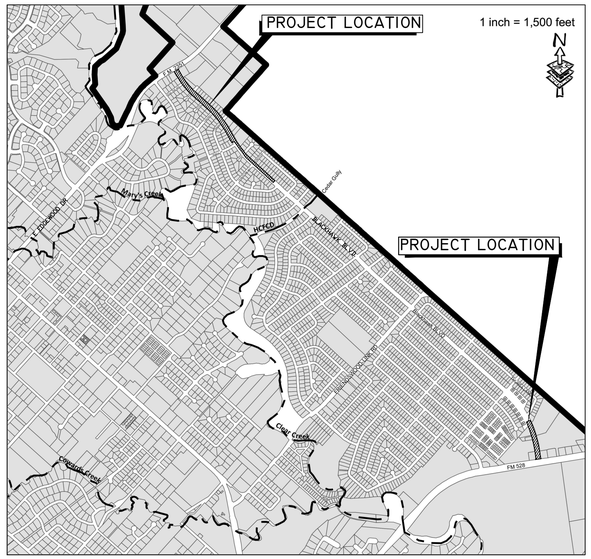
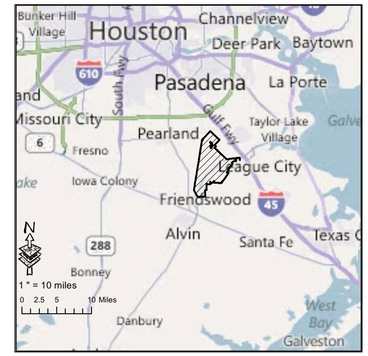


LOCATION MAP

KEY MAP: HARRIS COUNTY 617 S,W AND 657 B,C

HARRIS COUNTY
CITY OF FRIENDSWOOD, TEXAS
BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C



VICINITY MAP

KEY MAP: HARRIS COUNTY 617 S,W AND 657 B,C

MARCH, 2026

NOTICE:

For your safety, you are required by Texas Law to call 811 at least 48 hours before you dig, so that underground line can be marked. This Verification does not fulfill your obligation to call 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date:
CenterPoint Energy natural gas utilities shown. (Gas service lines are not shown). The signature not to be used for conflict verification. Signature Valid for six months.
Date:
CenterPoint Energy/UNDERGROUND Electrical Facilities Verification ONLY. (This Signature verifies existing underground facilities - not to be used for conflict verification.) Signature Valid for six months.
Date:
AT&T (Approved for AT&T Texas/SWBT underground conduit facilities only) Signature Valid for one year.

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

Ngoc Kim Le
03-02-2026

FRIENDSWOOD TEXAS

3/2/26
Jildardo Arias, PE, CFM
Director of Engineering
City Engineer

3/2/26
Steve Vavrecka, CPM
Director of Public Works

NOTE:

This is to certify that the above signed have reviewed all sheets provided and found them to be in general conformance with the requirements established by the City of Friendswood. This approval is only valid for three hundred sixty-five (365) calendar days. Please note, this does not necessarily mean that all the calculations provided in the plans have been completely checked and verified. The plans submitted have been prepared, signed and sealed by a professional engineer licensed to practice engineering in the State of Texas, which conveys the engineer's responsibility and accountability.

EFFECTIVE DATE: SEPTEMBER 3, 2022

SUBMITTED BY: Ngoc Kim Le DATE: 03-02-2026

Ngoc Kim Le, P.E.
HDR Engineering, Inc.

HDR Engineering Inc. Texas Reg. No. 754
4828 Loop Central Drive, Suite 700 • Houston, Texas 77081
(713) 622-9264 • Fax (713) 622-9265 • www.hdrinc.com

HDR PROJECT NO. 10390880
CSP #2026-02

REV. NO.	DATE	DESCRIPTION	P.E. APPR.
△			
△			

INDEX OF SHEETS

SHEET NO.	SHEET TITLE	
1	COVER SHEET	
2	INDEX SHEET	
3	CITY OF FRIENDSWOOD GENERAL NOTES 1	
4	CITY OF FRIENDSWOOD GENERAL NOTES 2	
5	ADDITIONAL GENERAL NOTES	
6	BASELINE & SURVEY CONTROL MAP 1	
7	BASELINE & SURVEY CONTROL MAP 2	
8	LAYOUT SHEET 1	
9	LAYOUT SHEET 2	
10	DRAINAGE AREA MAP 1	
10A	DRAINAGE AREA MAP 2	
11	DRAINAGE AREA MAP 3	
	PAVING AND DRAINAGE PLAN & PROFILE SHEETS	
12	BLACKHAWK BOULEVARD	STA. 0+00 TO STA. 4+00
13	BLACKHAWK BOULEVARD	STA. 4+00 TO STA. 8+00
14	BLACKHAWK BOULEVARD	STA. 8+00 TO STA. 11+50
15	BLACKHAWK BOULEVARD	STA. 11+50 TO STA. 16+00
16	BLACKHAWK BOULEVARD	STA. 16+00 TO STA. 20+39
17	BLACKHAWK BOULEVARD	STA. 20+39 TO STA. 24+00
18	BLACKHAWK BOULEVARD	STA. 24+00 TO STA. 28+00
19	BLACKHAWK BOULEVARD	STA. 28+00 TO STA. 32+00
20	REGAL PINE WAY	STA. 0+00 TO STA. 2+58.66
21	BENTWOOD DRIVE	STA. 0+00 TO STA. 2+94.97
22	COVENTRY COURT	STA. 0+00 TO STA. 2+48.26
23	TASHKENT DRIVE	STA. 0+00 TO STA. 2+51.23
24	EDENVALE STREET	STA. 0+00 TO STA. 3+21.76
	WATER PLAN & PROFILE SHEETS	
25	BLACKHAWK BOULEVARD	STA. 0+00 TO STA. 4+00
26	BLACKHAWK BOULEVARD	STA. 4+00 TO STA. 8+00
27	BLACKHAWK BOULEVARD	STA. 8+00 TO STA. 11+50
28	BLACKHAWK BOULEVARD	STA. 11+50 TO STA. 16+00
29	BLACKHAWK BOULEVARD	STA. 16+00 TO STA. 20+39
	24" TRANSMISSION WATER MAIN PLAN & PROFILE SHEETS	
30	BLACKHAWK BOULEVARD	STA. 0+00 TO STA. 4+00
31	BLACKHAWK BOULEVARD	STA. 4+00 TO STA. 8+00
32	BLACKHAWK BOULEVARD	STA. 8+00 TO STA. 12+00
33	BLACKHAWK BOULEVARD	STA. 12+00 TO STA. 16+00
34	BLACKHAWK BOULEVARD	STA. 16+00 TO STA. 18+41
	PAVING AND DRAINAGE PLAN & PROFILE SHEETS	
35	BLACKHAWK BOULEVARD	STA. 100+00 TO STA. 104+00
36	BLACKHAWK BOULEVARD	STA. 104+00 TO STA. 108+00
37	BLACKHAWK BOULEVARD	STA. 108+00 TO STA. 111+32.76

SHEET NO.	*DETAILS*
38	STORM WATER POLLUTION PREVENTION PLAN NOTES
39	STORM WATER POLLUTION PREVENTION PLAN SHEET 1
40	STORM WATER POLLUTION PREVENTION PLAN SHEET 2
41	STORM WATER POLLUTION PREVENTION PLAN SHEET 3
42	STORM WATER POLLUTION PREVENTION PLAN SHEET 4
43	CITY OF FRIENDSWOOD STORM WATER POLLUTION PREVENTION PLAN STANDARD DETAILS
44	CITY OF FRIENDSWOOD STORM WATER POLLUTION PREVENTION PLAN STANDARD DETAILS (CONT.)
45	CITY OF FRIENDSWOOD PAVING STANDARD DETAILS
46	ADDITIONAL PAVING DETAILS
47	TYPICAL PAVING SECTIONS
48	WHEELCHAIR RAMP DETAILS 1
49	WHEELCHAIR RAMP DETAILS 2
* 50	TxDOT SIGNAL DETAILS/STANDARDS LOOP DETECTOR DETAILS
51	MISCELLANEOUS DETAILS
52	CITY OF FRIENDSWOOD STORM SEWER STANDARD DETAILS
53	ADDITIONAL STORM SEWER DETAILS
* 54	SINGLE BOX CULVERTS PRECAST 5'-0" SPAN
55	RAM-NEK GASKET DETAIL FOR BOX CULVERTS
56	CITY OF FRIENDSWOOD METER AND VAULT STANDARD DETAILS
57	WATER DISTRIBUTION STANDARD DETAILS
58	WATER DETAILS 1
59	WATER DETAILS 2
60	WATER DETAILS 3

SHEET NO.	*TRAFFIC CONTROL*
61	TRAFFIC CONTROL PLAN GENERAL NOTES & SEQUENCE OF WORK NARRATIVE
62	TRAFFIC CONTROL PLAN ADVANCE WARNING SIGN LAYOUT
63	TRAFFIC CONTROL PLAN OVERALL LAYOUT
64	TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASES 1 & 2
65	TRAFFIC CONTROL PLAN PHASE 1 AT FM 528
66	TRAFFIC CONTROL PLAN PHASE 2 AT FM 528
67	TRAFFIC CONTROL PLAN DETOUR PLAN PHASES 3 & 4
68	TRAFFIC CONTROL PLAN INTERSECTION DETAIL
69	TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASES 3 & 4
70-71	TRAFFIC CONTROL PLAN PHASE 3
72-73	TRAFFIC CONTROL PLAN PHASE 4
73A	TRAFFIC CONTROL PLAN PHASE 4
74	TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASES 5 & 6
75	TRAFFIC CONTROL PLAN PHASE 5 AT FM 2351
76	TRAFFIC CONTROL PLAN PHASE 6 AT FM 2351
	TRAFFIC CONTROL STANDARDS
* 77	BARRICADE AND CONSTRUCTION (BC(1)-21)
* 78	BARRICADE AND CONSTRUCTION (BC(2)-21)
* 79	BARRICADE AND CONSTRUCTION (BC(3)-21)
* 80	BARRICADE AND CONSTRUCTION (BC(4)-21)
* 81	BARRICADE AND CONSTRUCTION (BC(5)-21)
* 82	BARRICADE AND CONSTRUCTION (BC(6)-21)
* 83	BARRICADE AND CONSTRUCTION (BC(7)-21)
* 84	BARRICADE AND CONSTRUCTION (BC(8)-21)
* 85	BARRICADE AND CONSTRUCTION (BC(9)-21)
* 86	BARRICADE AND CONSTRUCTION (BC(10)-21)
* 87	BARRICADE AND CONSTRUCTION (BC(11)-21)
* 88	BARRICADE AND CONSTRUCTION (BC(12)-21)
* 89	TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/REMOVAL (TCP(3-3)-14)
	TEMPORARY SIGNALS
90	TRAFFIC CONTROL PLAN PHASE 1 TEMPORARY SIGNAL LAYOUT
91	TRAFFIC CONTROL PLAN PHASE 2 TEMPORARY SIGNAL LAYOUT
92	TRAFFIC CONTROL PLAN PHASE 5 TEMPORARY SIGNAL LAYOUT
93	TRAFFIC CONTROL PLAN PHASE 6 TEMPORARY SIGNAL LAYOUT
* 94	TRAFFIC SIGNAL WORK TYPICAL DETAILS (WZ(BTS-1)-13)
* 95	TRAFFIC SIGNAL WORK BARRICADES AND SIGNS (WZ(BTS-2)-13)
* 96	WIND VELOCITY AND ICE ZONES (WV & IZ-14)
* 97	TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES (SP-100(1)-12)
* 98	TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES (SP-100(2)-12)
	SIGNING & PAVEMENT MARKING SHEETS
99	PAVEMENT MARKING & SIGNING STA. 0+00 TO STA. 15+75
100	PAVEMENT MARKING & SIGNING STA. 15+75 TO STA. 30+35
101	PAVEMENT MARKING & SIGNING STA. 102+73 TO STA. 111+32
102	CITY OF FRIENDSWOOD PERMANENT PAVEMENT MARKING STANDARD DETAILS
103	CITY OF FRIENDSWOOD BARRICADE AND MISCELLANEOUS DETAILS
104	TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS. (TCP(2-5)-18)

SHEET NO.	*TREE PROTECTION PLANS*
105	TREE PROTECTION PLAN - SHEET 1 OF 7
106	TREE PROTECTION PLAN - SHEET 2 OF 7
107	TREE PROTECTION PLAN - SHEET 3 OF 7
108	TREE PROTECTION PLAN - SHEET 4 OF 7
109	TREE PROTECTION PLAN - SHEET 5 OF 7
110	TREE PROTECTION PLAN - SHEET 6 OF 7
111	TREE PROTECTION PLAN - SHEET 7 OF 7

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED BY AN ASTERICK (*) HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Ngoc Kim Le
NGOC KIM LE, PE
102192

03-02-2026
DATE

HDR

Texas P.E. Firm
Registration No. F-754

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

Ngoc Kim Le
03-02-2026

SHEET NAME

Index Sheet

SCALE NTS

SHEET NUMBER

SHEET 2 OF 111

FILE NAME Package B 17-019-02 Index Sheet.dwg

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISED CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
2. ELEVATION AND CONTOURS SHOWN, UNLESS OTHERWISE DEFINED, ARE BASED ON NAD 83.
3. TRENCH SAFETY SYSTEM TO MEET, AS A MINIMUM, THE REQUIREMENTS OF OSHA SAFETY AND HEALTH REGULATIONS PART 1926, SUBPART P.
4. EXISTING UNDERGROUND UTILITIES ARE NOT SHOWN. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (713-223-4567) FOR CENTERPOINT, TEXAS-NEW MEXICO POWER AND AT&T TELEPHONE AND TEXAS ONE-CALL SYSTEM (811) FOR PIPELINES AND CABLE T.V.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE DEPTH, LOCATION AND EXISTENCE OF ALL EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION.
6. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD BEFORE COMMENCING WORK. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPORT ANY AND ALL DISCREPANCIES TO THE OWNER AND THE ENGINEER IN A TIMELY MANNER.
7. CONTRACTOR SHALL ADEQUATELY PROTECT EXISTING STRUCTURES, UTILITIES, TREES, SHRUBS, OTHER PERMANENT OBJECTS AND ADJOINING PROPERTY.
8. NO OPEN EXCAVATIONS SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE COVERED, AS A MINIMUM, WITH STEEL PLATING WHEN IN PAVED AREAS; 3/4 INCH PLYWOOD, WOOD PLANKING WITH OSHA ORANGE PLASTIC EXPANDED MESH BARRIER AROUND PERIMETER IN UNPAVED AREAS, OR AS APPROVED BY THE CITY OF FRIENDSWOOD.
9. EXISTING PAVEMENTS, CURBS, SIDEWALKS AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION BY THE CONTRACTOR FOR THEIR CONVENIENCE SHALL BE REPLACED PER CURRENT TECHNICAL SPECIFICATIONS BY THE CONTRACTOR AT HIS EXPENSE.
10. CONTRACTOR SHALL PLAN, SCHEDULE, AND PERFORM HIS WORK SO AS TO PROVIDE AND MAINTAIN SAFE PUBLIC TRAFFIC (INGRESS AND EGRESS) AS WELL AS NON-INCONVENIENCE TO ALL PROPERTY OWNERS ALONG THE PROJECT RIGHT OF WAYS DURING CONSTRUCTION PERIOD.
11. FOR LOCATIONS WHERE OPEN CUT CONSTRUCTION IS REQUIRED IN STREETS THE CONTRACTOR SHALL FURNISH AND MAINTAIN ADEQUATE BARRICADES, WARNING AND DIRECTING SIGNS, FLAGS, AND LIGHTS, NOTIFY CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411.
12. ALL SIGNS, BARRICADES, PAVEMENT MARKINGS, TRAFFIC SIGNALS, AND CHANNELIZING DEVICES USED TO HANDLE TRAFFIC SHALL BE SHOWN ON A TRAFFIC CONTROL PLAN (TO BE APPROVED BY THE CITY AND TxDOT IF APPLICABLE) AND SHALL CONFORM TO THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVISED FOR STREET AND HIGHWAYS (TMUTCD), "PART VI-TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS."
13. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

PAVING:

1. PAVEMENT SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISIONS.
2. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL RETURNS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.
5. ALL FILL IN EXISTING OR PROPOSED RIGHTS-OF WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF EIGHT (8) INCHES OR LESS AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH AN OPTIMUM MOISTURE CONTENT OF ± 3%.
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE 60, NO. 4 REBAR, SPACED AT SIXTEEN (16) INCH ON CENTERS EACH WAY.
7. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF FORTY (40) FEET WITH CONTROL JOINTS NO GREATER THAN EVERY TEN (20) FEET.
8. ALL CONCRETE USED FOR PAVEMENT SHALL BE CLASS "A" CONCRETE WITH A MINIMUM ~~5.0~~ 5.5 SACK OF CEMENT PER CUBIC YARDS AND A MINIMUM ~~3,000~~ 3,500 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS.
9. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE STABILIZATION AT A MINIMUM OF ~~6%~~ 8%.
10. CONTRACTOR SHALL INSTALL STREET SIGNS AND STOP SIGNS PER CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
11. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
12. FOR ALL CONCRETE TO BE REMOVED, A ~~THREE (3) INCH DEEP~~ FULL DEPTH SAW CUT SHALL BE PROVIDED PRIOR TO REMOVAL.
13. REPRESENTATIVES FROM THE CITY, THE OWNER AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL DENSITY TESTS, LIME OPERATIONS AND PLACEMENT OF CONCRETE PAVING.
14. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TEST AND/OR CONCRETE CYLINDERS HAVE BEEN TAKEN.
15. BLUE REFLECTIVE PAVEMENT MARKERS SHALL BE PLACED AT FIRE HYDRANT LOCATIONS AND OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY. REFLECTORS SHALL FACE FLOW OF TRAFFIC.
16. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET B/B OF CURB:
    - 16.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.
    - 16.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.
17. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET B/B OF CURB AND ALL MAJOR ARTERIAL THOROUGHFARES:
    - 17.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.
    - 17.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.

SANITARY SEWERS

1. FINISHED ELEVATION ON SANITARY MANHOLE RIMS SHALL BE THREE (3) INCHES ABOVE FINISHED GRADE WITHIN THE UTILITY EASEMENT. IF MANHOLE IS LOCATED ADJACENT TO A PUBLIC STREET, THE FINAL ELEVATION OF THE MANHOLE RIM SHALL BE TWO (2) INCHES ABOVE THE CURB OR CENTERLINE OF STREET FOR STREETS WITHOUT PERIMETER CURB.
2. WATER LINES AND SANITARY SEWERS SHALL BE INSTALLED IN SEPARATE TRENCHES AND BE A MINIMUM SEPARATION OF NINE (9) FEET.
3. POLYVINYL CHLORIDE (PVC) SHALL BE IN ACCORDANCE WITH ASTM D3034, SDR 26 FOR ALL DEPTHS.
4. ALL PVC PIPES (ALL TYPES AND SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE A RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D3212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477, SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SANITARY SEWER LINES.
5. ALL DUCTILE IRON (DI) PIPE SHALL BE ONE HUNDRED FIFTY (150) PSI WITH EIGHT (8) MIL, BLACK VIRGIN POLYETHYLENE WRAP AS SPECIFIED IN ANSI/AWWA A21.5/C105.

SANITARY SEWERS (CONT.)

6. SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD DESIGN STANDARDS. CONTRACTOR TO FURNISH TEST PLUGS AND RISERS. ALL SANITARY SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
7. SANITARY SEWER TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT ARE TO BE BACKFILLED WITH CEMENT-STABILIZED SAND BACKFILL, AS SPECIFIED, TO WITHIN ONE (1) FOOT OF SUBGRADE. BEDDING WILL BE CEMENT-STABILIZED SAND BACKFILL (1.1 SACKS CEMENT PER TON OF SAND) FOR ALL SANITARY SEWERS.
8. WATER LINE/NEW SEWER LINE SEPARATION. WHEN NEW SANITARY SEWERS ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO WATER LINES THAN NINE (9) FEET IN ALL DIRECTIONS. SEWERS THAT PARALLEL TO WATER LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHEN NINE (9) FEET OF SEPARATION CANNOT BE MAINTAINED, THE FOLLOWING GUIDELINES APPLY:
    - 8.1 WHEN THE SANITARY SEWER PARALLELS A WATER LINE, THE SANITARY SEWER SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC MEETING ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO (2) FEET BETWEEN OUTSIDE DIAMETERS AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR (4) FEET BETWEEN OUTSIDE DIAMETERS. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE.
    - 8.2 WHEN A SANITARY SEWER CROSSES A WATER LINE AND THE SEWER IS CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC WITH A MINIMUM PRESSURE RATING OF 150 PSI; AN ABSOLUTE MINIMUM OF SIX (6) INCHES BETWEEN OUTSIDE DIAMETERS SHALL BE MAINTAINED. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE WHEN POSSIBLE AND ONE (1) LENGTH OF THE SANITARY SEWER PIPE MUST BE CENTERED ON THE WATER LINE.
    - 8.3 WHEN A SANITARY SEWER CROSSES UNDER A WATER LINE AND THE SEWER IS CONSTRUCTED OF ABS TRUSS PIPE, SIMILAR SEMI-RIGID PLASTIC COMPOSITE PIPE, CLAY PIPE OR CONCRETE PIPE WITH GASKETED JOINTS, A MINIMUM OF TWO (2) FEET OF SEPARATION SHALL BE MAINTAINED. THE INITIAL BACKFILL SHALL BE CEMENT-STABILIZED SAND (MINIMUM 1.1 SACKS OF CONCRETE PER TON OF SAND) FOR ALL SECTIONS OF SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE. THE INITIAL BACKFILL SHALL BE FROM ¼ DIAMETER BELOW THE CENTERLINE OF THE PIPE TO ONE PIPE DIAMETER (BUT NOT LESS THAN TWELVE (12) INCHES) ABOVE THE PIPE.
    - 8.4 WHEN A SANITARY SEWER CROSSES OVER A WATER LINE, ALL PORTIONS OF THE SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. IN LIEU OF THIS PROCEDURE THE NEW SANITARY SEWER MAY BE ENCASED IN A JOINT OF 150 PSI PRESSURE CLASS PIPE AT LEAST EIGHTEEN (18) FEET LONG AND TWO (2) NOMINAL SIZES LARGER THAN THE NEW SANITARY SEWER. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT INTERVALS OF FIVE (5) FEET WITH SPACERS OR BE FILLED TO THE SPRINGLINE WITH WASHED SAND. THE ENCASEMENT PIPE SHOULD BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH NON-SHRINK CEMENT GROUT OR WITH A MANUFACTURED SEAL.
9. ALL PROPOSED SANITARY SEWER LINES SHALL BE DUCTILE IRON OR SDR 26 PVC. DUCTILE IRON PIPE SHALL ONLY BE USED AS APPROVED BY THE CITY OF FRIENDSWOOD.
10. FOR ALL PVC PIPE, USE MANHOLE WATER STOP GASKET AND CLAMP ASSEMBLY AT MANHOLE CONNECTIONS.
11. SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED. ALL SANITARY SEWER MANHOLES SHALL BE AT LEAST THREE (3) INCHES ABOVE FINISHED GRADE OR ABOVE THE 100 YEAR BASE FLOOD ELEVATION (BFE). FOR MANHOLES LOCATES IN THE 100-YEAR FLOOD PLAIN, VENT AND SEAL (BOLTED MANHOLE LID W/ FOUR (4) BOLTS, NO HOLES IN LID) THE MANHOLE TOP AND PROVIDE INFLOW PROTECTOR INSERT UNDER COVER. SECTIONS OF PRECAST MANHOLES SHALL BE JOINED WITH "RAM NEK" IN FLOOD PLAIN.
12. SANITARY SEWER LINES IN PIPE ZONE INSIDE LOT EASEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND OR SELECT FILL MATERIAL WITH A PI BETWEEN 20 AND 40.
13. IF WET SAND IS ENCOUNTERED IN TRENCH, USE SPECIAL BEDDING. UNDER NO CIRCUMSTANCES IS SAND TO BE ADDED TO A TRENCH UNDER WATER.
14. SANITARY SEWERS CROSSING UTILITIES OTHER THAN WATER LINES SHALL HAVE A MINIMUM CLEARANCE OF SIX (6) INCHES.
15. ALL PRECAST MANHOLES SHALL HAVE A TOP ADJUSTMENT CONSTRUCTED OF PRECAST PCC RINGS NO GREATER THAN TWENTY-FOUR (24) INCHES IN HEIGHT, SEALED WITH NON-SHRINK GROUT, INSIDE AND OUTSIDE. BRICK AND FIBERGLASS MANHOLES SHALL NOT BE ALLOWED.
16. ALL SANITARY SEWER MANHOLE COVERS MUST INCLUDE THE WORD "SANITARY SEWER" AND "CITY OF FRIENDSWOOD". THEY MUST ALSO HAVE THE CITY SEAL.
17. SANITARY SEWER MANHOLE COVERS SHALL BE A MINIMUM OF THIRTY-TWO (32) INCHES IN DIAMETER.
18. ALL SANITARY SEWER MANHOLES SHALL HAVE AN INFLOW PROTECTOR,

STORM SEWERS:

1. STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS, LATEST REVISIONS.
2. ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C76, CLASS III, TONGUE AND GROOVE, RAM-NEK JOINTS UNLESS OTHERWISE NOTED.
3. REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS. STORM SEWER PIPE INSTALLED UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND, (1.1 SACKS OF CEMENT PER TON OF SAND), TO THE BOTTOM OF THE SUBGRADE.
4. CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS "A" AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT TWENTY-EIGHT (28) DAYS.
5. ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE BEFORE PAVING IS COMPLETE.
6. MINIMUM STORM SEWER SIZE IS TWENTY-FOUR (24) INCH DIAMETER. MINIMUM UPSTREAM ROADSIDE DITCH CULVERT SIZE IS EIGHTEEN (18) INCH DIAMETER.
7. ALL STORM SEWER MANHOLE COVERS MUST INCLUDE THE WORDS, "STORM SEWER" AND "CITY OF FRIENDSWOOD" AND HAVE THE "CITY SEAL." MANHOLE COVERS SHALL BE THIRTY-TWO (32) INCHES IN DIAMETER EXCEPT AT CURB INLET COVERS WHICH ARE TWENTY-FOUR (24) INCHES.
8. CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWERS.
9. ALL INLETS IN RESIDENTIAL DEVELOPMENTS TO BE TYPE "H-2" OR TYPE "B-B" WITH GRATES. ALL INLETS IN COMMERCIAL DEVELOPMENTS AND ON MAJOR THOROUGHFARES TO BE TYPE "H-2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF FRIENDSWOOD.
10. ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDROMULCHED AS PER TECHNICAL SPECIFICATIONS SECTION 02910 – HYDROMULCH SEEDING OR APPROVED EQUAL.

WATER LINES:

1. WATER LINE CONSTRUCTION AND TESTING IS TO BE PERFORMED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.

WATER LINES (CONT.):

2. ALL WATER MAINS SHALL HAVE A MINIMUM COVER OF FOUR (4) FEET MEASURED FROM CENTERLINE OF STREET OR EXISTING NATURAL GROUND WHICHEVER DEPTH IS GREATER, UNLESS OTHERWISE NOTED.
3. PRESSURE TEST OF ALL WATER LINES SHALL BE AT 150 PSI FOR FOUR (4) HOURS AND WITNESSED BY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT, EXCEPT FIRE LINES WHICH SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND WITNESSED BY THE FIRE MARSHAL.
4. SINGLE METER SERVICE LINES SHALL BE ONE (1) INCH MINIMUM I.D., C.T.S. POLYETHYLENE, SDR-9.
5. CONTRACTOR TO FURNISH AND INSTALL SINGLE SERVICE METER BOXES AT FINISH GRADE.
6. FIRE HYDRANT ASSEMBLIES SHALL INCLUDE ONE (1) EACH LINE SIZE BY SIX (6) INCH TEE, ONE (1) EACH SIX (6) INCH GATE VALVE AND BOX, ONE (1) EACH FIRE HYDRANT WITH SIX (6) INCH LEAD PIPING AND TIE BACKS.
7. WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C-500, OPEN COUNTER CLOCKWISE LEFT, EQUIPPED WITH TWO (2) INCH SQUARE OPERATING NUT. OPERATING NUT SHALL BE A MAXIMUM OF FIVE (5) FEET BELOW FINISH GRADE.
8. WATER LINES FOUR (4) INCH THROUGH TWELVE (12) INCH I.D. SHALL COMPLY THE REQUIREMENTS OF AWWA STANDARD C-900-75, CLASS 150, SDR-18, WITH CAST IRON OUTSIDE DIAMETER AND GASKET BELL END. FITTINGS ARE TO BE MECHANICAL JOINTS IN ACCORDANCE WITH AWWA C-100 OR C-110.
9. ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL BE CLASS "C" AND HAVE A MINIMUM OF 2,500 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS AND CONFORM TO CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS.
10. GRAY IRON AND DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C-110 AND END JOINTS OF FITTINGS AND MAIN VALVES SHALL CONFORM TO AWWA C-110. FOR RUBBER GASKETED JOINTS, END JOINTS TO FITTINGS AND MAIN LINE VALVES SHALL CONFORM TO AWWA C-111. GRAY IRON AND DUCTILE IRON FITTINGS SHALL BE CEMENT LINED OR EPOXY COATED.
11. MINIMUM BURY FOR ALL FIRE HYDRANTS SHALL BE FOUR (4) FEET UNLESS OTHERWISE NOTED. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE. PUMPER SERVICE CONNECTION TO FACE CURB.
12. INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
13. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 SEVENTY-TWO (72) HOURS PRIOR TO START OF CONSTRUCTION.
14. ALL WATER LINES TO BE BACKFILLED TO ONE (1) FOOT ABOVE TOP OF PIPE WITH BANK SAND. FOR PORTIONS OF PIPE LOCATED UNDER PAVEMENT, BACKFILL FROM INITIAL BACKFILL OF BANK SAND TO ONE (1) FOOT BELOW PROPOSED SUBGRADE UNDER PAVEMENT WITH CEMENT-STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND).
15. ALL FIRE HYDRANTS ARE TO BE LOCATED AS SHOWN ON THE PLANS AND SET THREE (3) FEET BEHIND THE CURB, ONE (1) FOOT FROM PROPERTY LINE FOR STREETS WITH DITCHES OR AT AN APPROVED LOCATION ON RURAL SECTION ROADS. ALL FIRE HYDRANTS SHALL BE AUDITED AND PAINTED AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
16. ALL TAPPING SLEEVES SHALL BE STAINLESS STEEL FULL CIRCLE WITH MECHANICAL JOINT TAPPING SLEEVE.
17. THE CONTRACTOR SHALL NOT OPERATE EXISTING CITY WATER VALVES. THE CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 TWENTY-FOUR (24) HOURS MINIMUM FOR ANY VALVE OPERATION NECESSARY FOR THE PROJECT. IF ANY VALVE CLOSING RESULTS IN INTERRUPTED SERVICE TO RESIDENTS OR BUSINESSES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO THE AFFECTED PARTIES TWENTY-FOUR (24) HOURS IN ADVANCE OF THE INTERRUPTION.
18. FOR ALL CONSTRUCTION WATER USAGE ON THE PROJECT, A FIRE HYDRANT METER SHALL BE OBTAINED FROM THE CITY PUBLIC WORKS DEPARTMENT AT 15355 BLACKHAWK BLVD (281-996-3380). A DEPOSIT SHALL BE REQUIRED FOR THE METER AND A FEE SHALL BE CHARGED FOR ALL METERED WATER USAGE. THE CONTRACTOR SHALL SUPPLY A BACKFLOW PREVENTER FOR THE FIRE HYDRANT METER.

TESTING

ALL TESTING SHALL CONFORM WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS SECTION 01470 - TESTING LABORATORY SERVICES AND SECTION 01475 - TESTING PROCEDURES.

1. SECTION 02125 - EXCAVATION AND BACKFILL FOR UTILITIES:
    - 1.1. BACKFILL SHALL BE PLACED IN MAXIMUM LIFTS OF EIGHT (8) INCHES AND COMPACTED TO A DENSITY OF NOT LESS THAN 95% STANDARD PROCTOR WITH OPTIMUM MOISTURE BETWEEN PLUS 3% AND MINUS 3% OR AS OTHERWISE SPECIFIED BY THE SOILS LABORATORY. TEST SHALL BE TAKEN EVERY LIFT, EVERY 500 LINEAR FEET, OR BETWEEN MANHOLES, WHICHEVER RESULTS IN THE GREATEST NUMBER OF DENSITY TESTS.
    - 1.2. FIELD MOISTURE/DENSITY TEST SHALL BE PERFORMED AT A FREQUENCY OF AT LEAST ONE (1) TEST PER 500 SQUARE YARDS OF COMPACTED LIFT. THE DENSITY SHALL NOT BE LESS THAN 95% OF STANDARD PROCTOR WITH A MOISTURE CONTENT OF BETWEEN PLUS 3% AND MINUS 3% OPTIMUM MOISTURE, OR AS DETERMINED BY SOILS LABORATORY. MAXIMUM LIFT FOR TESTING COMPACTED FILL SHALL NOT EXCEED TWELVE (12) INCHES.
2. SECTION 02300 - CAST-IN-PLACE CONCRETE MANHOLES AND SECTION 02305 - PRECAST CONCRETE MANHOLES:
    - 2.1. EXFILTRATION TEST SHALL BE REQUIRED ON EACH MANHOLE SYSTEM.
        - 2.1.1. EACH MANHOLE IS TO BE PLUGGED, FILLED TO THE TOP OF THE RIM WITH WATER FOR THIRTY (30) MINUTES WITH THE ALLOWABLE LEAKAGE OF NOT MORE THAN ½ INCH; OR
        - 2.1.2. PLUG MANHOLE AND VACUUM TEST AT TEN (10) INCHES OF MERCURY WITH A LOSS OF NO MORE THAN ONE (1) INCH OF MERCURY FOR THE TIME TO BE DETERMINED BY THE WIDTH AND DEPTH OF THE MANHOLE.
3. SECTION 02400 - WATER LINES
    - 3.1. PRESSURE TEST:
        - 3.1.1. A TEST, TO BE SUCCESSFUL SHALL BE WITNESSED BY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT FOR A FOUR (4) HOUR PERIOD, DURING REASONABLE HOURS. THE ALLOWABLE LEAKAGE SHALL BE NO GREATER THAN DETERMINED BY THE FOLLOWING FORMULA:

            $$L = SD\sqrt{P} / 148{,}000$$

            IN WHICH L IS THE ALLOWABLE LEAKAGE, IN GALLONS PER HOUR OF TESTING; S IS THE LENGTH OF PIPE BEING TESTED, IN FEET; D IS THE NOMINAL INSIDE DIAMETER OF THE PIPE, IN INCHES; AND P IS THE AVERAGE TEST PRESSURE DURING THIS TEST, IN POUNDS PER SQUARE INCH. THE TEST PRESSURE SHALL BE 150 PSI FOR FOUR (4) HOURS. ALL VALVES, FIRE HYDRANTS, AND SERVICES ARE TO BE TESTED TOGETHER.
        - 3.1.2 FIRE LINES SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE FIRE MARSHAL. LEAKAGE SHALL BE CALCULATED AS STATED ABOVE.

