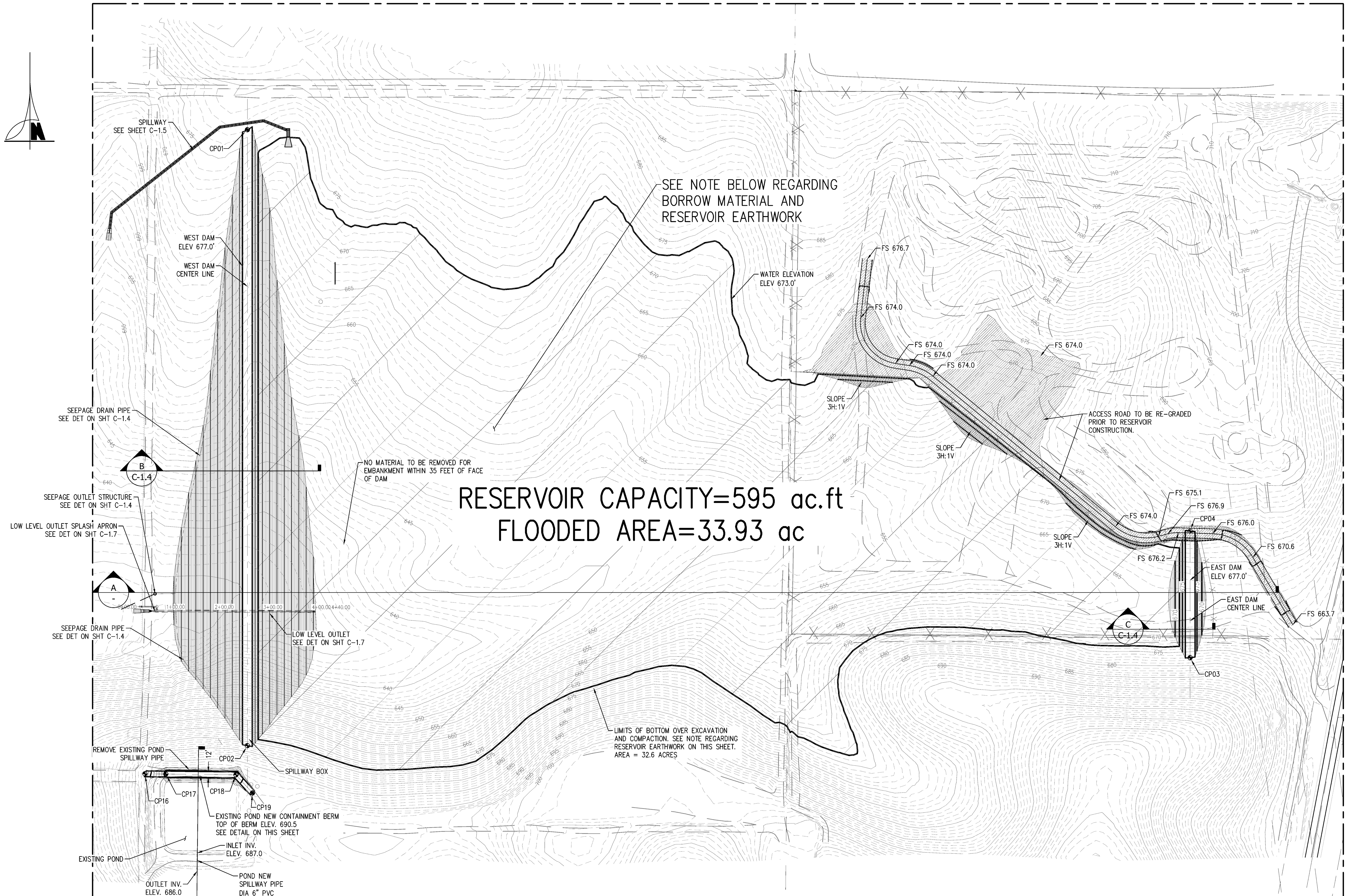
BY:	REVISION:	NO.	DATE:

CORNERSTONE ENGINEERING, INC.
208 OAK STREET
BAKERSFIELD, CA 93304
TEL: (661) 325-9474
FAX: (661) 322-0129
CONSULTING CIVIL ENGINEERING AND LAND SURVEYING
www.cornerstoneeng.com

DEVELOPMENT BY:
KERN-TULARE WATER DISTRICT
5001 CALIFORNIA AVE, SUITE 102
BAKERSFIELD, CA 93309
661-327-3132

KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
TITLE SHEET, LOCATION MAP, & DRAWING INDEX

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO:	3531800_GUZ-PKG
JOB NO.:	353-18-00



PLAN OF RESERVOIR AND DAMS

SCALE 1"=100'-0"

GRAPHIC SCALE

(IN FEET)
1 inch = 100 ft.

POINT TABLE

CP #	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP16	2456023.37	6244894.62	683.00	CONTAINMENT BERM CLINE
CP17	2456022.89	6244937.63	690.50	CONTAINMENT BERM CLINE
CP18	2456021.27	6245082.07	690.50	CONTAINMENT BERM CLINE
CP19	2455983.93	6245116.04	689.00	CONTAINMENT BERM CLINE

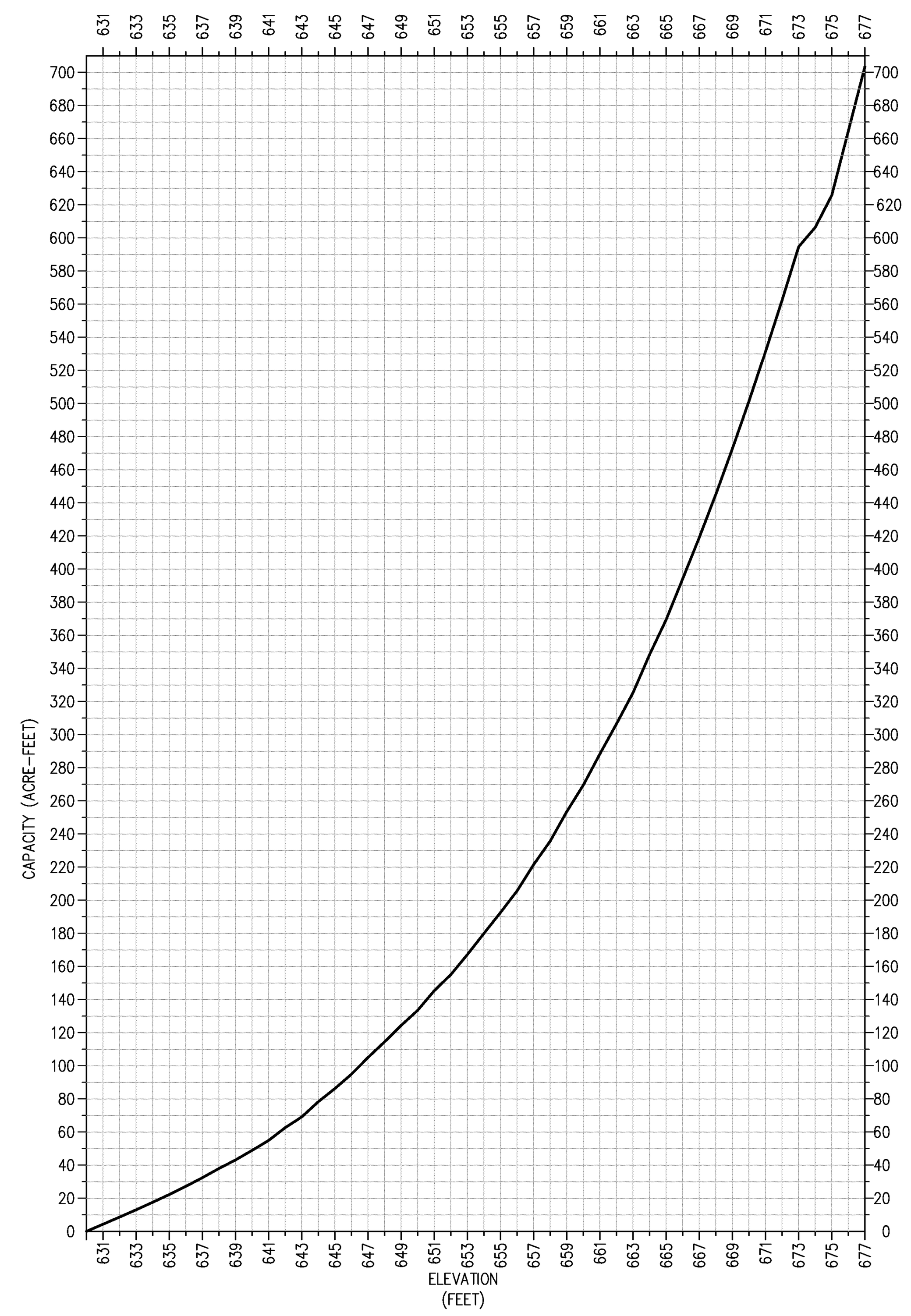
SOUTH POND DAM POINT TABLE

RESERVOIR EARTHWORK NOTE:
CONTRACTOR MAY UTILIZE ANY SOIL WITHIN THE RESERVOIR HIGH WATER MARK AS BORROW MATERIAL, PROVIDED IT CONFORMS TO THE EMBANKMENT FILL MATERIAL SPECIFICATIONS. UPON COMPLETION OF THE DAM STRUCTURES. CONTRACTOR SHALL PREPARE THE LINER MATERIAL AS PER THE SPECIFICATIONS, AND GRADE TO A SMOOTH UNIFORM SLOPE.

POINT TABLE

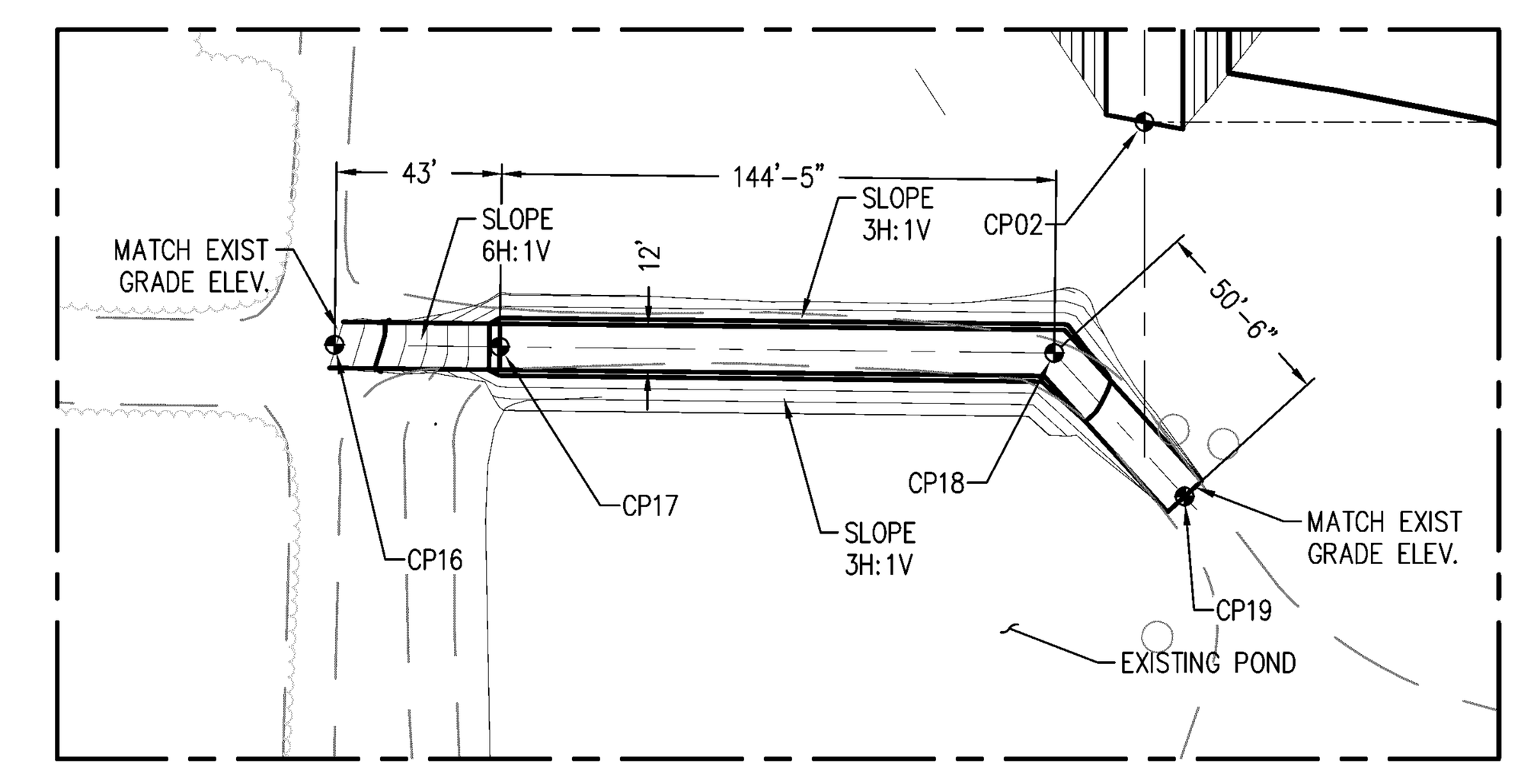
CP #	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP01	2457350.28	6245105.60	677.00	WEST BERM @ CLINE
CP02	2456081.39	6245105.58	677.00	WEST BERM @ CLINE
CP03	2456262.65	6247046.75	677.00	EAST BERM @ CLINE
CP04	2456523.28	6247046.75	677.00	EAST BERM @ CLINE

GUZMAN RESERVOIR DAMS POINT TABLE



DEPTH/CAPACITY CURVE

NOT TO SCALE

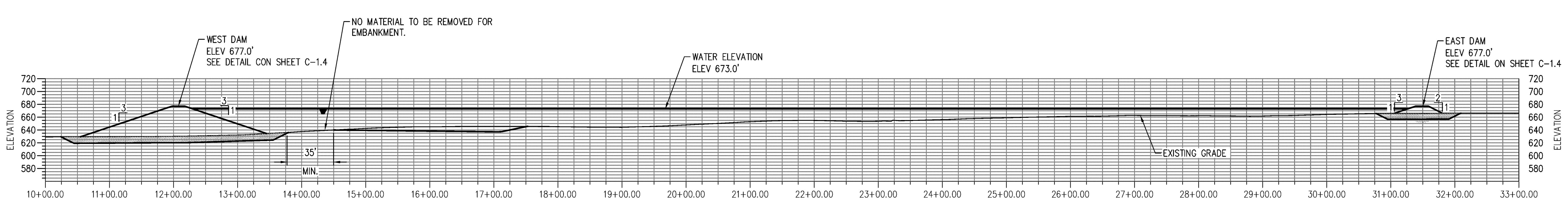


EXISTING POND BERM DETAILED PLAN

SCALE 1"=50'-0"

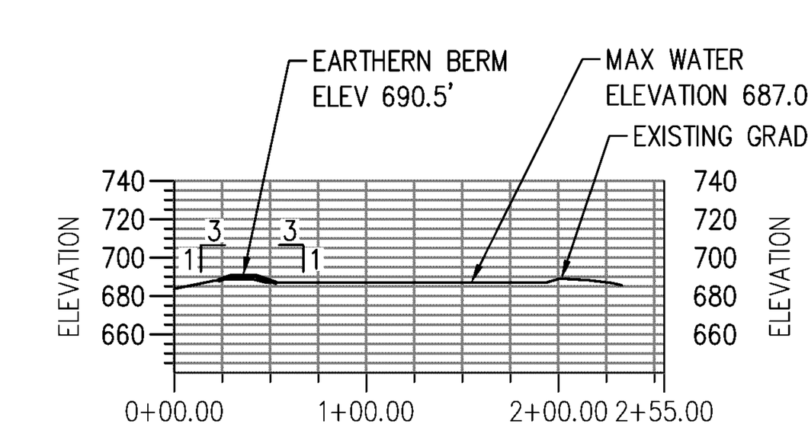
GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft.



SECTION A – LONGITUDINAL PROFILE

LOOKING NORTH
HOR SCALE 1"=100'-0"
VER SCALE 1"=100'-0"



SECTION D

LOOKING EAST
HOR SCALE 1"=100'-0"
VER SCALE 1"=100'-0"

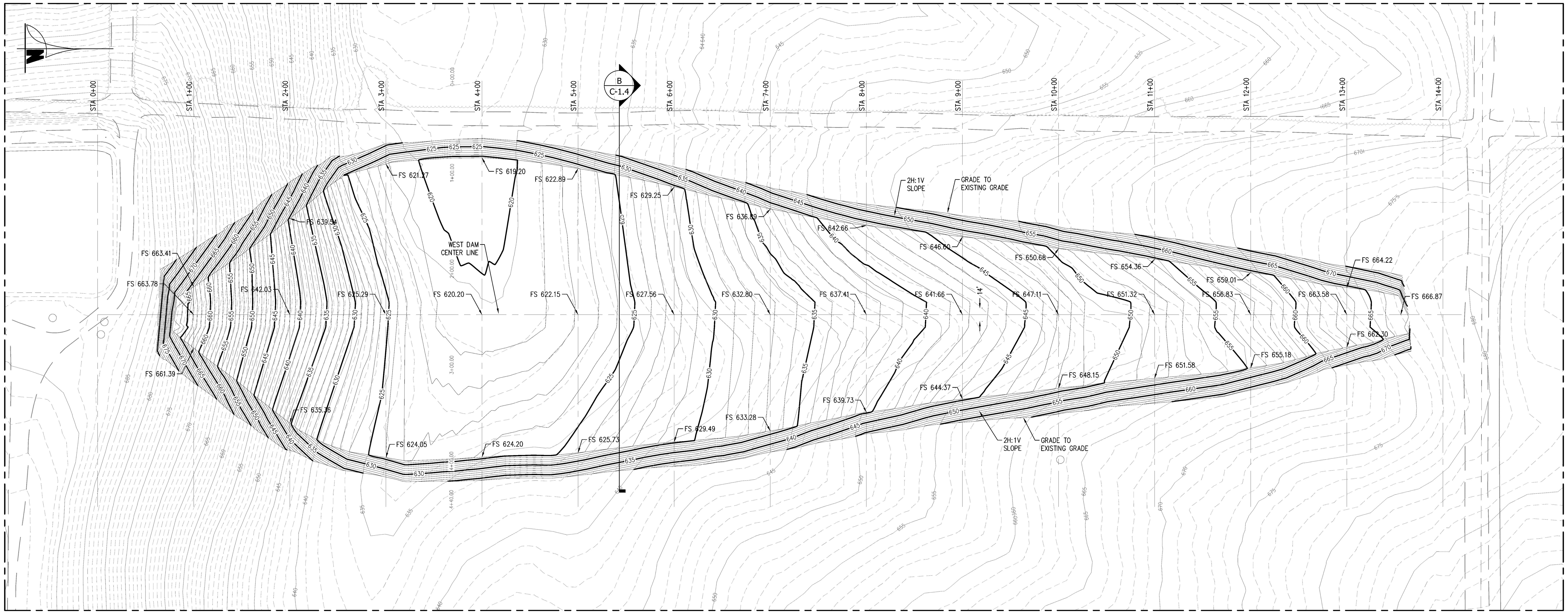
REGISTERED PROFESSIONAL ENGINEER No. C-63332 CIVIL STATE OF CALIFORNIA

CORNERSTONE ENGINEERING, INC.
208 OAK STREET BAKERSFIELD, CA 93304
CONSULTING CIVIL ENGINEERING AND LAND SURVEYING

DEVELOPMENT BY:
KERN-TULARE WATER DISTRICT
5001 CALIFORNIA AVE. SUITE 102
BAKERSFIELD, CA 93309
661-327-3132

KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
RESERVOIR PLAN AND PROFILE

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00
C-1.2	SHEET 2 OF 13



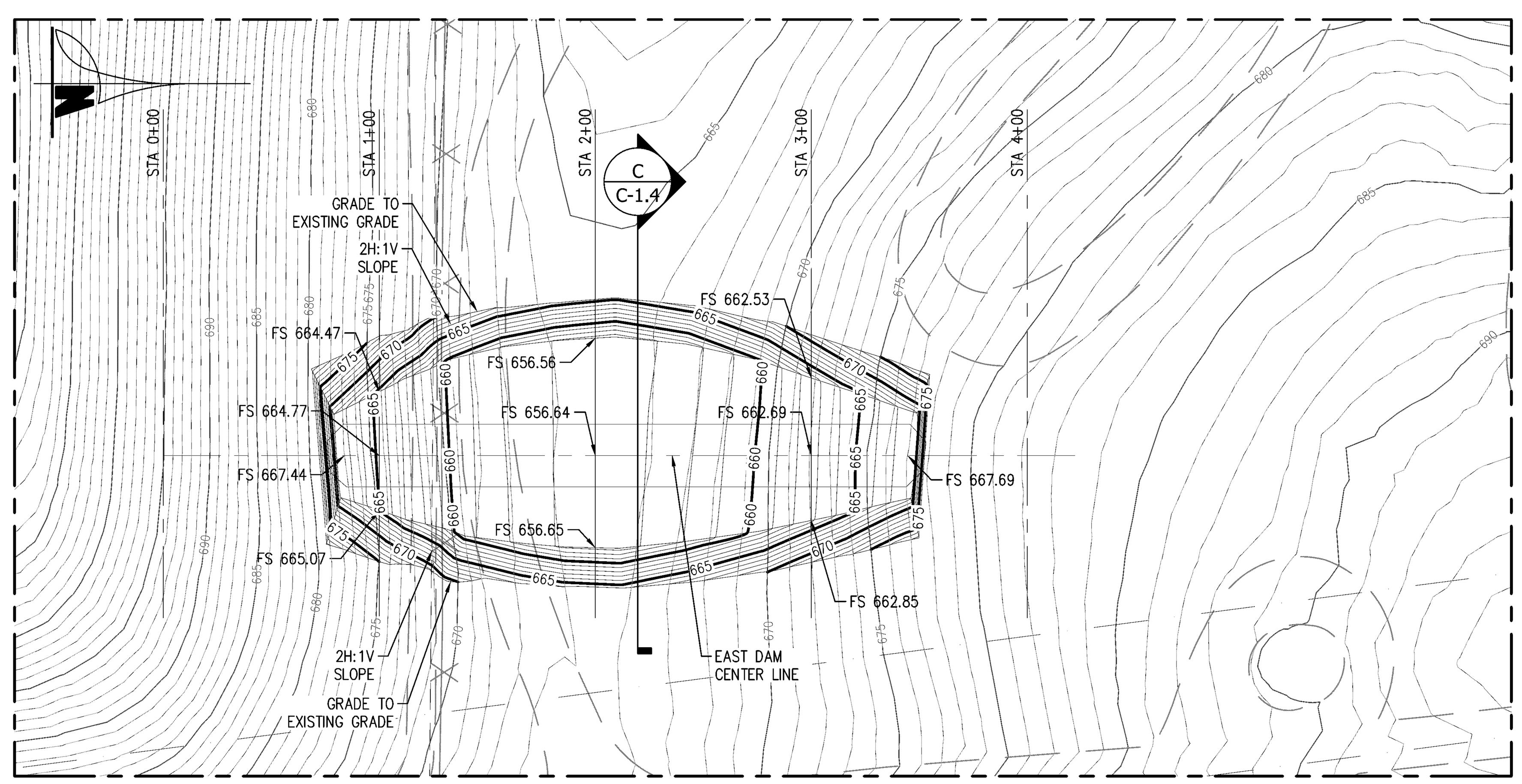
WEST DAM OVEREXCAVATION PLAN

SCALE 1"=50'-0"

GRAPHIC SCALE

50' 25' 0' 25' 50'

(IN FEET)
1 inch = 50 ft.



EAST DAM OVEREXCAVATION PLAN

SCALE 1"=50'-0"

GRAPHIC SCALE

50' 25' 0' 25' 50'

(IN FEET)
1 inch = 50 ft.

NO.	DATE:	REVISION:	BY:

REGISTERED PROFESSIONAL ENGINEER
No. C-63332
CIVIL
STATE OF CALIFORNIA

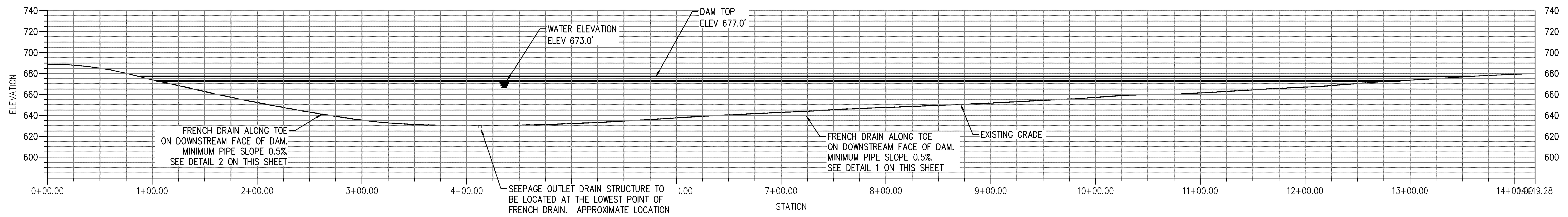
CORNERSTONE ENGINEERING, INC.

CONSULTING CIVIL ENGINEERING AND LAND SURVEYING

DEVELOPMENT BY:
KERN-TULARE WATER DISTRICT
5001 CALIFORNIA AVE, SUITE 102
BAKERSFIELD, CA 93309
661-327-3132

KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
BERMS OVEREXCAVATION

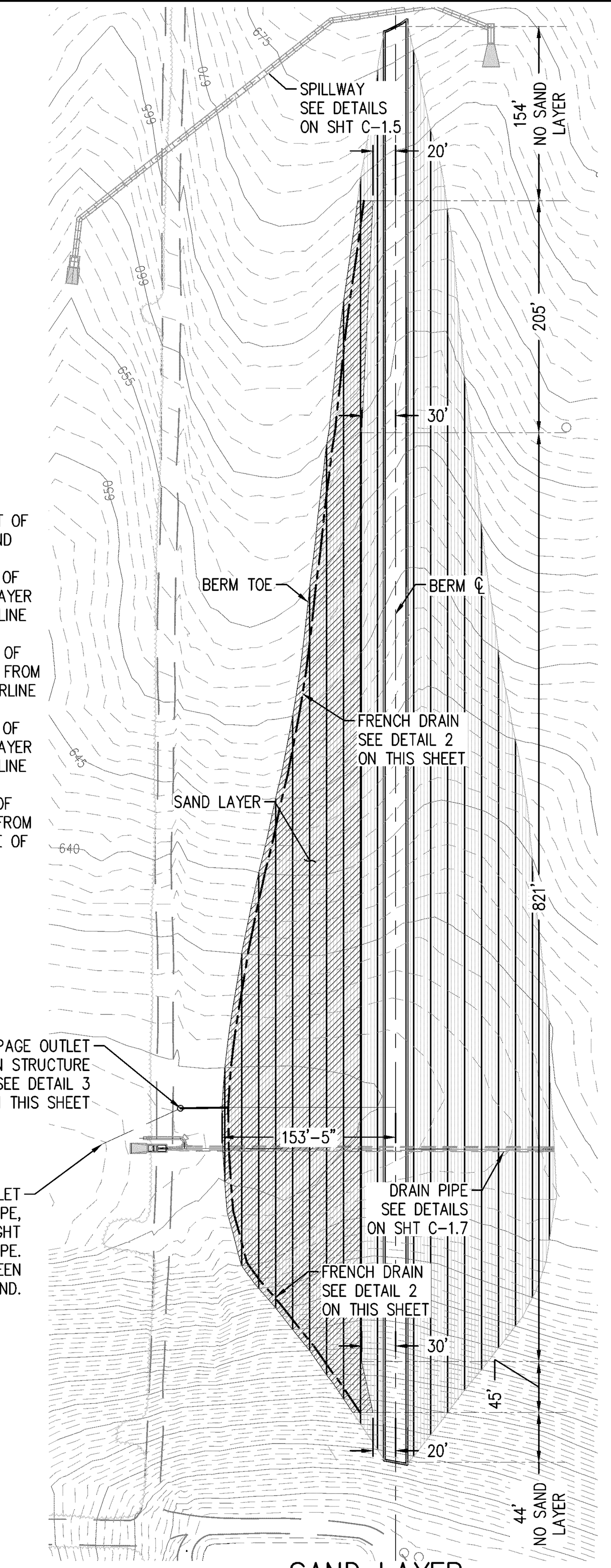
DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00
C-1.3	SHEET 3 OF 13



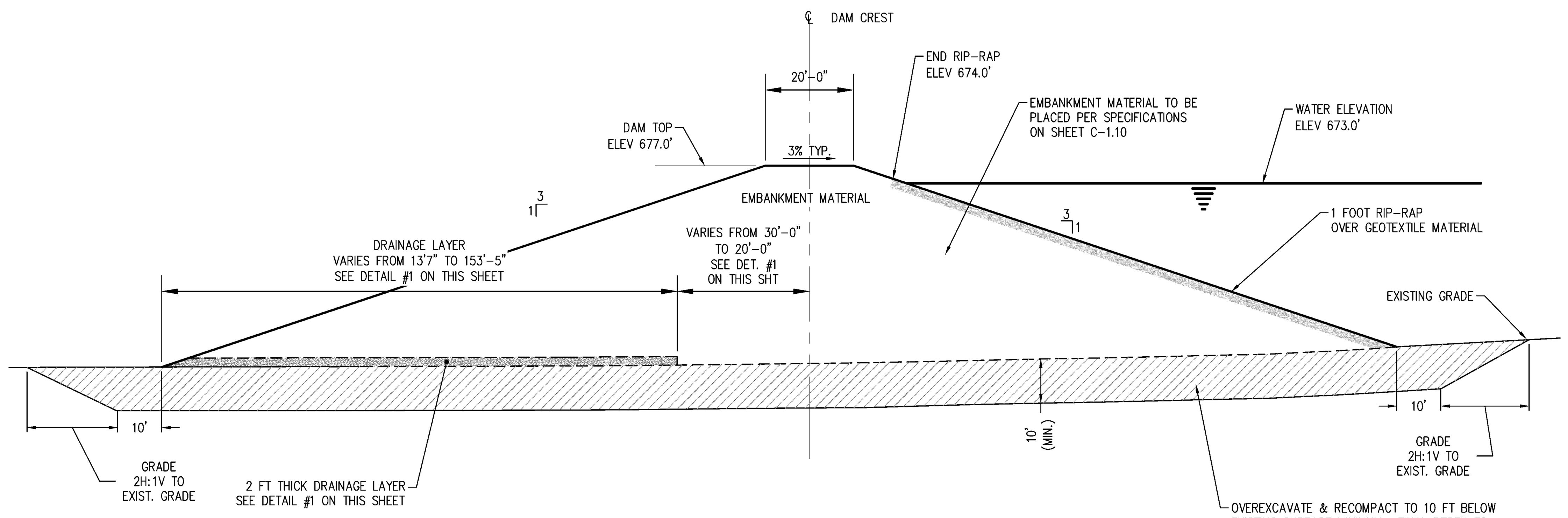
PROFILE ALONG WEST DAM
LOOKING WEST
HOR SCALE 1"=60'-0"
VER SCALE 1"=60'-0"

SAND DRAINAGE LAYER LOCATION NOTES:

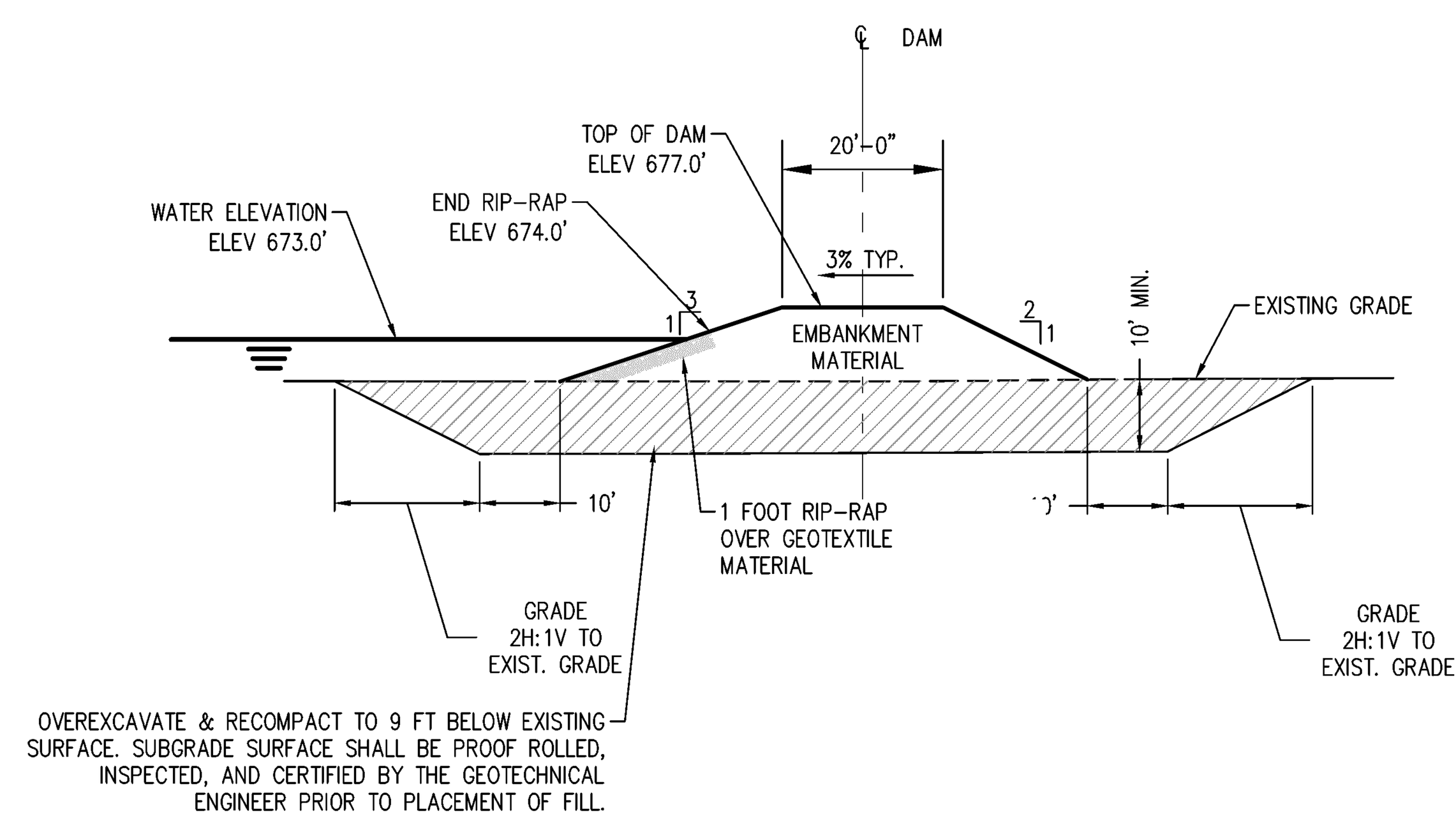
1. THE NORTHERLY 154 FEET AND SOUTHERNLY 44 FEET OF THE MAIN DAM ENBANKMENT DO NOT REQUIRE A SAND DRAINAGE LAYER.
2. AT A DISTANCE OF 154 FEET FROM THE NORTH END OF THE MAIN DAM EMBANKMENT, THE SAND DRAINAGE LAYER BEGINS AT 20 FEET DOWNSTREAM FROM THE CENTERLINE OF DAM CREST.
3. AT A DISTANCE OF 359 FEET FROM THE NORTH END OF THE DAM, THE SAND DRAINAGE LAYER TRANSITIONS FROM 20 FEET TO 30 FEET DOWNSTREAM FROM THE CENTERLINE OF THE DAM CREST.
4. AT AT DISTANCE OF 44 FEET FROM THE SOUTH END OF THE MAIN DAM EMBANKMENT, THE SAND DRAINAGE LAYER BEGINS AT 20 FEET DOWNSTREAM FROM THE CENTERLINE OF DAM CREST.
5. AT A DISTANCE OF 99 FEET FROM THE SOUTH END OF THE DAM, THE SAND DRAINAGE LAYER TRANSITIONS FROM 20 FEET TO 30 FEET DOWNSTREAM FROM CENTERLINE OF DAM CREST.



