CITY OF ROCKWALL

CONSTRUCTION PLANS FOR

MUNSON STREET IMPROVEMENTS

SANITARY SEWER LINE AND WATER LINE REPLACEMENT

(FANNIN STREET TO CLARK STREET)

MAYOR
JIM PRUITT

CITY COUNCIL

KEVIN FOWLER — SCOTT MILDER

JOHN HOHENSHELT — MIKE TOWNSEND

DENNIS LEWIS — DAVID WHITE

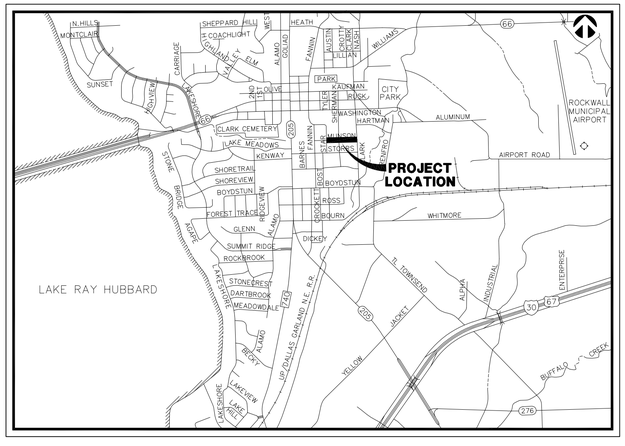
CITY MANAGER
RICK CROWLEY

CONTRACTOR

BARSON UTILITIES, INC.
COMPLETED DECEMBER 2016

City of Rockwall

CIP 2015-023



VICINITY MAP

BW2 JOB NO. 15-1742

MARCH 2016

"REVISED PER ADDENDA"

SHEET INDEX

RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED PROFESSIONAL ENGINEER
1-2017
1 2

OWNER:

CITY OF ROCKWALL
385 S. GOLIAD STREET
ROCKWALL, TEXAS 75087

ENGINEER:

BW2 ENGINEERS, INC.

1919 S. SHILOH ROAD
SUITE 500, L.B. 27
GARLAND, TEXAS 75042
Firm Registration No. F-5290

15-1742 - MUNSON STREET IMPROVEMENTS-SANITARY SEWER REPLACEMENT

GENERAL NOTES:

1. It is the CONTRACTOR's responsibility to maintain neat and accurate plans of record.
2. The CONTRACTOR is responsible for maintaining adequate site drainage throughout the duration of this project.
3. The CONTRACTOR is responsible for obtaining all necessary permits and approvals before construction begins.
4. The CONTRACTOR shall replace all fence removed during construction in as good as or better condition than before construction.
5. The CONTRACTOR shall take all necessary precautions to ensure that electric power and telephone poles are either moved to a safe location by the affected utility company or not disturbed during construction. All costs incurred for moving electric power and telephone poles shall be included in the price bid for the construction of the project.
6. The CONTRACTOR shall restore all property including driveways, public streets, sidewalks, public utilities, franchise utilities, private utilities, and all other improvements removed or damaged inside and outside the project limits during construction to as good as or better condition than before construction. Restoration shall be made immediately after the property no longer interferes with construction. All costs incurred for restoring any of the above items shall be included in the price bid for the construction of the project.
7. The information shown on these drawings concerning type and location of underground and other utilities is not guaranteed to be accurate or all–inclusive. The CONTRACTOR is responsible for making his own determinations as to the type and location of underground utilities and other utilities as may be necessary to avoid damage thereto.
8. The CONTRACTOR shall not place fill or waste material on any private property without prior written permission from the ENGINEER. No excess excavated material shall be deposited in low areas or along natural drainage ways that will restrict the natural flow of water. If the CONTRACTOR places excavated material in low areas that will cause flood damage, CONTRACTOR will be responsible for all damage resulting from such fill, and he shall remove the fill at CONTRACTOR's expense.
9. All streets within the scope of the Contract shall be kept accessible to fire trucks, ambulances and other emergency vehicles.
10. The CONTRACTOR shall be responsible for public safety during the duration of construction. All barricades, warning signs, lights, devices, etc., for the guidance and protection of traffic and pedestrians must conform to the installation shown in Texas Manual of Uniform Traffic Control Devices, as currently amended by the Texas Department of Transportation. CONTRACTOR shall at all times provide barricades, warning signs and lighting adequate to safeguard the public from any hazards resulting from open trenches during non–work hours.
11. Filter fabric fence for erosion control shall be provided in accordance with specifications and as shown on the plans and in accordance with the EPA regulations.
12. The CONTRACTOR shall use the public right–of–ways and existing utility easements for access to the job site.
13. The CONTRACTOR shall select the subcontractor to be utilized for testing and lab work. The CONTRACTOR shall be responsible for paying for testing and lab work. Selection of subcontractor for this purpose will be subject to approval by the OWNER. Testing referred to herein includes compaction and water pressure testing, which shall be required on this project.
14. The CONTRACTOR shall keep excavated trenches free of groundwater during construction. If necessary, the CONTRACTOR shall utilize dewatering procedures in order to control groundwater during construction such that it does not affect his construction work.
15. The CONTRACTOR shall provide means for adequately controlling and avoiding soil erosion during construction. The CONTRACTOR shall not store spoil in drainage ways during construction.
16. All disturbed earth areas are to be finish graded to original or proposed contours, fertilized and either hydromulched with bermuda seed or covered with block sod according to NCTCOG specifications immediately after construction. Backfill to be select material free of rock and other debris. CONTRACTOR shall thoroughly water the hydromulch or block sod immediately after placement. Block sod shall match the existing type of grass on a case by case basis. There shall be no separate pay for matching each type of grass. The CONTRACTOR shall also be responsible for continued maintenance and watering of the newly hydromulched or sodded areas until the entire project is completed and accepted by the City of Rockwall. Watering of the bermuda hydromulch or block sod shall be done in a manner and quantity as directed by City of Rockwall field representative.
   ⚠1 Block sodding shall be utilized to cover areas disturbed in the City road right–of–way.
17. No existing sprinkler/irrigations systems have been shown on the plans; however, they may exist in certain areas. It is the CONTRACTORS responsibility to locate any existing irrigation systems within the project limits and determine if they will be affected by this construction. If CONTRACTOR encounters any sprinkler systems during construction, he shall repair and/or replace in as good as or better condition than before construction. All costs incurred for restoring any sprinkler/irrigation systems shall be included in the price bid for the construction of the project.
18. The CONTRACTOR shall maintain adequate sanitary facilities for use by workers throughout construction.
19. The CONTRACTOR shall conform to the Occupational Safety and Health Administration's (OSHA) standards for trench safety that are in effect during the period of construction.
20. All materials and workmanship shall conform to the City of Rockwall Standards and Specifications and the North Central Texas Council of Government (NCTCOG) Standards and Specifications 3rd edition, except as noted. In the event of a conflict, the City of Rockwall Standards and Specifications shall govern.
21. No existing trees shall be removed without approval of the City of Rockwall.
22. CONTRACTOR shall provide all necessary construction staking.
23. CONTRACTOR's working hours shall be in accordance with the provisions of the current City Ordinance governing hours of construction work in the City.
24. The CONTRACTOR shall assume responsibility for protection of public utilities in the construction of this project. All manholes, valve boxes, fire hydrants, etc., must be adjusted to proper line and grade by the CONTRACTOR prior to and/or after placing any permanent paving. The CONTRACTOR shall also be responsible for support of existing utility poles, street signs, etc., when excavating in the vicinity of such poles.

GENERAL NOTES CONT'D.:

25. Driveways affected by construction shall be replaced with driveway of same type material and surface as that removed for installation of water line. Driveway culverts shall be removed when necessary to allow for construction of water line. Culverts are to be replaced in the same location if condition of culvert is deemed satisfactory by OWNER. If culvert cannot be salvaged, a new culvert of the same type removed will be installed by the CONTRACTOR. Driveways that are disturbed during construction shall be restored to as good as or better condition than they were prior to construction and materials utilized to restore the driveway shall be the same material as what the driveway is presently made of. All costs incurred for removing and replacing driveways and/or driveway culverts shall be included in the price bid for the construction of the project.
26. All existing water lines and service lines to remain in service during construction. At times when water has to be cut–off, the CONTRACTOR shall coordinate with the City of Rockwall Water Department (972–771–7730) to notify the affected area at least 48 hours prior to water cut–off.
27. The CONTRACTOR shall phase his daily work schedule so that all driveway crossings are to be complete prior to the end of the day. No driveway crossings are to be left open overnight. During installation of the pipeline across driveways, the CONTRACTOR shall be prepared to provide access across trenches and driveways at all times in case of emergency.
28. Proposed water line shall be polyvinyl chloride (PVC) AWWA C900, DR 14 Class 200. New water service lines shall be Poly SDR 9 pipe with compression type fittings. Main line valves and fittings shall be cast iron.
29. CONTRACTOR shall install isolation gate valves and fire hydrants at locations shown on plans unless otherwise directed by OWNER. OWNER may direct CONTRACTOR to locate valves and fire hydrants at locations other than those shown on plans. Also, OWNER may add additional isolation gate valves and fire hydrants as required for operational purposes.
30. The CONTRACTOR is responsible for keeping streets, parking areas, sidewalks, etc., adjacent to the project free of mud and debris from construction.
31. The City of Rockwall Engineering Department Construction Inspector is to be notified 48 hours (2 working days) prior to any construction of paving and utilities in rights–of–way and easements.
32. Arrangements for construction water shall be made through the City of Rockwall Water Department (972–771–7730).
33. All locations of underground utility lines are approximate. CONTRACTOR shall contact the proper utility companies at least 48 hours prior to construction, shall inform them of beginning of construction and shall make arrangements to have utilities located by flagging. Flagging of utilities shall be completed prior to beginning construction.
34. PVC pipe shall be manufactured from a low filler PVC component capable of meeting the highest performance standards of the ASTM specifications.
35. Construction sites shall be secure at all times. Safety precautions shall be taken to protect the public from any injury which might result from construction activities.
36. As part of bid item, "EROSION CONTROL", the CONTRACTOR shall be responsible for implementing any and all erosion control measures as needed to control runoff of siltation from the project site. This shall include, but is not limited to, silt fencing, rock berms, etc. The CONTRACTOR shall maintain these erosion control measures as required until the construction is completed and sod has been placed over disturbed areas.
37. CONTRACTOR shall expose each existing pipeline to which a proposed pipeline will be connected and shall verify the horizontal and vertical location of the existing pipeline prior to the installation of the proposed pipeline.
38. Proposed water line shall have a minimum cover of forty eight inches (48").
39. The fittings for the proposed water line shall be AWWA C153 compact fittings.
40. All materials furnished and installed on this project shall be domestic materials and shall be in compliance with the appropriate AWWA Standards for such items.
41. Block sodding shall be installed to match surrounding areas where the ground is disturbed in the construction area. City reserves the right to provide direction with regard to areas to be sodded. The CONTRACTOR will receive payment only for the square yards of area actually sodded in the construction area.
42. If any conflicts with other utilities occur during the construction activities, the CONTRACTOR shall immediately notify the City's representative and shall make adjustments as necessary with City's concurrence.
43. No connections to other City water distribution lines shall be made on Fridays.
44. CONTRACTOR is responsible for locating all existing buried lines. Locations of pipelines shown on he plans are approximate and are to the best knowledge of the engineer. CONTRACTOR will make all repairs to existing lines damaged during construction work and will have materials on hand to make such repairs.
45. CONTRACTOR shall take the existing water lines out of service and abandon in place once all service connections are changed over. CONTRACTOR shall cut and plug existing water lines in a sufficient manner to prevent loss of water.
46. Mega–lugs shall be furnished and installed on all bends, valves, joints, and other fittings that are required for the proposed water line.
47. Blue EMS locator marker pads shall be furnished and installed no deeper than 4 feet by the CONTRACTOR at 250' intervals along the water line, beside all valves, above all bends, and above all corporation stops on the proposed water line.
48. CONTRACTOR shall furnish and install a tracer wire that is compatible with and will allow detection by radio detection corporation's digital PXL–2 pipe locator. The tracer wire shall be installed just above the proposed water lines and throughout the length of the water lines. The tracer wire shall be minimum 14 gauge wire.
49. If the CONTRACTOR excavates a trench for the proposed water line and proposed sanitary ⚠1 sewer line to a depth requiring a trench safety plan, CONTRACTOR shall provide a trench safety plan prepared and sealed by a licensed engineer, which shall be in conformance with OSHA requirements. CONTRACTOR shall provide trench safety during construction per the trench safety plan when and where it is required as a result of OSHA requirements, job conditions, site conditions, or soil conditions.

