

MILE HIGH FLOOD DISTRICT
CITY OF LOUISVILLE, COLORADO

NOT FOR CONSTRUCTION

PLANS REFLECT IMPROVEMENTS FOR CLOMR MODELING
ONLY AND ARE NOT OF SUFFICIENT DETAIL TO BE USED FOR
CONSTRUCTION

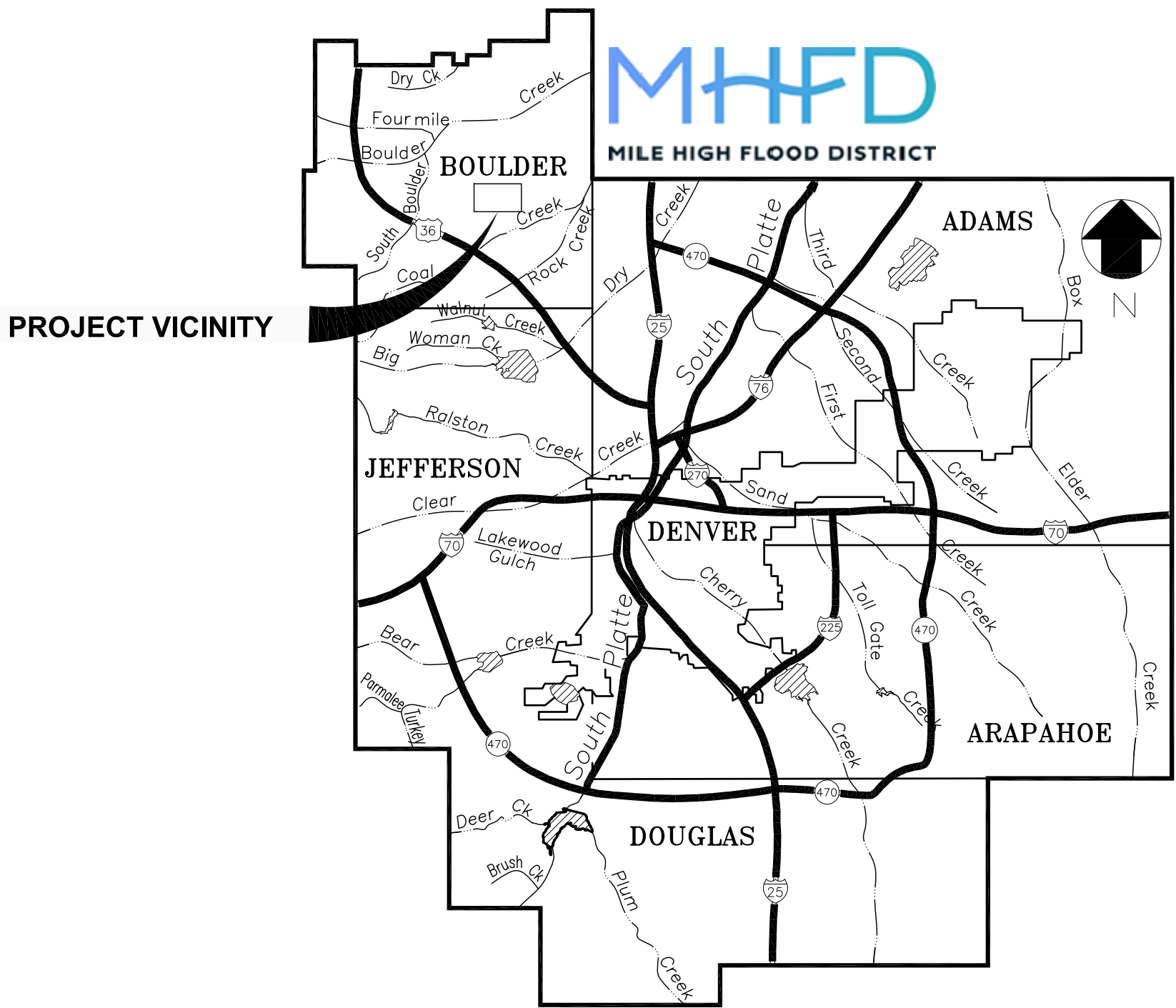
90% DRAWINGS
MARCH 2022

DRAINAGEWAY A-1 CULVERT REPLACEMENT
LOUISVILLE, COLORADO

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ATTACHED SUBSURFACE UTILITY ENGINEERING PLANS (BY UMSI)



MHFD VICINITY MAP
NOT TO SCALE

MHFD PROJECT NO. 107315
MHFD AGREEMENT NO. 20-07.29B

PREPARED BY:

ENGUITY ENGINEERING SOLUTIONS
10106 WEST SAN JUAN WAY, SUITE 215
LITTLETON, COLORADO 80127



SITE MAP
NOT TO SCALE

APPROVALS



Ken MacKenzie, P.E.
Executive Director

Date

Kurt Bauer, P.E., CFM Project Manager
Watershed Manager

Date



Cameron Fowlkes, P.E., CFM
Assistant City Engineer
City of Louisville - Department of Public Works

Date



Jeffrey Sickles, P.E.
Principal-in-Charge

Date

Craig Baxter, P.E.
Project Engineer

Date

CONSTRUCTION NOTES

1. All materials and construction shall be in conformance with the latest edition of the Mile High Flood District (MHFD) Specifications and Criteria, unless otherwise specified on the drawings.
2. All materials and workmanship shall be subject to inspection by the Mile High Flood District (MHFD) and the City of Louisville.
3. A preconstruction meeting shall be scheduled a minimum of 48 hours and a maximum of 96 hours prior to the start of construction.
4. MHFD and/or City of Louisville shall be contacted a minimum of 24 hours prior to a necessary inspection.
5. Location of existing utilities shall be verified by the contractor prior to actual construction. For information contact: 811 or www.Call811.com or 1-800-922-1987. The Contractor shall field verify size and horizontal and vertical locations of existing facilities prior to construction, and notify the engineer of any discrepancies. All utilities shall be protected by the contractor in place.
6. The contractor is responsible for coordination of utility relocation by utility companies. The contractor shall be responsible for protecting utilities during construction and shall hold City of Louisville harmless for damages arising from the contractor's failure to adequately protect existing utilities.
7. The Contractor shall have one (1) signed copy of the constuction plans, approved by MHFD, one (1) signed copy of the GESC plans, approved by City of Louisville, and one (1) copy of MHFD specifications, at the job site at all times.
8. Existing facilities not indicated to be removed shall be protected in place or removed and replaced in kind, as approved by the engineer.
9. All trenches shall be adequately supported and the safety of workers provided for as required by the most recent Occupational Safety and Health Administration (OSHA) "Safety and Health Regulations for Construction".
10. Compaction of all trenches must be attained and compaction test results submitted to MHFD in preliminary form prior to paving and in final form prior to probationary acceptance.
11. The work will take place in and around a stream, subject to periodic flooding. The Contractor shall be responsible for the control of surface and subsurface water during the course of the work. Any damage to the work resulting from surface flows, base flows or flood flows including buoyancy forces on pipelines and other facilities shall be corrected by the Contractor at the Contractor's sole cost.
12. Contractor shall protect existing trees and shrubs as shown on the plans. All trees and shrubs to be removed are specifically shown on the plans and shall be staked by the contractor and approved by the engineer prior to construction. All trees and shrubs removed shall be hauled off-site.
13. Topsoil shall be stripped to a depth of 6" prior to grading, stockpiled during grading, and redistributed over graded areas prior to seeding.
14. Contractor shall field verify the location (horizontal and vertical) at connections to all existing infrastructure. This information shall be collected and submitted to the engineer for review prior to fabrication and/or prior to installation of any new facilities shown on these contract drawings. The engineer will determine if any minor modifications to the new facilities shown on the contract drawings are necessary such as horizontal and vertical adjustments.
15. Contractor shall confine work to the construction limits shown.
16. Muck excavation shall be used only as approved by the Engineer.
17. All removal items shall become the contractor's property to be disposed of in accordance with specifications at no additional expense to the owners.
18. The contractor shall notify the engineer immediately of any field condition not consistent with the contract documents.
19. The contractor is responsible for any and all permits, license, fees, and bonds that are necessary to complete the construction of this project. The cost of these items shall not be measured and paid for separately, but shall be included the work.
20. The contractor shall be responsible for the cleanup of any trash or mud on the site or adjacent streets as a result of construction. The contractor shall restore access areas to their original grades and pre-disturbance state of vegetation. The cost to restore these areas shall not be measured and paid for separately, but shall be included in the cost of the work.
21. Saw cutting, removal, and disposal of all existing concrete and asphalt pavement shall not be paid for separately but shall be included in the cost of the work.
22. The Contractor is responsible for implementing and maintaining erosion and sediment control measures at all times during construction.
23. The Contractor shall provide, erect and maintain proper traffic control devices until the site is open to traffic. If needed, the Contractor shall submit a traffic control plan to the City of Louisville for approval prior to construction.
24. Repair of any damage to existing improvements or landscaping is the responsibility of the Contractor.
25. All damaged existing curb, gutter, and sidewalk shall be repaired prior to acceptance of completed improvements.
26. All construction activities must comply with the State of Colorado permitting process for "Stormwater Discharges Associated with Construction Activity." For information, please contact Colorado Department of Health, Water Quality Control Division, WQCD-PE-B2, 4300 Cherry Drive South, Denver, Colorado 80222-1530. Attention: Permits and Enforcement Section. Phone (303) 692-3500. The disturbance for this project is greater than one acre and a SWMP will be required.
27. A City of Louisville Site Development Permit will be Required.

STORM DRAINAGE INFRASTRUCTURE NOTES

1. All storm drainage improvements are subject to compliance with MHFD Specifications and Criteria, unless otherwise specified.
2. The Contractor shall comply with the "Colorado Water Quality Control Act" (Title 25, Article 8, CRS), the "Protection of Fishing Stream" (Title 33, Article 5, CRS), the "Clean Water Act" (33 USC 1344). In the event of conflicts between these requirements and water quality control laws, rules, or regulations of other Federal, or State agencies, the more restrictive laws, rules, or regulations shall apply.
3. The contractor shall have, onsite at all times, an up to date (City Approved) Stormwater Management Plan (SWMP) that accurately represents current field conditions. The developer shall comply with all terms and conditions of the Colorado Department of Public Health and Environment (CDPHE) "Stormwater Discharges Associated with Construction Activity" permit, the Storm Water Management Plan (SWMP), and the Erosion Control Plan.
3. Structural backfill shall be compacted to conform to MHFD Specification 31 23 33.
4. If any grouting becomes required it shall be in accordance with section 31 37 19 of the Mile High Flood District (MHFD) specifications.
5. All boulders and riprap shall be selected and placed in accordance with section 31 37 00 of the Mile High Flood District (MHFD) specifications.
6. Contractor shall refer to City of Louisville's Construction Best Management Practices details and notes for all requirements relating to re-vegetation, sediment and erosion control requirements for construction activities.

BACKFILL NOTES

1. Prior to fill placement, areas shall be stripped of existing vegetation and other organic or harmful materials from the construction areas. Surfaces shall be free of mounds and depressions which could prevent uniform compaction.
2. Fill against wing walls shall be compacted to densities specified and accomplished with hand-operated tampers or other lightweight compactors. Over compaction may cause excessive lateral earth pressures, which may result in wall movement.
3. Clean on-site soils or approved imported materials, less than 3 inches in size, may be used as fill material. Imported fill shall be reviewed by the geotechnical engineer prior to importing to the site.
4. Engineered fill shall be placed and compacted in horizontal loose lifts of 8 inches or less in thickness, using equipment and procedures that will produce a uniform fill with the recommended moisture contents and densities throughout the lift. Backfill shall be uniformly distributed in layers brought up equally on both sides of the box culvert. Recommended compaction criteria for engineered fill is 95% of the maximum dry density (AASHTO T99) within 3 percent of the optimum moisture content.
5. Placement and compaction criteria presented herein, assume that fill depths are approximately 10 feet.

CITY OF LOUISVILLE NOTES

1. No work may commence within any improved public right-of-way until a right-of-way permit is obtained. The developer shall submit a construction traffic control plan, prepared in accordance with MUTCD and Louisville standards for approval prior to any construction activities within, or affecting, the right-of-way. The contractor shall be responsible for providing any and all traffic control devices as may be required by the construction activities.
2. The limits of any concrete and/or asphalt removal in the right of way will be as directed by the city inspector.
3. All concrete (public improvements) shall have a minimum 28 day compressive strength of 4500 psi. No fly ash or water reducer is allowed.
4. All water main fittings and valves shall be restrained using Megalugs or approved equal. For fittings and valves the contractor shall use corrosion resistant T-head bolts with a fluoropolymer coating and shall be either "Cor-Blue" by NSS Industries or "Blue Bolt" by Birmingham Fasteners or approved equal.
5. All water main tee/gate valve connections shall use swivel tees and/or solid by Swivel Adapters.
6. All public fire hydrants shall be factory painted red.
7. All materials, workmanship, and construction of public improvements (waterline, sewerline, asphalt and concrete) and improvements in the right of way shall meet or exceed the standards and specifications set forth in the City of Louisville Design and Construction Standards, latest version. All work shall be inspected and approved by the city of Louisville.

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Know what's below.
Call before you dig.



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 MILE HIGH FLOOD DISTRICT
2480 W. 26TH AVE., STE. 156-B
DENVER, CO 80211

LOCAL GOVERNMENT SPONSOR:
 CITY OF LOUISVILLE
DEPARTMENT OF PUBLIC WORKS
749 MAIN ST.
LOUISVILLE, CO 80027

PREPARED BY:
 Enginuity
ENGINEERING SOLUTIONS
10106 WEST SAN JUAN WAY, STE 215
LITTLETON, COLORADO 80127
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FX : 303-872-9104

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3/4/22

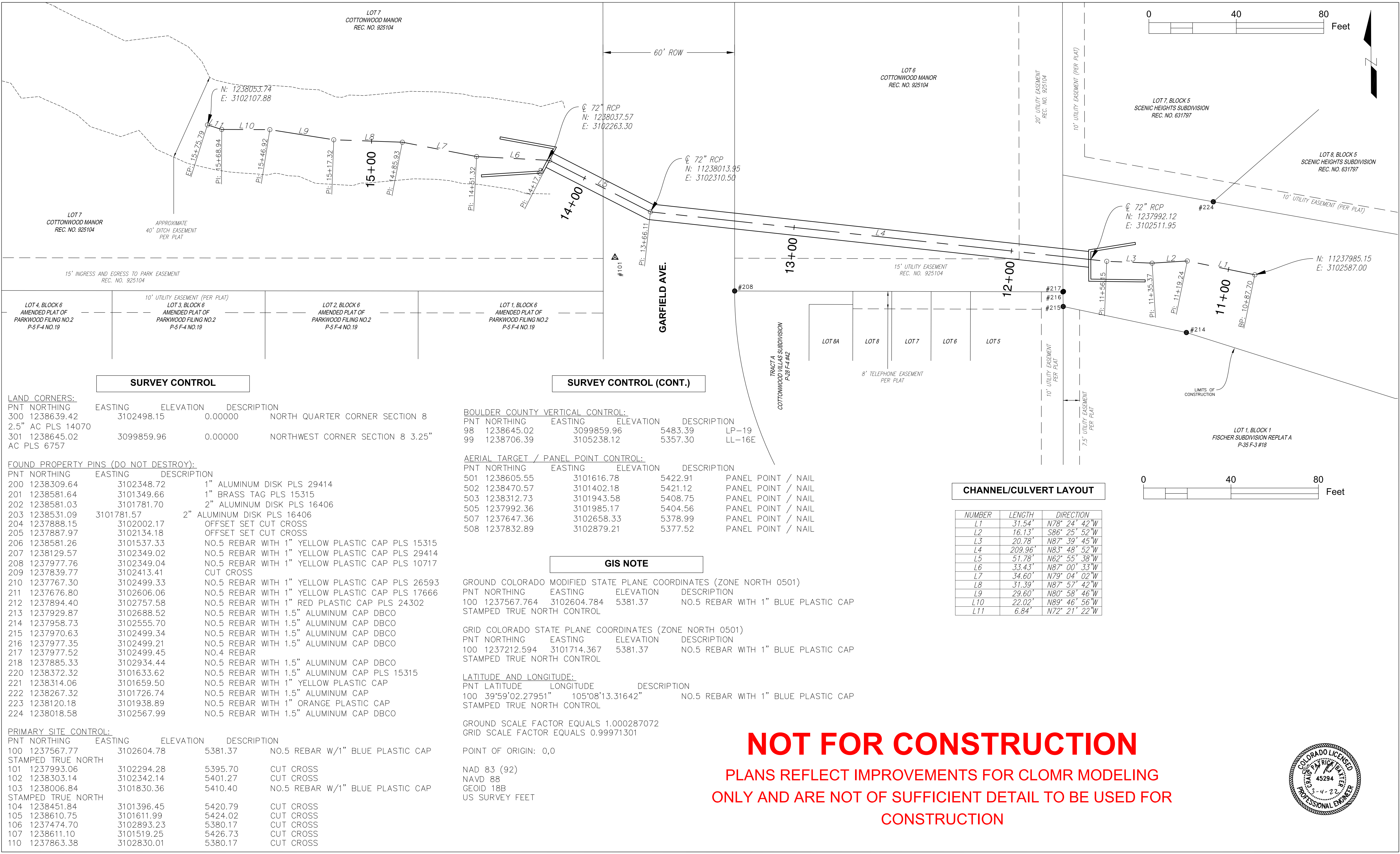
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CONSULTANT ENGINEER CERTIFICATION
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DRAINAGEWAY A-1 CULVERT REPLACEMENT

GENERAL NOTES

SHEET/REFERENCE NO.
02
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MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
2480 W. 26TH AVE., STE. 156-B
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CITY OF LOUISVILLE

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DRAINAGEWAY A-1 CULVERT REPLACEMENT

PROJECT CONTROL

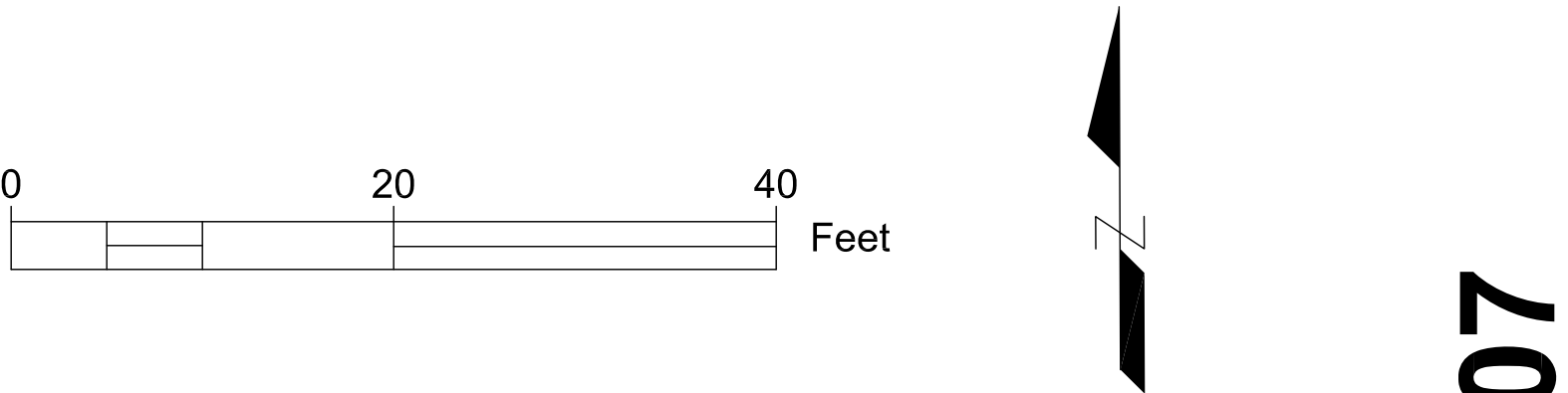
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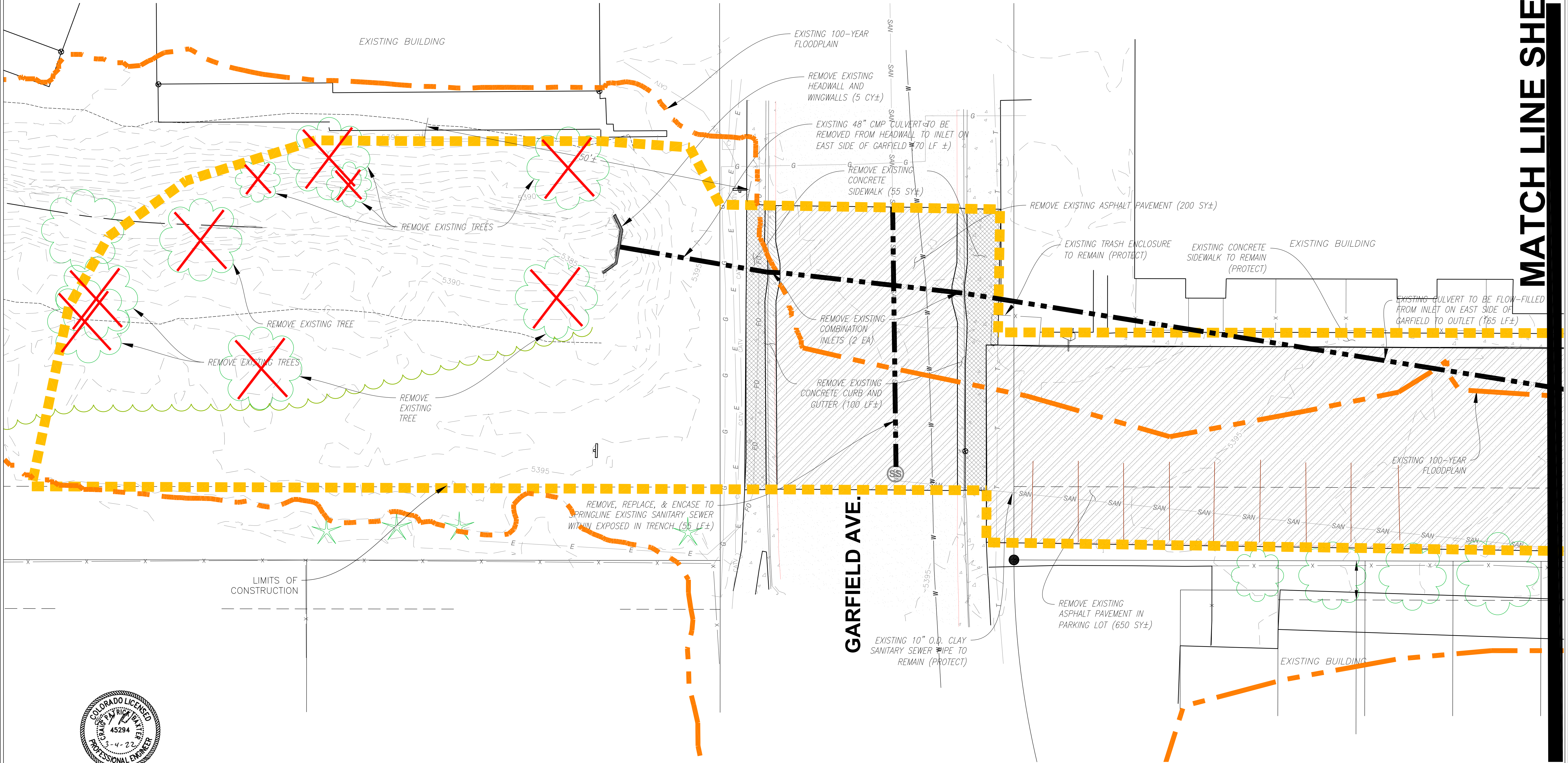


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MATCH LINE SHEET 07



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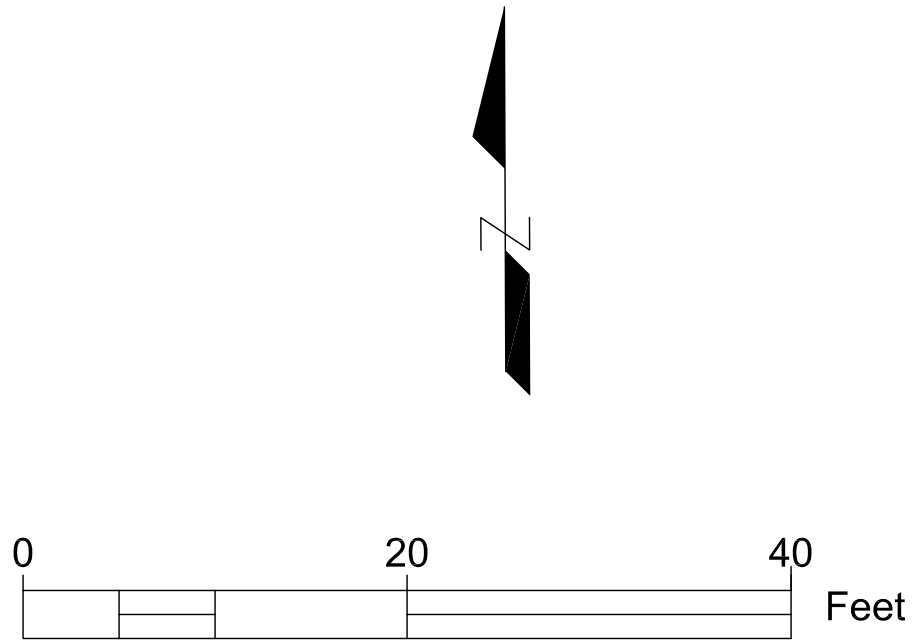
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DRAINAGEWAY A-1 CULVERT REPLACEMENT
SITE AND DEMOLITION PLAN (1 OF 3)

SHEET/REFERENCE NO.
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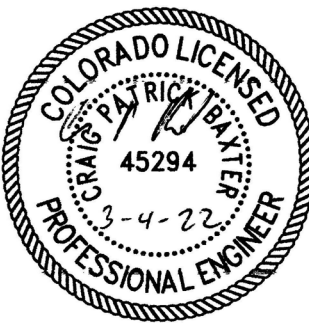
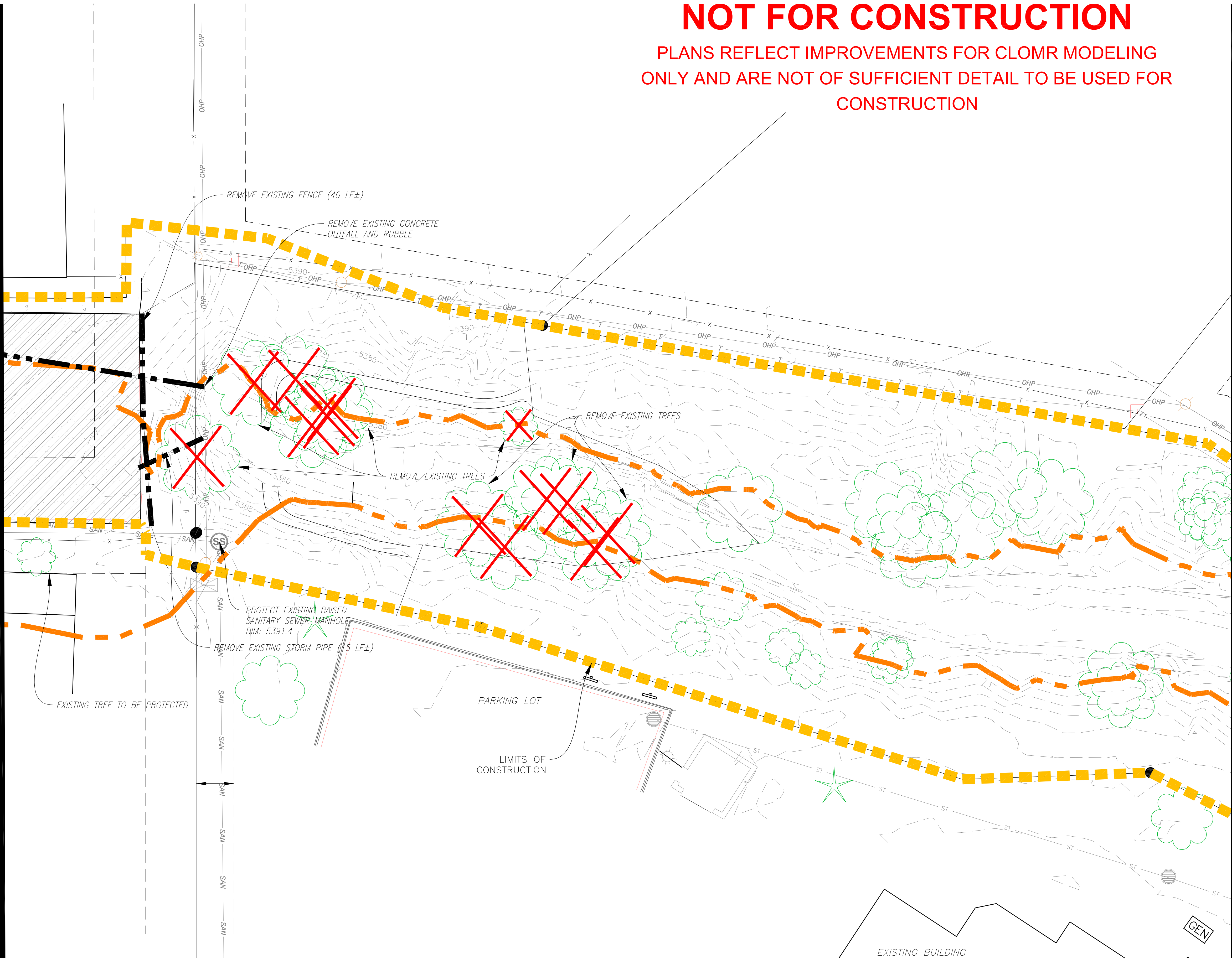
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MATCH LINE SHEET 06

MATCH LINE SHEET 08



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CONSULTANT ENGINEER CERTIFICATION

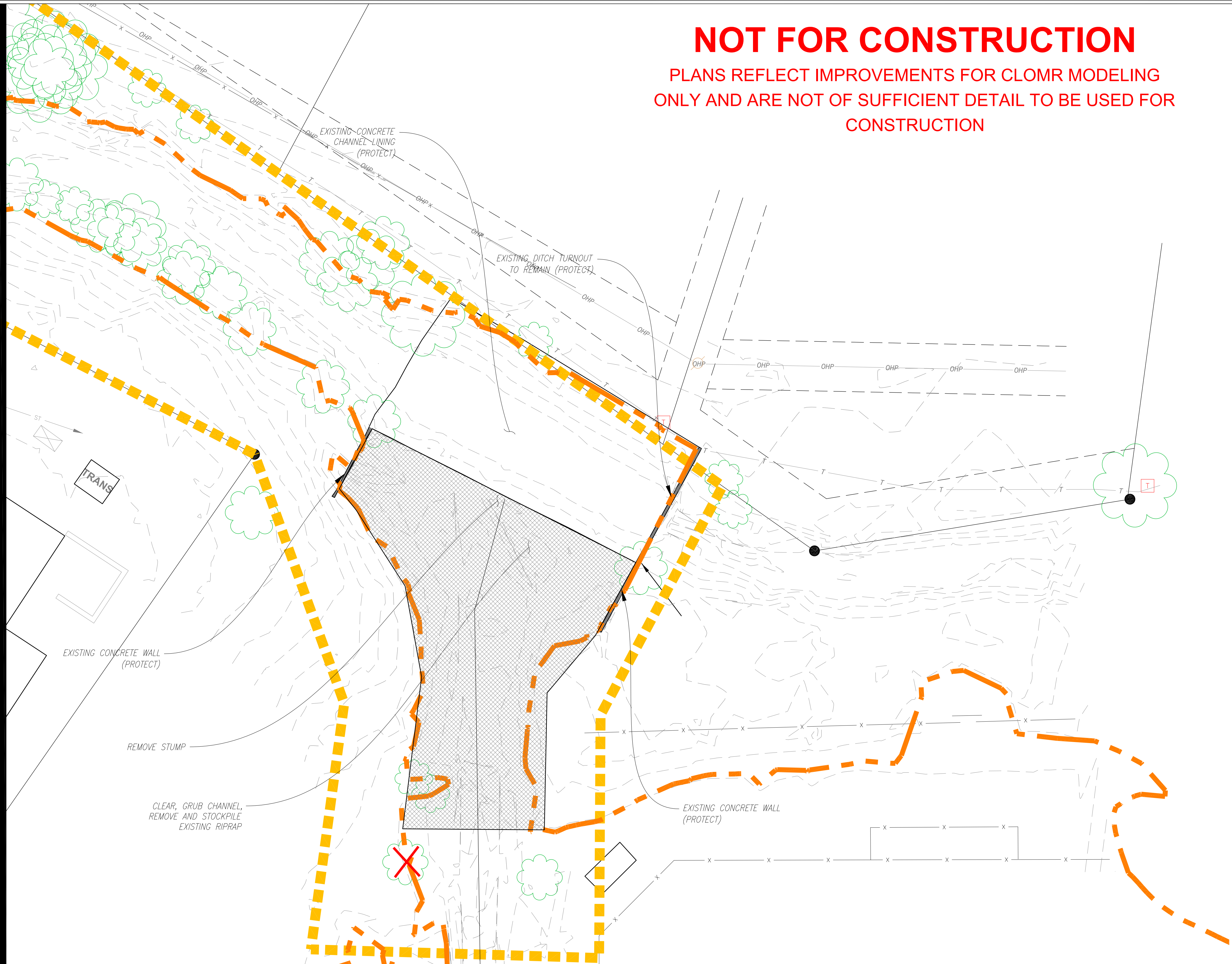
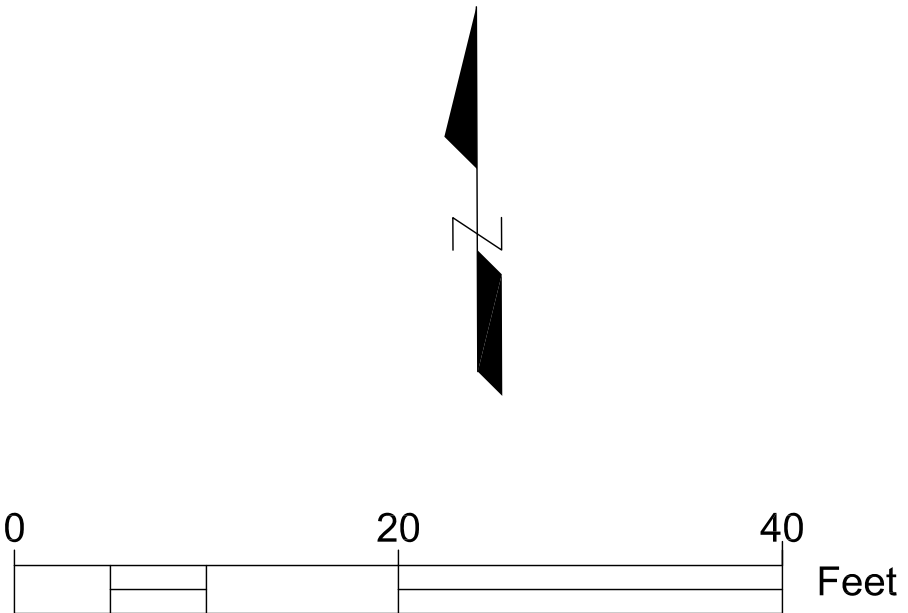
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DRAINAGEWAY A-1 CULVERT REPLACEMENT

