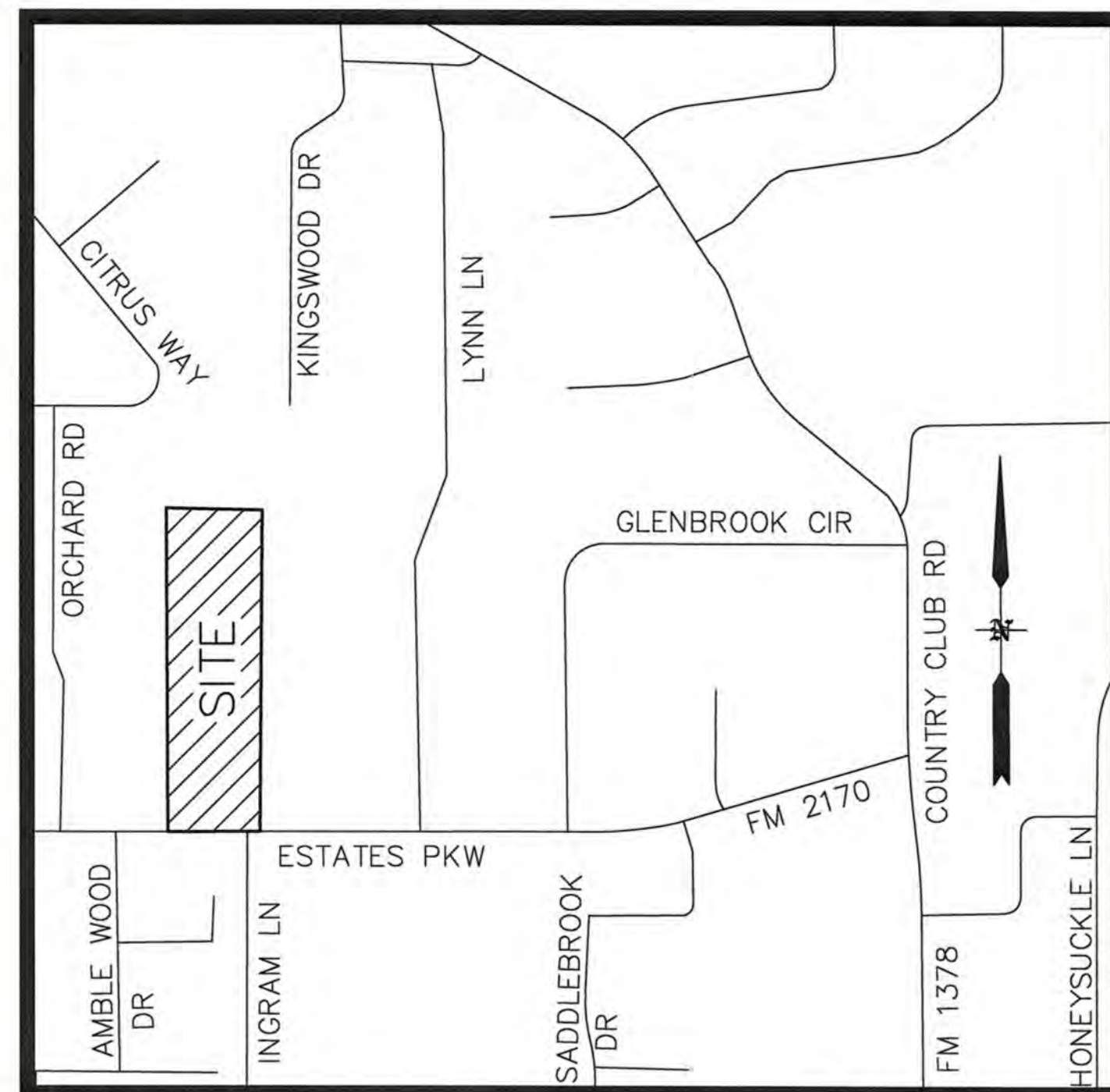


CONSTRUCTION PLANS FOR

THE FARMSTEAD

CITY OF LUCAS, COLLIN COUNTY, TEXAS
5 SINGLE FAMILY LOTS, 11.941 ACRES



VICINITY MAP
N.T.S.

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11	EROSION CONTROL PLAN
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RECORD DRAWINGS
THESE RECORD DRAWINGS HAVE BEEN PREPARED
BASED ON INFORMATION PROVIDED BY OTHERS.
THE ENGINEER HAS NOT VERIFIED THE ACCURACY
OF THIS INFORMATION AND SHALL NOT BE
RESPONSIBLE FOR ANY DISCREPANCIES WHICH MAY
BE INCORPORATED HEREIN AS A RESULT.

ENGINEERING CONCEPTS & DESIGNS, L.P.
Todd D. Winters 11-7-19
TODD D. WINTERS, P.E.

APPROVED
CITY OF LUCAS
SA 12 3-18-19

FOR CONSTRUCTION

MARCH 2019

ENGINEERINGCONCEPTS
& DESIGN, L.P.

THE FARMSTEAD
THE CITY OF LUCAS, COLLIN COUNTY, TEXAS

SHEET

01
OF
15

CAUTION! EXISTING UTILITIES

CONTRACTOR SHOULD CALL 1-800-DIG-TESS PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES FOR EXISTING UTILITY LOCATIONS. EXISTING UTILITIES AND UNDERGROUND FACILITIES INDICATED ON THESE PLANS HAVE BEEN LOCATED FROM REFERENCE INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY BOTH HORIZONTALLY AND VERTICALLY THE LOCATION OF ALL EXISTING UTILITIES AND UNDERGROUND FACILITIES PRIOR TO CONSTRUCTION AND TO TAKE NECESSARY PRECAUTIONS IN ORDER TO PROTECT ALL FACILITIES ENCOUNTERED. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION.

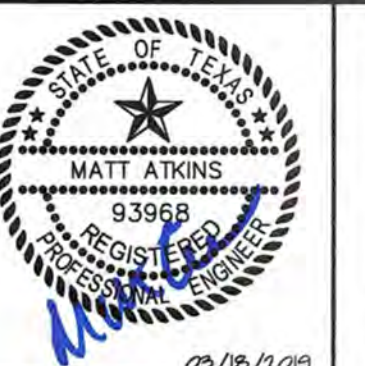
OWNER/DEVELOPER
OW HOMES, LLC
890 WEST FOREST GROVE ROAD
LUCAS, TX 75002-8446
214-801-9193

LAND SURVEYOR
R.C. MYERS SURVEYING, LLC
488 ARROYO COURT
SUNNYVALE, TX 75182
(214) 532-0636
FAX (972) 412-4875
EMAIL: rcmysurveying@gmail.com
FIRM NO. 10192300 JOB NO. 418

ENGINEERINGCONCEPTS
& DESIGN, L.P.
ENGINEERING / PROJECT MANAGEMENT /
CONSTRUCTION SERVICES - FIRM REG. #F-001145
201 WINDCO CIR, STE 200, WYLIE, TX 75098
972-941-8400 FAX: 972-941-8401 WWW.ECDLP.COM

REVISIONS:	
DATE:	MARCH 2019
PROJECT NO.:	08361
DWG FILE NAME:	08361 COVER SHEET.DWG

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF CONSTRUCTION.
THE SEAL APPEARING ON THIS DOCUMENT WAS
AUTHORIZED BY MATT ATKINS, P.E. 93968



1. All work and materials shall conform to the City of Lucas Engineering Design Manual and the "Standard Specifications for Public Works Construction" published by the North Central Texas Council of Governments (NCTCOG), latest edition. In the event of conflict, duplication, or variance, the City Engineer shall have the final decision on all construction materials, methods, and procedures.
2. Prior to construction, the contractor shall familiarize himself with the contract documents and specifications, the plans including all notes and any other applicable standards or specifications relevant to the proper completion of the work specified. Failure on the part of the contractor to familiarize himself with all standards or specifications pertaining to this work shall in no way relieve the contractor of responsibility for performing the work in accordance with all such applicable standards and specifications.
3. Contractor shall have in his possession, prior to construction, all-necessary permits, licenses, etc. Contractor shall have at least one set of approved engineering plans and specifications on site at all time.
4. Any item of work called for by the plans and/or specification and not included, as a bid item shall be subsidiary to the construction of the various bid items.
5. Construction inspection will be performed by representatives of the owner, engineer, city, geotechnical engineer, and reviewing authorities and agencies. Unrestricted access shall be provided to them at all times. Contractor is responsible for scheduling required inspections as required by contract documents.
6. Any item requiring inspection by the City, must be performed between the hours of 8am-5pm Monday thru Friday.
7. The contractor and all subcontractors must confine their activities to the work area. Any damage resulting from construction activities, shall be the contractor's responsibility.
8. It will be the responsibility of each contractor to protect all existing public and private utilities throughout the construction of this project. Contractor shall contact the appropriate utility companies for line locations prior to commencement of construction and shall assume full liability to those companies for any damages caused to their facilities. Location of utilities are taken from the City of Lucas and Utility Company records. Contractor shall field verify to determine exact location of utilities.
9. Trench safety design will be the responsibility of the contractor. The contractor shall abide by all applicable federal, state, and local laws governing excavation. Trench side slopes shall meet OSHA standards. Benching, shoring, and bracing shall be required when side slope standards are not met. A pull box, meeting OSHA standards will be acceptable. The contractor shall submit detailed plans to the City Engineer for review showing how OSHA Standards for excavation shall be met prior to the start of any utility construction. The plans shall be sealed by an Engineer registered by the State of Texas.
10. Contractor shall stockpile salvage materials for inspection. All items not salvaged by the owner shall be removed from the site at the contractor's expense. The owner will transport salvaged materials away from the site at the owner's expense. Salvage, stockpile, and removal of materials shall be considered subsidiary to the various bid items and shall not be paid for directly unless such items are specifically included in the bid items.
11. The contractor shall be responsible for providing and maintaining all necessary warning and safety work, material, and operations needed to provide for the health and safety of the public until all work has been completed, including maintenance bond periods, and to be accepted by the City of Lucas in writing.
12. All construction and materials testing unless otherwise indicated, shall be performed by an Engineering Testing Laboratory employed by the Contractor. The testing laboratory shall be approved by the City of Lucas. The testing laboratory shall make tests necessary to insure that construction is in accordance with the approved plans and specifications. Re-testing required due to construction not being performed in accordance with the plans and specifications shall be at the expense of the contractor. The testing laboratory shall submit testing reports to the City Engineer and Design Engineer.
13. Any additional excavated material shall be placed as directed by the Owner.
14. All fill areas to be density and moisture controlled. Fill should be compacted to 98% of standard proctor density at a minimum of 2% above optimum moisture content.
15. "The contractor shall contact NTMWD Engineering at (972) 442-5405 at least 48 hours prior to performing any work in the vicinity of the NTMWD facilities."
16. "The contractor shall contact TxDot at least 48 hours prior to performing any work in the vicinity of the NTMWD facilities."

1. All grading shall conform to the City of Lucas standards.
2. Site Preparation: All surface vegetation and the foreign materials such as roots, grass, etc., shall be stripped to a minimum depth of 4 inches and removed. All cleared and grubbed materials shall be removed off-site in accordance with local, state, and federal regulations.
3. Scarifying Area to be Filled: In areas where fills are desired, the stripped surface shall be scarified to a depth of at least 6 inches for uniform compaction. The scarified surface shall be such that it is free from lumps and uneven surfaces.
4. Compacting Area to be Filled: After clearing and scarifying the area to be filled, the soils shall be brought to a moisture content of -2% to $+4\%$ of the optimum moisture value and compacted in 6 inch maximum lifts, mechanically to at least 98% of Standard Proctor maximum dry density (ASTM D 998). R.O.W. areas to be filled shall be brought to moisture content of 0% to $+4\%$ of the optimum moisture value and compacted, in 6 inch maximum lifts, mechanically to at least 98% of Standard Proctor maximum dry density (ASTM D 998)
5. Fill Material: On-site soil and/or rock could be used as random fill provided such material is free from vegetation and other deleterious substances. No fill material shall contain rocks or lumps having a diameter of 6 inches or greater.
6. Depth and Mixing of Fill Layers: The fill materials shall be placed in level, uniform layers. Each layer shall be thoroughly blade mixed during spreading to insure uniform compaction. These materials shall be placed in loose lifts with density and moisture content shall conform to that specified herein.
7. Compaction of Fill Layer: Compaction equipment shall be capable of compacting all fill soils to the specified density. Compaction of all fill shall be accomplished with the material at the specified moisture content. Each fill layer shall be compacted uniformly with sufficient effort to achieve the specified degree of compaction.
8. Amount of Compaction: After each fill layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to a minimum 98% of the Standard Proctor density (ASTM D 998).
9. Moisture Content: All fill material shall be compacted at the appropriate moisture content as defined for the particular soil type. Each layer shall be brought to a moisture content of -2% to $+4\%$ of the optimum moisture value as determined by ASTM D 698. The compaction moisture content of limestone or other rock-like materials is not considered crucial, provided the proper degree of compaction is attained. R.O.W. areas to be filled shall be brought to moisture content of 0% to $+4\%$ of the optimum moisture value and compacted, in 6 inch maximum lifts, mechanically to at least 98% of Standard Proctor maximum dry density (ASTM D 698)
10. Slope Control: In areas where cut of fill slopes exceed 3 feet in depth/height, a slope ratio of one (vertical) to 4 (horizontal) shall not be exceeded. Compaction operations of fill slopes shall be continued until the slopes are stable.
11. Field Density: Field density tests of fill and/or backfill shall be controlled by an Engineering Testing Laboratory. Density tests shall be taken in the compacted material below the disturbed surface. When these tests indicate that the density or any layer of fill is below the required density, the particular soil or rock layer shall be reworked until the proper density and/or moisture content is achieved. Re-testing of reworked areas shall be at contractor's expense.
12. Tolerance for Rough Grading: Streets shall be rough graded within 0.2' of plan grades prior to utility construction. Utility contractor shall return street to within 0.2' of plan grade prior to street paving.
13. Supervision: Supervision by the Soils Engineer shall be of such continuity during the grading operations that he can adequately describe the work done and evaluate that work in comparison with the specifications. Actual supervision shall be the Contractor's Supervisor.
14. Reports: The Testing Laboratory shall send 1 copy of each test, inspection, or evaluation report to the Public Works Department, Owner, and Design Engineer.
15. All excess earth shall be used on-site or taken to an area designated by the Engineer at the Contractor's expense.

3. Concrete street pavement shall be NCTCOG Class "C", 3,600 PSI compressive strength. Air content shall be 3%–5%. Pavement thickness and reinforcing steel shall be as indicated on construction plans and conforming with current City of Lucas Standards.
4. The subgrade shall be treated 7 inches deep, minimum, with lime slurry. Lime slurry shall be Type B Grade 1 and applied in accordance with the City Standard Specifications. Lime shall be applied at a rate of 7.0% of the dry weight soil and have a P.L. of less than 15. Compaction of the lime stabilized subgrade shall be to 95% Standard Proctor density. Stabilization shall extend 2' ft. beyond back of curb (refer to typical paving section).
5. All dimensions are to edge of pavement unless otherwise noted. Elevations are edge of pavement unless otherwise noted.
6. Water meters and/or services shown to be in conflict with proposed paving or drainage facilities are to be relocated by the Contractor, subject to review by the Public Works Department, prior to commencement of construction of paving and drainage.
7. Power and telephone poles shown to be in conflict with proposed sidewalk paving to be relocated by appropriate utility prior to paving.
8. It will be the responsibility of the paving contractor to protect all public utilities of this project. All manholes, valve boxes, fire hydrants, etc., must be adjusted to proper line and grade by the paving contractor prior to and after the placing of permanent paving.
9. Expansion or construction joints shall be placed at 600 feet maximum spacing or the final pour of the construction day. Transverse contraction joints shall be placed on 20 feet maximum spacing. Refer to City of Lucas Standard Details.
10. Contraction joints shall be formed by sawing. Joint depth shall be equal to one-fourth (1/4) of slab thickness. Sawing of joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling. All joints shall be completed before uncontrolled shrinkage cracking occurs. Joints shall be continuous across the slab and extend completely through the edge of pavement. All joint openings to be cleaned and sealed with non poured rubber joint sealing compound prior to opening to traffic.
11. Any excess earth shall be taken to an area, to be designated by the Engineer at the contractors expense.
12. Back fill shall be placed along all pavement edges. Back fill material shall be free of earthwork debris such as muck, rock, refuse, stumps, concrete, asphalt, or other unsuitable materials and shall consist of soil suitable for sodding.
13. Topsoil to stripped and placed on parkways and yards on lots.
14. City will water test streets upon completion. Any standing water must be remedied before acceptance.

1. All work and materials shall be in accordance with City of LUCAS standard specifications.
2. Fire Hydrants shall be Watertool or approved equal, 3-way breakaway type, no less than 5½ inches in size and shall conform to the provisions of the latest AWWA Standard C502, and shall have a bury depth of five feet. Valves shall be placed on all fire hydrant leads and shall be F x M.I.. Fire hydrants shall be located so that breakaway point is no less than 2-inches and no greater than 6-inches above the grade surface and a minimum of 2-feet and a maximum of 6-feet behind the edge of pavement line, as based on the location of the sidewalk. The fire hydrant shall not be in the sidewalk and shall be installed so the customer connection will face the street, or as directed by the fire department. A Blue Stimsonite, Fire-Lite reflector (or approved equal) shall be placed in the center of the drive lane on the side of the fire hydrant.
3. Fire hydrant Bonnets shall be painted blue. The remainder of the hydrant above ground shall be painted aluminum.
4. Valves 12" and under to be Gate Valves meeting requirements of AWWA C500 or AWWA C509 (NCTOG Item 2.13.1) with non-rising stems. Contractor shall mark pavement with "V" at location of valve.
5. Water Mains – All water mains, fittings, and valves shall meet AWWA specifications. All water lines to be C900 DR-18 (NCTOG Item 2.12.2). Minimum cover over water mains shall be 6" dia. and under, 3.5-feet, 8" dia., 4-feet, 12" dia. 4.5 feet–5 feet. DR-18 water mains to be tested at 150 psi for a continuous period of four (4) hours. Leakage rate shall not exceed 0 gallons per inch of nominal diameter per mile of pipe over test period. Contractor shall flush and sterilize lines and prove lines to be free of conforms organisms by obtaining samples for laboratory tests for contamination. The Contractor shall flush and sterilize until samples for test are free from contamination. Jetting of backfill will not be permitted.
6. All water services shall be 1" poly. Meter boxes shall comply with current City of LUCAS Standards and Specifications.
7. Contractor shall tie a 1" piece of blue plastic flagging to the water service and shall leave a minimum of 36" of flagging exposed after backfill. Contractor shall also mark pavement with "W" at location of water service.
8. Contractor shall furnish a maintenance bond to the City of LUCAS to run for two years from the date of acceptance.
9. The source of water supply for this addition will be from the City of LUCAS.
10. Valve boxes shall be furnished and set on each gate valve. After the final clean-up and alignment has been completed, the Contractor (utility) shall pour a concrete block 6" x 18" x 18" around all valves box tops so the finished grade is level with the finished parkway.
11. Water lines shall be pressure tested and disinfected in accordance with AWWA C601.
12. Water valves deeper than 4' shall have extensions in accordance with City of LUCAS Details.
13. All embedment to be class B+ or better as detailed in the NCTOG Construction Standards.

(4) Where the nine-foot separation distance cannot be achieved, the following criteria shall apply.

(A) New waterline installation – parallel lines.

(i) Where a new potable waterline parallels an existing, non-pressure or pressure rated wastewater main or lateral and the licensed professional engineer or licensee is unable to locate the existing wastewater main or lateral is not working, the new potable waterline shall be located at least two feet above the existing wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the existing wastewater main or lateral. Every effort shall be exerted not to disturb the bedding and backfill of the existing wastewater main or lateral.

(ii) Where a new potable waterline parallels an existing pressure rated wastewater main or lateral and it cannot be determined by the licensed professional engineer or licensee if the existing wastewater main or lateral shall be replaced with at least 150 psi pressure rated pipe. The new potable waterline shall be located at least two feet above the new wastewater line, measured vertically, and at least four feet away, measured horizontally, from the replaced wastewater main or lateral.

(iii) Where a new potable waterline crosses a new, standard pipe segment of a new wastewater main, the wastewater main or lateral shall be constructed of at least 150 psi pressure rated pipe. The new potable waterline shall be located at least two feet above the wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the wastewater main or lateral.

(B) New waterline installation – crossing lines.

(i) Where a new potable waterline crosses an existing, non-pressure rated wastewater main or lateral, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least two feet above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. If the existing wastewater main or lateral is disturbed or shows signs of leaking, it shall be replaced with at least 150 psi pressure rated pipe.

