City of Thornton

City Development
Floodplain Development Permit

Permit No. 2018-15
Building Permit No. _____

General Information

Project Name: West Cooley Reservoir - 2015 Flood Repairs
Date: 10/18/18

Project Location: Between E. 88th Avenue and E. 104th Avenue, along the South Platte River

Owner/Developer: City of Thornton
Phone No.: 720-977-6272

Owner Address: 12450 Washington Street, Thornton, CO 80241

Contractor: TBD
Phone No.:

Contractor Address: TBD

Project Description

Residential: N/A
Type:
Number of Lots/Units:

Non-Residential: Municipal project for the City of Thornton
Type: Civil

Project Explanation (What is being done in drainage way): Repairs to the City of Thornton's gravel pit reservoirs facilities damaged from flooding

Floodplain Data

Drainageway Name: South Platte River

Project is located in: Floodfringe / Floodway: Portions of the floodfringe and floodway

Project is located in Flood Zone: Zone AE

100-Year Flood Elevation: Varies throughout the site

Source Document: Federal Emergency Management Agency Flood Insurance Study, Adams County, 2007

Other Explanation:

Additional Information

List all other Permit requirements for this Project (i.e., 404, LOMR, etc.): USACE 404 Nationwide Permit and Individual Permit

Elevation Certificate Requirements: N/A

Floodproofing Requirements: N/A

Signature Block

Applicant: _____ Date: 11/1/18

Floodplain Administrator: _____ Date: 11/1/18

October 23, 2018
Project 16116

Mr. Jim Kaiser, P.E., CFM
City of Thornton Floodplain Manager
12450 Washington Street, Suite 100
Thornton, CO 80241

Re: West Cooley Reservoir – 2015 Flood Repairs Project, Thornton CIP 16-351C
Project Explanation and Floodplain Impacts

Dear Mr. Kaiser:

The City of Thornton (Thornton) is planning to construct the West Cooley Reservoir – 2015 Flood Repairs Project (Project) within the jurisdiction of Thornton. RJH has performed floodplain evaluations to support obtaining a Thornton Floodplain Development Permit. Our conclusions regarding impacts to the floodplain are presented in this letter. A Floodplain Development Permit application is provided in Attachment 1.

Since the 1980s, Thornton has been developing a raw water supply system along the east and west sides of the South Platte River (River) between about 72nd and 104th Avenues. This water supply system (System) includes below-ground gravel pit reservoirs, combined above- and below-ground gravel pit reservoirs, and ancillary facilities. In September 2013, a large flood event in the River resulted in River flows overtopping several System gravel pit reservoirs. The flood flows caused moderate to severe damage at the West Cooley Reservoir complex including breaching and erosion of reservoir berms and slopes and damage to ancillary facilities including soil-bentonite barrier wall, access roads, trails, slope protection, alluvial wells, and other miscellaneous facilities.

In June 2015 and just prior to beginning construction to repair the 2013 flood damage, another flood event in the River resulted in flows breaching the berm between the River and the South Cell. The flood flows caused additional damage to existing breaches, additional damage to ancillary facilities including soil-bentonite barrier wall, access roads, trails, alluvial wells, and other miscellaneous facilities at West Cooley and a breach between the Central Cell and the River. As part of this flood event, much of the River was diverted through the South Cell and Central Cell and left a portion of the main River channel nearly dry.

The purpose of this Project is to repair facilities damaged from the floods to their pre-flood conditions and construct spillways (overflow channels) to route future flood events through the reservoir system that will reduce damage from future flood events. The repair sites are all

9800 Mt. Pyramid Court, Suite 330
Englewood, CO 80112
www.rjh-consultants.com

303-225-4611 – phone
303-225-4615 – fax
866-900-1930 – toll free

located within the Federal Emergency Management Agency (FEMA) 100-year regulatory floodplain on the South Platte River.

The design and construction are being funded in part by the Federal Emergency Management Agency (FEMA). Select design drawings showing the repair and overflow channel concepts are provided in Attachment 2. A brief description of the construction at each repair site is as follows:

1. River to South Cell (Site 1):
    a. Removing and temporarily stockpiling deposited soils that are currently within the breach and reservoir.
    b. Placing earthfill to restore the berm to pre-flood grades and restoring other damaged site facilities.
    c. Repairing the damaged portion of the soil-bentonite barrier wall.
    d. Repairing the damaged alluvial well piping and electrical conduits.
    e. Excavating an earthen channel, constructing an earthen flow containment berm, constructing reinforced concrete cutoff walls at the river-side and reservoir-side of the overflow channel, and constructing a grouted riprap chute along the slope of the reservoir.
2. South Cell to Central Cell (Site 2):
    a. Placing earthfill and performing grading as necessary to restore the berm to its pre-flood grade.
    b. Repairing damaged sections of the access road.
    c. Reinstalling the interconnect gate control vault and hydraulic lines, and raising the top of the vault.
    d. Excavating an earthen channel, constructing a reinforced concrete cutoff wall, and constructing loose placed riprap on the slope of the South Cell, and constructing a grouted riprap chute along the slope of the Central Cell.
3. Central Cell to River (Site 3):
    a. Placing earthfill to restore the berm to pre-flood grades and restoring other damaged site facilities.
    b. Repairing the damaged portion of the soil-bentonite barrier wall.
    c. Excavating two earthen channels, constructing reinforced concrete cutoff walls at the river-side and reservoir-side of each overflow channel, and constructing a grouted riprap chute along the slope of the reservoir and the river for each overflow channel.
4. North Cell (Site 4):
    a. Placing earthfill to restore the berm to pre-flood grades and restoring other damaged site facilities.
    b. Repairing displaced riprap slope protection.

c. Reinstalling the interconnect gate control vault and hydraulic lines, and raising the top of the vault.

Except for the repairs to the interconnect gate control vaults and the flow containment berm at the Site 1 overflow channel, repairs and overflow channels will consist of either restoring facilities to their pre-flood condition (including final grades for earthfill) or lowering the existing ground surface (by excavating earthen channels). Therefore, these activities could not cause a net rise in base flood elevations.

The flow containment berm will consist of constructing an earthen berm with a 3H:1V interior (west) slope, a 4H:1V exterior (east) slope, and a 5-foot crest width. The crest elevation of the berm will vary along the spillway profile (decreasing to the north) to provide a 2.5-foot channel depth. Overall, construction of the overflow channel reduces the ground surface elevation. However, locally, construction of the flow containment berm increases the existing ground surface elevation. Therefore, as part of the overflow channel design, RJH performed hydraulic modeling to evaluate possible impacts to the River floodplain. Based on the results of hydraulic modeling, the overflow channel construction would cause no net rise in base flood elevations.

The interconnect gate control vault modifications will consist of raising the top of the vaults above the 100-year base flood elevation using pre-cast concrete extensions. In RJH's opinion, the interconnect gate control vault modifications will not cause a rise in base flood elevations and will not adversely impact adjacent property owners because the width of the vaults is relatively minor compared to the overall extent of the floodplain at this location, which is about 4,000 feet. The interconnect gate control vaults are 5 feet wide, which represents about 0.1 percent of the total floodplain width. In our opinion, potential impacts to the floodplain from the interconnect gate control vault modifications are well within the range of uncertainties associated with the development of floodplain elevations and should produce negligible impacts on the current regulatory base flood elevations.

During construction, a temporary cofferdam will be built at Site 1. The temporary cofferdam will be constructed to provide flood protection up to about the 10-year flood event. Based on previous hydraulic modeling and an assumption that the cofferdam will not fail when it is overtopped at flows greater than the 10-year event, the temporary cofferdam could increase the 100-year base flood elevations up to a maximum of 0.78 foot. These results were presented to Thornton in a memorandum dated January 19, 2017.

During construction a temporary stockpile of earthen materials will be placed along the berm between the River and South Cell (Site 1). The stockpile could be as large as approximately 110 feet wide by 275 feet long with stockpile heights up to about 15 feet.

As part of work performed for Thornton for the 2013 flood repairs project, RJH performed hydraulic modeling to evaluate possible impacts to the River floodplain from the temporary stockpile. The results of this modeling were presented in a letter to Thornton dated April 29, 2015. Based on the results of hydraulic modeling, the temporary stockpile would cause no net rise in base flood elevations.

Please call if you have any questions or require additional information.

Sincerely,

RJH CONSULTANTS, INC.

Robert J. Huzjak, P.E.
Project Manager

c. Mr. Eduardo Moreno

RJH/tjp

Attachment 1: Thornton Floodplain Development Permit Application
Attachment 2: Design Drawings

ATTACHMENT 1

THORNTON FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

City of Thornton

City Development Permit No._____
Floodplain Development Permit Building Permit No._____

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Elevation Certificate Requirements: N/A

Floodproofing Requirements: N/A

Signature Block

Applicant Date

Floodplain Administrator Date

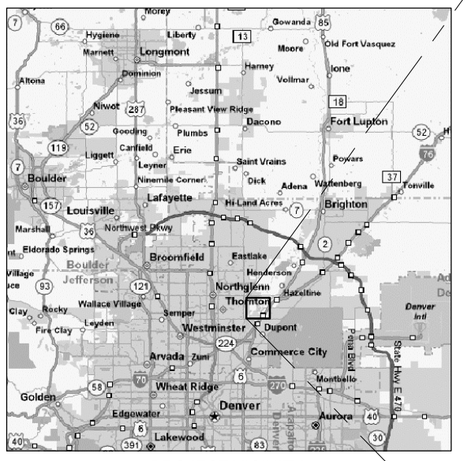
ATTACHMENT 2

DESIGN DRAWINGS

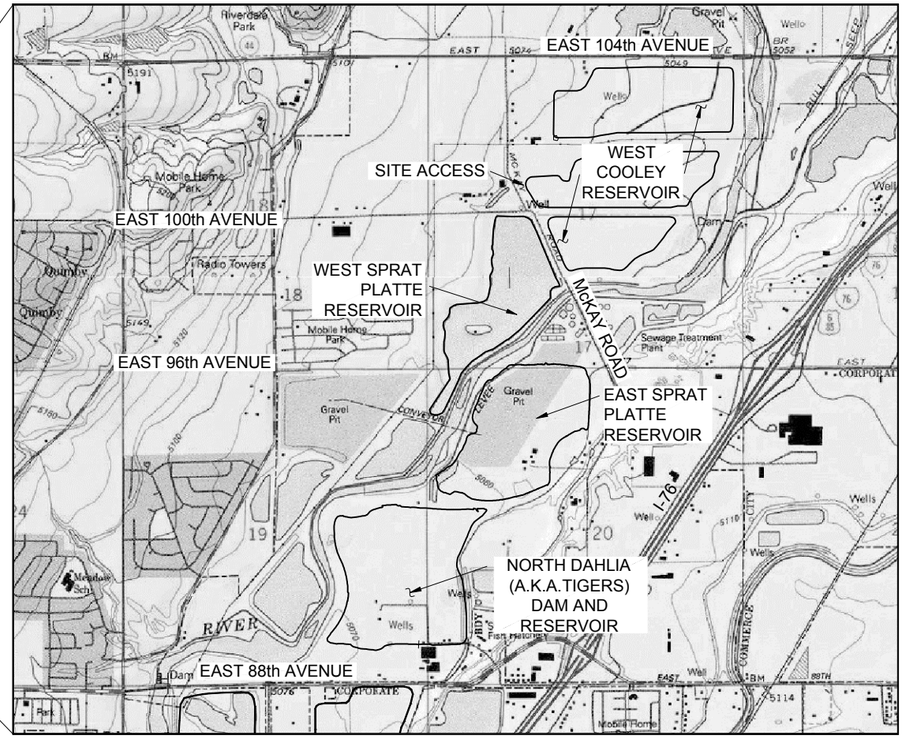
CITY OF THORNTON

WEST COOLEY RESERVOIR
2015 FLOOD REPAIRS PROJECT

CONSTRUCTION DRAWINGS
THORNTON CIP NO. 16-351C
THORNTON, COLORADO



PROJECT VICINITY MAP
(NOT TO SCALE)



SITE LOCATION MAP
(NOT TO SCALE)

PRELIMINARY
NOT FOR CONSTRUCTION

GENERAL PROJECT INFORMATION

AS OWNERS THEREOF WE HEREBY ACCEPT AND APPROVE THESE PLANS FOR CONSTRUCTION OF THE WEST COOLEY RESERVOIR – 2015 FLOOD REPAIRS PROJECT.