SITE AND DEMOLITION PLAN (2 OF 3)

MATCH LINE SHEET 07

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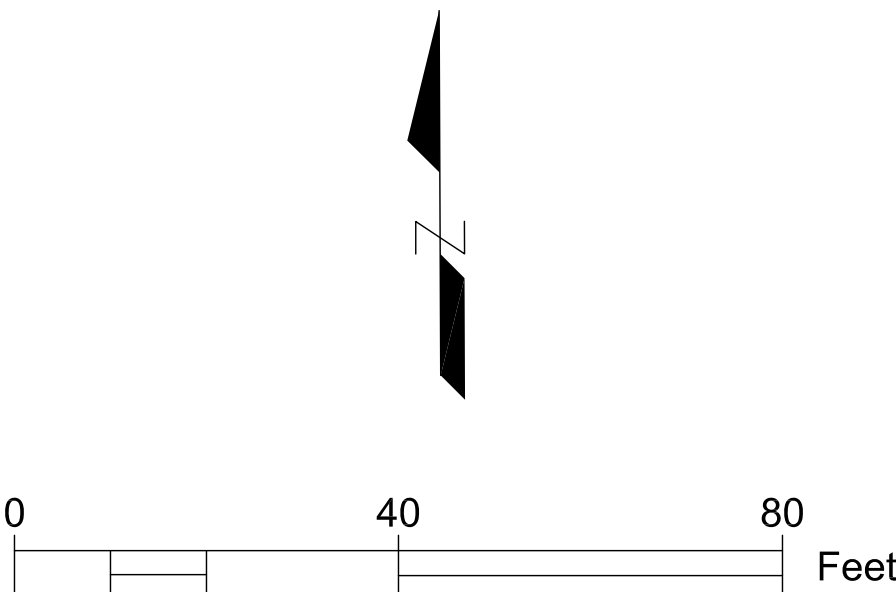
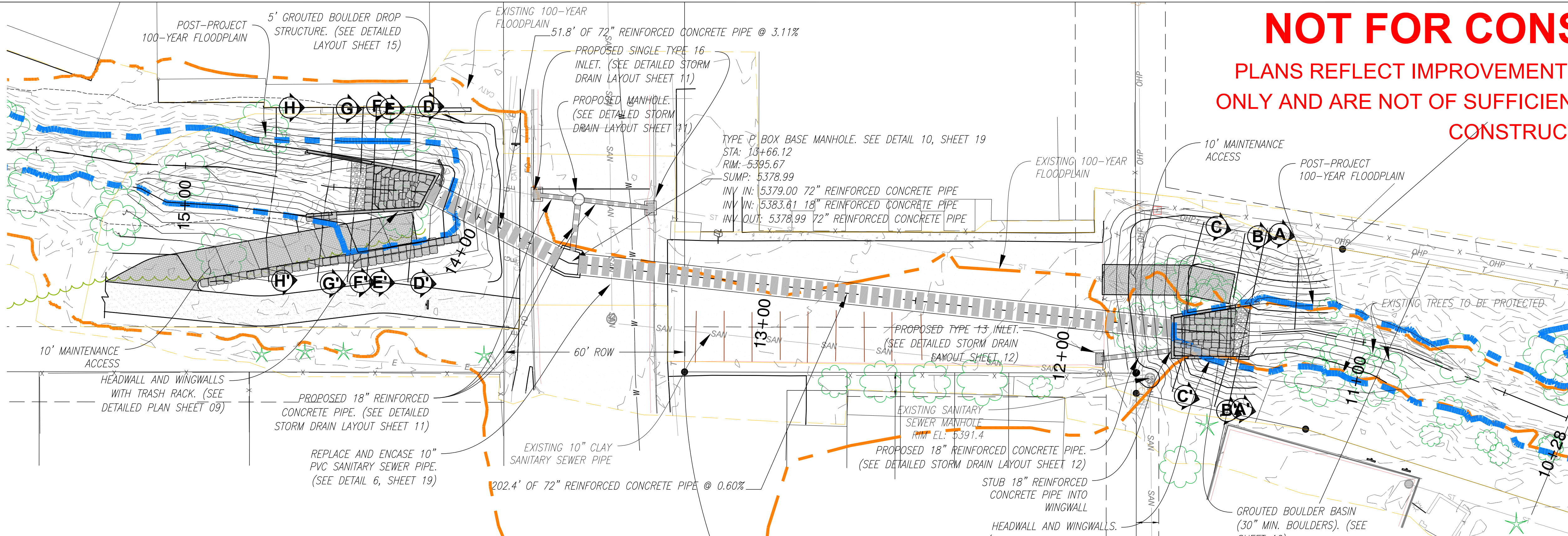
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DRAINAGEWAY A-1 CULVERT REPLACEMENT
SITE AND DEMOLITION PLAN (3 OF 3)

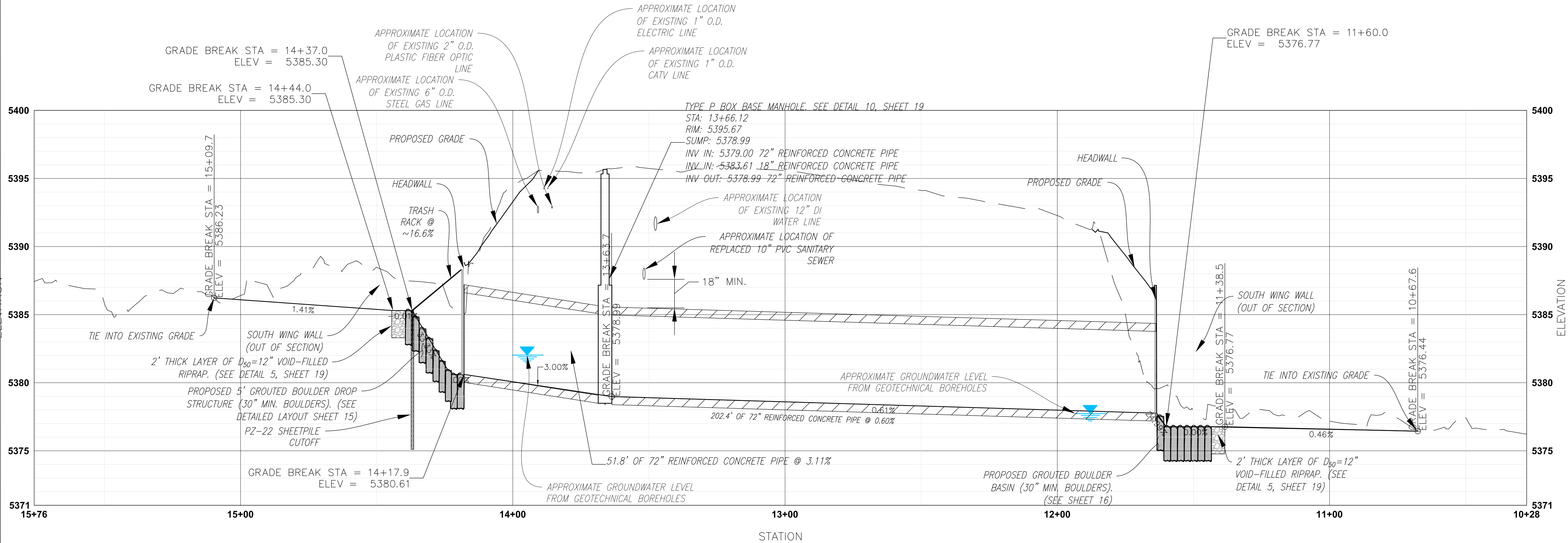
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- NOTES:
1. EXCAVATE AND BACKFILL FOR 72" RCP CULVERT PER CDOT STANDARD PLAN M-206-1
 2. 72" RCP TO MEET CDOT STANDARD PLAN M-603-2



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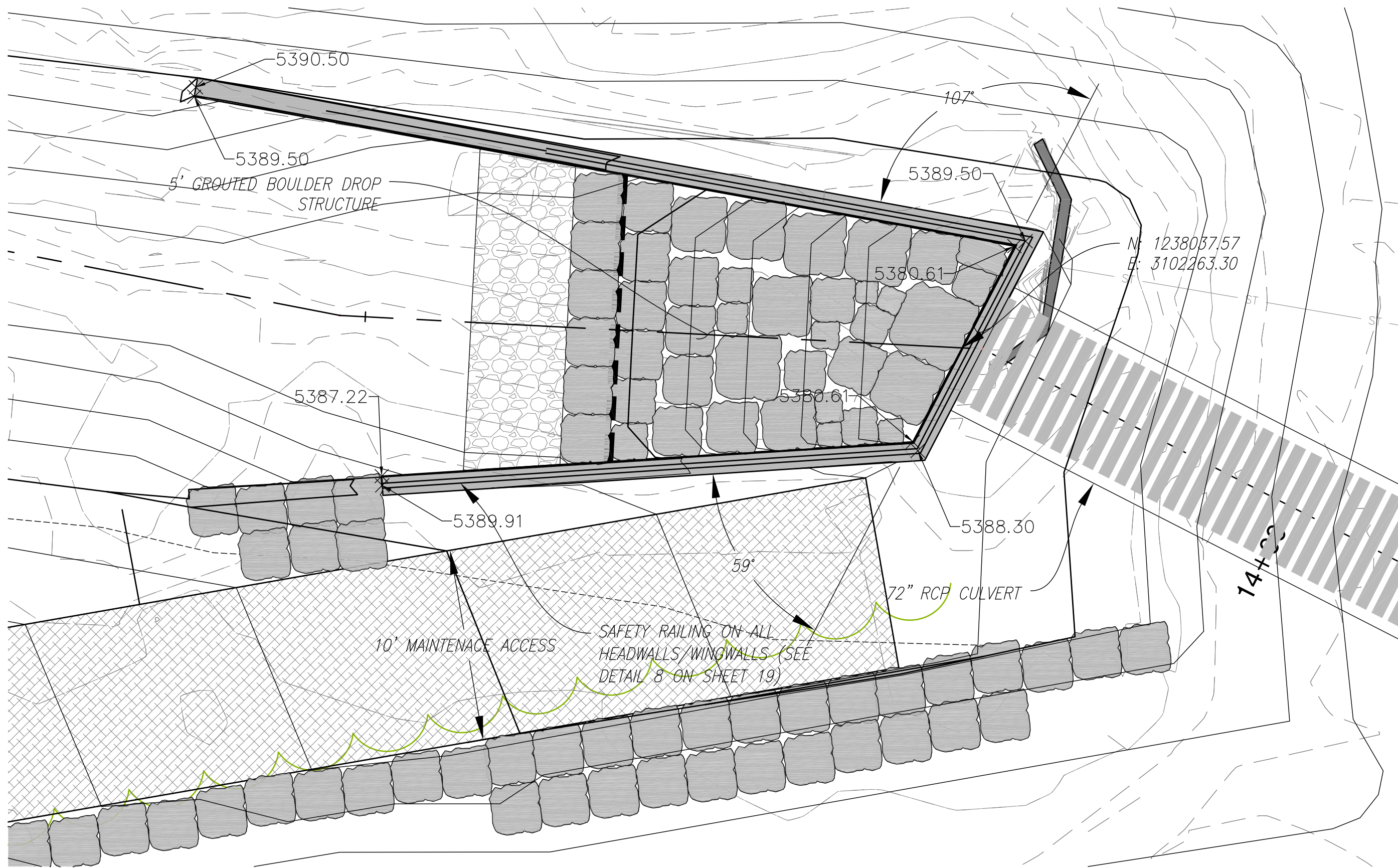
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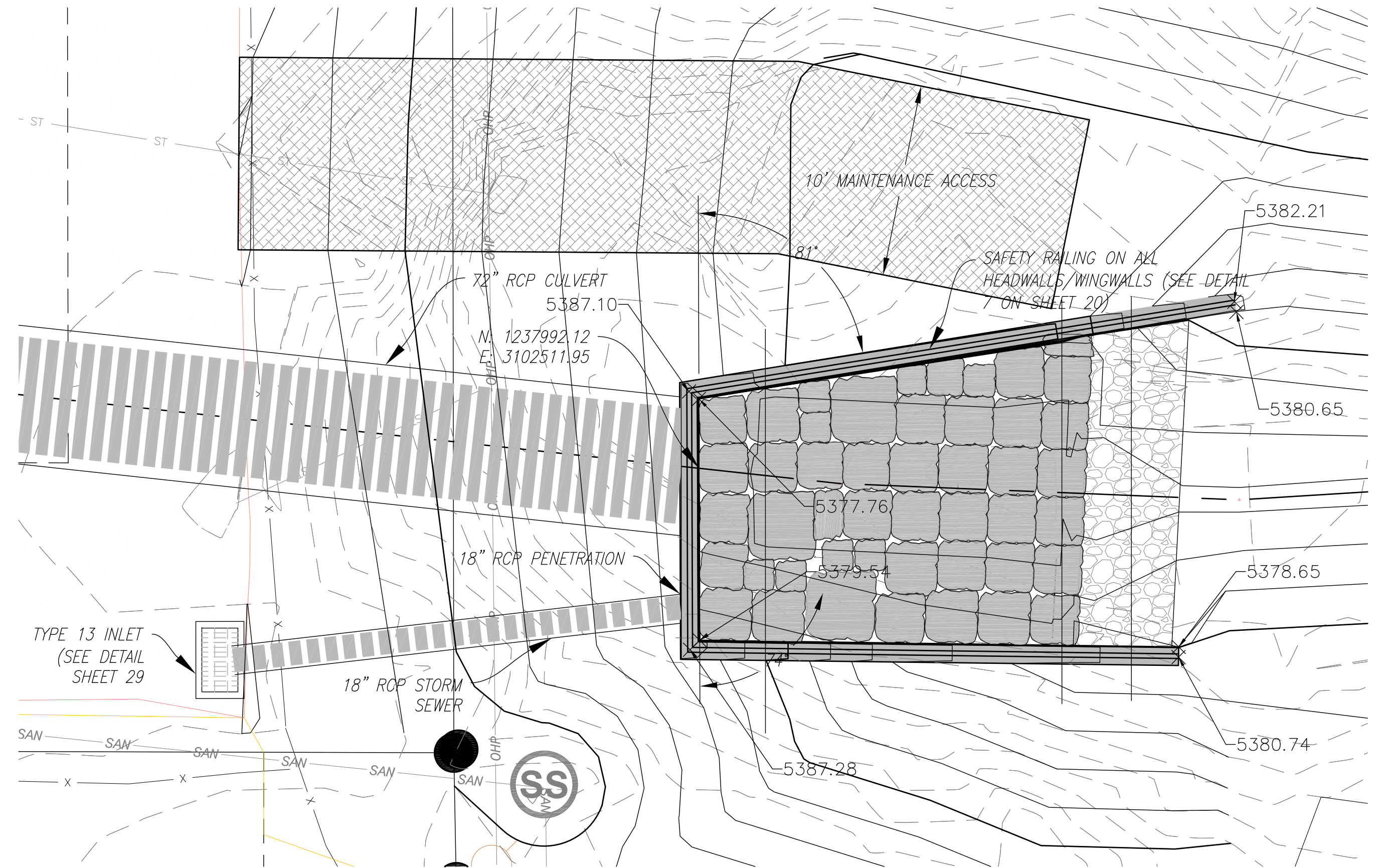
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DRAINAGEWAY A-1 CULVERT REPLACEMENT
CULVERT PLAN AND PROFILE

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CULVERT INLET DETAIL



CULVERT OUTLET DETAIL

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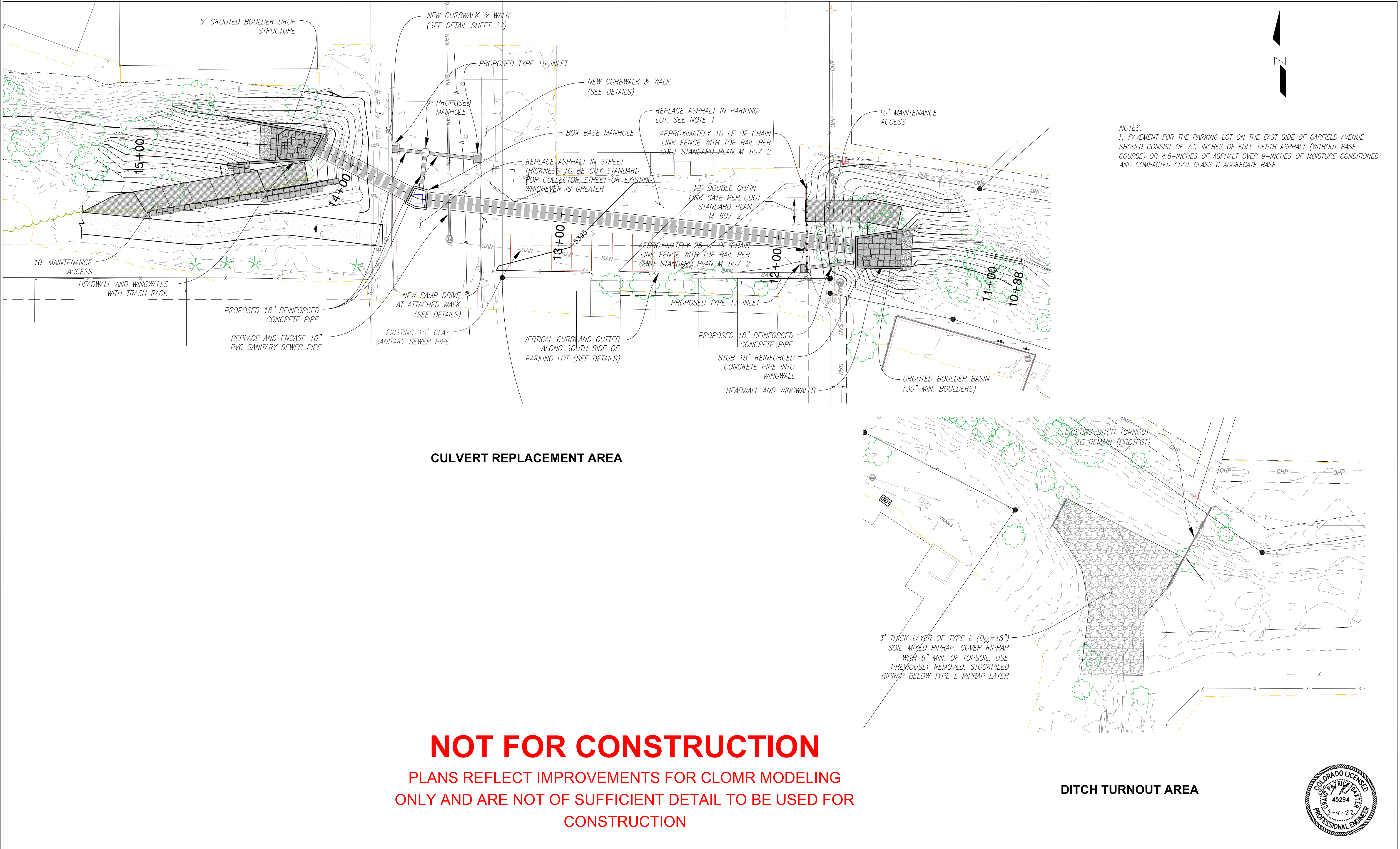
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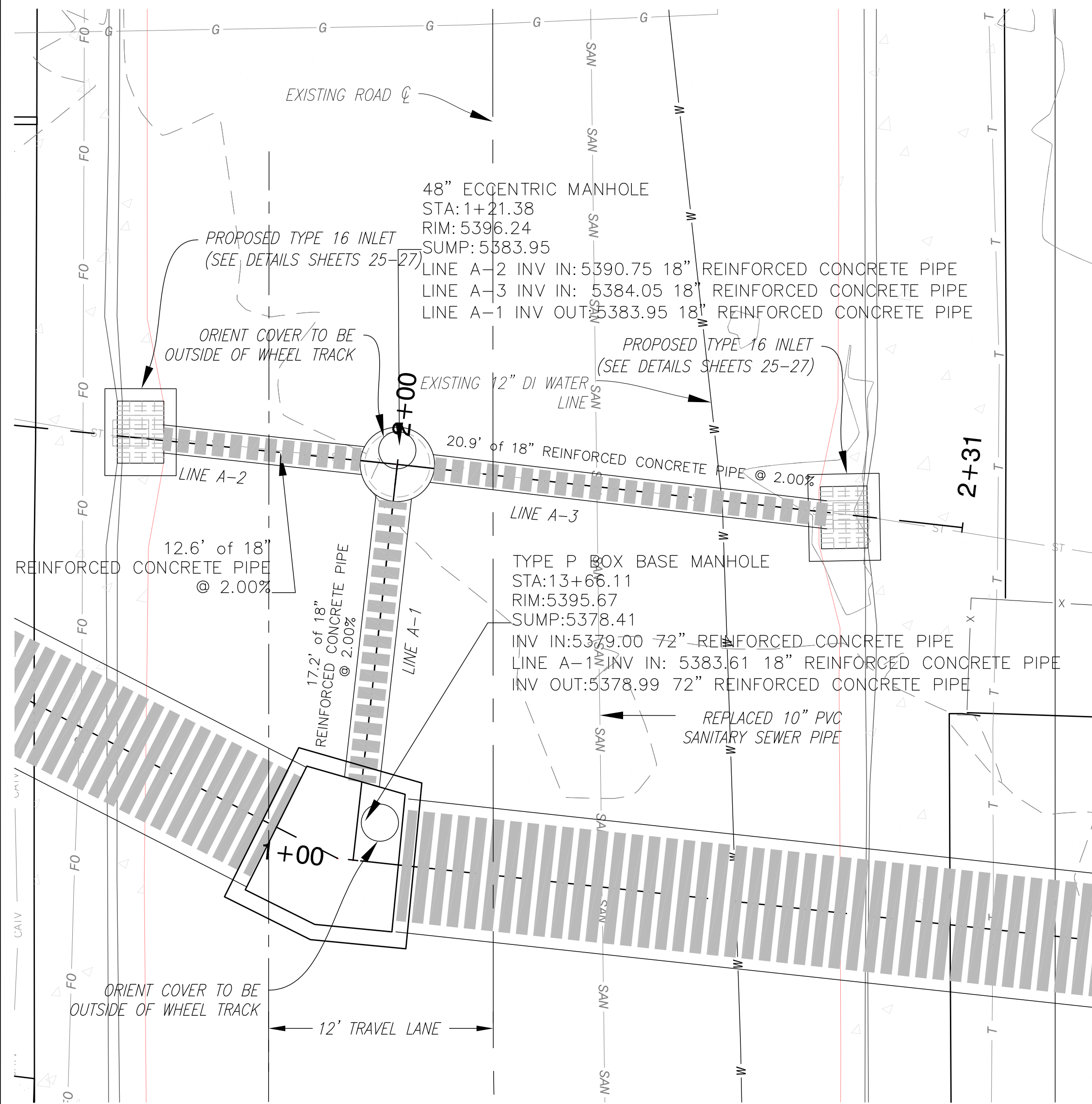
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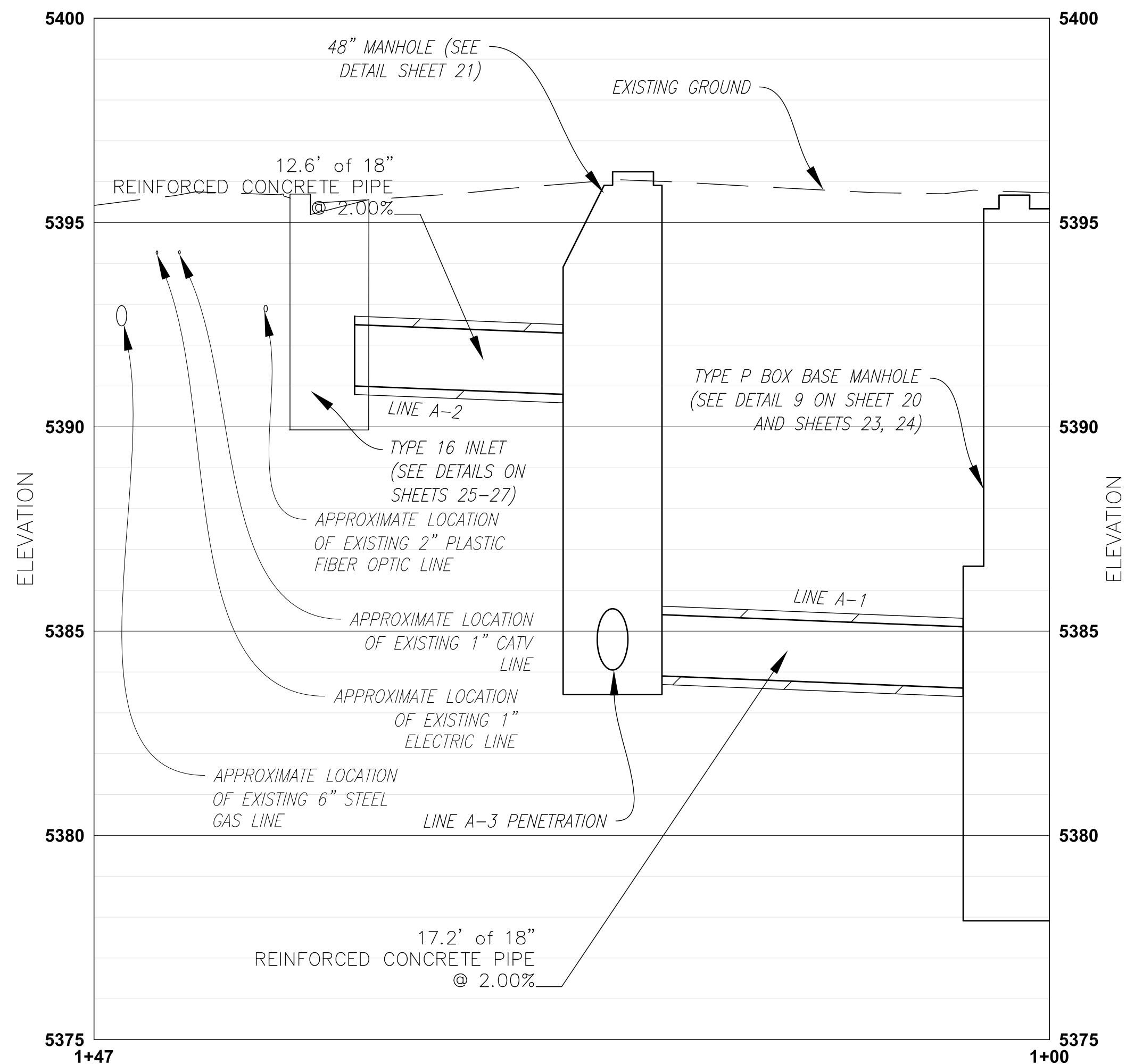
DRAINAGEWAY A-1 CULVERT REPLACEMENT
CULVERT INLET AND OUTLET DETAIL

SHEET/REFERENCE NO.
09
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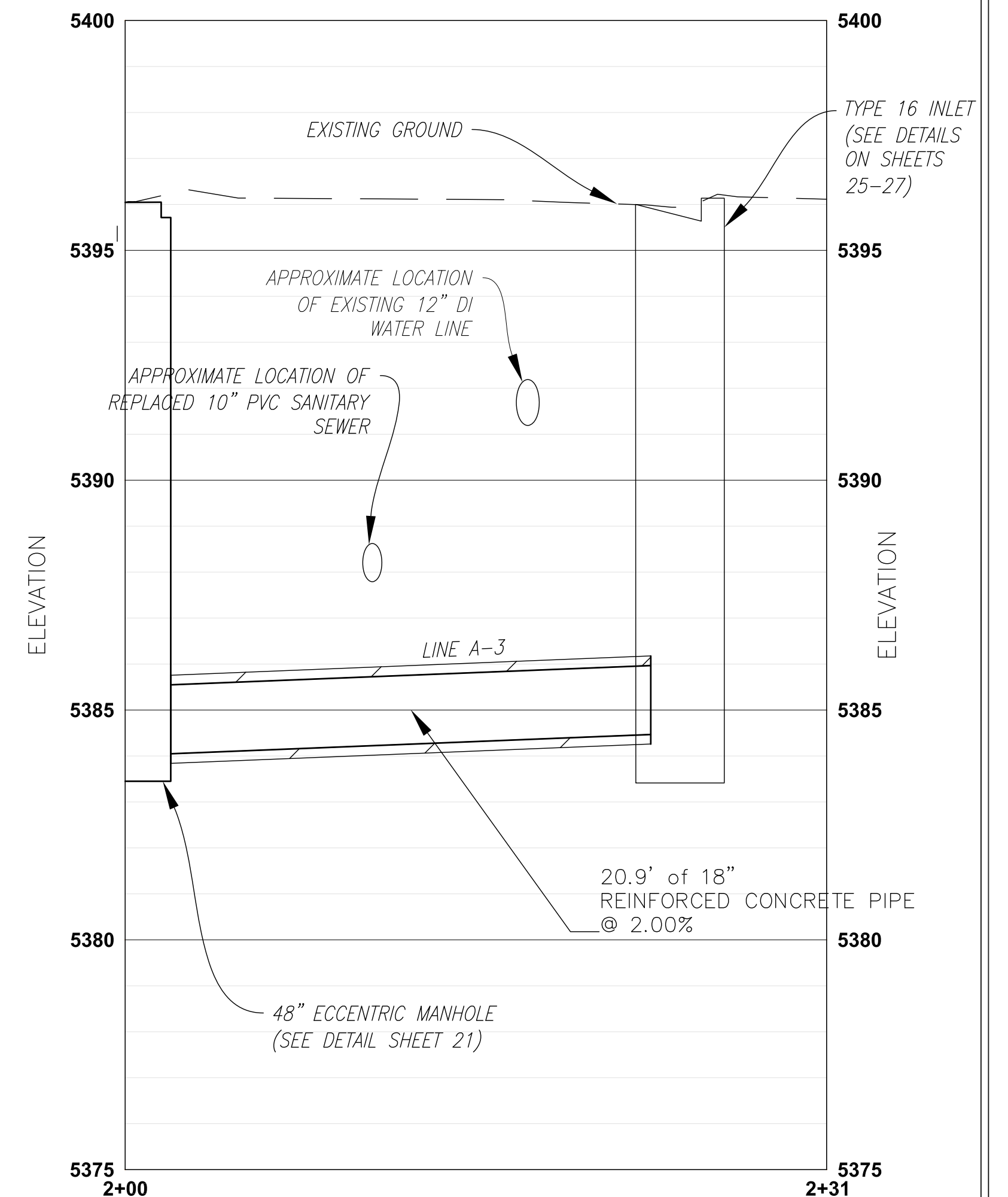