SAND LAYER
PLAN VIEW
SCALE 1"=100'

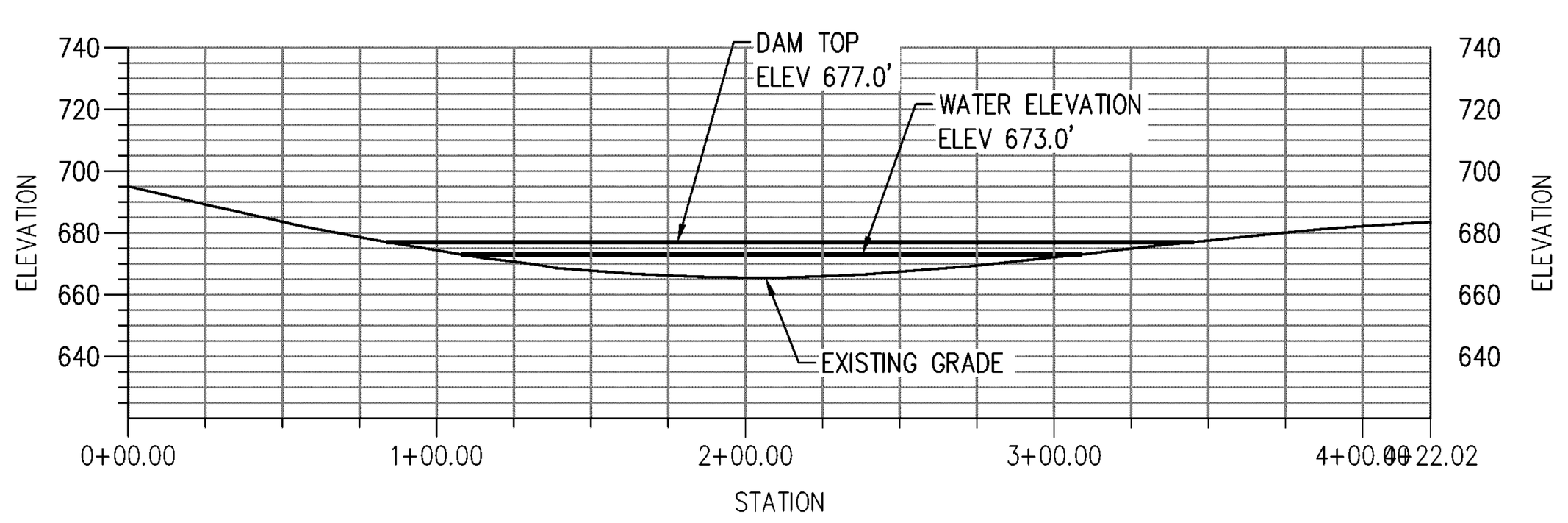


SECTION B THROUGH WEST DAM
LOOKING NORTH
SCALE 1"=20'-0"

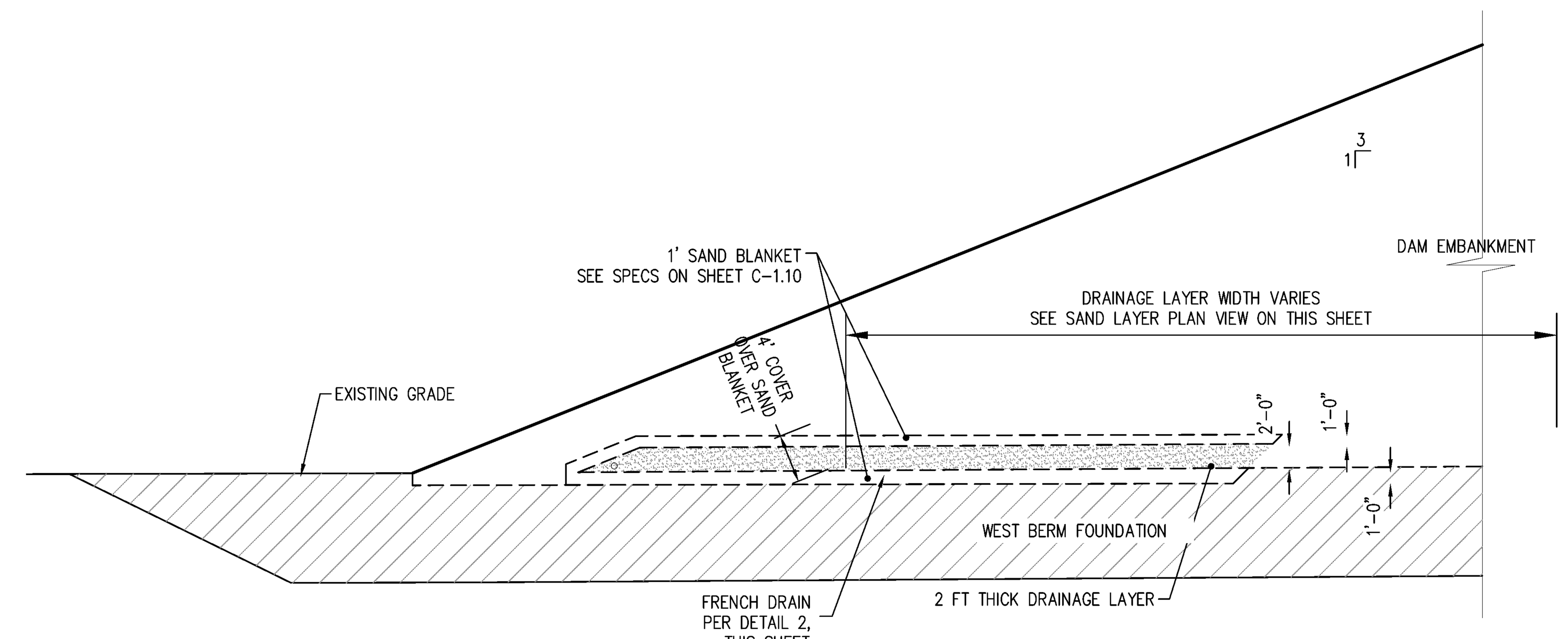


SECTION C THROUGH EAST DAM
LOOKING NORTH
SCALE 1"=20'-0"

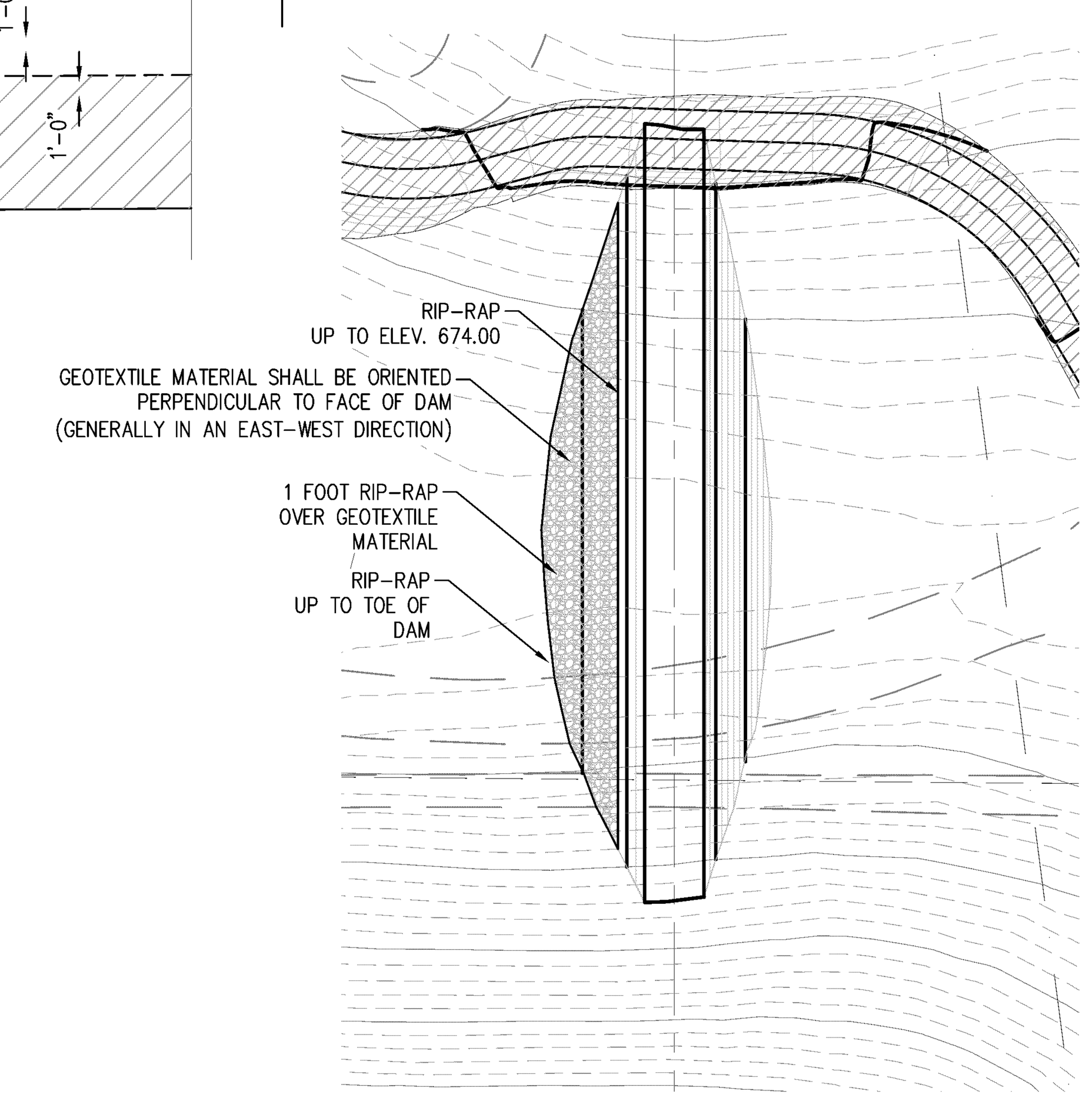
NOTE: ALL FILL MATERIAL PLACED IN FOUNDATION OR EMBANKMENT ARE SUBJECT TO THE SAME SPECIFICATIONS FOUND ON SHEET C-1.10.



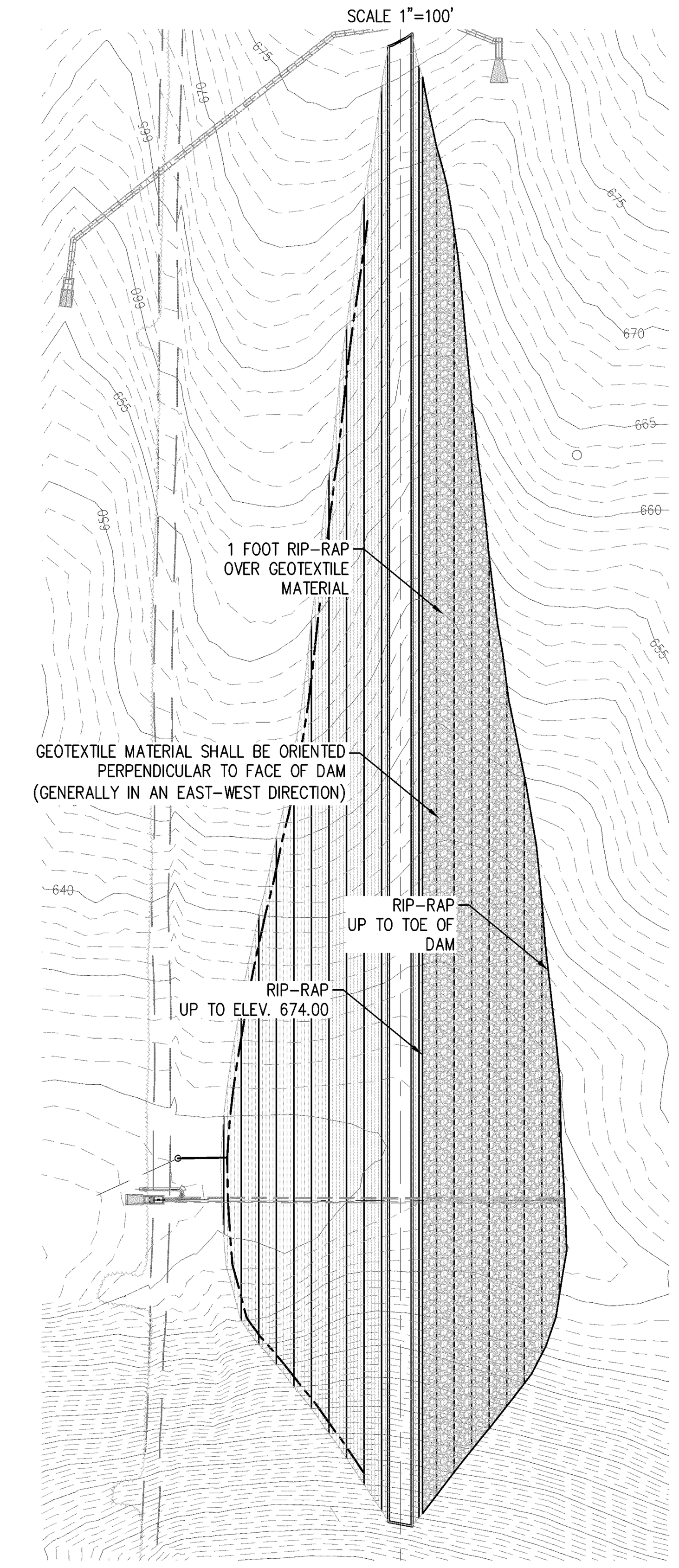
PROFILE ALONG EAST DAM
LOOKING WEST
HOR SCALE 1"=60'-0"
VER SCALE 1"=60'-0"



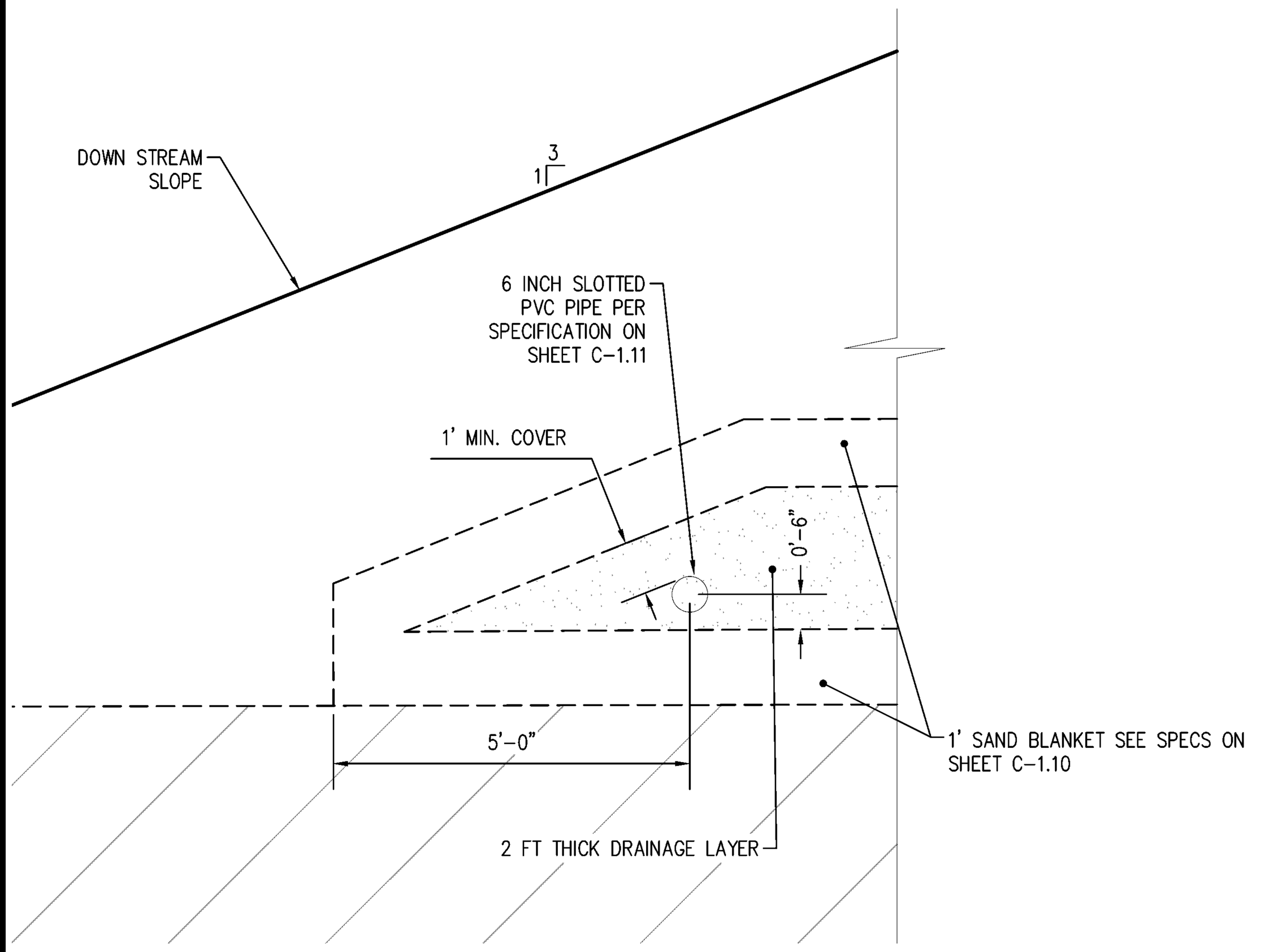
DETAIL #1
SAND LAYER PROFILE VIEW
SCALE 1"=10'



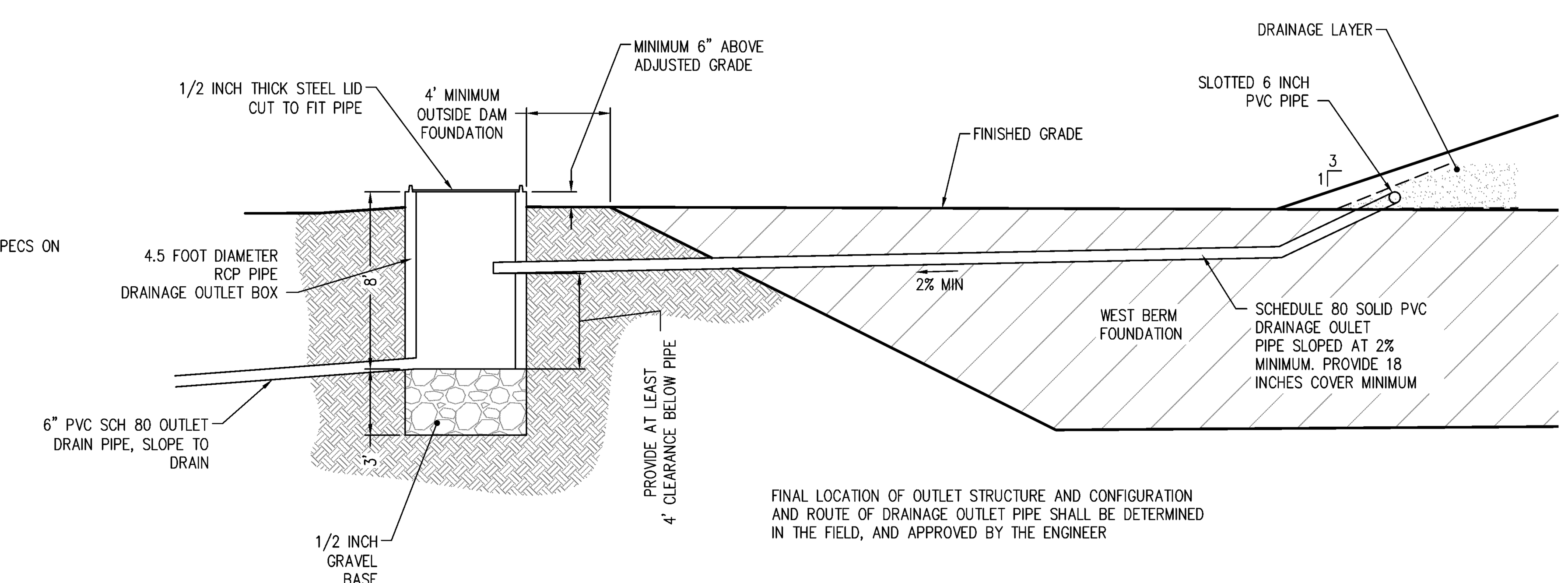
EAST DAM RIP-RAP PLAN VIEW
SCALE 1"=50'



MAIN DAM RIP-RAP PLAN VIEW
SCALE 1"=100'



DETAIL #2
FRENCH DRAIN
SCALE 1"=2'-0"



FINAL LOCATION OF OUTLET STRUCTURE AND CONFIGURATION AND ROUTE OF DRAINAGE OUTLET PIPE SHALL BE DETERMINED IN THE FIELD, AND APPROVED BY THE ENGINEER

DETAIL #3
SEEPAGE OUTLET DRAIN
SCALE 1"=10'-0"

NO.	DATE:	REVISION:	BY:

REGISTERED PROFESSIONAL ENGINEER
CLAUDE ALAN WHITTEN
No. C-63332
CIVIL
STATE OF CALIFORNIA

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DEVELOPMENT BY:
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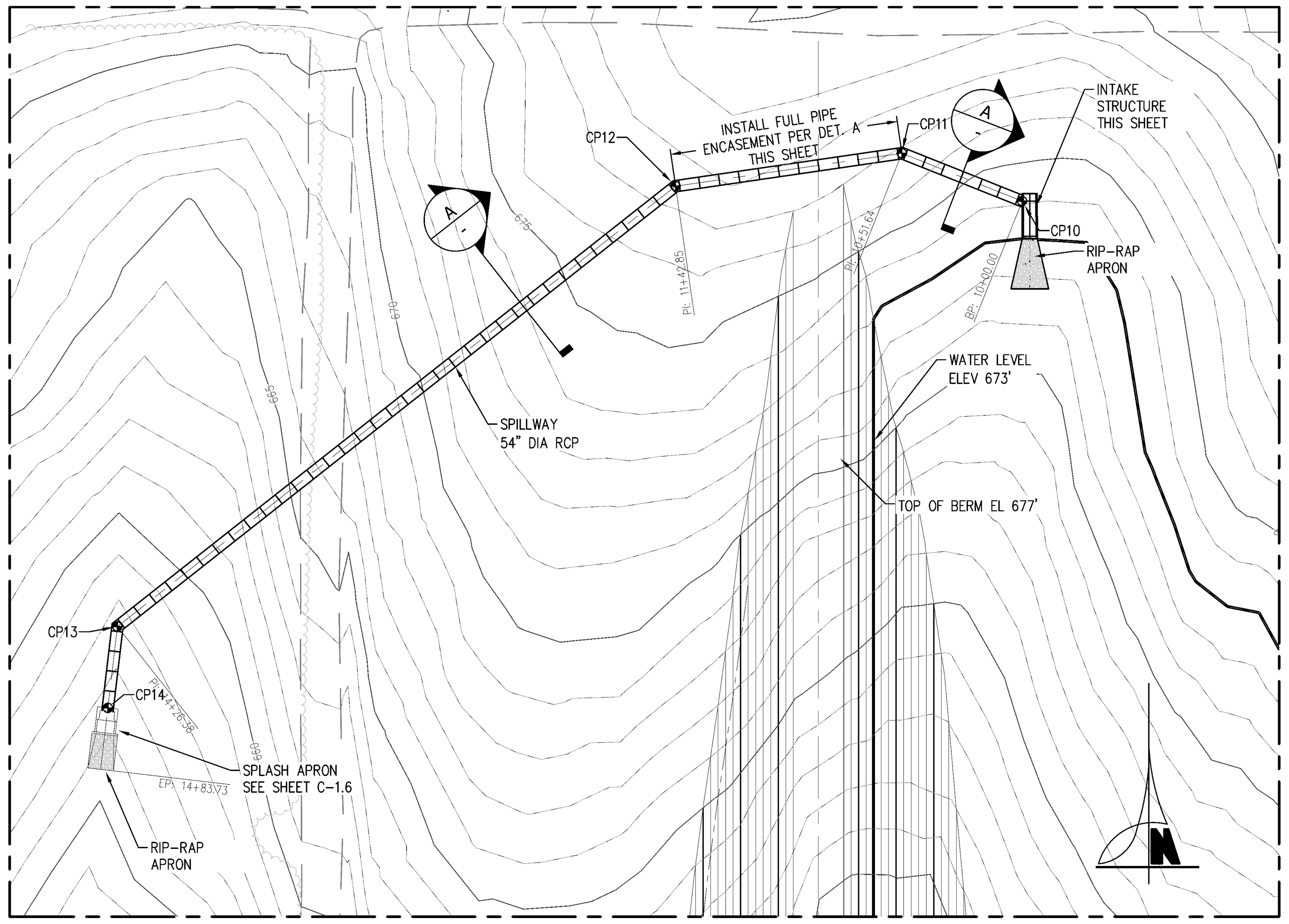
5001 CALIFORNIA AVE. SUITE 102
BAKERSFIELD, CA 93309
661-327-3132

KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
RESERVOIR BERMS DETAILS

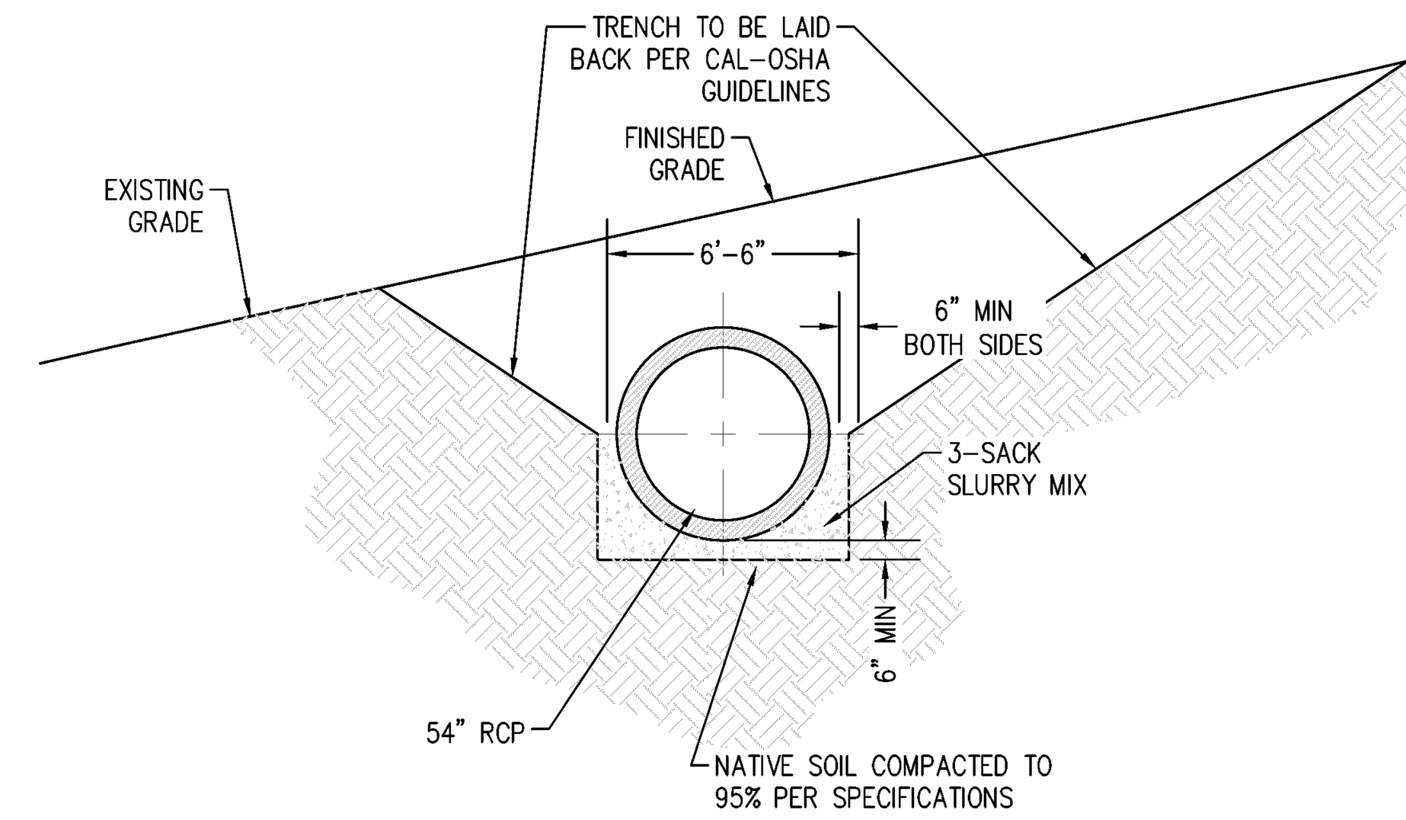
DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO:	3531800_GUZ-PKG
JOB NO.:	353-18-00
C-1.4	SHEET 4 OF 13



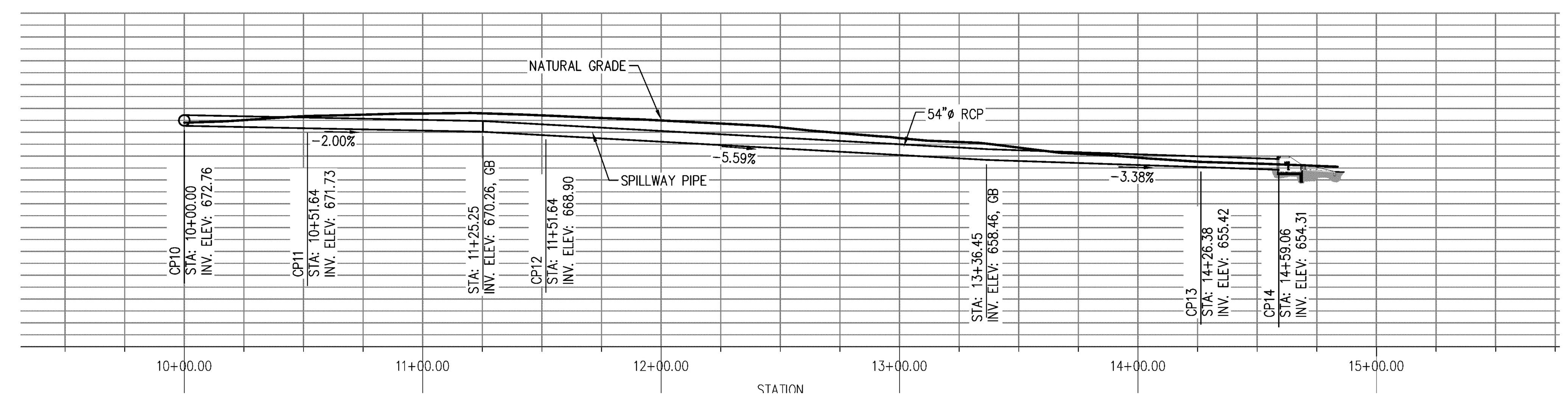
SPILLWAY PLAN
SCALE 1"=40'-0"

GRAPHIC SCALE
40' 20' 0' 20' 40'
(IN FEET)
1 inch = 40 ft.

POINT TABLE				
CP #	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP10	2457349.66	6245186.87	672.76	SPILLWAY PIPE ENTRANCE
CP11	2457368.76	6245138.89	671.73	SPILLWAY PIPE BEND 15°
CP12	2457355.61	6245048.63	668.90	SPILLWAY PIPE BEND 15°
CP13	2457179.93	6244826.09	655.42	SPILLWAY PIPE BEND 45°
CP14	2457147.47	6244822.27	654.31	SPILLWAY PIPE END



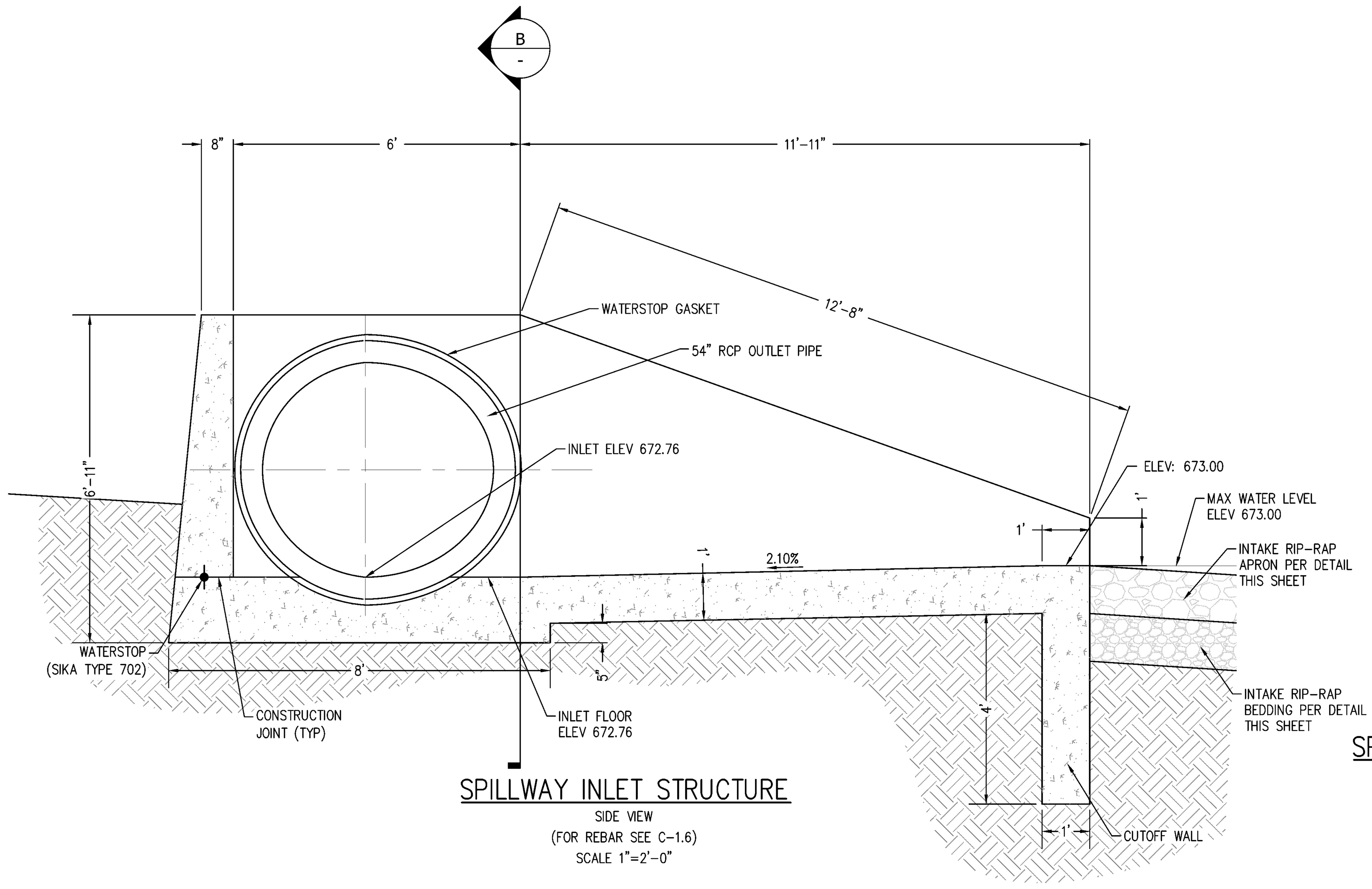
PIPE SECTION 'A'
TYPICAL DISCHARGE PIPE DETAIL
SCALE 1"=5'-0"



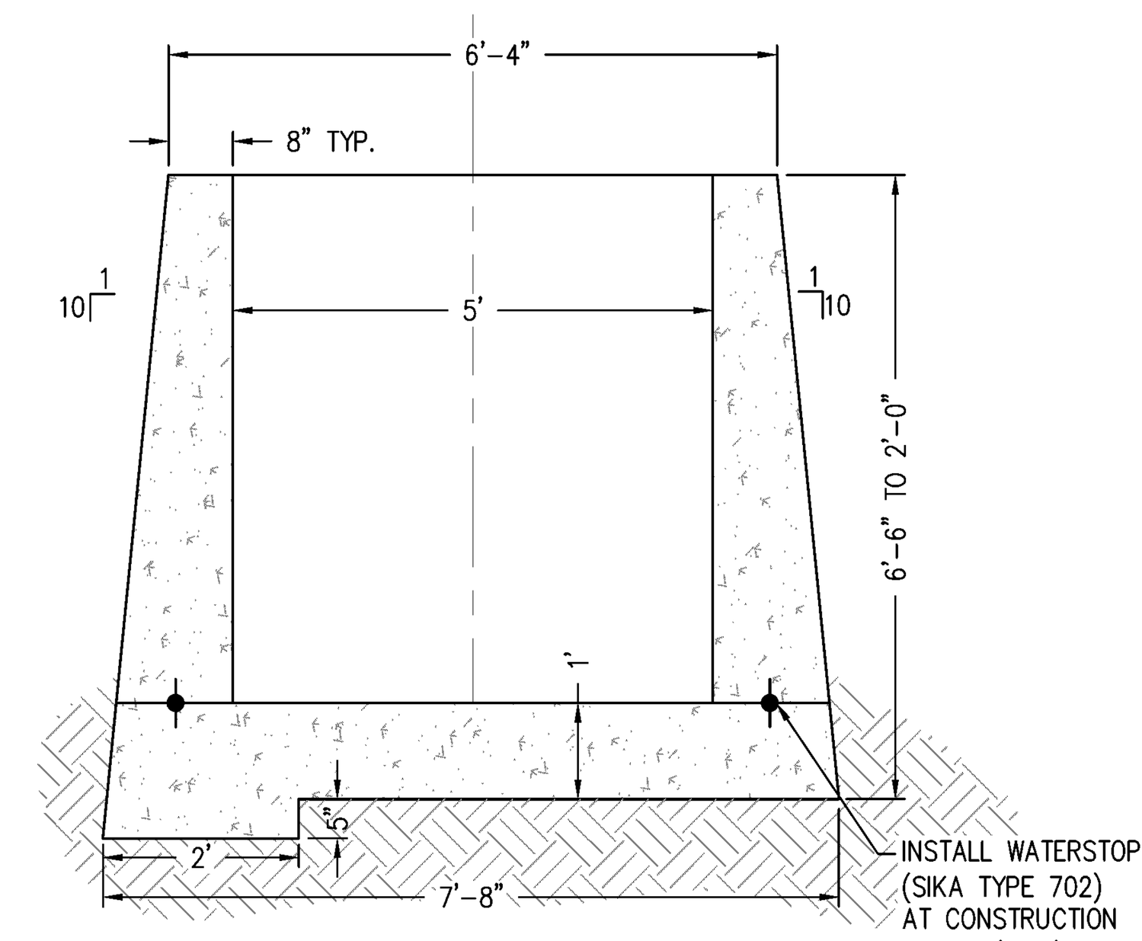
SPILLWAY DISCHARGE CHANNEL LONGITUDINAL PROFILE
LOOKING NORTHEASTERLY
HOR SCALE 1"=40'-0"
VER SCALE 1"=40'-0"

NOTE:

GRADE BREAKS SHALL OCCURE AT NEAREST PIPE JOINT.