CITY OF THORNTON, COLORADO
OWNER

–
CONTRACTOR

RJH CONSULTANTS, INC., ENGLEWOOD, COLORADO
ENGINEER

CONSTRUCTION STARTED

CONSTRUCTION COMPLETED

CITY OF THORNTON APPROVALS

PROJECT MANAGER – EDUARDO MORENO	DATE
WATER RESOURCES SENIOR MANAGER – EDWARD LANYON	DATE
WATER RESOURCES MANAGER – EMILY HUNT	DATE
SENIOR CIVIL ENGINEER – DAN SHILTZ, P.E.	DATE
SENIOR CIVIL ENGINEER – JAMES KAISER, P.E., C.F.M.	DATE
EMERGENCY AND SAFETY ADMINISTRATOR – RYAN DOYLE	DATE

PREPARED FOR:
City of Thornton

PREPARED BY:
RJH CONSULTANTS, INC.

RJH CONSULTANTS, INC.
ENGLEWOOD • COLORADO
www.rjh-consultants.com

I HEREBY CERTIFY THAT THESE PLANS FOR THE WEST COOLEY RESERVOIR – 2015 FLOOD REPAIRS PROJECT WERE PREPARED BY ME (OR UNDER MY DIRECT SUPERVISION) FOR THE OWNERS THEREOF.

ROBERT J. HUZJAK, P.E. COLORADO P.E. NO.25734

REGISTERED ENGINEER
RJH CONSULTANTS, INC.

THESE PLANS REPRESENT THE AS–CONSTRUCTED CONDITIONS OF THE WEST COOLEY RESERVOIR – 2015 FLOOD REPAIRS PROJECT TO THE BEST OF MY KNOWLEDGE AND JUDGMENT, BASED IN PART ON INFORMATION FURNISHED BY OTHERS, AS OF THE _____ DAY OF _____, _____.

(ENGINEER'S PRINTED NAME) (SIGNATURE)

DWG. NO.
A-01

SHEET NO.
1 of 39

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GENERAL NOTES

1. BASIS OF TOPOGRAPHIC MAPPING IS A COMPOSITE OF THE FOLLOWING SOURCES:
   A. PROJECT TOPOGRAPHIC MAPPING (2016 SURVEY DATA) WAS DEVELOPED BY HCL ENGINEERING AND SURVEYING IN OCTOBER 2016 AND JANUARY 2017. THE SURVEY WAS AMENDED WITH ADDITIONAL INFORMATION DEVELOPED BY J.R. ENGINEERING (FEBRUARY, 2016).
   B. TOPOGRAPHIC SURVEY AT WEST COOLEY NORTH CELL FROM "2012 SLOPE PROTECTION PROJECTS WEST COOLEY – NORTH CELL" RECORD DRAWINGS (THORNTON CIP NO. 09–793B) (RJH CONSULTANTS, 2013).
   C. TOPOGRAPHIC SURVEY WITHIN WEST COOLEY SOUTH CELL FROM "CONSTRUCTION PLANS FOR CITY OF ARVADA SOUTH PLATTE RESERVOIR PROJECT" RECORD DRAWINGS (APPLEGATE, 2003).
   D. TOPOGRAPHIC SURVEY AT OTHER LOCATIONS FROM 2–FOOT TOPOGRAPHIC MAPPING PROVIDED BY CITY OF THORNTON (2008).
2. ACTUAL SITE CONDITION MAY DEVIATE FROM TOPOGRAPHY SHOWN. CONTRACTOR TO CONFIRM SITE TOPOGRAPHY PRIOR TO STARTING EARTHWORK.
3. RIGHTS–OF–WAY AND EASEMENTS ARE APPROXIMATE. BASIS OF RIGHTS–OF–WAY AND EASEMENTS IS FROM "2012 SLOPE PROTECTION PROJECTS WEST COOLEY – NORTH CELL" RECORD DRAWINGS (THORNTON CIP NO. 09–793B) (RJH CONSULTANTS, 2013) AND FROM OCTOBER 27, 2006 ALTA/ACSM LAND TITLE SURVEY PREPARED BY J.R. ENGINEERING.
4. BASIS OF PROPERTY BOUNDARIES IS FROM HARRIS KOCHER SMITH (HKS) SURVEY (SEPTEMBER 2014).
5. LOCATION AND NATURE OF EXISTING UTILITIES AND EXISTING FACILITIES SHOWN ON THE DRAWINGS ARE APPROXIMATE. FIELD LOCATE ALL UTILITIES AND FACILITIES, WHETHER SHOWN ON THE DRAWINGS OR NOT, PRIOR TO EXCAVATION AND DEMOLITION. PROTECT ALL UTILITIES AND FACILITIES IN PLACE UNLESS DESIGNATED FOR REMOVAL, DEMOLITION, OR REPLACEMENT.
6. UNLESS SHOWN OR SPECIFIED OTHERWISE. PAYLINES FOR UNIT PRICE PAY ITEMS ARE BASED ON THE DESIGN LINES (NEAT LINES) SHOWN ON THE PLANS.

LEGEND

DETAIL — A / A-03 — DETAIL TITLE. THE LETTER "A" REFERS TO THE DETAIL DESIGNATION. THE NUMBER "A–03" REFERS TO THE DRAWING NUMBER WHERE THE DETAIL IS CALLED OUT.

SECTION **STA 0+00** — 1 / A-03 — SECTION TITLE. THE NUMBER "1" REFERS TO THE SECTION DESIGNATION. THE NUMBER "A–03" REFERS TO THE DRAWING NUMBER WHERE THE SECTION IS CALLED OUT.

1 / A-03 — SECTION LOCATION. THE NUMBER "1" REFERS TO THE SECTION DESIGNATION. THE NUMBER "A–03" REFERS TO THE DRAWING NUMBER WHERE THE SECTION IS SHOWN.

A / A-03 — DETAIL LOCATION. THE LETTER "A" REFERS TO THE DETAIL DESIGNATION. THE NUMBER "A–03" REFERS TO THE DRAWING NUMBER WHERE THE DETAIL IS SHOWN.

- APPROXIMATE TREE AND SHRUB LIMITS
- INDIVIDUAL SHRUB OR TREE
- EARTH SLOPE
- CUT SLOPE
- HORIZONTAL COORDINATE GRID MARK
- SCP-02 — SURVEY CONTROL POINT
- CCP-02 — CONSTRUCTION CONTROL POINT
- EXISTING MONITORING WELL OR PIEZOMETER
- EXISTING PRODUCTION WELL
- EXISTING ALLUVIAL WELL
- EXISTING VALVE
- BLOW–OFF VALVE
- ELECTRICAL TRANSMISSION TOWER

- 3630 — EXISTING INDEX TOPOGRAPHIC CONTOUR WITH ELEVATION IN FEET
- EXISTING INTERMEDIATE TOPOGRAPHIC CONTOUR
- PAVED ROAD
- GRAVEL OR UNIMPROVED ROAD
- PROPERTY LINE
- LIMIT OF SITE DISTURBANCE (PROJECT LIMITS)
- CENTERLINE
- LIMIT OF CONTRACTOR STAGING AND STOCKPILING
- SURFACE WATERWAY
- RIGHT–OF–WAY
- EASEMENT
- APPROXIMATE WATER LEVEL
- FENCE
- TRAIL SAFETY FENCE
- FLOODPLAIN LIMITS
- FLOODWAY LIMITS
- WATERLINE
- SILT FENCE
- SOIL–BENTONITE BARRIER WALL
- GEOTEXTILE
- APPROXIMATE GEOLOGIC CONTACT
- OHE — OHE — OVERHEAD ELECTRIC
- UE — UE — UNDERGROUND ELECTRIC
- UC — UC — UNDERGROUND COMMUNICATION

ABBREVIATIONS:

AB	= ANCHOR BOLT
ABT	= ABOUT
ADAS	= AUTOMATIC DATA ACQUISITION SYSTEM
ADDL	= ADDITIONAL
ALUM	= ALUMINUM
ALT	= ALTERNATE
APPROX	= APPROXIMATE
AS	= AUXILIARY SPILLWAY
ASCP	= AUXILIARY SPILLWAY CONTROL POINT
BF	= BOTTOM FACE
BLDG	= BUILDING
BM	= BENCHMARK
BOC	= BOTTOM OF CONCRETE
BOH	= BOTTOM OF HOLE
BOT	= BOTTOM
BR	= BOTTOM ROW
BRG	= BEARING
BTWN	= BETWEEN
CCM	= CELLULAR CONCRETE MAT
CDOT	= COLORADO DEPT OF TRANSPORTATION
CFS	= CUBIC FEET PER SECOND
CJ	= CONSTRUCTION JOINT
CL, ℄	= CENTERLINE
CLR	= CLEAR
CMP	= CORRUGATED METAL PIPE
CMU	= CONCRETE MASONRY UNIT
COL	= COLUMN
CONC	= CONCRETE
CONN	= CONNECTION
CONT	= CONTINUOUS
CP	= CONTROL POINT
CTJ	= CONTRACTION JOINT
CTR	= CENTER
DIA	= DIAMETER
DIAG	= DIAGONAL
DWG, DWGS	= DRAWING OR DRAWINGS
DWL	= DOWEL
DWLS	= DOWELS
E	= EAST OR EASTING
EA	= EACH
EC	= EACH CORNER
ECP	= EMBANKMENT CONTROL POINT
EF	= EACH FACE
EJ	= EXPANSION JOINT
EL, ELEV	= ELEVATION
EQ	= EQUAL
ER	= EACH ROW
ES	= EACH SIDE
EW	= EACH WAY
EXST	= EXISTING
EXT	= EXTENSION
EXP	= EXPANSION
F	= FAHRENHEIT
FB	= FLAT BAR
FD	= FLOOR DRAIN
FDN	= FOUNDATION
FF	= FAR FACE, FINISHED FLOOR
FIN	= FINISH
FLG	= FLANGE
FO	= FACE OF
FR	= FAR ROW
FS	= FAR SIDE
FT	= FEET OR FOOT
FES	= FLARED END SECTION
FTG	= FOOTING
GALV	= GALVANIZED
GR	= GRADE
H	= HORIZONTAL
H.A.S.	= HEADED ANCHOR STUD
HDPE	= HIGH DENSITY POLYETHYLENE
HGT	= HEIGHT
HK	= HOOK
HORZ	= HORIZONTAL
HR	= HANDRAIL
HS	= HIGH STRENGTH
HSS	= HOLLOW STRUCTURAL SECTION
HYD	= HYDRAULIC
ID	= INSIDE DIAMETER
IE	= INVERT ELEVATION
I.F.	= INSIDE FACE
INV	= INVERT
JT	= JOINT
LG	= LONG
LP	= LOW POINT
LPBO	= LOW POINT BLOW–OFF
MAX	= MAXIMUM
MIN	= MINIMUM
MH	= MANHOLE
MFR	= MANUFACTURER
MSE	= MECHANICALLY STABILIZED EARTH
NAD	= NORTH AMERICAN DATUM
NAVD	= NORTH AMERICAN VERTICAL DATUM
N	= NORTH OR NORTHING
NF	= NEAR FACE
NGS	= NATIONAL GEODETIC SURVEY
NGVD	= NATIONAL GEODETIC VERTICAL DATUM
NO.	= NUMBER
NR	= NEAR ROW
NTS	= NOT TO SCALE
NWL	= NORMAL WATER LEVEL
OC	= ON CENTER
OD	= OUTSIDE DIAMETER
O.F.	= OUTSIDE FACE
OH	= OVERHEAD
OPNG	= OPENING
OPP	= OPPOSITE
O.R.	= OUTSIDE ROW
OW	= OUTLET WORKS
OWC	= OUTLET WORKS CONDUIT
OWCP	= OUTLET WORKS CONTROL POINT
PC	= POINT OF CURVATURE
PD	= PLAIN DOWELS
PE	= POLYETHYLENE
PEN.	= PENETRATION
PI	= POINT OF INTERSECTION
PJF	= PREFORMED JOINT FILER
PL, P	= PLATE
PMF	= PROBABLE MAXIMUM FLOOD
PT	= POINT OF TANGENCY
PVC	= POLYVINYL CHLORIDE
RB	= ROOF BEAM
RCP	= REINFORCED CONCRETE PIPE
REINF	= REINFORCEMENT
REQ'D	= REQUIRED
ROW	= RIGHT OF WAY
S	= SLOPE
SC	= SOIL–CEMENT
SCH	= SCHEDULE
SEO	= STATE ENGINEER'S OFFICE
SIM	= SIMILAR
SPC, SPCS	= SPACE OR SPACES
SPY	= SPILLWAY
SS	= STAINLESS STEEL
STA	= STATION
STL	= STEEL
SQ	= SQUARE
SYM	= SYMMETRICAL
T&B	= TOP & BOTTOM
TF	= TOP FACE
THK	= THICK
TL	= TOP LAYER
T.O.	= TOP OF
TOC	= TOP OF CONCRETE
TOW	= TOP OF WALL
TR	= TOP ROW
TW	= TAILWATER
TYP	= TYPICAL
UCP	= UTILITY CARRIER PIPE
UDP	= UNDERDRAIN PIPE
UNC	= UNIFIED NATIONAL COARSE THREAD
UNO	= UNLESS NOTED OTHERWISE
USGS	= UNITED STATES GEOLOGICAL SURVEY
V	= VERTICAL
VERT	= VERTICAL
WS	= WATER SURFACE
WSA	= WATERSTOP
WWF	= WELDED WIRE FABRIC