GENERAL CONSTRUCTION NOTES			ENGINEERING DEPARTMENT	STATE OF TEXAS · NGOC KIM LE · 132332 · LICENSED · PROFESSIONAL ENGINEER · 03-02-2026
FILE NAME: 2-GCN1-2022.DWG	DATE APPROVED: SEPTEMBER 3, 2022			PROJECT NUMBER: / DATE SUBMITTED: / SHEET: 3 OF 111
	SCALE: NTS	REVISED DATE: SEPT. 2022		

TESTING (CONT.)

3.2 BACTERIAL TEST (BAC-T):

3.2.1 BACTERIAL SAMPLE IS REQUIRED FOR EACH 1,200 FEET OF WATER MAIN, OR CLOSER DEPENDING ON FIRE HYDRANT LOCATIONS, OR PORTION THEREOF. ALSO DEAD ENDS ARE SUBJECT TO TESTING, SUCH AS CUL-DE-SAC. THE FORM NEEDS TO BE LABELED "CONSTRUCTION" OR "SPECIAL." BOTH FORM AND SAMPLE ARE TESTED AT A LABORATORY APPROVED BY TCEQ. PAYMENT SHALL BE EXPECTED AT TIME OF SAMPLING. SAMPLINGS SHALL ONLY BE CONDUCTED ON TUESDAYS AND THURSDAYS WITH FORTY-EIGHT (48) HOUR NOTIFICATION TO THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411.

4. SECTION 02500 - GRAVITY SANITARY SEWERS:

4.1 LOW PRESSURE AIR TEST - THE PIPE SHALL UNDERGO A LOW PRESSURE AIR TEST WHICH SHALL CONFORM TO ASTM C828 AND ASTM C494. THE PRESSURE SHALL BE FIVE (5) PSI FOR A DURATION AS DETERMINED BY THE LENGTH AND NOMINAL I.D. OF THE PIPE BEING TESTED.

4.2 MANDREL DEFLECTION TEST - FLEXIBLE AND SEMI-RIGID PIPE DIAMETER DEFLECTION TEST SHALL BE DONE NO SOONER THAN THIRTY (30) DAYS AFTER FINAL BACKFILL. RUN TEST WITH A MANDREL HAVING A DIAMETER EQUAL TO 95% OF THE INSIDE NOMINAL DIAMETER OF THE PIPE BEING TESTED. MANDREL SHALL BE NINE (9) ARM WITH STEEL PROVING RING 2½ INCH RING WIDTH. TO PASS, MANDREL SHALL PASS FREELY THROUGH THE PIPE, PULLED BY ONE (1) WORKER. NO MECHANICAL MEANS SHALL BE ALLOWED TO PULL THE MANDREL.

5. SECTION 02720 - LIME-STABILIZED SUBGRADE:

5.1 LIME

5.1.1 PERCENT LIME DETERMINATION TEST SHALL BE TAKEN BY A CERTIFIED TESTING LABORATORY IN ACCORDANCE WITH ASTM C977-92, BUT SHALL NOT BE LESS THAN 6%.

5.1.2 THE PERCENT LIME USED SHALL BRING THE SOIL TO A P.I. OF NOT MORE THAN 15.

5.1.3 HYDRATED LIME SHALL BE SAMPLED AND TAKEN AT THE DISTRIBUTION AREA OF THE TANKER TRUCK AND TESTED.

5.2. SUBGRADE

5.2.1. ALL SUBGRADE SHALL MEET THE FOLLOWING REQUIREMENTS WHEN TEST DRY BY LABORATORY SIEVES:

MINIMUM PASSING 1¾ INCH SIEVE - 100%
MINIMUM PASSING ¾ INCH SIEVE - 85%
MINIMUM PASSING #4 SIEVE - 60%

5.2.2. ALL SUBGRADE SHALL PASS A DENSITY TEST OF NOT LESS THAN 95% STANDARD PROCTOR. METHOD OF TESTING AS PER ASTM D698. TEST TO BE TAKEN EVERY 200 FEET AS MEASURED ALONG CENTERLINE OF THE ROADWAY AT VARYING DISTANCES FROM CENTERLINE OF THE ROADWAY, OR AS DIRECTED BY THE CITY.

5.2.3. THICKNESS TESTS SHALL BE TAKEN AT EVERY 200 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.

5.2.4. IF A SINGLE STORM EVENT PRODUCES ONE (1) INCH OR MORE OF RAINFALL, CONTRACTOR SHALL RETEST THE SUBGRADE FOR DENSITY. THE INTERVAL FOR DENSITY RETESTS SHALL BE NOT LESS THAN 500 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.

6. SECTION 02805 - CONCRETE PAVING:

6.1 THE CONCRETE PAVEMENT WILL BE TESTED FOR DEPTHS IN ACCORDANCE WITH ASTM C174 TEST. THICKNESS SHALL NOT BE DEFICIENT BY MORE THAN ¼ INCH.

7. SECTION 03300 - STRUCTURAL CONCRETE:

7.1 THE SLUMP, WHEN PLACING CONCRETE, SHALL NOT BE GREATER THAN FIVE (5) INCHES. THIS TEST SHALL BE TAKEN FOR EVERY 100 CUBIC YARDS OF CONCRETE, BUT MAY BE TAKEN MORE FREQUENTLY IF THE CONSISTENCY OF THE CONCRETE APPEARS TO VARY PER THE TESTING LABORATORY TECHNICIAN OR THE CITY PROJECT MANAGER.

7.2 TEMPERATURE OF THE CONCRETE WILL BE TAKEN AS DIRECTED BY THE CITY PROJECT MANAGER AND SHALL BE LESS THAN 90° F.

7.3 THERE SHALL BE CYLINDERS TAKEN BY THE TESTING LABORATORY TECHNICIAN, IN ACCORDANCE WITH ASTM C31 TEST, NUMBERING FOUR (4) CYLINDERS PER 150 CUBIC YARDS OF PAVING OR PART THEREOF FOR EACH DAYS PLACEMENT. TWO (2) CYLINDERS SHALL BE TESTED AT SEVEN (7) DAYS AND TWO (2) CYLINDERS SHALL BE TESTED AT TWENTY-EIGHT (28) DAYS TO ASSURE THE MINIMUM DESIGN STRENGTH IS ACHIEVED.

PRIVATE UTILITY NOTES:

CENTERPOINT ENERGY ELECTRIC FACILITIES:

CENTERPOINT ENERGY EASEMENT

NO APPROVAL TO USE, CROSS, OR OCCUPY CENTERPOINT FEE OF EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT CENTERPOINT ENERGY SURVEYING & RIGHT OF WAY DIVISION AT (713) 207-6348 OR (713) 207-5769.

WARNING - OVERHEAD ELECTRICAL LINES

1. OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

   1.1 ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND

   1.2 OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN TEN (10) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

2. PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713) 207-2222.

WARNING - UNDERGROUND ELECTRICAL LINES

1. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

2. ALL INFORMATION CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTORS ARE RESPONSIBLE FOR MAKING THEIR OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND PIPELINES, CONDUITS, AND STRUCTURES BY CONTACTING OWNERS OF UNDERGROUND UTILITIES OR BY EXCAVATING IN ADVANCE OF CONSTRUCTION.

3. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATION OF ALL UTILITIES WHEN AND WHERE THEY FALL IN THE PATH OF CONSTRUCTION.

4. THE CONTRACTOR IS ALSO RESPONSIBLE FOR CONTACTING THE UTILITY COORDINATING COMMITTEE AT (713) 223-4567 AND TEXAS ONE CALL AT 1-800-245-4545, FORTY-EIGHT (48) HOURS PRIOR TO ANY CONSTRUCTION.

5. THE LOCATION OF ANY CENTERPOINT ENERGY UTILITIES ARE SHOWN IN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. THEY AGREE TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

6. ALL PROPOSED FACILITIES SHALL MAINTAIN 12' CLEAR FROM ALL EXISTING UTILITIES.

CENTERPOINT ENERGY GAS FACILITIES:

WARNING - UNDERGROUND GAS FACILITIES

1. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

2. WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE CALL (713) 207-5463 OR (713) 945-8037 (7:00 AM TO 4:30 PM) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.

3. WHEN EXCAVATING WITHIN EIGHTEEN (18) INCHES OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

4. WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.

5. FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-2111 OR (713) 207-4200.

6. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

AT&T TEXAS/SWBT FACILITIES:

1. THE LOCATIONS OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

2. THE CONTRACTOR SHALL CALL (800) 344-8377 (TEXAS 811) A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

3. WHEN EXCAVATING WITHIN EIGHTEEN (18) INCHES OF THE INDICATED LOCATION OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING THE CONTRACTOR SHALL EXPOSE THE AT&T TEXAS/SWBT FACILITIES.

4. WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO PREVENT DAMAGE TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

5. THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES OR BURIED CABLE FACILITIES SHOWN ON THESE PLANS DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES OR OTHER CABLES IN CONDUIT IN THE AREA.

6. PLEASE CONTACT AT&T TEXAS DAMAGE PREVENTION MANAGER KEVIN RAY AT (713) 614-1983 OR E-MAIL HIM AT KR7896@ATT.COM, IF CABLE LOCATE REQUESTS ARE NOT COMPLETED FOR OUR AT&T TEXAS/SWBT FACILITIES.

COMCAST FACILITIES:

1. CONTACT MR. BILL LEOPARD AT (281) 802-1679 OR MR. MOHAMMAD WOHEIDY AT (713) 895-1213 BEFORE PROCEEDING WITH CONSTRUCTION WORK IN THE VICINITY OF COMCAST/TIME WARNER CABLE FACILITIES.

2. WHEN EXCAVATING WITHIN EIGHTEEN (18) INCHES OF THE INDICATED LOCATION OF UNDERGROUND FACILITY, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

GENERAL CONSTRUCTION NOTES (CONTINUED)

FILE NAME: 3-GCN2-2022.DWG
DATE APPROVED: MARCH 30, 2022
SCALE: NTS
REVISED DATE: MARCH 2022

ENGINEERING DEPARTMENT

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER
03-02-2026

PROJECT NUMBER:
DATE SUBMITTED:
SHEET: 4 OF 111

General Notes:

1. The Contractor shall verify locations of all underground utility lines prior to construction.
2. It is the contractor's responsibility to verify the existence, size, depth, location and material of all existing utilities prior to construction which may conflict with the proposed construction. The Contractor is made aware of the conflicts with existing utilities including but not limited to water, sewer, storm, gas, cable, electric, which may not be shown on the drawings. The Contractor is responsible for taking adequate precautions to maintain the integrity of the existing utilities at no additional cost to the project.
3. It is the Contractor's responsibility to verify and determine the depth, location, elevation, alignment and existence of all surface or underground utilities and structures in and around the vicinity of the work to be performed prior to commencing construction. The Contractor shall notify the Owner of any conflicts found prior to commencing construction. The Contractor shall allow ample time to the Owner to determine a resolution to the conflict. The Contractor shall be aware there is a potential for delay due to conflicts and shall allow such time in his project cost and construction schedule. No additional payment shall be made for any downtime cost due to such conflicts.
4. The Contractor shall contact all pertinent utility and pipeline companies 48 hours (minimum) prior to excavation in a project area. The Contractor shall contact Lonestar Notification Center at (713) 223-4567, DIG TESS Notification Center at 1-800-DIG (344)-TESS(8377) and TEXAS ONE CALL Notification Center at 1-800-245-4545 to provide utility locations. All utilities (including but not limited to pipelines, natural gas lines, fiber optic cable, buried electric, telephone, television, water, sanitary sewer, storm sewer, etc.) shall be identified prior to excavation.
5. The Contractor shall verify all dimensions and conditions in the field before commencing work. It shall be the Contractor's responsibility to report any and all discrepancies to the Owner in a timely manner.
6. The Contractor shall adequately protect existing structures, utilities, trees, shrubs, landscaping and other objects. All costs for repair and/or replacement of damage due to Contractor's operations shall be paid by Contractor at no additional cost to project.
7. Trees within the Street Right-of-Way shall not be removed or disturbed. Where tree roots must be cut, follow the repair methods described in the Specifications. All landscaping (trees, bushes, shrubs (all kinds)) damaged or removed to facilitate construction shall be replaced with equal kind at no cost to the project, unless stated otherwise in the bid proposal. The Contractor shall utilize the services of a Professional Urban Forester to protect existing landscaping including but not limited to trees, shrubs and bushes during the construction operations at no additional cost to the project.
8. The Contractor shall maintain access to Residential and Commercial properties adjacent to work areas at all times at no separate pay.
9. The Contractor shall conduct his operations in a manner such that trucks and other vehicles do not create a dirt nuisance or safety hazard in any streets, public or private. Clean up of streets shall be done daily at no additional cost to the project.
10. Any area of grass which is disturbed or dug up during the construction shall be replaced with St. Augustine sod or grass which matches the grass removed. See grass sodding details.
11. When construction occurs in the City Right-of-Ways, Alleys, and Easements care shall be taken to prevent construction damage to areas. Contractor shall remove and replace fence sections as necessary to accomplish the construction at no additional cost to the Project. In the event of damage to driveways, sidewalks, structures, plants, landscaping, etc. the Contractor will replace them with equal product, all at no additional cost to the Project.
12. Relocation of existing utilities shall be coordinated with the City of Friendswood 72 hours prior to relocation. This includes but is not limited to water line and sanitary sewer relocation's and operation of water line valves.
13. The Contractor shall verify pipe sizes prior to commencing construction at no cost to the project.
14. Valves and other utility structures in the construction area shall be adjusted to finished grade at no additional cost. Rim elevations for manholes shall be set flush with the finished grade for all manholes located in pavement. (No separate pay)
15. No excavations shall be left open overnight. All excavations which cannot be backfilled overnight for the installation of manholes, water, storm and sewer lines, and other utilities shall be covered with steel sheeting when in paved areas; steel sheeting, wood planking or material which is approved by City or pertinent entity (TxDOT or County) in other areas. The excavation area shall be protected with traffic barricades equipped with flashing yellow lights. The excavation areas must be completely cordoned off with plastic construction fencing material meeting the City's and pertinent entity's (TxDOT's or County's) requirements. The excavation area must be adequately protected and made safe.
16. Existing pavement, curb, sidewalk, driveway, and landscaped areas damaged during construction by the Contractor shall be replaced by the Contractor to original condition at the Contractors expense.
17. Where any street or any section of a street is closed, the Contractor shall furnish and maintain adequate barricades, warning and directing signs, red flags and lights and/or flagman at the end of each street and at all intersections along the street within the limits of the work area. All expenses incurred for the above work shall be paid by the Contractor. All warning signs and barricades shall conform to the Texas Manual of Uniform Traffic Control Devices-Latest Edition.
18. The Contractor shall not use Residents' water.
19. Maintain clearances as required between the proposed storm sewer and all gas lines, petroleum lines and all other utilities proposed or existing. All clearances shall be obtained in writing from the appropriate company or utility. A copy of all documentation shall be provided to the Engineer by the Contractor.
20. On all pavements to be removed, including driveways and sidewalks, the pavement shall be sawcut prior to removal. No separate pay.
21. When construction occurs on a street but the street is not closed completely, the Contractor shall employ off-duty Police Officers or Certified Flagman to maintain traffic flow as described in the specifications.
22. In the event a Gas Line, Petrochemical product line or pipe line is exposed during excavation and is in need of relocation, the appropriate company shall be contacted by the Contractor to have the status of the line verified. Contractor is responsible for contacting and coordinating with the line owner to relocate the lines. The City is not responsible for any claims or delays resulting from such relocation.
23. Texas Law Article 1436c, prohibits all activities in which persons or equipment may come within six feet of energized overhead power lines, and Federal Regulations, Title 29, Part 1910. 180 (l) and Part 1926. 550 (a) (15) require a minimum clearance of ten feet from these facilities. The above laws carry both criminal and civil liabilities, with Contractors and owners being legally responsible for the safety of workers under these laws. If the Contractor must work near overhead power lines, call CPE at (713) 207-2222 for the lines to be de-energized and/or moved at the Contractors expense.
24. The Contractor shall be aware that utilities exist or may exist in the construction area which:
    a. Have not been field verified (NFV)
    b. Have not been located on the drawings
    c. May not be shown accurately on the drawings
    d. May exist in the construction area and not shown on the drawings

    It is the Contractors responsibility to verify the location, size and depth of all existing utilities prior to excavation at no additional cost to the project. Contractor shall include costs in his bid for work associated with locating unknown lines and dealing with issues associated with lines that fall in the above noted category.
25. The Contractor shall coordinate with the City as necessary, and when required, regarding "Special Events" that may be affected by construction. These events may require consideration by the Contractor (construction schedule or sequence, cleanup, street and sidewalk cleaning, removal and disposal of debris, etc.). The Contractor shall perform this work at no additional cost to the project.
26. There shall be no separate pay for items covered in these notes unless specifically established in the bid proposal.
27. VERIFICATION OF STRUCTURE LIMITS: Contractor shall verify the limits of all structures which may impact the proposed improvements prior to construction. This shall include, but is not limited to the horizontal and vertical limits of above ground and below ground structures, supports, foundations, piers, pilings, etc.
28. The Contractor shall make provisions for maintaining trash collection and mail delivery throughout the duration of the contract work.
29. No fliers shall be placed in mail boxes. A $500.00 fine may be levied by the U.S. Postal Service for each box. Construction notices are the responsibility of the Contractor.

Traffic Control and Pavement Marking:

1. Contractor shall provide and install all traffic control devices as per the latest revision of the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and TxDOT (Texas Department of Transportation) where applicable.
2. All temporary traffic control devices markings, striping and signage required for this project shall be included in the traffic control and regulation costs. Temporary pavement markings shall conform to Harris County's requirements. Any changes to traffic control deemed necessary due to field conditions shall be performed at no additional cost to the project.
3. The Contractor shall maintain access to residential and commercial properties adjacent to and in the work areas at all times. Where necessary, Contractor shall construct temporary driveways for access at no cost to project.
4. Contractor shall open all closed roads during non-working hours. The Contractor is responsible for traffic safety and shall adequately and safely cover and/or backfill trench or other excavations prior to opening roads to traffic.
5. Contractor shall notify the City of Friendswood, ambulance, police, fire, and other emergency service agencies in writing at least 72 hours prior to closure of any street, intersection, or lane of traffic. Contractor shall make necessary provisions to allow access to Emergency vehicles at all times.
6. Installation and maintenance of signing is sole responsibility of Contractor. This includes repair and/or replacement due to acts of vandalism or accident.
7. Remove existing stop signs, street name signs, and warning signs that are in conflict with traffic control plans and replace with drum-mounted signs. Replace existing signs upon completion of work per the Pavement Markings & Signing Sheets.
8. The construction traffic control signs, devices and barricades on these drawings constitute minimum requirements and not intended to cover special circumstances or other conditions that may arise due to unforeseen field conditions. The Contractor shall place and maintain sufficient additional signs, barricades, and warning devices to warn the public and provide for the safe movement of traffic and the construction zone safety. Where project requirements are not fully satisfied by the standards shown hereon, the "Texas Manual on Uniform Traffic Control Devices" shall govern.
9. Heavy Trucks and construction equipment must stay on main roads approved by City and cannot enter side streets for ingress or egress to construction site.
10. TCP to be completely set-up in place prior to any work being started during that day.

Drainage & Paving Notes:

1. Drainage is of utmost importance to this Project. The Contractor is responsible for the verification of key design elevations. The Contractor shall also take care to obtain all grades designated on the Drawings. He shall perform all transitions to existing pavements and driveways so that positive drainage is maintained and ponding is prevented. Transitions shall be performed so that a smooth driving surface is maintained. Contractor shall transition driveways so that vehicles will not "bottom out".
2. Relocate all existing utilities as necessary for Storm Sewer and Pavement installation. Location and elevations of existing utilities shown on Drawings are approximate and shall be determined by the Contractor prior to construction. Relocation of existing utilities shall be at the Contractor's expense.
3. Where new curb is installed, Contractor shall backfill and regrade behind curb (with select fill at no separate pay) as necessary to maintain positive drainage from non-paved areas over top of curb.
4. Repair or replace Yard Drains that pass through existing or proposed curbs. Maintain yard drainage to new pavement at all times.
5. Limits of sidewalk and driveway replacements shown on the plans are approximate. Limits for replacements for adjustment in grade shall be submitted by the contractor and approved by the Engineer and the City prior to construction.
6. It is the Contractor's responsibility to determine the length of the ramp to comply with ADA requirements.
7. The Contractor shall adhere to all ADA requirements including cross slope and running slope.
8. Contractor shall cover open excavations with anchored steel plates during non-working hours.
9. Contractor shall comply with OSHA regulations and State of Texas Law concerning excavation, trenching and shoring.
10. Contractor to make necessary precautions to protect root systems of shrubs, plants and trees along the area of excavation.
11. Contractor shall maintain adequate drainage at all times during construction.

Water Line Construction Notes:

1. The Contractor shall be aware that the location of the existing water lines shown on the plans have not been field verified. The Contractor shall verify the actual location of the existing water lines in the field prior to constructing the proposed water line.
2. The Contractor shall notify the Owner, at least 72 hours prior to connecting new water line to existing water system and prior to any disruption of water service.
3. Contractor shall notify Owner immediately upon encountering leaking sanitary sewer during installation of water lines.
4. Contractor may deflect water lines slightly to avoid conflicts with utilities. The Owner and the Engineer must be contacted for approval at least 72-hours in advance of any decision to deflect water lines. Contractor shall keep an accurate record of all locations where water lines are deflected and show the deflections on the required red line record print set. Any such deflection shall be within the limits allowed and recommended by the manufacturer of the pipe, fittings and couplings and shall not be to a degree where the pipe, fittings or couplings performance or strength is reduced.
5. The Contractor is to install temporary taps and blow-off valves, as required to flush the newly constructed water line, for chlorination and testing. Blow-off valves shall be removed by the Contractor promptly upon successful completion of all testing (No separate pay).
6. The Contractor shall maintain 12-inch minimum clearance between proposed water and existing utilities (i.e. storm, exist water) unless otherwise noted. For clearance of sanitary sewer facilities use applicable notes of Texas Commission On Environmental Quality (TCEQ) criteria.
7. There shall be no separate pay for items covered in these notes unless specifically established in the bid proposal.
8. Wet connections and installation of valves on existing mains shall be coordinated with the Owner in such a manner and at such hours as to cause the least inconvenience to the public. When the existing mains have been cut or a plug removed for a connection, then the work for making the connection shall progress without interruption until complete. The Contractor is made aware that valves may not be present on existing lines to isolate the main to accomplish construction and tie-ins. In the event the Contractor requires the Owner's assistance in operating valves to perform wet connections or any other work, the Contractor shall request such assistance from the Owner in writing a minimum of twenty four (24) hours prior to the need for such assistance. The Contractor shall coordinate with the Owner as to the time required for such operation and as to the availability of Owner personnel to perform such assistance.
9. Backfill above water pipe with bank sand, unless otherwise noted. Include cost in the contract unit price bid for items of which work is a component part as incidental to work.

Sanitary Notes:

1. Contractor shall maintain the integrity of the existing sewer system during construction.
2. Any sanitary sewer requiring removal, replacement and/or abandonment shall be brought to the attention of the Owner and concurrence with the Contractor's assessment shall be obtained from the Owner prior to work being done. Contractor shall submit plan and recommendation in writing for review.
3. The existing sanitary sewers shown on these plans have not all been field verified and may not represent all sanitary sewers existing in the project areas; therefore, all locations requiring adherence to TCEQ clearance regulations may not be represented. It is the Contractor's responsibility to field verify all sanitary sewer locations in project areas and provide Owner with plan for adherence to TCEQ clearance regulations for concurrence. It is the Contractor's responsibility to ensure that all TCEQ requirements as noted in the specifications are met.

EMAIL FRIENDSWOOD PUBLIC PUBLIC WORKS DEPARTMENT FOR LINE LOCATES:
LOCATES@FRIENDSWOOD.COM
MINIMUM 48 HOURS PRIOR TO DIGGING

CALL FRIENDSWOOD ENGINEERING DEPARTMENT FOR FINAL INSPECTION:
281-993-3411

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

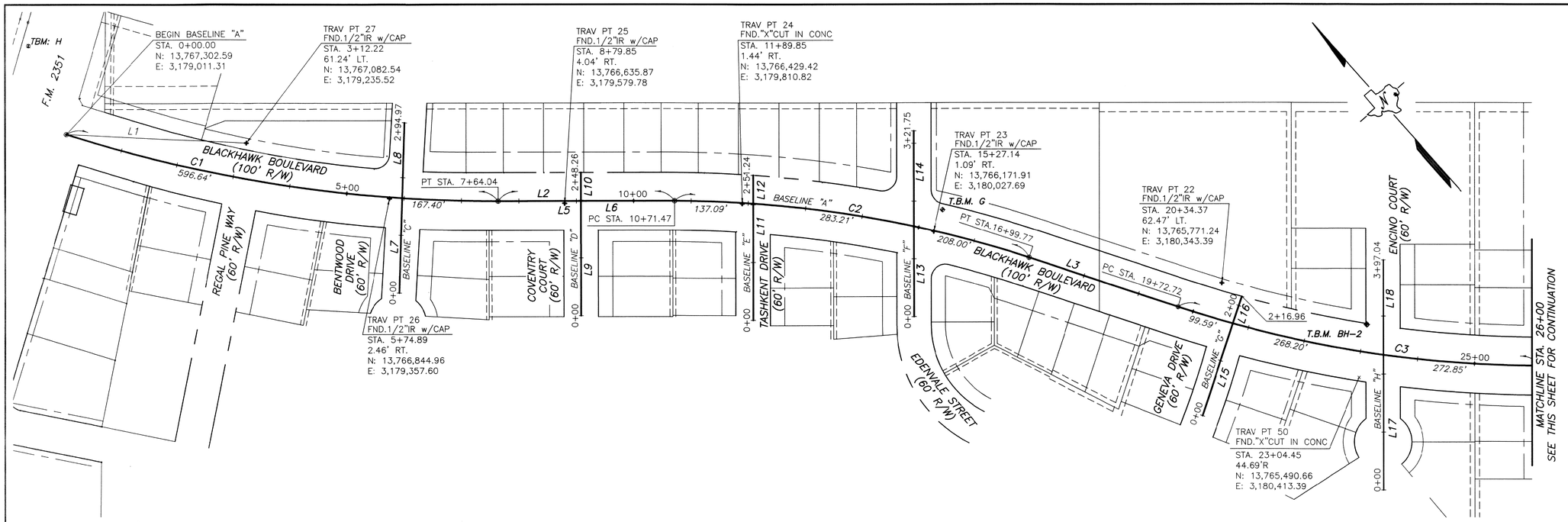
Additional General Notes

SCALE

SHEET NUMBER

SHEET 5 OF 111

FILE NAME Package B 17-019-05 General Notes.dwg



CONTROL BENCHMARK

HARRIS COUNTY FLOODPLAIN REFERENCE MARK No. 010413 BEING AN BRASS DISC STAMPED "RM 010413" LOCATED ON SOUTHERLY END OF DRAINAGE DITCH CONCRETE HEADWALL LOCATED ON EASTERLY SIDE OF BLACKHAWK BOULEVARD APPROXIMATELY 210' SOUTHERLY OF THE INTERSECTION OF SHADY OAKS AND BLACKHAWK BOULEVARD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 16.52 (NAVD 88, 2001 ADJ.)

T.B.M. G

CHISELED SQUARE ON BB-INLET LOCATED AT THE SOUTHEASTERLY CORNER OF BLACKHAWK BOULEVARD AND EDENVALE STREET. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 24.11 (NAVD 88, 2001 ADJ.)

T.B.M. H

CHISELED SQUARE ON C-INLET LOCATED ON NORTHERLY SIDE OF F.M. 2351 APPROXIMATELY 130' EASTERLY FROM THE INTERSECTION OF F.M. 2351 AND BLACKHAWK BOULEVARD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 27.98 (NAVD 88, 2001 ADJ.)

T.B.M. BH-2

CHISELED SQUARE ON CONCRETE HEADWALL LOCATED ON THE NORTHEAST CORNER OF BLACKHAWK BOULEVARD AND ENCINO COURT. (EXACT LOCATION SHOWN ON SURVEY).

ELEVATION 27.90 (NAVD 88, 2001 ADJ.)

T.B.M. EB

CHISELED SQUARE ON CURB OF BB INLET LOCATED ON NORTHWEST CORNER OF BLACKHAWK BOULEVARD AND EDENVALE STREET. (EXACT LOCATION SHOWN ON SURVEY).

ELEVATION 24.10 (NAVD 88, 2001 ADJ.)

ABBREVIATIONS

FND.	FOUND
IR	IRON ROD
PT	POINT
STA.	STATION

NOTES:

1. COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999873 AND ARE BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, SOUTH CENTRAL ZONE No. 4204. HARRIS COUNTY REFERENCE MARK NUMBER REF MARK 010115, BEING A BRASS DISC STAMPED "RM 010115" AND HAVING PUBLISHED GRID COORDINATES OF (N: 13,768,942.24), (E: 3,175,520.93) WAS USED TO ESTABLISH HORIZONTAL CONTROL FOR PROJECT.
2. ALL FOUND 1/2" IRON RODS WITH CAP STAMPED "C.L. DAVIS RPLS 4464"
3. R/W INDICATES PUBLIC STREET RIGHT-OF-WAY.