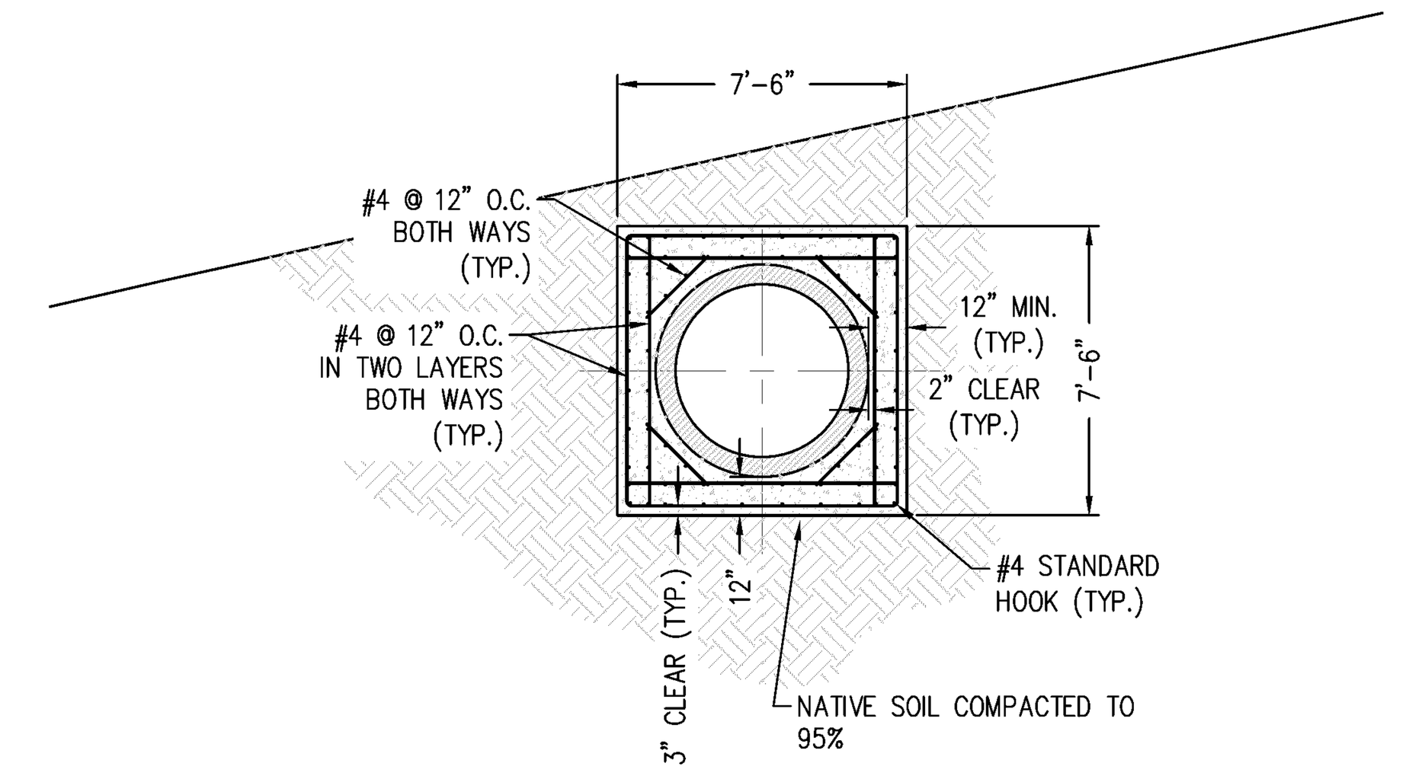


SPILLWAY INLET STRUCTURE
SIDE VIEW
(FOR REBAR SEE C-1.6)
SCALE 1"=2'-0"

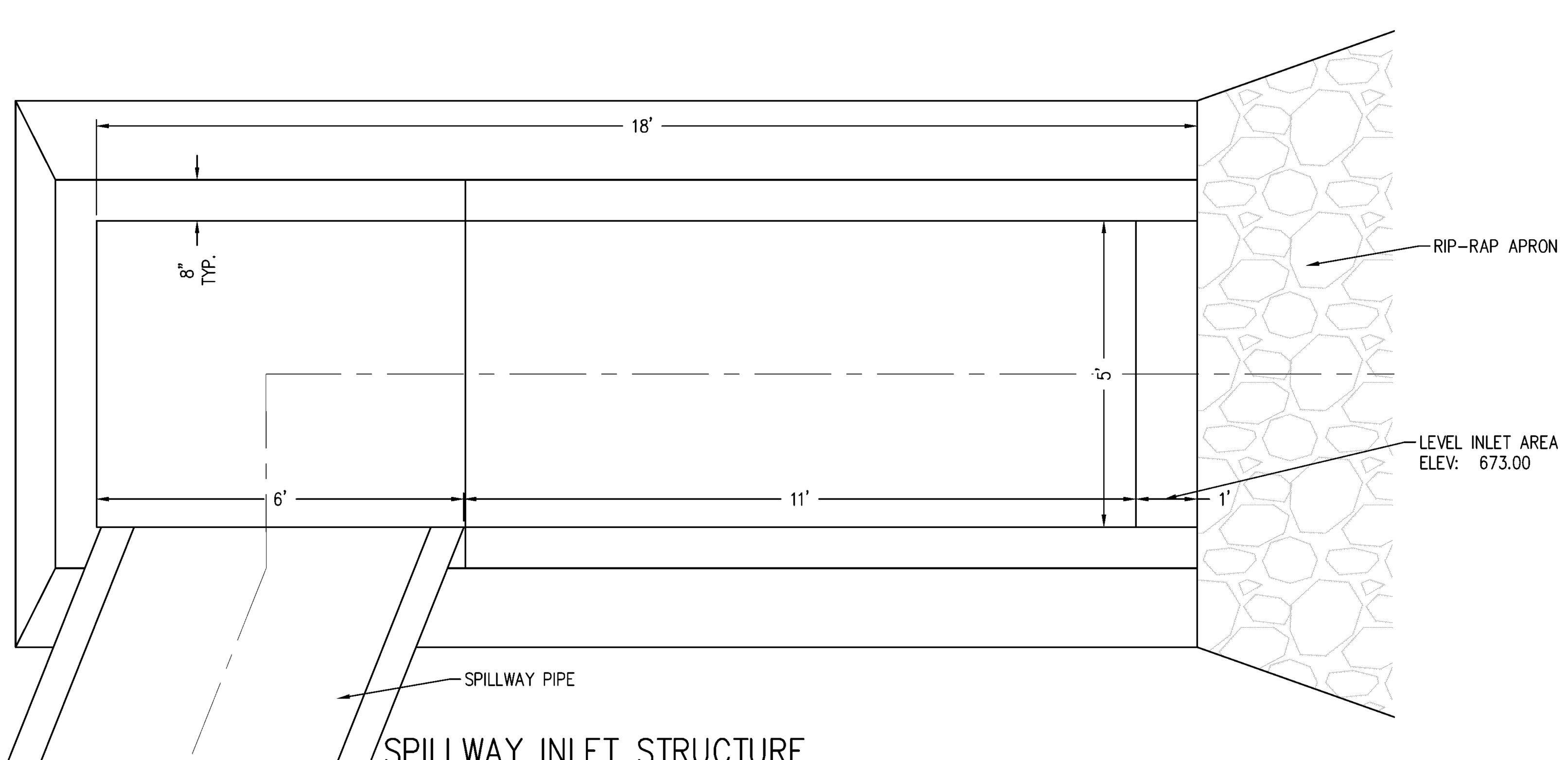


SECTION B
SPILLWAY APRON AND WINGS DETAIL (INTAKE)
LOOKING WESTERLY
(FOR REBAR SEE C-1.6)
SCALE 1"=2'-0"

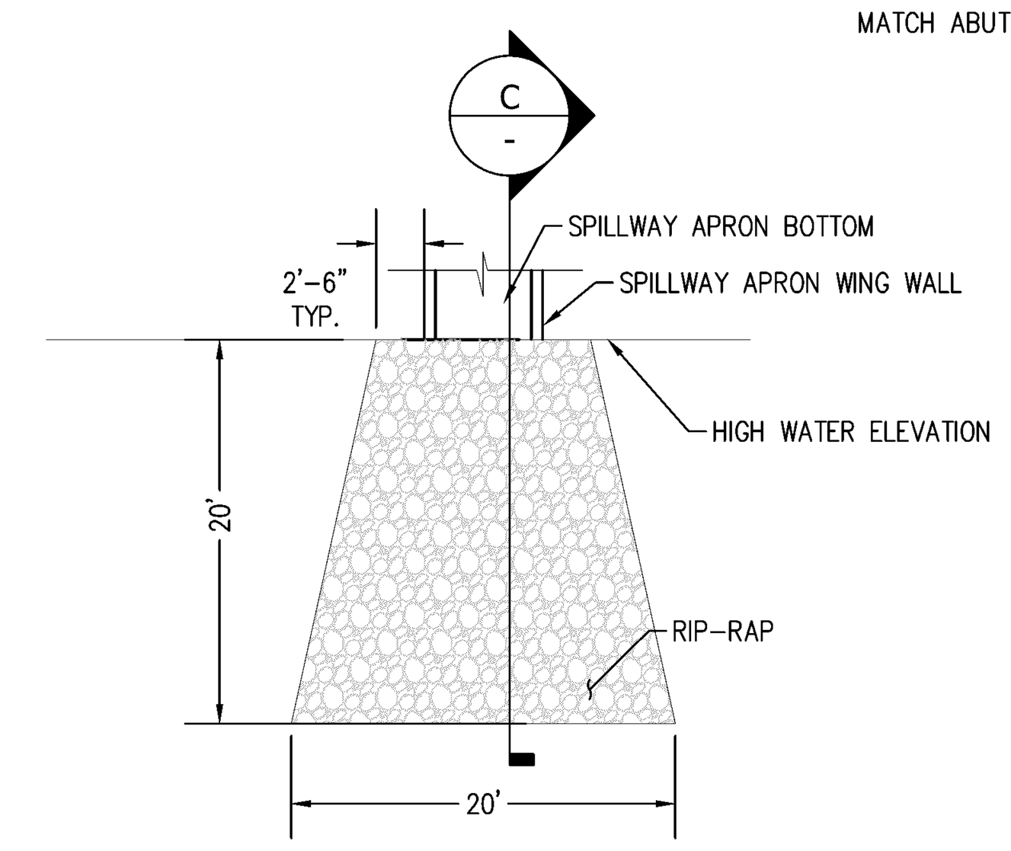
NOTE:
ALL REBAR HOOKS, SPLICES AND EMBEDMENT SHALL BE PER REBAR DETAILING CHART, SHT C-1.9



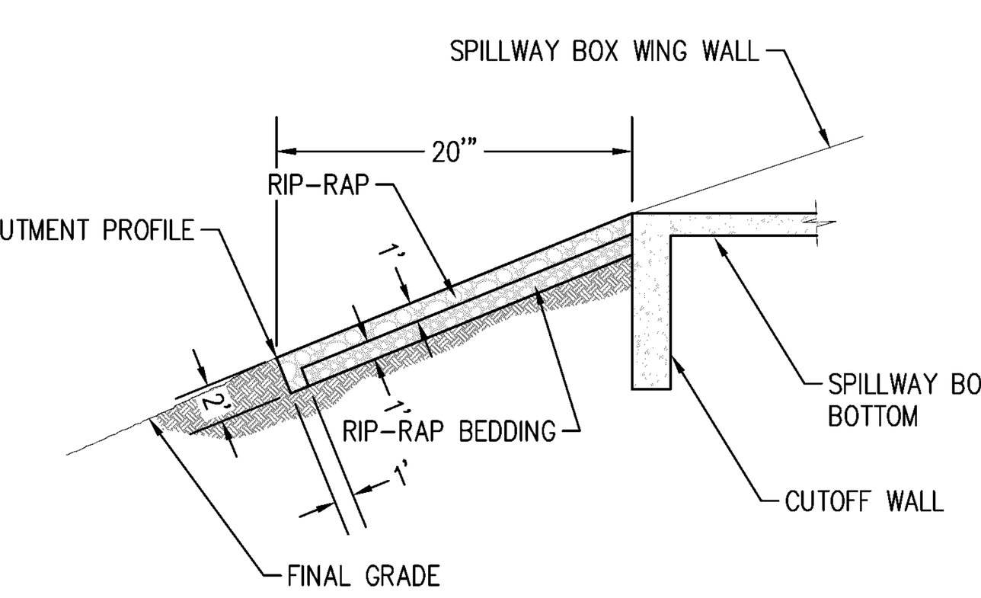
DETAIL 'A'
DISCHARGE PIPE ENCASEMENT
SCALE 1"=5'-0"



SPILLWAY INLET STRUCTURE
TOP VIEW
(FOR REBAR SEE C-1.6)
SCALE 1"=2'-0"

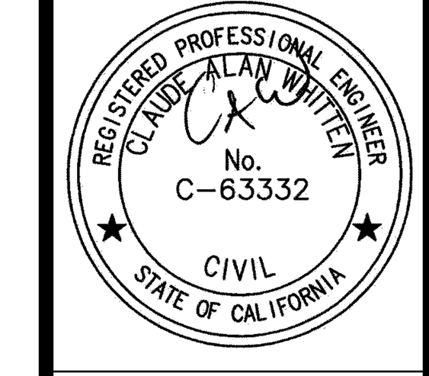


INTAKE RIP-RAP APRON DETAIL
(VIEW LOOKING WESTERLY)
SCALE 1"=10'-0"



SECTION C
INTAKE RIP-RAP APRON
SCALE 1"=10'-0"

BY:
REVISION:
NO. DATE:



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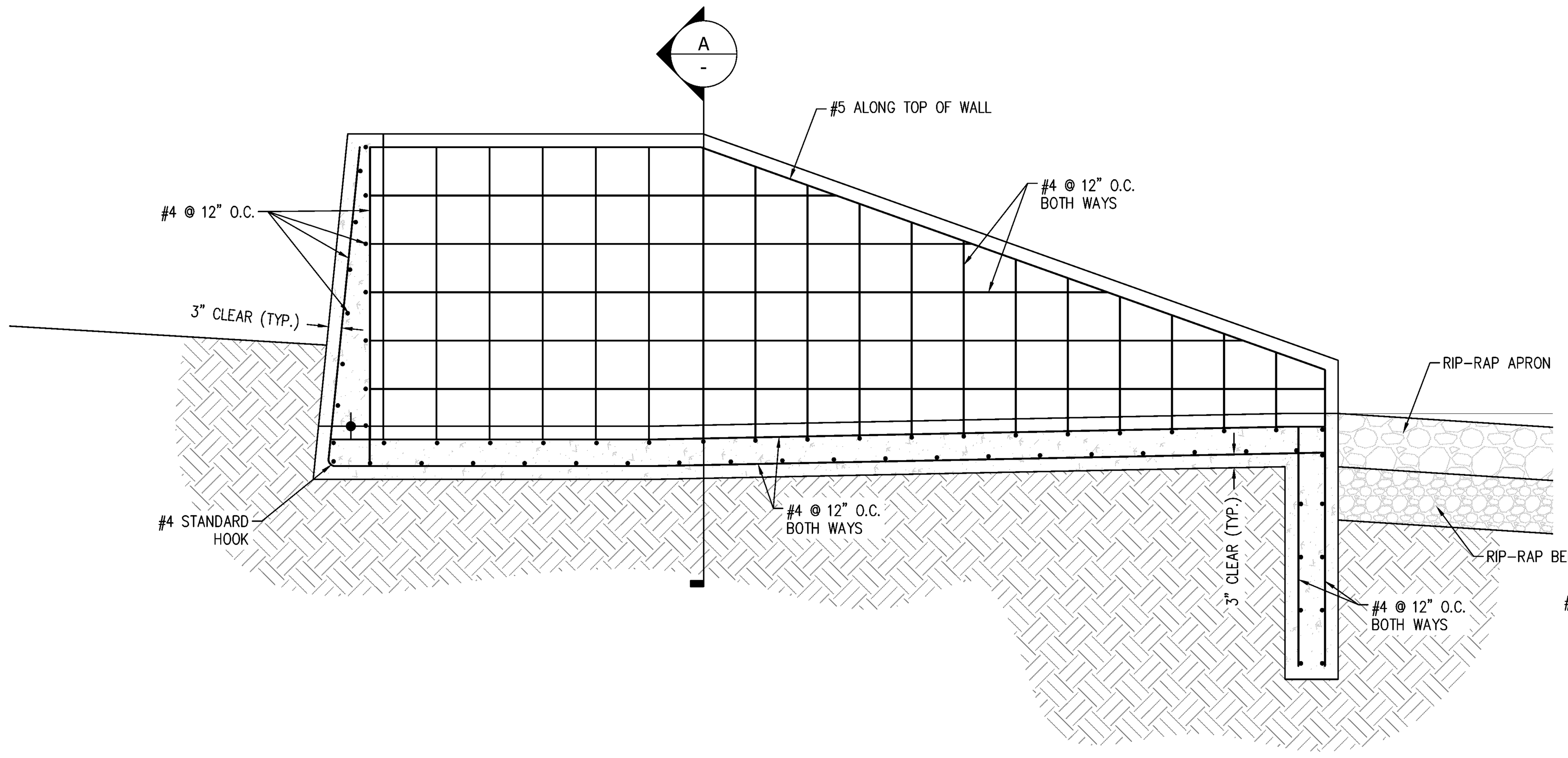
KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
SPILLWAY PLAN, PROFILES AND DETAILS

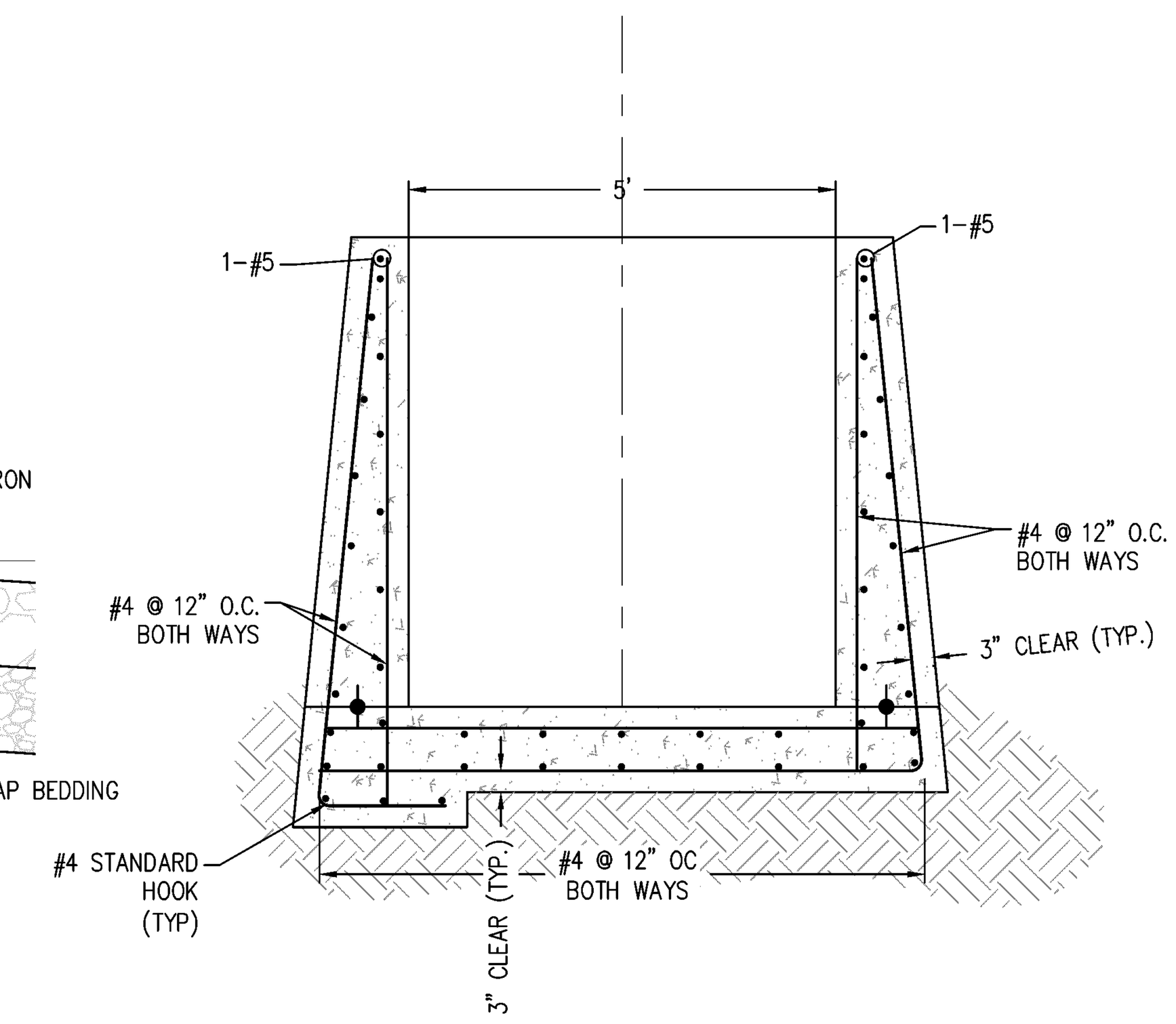
DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00
C-1.5	SHEET 5 OF 13



SPILLWAY APRON AND EAST WING WALL REINFORCEMENT (INTAKE)

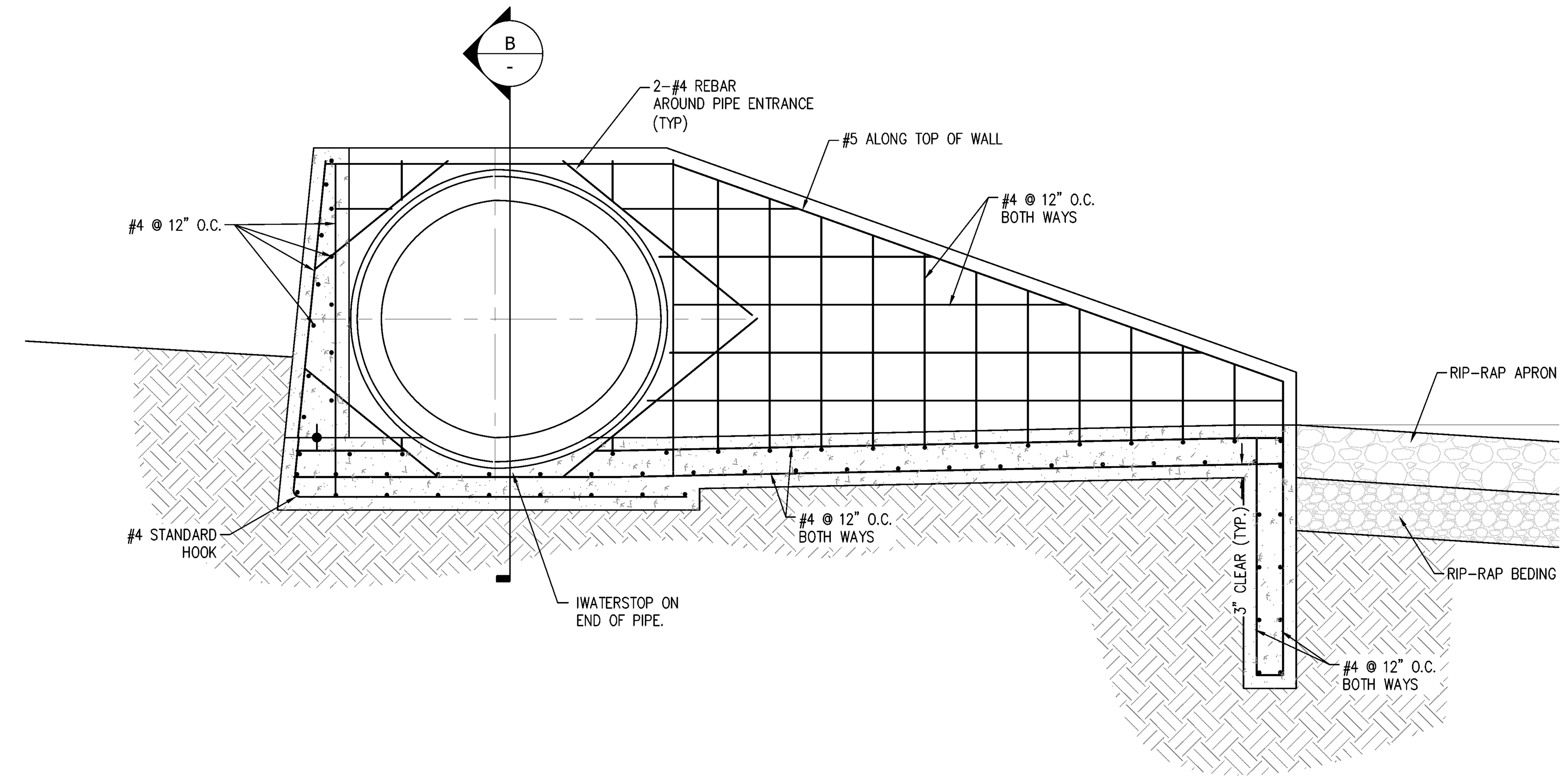
LOGITUDINAL SECTION LOOKING NORTHERLY

SCALE 1"=2'-0"



SECTION A

SCALE 1"=1'-0"

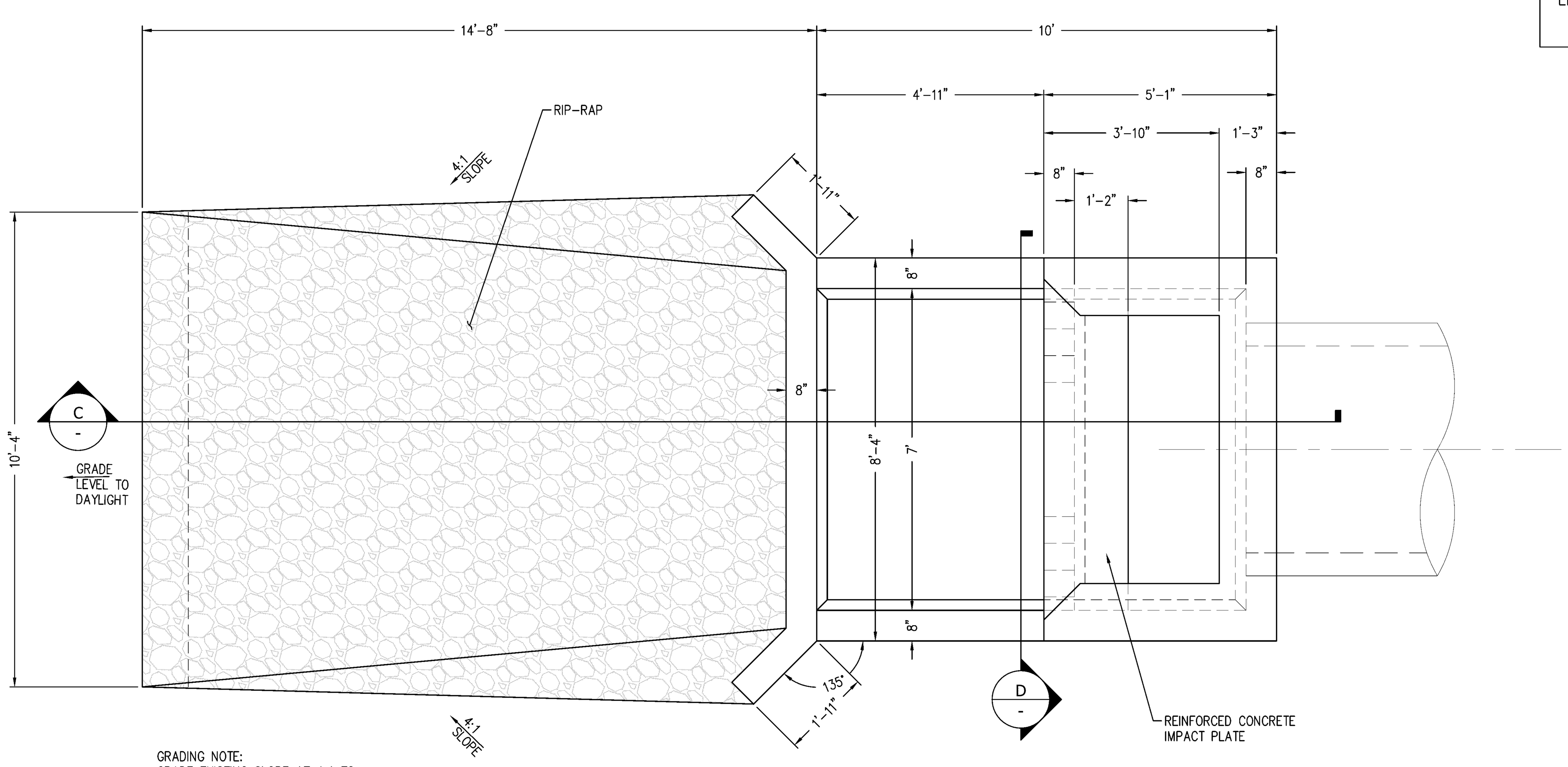


SPILLWAY APRON AND WEST WING WALL REINFORCEMENT (INTAKE)

LOGITUDINAL SECTION LOOKING NORTHERLY

SCALE 1"=2'-0"

NOTE:
ALL REBAR HOOKS, SPLICES AND EMBEDMENT SHALL BE PER REBAR DETAILING CHART, SHT C-1.9

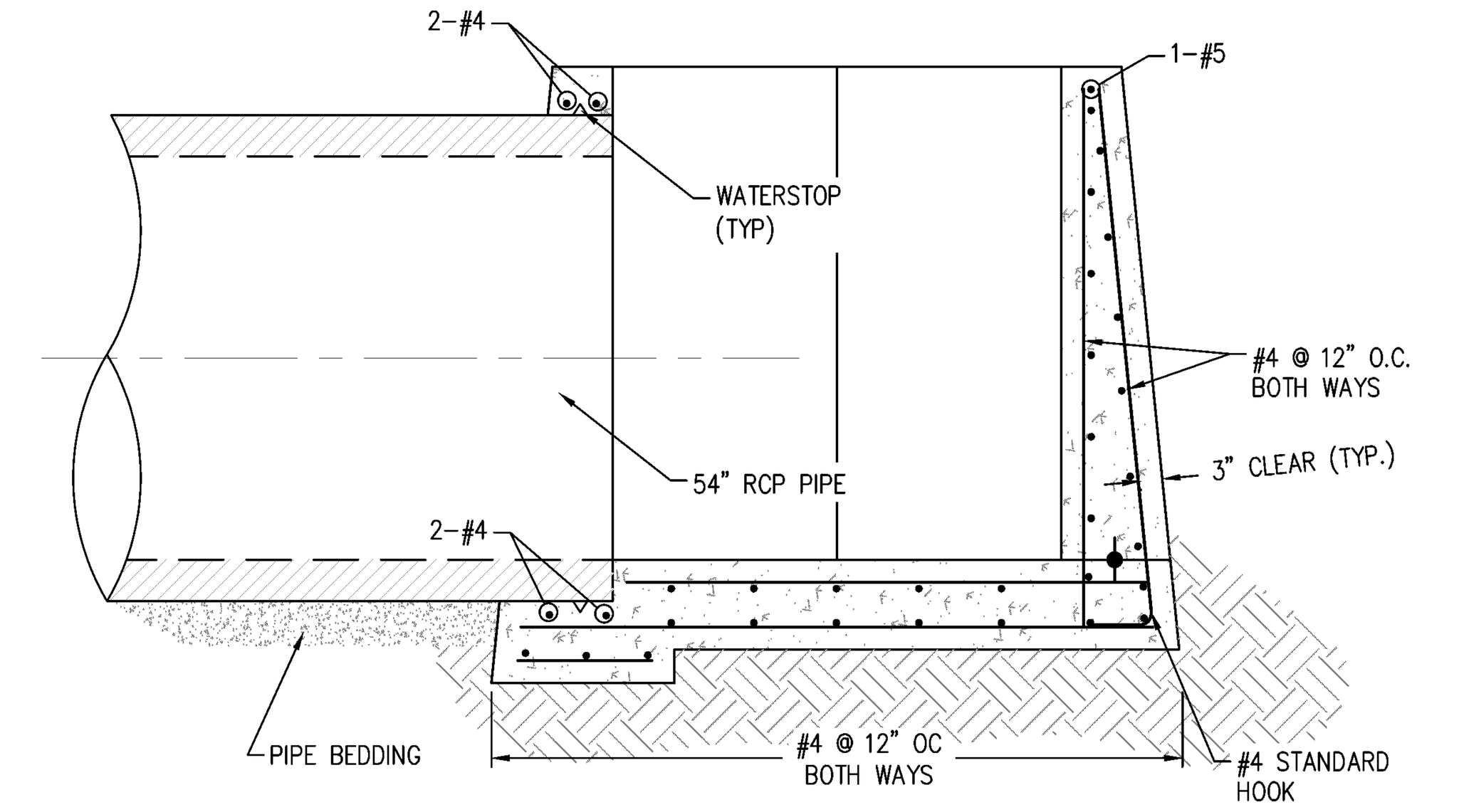


GRADING NOTE:
GRADE EXISTING SLOPE AT 4:1 TO SIDES OF RIP-RAP PAD. GRADE OUTLET END OF RIP-RAP PAD LEVEL TO DAYLIGHT

SPILLWAY SPLASH APRON

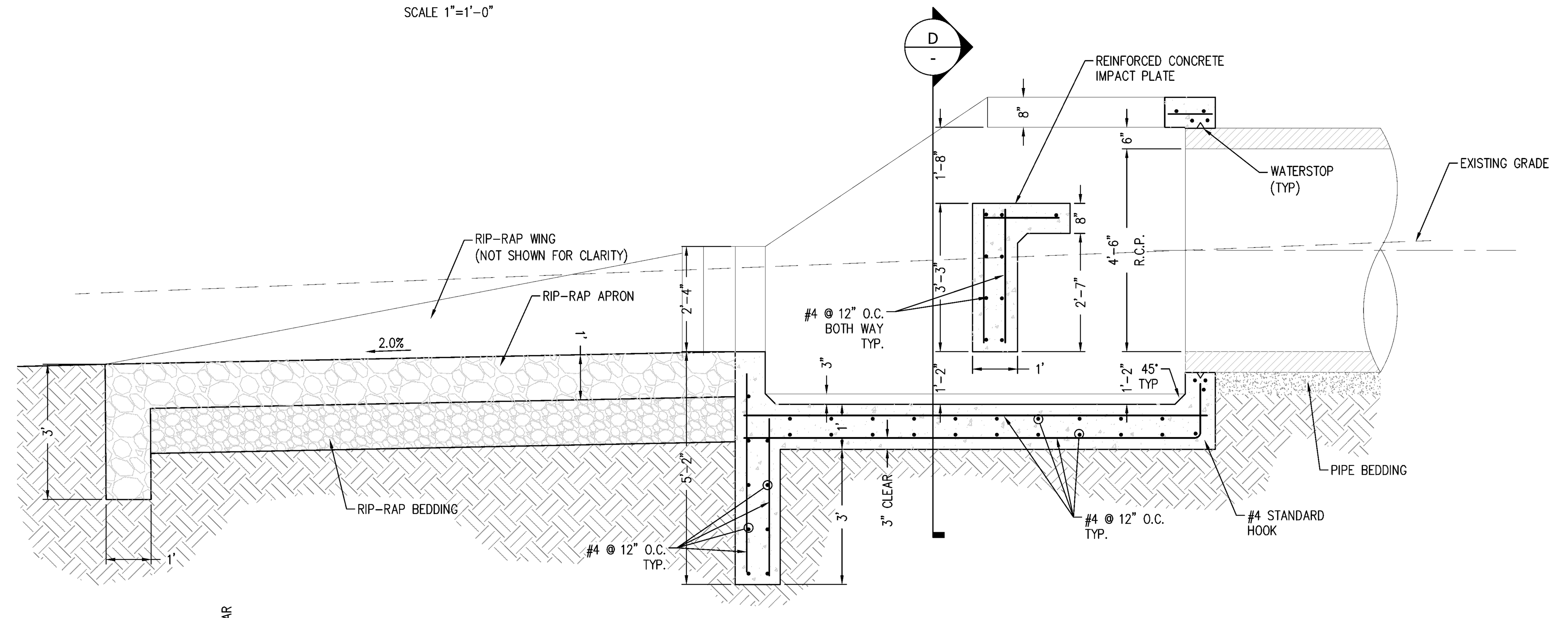
SCALE 1"=2'-0"