(ii) Where a new potable waterline crosses an existing, pressure rated wastewater main or lateral, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least six inches above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. If the existing wastewater main or lateral shows signs of leaking, it shall be replaced for at least nine feet in both directions (18 feet total) with at least 150 psi pressure rated pipe.

(iii) Where a new potable waterline crosses a new, non-pressure rated wastewater main or lateral and the standard pipe segment length of the wastewater main or lateral is at least 18 feet, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least two feet above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. The wastewater pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The wastewater main or lateral shall be embedded in cement stabilized sand (see clause (V) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end.

(iv) Where a new potable waterline crosses a new, pressure rated wastewater main or lateral, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The waterline pipe is less than 18 feet in length, the potable water pipe segment shall be centered over the wastewater line. The materials and method of installation shall conform with one of the following options.

(i) Within nine feet horizontally of either side of the waterline, the wastewater pipe and joints shall be constructed with pipe material having a minimum pipe stiffness of at least 150 psi. An absolute minimum vertical separation distance of two feet shall be provided. The wastewater main or lateral shall be located below the waterline.

(ii) All sections of wastewater main or lateral within nine feet horizontally of the waterline shall be encased in an 18-foot (or longer) section of pipe. Flexible encasing pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The encasing pipe shall be centered on the waterline and shall be at least two nominal pipe diameters greater than the wastewater main or lateral. The space around the carrier pipe shall be supported at five-foot (or less) intervals with spacers or be filled to the springline with washed sand. Each end of the casing shall be sealed with watertight non-shrink cement grout or a manufactured watertight seal. An absolute minimum separation distance of six inches between the encasement pipe and the waterline shall be provided. The wastewater main or lateral shall be located below the waterline.

(iii) When a new waterline crosses under a wastewater main or lateral, the waterline shall be encased as described for wastewater mains or laterals.

In subclause (II) of this clause or constructed of ductile iron or steel pipe with mechanical or welded joints as appropriate. An absolute minimum separation distance of one foot between the waterline and the wastewater main or lateral shall be provided. Both the waterline and wastewater main or lateral must pass a pressure test.

(V) Where a new potable waterline crosses a new, pressure rated wastewater main or lateral, one segment of the waterline pipe shall be centered over the wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the center line of the wastewater main or lateral. The potable waterline shall be at least six inches above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. If the existing wastewater main or lateral shows signs of leaking, it shall be replaced for at least nine feet in both directions (18 feet total) with at least 150 psi pressure rated pipe. The waterline pipe shall be embedded in cement stabilized sand (see clause (V) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end.

(vi) Where cement stabilized sand bedding is required, the cement stabilized sand shall have a minimum of 10% cement per cubic yard of cement stabilized sand (see clause (V) of this subparagraph) and be placed at least six inches above the waterline pipe and at least four inches below the waterline pipe or lateral bedding is recommended for the identification of pressure rated wastewater mains during future construction.

All backfill for utilities and pavement including lime stabilized subgrade to be +2% or higher of optimum moisture.

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CHECKED: M.A.	DATE: MARCH 2019
PROJECT NO.: 08361	
DWG FILE NAME: 08361 GENERAL NOTES & TYPICAL SECTION.DWG	

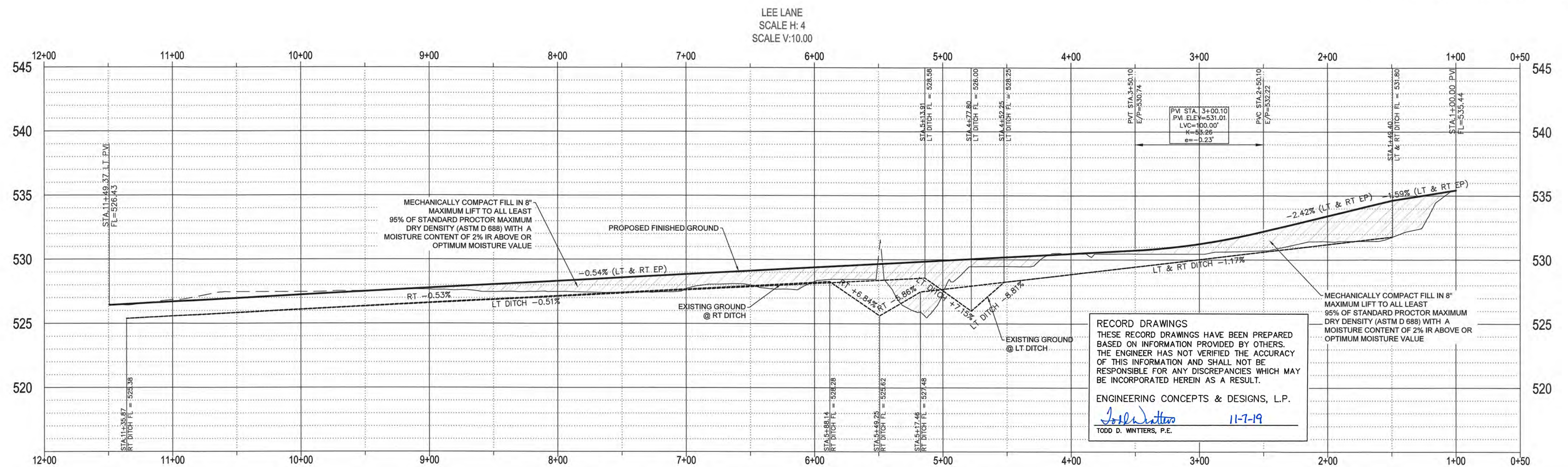
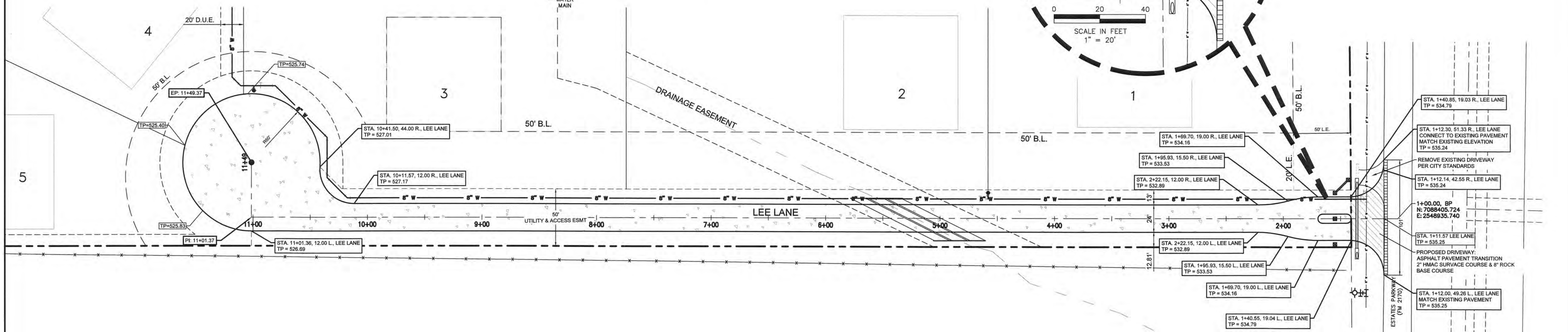
GENERAL NOTES & TYPICAL SECTION

THE FARMSTEAD

COLLIN COUNTY, TEXAS

04

15



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REVISIONS:

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CHECKED: M.A.	DATE: MARCH 2019
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DWG FILE NAME: 08361 PAVING PLAN & PROFILE.DWG	

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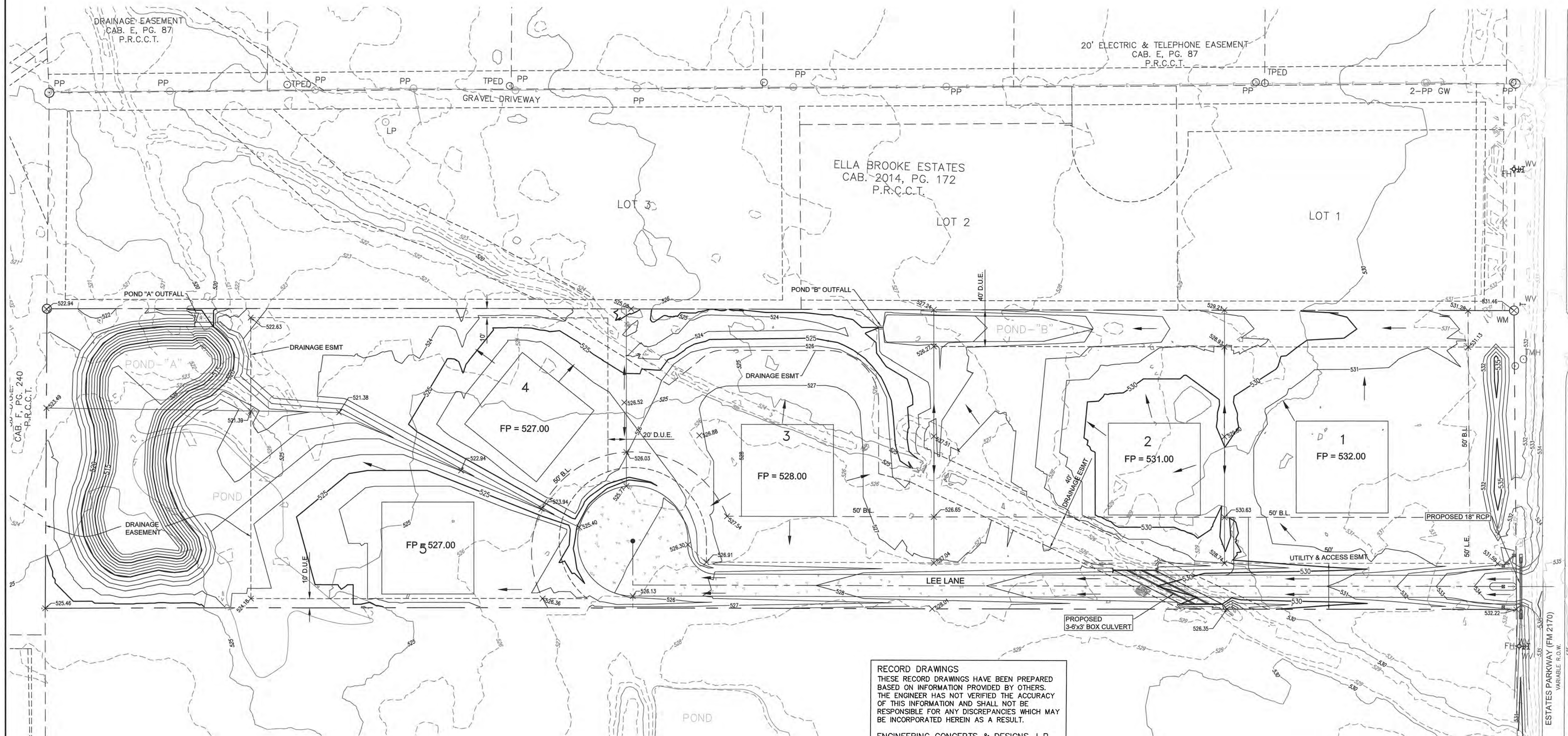


PAVING PLAN & PROFILE

THE FARMSTEAD

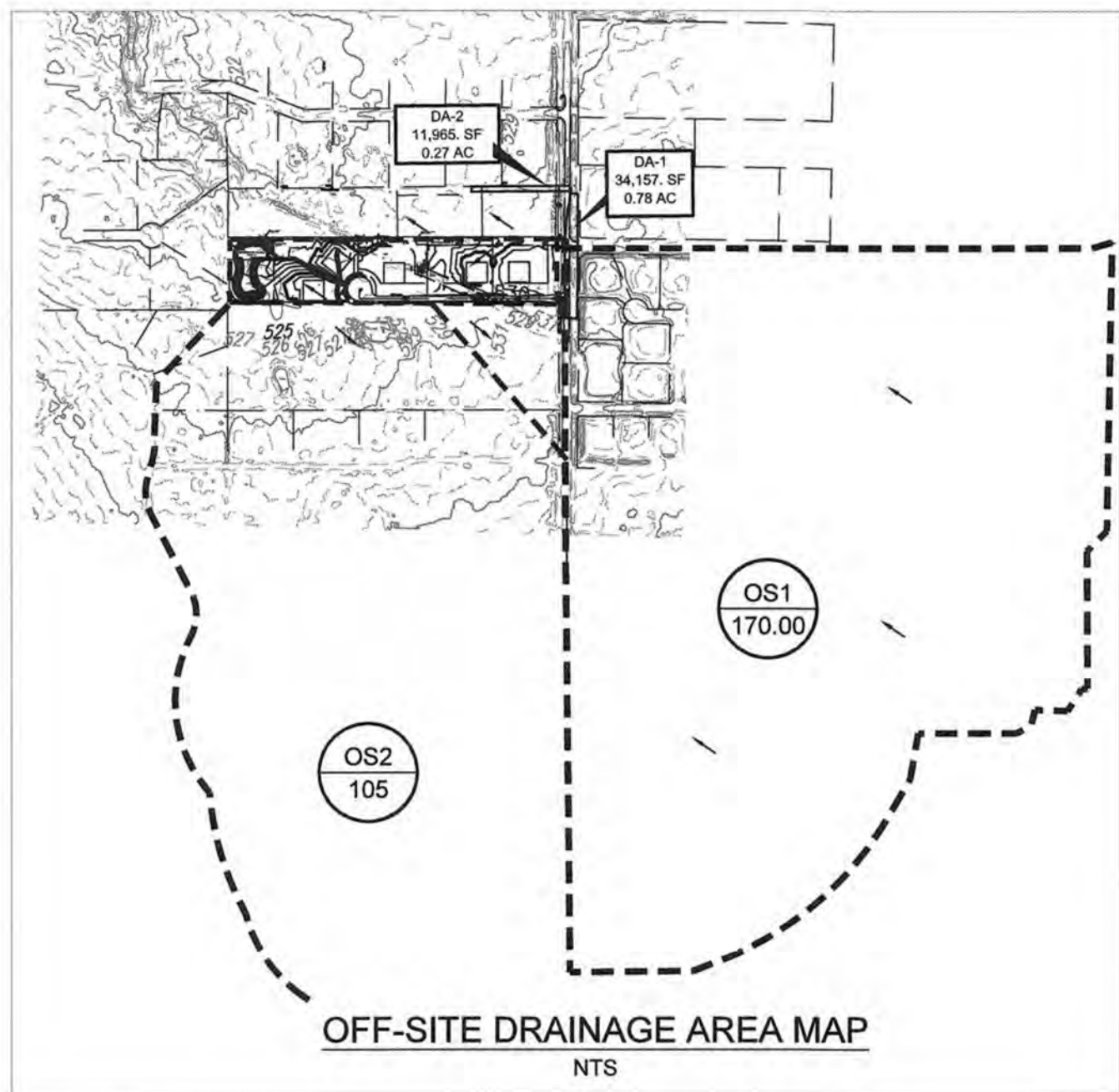
COLLIN COUNTY, TEXAS

SHEET
05
OF
15



ENGINEERING CONCEPTS & DESIGNS, L.P.
 11-7-19
 TODD D. WINTERS, P.E.

SHEET
06
OF
15



DRIVEWAY CULVERT CHART

LOT#	SIZE
1	18"
2	18"
3	18"
4	18"
5	18"

EXISTING DRAINAGE AREA DATA

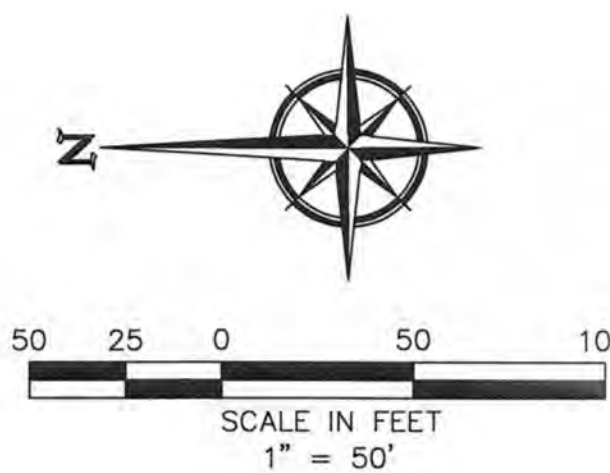
Area ID	Area (acres)	C	CA	T _c (min.)	I ₁₀₀	Q ₁₀₀ (cfs)
A	5.50	0.30	1.65	15	7.52	12.41
B	2.28	0.30	0.69	15	7.52	6.20
C	3.57	0.30	1.07	15	7.52	8.05
D	0.32	0.30	0.10	15	7.52	0.72
OS1	170.00	0.30	51.00	30	5.75	293.25
OS2	105.00	0.30	31.50	30	5.75	181.13
Total						501.76

PROPOSED DRAINAGE AREA DATA

Area ID	Area (acres)	C	CA	T _c (min.)	I ₁₀₀	Q ₁₀₀ (cfs)	COMMENTS
A	5.50	0.40	2.20	15	7.52	16.54	Detained in Pond A
B	2.28	0.40	0.91	15	7.52	6.86	Undetained
C	3.57	0.40	1.43	15	7.52	10.74	Detained in Pond B
D	0.32	0.85	0.27	15	7.52	2.05	Free Release in Estates Pkwy
OS1	170.00	0.30	51.00	30	5.75	293.25	Pass-thru
OS2	105.00	0.30	31.50	30	5.75	181.13	Pass-thru
Total						510.56	

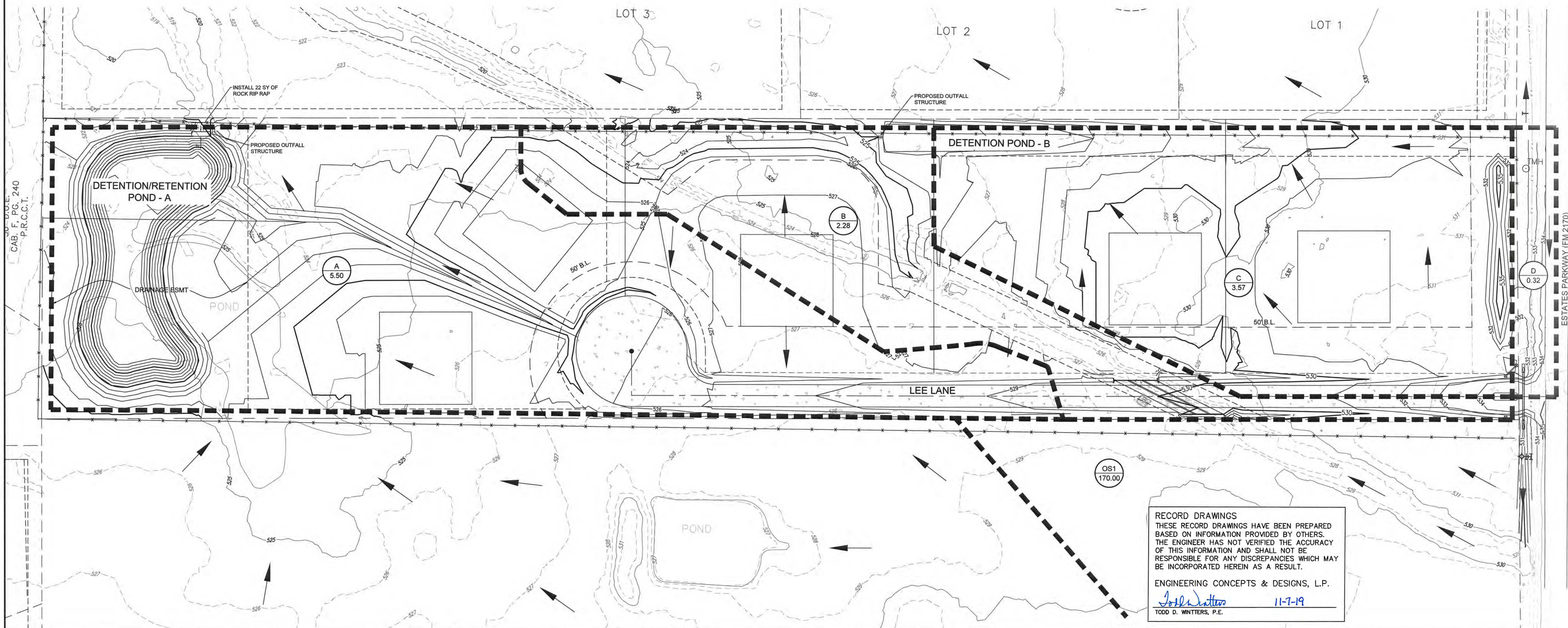
Onsite Existing Conditions		
Area	11.35	acres
Time (T _c)	15.00	mins
C value	0.30	
I-100yr	7.52	in/hr
Q100yr	25.61	cfs

Onsite Proposed Conditions		
Area	11.35	acres
Time (T _c)	15.00	mins
C value	0.40	
I-100yr	7.52	in/hr
Q100yr	34.14	cfs