GENERAL NOTES CONT'D.:

50. Proposed sewer line shall be polyvinyl chloride (PVC) SDR 35 for sewer line less than 10 feet deep and SDR 26 for sewer line more than 10 feet deep.
51. Green EMS locator marker pads shall be furnished and installed no deeper than 4 feet by the CONTRACTOR at 250' intervals along the sewer line, beside manholes and cleanouts, and above all changes in direction.
52. Manholes shall be Raven lined or lined with approved equal lining system.
53. There is no separate pay resulting from any of the work required as a result of the requirements included in these general notes, unless otherwise noted. All work required shall be included in the unit price bid for the project.

⚠1 54. City of Rockwall is a tax exempt entity. Therefore, material provided for this project shall be tax exempt. The City will provide the appropriate tax exempt forms to the CONTRACTOR for their utilization on this project.

⚠1 55. The City is willing to pay the contractor for 85% of materials on hand during construction of the project. CONTRACTOR will be responsible for providing the City with adequate documentation regarding the purchase of the materials on hand.

⚠1 56. All of the items furnished and installed for this project will be in accordance with the North Central Texas Council of Governments Public Works Construction Standards, 3rd Edition (1998) (as modified by the City of Rockwall addendum), except for the asphalt pavement replacement. Asphalt pavement replacement shall be in accordance with the attached detail entitled "Typical Asphalt Pavement Repair Section".

⚠1 57. Any concrete driveways removed in order to install the pipelines on this project shall be replaced with 6" thick concrete, including No. 3 reinforcing bars at 24" centers. The concrete furnished and installed for this purpose shall be 3,600 psi, 6 sack minimum.

⚠1 58. CONTRACTOR shall remove existing sanitary sewer line as necessary in order to install the proposed sanitary sewer line. If the CONTRACTOR utilizes sewage bypass pumping in order to install the proposed sewer lines, arrangements for the bypass pumping shall be made by the CONTRACTOR and the cost of such bypass pumping shall be incidental to the project and shall be included by the CONTRACTOR in the price bid for the project. CONTRACTOR shall be responsible for coordinating with property owners in making connections to the individual property owner's sanitary sewer service lines.

GENERAL TRAFFIC CONTROL NOTES

1. All temporary signs, markings, cones, channelizing devices, warning lights and barricades shall be in accordance with the current State of Texas Manual on Uniform Traffic Control Devices (MUTCD).
2. Type "A" warning lights shall be placed on all advance warning signs. In addition, flags shall be placed on all advance warning signs that detour traffic.
3. Any existing conflicting markings shall be removed prior to shifting traffic.
4. All temporary pavement markings required during construction shall be of the removable type. Temporary markings and striping may be required to transition travel lanes between construction phases. All pavement markings and striping shall be reflective.
5. The spacing of signs and channelization devices may be adjusted to fit the geometric conditions encountered, such as driveways, intersecting roadways, vertical and horizontal alignment, etc., as approved by the City of Rockwall.
6. Advance warning signs shall not be displayed more than forty–eight (48) hours before physical construction begins. Signs may be erected up to one week before needed, if the sign face is fully covered.
7. Use of barricades, portable barrier rails, vertical panels, and drums shall be limited to the immediate areas of construction where a hazard is present. These devices shall not be stored along the roadway within thirty (30) feet of the edge of the traveled way before or after use unless protected by guardrail, bridge rail, and/or barriers installed for other purposes. These devices shall be removed from the construction work zone when the City of Rockwall determines they are no longer needed. Where there is insufficient right–of–way to provide for this thirty (30) foot setback, the City of Rockwall shall approve alternate locations.
8. The posted speed for warning signage is to be determined at the site by the City of Rockwall.
9. Reduced speed warning signage should be placed prior to and at regular intervals within the construction zone.
10. As part of the bid item, "Construction Barricading/Signing/Traffic Control," the CONTRACTOR is required to submit a traffic control plan signed and sealed by a Licenced Professional Engineer in the State of Texas for construction a minimum of 3 days prior to changes in traffic handling or movement. These plans are to be reviewed and approved by the City of Rockwall prior to construction of that phase.
11. The CONTRACTOR shall accommodate existing traffic during construction and shall maintain at least one open lane of traffic at all times. Use of flag men, barricades, vertical panels, etc. shall be required and shall be considered subsidiary to "Construction Barricading/Signing/Traffic Control".
12. CONTRACTOR shall be required to place temporary pavement markings and/or buttons as needed to mantain traffic in a safe and efficient manner after removal of existing markings. These temporary markings shall not be paid for separately but shall be considered subsidiary to "CONSTRUCTION BARRICADING/SIGNING/TRAFFIC CONTROL".

CONSTRUCTION SEQUENCE:

1. Existing water lines shall remain in service until all new water lines are installed and ready for service. Once new water lines are all installed and ready for service, new water lines shall be placed in service and existing water service connections shall be switched over to the new water lines where existing water lines are being replaced by the new water lines.
2. Existing sewer lines shall remain in service until all new sewer lines are installed and ready for service. Once new sewer lines are all installed and ready for service, new sewer lines shall be placed in service and existing sewer service lines shall be switched over to the new sewer lines where existing sewer lines are being replaced by the new sewer lines.

RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

EROSION CONTROL NOTES:

1. Erosion control devices as shown on the erosion control plan for the project shall be installed prior to the start of land disturbing activities on the project.
2. All erosion control devices are to be installed in accordance with the approved plans and specifications for the project. Changes are to be approved before construction by the Design Engineer and City of Rockwall.
3. If the erosion control plans as approved cannot control erosion and off–site sedimentation from the project, the erosion control plan will be required to be revised and/or additional erosion control devices will be required on site.
4. If off–site soil borrow or spoil sites are used in conjunction with this project, this information shall be disclosed and shown on the erosion control plan. Staging, borrow, and spoil areas (including those located off–site) are considered a part of the project site and therefore shall comply with the City of Rockwall's erosion control requirements. Perimeter controls will be provided by the CONTRACTOR for these areas. They shall be stabilized with permanent ground cover prior to final approval of the project.
5. All erosion control devices shall be inspected weekly by the CONTRACTOR and after all major rain events. Any devices that are damaged or displaced will be restored (no separate pay).
6. All non–impervious areas after construction shall be covered with sod or landscaped in accordance with the landscape drawings. All other remaining areas shall be hydromulched or covered with curlex blanket (where shown) and maintained until established.
7. Temporary stone stabilized construction entrance shall have the following minimum dimensions (unless otherwise shown): 25' wide x 50' long x 8" deep. (4"–6" course aggregate). No crushed concrete allowed. Place filter fabric under stone per NCTCOG item 2.23.3.
8. The stabilized construction entrance is to be used as a vehicle wash down area for debris and soil removal prior to exiting the site. This stabilized entrance shall be top dressed with additional stone as necessary. Location of stabilized entrance may be modified if approved by City of Rockwall and the Design Engineer. These stabilized construction entrance requirements shall be ⚠1 applicable to any staging areas utilized for this project.
9. The CONTRACTOR shall be responsible, as the entity exercising operational control, for all permitting as required by the EPA/TCEQ. This includes, but is not limited to, meeting all requirements of TPDES General Permit TXR150000 and payment of all associated fees.
10. It should be noted that the area of impact on this project will require a small construction permit through TCEQ.
11. It is very important that mud and other debris be kept off all roads. CONTRACTOR shall immediately remove any mud and debris deposited on roads.
12. CONTRACTOR will replace any erosion control devices that are damaged and/or displaced during construction (no separate pay).

!! CAUTION !!

THERE ARE EXISTING AND/OR PROPOSED UTILITIES IN PROJECT AREA. UTILITY INFORMATION SHOWN ON PLANS REPRESENTS APPROXIMATE LOCATIONS OF EXISTING UTILITIES AND IS NOT NECESSARILY ALL-INCLUSIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS OF ALL EXISTING UTILITIES AND SHALL BE REQUIRED TO PROTECT UTILITIES TO AVOID DAMAGE.

PRIOR TO ANY EXCAVATION, CONTRACTOR SHALL CONTACT DIG-TESS, TEXAS ONE CALL, LONE STAR NOTIFICATION AND OTHERS AS REQUIRED TO LOCATE EXISTING UTILITIES.