(REBARS NOT SHOWN)



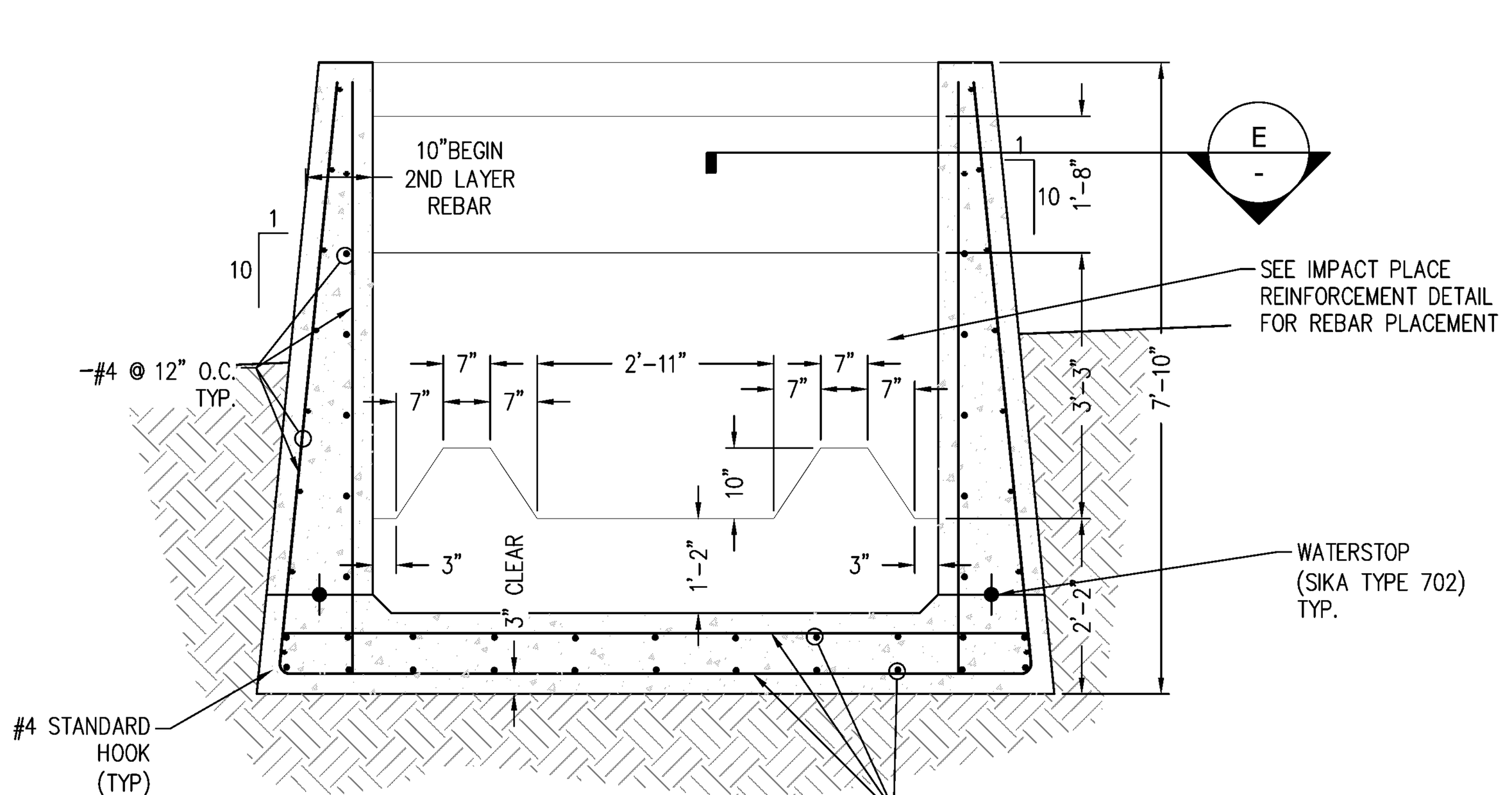
SECTION B

SCALE 1"=1'-0"



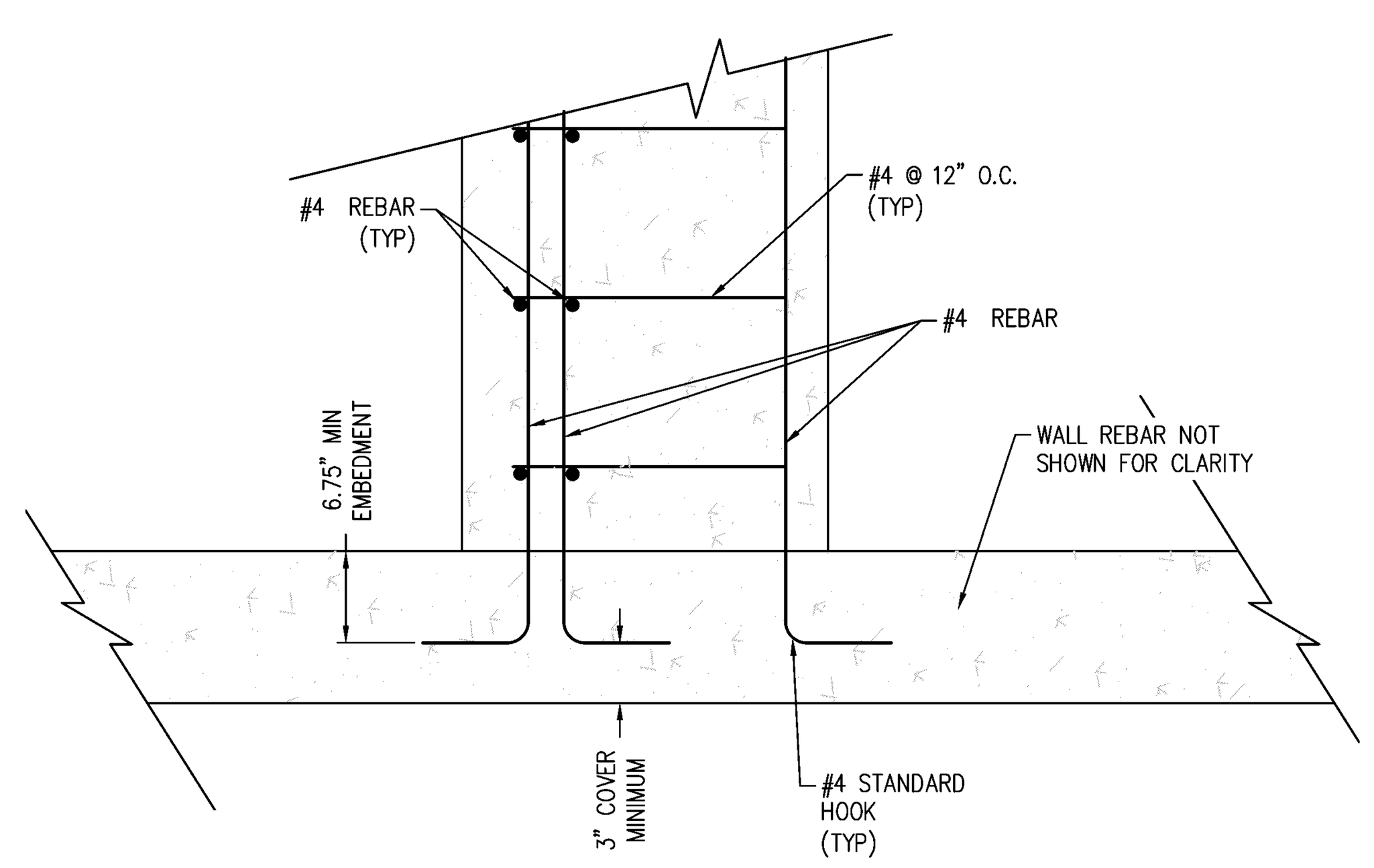
SECTION C

SCALE 1"=2'-0"



SECTION D

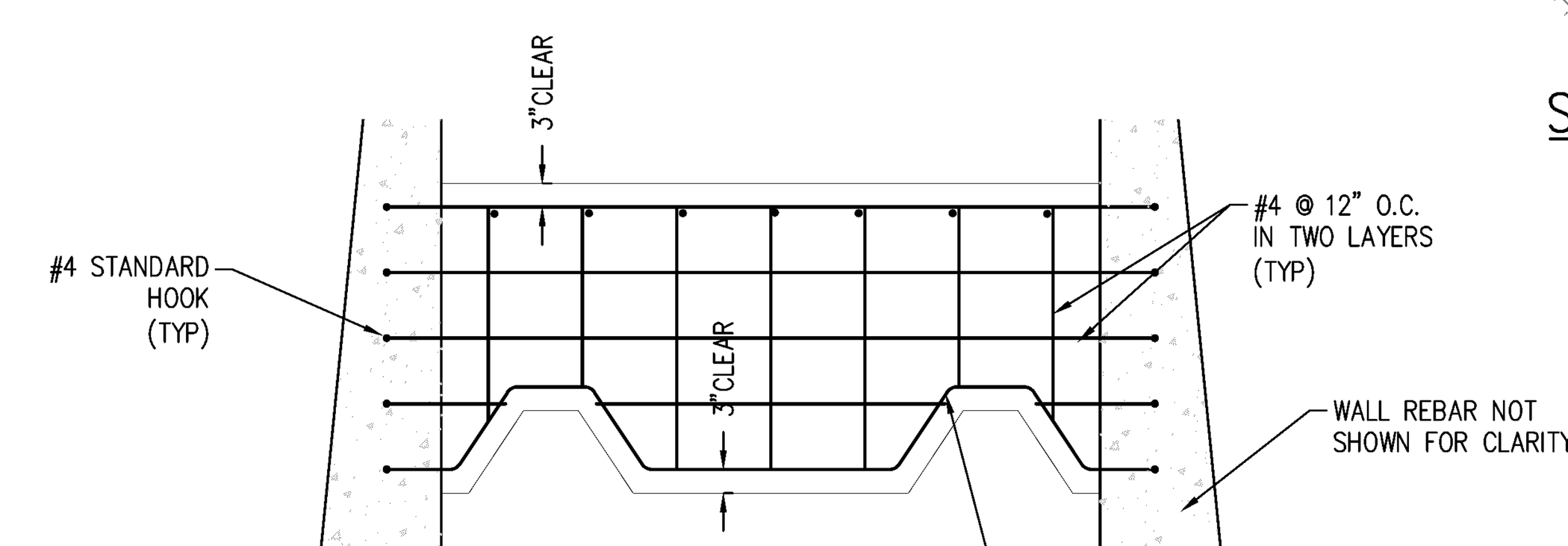
SCALE 1"=2'-0"



SECTION E

IMPACT PLATE CONNECTION

SCALE 1"=1'-0"



IMPACT PLATE REINFORCEMENT

SCALE 1"=2'-0"

NO.	DATE:	REVISION:	BY:

REGISTERED PROFESSIONAL ENGINEER
CLAUDE ALAN WHITTEN
No. C-63332
CIVIL
STATE OF CALIFORNIA

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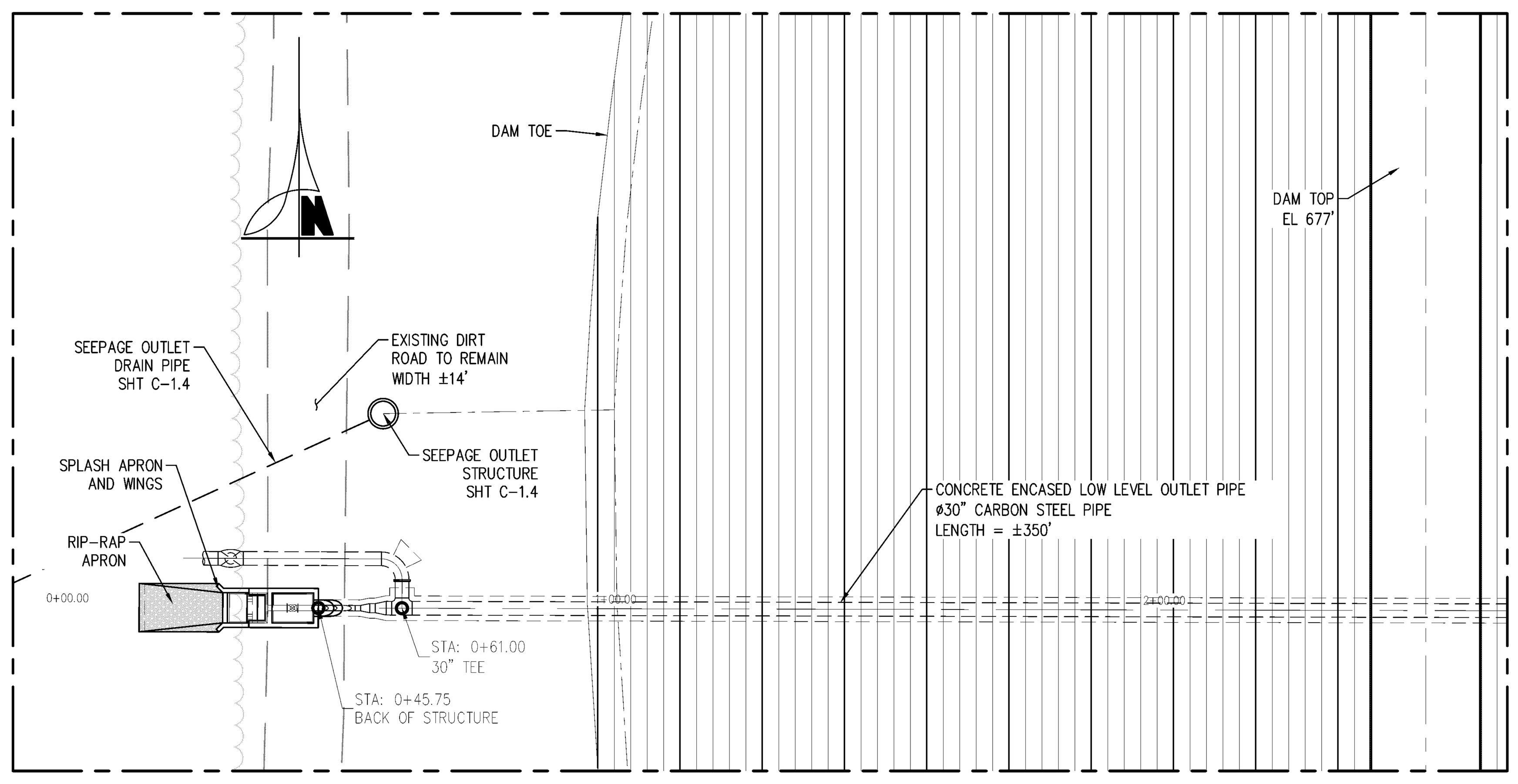
DEVELOPMENT BY:
KERN-TULARE WATER DISTRICT
5001 CALIFORNIA AVE, SUITE 102
BAKERSFIELD, CA 93309
661-327-3132

KERN-TULARE WATER DISTRICT WATER PIPELINE
GUZMAN WATER RESERVOIR SPILLWAY REINFORCEMENT DETAILS

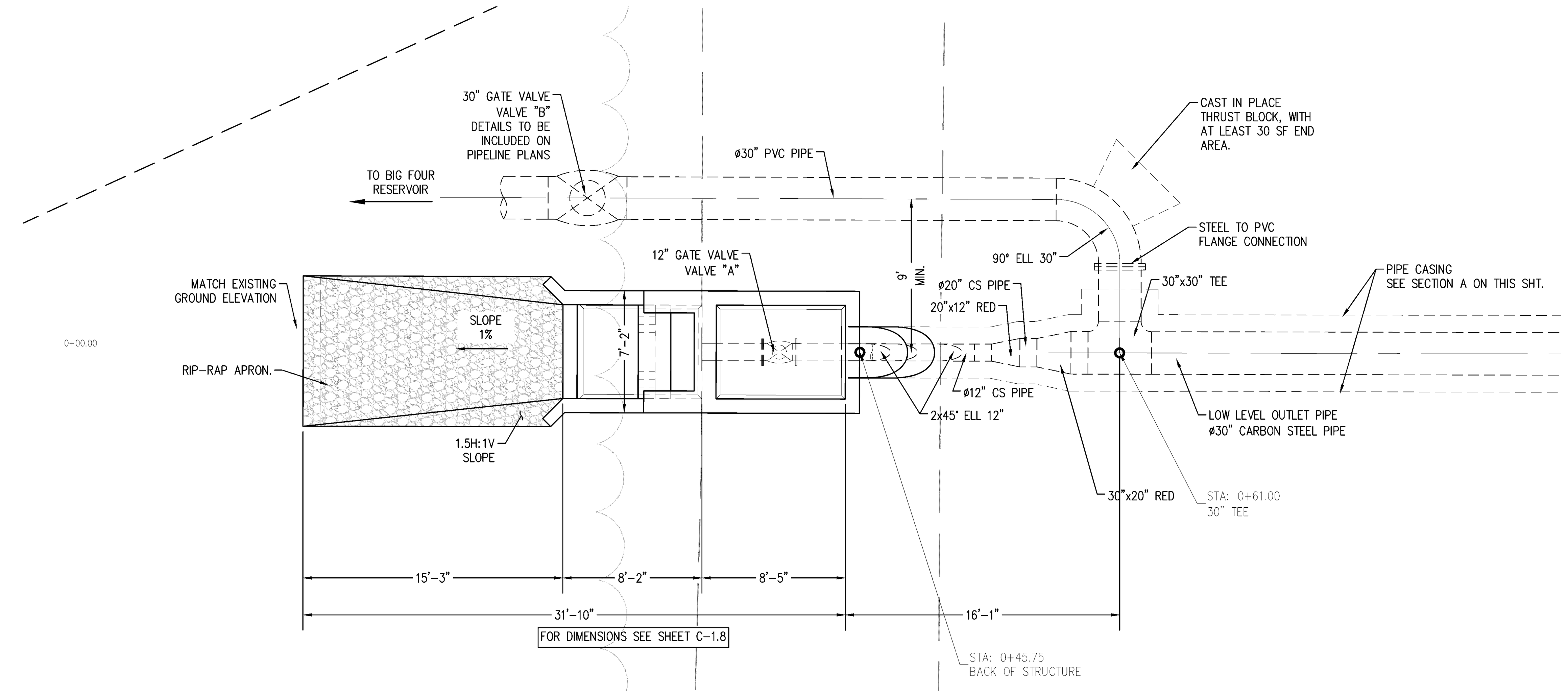
DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00
C-1.6	SHEET 6 OF 13



LOW LEVEL OUTLET DETAIL

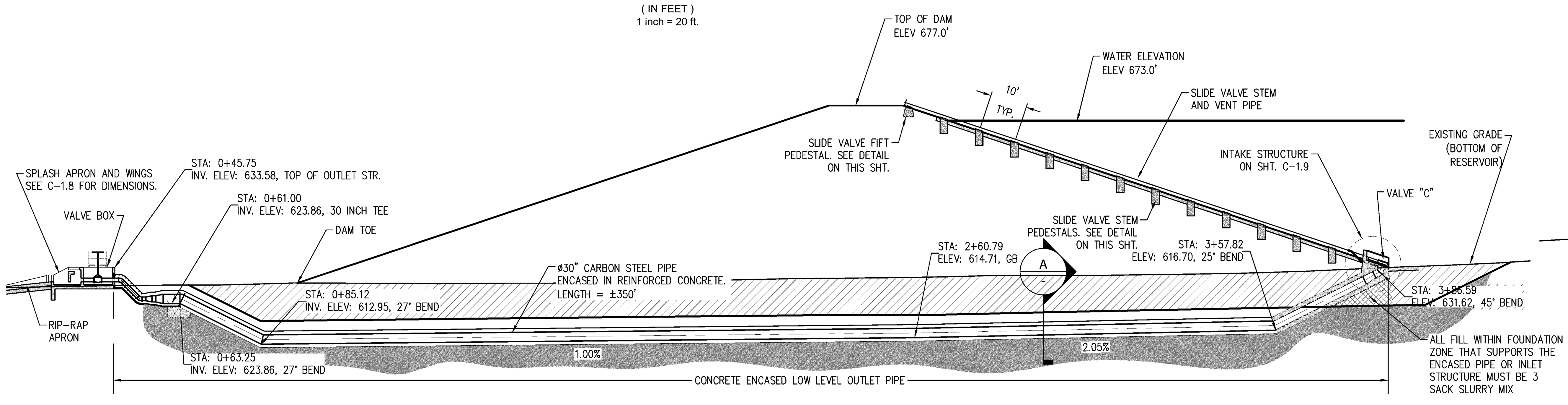
SCALE 1"=20'-0"

GRAPHIC SCALE
20' 10' 0' 10' 20'
(IN FEET)
1 inch = 20 ft.



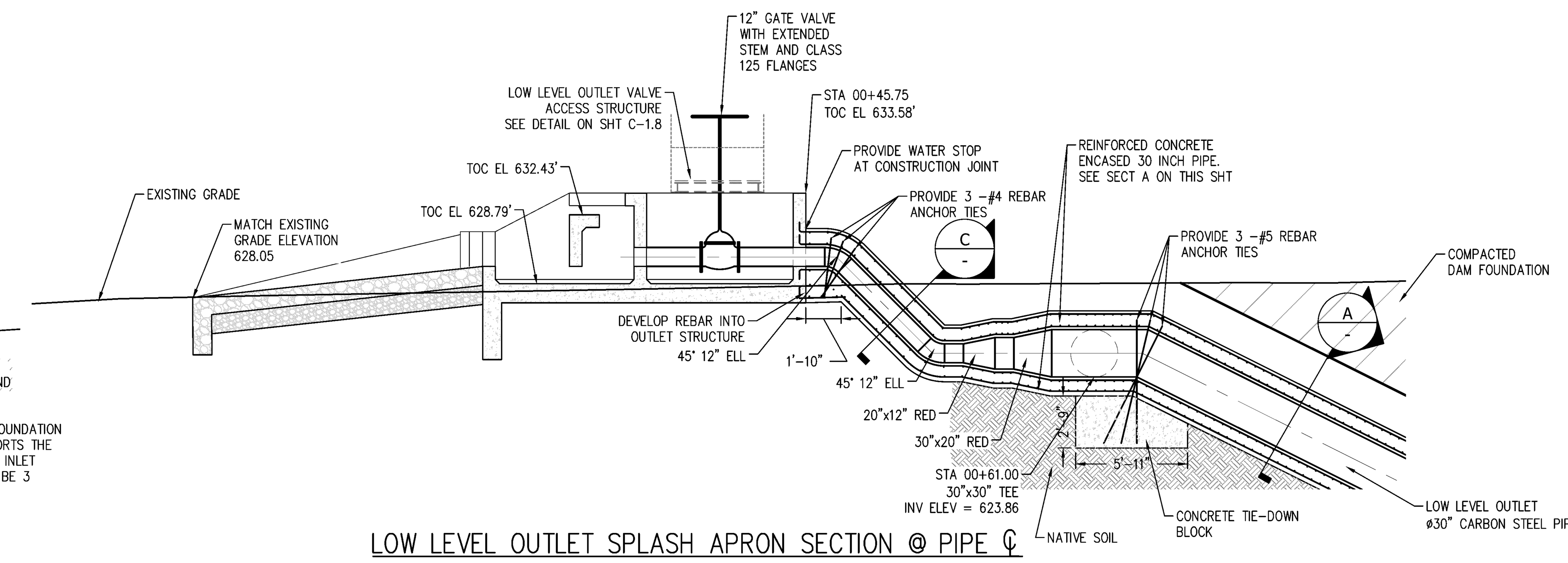
LOW LEVEL OUTLET AND SPLASH APRON DETAIL

SCALE 1"=5'-0"



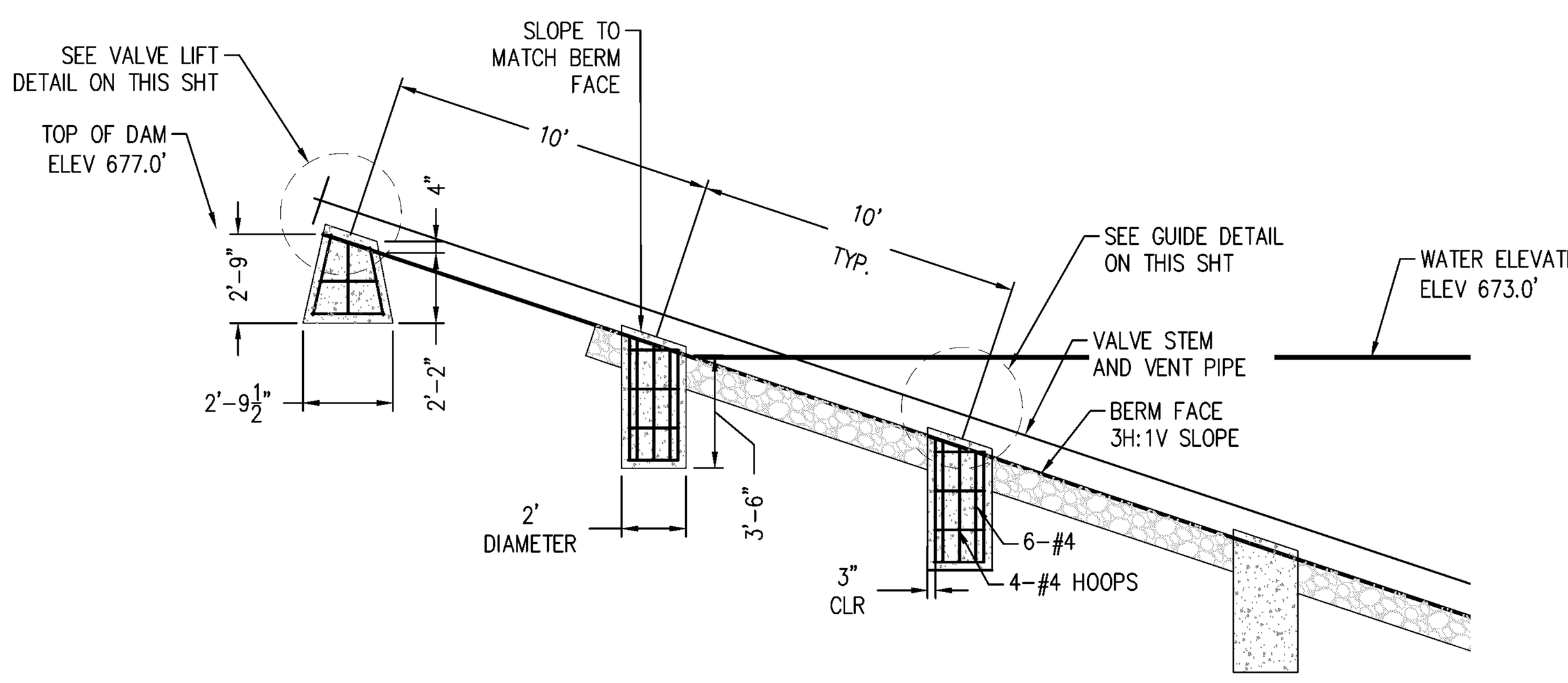
WEST DAM PROFILE WITH LOW LEVEL OUTLET PIPE

(LOOKING NORTH)
SCALE 1"=20'-0"



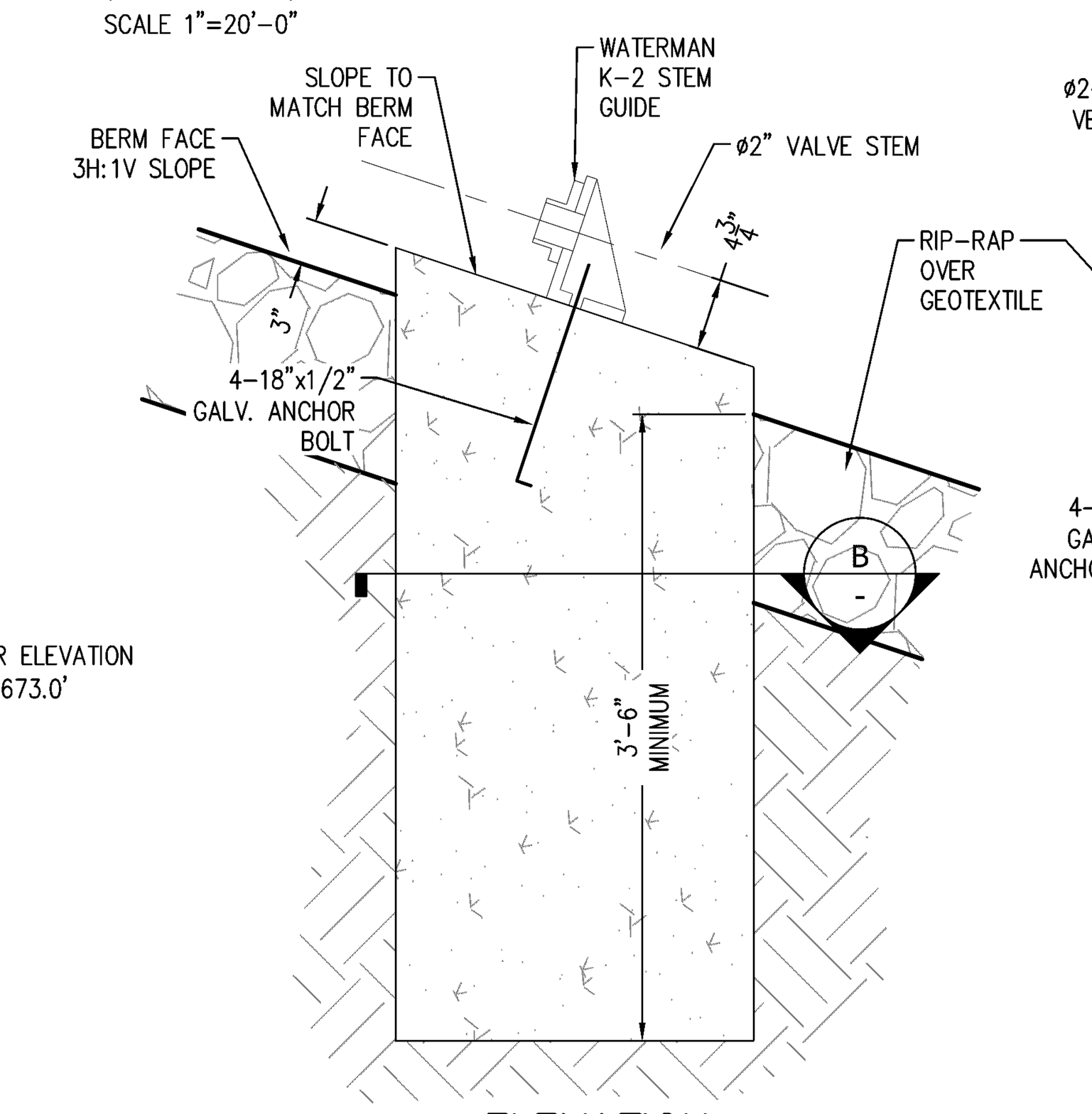
LOW LEVEL OUTLET SPLASH APRON SECTION @ PIPE ℄

LOOKING NORTH
(REBARS NOT SHOWN)
SCALE 1"=5'-0"



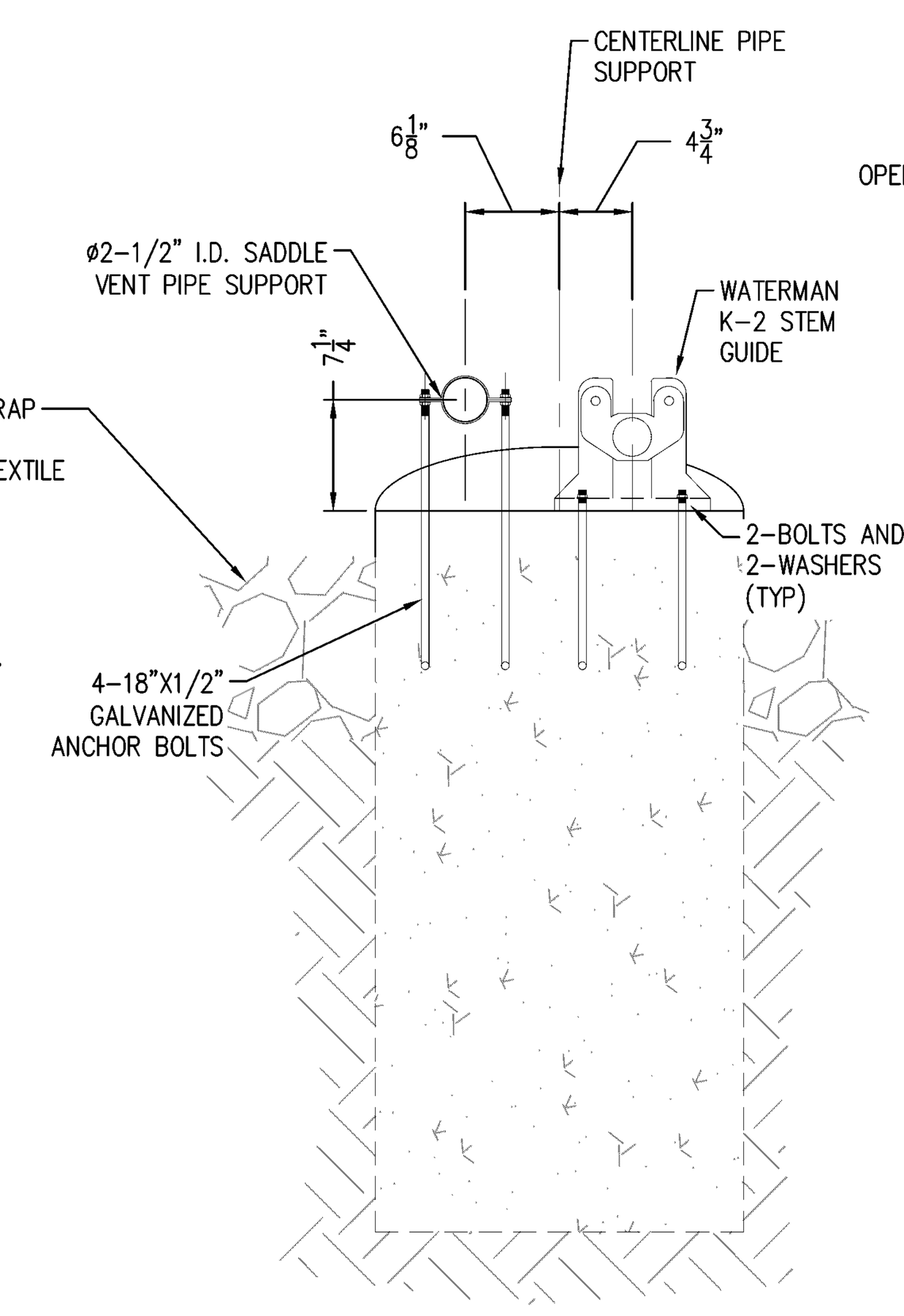
STEM PEDESTALS

SCALE 1"=5'-0"



ELEVATION

LOOKING NORTH
(VENT PIPE NOT SHOWN FOR CLARITY)