DRAINAGE LEGEND

- PROPOSED DRAINAGE AREA BOUNDARY
- DRAINAGE FLOW ARROWS
- DRAINAGE AREA #
AREA IN ACRES



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201 WINDCO CIR, STE 200, WYLIE, TX 75098
972-941-8400 FAX: 972-941-8401 WWW.ECDLP.COM

REVISIONS:

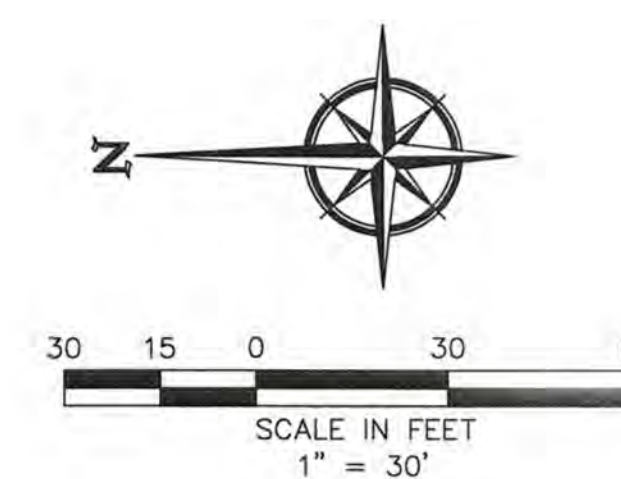
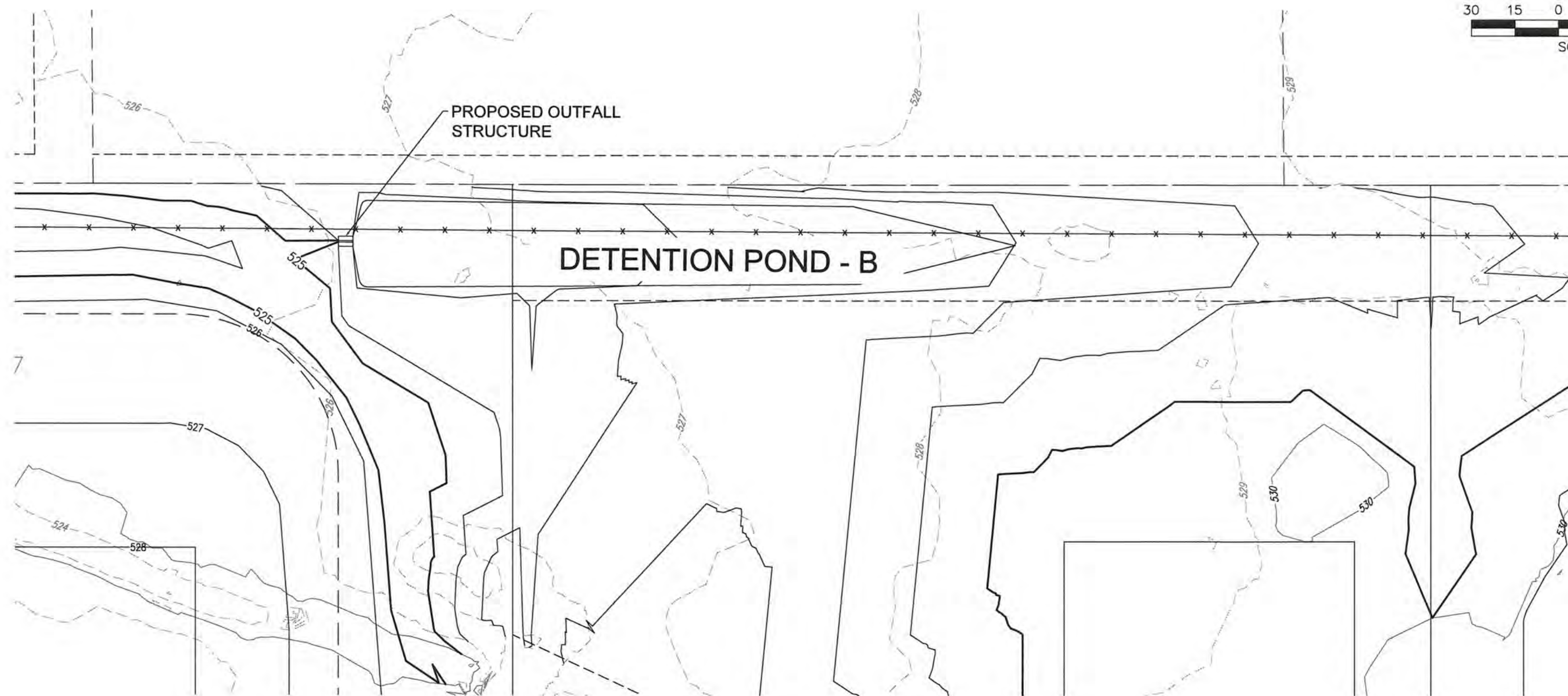
DRAWN: JD	DATE:
CHECKED: M.A.	DATE: MARCH 2019
PROJECT NO.: 08361	
DWG FILE NAME: 08361 DRAINAGE AREA MAP.DWG	

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DRAINAGE AREA MAP
THE FARMSTEAD
COLLIN COUNTY, TEXAS

SHEET
07
OF
15



POND A RELEASE CALCULATIONS						
	On-Site Area A (AC)	Tc (min)	K-Value	C-Factor	Intensity I (in/hr)	Flow Q (cfs)
PRE-DEVELOPED CONDITIONS (Onsite - Total)	5.50	15	1.00	0.30	7.52	12.41
DEVELOPED CONDITIONS (Onsite - Total)	5.50	15	1.00	0.40	7.52	16.54
BYPASS CONDITIONS (Onsite - Not to Pond)	2.28	15	1.00	0.40	7.52	6.86
FLOW THROUGH CONDITIONS (Offsite - To Pond)	105.00	30	1.00	0.30	5.75	181.13

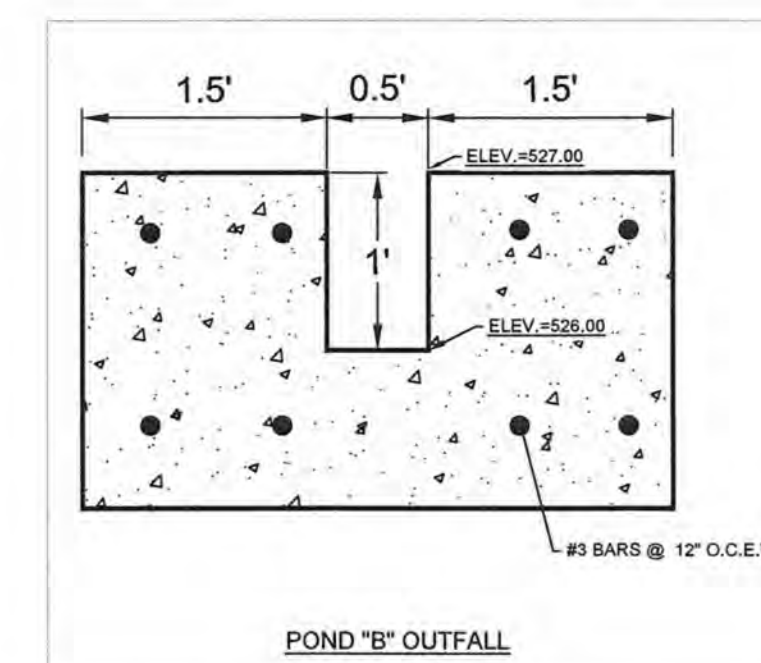
Existing Site Release	Flow Qe =	Pre-Developed Q + Flow Through Q
	Qe =	193.53 cfs
Pond Release Flow	Qp =	Pre-Developed Q + Flow Through Q - Bypass Q
	Qp =	186.67 cfs
Site Release Flow	Qs =	Pond Release Qp+ Bypass Q
	Qs =	193.53 cfs

POND B RELEASE CALCULATIONS						
	On-Site Area A (Ac)	Tc (min)	K-Value	C-Factor	Intensity (in/hr)	Flow (cfs)
PRE-DEVELOPED CONDITIONS (Onsite - Total)	3.57	15	1.00	0.30	7.52	8.05
DEVELOPED CONDITIONS (Onsite - Total)	3.57	15	1.00	0.40	7.52	10.74
BYPASS CONDITIONS (Onsite - Not to Pond)	2.28	15	1.00	0.40	7.52	6.86
FLOW THROUGH CONDITIONS (Offsite - To Pond)	0.00	30	1.00	0.30	5.75	0.00

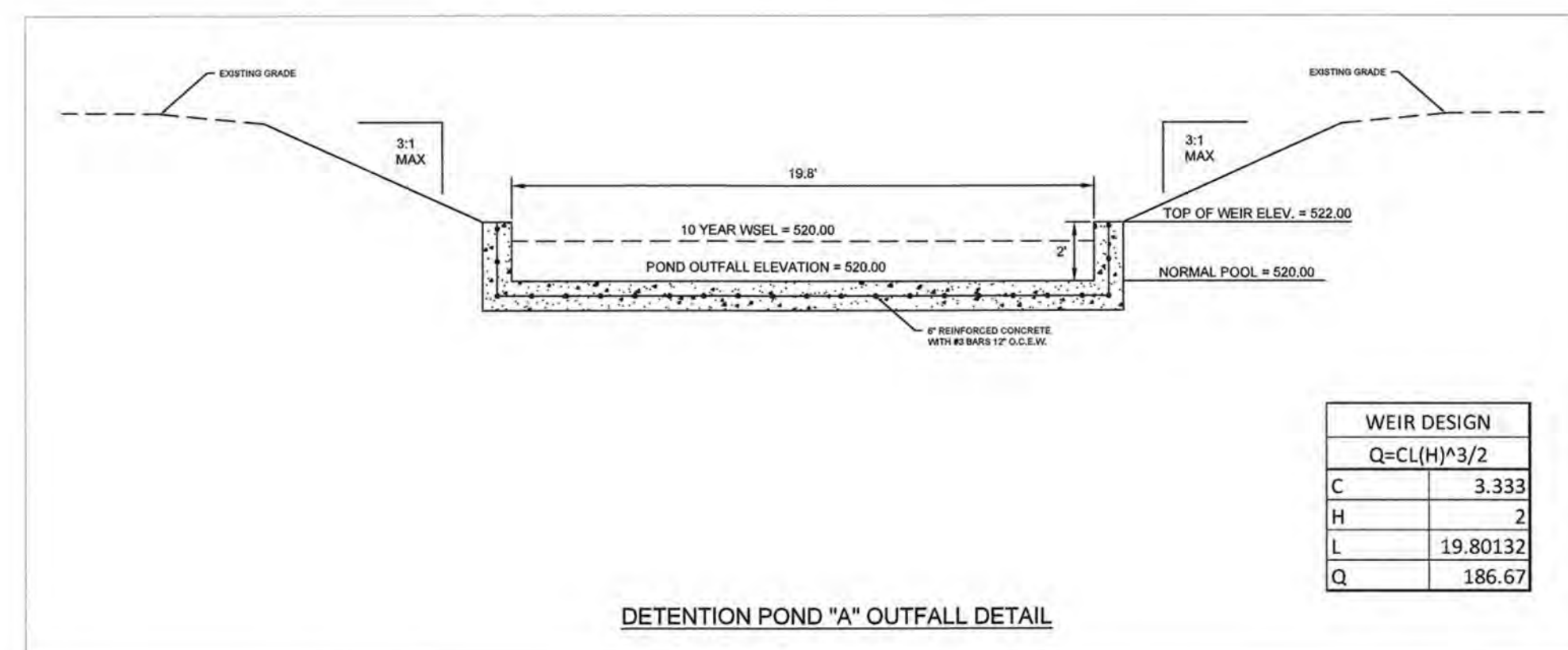
Existing Site Release: Flow Qe =	Pre-Developed Q + Flow Through Q
Qe =	8.05 cfs

Pond Release Flow Qp =	Pre-Developed Q + Flow Through Q - Bypass Q
Qp =	1.20 cfs

Site Release Flow Qs =	Pond Release Qp + Bypass Q
Qs =	8.05 cfs



WEIR DESIGN	
$Q = CL(H)^{3/2}$	
C	3.3
H	
L	0.5100
Q	1



POND	ONSITE FLOW TO POND (CFS)	ALLOWABLE RELEASE RATE (CFS)	OFF-SITE BYPASS THROUGH	TOTAL RELEASE RATE (CFS)	STORAGE REQUIRED (CF)	STORAGE PROVIDED (CF)	COMMENTS
POND A	16.54	12.41	181.13	186.67*	6822	68148	*OVER DETAIN FOR AREA A
POND B	10.74	8.05	0	12*	6593	7938	*OVER DETAIN FOR AREA B

SITE RELEASE	EXISTING (CFS)	PROPOSED (CFS)
NORTH OUTFALL	193.53	186.67
MAIN CREEK	308.23	303.35

RECORD DRAWINGS
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BE INCORPORATED HEREIN AS A RESULT.

ENGINEERING CONCEPTS & DESIGNS, L.P.

Todd D. Winters
TODD D. WINTTERS, P.E.

11-7-14

CAUTION! EXISTING UTILITIES

CONTRACTOR SHOULD CALL 1-800-DIG-TESS PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES FOR EXISTING UTILITY LOCATIONS. EXISTING UTILITIES ARE LOCATED AT THE LOCATIONS INDICATED ON THESE PLANS HAVE BEEN LOCATED FROM REFERENCE INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY BOTH HORIZONTALLY AND VERTICALLY THE LOCATION OF ALL EXISTING UTILITIES AND UNDERGROUND FACILITIES PRIOR TO CONSTRUCTION AND TO TAKE NECESSARY PRECAUTIONS IN ORDER TO PROTECT ALL FACILITIES ENCOUNTERED. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING UTILITIES FROM DAMAGE DURING



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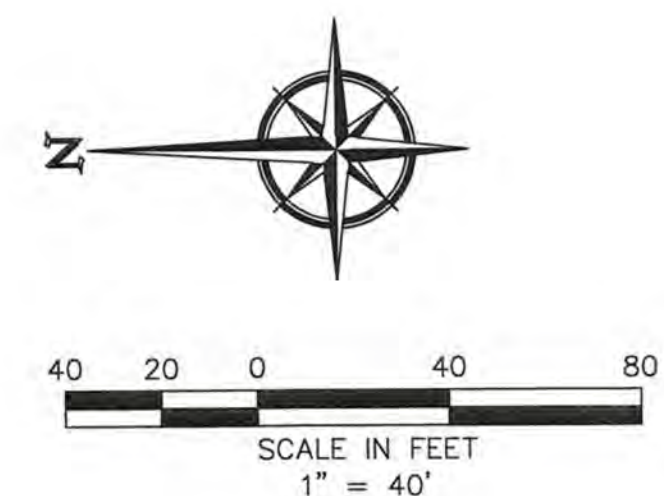
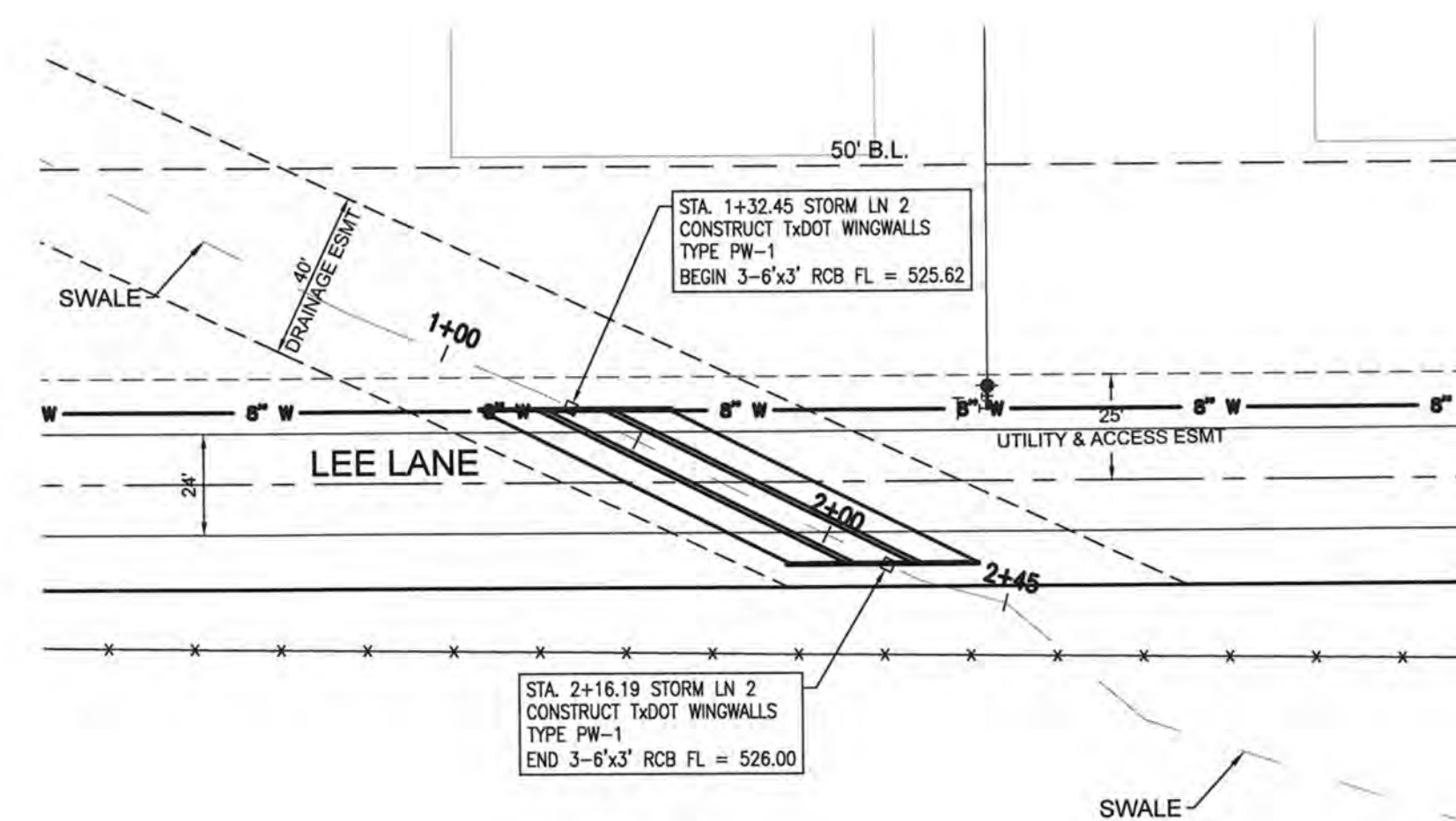
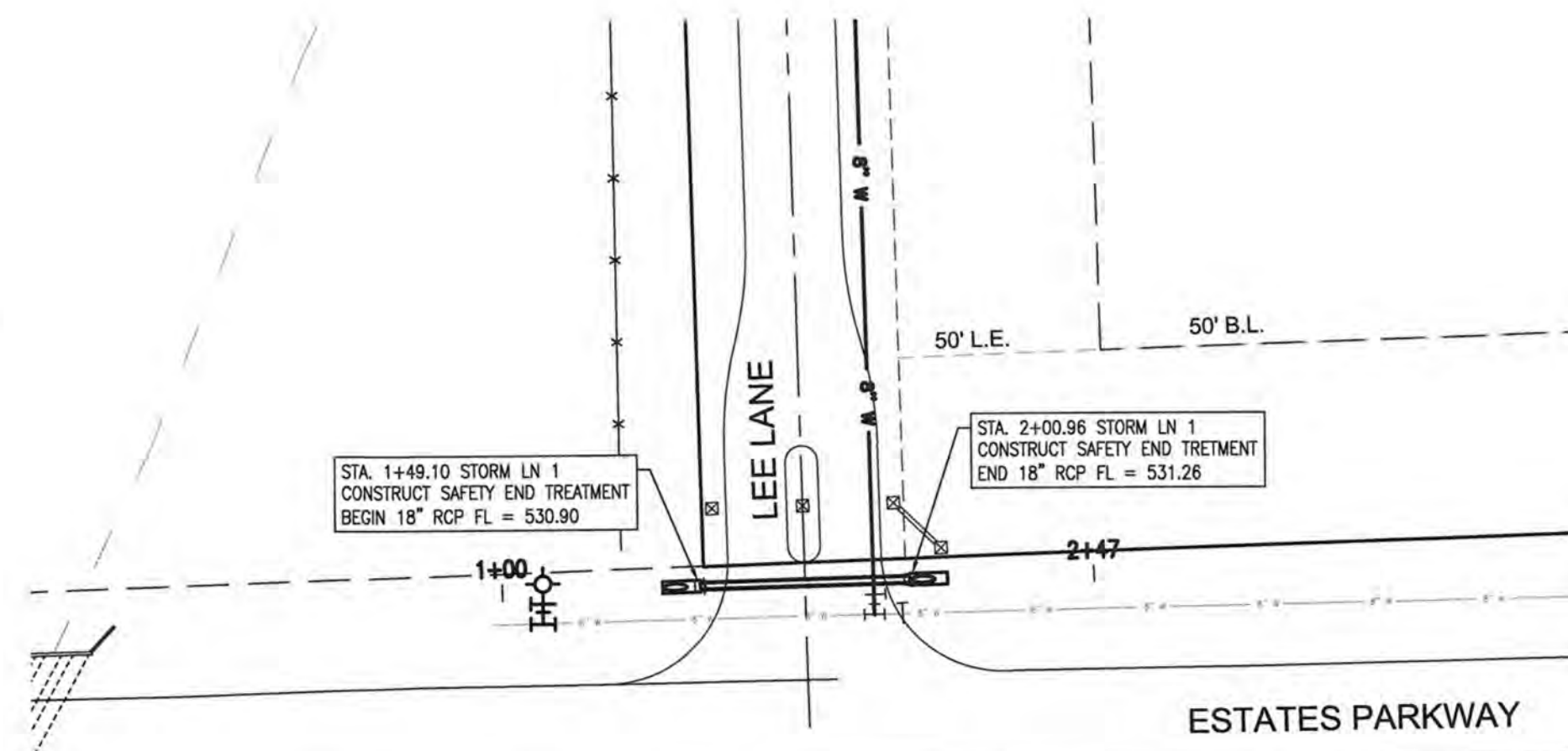
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DRAWN: JD	DATE:
CHECKED: M.A.	DATE: MARCH 2019
PROJECT NO.: 08361	
DWG FILE NAME: 08361 DRAINAGE AREA MAP DWG	