GARFIELD AVENUE STORM SEWER PLAN VIEW

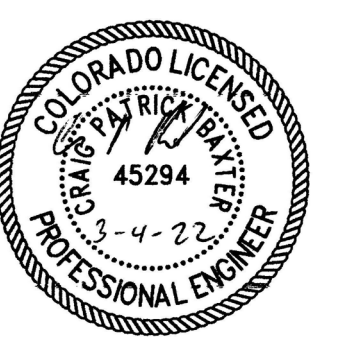


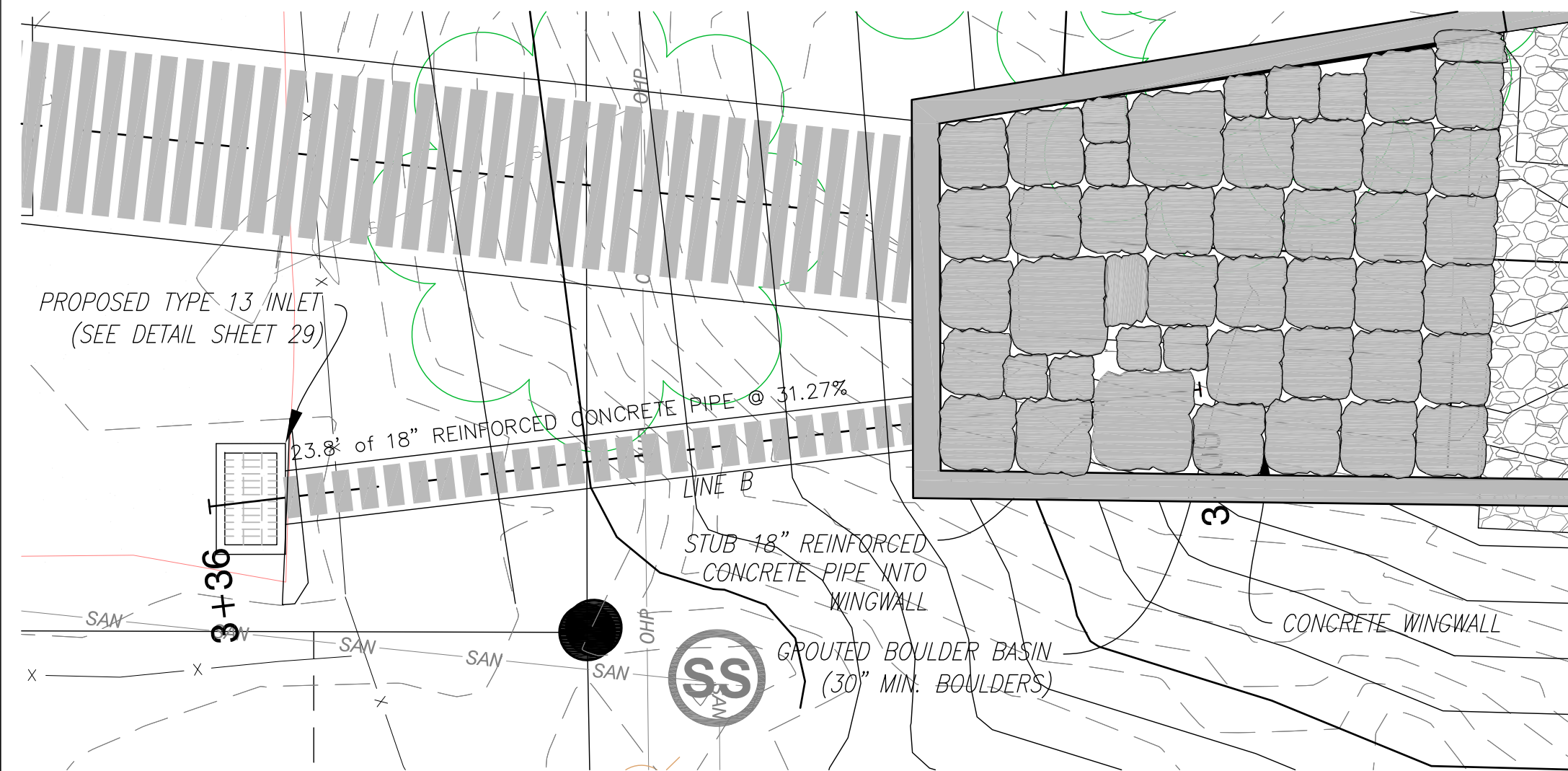
STORM SEWER LINE A-1, A-2
PROFILE



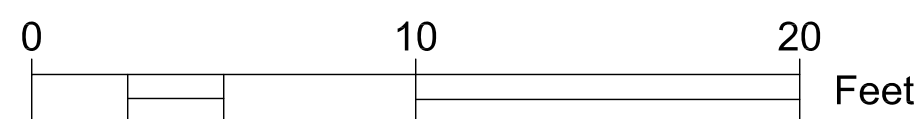
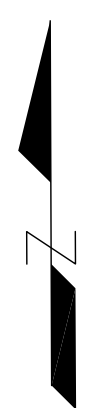
STORM SEWER LINE A-3 PROFILE

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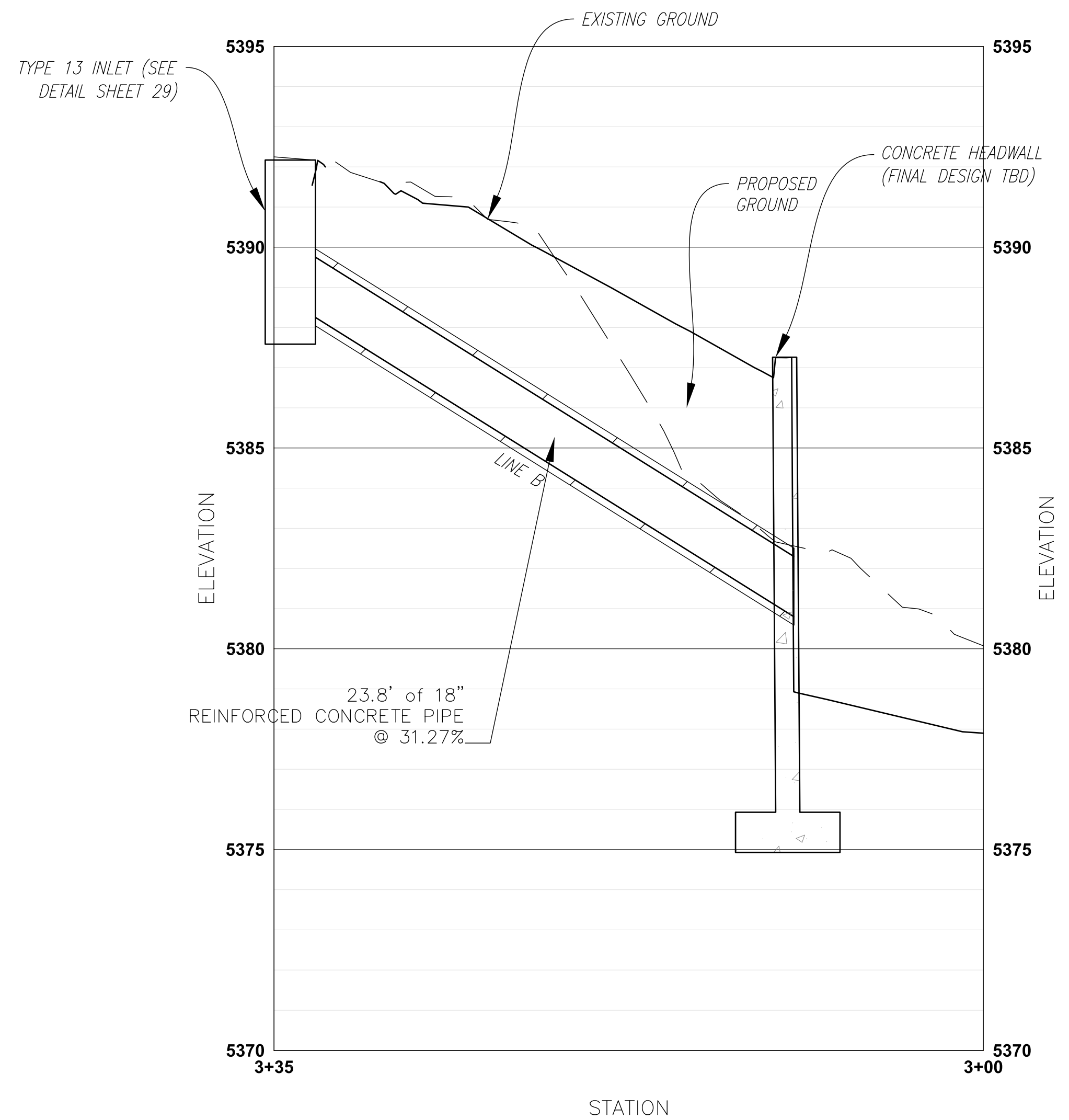


PARKING LOT DRAINAGE STORM SEWER PLAN VIEW



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STORM SEWER LINE B PROFILE

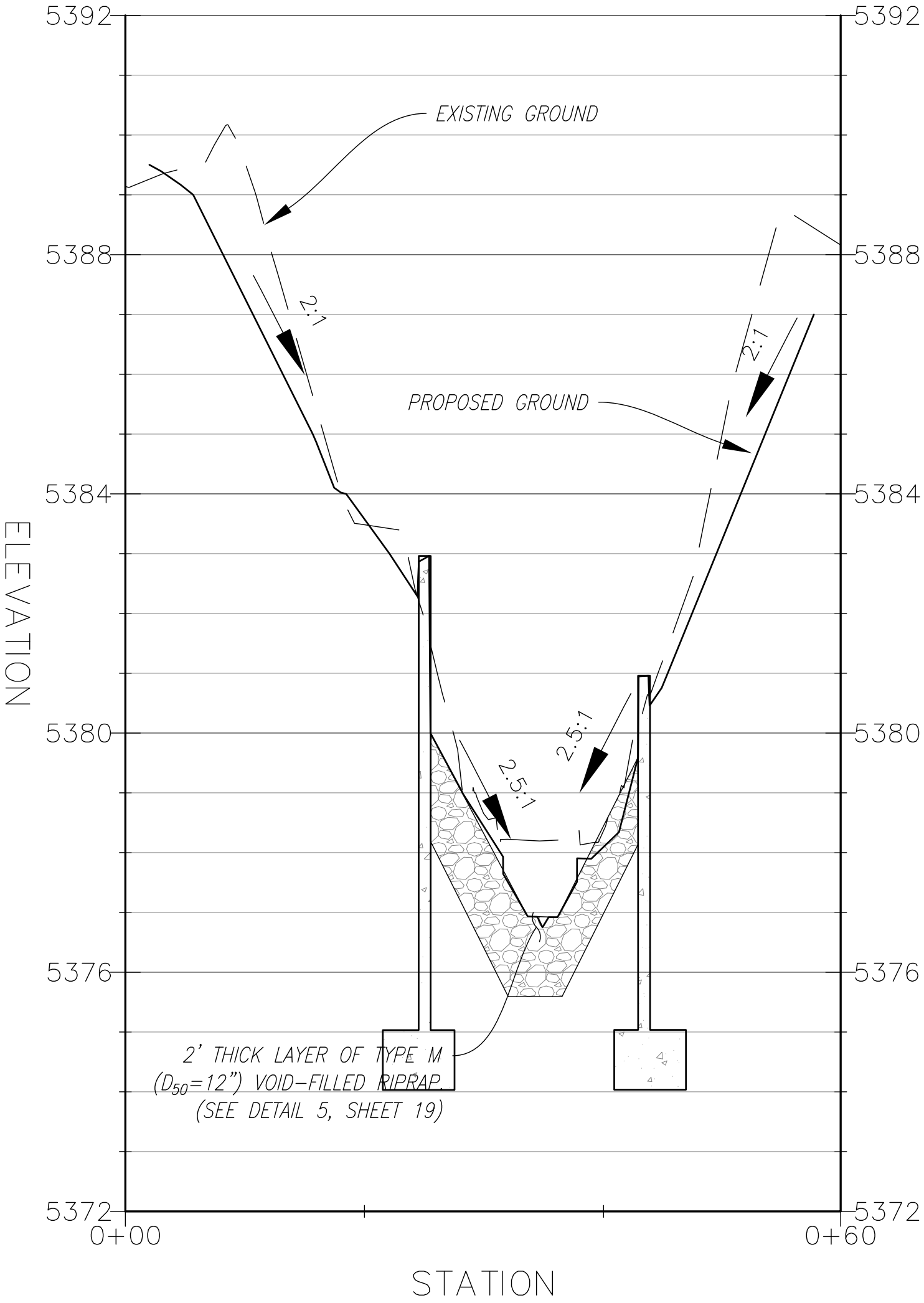


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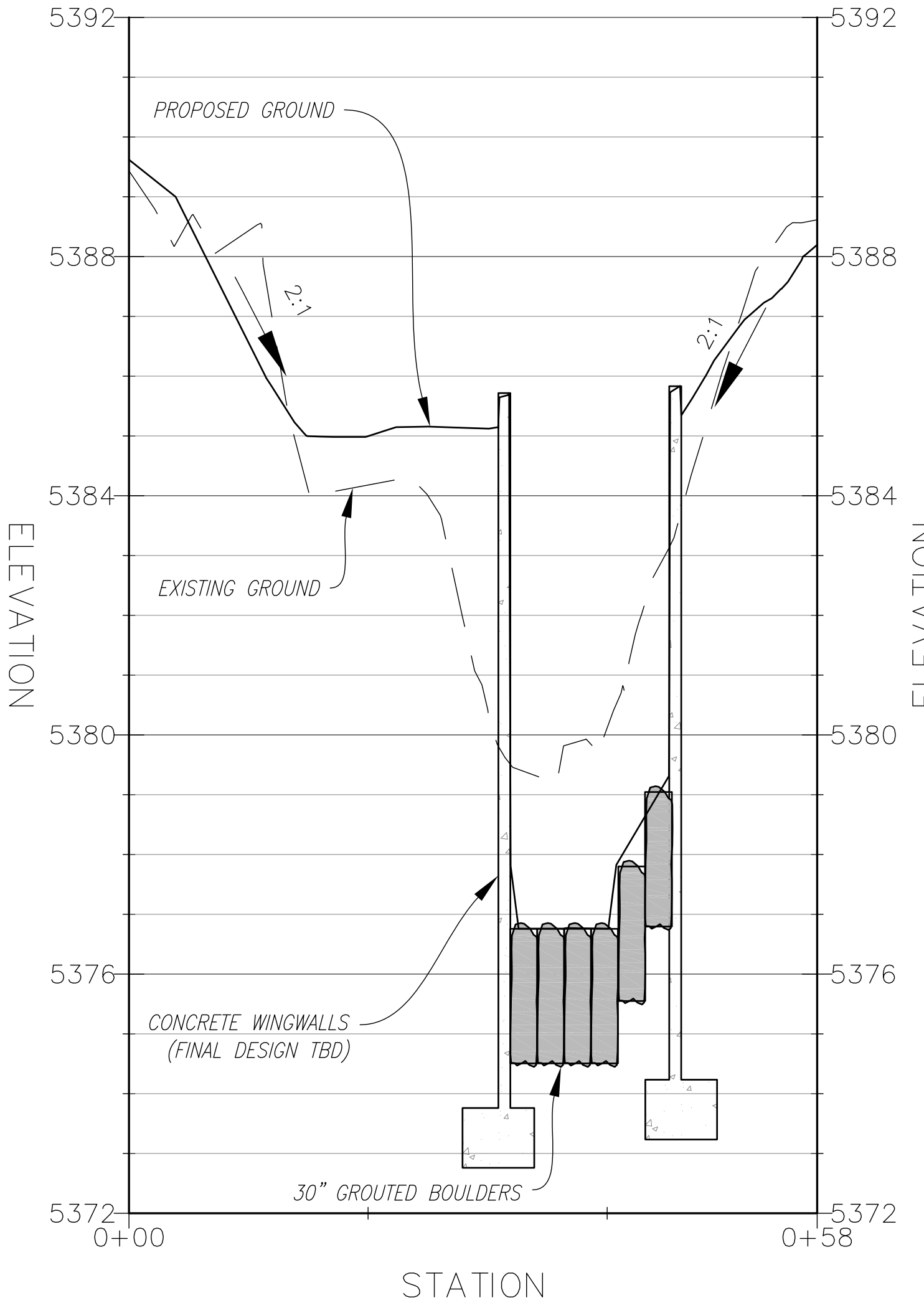
CONSULTANT ENGINEER CERTIFICATION
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NOT FOR
CONSTRUCTION

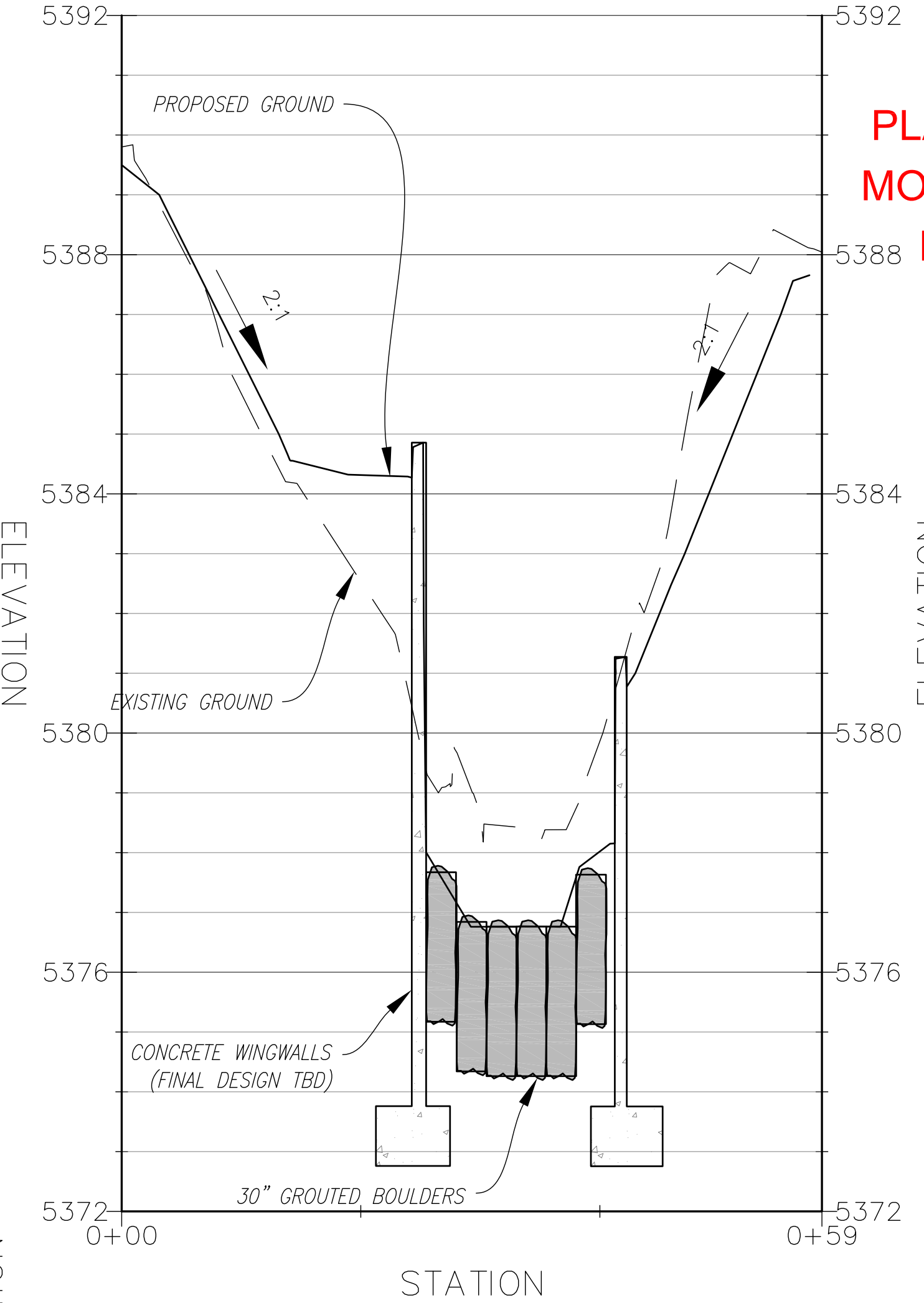
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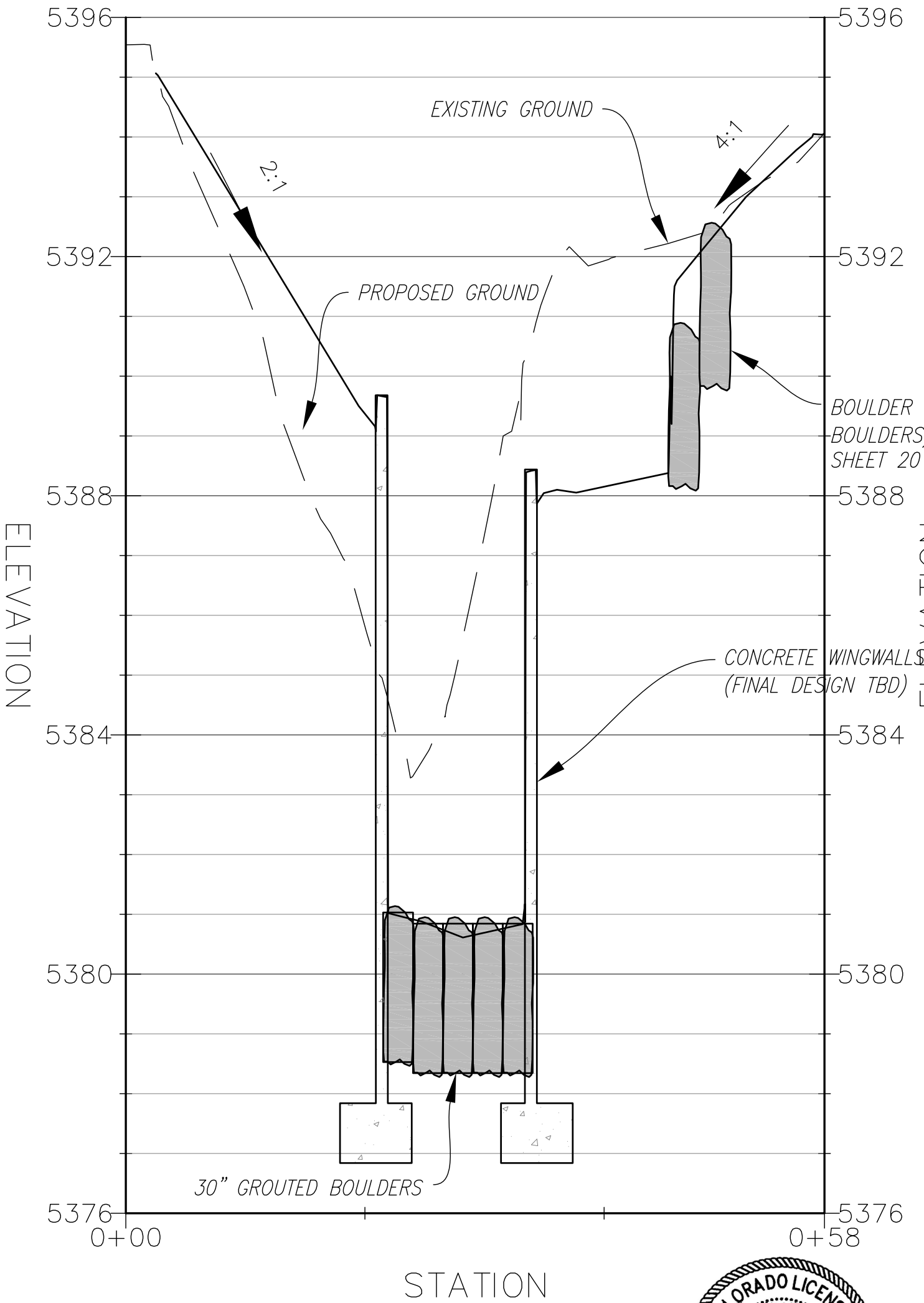
CROSS SECTION A-A'



CROSS SECTION C-C'



CROSS SECTION B-B'



CROSS SECTION D-D'



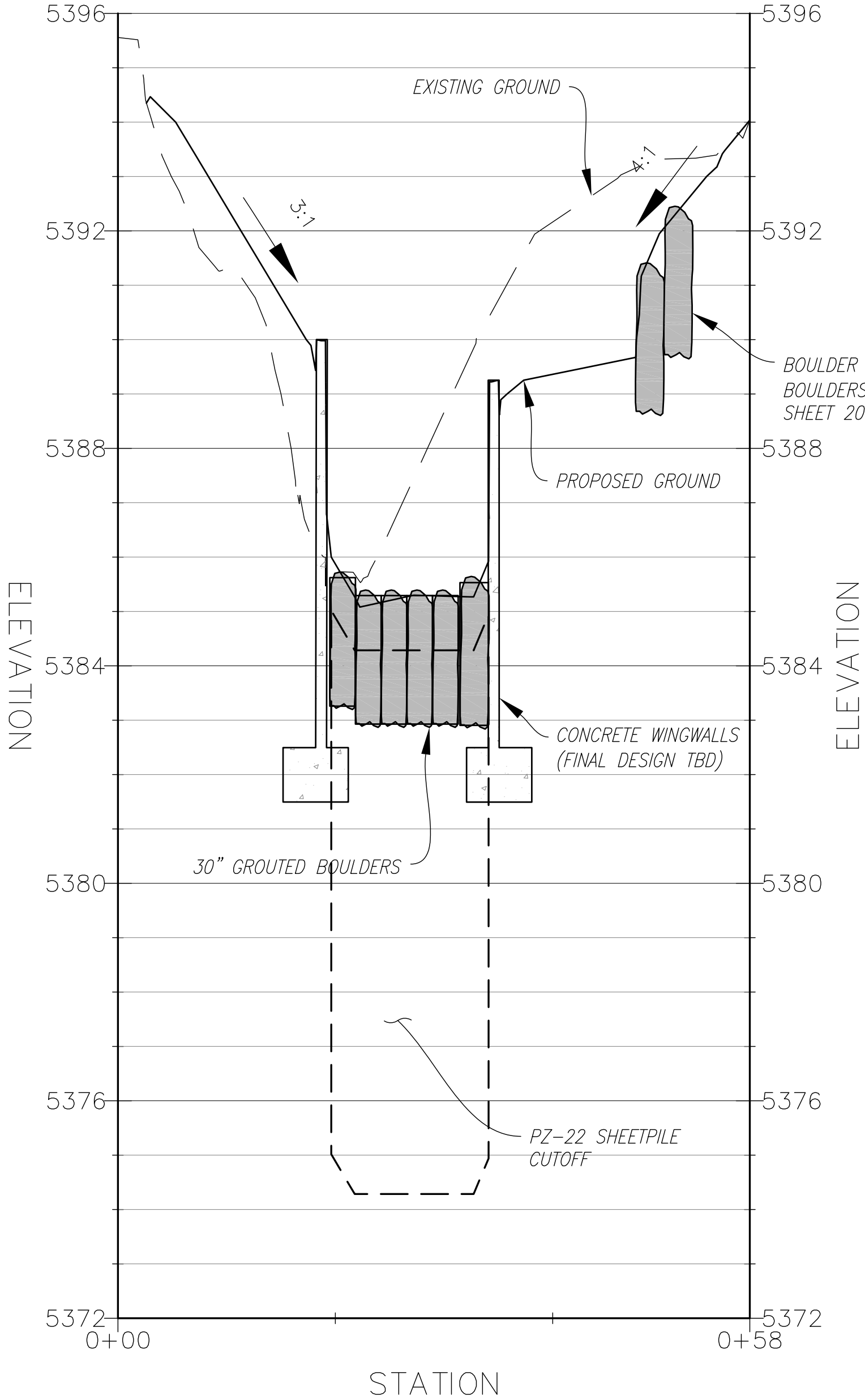
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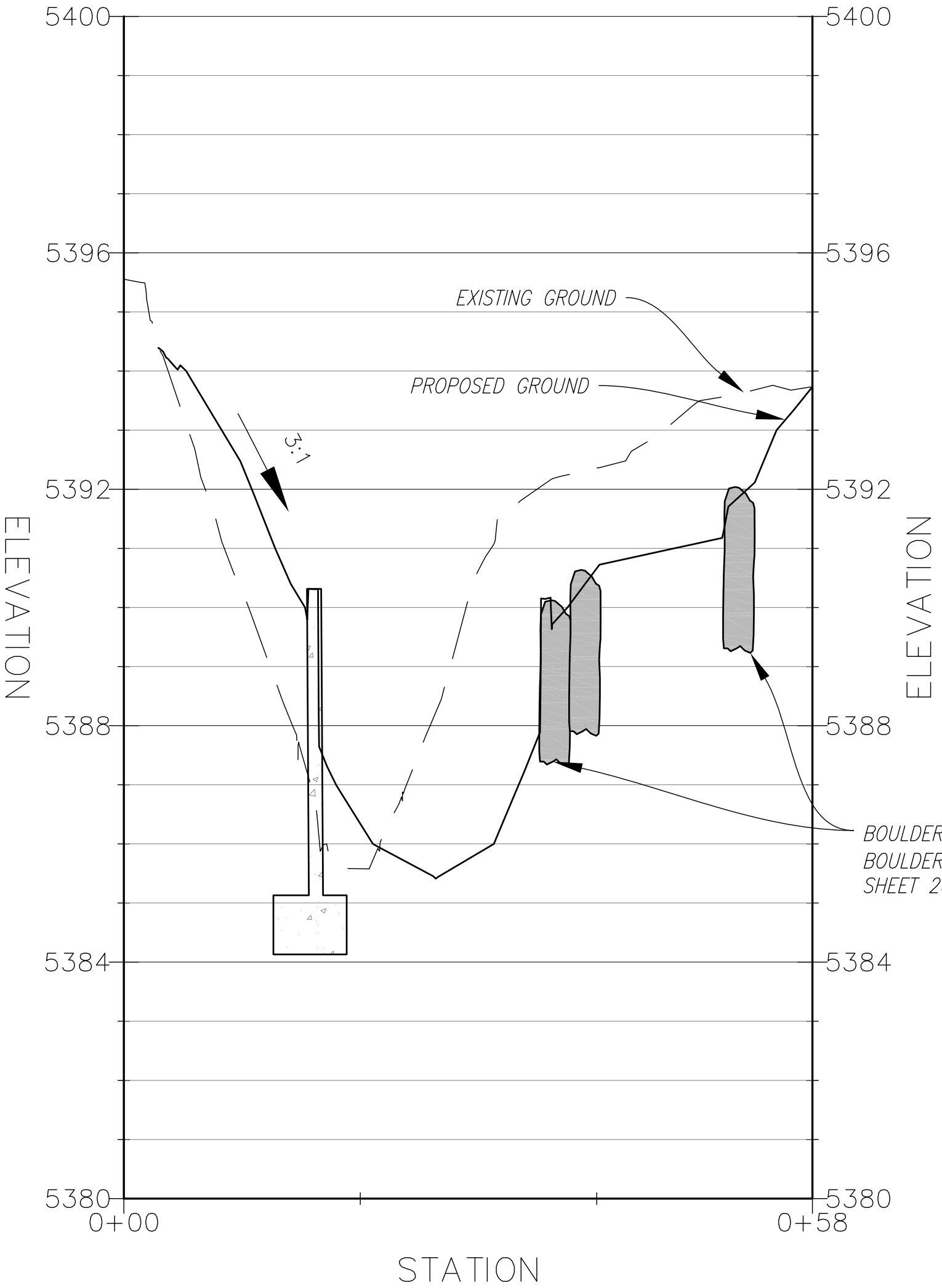
DRAINAGEWAY A-1 CULVERT REPLACEMENT
CHANNEL SECTIONS (1 OF 2)

NOT FOR
CONSTRUCTION

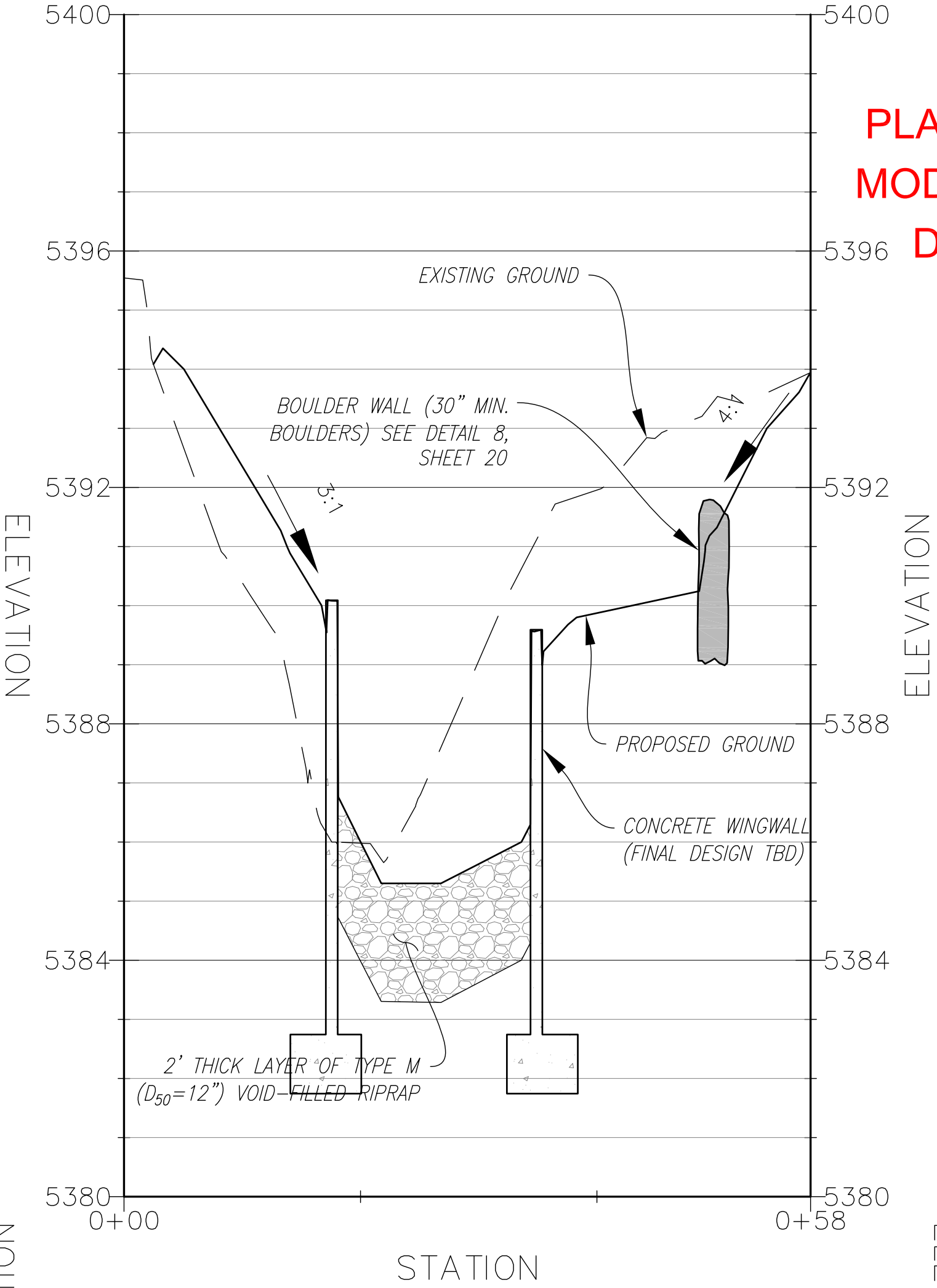
PLANS REFLECT IMPROVEMENTS FOR CLOMR
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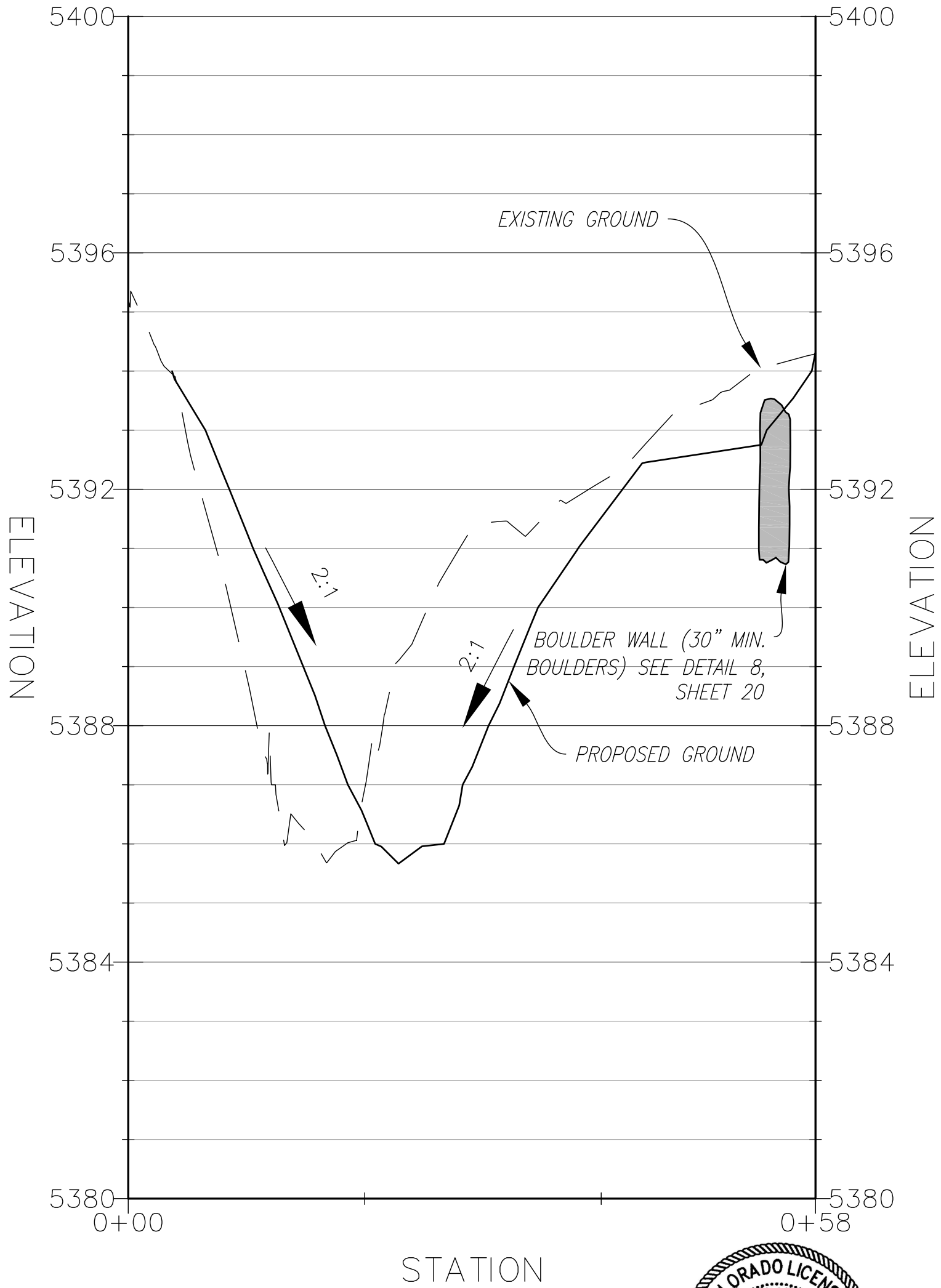
CROSS SECTION E-E'