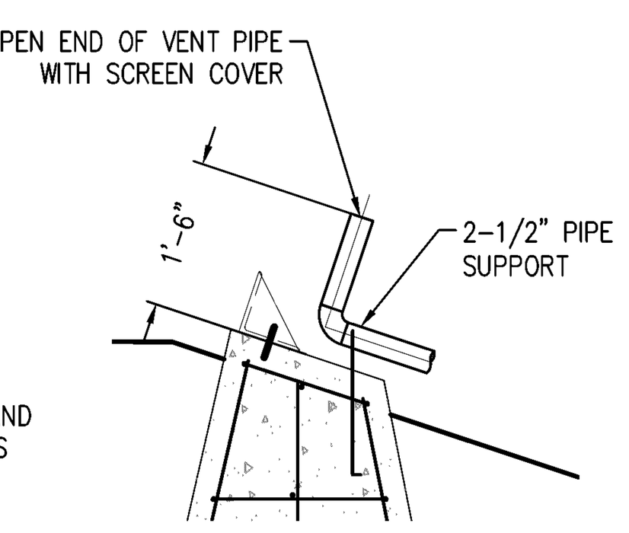


ELEVATION

LOOKING WEST

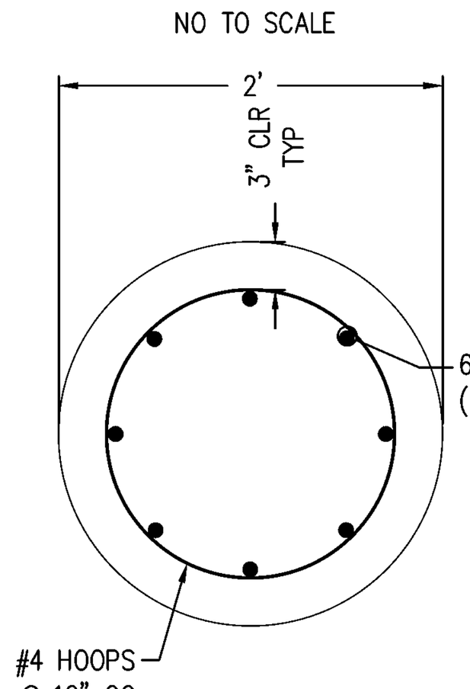
GUIDE DETAIL

SCALE 1"=1'-0"
(REBARS NOT SHOWN FOR CLARITY)



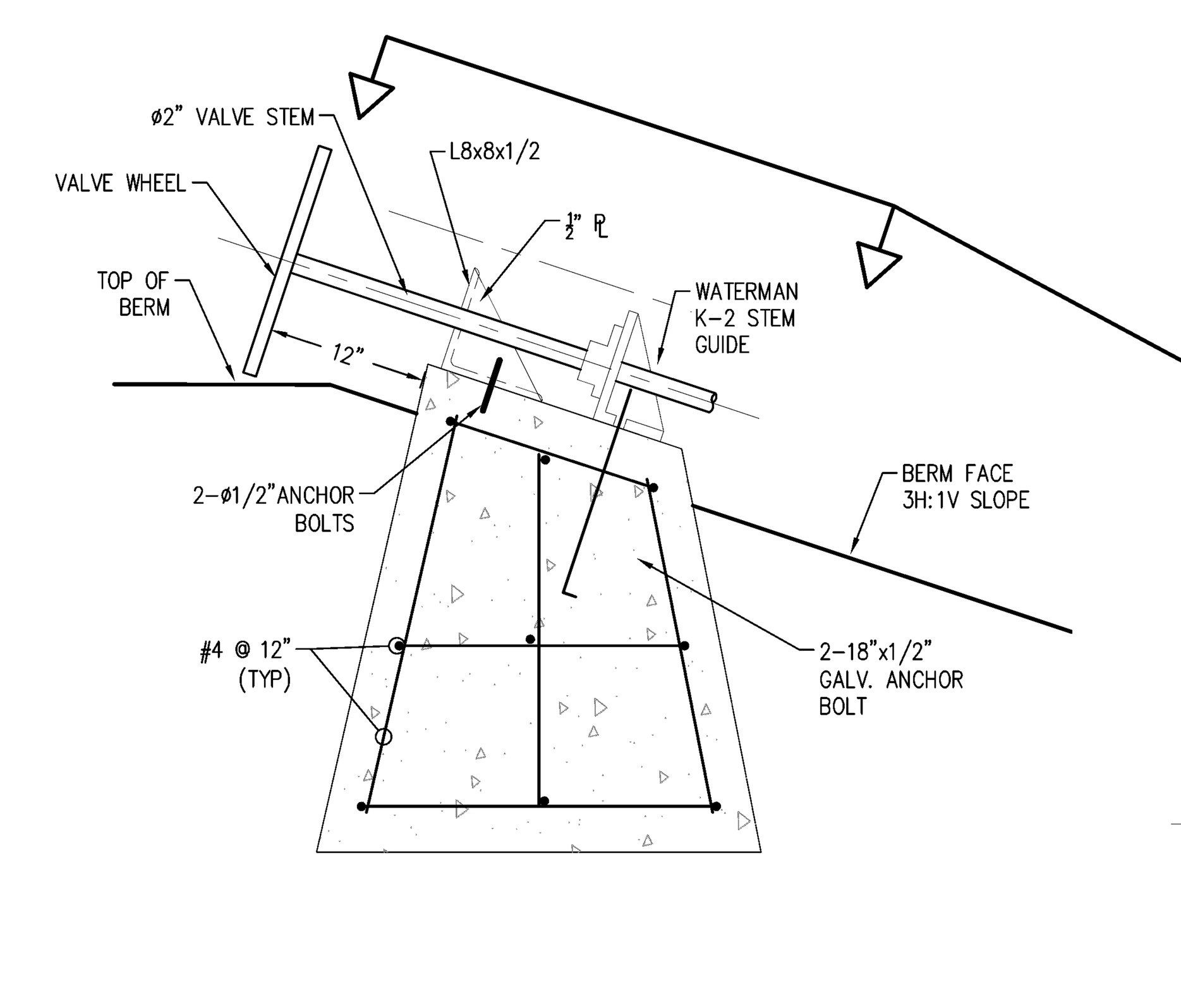
VENT PIPE TERMINATION

NO TO SCALE



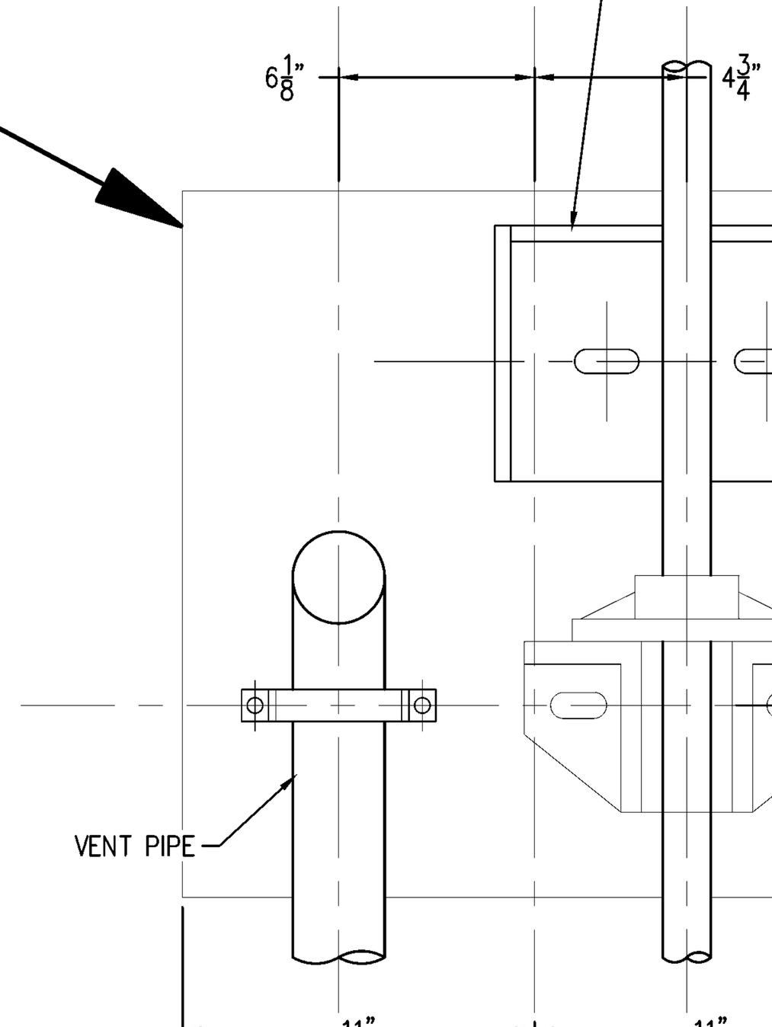
SECTION B

STEM PEDESTAL
SCALE 1"=1'-0"



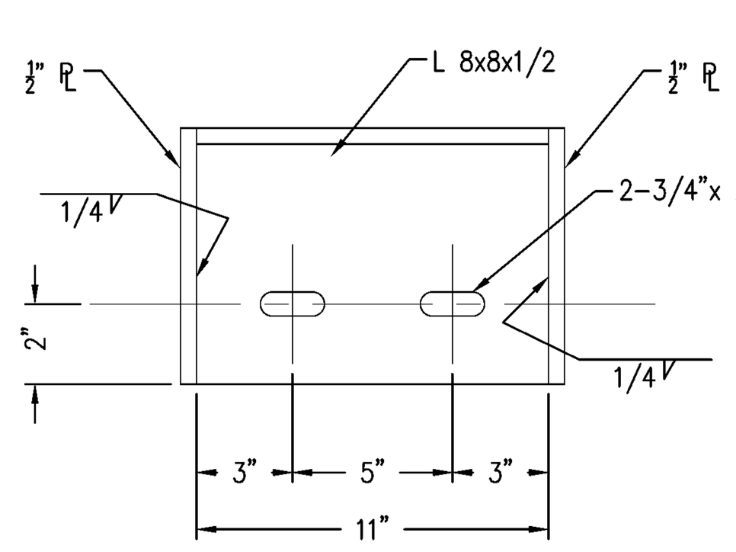
VALVE LIFT PEDESTAL DETAIL

SCALE 1"=1'-0"

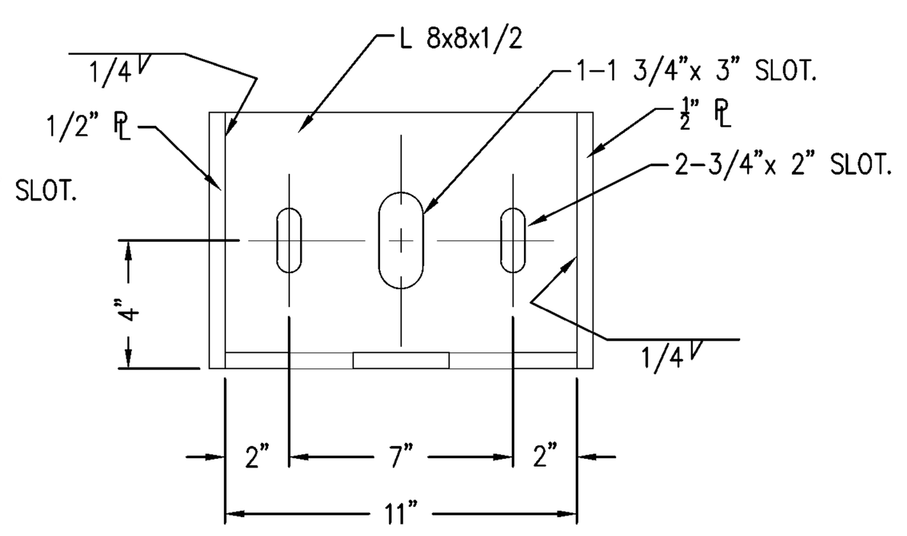


PLAN VIEW

NO TO SCALE



PLAN VIEW

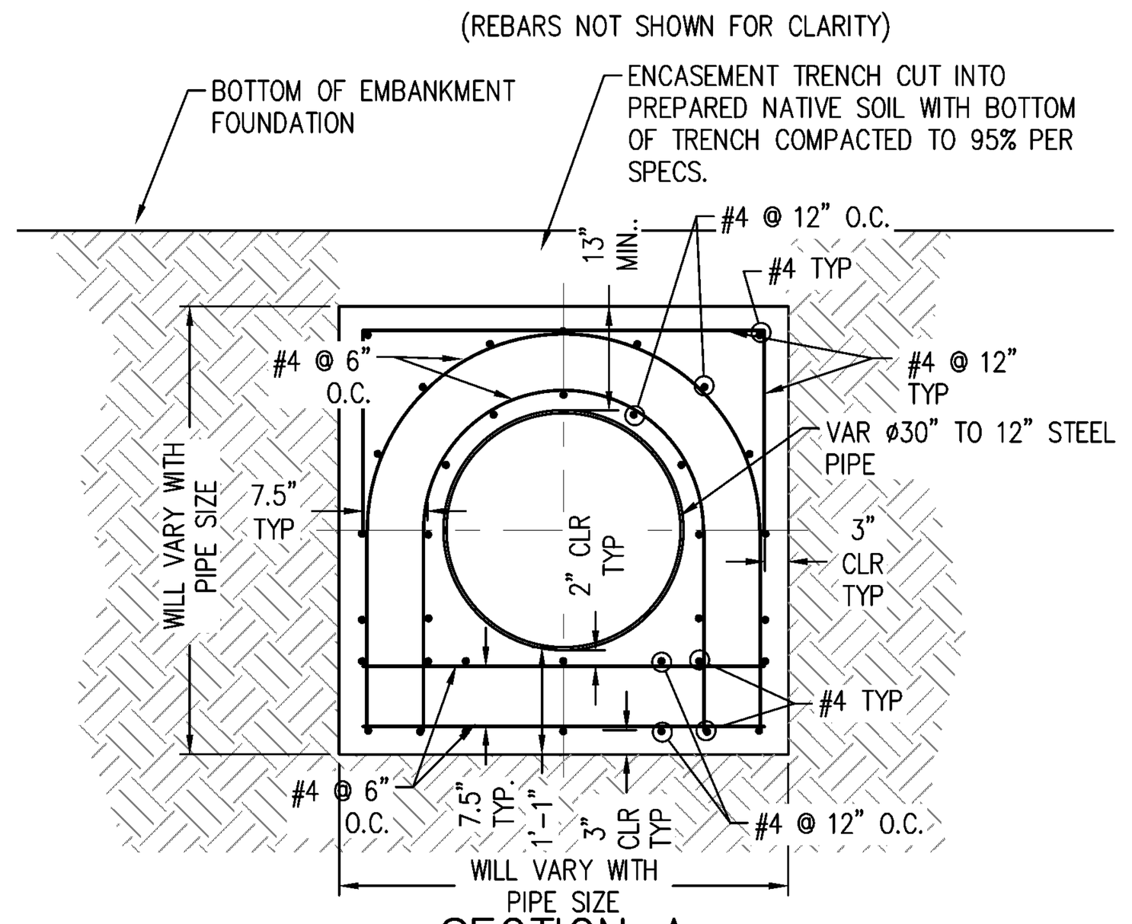


ELEVATION

LOOKING WEST

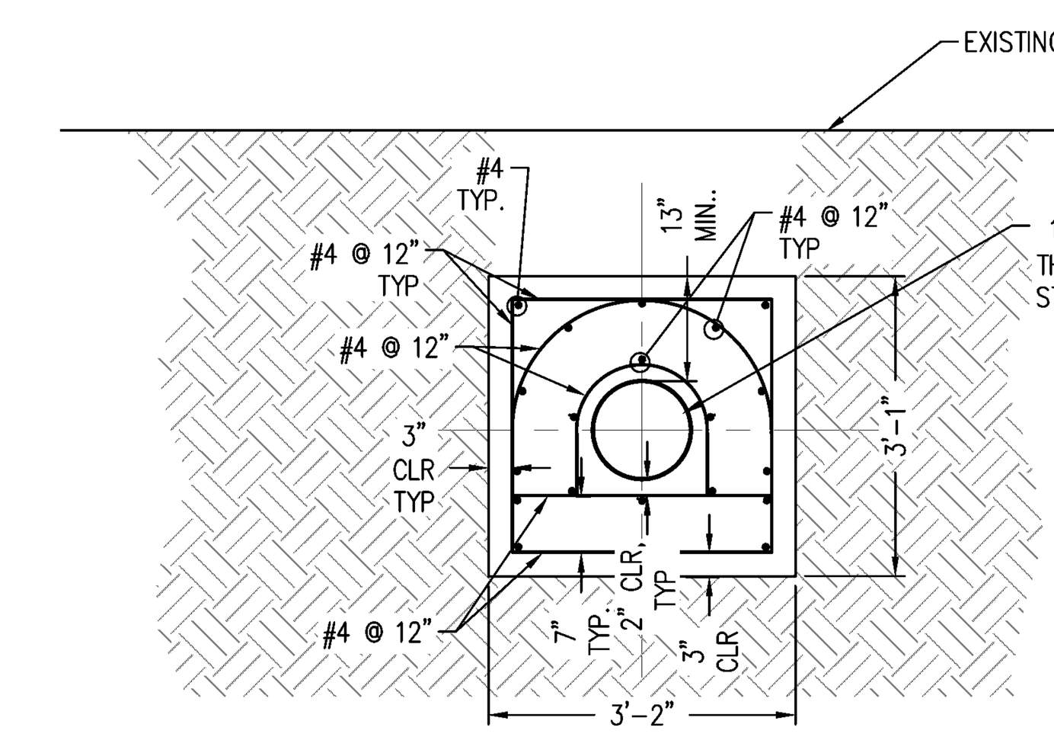
HAND WHEEL BRACKET DETAIL

NO TO SCALE



SECTION A

REINFORCED CONCRETE CASING
30 INCH PIPE AND TRANSITIONS
SCALE 1"=2'-0"



SECTION C

REINFORCED CONCRETE CASING
12 INCH PIPE
SCALE 1"=2'-0"

NOTE:
ALL REBAR HOOKS, SPLICES AND
EMBEDMENT SHALL BE PER REBAR
DETAILING CHART, SHT C-1.9

NO.	DATE	REVISION	BY

REGISTERED PROFESSIONAL ENGINEER
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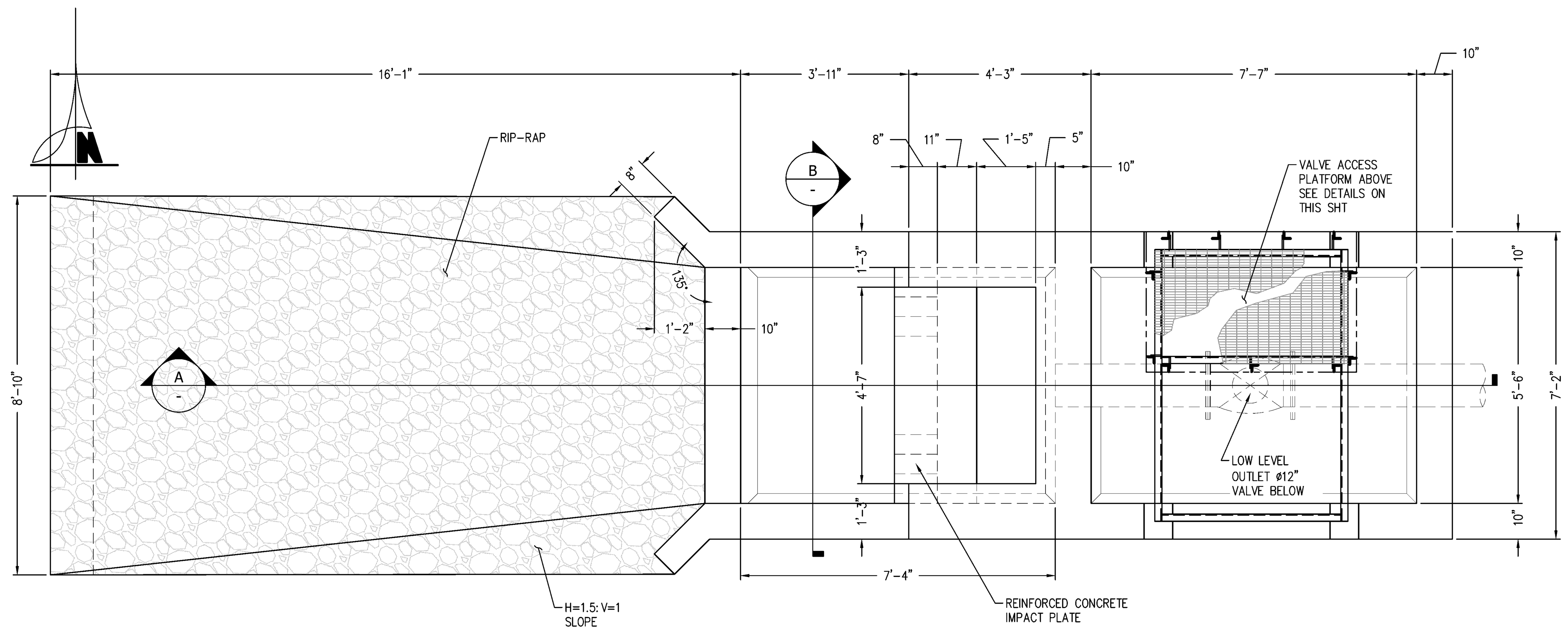
BAKERSFIELD, CA 93309
661-327-3132

KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
LOW LEVEL OUTLET DETAILS

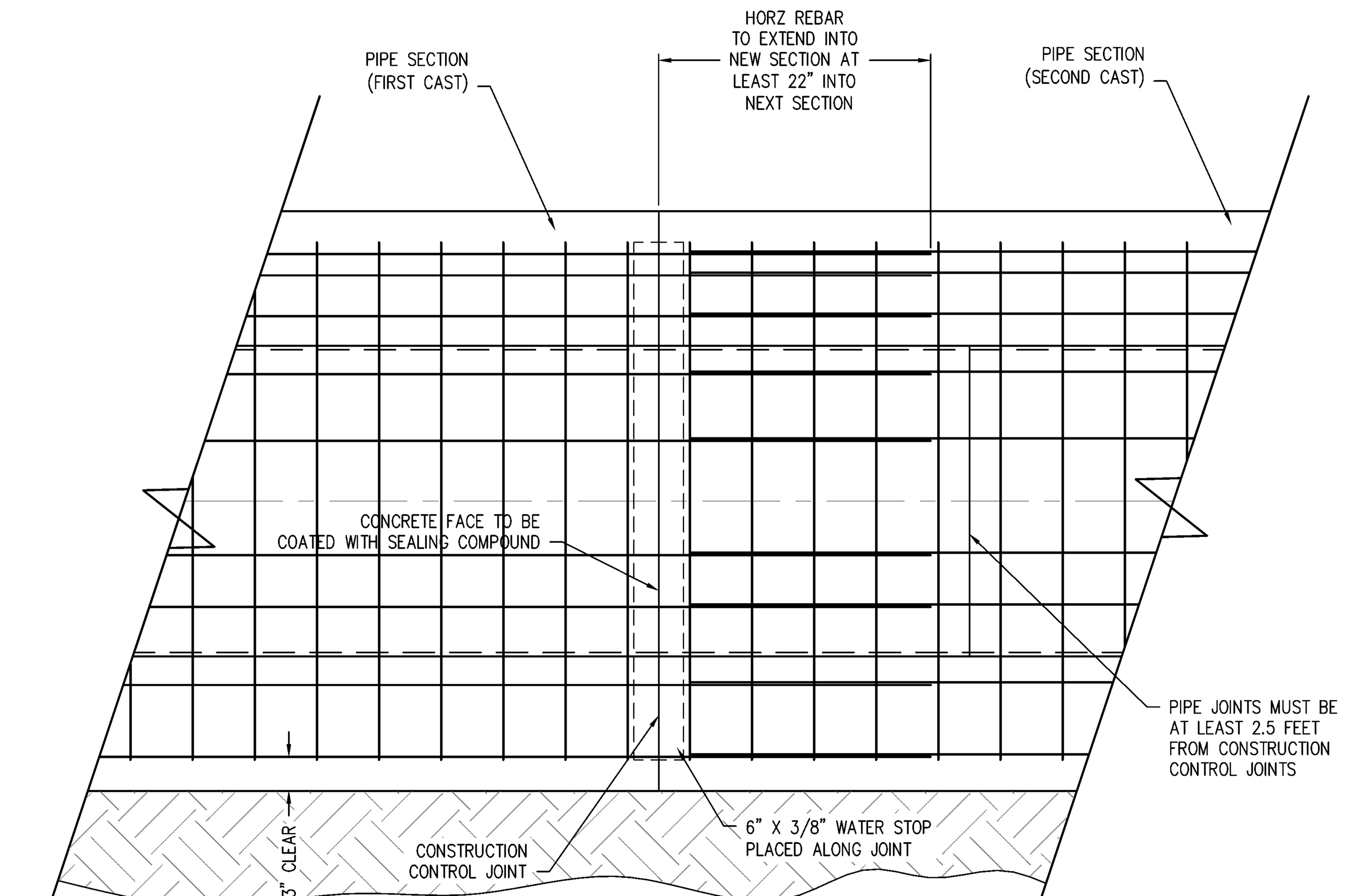
DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00
C-1.7	SHEET 7 OF 13



LOW LEVEL OUTLET SPLASH APRON

SCALE 1"=2'-0"

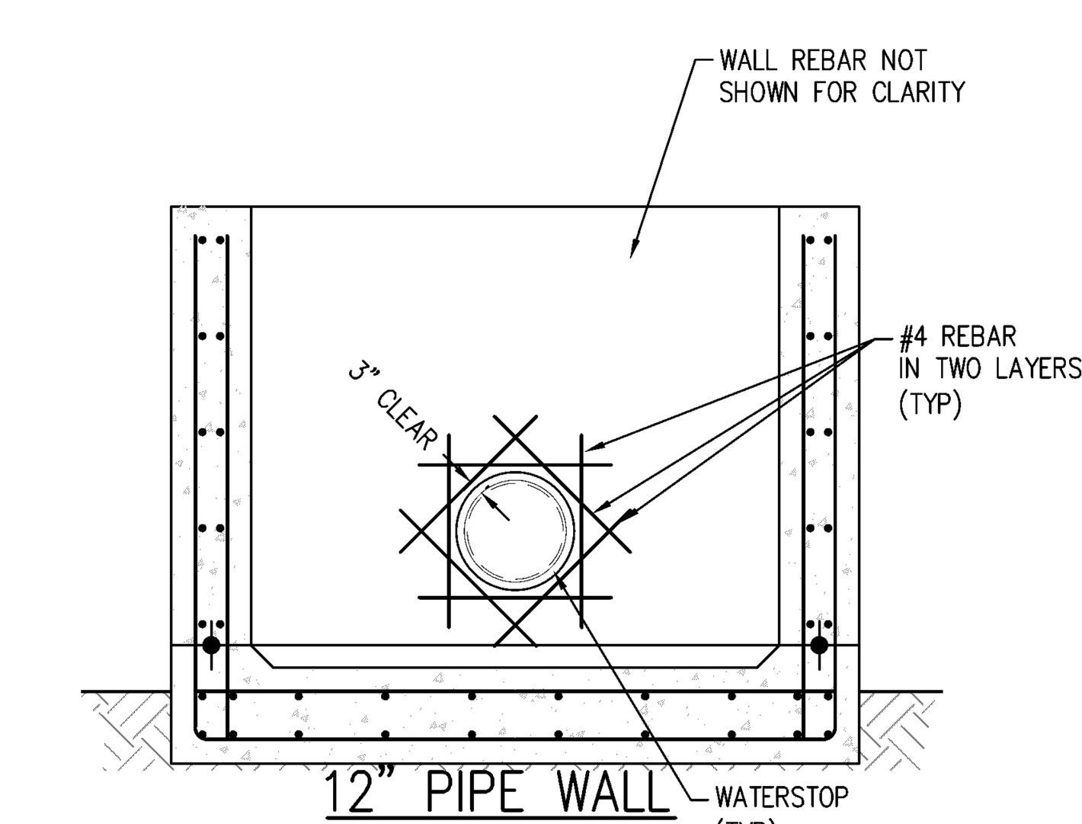
(REBARS NOT SHOWN)



DETAIL A

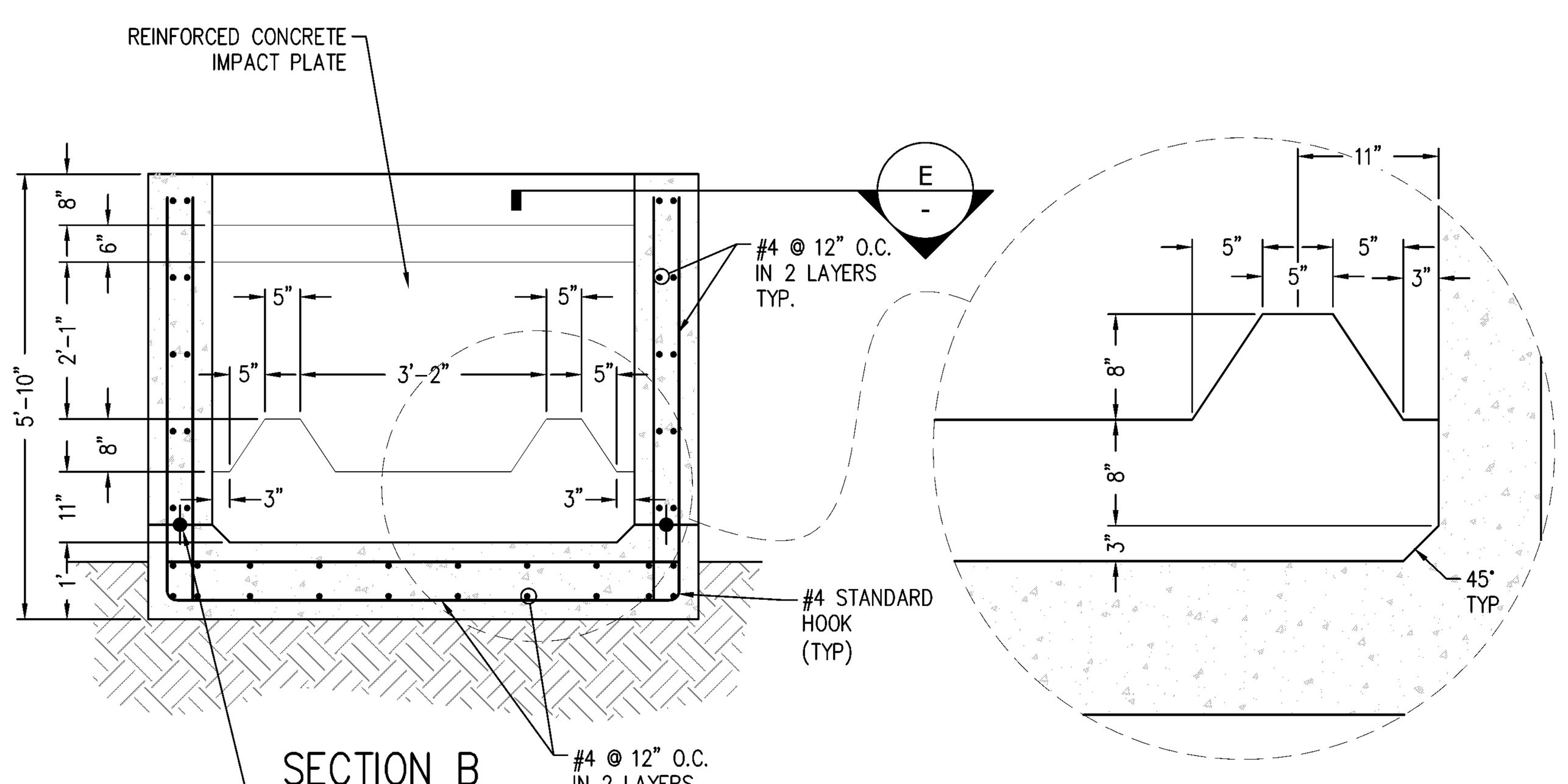
ENCASED PIPE JOINT DETAIL

SCALE 1"=1'-0"



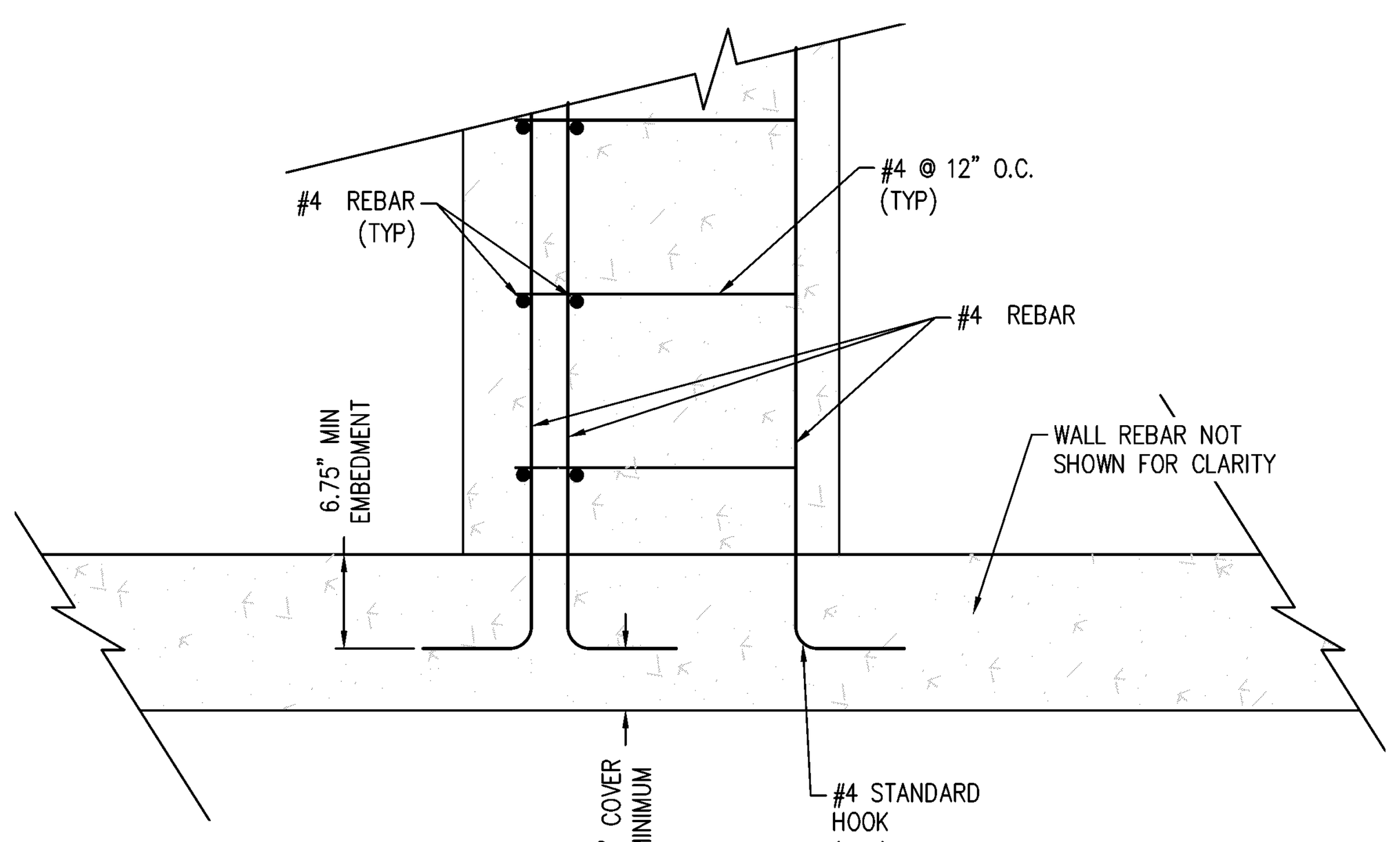
12" PIPE WALL PENATRATION

SCALE 1"=2'-0"



SECTION B

SCALE 1"=2'-0"