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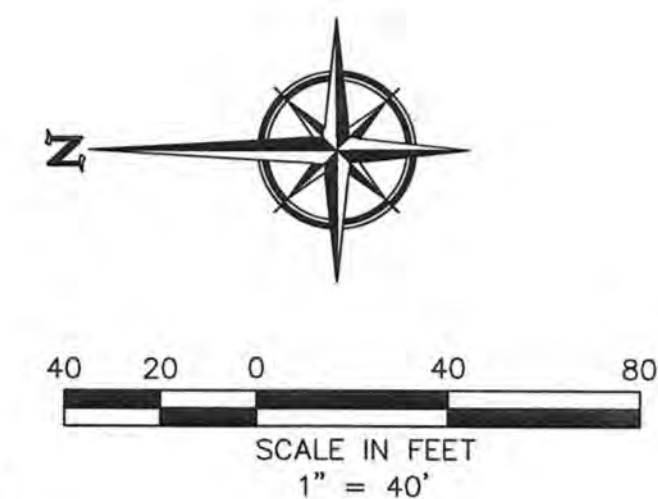
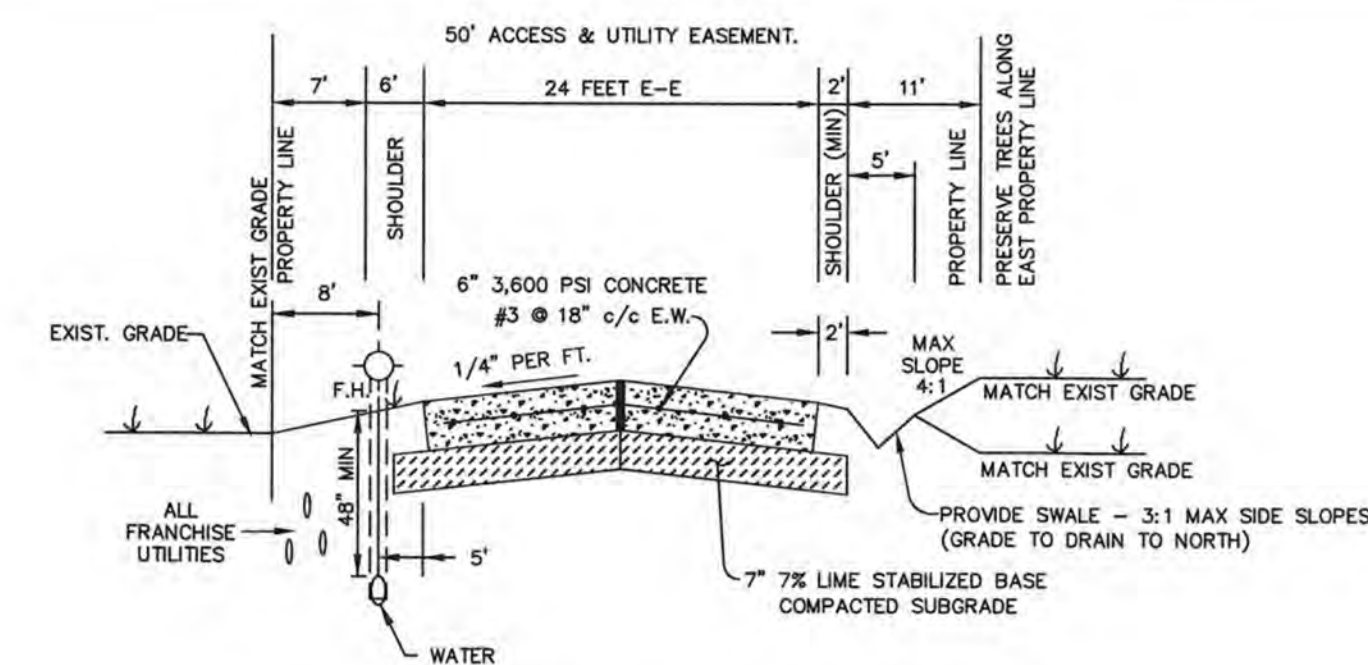
DETENTION CALCULATIONS
THE FARMSTEAD
COLLIN COUNTY, TEXAS

SHEET
08
OF
15

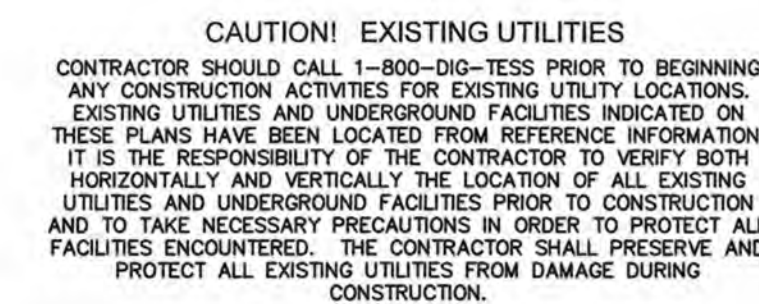


Todd D. Winters 11-7-19
TODD D. WINTERS, P.E.

SHEET
09
OF
15



TYPICAL PAVING SECTION
(24 E-E CONCRETE STREET)
(LOOKING NORTH)



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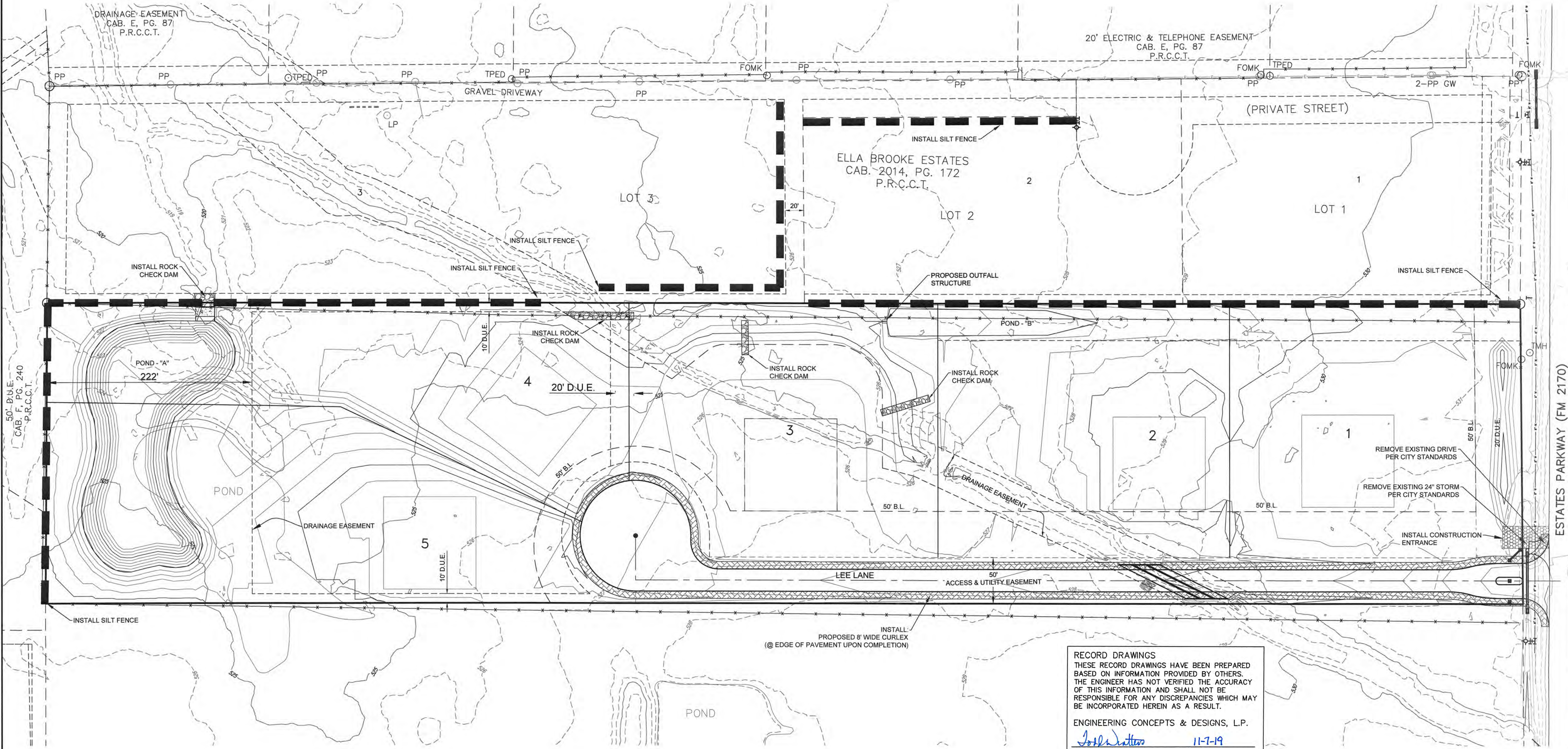
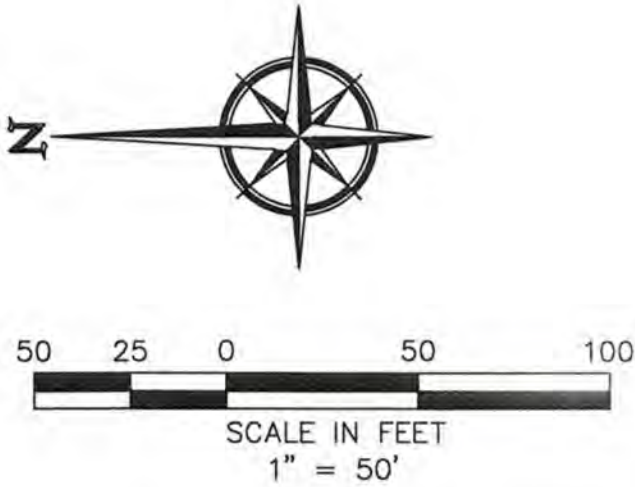
WATER PLAN THE FARMSTEAD COLLIN COUNTY, TEXAS

SHEET
10
OF
15

NOTE:
ALL DISTURBED AREAS TO BE
100% STABILIZED PRIOR TO
FINAL ACCEPTANCE.

LEGEND

- SILT FENCE
- CONSTRUCTION ENTRANCE
- CURLEX



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ENGINEERINGCONCEPTS
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PROJECT NO.: 08361	
DWG FILE NAME: 08361 EROSION CONTROL PLAN.DWG	

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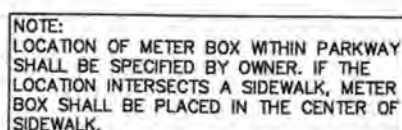


EROSION CONTROL PLAN
THE FARMSTEAD
COLLIN COUNTY, TEXAS

SHEET
11
OF
15



I.D. (IN.)	T (IN.)	$\Delta =$ 11.0 (FT.)	$\Delta =$ 22.50 (FT.)	E (FT.)
4.6, 8	0.4	1.5	1.5	0.9
10, 12	0.5	1.5	1.5	1.2
16, 18	0.6	1.5	1.5	1.6
20	0.7	1.5	1.5	1.8
24	0.9	1.5	1.5	2.1
30	2.9	1.5	1.9	2.6
36	4.5	1.5	2.3	3.3
42	5.0	1.8	2.6	3.8
48	5.5	2.0	3.0	4.3
54	6.0	2.3	3.4	4.8
60	6.5	2.5	3.8	5.3
66	6.8	2.8	4.1	5.7
72	7.5	3.0	4.5	6.3
78	7.5	3.3	4.9	6.7
84	8.0	3.5	5.3	7.2
90	8.5	3.8	5.6	7.7
96	9.0	4.0	6.0	8.2



ID.	EARTH			ROCK		
	THRUST (TONS)	C (FT)	A (FT)	VOL (C.Y.)	A (FT)	VOL (C.Y.)
4,6,8	1.5	1.5	2.5	0.3	2.0	0.4
10,12	1.5	1.5	3.5	0.6	2.5	0.3
16,18	25.5	2.0	5.5	1.6	4.0	0.9
20	2.5	2.0	7.0	0.9	3.0	0.5
24	45.2	2.5	7.0	3.1	5.0	1.7
30	53.0	3.0	7.5	4.1	5.5	2.4
36	76.0	4.0	9.0	7.3	6.5	4.2
42	100.0	4.0	9.0	10.0	6.5	4.2
48	166.0	5.0	12.0	15.8	8.5	8.7
54	172.0	5.5	13.5	21.4	9.5	11.9
60	272.0	6.5	15.0	28.4	10.5	15.7
66	287.0	7.0	16.0	29.9	11.0	16.3
72	305.0	7.5	17.5	32.2	12.5	22.7
78	358.0	8.0	18.0	58.9	13.5	33.7
84	416.0	8.5	20.5	72.3	14.5	41.2
90	448.0	9.0	22.0	87.7	15.5	49.7
96	448.0	9.0	23.0	100.0	16.0	56.0

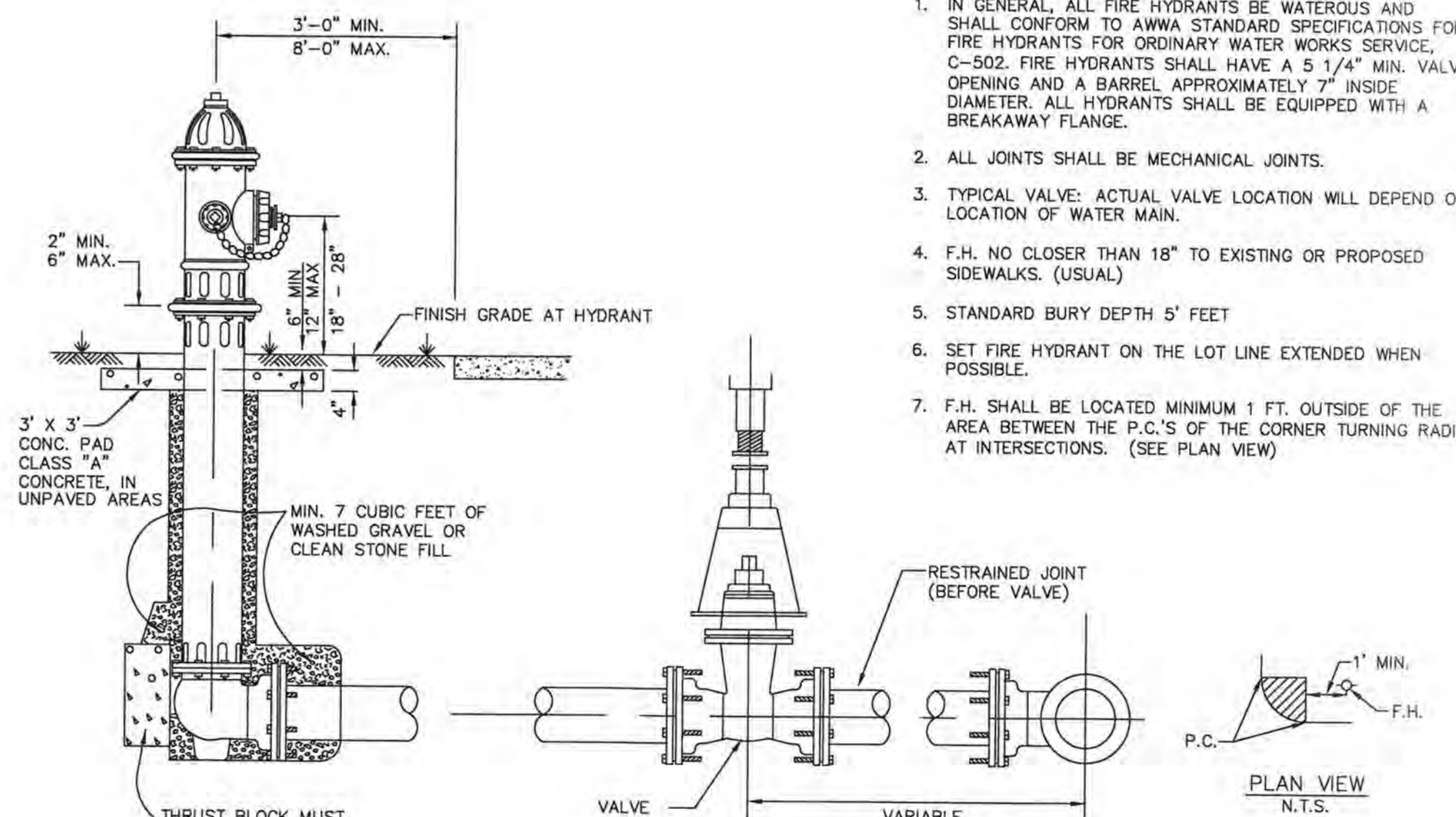
Earth A1.25°												Jan. 22.50°												
(I ₀ , A ₀)	EARTH						ROCK						EARTH						ROCK					
	G	THURST	A	B	VOL.	C/VOL.	G	THURST	A	B	VOL.	C/VOL.	G	THURST	A	B	VOL.	C/VOL.	G	THURST	A	B	VOL.	C/VOL.
4,6,8	0.4	1.9	1.0	1.1	0.5	1.0	0.1	4,6,8	0.8	4.6,8	0.8	4.6,8	0.8	4,6,8	0.8	4.6,8	0.8	4.6,8	0.8	4,6,8	0.8	4.6,8	0.8	4.6,8
10,12	0.6	2.2	1.5	1.5	0.1	1.0	1.5	1.0	1.5	1.0	1.5	1.0	10,12	1.1	4.4	2.0	2.5	0.3	1.5	1.5	1.0	1.5	1.0	1.5
16,18	0.6	2.0	2.0	2.5	0.3	1.5	2.0	16,18	1.1	8.9	3.0	3.5	0.6	2.0	2.5	0.3	1.5	2.0	2.5	0.3	1.5	2.0	2.5	0.3
20	1.0	2.5	2.5	3.0	0.5	2.0	3.0	20	1.8	12.3	3.5	3.5	0.7	2.0	3.0	3.0	3.5	0.7	2.0	3.0	3.0	3.5	0.7	
24	1.1	8.9	3.0	3.5	0.5	2.0	3.0	24	2.2	17.7	4.0	4.0	1.0	2.0	3.0	3.0	4.0	1.0	2.0	3.0	3.0	4.0	1.0	
30	1.4	10.4	3.0	3.5	0.5	2.0	3.0	30	2.6	20.7	2.6	4.5	1.5	3.0	4.0	4.0	4.5	1.5	3.0	4.0	4.0	4.5	1.5	
36	1.7	20.0	3.5	4.5	0.9	2.0	4.0	36	3.3	29.8	5.5	5.5	2.3	4.0	5.0	5.0	5.5	2.3	4.0	5.0	5.0	5.5	2.3	
42	1.9	25.0	4.5	5.0	1.5	2.5	5.0	42	3.8	40.5	7.0	6.0	3.9	4.5	6.0	6.0	6.9	3.9	4.5	6.0	6.0	6.9	3.9	
48	2.0	25.0	5.0	5.0	1.5	2.5	5.0	48	4.0	40.5	7.0	6.0	3.9	4.5	6.0	6.0	7.0	4.5	6.0	6.0	7.0	4.5	6.0	
54	2.5	33.7	6.0	6.0	3.0	6.0	1.4	54	4.9	67.0	9.0	9.0	6.0	7.0	8.0	8.0	9.0	6.0	7.0	8.0	8.0	9.0	6.0	
60	2.7	41.6	6.0	7.0	3.8	3.0	7.0	1.8	60	5.5	82.7	9.5	9.0	10.6	7.0	8.0	8.0	10.6	7.0	8.0	8.0	10.6	7.0	
66	3.0	50.3	8.5	8.5	6.1	8.5	8.0	2.7	66	6.0	100.1	10.5	10.0	11.8	8.5	8.5	8.5	11.8	8.5	8.5	8.5	11.8	8.5	
72	3.3	59.8	8.5	8.5	6.1	8.5	8.0	3.3	72	6.6	100.1	10.5	10.0	11.8	8.5	8.5	8.5	11.8	8.5	8.5	8.5	11.8	8.5	
78	3.8	70.2	8.5	8.5	6.1	8.5	8.0	3.8	78	7.2	100.1	10.5	10.0	11.8	8.5	8.5	8.5	11.8	8.5	8.5	8.5	11.8	8.5	
84	3.8	81.5	8.5	10.0	10.5	10.5	10.5	8.4	7.8	100.1	10.5	10.0	11.8	8.5	8.5	8.5	11.8	8.5	8.5	8.5	11.8	8.5	8.5	
90	4.1	83.5	9.5	10.0	12.2	5.0	10.0	6.3	9.0	8.2	186.1	14.0	13.5	33.7	8.5	10.0	14.0	13.5	33.7	8.5	10.0	14.0	13.5	