BASELINE INTERSECTIONS	NORTHING	EASTING
BL A STA. 05+96.67 = BL C STA. 01+64.31	13,766,831.09	3,179,374.55
BL A STA. 09+08.43 = BL D STA. 01+98.82	13,766,619.91	3,179,603.83
BL A STA. 12+08.56 = BL E STA. 02+02.12	13,766,417.13	3,179,825.00
BL A STA. 14+91.77 = BL F STA. 01+56.71	13,766,201.28	3,180,007.97
BL A STA. 20+72.31 = BL G STA. 01+67.71	13,765,706.23	3,180,310.67
BL A STA. 23+40.51 = BL H STA. 02+33.14	13,765,491.52	3,180,471.07
BL A STA. 26+40.93 = BL I STA. 01+94.71	13,765,278.57	3,180,682.60
BL A STA. 33+40.54 = BL J STA. 02+38.76	13,764,813.47	3,181,205.21
BL A STA. 36+20.54 = BL K STA. 01+65.81	13,764,627.32	3,181,414.38

CURVE	RADIUS	DELTA ANGLE	ARC LENGTH	CHORD BEARING	CHORD LENGTH
C1	2,474.56'	17°41'26"	764.04'	S 39°32'55" E	761.01'
C2	1,969.68'	18°16'35"	628.30'	S 39°15'20" E	625.64'
C3	2,015.17'	18°12'54"	640.64'	S 39°13'29" E	637.95'
C4	4,260.27'	07°32'39"	560.96'	S 44°33'36" E	560.56'
C5	OUT OF AREA				
C6	OUT OF AREA				
C7	521.58'	12°35'54"	114.69'	N 47°58'24" E	114.46'

LINE	BEARING	DISTANCE
L1	N 45°32'12" W	314.15'
L2	S 48°23'38" E	307.43'
L3	S 30°07'02" E	272.95'
L4	OUT OF AREA	
L5	S 48°23'38" E	144.38'
L6	S 48°23'38" E	163.04'
L7	N 43°28'28" E	164.31'
L8	N 43°28'28" E	130.66'
L9	N 41°38'22" E	198.82'
L10	N 41°38'22" E	49.44'
L11	N 41°41'54" E	202.12'
L12	N 41°41'54" E	49.12'

LINE	BEARING	DISTANCE
L13	N 41°37'45" E	156.71'
L14	N 41°37'45" E	165.04'
L15	N 60°07'06" E	167.71'
L16	N 60°07'06" E	49.25'
L17	N 41°39'01" E	233.14'
L18	N 41°39'01" E	163.90'
L19	N 41°44'45" E	194.71'
L20	N 41°44'45" E	177.48'
L21	N 41°40'03" E	51.06'
L22	N 41°40'03" E	49.39'
L23	N 41°40'27" E	51.12'
L24	N 41°40'27" E	164.39'

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS · REGISTERED · C.L. DAVIS · 4464 · PROFESSIONAL LAND SURVEYOR

10/06/2025

SHEET NAME

CONTROL SHEET

SCALE: 0 50 100 150 200 — 1" = 100'

SHEET NUMBER

SHEET 6 OF 111

FILE NAME

C.L. DAVIS & CO. LAND SURVEYING
1500 WINDING WAY
FRIENDSWOOD, TEXAS 77546
281-482-9490
FIRM NO. 10082000

CONTROL SHEET

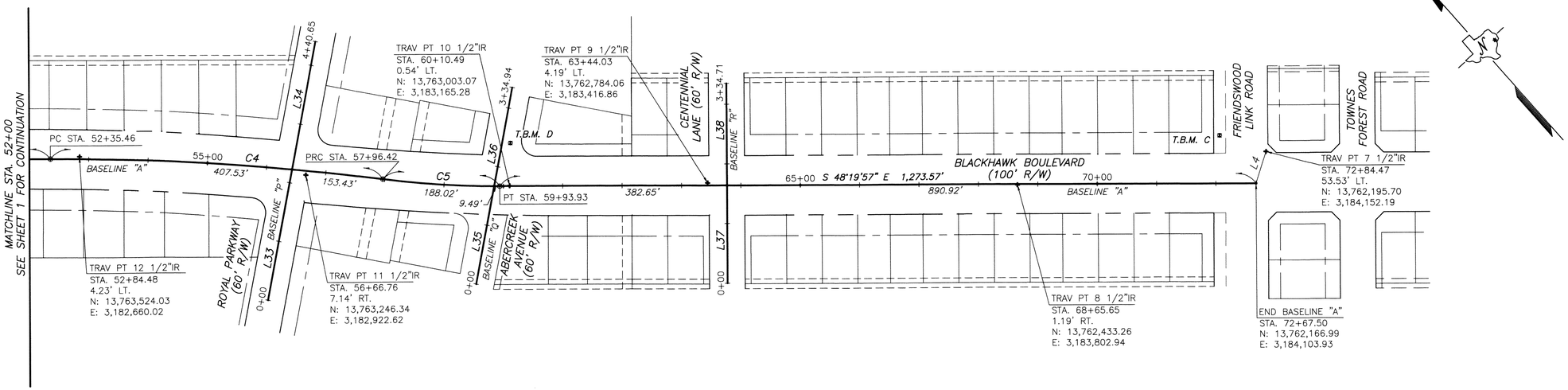
BLACKHAWK BOULEVARD
BETWEEN GENEVA DRIVE
AND EDENVALE STREET
FRIENDSWOOD, HARRIS COUNTY, TEXAS

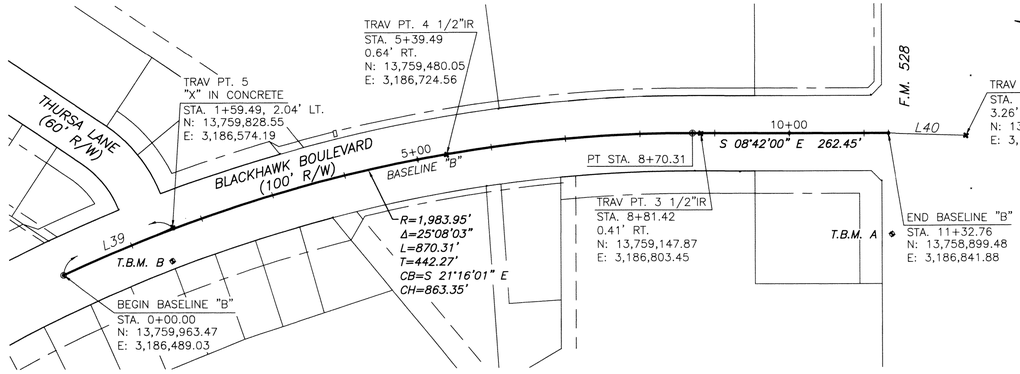
DATE: 10-06-2025 | SCALE: 1" = 100' | JOB NO.: 11-1086

DWG FILE: 11-1086-CONTROL SHEET

CRD FILE: 11-1086-TSARP-BASE

N:\11 Misc-11-1051-1HHU-11-1100\11-1086\BLACKHAWK BLVD PHASE 2-PROJECT\11-1086-Control Sheet 2025.dwg





CONTROL BENCHMARK

HARRIS COUNTY FLOODPLAIN REFERENCE MARK No. 010413 BEING AN BRASS DISC STAMPED "RM 010413" LOCATED ON SOUTHERLY END OF DRAINAGE DITCH CONCRETE HEADWALL LOCATED ON EASTERLY SIDE OF BLACKHAWK BOULEVARD APPROXIMATELY 210' SOUTHERLY OF THE INTERSECTION OF SHADY OAKS AND BLACKHAWK BOULEVARD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 16.52 (NAVD 88, 2001 ADJ.)

T.B.M. A

CHISELED SQUARE ON C-INLET LOCATED ON THE NORTHERLY SIDE OF F.M. 528 APPROXIMATELY 130' WESTERLY FROM THE INTERSECTION OF F.M. 528 AND BLACKHAWK BOULEVARD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 21.48 (NAVD 88, 2001 ADJ.)

T.B.M. B

CHISELED SQUARE ON BB-INLET LOCATED ON WESTERLY SIDE OF THE INTERSECTION OF BLACKHAWK BOULEVARD AND THURSA LANE. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 21.26 (NAVD 88, 2001 ADJ.)

T.B.M. C

CHISELED SQUARE ON BB-INLET LOCATED AT THE NORTHEASTERLY CORNER OF BLACKHAWK BOULEVARD AND FRIENDSWOOD LINK ROAD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 25.25 (NAVD 88, 2001 ADJ.)

T.B.M. D

CHISELED SQUARE ON BB-INLET LOCATED ON SOUTHEASTERLY CORNER OF BLACKHAWK BOULEVARD AND ABERCREEK AVENUE. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 25.74 (NAVD 88, 2001 ADJ.)

T.B.M. E

CHISELED SQUARE ON BB-INLET LOCATED AT THE NORTHEASTERLY CORNER OF BLACKHAWK BOULEVARD AND APPLEBLOSSOM LANE. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 23.79 (NAVD 88, 2001 ADJ.)

T.B.M. F

CHISELED SQUARE ON BB-INLET LOCATED AT THE SOUTHWESTERLY CORNER OF EDENVALE STREET AND BLACKHAWK BOULEVARD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 23.75 (NAVD 88, 2001 ADJ.)

T.B.M. G

CHISELED SQUARE ON BB-INLET LOCATED AT THE SOUTHEASTERLY CORNER OF BLACKHAWK BOULEVARD AND EDENVALE STREET. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 24.11 (NAVD 88, 2001 ADJ.)

T.B.M. H

CHISELED SQUARE ON C-INLET LOCATED ON NORTHERLY SIDE OF F.M. 2351 APPROXIMATELY 130' EASTERLY FROM THE INTERSECTION OF F.M. 2351 AND BLACKHAWK BOULEVARD. (EXACT LOCATION SHOWN ON SURVEY)

ELEVATION 27.98 (NAVD 88, 2001 ADJ.)

BASELINE INTERSECTIONS	NORTHING	EASTING
BL A STA. 05+96.67 = BL C STA. 01+64.31	13,766,831.09	3,179,374.55
BL A STA. 09+08.43 = BL D STA. 01+98.82	13,766,619.91	3,179,603.83
BL A STA. 12+08.56 = BL E STA. 02+02.12	13,766,417.13	3,179,825.00
BL A STA. 14+91.77 = BL F STA. 01+56.71	13,766,201.28	3,180,007.97
BL A STA. 20+72.31 = BL G STA. 01+67.71	13,765,706.23	3,180,310.67
BL A STA. 23+40.51 = BL H STA. 02+33.14	13,765,491.52	3,180,471.07
BL A STA. 26+40.93 = BL I STA. 01+94.71	13,765,278.57	3,180,682.60
BL A STA. 33+40.54 = BL J STA. 02+38.76	13,764,813.47	3,181,205.21
BL A STA. 36+20.54 = BL K STA. 01+65.81	13,764,627.32	3,181,414.38
BL A STA. 39+00.56 = BL L STA. 01+75.15	13,764,441.16	3,181,623.56
BL A STA. 41+00.56 = BL M STA. 01+58.99	13,764,308.20	3,181,772.96
BL A STA. 43+24.10 = BL N STA. 01+52.66	13,764,159.59	3,181,939.95
BL A STA. 48+81.46 = BL O STA. 00+49.63	13,763,789.05	3,182,356.30
BL A STA. 56+42.99 = BL P STA. 02+22.87	13,763,268.64	3,182,911.76
BL A STA. 59+84.44 = BL Q STA. 01+66.70	13,763,020.01	3,183,145.48
BL A STA. 59+84.44 = BL R STA. 01+63.87	13,762,759.28	3,183,438.40

CURVE	RADIUS	DELTA ANGLE	ARC LENGTH	CHORD BEARING	CHORD LENGTH
C1	2,474.56'	17°41'26"	764.04'	S 39°32'55" E	761.01'
C2	1,969.68'	18°16'35"	628.30'	S 39°15'20" E	625.64'
C3	2,015.17'	18°12'54"	640.64'	S 39°13'29" E	637.95'
C4	4,260.27'	07°32'39"	560.96'	S 44°33'36" E	560.56'
C5	1,500.00'	07°32'40"	197.51'	S 44°33'37" E	197.37'
C6	241.58'	44°30'59"	187.70'	N 63°55'32" E	183.01'
C7	521.58'	12°35'54"	114.69'	N 47°58'24" E	114.46'
C8	801.58'	08°52'18"	124.12'	N 46°06'12" E	123.99'

NOTE:
COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999873 AND ARE BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, SOUTH CENTRAL ZONE No. 4204. HARRIS COUNTY REFERENCE MARK NUMBER REF MARK 010115, BEING A BRASS DISC STAMPED "RM 010115" AND HAVING PUBLISHED GRID COORDINATES OF (N: 13,768,942.24), (E: 3,175,520.93) WAS USED TO ESTABLISH HORIZONTAL CONTROL FOR PROJECT.

LINE	BEARING	DISTANCE
L1	N 45°32'12" W	314.15'
L2	S 48°23'38" E	307.43'
L3	S 30°07'02" E	272.95'
L4	N 59°15'04" E	56.16'
L5	S 48°23'38" E	144.38'
L6	S 48°23'38" E	163.04'
L7	N 43°28'28" E	164.31'
L8	N 43°28'28" E	130.66'
L9	N 41°38'22" E	198.82'
L10	N 41°38'22" E	49.44'
L11	N 41°41'54" E	202.12'
L12	N 41°41'54" E	49.12'
L13	N 41°37'45" E	156.71'
L14	N 41°37'45" E	165.04'
L15	N 60°07'06" E	167.71'
L16	N 60°07'06" E	49.25'
L17	N 41°39'01" E	233.14'
L18	N 41°39'01" E	163.90'
L19	N 41°44'45" E	194.71'
L20	N 41°44'45" E	177.48'

LINE	BEARING	DISTANCE
L21	N 41°40'03" E	51.06'
L22	N 41°40'03" E	49.39'
L23	N 41°40'27" E	51.12'
L24	N 41°40'27" E	164.39'
L25	N 41°40'03" E	51.03'
L26	N 41°40'03" E	128.39'
L27	N 41°40'03" E	158.99'
L28	N 41°40'03" E	190.67'
L29	N 43°49'07" E	152.66'
L30	N 43°49'07" E	49.43'
L31	N 41°37'27" E	49.63'
L32	N 41°37'27" E	164.32'
L33	N 52°22'33" E	222.87'
L34	N 52°22'33" E	217.78'
L35	N 52°23'15" E	166.70'
L36	N 52°23'15" E	168.24'
L37	N 41°37'02" E	163.87'
L38	N 41°37'02" E	170.84'
L39	N 32°15'41" W	159.54'
L40	S 06°54'15" E	104.02'

100% SUBMITTAL
SHEET 2 OF 2

C.L. DAVIS & CO. LAND SURVEYING
1500 WINDING WAY
FRIENDSWOOD, TEXAS 77546
281-482-9490
FIRM NO. 10082000

CONTROL SHEET

BLACKHAWK BOULEVARD BETWEEN
F.M. 2351 AND FRIENDSWOOD LINK
AND BETWEEN
THURSA LANE AND F.M. 528
FRIENDSWOOD, HARRIS COUNTY, TEXAS

DATE: 05-19-2017	SCALE: 1" = 100'	JOB NO.: 11-1086
DWG FILE: 11-1086-CONTROL SHEET		
CRD FILE: 11-1086-TSARP-BASE		

HDR
Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

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Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS REGISTERED C.L. DAVIS 4464 PROFESSIONAL LAND SURVEYOR

SHEET NAME

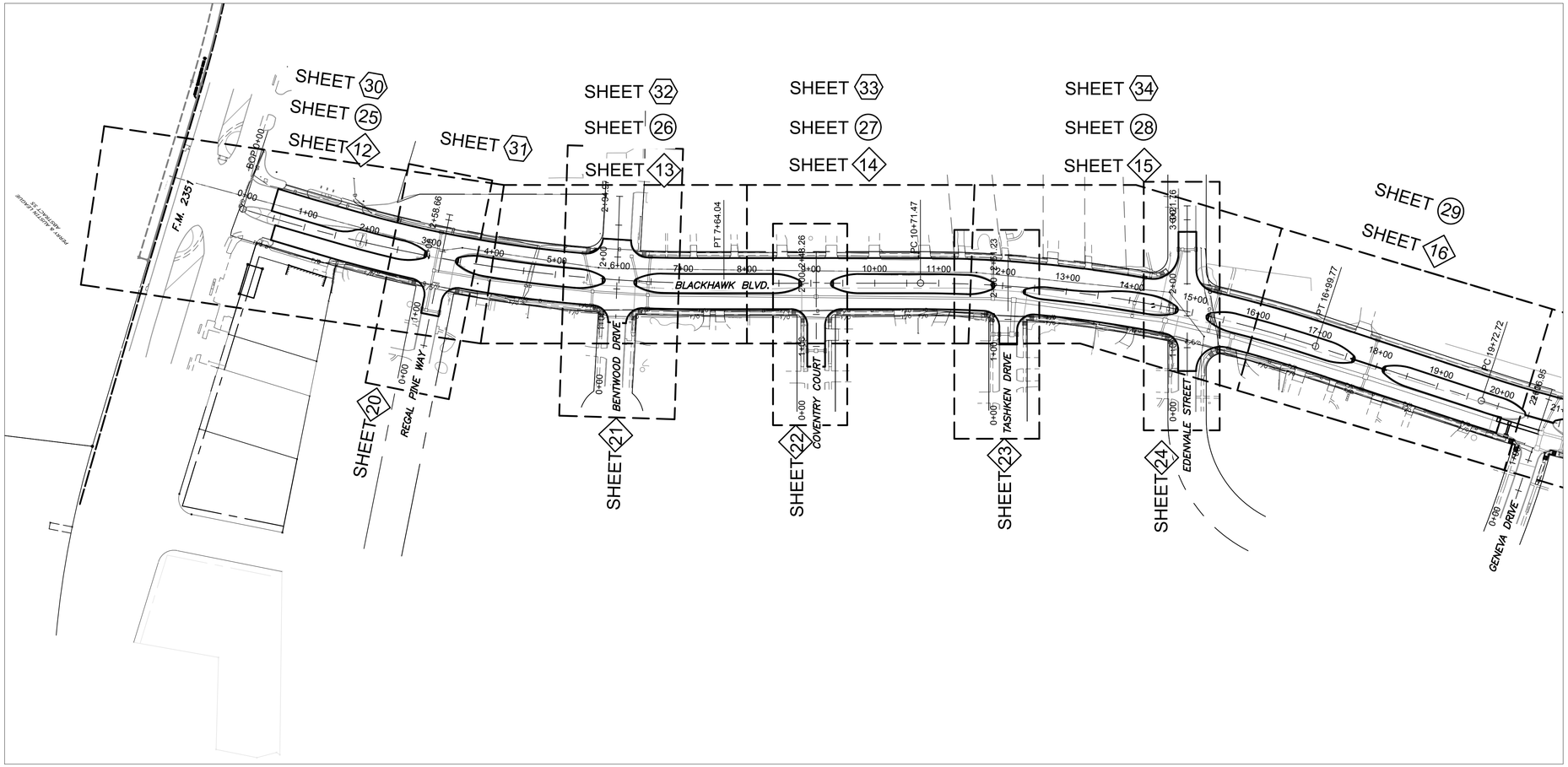
CONTROL SHEET

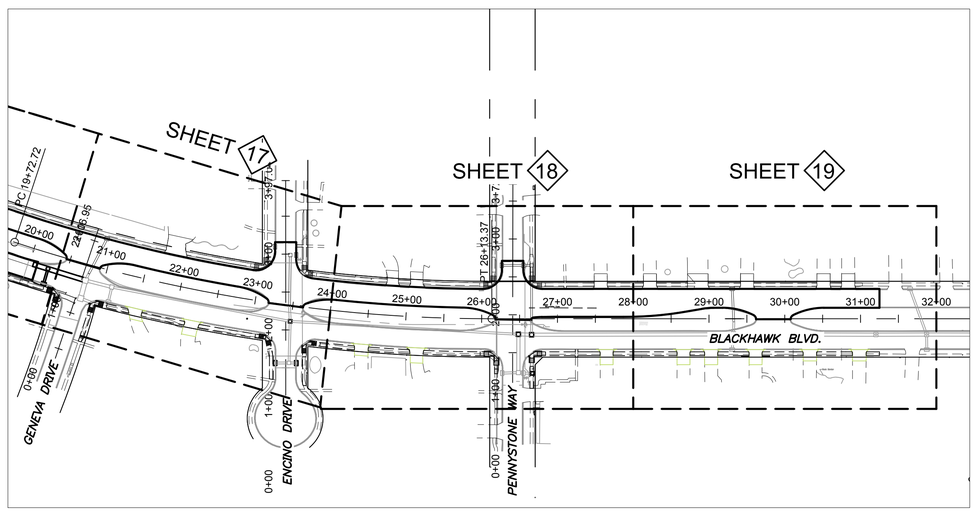
SCALE 0 50 100 150 200
1" = 100'

SHEET NUMBER

SHEET 7 OF 111

FILE NAME





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Registration No. F-754

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

LEGEND

- SHEET LIMITS AND SHEET NUMBER
- X — PAVING & DRAINAGE
- Y — WATER
- Z — 24" TRANSMISSION WATER MAIN

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

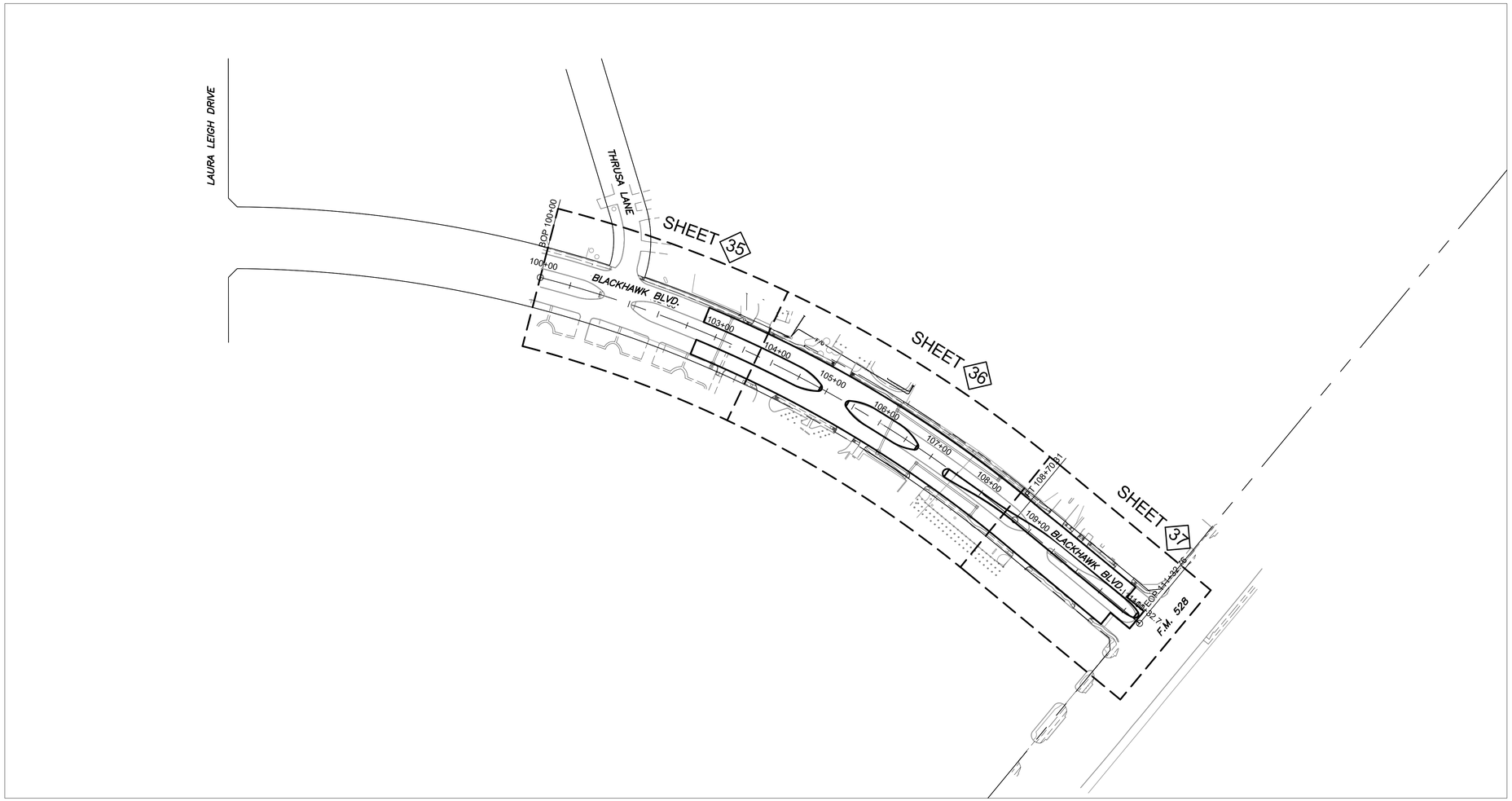
Layout Sheet 1

SCALE 1" = 100'

SHEET NUMBER

SHEET 8 OF 111

FILE NAME Package B 17-019-08_09 Layout Sheet.dwg



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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

LEGEND

SHEET LIMITS AND SHEET NUMBER

PAVING & DRAINAGE, WATER

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

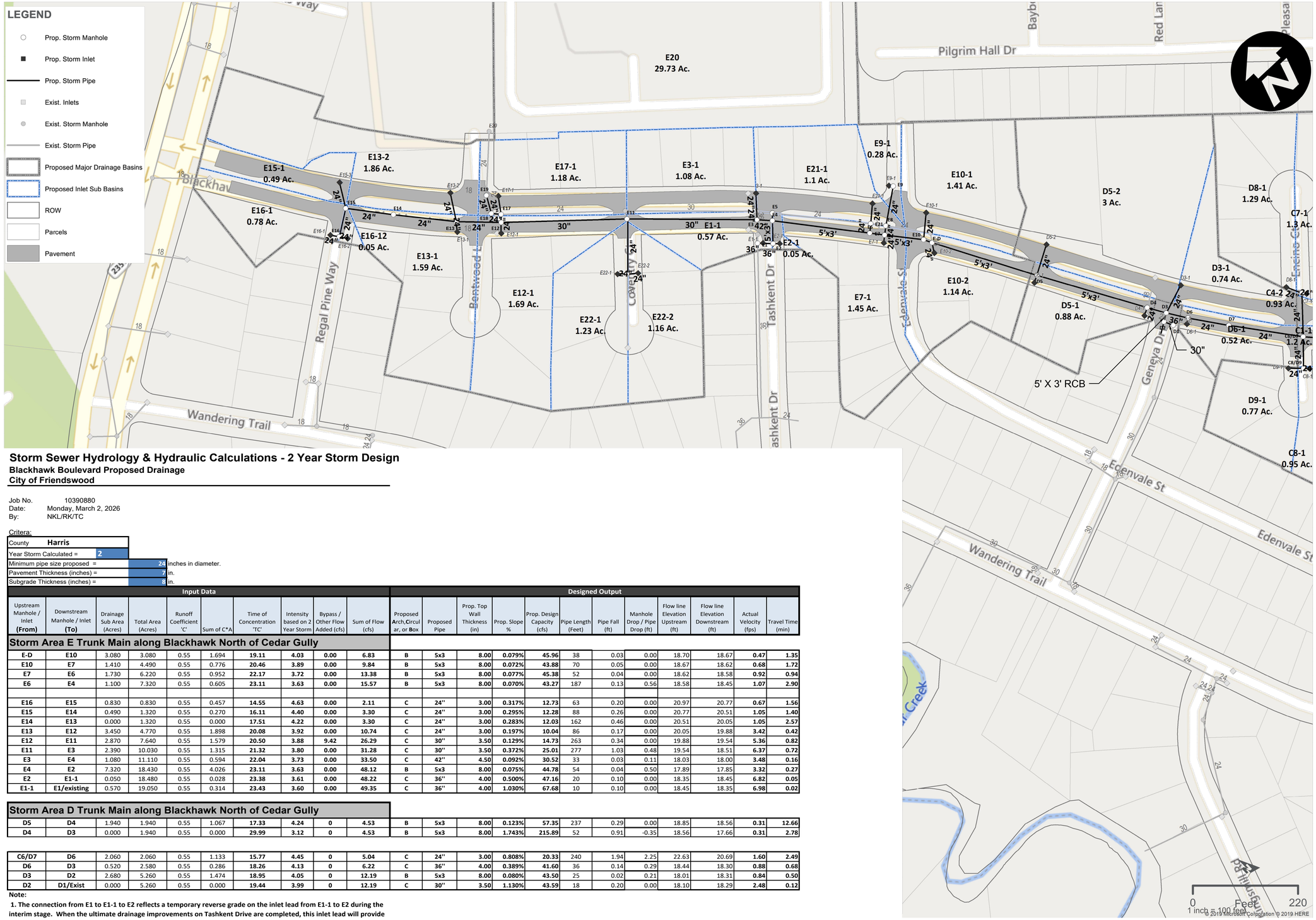
Layout Sheet 2

SCALE 1" = 100'

SHEET NUMBER

SHEET 9 OF 111

FILE NAME Package B 17-019-08_09 Layout Sheet.dwg



Storm Sewer Hydrology & Hydraulic Calculations - 2 Year Storm Design

Blackhawk Boulevard Proposed Drainage
City of Friendswood

Job No. 10390880
Date: Monday, March 2, 2026
By: NKL/RK/TC

Critera:

County	Harris
Year Storm Calculated =	2
Minimum pipe size proposed =	24 inches in diameter.
Pavement Thickness (inches) =	7 in.
Subgrade Thickness (inches) =	8 in.

Input Data										Designed Output											
Upstream Manhole / Inlet (From)	Downstream Manhole / Inlet (To)	Drainage Sub Area (Acres)	Total Area (Acres)	Runoff Coefficient 'C'	Sum of C*A	Time of Concentration 'TC'	Intensity based on 2 Year Storm	Bypass / Other Flow Added (cfs)	Sum of Flow (cfs)	Proposed Arch,Circular, or Box	Proposed Pipe	Prop. Top Wall Thickness (in)	Prop. Slope %	Prop. Design Capacity (cfs)	Pipe Length (Feet)	Pipe Fall (ft)	Manhole Drop / Pipe Drop (ft)	Flow line Elevation Upstream (ft)	Flow line Elevation Downstream (ft)	Actual Velocity (fps)	Travel Time (min)
Storm Area E Trunk Main along Blackhawk North of Cedar Gully																					
E-D	**E10**	3.080	3.080	0.55	1.694	**19.11**	**4.03**	**0.00**	**6.83**	**B**	**5x3**	**8.00**	**0.079%**	**45.96**	38	0.03	0.00	18.70	18.67	**0.47**	**1.35**
E10	**E7**	1.410	4.490	0.55	0.776	**20.46**	**3.89**	**0.00**	**9.84**	**B**	**5x3**	**8.00**	**0.072%**	**43.88**	70	0.05	0.00	18.67	18.62	**0.68**	**1.72**
E7	**E6**	1.730	6.220	0.55	0.952	**22.17**	**3.72**	**0.00**	**13.38**	**B**	**5x3**	**8.00**	**0.077%**	**45.38**	52	0.04	0.00	18.62	18.58	**0.92**	**0.94**
E6	**E4**	1.100	7.320	0.55	0.605	**23.11**	**3.63**	**0.00**	**15.57**	**B**	**5x3**	**8.00**	**0.070%**	**43.27**	187	0.13	0.56	18.58	18.45	**1.07**	**2.90**
E16	**E15**	0.830	0.830	0.55	0.457	**14.55**	**4.63**	**0.00**	**2.11**	**C**	**24''**	**3.00**	**0.317%**	**12.73**	63	0.20	0.00	20.97	20.77	**0.67**	**1.56**
E15	**E14**	0.490	1.320	0.55	0.270	**16.11**	**4.40**	**0.00**	**3.30**	**C**	**24''**	**3.00**	**0.295%**	**12.28**	88	0.26	0.00	20.77	20.51	**1.05**	**1.40**
E14	**E13**	0.000	1.320	0.55	0.000	**17.51**	**4.22**	**0.00**	**3.30**	**C**	**24''**	**3.00**	**0.283%**	**12.03**	162	0.46	0.00	20.51	20.05	**1.05**	**2.57**
E13	**E12**	3.450	4.770	0.55	1.898	**20.08**	**3.92**	**0.00**	**10.74**	**C**	**24''**	**3.00**	**0.197%**	**10.04**	86	0.17	0.00	20.05	19.88	**3.42**	**0.42**
E12	**E11**	2.870	7.640	0.55	1.579	**20.50**	**3.88**	**9.42**	**26.29**	**C**	**30''**	**3.50**	**0.129%**	**14.73**	263	0.34	0.00	19.88	19.54	**5.36**	**0.82**
E11	**E3**	2.390	10.030	0.55	1.315	**21.32**	**3.80**	**0.00**	**31.28**	**C**	**30''**	**3.50**	**0.372%**	**25.01**	277	1.03	0.48	19.54	18.51	**6.37**	**0.72**
E3	**E4**	1.080	11.110	0.55	0.594	**22.04**	**3.73**	**0.00**	**33.50**	**C**	**42''**	**4.50**	**0.092%**	**30.52**	33	0.03	0.11	18.03	18.00	**3.48**	**0.16**
E4	**E2**	7.320	18.430	0.55	4.026	**23.11**	**3.63**	**0.00**	**48.12**	**B**	**5x3**	**8.00**	**0.075%**	**44.78**	54	0.04	0.50	17.89	17.85	**3.32**	**0.27**
E2	**E1-1**	0.050	18.480	0.55	0.028	**23.38**	**3.61**	**0.00**	**48.22**	**C**	**36''**	**4.00**	**0.500%**	**47.16**	20	0.10	0.00	18.35	18.45	**6.82**	**0.05**
E1-1	**E1/existing**	0.570	19.050	0.55	0.314	**23.43**	**3.60**	**0.00**	**49.35**	**C**	**36''**	**4.00**	**1.030%**	**67.68**	10	0.10	0.00	18.45	18.35	**6.98**	**0.02**
Storm Area D Trunk Main along Blackhawk North of Cedar Gully																					
D5	**D4**	1.940	1.940	0.55	1.067	**17.33**	**4.24**	**0**	**4.53**	**B**	**5x3**	**8.00**	**0.123%**	**57.35**	237	0.29	0.00	18.85	18.56	**0.31**	**12.66**
D4	**D3**	0.000	1.940	0.55	0.000	**29.99**	**3.12**	**0**	**4.53**	**B**	**5x3**	**8.00**	**1.743%**	**215.89**	52	0.91	-0.35	18.56	17.66	**0.31**	**2.78**
C6/D7	**D6**	2.060	2.060	0.55	1.133	**15.77**	**4.45**	**0**	**5.04**	**C**	**24''**	**3.00**	**0.808%**	**20.33**	240	1.94	2.25	22.63	20.69	**1.60**	**2.49**
D6	**D3**	0.520	2.580	0.55	0.286	**18.26**	**4.13**	**0**	**6.22**	**C**	**36''**	**4.00**	**0.389%**	**41.60**	36	0.14	0.29	18.44	18.30	**0.88**	**0.68**
D3	**D2**	2.680	5.260	0.55	1.474	**18.95**	**4.05**	**0**	**12.19**	**B**	**5x3**	**8.00**	**0.080%**	**43.50**	25	0.02	0.21	18.01	18.31	**0.84**	**0.50**
D2	**D1/Exist**	0.000	5.260	0.55	0.000	**19.44**	**3.99**	**0**	**12.19**	**C**	**30''**	**3.50**	**1.130%**	**43.59**	18	0.20	0.00	18.10	18.29	**2.48**	**0.12**

Note:

1. The connection from E1 to E1-1 to E2 reflects a temporary reverse grade on the inlet lead from E1-1 to E2 during the interim stage. When the ultimate drainage improvements on Tashkent Drive are completed, this inlet lead will provide a positive grade.

2. The drainage calculations take into account a parallel system that connects to the trunk line at manhole E12. The flow from this parallel system has not been deducted from the proposed system's sum of flow.

3. The increased in pipe size and addition of box culvert in areas shown on the plan and profiles are added to provide storage and control the hydraulic grade line until such a time that the downstream of the various systems are improved. In addition to pipe size increase, interconnection of system has been added.