- EARTH
- CONCRETE
- EROSION REPAIRS
- STOCKPILE AREA
- LOW–PERMEABLE FILL
- SOIL–BENTONITE BACKFILL
- EXISTING SOIL–BENTONITE BARRIER WALL
- WETLANDS
- RIPRAP
- AGGREGATE SURFACING AND RIPRAP BEDDING

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	DATE	ISSUE/REVISION	DES	DRN	CHK	APP
1	05/2017	98% DESIGN	MSS	BMB	JDN	RJH

RJH CONSULTANTS, INC.

City of Thornton

RJH PROJECT 16116

WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT THORNTON, COLORADO

GENERAL NOTES, ABBREVIATIONS, AND LEGEND

DWG. NO. A-03

SHEET NO. 3 of 39

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SURVEY CONTROL POINTS (NOTE 6)

CONTROL POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
SCP-01	744503.71	166339.83	5056.05	NO. 5 REBAR WITH ALUM CAP
SCP-02	744495.78	165910.79	5057.57	NO. 5 REBAR WITH ALUM CAP
SCP-03	744795.40	166517.63	5054.80	NO. 5 REBAR WITH ALUM CAP
SCP-04	745618.34	165969.34	5054.00	NO. 5 REBAR WITH ALUM CAP
SCP-05	745608.54	166960.66	5047.17	NO. 5 REBAR WITH ALUM CAP
SCP-06	746665.59	168141.92	5050.00	NO. 5 REBAR WITH ALUM CAP
SCP-07	746420.42	167935.66	5051.07	NO. 5 REBAR WITH ALUM CAP
SCP-08	746722.07	167743.28	5050.00	NO. 5 REBAR WITH ALUM CAP
SCP-09	746891.92	167387.78	5049.61	NO. 5 REBAR WITH ALUM CAP
SCP-10	746577.18	164886.54	5057.96	NO. 5 REBAR WITH ALUM CAP
SCP-11	746487.98	164492.97	5059.87	NO. 5 REBAR WITH ALUM CAP
SCP-12	747245.02	164911.10	5060.38	NO. 5 REBAR WITH ALUM CAP
SCP-13	747837.96	164864.82	5070.17	NO. 5 REBAR WITH ALUM CAP

NW CORNER SEC 17 T25, R67W N: 748221.15 E: 162857.55

E 104TH AVE

1/4 CORNER SEC 17 T25, R67W N: 748228.14 E: 165496.40

851 LLC

SCP-13

WEST COOLEY NORTH CELL MAX NWL 5046.0

APPROX LIMITS OF 100-YEAR FLOODPLAIN (NOTE 1)

ADAMS COUNTY

CITY OF THORNTON

SPILLWAY

WEST COOLEY NORTH CELL TO CENTRAL CELL INTERCONNECT GATE VAULT

SLOPE PROTECTION

BORROW AREA 1 DWG A-06

SITE 4 (DWG E-01)

STAFF GAUGE

ACCESS ROAD

PROPERTY BOUNDARY

SCP-12

50' DRAINAGE EASEMENT

DONALD R. DEWITT REVOCABLE TRUST

FORD SEEP FLUME

OVERHEAD ELECTRICAL LINE

SCP-09

SCP-08

SCP-06

SCP-10

SCP-11

210' PUBLIC SERVICE OF COLORADO RIGHT-OF-WAY

WEST COOLEY CENTRAL CELL TO NORTH CELL INTERCONNECT GATE VAULT

SCP-07

ACCESS ROAD

BORROW AREA 2 DWG A-07

WEST COOLEY CENTRAL CELL MAX NWL 5048.0

SITE 3 (DWG D-01)

NOTE 2

APPROX LIMITS OF FLOODWAY (NOTE 1)

CONVEYOR

STABILIZED CONSTRUCTION ENTRANCE

PRIMARY SITE ENTRANCE

SITE 2 (DWG C-01)

LCC DISCHARGE STRUCTURE

ACCESS ROAD

CITY OF THORNTON

E 100TH AVE

SCP-04

SCP-05

FULTON DITCH

FULTON DITCH DIVERSION STRUCTURE

ACCESS ROAD IMPROVEMENTS DWG A-08

McKAY ROAD PUMP STATION

WEST COOLEY SOUTH CELL TO CENTRAL CELL INTERCONNECT GATE VAULT

WEST SPRAT PLATTE

ACCESS ROAD

WEST COOLEY SOUTH CELL MAX NWL 5051.0

PROPERTY BOUNDARY

MULTI-USE TRAIL

ADAMS COUNTY 20' TRAIL EASEMENT

WEST COOLEY SOUTH CELL TO WEST SPRAT INTERCONNECT GATE VAULT

OVERHEAD ELECTRICAL LINE

SITE 1 (DWG B-01)

CITY OF THORNTON

FULTON IRRIGATION DITCH COMPANY

FLOW

RIVER

ARVADA PUMP STATION

INLET STRUCTURE

STAFF GAUGE

SCP-03

WEST SPRAT PLATTE MAX NWL 5055.0

SCP-02

SCP-01

PLATTE

APPROX ALLUVIAL WELLS RAW WATER SYSTEM

ALTERNATE SITE ENTRANCE (NOTE 3)

SOUTH ADAMS COUNTY WATER AND SANITATION DISTRICT

SOUTH

ADAMS COUNTY TRAIL AND FULTON DITCH COMPANY ACCESS EASEMENT

N

0 150 300 600 900

SCALE IN FEET

NOTES:

1. APPROXIMATE LIMITS OF FLOODWAY AND 100-YEAR FLOODPLAIN FROM "FLOOD HAZARD AREA DELINEATION: SOUTH PLATTE RIVER, ADAMS COUNTY" (UDFCD, 2005).
2. PROTECT AND PRESERVE EXISTING ASPHALT PATCH AND REPLACE IF DAMAGED DURING CONSTRUCTION.
3. UTILIZE ALTERNATIVE SITE ENTRANCE IF ACCESS TO THE PRIMARY SITE ENTRANCE IS RESTRICTED BECAUSE OF CONSTRUCTION ACTIVITIES AT WEST SPRAT PLATTE.
4. BASIS OF BEARINGS IS THE NORTH LINE OF THE NORTHWEST QUARTER OF SECTION 17 AS MONUMENTED WITH A 3.25" ALUMINUM CAP IN RANGE BOX PLS 23516 AT THE WEST END AND A 3.25" ALUMINUM CAP IN RANGE BOX PLS 23516 AT THE EAST END BEARING S89°50'54"W A DISTANCE OF 2638.89'.
5. VERTICAL AND HORIZONTAL DATUM:
   A. VERTICAL DATUM IS 1988 NAVD.
   B. HORIZONTAL DATUM IS BASED ON JOHN E. CHANCE (ADAMS COUNTY) SURVEY, 1996. THIS COORDINATE SYSTEM IS A MODIFIED PROJECT SYSTEM BASED ON COLORADO STATE PLANE CENTRAL ZONE (NAD83/92) MODIFIED TO GROUND BY A COMBINED FACTOR OF 1/0.99979199, AND NORTHING VALUES TRUNCATED BY 1,000,000 AND EASTING VALUES BY 3,000,000.
6. SURVEY CONTROL POINTS SET BY HCL ENGINEERING AND SURVEYING. ALUMINUM CAPS ARE 2-INCH DIAMETER AND ARE STAMPED, "CONTROL POINT CP" FOLLOWED BY THE CONTROL POINT NUMBER.

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	DATE	ISSUE/REVISION	DES	DRN	CHK	APP
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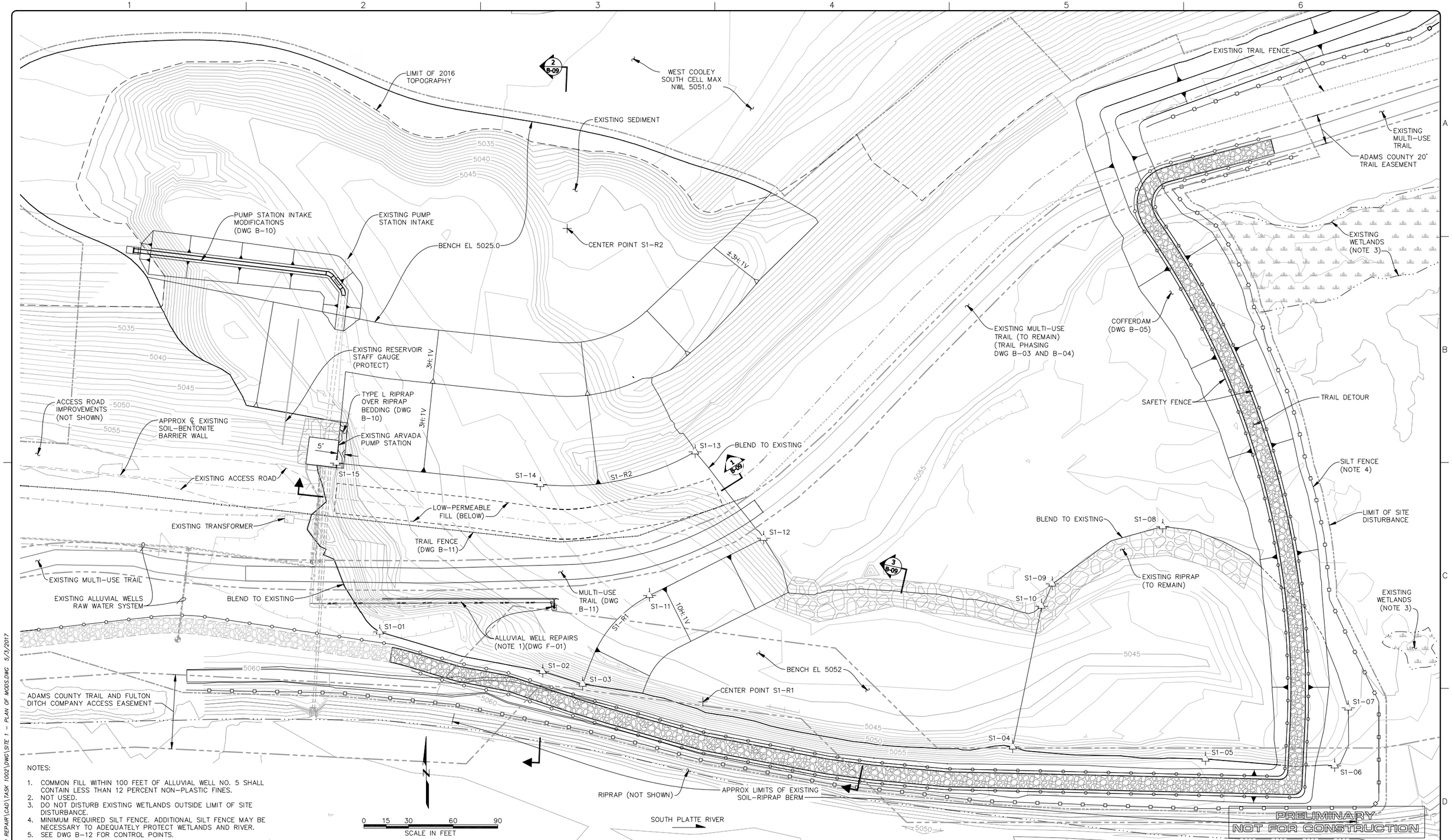
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT THORNTON, COLORADO