TABLES OF DIMENSIONS AND QUANTITIES

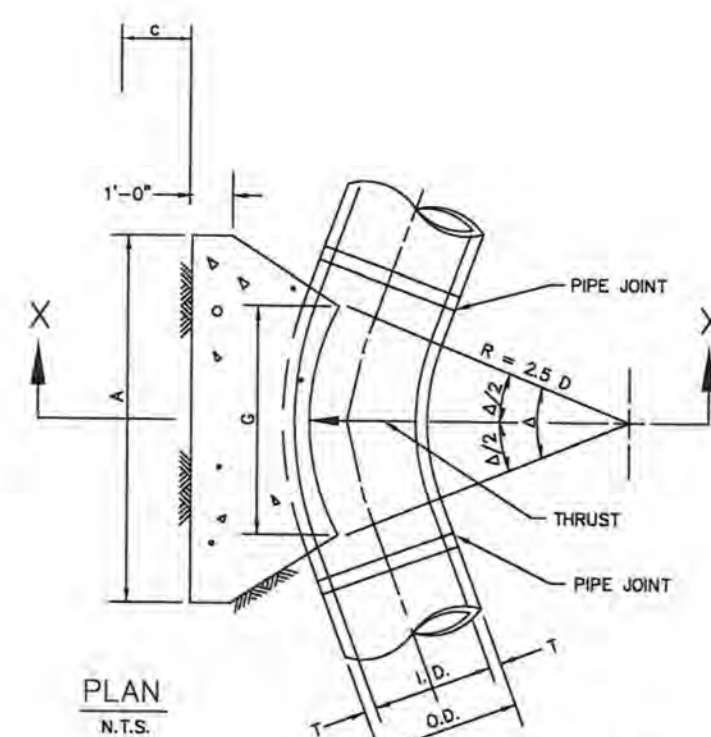
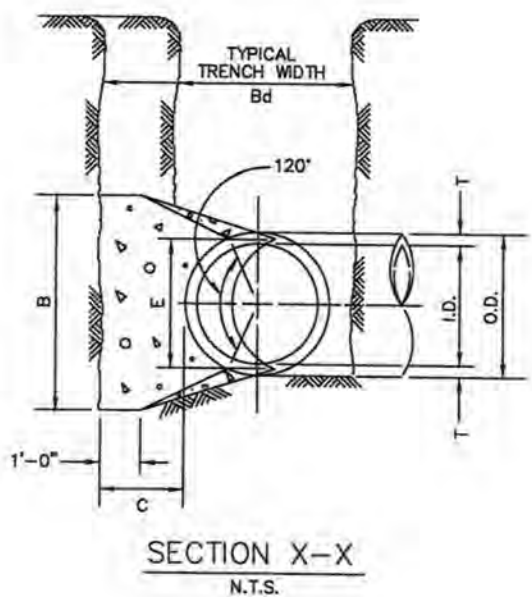
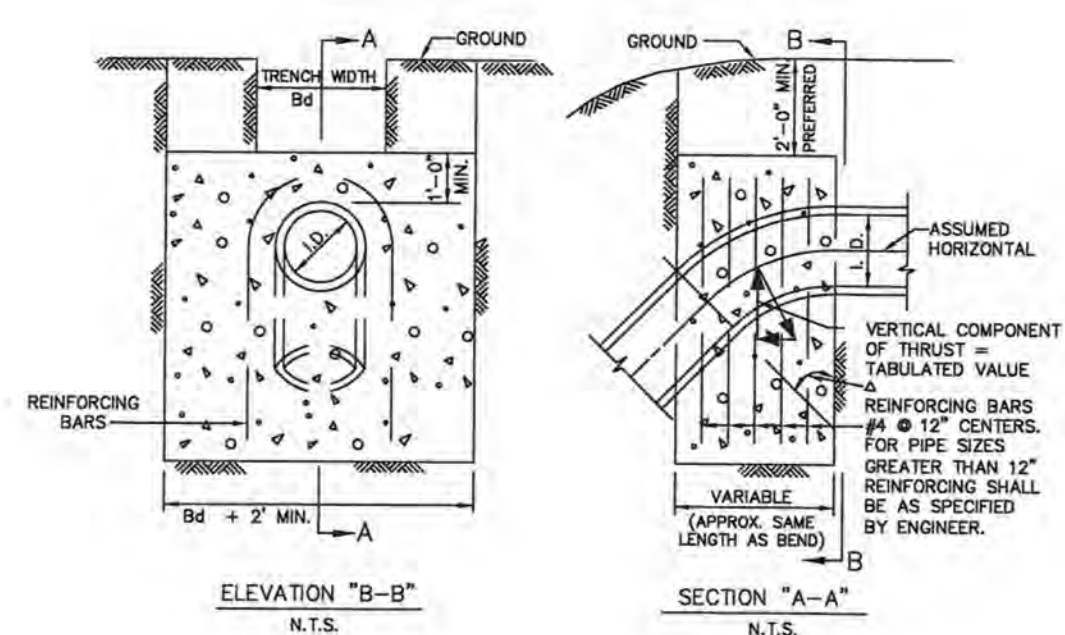
Δ = 30°										Δ = 45°									
EARTH										ROCK									
I.D. (IN.)	G. THRUST (T)	H. (FT)	B. VOL. (CY.)	V. VOL. (CY.)	I.D. (IN.)	G. THRUST (T)	H. (FT)	B. VOL. (CY.)	V. VOL. (CY.)	I.D. (IN.)	G. THRUST (T)	H. (FT)	B. VOL. (CY.)	V. VOL. (CY.)					
16.8	2.4	18.6	5.5	2.5	2.3	0.2	1.0	1.5	0.3	16.8	1.5	3.9	2.0	2.0	0.2				
10.12	1.5	13.9	3.5	2.5	2.3	0.2	1.0	1.5	0.3	10.12	2.2	8.0	2.0	2.0	0.2				
16.18	2.2	15.2	3.5	2.5	2.3	0.2	1.0	1.5	0.3	16.18	3.2	19.9	4.5	4.2	1.3				
20	2.4	16.3	4.5	4.0	1.0	3.0	0.5	2.0	3.6	24.1	5.5	4.5	1.5	3.5	0.7				
24	2.9	23.4	6.0	4.0	1.4	3.5	3.5	0.7	24	4.3	34.6	8.0	4.5	2.3	4.5				
3.6	3.6	27.5	6.5	5.0	1.9	3.5	4.0	0.9	3.6	5.4	40.6	8.5	5.0	3.2	5.5				
40	4.1	30.6	7.0	6.0	3.4	4.5	1.6	3.6	40	6.3	58.5	10.0	6.0	5.5	6.5				
42	5.1	33.0	7.5	6.0	3.4	4.5	1.6	3.6	42	6.8	61.6	11.5	7.0	6.0	5.0				
48	5.8	37.0	8.0	6.0	7.4	6.0	3.7	4.8	48	8.8	104.3	12.5	8.0	7.0	6.5				
54	5.5	40.5	8.0	10.3	7.0	6.5	5.3	5.4	54	9.7	137.5	15.0	9.0	12.7	10.5				
60	7.3	10.0	10.0	10.0	13.9	7.5	7.3	6.0	60	10.7	162.4	15.0	10.0	12.1	11.5				
66	8.0	132.9	12.5	11.0	18.9	8.5	8.6	8.6	66	11.8	166.5	18.0	11.0	23.5	16.5				
72	8.7	158.2	13.5	12.0	20.0	9.0	12.3	7.2	72	12.9	233.9	19.5	12.0	38.6	14.5				
74	18.6	15.5	15.5	16.0	24.0	9.0	12.3	7.2	74	13.9	274.3	21.0	13.0	46.4	14.5				
84	10.1	21.5	15.5	14.0	24.0	9.0	12.3	7.2	84	13.9	318.2	23.0	13.0	53.5	15.5				
90	10.9	24.71	16.5	15.0	45.0	11.5	23.9	9.0	90	16.1	359.5	25.0	15.0	62.5	15.5				
96	11.6	28.21	16.5	15.0	55.5	12.5	28.9	9.6	96	15.4	415.2	26.0	16.0	89.5	15.5				

$\lambda = 67.50^\circ$												$\lambda = 90^\circ$																																
		EARTH						ROCK								EARTH						ROCK																						
(N)	(S)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	(N)	(S)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	(N)	(S)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	(N)	(S)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	θ (TR)	θ (TR)															
4.6	2.1	5.6	3.0	2.0	0.3	2.0	1.5	0.2	4.6	2.7	7.1	5.0	1.5	0.4	2.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	4.6	2.1	5.6	3.0	2.0	0.3	2.0	1.5	0.2	4.6	2.7	7.1	5.0	1.5	0.4	2.3	0.2	0.2	0.2	0.2	0.2	0.2
10.12	3.1	26.3	7.5	4.5	2.5	0.8	3.5	2.0	0.4	10.12	4.0	16.0	6.5	2.5	1.0	3.5	2.5	0.5	0.5	0.5	0.5	10.12	3.1	26.3	7.5	4.5	2.5	0.8	3.5	2.0	0.4	10.12	4.0	16.0	6.5	2.5	1.0	3.5	2.5	0.5	0.5	0.5	0.5	
16.16	7.7	28.6	7.5	4.5	2.5	0.8	3.5	2.0	0.4	16.16	6.0	36.0	9.0	4.0	2.4	4.5	3.5	0.8	0.8	0.8	0.8	16.16	7.7	28.6	7.5	4.5	2.5	0.8	3.5	2.0	0.4	16.16	6.0	36.0	9.0	4.0	2.4	4.5	3.5	0.8	0.8	0.8	0.8	
20.52	9.4	24.9	7.5	4.5	2.5	0.8	3.5	2.0	0.4	20.52	7.0	28.0	7.5	4.5	2.5	0.8	3.5	2.0	0.4	0.4	0.4	20.52	9.4	24.9	7.5	4.5	2.5	0.8	3.5	2.0	0.4	20.52	7.0	28.0	7.5	4.5	2.5	0.8	3.5	2.0	0.4	0.4	0.4	
24	6.2	50.3	11.5	4.5	3.5	6.5	4.0	1.6	2.4	7.9	64.0	14.5	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	24	6.2	50.3	11.5	4.5	3.5	6.5	4.0	1.6	2.4	7.9	64.0	14.5	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
28	7.8	58.9	12.0	4.5	3.5	6.5	4.0	1.6	2.8	8.9	76.0	15.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	28	7.8	58.9	12.0	4.5	3.5	6.5	4.0	1.6	2.8	8.9	76.0	15.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
32	10.4	84.9	14.5	4.5	3.5	6.5	4.0	1.6	3.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	32	10.4	84.9	14.5	4.5	3.5	6.5	4.0	1.6	3.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
36	12.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	3.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	36	12.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	3.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
40	14.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	4.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	40	14.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	4.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
44	16.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	4.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	44	16.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	4.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
48	18.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	4.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	48	18.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	4.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
52	20.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	5.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	52	20.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	5.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
56	22.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	5.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	56	22.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	5.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
60	24.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	6.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	60	24.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	6.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
64	26.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	6.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	64	26.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	6.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
68	28.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	6.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	68	28.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	6.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
72	30.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	7.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	72	30.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	7.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
76	32.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	7.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	76	32.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	7.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
80	34.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	8.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	80	34.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	8.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
84	36.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	8.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	84	36.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	8.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
88	38.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	8.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	88	38.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	8.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
92	40.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	9.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	92	40.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	9.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
96	42.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	9.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	96	42.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	9.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
100	44.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	10.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	100	44.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	10.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
104	46.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	10.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	104	46.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	10.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
108	48.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	10.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	108	48.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	10.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
112	50.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	11.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	112	50.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	11.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
116	52.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	11.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	116	52.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	11.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
120	54.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	12.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	120	54.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	12.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
124	56.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	12.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	124	56.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	12.4	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
128	58.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	12.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	128	58.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	12.8	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
132	60.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	13.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	132	60.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	13.2	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
136	62.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	13.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	136	62.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	13.6	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6			
140	64.8	84.9	14.5	4.5	3.5	6.5	4.0	1.6	14.0	11.0	108.0	16.0	4.5	3.5	6.5	4.0	1.6	1.6	1.6	1.6	140	64.8	84.9	14.5	4.5	3.5	6.5</																	

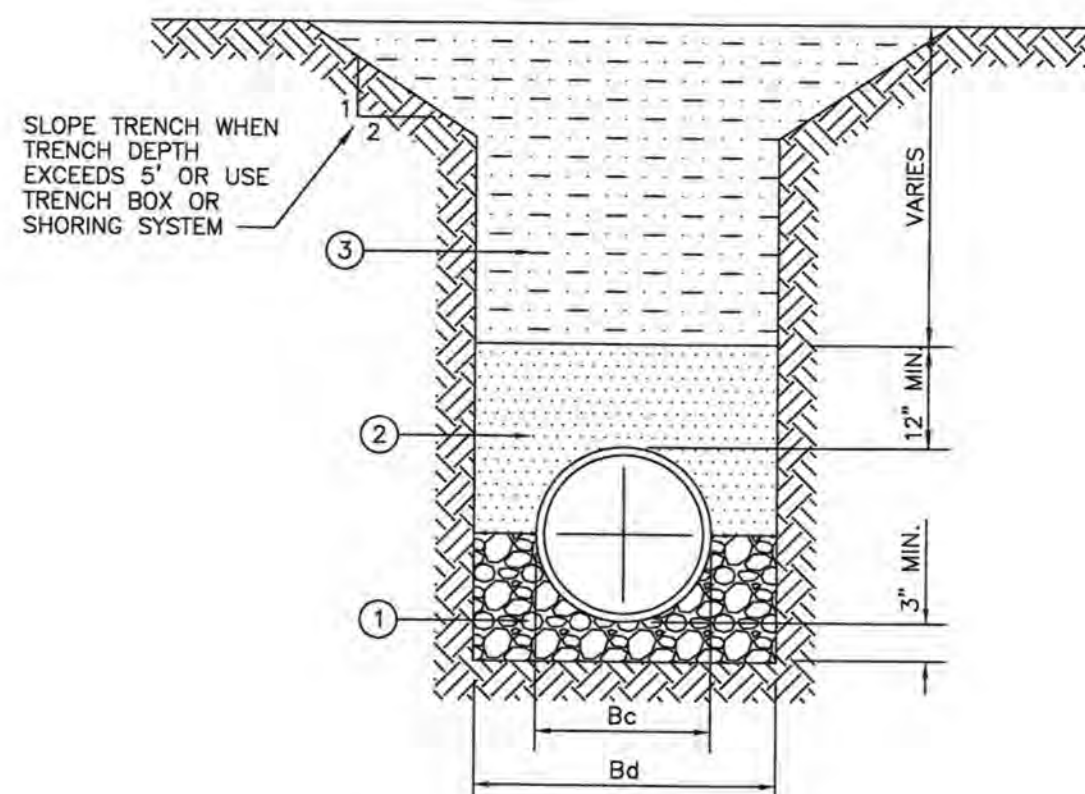
TABLES OF DIMENSIONS AND QUANTITIES



NOTE:
IN UNPAVED AREAS, INSTALL 2' x 2' x 6" CONCRETE VALVE PAD FLUSH WITH THE TOP OF VALVE BOX. REINFORCE WITH #3 BARS ON 6" CENTERS BOTH WAYS.



REFER TO
STD. DWG. No. 4040
FOR GENERAL NOTES.



- ① WELL GRATED GRAVEL, COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- ② GRANULAR MATERIAL (SAND) COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- ③ SELECT MATERIAL FREE OF ROCKS, CLUMPS OR DEBRIS LARGER THAN 6" IN GREATEST DIMENSION. COMPACT TO 90% STANDARD PROCTOR DENSITY. UNDER STRUCTURES, ROADWAYS AND PAVEMENT; EXCLUDE MATERIAL WITH LL >50 COMPACT TO 98% STANDARD PROCTOR DENSITY. GRANULAR MATERIAL MUST BE WELL GRADED.

ROADWAY BASE

IF VALVE OPERATING NUT IS MORE THAN 3' BELOW PAVEMENT SURFACE
→ PROVIDE EXTENSION STEM TO 1' BELOW PAVEMENT SURFACE.

VALVE BOX

GATE VALVE

TORQUE BOLTS PRIOR TO BACKFILL.

DRAWING PERTAINS TO ALL GATE VALVE SIZES 4" THRU 12"

RECORD DRAWINGS

THESE RECORD DRAWINGS HAVE BEEN PREPARED
BASED ON INFORMATION PROVIDED BY OTHERS.
THE ENGINEER HAS NOT VERIFIED THE ACCURACY
OF THIS INFORMATION AND SHALL NOT BE
RESPONSIBLE FOR ANY DISCREPANCIES WHICH MAY
BE INCORPORATED HEREIN AS A RESULT.

ENGINEERING CONCEPTS & DESIGNS, L.P.

Todd D. Winters 11-7-19

TODD D. WINTERS, P.E.

A	11.25°		22.50°		30°		45°		67.50°		90°		A
	THRUST (kN)	LO. (mm)	THRUST (kN)	LO. (mm)	THRUST (kN)	LO. (mm)	THRUST (kN)	LO. (mm)	THRUST (kN)	LO. (mm)	THRUST (kN)	LO. (mm)	
4.6.8	1.0	0.5	2.0	1.0	2.5	1.3	3.8	1.8	4.9	2.5	5.7	3.0	4.6.8
10.12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10.12
15.18	3.6	2.1	6.7	3.8	12.7	6.4	18.6	9.0	23.5	11.8	25.5	12.7	15.18
20.23	5.1	3.1	12.0	6.1	16.2	8.6	22.1	11.3	28.0	14.5	30.0	15.5	20.23
24	8.2	4.4	17.3	8.7	22.6	11.3	32.0	16.0	41.8	20.9	44.2	22.6	24
30	10.5	5.2	20.3	10.1	26.3	13.3	37.5	18.8	49.0	24.5	51.3	26.5	30
36	12.8	6.1	23.2	11.8	30.2	14.8	42.0	21.0	53.5	27.0	55.5	28.5	36
42	20.3	10.1	39.8	19.9	52.0	26.0	73.5	36.7	96.0	48.0	104.0	52.0	42
48	26.5	13.2	51.6	26.0	67.9	33.9	96.0	48.0	126.0	62.7	136.0	67.0	48
54	32.7	16.1	64.7	32.7	82.9	40.5	114.0	57.0	147.0	74.5	156.0	78.0	54
60	41.4	20.7	81.2	40.5	106.0	53.0	150.0	75.0	196.0	98.0	210.0	106.0	60
66	50.1	25.0	98.2	49.1	128.0	64.2	182.0	90.7	237.0	119.0	250.0	128.0	66
72	58.8	29.1	115.8	58.8	147.0	74.0	204.0	102.0	264.0	132.0	276.0	138.0	72
78	69.9	35.0	137.0	68.8	179.0	90.0	245.0	127.0	313.0	160.0	326.0	166.0	78
84	81.1	40.5	159.0	79.5	208.0	104.0	294.0	147.0	384.0	192.0	416.0	208.0	84
90	92.4	45.9	179.0	89.4	230.0	116.0	327.0	166.0	441.0	220.0	474.0	236.0	90
96	106.0	53.0	208.0	104.0	272.0	136.0	375.0	188.0	495.0	247.5	519.0	262.5	96

GENERAL NOTES FOR ALL THRUST BLOCKS:

1. CONCRETE FOR BLOCKING SHALL BE CLASS "B".
2. ALL CALCULATIONS ARE BASED ON INTERNAL PRESSURE OF 200 PSI FOR DUCTILE IRON, P.V.C., AND 150 PSI FOR CONCRETE PIPE.
3. VOLUMES OF THRUST BLOCKS ARE NET VOLUMES OF CONCRETE TO BE FURNISHED. THE CORRESPONDING WEIGHT OF THE CONCRETE (CLASS "B") IS EQUAL TO OR GREATER THAN THE VERTICAL COMPONENT OF THE THRUST ON THE VERTICAL BEND.
4. WALL THICKNESS (T) ASSUMED HERE FOR ESTIMATING PURPOSES ONLY.
5. POUR CONCRETE FOR BLOCK AGAINST UNDISTURBED EARTH.
6. DIMENSIONS MAY BE VARIED AS REQUIRED BY FIELD CONDITIONS WHERE AND AS DIRECTED BY THE ENGINEER. THE VOLUME OF CONCRETE BLOCKING SHALL NOT BE LESS THAN SHOWN HERE.
7. THE SOIL BEARING PRESSURES ARE BASED ON 1000 LBS./S.F. IN SOIL AND 2000 LBS./S.F. IN ROCK.
8. USE POLYETHYLENE WRAP OR EQUAL BETWEEN CONCRETE AND BEND, TEE, OR PLUG TO PREVENT THE CONCRETE FROM STICKING TO IT.
9. CONCRETE SHALL NOT EXTEND BEYOND JOINTS.