CROSS SECTION G-G'



CROSS SECTION F-F'



CROSS SECTION H-H'



PREPARED FOR:
MHFD
MILE HIGH FLOOD DISTRICT
2480 W. 26TH AVE., STE. 156-B
DENVER, CO 80211

LOCAL GOVERNMENT SPONSOR:
City of Louisville
DEPARTMENT OF PUBLIC WORKS
749 MAIN ST.
LOUISVILLE, CO 80027

PREPARED BY:
Enginuity
ENGINUTY ENGINEERING SOLUTIONS
10106 WEST SAN JUAN WAY, STE 215
LITTLETON, COLORADO 80127
PH : 303-872-9112
FX : 303-872-9104

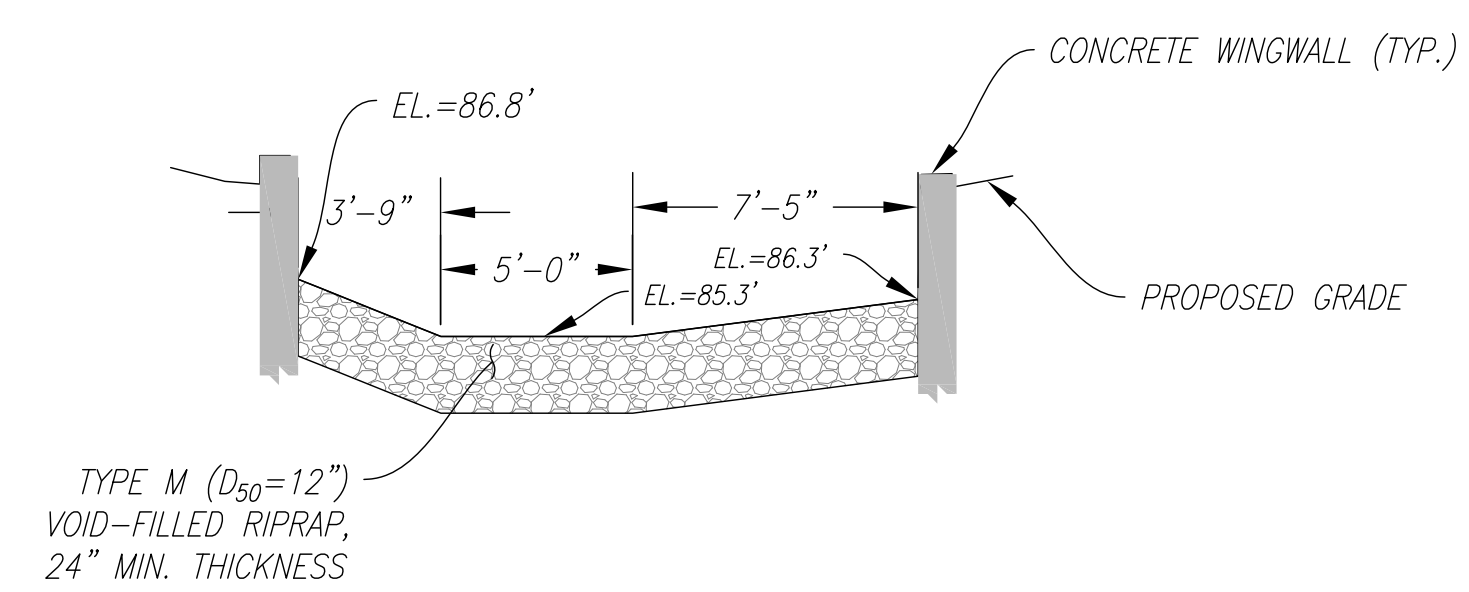
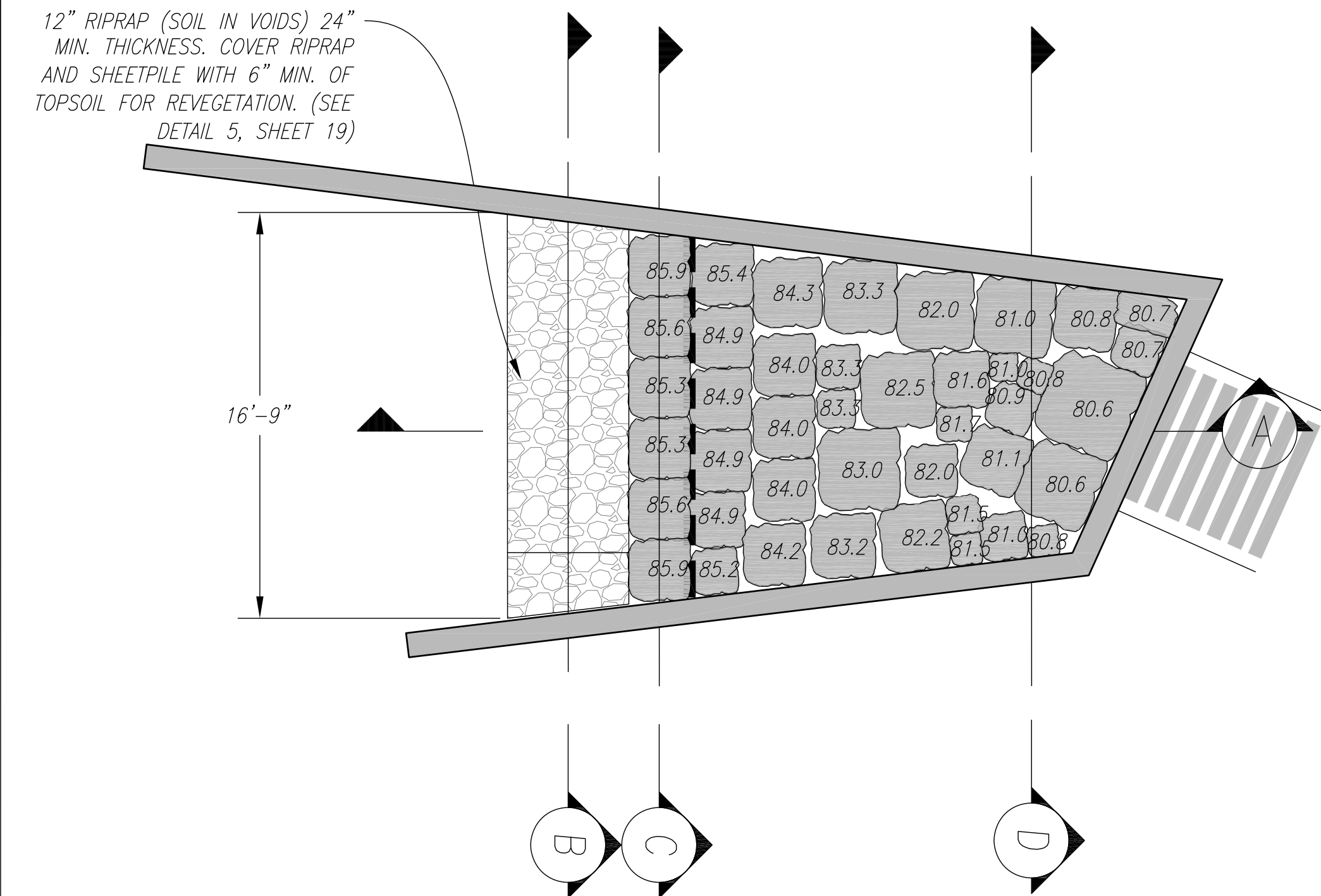
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DRAWN: CPB
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DATE: 3/4/22

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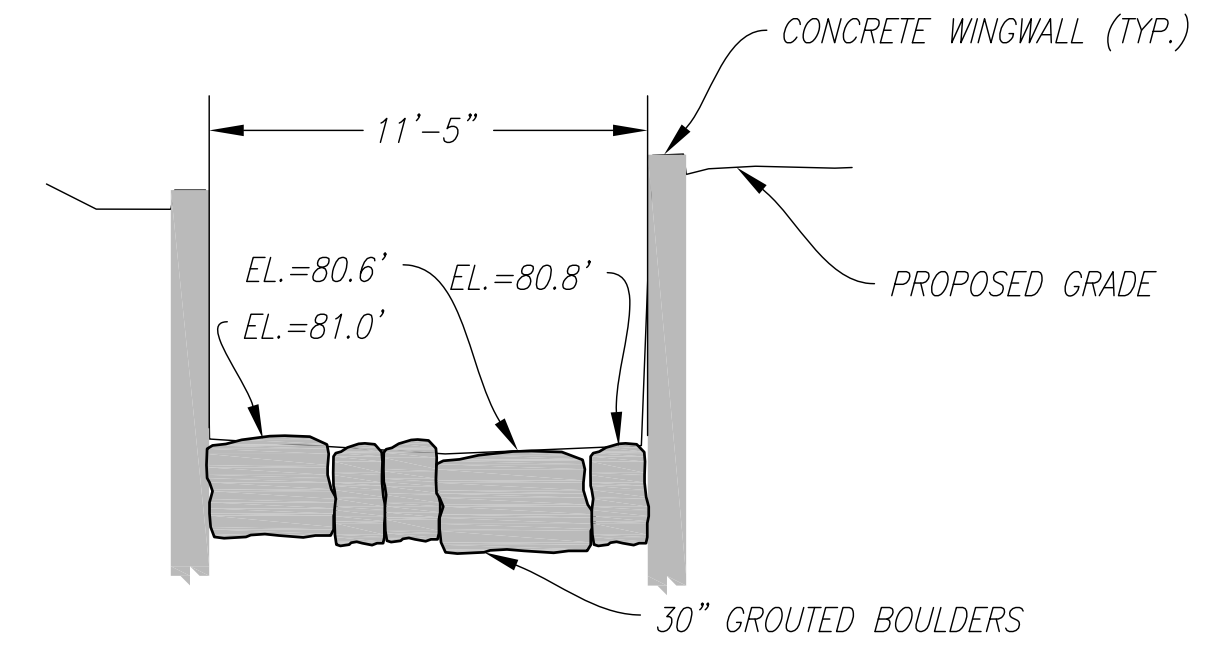
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DRAINAGEWAY A-1 CULVERT REPLACEMENT
CHANNEL SECTIONS (2 OF 2)

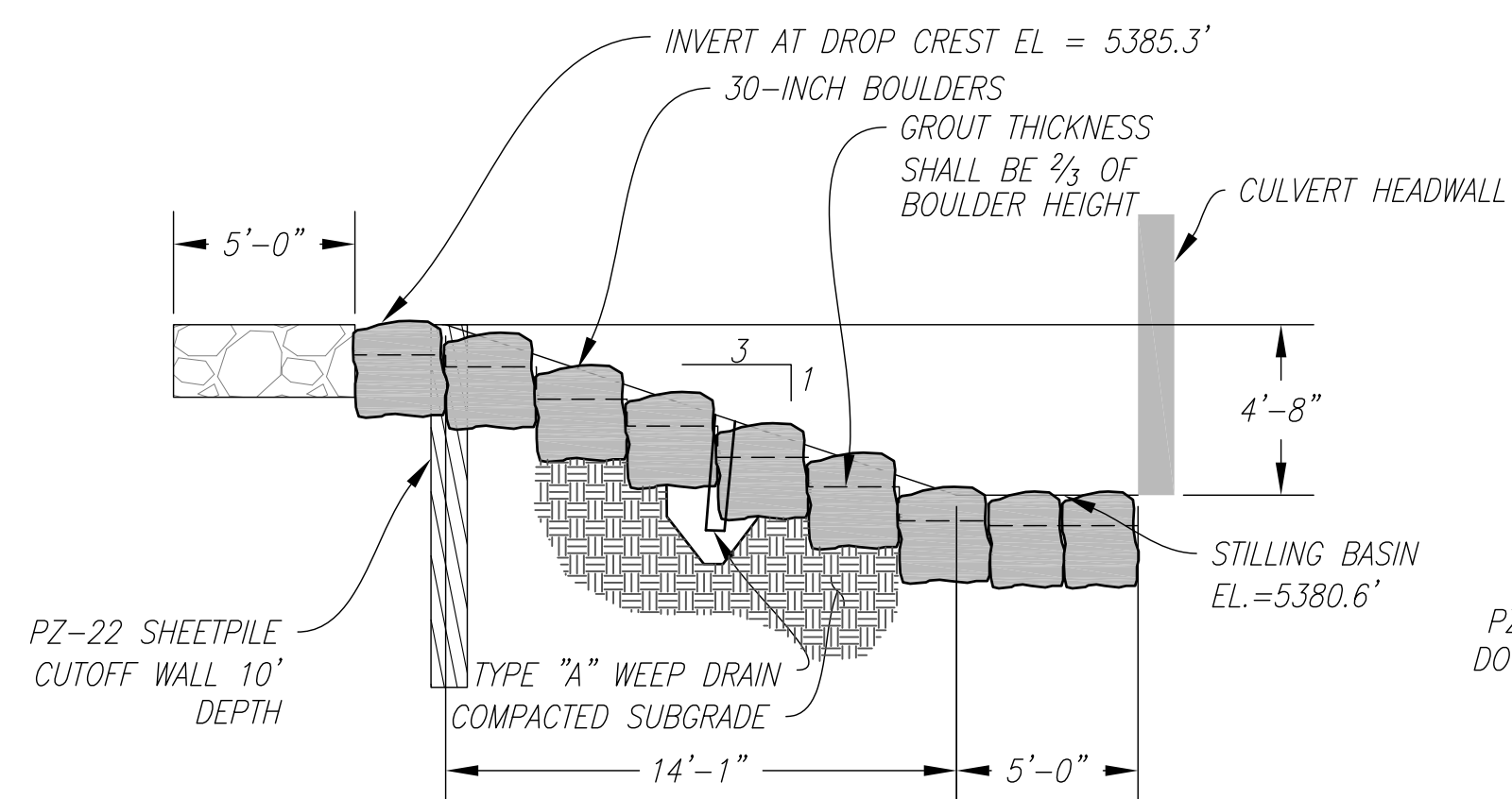
SHEET/REFERENCE NO.
14
OF
31



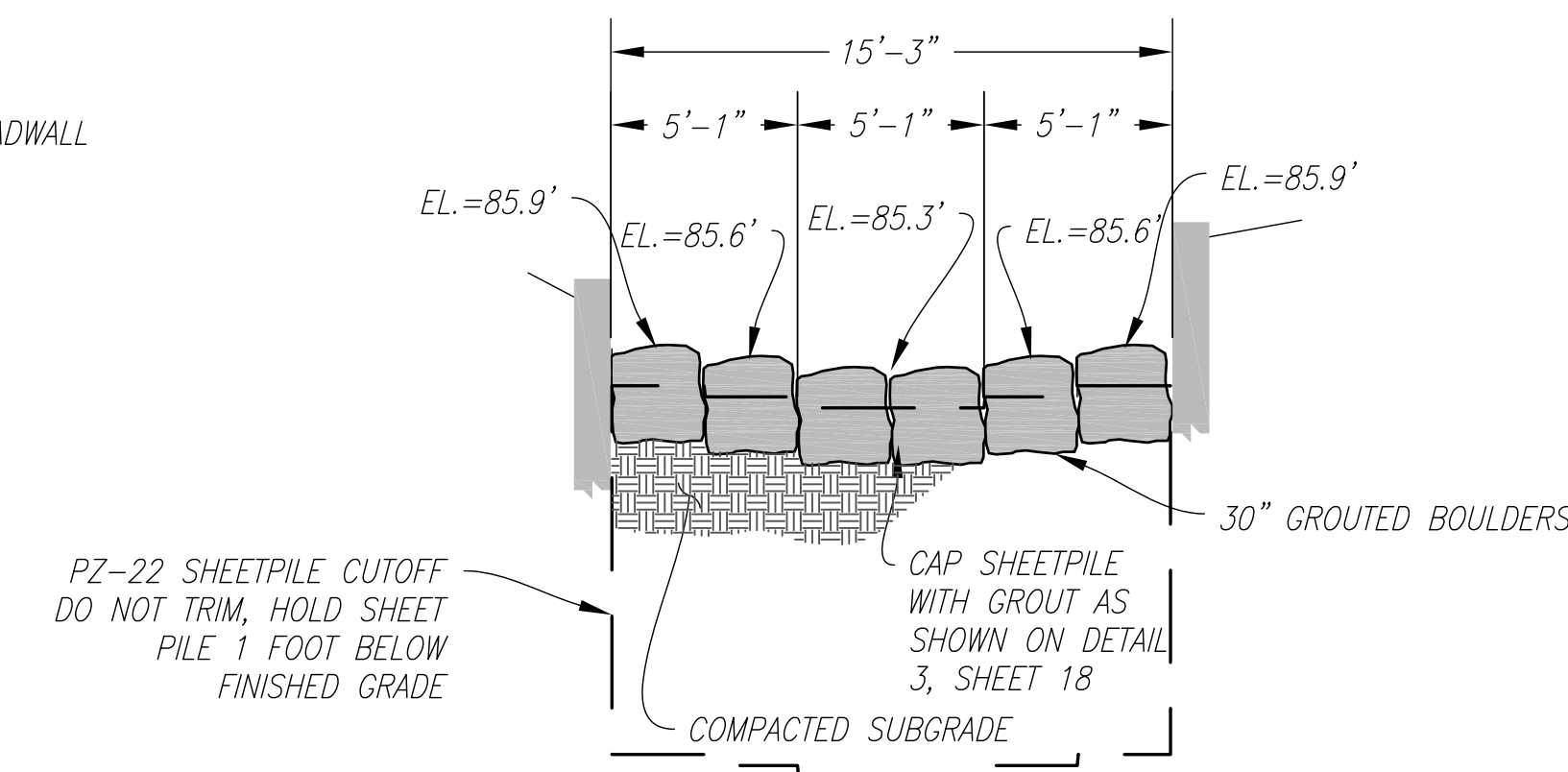
SECTION B



SECTION D



SECTION A



SECTION C

DROP STRUCTURE LAYOUT TABLE				
STATION	POINT #	NORTHING	EASTING	DESCRIPTION
14+44.5	1	1238038.9	3102237.8	CENTER OF UPSTREAM END OF RIPRAP
14+37.0	2	1238038.5	3102245.3	CENTER OF SHEETPILE CUTOFF
14+22.9	3	1238037.8	3102259.4	CENTER OF DOWNSTREAM END OF DROP FACE
14+44.5	4	1238047.9	3102238.3	CHANNEL LEFT EXTENT OF UPSTREAM END OF RIPRAP
14+37.0	5	1238046.6	3102245.7	CHANNEL LEFT EXTENT OF SHEETPILE CUTOFF
14+44.5	6	1238031.2	3102237.4	CHANNEL RIGHT EXTENT OF UPSTREAM END OF RIPRAP
14+37.0	7	1238031.7	3102245.0	CHANNEL RIGHT EXTENT OF SHEETPILE CUTOFF

SHEET PILE LAYOUT TABLE					
STATION	POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
14+37.0	8	1238046.6	3102245.7	5384.9	CHANNEL LEFT EXTENT OF SHEETPILE CUTOFF
14+37.0	9	1238044.1	3102245.6	5384.6	SHEETPILE CUTOFF GRADE BREAK
14+37.0	10	1238041.5	3102245.5	5384.3	SHEETPILE CUTOFF GRADE BREAK
14+37.0	11	1238036.6	3102245.2	5384.3	SHEETPILE CUTOFF GRADE BREAK
14+37.0	12	1238034.1	3102245.1	5384.6	SHEETPILE CUTOFF GRADE BREAK
14+37.0	13	1238031.7	3102245.0	5384.9	CHANNEL RIGHT EXTENT OF SHEETPILE CUTOFF

NOT FOR CONSTRUCTION

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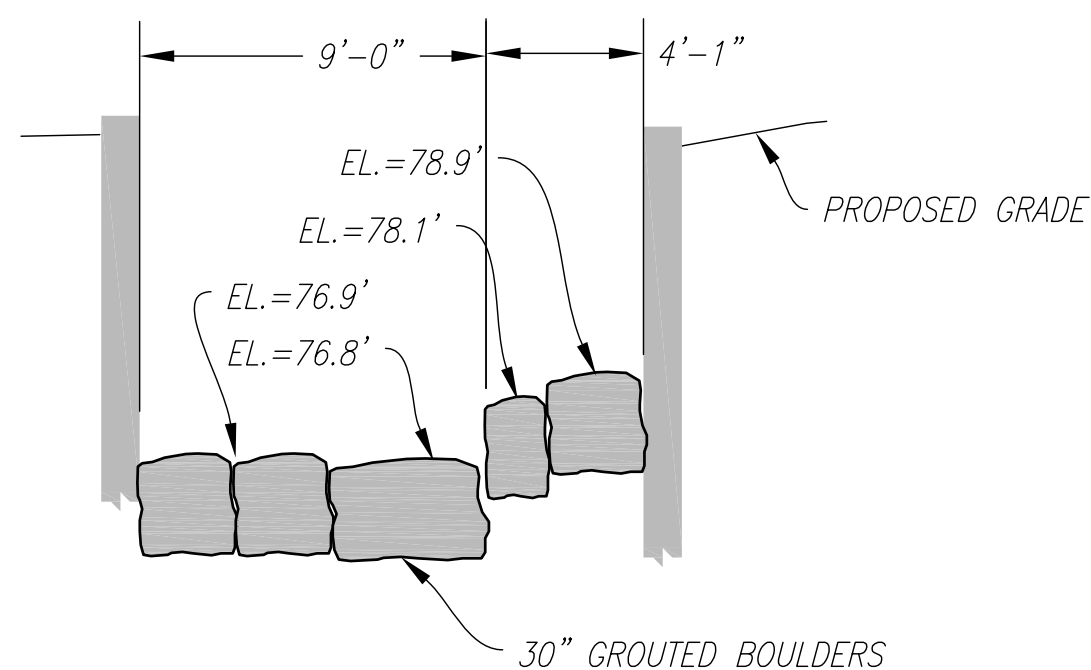
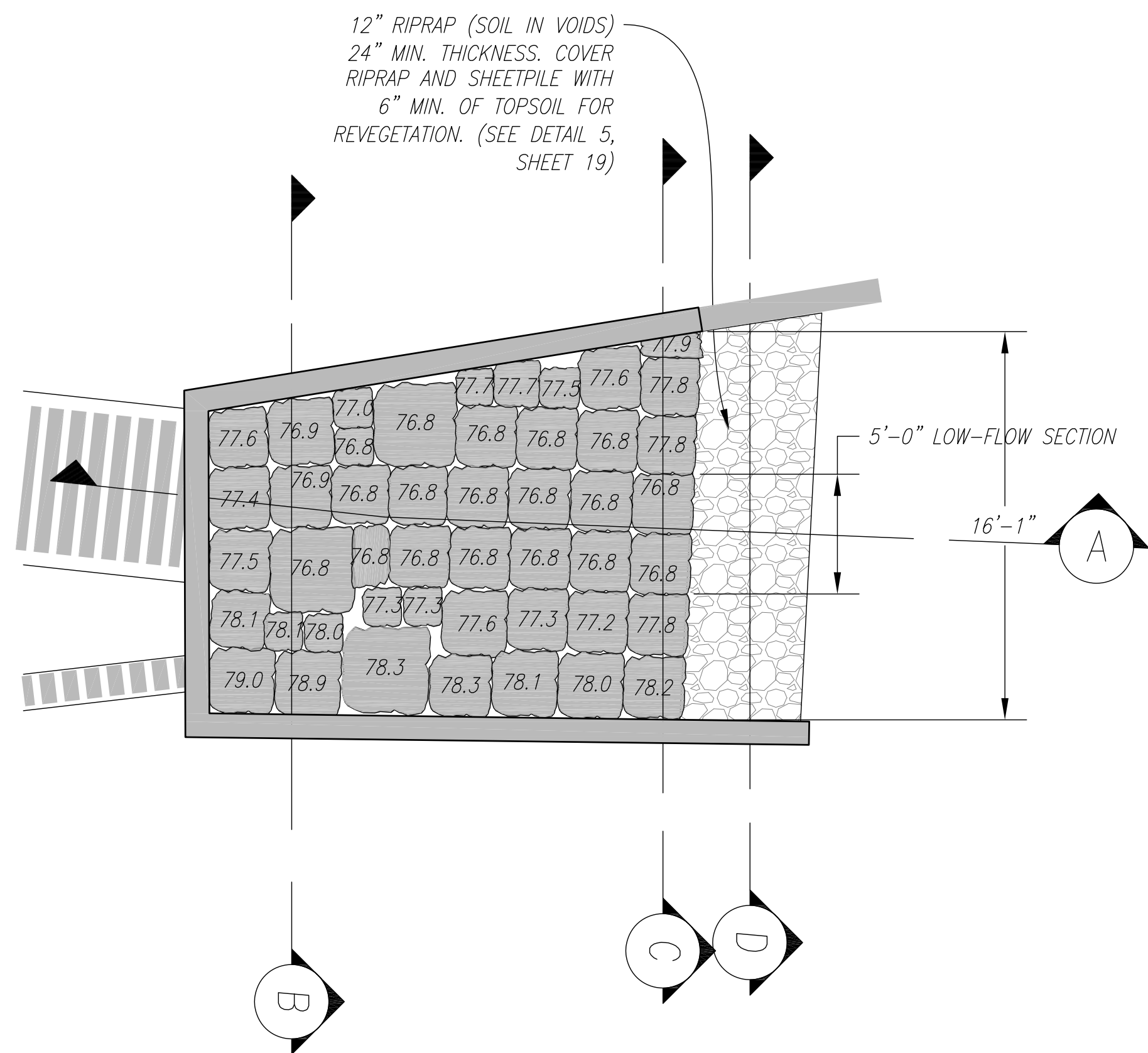
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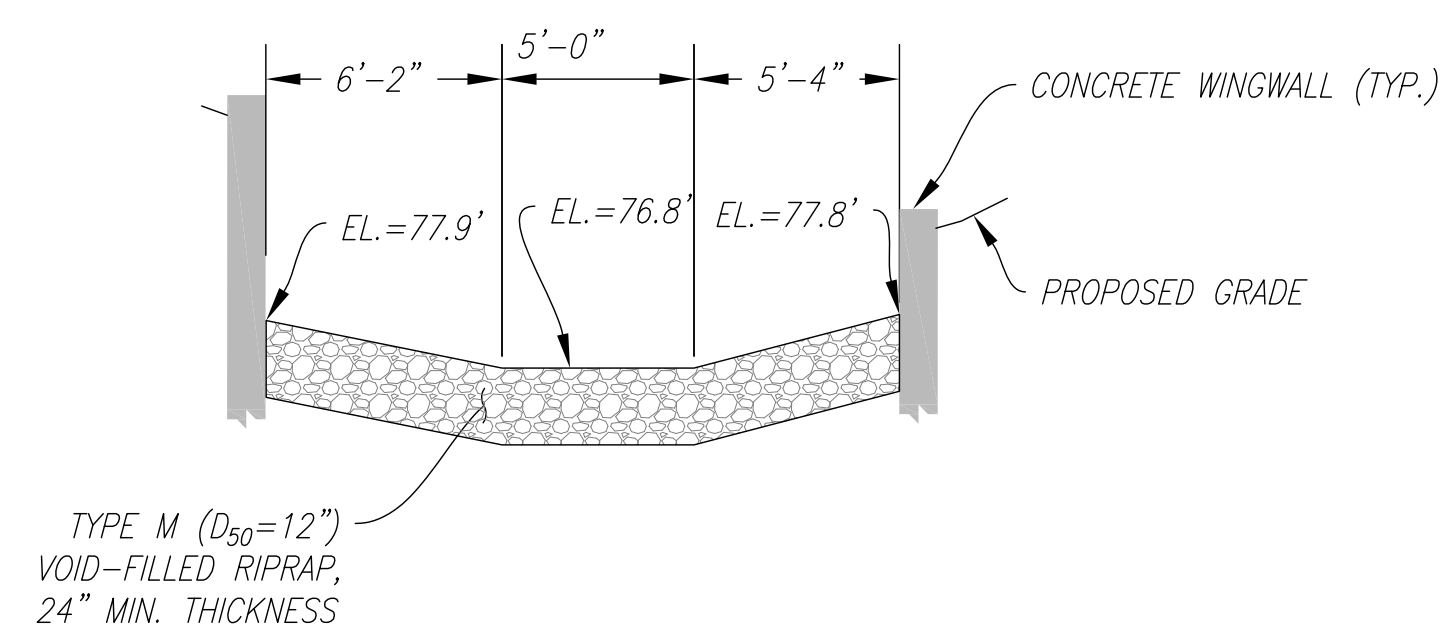
DRAINAGEWAY A-1 CULVERT REPLACEMENT