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Registration No. F-754

HDR Engineering, Inc.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

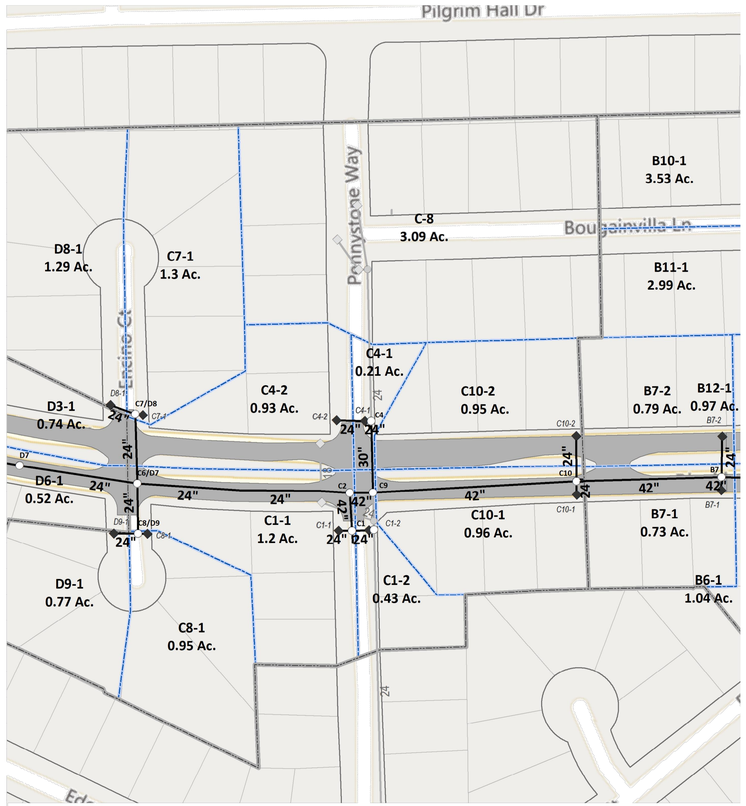
SHEET NAME

DRAINAGE AREAS AND CALCULATIONS - 1

SHEET NUMBER

SHEET 10 OF 111

FILE NAME Package B 17-019-8_10 Drainage Areas Map.dwg





LEGEND

- DCreeks
- Prop. Storm Manhole
- Prop. Storm Inlet
- Prop. Storm Pipe
- Exist. Inlets
- Exist. Storm Manhole
- Exist. Storm Pipe
- Proposed Major Drainage Basins
- Proposed Inlet Sub Basins
- Pavement
- ROW
- Parcels

0 Feet 220

1 inch = 100 feet

Storm Sewer Hydrology & Hydraulic Calculations - 2 Year Storm Design

Blackhawk Boulevard Proposed Drainage

City of Friendswood

Job No. 10390880
Date: Monday, March 2, 2026
By: NKL/RK/TC

Critera:

County	**Harris**	
Year Storm Calculated =	2	
Minimum pipe size proposed =	24	inches in diameter.
Pavement Thickness (inches) =	7	in.
Subgrade Thickness (inches) =	8	in.

Input Data										Designed Output											
Upstream Manhole / Inlet **(From)**	Downstream Manhole / Inlet **(To)**	Drainage Sub Area (Acres)	Total Area (Acres)	Runoff Coefficient 'C'	Sum of C*A	Time of Concentration 'TC'	Intensity based on 2 Year Storm	Bypass / Other Flow Added (cfs)	Sum of Flow (cfs)	Proposed Arch,Circular, or Box	Proposed Pipe	Prop. Top Wall Thickness (in)	Prop. Slope %	Prop. Design Capacity (cfs)	Pipe Length (Feet)	Pipe Fall (ft)	Manhole Drop / Pipe Drop (ft)	Flow line Elevation Upstream (ft)	Flow line Elevation Downstream (ft)	Actual Velocity (fps)	Travel Time (min)
Storm Area C Trunk Main along Blackhawk North of Cedar Gully																					
C6/D7	**C2**	2.250	2.250	0.55	1.238	**15.77**	**4.45**	**0**	**5.50**	**C**	**24"**	**3.00**	**0.808%**	**20.33**	302	2.44	0.23	22.61	20.17	**1.75**	**2.87**
C2	**C1**	3.390	5.640	0.55	1.865	**18.64**	**4.08**	**0**	**13.12**	**C**	**42"**	**4.50**	**0.080%**	**28.46**	51	0.04	0.00	20.12	20.08	**1.36**	**0.62**
C1	**C1-2**	1.200	6.840	0.55	0.660	**19.27**	**4.01**	**0**	**15.77**	**C**	**24"**	**3.00**	**1.000%**	**22.62**	7	0.07	0.00	20.08	20.01	**5.02**	**0.02**
C1-2	**C/exist.**	0.430	7.270	0.55	0.237	**19.29**	**4.01**	**0**	**16.71**	**C**	**24"**	**3.00**	**1.100%**	**23.72**	12	0.13	0.00	20.01	19.88	**5.32**	**0.04**

Note:

1. The inlet lead connection from manhole C1 to inlet C1-2 outfalls to manhole C during the interim stage. When the ultimate drainage improvements on Pennystone Way are completed, this inlet lead will need to be replaced to provide a positive grade to manhole C1.

2. The increased in pipe size in areas shown on the plan and profiles are added to provide storage and control the hydraulic grade line until such a time that the downstream of the various systems are improved. In addition to pipe size increase, interconnection of system has been added.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

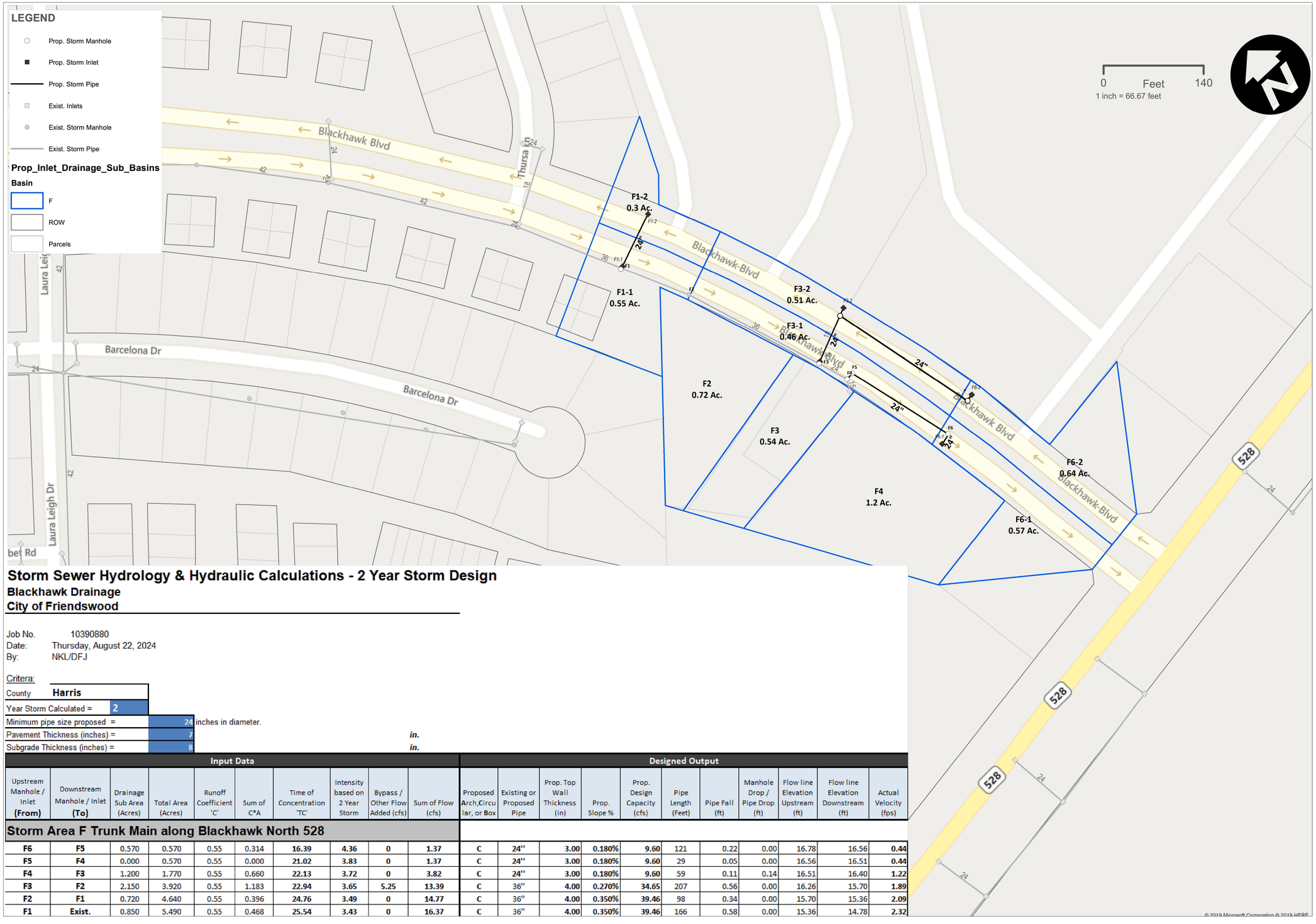
DRAINAGE AREAS AND CALCULATIONS - 2

SHEET NUMBER

SHEET 10A OF 111

FILE NAME

Package B 17-019-8_10 Drainage Areas Map.dwg



Storm Sewer Hydrology & Hydraulic Calculations - 2 Year Storm Design

Blackhawk Drainage
City of Friendswood

Job No. 10390880
Date: Thursday, August 22, 2024
By: NKL/DFJ

Critera:

County	Harris
Year Storm Calculated =	2
Minimum pipe size proposed =	24 inches in diameter.
Pavement Thickness (inches) =	7 *in.*
Subgrade Thickness (inches) =	8 *in.*

Input Data										Designed Output										
Upstream Manhole / Inlet (From)	Downstream Manhole / Inlet (To)	Drainage Sub Area (Acres)	Total Area (Acres)	Runoff Coefficient 'C'	Sum of C*A	Time of Concentration 'TC'	Intensity based on 2 Year Storm	Bypass / Other Flow Added (cfs)	Sum of Flow (cfs)	Proposed Arch,Circular, or Box	Existing or Proposed Pipe	Prop. Top Wall Thickness (in)	Prop. Slope %	Prop. Design Capacity (cfs)	Pipe Length (Feet)	Pipe Fall (ft)	Manhole Drop / Pipe Drop (ft)	Flow line Elevation Upstream (ft)	Flow line Elevation Downstream (ft)	Actual Velocity (fps)
Storm Area F Trunk Main along Blackhawk North 528																				
F6	**F5**	0.570	0.570	0.55	0.314	**16.39**	**4.36**	**0**	**1.37**	**C**	**24"**	**3.00**	**0.180%**	**9.60**	121	0.22	0.00	16.78	16.56	**0.44**
F5	**F4**	0.000	0.570	0.55	0.000	**21.02**	**3.83**	**0**	**1.37**	**C**	**24"**	**3.00**	**0.180%**	**9.60**	29	0.05	0.00	16.56	16.51	**0.44**
F4	**F3**	1.200	1.770	0.55	0.660	**22.13**	**3.72**	**0**	**3.82**	**C**	**24"**	**3.00**	**0.180%**	**9.60**	59	0.11	0.14	16.51	16.40	**1.22**
F3	**F2**	2.150	3.920	0.55	1.183	**22.94**	**3.65**	**5.25**	**13.39**	**C**	36"	**4.00**	**0.270%**	**34.65**	207	0.56	0.00	16.26	15.70	**1.89**
F2	**F1**	0.720	4.640	0.55	0.396	**24.76**	**3.49**	**0**	**14.77**	**C**	36"	**4.00**	**0.350%**	**39.46**	98	0.34	0.00	15.70	15.36	**2.09**
F1	**Exist.**	0.850	5.490	0.55	0.468	**25.54**	**3.43**	**0**	**16.37**	**C**	36"	**4.00**	**0.350%**	**39.46**	166	0.58	0.00	15.36	14.78	**2.32**

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

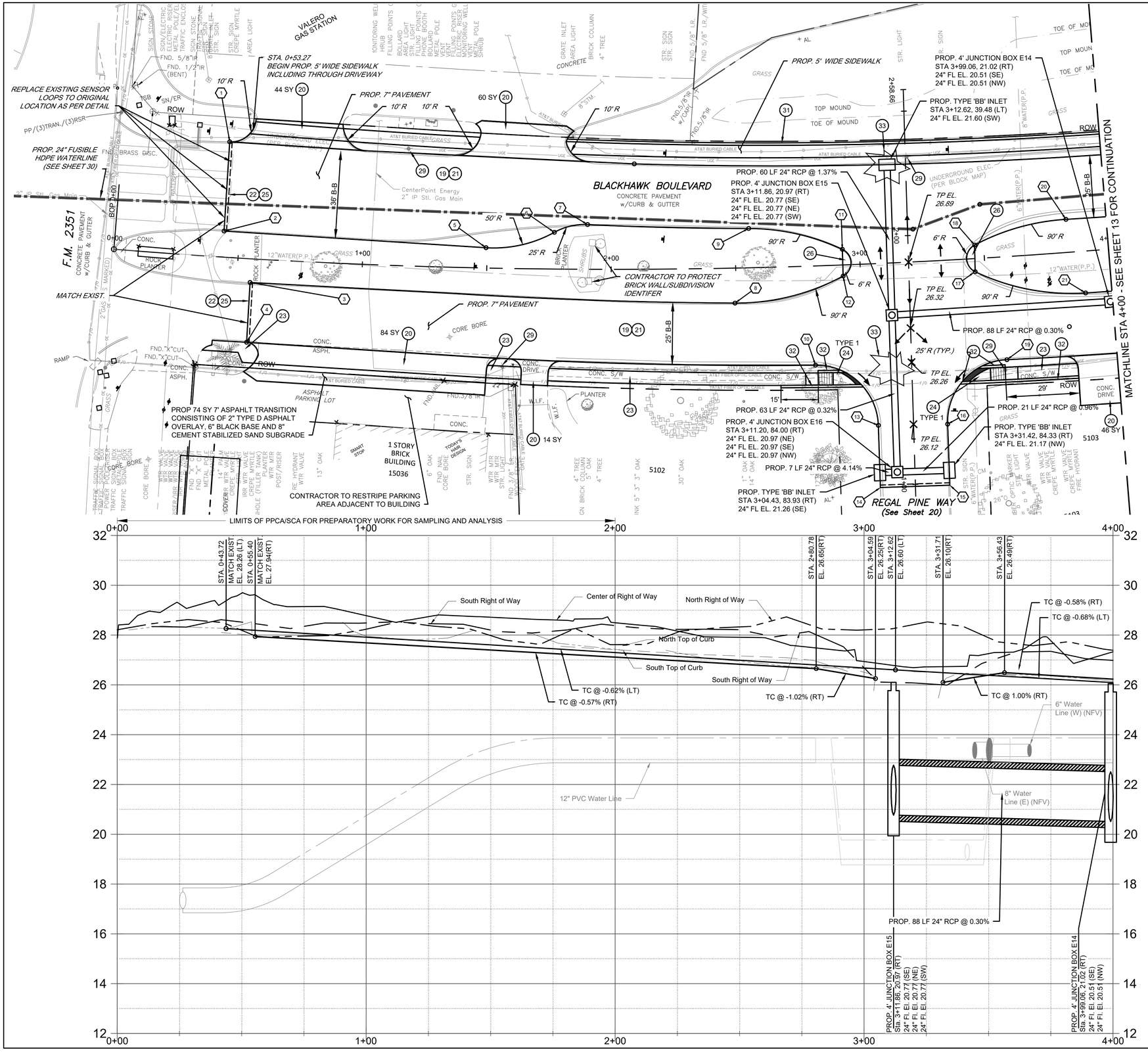
SHEET NAME

Drainage Areas and Calculations - 3

SHEET NUMBER

SHEET 11 OF 111

FILE NAME Package B 17-019-10_11 Drainage Areas Map.dwg



#	STATION	OFFSET	TC ELEV.
1	PI 0+43.72	46.30' LT.	28.26
2	PI 0+43.72	10.41' LT.	29.22
3	PI 0+55.40	9.52' RT.	28.53
4	PI 0+55.40	33.58' RT.	27.94
5	PC 1+49.54	8.16' LT.	28.43
6	PRC 1+77.01	14.76' LT.	28.10
7	PT 1+90.42	17.96 LT.	27.93
8	PC 2+49.45	14.07' RT.	27.49
9	PC 2+55.57	15.79' RT.	27.50
10	ER 2+80.78	39.85' RT	26.65
11	PCC 2+93.09	6.28' LT	27.43
12	PCC 2+93.02	4.44' RT.	27.43
13	ER 3+04.59	64.93' RT.	26.25
14	PI 3+04.38	89.93' RT.	26.15
15	PI 3+31.31	90.33' RT.	26.00
16	ER 3+31.71	65.78' RT.	26.10
17	PCC 3+45.99	5.29' RT.	27.10
18	PCC 3+46.38	5.43' LT.	27.10
19	ER 3+56.43	41.32' RT.	26.49
20	PC 3+83.82	13.28' LT.	26.71
21	PC 3+89.48	16.80' RT	26.95

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6'-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR
Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

FOR WATER LINE, SEE SHEET 25

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 0+00 to Sta. 4+00

SCALE

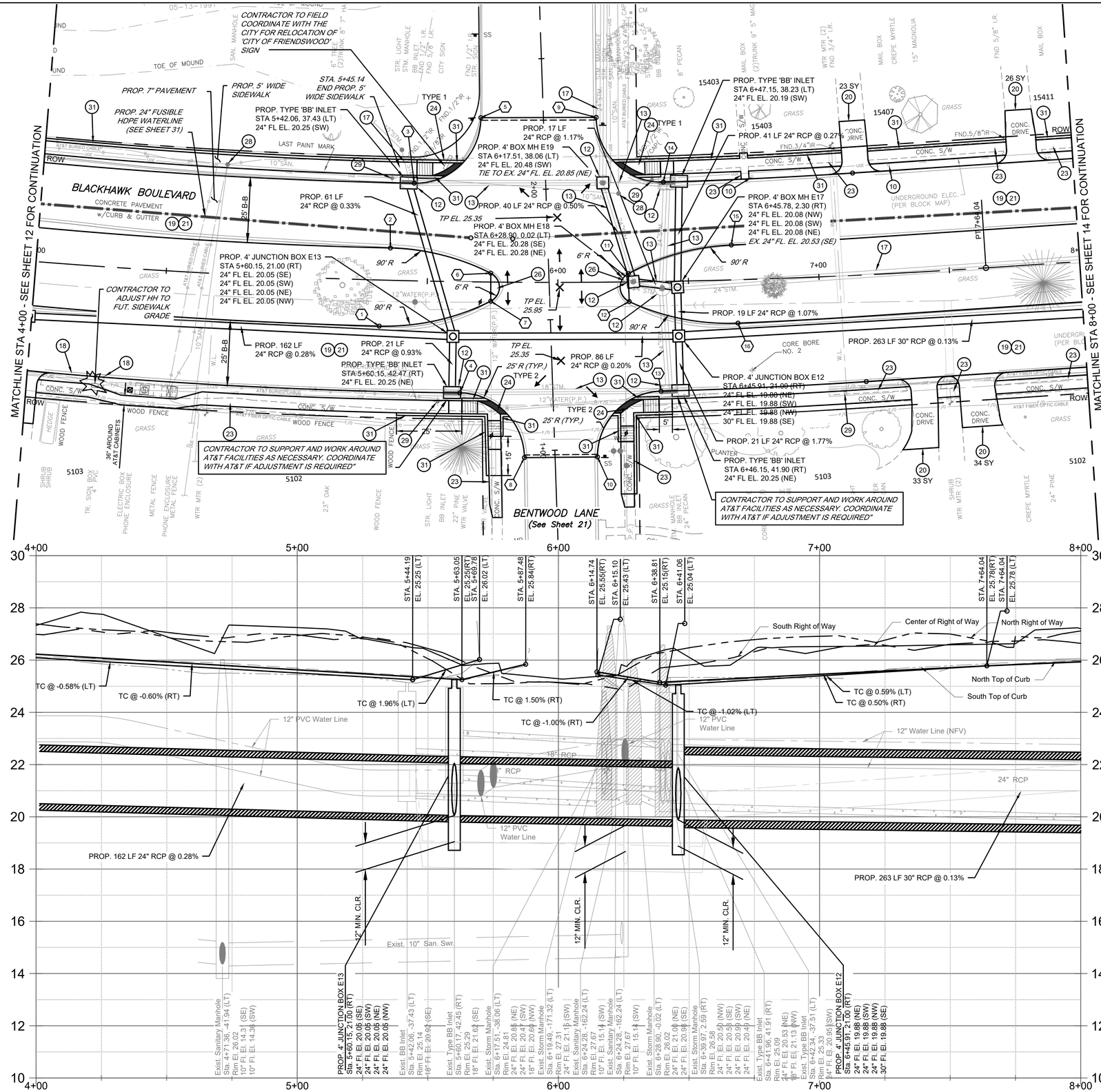
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 12 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PT 5+32.06	17.64' RT.	25.97
2	PT 5+35.56	12.37' LT.	25.82
3	ER 5+44.19	37.38' LT.	25.25
4	ER 5+63.05	42.56' RT.	25.25
5	ER 5+69.78	62.89' LT.	26.02
6	PCC 5+74.25	3.39' LT.	26.19
7	PCC 5+74.37	7.33' RT.	26.19
8	ER 5+87.48	67.12' RT.	25.84
9	ER 6+15.10	63.11' LT.	25.43
10	ER 6+14.74	66.91' RT.	25.55
11	PCC 6+27.01	3.19' LT.	26.29
12	PCC 6+27.25	7.53' RT.	26.21
13	ER 6+38.81	41.99' RT.	25.25
14	ER 6+41.06	38.04' LT.	25.19
15	PC 6+66.79	13.37' LT.	25.83
16	PC 6+68.50	16.61' RT.	25.90

HDR

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Registration No. F-754

HDR Engineering, Inc.

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Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION. SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

FOR WATER LINE, SEE SHEET 26

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER
03-02-2026

SHEET NAME

Blackhawk Blvd
Sta. 4+00 to Sta. 8+00

SCALE

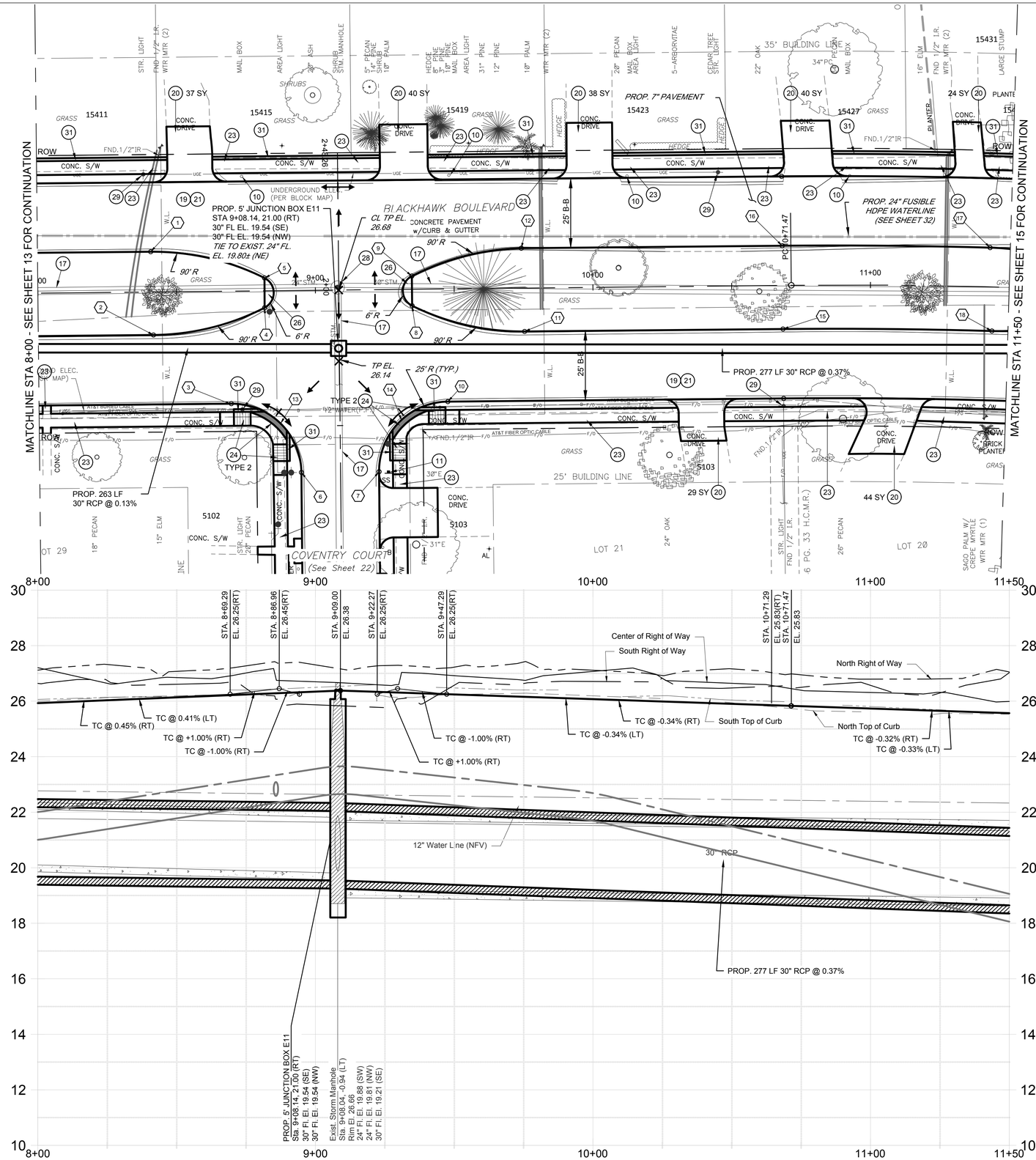
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 13 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PT 8+40.80	14.51' LT.	26.62
2	PT 8+41.49	15.49' RT.	26.62
3	ER 8+69.29	40.52' RT.	26.25
4	PCC 8+81.64	6.08' RT.	27.00
5	PCC 8+81.70	4.63' LT.	27.00
6	ER 8+94.27	65.54' RT.	26.25
7	ER 9+22.27	65.57' RT.	26.25
8	PCC 9+34.79	5.94' RT.	27.02
9	PCC 9+34.80	4.78' LT.	27.02
10	ER 9+47.29	40.59' RT.	26.25
11	PC 9+75.21	15.62' RT.	26.67
12	PC 9+75.21	15.62' RT.	26.67
13	PC 8+86.96	47.86' RT.	26.45
14	PC 9+29.61	47.90' RT.	26.45
15	PT 10+68.32	15.72' RT.	26.35
16	PT 10+68.35	14.28' LT.	26.35
17	PC 11+42.74	14.12' LT.	26.11
18	PC 11+44.17	15.89' RT.	26.11

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6"-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

FOR WATER LINE, SEE SHEET 27

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 8+00 to Sta. 11+50

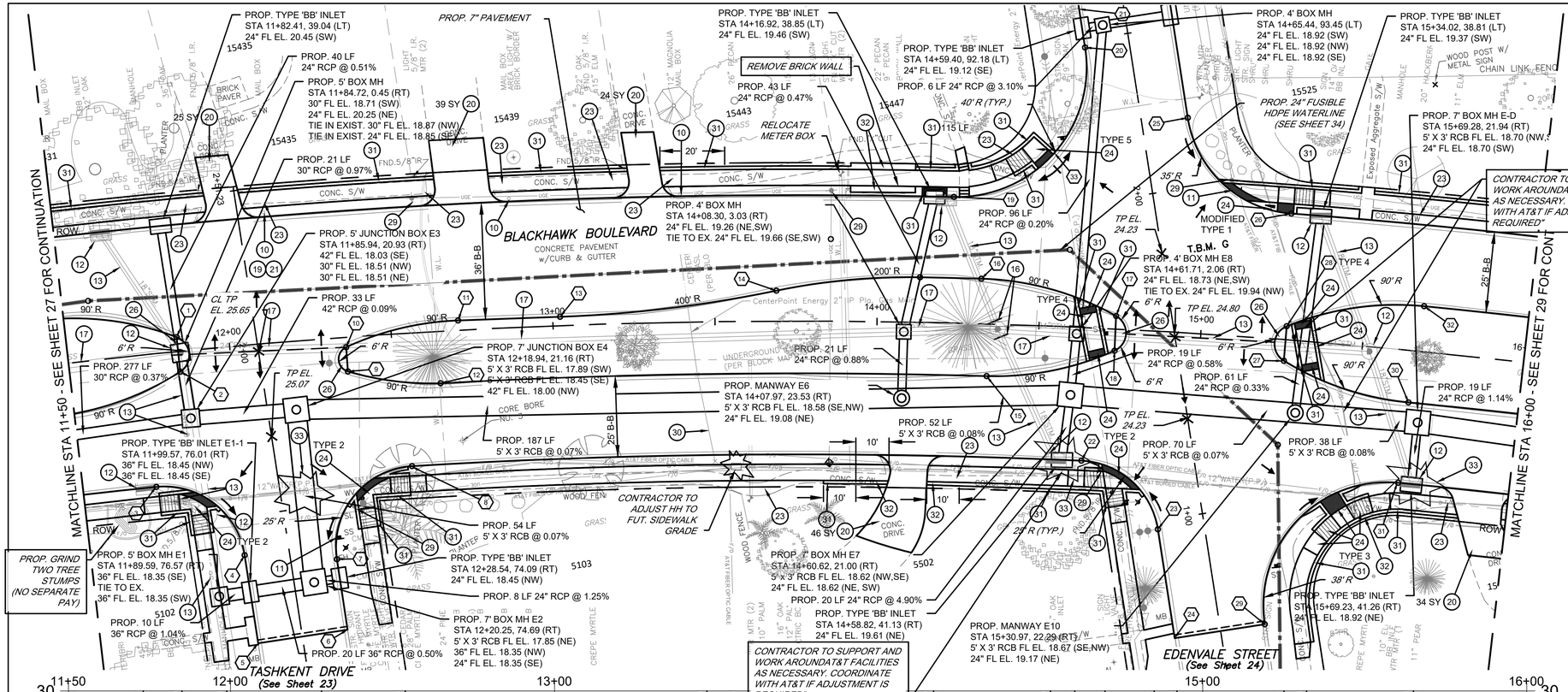
SCALE

0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 14 OF 111

FILE NAME Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PCC 11+83.98	4.41' LT.	26.18
2	PCC 11+84.07	6.31' RT.	26.18
3	ER 11+73.04	40.94' RT.	25.50
4	ER 11+98.81	64.53' RT.	24.73
5	PI 12+00.63	91.97' RT.	24.53
6	PI 12+29.81	90.05' RT.	24.54
7	ER 12+28.07	68.11' RT.	24.69
8	ER 12+53.89	41.06' RT.	25.09
9	PCC 12+35.86	10.59' RT.	25.87
10	PCC 12+35.84	3.10' RT.	26.04
11	PC 12+70.82	2.99' LT.	25.73
12	PC 12+64.32	16.07' RT.	25.56
13	PRC 13+02.28	2.70' LT.	25.57
14	PRC 13+68.98	9.40' LT.	25.00
15	PT 14+34.30	16.13' RT.	24.81
16	PT 14+31.80	13.87' LT.	24.58
17	PCC 14+73.61	3.99' LT.	25.14
18	PCC 14+73.66	6.73' RT.	25.14
19	ER 14+22.80	38.87' LT.	23.96
20	ER 14+60.52	86.30' LT.	23.96
21	PI 14+58.28	98.07' LT.	24.12
22	ER 14+64.95	41.12' RT.	24.19
23	ER 14+90.26	61.02' RT.	24.59
24	PI 14+97.76	94.26' RT.	24.81
25	ER 14+92.05	66.26' LT.	24.44
26	ER 15+25.06	38.93' LT.	23.94
27	PCC 15+26.19	6.55' RT.	25.02
28	PCC 15+26.26	4.17' LT.	25.02
29	ER 15+26.51	88.05' RT.	24.58
30	PC 15+67.77	13.98' LT.	24.44
31	ER 15+65.01	41.02' RT.	23.92
32	PC 15+67.77	13.98' LT.	24.63
33	POC 14+52.67	53.43' LT.	24.36

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

FOR WATER LINE, SEE SHEET 28

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS — NGOC KIM LE — 102192 — LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 11+50 to Sta. 16+00

SCALE: 0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 15 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

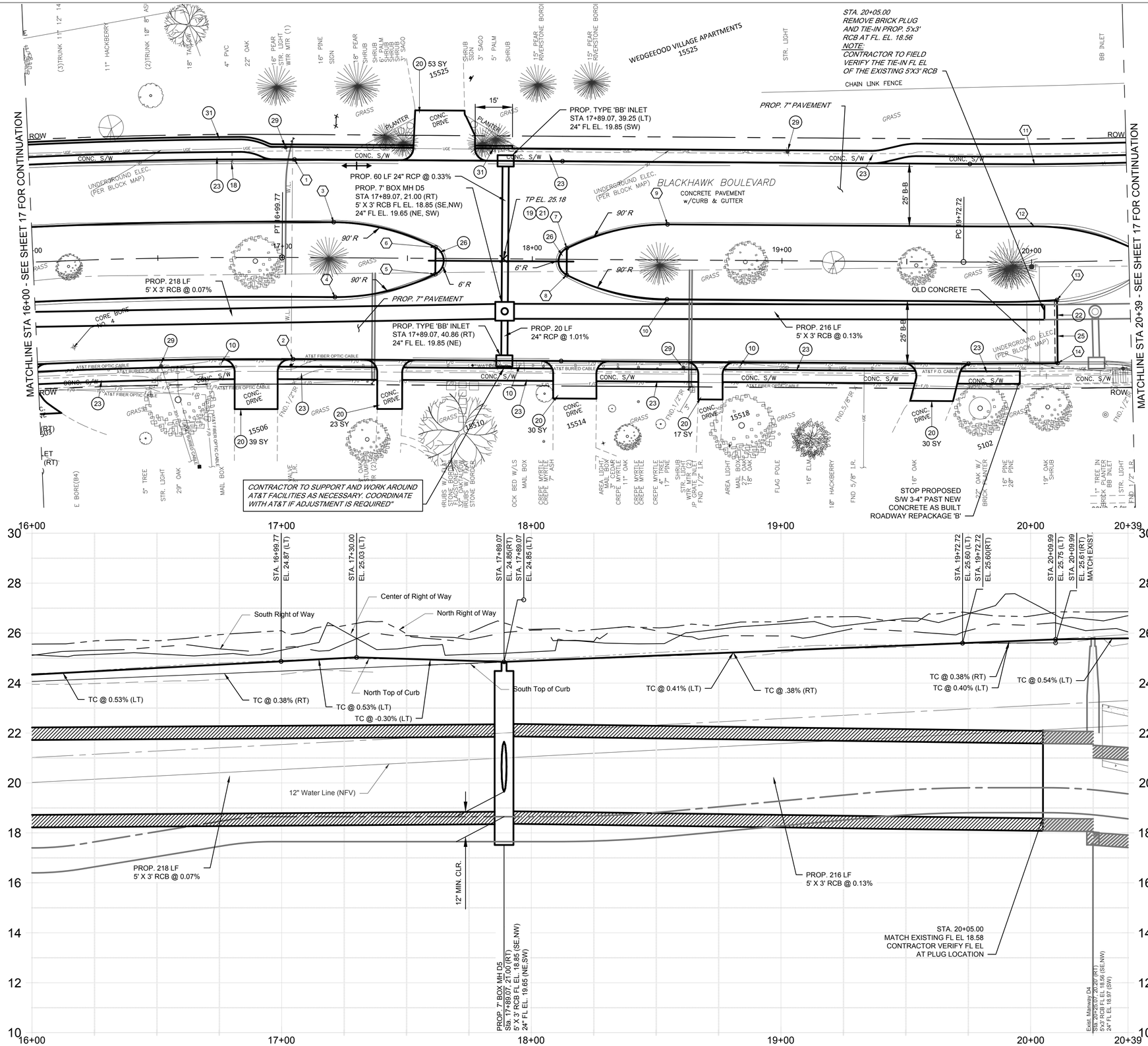
4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL



#	STATION	OFFSET	TC ELEV.
1	PT 17+04.47	39.24' LT.	24.99
2	PT 17+04.47	40.76' RT.	24.50
3	PT 17+20.33	14.24' LT.	25.50
4	PT 17+21.04	15+76' RT.	25.09
5	PCC 17+61.19	6.30' RT.	25.44
6	PCC 17+61.24	4.41' LT.	25.64
7	PCC 18+13.79	4.46' LT.	25.68
8	PCC 18+13.83	6.26' RT.	25.68
9	PC 18+54.06	14.25' LT.	25.64
10	PC 18+54.06	15.75' RT.	25.64
11	PC 20+01.45	39.13' LT.	25.75
12	PC 20+01.16	14.23' LT.	26.26
13	PC 20+09.99	15.32' RT.	26.11 (MATCH EXIST.)
14	PC 20+09.99	40.59' RT.	25.61 (MATCH EXIST.)