WATER EMBEDMENT

CLASS "B+"

(per NCTCOG Standards)

CAUTION! EXISTING UTILITIES

CONTRACTOR SHOULD CALL 1-800-DIG-TESS PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES. ALL EXISTING UTILITY LOCATIONS, INCLUDING BUT NOT LIMITED TO, WATER, GAS, ELECTRIC, AND TELEPHONE, EXISTING UTILITIES AND UNDERGROUND FACILITIES INDICATED ON THESE PLANS HAVE BEEN LOCATED FROM REFERENCE INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY BOTH HORIZONTALLY AND VERTICALLY THE LOCATION OF ALL EXISTING UTILITIES AND UNDERGROUND FACILITIES PRIOR TO CONSTRUCTION AND TO TAKE NECESSARY PRECAUTIONS IN ORDER TO PROTECT ALL FACILITIES ENCOUNTERED. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION.

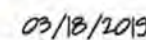


ENGINEERING / PROJECT MANAGEMENT /
CONSTRUCTION SERVICES - FIRM REG. #F-001145
201 WINDCO CIR, STE 200, WYLIE, TX 75098
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REVISIONS:

DRAWN: JD		DATE:
CHECKED: M.A.		DATE: MARCH 2019
PROJECT NO.: 08361		
DWG FILE NAME: 08361 PAVING DETAILS.DWG		

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WATER DETAILS

THE FARMSTEAD

COLLIN COUNTY, TEXAS

SHEET

12

OF

15

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DATE: FILE:

TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

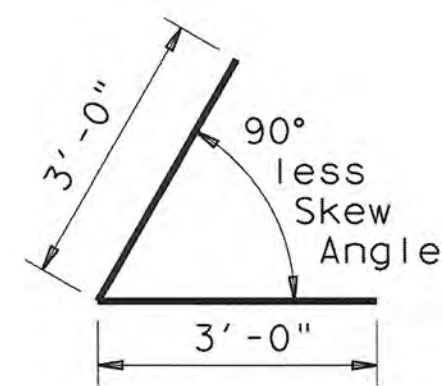
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2-Wings)	Estimated Quantities per ft of Toewall (1-Toewall)
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2		Reinf (Lb/Ft)	Conc (CY/Ft)
					Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000
9'-0"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136
10'-0"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234
11'-0"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438
12'-0"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592
13'-0"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804
14'-0"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046
15'-0"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448

TABLE OF WINGWALL REINFORCING (2-Wings)

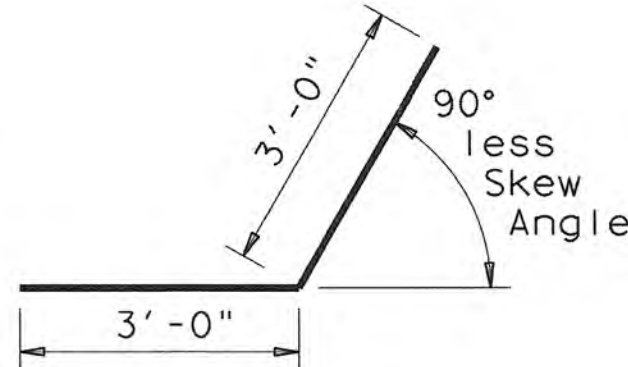
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

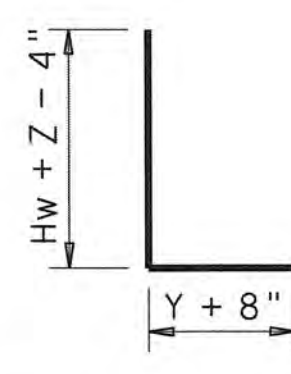
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



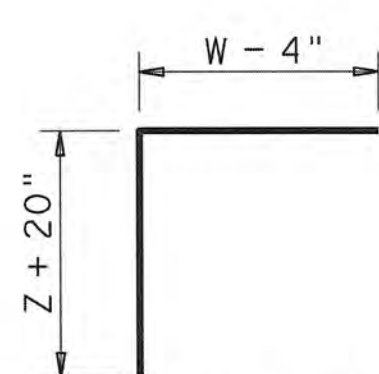
BARS D1



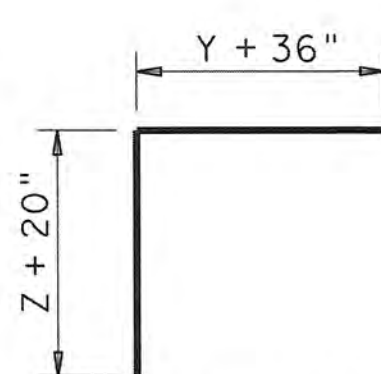
BARS D2



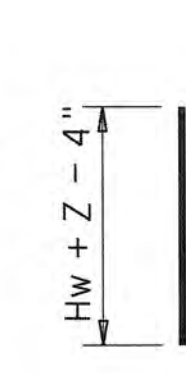
BARS J1



BARS J2



BARS J3



BARS V

WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

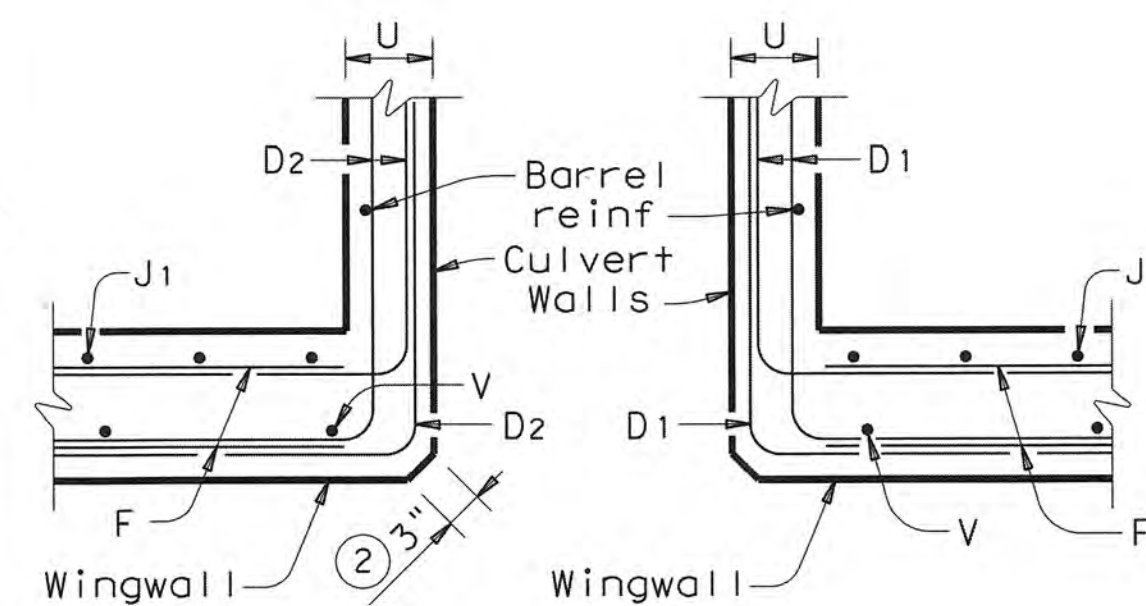
$$\begin{aligned} Hw &= H + T + C \\ Lw &= (Hw) (SL) \div \text{Cosine } \theta \text{ for Ty PW-1} \\ &= (Hw - 1') (SL) \div \text{Cosine } \theta \text{ for Ty PW-2 and } Hw \geq 4' \\ &= (Hw - 0.5') (SL) \div \text{Cosine } \theta \text{ for Ty PW-2 and } Hw < 4' \end{aligned}$$

For Cast-in-place culverts:
 $Ltw = [(N) (S) + (N + 1) (U)] \div \text{Cosine } \theta$

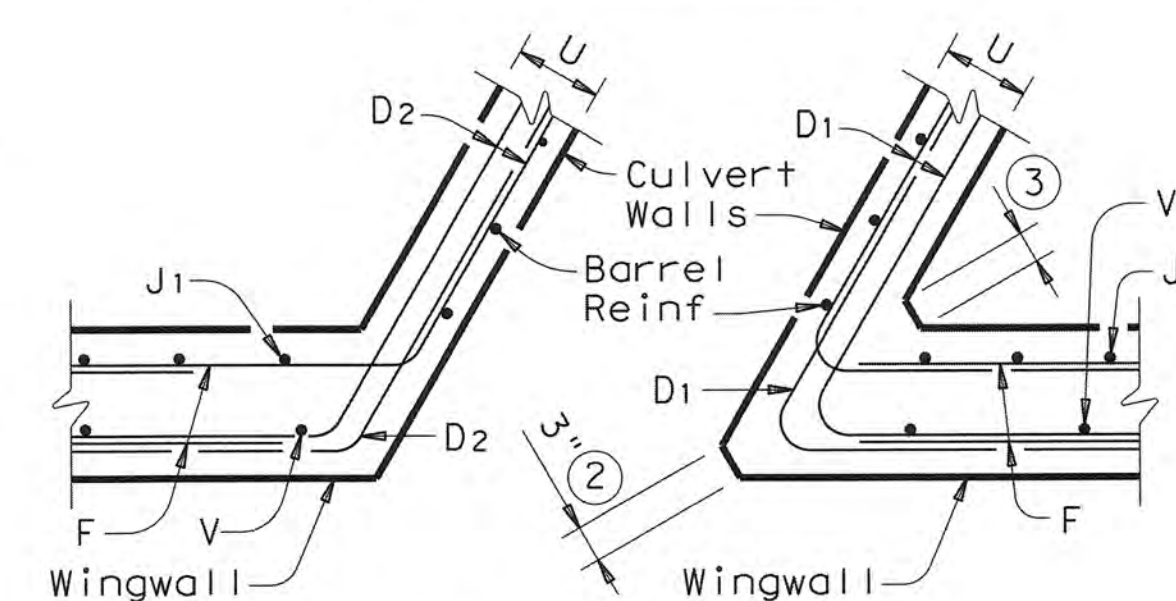
For Precast culverts:
 $Ltw = [(N) (2U + S) + (N - 1) (0.5')] \div \text{Cosine } \theta$
Total Wingwall Area (Two Wings ~ SF)
= (2) (Hw) (Lw) for Ty PW-1
= (2) (Hw) (Lw) - 6 SF for Ty PW-2 and $Hw \geq 4'$
= (2) (Hw) (Lw) - 1.5 SF for Ty PW-2 and $Hw < 4'$

Hw = Height of Wingwall
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans
SL:1 = Channel Slope ratio. (Horizontal: 1 Vertical, Usual value is 2:1)
 θ = Culvert Skew

See applicable box culvert standard for S, H, T and U values.