CONTRACTOR SHALL ALSO CONTACT APPROPRIATE CITY UTILITY DEPARTMENT FOR FIELD LOCATES OF MUNICIPAL INFRASTRUCTURE 48 HOURS PRIOR TO CONSTRUCTION.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2			
⚠1	5/26/16	REVISED PER ADDENDUM NO. 1	MRB

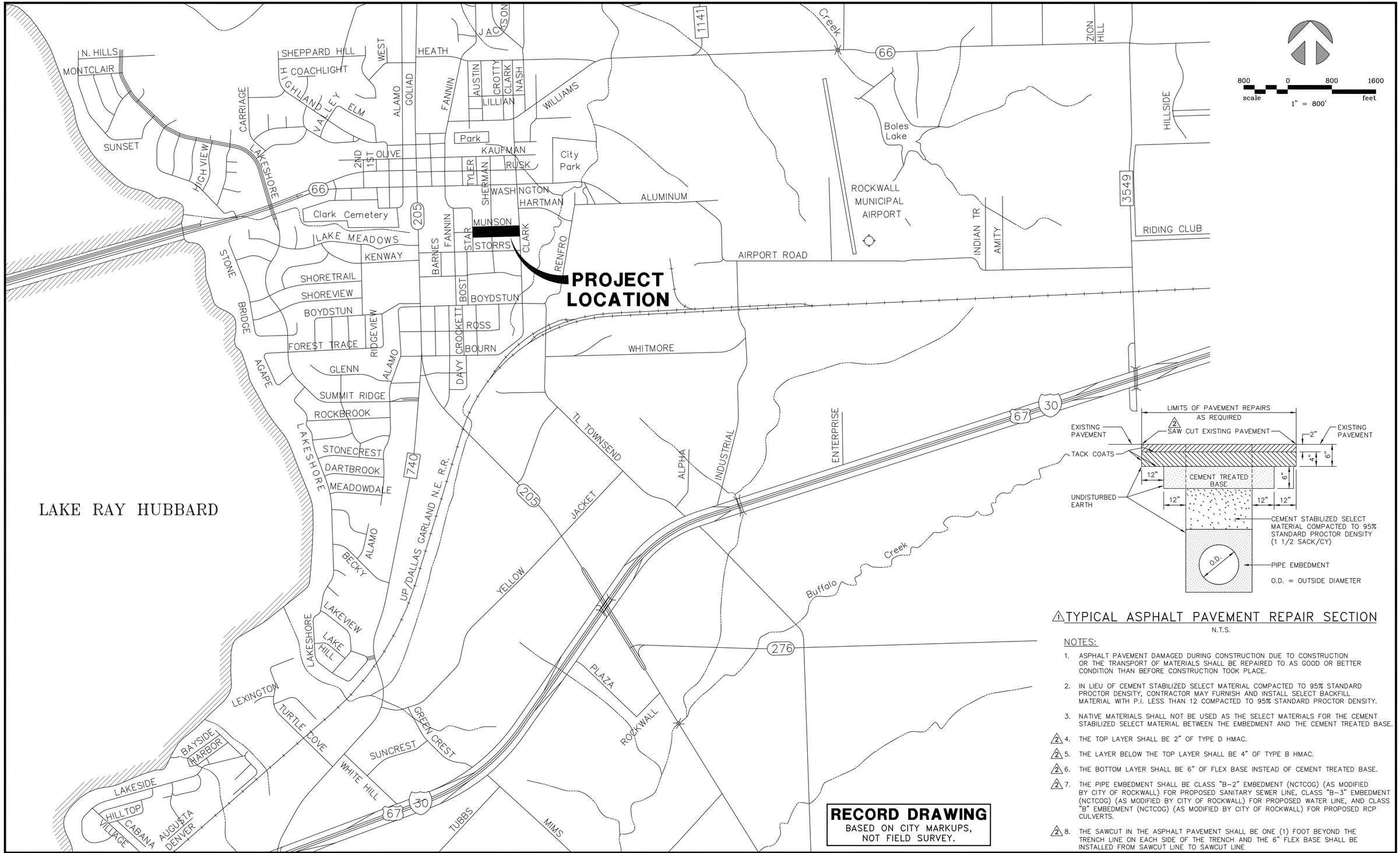
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: NO SCALE
DATE: MARCH 2016
DWG. NAME: 1742GENNOTE

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS · MICHAEL R. BURGE · 41290 · REGISTERED PROFESSIONAL ENGINEER · 5/26/16 ⚠1

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
PROJECT GENERAL NOTES
CITY OF ROCKWALL

SHEET NO. 2
OF 12 SHEETS
JOB NO. 15–1742



1 TYPICAL ASPHALT PAVEMENT REPAIR SECTION

N.T.S.

NOTES:

1. ASPHALT PAVEMENT DAMAGED DURING CONSTRUCTION DUE TO CONSTRUCTION OR THE TRANSPORT OF MATERIALS SHALL BE REPAIRED TO AS GOOD OR BETTER CONDITION THAN BEFORE CONSTRUCTION TOOK PLACE.
2. IN LIEU OF CEMENT STABILIZED SELECT MATERIAL COMPACTED TO 95% STANDARD PROCTOR DENSITY, CONTRACTOR MAY FURNISH AND INSTALL SELECT BACKFILL MATERIAL WITH P.I. LESS THAN 12 COMPACTED TO 95% STANDARD PROCTOR DENSITY.
3. NATIVE MATERIALS SHALL NOT BE USED AS THE SELECT MATERIALS FOR THE CEMENT STABILIZED SELECT MATERIAL BETWEEN THE EMBEDMENT AND THE CEMENT TREATED BASE.
2. 4. THE TOP LAYER SHALL BE 2" OF TYPE D HMAC.
2. 5. THE LAYER BELOW THE TOP LAYER SHALL BE 4" OF TYPE B HMAC.
2. 6. THE BOTTOM LAYER SHALL BE 6" OF FLEX BASE INSTEAD OF CEMENT TREATED BASE.
2. 7. THE PIPE EMBEDMENT SHALL BE CLASS "B-2" EMBEDMENT (NCTCOG) (AS MODIFIED BY CITY OF ROCKWALL) FOR PROPOSED SANITARY SEWER LINE, CLASS "B-3" EMBEDMENT (NCTCOG) (AS MODIFIED BY CITY OF ROCKWALL) FOR PROPOSED WATER LINE, AND CLASS "B" EMBEDMENT (NCTCOG) (AS MODIFIED BY CITY OF ROCKWALL) FOR PROPOSED RCP CULVERTS.
2. 8. THE SAWCUT IN THE ASPHALT PAVEMENT SHALL BE ONE (1) FOOT BEYOND THE TRENCH LINE ON EACH SIDE OF THE TRENCH AND THE 6" FLEX BASE SHALL BE INSTALLED FROM SAWCUT LINE TO SAWCUT LINE

RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2	5/26/16	REVISED PER ADDENDUM NO. 2	MRB
1	5/26/16	REVISED PER ADDENDUM NO. 1	MRB

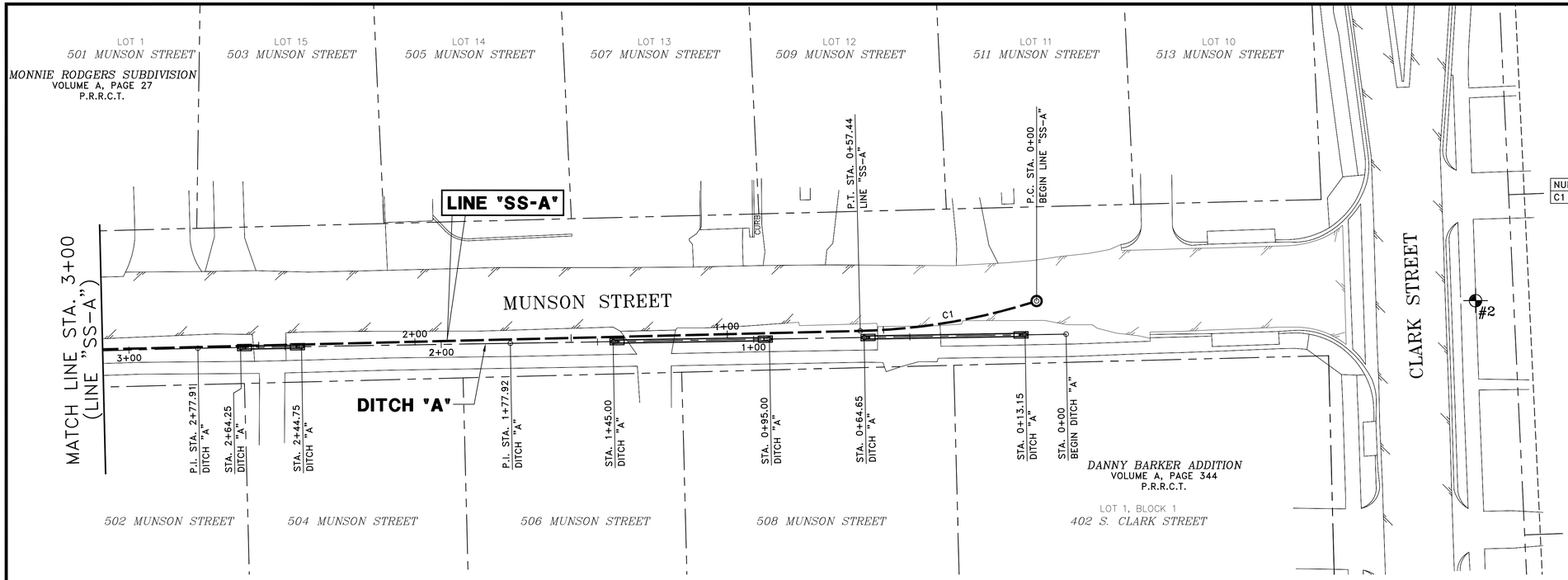
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: 1" = 800'
DATE: MARCH 2016
DWG. NAME: 1742LOCMAP

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED PROFESSIONAL ENGINEER
5/26/16
1
2

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
PROJECT LOCATION MAP
CITY OF ROCKWALL

SHEET NO. 3
OF 12 SHEETS
JOB NO. 15-1742



C/L SANITARY SEWER CURVE DATA

NUMBER	RADIUS	DELTA ANGLE	ARC LENGTH	CHORD DIRECTION	CHORD LENGTH
C1	200.00'	16°27'21"	57.44'	S 80°22'44" W	57.24'