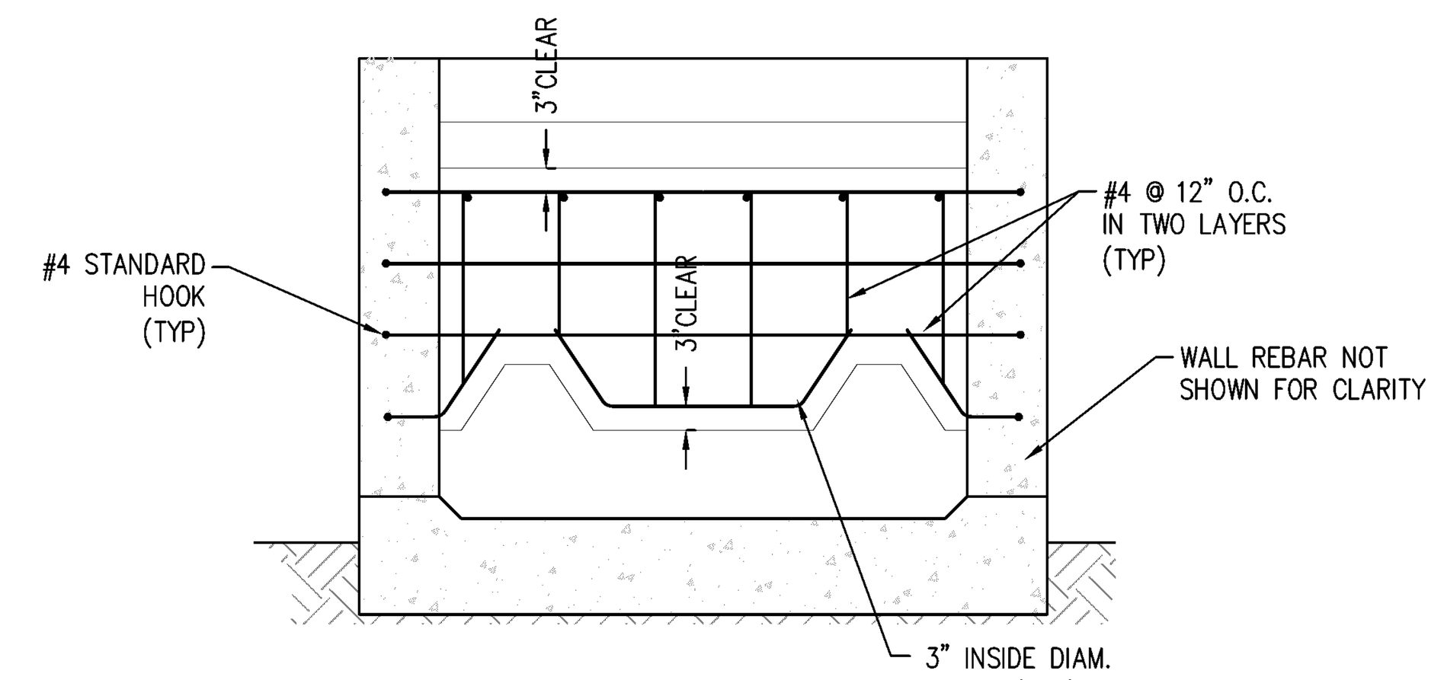


SECTION E

IMPACT PLATE CONNECTION

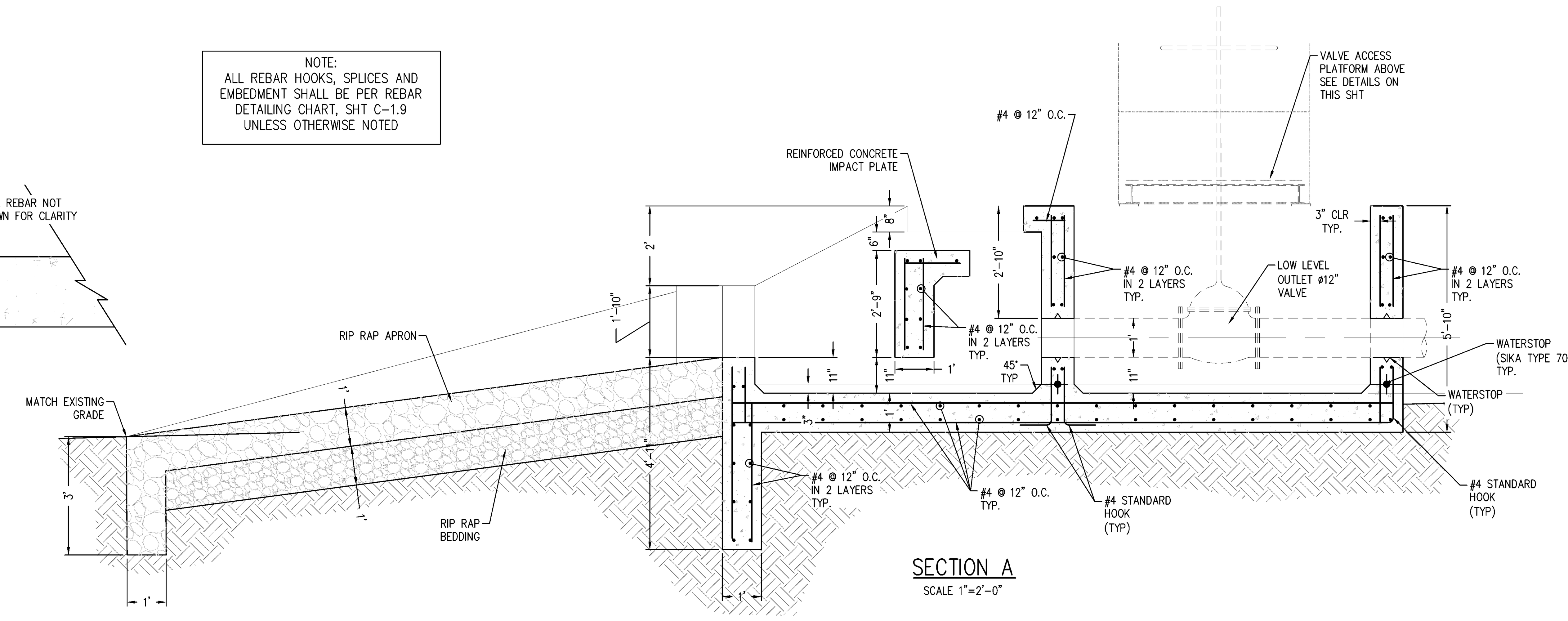
SCALE 1"=1'-0"

NOTE:
ALL REBAR HOOKS, SPLICES AND EMBEDMENT SHALL BE PER REBAR DETAILING CHART, SHT C-1.9 UNLESS OTHERWISE NOTED



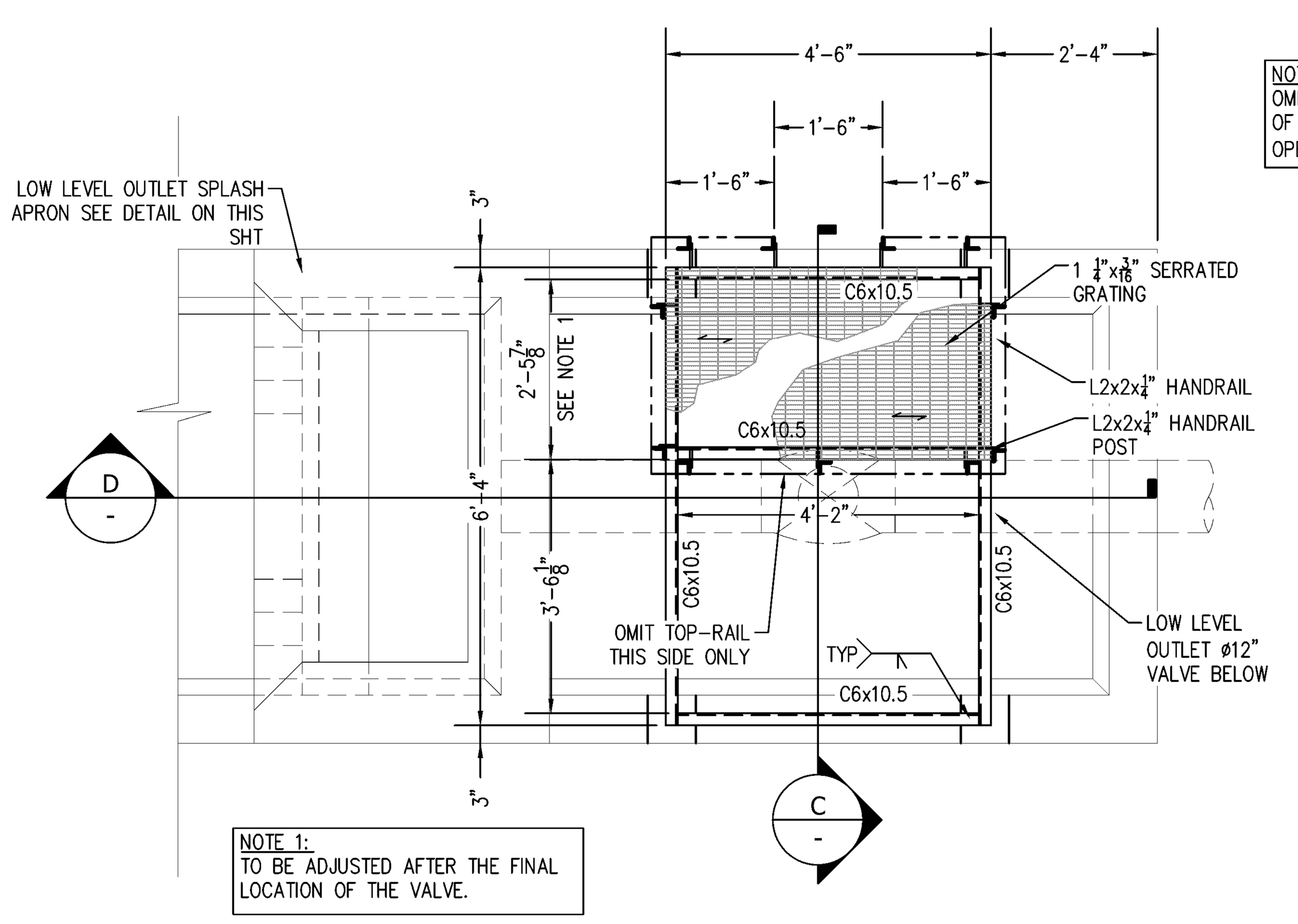
IMPACT PLATE REINFORCEMENT

SCALE 1"=2'-0"



SECTION A

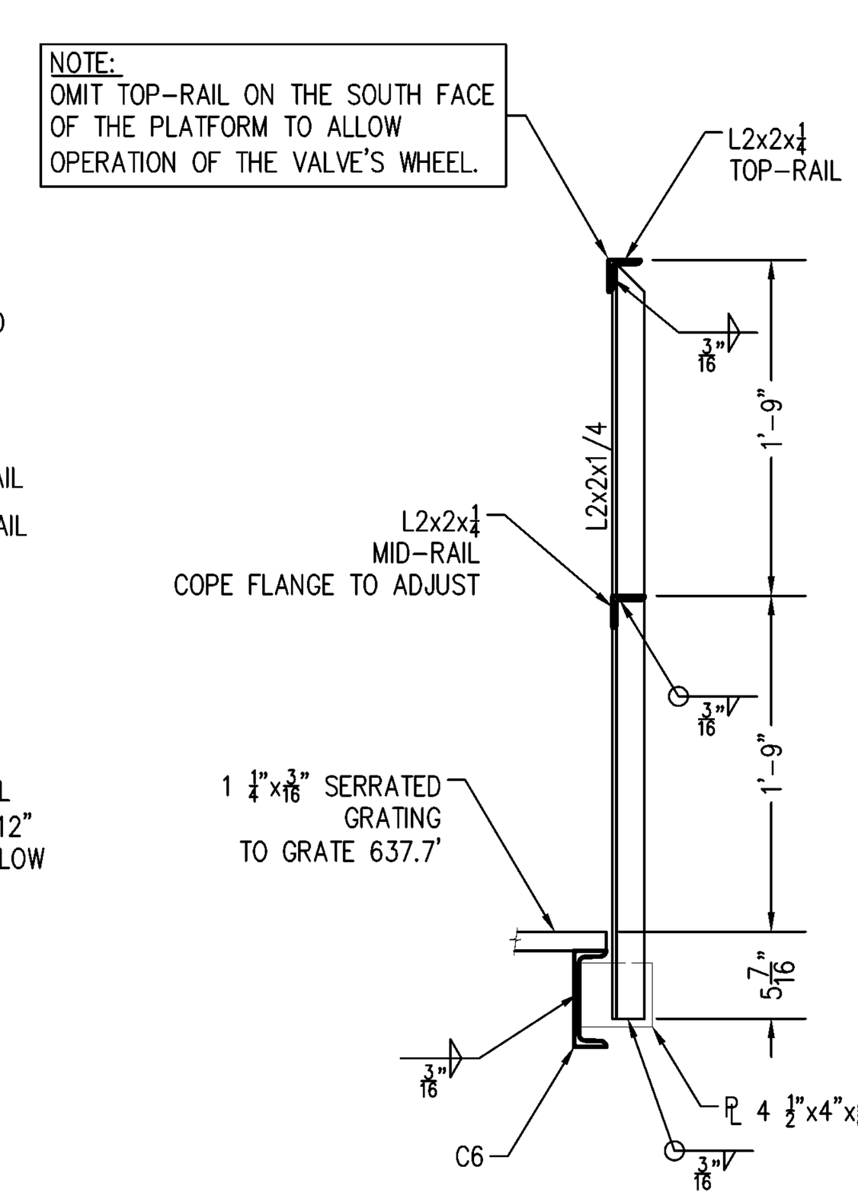
SCALE 1"=2'-0"



NOTE 1:
TO BE ADJUSTED AFTER THE FINAL LOCATION OF THE VALVE.

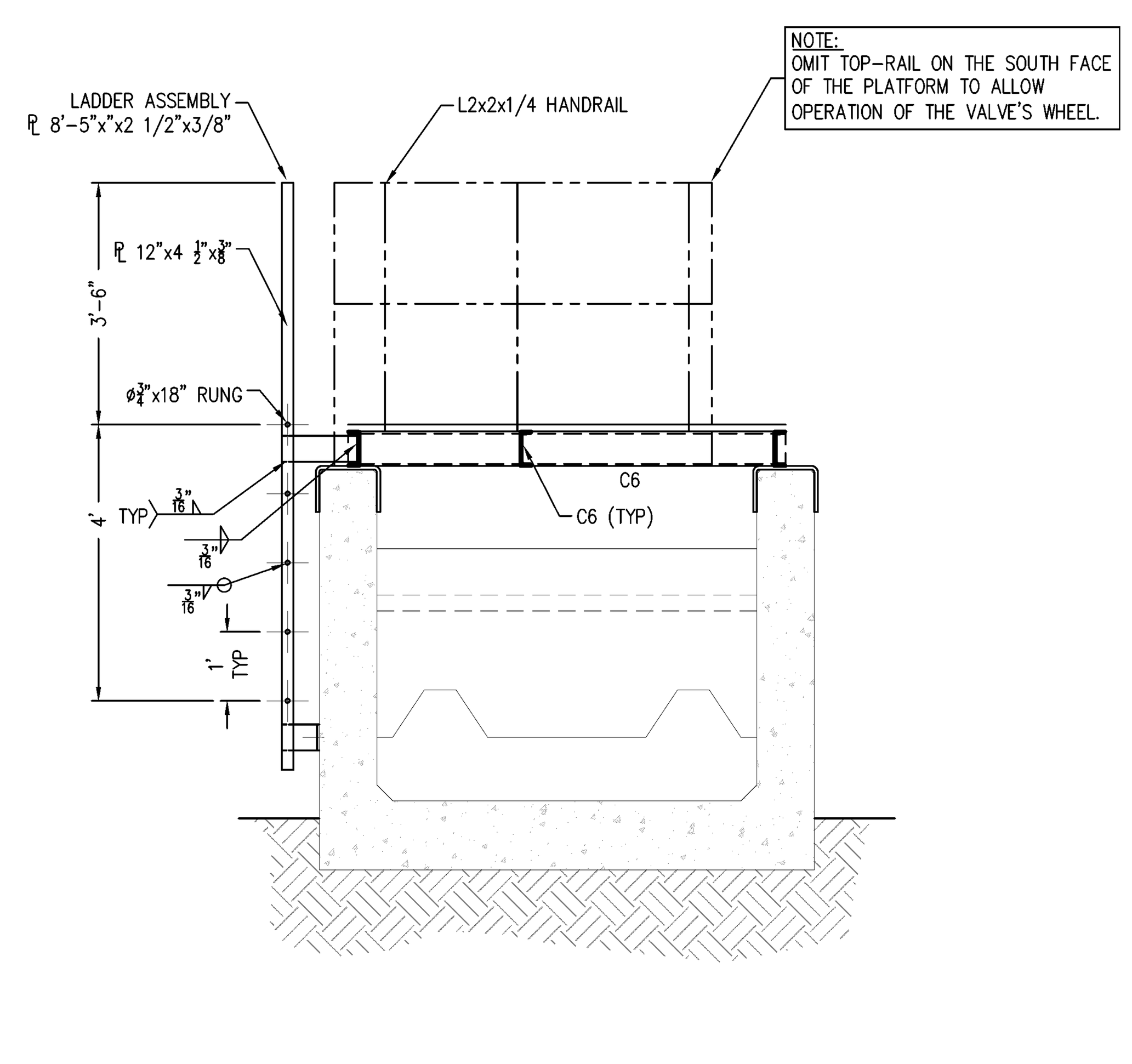
PLATFORM OVER LOW LEVEL OUTLET VALVE DETAIL

SCALE 1"=2'-0"



HANDRAIL DETAIL

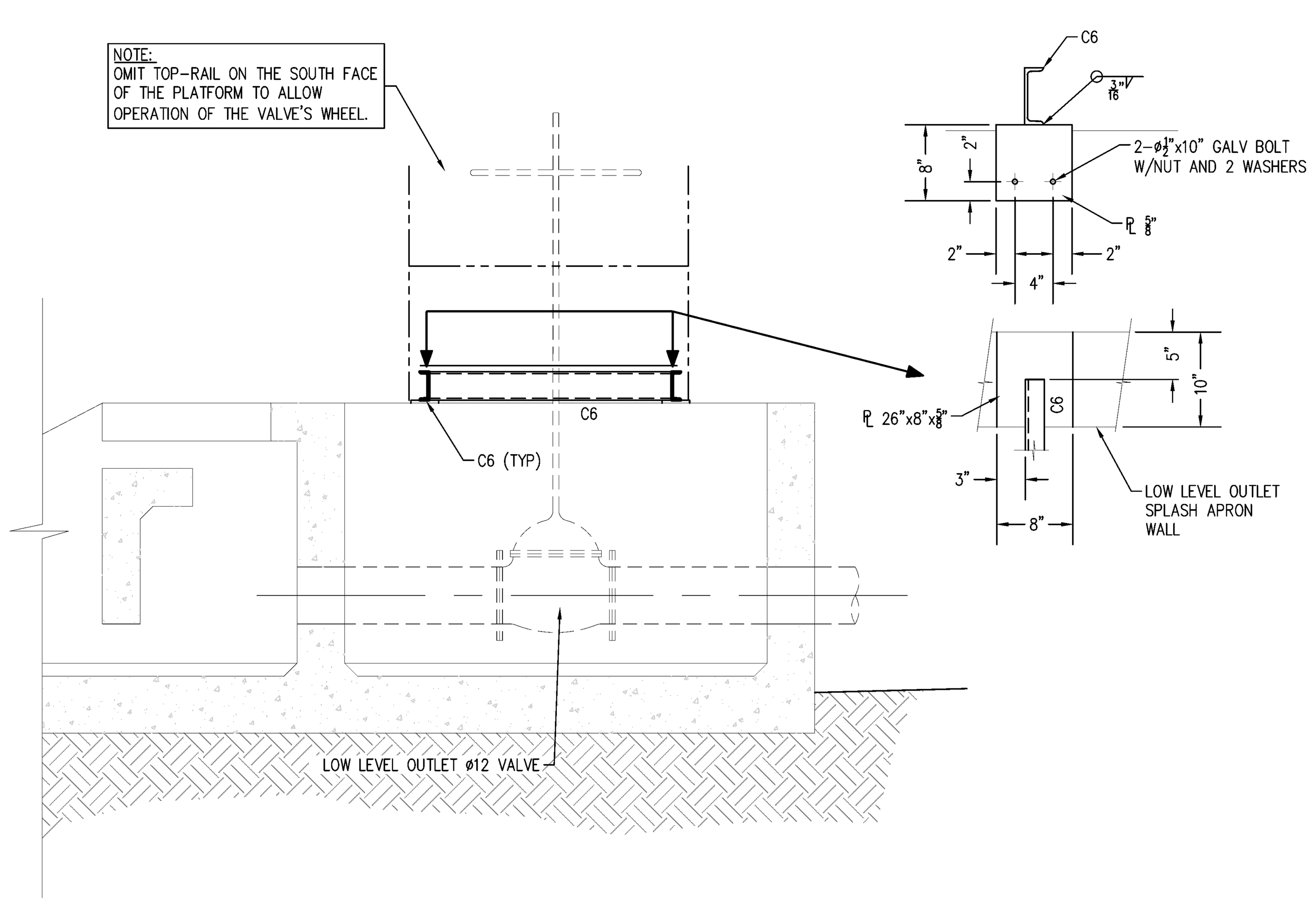
SCALE 1"=1'-0"



SECTION C

LOOKING EAST

SCALE 1"=2'-0"



SECTION D

LOOKING NORTH

SCALE 1"=2'-0"

CORNERSTONE ENGINEERING, INC.

CONSULTING CIVIL ENGINEERING AND LAND SURVEYING

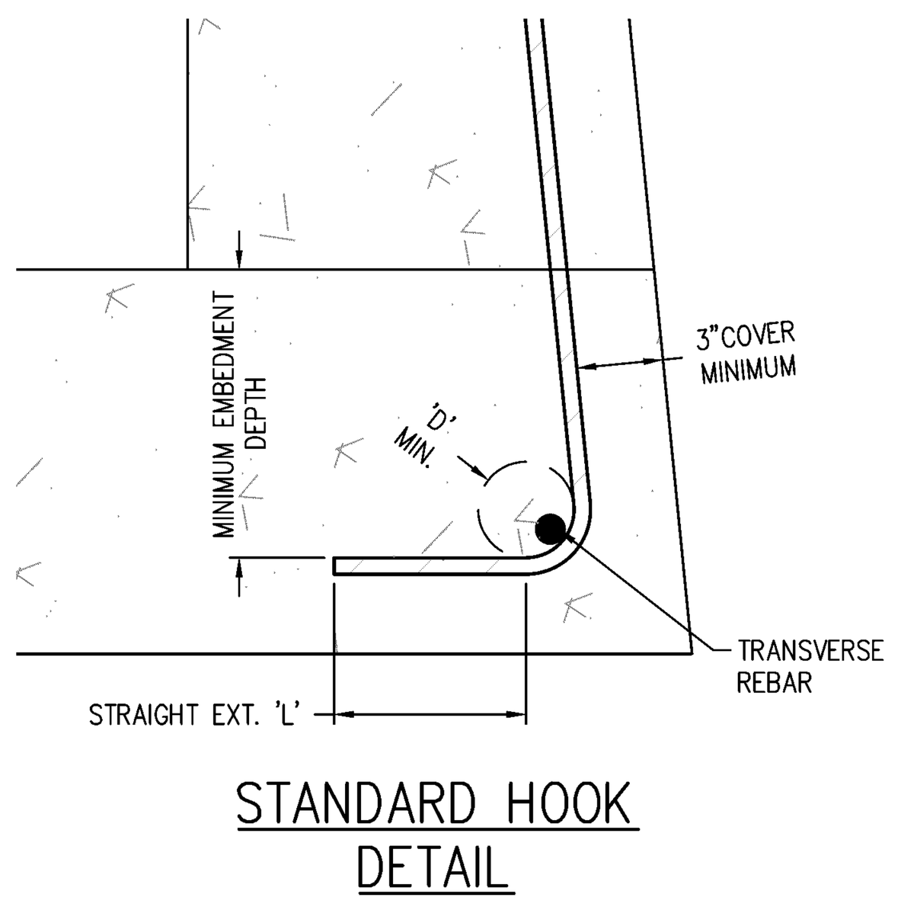
DEVELOPMENT BY:
KERN-TULARE WATER DISTRICT
5001 CALIFORNIA AVE, SUITE 102
BAKERSFIELD, CA 93309
661-327-3132

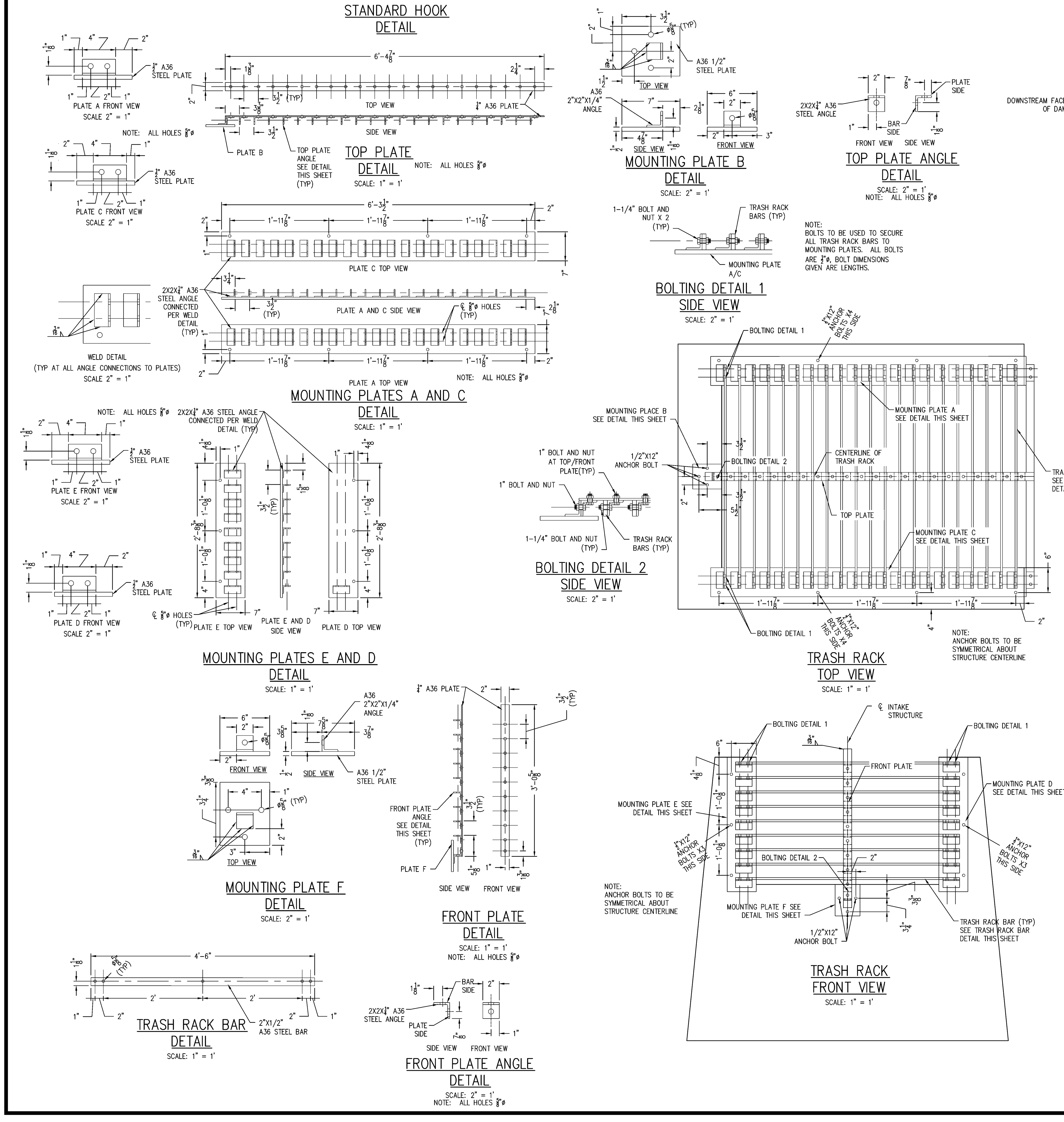
KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
LOW LEVEL OUTLET
STRUCTURE DETAILS

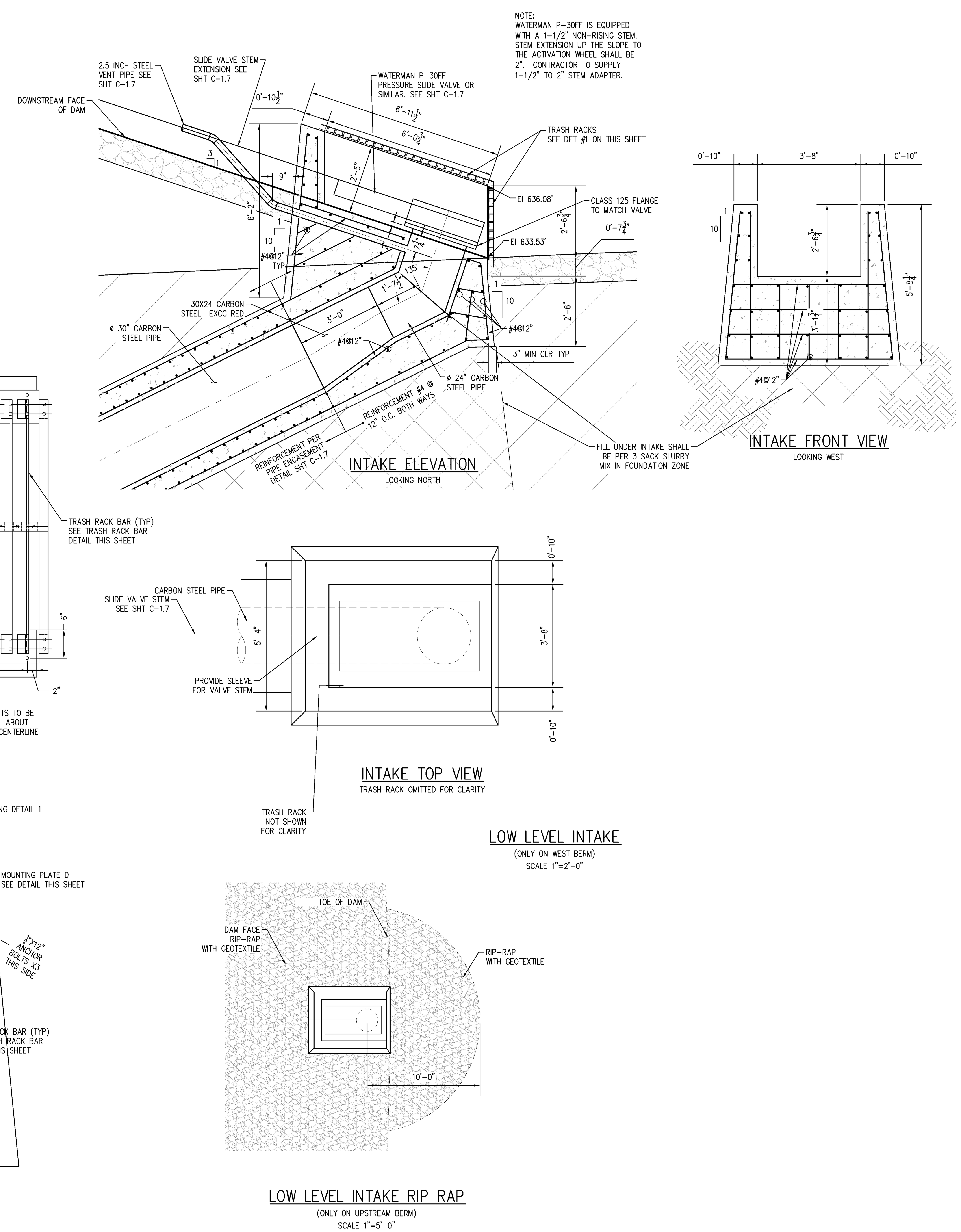
DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00
C-1.8	SHEET 8 of 13

REBAR DETAILING CHART

BAR SIZE	90° MINIMUM RADIUS DIMENSION 'D' PER ACI 318–14 TABLE 25.3.1	STRAIGHT EXTENSION MINIMUM DIMENSION 'L' PER ACI 318–14 TABLE 25.3.1	MINIMUM EMBEDMENT DEPTH FOR HOOKS PER ACI 318–14 SECTION 25.4.3.1		MINIMUM DEVELOPMENT LENGTH PER ACI 318–14 SECTION 25.4.2.2		MINIMUM LAP SLICE LENGTH PER ACI 318–14 TABLE 25.5.2.1	
			3,000 PSI CONCRETE	4,000 PSI CONCRETE	3,000 PSI CONCRETE	4,000 PSI CONCRETE	3,000 PSI CONCRETE	4,000 PSI CONCRETE
#4	3"	6"	7.75"	6.75"	22"	19"	28.75"	24.75"
#5	3.75"	7.25"	9.75"	8.5"	27.5"	23.75"	35.75"	31"







LOW LEVEL INTAKE
(ONLY ON WEST BERM)
SCALE 1"=2'-0"

NO.	DATE:	REVISION:	BY:

REGISTERED PROFESSIONAL ENGINEER CLYDE ALAN WHITTEN No. C-63332 CIVIL STATE OF CALIFORNIA

CORNERSTONE ENGINEERING, INC.
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KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
LOW LEVEL INTAKE

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO:	3531800_GUZ-PKG
JOB NO.:	353-18-00

C-1.9 SHEET 9 OF 13

VARIATIONS FROM PLANS AND SPECIFICATIONS

DSOD AND THE ENGINEER WILL BE PROMPTLY NOTIFIED OF ANY CHANGED CONDITIONS FROM THOSE SHOWN IN THIS PLAN AND SPECIFICATIONS.

CLEARING

AREAS TO BE CLEARED CONSIST OF THE RESERVOIR AREA, SITE OF DAM EMBANKMENT, A 25-FOOT STRIP ADJOINING THE DOWNSTREAM TOE OF THE DAM EMBANKMENT, SPILLWAY AREA, AND BORROW AND STOCKPILE AREAS. CLEARING SHALL CONSIST OF REMOVAL AND DISPOSAL OF ALL TREES, BRUSH, DOWN TIMBER, RUBBISH, AND ANY EXISTING FENCES.

GRUBBING

THE ENTIRE FOUNDATION AREA FOR THE DAM EMBANKMENT AND OTHER STRUCTURES AND ALL PORTIONS OF THE BORROW AREAS SHALL BE GRUBBED. GRUBBING OF FOUNDATION AREAS SHALL CONSIST OF THE REMOVAL OF ALL STUMPS AND ROOTS TO A DEPTH OF 3 FEET BELOW NATURAL GROUND SURFACE. THE BORROW AREAS SHALL BE GRUBBED TO THE EXTENT NECESSARY TO OBTAIN MATERIAL FREE OF STUMPS AND ROOTS.

EXCAVATION

A. GENERAL

ALL CONSTRUCTION OPERATIONS SHALL BE SO CONDUCTED AS TO AVOID STREAM SEDIMENTATION IN ACCORDANCE WITH THE REQUIREMENTS OF THE WATER RESOURCES CONTROL BOARD AND THE DEPARTMENT OF FISH AND GAME.

ALL EXCAVATION SHALL BE CARRIED TO LINES, GRADES, AND DIMENSIONS SHOWN ON THE DRAWINGS OR ESTABLISHED BY THE ENGINEER. DURING THE PROGRESS OF THE WORK, IT MAY BE FOUND NECESSARY OR DESIRABLE TO VARY THE SLOPES OR THE DIMENSIONS OF THE EXCAVATION FROM THOSE SPECIFIED HEREIN, CONTRACTOR SHALL NOT DO SO WITHOUT THE AUTHORIZATION OF THE ENGINEER AND DSOD.

B. DAM EMBANKMENT FOUNDATION

THE ENTIRE AREA TO BE OCCUPIED BY THE FOUNDATION OF THE DAM SHALL BE EXCAVATED TO LINE AND GRADE AS SHOWN ON THE PLANS. THE INTENT IS TO PROVIDE A BASE FOR THE EMBANKMENT DAMS THAT IS FIRM AND UNYEILDING AND ACCEPTABLE TO DSOD.

THE GEOTECHNICAL ENGINEER MUST INSPECT FOUNDATION MATERIAL PRIOR TO ANY BACKFILL OPERATIONS.

WHERE GEOTECHNICAL ENGINEER DETERMINES BEDS AND LENSES OF LOOSE OR FRIABLE COURSE-GRAINED SANDY SOIL ARE PRESENT, THESE INSUFFICIENT MATERIALS MUST BE EXCAVATED AND REMOVED UNTIL SUITABLE FOUNDATION IS UNEARTHED, PER GEOTECHNICAL ENGINEER'S APPROVAL.

THE GEOTECHNICAL ENGINEER MUST RE-INSPECT AND APPROVE FOUNDATION MATERIAL PRIOR TO ANY BACKFILL OPERATIONS.

DIVISION OF SAFETY OF DAMS (DSOD) SHALL INSPECT FOUNDATION SURFACES BEFORE CONDUCTING ANY SCARIFICATION.

C. SPILLWAY

EXCAVATION FOR SPILLWAY INCLUDES ALL EXCAVATION REQUIRED FOR THE APPROACH CHANNEL, SPILLWAY CREST, AND SPILLWAY DISCHARGE CHANNEL.

D. LOW LEVEL OUTLET TRENCH

THE TRENCH IN WHICH THE CONDUIT IS TO BE LAID OR CONSTRUCTED SHALL BE CAREFULLY EXCAVATED TO THE ESTABLISHED LINES AND GRADES SHOWN ON THE DRAWINGS, OR AS REVISED AND APPROVED BY THE ENGINEER, TO PROVIDE A FIRM, UNIFORM, AND UNYIELDING FOUNDATION FOR THE ENTIRE LENGTH OF THE CONDUIT.