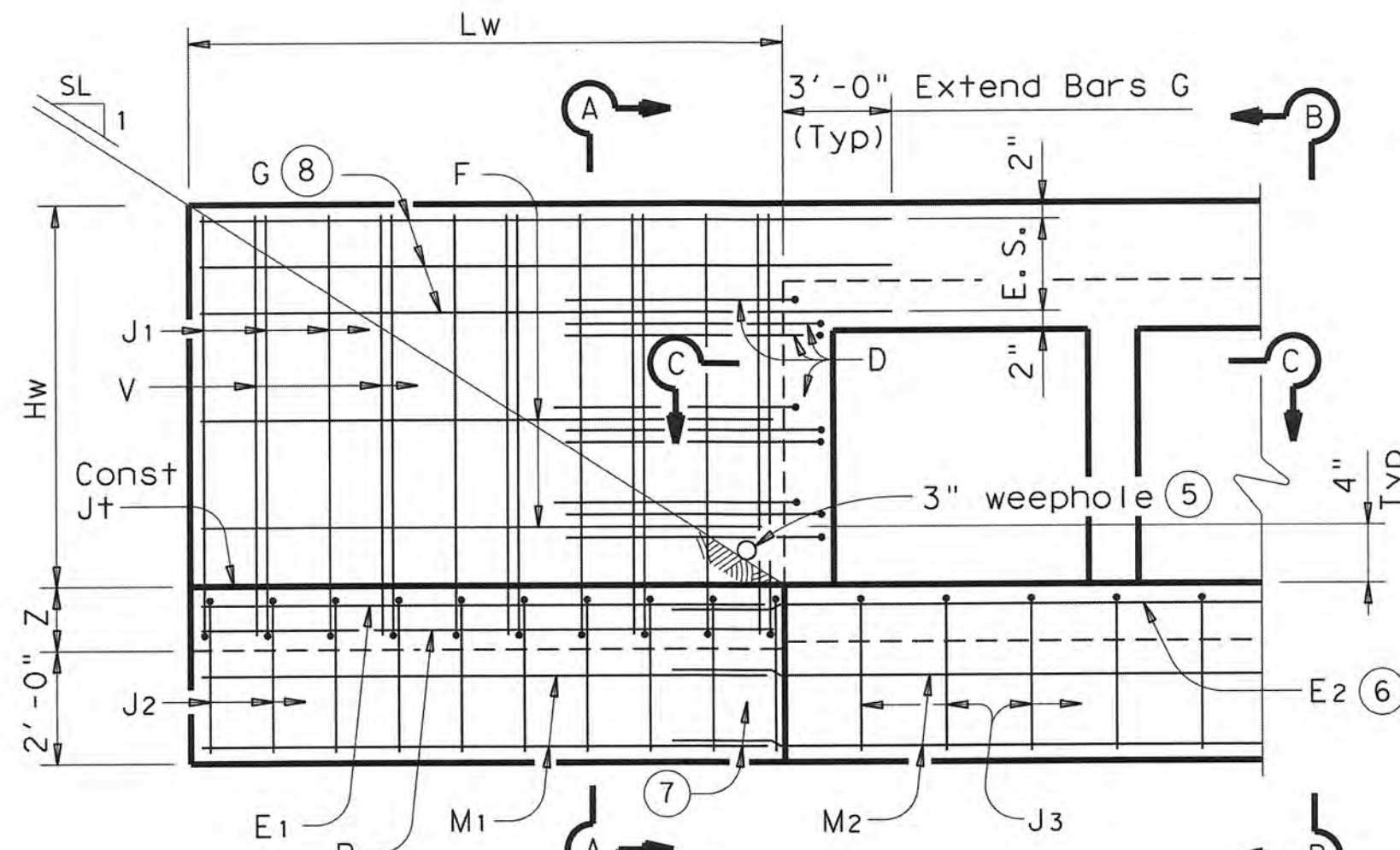


SECTION C-C

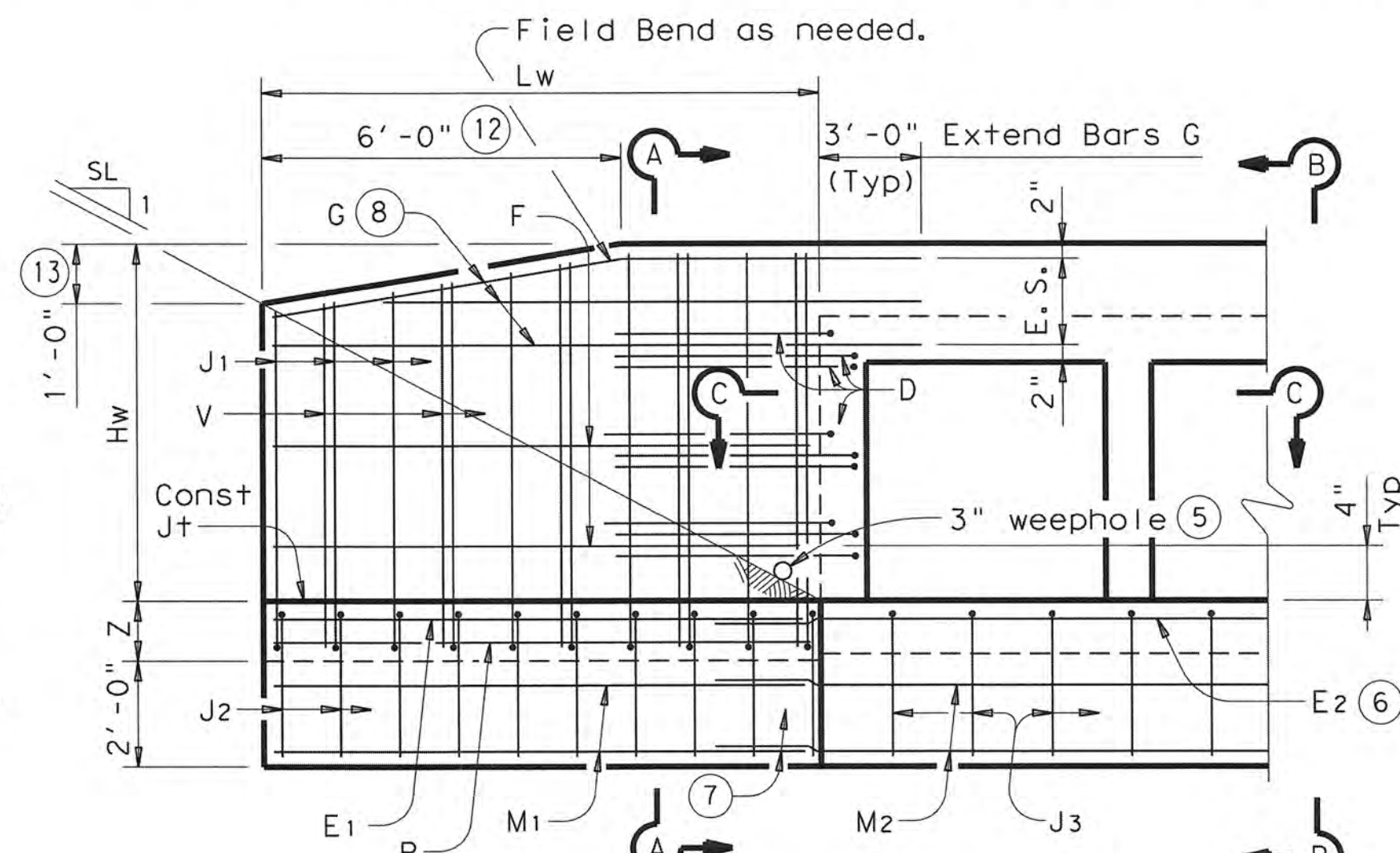


SECTION C-C

PARTIAL ELEVATION - PW-1

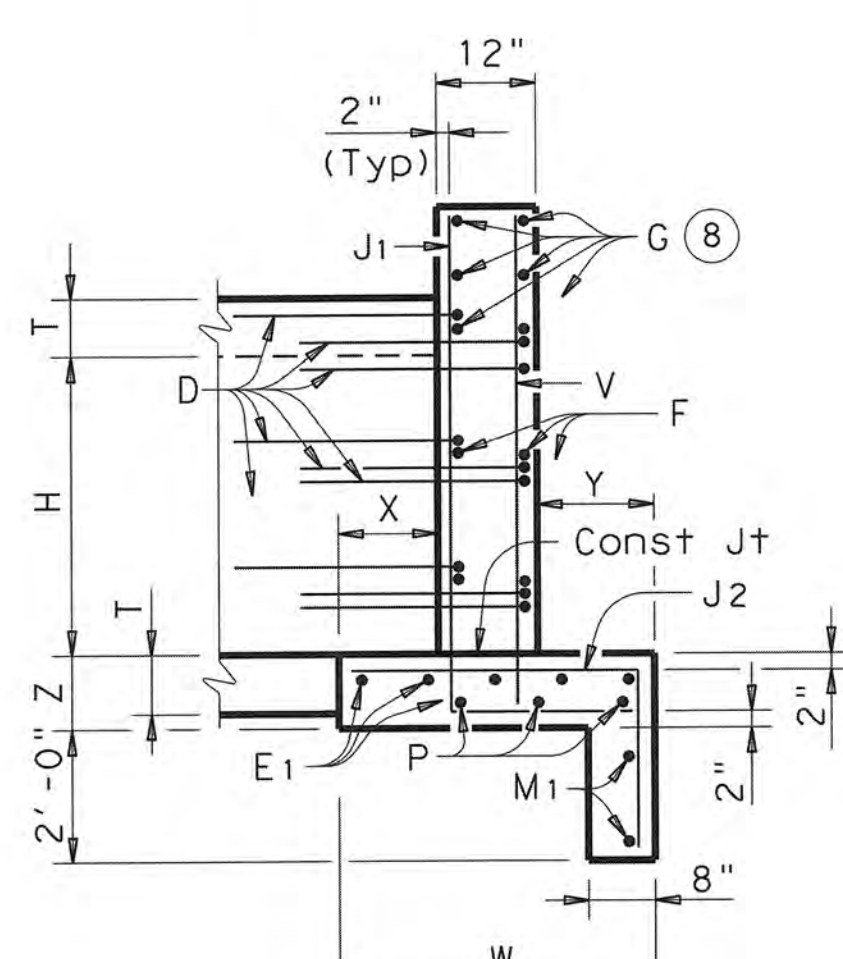


PARTIAL ELEVATION - PW-2



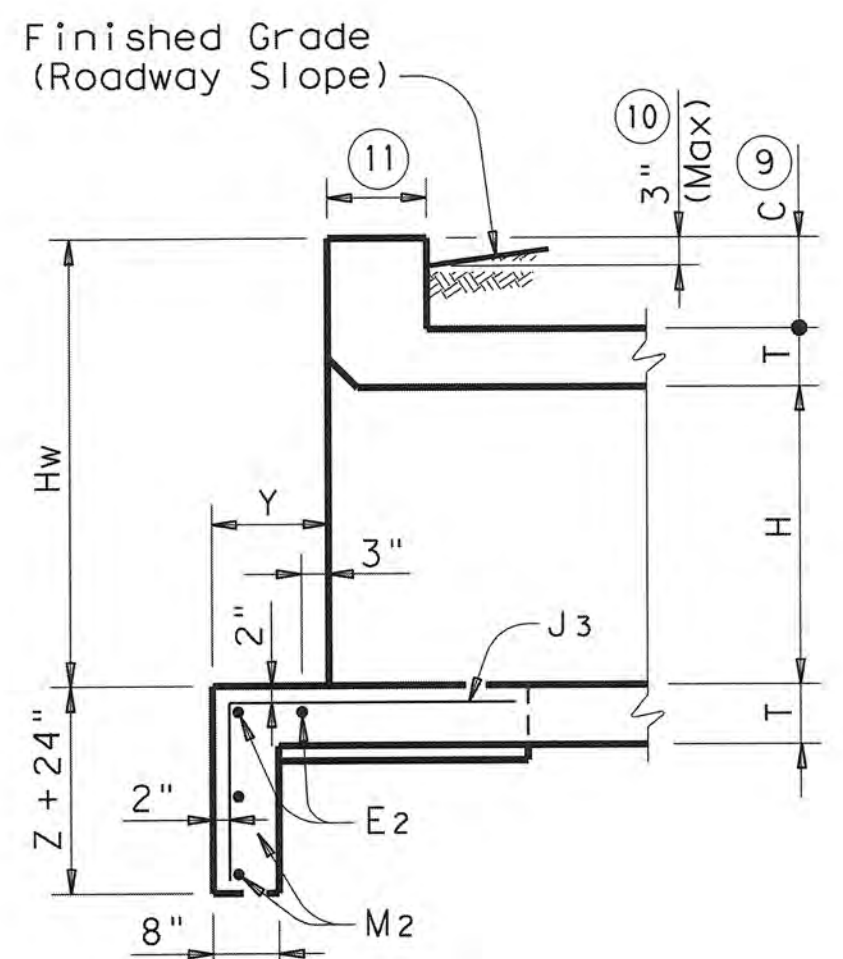
SECTION A-A

(Showing Wing Reinf)

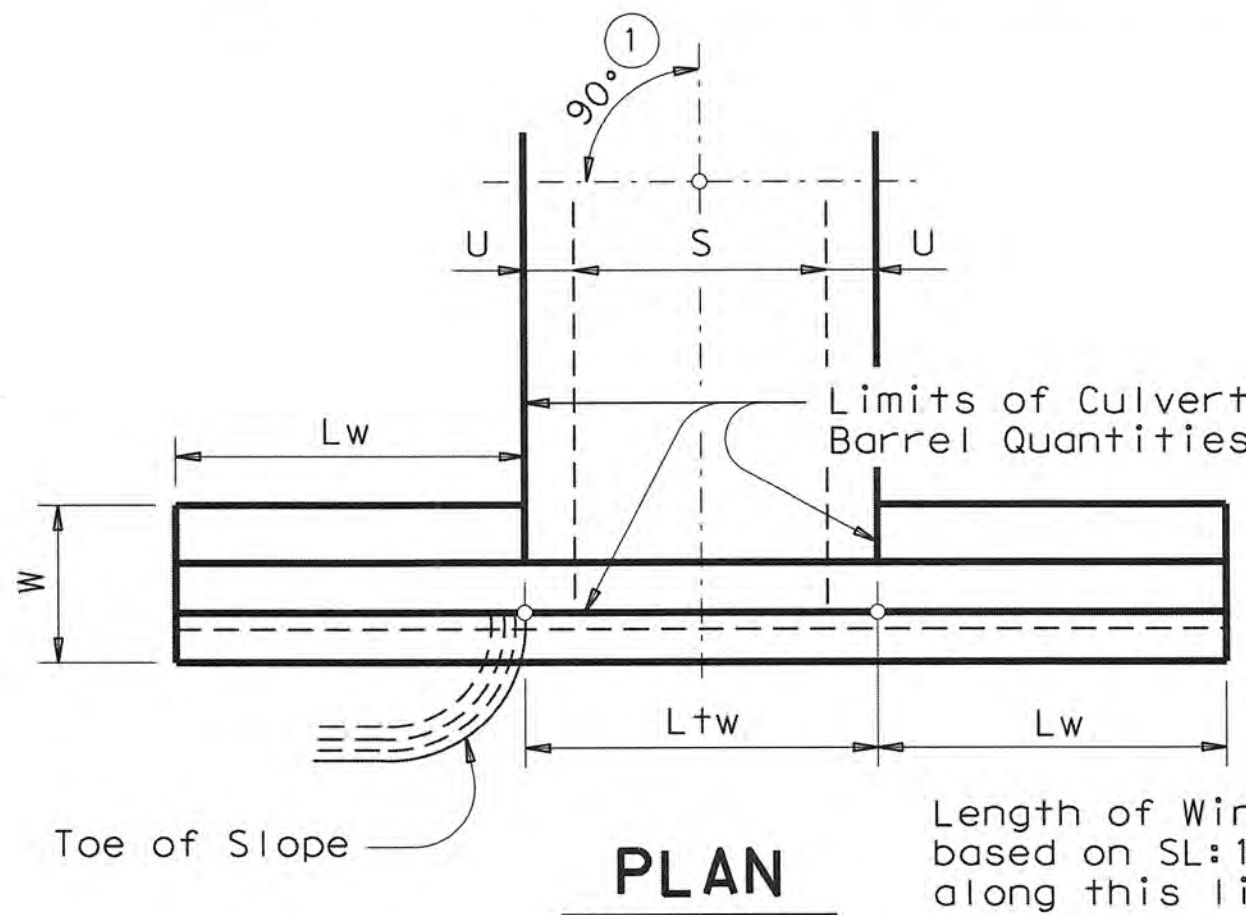


SECTION B-B

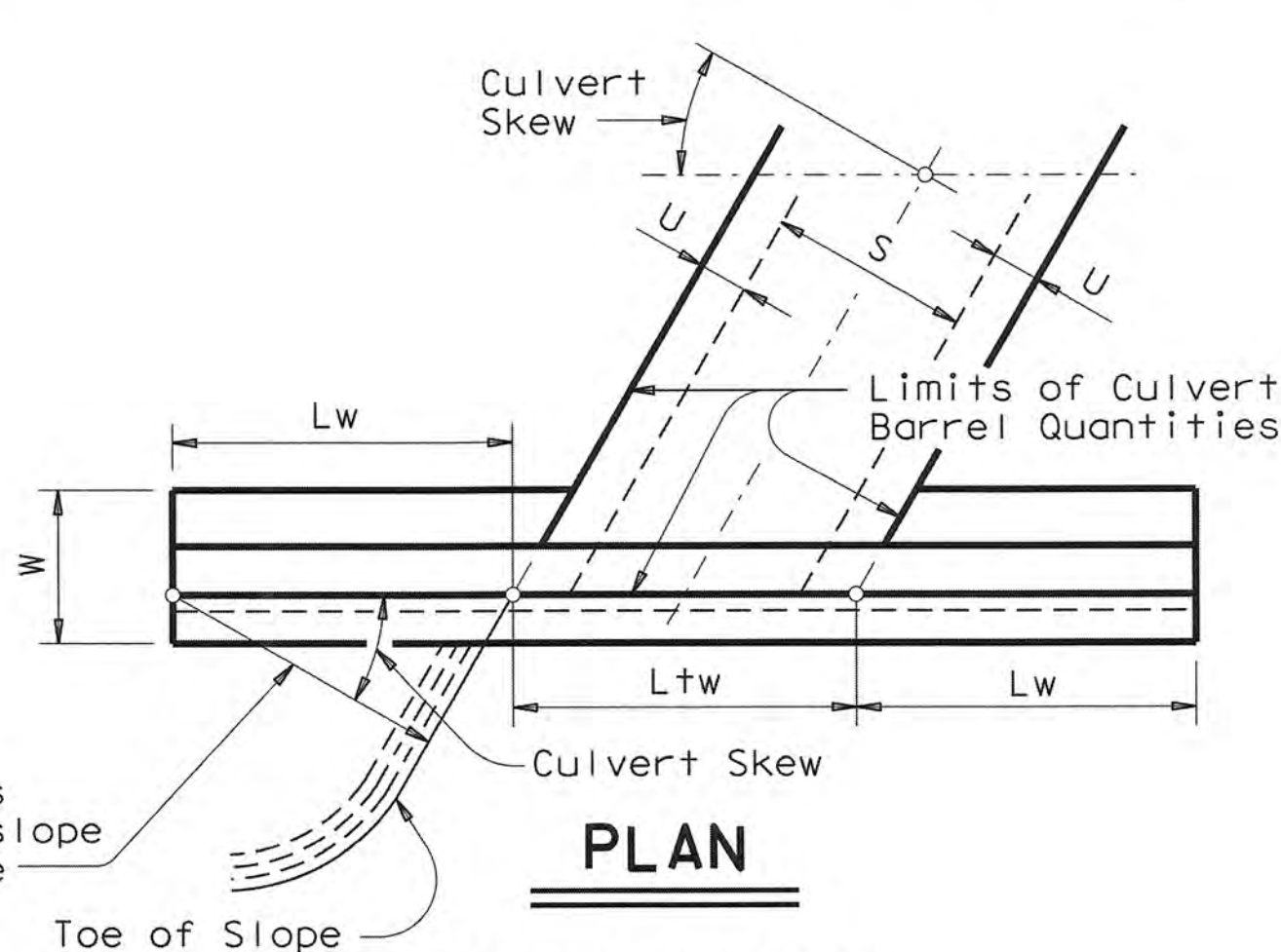
(Showing Wing Reinf)



DETAILS FOR NON-SKEWED BOX CULVERTS



DETAILS FOR SKEWED BOX CULVERTS



- Skew Angle = 0°
- At discharge end, chamfer may be 3/4".
- For 15° Skew ~ 1"
For 30° Skew ~ 2"
For 45° Skew ~ 3"
- Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
- Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
- Extend Bars E2 1'-6" minimum into the wingwall footing.
- Lap Bars M1 1'-6" minimum with Bars M2.
- Bars G equally spaced at 8" maximum, place as shown. Provide at least two pair Bars G per wing.
- 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, curbs cannot project more than 3" above finished grade.
 - For structures with bridge rail, build curbs flush with finished grade.Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- 1'-0" typical. 2'-0" typical when RAC standard is referenced elsewhere in the plans.
- 3'-0" for Hw < 4'.
- 6" for Hw < 4'.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Provide Class "C" Concrete (f'c = 3,600 psi Min) and Grade 60 reinforcing steel.
Provide 1 1/4" Min clear cover to reinforcing steel.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See BCS sheet for wingwall type and additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

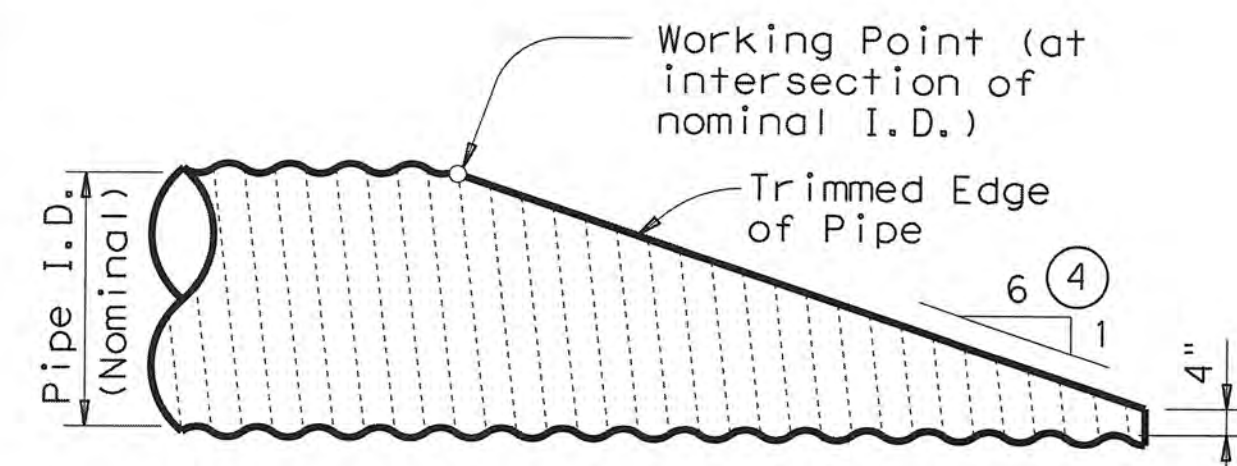
DESIGNER NOTES:

Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.



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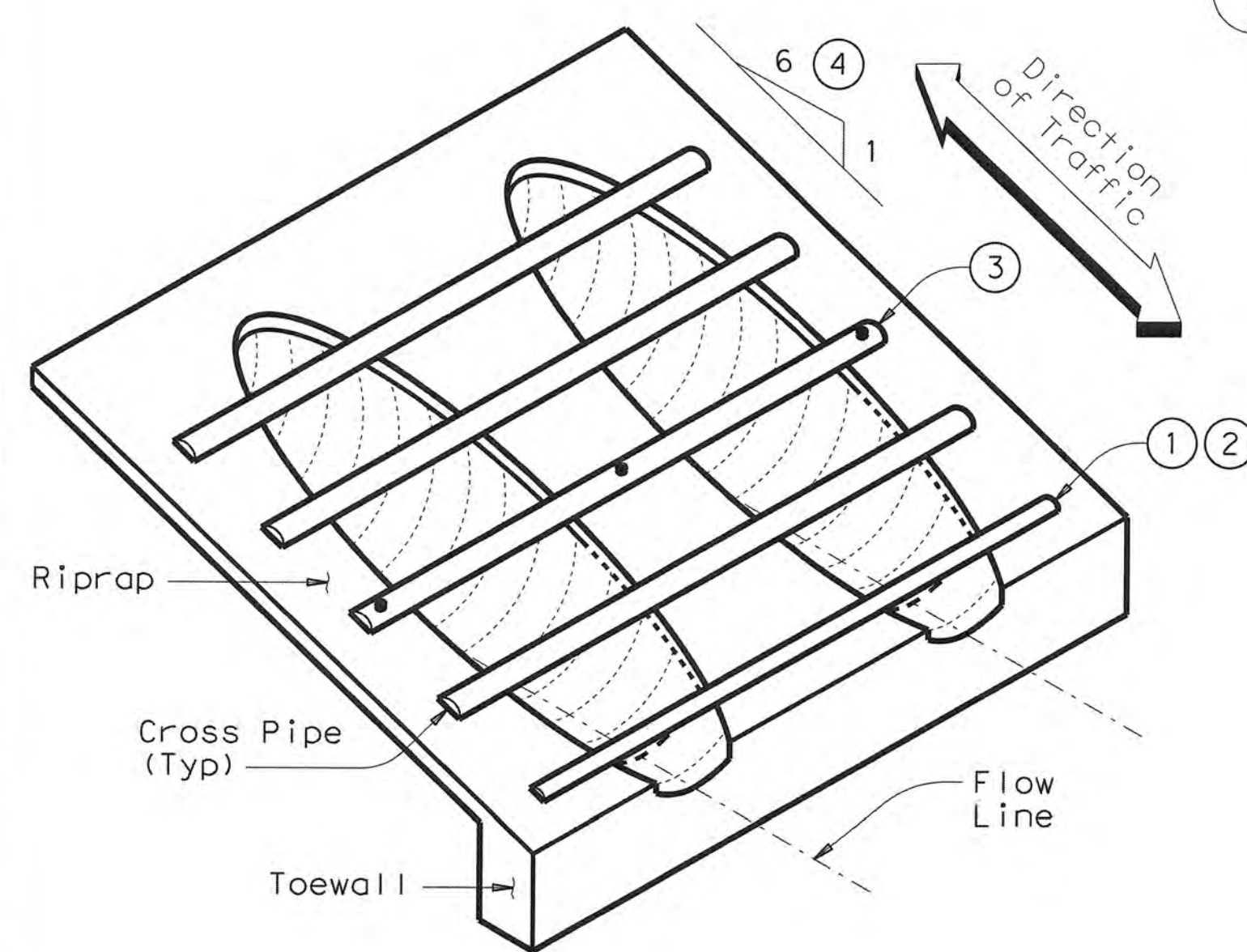
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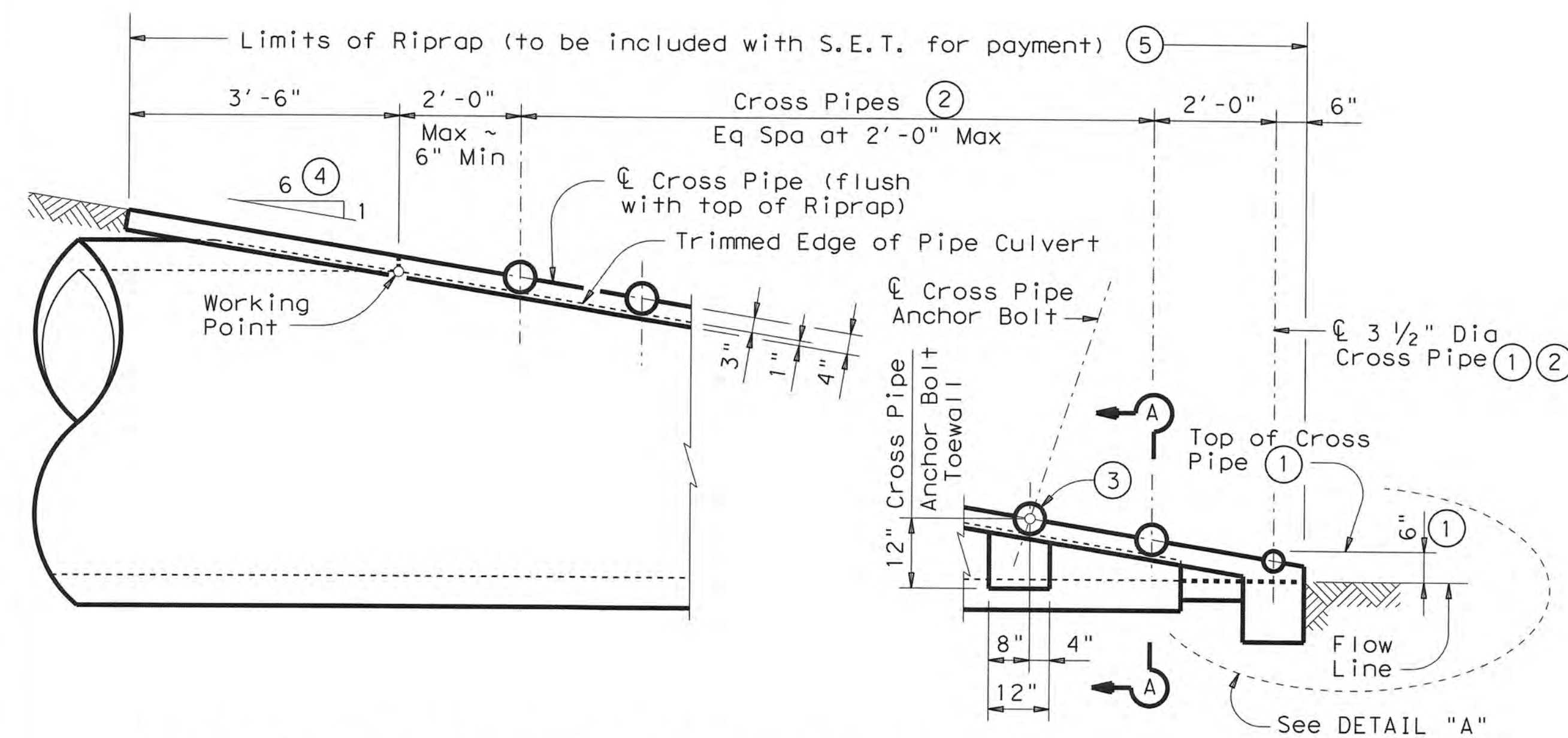
NOTE: All Cross Pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert.)
(Details at Concrete Pipe Culvert are similar.)