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
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12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
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16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6"-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

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Houston, Texas 77081
P 713.622.9264 F 713.622.9265
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

FOR WATER LINE, SEE SHEET 29

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 16+00 to Sta. 20+39

SCALE

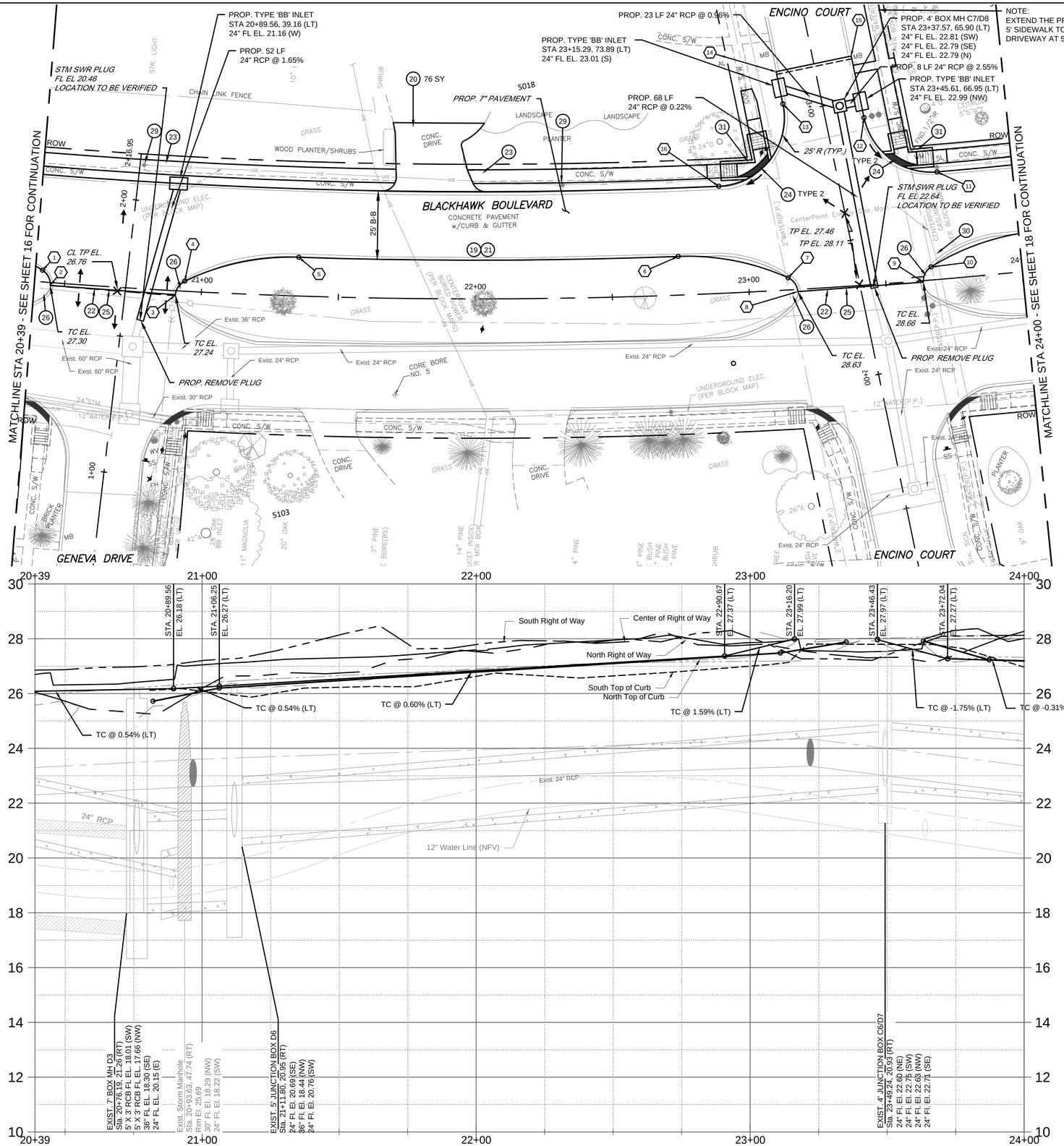
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 16 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PCC 20+41.40	4.01' LT.	26.19
2	ER 20+45.00	1.06' LT.	27.30
3	ER 20+90.57	1.46' LT.	27.24
4	PCC 20+93.72	3.69' LT.	26.92
5	PC 21+33.56	15.86' LT.	26.95
6	PT 22+74.55	14.12' LT.	27.79
7	PCC 23+14.47	4.44' LT.	28.18
8	ER 23+17.80	0.78' LT.	28.63
9	ER 23+63.82	0.53' LT.	28.66
10	PCC 23+66.96	5.94' LT.	28.34
11	ER 23+72.04	39.15' LT.	27.27
12	ER 23+46.43	61.01' LT.	27.97
13	ER 23+14.37	79.82' LT.	27.99
14	PI 23+16.20	67.95' LT.	28.03
15	PI 23+43.26	83.77' LT.	28.06
16	ER 22+90.67	39.12' LT.	27.37

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6"-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

FOR WATER LINE, SEE SHEET 37

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 20+39 to Sta. 24+00

SCALE

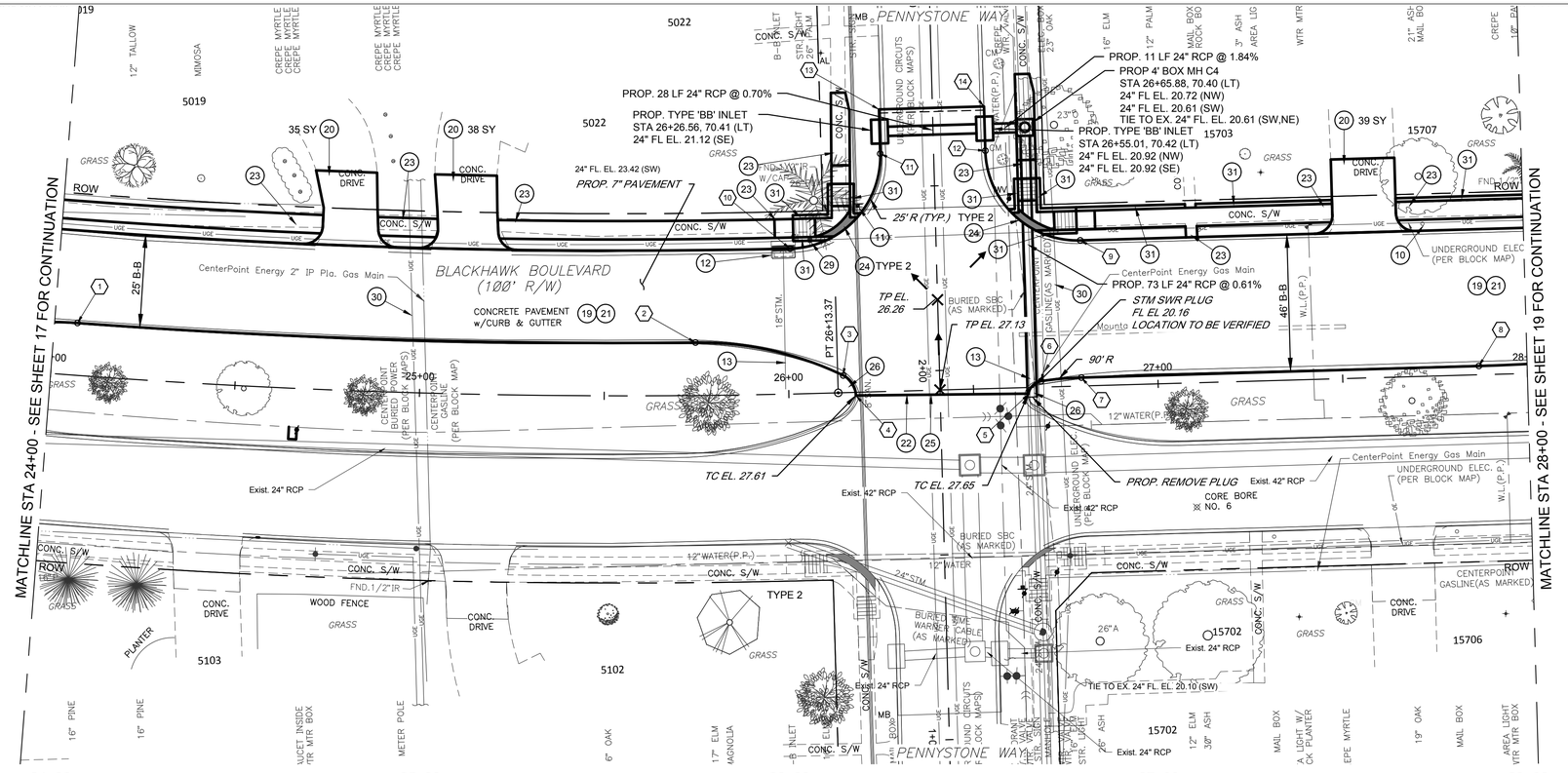
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1" = 2' - V

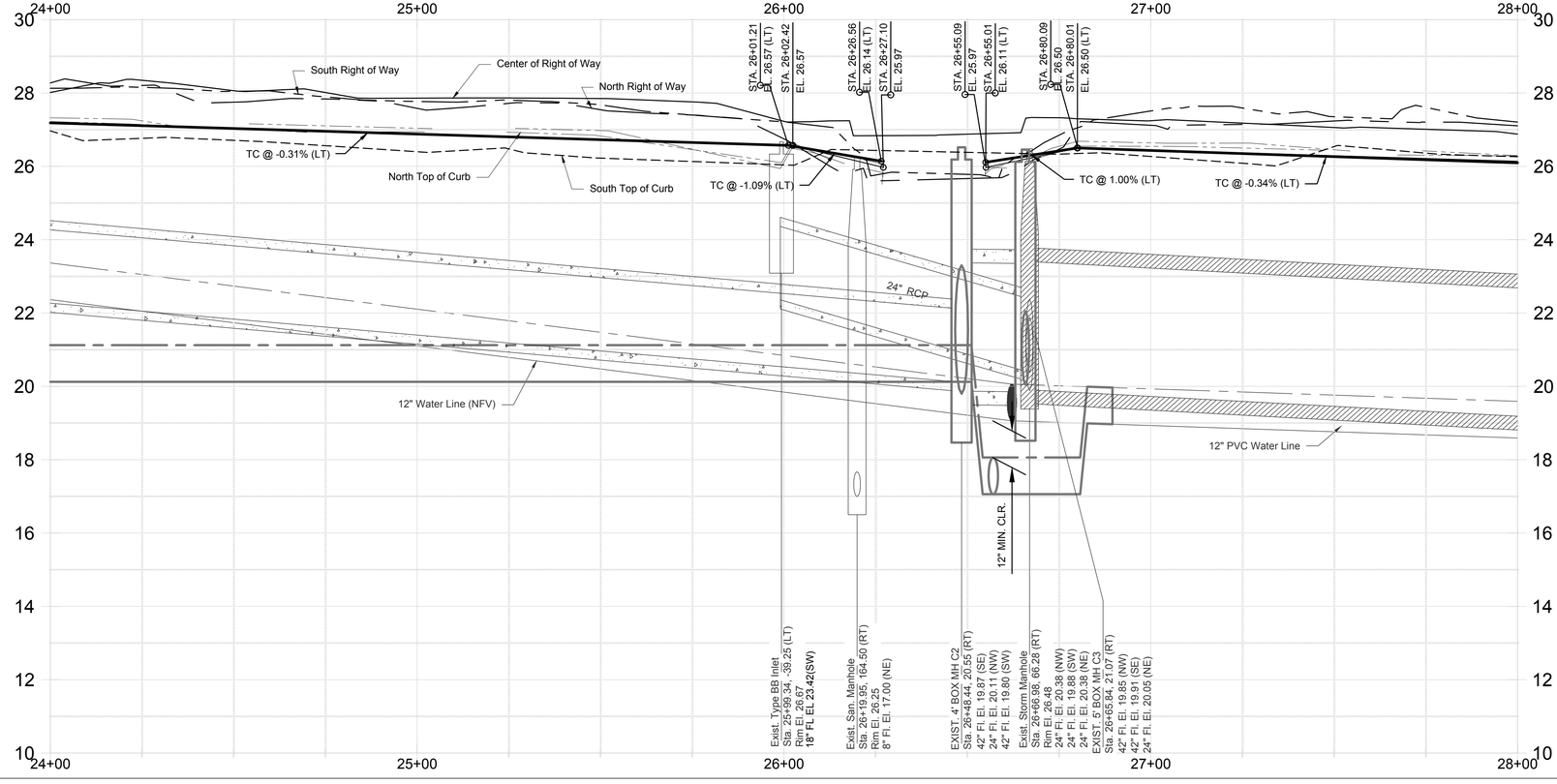
SHEET NUMBER

SHEET 17 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg





#	STATION	OFFSET	TC ELEV.
1	PC 24+06.22	14.17' LT.	27.70
2	PT 25+74.85	14.34' LT.	27.16
3	PCC 26+14.85	4.67' LT.	27.30
4	ER 26+18.13	0.84' LT.	27.61
5	ER 26+64.89	1.67' LT.	27.65
6	PCC 26+68.33	1.61' LT.	27.28
7	PC 26+79.28	2.28' LT.	27.25
8	PT 27+86.93	2.37' LT.	26.93
9	ER 26+80.01	39.42' LT.	26.50
10	ER 26+01.21	39.38' LT.	26.57
11	ER 26+26.56	64.41' LT.	26.14
12	ER 26+55.01	64.42' LT.	26.11
13	ER 26+27.10	65.63' LT.	26.10
14	PI 26+55.01	76.41' LT.	26.04

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
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16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE, UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6'-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

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Registration No. F-754

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

FOR WATER LINE, SEE SHEET 38

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 24+00 to Sta. 28+00

SCALE

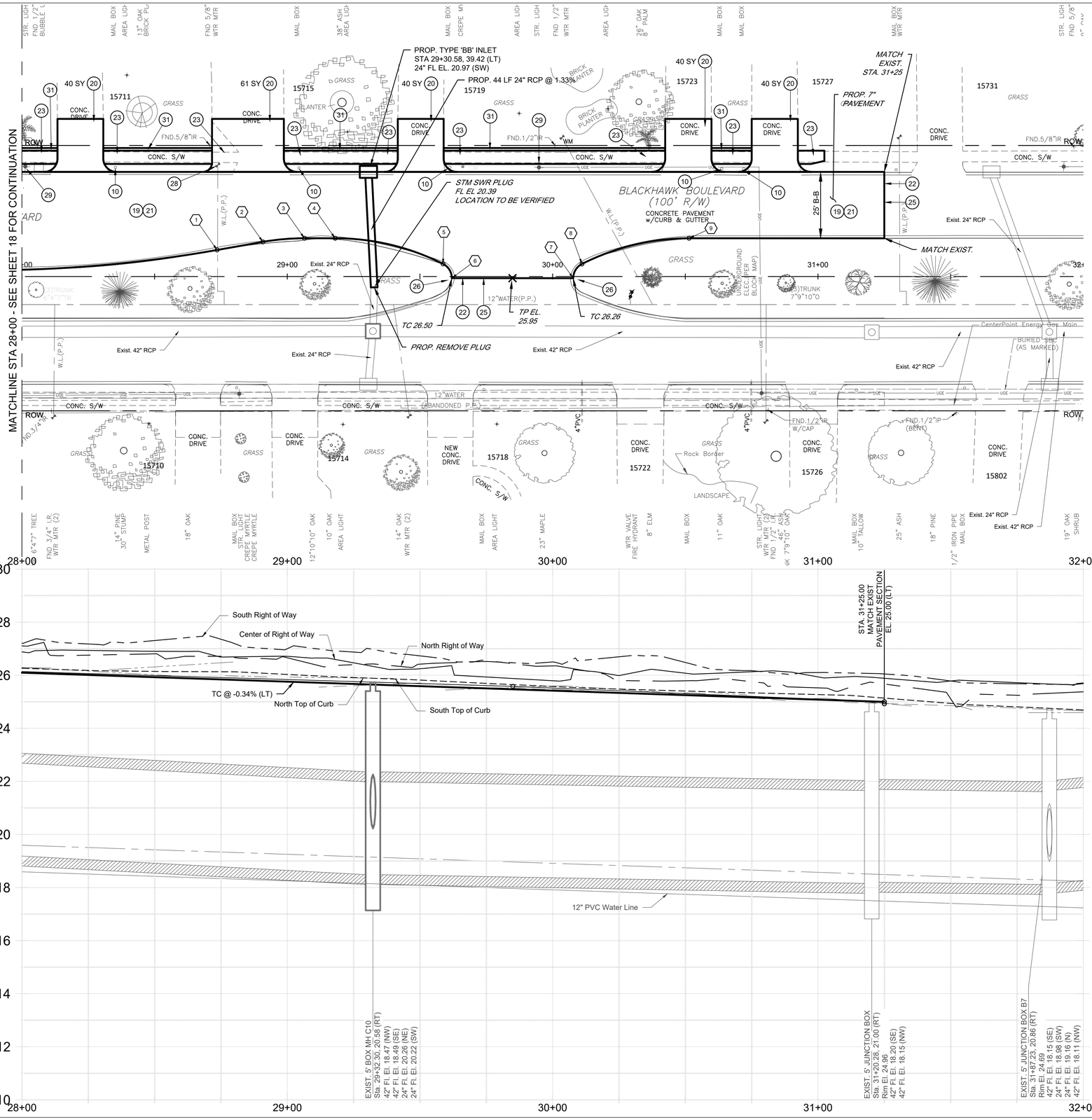
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1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 18 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PRC 28+73.73	10.03' LT.	26.35
2	PCC 28+90.80	13.05' LT.	26.24
3	PT 29+06.47	14.42' LT.	26.17
4	PC 29+18.04	14.42' LT.	26.14
5	PCC 29+58.71	4.75' LT.	26.36
6	ER 29+61.90	0.61' RT.	26.26
7	ER 37+77.00	39.95' LT.	26.50
8	PCC 30+11.06	4.73' LT.	26.16
9	PC 30+51.42	14.42' LT.	25.78

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
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17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6'-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 28+00 to Sta. 32+00

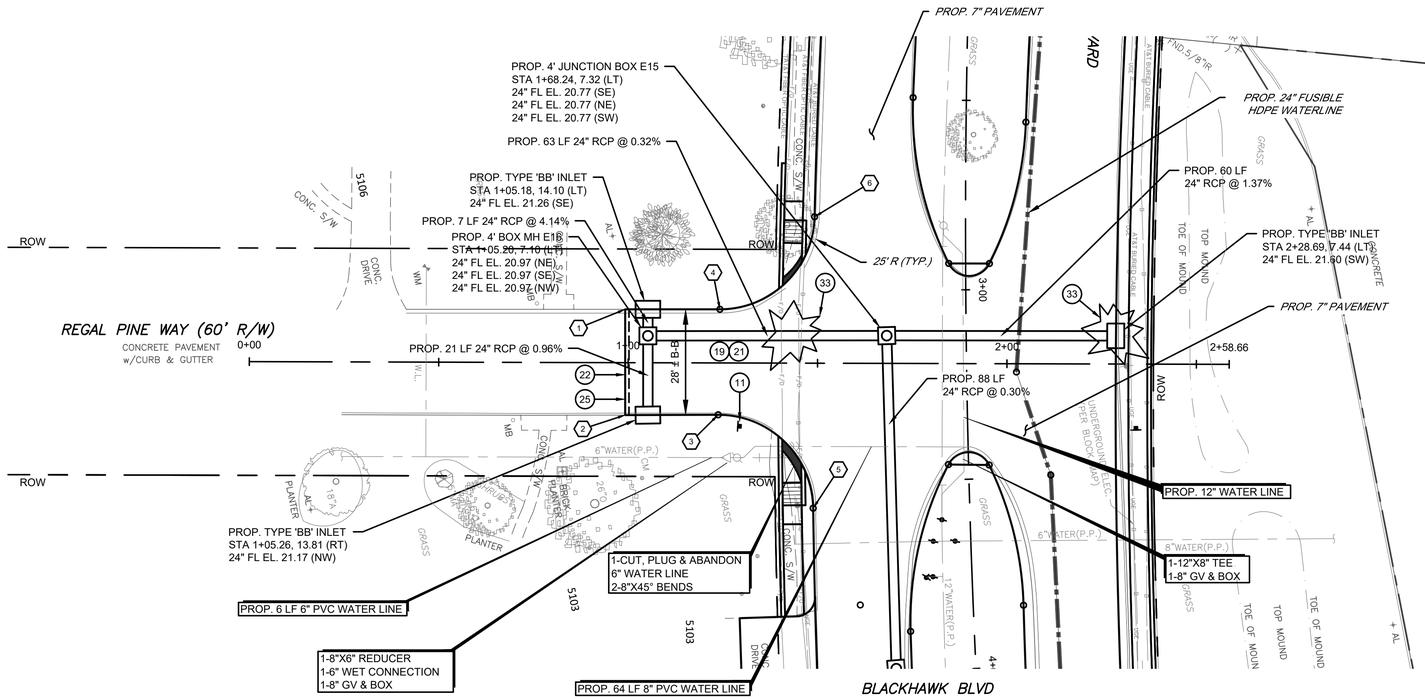
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1" = 20' - H
1" = 2' - V

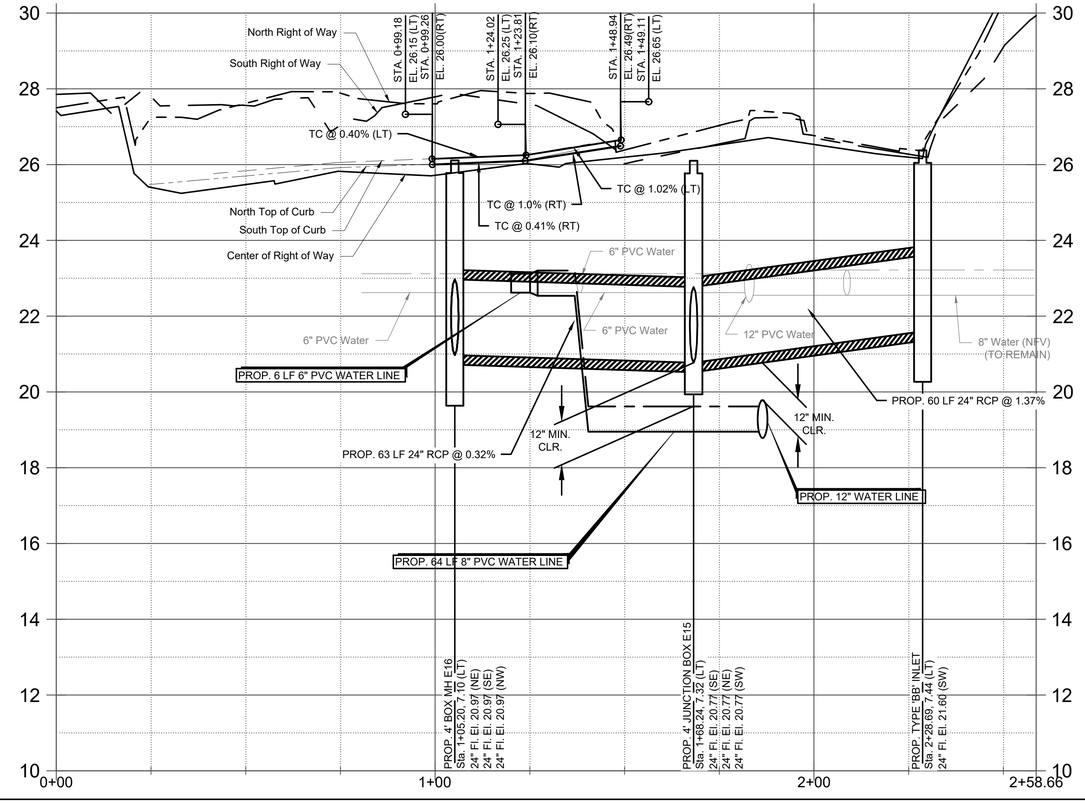
SHEET NUMBER

SHEET 19 OF 111

FILE NAME



#	STATION	OFFSET	TC ELEV.
1	PI 0+99.18	14.08' LT.	26.18
2	PI 0+99.26	13.83' RT.	26.00
3	ER 1+23.81	13.69' RT.	26.10
4	ER 1+24.02	14.15' LT.	26.25
5	ER 1+48.94	38.27' RT.	26.49
6	ER 1+49.11	38.63' LT.	26.65



KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES).
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

Ngoc Kim Le
03-02-2026

SHEET NAME

Regal Pine Way
Sta. 0+00 To Sta. 2+58.66

SCALE

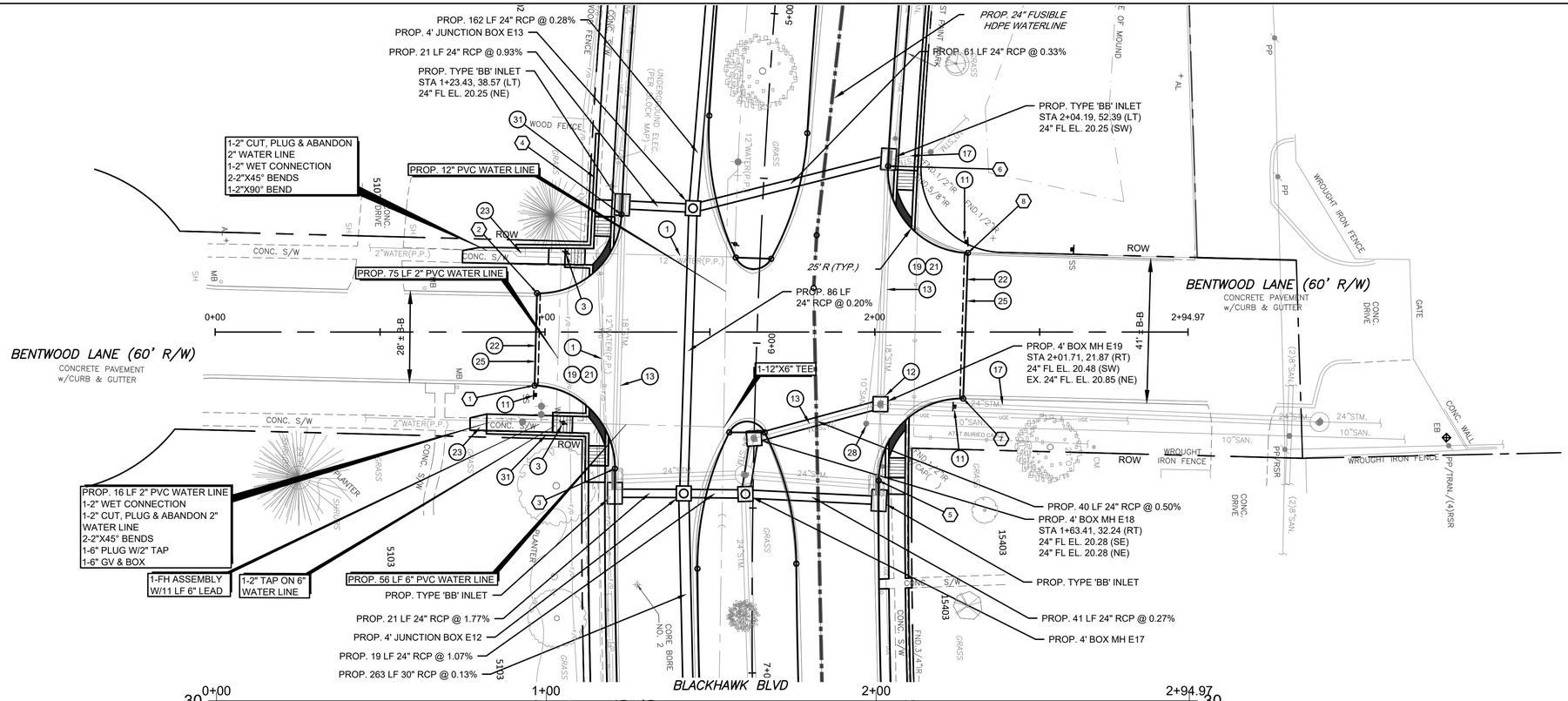
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1" = 2' - V

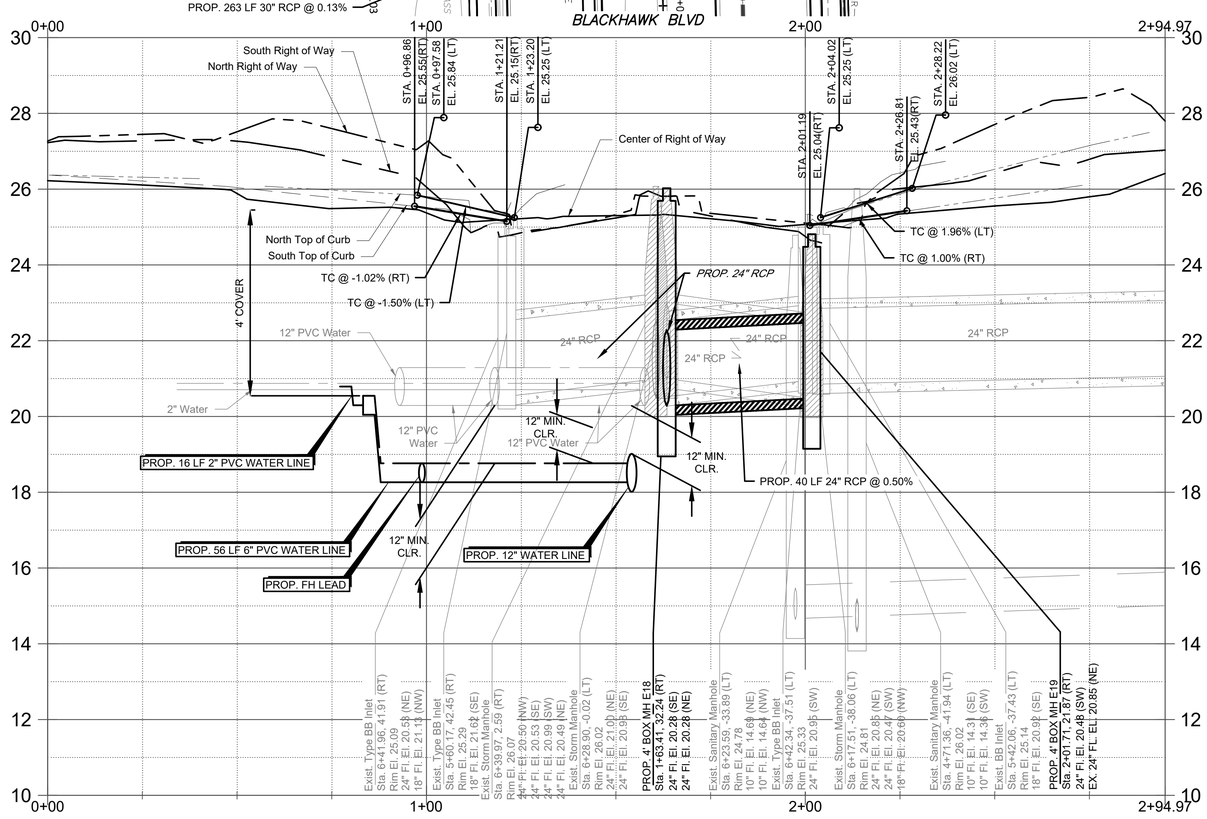
SHEET NUMBER

SHEET 20 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg





#	STATION	OFFSET	TC ELEV.
1	ER 0+96.86	16.23' RT.	25.55
2	ER 0+97.58	11.76' LT.	25.84
3	ER 1+21.21	41.40' RT.	25.25
4	ER 1+23.20	35.63' LT.	25.25
5	ER 2+01.19	45.05' RT.	25.19
6	ER 2+04.02	50.30' LT.	25.25
7	ER 2+26.81	20.19' RT.	25.43
8	ER 2+28.22	23.96' LT.	26.02

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
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20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
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29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.