GENERAL PLAN OF EXISTING CONDITIONS AND SURVEY CONTROL

DWG. NO. A-05

SHEET NO. 5 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 100Z\DWG\GENERAL PLAN OF EXISTING CONDITIONS AND SURVEY CONTROL.DWG
5/5/2017



NOTES:

1. COMMON FILL WITHIN 100 FEET OF ALLUVIAL WELL NO. 5 SHALL CONTAIN LESS THAN 12 PERCENT NON-PLASTIC FINES.
2. NOT USED.
3. DO NOT DISTURB EXISTING WETLANDS OUTSIDE LIMIT OF SITE DISTURBANCE.
4. MINIMUM REQUIRED SILT FENCE. ADDITIONAL SILT FENCE MAY BE NECESSARY TO ADEQUATELY PROTECT WETLANDS AND RIVER.
5. SEE DWG B-12 FOR CONTROL POINTS.

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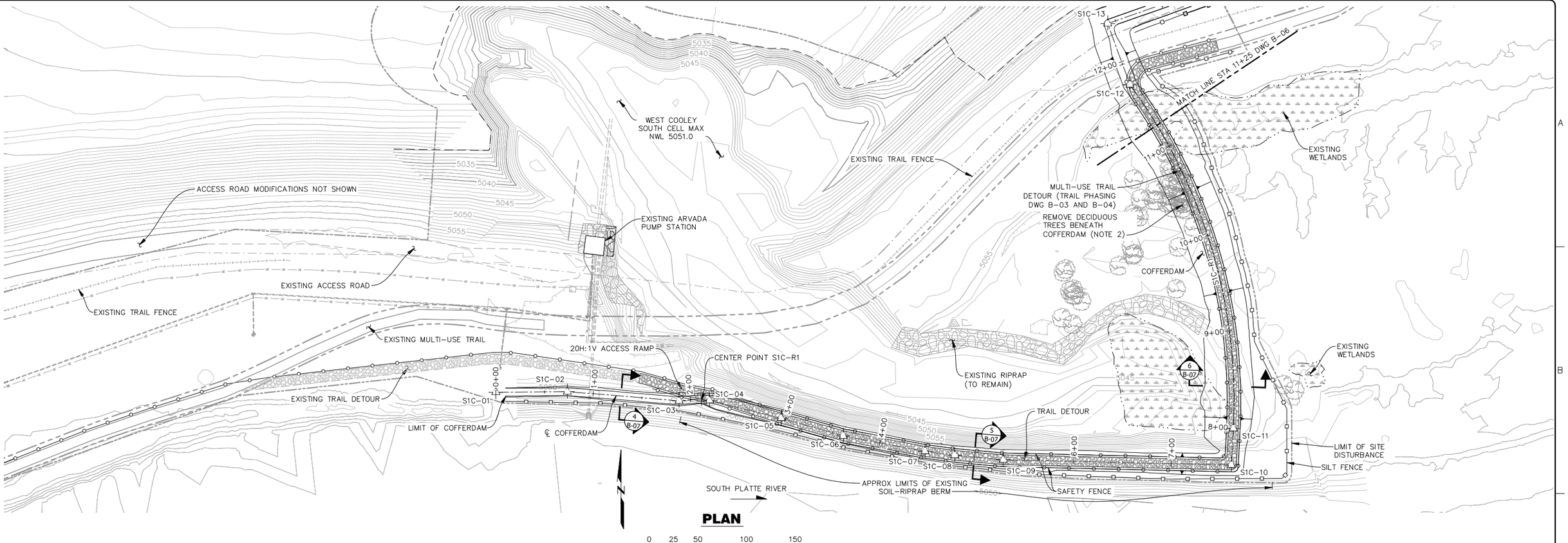
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT THORNTON, COLORADO

SITE 1 - PLAN OF MODIFICATIONS

DWG. NO. B-02

SHEET NO. 10 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 1 - PLAN OF MODS.DWG 5/3/2017



NOTES:

1. TRANSITION CREST WIDTH AND SIDE SLOPES BETWEEN STATION 2+10 AND 2+20.
2. DO NOT DISTURB TREES OUTSIDE LIMIT OF COFFERDAM.

PRELIMINARY
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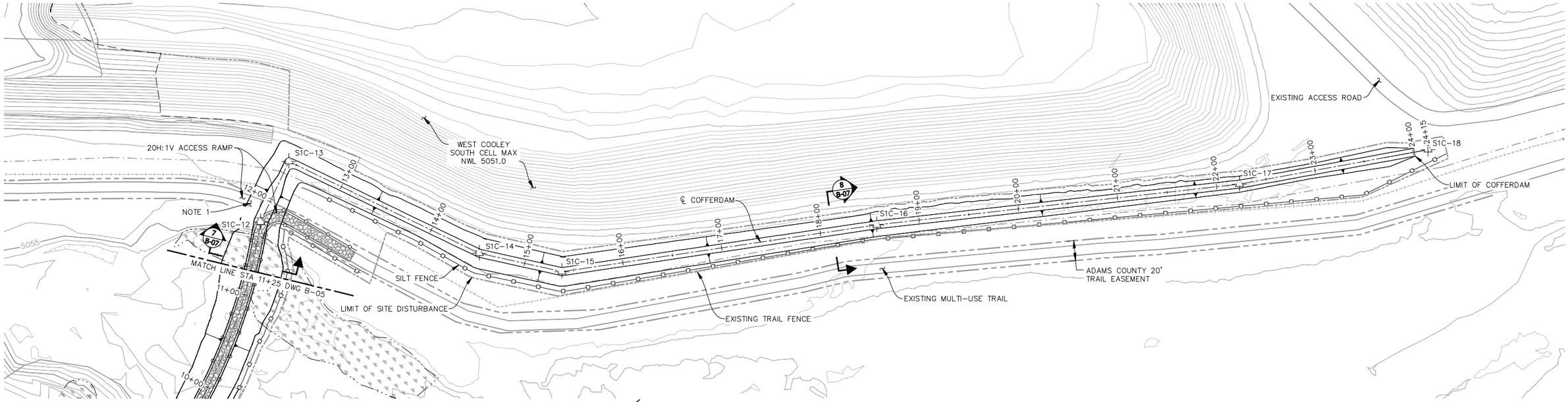
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT THORNTON, COLORADO

SITE 1 - COFFERDAM PLAN AND PROFILE (SHEET 1 OF 2)

DWG. NO. B-05

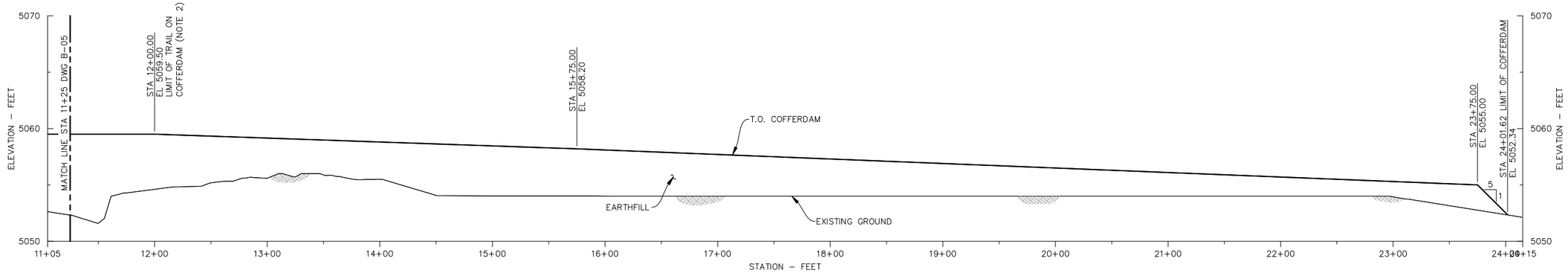
SHEET NO. 13 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 1 - COFFERDAM PLAN AND PROFILE.DWG 5/3/2017



PLAN

0 25 50 100 150
SCALE IN FEET



PROFILE

0 25 50 100 150
SCALE IN FEET
(HORIZONTAL)

0 2.5 5 10 15
SCALE IN FEET
(VERTICAL)

NOTES:

1. SAWCUT, DEMOLISH, AND DISPOSE OF EXISTING MULTI-USE TRAIL AND FENCE BELOW COFFERDAM.
2. TRANSITION CREST WIDTH BETWEEN STATION 12+10 AND 12+20.