DROP STRUCTURE LAYOUT

SHEET/REFERENCE NO.
15
OF
31

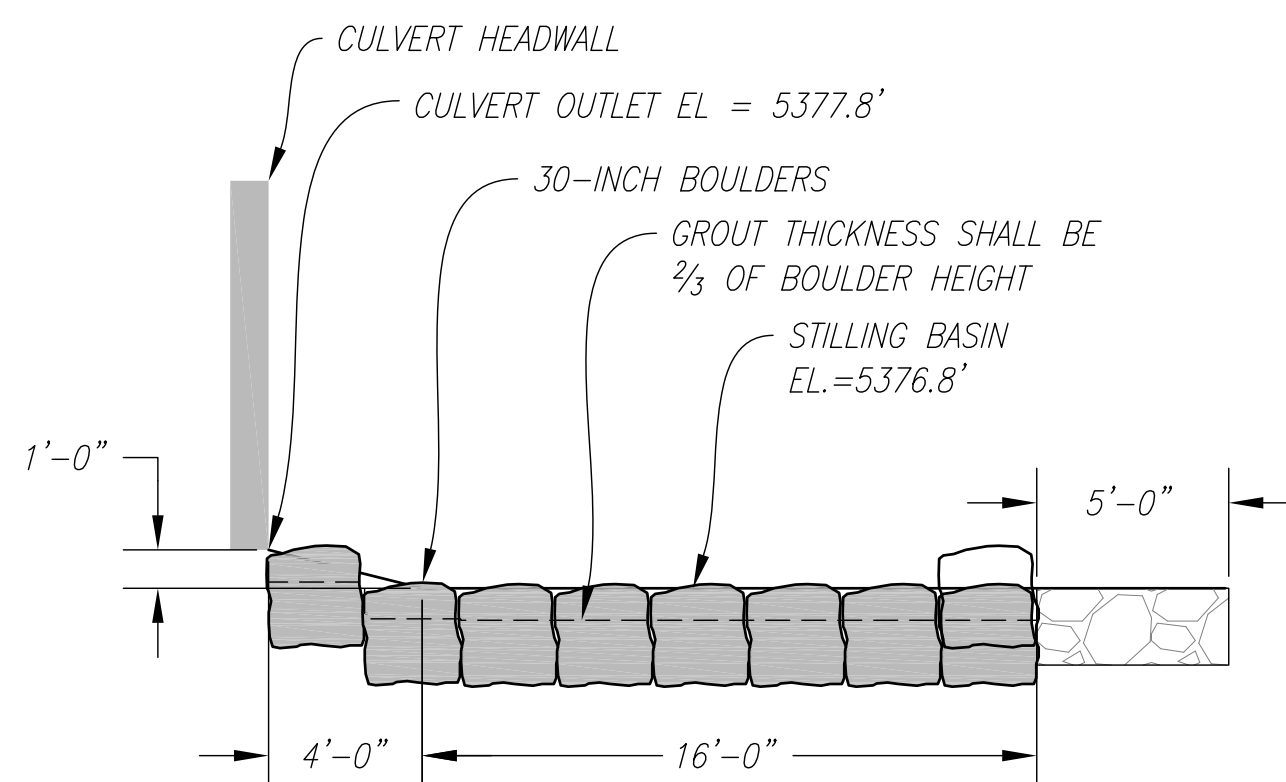


SECTION B

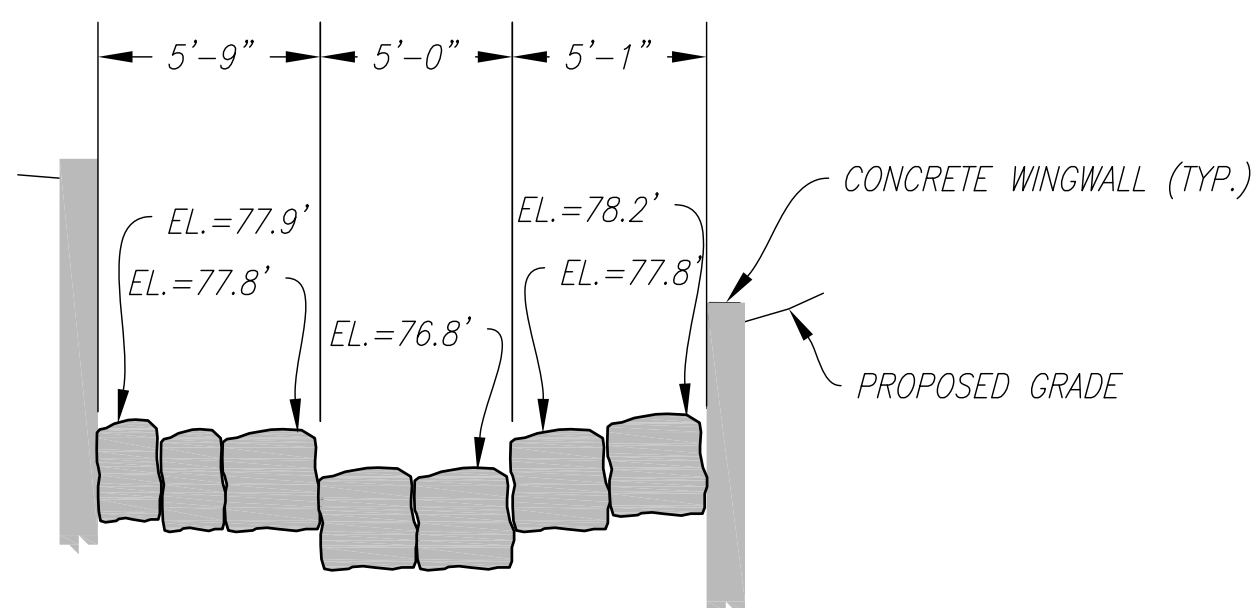


SECTION D

GROUTED BOULDER BASIN LAYOUT TABLE				
STATION	POINT #	NORTHING	EASTING	DESCRIPTION
11+60.0	8	1237991.7	3102515.4	CENTER OF BOTTOM OF DROP
11+44.6	9	1237990.9	3102530.8	CENTER OF LOW FLOW SECTION
11+41.0	10	1237990.7	3102534.4	CENTER OF DOWNSTREAM RIPRAP

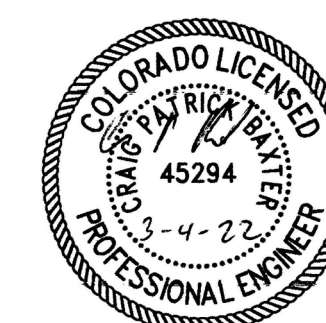


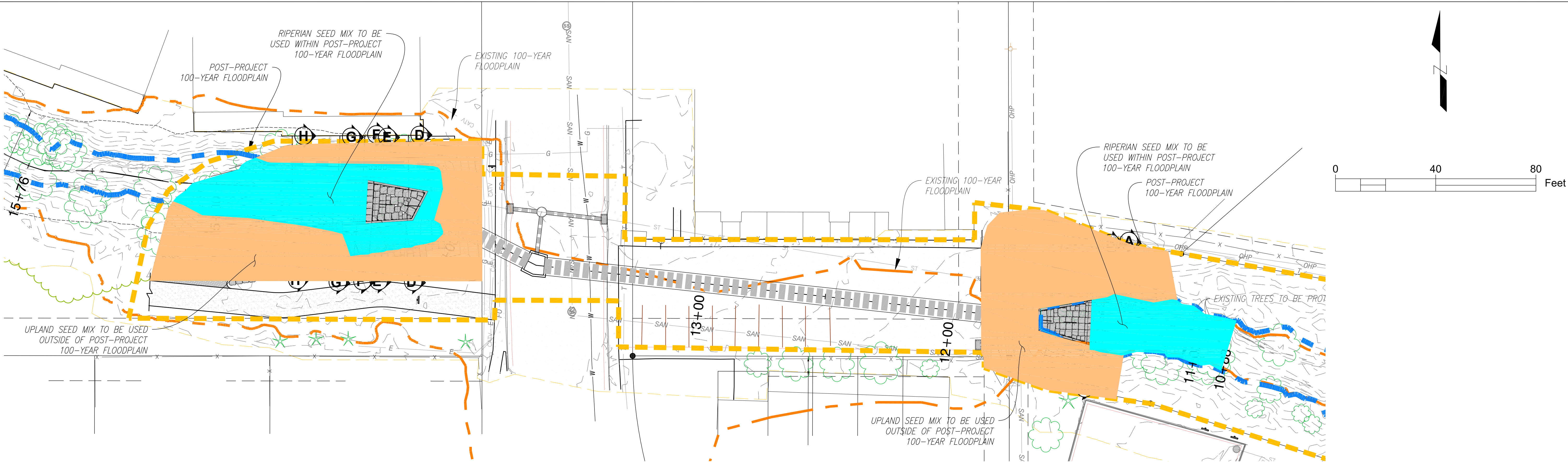
SECTION A



SECTION C

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CULVERT REPLACEMENT AREA

6,074 Zone Area (ft²):
0.153 Zone Area (ac)*

Riparian Seeding

Type	SCIENTIFIC NAME	COMMON NAME	VARIETY	LB/AC	% of seed mix	PLS Needed**
Gramanoid	<i>Bouteloua gracilis</i>	Blue grama	Lovington	2.0	0.16	0.32
Gramanoid	<i>Elymus canadensis</i>	Canada wildrye	Mandan	11.0	0.05	0.60
Gramanoid	<i>Nasella viridula</i>	Green needlegrass	Chucaras (if available)	7.5	0.05	0.38
Herb/Forb	<i>Lupinus argenteus</i>	Silvery Lupine	-	25.0	0.01	0.25
Herb/Forb	<i>Tradescantia occidentalis</i>	Spiderwort	-	0.1	0.01	0.001
Herb/Forb	<i>Monarda fistulosa</i>	Wild bergamont	-	0.8	0.01	0.01
Herb/Forb	<i>Achillea millefolium</i>	Yarrow	-	1.0	0.01	0.01
Gramanoid	<i>Elymus trachycaulus</i>	Slender wheatgrass	Pryor	8.3	0.20	1.65
Gramanoid	<i>Pascopyrum smithii</i>	Western wheatgass	Native	11.0	0.25	2.75
Gramanoid	<i>Panicum virgatum</i>	Switchgrass	Native	3.0	0.15	0.45
Gramanoid	<i>Sorghastrum avenaceum (S. nutans)</i>	Indian grass	Holt	7.25	0.10	0.73
					1.00	7.14
PLS needed for Riparian Zone						1.09

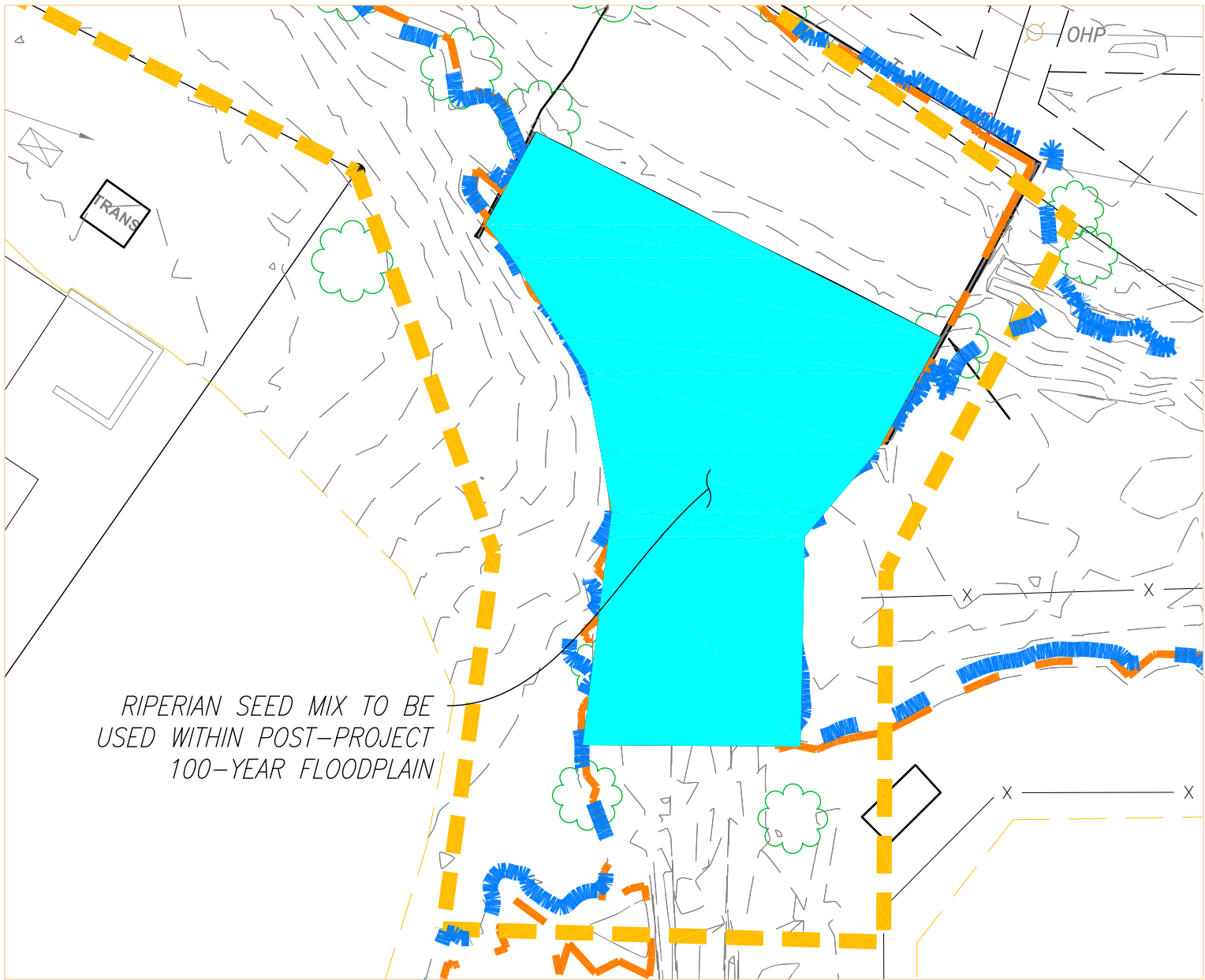
* Allows for 10% seeding overlap between zones
**PLS = Pure Live Seed – If broadcast seeding, double the rate

7,338 Zone Area (ft²):
0.185 Zone Area (ac)*

Upland Seeding

Type	SCIENTIFIC NAME	COMMON NAME	VARIETY	LB/AC	% of seed mix	PLS Needed**
Herb/Forb	<i>Achillea millefolium</i>	Yarrow	-	1	0.01	0.0
Herb/Forb	<i>Artemisia ludoviciana</i>	Prairie sage	-	0.45	0.01	0.0
Gramanoid	<i>Bouteloua curtipendula</i>	Sideoats grama	Butte	8	0.10	0.8
Gramanoid	<i>Bouteloua gracilis</i>	Blue grama	Lovington	3	0.16	0.5
Gramanoid	<i>Elymus trachycaulus</i>	Slender wheatgrass	Pryor	10	0.10	1.0
Gramanoid	<i>Distichlis spicata</i>	Saltgrass	-	8	0.10	0.8
Herb/Forb	<i>Cleome serrulata</i>	Rocky mountain beeplant	-	13	0.01	0.1
Herb/Forb	<i>Dalea purpurea</i>	Prairie clover	-	6	0.01	0.1
Herb/Forb	<i>Helianthus maximiliana</i>	Maximilian sunflower	-	5	0.01	0.1
Gramanoid	<i>Hesperostipa comata</i>	Needle-and-thread	Native	10.5	0.20	2.1
Herb/Forb	<i>Sphaeralcea coccinea</i>	Scarlet globemallow	-	1.5	0.01	0.0
Herb/Forb	<i>Linum lewisii</i>	Blue flax	-	4	0.01	0.0
Gramanoid	<i>Pascopyrum smithii</i>	Western wheatgrass	Native	11	0.25	2.8
Herb/Forb	<i>Ratibida columnifera</i>	Yellow Coneflower	-	0.5	0.01	0.0
Gramanoid	<i>Sporobolus cryptandrus</i>	Sand dropseed	Native	0.6	0.01	0.0
					1.00	8.3
PLS needed for Upland Zone						1.53

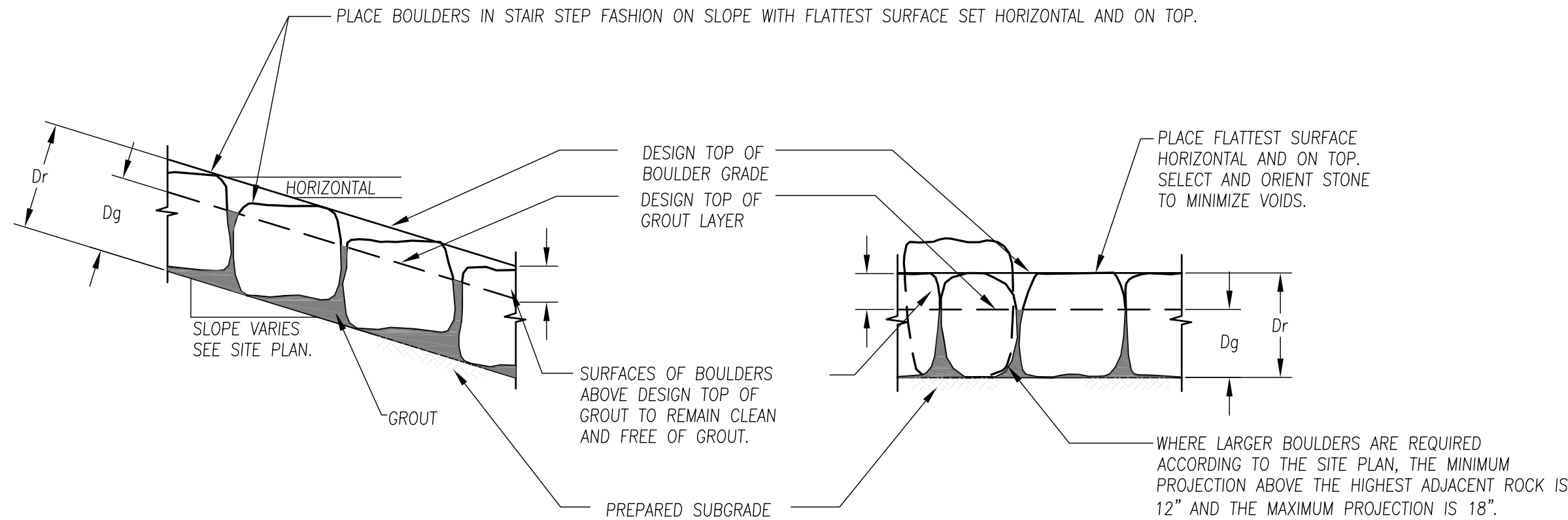
* Allows for 10% seeding overlap between zones
**PLS = Pure Live Seed – If broadcast seeding, double the rate



DITCH TURNOUT AREA

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NOTES:
1. THE TOPS OF BOULDERS MAY VARY FROM THE DESIGN GRADE BY 4"± AND EXCEPT AT THE DROP CRESTS, UP TO 20% OF THE BOULDERS MAY PROTRUDE ABOVE THE DESIGN GRADE UP TO 8" (OR AS DIRECTED OR INDICATED). AT THE DROP CREST NO BOULDER SHALL VARY FROM THE D_r BY MORE THAN 2" OR AS INDICATED ON THE DRAWINGS. THE ENGINEER MAY REQUEST GREATER VARIATION AT SELECT LOCATIONS.
2. BEFORE GROUTING, CLEAN ALL DIRT AND MATERIALS FROM ROCK THAT COULD PREVENT THE GROUT FROM BONDING TO ROCK. FINAL PLACEMENT OF BOULDERS TO BE APPROVED BY THE ENGINEER PRIOR TO GROUTING.
3. PLACE GROUT BY INJECTION METHODS TO FILL VOIDS TO THE SPECIFIED GROUT DEPTH. CLEAN EXCESS GROUT FROM ALL EXPOSED SURFACES.
4. THE CONTRACTOR SHALL CONTROL GROUT MIX AND PLACEMENT PROCEDURES TO ACHIEVE THE SPECIFIED THICKNESS AND GRADE OF THE GROUT LAYER. INTENT IS TO MINIMIZE VISIBILITY OF GROUT, BUT ACHIEVE MINIMUM THICKNESS INDICATED WHERE SPECIFIED, OR ON DRAWING.

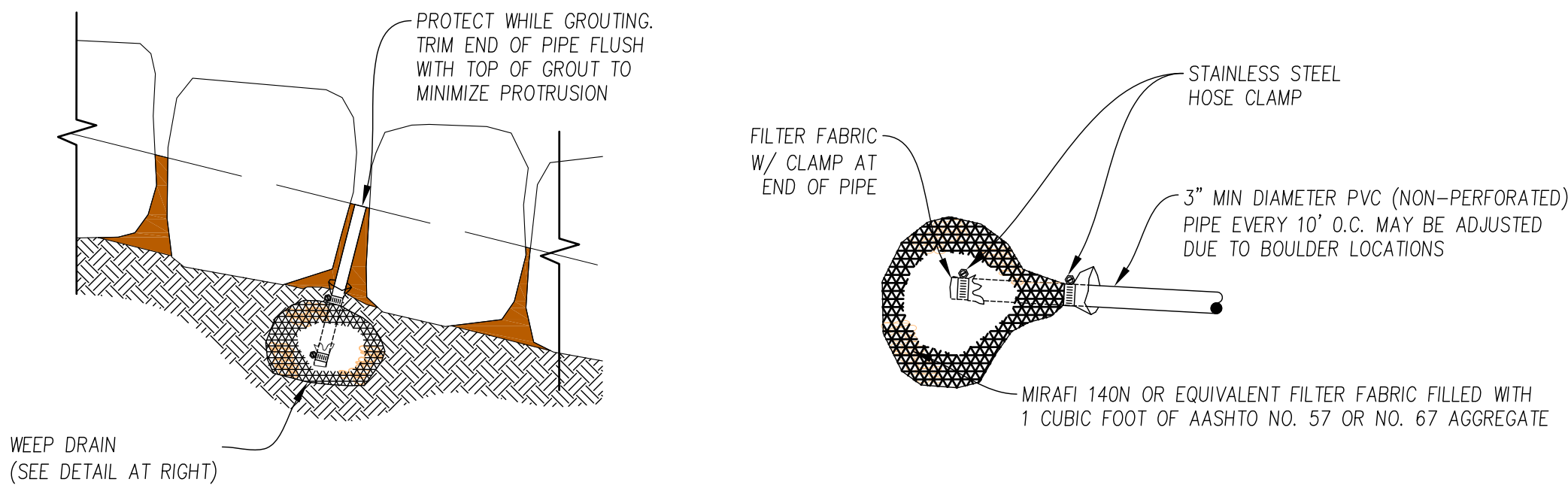
D _r	D _g
18	12
24	18
30	22
36	27
42	31
48	36
ALL DIMENSIONS IN INCHES	

D_r= DEPTH OF ROCK LAYER WHICH IS EQUIVALENT TO THE MINIMUM BOULDER SIZE. SEE TABLE THIS SHEET AND SITE PLAN.

D_g= DEPTH OF GROUT LAYER, SEE TABLE.

1
18 TYPICAL GROUTED BOULDER PLACEMENT

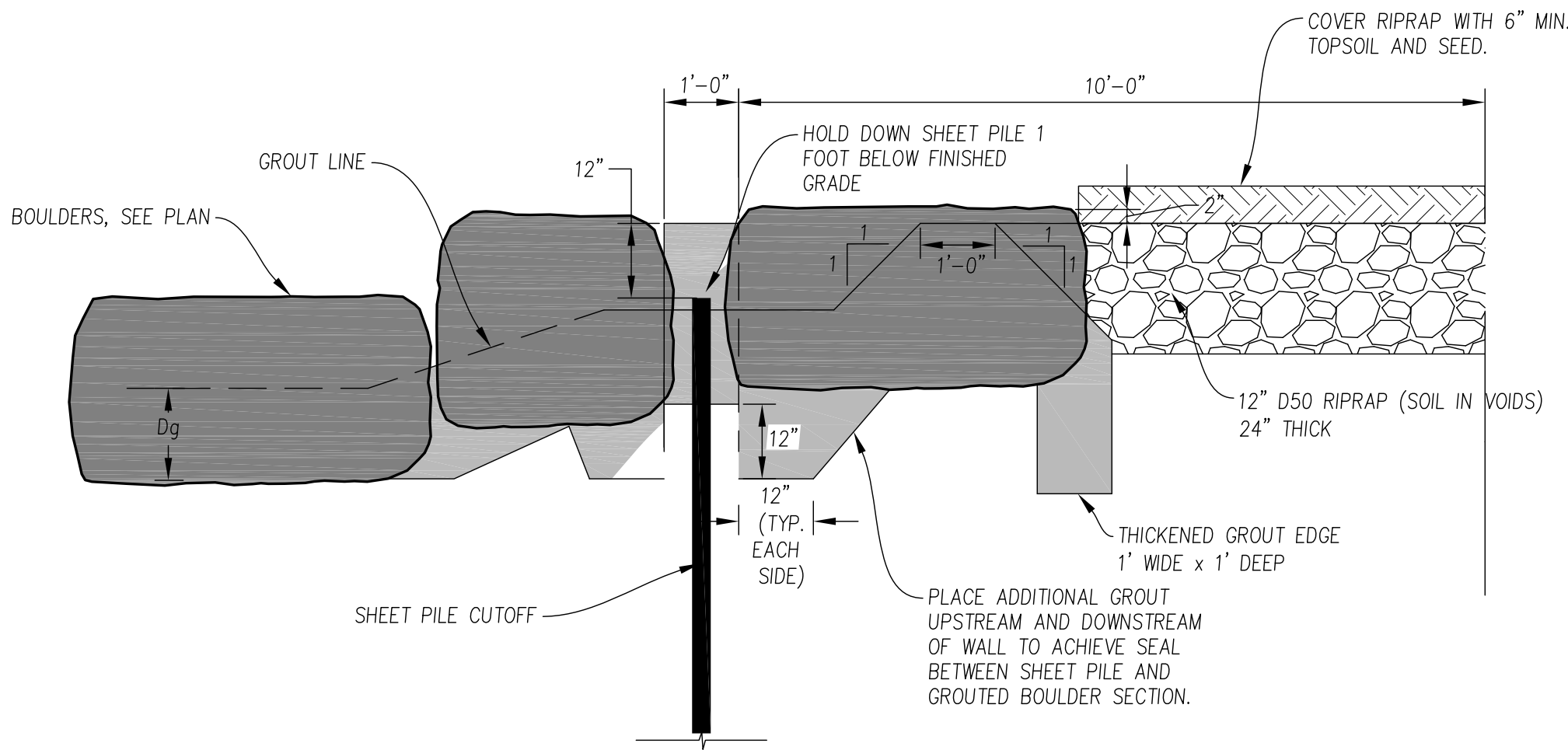
NTS



NOTE: INSTALL WEEP DRAINS FOR DROPS AND WALLS 5' AND GREATER AT 10' O.C. AT ELEVATIONS AND LOCATIONS SHOWN ON THE DRAWINGS

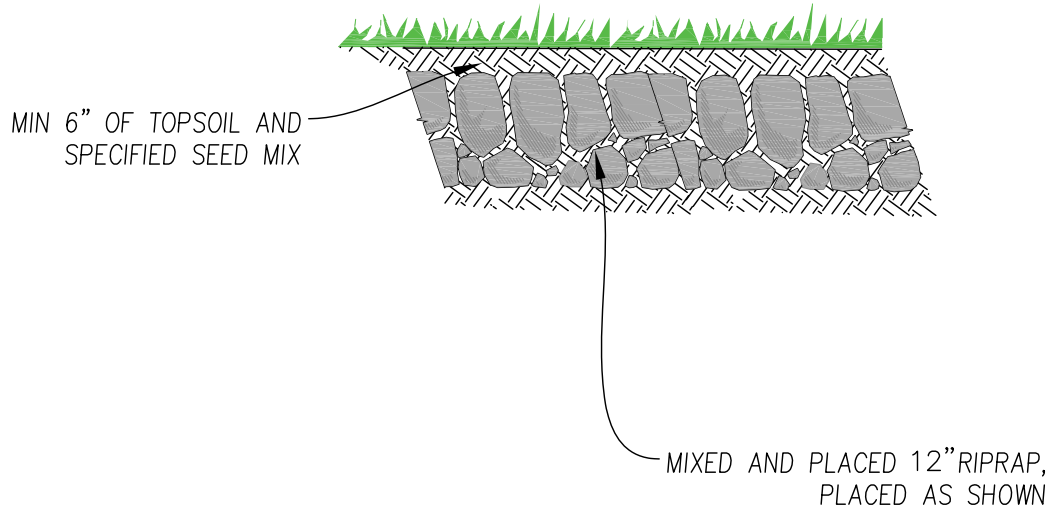
2
18 TYPICAL WEEP DRAIN SYSTEM

NTS



3
18 SHEET PILE CUTOFF INTERFACE

NTS



SOIL RIPRAP NOTES:

- THICKNESS OF SOIL RIPRAP SHALL BE NO LESS THAN THICKNESS SHOWN AND NO MORE THAN 6-INCHES GREATER THAN THE THICKNESS SHOWN.
- RIPRAP VOIDS ARE TO BE FILLED WITH NATIVE SOIL. THE RIPRAP SHALL BE PRE-MIXED WITH THE NATIVE SOIL AT THE FOLLOWING PROPORTIONS BY VOLUME: 65 PERCENT RIPRAP AND 35 PERCENT SOIL. THE SOIL USED FOR MIXING SHALL BE NATIVE TOPSOIL AND SHALL HAVE A MINIMUM FINES CONTENT OF 15 PERCENT. THE SOIL RIPRAP SHALL BE INSTALLED IN A MANNER THAT RESULTS IN A DENSE, INTERLOCKED LAYER OF RIPRAP WITH RIPRAP VOIDS FILLED COMPLETELY WITH SOIL. SEGREGATION OF MATERIALS SHALL BE AVOIDED AND IN NO CASE SHALL THE COMBINED MATERIAL CONSIST PRIMARILY OF SOIL; THE DENSITY AND INTERLOCKING NATURE OF RIPRAP IN THE MIXED MATERIAL SHALL ESSENTIALLY BE THE SAME AS IF THE RIPRAP WAS PLACED WITHOUT SOIL.
- A SURFACE LAYER OF TOPSOIL SHALL BE PLACED OVER THE SOIL RIPRAP ACCORDING TO THE THICKNESS SPECIFIED ON THE CONTRACT DRAWINGS. THE TOPSOIL SURFACE LAYER SHALL BE COMPACTED TO APPROXIMATELY 85% OF MAXIMUM DENSITY AND WITHIN TWO PERCENTAGE POINTS OF OPTIMUM MOISTURE IN ACCORDANCE WITH ASTM D698. TOPSOIL SHALL BE ADDED TO ANY AREAS THAT SETTLE.
- ALL SOIL RIPRAP THAT IS BURIED WITH TOPSOIL SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY TOPSOIL PLACEMENT.

4
18 BURIED SOIL RIPRAP PROTECTION DETAIL AND NOTES

NTS



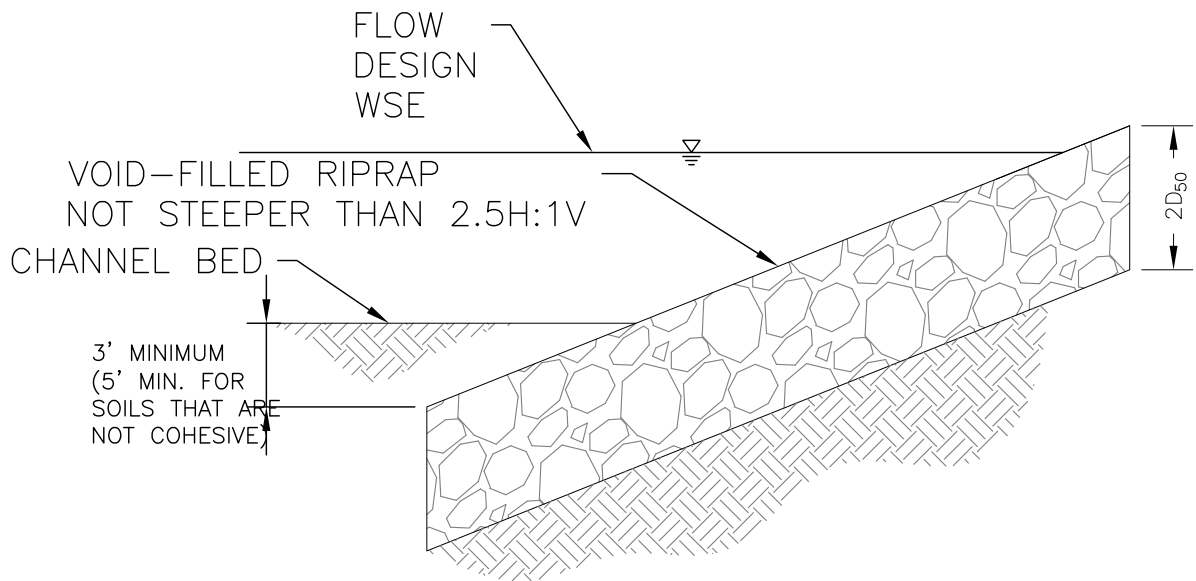
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TABLE 1. MIX REQUIREMENTS FOR TYPE M AND H VOID-FILLED RIPRAP (D ₅₀ = 12 TO 18 INCH)		
APPROPRIATE PROPORTIONS (BY VOLUME)	MATERIAL TYPE	MATERIAL DESCRIPTION
6 PARTS	RIPRAP	D ₅₀ = 12-INCH (TYPE M) OR D ₅₀ = 18-INCH (TYPE H), SEE TABLE 3
2 PART	VOID-FILL MATERIAL	7-INCH MINUS CRUSHED ROCK SURGE (100% PASSING 7-INCH SIEVE, 80-100% PASSING 6-INCH SIEVE, 35-50% PASSING 3-INCH SIEVE, 10-20% PASSING 1½-INCH SIEVE)
1 PART	VOID-FILL MATERIAL	VTC (VEHICLE TRACKING CONTROL) ROCK (CRUSHED ROCK WITH 100% PASSING 4-INCH SIEVE, 50-70% PASSING 3-INCH SIEVE, 0-10% PASSING 2-INCH SIEVE)
1 PART	VOID-FILL MATERIAL	4-INCH MINUS PIT RUN SURGE (ROUND RIVER ROCK AND SAND, WELL GRADED, 90-100% PASSING 4-INCH SIEVE, 70-80% PASSING 1½-INCH SIEVE, 40-60% PASSING ¾-INCH SIEVE, 10-30% PASSING #16 SIEVE)
1 PART	VOID-FILL MATERIAL	TYPE II BEDDING (CRUSHED ROCK WITH 100% PASSING 3-INCH SIEVE, 20-90% PASSING ¾-INCH SIEVE, 0-20% PASSING #4 SIEVE, 0-3% PASSING #200 SIEVE)
½ TO 1 PART	VOID-FILL MATERIAL	NATIVE TOPSOIL



NOTE: MIX ON SITE AND PRIOR TO PLACEMENT

VOID-FILLED RIPRAP PLACEMENT AND GRADATION NOTES:

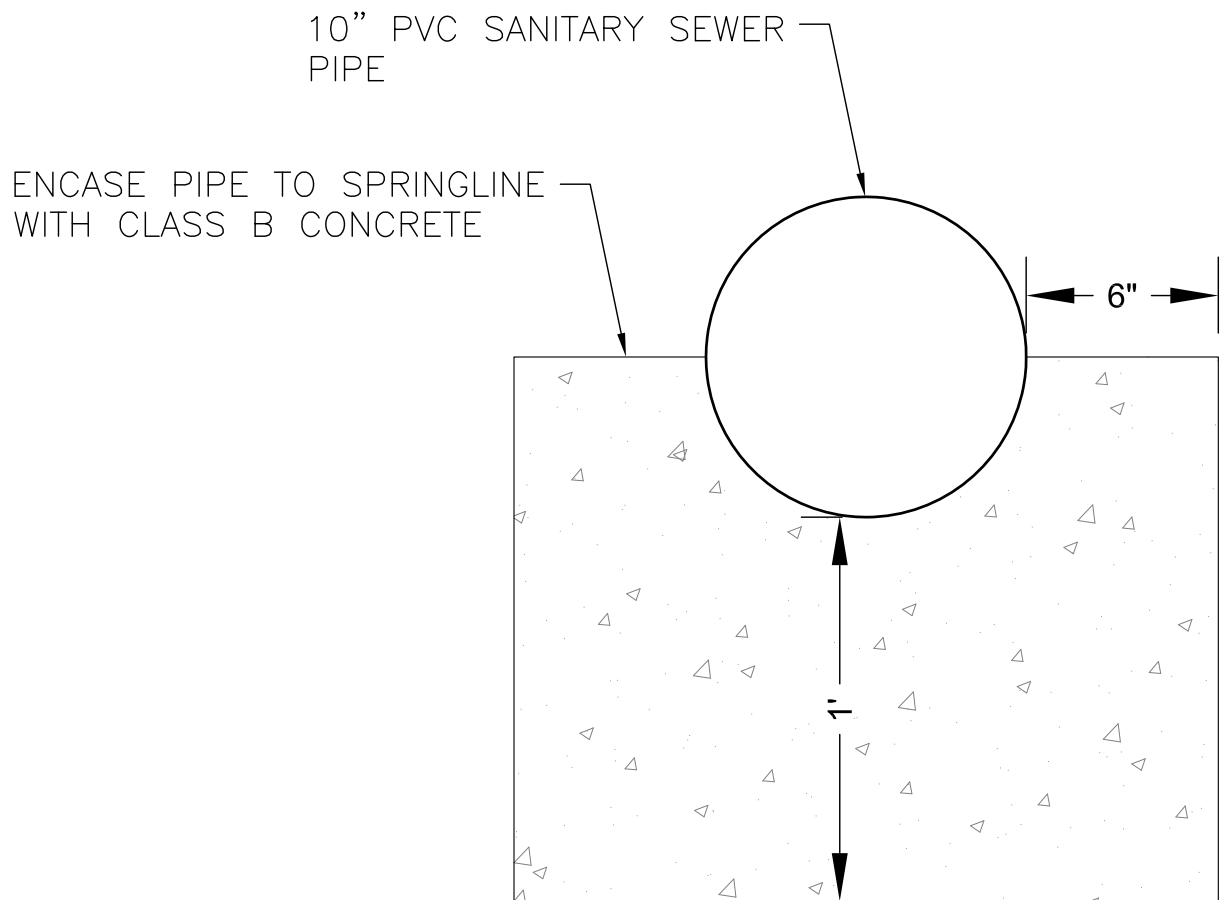
- WHERE "VOID-FILLED RIPRAP" IS DESIGNATED ON THE CONTRACT DRAWINGS, RIPRAP SHALL BE MIXED WITH THE MATERIALS AND ASSOCIATED PROPORTIONS LISTED IN TABLE 1 TO FILL THE VOIDS OF THE RIPRAP.
- THE MIX PROPORTIONS PROVIDED IN TABLE 1 ARE APPROXIMATE AND ARE SUBJECT TO ADJUSTMENT BY THE ENGINEER.
- THE RIPRAP AND VOID-FILLED MATERIALS SHALL BE STOCKPILED SEPERATELY AND THOROUGHLY MIXED PRIOR TO PLACEMENT AND SHALL BE INSTALLED AND COMPACTED SO THAT A DENSE, INTERLOCKED LAYER OF RIPRAP AND VOID-FILL MATERIAL IS PROVIDED WITH RIPRAP VOIDS COMPLETELY FILLED. THE LOOSE MATERIAL SHALL BE PLACED IN A SINGLE LIFT OF SUFFICIENT HEIGHT SUCH THAT FINAL GRADE WILL BE ACHIEVED UPON COMPACTED. IF THE COMPACTED MATERIAL IS BELOW FINAL GRADE, PLACEMENT OF ONLY THE SMALLER VOID-FILL MATERIALS TO ACHIEVE FINAL GRADE IS NOT PERMITTED. IN SUCH CASES IT IS NECESSARY TO ADD MORE STANDARD SIZED VOID-FILLED RIPRAP AND REMIX THE ENTIRE THICKNESS OF ROCK TO ACHIEVE THE DESIGN SECTION. SEGREGATION OF MATERIALS SHALL BE AVOIDED AND IN NO CASE SHALL THE

COMBINED MATERIAL CONSIST PRIMARILY OF THE VOID-FILL MATERIALS. THE DENSITY AND INTERLOCKING NATURE OF RIPRAP IN THE MIXED MATERIAL SHALL ESSENTIALLY BE THE SAME AS IF THE RIPRAP WAS PLACED WITHOUT FILLING THE VOIDS.