50. CAUTION: GAS LINES EXISTS IN AREA OF WORK

51. 6"-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Bentwood Lane
Sta. 0+00 to Sta. 2+94.97

SCALE

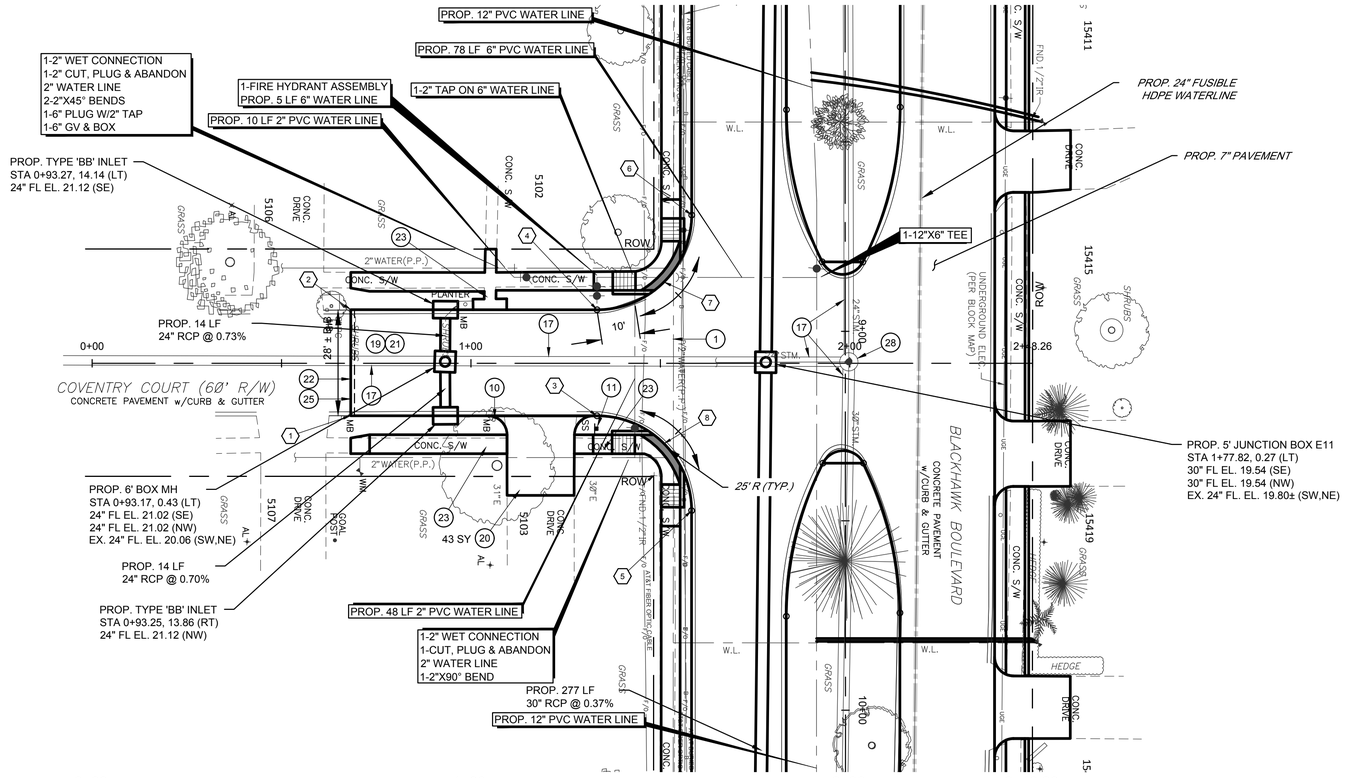
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SHEET NUMBER

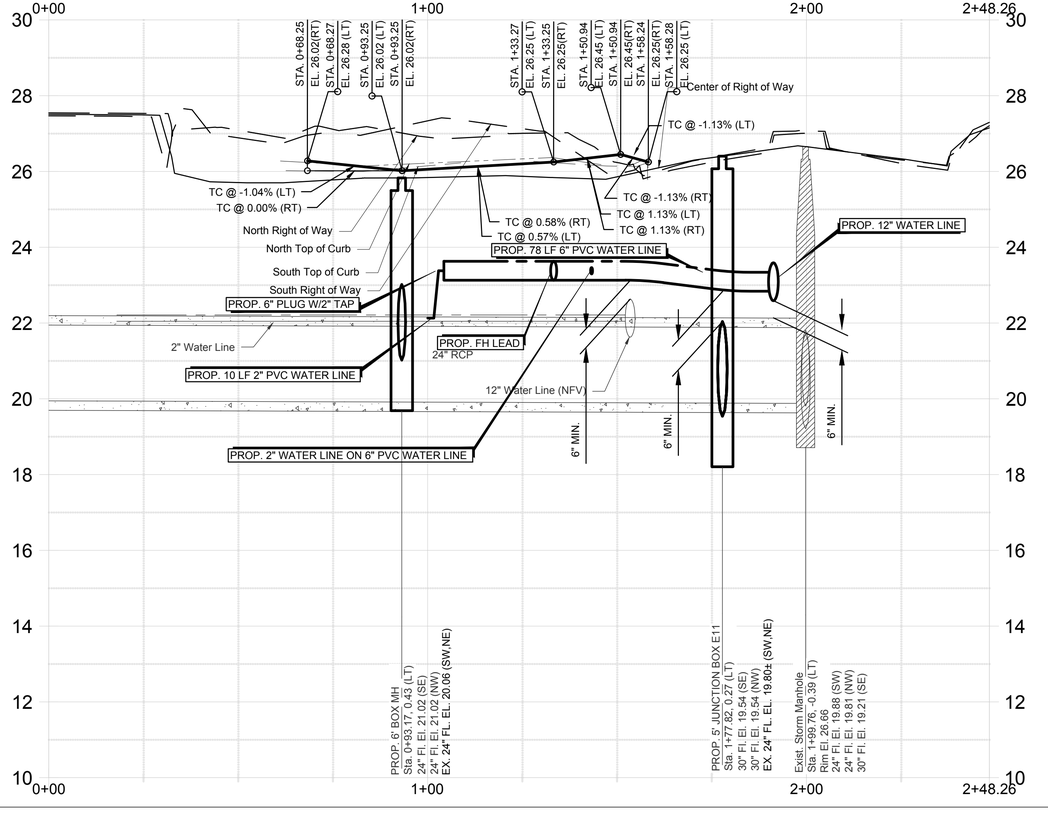
SHEET 21 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PI 0+68.25	13.85' RT.	26.02
2	PI 0+68.27	14.15' LT.	26.28
3	ER 1+33.25	13.88' RT.	26.25
4	ER 1+33.27	14.12' LT.	26.25
5	ER 1+58.24	38.89' RT.	26.25
6	ER 1+58.28	39.11' LT.	26.25
7	ER 1+50.94	21.44' LT.	26.45
8	ER 1+50.94	21.21' RT.	26.45



KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
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8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
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11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE, UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Coventry Court
Sta. 0+00 to Sta. 2+48.26

SCALE

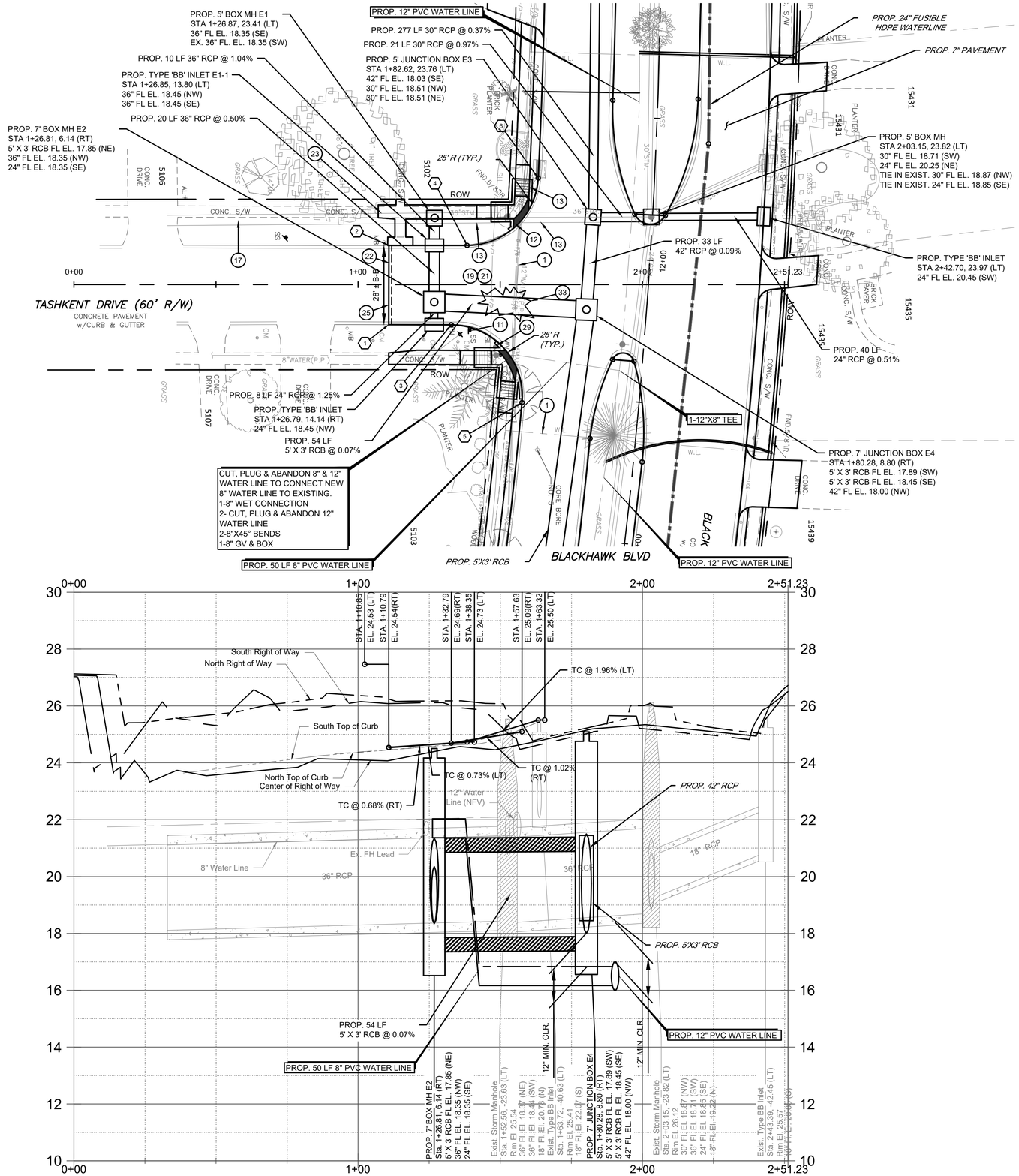
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1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 22 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PI 1+10.79	14.10' RT.	24.54
2	PI 1+10.85	13.80' LT.	24.53
3	ER 1+32.79	14.15' RT.	24.69
4	ER 1+38.35	13.80' LT.	24.73
5	ER 1+57.63	41.45' RT.	25.09
6	ER 1+63.32	37.50' LT.	25.50

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Tashkent Drive
Sta. 0+00 To Sta. 2+51.23

SCALE

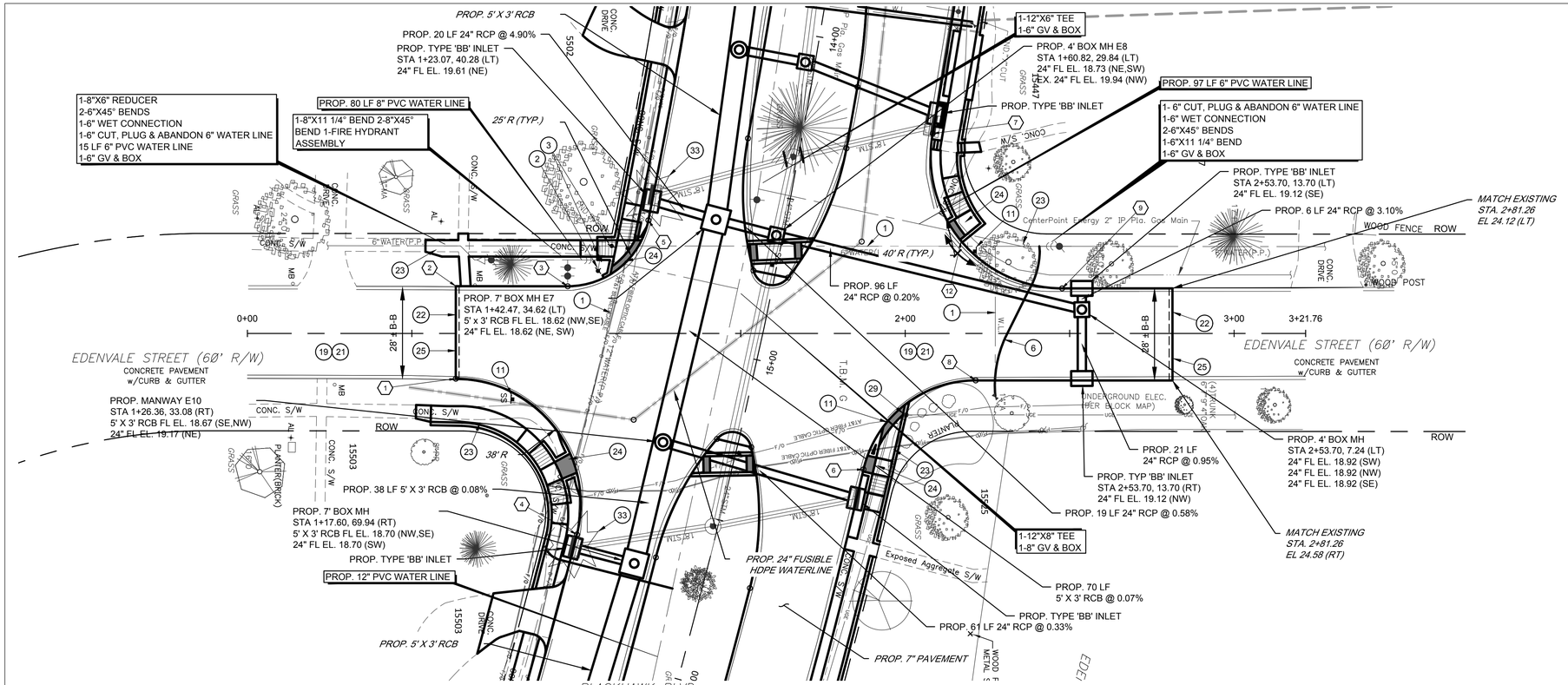
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1" = 20' - H
1" = 2' - V

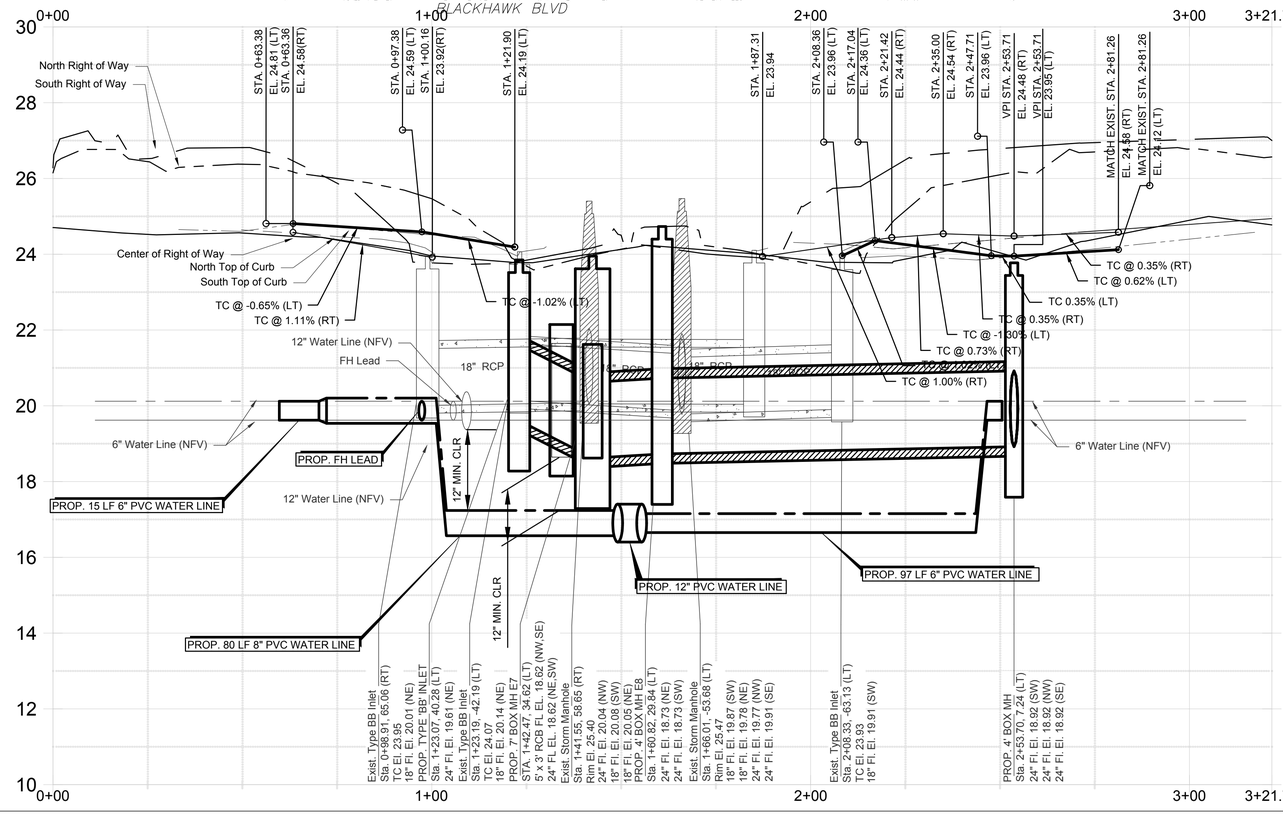
SHEET NUMBER

SHEET 23 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg





#	STATION	OFFSET	TC ELEV.
1	ER 0+63.36	13.76' RT.	24.58
2	PI 0+63.38	14.36' LT.	24.81
3	ER 0+97.38	14.34' LT.	24.59
4	ER 1+00.16	61.12' RT.	23.92
5	ER 1+21.90	34.40' LT.	24.19
6	ER 1+87.31	41.34' RT.	23.94
7	ER 2+08.36	60.77' LT.	23.96
8	ER 2+21.42	14.28' RT.	24.44
9	ER 2+47.71	13.70' LT.	23.96
12	2+17.04	28.05' LT.	24.36

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER; PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6'-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Edenvale Street
Sta. 0+00 To Sta. 3+21.76

SCALE

0 10 20 30 40

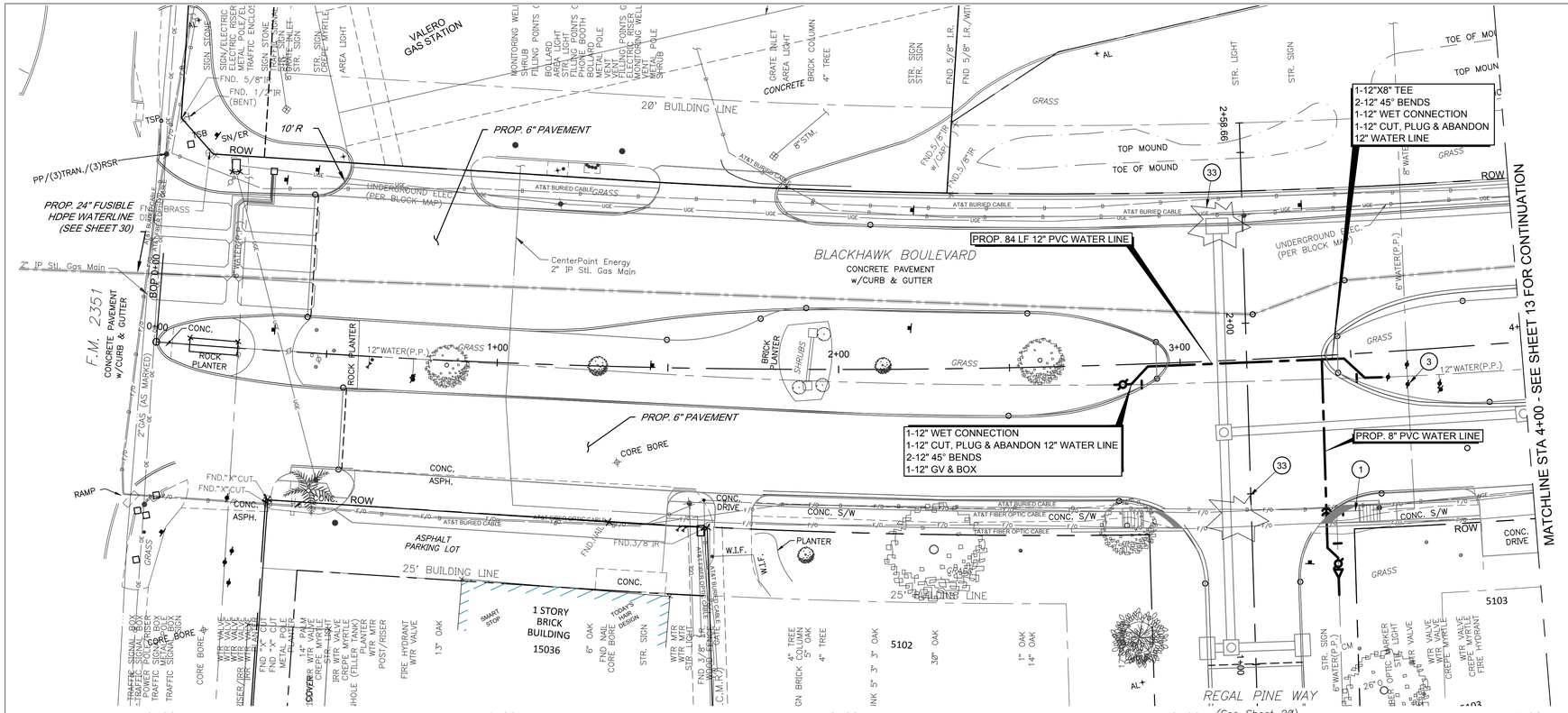
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1" = 2' - V

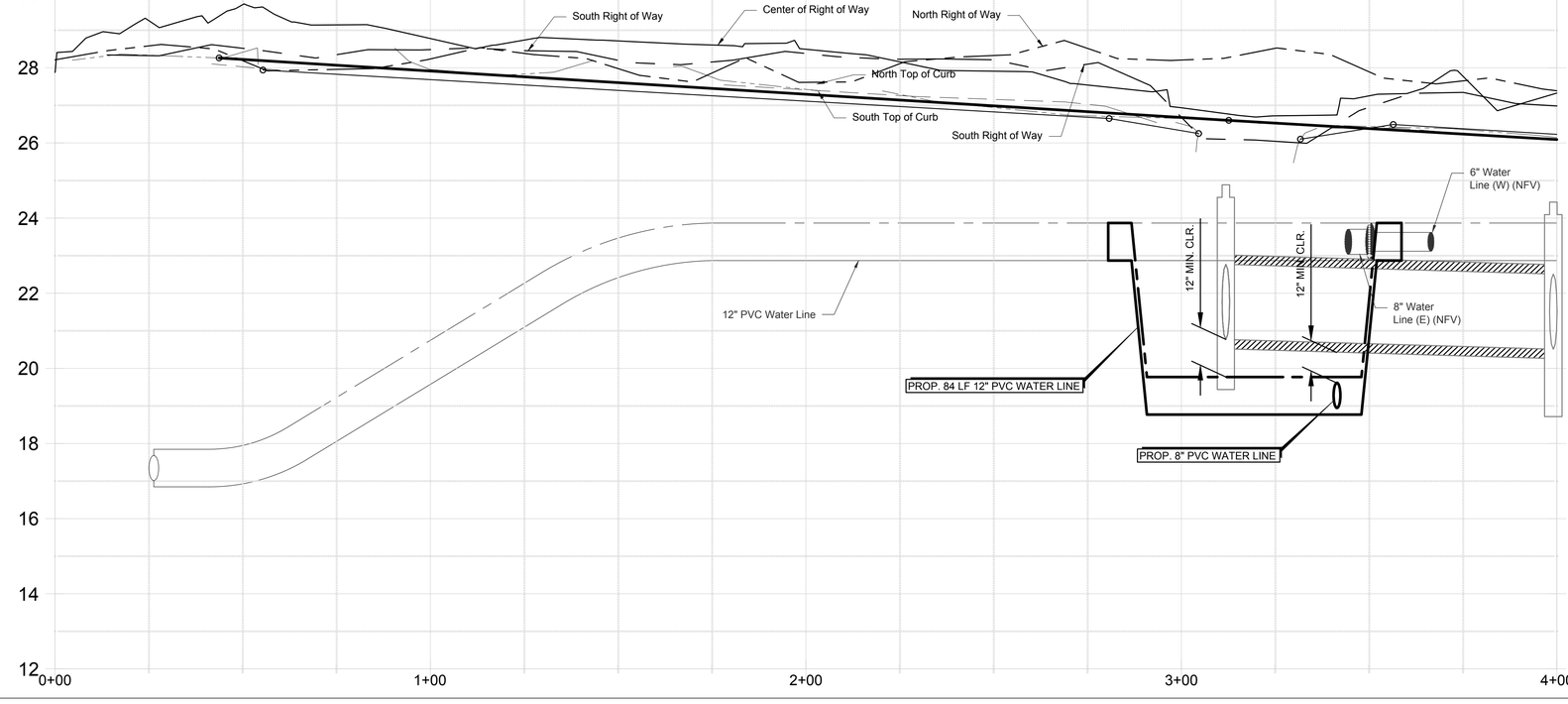
SHEET NUMBER

SHEET 24 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg





KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

PROPOSED WATER LINE TO BE INSTALLED BY TRENCHLESS METHOD. REFER TO TREE PROTECTION PLANS FOR LOCATIONS OF TREE PROTECTION FENCING. NO BORE PITS WITHIN FENCING AREAS.

FOR PAVING & DRAINAGE, SEE SHEET 12

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 0+00 to Sta. 4+00
(Water)

SCALE

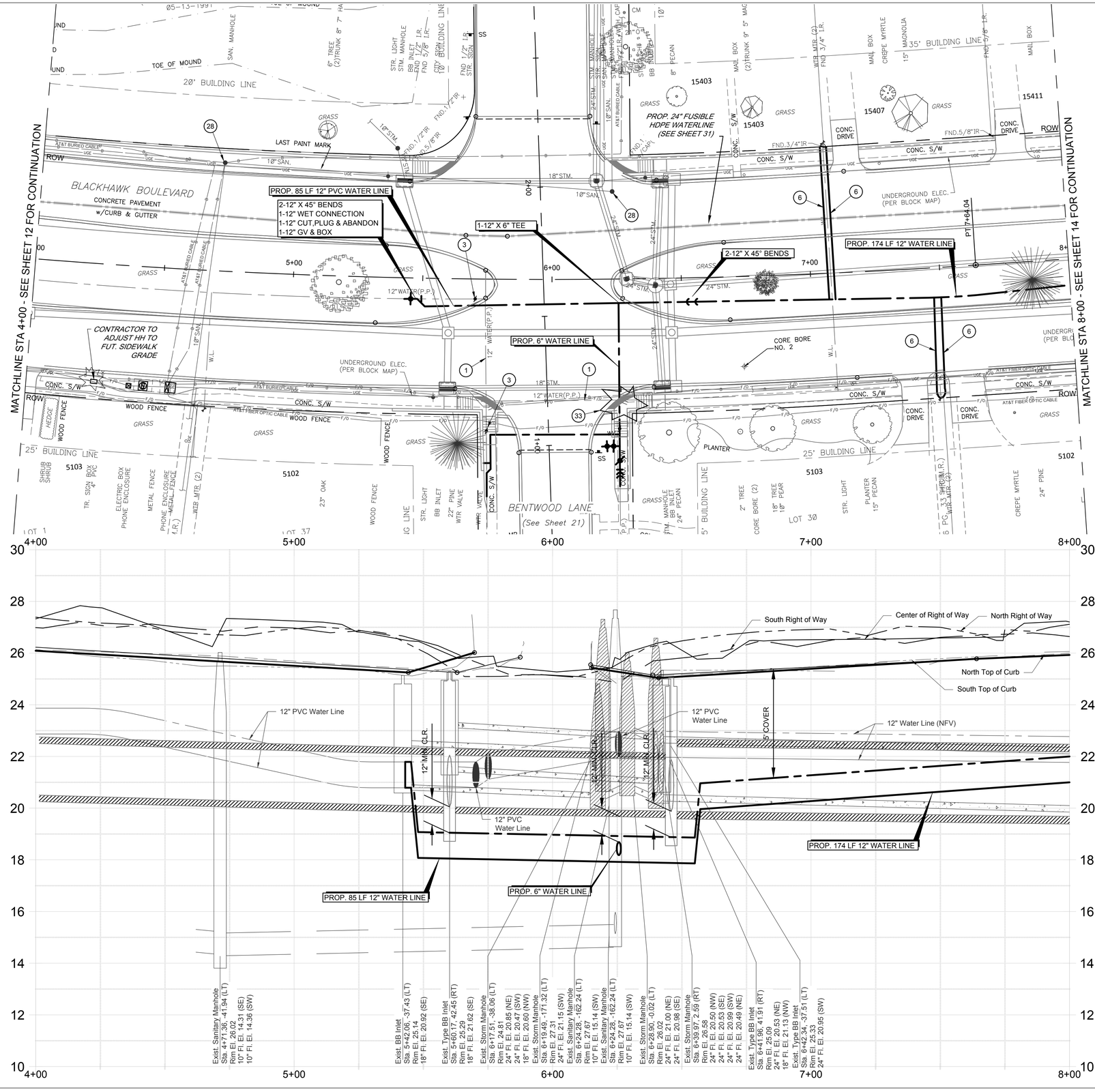
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1" = 2' - V

SHEET NUMBER

SHEET 25 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

PROPOSED WATER LINE TO BE INSTALLED BY TRENCHLESS METHOD. REFER TO TREE PROTECTION PLANS FOR LOCATIONS OF TREE PROTECTION FENCING. NO BORE PITS WITHIN FENCING AREAS.

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6"-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

FOR PAVING & DRAINAGE, SEE SHEET 13

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd
Sta. 4+00 to Sta. 8+00
(Water)

SCALE

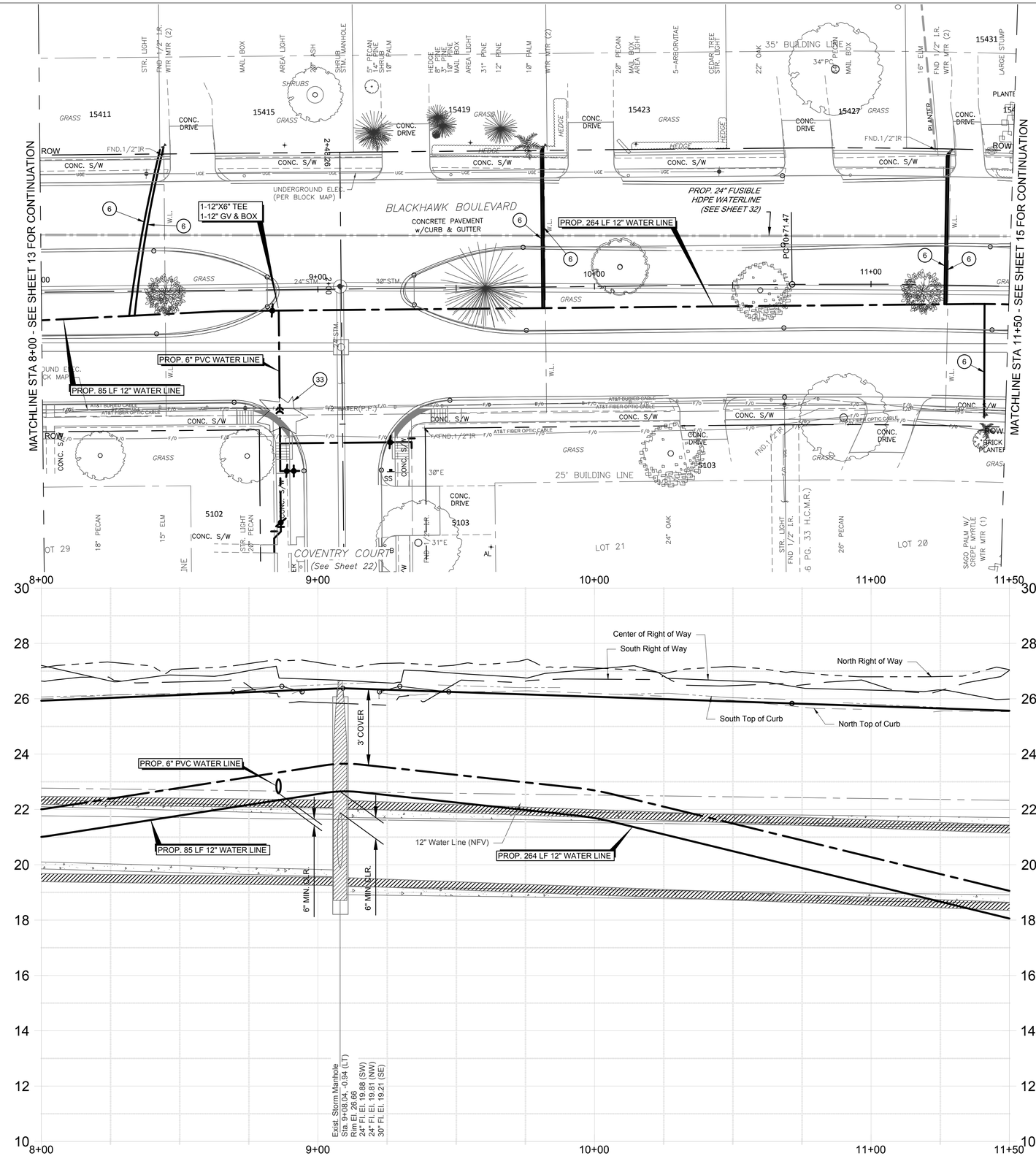
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SHEET NUMBER

SHEET 26 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
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8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
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17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
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26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6"-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

PROPOSED WATER LINE TO BE INSTALLED BY TRENCHLESS METHOD. REFER TO TREE PROTECTION PLANS FOR LOCATIONS OF TREE PROTECTION FENCING. NO BORE PITS WITHIN FENCING AREAS.