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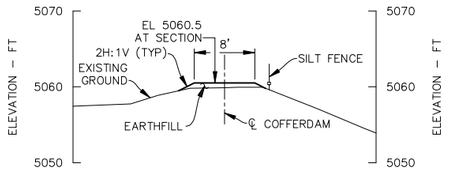
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT
THORNTON, COLORADO

SITE 1 - COFFERDAM PLAN AND PROFILE (SHEET 2 OF 2)

DWG. NO. B-06

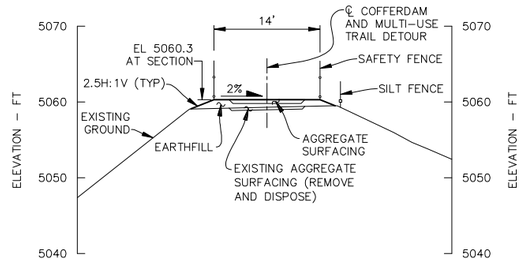
SHEET NO. 14 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 1 - COFFERDAM PLAN AND PROFILE.DWG 5/3/2017



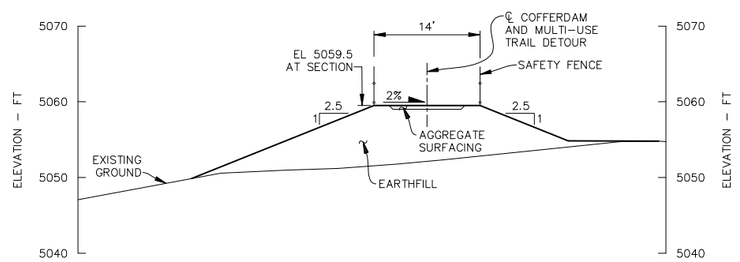
SECTION 4 B-05

0 5 10 20 30
SCALE IN FEET



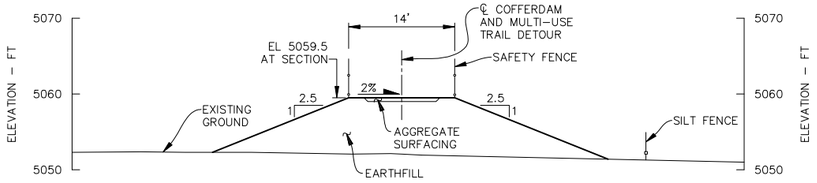
SECTION 5 B-05

0 5 10 20 30
SCALE IN FEET



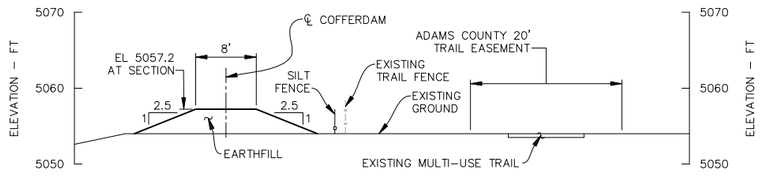
SECTION 6 B-05

0 5 10 20 30
SCALE IN FEET



SECTION 7 B-06

0 5 10 20 30
SCALE IN FEET



SECTION 8 B-06

0 5 10 20 30
SCALE IN FEET

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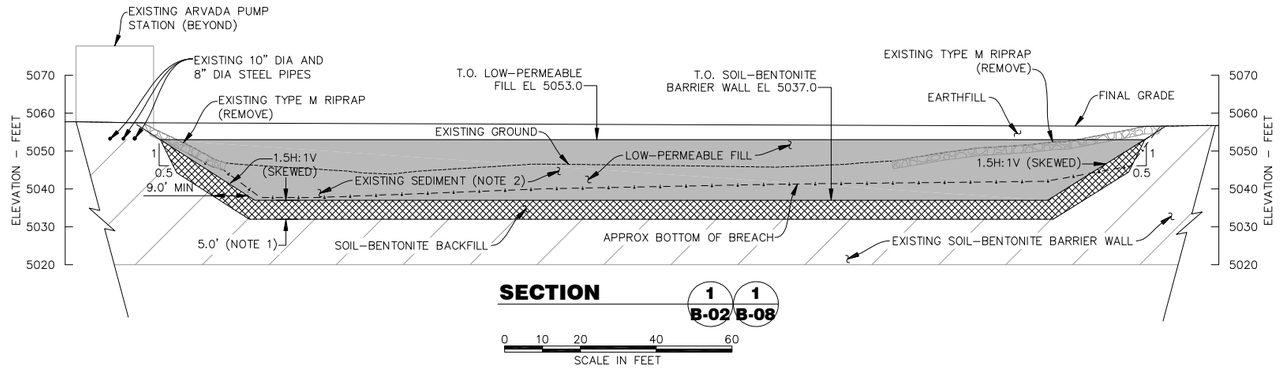
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT
THORNTON, COLORADO

SITE 1 - COFFERDAM SECTIONS

DWG. NO. B-07

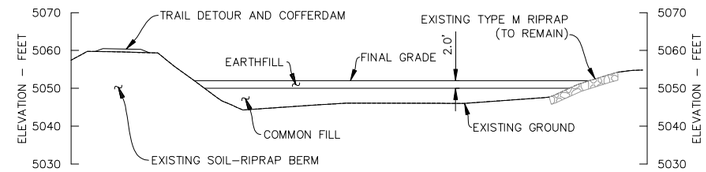
SHEET NO. 15 of 39

P:\16116 – W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 1 – COFFERDAM PLAN AND PROFILE.DWG 5/3/2017



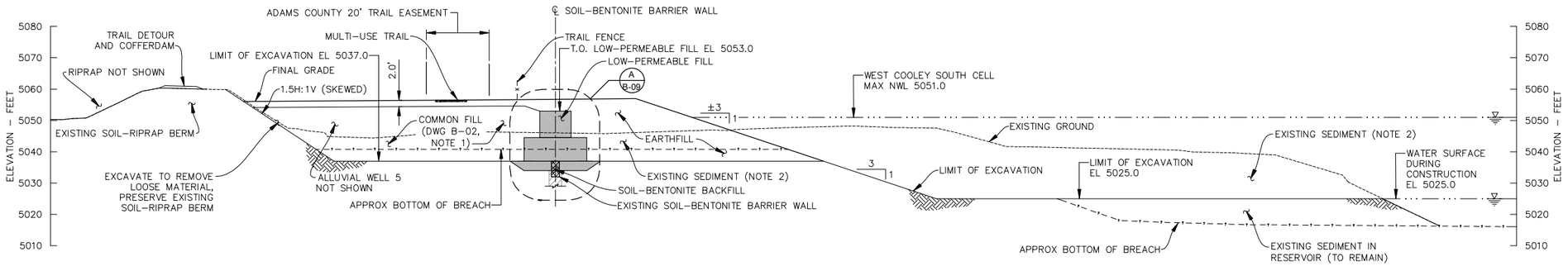
SECTION 1 B-02 / 1 B-08

0 10 20 40 60
SCALE IN FEET



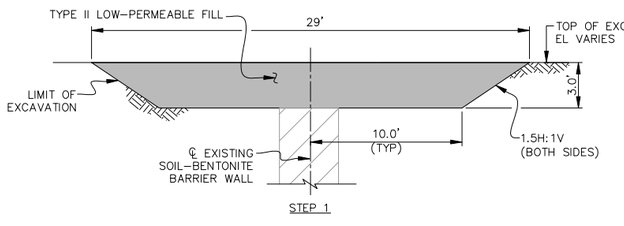
SECTION 3 B-02

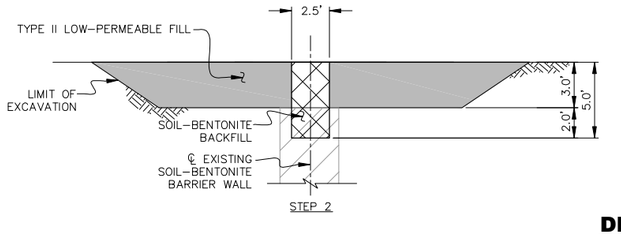
0 10 20 40 60
SCALE IN FEET

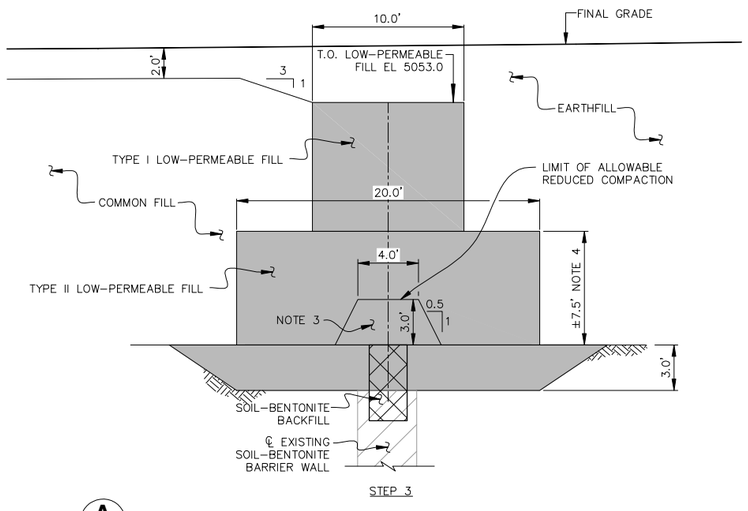


SECTION 2 B-02 / 2 B-08

0 10 20 40 60
SCALE IN FEET







DETAIL A B-09

0 2.5 5 10 15
SCALE IN FEET

SOIL-BENTONITE BARRIER WALL REPAIR INSTALLATION SEQUENCE:

1. EXCAVATE SEDIMENT AS SHOWN ON THE SITE 1 EXCAVATION PLAN. PLACE LOW-PERMEABLE FILL AS SHOWN.
2. EXCAVATE THROUGH LOW-PERMEABLE FILL AND INTO EXISTING SOIL-BENTONITE BARRIER WALL. EXCAVATION MUST OVERLAP EXISTING BARRIER WALL BY MINIMUM OF 2 FEET. BACKFILL TRENCH WITH SOIL-BENTONITE BACKFILL.
3. PLACE LOW-PERMEABILITY FILL TO ELEVATION 5053.0.

NOTES:

1. EXCAVATE TOP 5.0 FEET OF EXISTING SOIL-BENTONITE BARRIER WALL.
2. SEDIMENT DEPOSITED DURING FLOOD EVENT. CONCRETE AND MISCELLANEOUS DEBRIS COULD BE LOCATED WITHIN SEDIMENT. EXCAVATE AND STOCKPILE SEDIMENT FOR USE AS COMMON FILL AND DISPOSE OF CONCRETE AND MISCELLANEOUS DEBRIS. LIMITS OF EXISTING SEDIMENT MAY VARY FROM THOSE SHOWN.
3. COMPACT LOW-PERMEABLE FILL DIRECTLY ABOVE AND ALONG SOIL-BENTONITE BARRIER WALL NOT LESS THAN 92-PERCENT RELATIVE COMPACTION.
4. UTILIZE ALL ACCEPTABLE TYPE II LOW-PERMEABLE FILL BEFORE PLACING TYPE I LOW-PERMEABLE FILL.

PRELIMINARY
NOT FOR CONSTRUCTION

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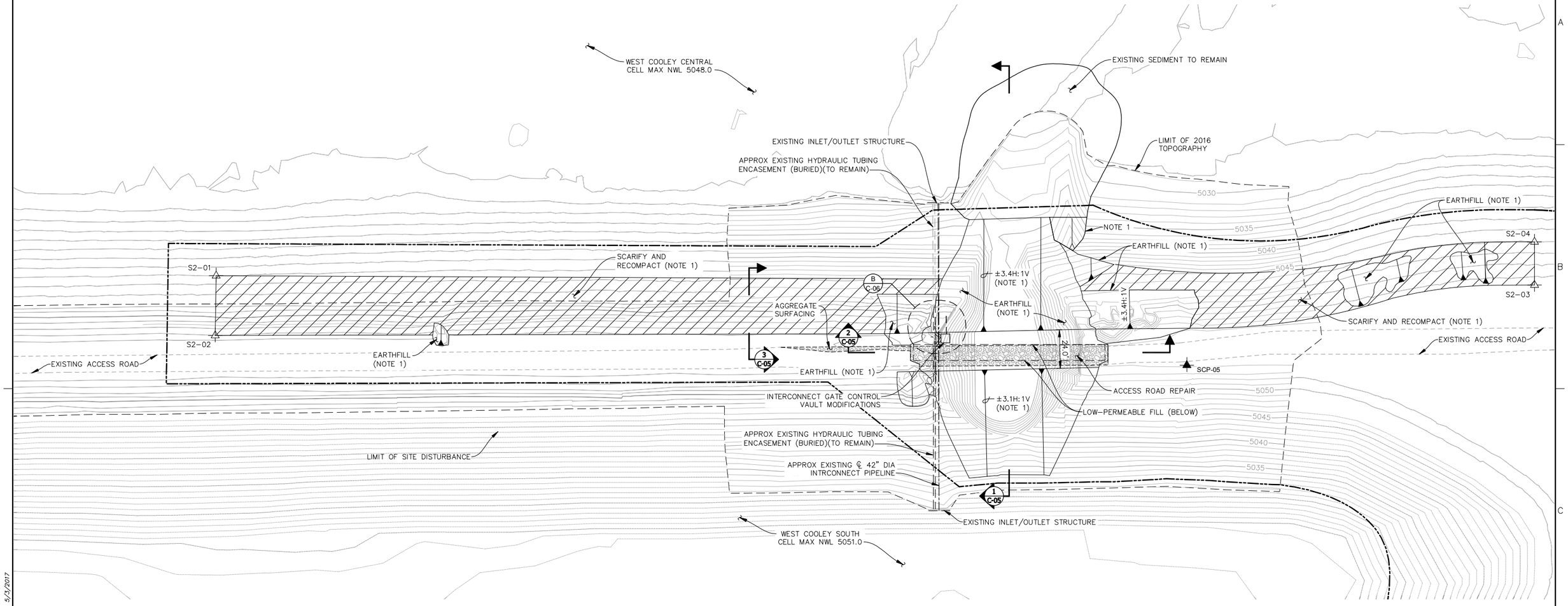
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT THORNTON, COLORADO