HORIZONTAL AND VERTICAL CONTROL POINTS

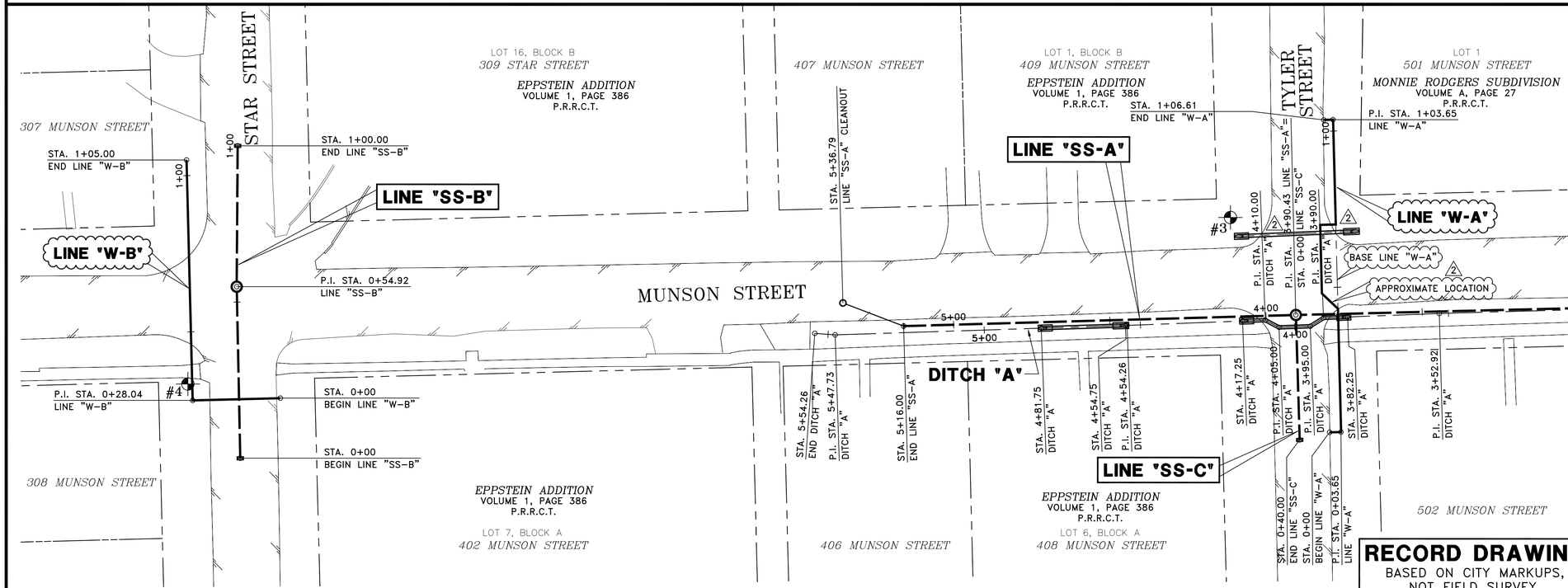
NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
2	7027675.0340	2596487.7740	536.83	"x" CUT
3	7027688.4750	2595936.9920	561.62	1/2" I.R. W/CAP
4	7027635.1990	2595603.3630	573.18	1/2" I.R. W/CAP

SANITARY SEWER – LINE "SS-A", LINE "SS-B, AND LINE "SS-C"

STATION	NORTHING	EASTING
P.C. STA. 0+00 LINE "SS-A"	7027674.9392	2596347.2761
P.T. STA. 0+57.44 LINE "SS-A"	7027665.3717	2596290.8366
P.I. STA. 3+90.43 LINE "SS-A"= STA. 0+00 LINE "SS-C"	7027657.2753	2595957.9475
STA. 5+16.00 LINE "SS-A"	7027653.7091	2595832.4276
STA. 5+36.79 LINE "SS-A"	7027661.1164	2595813.0020
STA. 0+00 LINE "SS-B"	7027611.4164	2595620.1171
P.I. STA. 0+54.92 LINE "SS-B"	7027666.3252	2595618.9788
STA. 1+00.00 LINE "SS-B"	7027711.4036	2595619.2868
STA. 0+40.00 LINE "SS-C"	7027617.2938	2595959.1651

WATER – LINE "W-A" AND LINE "W-B"

STATION	NORTHING	EASTING
STA. 0+00 LINE "W-A"	7027619.7167	2595968.7678
P.I. STA. 0+03.65 LINE "W-A"	7027619.8102	2595972.4134
P.I. STA. 1+03.65 LINE "W-A"	7027719.7773	2595969.8513
STA. 1+06.61 LINE "W-A"	7027719.7014	2595966.8885
STA. 0+00 LINE "W-B"	7027630.6517	2595632.9199
P.I. STA. 0+28.04 LINE "W-B"	7027629.9333	2595604.8926
STA. 1+05.00 LINE "W-B"	7027706.8716	2595602.9208



STORM SEWER – DITCH "A"

STATION	NORTHING	EASTING
STA. 0+00 DITCH "A"	7027664.3200	2596356.7120
STA. 0+13.15 DITCH "A"	7027664.1033	2596343.5638
STA. 0+64.65 DITCH "A"	7027663.2515	2596292.0708
STA. 0+95.00 DITCH "A"	7027662.7548	2596261.7249
STA. 1+45.00 DITCH "A"	7027661.9310	2596211.7317
P.I. STA. 1+77.92 DITCH "A"	7027661.3886	2596178.8193
STA. 2+44.75 DITCH "A"	7027660.3392	2596111.9944
STA. 2+64.25 DITCH "A"	7027660.0330	2596092.4968
P.I. STA. 2+77.91 DITCH "A"	7027659.8185	2596078.8355
P.I. STA. 3+52.92 DITCH "A"	7027657.7554	2596003.8601
STA. 3+82.25 DITCH "A"	7027656.6355	2595974.5482
P.I. STA. 3+90.00 DITCH "A"	7027656.3396	2595966.8039
P.I. STA. 3+95.00 DITCH "A"	7027653.6761	2595962.5724
P.I. STA. 4+05.00 DITCH "A"	7027653.2943	2595952.5797
P.I. STA. 4+10.00 DITCH "A"	7027655.6272	2595948.1572
STA. 4+17.25 DITCH "A"	7027655.3504	2595940.9125
P.I. STA. 4+54.26 DITCH "A"	7027653.9375	2595903.9330
STA. 4+54.75 DITCH "A"	7027653.9215	2595903.4398
STA. 4+81.75 DITCH "A"	7027653.0460	2595876.4540
P.I. STA. 5+47.73 DITCH "A"	7027650.9066	2595810.5102
STA. 5+54.26 DITCH "A"	7027651.3750	2595803.9990

RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

NOTE:
1. COORDINATES SHOWN HEREON ARE TEXAS STATE PLANE COORDINATES NORTH CENTRAL ZONE (4202) NAD 83 AT SURFACE WITH A SCALE FACTOR OF 1.000146135. VERTICAL DATUM IS AT NAVD 88.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2			
1	1/20/17	REVISED PER CITY MARKUPS	MRB

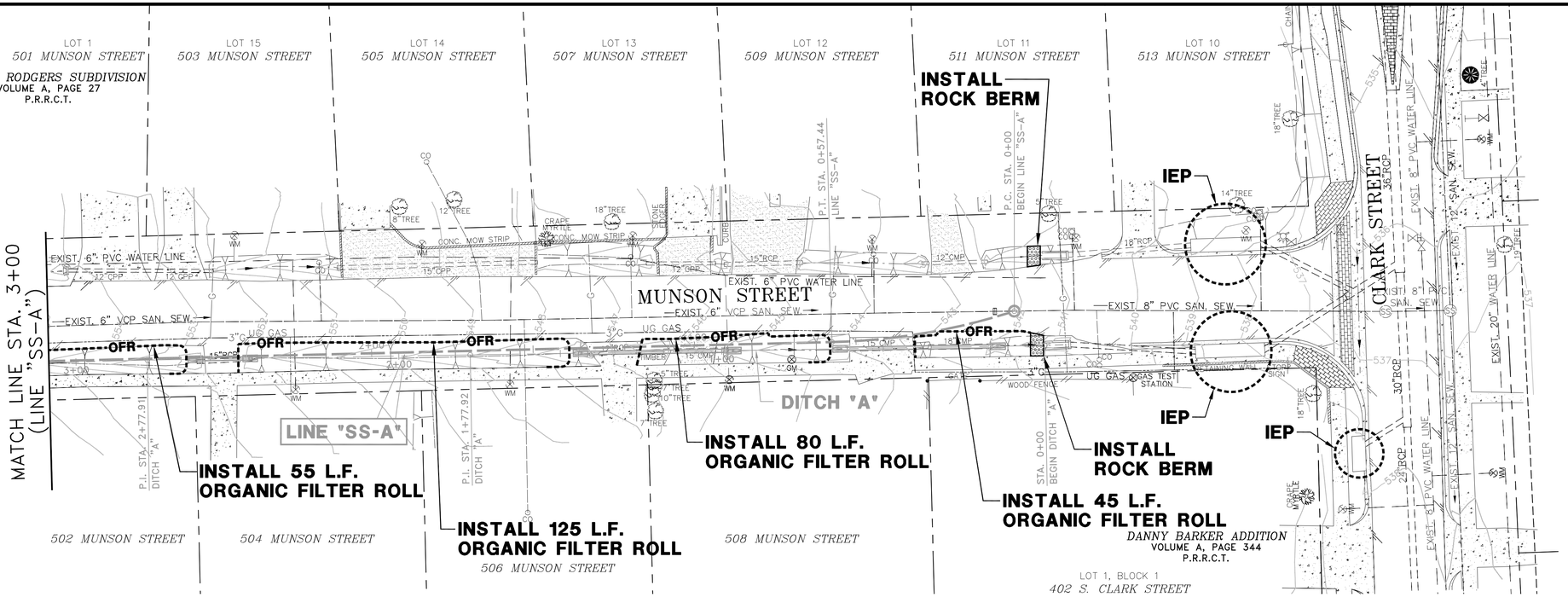
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: 1" = 20
DATE: MARCH 2016
DWG. NAME: 1742HORZCONT

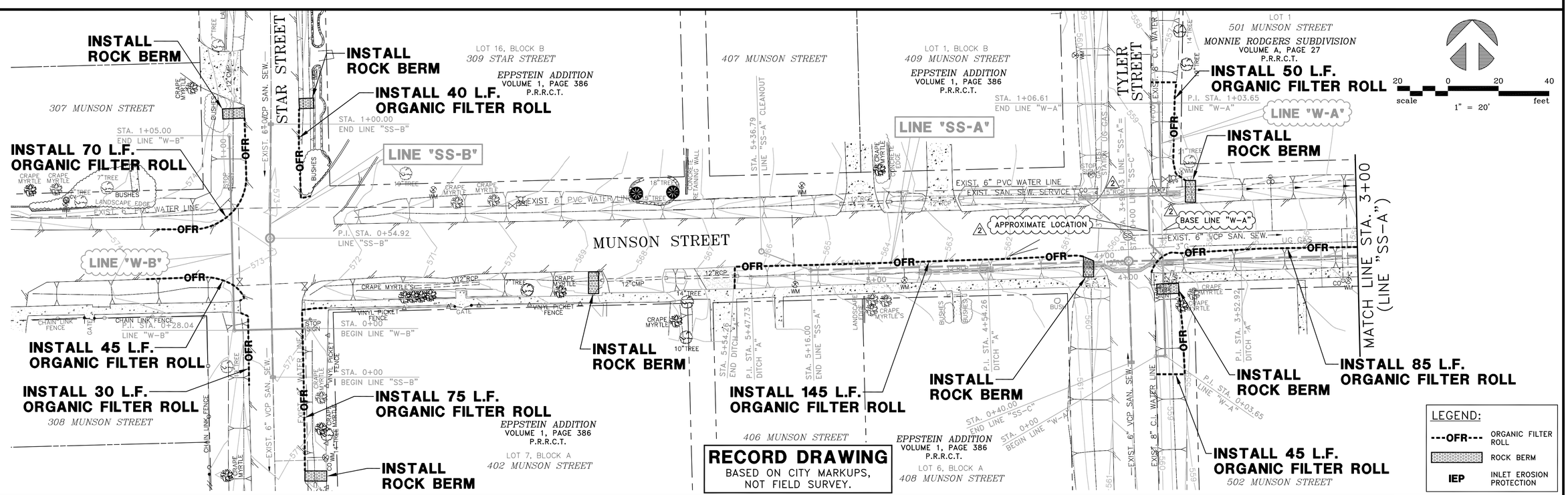
BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED PROFESSIONAL ENGINEER
1-30-17