E. UTILIZATION OF EXCAVATED MATERIALS

IT IS THE INTENT OF THESE SPECIFICATIONS THAT ALL REQUIRED EXCAVATION SUITABLE FOR EMBANKMENT SHALL BE UTILIZED IN THE PERMANENT CONSTRUCTION. SUITABLE MATERIALS SHALL BE EXCAVATED SEPARATELY FROM THE MATERIALS TO BE WASTED. THE SUITABLE MATERIALS SHALL BE SEGREGATED BY LOADS DURING THE EXCAVATION OPERATIONS AND PLACED IN STOCKPILES UNTIL TESTING VERIFIES THE MATERIALS SUITABILITY. AFTER ACCEPTANCE, MATERIAL SHALL BE PLACED IN THE DESIGNATED FINAL LOCATIONS. EXCAVATED MATERIALS, IF ANY, WHICH ARE UNSUITABLE FOR, OR IN EXCESS OF, DAM EMBANKMENT OR OTHER CONSTRUCTION REQUIREMENTS, SHALL BE DISPOSED OF WITHIN THE VICINITY AS DIRECTED. WASTE AREAS SHALL BE LEFT REASONABLY SMOOTH AND SHALL BE SLOPED TO DRAIN.

F. BORROW EXCAVATION

EXCEPT FOR UTILIZATION OF MATERIAL OBTAINED FROM REQUIRED EXCAVATION AS HEREIN SPECIFIED AND SHOWN ON THE DRAWINGS, ALL MATERIAL NECESSARY FOR CONSTRUCTION OF REQUIRED EMBANKMENTS SHALL BE OBTAINED FROM THE BORROW AREA SHOWN ON THE DRAWINGS WITHIN THE RESERVOIR SITE. THE METHOD OF EXCAVATION IN THE BORROW AREA SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.

BORROW AREAS SHALL BE STRIPPED OF ALL TOPSOIL CONTAINING HUMUS, ROOTS, RUBBISH, AND OTHER MATERIALS NOT SUITABLE FOR PLACING IN THE COMPACTED FILL. THE SEQUENCE OF STRIPPING OPERATIONS SHALL BE COORDINATED WITH THE EXCAVATION AND FILL SO AS TO EFFECT REQUIRED MOISTURE CONTROL WITH MINIMUM ADDITION OF MOISTURE TO THE EXCAVATED MATERIAL.

UNSUITABLE MATERIAL ENCOUNTERED IN THE BORROW AREAS SHALL BE WASTED AS DIRECTED BY THE ENGINEER. THE SURFACE OF ALL WASTE AREAS SHALL BE LEFT IN A REASONABLY SMOOTH CONDITION AND SHALL BE SLOPED TO DRAIN.

UNDERDRAINS

A. GENERAL

THE CONTRACTOR SHALL FURNISH ALL MATERIALS AND LABOR REQUIRED FOR INSTALLING THE DRAINAGE BLANKET, TOE DRAIN, AND DRAINS AS SHOWN ON THE DRAWINGS.

B. DRAINAGE LAYER MATERIAL

DRAINAGE LAYER MATERIAL FOR DRAIN BLANKETS, OR OTHER SUBDRAINAGE PURPOSES SHALL CONSIST OF HARD, DURABLE, CLEAN SAND, GRAVEL OR CRUSHED STONE AND SHALL BE FREE FROM ORGANIC MATERIAL, CLAY BALLS, OR OTHER DELETERIOUS SUBSTANCES.

THE PERCENTAGE COMPOSITION BY WEIGHT OF PERMEABLE MATERIAL IN-PLACE SHALL CONFORM TO THE FOLLOWING STANDARD SAND GRADING FOR ASTM D448-BLEND 579:

SIEVE SIZE	PERCENTAGE PASSING
1 1/2 INCH	100
1 INCH	90-100
3/4 INCH	75-85
3/8 INCH	40-60
NO. 4	20-35
NO. 8	5-15
NO. 16	0-5

C. INSTALLING DRAINAGE LAYER MATERIAL

PERMEABLE DRAINAGE LAYER MATERIAL (SAND) SHALL BE PLACED ACCORDING TO THE DIMENSIONS AND DETAILS SHOWN ON THE DRAWINGS. PERMEABLE DRAIN MATERIAL SHALL BE PLACED AND COMPACTED THOROUGHLY WET.

DRAINAGE LAYER MATERIAL SHALL BE COMPACTED IN LAYERS NOT EXCEEDING EIGHT INCHES OF LOOSE PLACED MATERIAL, AND SHALL BE THOROUGHLY MOISTENED BEFORE COMPACTION. A MINIMUM OF 6 PASSES OF A SELF PROPELLED SMOOTH SINGLE DRUM VIBRATORY ROLLERS EQUIVALENT TO CATERPILLAR CS663E SHALL BE USED FOR COMPACTION. GENERALLY ROLLER DRUMS SHALL HAVE A DIAMETER BETWEEN 60 AND 66 INCHES WITH A WIDTH OF BETWEEN 72 AND 84 INCHES. THE VIBRATORY ROLLERS SHALL HAVE A MINIMUM STATIC OPERATING WEIGHT OF 24,000 POUNDS (12 TONS). THE DRUM SHALL PRODUCE A MINIMUM CENTRIFUGAL FORCE OF 35,000 POUNDS OVER A RANGE OF FREQUENCIES OF VIBRATION FROM 1,500 TO 2,000 CYCLES PER MINUTE AND AT AN APPLIED FORCE OF NOT LESS THAN 5,000 POUNDS PER FOOT OF DRUM WIDTH. VIBRATORY ROLLERS SHALL OPERATE AT SPEEDS NOT TO EXCEED 2 MILES PER HOUR.

IF, WITH THE REQUIRED WATER CONTENT, IT IS FOUND NECESSARY TO ROLL EACH 8-INCH LAYER MORE THAN 6 TIMES TO OBTAIN THE REQUIRED COMPACTION, THE NUMBER OF PASSES SHALL BE CHANGED, AND/OR THE EQUIPMENT CHANGED ACCORDINGLY. ALTERNATE METHODS AND COMPACTION EQUIPMENT SHALL BE PROVEN BY TEST FILLS AND APPROVED BY THE ENGINEER. THE PERMEABLE DRAINAGE LAYER SHALL BE COMPACTED TO A MINIMUM OF 100% OF RELATIVE COMPACTION BASED ON ASTM D698.

D. SAND BLANKET MATERIAL

MATERIAL USED AS SAND BLANKET MATERIAL USED WITHIN 1 FOOT OF DRAINAGE LAYER MATERIAL SHALL BE FREE FROM ORGANIC MATERIAL, CLAY BALLS, OR OTHER DELETERIOUS SUBSTANCES

THE PERCENTAGE COMPOSITION BY WEIGHT OF SAND BLANKET ADJACENT MATERIAL IN-PLACE SHALL CONFORM TO THE FOLLOWING STANDARD SAND GRADING FOR ASTM C33 SAND:

SIEVE SIZE	PERCENTAGE PASSING
3/8 INCH	100
NO. 4	95-100
NO. 8	80-100
NO. 16	50-85
NO. 30	25-60
NO. 50	10-30
NO. 100	2-10

E. INSTALLING SAND BLANKET MATERIAL

MATERIAL USED AS THE ADJACENT MATERIAL SHALL BE PLACED ACCORDING TO THE DIMENSIONS AND DETAILS SHOWN ON THE PLANS.

SAND BLANKET MATERIAL SHALL BE PLACED AND COMPACTED IN THE SAME MANNER AND REQUIREMENTS AS DRAINAGE LAYER MATERIAL.

F. QUALITY CONTROL

AT LEAST ONCE PER WORK SHIFT WHEN THE DRAINAGE LAYER AND SAND BLANKET MATERIALS ARE BEING PUT IN PLACE, SAMPLE SHALL BE TAKEN OF EACH AND TESTED PER ASTM C136.

EMBANKMENT

A. REQUIREMENTS

EMBANKMENTS SHALL BE CONSTRUCTED TO THE LINES AND GRADES AND CROSS SECTIONS INDICATED ON THE DRAWINGS, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE CONTRACTOR SHALL MAINTAIN AND PROTECT THE EMBANKMENT THROUGH EROSION CONTROL MEASURES UNTIL FINAL COMPLETION AND ACCEPTANCE OF ALL WORK.

ANY MATERIAL PLACED IN THE EMBANKMENT WHICH FAILS TO MEET THE REQUIREMENTS OF THE SPECIFICATIONS, OR WHICH MAY HAVE BEEN PLACED OR COMPACTED AT TIMES OR IN A MANNER NOT ACCEPTABLE TO THE ENGINEER, SHALL BE REMOVED AND DISPOSED OF OR REPLACED PROPERLY AT NO COST TO THE OWNER.

THE EMBANKMENT SOIL MUST BE COMPACTED, BASE ON ASTM D-698, TO A RELATIVE COMPACTION OF 100%.

IN-PLACE DENSITY AND GRAIN SIZE DISTRIBUTION TESTING SHOULD HAVE AT LEAST ONE TEST PER 2,000 CUBIC YARDS PLACED, PER LIFT, OR PER SHIFT, WHICHEVER IS GREATER. THE USE OF NUCLEAR DENSITY GAUGE IS ALLOWED FOR INTERMEDIATE DENSITY QUALITY CONTROL. HOWEVER, ONLY THE SAND CONE TESTS FOR IN-PLACE DENSITY (ASTM D1556) MEASUREMENTS OF EMBANKMENT FILL SHALL BE USED FOR TESTS OF RECORD.

B. MATERIALS

EMBANKMENTS ARE TO BE CONSTRUCTED OF SUITABLE EARTH OR ROCK MATERIALS OBTAINED FROM ON-SITE BORROW AREAS, FOUNDATION, SPILLWAY AND OTHER REQUIRED EXCAVATIONS AS LONG AS THEY MEET THE GRADATION REQUIREMENTS LISTED IN THIS SECTION. IT IS THE INTENT OF THESE SPECIFICATIONS THAT EMBANKMENT MATERIALS BE FOUND ONSITE AT A DEPTH OF 2 FEET TO 5 FEET BELOW ORIGINAL GRADE, AND MATERIALS WITH EXCESSIVE AMOUNTS OF SAND NOT BE USED. MATERIALS CONTAINING BRUSH, ROOT, SOD, OR OTHER ORGANIC MATERIALS WILL NOT BE CONSIDERED SUITABLE. THE SUITABILITY OF MATERIALS SHALL BE SUBJECT TO APPROVAL, AND THE DISPOSITION OF MATERIALS IN THE EMBANKMENT WILL BE AS DIRECTED BY THE ENGINEER. THE CONTRACTOR SHALL EXCAVATE AT THE LOCATIONS DIRECTED BY THE ENGINEER WHENEVER SUCH CONTROL IS NECESSARY TO OBTAIN THE TYPE OF MATERIAL REQUIRED FOR THE EMBANKMENT.

ALL EXCAVATED MATERIALS SHALL BE STOCKPILED AND TESTED FOR CONFORMANCE WITH THE GRADATION REQUIREMENTS PRIOR TO BEING PLACED IN THE EMBANKMENT.

BLENDING OF MATERIALS ON SITE TO MEET GRADATION REQUIREMENTS WILL BE ALLOWED. THE CONTRACTOR SHALL ESTABLISH A BLENDING AREA OUTSIDE OF THE EMBANKMENT AREAS AND BLENDING PROCEDURES ACCEPTABLE TO THE ENGINEER, AND DSOD. BLENDED MATERIAL SHALL NOT BE MOVED TO THE EMBANKMENT UNTIL TESTED AND APPROVED BY THE ENGINEER.

THE PERCENTAGE COMPOSITION BY WEIGHT OF EMBANKMENT MATERIAL IN-PLACE SHALL CONFORM TO THE FOLLOWING GRADINGS WHEN DETERMINED BY ASTM D-422:

SIEVE SIZE	PERCENTAGE PASSING
NO. 4	90-100
NO. 8	90-100
NO. 16	80-95
NO. 30	70-90
NO. 50	55-80
NO. 100	40-70
NO. 200	30-50

FURTHER, EMBANKMENT MATERIAL SHALL HAVE A PLASTIC LIMIT OF LESS THAN 25, A LIQUID LIMIT LESS THAN 45, AND PLASTICITY INDEX BETWEEN 7 AND 25 AS DEFINED BY ASTM D4318. MINIMUM TESTING FREQUENCY SHALL BE 1 TEST PER 5,000 CUBIC YARDS OF MATERIAL PLACED, OR WHEN THERE IS A CHANGE IN MATERIAL PROPERTIES.

C. FOUNDATION PREPARATION

THE FOUNDATION SHALL BE EXCAVATED TO THE APPROXIMATE DEPTH AND AT THE LOCATION SHOWN ON THE DRAWINGS. THE EXACT DEPTH WILL BE DETERMINED BY THE NATURE OF THE MATERIALS ENCOUNTERED, AND SHALL BE 10 FOOT MINIMUM.

AFTER CLEARING AND STRIPPING HAS BEEN COMPLETED AS SPECIFIED, EARTH FOUNDATIONS SHALL BE PREPARED AS FOLLOWS:

ALL LOOSE ROCK FRAGMENTS, DIRT, GRAVEL, STANDING OR RUNNING WATER, AND OTHER OBJECTIONABLE MATERIALS SHALL BE REMOVED FROM THE SURFACE OF THE ENTIRE AREA OF THE FOUNDATIONS, BY HAND IF NECESSARY, TO THE EXTENT DIRECTED BY THE ENGINEER. OPEN CRACKS OR JOINTS SHALL BE FILLED WITH BACKFILL CONCRETE OR GROUT AFTER REMOVING SOFT OR ERODIBLE CRACK-FILLING MATERIALS TO A DEPTH DIRECTED BY THE ENGINEER. NO FILL SHALL BE PLACED IN THE FOUNDATION UNTIL THE AREA TO BE COVERED HAS BEEN INSPECTED AND APPROVED BY THE ENGINEER AND BY DULY DESIGNATED REPRESENTATIVES OF THE DEPARTMENT OF WATER RESOURCES, DIVISION OF SAFETY OF DAMS.

THE SIDES OF STUMP HOLES, TEST PITS, AND OTHER SIMILAR CAVITIES OR DEPRESSIONS SHALL BE BROKEN DOWN, WHERE SO DIRECTED, SO AS TO FLATTEN OUT THE SLOPES AND THE SIDES OF THE CUT OR HOLE SHALL BE SCARIFIED TO PROVIDE BOND BETWEEN THE FOUNDATION MATERIAL AND THE FILL WHERE DIRECTED. UNLESS OTHERWISE DIRECTED, EACH DEPRESSION SHALL BE FILLED WITH PROPERLY MOISTURE-CONDITIONED MATERIALS. THE FILL SHALL BE PLACED IN LAYERS AND COMPACTED IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THIS SECTION. MATERIALS WHICH CANNOT BE COMPACTED BY ROLLER EQUIPMENT BECAUSE OF INADEQUATE CLEARANCES SHALL BE SPREAD IN 4-INCH-THICK LAYERS AND EACH LAYER SHALL BE COMPACTED WITH POWER TAMPERS TO THE REQUIRED DENSITY OF THE CONTIGUOUS COMPACTED MATERIALS. AFTER FILLING OF DEPRESSIONS, AND IMMEDIATELY PRIOR TO PLACEMENT OF COMPACTED FILL IN THE EMBANKMENT, THE EMBANKMENT FOUNDATION, EXCLUDING BEDROCK FOUNDATIONS, SHALL BE SCARIFIED TO A DEPTH OF 3 INCHES.

AFTER REMOVAL OF ROOTS OR OTHER DEBRIS TURNED UP IN THE PROCESS OF SCARIFICATION, THE ENTIRE SURFACE OF THE EMBANKMENT FOUNDATION MATERIAL SHALL BE MOISTURE CONDITIONED AND COMPACTED IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF EMBANKMENT SECTIONS (E) AND (F) BELOW.

D. PLACEMENT

NO FILL SHALL BE PLACED ON ANY PART OF THE EMBANKMENT FOUNDATION UNTIL THE AREA TO BE COVERED HAS BEEN INSPECTED AND APPROVED. THE DISTRIBUTION OF MATERIALS SHALL BE SUCH THAT THE EMBANKMENT WILL BE FREE FROM LENSES, POCKETS, STREAKS, AND LAYERS OF MATERIAL DIFFERING SUBSTANTIALLY IN TEXTURE OR GRADATION FROM THE SURROUNDING MATERIAL. MATERIALS SHALL BE SPREAD IN LAYERS OF UNIFORM THICKNESS AND DISKED TO INSURE UNIFORM MOISTURE CONDITIONING. UNLESS OTHERWISE DIRECTED, THE THICKNESS OF LAYERS BEFORE COMPACTION SHALL BE NOT MORE THAN 8 INCHES. COMPACTION OF EACH LAYER SHALL BE CONDUCTED IN A SYSTEMATIC AND CONTINUOUS MANNER SO AS TO ENSURE THE SPECIFIED COVERAGE.

ROLLING SHALL BE DONE PARALLEL TO THE AXIS OF THE DAM WHEREVER POSSIBLE. THE EMBANKMENT SHALL BE BROUGHT UP IN LAYERS SUCH THAT THE SURFACE IS ESSENTIALLY LEVEL AT ALL TIMES, EXCEPT FOR A SLIGHT SLOPE FOR DRAINAGE. IN GENERAL, THE MORE FINE IMPERVIOUS MATERIALS SHALL BE PLACED TOWARD THE CENTER OF THE EMBANKMENT, AND THE COARSE MORE PERVIOUS MATERIALS TOWARD THE OUTER PORTION OF THE EMBANKMENT. MATERIALS PLACED THE EMBANKMENT SHALL HAVE AT LEAST 30 PERCENT OF THE MATERIAL BY WEIGHT PASSING THE NO. 200 SIEVE. NO MATERIAL LARGER THAN 4.75-INCH MAXIMUM DIMENSION WILL BE PERMITTED IN AN 8-INCH LAYER, AND EACH LARGE PIECE SHALL BE SURROUNDED BY FINE MATERIAL. SEVERAL LARGE PIECES IN CONTACT WITH EACH OTHER WILL NOT BE ACCEPTABLE. EMBANKMENT CONSTRUCTION SHALL BE SUSPENDED WHEN THE AMBIENT TEMPERATURE DROPS BELOW 32° F. BETWEEN PLACEMENT OF LAYERS, THE TOP SURFACE SHALL BE SCARIFIED TO A DEPTH OF 1 TO 3 INCHES IN ORDER TO BIND THE LIFTS TOGETHER. THIS REQUIREMENT MAY BE WAIVED BY DSOD IF IN THEIR OPINION THERE IS NO LAMINATION BETWEEN LIFTS.

E. MOISTURE CONTROL

THE FILL MATERIAL SHALL HAVE A MOISTURE CONTENT THROUGHOUT EACH LAYER AT TIME OF COMPACTION OF FROM "OPTIMUM" TO "OPTIMUM PLUS THREE PERCENT", AS DETERMINED BY ASTM D-698, METHOD A, UNLESS OTHERWISE DIRECTED. THE CONTRACTOR WILL BE REQUIRED TO ADD WATER AND MANIPULATE THE FILL MATERIALS BY HARROWING OR OTHER APPROVED METHODS SO AS TO PROVIDE A UNIFORM DISTRIBUTION OF MOISTURE IN THE MATERIAL WITHIN THE LIMITS SPECIFIED ABOVE. THE APPLICATION OF WATER TO THE FILL MATERIAL SHALL BE DONE AT THE SITE OF EXCAVATION OR STOCKPILE. ALL MOISTURE CONDITIONING SHALL TAKE PLACE OUTSIDE OF THE DAM EMBANKMENTS.

WHEN FILL PLACEMENT OPERATIONS ARE INTERRUPTED FOR AN EXTENDED PERIOD OF TIME (GREATER THAN 2 HOURS OR AS DETERMINED BY THE SOILS ENGINEER), THE EXISTING SURFACE SHALL BE SCARIFIED BY DISKING AND MOISTURE CONTROLLED TO A DEPTH OF 1 TO 3 INCHES PRIOR TO THE PLACEMENT OF THE NEXT LAYER OF EMBANKMENT MATERIAL.

F. COMPACTION

WHEN THE MOISTURE CONTENT AND CONDITIONS OF THE EMBANKMENT MATERIAL ARE SATISFACTORY, FILL MATERIAL SHALL BE PLACED AS PREVIOUSLY SPECIFIED AND COMPACTED BY A MINIMUM OF EIGHT PASSES OF A CATERPILLAR 825 COMPACTOR OR APPROVED EQUIVALENT. GENERALLY ROLLER DRUMS SHALL BE NO LESS THAN 60 INCHES IN DIAMETER AND NOT LESS THAN 60 INCHES IN LENGTH. THE WEIGHT OF THE ROLLER SHALL NOT BE LESS THAN 4,000 POUNDS PER LINEAR FOOT OF DRUM LENGTH. IF, WITH THE REQUIRED WATER CONTENT, IT IS FOUND NECESSARY TO ROLL EACH 8-INCH LAYER MORE THAN 8 TIMES TO OBTAIN THE REQUIRED COMPACTION, THE NUMBER OF PASSES SHALL BE CHANGED ACCORDINGLY AS DIRECTED BY THE ENGINEER. HOWEVER, THE EMBANKMENT FILL SHALL BE COMPACTED TO A 100% RELATIVE COMPACTION, AS DETERMINED BY ASTM D-698. COMPACTION BY FLOODING OR JETTING WILL NOT BE PERMITTED.

WHERE AFOREMENTIONED ROLLING TECHNIQUE CANNOT BE UTILIZED (AREAS WHERE HAND COMPACTION IS REQUIRED), EMBANKMENT FILL SHALL BE COMPACTED BY AT LEAST THREE PASSES OF A HEAVY-DUTY, VIBRATING BASE-PLACE COMPACTOR WEIGHING NO LESS THAN 200 POUNDS, AND HAVING A VIBRATION FREQUENCY OF NO LESS THAN 1,600 CYCLES PER MINUTE. THE COMPACTOR SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.

G. FINISHING EMBANKMENTS

AFTER COMPLETION OF THE EMBANKMENT, THE SLOPES SHALL BE DRESSED AND GRADED SO AS TO PROVIDE A UNIFORM SURFACE AND SLOPE. THE CREST SHALL BE DRESSED AND SLOPED FOR DRAINAGE AS SHOWN ON THE DRAWINGS.

UPON COMPLETION OF EMBANKMENTS, HYDROSEED MIXTURE APPROVED BY THE ENGINEER WILL BE APPLIED.

H. STRUCTURE BACKFILL

THE REQUIREMENTS FOR PLACEMENT OF FILL AROUND JURISDICTIONAL STRUCTURES SHALL BE THE SAME AS PLACEMENT OF FILL IN THE EMBANKMENT WITH THE FOLLOWING EXCEPTIONS:

NO LARGE EQUIPMENT CAN BE USED WITHIN 5-FEET OF JURISDICTIONAL STRUCTURES. SMALL EQUIPMENT OR HAND TOOLS MUST BE USED AND APPROVED PRIOR TO USE. THE BACKFILL AROUND STRUCTURES SHALL CONTAIN NO PARTICLES LARGER THAN 2-INCHES IN GREATEST DIMENSION WHEN PLACING MATERIAL WITHIN 5-FEET OF A STRUCTURE.

I. RESERVOIR LINER

USE THE UPPER 2 FEET OF SOIL WITHIN RESERVOIR AS THE LINER. CONTRACTOR TO REMOVE ORGANIC MATERIAL AND STOCKPILE. THE FINAL RESERVOIR LINER SHALL CONSIST OF 2 FEET OF CLAYEY SAND OR SANDY CLAY HAVING AT LEAST 30% FINES THAN #200 SLEEVE, AND COMPACTED TO 100% MAXIMUM DENSITY BASED ON ASTM TEST METHOD D698. COMPACTED LINER SHALL BE MOISTURE CONDITIONED AT OR ABOVE OPTIMUM MOISTURE.

RIP-RAP

A. GENERAL

THE CONTRACTOR SHALL FURNISH ALL MATERIALS AND LABOR REQUIRED FOR PLACING RIP-RAP AND BEDDING TO THE LINES AND DIMENSIONS AS SHOWN ON THE DRAWINGS.

B. QUALITY

INDIVIDUAL ROCKS SHALL BE DENSE, SOUND, AND RESISTANT TO ABRASION AND SHALL BE FREE FROM CRACKS, SEAMS, AND OTHER DEFECTS THAT WOULD TEND TO INCREASE UNDULY THEIR ALTERATION BY WATER AND FROST ACTIONS. THE ROCKS MAY BE EITHER ANGULAR, AS OBTAINED FROM QUARRY OPERATIONS, OR ROUND, EXCEPT THAT ROUND ROCKS SHALL NOT BE PLACED ON ANY SURFACES HAVING SLOPES STEEPER THAN 2:1. THE ROCKS SHALL HAVE A MINIMUM BULK SPECIFIC GRAVITY OF 2.4 (150 POUNDS PER CUBIC FOOT) WHEN TESTED IN ACCORDANCE WITH ASTM C-99.

C. GRADATION

RIP-RAP SHALL BE REASONABLY WELL GRADED TO THE FOLLOWING STANDARD:

NOMINAL MEDIAN SIZE	D15	D50	D100
6 INCHES	3.7 TO 5.2 INCHES	5.7 TO 6.9 INCHES	12 INCHES MAXIMUM

D. BEDDING

BEDDING MATERIAL SHALL CONFORM TO THE FOLLOWING GRADATION FOR ASTM D448-3:

SIEVE SIZE	PERCENTAGE PASSING
2.5"	100
2"	90-100
1.5"	35-70
1"	0-15
1/2"	0-5

BEDDING MATERIAL SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 10 INCHES LOOSE THICKNESS BY VIBRATING ROLLERS OR HAND OPERATED TAMPING EQUIPMENT. BEDDING MATERIAL WITHIN 5 FEET OF STRUCTURES SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES IN LOOSE THICKNESS BY HAND-HELD POWER TAMPERS. BEDDING MATERIAL SHALL BE PLACED AND COMPACTED THOROUGHLY WET. THE COMPACTION AND/OR ALTERNATE METHODS OF COMPACTION SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.

E. INSTALLING RIP-RAP

THE RIP-RAP NEED NOT BE COMPACTED, BUT SHALL BE PLACED TO GRADE IN A MANNER TO ENSURE THAT THE LARGER ROCK FRAGMENTS ARE UNIFORMLY DISTRIBUTED, AND THE SMALLER ROCK FRAGMENTS SERVE TO FILL THE SPACES BETWEEN THE LARGER ROCK FRAGMENTS SO AS TO RESULT IN WELL-KEYED, DENSELY PLACED, UNIFORM LAYERS OF RIP-RAP OF THE SPECIFIED THICKNESS. HAND PLACING WILL BE REQUIRED ONLY TO THE EXTENT NECESSARY TO SECURE THE RESULTS SPECIFIED ABOVE.

CONCRETE

A. GENERAL

THE CONTRACTOR SHALL FURNISH OR PROCURE ALL MATERIALS AND LABOR REQUIRED FOR CONSTRUCTING ALL THE CONCRETE STRUCTURES, INCLUDING THE SPILLWAY SILL AND INTAKE STRUCTURE, PIPE EMBEDMENTS, AND BACKFILL CONCRETE , TO THE LINES AND GRADES SHOWN ON THE DRAWINGS.

MIX DESIGNS FOR ALL CONCRETE MIXES WILL BE SUBMITTED FOR REVIEW AND APPROVAL, ALONG WITH A DESCRIPTION OF ANY STEEL OR FIBER REINFORCEMENT, IN ADVANCE OF ANY CONCRETE PLACEMENT.

B. COMPOSITION

CONCRETE SHALL MEET OR EXCEED LATEST ADOPTED ACI-318 CODE.

C. CEMENT

THE CEMENT USED FOR ALL CONCRETE STRUCTURES SHALL BE ASTM C-150, PORTLAND CEMENT TYPE II OR TYPE V.

D. AGGREGATES

ALL CONCRETE AGGREGATE SHALL BE FROM PROVEN SOURCES OF MATERIALS NOT REACTIVE TO ALKALI OR SULFATES, WITH MAXIMUM SIZE PARTICLES PASSING AS SPECIFIED BELOW. AGGREGATES SHALL CONFORM TO ASTM C-33.

E. STRENGTH AND CONSISTENCY

1. STRUCTURAL CONCRETE - SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI UNLESS AND HAVE A SLUMP OF 4"±1". THE MAXIMUM SIZE AGGREGATE SHALL BE 1 INCH.

2. PIPE EMBEDMENT CONCRETE - SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,000 PSI AND HAVE A SUMP OF 2 TO 4 INCHES. THE MAXIMUM SIZE AGGREGATE SHALL BE 3/4 INCH.

3. THRUST BLOCKS - SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,000 PSI AND HAVE A SUMP OF 2 TO 4 INCHES. THE MAXIMUM SIZE AGGREGATE SHALL BE 3/4 INCH.

4. BACKFILL CONCRETE "CONTROLLED LOW STRENGTH MATERIAL"- SHALL CONTAIN NOT LESS THAN ONE 94-POUND SACKS OF TYPE II PORTLAND CEMENT PER ONE CUBIC YARD OF SAND AND SHALL HAVE ONLY SUFFICIENT WATER TO PROVIDE THE NECESSARY CONSISTENCY FOR PLACING. BACKFILL CONCRETE SHALL NOT BE USED ON ANY STRUCTURES WITHIN THE DAM EMBANKMENTS, EXCLUDING THE INTAKE STRUCTURE.

F. STEEL REINFORCEMENT

STEEL REINFORCEMENT SHALL CONSIST OF INTERMEDIATE GRADE DEFORMED BARS, CONFORMING TO ASTM A-615, GRADE 60. REINFORCING STEEL SHALL BE CLEAN AND FREE FROM HEAVY RUST, SCALE, OR COATING OF ANY KIND AND SHALL BE HELD IN PLACE AND TIED AT SPLICES, CORNERS, AND INTERSECTIONS WITH 16-GAUGE ANNEALED WIRE.

THE SPACING OF BARS, MEASURED CENTER TO CENTER, SHALL BE AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER. ALL REBAR SPLICES, HOOKS, AND EMBEDMENTS, SHALL BE PER THE REBAR DETAILING CHART ON SHEET C-1.9.

HEAT WILL NOT BE USED TO ASSIST THE BENDING OF REBAR.

ALL REINFORCEMENT WILL BE PLACED SO THAT THE CLEAR DISTANCE BETWEEN THE FACE OF THE CONCRETE AND THE NEAREST REINFORCEMENT IS 3 INCHES UNLESS OTHERWISE NOTED.

ANY REINFORCEMENT DOWELED INTO EXISTING CONCRETE MUST USE CEMENTITIOUS GROUT; THE USE OF EPOXY ADHESIVES IS NOT ALLOWED.

G. FORMS

FORMS SHALL BE TRUE TO LINE AND GRADE, MORTAR TIGHT AND SUFFICIENTLY RIGID TO PREVENT BULGING AND DEFORMATION UNDER LOAD.

NO FORMS SHALL BE REMOVED WITHIN FOUR DAYS OF PLACING CONCRETE, OR WITHOUT APPROVAL BY THE ENGINEER, AND ALL REMOVAL SHALL BE ACCOMPLISHED IN A MANNER WHICH WILL PREVENT INJURY TO THE CONCRETE.

THE LOCATION OF ALL CONSTRUCTION JOINTS SHALL BE APPROVED BY THE ENGINEER. WATER STOPS SHALL BE USED IN ALL CONSTRUCTION JOINTS.

THE USE OF 'STARTER WALLS' IN CONCRETE STRUCTURES IS PROHIBITED.

H. TRANSPORTATION AND PLACING

READY-MIX CONCRETE DELIVERIES WILL BE REJECTED IF AN ELAPSED TIME OF 1-1/2 HOURS IS EXCEEDED FROM BATCHING TO PLACING, AND IF DRUM ROTATION IS NOT BETWEEN 85 AND 250 REVOLUTIONS.

CONCRETE TEMPERATURE AT TIME OF PLACEMENT SHALL NOT EXCEED 90 DEGREES.

CONCRETE SHALL BE TRANSPORTED FROM THE MIXER TO THE FORMS AS RAPIDLY AS POSSIBLE BY METHODS THAT WILL PREVENT SEGREGATION AND LOSS OF INGREDIENTS. ANY CONCRETE WHICH, DURING TRANSPORTATION, HAS BECOME TOO STIFF FOR EFFECTIVE PLACEMENT OR CONSOLIDATION SHALL BE WASTED. IN NO CASE SHALL CONCRETE BE USED WHICH HAS BEEN RETAINED IN TRUCK MIXERS FOR MORE THAN 90 MINUTES AFTER THE INTRODUCTION OF MIXING WATER TO THE BATCH. CONCRETE, RETAINED IN TRUCK MIXERS FOR MORE THAN 45 MINUTES SHALL BE CONTINUOUSLY AGITATED.

BEFORE PLACING CONCRETE, THE FORMS AND STEEL REINFORCEMENT SHALL BE APPROVED FOR POSITION, STABILITY, AND CLEANLINESS. CONCRETE PLACEMENT SHALL NOT COMMENCE UNTIL THE ENGINEER'S APPROVAL HAS BEEN OBTAINED, AND DSOD HAS INSPECTED THE WORK. ALL CONCRETE SHALL BE PLACED IN THE PRESENCE OF THE ENGINEER. THE CONCRETE SHALL BE DEPOSITED AS NEARLY AS POSSIBLE IN ITS FINAL POSITION. DROP CHUTES AND ELEPHANT TRUNKS SHALL BE USED ON DROPS GREATER THAN 5 FEET. CONCRETE SHALL BE PLACED AT SUCH A RATE THAT ALL CONCRETE IN THE SAME LIFT WILL BE DEPOSITED ON PLASTIC CONCRETE. THE CONCRETE COMPRISING EACH UNIT OF WORK SHALL BE PLACED IN A CONTINUOUS LIFT. IN NO CASE SHALL WATER BE ADDED TO THE CONCRETE TO INCREASE WORKABILITY.

CONCRETE SHALL BE TRANSPORTED FROM THE MIXER AND PLACED WITHIN THE FORMS WITHIN LIMITS OF TIME AND BY METHODS THAT WILL PREVENT SEGREGATION AND LOSS OF INGREDIENTS, SO AS TO PROVIDE A DENSE AND HOMOGENEOUS MASS, FREE FROM VOIDS OR ROCK POCKETS, AND CONFORMING TO THE LINES AND GRADES SHOWN ON THE DRAWINGS.

ALL CONCRETE SHALL BE THOROUGHLY COMPACTED INTO PLACE BY USE OF APPROVED IMMERSION-TYPE VIBRATORS, SUPPLEMENTED BY HAND SPADING, RODDING, AND TAMPING, AS NECESSARY. THE DURATION OF VIBRATION SHALL BE LIMITED TO THE MINIMUM REQUIRED TO PRODUCE SATISFACTORY CONSOLIDATION WITHOUT CAUSING SEGREGATION. VIBRATORS SHALL NOT BE USED TO PROMOTE HORIZONTAL MOVEMENT OF CONCRETE WITHIN THE FORMS.

WHEN PLACING NEW CONCRETE AGAINST ANY PREVIOUSLY PLACED CONCRETE (COLD JOINT) THE INTERFACE SURFACE SHALL BE SANDBLASTED (OR APPROVED EQUIVALENT) TO CREATE A ROUGH SURFACE WITH 1/4-INCH AMPLITUDE. DSOD APPROVAL OF THE SURFACE CONDITION MUST BE OBTAINED PRIOR TO PLACING ANY CONCRETE.

I. FINISHING

IMMEDIATELY AFTER REMOVAL OF FORMS, ALL UNSIGHTLY RIDGES OR LIPS SHALL BE REMOVED FROM PERMANENTLY EXPOSED SURFACES. DEFECTIVE CONCRETE AND CONCRETE CONTAINING VOIDS OR ROCK POCKETS SHALL BE REMOVED AND REPAIRED AS DIRECTED BY THE ENGINEER. ALL PERMANENTLY EXPOSED CONCRETE (OTHER THAN FORMED FACES) SHALL HAVE WOOD FLOAT FINISH.

WHERE REQUIRED ON THE PLANS, CONCRETE SEALER SHALL BE APPLIED. IT IS UNDERSTOOD THAT CONCRETE SEALER WILL BE APPLIED TO THE CONTROL JOINTS PRIOR TO THE RECOMMENDED MANUFACTURERS RECOOMENDATIONS.
CONCRETE SEALER SHALL BE LOW-VOC ACRYLIC TYPE SEALER. CONTRACTOR TO SUBMIT SEALER FOR APPROVAL PRIOR TO CONSTRUCTION.