SITE 1 - REPAIR SECTIONS

DWG. NO. B-09

SHEET NO. 17 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 1 - PLAN OF MODS.DWG 5/3/2017



N

0 15 30 60 90
SCALE IN FEET

SLOPE REPAIR CONTROL POINTS		
CONTROL POINT	NORTHING	EASTING
S2-01	745664.20	166356.58
S2-02	745626.99	166356.00
S2-03	745658.43	167177.01
S2-04	745685.25	167176.97

NOTES:

1. MATCH ADJACENT SLOPE.
2. CONTROL POINTS FOR REPAIR EXCAVATION PROVIDED ON DWG C-03.

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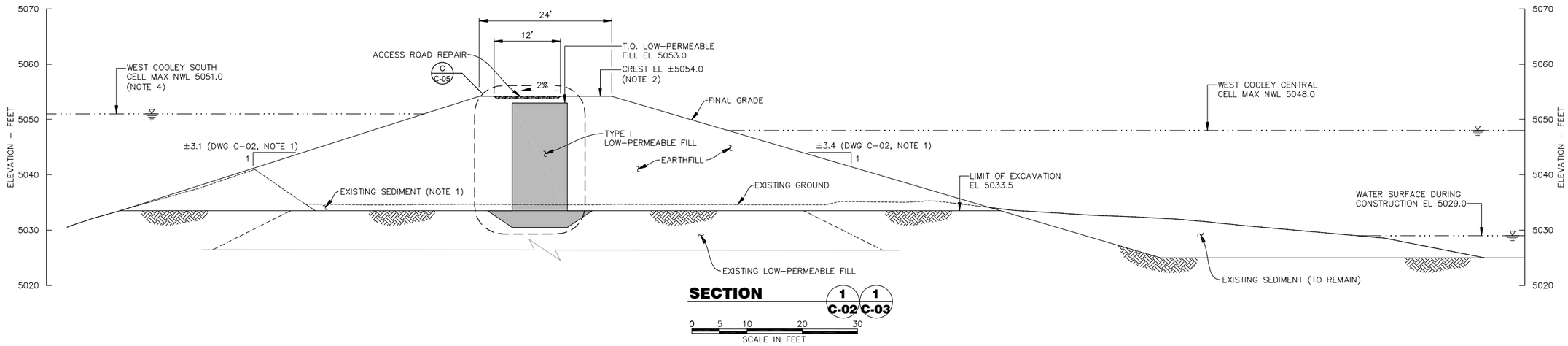
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT
THORNTON, COLORADO

SITE 2 - GENERAL PLAN OF MODIFICATIONS

DWG. NO. C-02

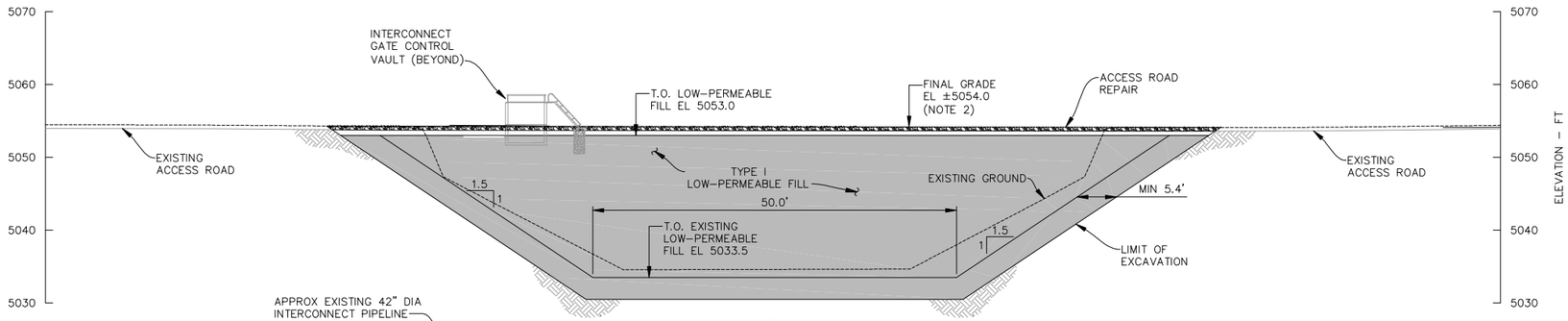
SHEET NO. 22 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 2 - PLAN OF MODS.DWG 5/3/2017



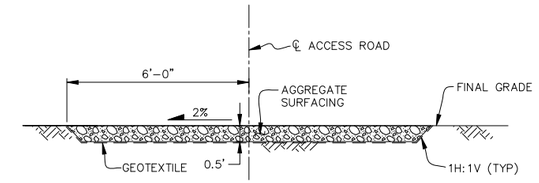
SECTION 1 C-02 / 1 C-03

0 5 10 20 30
SCALE IN FEET



SECTION 2 C-02 / 2 C-03

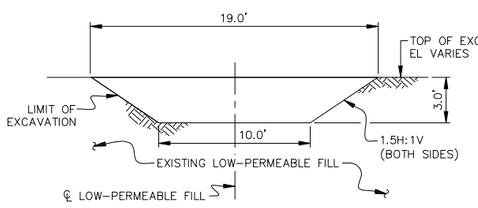
0 5 10 20 30
SCALE IN FEET



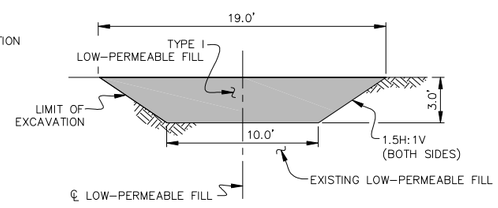
TYP DETAIL
ACCESS ROAD
NOT TO SCALE

LOW-PERMEABLE FILL INSTALLATION SEQUENCE:

1. EXCAVATE AS SHOWN ON DRAWINGS. EXCAVATE ADDITIONAL 3 FEET DEEP TO THE DIMENSIONS PROVIDED.
2. PLACE TYPE I LOW-PERMEABILITY FILL AS SHOWN IN STEP 2.
3. PLACE TYPE I LOW-PERMEABILITY FILL TO ELEVATION 5053.0 AND ADJACENT EARTHFILL AS SHOWN IN STEP 3.



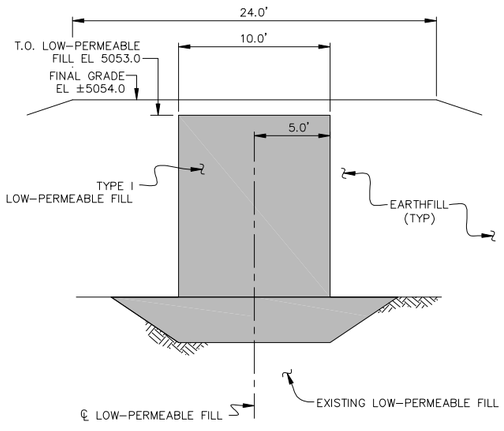
STEP 1



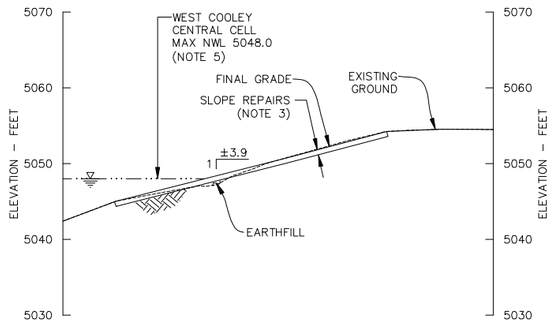
STEP 2

DETAIL C C-05

0 2.5 5 10 15
SCALE IN FEET



STEP 3



SECTION 3 C-02

0 5 10 20 30
SCALE IN FEET

NOTES:

1. LIMITS OF SEDIMENT MAY VARY FROM THOSE SHOWN.
2. MATCH ADJACENT SLOPE AT BOTH ENDS OF EXCAVATION.
3. REMOVE EXISTING VEGETATION AND DEBRIS. SCARIFY, GRADE, AND RE-COMPACT TOP 8 INCHES.
4. CONSTRUCTION WATER LEVEL IS EL. 5025.0.
5. CONSTRUCTION WATER LEVEL IS EL 5029.0.

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WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT
THORNTON, COLORADO

SITE 2 - REPAIR SECTIONS

DWG. NO. C-05

SHEET NO. 25 of 39

P:\16116 - W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 2 - PLAN OF MODS.DWG 5/3/2017

CONTROL POINTS			
CONTROL POINT	DESCRIPTION	NORTHING	EASTING
S3–01	TOP OF FILL	746471.52	167847.66
S3–02	TOP OF FILL	746567.35	167888.65

WEST COOLEY CENTRAL CELL
MAX NWL 5048.0

SCP–08

PUBLIC SERVICE COMPANY OF COLORADO ROW

OVERHEAD ELECTRICAL LINE

LIMIT OF 2016 TOPOGRAPHY

2 D-04

NOTE 3

±3.3H:1V

S3–01

S3–02

STAGING AND STOCKPILE LIMITS

EXISTING SOIL–RIPRAP STOCKPILE (REMOVE AND DISPOSE)

EXISTING ACCESS ROAD

1 D-04

ACCESS ROAD

APPROX ℄ EXISTING SOIL–BENTONITE BARRIER WALL

LOW–PERMEABLE FILL (BELOW)

EXISTING ACCESS ROAD

STAGING AND STOCKPILE LIMITS

SILT FENCE (NOTE 2)

SCP–07

NOTE 3

EL ±5050.0

APPROX LIMITS OF EXISTING SOIL–RIRAP BERM

EXISTING TRAIL FENCE

EXISTING TRAIL FENCE

EXISTING CONVEYOR GUY WIRES

SILT FENCE (NOTE 2)

EXISTING WETLANDS (NOTE 1)

EXISTING DETOUR SAFETY FENCE (NOTE 4)

EXISTING MULTI–USE TRAIL DETOUR (NOTE 4)

EXISTING MULTI–USE TRAIL

LIMIT OF SITE DISTURBANCE

EXISTING RETAINING WALL

EXISTING MULTI–USE TRAIL

SCP–06

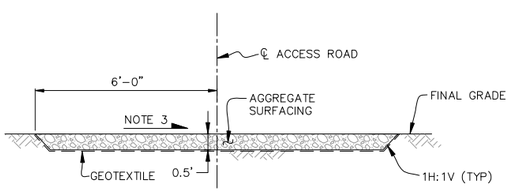
EXISTING WETLANDS (NOTE 1)

EXISTING WETLANDS (NOTE 1)

EXISTING CONVEYOR

℄ EXISTING SINCLAIR PIPELINE (APPROX)

SOUTH PLATTE RIVER FLOW



TYPICAL SECTION

NOT TO SCALE

NOTES:

1. DO NOT DISTURB EXISTING WETLANDS.
2. MINIMUM REQUIRED SILT FENCE. ADDITIONAL SILT FENCE MAY BE NECESSARY TO ADEQUATELY PROTECT WETLANDS AND RIVER.
3. BLEND TO EXISTING GROUND SURFACE.
4. MAINTAIN DETOUR THROUGHOUT CONSTRUCTION.