- COMPACTION OF THE VOID-FILLED RIPRAP SHALL BE PERFORMED BY WHEEL ROLLING WITH HEAVY RUBBER-TIRED EQUIPMENT (E.G. FRONT END LOADER). THE MOISTURE CONTENT OF THE MIXTURE SHALL BE AT OPTIMUM CONDITIONS PRIOR TO COMPACTION AND WATER SHALL BE ADDED, AS NECESSARY, AT THE DIRECTION OF THE ENGINEER.
- WHERE INDICATED ON THE DRAWINGS, A SURFACE LAYER OF MOIST TOPSOIL SHALL BE PLACED OVER THE VOID-FILLED RIPRAP. THE TOPSOIL SURFACE LAYER SHALL BE COMPACTED TO APPROXIMATELY 85% OF MAXIMUM DENSITY AND WITHIN TWO PERCENTAGE POINTS OF OPTIMUM MOISTURE IN ACCORDANCE WITH ASTM D698. TOPSOIL SHALL BE ADDED TO ANY AREAS THAT SETTLE.
- ALL VOID-FILLED RIPRAP THAT IS BURIED WITH TOPSOIL SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY TOPSOIL PLACEMENT.

TABLE 2. VOID-FILLED RIPRAP PLACEMENT AND GRADATION			
RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D ₅₀ * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

*D₅₀ = MEAN ROCK SIZE



5
19

VOID-FILLED RIPRAP PLACEMENT AND GRADATION (FROM MHFD)

NTS

6
19

SANITARY SEWER PIPE ENCASEMENT DETAIL

NTS



PREPARED FOR:

MHFD

MILE HIGH FLOOD DISTRICT
2480 W. 26TH AVE., STE. 156-B
DENVER, CO 80211

LOCAL GOVERNMENT SPONSOR:

CITY OF LOUISVILLE
DEPARTMENT OF PUBLIC WORKS
749 MAIN ST.
LOUISVILLE, CO 80027

PREPARED BY:

Enginuity

ENGINUITY ENGINEERING SOLUTIONS
10106 WEST SAN JUAN WAY, STE 215
LITTLETON, COLORADO 80127
PH : 303-872-9112
FX : 303-872-9104

DESIGNED:

DRAWN:

CHECKED:

DATE:

REVISION	DESCRIPTION	BY	DATE
(R-)			
(R-)			
(R-)			
(R-)			

CONSULTANT ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE MILE HIGH FLOOD DISTRICT (MHFD) AND CITY OF LOUISVILLE STANDARDS AND STATUTES, RESPECTIVELY; AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

DRAINAGEWAY A-1 CULVERT REPLACEMENT

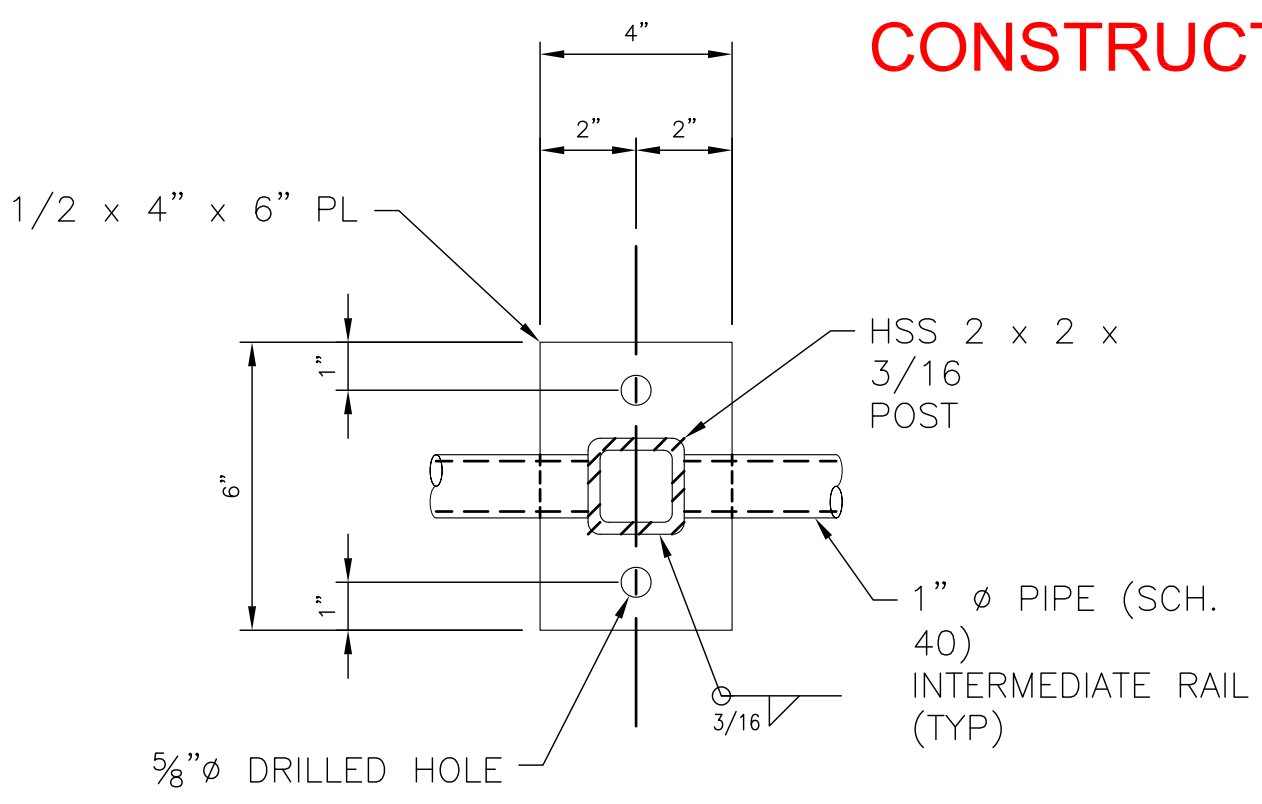
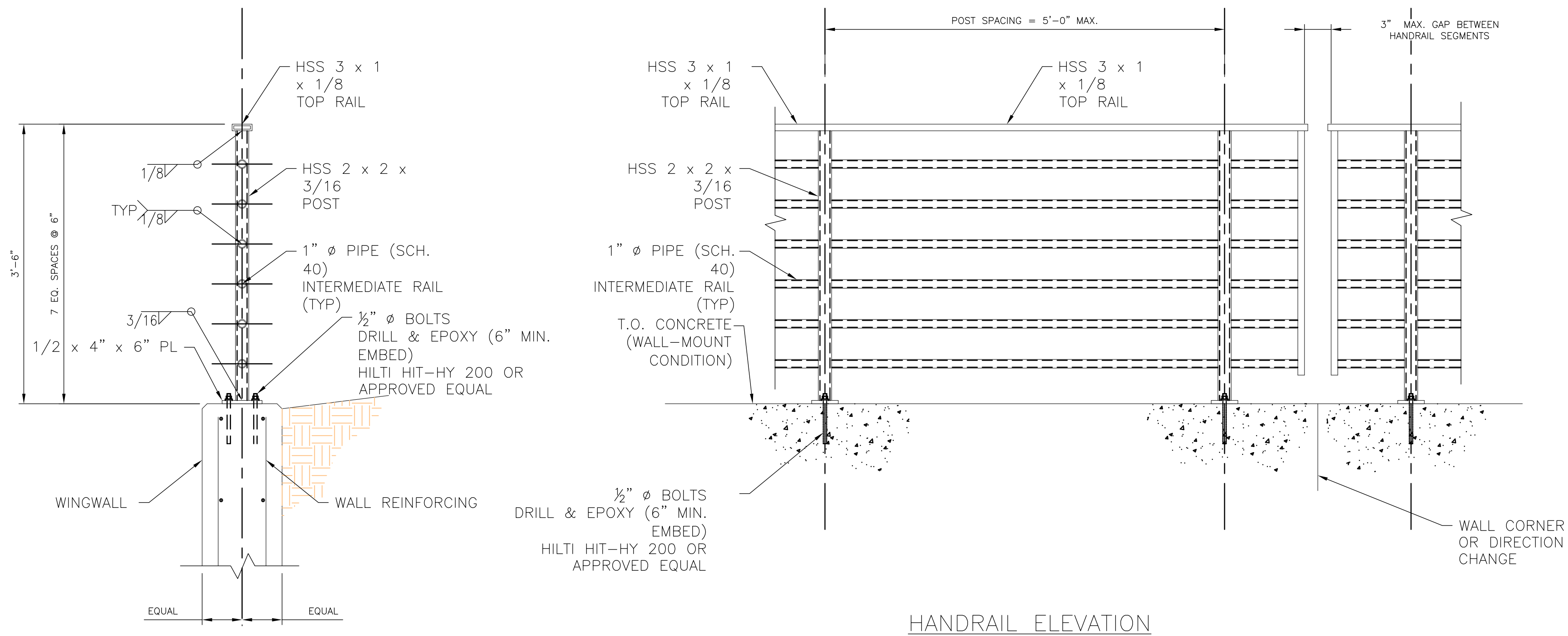
PROJECT SPECIFIC DETAILS (2 OF 3)

SHEET/REFERENCE NO.

19
OF
31

NOT FOR CONSTRUCTION

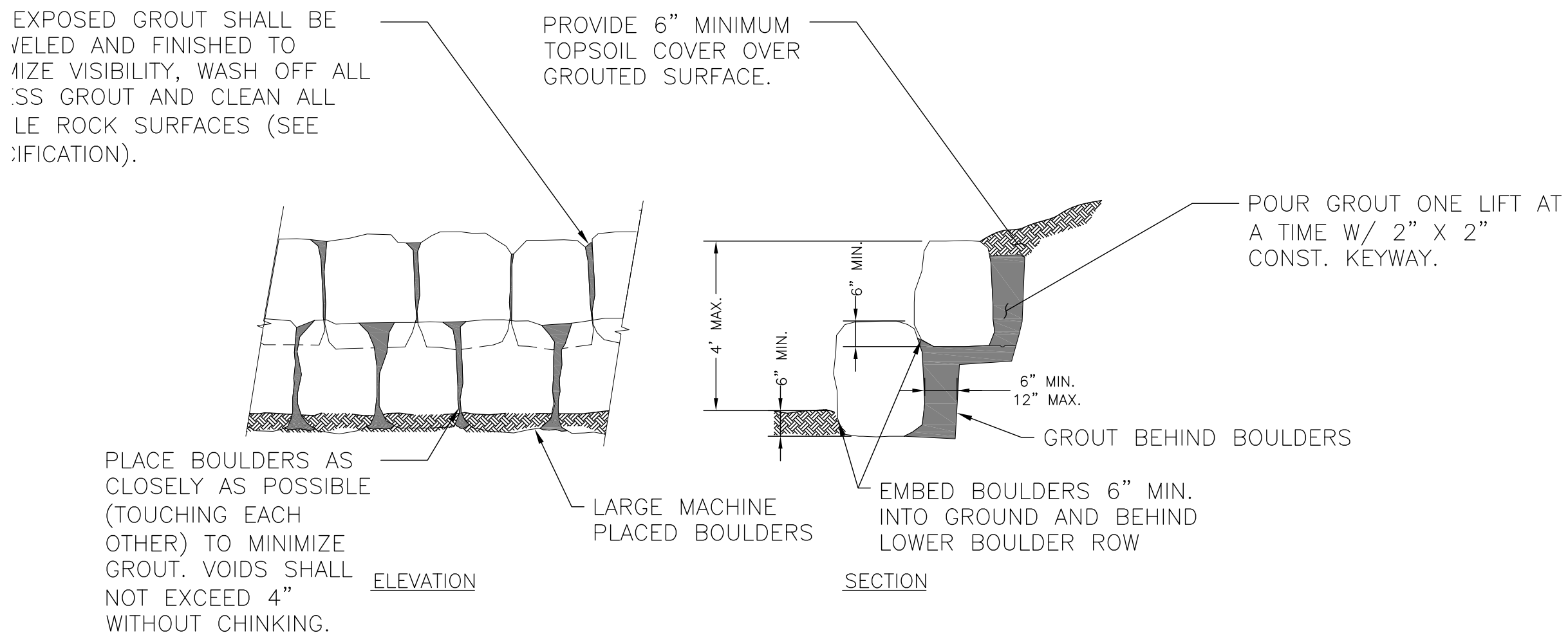
PLANS REFLECT IMPROVEMENTS FOR CLOMR MODELING ONLY AND ARE NOT OF SUFFICIENT DETAIL TO BE USED FOR CONSTRUCTION



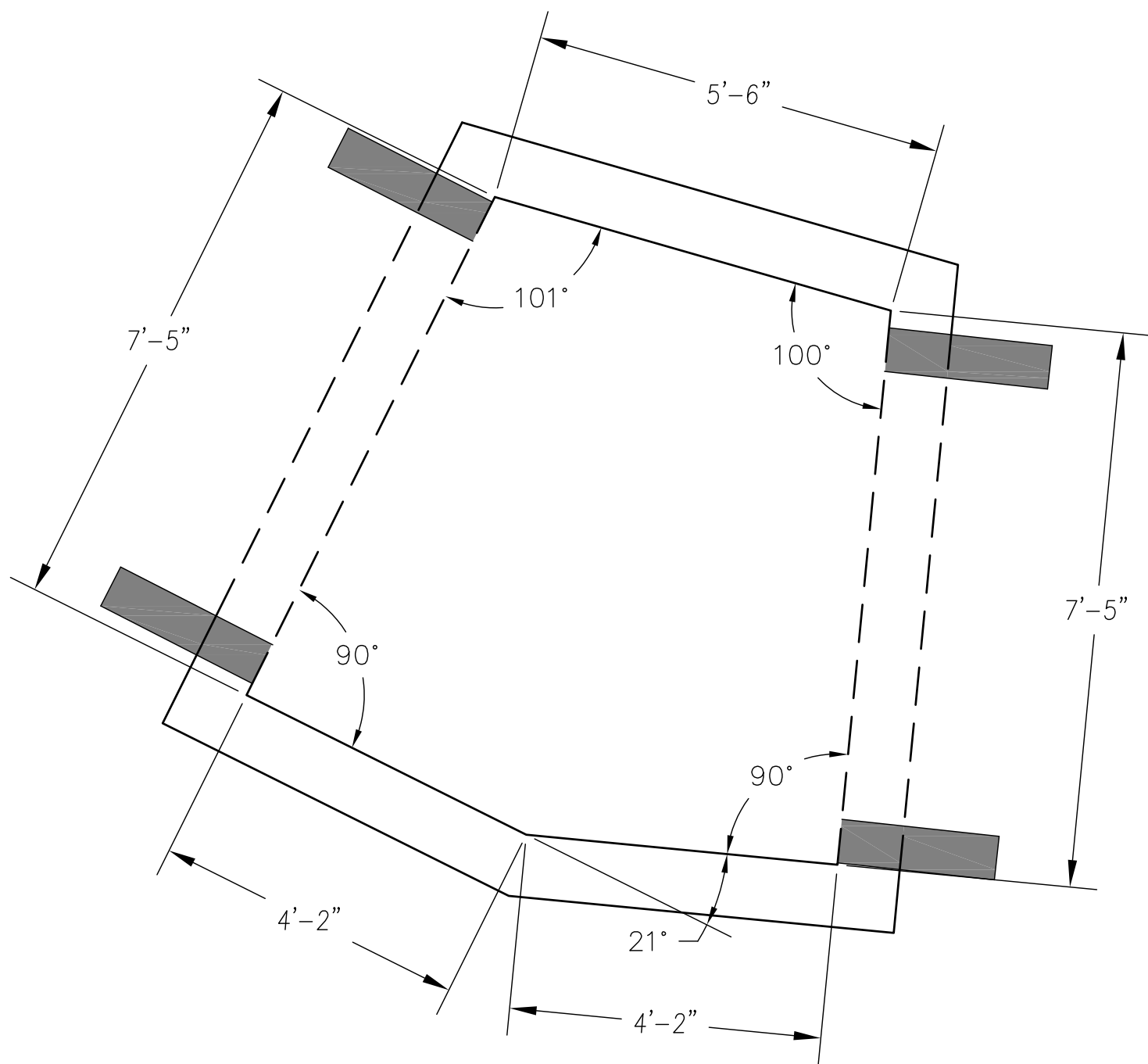
HANDRAIL SECTION - WALL-MOUNT

HANDRAIL ELEVATION

7/20 SAFETY HANDRAIL NTS



8/20 STACKED BOULDER WALL NTS



9/20 MODIFIED DENVER TYPE-P MANHOLE SCALE: 1"=2'



DESIGNED:			
DRAWN:			
CHECKED:			
DATE:			

REVISION	DESCRIPTION	BY	DATE
(R-)			
(R-)			
(R-)			
(R-)			
(R-)			

CONSULTANT ENGINEER CERTIFICATION
I HEREBY AFFIRM THAT THESE PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE MILE HIGH FLOOD DISTRICT (MHFD) AND CITY OF LOUISVILLE STANDARDS AND STATUTES, RESPECTIVELY; AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

DRAINAGEWAY A-1 CULVERT REPLACEMENT
PROJECT SPECIFIC DETAILS (3 OF 3)



NOTES:

1. DEPTH OF BEDDING BELOW PIPE:

$\frac{D}{2}$	$d(\text{MIN.})$
27" & SMALLER	3"
30" - 60"	4"
66" & LARGER	6"
2. GRANULAR BEDDING SHALL BE PLACED FROM THE TRENCH BOTTOM TO THE HORIZONTAL CENTERLINE OF THE PIPE.
3. SELECT BACKFILL FROM THE CENTERLINE TO 12" ABOVE THE PIPE SHALL BE PLACED IN 6" LIFTS AND HAND COMPACTED TO 95%.

REVISIONS		 City of Louisville DEPARTMENT OF PUBLIC WORKS COLORADO - SINCE 1882	DRAWN BY: ML JAN 94 APPROVED BY: CMD MAR 15
DATE	BY		SHEET
MAR 2015	CMD		
		TYPICAL STORM SEWER TRENCH	
		41 OF 74	

G:\STANDARDS DETAILS\DETAILS\STORM\M1 TYPICAL STORM SEWER TRENCH.DWG



- 4' OR 5' WIDE WALKS SHALL BE 4" THICK
- 8' WIDE WALKS SHALL BE 6" THICK
- ALL WALKS AT RESIDENTIAL DRIVEWAYS SHALL BE 6" WITH FIBERMESH

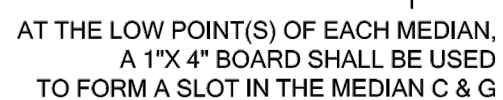


CONTRACTION OR
WEAKENED PLANE JOINT



REVISIONS		 City of Louisville DEPARTMENT OF PUBLIC WORKS COLORADO - SINCE 1882	DRAWN BY: ML JAN 94 APPROVED BY: CMD MAR 15
DATE	BY		SHEET
MAR 2015	CMD		
		CURBALK & WALK	57 OF 74

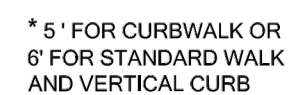
G:\STANDARDS DETAILS\DETAILS\STREET\57 CURB\WALK & WALK.DWG



MEDIAN CURB & GUTTER

REVISIONS		 City of Louisville DEPARTMENT OF PUBLIC WORKS COLORADO - SINCE 1882	DRAWN BY: ML JAN-84 APPROVED BY: CMD MAR 15
DATE	BY		SHEET
MAR 2015	CMD		
		CURB & GUTTER	58 OF 74

G:\STANDARDS DETAILS\DETAILS\STREET\58 CURB & GUTTER.DWG



ISOMETRIC VIEW

- NOTES:**

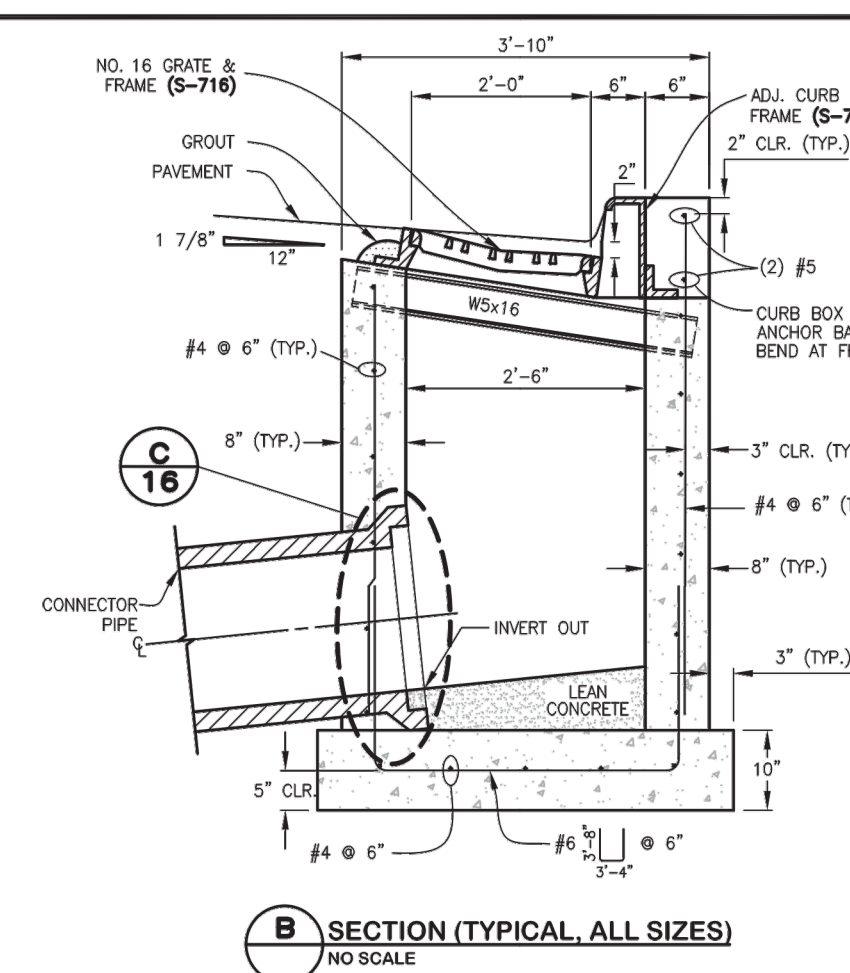
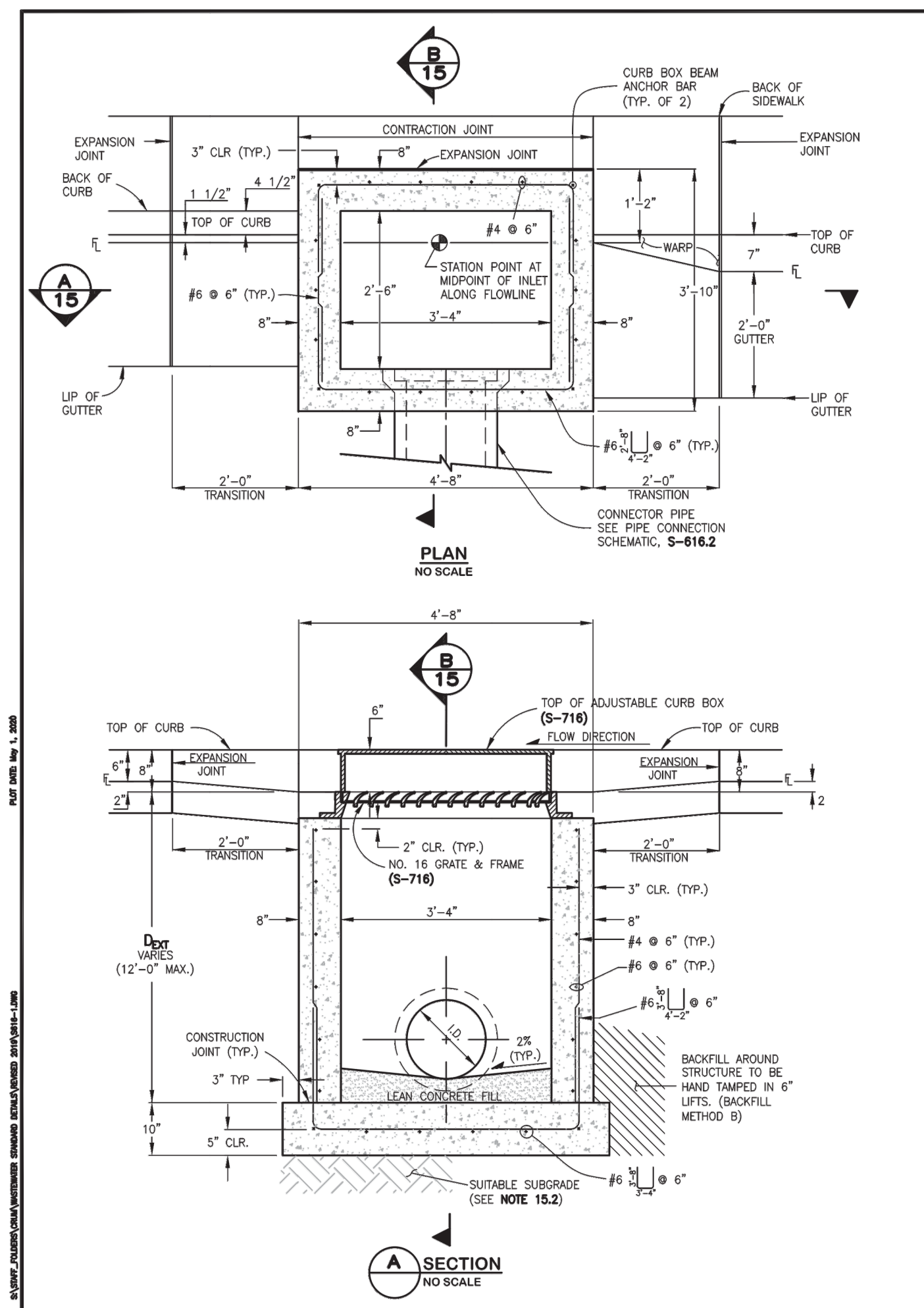
1. CONTRACTION JOINTS ARE REQUIRED AT EACH SIDE OF
2. EACH SECTION AND EVERY 10' (MAX) ALONG THE DRIVEWAY.
3. EXPANSION JOINT REQUIRED IF DRIVEWAY IS CONCRETE BEHIND
4. CURB CUT.
5. BACK OF CURB CUT EXTENDS TO BACK OF WALK OR BIKE PATH.
6. NO END OF CURB SHALL BE CONSTRUCTED WITHIN 5' - 0" OF A
7. PROPERTY LINE OR 30' - 0" OF A PROPERTY CORNER.
8. TRAFFIC ENGINEER SHALL APPROVE LOCATION OF CURB CUT
9. BEFORE CONSTRUCTION.
10. 6.5 SACK CONCRETE WITH FIBERMESH REQUIRED.