J. WATERSTOP

WHERE INDICATED ON THE PLANS, PROVIDE FLEXIBLE PVC (POLYVINYLE CHLORIDE) WATERSTOPS OF THE TYPE, SIZE, AND PROFILE SPECIFIED. THE PVC WATERSTOP SHALL BE EXTRUDED FROM AN ELASTOMERIC PLASTIC MATERIAL OF WHICH THE BASIC RESIN IS VIRGIN POLYVINYLE CHLORIDE. THE PVC COMPOUND SHALL NOT CONTAIN ANY SCRAPPED OR RECLAIMED MATERIAL OR PIGMENT.

FIELD BUTT SPLICES OF WATERSTOP SHALL BE ALLOWED. SPLICES SHALL BE HEAT FUSED WELDED USING TEFLON COATED THERMOASTALLY CONTROLLED WATERSTOP SPLICING IRON FOLLOWING APPROVED MANUFACTURER RECOMMENDATIONS. LAPPING OF WATERSTOP, USE OF ADHESIVES, OR SOLVENTS SHALL NOT BE ALLOWED.

K. EMBEDDED ITEMS

BEFORE PLACING CONCRETE, CARE SHALL BE TAKEN TO DETERMINE THAT ALL EMBEDDED ITEMS ARE FIRMLY AND SECURELY FASTENED IN PLACE IN TRUE ALIGNMENT, AS INDICATED ON THE DRAWINGS OR AS REQUIRED. EMBEDDED ITEMS SHALL BE FREE OF OIL AND OTHER FOREIGN MATTER, SUCH AS LOOSE COATINGS OF RUST, PAINT, AND SCALE.

L. CURING AND PROTECTION

ALL CONCRETE SHALL BE MOIST CURED BY MAINTAINING ALL SURFACES CONTINUOUSLY WET FOR A PERIOD OF NOT LESS THAN 14 DAYS AFTER BEING PLACED BY SPRINKLING OR SPRAYING OR BY OTHER METHODS APPROVED BY THE ENGINEER. AT THE OPTION OF THE CONTRACTOR, AND IF APPROVED, CONCRETE MAY BE CURED WITH PIGMENTED CURING COMPOUND OF THE SURFACE MEMBRANE TYPE INSTEAD OF WATER. CURING COMPOUND, IF USED, SHALL BE APPLIED AND MAINTAINED IN STRICT COMPLIANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

ALL FRESH CONCRETE SHALL BE ADEQUATELY PROTECTED FROM DAMAGE BY CONSTRUCTION EQUIPMENT.

K. TESTING

COMPRESSIVE STRENGTH OF CONCRETE SHALL BE DETERMINED BY ASTM C39 "STANDARD TEST METHOD OF COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS". SLUMP SHALL BE DTERMINED USING ASTM C143, "STANDARD TEST METHOD FOR SLUMP OF HYDRAULIC-CEMENT CONCRETE". CONCRETE SHALL BE SAMPLED AND TESTED AT A MINIMUM OF ONCE PER 100 CUBIC YARDS PLACED, OR ONCE DAILY, WHICHEVER IS MORE FREQUENT, OR AT THE REQUEST OF THE ENGINEER OR DSOD.

TRASHRACK

TRASHRACKS SHALL CONSIST OF GALVANIZED STRUCTURAL STEEL MEMBERS, FABRICATED AND INSTALLED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A-36. BOLTS, WASHERS, AND NUTS SHALL BE STAINLESS STEEL GRADE 316. LOCK WASHERS SHALL BE USED WITH ALL BOLTS.

ALL TRASH RACK PARTS SHALL BE PAINTED PRIOR TO INSTALLATION.

RESERVOIR BOTTOM

CONTRACTOR SHALL GRADE THE BOTTOM OF RESERVOIR TO A SMOOTH UNIFORM SURFACE THEN OVER-EXCAVATE, MOISTURE ADJUST AND RE-COMPACT THE RESERVOIR BOTTOM 24", COMPACTED TO AN AVERAGE RELATIVE COMPACTION OF 92%, PER ASTM D-698.

STEEL PIPE SPECIFICATIONS

A. GENERAL

ALL 12 INCH STEEL PIPE SHALL BE OF STANDARD THICKNESS (0.375") AND BE MADE FROM 36,000 PSI MINIMUM YIELD STRENGTH CONFORMING TO REQUIREMENTS FOR ASTM A36.

ALL STEEL PIPES LARGER THAN 12 INCHES SHALL CONFORM TO AMERICAN WATER WORKS ASSOCIATION (AWWA) C200. THE STEEL FOR THE CYLINDER SHALL BE DESIGNED FOR A MINIMUM OF 300 PSI WORKING PRESSURE AND 36,000 PSI MINIMUM YIELD STRENGTH CONFORMING TO REQUIREMENTS FOR ASTM A36.

B. INTERIOR LINING

EXCEPT WHERE PROVIDED FOR IN AWWA C205 THE INTERIOR SURFACES ALL STEEL PIPES, AND FITTINGS, SHALL BE CLEANED AND COATED WITH CEMENT-MORTAR LINING APPLIED CENTRIFUGALLY IN THE SHOP IN CONFORMANCE WITH AWWA C205. EVERY PRECAUTION SHALL BE TAKEN TO PREVENT DAMAGE TO THE COATING. IF COATING IS DAMAGED OR FOUND FAULTY AT THE CONSTRUCTION SITE, THE DAMAGE OR UNSATISFACTORY PORTIONS SHALL BE REPLACED WITH COATING CONFORMING TO THESE SPECIFICATIONS.
CEMENT-MORTAR LINING SHALL BE KEPT MOIST DURING STORAGE AND SHIPPING. THE CONTRACTOR SHALL PROVIDE A POLYETHYLENE OR OTHER SUITABLE BULKHEAD ON THE ENDS OF THE PIPE AND ON ALL SPECIAL OPENINGS TO PREVENT DRYING OUT THE LINING. ALL BULKHEADS SHALL BE SUBSTANTIAL ENOUGH TO REMAIN INTACT DURING SHIPPING AND STORAGE UNTIL THE PIPE IS INSTALLED.

C. WELDED JOINTS

ALL PIPE JOINTS SHALL BE WELDED LAP JOINTS CONFORMING TO THE REQUIREMENTS OF AWWA C200, AND MAY BE FIELD WELDING IN ACCORDANCE WITH THE REQUIREMENTS OF AWWA C206. PIPES MAY BE WELDED ON THE OUTSIDE ONLY.

D. FLANGE JOINTS

ALL FLANGES SHALL COMPLY WITH AWWA C207 CLASS B RATINGS, AND SHALL HAVE A MINIMUM WORKING PRESSURE OF 125 PSI. ALL FLANGES SHALL BE SHOP WELDED, AND COVERED WITH A PROTECTIVE COATING CONFORMING WITH AWWA C210 PRIOR TO BEING DELIVERED IN THE FIELD.

E. CONCRETE ENCASEMENT

WHERE THE PLANS INDICATE THE PIPE IS TO BE ENCASED IN CONCRETE, ENCASEMENT SHALL BE CAST IN SECTIONS 12 FEET LONG WITH WATER BLOCK INSTALLED BETWEEN EACH SECTION, AND REBAR DEVELOPED BETWEEN EACH SECTION.

AS SOON AS FORMS ARE REMOVED, JOINT SEALING COMPOUND SHALL BE APPLIED AT ENDS OF FORMS.

PIPE ENCASEMENT WILL BE CAST IN TRENCH CUT INTO PREPARED NATIVE SOIL WITH BOTTOM COMPACTED TO 95% PER ASTM 698.

TO AVOID AIR ENTRAPMENT UNDER THE PIPE, THE FIRST LIFT NEEDS TO BE PLACED ON ONE SIDE OF THE PIPE AND VIBRATED UNTIL IT FILLS TO THE SPRING LINE ON THE OTHER SIDE OF THE PIPE.

PIPE SHALL BE SUPPORTED ON CONCRETE BOCKS, CONCRETE PADS OR OTHER NON-BIODEGRADABLE MATERIALS DURING CASTING OPERATIONS.

PIPE SHALL BE SECURED AGAINST FLOTATION DURING CASTING OPERATIONS BY EITHER USING TIE DOWN BLOCKS, OR FILLING THE PIPE WITH WATER DURING CASTING.

CONTRACTOR SHALL WAIT AT LEAST THREE DAYS BETWEEN CASTING OF ADJACENT PIPE SECTIONS.

NO.	DATE:	REVISION:	BY:

REGISTERED PROFESSIONAL ENGINEER
CLAUDE ALAN WHITTEN
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CIVIL
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DEVELOPMENT BY:
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KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
SPECIFICATIONS

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO:	3531800_GUZ-PKG
JOB NO.:	353-18-00

C-1.10

WELDING SPECIFICATIONS:

A. GENERAL

CONTRACTOR SHALL FURNISH AND PROVIDE ALL MATERIALS AND QUALIFIED WELDERS REQUIRED FOR WELDING MATERIALS TO THE LINE AND DIMENSIONS SHOWN ON THE DRAWINGS. WELDING MAY BE DONE IN EITHER THE FIELD OR THE SHOP.

B. SURFACE PREPARATION

SURFACES AND EDGES TO BE WELDED SHALL BE SMOOTH, UNIFORM AND FREE FROM FINS, TEARS, CRACKS AND OTHER DISCONTINUITIES WHICH AFFECT THE QUALITY OR STRENGTH OF THE WELD. SURFACES TO BE WELDED AND SURFACES ADJACENT TO A WELD SHALL ALSO BE FREE FROM LOOSE OR THICK SCALE, LAG, RUST, MOISTURE, GREASE AND OTHER FOREIGN MATERIAL THAT WOULD PREVENT PROPER WELDING OR PRODUCE OBJECTIONAL FUMES. MILL SCALE THAT CAN WITHSTAND VIGOROUS WIRE BRUSHING, THIN RUST-INHIBITIVE COATINGS, AND ANTI-SPATTER COMPOUND MAY REMAIN.

C. WELD EXECUTION

PARTS TO BE JOINED BY A FILLET WELD SHALL BE BROUGHT AS CLOSE CONTACT AS PRACTICAL. THE ROOT OPENING SHALL NOT EXCEED 1/16 OF AN INCH. THE USE OF FILLER PLATES SHALL BE PROHIBITED.

D. WELD STRENGTH

ALL WELDS SHALL HAVE A TENSILE STRENGTH OF AT LEAST 70 KIPS.

E. WELD INSPECTION

ALL WELDS SHALL BE VISUALLY INSPECTED BY AN AMERICAN WELDING SOCIETY CERTIFIED WELDING INSPECTOR. THE INSPECTOR SHALL MAKE AN INDEPENDENT REPORT RECOMMENDING APPROVAL OR REJECTION OF THE WELD TO THE CIVIL ENGINEER. FINAL ACCEPTANCE OF ALL WELDS SHALL BE AT THE DISCRETION OF THE CIVIL ENGINEER.

F. CLEAN UP

SLAG SHALL BE REMOVED FROM ALL COMPLETED WELDS, AND THE WELD AND BRUSH SHALL BE CLEANED BY BRUSHING OR OTHER SUITABLE MEANS.

PAINTING:

A. GENERAL

CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR REQUIRED FOR PAINTING ALL EXPOSED STEEL SURFACES. PAINT MAY BE APPLIED IN EITHER THE FIELD OR IN THE SHOP. AN EPOXY BASED PAINT TO BE SPECIFIED BY THE CONTRACTOR AND APPROVED BY THE CIVIL ENGINEER. THE COLOR SHALL BE SELECTED BY THE OWNER.

B. SURFACE PREPARATION

ALL SURFACES TO BE PAINTED SHALL BE CLEANED PER THE PAINT MANUFACTURERS RECOMMENDATIONS, AND SHALL BE FREE FROM RUST, MOISTURE, GREASE, AND OTHER FOREIGN MATERIALS THAT WOULD PREVENT PROPER PAINT ADHESION.

C. APPLICATION

PAINT SHALL BE APPLIED PER THE MANUFACTURERS RECOMMENDATIONS.

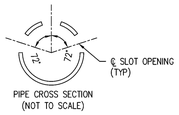
SLOTTED PVC PIPE

A. GENERAL

CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR REQUIRED FOR INSTALLING ALL SLOTTED PVC PIPE PER THE PLANS AND PROFILES.

B. MATERIAL

ALL SLOTTED PVC PIPE SHALL BE SCHEDULE 80 IN ACCORDANCE WITH ASTM D1784. SLOTTED PVC SHALL BE MANUFACTURED WITH PRECISE AND CONSISTENT SPACING AND SIZE OF SLOTS. FIELD CUTTING OF SLOTS IS NOT ACCEPTABLE. EDGES NEED TO BE FINISHED CLEANLY WITH NO BURS. ALL SLOTS SHALL BE 0.093 INCHES WIDE AND HAVE A LENGTH OF 1.9 INCHES AND CUT INTO THE PIPE IN THE FOLLOWING PATTERN:



PIPE CROSS SECTION
(NOT TO SCALE)

ALL SLOTS TO BE CUT ON A ONE INCH HORIZONTAL SPACING. ALL SLOTTED PVC SHALL BE INSTALLED WITH SLOTS FACING UP.

C. JOINTS

JOINTS TO BE INTEGRAL BELL AND SPIGOT AND SOLVENT WELDED AND WATER TIGHT PER ASTM D3212.

REINFORCED CONCRETE PIPE (RCP)

CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR REQUIRED FOR ALL INSTALLATION OF ALL REINFORCED CONCRETE PIPE PER THE PLANS AND PROFILES.

ALL REINFORCED CONCRETE PIPE SHALL BE CLASS III PER ASTM C-76 WITH INTEGRATED BELL AND SPIGOT. RUBBER PIPE GASKETS SHALL MEET THE REQUIREMENTS OF ASTM C-443. RUBBER GASKETS SHALL BE CLEANED AND LUBRICATED PER THE MANUFACTURES RECOMMENDATIONS PRIOR TO INSTALLATIONS.

ALL RCP PIPE FITTING CALLED OUT ON THE PLANS SHALL BE PRE-CAST WITH BELL AND SPIGOT ENDS COMPATIBLE WITH THE RCP BELL AND SPIGOTS. CAST IN PLACE FITTING SHALL NOT BE USED.

ALL RCP SHALL BE LAID IN 8 FOOT SECTIONS, AND SHALL BE PLACED IN TRENCH CUT INTO PREPARED NATIVE SOIL WITH BOTTOM OF TRENCH COMPACTED TO 95% AS PER ASTM 698.

WHERE PIPE IS TO BE ENCASED IN CONCRETE OR SUPPORTED BY SLURRY FILL, PIPE SHALL BE SUPPORTED BY SUPPORTED ON CONCRETE BLOCKS, CONCRETE PADS, OR OTHER NON-BIODEGRADABLE MATERIAL DURING CASTING OPERATIONS. TO AVOID AIR ENTRAPMENT UNDER THE PIPE, THE FIRST LIFT NEEDS TO BE PLACED ON ONE SIDE OF THE PIPE AND VIBRATED UNTIL IT FILLS TO THE SPRING LINE ON THE OTHER SIDE OF THE PIPE.

PIPE SHALL BE SECURED AGAINST FLOTATION DURING CASTING OPERATIONS BY EITHER USING TIE DOWN BLOCKS, OR FILLING THE PIPE WITH WATER DURING CASTING OPERATIONS.

WHERE RCP PENETRATES CONCRETE STRUCTURES, PIPE ENDS SHALL BE FITTED WITH WATERSTOP RINGS THAT MEET THE REQUIREMENTS OF ASTM C-923. STRUCTURES SHALL BE CAST WITH PIPE IN PLACE, AND NOT GROUTED IN AFTER CASTING.

GEOTEXTILE FABRIC

CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR REQUIRED FOR ALL INSTALLATION OF ALL GEOTEXTILE FABRIC PER THE PLANS AND PROFILES.

ALL GEOTEXILE FABRIC SHALL BE MIRAFI 1100N. FABRIC SHALL BE DELIVERED IN 15' X 300' ROLLS, AND STORED AND HANDLED PER MANUFACTURES RECOMMENDATIONS

INSTALLATION

PREPARE THE SURFACE ON WHICH THE GEOTEXTILE IS TO BE PLACED SO THAT NO DAMAGE TO THE GEOTEXTILE WILL OCCUR. GRADE SOIL SHOULD BE EXCAVATED TO THE LINES AND GRADES AS SHOWN ON THE CONSTRUCTION DRAWINGS.. THE GRADE SOIL SHOULD BE CLEARED OF ALL DELETERIOUS MATERIALS AND THE SURFACE SHOULD BE SMOOTH AND LEVEL SUCH THAT ANY SHALLOW DEPRESSIONS AND HUMPS DO NOT EXCEED 6 INCHES IN DEPTH AND HEIGHT.

THE GEOTEXTILE SHOULD BE PLACED AT THE CORRECT ELEVATION AND ORIENTATION AS SHOWN ON THE CONSTRUCTION DRAWINGS. CORRECT ORIENTATION OF THE GEOTEXTILE IS OF UTMOST IMPORTANCE AND SHALL BE VERIFIED BY THE CONTRACTOR. THE GEOTEXTILE SHALL BE CUT TO LENGTH AS SHOWN ON THE CONSTRUCTION DRAWINGS USING A RAZOR KNIFE, SCISSORS, SHARP KNIFE, OR OTHER ENGINEER APPROVED CUTTING TOOL.

AFTER THE GEOTEXTILE HAS BEEN SITUATED IN PLACE IT SHOULD BE TENSIONED BY HAND UNTIL TAUT, (I.E. FREE OF WRINKLES AND LYING FLAT). ADJACENT GEOTEXTILE PANELS, IN THE CASE OF 100 PERCENT COVERAGE IN PLAN VIEW, ADJACENT PANELS SHOULD BE OVERLAPPED BY 2 TO 3 FEET. GEOTEXTILE PANELS MAY BE SECURED IN-PLACE WITH STAPLES, PINS, SAND BAGS, OR RIP-RAP.

THE GEOTEXTILE MAY NOT BE SPLICED IN THE PRIMARY STRENGTH DIRECTION THROUGH OVERLAP, SEWING, OR OTHER MECHANICAL CONNECTION. THEREFORE, THE GEOTEXTILE SHOULD BE INSTALLED IN ONE CONTINUOUS PIECE WITH THE PRIMARY STRENGTH DIRECTION EXTENDING THE FULL LENGTH OF THE REINFORCED AREA.

RIP-RAP SHOULD BE PLACED, SPREAD, AND COMPACTED IN SUCH A MANNER THAT MINIMIZES THE DEVELOPMENT OF WRINKLES IN AND/OR MOVEMENT OF THE GEOTEXTILE. CARE SHOULD BE TAKEN TO CONTROL THE TIMING AND RATE OF PLACEMENT OF RIP-RAP MATERIAL TO ENSURE THAT CONSTRUCTION ACTIVITIES OR SITE VEHICLES TRAVELING ON ANY EXPOSED GEOTEXTILE DO NOT DAMAGE THE MATERIAL.

SUBMITTALS

PRIOR TO CONSTRUCTION BEGINNING, THE CONTRACTOR SHALL SUBMIT TO THE CIVIL ENGINEER FOR APPROVAL THE FOLLOWING ITEMS:

1. PROPOSED METHODOLOGY FOR EXCAVATION, BLENDING, AND PLACEMENT OF EMBANKMENT MATERIAL. INCLUDE ALL EQUIPMENT TO BE USED, AND ALL QUALITY CONTROL MEASURES AS REQUIRED BY THESE SPECIFICATIONS. ALSO INCLUDE ALL PROPOSED LOCATIONS FOR STOCKPILING AND BLENDING.

2. SEPARATE SUBMITTAL FOR FOR EACH CONCRETE MIX. INCLUDE ALTERNATE MIX DESIGNS WHEN CHARACTERISTICS OF MATERIALS, PROJECT CONDITIONS, WEATHER, TEST RESULTS, OR OTHER CIRCUMSTANCES WARRANT ADJUSTMENTS. MIX DESIGN SHALL INCLUDE: PROJECT NAME, ADDRESS, MIX NUMBER, APPLICATION AND LOCATION ON SITE, MAXIMUM SLUMP AND SIGNATURE AND STAMP OF LICENSED CIVIL ENGINEER RESPONSIBLE FOR MIX DESIGN.

3. ALL VALVES SHOWN ON PLANS.

4. ALL PVC PIPE, INCLUDING SLOTTED PIPE

5. ALL RCP PIPE

6. PLAN FOR SUPPORTING RCP PIPE DURING CASTING OPERATIONS, INCLUDING PLAN FOR SECURING PIPE AGAINST FLOTATION.

7. TRENCHING PLAN FOR ALL OPEN CUT TRENCHES, INCLUDING SIDE SLOPES AND STEP BACKS.

8. ALL WATERSTOP USED FOR CONCRETE CONSTRUCTION JOINTS

9. JOINT SEALING COMPOUND TO BE USED ON ENDS OF PIPE ENCASEMENT SECTIONS.

10. SHOP DRAWINGS FOR ALL TRASH RACK PARTS.

11. GEOTEXTILE FABRIC

WATERSTOP

ALL WATERSTOP SHALL BE SIKA GREENSTREAK TYPE 783 STANDARD WEIGHT RIBBED 6"X 3/8" PVC WATERSTOP OR APPROVED EQUAL.

FIELD INSPECTIONS BY DSOD:

A. GENERAL

REPRESENTATIVES FROM DSOD WILL PERIODICALLY INSPECT THE WORK IN PROGRESS DURING CONSTRUCTION, INCLUDING THE MATERIALS BEING INCORPORATED INTO THE WORKS, AS WELL AS THE TEST RESULTS AND DOCUMENTATION ASSOCIATED WITH THE PROJECT. THE CONTRACTOR SHALL ALLOW DSOD REPRESENTATIVES ACCESS TO ALL LOCATIONS WITHIN THE PROJECT BOUNDARIES. ALL COMMUNICATIONS WITH DSOD PERTAINING TO THE PROJECT SHALL BE COORDINATED THROUGH THE OWNER'S ENGINEER OR DESIGNATED REPRESENTATIVE.

B. INSPECTION NOTICE

A 72-HOUR NOTICE FROM THE OWNER'S REPRESENTATIVE IS REQUIRED TO SCHEDULE A DSOD INSPECTION. THEREFORE, THE CONTRACTOR SHALL COOPERATE WITH THE OWNER'S REPRESENTATIVE BY GIVING AT LEAST 72-HOUR (BUSINESS DAYS) NOTICE OF ANY INSPECTION REQUIRING DSOD INVOLVEMENT TO ENSURE THE OWNER HAS SUFFICIENT TIME TO COORDINATE WITH DSOD.

ENVIRONMENTAL COMPLIANCE

A. GENERAL

CONTRACTOR SHALL FOLLOW ALL APPLICABLE STATE, FEDERAL, AND LOCAL LAWS AND REGULATIONS WITH REGARDS TO ENVIRONMENTAL COMPLIANCE. IN PARTICULAR, THE CONTRACTOR SHALL PROVIDE WRITTEN CONFIRMATION OF COMPLIANCE WITH THE FOLLOWING:

B. PRE-CONSTRUCTION COMPLIANCE:

1. BIOLOGICAL RESOURCES: A QUALIFIED BIOLOGIST SHALL CONDUCT SURVEYS FOR BALD EAGLE AND OTHER RAPTORS ON AND WITHIN 500' OF AN ACTIVITY SITE FOR ACTIVE RAPTOR NESTS PRIOR TO ONSITE ACTIVITIES. IF RAPTORS ARE FOUND TO OCCUR, THEIR ACTIVE NEST SHALL BE AVOIDED BY 500'. THE 500' NO-DISTURBANCE AREA CAN BE REDUCED IF IT IS DETERMINED BY A QUALIFIED BIOLOGISTS THAT ACTIVITIES DO NOT AFFECT BREEDING SUCCESS. IF FOUND TO OCCUR, ACTIVE GOLDEN EAGLE NESTS SHALL BE AVOIDED BY 1 MILE AND ACTIVITIES SHALL NOT OCCUR WITHIN LINE-OF-SIGHT OF ACTIVE NESTS

   SPECIFIC TO OTHER MIGRATORY BIRDS PROTECTED BY THE MIGRATORY BIRD TREATY ACT, THE QUALIFIED BIOLOGIST SHALL CONDUCT THE SURVEY FOR ACTIVE BIRD NESTS AT AN ACTIVITY SITE IF ACTIVITIES ARE SCHEDULED TO OCCUR DURING THE BREEDING SEASON (FEBRUARY 15 THROUGH SEPTEMBER 15). THE SURVEY SHALL INCLUDE THE SITE AND NO LESS THAN 500' OUTSIDE OF SITE BOUNDARIES. IF ACTIVE NESTS ARE LOCATED WITHIN THE SITE BOUNDARIES, CONSTRUCTION ACTIVITIES SHALL BE RESTRICTED AS NECESSARY TO AVOID DISTURBANCE OF THE NEST UNTIL IT IS ABANDONED OR A QUALIFIED BIOLOGIST DEEMS DISTURBANCE POTENTIAL TO BE MINIMAL (IN CONSULTATION WITH U.S. FISH AND WILDLIFE SERVICE AND CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE). RESTRICTIONS MAY INCLUDE ESTABLISHMENT OF AVOIDANCE BUFFERS (NO INGRESS OF PERSONNEL OR EQUIPMENT AT A MINIMUM RADIUS OF 50' OR MORE AROUND THE NEST AS ,RECOMMENDED BY THE BIOLOGIST) OR ALTERATION OF THE CONSTRUCTION SCHEDULE. ALL OBSERVED NESTS SHALL BE MONITORED BY A QUALIFIED BIOLOGIST TO DETERMINE NEST STATUS AND THE POTENTIAL FOR NEST ABANDONMENT.

   FOR THE PROTECTION OF SAN JOAQUIN KIT FOX, APPLICABLE AVOIDANCE MEASURES FROM SERVICE (2011) WOULD BE IMPLEMENTED. THOSE MEASURES THAT ARE APPLICABLE ARE THE ONES THAT DO NOT INVOLVE TAKE (SUCH AS DEN DESTRUCTION).

C. DURATION OF PROJECT:

1. AIR QUALITY: THE CONTRACTOR SHALL COMPLY WITH APPLICABLE EMISSION STANDARDS SET BY THE SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT. THIS INCLUDES FOLLOWING CONSTRUCTION DUST ORDINANCE OR OTHER BEST MANAGEMENT PRACTICES.

2. CULTURAL RESOURCES: IN THE UNLIKELY EVENT THAT UNANTICIPATED BURIED ARCHAEOLOGICAL DEPOSITS ARE ENCOUNTERED DURING CONSTRUCTION, WORK IN THE IMMEDIATE VICINITY OF THE DISCOVERY MUST CEASE UNTIL THE FIND CAN BE EVALUATED BY RECLAMATION AND MANAGED PURSUANT TO THE REQUIREMENTS OF 36 CODE OF FEDERAL REGULATIONS (CFR) 800.13 AND OTHER APPLICABLE FEDERAL LAWS AND REGULATIONS. IF HUMAN REMAINS ARE INADVERTENTLY DISCOVERED, RECLAMATION WILL COMPLY FULLY WITH NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990 AS OUTLINED AT 43 CFR PART 10, AND OTHER FEDERAL LAWS AND REGULATIONS AS APPLICABLE.

3. WATER RESOURCES: THIS PROJECT IS SUBJECT TO THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES.

   THE CONTRACTOR SHALL FOLLOW THE MONITORING AND REPORTING PROGRAM, AS PER THEIR NPDES PERMIT, TO MINIMIZE IMPACT TO WATER RESOURCES.

   THE CONTRACTOR SHALL MEET THE CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD ISSUED WATER QUALITY OBJECTIVES ASSOCIATED WITH THEIR WASTE DISCHARGE REQUIREMENT (WDR) PERMIT TO PROTECT AND ENHANCE THE BENEFICIAL USES OF WATER IN THE TULARE LAKE BASIN.

   THE DISTRICT SHALL FOLLOW THE MONITORING AND REPORTING PROGRAM, AS PER THEIR WDR PERMIT, TO MINIMIZE IMPACT TO WATER RESOURCES.

NO.	DATE:	REVISION:	BY:

REGISTERED PROFESSIONAL ENGINEER
CLAUDE A. WITTEN
No. C-63332
CIVIL
STATE OF CALIFORNIA

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DEVELOPMENT BY:
KERN-TULARE WATER DISTRICT
5001 CALIFORNIA AVE., SUITE 102
BAKERSFIELD, CA 93309
661-327-7132

KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR SPECIFICATIONS

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO: 3531800_GUZ-PKG	
JOB NO.:	353-18-00

C-1.11 | SHEET 11 OF 13

EROSION CONTROL NOTES:

1. IN CASE OF EMERGENCY, CALL ______________________
2. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. NECESSARY MATERIALS SHALL BE AVAILABLE ON SITE AND STOCKPILED AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS IMMINENT.
3. EROSION CONTROL DEVICES SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE BUILDING OFFICIAL.
4. ALL REMOVABLE EROSION PROTECTIVE DEVICES SHALL NOT BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE 5-DAY RAIN PROBABILITY FORECAST EXCEEDS 40%.
5. AFTER A RAINSTORM ALL SILT AND DEBRIS SHALL BE REMOVED FROM STREETS, CHECK BERMS AND BASINS.
6. GRADED AREAS ON THE PERMITTED AREA PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPES AT THE CONCLUSION OF EACH WORKING DAY. DRAINAGE TO BE DIRECTED TOWARD DESILTING FACILITIES.
7. THE PERMITTEE AND CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATER CREATED A HAZARDOUS CONDITION.
8. THE UNDERSIGNED CIVIL ENGINEER SHALL INSPECT THE EROSION CONTROL WORK AND ENSURE THAT THE WORK IS IN ACCORDANCE WITH THE APPROVED PLANS.

EROSION CONTROL PLAN

SCALE 1"=60'-0"

EROSION & SEDIMENT CONTROL CONSTRUCTION NOTES

ALL BMPs SHALL BE IN ACCORDANCE WITH MODEL BMPs FROM THE CALIFORNIA STORMWATER BMP HANDBOOK FOR CONSTRUCTION AT WWW.CABMPHANDBOOKS.COM

LEGEND

FIBER ROLL

GRAPHIC SCALE
60' 30' 0' 30' 60'
(IN FEET)
1 inch = 60 ft.

BY: | REVISION: | NO. | DATE:

REGISTERED PROFESSIONAL ENGINEER
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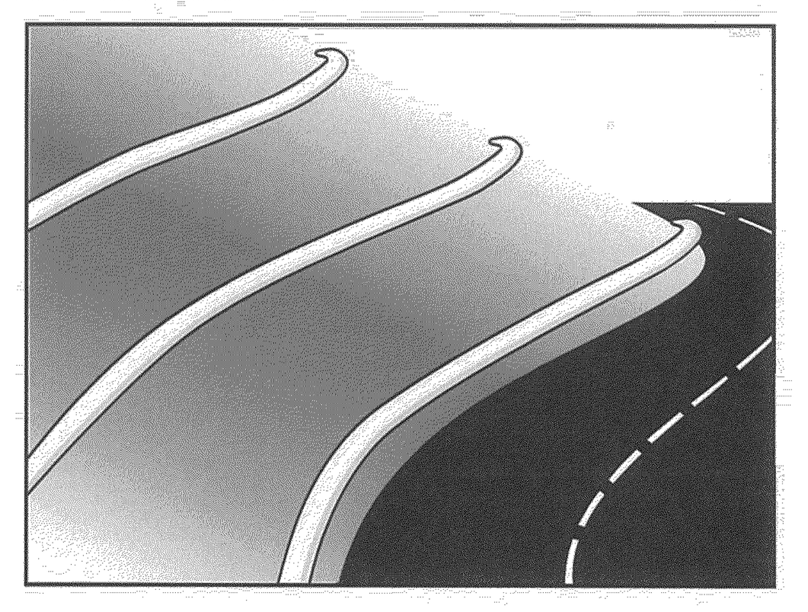
KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
EROSION CONTROL PLAN

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO:	3531800_GUZ-PKG
JOB NO.:	353-18-00
C-1.12	SHEET 12 OF 13

Fiber Rolls SE-5



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Category
☒ Secondary Category

Description and Purpose
A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications
Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives
SE-1 Silt Fence
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-12 Manufactured Linear Sediment Controls
SE-14 Biofilter Bags

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CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Around temporary stockpiles.

Limitations
- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation
Fiber Roll Materials
- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation
- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal
- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs
Material costs for regular fiber rolls range from \$20 - \$30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-\$9.00 per linear foot, based upon vendor research.

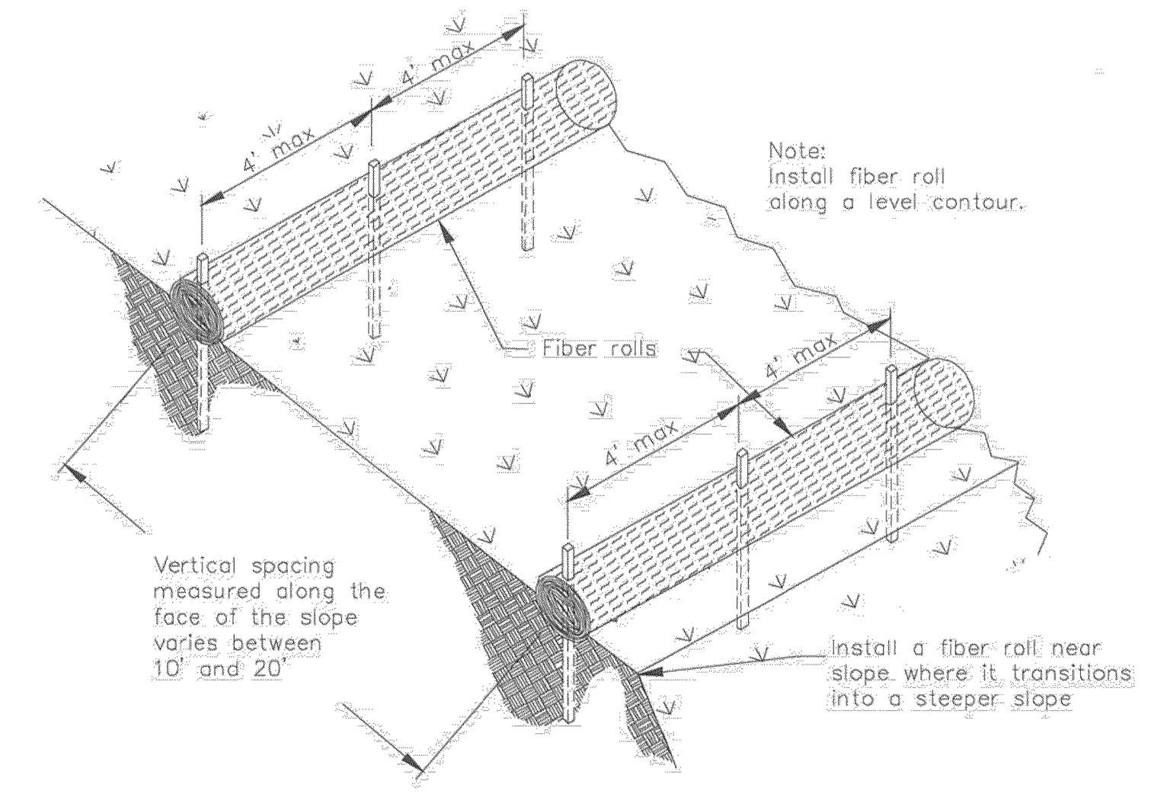
Inspection and Maintenance
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

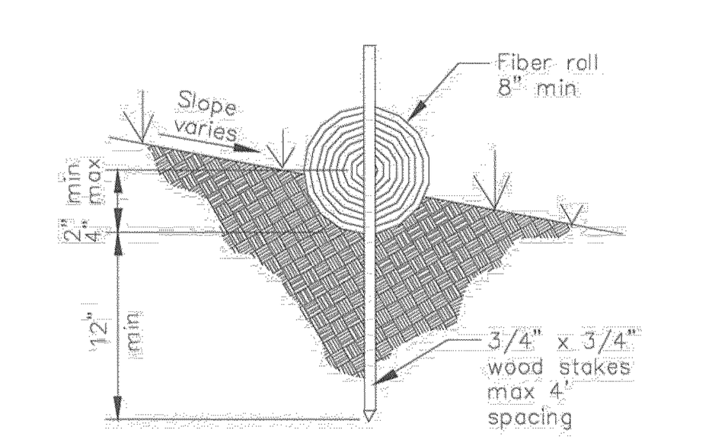
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

NO.	DATE:	REVISION:	BY:

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KERN-TULARE WATER DISTRICT
WATER PIPELINE
GUZMAN WATER RESERVOIR
EROSION CONTROL BMP's

DESIGNER:	CAW
CHECKED BY:	DGW
DATE:	6/19/2019
DRAFTER	MAA
SCALE:	AS SHOWN
COMP. NO:	3531800_GUZ-PKG
JOB NO.:	353-18-00
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