0 15 30 60 90
SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION

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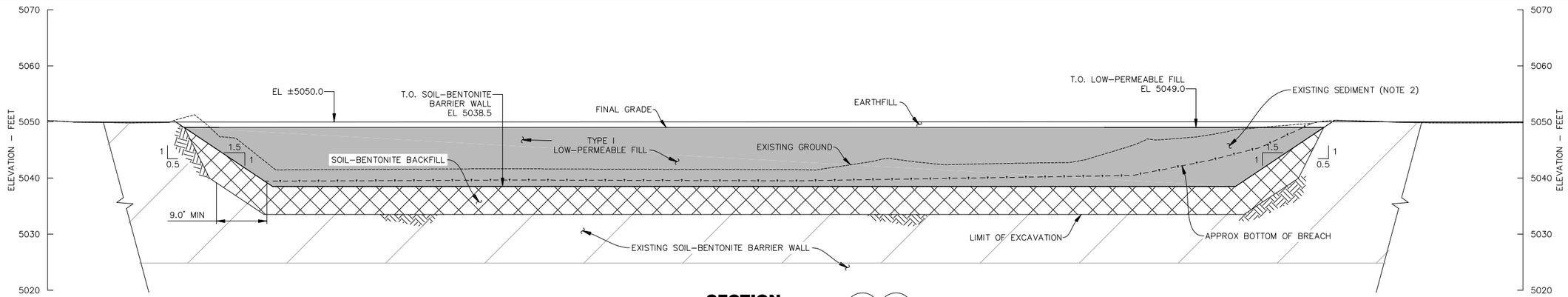
WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT
THORNTON, COLORADO

SITE 3 - PLAN OF MODIFICATIONS

DWG. NO. D-02

SHEET NO. 28 of 39

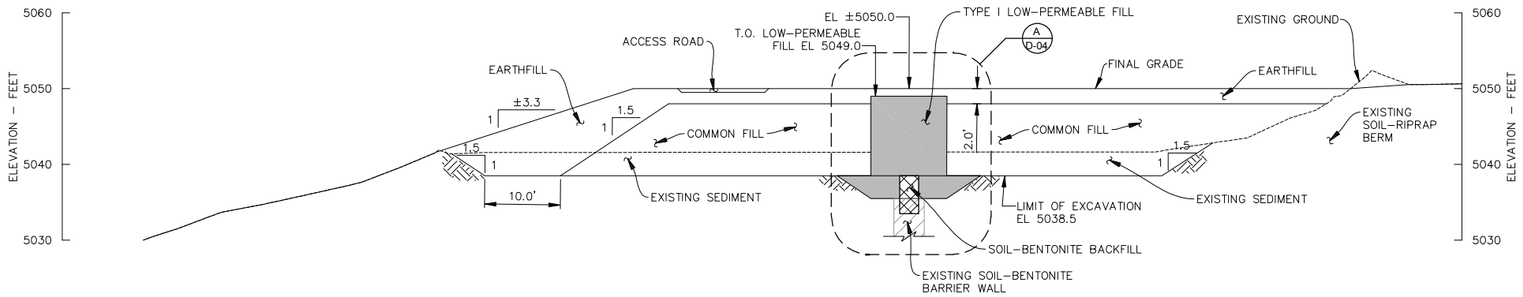
P:\16116 – W COOLEY FLOOD REPAIR\CAD\TASK 1002\DWG\SITE 3 – PLAN OF MODIFICATIONS.DWG 5/3/2017



SECTION 1 D-02 / 1 D-03

0 5 10 20 30

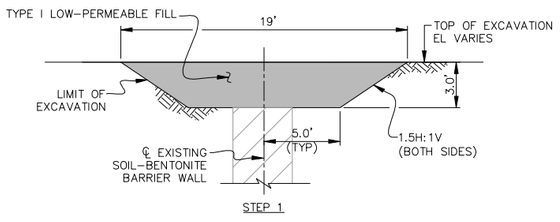
SCALE IN FEET



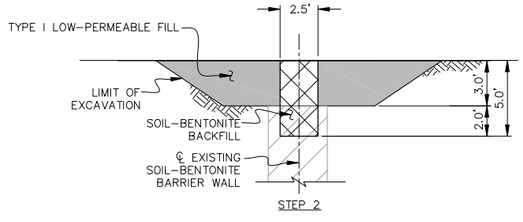
SECTION 2 D-02 / 2 D-03

0 5 10 20 30

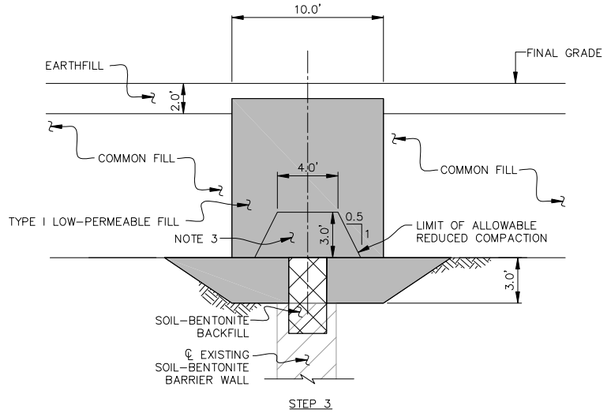
SCALE IN FEET



STEP 1



STEP 2



STEP 3

DETAIL A D-04

0 2.5 5 10 15

SCALE IN FEET

SOIL-BENTONITE BARRIER WALL REPAIR INSTALLATION SEQUENCE:

1. EXCAVATE SEDIMENT AS SHOWN ON THE SITE 3 EXCAVATION PLAN. PLACE TYPE I LOW-PERMEABLE FILL AS SHOWN.
2. EXCAVATE THROUGH TYPE I LOW-PERMEABLE FILL AND INTO EXISTING SOIL-BENTONITE BARRIER WALL. EXCAVATION MUST OVERLAP EXISTING BARRIER WALL BY MINIMUM OF 2 FEET. BACKFILL TRENCH WITH SOIL-BENTONITE BACKFILL.
3. PLACE TYPE I LOW-PERMEABILITY FILL TO ELEVATIONS SHOWN.

NOTES:

1. NOT USED.
2. SEDIMENT DEPOSITED DURING FLOOD EVENT. CONCRETE AND MISCELLANEOUS DEBRIS COULD BE LOCATED WITHIN SEDIMENT. EXCAVATE AND STOCKPILE SEDIMENT FOR USE AS COMMON FILL AND DISPOSE OF CONCRETE AND MISCELLANEOUS DEBRIS. LIMITS OF EXISTING SEDIMENT MAY VARY FROM THOSE SHOWN.
3. COMPACT TYPE I LOW-PERMEABLE FILL DIRECTLY ABOVE AND ALONG SOIL-BENTONITE BARRIER WALL NOT LESS THAN 92-PERCENT RELATIVE COMPACTION.

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SITE 3 - REPAIR SECTIONS

DWG. NO. D-04

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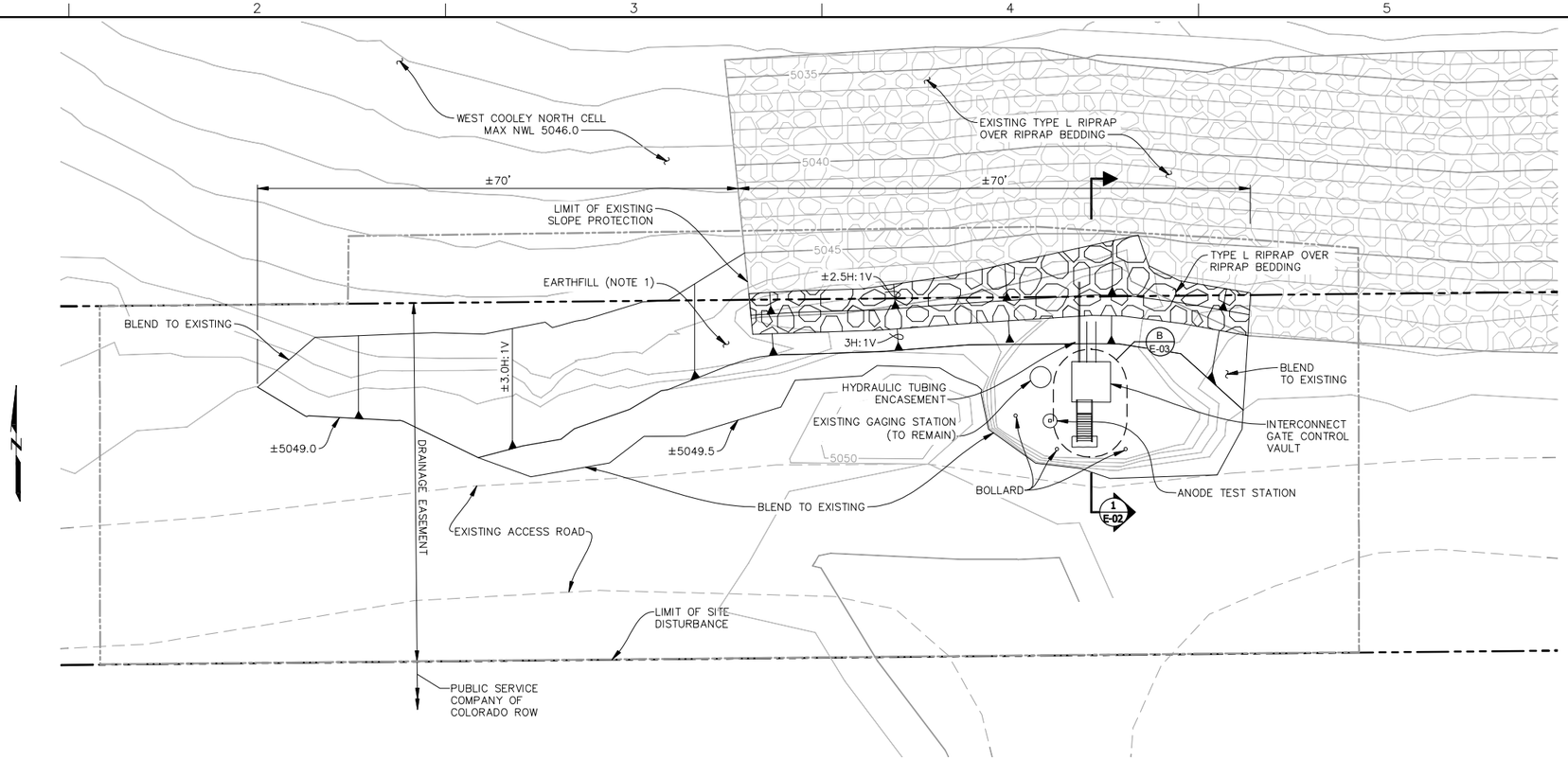
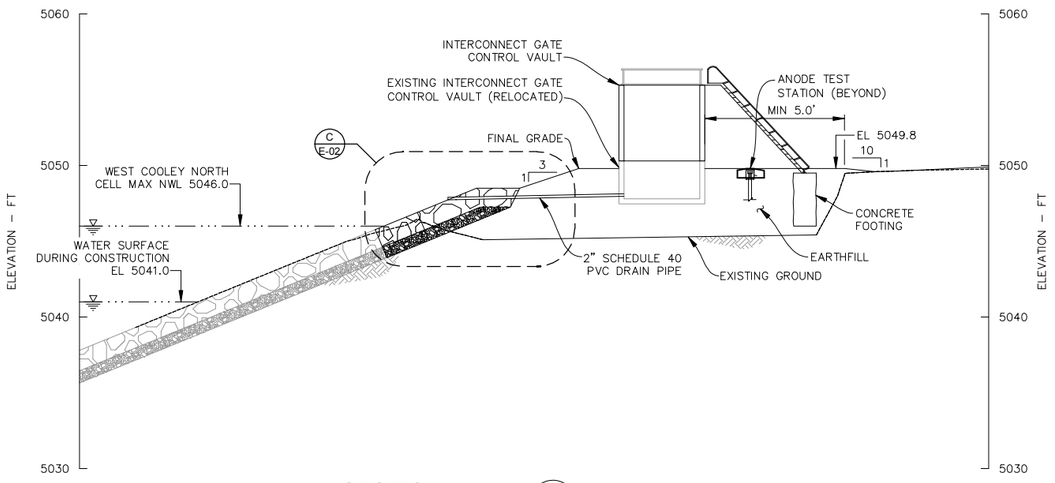
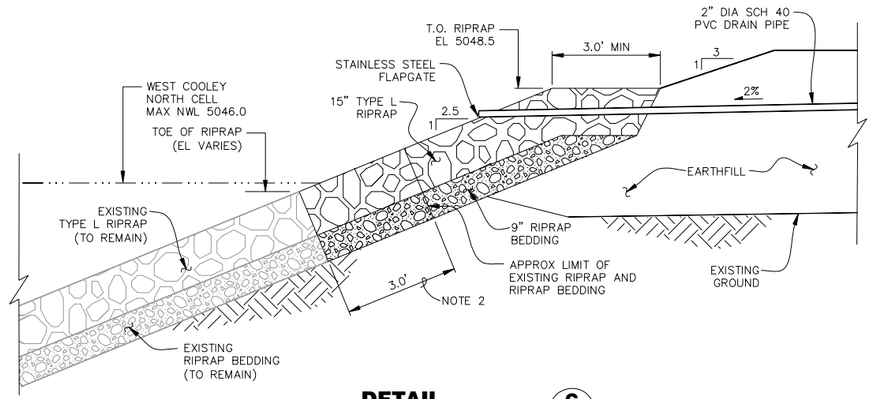