FOR PAVING & DRAINAGE, SEE SHEET 14

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 8+00 To Sta. 11+50
(Water)

SCALE

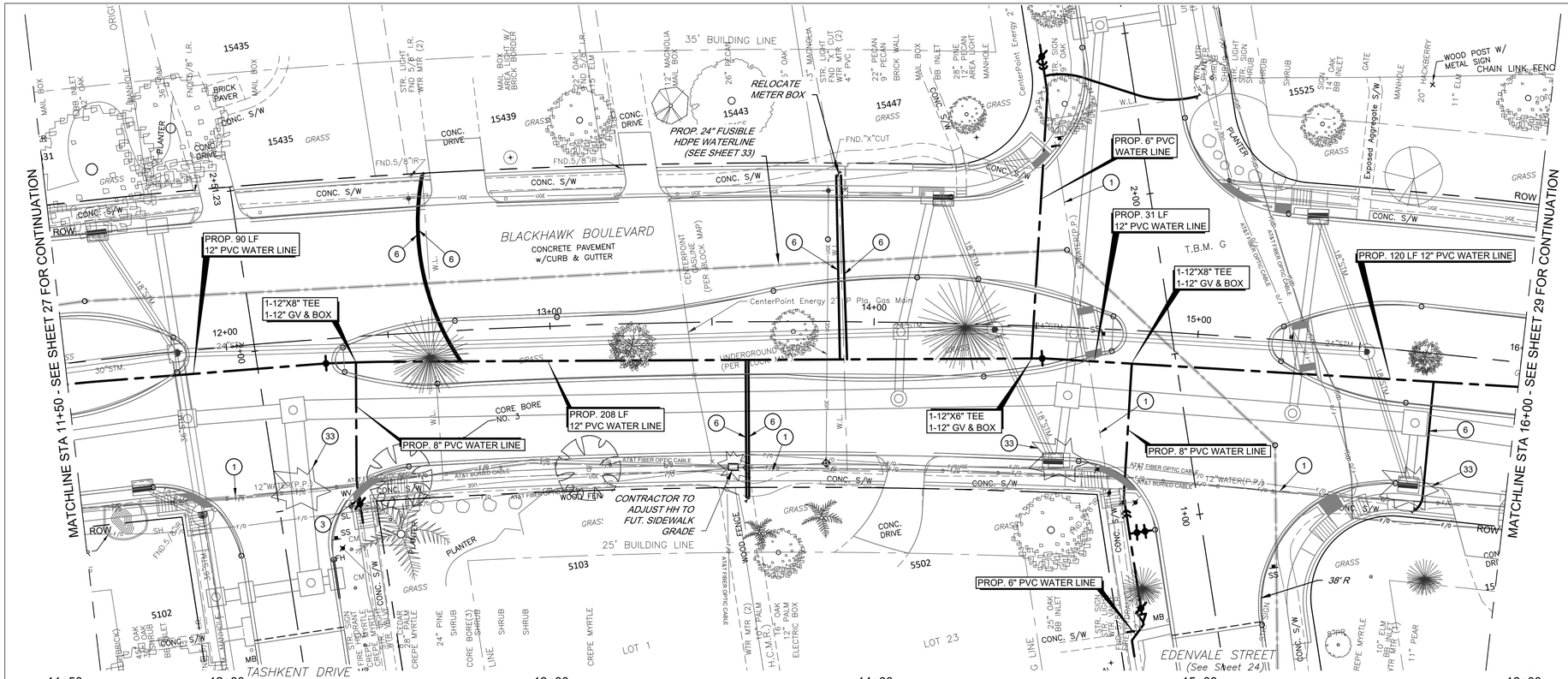
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1" = 20' - H
1" = 2' - V

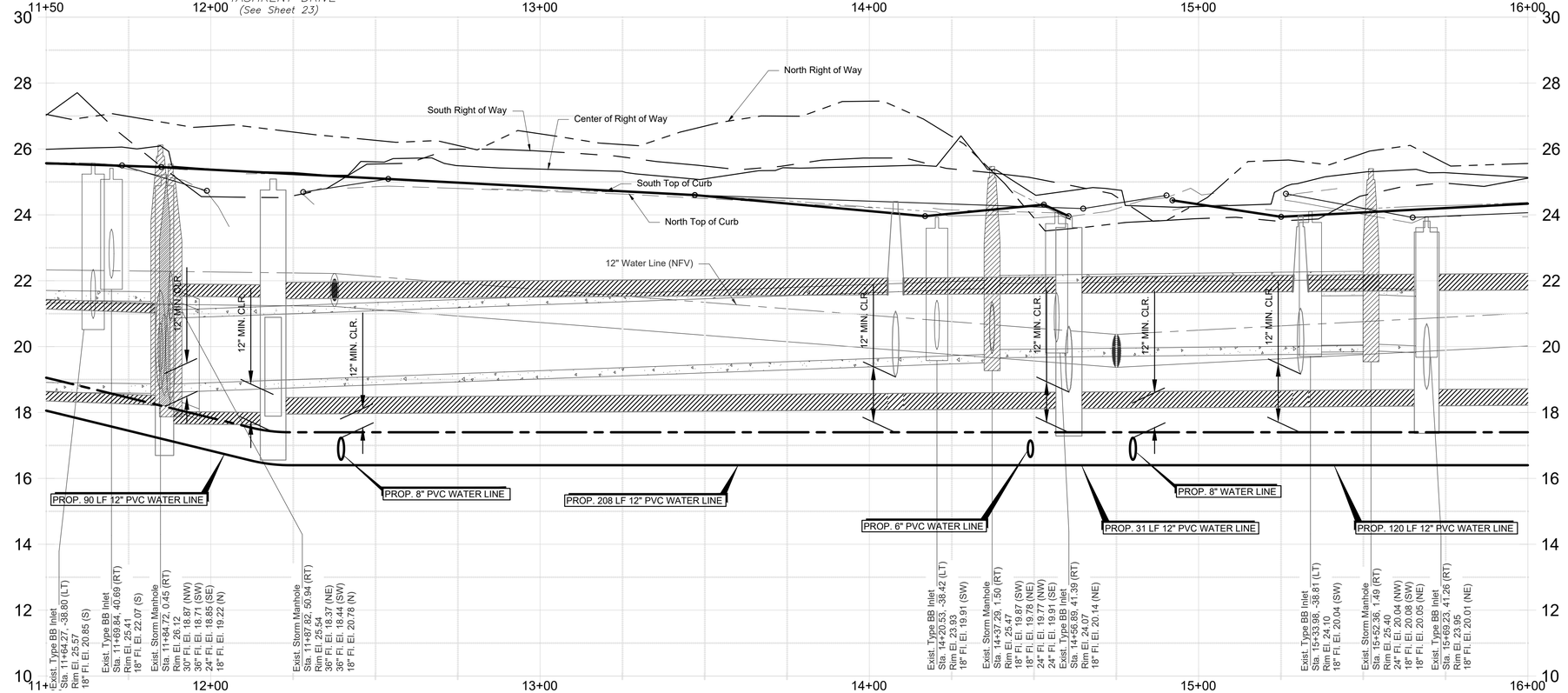
SHEET NUMBER

SHEET 27 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg





KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
50. CAUTION: GAS LINES EXISTS IN AREA OF WORK
51. 6'-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

PROPOSED WATER LINE TO BE INSTALLED BY TRENCHLESS METHOD. REFER TO TREE PROTECTION PLANS FOR LOCATIONS OF TREE PROTECTION FENCING. NO BORE PITS WITHIN FENCING AREAS.

FOR PAVING & DRAINAGE, SEE SHEET 15

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 11+50 To Sta. 16+00
(Water)

SCALE

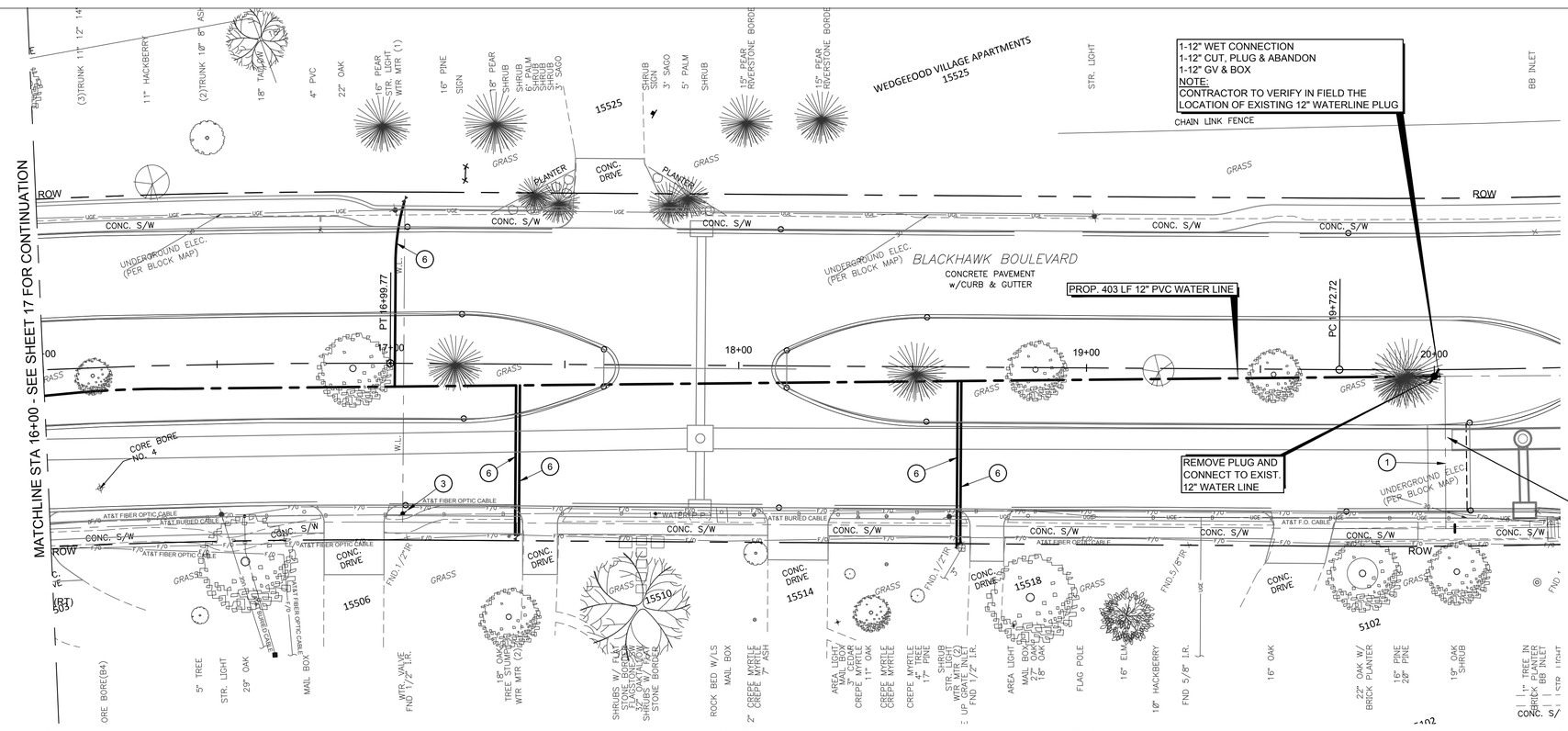
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 28 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



NOTE:
CONTRACTOR TO MAKE CONNECTION NORTH OF THE EXISTING 12" WATERLINE, BEFORE ABANDONING THE EXISTING 12" WATERLINE

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

PROPOSED WATER LINE TO BE INSTALLED BY TRENCHLESS METHOD. REFER TO TREE PROTECTION PLANS FOR LOCATIONS OF TREE PROTECTION FENCING. NO BORE PITS WITHIN FENCING AREAS.

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

FOR PAVING & DRAINAGE, SEE SHEET 16

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 16+00 To Sta. 20+39
(Water)

SCALE
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 29 OF 111

FILE NAME
Package B New Existing Surface Updated.dwg

HDR
Texas P.E. Firm
Registration No. F-754

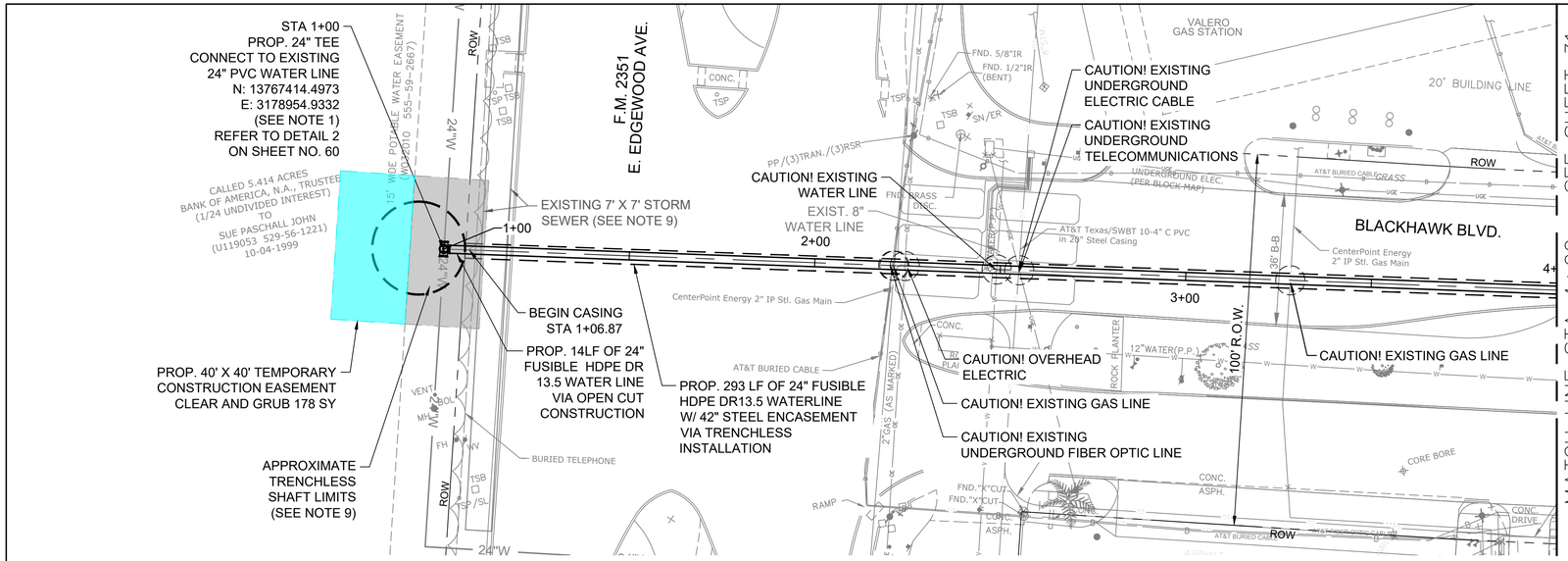
HDR Engineering, Inc.

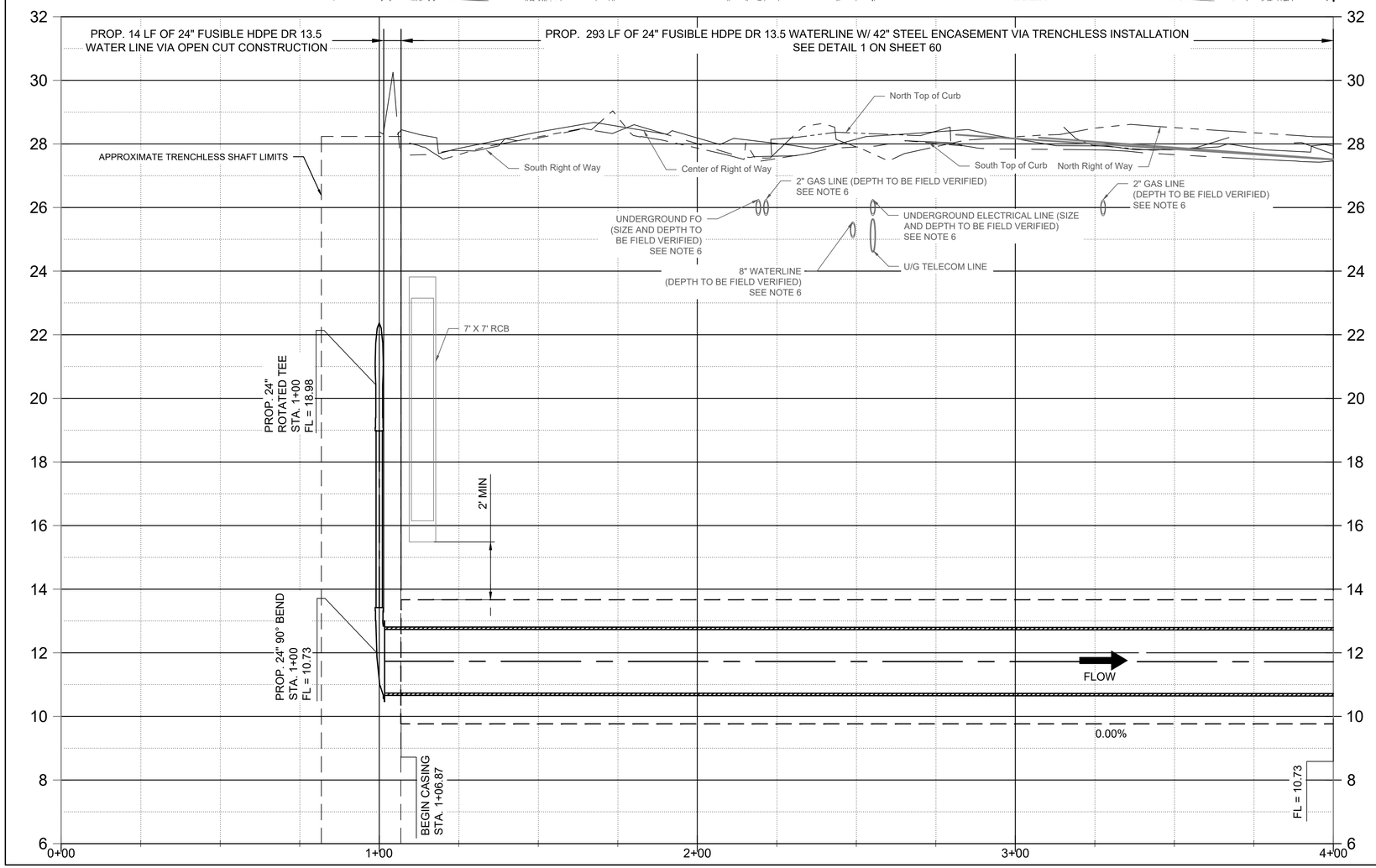
4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS





NOTES:

1. EXISTING WATER SERVICE SHALL BE MAINTAINED AT ALL TIMES. PROVIDE A LINE STOP IF REQUIRED TO MAINTAIN WATER SERVICE. NO SEPARATE PAYMENT WILL BE MADE FOR TEMPORARY MEASURES.
2. MAINTAIN DRAINAGE AT ALL TIMES DURING TRENCHLESS CONSTRUCTION ACTIVITIES. NO SEPARATE PAY WILL BE MADE FOR TEMPORARY FACILITIES NEEDED FOR DRAINAGE.
3. ALL FITTINGS SHALL BE MECHANICAL JOINT DUCTILE IRON FITTINGS.
4. CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORT AND BRACING FOR ALL EXISTING UTILITIES AT CROSSINGS WITH THE PROPOSED 24-INCH WATER LINE.
5. CONTRACTOR SHALL PROTECT EXISTING TREES. NO TREES SHALL BE DAMAGED OR REMOVED UNLESS INDICATED OTHERWISE ON DRAWINGS. NO SEPARATE PAYMENT WILL BE MADE TO REPLACE ANY DAMAGED TREES.
6. WHERE THE WATER LINE CROSSES AN EXISTING UTILITY OTHER THAN A SANITARY SEWER LINE, A MINIMUM (6) INCHES OF CLEARANCE MUST BE MAINTAINED BETWEEN THE OUTSIDE WALL OF THE WATER LINE AND THE OUTSIDE WALL OF THE UTILITY BEING CROSSED.
7. WATER LINE SHALL BE HYDROSTATIC TESTED AND DISINFECTED PER SPEC SECTIONS 02450, 02455, AND AWWA C651-23 UPON COMPLETING INSTALLATION OF PIPE.
8. MAINTAIN EXISTING 7' X 7' RCB AT ALL TIMES. ANY DAMAGE TO THE RCB SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE OWNER.
9. TRENCHLESS SHAFTS ARE SHOWN FOR INFORMATION ONLY. SHAFT DESIGNS SHALL STAY WITHIN THE CITY R.O.W. OR EASEMENT. SHAFT LOCATIONS AND DIMENSIONS ARE SHOWN AS GUIDELINES FOR APPROXIMATE LOCATIONS AND SIZES. CONTRACTOR SHALL PROVIDE FINAL ENGINEERED SHAFT DESIGN PER SPECIFICATION 02270.
10. REFER TO THE TRAFFIC CONTROL SHEETS FOR PHASING ACROSS DRIVEWAYS AND INTERSECTIONS.

GARVER
12141 Wickchester Lane
Suite 200, Houston, TX
77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS
STATE OF TEXAS
ARIEL CHAVEZ II
63682
REGISTERED
PROFESSIONAL ENGINEER
Digitally signed on 02/11/2026

FOR PAVING & DRAINAGE, SEE SHEET 25

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

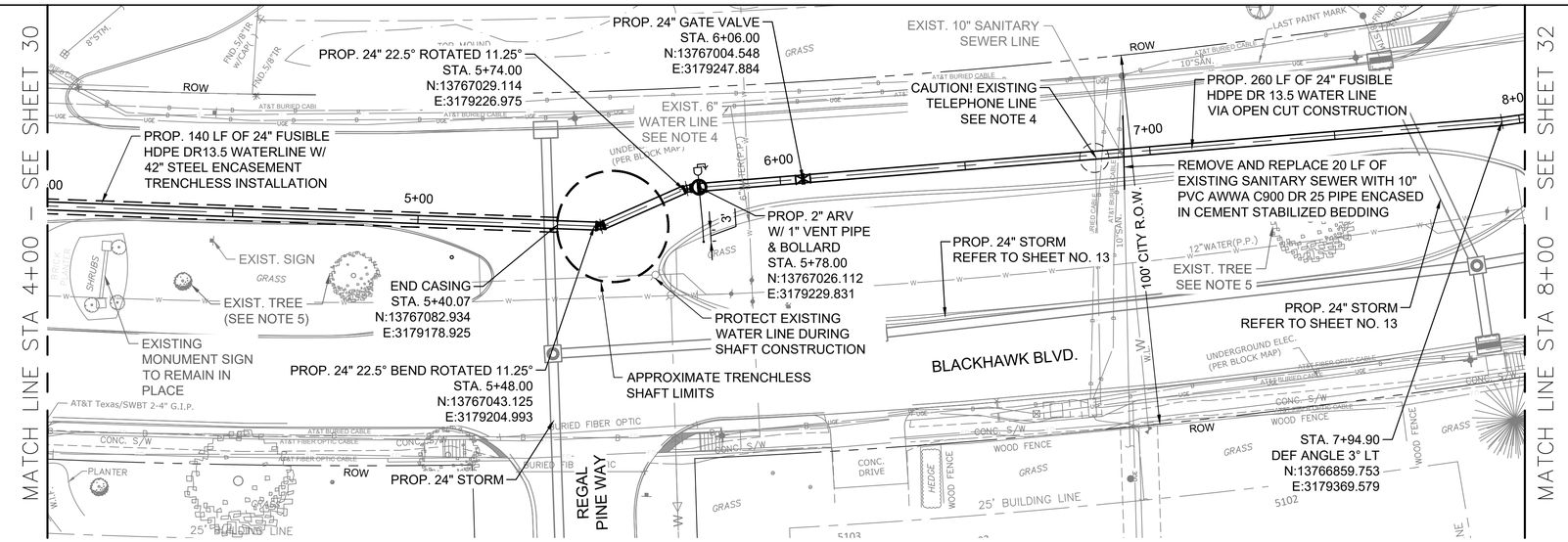
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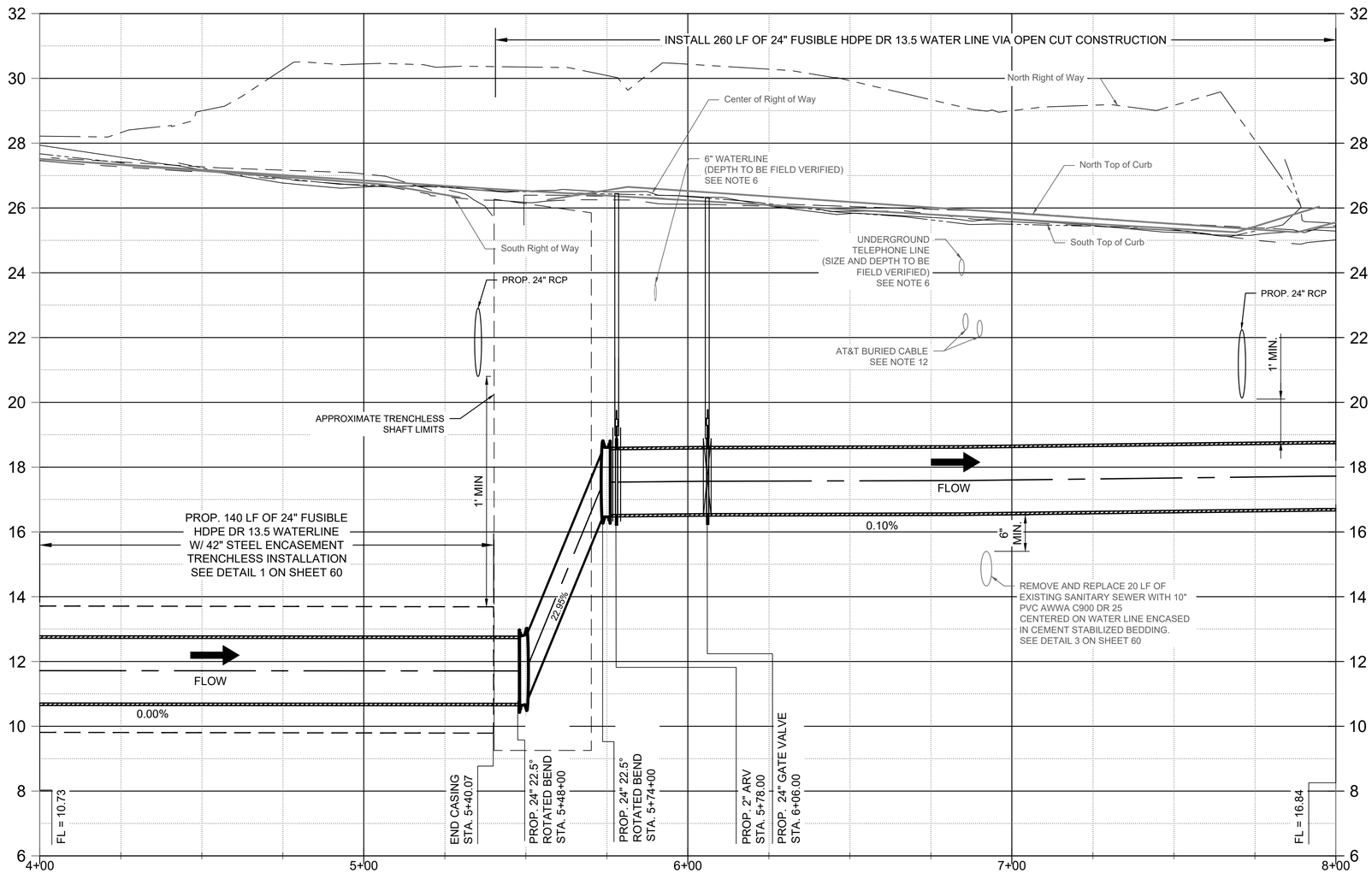
Blackhawk Blvd.
Sta. 0+00 to Sta. 4+00

SCALE
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER
SHEET 30 OF 111

FILE NAME
FCCC_XREF-PLAN (HDR).dwg





NOTES:

1. EXISTING WATER SERVICE SHALL BE MAINTAINED AT ALL TIMES.
2. MAINTAIN DRAINAGE AT ALL TIMES DURING TRENCHLESS CONSTRUCTION ACTIVITIES. NO SEPARATE PAY WILL BE MADE FOR TEMPORARY FACILITIES NEEDED FOR DRAINAGE.
3. ALL FITTINGS SHALL BE MECHANICAL JOINT DUCTILE IRON FITTINGS.
4. CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORT AND BRACING FOR ALL EXISTING UTILITIES AT CROSSINGS WITH THE PROPOSED 24-INCH WATER LINE.
5. CONTRACTOR SHALL PROTECT EXISTING TREES. NO TREES SHALL BE DAMAGED OR REMOVED UNLESS INDICATED OTHERWISE IN DRAWINGS. NO SEPARATE PAYMENT WILL BE MADE TO REPLACE ANY DAMAGED TREES.
6. WHERE THE WATER LINE CROSSES AN EXISTING UTILITY OTHER THAN A SANITARY SEWER LINE, A MINIMUM (6) INCHES OF CLEARANCE MUST BE MAINTAINED BETWEEN THE OUTSIDE WALL OF THE WATER LINE AND THE OUTSIDE WALL OF THE UTILITY BEING CROSSED.
7. WATER LINE SHALL BE HYDROSTATIC TESTED AND DISINFECTED PER SPEC SECTIONS 02450, 02455 AND AWWA C651-23 UPON COMPLETING INSTALLATION OF PIPE.
8. TRENCHLESS SHAFTS ARE SHOWN FOR INFORMATION ONLY. SHAFT DESIGNS SHALL STAY WITHIN THE CITY R.O.W. OR EASEMENT. SHAFT LOCATIONS AND DIMENSIONS ARE SHOWN AS GUIDELINES FOR APPROXIMATE LOCATIONS AND SIZES. CONTRACTOR SHALL PROVIDE FINAL ENGINEERED SHAFT DESIGN PER SPECIFICATION 02270
9. REFER TO TRAFFIC CONTROL SHEETS FOR PHASING ACROSS DRIVEWAYS AND INTERSECTIONS.
10. REFER TO PAVING SHEETS FOR RESTORATION REQUIREMENTS.
11. WHERE THE AIR RELEASE VALVE ABOVE-GROUND PIPING IS LOCATED BEHIND THE CURB, IT SHALL BE INSTALLED NOT LESS THAN 3.0 FT. BEHIND THE BACK OF CURB.
12. CONTRACTOR SHALL COORDINATE WITH AT&T PRIOR TO BEGINNING EXCAVATION.