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
HORIZONTAL AND VERTICAL CONTROL PLAN
CITY OF ROCKWALL

SHEET NO. 4
OF 12 SHEETS
JOB NO. 15-1742





RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2			
1	1/20/17	REVISED PER CITY MARKUPS	MRB

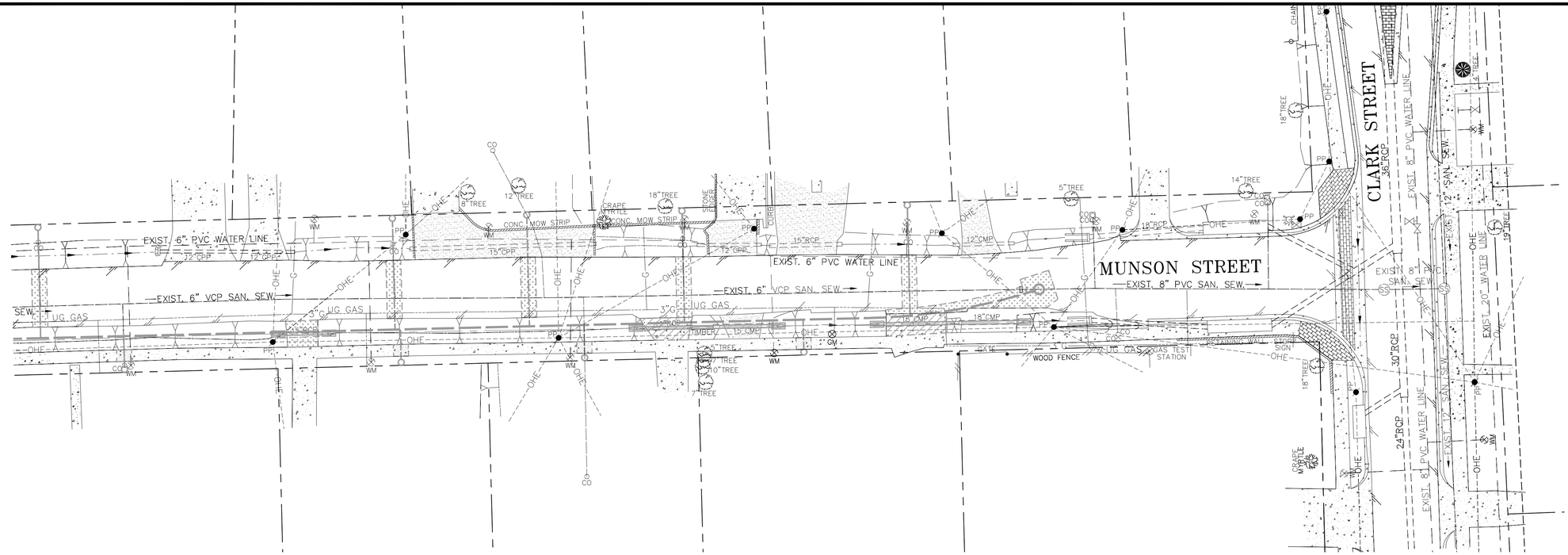
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: 1" = 20
DATE: MARCH 2016
DWG. NAME: 1742EROSCONT

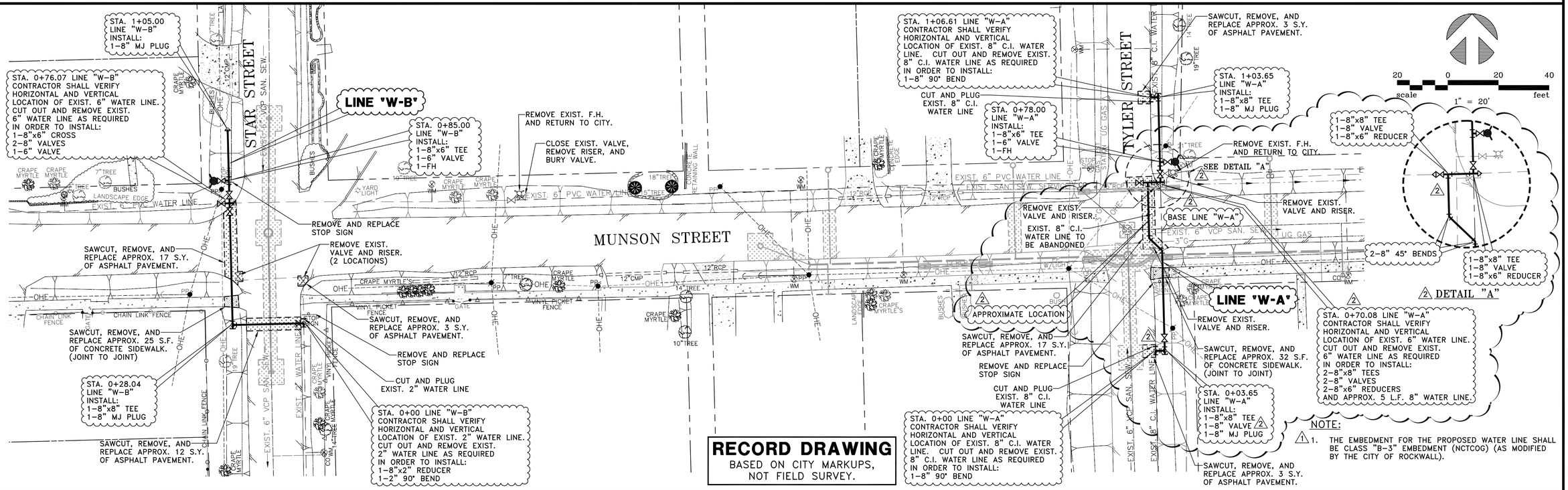
BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED PROFESSIONAL ENGINEER
1-20-17

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
EROSION CONTROL PLAN
CITY OF ROCKWALL

SHEET NO. 5
OF 12 SHEETS
JOB NO. 15-1742





NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2	1/20/17	REVISED PER CITY MARKUPS	MRB
1	5/26/16	REVISED PER ADDENDUM NO. 1	MRB

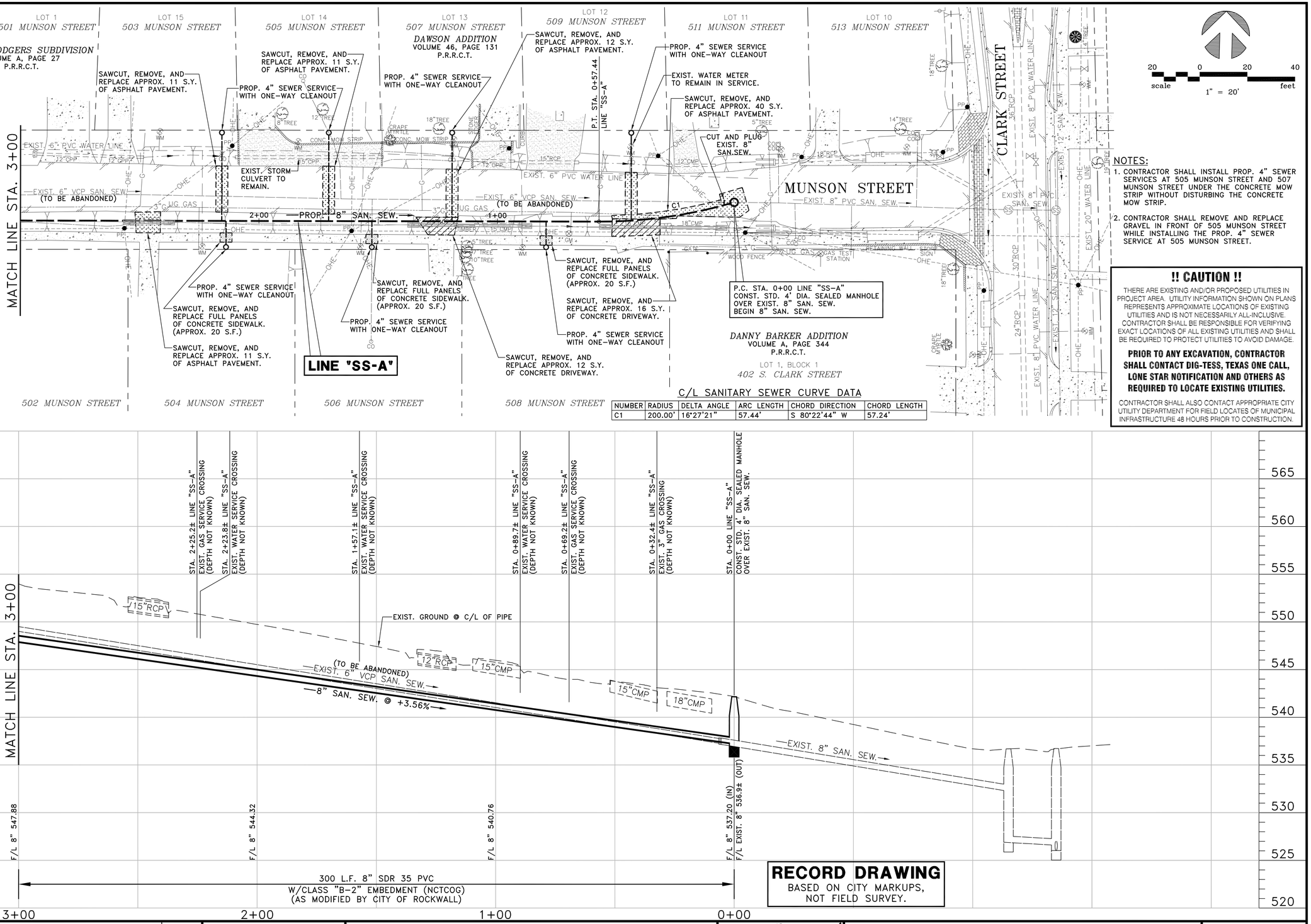
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: 1" = 20
DATE: MARCH 2016
DWG. NAME: 1742WATER

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED
PROFESSIONAL
ENGINEER
1-20-17
1 2

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
LINE "W-A" AND LINE "W-B"
CITY OF ROCKWALL

SHEET NO. 6
OF 12 SHEETS
JOB NO. 15-1742



C/L SANITARY SEWER CURVE DATA

NUMBER	RADIUS	DELTA ANGLE	ARC LENGTH	CHORD DIRECTION	CHORD LENGTH
C1	200.00'	16°27'21"	57.44'	S 80°22'44" W	57.24'

NOTES:

1. CONTRACTOR SHALL INSTALL PROP. 4" SEWER SERVICES AT 505 MUNSON STREET AND 507 MUNSON STREET UNDER THE CONCRETE MOW STRIP WITHOUT DISTURBING THE CONCRETE MOW STRIP.
2. CONTRACTOR SHALL REMOVE AND REPLACE GRAVEL IN FRONT OF 505 MUNSON STREET WHILE INSTALLING THE PROP. 4" SEWER SERVICE AT 505 MUNSON STREET.