PLAN 0 5 10 20 30 SCALE IN FEET



SECTION 1 / E-02 0 2.5 5 10 15 SCALE IN FEET



DETAIL C / E-02 0 1 2 4 6 SCALE IN FEET

NOTES:

1. PLACE EARTHFILL TO MATCH ADJACENT SLOPE.
2. REMOVE TOP 3 FEET OF EXISTING RIPRAP AND RIPRAP BEDDING.

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WEST COOLEY RESERVOIR - 2015 FLOOD REPAIRS PROJECT
THORNTON, COLORADO

SITE 4 - MODIFICATIONS
PLAN AND SECTIONS

DWG. NO. E-02

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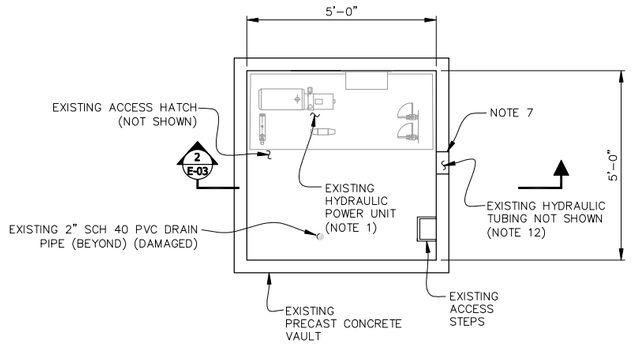
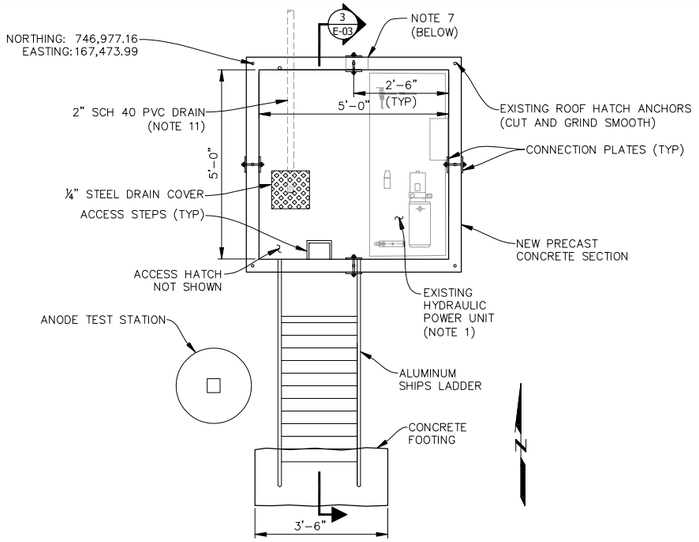


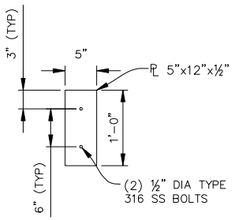
DETAIL A
EXISTING VAULT E-01

0 1 2 4
SCALE IN FEET



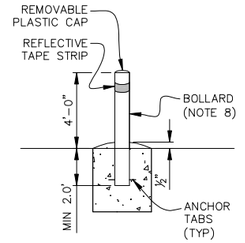
DETAIL B
MODIFIED VAULT E-02

0 1 2 4
SCALE IN FEET

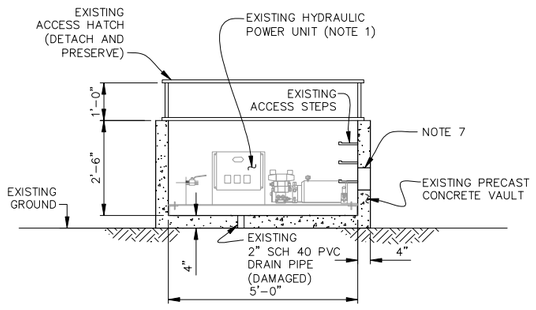


TYP DETAIL
CONNECTION PLATE

0 1 2
SCALE IN FEET

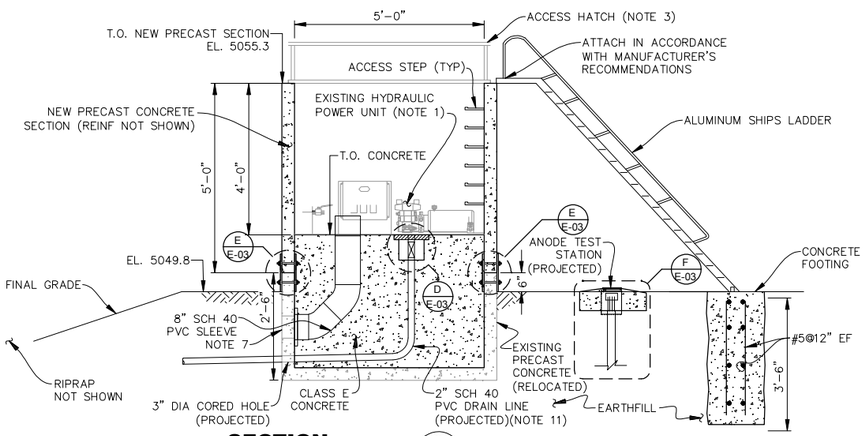


TYP DETAIL
BOLLARD
NOT TO SCALE



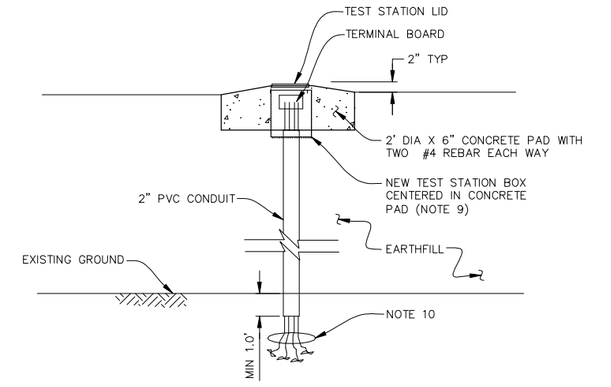
SECTION 2
EXISTING VAULT E-03

0 1 2 4
SCALE IN FEET

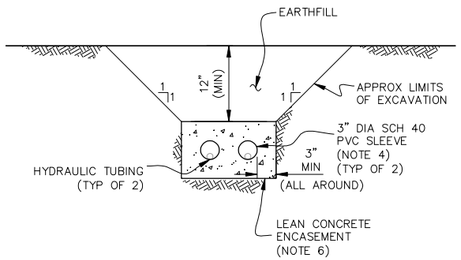


SECTION 3
MODIFIED VAULT E-03

0 1 2 4
SCALE IN FEET

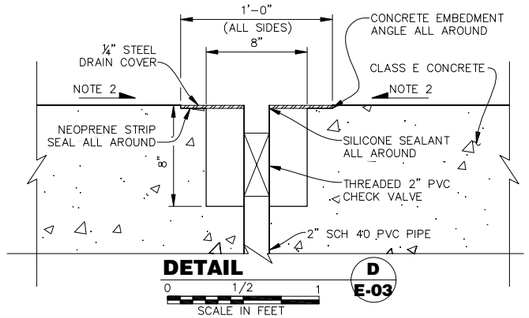


DETAIL F
ANODE TEST STATION E-03
NOT TO SCALE



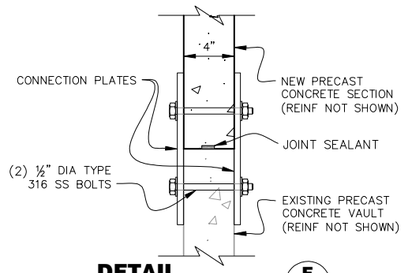
TYPICAL SECTION

0 .5 1 2 3
SCALE IN FEET



DETAIL D
E-03

0 1/2 1
SCALE IN FEET



DETAIL E
E-03

0 1/2 1
SCALE IN FEET

NOTES:

1. PRESERVE AND REINSTALL EXISTING HYDRAULIC POWER UNIT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
2. SLOPE CONCRETE AT 1–PERCENT SLOPE TOWARDS DRAIN PIPE.
3. REINSTALL EXISTING ACCESS HATCH.
4. INSTALL PVC PIPE AROUND EXISTING HYDRAULIC TUBING. DO NOT DETACH HYDRAULIC TUBING. CUT PVC PIPE LONGITUDINALLY TO ACCOMMODATE ENCASEMENT OF HYDRAULIC TUBING. INSTALL AND TIGHTEN STAINLESS STEEL BAND CLAMPS AROUND PVC CONDUITS PRIOR TO ENCASEMENT AT MINIMUM 10 FOOT SPACING.
5. NOT USED.
6. EXTEND CONCRETE ENCASEMENT TO EXISTING GATE CONTROL VAULT.
7. EXISTING 6 INCH TO 7 INCH DIA BLOCKOUT FOR HYDRAULIC LINES. ANNULAR SPACE FILLED WITH GROUT.
8. 5½ INCH DIAMETER CONCRETE FILLED BEACON TRAFFIC BOLLARD, TYPE BBOLPP–48–5.5. SET BOLLARD IN CONCRETE PER MANUFACTURERS SPECIFICATIONS. MINIMUM DEPTH 3.0 FEET. POWDER COATED SAFETY YELLOW FINISH.
9. A MINIMUM OF 2 FEET OF SLACKWIRE SHALL BE PROVIDED FOR ALL WIRES INSIDE THE TEST STATION BOX. THE 2" PVC CONDUIT SHALL EXTEND APPROXIMATELY 3 INCHES INTO THE BOTTOM OF THE TEST STATION BOX.
10. LOCATE EXISTING WIRES. CUT WIRES BACK TO REMOVE FRAYED ENDS. SPLICE NEW WIRES ON TO EXISTING WIRES WITH WATERPROOF SPLICE. LOCATE THE SPLICES WITHIN THE PVC CONDUIT.
11. SLOPE AT 2 PERCENT TO DAYLIGHT IN RESERVOIR WITH 2 INCH STAINLESS STEEL FLAP GATE.
12. FIELD VERIFY LOCATION OF EXISTING HYDRAULIC TUBING.

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SITE 4 - INTERCONNECT GATE CONTROL VAULT MODIFICATIONS

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