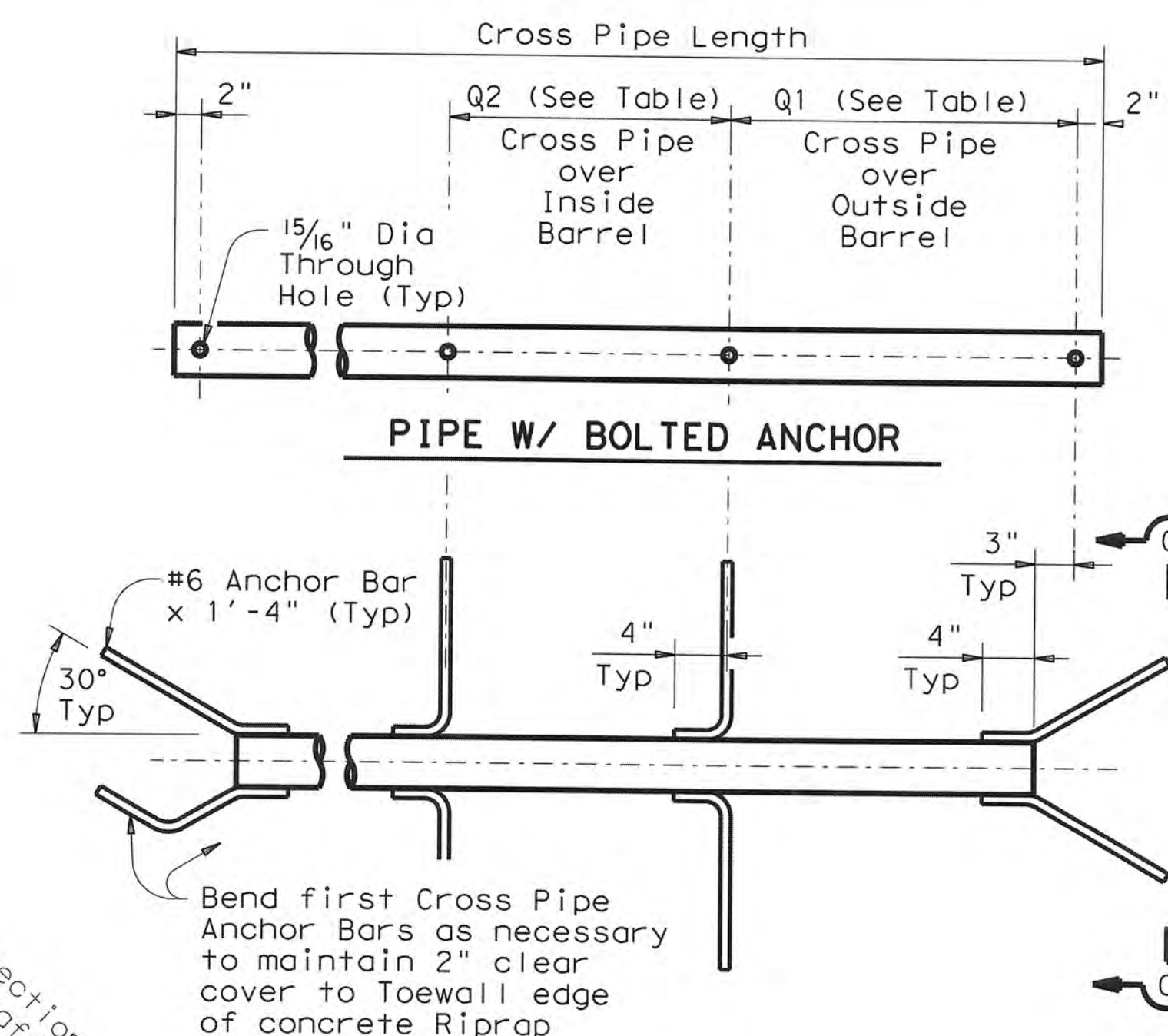


ISOMETRIC VIEW OF TYPICAL INSTALLATION

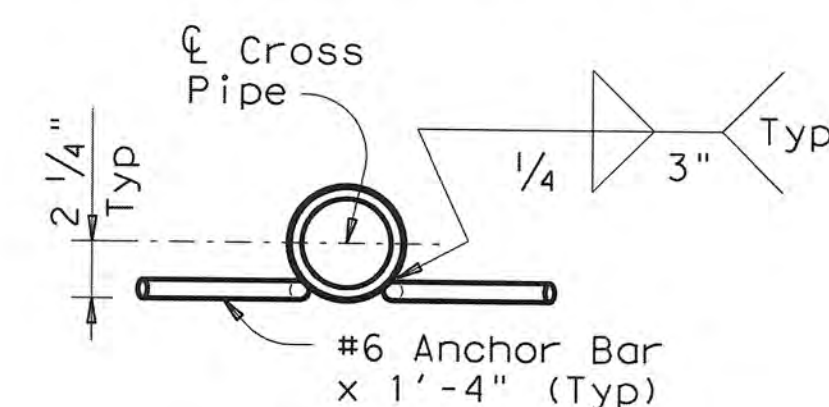


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

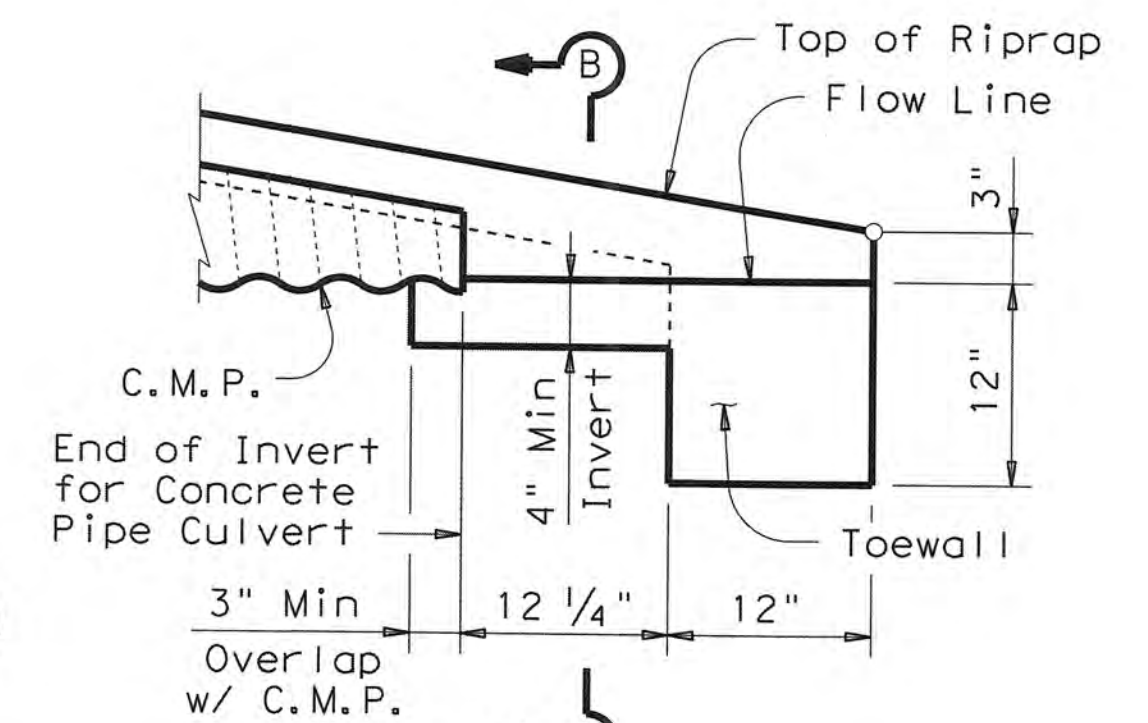
(Showing Concrete Pipe Culvert.)
(Details at Corrugated Metal Pipe Culvert are similar.)



PIPE W/ ANCHOR BARS

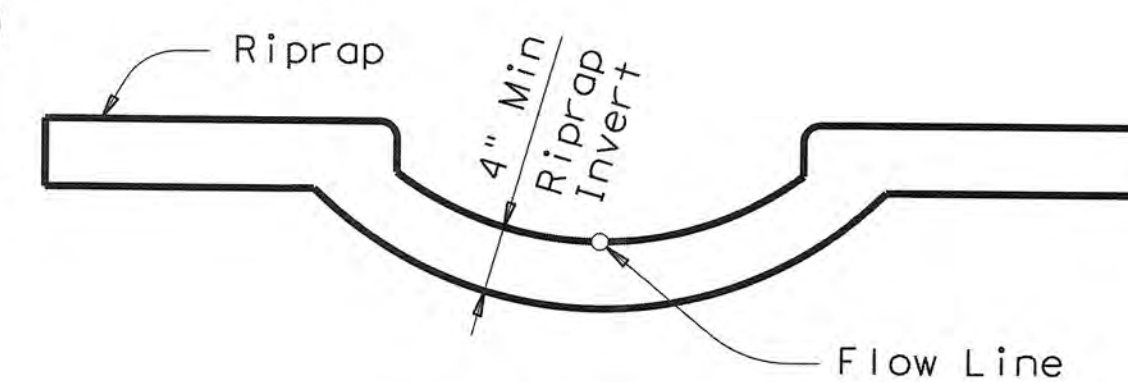


CROSS PIPE DETAILS



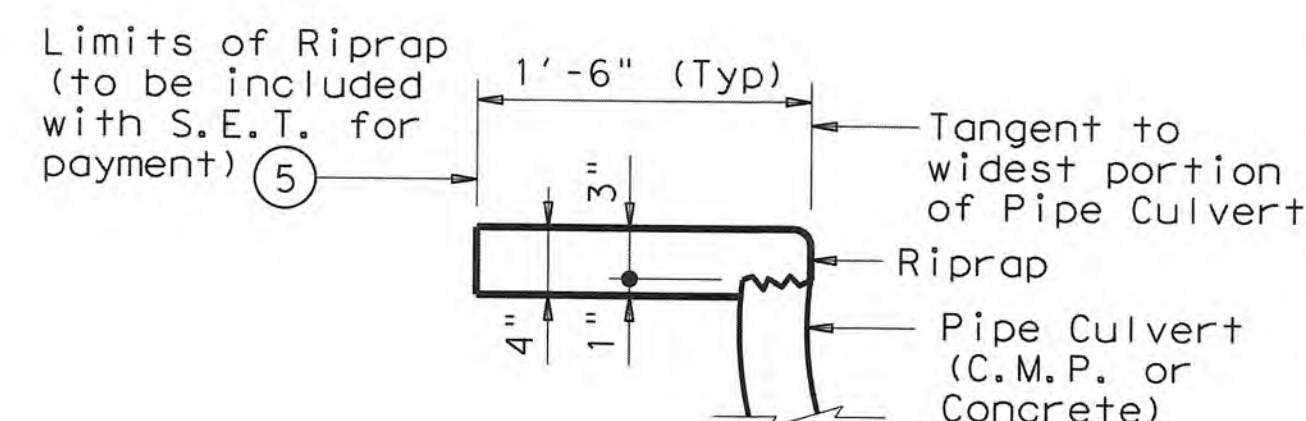
DETAIL "A"

(Showing Invert with Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Cross Pipes not shown for clarity.)

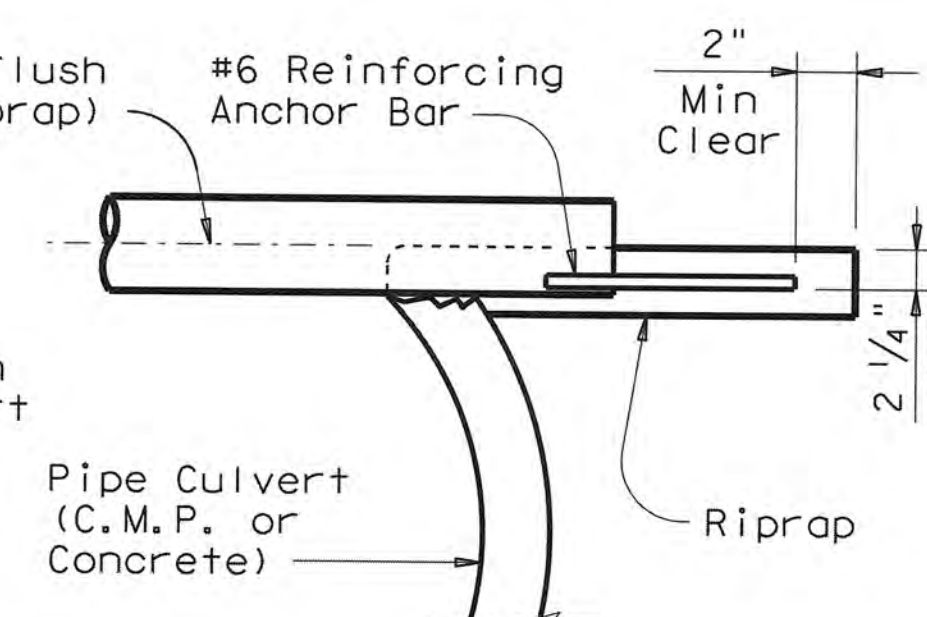


SECTION B-B

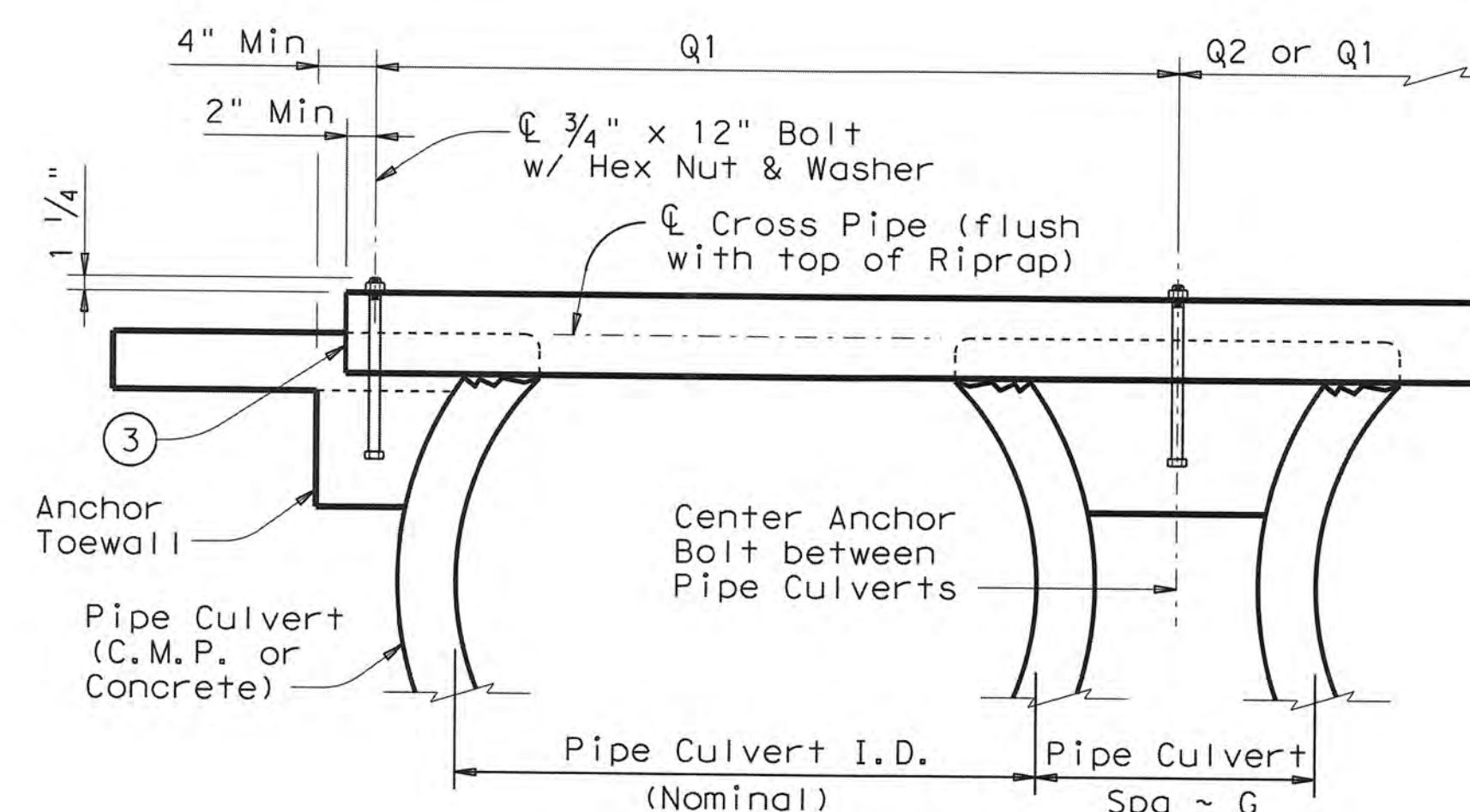
(Cross Pipes not shown for clarity.)



SHOWING TYPICAL PIPE CULVERT & RIPRAP



SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, & RIPRAP QUANTITIES ⁽²⁾									
Nominal Culvert I.D.	Conc Riprap (CY) ⁽⁶⁾	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for use of Cross Pipes		Cross Pipe Size	
12"	0.6	9"	N/A	2'-1"	1'-9"	3 or more Pipe Culverts		3" Std (3.500" O.D.)	
15"	0.7	11"	N/A	2'-5"	2'-2"				
18"	0.8	1'-2"	N/A	2'-10"	2'-8"				
21"	0.9	1'-4"	N/A	3'-2"	3'-1"				
24"	0.9	1'-7"	N/A	3'-6"	3'-7"	3 or more Pipe Culverts		3 1/2" Std (4.000" O.D.)	
27"	1.0	1'-8"	N/A	3'-10"	3'-11"	2 or more Pipe Culverts			
30"	1.1	1'-10"	N/A	4'-2"	4'-4"	All Pipe Culverts		4" Std (4.500" O.D.)	
33"	1.2	1'-11"	4'-2"	4'-5"	4'-8"				
36"	1.3	2'-1"	4'-5"	4'-9"	5'-1"	All Pipe Culverts		5" Std (5.563" O.D.)	
42"	1.5	2'-4"	4'-11"	5'-5"	5'-10"				
48"	1.7	2'-7"	5'-5"	6'-0"	6'-7"	All Pipe Culverts		5" Std (5.563" O.D.)	
54"	2.0	3'-0"	5'-11"	6'-9"	7'-6"				
60"	2.2	3'-3"	6'-5"	7'-4"	8'-3"				
66"	2.4	3'-3"	6'-11"	7'-10"	8'-9"				
72"	2.7	3'-4"	7'-5"	8'-5"	9'-4"				

- The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.
- Size of Cross Pipes, except the first bottom pipe, shall be as shown in the PIPE SIZE table. The first bottom pipe shall be 3 1/2" Standard Pipe (4" O.D.).
- The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, all other Cross Pipes may also be installed using the bolted connection details.
- Match Cross Slope as shown elsewhere in the plans. Cross Slope of 6:1 or flatter is required for vehicle safety.
- Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".
- Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple pipe culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

GENERAL NOTES:

Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Cross Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52. Bolts and nuts shall conform to ASTM A307.

All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

		Bridge Division Standard	
SAFETY END TREATMENT			
FOR 12" DIA TO 72" DIA			
PIPE CULVERTS			
TYPE II ~ PARALLEL DRAINAGE			
SETP-PD			
FILE: setppdse.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2010	CONT	SECT	JOB
REVISIONS			HIGHWAY
11-10: Add note for synthetic fibers.	DIST	COUNTY	SHEET NO.