TYPE OF CUT	WIDTH OF CURB CUT	TOTAL WIDTH	MINIMUM THICKNESS
SINGLE FAMILY	12' - 16'	22' - 26'	6"
MULTI-FAMILY	16' - 25'	26' - 35'	8"
COMMERCIAL	30' - 40'	40' - 50'	10"

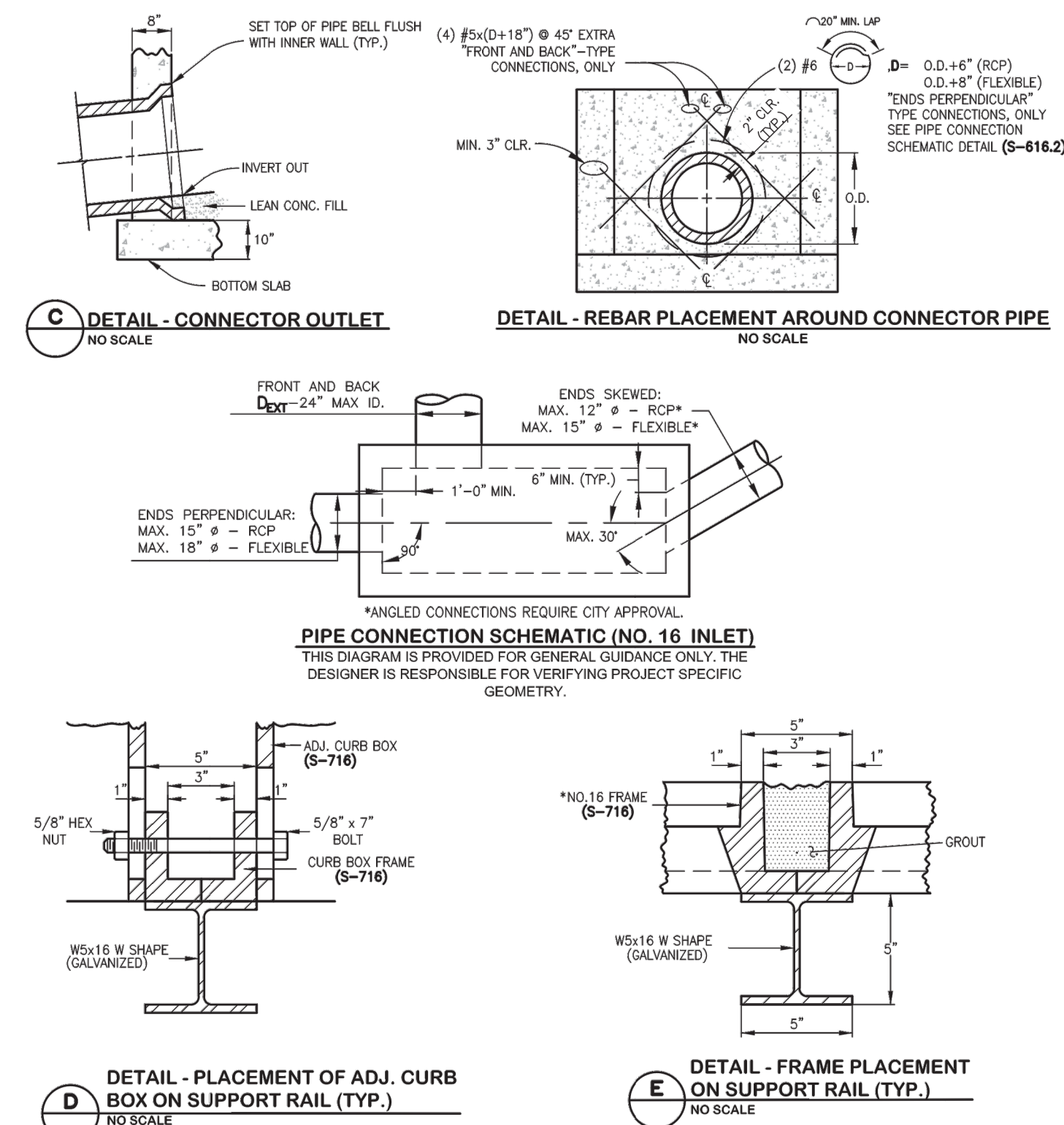
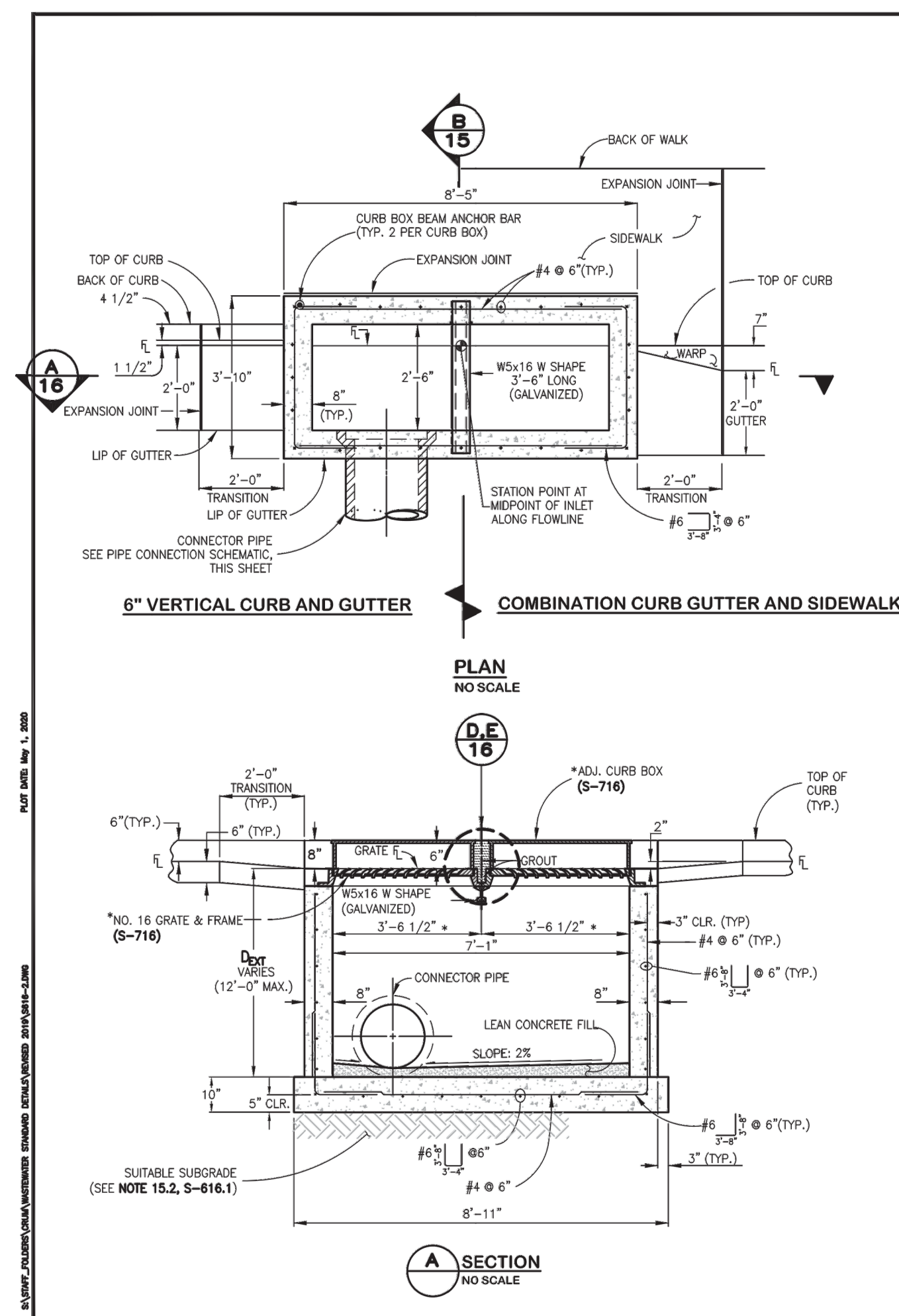
REVISIONS		 City of Louisville DEPARTMENT OF PUBLIC WORKS COLORADO - SINCE 1882	DRAWN BY: ML JAN 94
DATE	BY		APPROVED BY: CMD MAR 15
MAR 95	CMD		
		RAMP DRIVE AT ATTACHED WALK	SHEET 61 OF 74

G:\STANDARDS DETAILS\DETAILS\STREET\61 RAMP DRIVE AT ATTACHED WALK.DWG

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OF
31



STANDARD DETAILS		CITY AND COUNTY OF DENVER 2000 W. 3RD AVE. DENVER, CO 80223 www.denvergov.org		 DENVER THE REAL HIGH CITY		NO.		DESCRIPTION OF CONDITIONS		DATE		BY	
SINGLE NUMBER 16 INLET													
S-616.1													



DOUBLE NUMBER 16 INLET NOTES:

16.1 SEE DETAIL SPECIFICATIONS SECTION 11.05 STORM INLETS FOR MORE INFORMATION. USE OF THIS DETAIL WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT.

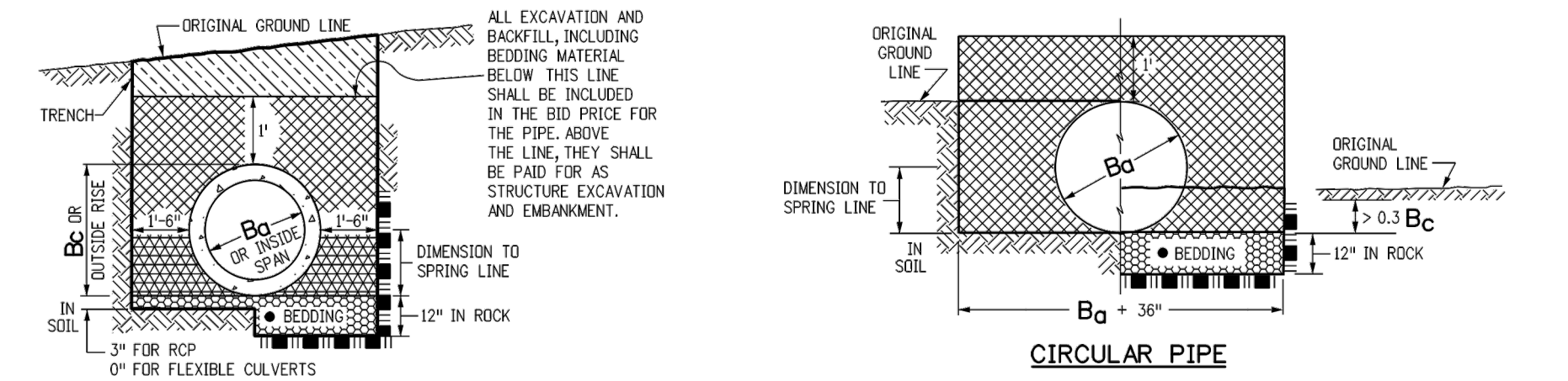
16.2 SEE GENERAL NOTES ON **S-616.1**.

16.3 EXPANSION JOINT MATERIAL SHALL BE PLACED FULL DEPTH OF THE CURB AND GUTTER, SEAWALL, CONCRETE PAVEMENT, AS APPLICABLE. THE TOP PORTION OF THE JOINT SHALL BE SEALED WITH SILICONE SEALANT.

16.4 SEE **S-616.1** FOR REBAR PLACEMENT AT WALL PENETRATION DETAIL.

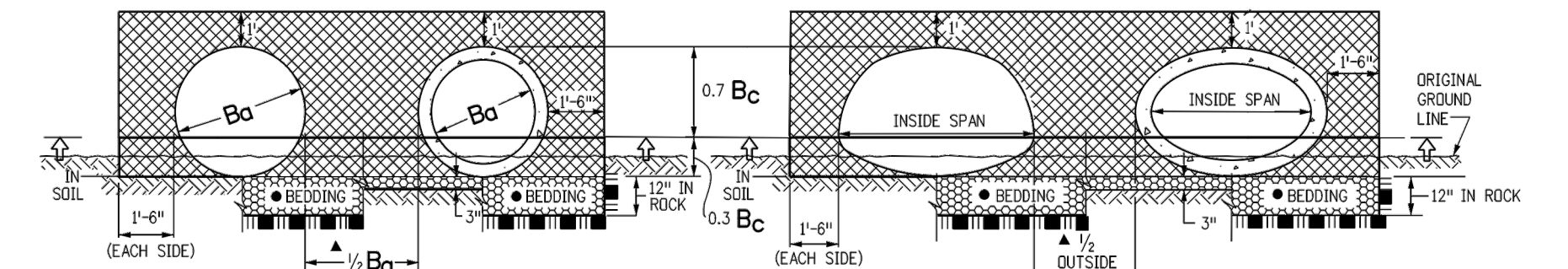
• STANDARD DETAIL **S-716** APPLIES TO ALL OF THE GRATE & FRAME GEOMETRIC DIMENSIONS FOR THE DOUBLE NUMBER 16 INLET EXCEPT FOR THE FRAME LENGTH. FRAME LENGTH SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALLED OUT IN THIS SHEET.

CITY AND COUNTY OF DENVER 2000 W. 3RD AVE., DENVER, CO 80223 www.denvergov.org	 DENVER THE REAL HIGH CITY	NO.	DESCRIPTION OF BUSINESS	DATE	BY
STANDARD DETAILS					
DOUBLE NUMBER 16 INLET					
S-616.2					
DESIGN BY:  ASP/DMT DESIGNED BY:  RUELL ASSOCIATES DATE: JUNE 2020 SCALE: 16					

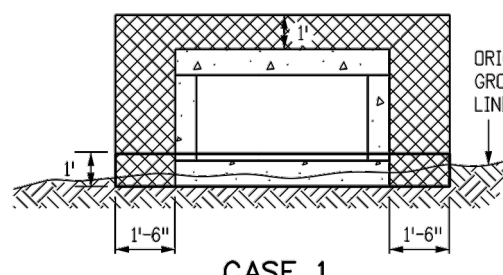


PIPE IN TRENCH

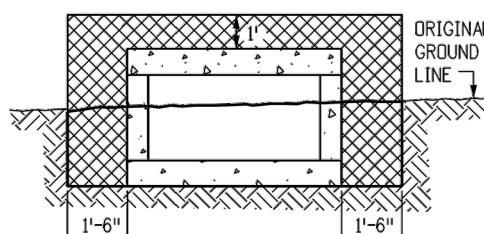
- THE BEDDING MATERIAL FOR RIGID PIPE IN SOIL SHALL BE 3 IN. OF LOOSE STRUCTURE BACKFILL (CLASS 1 OR 2). BEDDING IS NOT REQUIRED FOR FLEXIBLE PIPE IN SOIL. BEDDING MATERIAL FOR RIGID OR FLEXIBLE PIPE IN ROCK SHALL BE 12 IN. OF LOOSE STRUCTURE BACKFILL, CLASS 1.



CIRCULAR PIPE IN FILL



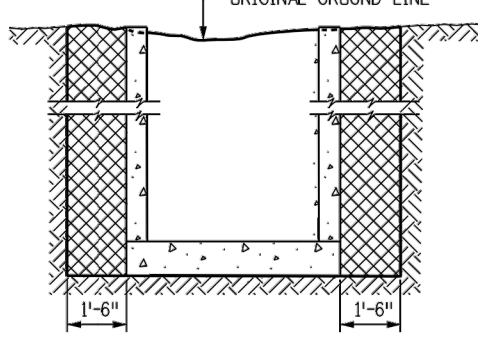
APPLIES WHEN THE ORIGINAL GROUND LINE IS LESS THAN 1 FT. ABOVE THE BOTTOM OF THE BOX CULVERT. THE EMBANKMENT SHALL BE BUILT UP TO 1 FT. ABOVE THE BOTTOM OF THE BOX CULVERT AND THEN EXCAVATED TO THE BOTTOM OF THE BOX CULVERT. THIS EMBANKMENT AND EXCAVATION WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK.



APPLIES WHEN THE ORIGINAL GROUND LINE IS MORE THAN 1 FT. ABOVE THE BOTTOM OF THE BOX CULVERT.

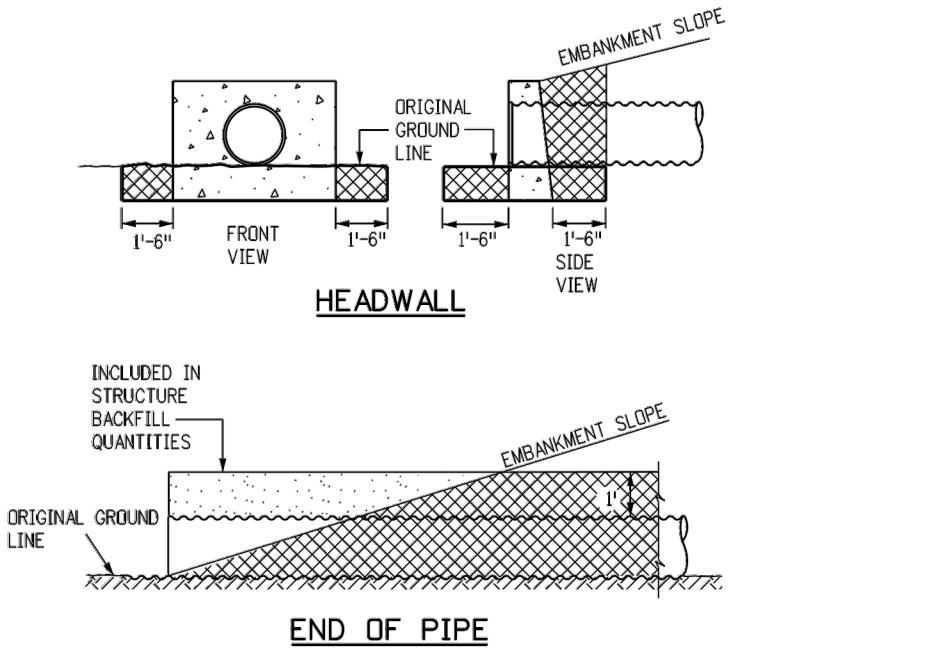
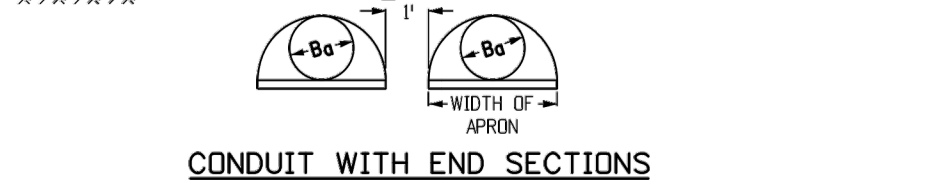
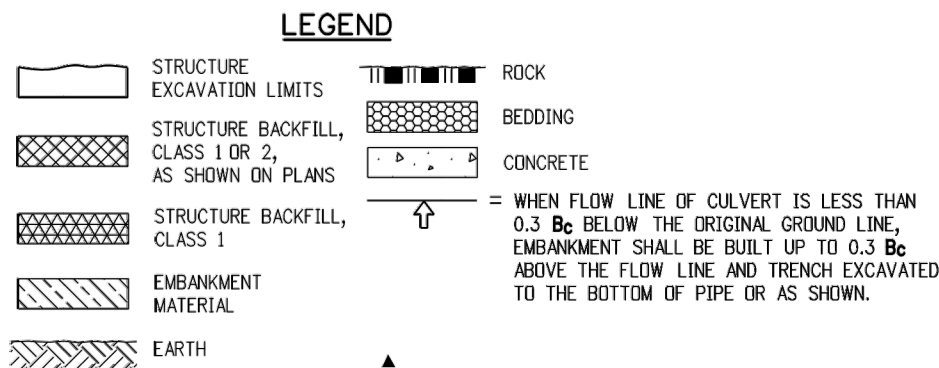
CONCRETE BOX CULVERT

IN BOTH CASES, THE TRENCH (OUTLINED BY THE THICK SOLID LINE) SHALL THEN BE EXCAVATED TO ACCOMMODATE CONSTRUCTION OF THE BOX CULVERT.



DROP INLETS AND DIVISION BOXES

- GENERAL NOTES**
1. EXCAVATION AND BACKFILL PATTERNS DIFFERENT FROM THOSE INDICATED ON THESE SHEETS WILL BE SHOWN ELSEWHERE ON THE PLANS.
 2. EXCAVATION FOR CHANNEL CHANGE OR CHANNEL IMPROVEMENT WILL BE EITHER UNCLASSIFIED EXCAVATION OR MUCK EXCAVATION AND WILL BE NOTED ON THE PLANS. EXCAVATION FROM THE CHANNEL FLOWLINE TO THE DEPTH REQUIRED FOR THE NEW STRUCTURE AND INCIDENTAL CHANNEL EXCAVATION WILL BE PAID FOR AS STRUCTURE EXCAVATION.
 3. STRUCTURE FOOTINGS WHICH ARE LOCATED IN ROCK SHALL BE POURED OUT TO UNDISTURBED ROCK WITHOUT TURNING IN CONFORMANCE WITH SUBSECTION 601.09(b).
 4. STRUCTURAL PLATE CULVERTS SHALL BE CONSTRUCTED AS SHOWN ON THE PLANS.
 5. B_a EQUALS THE INSIDE DIAMETER OF A PIPE AND B_c EQUALS THE OUTSIDE DIAMETER OF A PIPE. FOR THIN WALLED PIPES, IT IS ASSUMED THAT $B_a = B_c$.
 6. APPROXIMATE STRUCTURE EXCAVATION AND BACKFILL QUANTITIES, UP TO 1 FT. OVER THE PIPE WILL BE SHOWN ON THE PLANS, FOR INFORMATION ONLY.

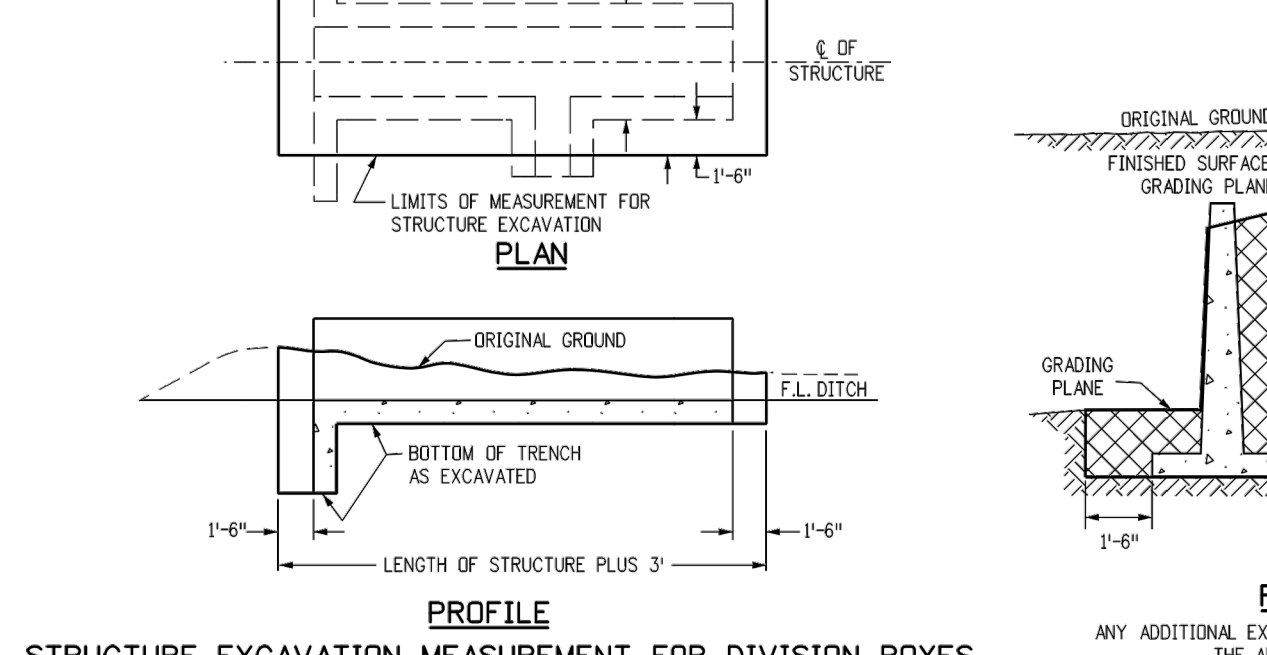
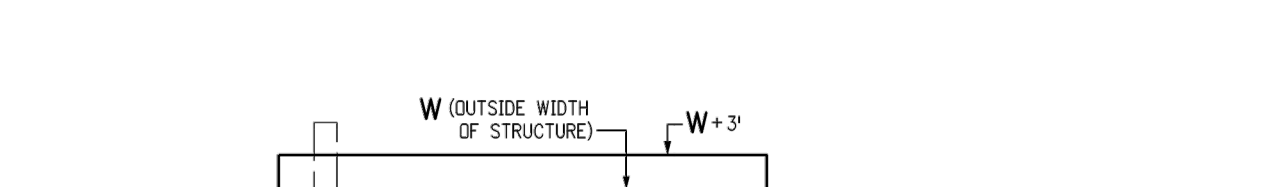
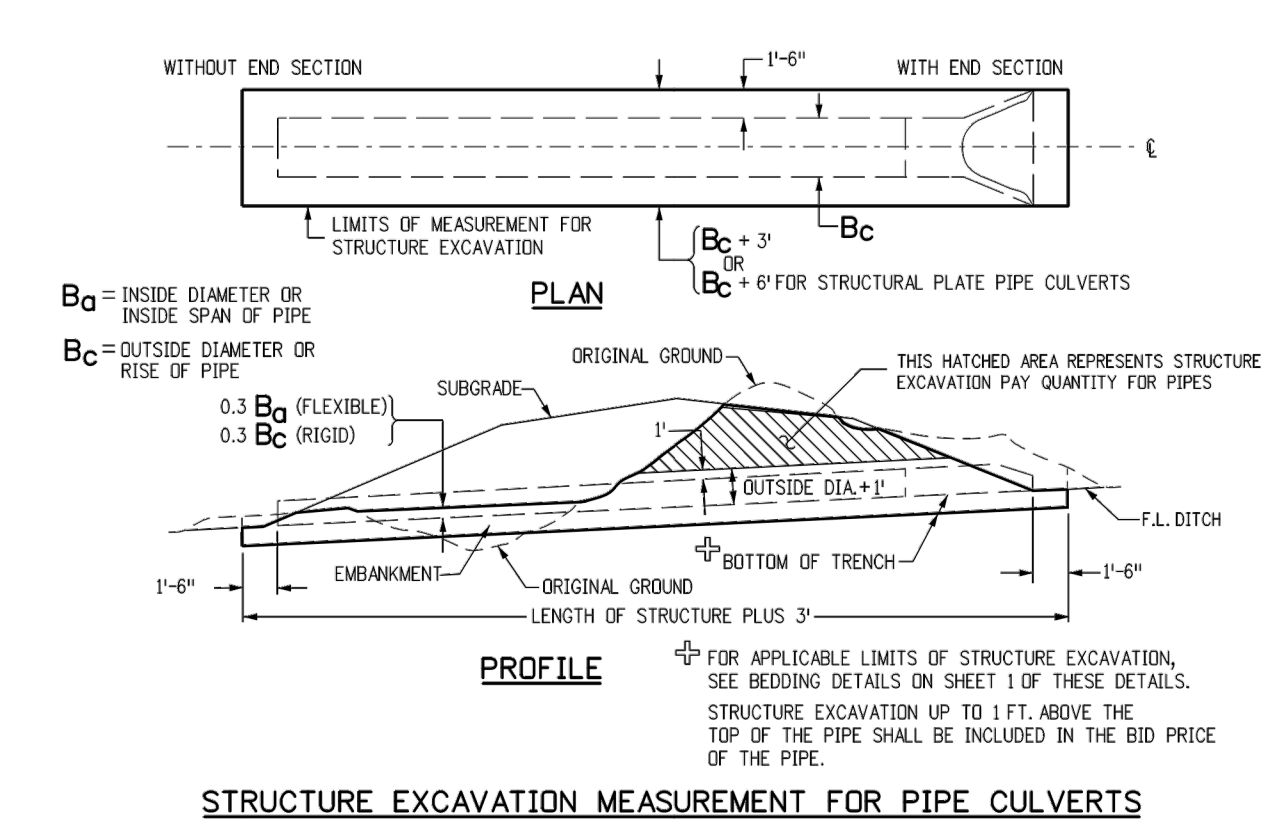


EXCAVATION AND BACKFILL FOR STRUCTURES

STANDARD PLAN NO. M-206-1

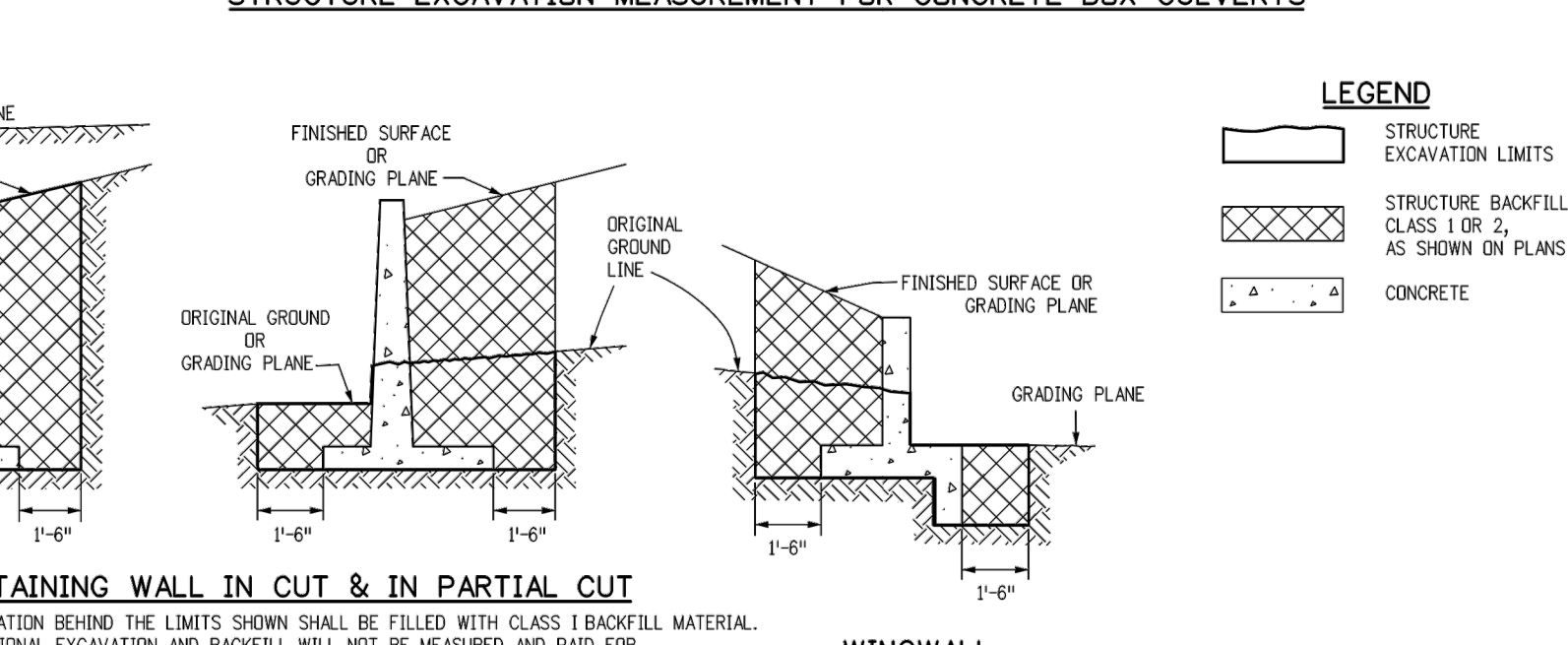
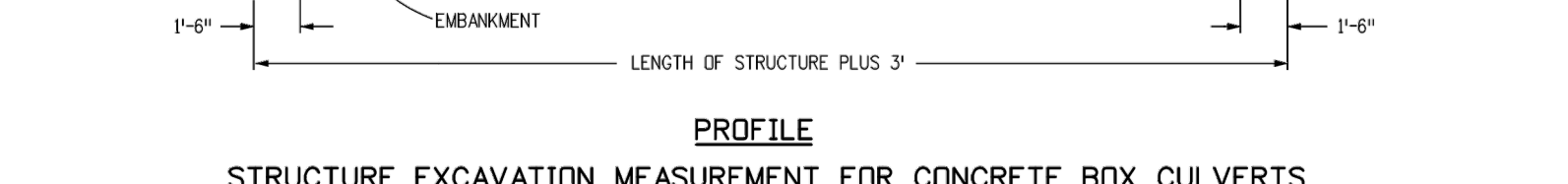
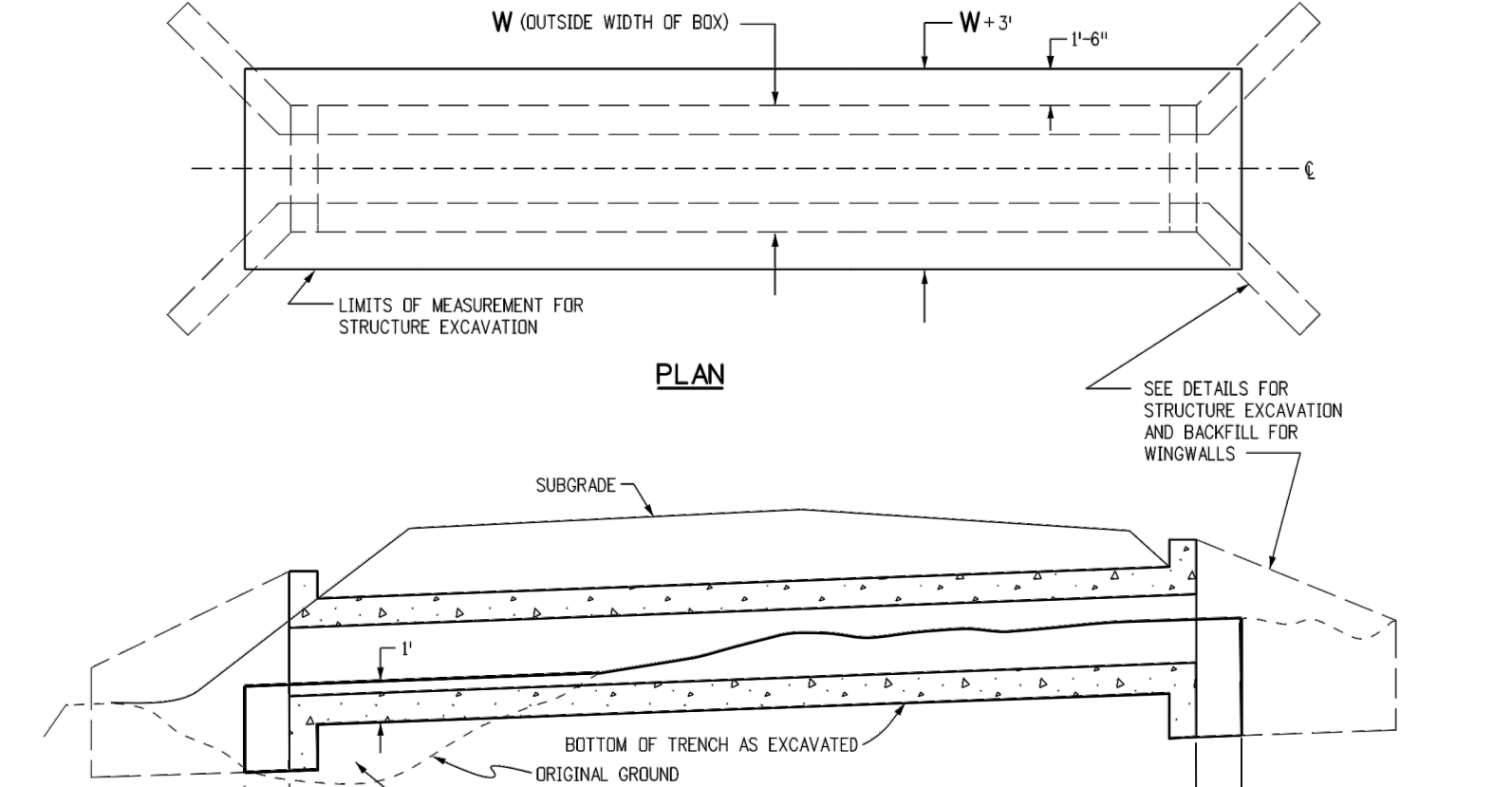
Standard Sheet No. 1 of 2

Project Sheet Number:



STRUCTURE EXCAVATION MEASUREMENT FOR DIVISION BOXES

WINGWALL

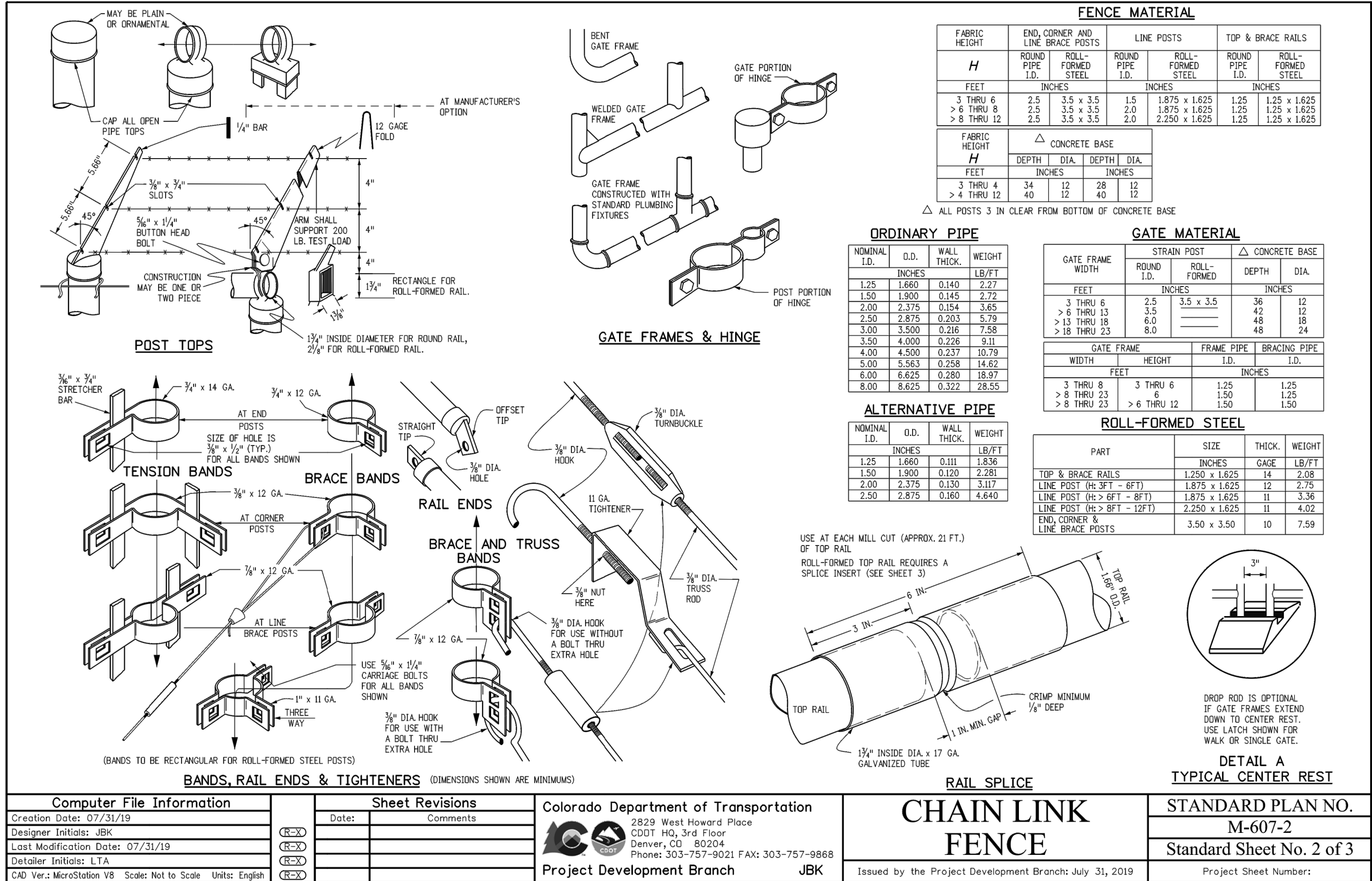
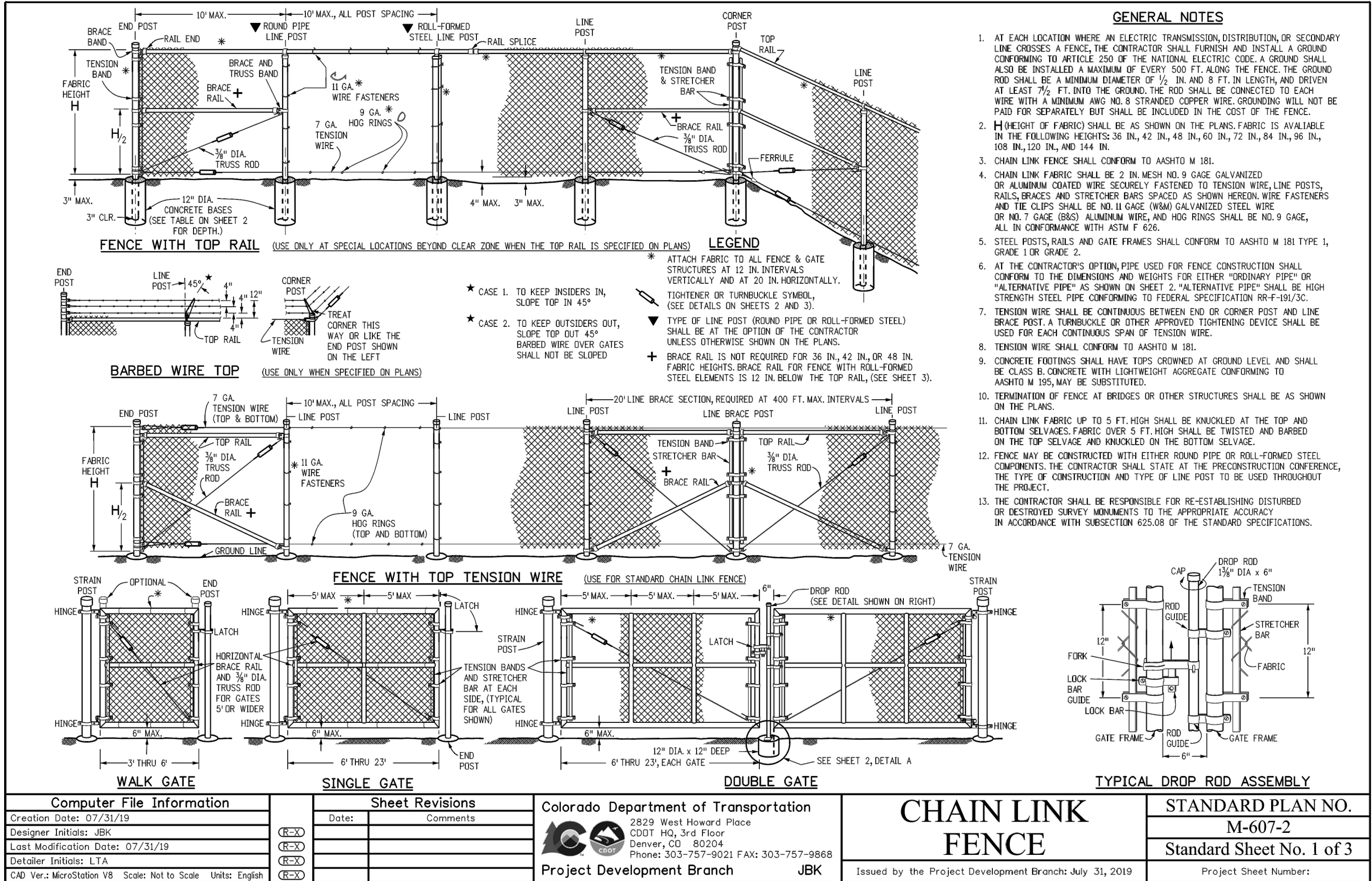


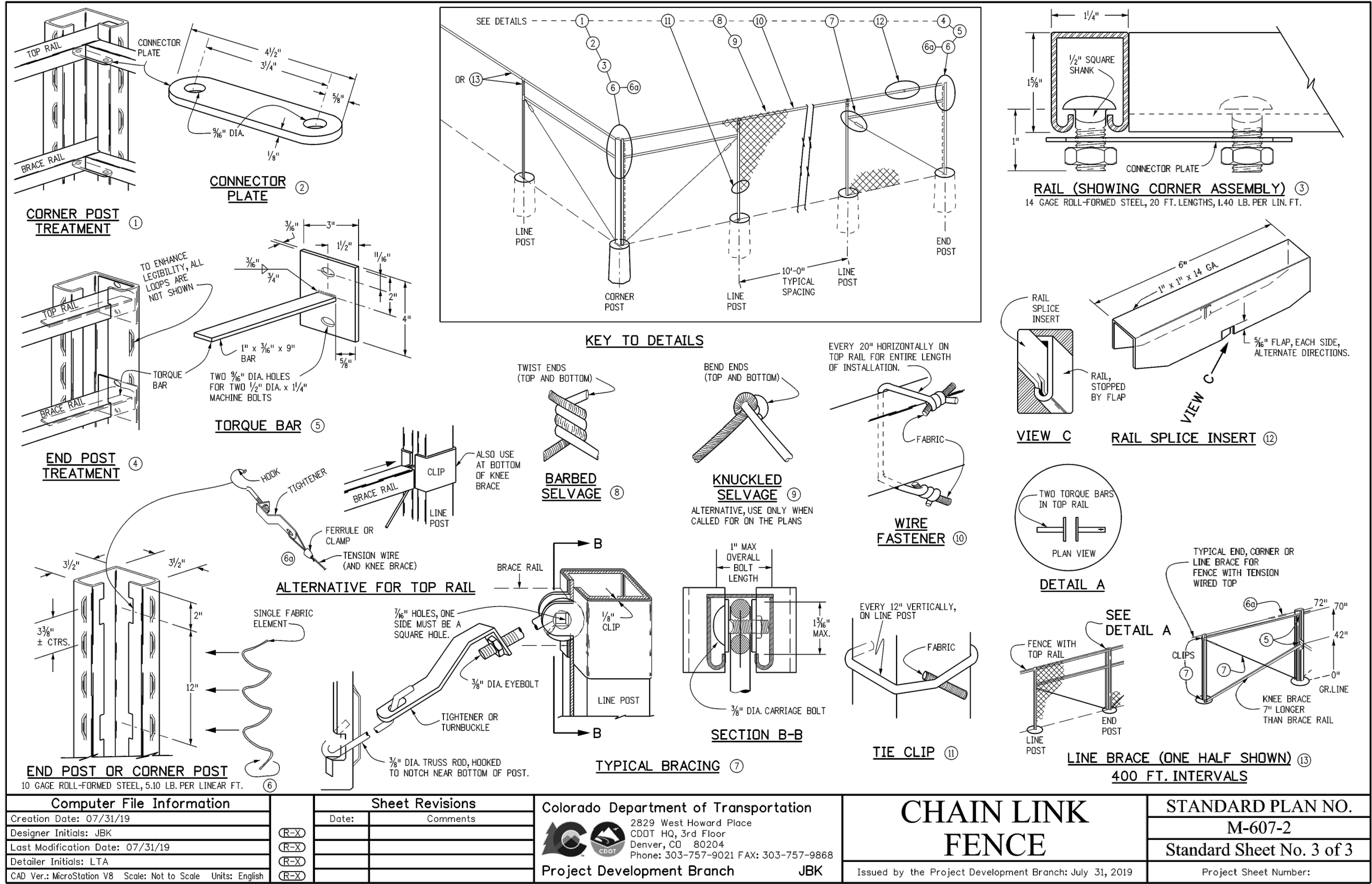
STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS

WINGWALL

Computer File Information		Sheet Revisions		Colorado Department of Transportation		EXCAVATION AND BACKFILL FOR STRUCTURES		STANDARD PLAN NO. M-206-1	
Creation Date: 07/31/19	Designer Initials: JBK	Date:	Comments:	2829 West Howard Place	CDOT HQ, 3rd Floor				
Last Modification Date: 07/31/19	Detailer Initials: LTA			Denver, CO 80204	Phone: 303-757-9021 FAX: 303-757-9868				
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English				Project Development Branch	JBK	Issued by the Project Development Branch: July 31, 2019		Project Sheet Number:	

Computer File Information		Sheet Revisions		Colorado Department of Transportation		EXCAVATION AND BACKFILL FOR STRUCTURES		STANDARD PLAN NO. M-206-1	
Creation Date: 07/31/19	Designer Initials: JBK	Date:	Comments:	2829 West Howard Place	CDOT HQ, 3rd Floor				
Last Modification Date: 07/31/19	Detailer Initials: LTA			Denver, CO 80204	Phone: 303-757-9021 FAX: 303-757-9868				
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English				Project Development Branch	JBK	Issued by the Project Development Branch: July 31, 2019		Project Sheet Number:	





PREPARED FOR:



MILE HIGH FLOOD DISTRICT
2480 W. 26TH AVE., STE. 156-B
DENVER, CO 80211

LOCAL GOVERNMENT SPONSOR:

CITY OF LOUISVILLE
DEPARTMENT OF PUBLIC WORKS
749 MAIN ST.
LOUISVILLE, CO 80027

PREPARED BY:



ENGUINITY ENGINEERING SOLUTIONS
10106 WEST SAN JUAN WAY, STE 215
LITTLETON, COLORADO 80127
PH : 303-872-9112
FX : 303-872-9104

DESIGNED:

DRAWN:

CHECKED:

DATE:

REVISION DESCRIPTION BY DATE

R-

R-

R-

R-

CONSULTANT ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE MILE HIGH FLOOD DISTRICT (MHFD) AND CITY OF LOUISVILLE STANDARDS AND STATUTES, RESPECTIVELY; AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

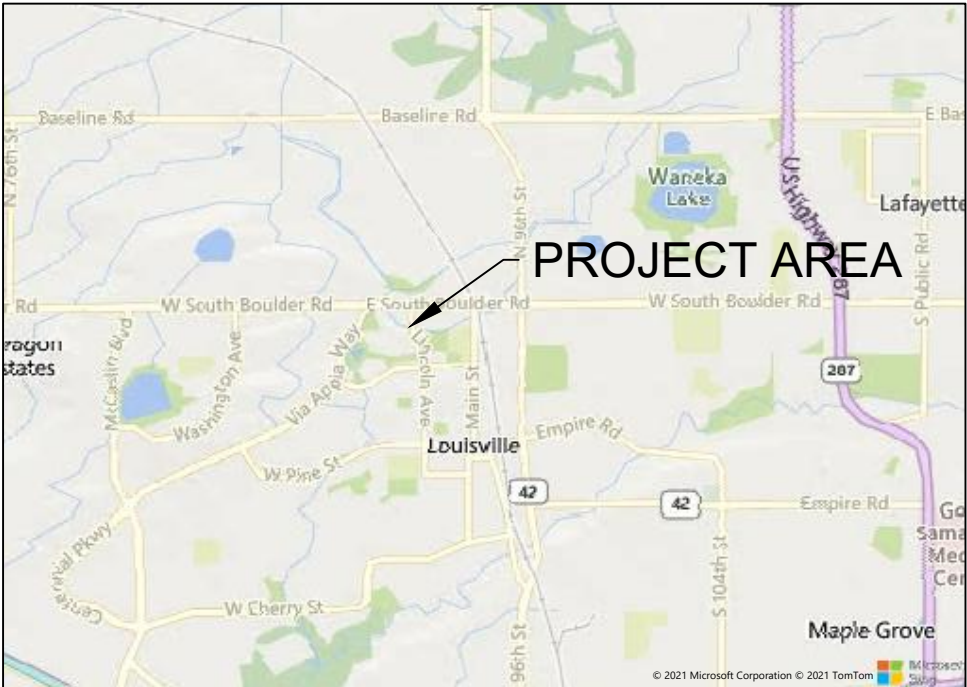
DRAINAGEWAY A-1 CULVERT REPLACEMENT
CDOT DETAILS (4 OF 4)

SHEET/REFERENCE NO.

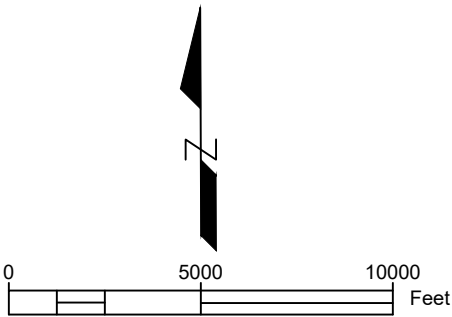
31
OF
31

Coal Creek Drainage A-1

SUE Utility Investigation and Documentation Per ASCE/CI 38-02
Louisville, CO



<u>SHEET NO.</u>	<u>INDEX OF SHEETS</u>
1	TITLE SHEET
2	GENERAL NOTES AND MAP KEY
3	SHEET LAYOUT
4-7	PLAN UTILITY DRAWINGS



Know what's below.
811 before you dig.



Print Date: 12/6/2021		Sheet Revisions			MHFD MILE HIGH FLOOD DISTRICT Mile High Flood District 2480 W. 26th Ave. Suite 156-B Denver, CO 80211 Phone: (303) 455-6277 Fax: (303) 455-7880	Coal Creek Drainage A-1			Project Number
File Name: Coal_Creek_Drainage_A-1_EXUTIL.dwg		Date:	Comments	Init.		SUE Utility Investigation			
Horiz. Scale: 1"=5000' Vert. Scale:		7/16/2021	Original	TFS		No Revisions:	Designer: TFS	Structure Numbers	
City Project Manager		12/6/2021	Test Hole Update	TFS		Revised:	Detailer: TFS		
MS UTILITY MAPPING SERVICES 15065 W. 44th Ave. Golden, CO 80403 (720)230-0780						Void:	Sheet Subset: UTIL	Subset Sheets: 01 of 07	Sheet Number 01

Survey Information:

This plan is an ASCE/CI 38-02 compliant investigation and documentation of existing subsurface and aerial utilities as of June/July 2021 and are subject to change. The survey of the surface features and field delineated buried utilities during the Phase 1 investigation was completed by UMS, Inc personnel. Mile High Flood District approved survey control was used to tie all survey data to the project coordinate system. Control points 101, 103, 107, 110, and 208 were used for site calibrations. The transcription of survey data to the CAD plans was completed by UMS, Inc.

Subsurface Utility Engineering (SUE) Notes:

UMS Inc. was responsible for the investigation of the existing buried utilities to the extent practical and as detailed in scope of work for this project. User's of this data set must understand and adhere to the limitations associated with the Quality Level values assigned to the depicted facilities. UMS, Inc. recommends that advanced geophysical survey and remote sensing methods, vacuum excavations or other non-destructive methods be used to obtain 3D data on utilities in potential conflict with proposed design and construction. UMS, Inc. strongly recommends users of this data become familiar with the ASCE/CI 38-02 standard guidelines and the corresponding data limitations inferred by the Quality Level values prior to employing the data set for design purposes. In addition, the SUE report(s) for this project must always accompany the existing utility reference CAD file to ensure proper interpretation and usage of the data set.

SUE Quality Levels:

The SUE utility investigation activities enable the assignment of ASCE/CI 38-02 "Quality Levels" to the depicted underground utilities. The following four Quality Levels are used to identify the degree of reliability to which the utilities are depicted:

- Quality Level (QL) A:** Precise horizontal and vertical location of utilities obtained by the actual exposure (or verification of previously exposed and surveyed utilities) and subsequent measurement of the subsurface utilities, usually at a specific point. minimally intrusive excavation equipment is typically used to minimize and potential for utility damage. A precise horizontal and vertical location, as well as other utility attributes, is shown on plan documents. Accuracy is typically set to 15-mm vertical and applicable horizontal survey and mapping accuracy as defined or expected by the project owner.
- QL B:** Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities. Quality Level B data should be reproducible by surface geophysics at any point along their depiction. This information is surveyed to applicable tolerances defined by the project and reduced onto plan documents.
- QL C:** Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlating this information to QL D information.
- QL D:** Information derived from existing records or oral recollections.

Note - Although reproducible, QL B positions can be influenced by physical factors that distort geophysical observations and the resulting interpreted location. For example, with inductive electromagnetic methods, adjacent conductors may create secondary magnetic fields that superposition with the primary field, causing the apparent position to be slightly different from the actual position.

With only QL C or QL D despications on the utility drawings, 15-30% of underground utilities may be missed or depicted with more than two feet of error, according to FHWA studies.

QL D information is adequate for rudimentary planning or background purposes only.

Disclaimer:

A possibility exists that abandoned, forgotten, non-detectable, undocumented utilities may not be evident using standard investigation procedures. This information is for design purposes only; markings placed on the ground or depictions developed by UMS are not intended to be used in lieu of One-Call (811) ticket submissions for excavation purposes. The use of this information by others does not relieve a contractor from the duty to comply with applicable utility prevention damage laws and regulations, including but not limited to, giving notifications to utility owners or "One Call/ Call Before You Dig (811)" prior to excavation.

Refer to [ASCE/CI 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data](#) and the [ASCE Subsurface Utility Engineering for Municipalities](#) publications for more derailed information.

- * Unless otherwise noted, all aerial installation depictions are based on surveyed pole locations or overhead line locations and apparent connectivity as observed and logged by UMS field personnel.
- *** Aerial background Imagery is for general reference only.

ABBREVIATIONS USED

AATUR = ABANDONED ACCORDING TO UTILITY RECORDS
EOI = END OF INFORMATION

EQUIPMENT USED

Radiodetection RD8100 Cable Locator
Trimble TSC7 Data Collector
Trimble R10 GNSS System
Duct Rodder

UTILITY CONTACTS

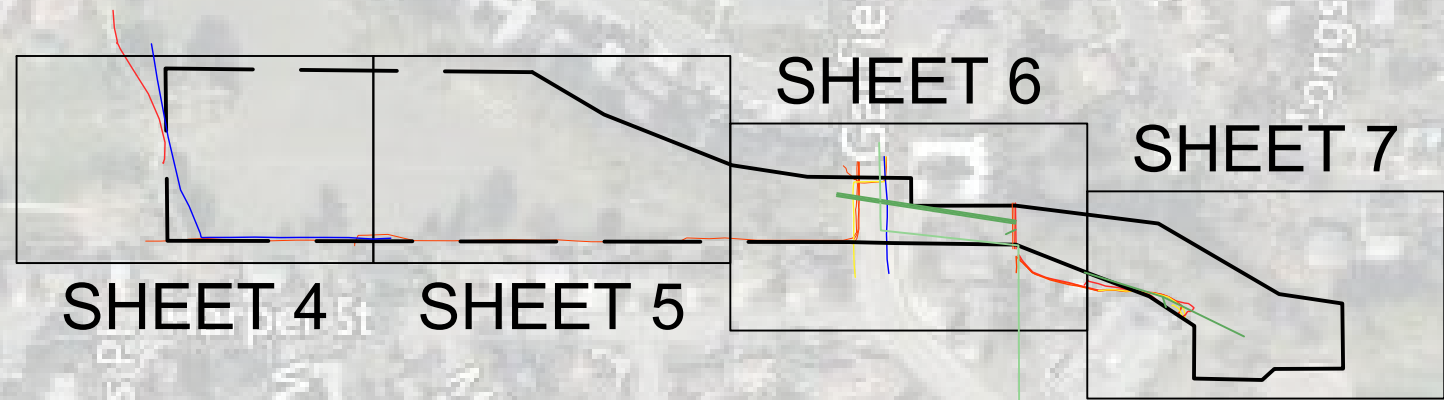
Utility	Utility Type	Contacts	Telephone/Email
Lumen (CenturyLink)	Telephone, Fiber	Joseph Osborne	Joseph.Osborne@Centurylink.com
City of Louisville (C.O.L)	Water, Storm, Sewer	Kerry Holle	kerryh@louisvilleco.gov
			303-335-4608
Comcast	Cable TV, Fiber	Artjahmel Davis	Artjahmel_Davis@comcast.com
			303-603-2682
Xcel Energy	Electric, Gas		geospatialrequests@xcelenergy.com
			303-571-3263

LEGEND

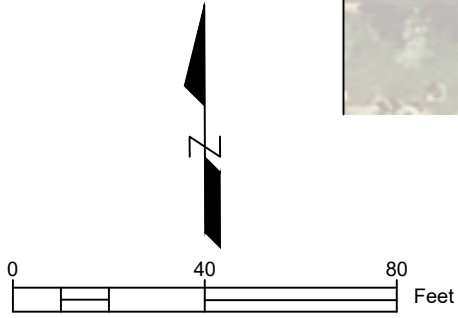
	AERIAL CABLE TELEVISION LINE		CABLE TELEVISION PEDESTAL
	AERIAL FIBER OPTIC LINE		GUY ANCHOR
	AERIAL POWER LINE		POWER PEDESTAL
	AERIAL TELEPHONE LINE		POWER POLE
	BURIED CABLE TELEVISION LINE		STREET LIGHT
	BURIED FIBER OPTIC LINE		SANITARY SEWER MANHOLE
	BURIED GAS LINE		STORM DRAIN CULVERT
	BURIED POWER LINE		STORM DRAIN INLET
	BURIED SANITARY SEWER LINE		STORM OUTFALL
	BURIED STORM SEWER LINE		TELEPHONE PEDESTAL
	BURIED STREET LIGHTING LINE		TEST HOLE
	BURIED TELEPHONE LINE		WATER METER
	BURIED WATER LINE		
	PROJECT BOUNDARY		

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File Name: Coal_Creek_Drainage_A-1_EXUTIL.dwg			Date:	Comments	Init.		No Revisions:						
Horiz. Scale:													

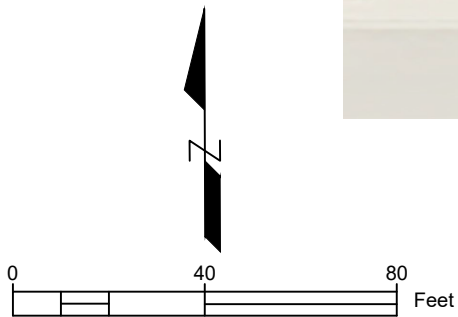
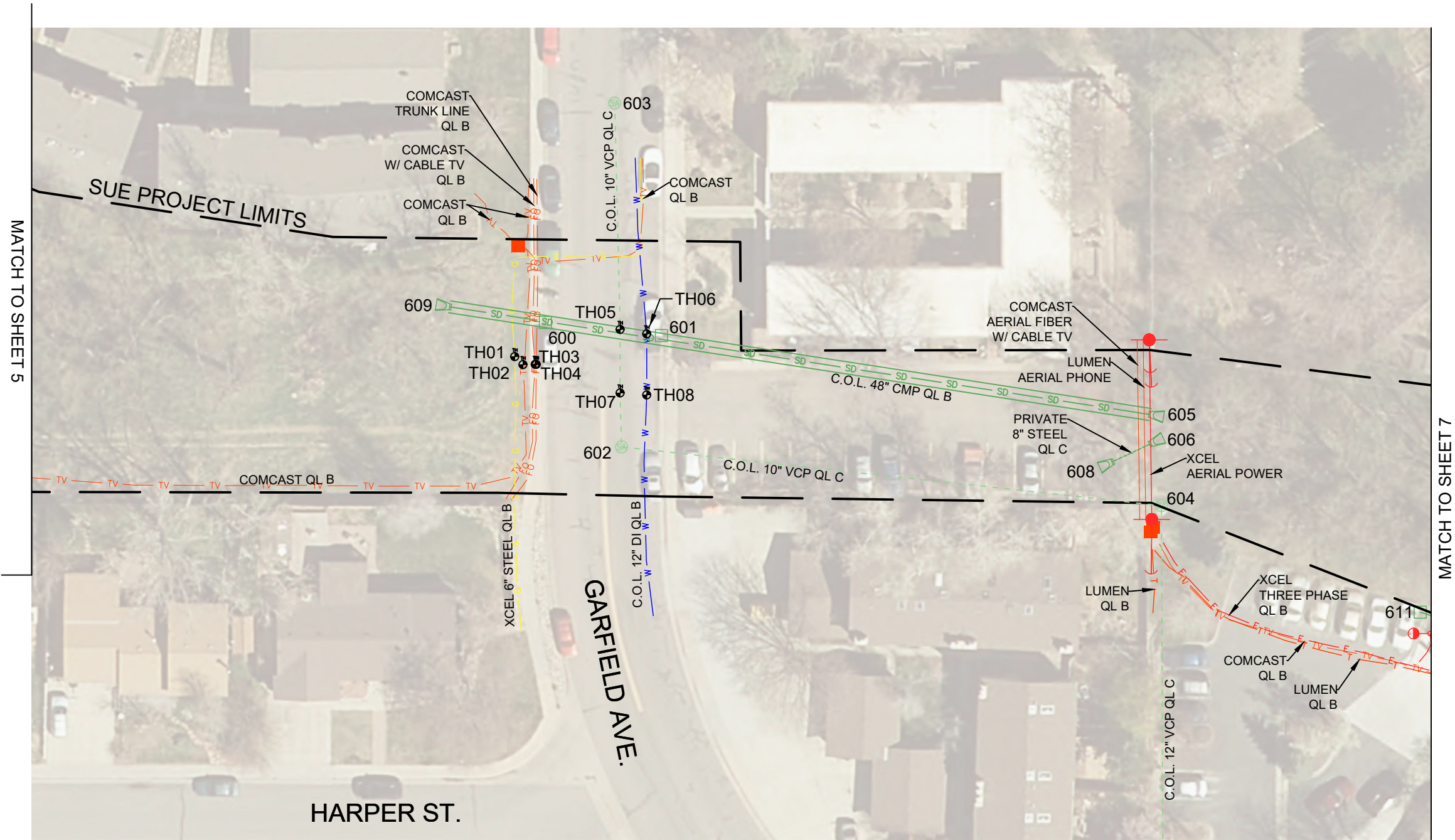
SHEET LAYOUT



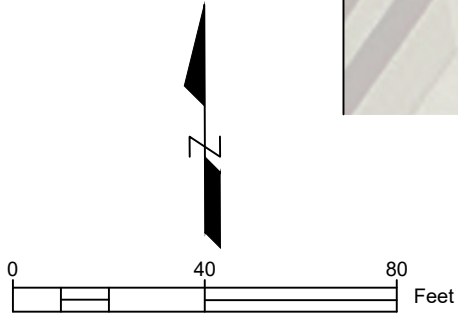
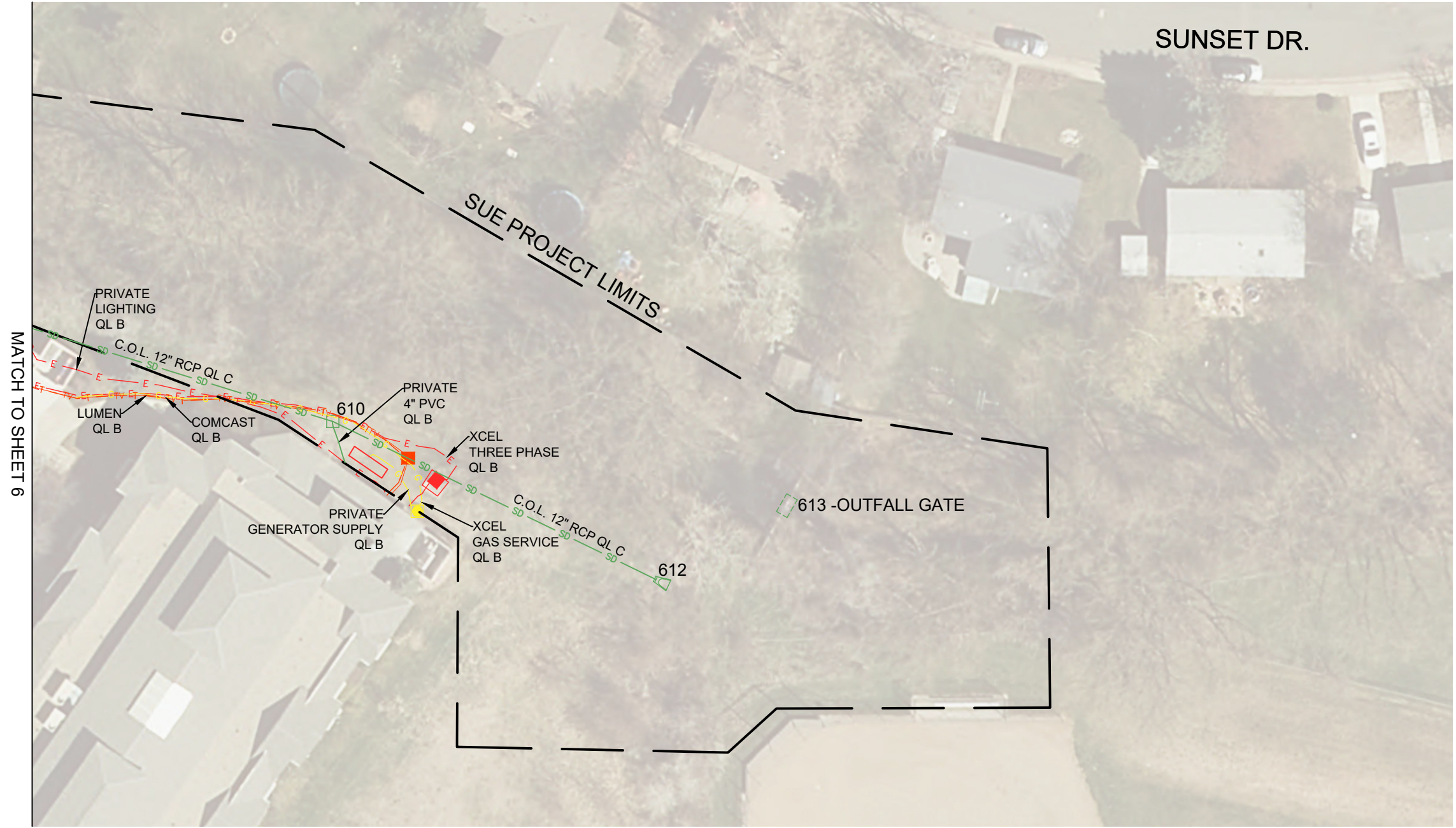
Print Date: 12/6/2021		Sheet Revisions			Coal Creek Drainage A-1 SUE Utility Investigation		Project Number	
File Name: Coal_Creek_Drainage_A-1_EXUTIL.dwg								
Horiz. Scale: 1"=250'								



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File Name: Coal_Creek_Drainage_A-1_EXUTIL.dwg			Date:	Comments	Init.									
Horiz. Scale: 1"=40'			7/16/2021	Original	TFS		No Revisions:							
Vert. Scale:			12/6/2021	Test Hole Update	TFS		Revised:		Designer: TFS		Structure Numbers			
City Project Manager							Void:		Detailer: TFS					
MS INC. UTILITY MAPPING SERVICES 15065 W. 44th Ave. Golden, CO 80403 (720)230-0780						Sheet Subset: UTIL		Subset Sheets: 05 of 07		Sheet Number 05				



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Horiz. Scale: 1"=40'													



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File Name: Coal_Creek_Drainage_A-1_EXUTIL.dwg			Date:	Comments	Init.								
Horiz. Scale: 1"=40' Vert. Scale:			7/16/2021	Original	TFS		No Revisions:		Designer: TFS		Structure		
City Project Manager			12/6/2021	Test Hole Update	TFS		Revised:		Detailer: TFS		Numbers		
MS INC UTILITY MAPPING SERVICES 15065 W. 44th Ave. Golden, CO 80403 (720)230-0780							Void:		Sheet Subset: UTIL		Subset Sheets: 07 of 07		Sheet Number 07