!! CAUTION !!

THERE ARE EXISTING AND/OR PROPOSED UTILITIES IN PROJECT AREA. UTILITY INFORMATION SHOWN ON PLANS REPRESENTS APPROXIMATE LOCATIONS OF EXISTING UTILITIES AND IS NOT NECESSARILY ALL-INCLUSIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS OF ALL EXISTING UTILITIES AND SHALL BE REQUIRED TO PROTECT UTILITIES TO AVOID DAMAGE.

PRIOR TO ANY EXCAVATION, CONTRACTOR SHALL CONTACT DIG-TESS, TEXAS ONE CALL, LONE STAR NOTIFICATION AND OTHERS AS REQUIRED TO LOCATE EXISTING UTILITIES.

CONTRACTOR SHALL ALSO CONTACT APPROPRIATE CITY UTILITY DEPARTMENT FOR FIELD LOCATES OF MUNICIPAL INFRASTRUCTURE 48 HOURS PRIOR TO CONSTRUCTION.

RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2			
1			

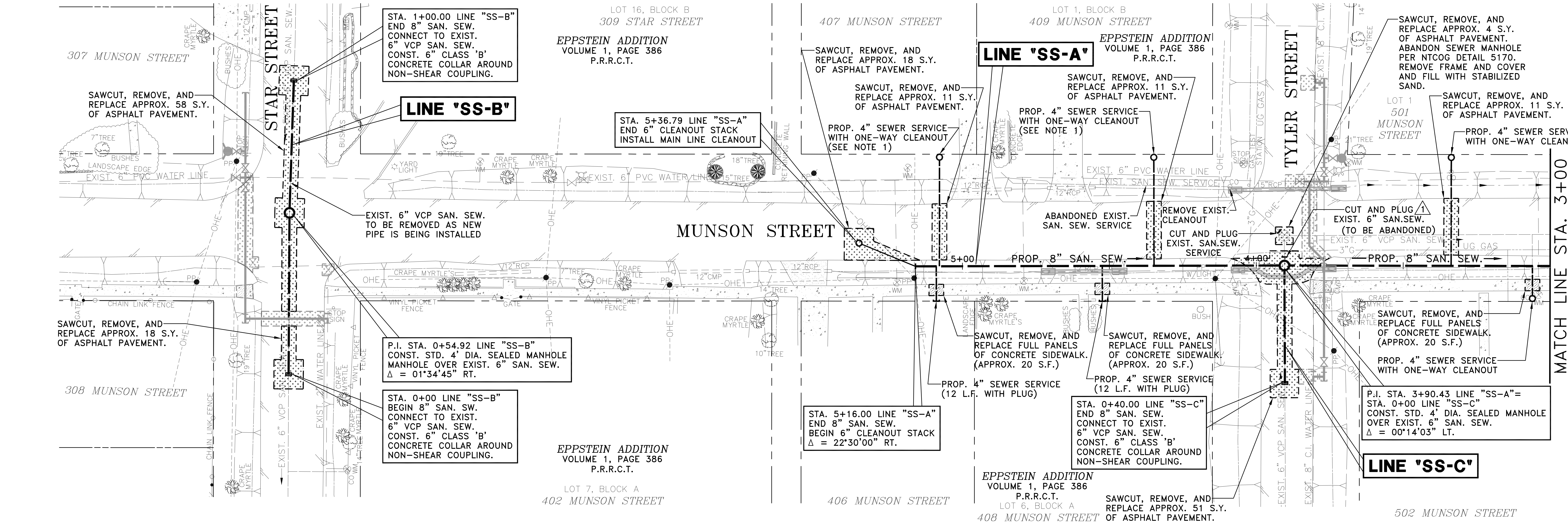
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: (H)1"=20', (V)1"=5'
DATE: MARCH 2016
DWG. NAME: 1742SSPP01

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED
PROFESSIONAL ENGINEER
5-30-16

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
LINE "SS-A" - STA. 0+00 TO STA. 3+00
CITY OF ROCKWALL

SHEET NO. 7
OF 12 SHEETS
JOB NO. 15-1742



NOTES:

1. CONTRACTOR SHALL LOCATE EXISTING SANITARY SEWER LINE WHERE IT CROSSES THE MUNSON STREET R.O.W. LINE FOR 407 MUNSON STREET AND 409 MUNSON STREET AND INSTALL NEW SERVICE LINES AT THESE LOCATIONS.
2. 406 MUNSON STREET AND 408 MUNSON STREET ARE CURRENTLY SERVED TO THE REAR (SOUTH SIDE) OF PROPERTY.

!! CAUTION !!

THERE ARE EXISTING AND/OR PROPOSED UTILITIES IN PROJECT AREA. UTILITY INFORMATION SHOWN ON PLANS REPRESENTS APPROXIMATE LOCATIONS OF EXISTING UTILITIES AND IS NOT NECESSARILY ALL-INCLUSIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS OF ALL EXISTING UTILITIES AND SHALL BE REQUIRED TO PROTECT UTILITIES TO AVOID DAMAGE.

PRIOR TO ANY EXCAVATION, CONTRACTOR SHALL CONTACT DIG-TESS, TEXAS ONE CALL, LONE STAR NOTIFICATION AND OTHERS AS REQUIRED TO LOCATE EXISTING UTILITIES.

CONTRACTOR SHALL ALSO CONTACT APPROPRIATE CITY UTILITY DEPARTMENT FOR FIELD LOCATES OF MUNICIPAL INFRASTRUCTURE 48 HOURS PRIOR TO CONSTRUCTION.

RECORD DRAWING
BASED ON CITY MARKUPS,
NOT FIELD SURVEY.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2			
⚠1	5/26/16	REVISED PER ADDENDUM NO. 1	MRB

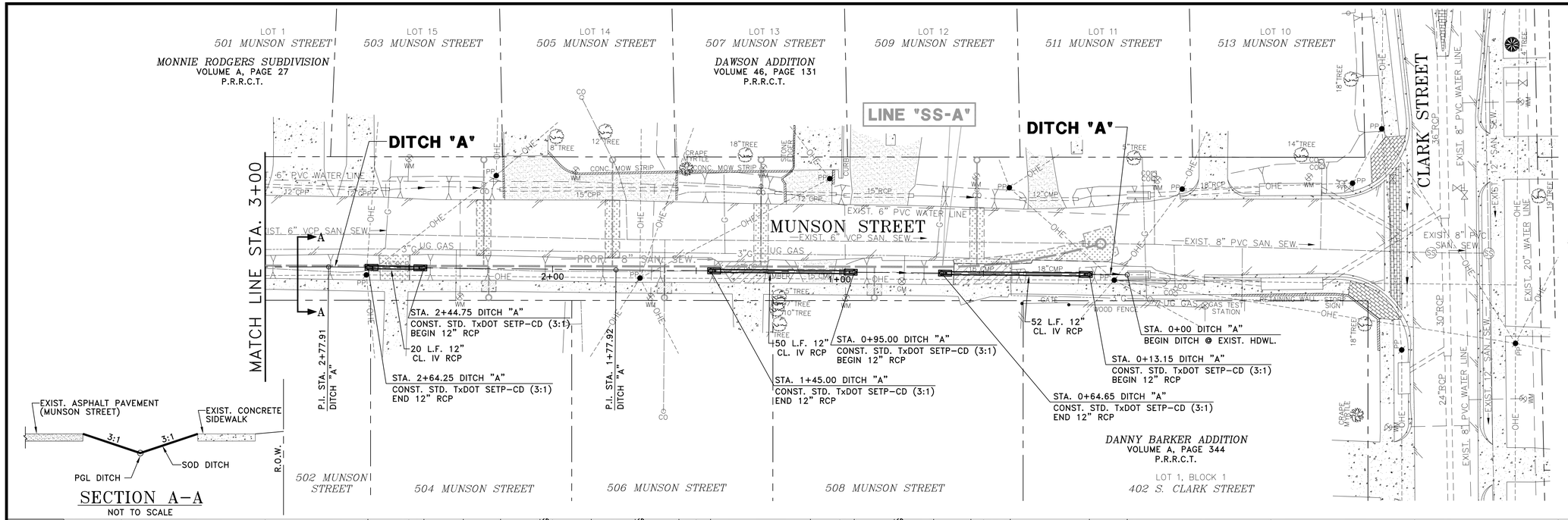
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: (H)1"=20', (V)1"=5'
DATE: MARCH 2016
DWG. NAME: 1742SSPP02

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

MICHAEL R. BURGE
41290
Michael R. Burge
5-26-16 ⚠1

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
LINE "SS-A" - STA. 3+00 TO STA. 5+16, LINE "SS-B", AND LINE "SS-C"
CITY OF ROCKWALL

SHEET NO. 8
OF 12 SHEETS
JOB NO. 15-1742



NOTE:

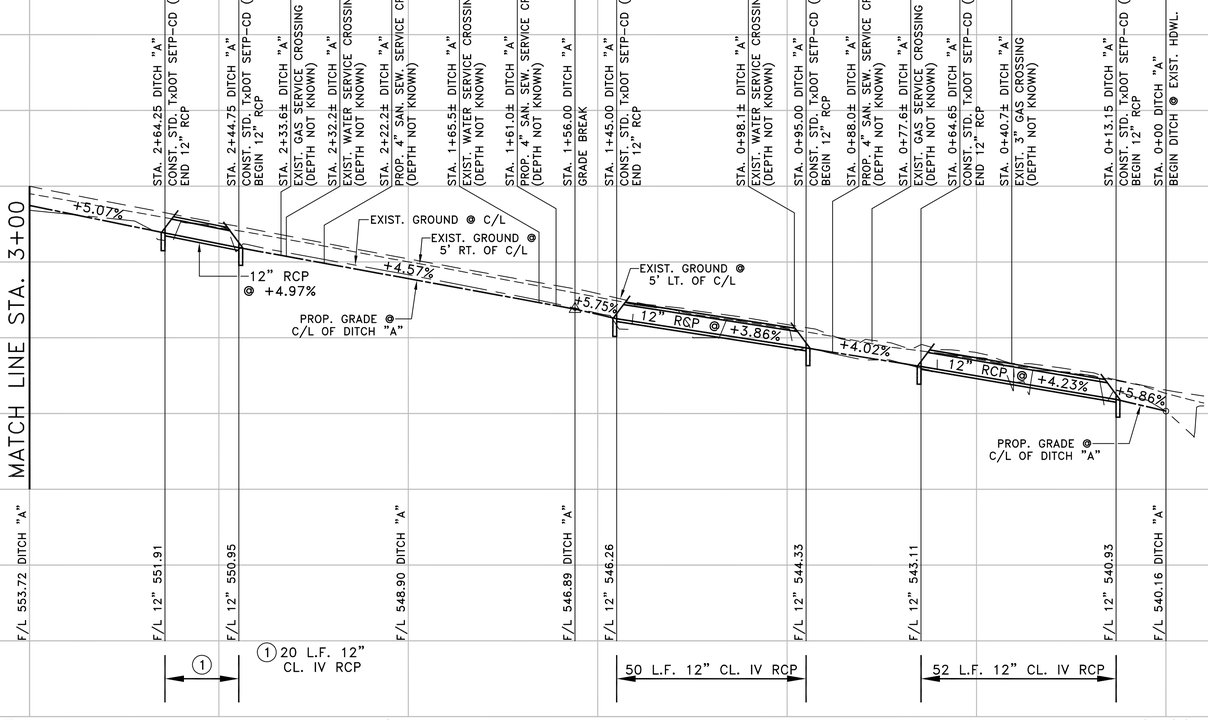
1. THE EMBEDMENT FOR THE PROPOSED RCP CULVERTS SHALL BE CLASS "B" EMBEDMENT (NCTCOG) (AS MODIFIED BY THE CITY OF ROCKWALL).

!! CAUTION !!

THERE ARE EXISTING AND/OR PROPOSED UTILITIES IN PROJECT AREA. UTILITY INFORMATION SHOWN ON PLANS REPRESENTS APPROXIMATE LOCATIONS OF EXISTING UTILITIES AND IS NOT NECESSARILY ALL-INCLUSIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS OF ALL EXISTING UTILITIES AND SHALL BE REQUIRED TO PROTECT UTILITIES TO AVOID DAMAGE.

PRIOR TO ANY EXCAVATION, CONTRACTOR SHALL CONTACT DIG-TESS, TEXAS ONE CALL, LONE STAR NOTIFICATION AND OTHERS AS REQUIRED TO LOCATE EXISTING UTILITIES.

CONTRACTOR SHALL ALSO CONTACT APPROPRIATE CITY UTILITY DEPARTMENT FOR FIELD LOCATES OF MUNICIPAL INFRASTRUCTURE 48 HOURS PRIOR TO CONSTRUCTION.



RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2			
1	5/26/16	REVISED PER ADDENDUM NO. 1	MRB

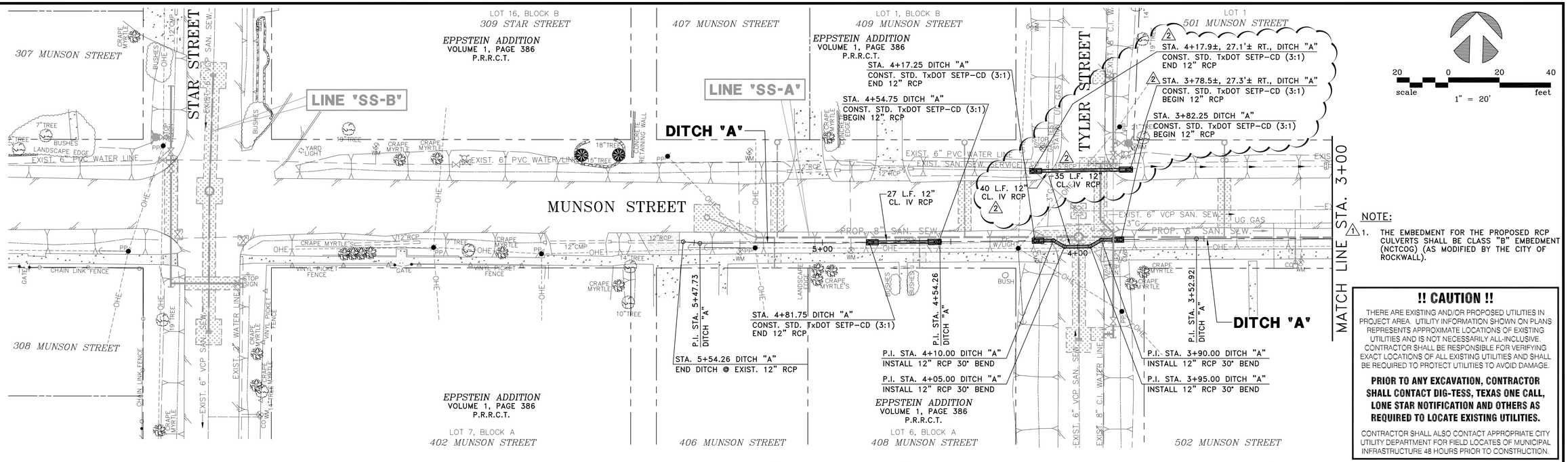
DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: (H)1"=20', (V)1"=5'
DATE: MARCH 2016
DWG. NAME: 1742DRNPP01

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED
PROFESSIONAL
ENGINEER
5-26-16

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
DITCH "A" - STA. 0+00 TO STA. 3+00
CITY OF ROCKWALL

SHEET NO. 9
OF 12 SHEETS
JOB NO. 15-1742



NOTE:

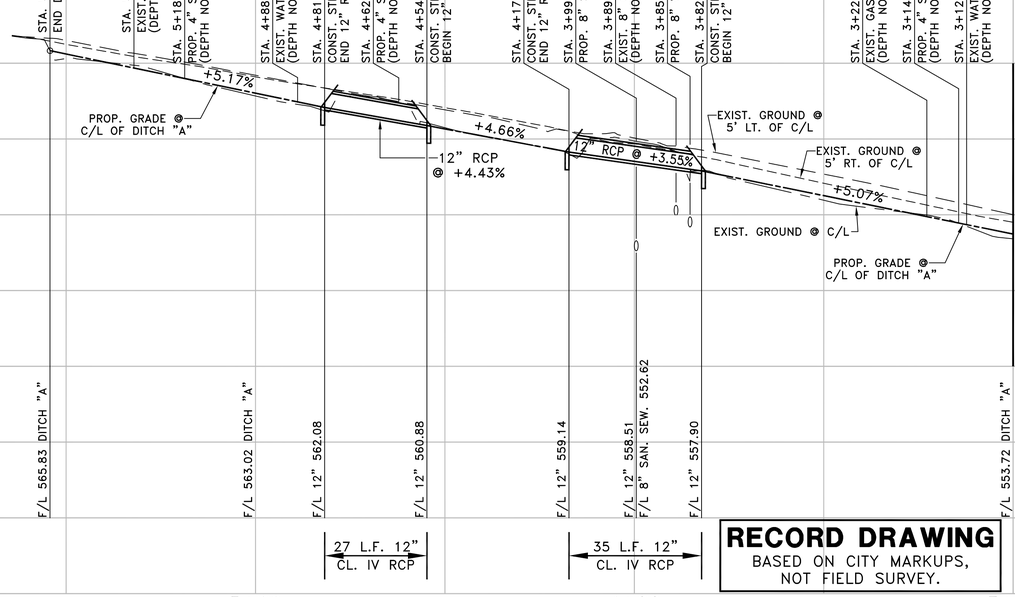
1. THE EMBEDMENT FOR THE PROPOSED RCP CULVERTS SHALL BE CLASS "B" EMBEDMENT (NCTCOG) (AS MODIFIED BY THE CITY OF ROCKWALL).

!! CAUTION !!

THERE ARE EXISTING AND/OR PROPOSED UTILITIES IN PROJECT AREA. UTILITY INFORMATION SHOWN ON PLANS REPRESENTS APPROXIMATE LOCATIONS OF EXISTING UTILITIES AND IS NOT NECESSARILY ALL-INCLUSIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS OF ALL EXISTING UTILITIES AND SHALL BE REQUIRED TO PROTECT UTILITIES TO AVOID DAMAGE.

PRIOR TO ANY EXCAVATION, CONTRACTOR SHALL CONTACT DIG-TESS, TEXAS ONE CALL, LONE STAR NOTIFICATION AND OTHERS AS REQUIRED TO LOCATE EXISTING UTILITIES.

CONTRACTOR SHALL ALSO CONTACT APPROPRIATE CITY UTILITY DEPARTMENT FOR FIELD LOCATES OF MUNICIPAL INFRASTRUCTURE 48 HOURS PRIOR TO CONSTRUCTION.



RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

NO.	DATE	REVISION	REVIEWED
6			
5			
4			
3			
2	1/20/17	ADDED 12" RCP W/STD. TxDOT SETP-CD (3:1) PER CITY MARKUPS	MRB
1	5/26/16	REVISED PER ADDENDUM NO. 1	MRB

DRAWN: BW2
DESIGN: MRB
REVIEWED: JFW
SCALE: (H)1"=20', (V)1"=5'
DATE: MARCH 2016
DWG. NAME: 1742DRNPP02

BW2 ENGINEERS, INC.
1919 S. Shiloh Road
Suite 500, L.B. 27
Garland, Texas 75042
(972) 864-8200 (T) (972) 864-8220 (F)
Firm Registration No. F-5290

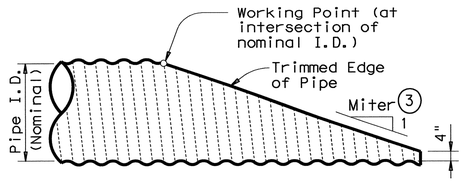
STATE OF TEXAS
MICHAEL R. BURGE
41290
REGISTERED PROFESSIONAL ENGINEER
Michael R. Burge 5-30-17
1 2

MUNSON STREET IMPROVEMENTS
SANITARY SEWER LINE AND WATER LINE REPLACEMENT
(FANNIN STREET TO CLARK STREET)
DITCH "A" - STA. 3+00 TO STA. 5+54.26
CITY OF ROCKWALL

SHEET NO. 10
OF 12 SHEETS
JOB NO. 15-1742

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

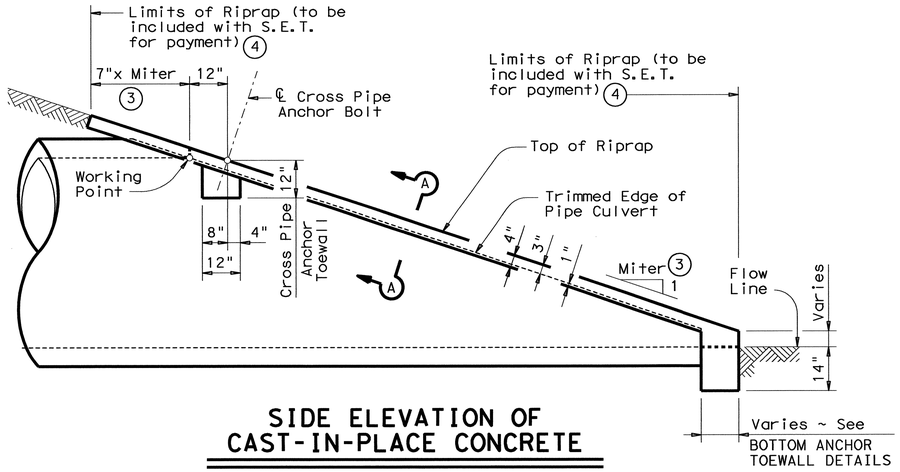
DATE:
FILE:



NOTE: All Pipe Runners, 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.

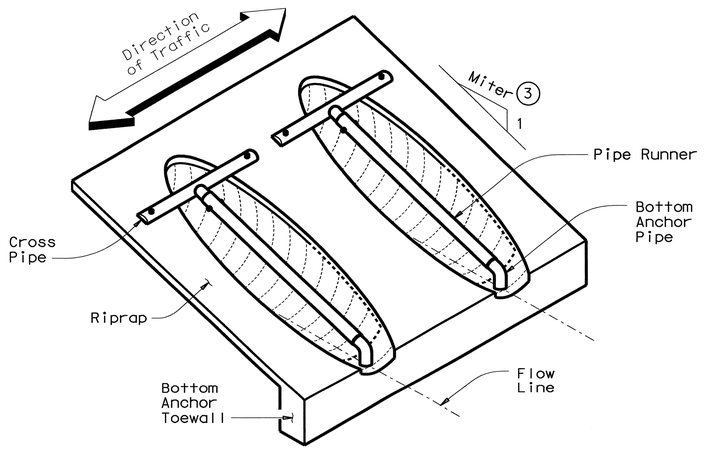
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert.
Details of Corrugated Metal Pipe Culvert are similar.
Pipe Runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS & PIPE RUNNER LENGTHS (1)(2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1'- 7"	3'- 5"	N/A	N/A	N/A	5'-10"	N/A	N/A	N/A	8'- 1"	N/A	N/A	N/A	12'- 9"
27"	1'- 8"	3'- 8"	N/A	N/A	5'- 5"	6'-11"	N/A	N/A	7'- 7"	9'- 7"	N/A	N/A	11'-11"	14'-11"
30"	1'-10"	3'-11"	N/A	N/A	6'- 4"	8'- 0"	N/A	N/A	8'- 9"	11'- 0"	N/A	N/A	13'- 8"	17'- 0"
33"	1'-11"	4'- 2"	6'- 2"	6'- 5"	7'- 3"	9'- 1"	8'- 6"	8'-10"	10'- 0"	12'- 5"	13'- 3"	13'- 9"	15'- 5"	19'- 2"
36"	2'- 1"	4'- 5"	6'-11"	7'- 3"	8'- 2"	10'- 2"	9'- 6"	9'-11"	11'- 2"	13'-10"	14'- 9"	15'- 3"	17'- 2"	21'- 3"
42"	2'- 4"	4'-11"	8'- 6"	8'-10"	9'-11"	12'- 4"	11'- 7"	12'- 0"	13'- 6"	16'- 8"	17'- 9"	18'- 5"	20'- 8"	25'- 7"
48"	2'- 7"	5'- 5"	10'- 1"	10'- 5"	11'- 9"	N/A	13'- 7"	14'- 2"	15'-10"	N/A	20'- 9"	21'- 6"	24'- 2"	N/A
54"	3'- 0"	5'-11"	11'- 8"	12'- 1"	N/A	N/A	15'- 8"	16'- 3"	N/A	N/A	23'-10"	24'- 8"	N/A	N/A
60"	3'- 3"	6'- 5"	13'- 3"	N/A	N/A	N/A	17'- 9"	N/A	N/A	N/A	26'-10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (No Skew)	Always required
42" to 60"	Always required	Always required

STANDARD PIPE SIZES & MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10'- 0"
4" STD	4.500"	4.026"	19'- 8"
5" STD	5.563"	5.047"	34'- 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Size of Pipe Runner shall be as shown in the tables. Cross Pipe shall be the same size as the Pipe Runner. Cross Pipe Stub Out and Bottom Anchor Pipe shall be the next smaller size pipe as shown in the STANDARD PIPE SIZES table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".

(3) Miter = Slope of Mitered Pipe Culvert End

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(5) 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.

RECORD DRAWING
BASED ON CITY MARKUPS,
NOT FIELD SURVEY.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

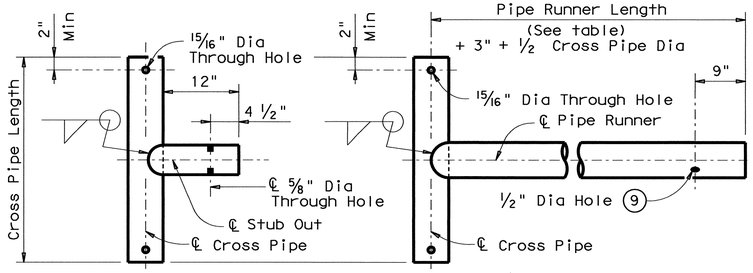
FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.

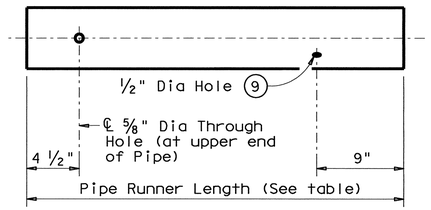
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



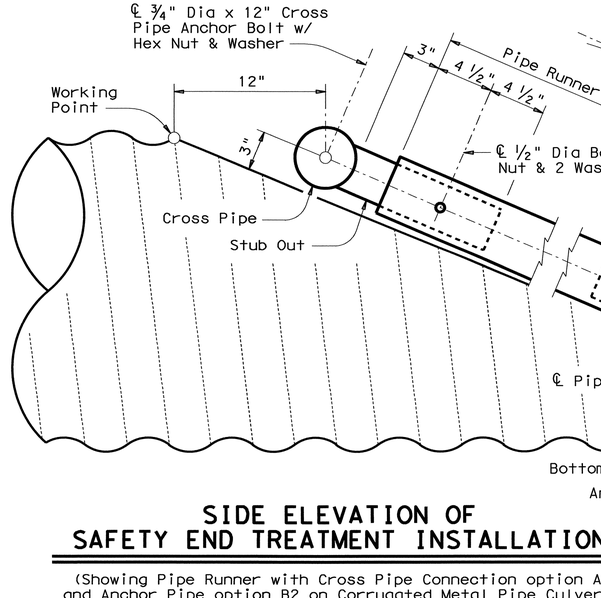
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



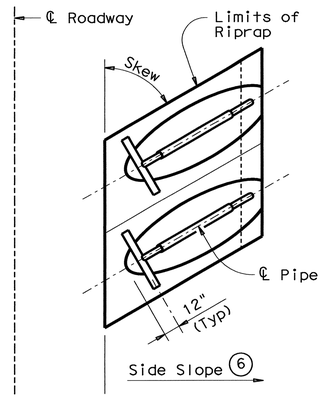
NOTE: The separate Pipe Runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

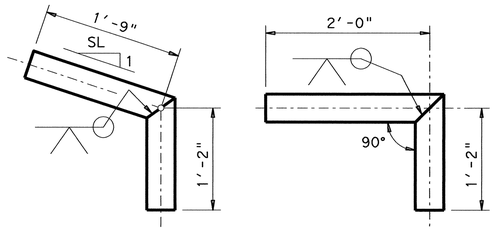


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing Pipe Runner with Cross Pipe Connection option A1 and Anchor Pipe option B2 on Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Riprap not shown for clarity)

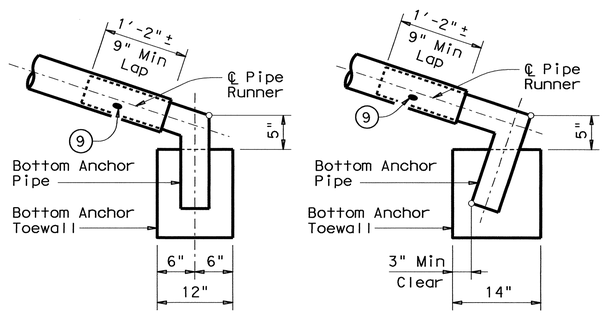


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

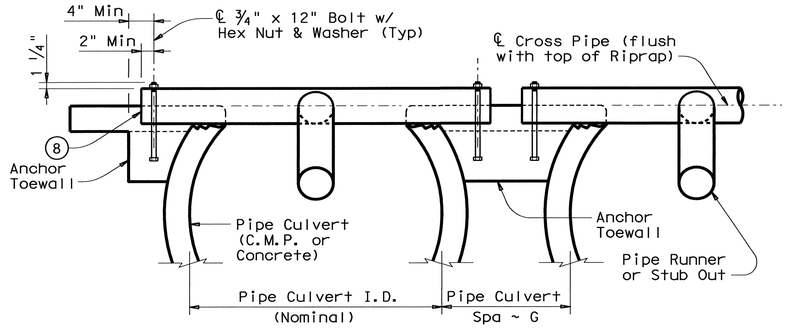
BOTTOM ANCHOR PIPE DETAILS (10)



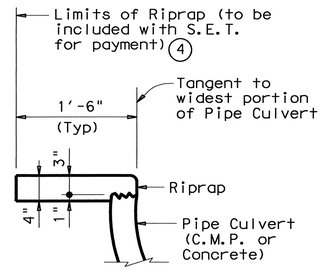
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert & Riprap not shown for clarity)



SHOWING CROSS PIPE & ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT & RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, & 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of Pipe Runner may vary slightly from Side Slope of Riprap and trimmed Culvert Pipe edge.

(8) 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.

(9) After installation, the 1/2" hole shall be inspected to ensure that the lap of the Pipe Runner with the Bottom Anchor Pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the Runner) may be substituted for the mitered and welded joint in the Bottom Anchor Pipe.

GENERAL NOTES:

Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The 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 Pipe Runners.

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.

Pipe Runners, Cross Pipes, and Anchor 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.

RECORD DRAWING
BASED ON CITY MARKUPS, NOT FIELD SURVEY.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.