GARVER
12141 Wickchester Lane
Suite 200, Houston, TX
77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS
STATE OF TEXAS
ARIEL CHAVEZ II
63682
REGISTERED PROFESSIONAL ENGINEER
Digitally signed on 02/11/2026

FOR PAVING & DRAINAGE, SEE SHEET 25

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

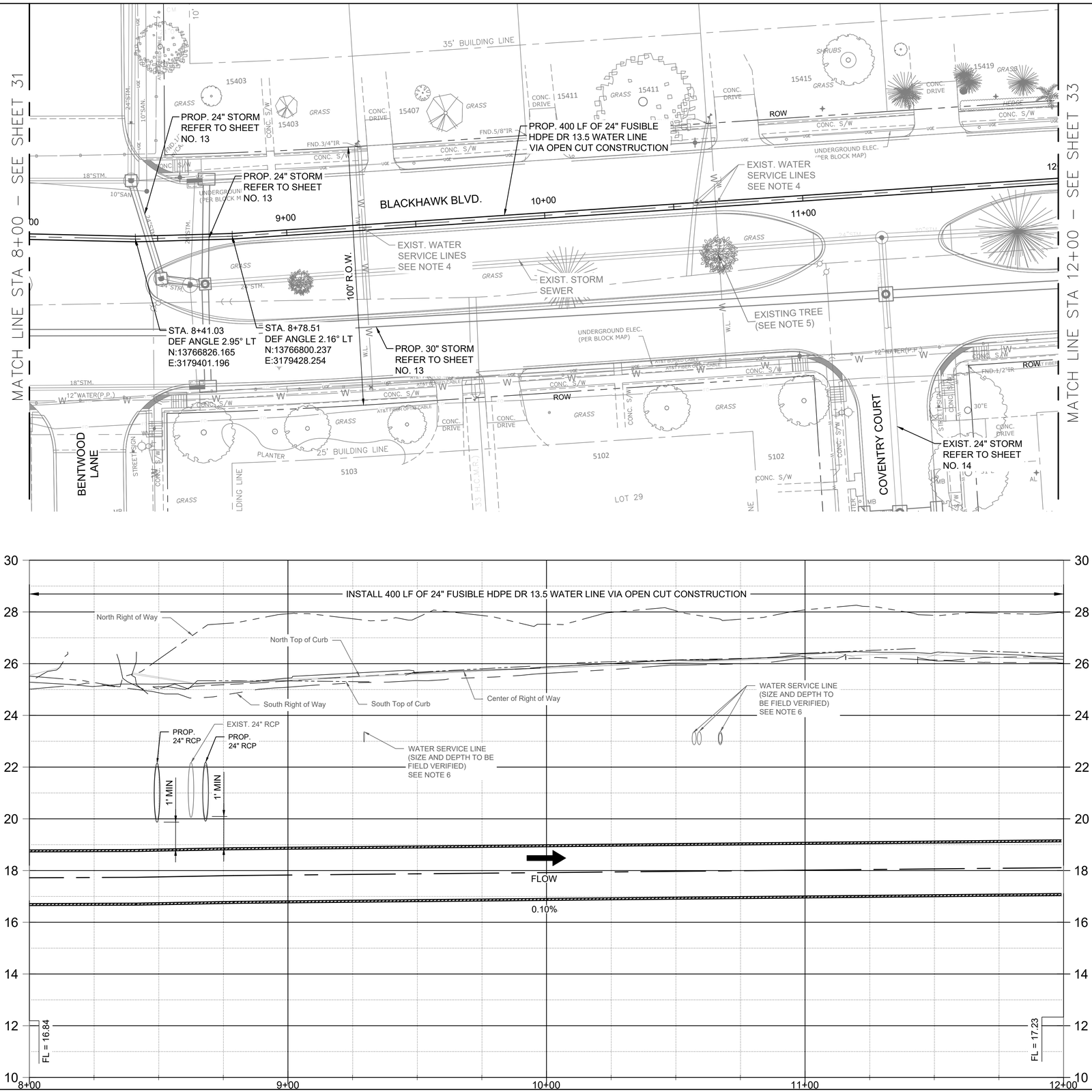
SHEET NAME

Blackhawk Blvd.
Sta. 4+00 to Sta. 8+00

SCALE
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER
SHEET 31 OF 111

FILE NAME
FCCC_XREF-PLAN (HDR).dwg



NOTES:

1. EXISTING WATER SERVICE SHALL BE MAINTAINED AT ALL TIMES, PROVIDE A LINE STOP IF REQUIRED TO MAINTAIN WATER SERVICE. NO SEPARATE PAYMENT WILL BE MADE FOR TEMPORARY MEASURES .
2. MAINTAIN DRAINAGE AT ALL TIMES DURING TRENCHLESS CONSTRUCTION ACTIVITIES. NO SEPARATE PAY WILL BE MADE FOR TEMPORARY FACILITIES NEEDED FOR DRAINAGE.
3. ALL FITTINGS SHALL BE MECHANICAL JOINT DUCTILE IRON FITTINGS.
4. CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORT AND BRACING FOR ALL EXISTING UTILITIES AT CROSSINGS WITH THE PROPOSED 24-INCH WATER LINE.
5. CONTRACTOR SHALL PROTECT EXISTING TREES. NO TREES SHALL BE DAMAGED OR REMOVED UNLESS INDICATED OTHERWISE ON DRAWINGS. NO SEPARATE PAYMENT WILL BE MADE TO REPLACE ANY DAMAGED TREES.
6. WHERE THE WATER LINE CROSSES AN EXISTING UTILITY OTHER THAN A SANITARY SEWER LINE, A MINIMUM (6) INCHES OF CLEARANCE MUST BE MAINTAINED BETWEEN THE OUTSIDE WALL OF THE WATER LINE AND THE OUTSIDE OF THE UTILITY BEING CROSSED.
7. WATER LINE SHALL BE HYDROSTATIC TESTED AND DISINFECTED PER SPEC SECTIONS 02450, 02455 AND AWWA C651-23 UPON COMPLETING INSTALLATION OF PIPE.
8. REFER TO TRAFFIC CONTROL SHEETS FOR PHASING ACROSS DRIVEWAYS AND INTERSECTIONS.
9. REFER TO PAVING SHEETS FOR RESTORATION REQUIREMENTS.

GARVER
12141 Wickchester Lane
Suite 200, Houston, TX
77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS
STATE OF TEXAS
ARIEL CHAVEZ II
63682
REGISTERED
PROFESSIONAL ENGINEER
Digitally signed on 02/11/2026

FOR PAVING & DRAINAGE, SEE SHEET 27

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

SHEET NAME

Blackhawk Blvd.
Sta. 8+00 to Sta. 12+00

SCALE

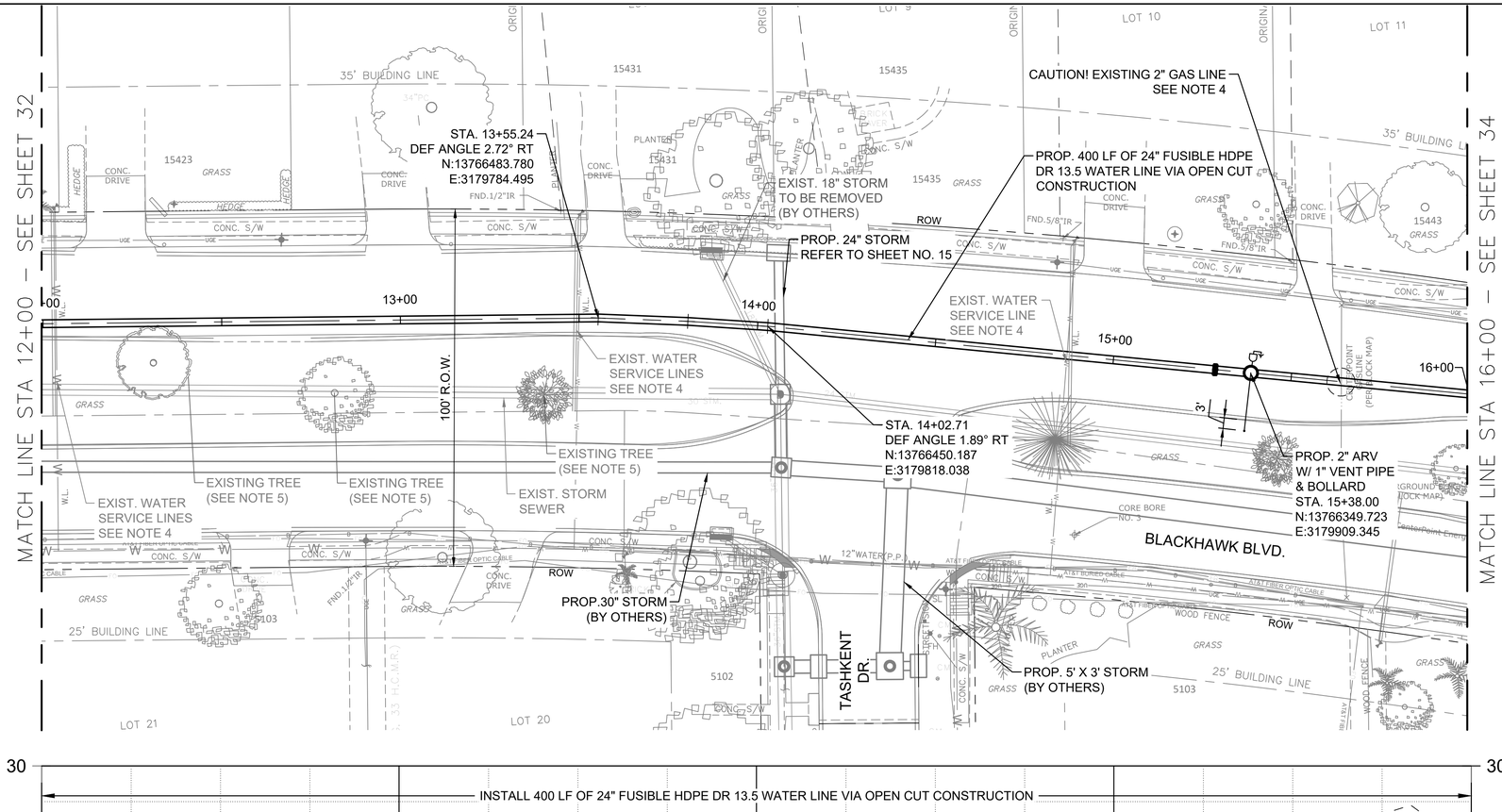
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1" = 2' - V

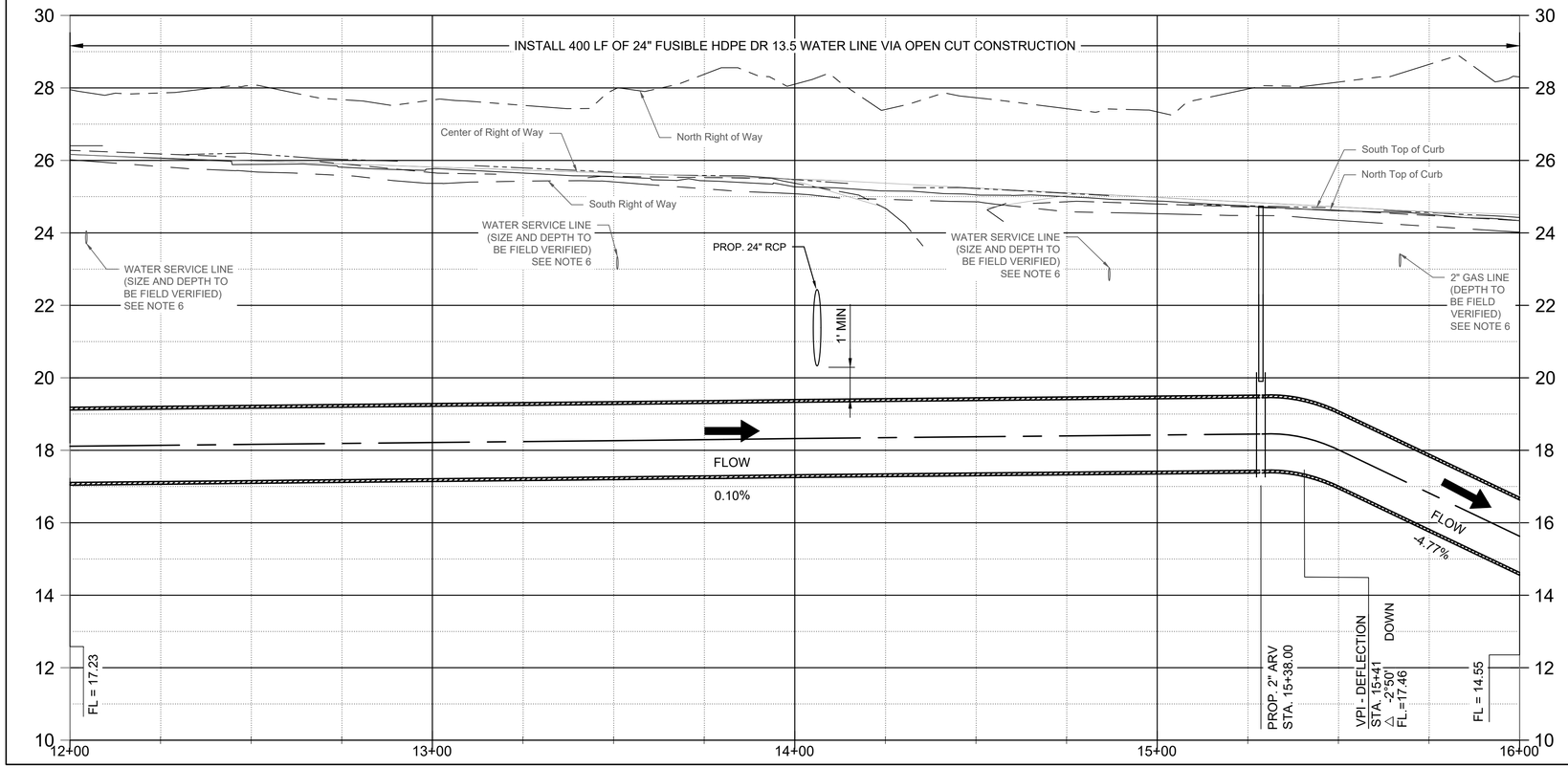
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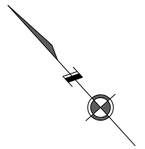
SHEET 32 OF 111

FILE NAME

FCCC_XREF-PLAN (HDR).dwg







NOTES:

1. EXISTING WATER SERVICE SHALL BE MAINTAINED AT ALL TIMES.
2. MAINTAIN DRAINAGE AT ALL TIMES DURING TRENCHLESS CONSTRUCTION ACTIVITIES. NO SEPARATE PAY WILL BE MADE FOR TEMPORARY FACILITIES NEEDED FOR DRAINAGE.
3. ALL FITTINGS SHALL BE MECHANICAL JOINT DUCTILE IRON FITTINGS.
4. CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORT AND BRACING FOR ALL EXISTING UTILITIES AT CROSSINGS WITH THE PROPOSED 24-INCH WATER LINE.
5. CONTRACTOR SHALL PROTECT EXISTING TREES. NO TREES SHALL BE DAMAGED OR REMOVED UNLESS INDICATED OTHERWISE ON DRAWINGS. NO SEPARATE PAYMENT WILL BE MADE TO REPLACE ANY DAMAGED TREES.
6. WHERE THE WATER LINE CROSSES AN EXISTING UTILITY OTHER THAN A SANITARY SEWER LINE, A MINIMUM (6) INCHES OF CLEARANCE MUST BE MAINTAINED BETWEEN THE OUTSIDE WALL OF THE WATER LINE AND THE OUTSIDE WALL OF THE UTILITY BEING CROSSED.
7. WATER LINE SHALL BE HYDROSTATIC TESTED AND DISINFECTED PER SPEC SECTIONS 02450, 02455 AND AWWA C651-23 UPON COMPLETING INSTALLATION OF PIPE.
8. REFER TO TRAFFIC CONTROL SHEETS FOR PHASING ACROSS DRIVEWAYS AND INTERSECTIONS.
9. REFER TO PAVING SHEETS FOR RESTORATION REQUIREMENTS.
10. WHERE THE AIR RELEASE VALVE ABOVE-GROUND PIPING IS LOCATED BEHIND THE CURB, IT SHALL BE INSTALLED NOT LESS THAN 3.0 FT. BEHIND THE BACK OF CURB.

GARVER

12141 Wickchester Lane
Suite 200, Houston, TX
77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS

STATE OF TEXAS
ARIEL CHAVEZ II
63682
REGISTERED
PROFESSIONAL ENGINEER

Digitally signed on 02/11/2026

FOR PAVING & DRAINAGE, SEE SHEET 28

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

SHEET NAME

Blackhawk Blvd.
Sta. 12+00 to Sta. 16+00

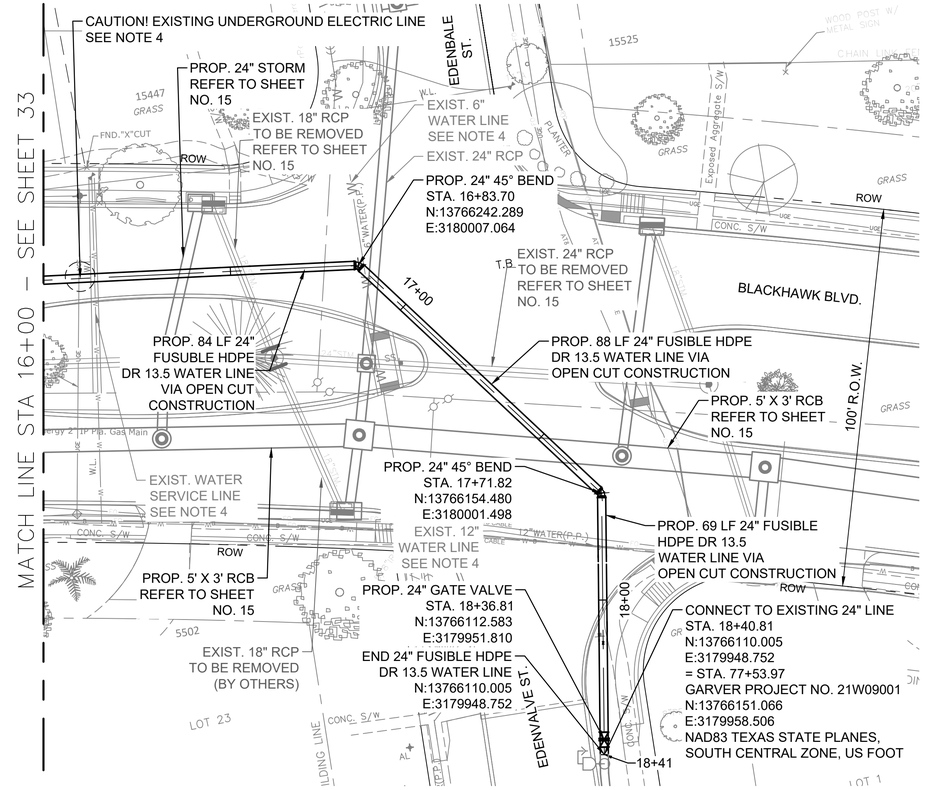
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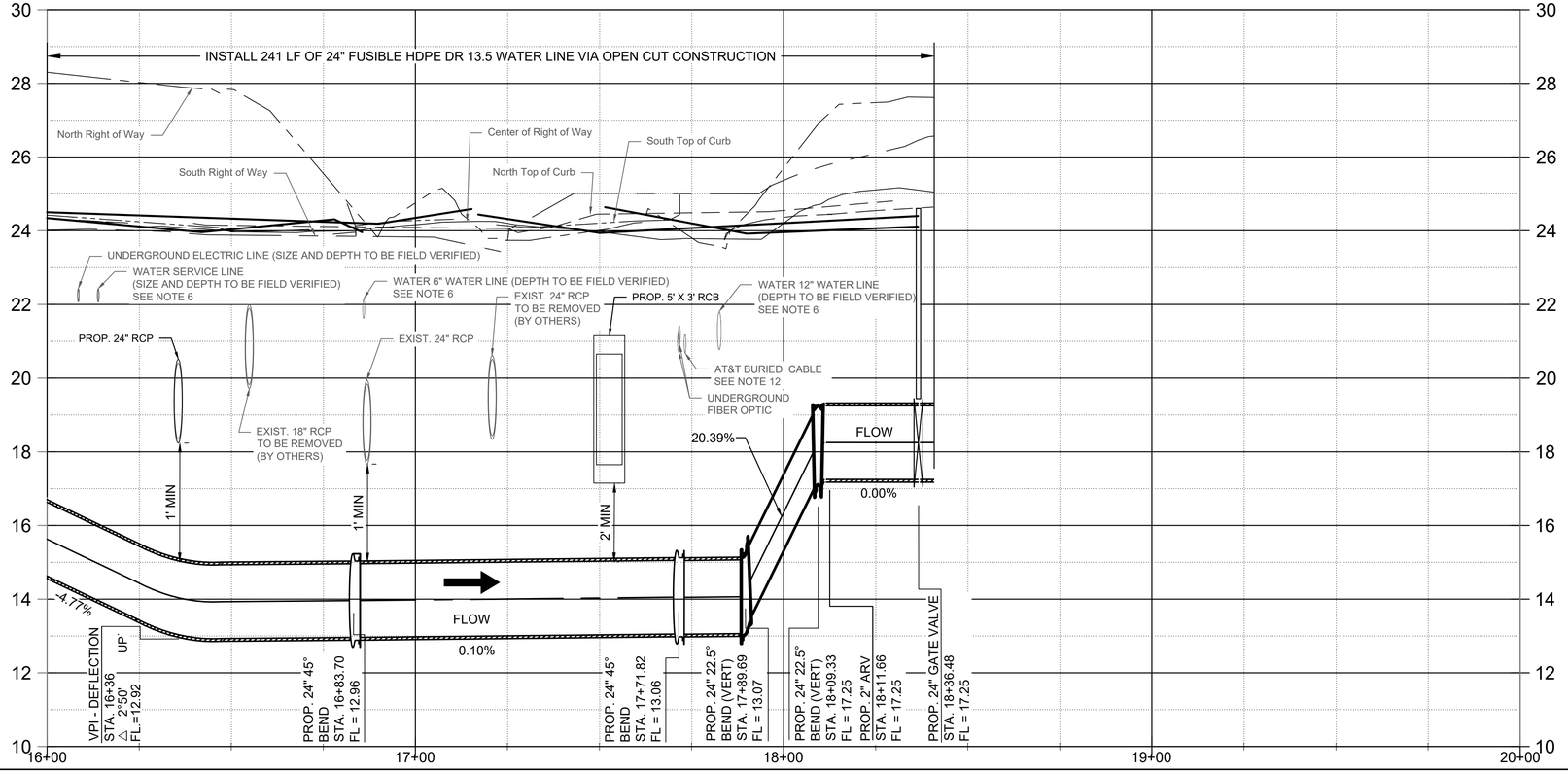
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 33 OF 111

FILE NAME FCCC_XREF-PLAN (HDR).dwg





NOTES:

1. EXISTING WATER SERVICE SHALL BE MAINTAINED AT ALL TIMES.
2. MAINTAIN DRAINAGE AT ALL TIMES DURING TRENCHLESS CONSTRUCTION ACTIVITIES. NO SEPARATE PAY WILL BE MADE FOR TEMPORARY FACILITIES NEEDED FOR DRAINAGE.
3. ALL FITTINGS SHALL BE MECHANICAL JOINT DUCTILE IRON FITTINGS.
4. CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORT AND BRACING FOR ALL EXISTING UTILITIES AT CROSSINGS WITH THE PROPOSED 24-INCH WATER LINE.
5. CONTRACTOR SHALL PROTECT EXISTING TREES. NO TREES SHALL BE DAMAGED OR REMOVED UNLESS INDICATED OTHERWISE ON DRAWINGS. NO SEPARATE PAYMENT WILL BE MADE TO REPLACE ANY DAMAGED TREES.
6. WHERE THE WATER LINE CROSSES AN EXISTING UTILITY OTHER THAN A SANITARY SEWER LINE, A MINIMUM (6) INCHES OF CLEARANCE MUST BE MAINTAINED BETWEEN THE OUTSIDE WALL OF THE WATER LINE AND THE OUTSIDE WALL OF THE UTILITY BEING CROSSED.
7. WATER LINE SHALL BE HYDROSTATIC TESTED AND DISINFECTED PER SPEC SECTIONS 02450, 02455 AND AWWA C651-23 UPON COMPLETING INSTALLATION OF PIPE.
8. REFER TO TRAFFIC CONTROL SHEETS FOR PHASING ACROSS DRIVEWAYS AND INTERSECTIONS.
9. REFER TO PAVING SHEETS FOR RESTORATION REQUIREMENTS.
10. CONTRACTOR SHALL COORDINATE WITH AT&T PRIOR TO BEGINNING EXCAVATION.

GARVER

12141 Wickchester Lane
Suite 200, Houston, TX
77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS

STATE OF TEXAS
ARIEL CHAVEZ II
63682
REGISTERED
PROFESSIONAL ENGINEER

Digitally signed on 02/11/2026

FOR PAVING & DRAINAGE, SEE SHEET 29

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

SHEET NAME

Blackhawk Blvd.
Sta. 16+00 to Sta. 18+41

SCALE

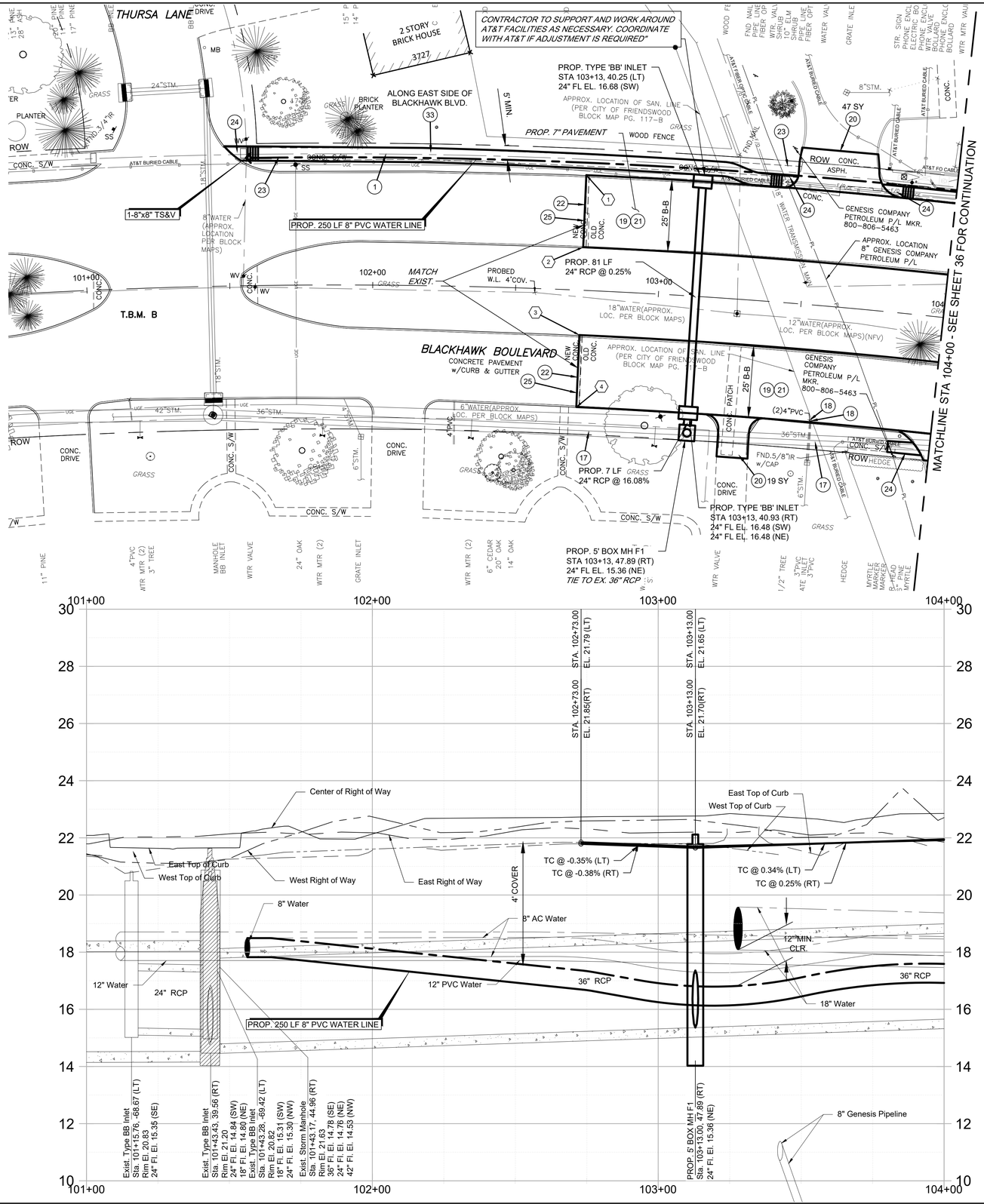
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 34 OF 111

FILE NAME

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#	STATION	OFFSET	TC ELEV.
1	PI 102+73.00	40.30' LT.	21.79
2	PI 102+73.00	15.11' LT.	22.35±
3	PI 102+73.00	15.70' RT.	22.30±
4	PI 102+73.00	40.91' RT.	21.85

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
2. REMOVE AND SALVAGE OF EXISTING FIRE HYDRANTS.
3. ABANDON EXISTING WATER VALVE AS PER SPECIFICATIONS.
4. REMOVE EXISTING WATER LINE.
5. PROP. SHORT SIDE WATER SERVICE REPLACEMENT.
6. PROP. LONG SIDE WATER SERVICE REPLACEMENT.
7. CENTER ONE JOINT OF PVC WATER LINE AT SANITARY CROSSING.
8. ADJUST EXIST. VALVE BOX AND METER BOX TO BE FLUSH WITH TOP OF PROPOSED PVMT OR FINISHED GRADE AS NOTED IN PLANS.
9. REMOVE 8" OR 12" AC WATER, PLUG EXISTING TO REMAIN & DISPOSE OF PER SPECIFICATIONS
10. REMOVE AND RESET MAILBOX (INCLUDE TEMPORARY RELOCATION PER US POSTAL SERVICE REQUIREMENTS).
11. REMOVE EXISTING SIGN.
12. REMOVE EXISTING INLET, MANHOLE OR JUNCTION BOX.
13. REMOVE EXISTING STORM SEWER PIPE OR CULVERT.
14. ABANDON EXISTING STORM SEWER LINE AS PER SPECIFICATIONS.
15. ABANDON EXISTING STORM OR SANITARY SEWER MANHOLE
16. PLUG EXISTING OR PROPOSED STORM SEWER.
17. EXISTING STORM SEWER TO REMAIN IN SERVICE.
18. REMOVE AND REPLACE EXIST. YARD DRAIN USING 4" PVC SCH 40 PIPE. UNLESS OTHERWISE NOTED. (SEE DETAIL IN PLANS).
19. REMOVE AND DISPOSE OF EXIST. PAVEMENT WITH OR WITHOUT CURB.
20. REMOVE AND REPLACE DRIVEWAY WITH 6" CONCRETE PER DETAILS.
21. PROPOSED 7" THICK CONCRETE PAVEMENT
22. PROPOSED UNDERCUT PAVING CONNECTION PER STD. DETAIL.
23. REMOVE & REPLACE CONCRETE SIDEWALK (TYP. 5' WIDE) & WALKWAY (MATCH EXISTING).
24. REMOVE & REPLACE WHEELCHAIR RAMPS & LANDINGS (INCLUDING TRUNCATED DOMES)
25. PROP. FULL DEPTH SAWCUT (NO SEPARATE PAY).
26. CONCRETE MEDIAN NOSE
27. EXISTING PRIVATE SPRINKLER VALVES, SPRINKLER HEADS AND IRRIGATION PIPING TO BE RELOCATED (SEE SPECIAL CONDITIONS).
28. ADJUST EXISTING MANHOLE RIM AND COVER (STORM, SANITARY OR OTHER) AND/OR METER AND VALVE BOXES TO GRADE.
29. CONTRACTOR SHALL COORDINATE SUPPORT, ADJUSTMENT OR RELOCATION OF POWER/LIGHT POLES, GUY ANCHORS AND/OR ELECTRICAL BOXES W/ OWNER OF POLES, AS REQUIRED.
30. CAUTION: GAS LINES EXISTS IN AREA OF WORK
31. 6'-12" SIDEWALK RETAINING WALL
32. 24" SIDEWALK RETAINING WALL
33. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd. Sta. 100+00 to Sta. 104+00

SCALE

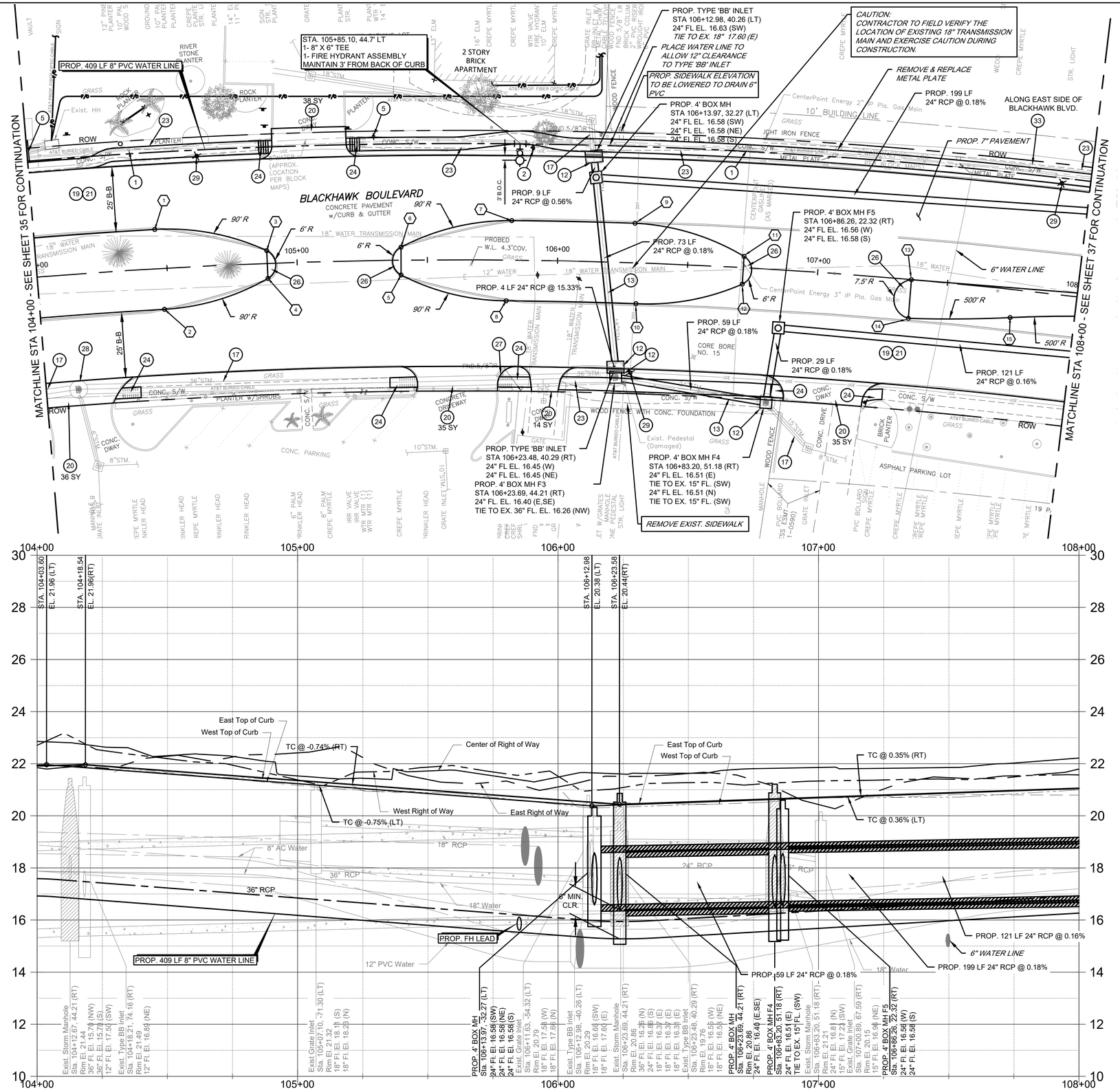
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1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 35 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
1	PT 104+46.15	15.07' LT.	22.19
2	PT 104+48.11	15.73' RT.	22.23
3	PCC 104+88.49	4.90' LT.	22.05
4	PCC 104+88.58	5.76' RT.	22.12
5	PCC 105+39.86	5.71' RT.	21.64
6	PCC 105+39.94	4.95' LT.	21.75
7	PC 105+82.23	15.13' LT.	21.14
8	PC 105+80.38	15.67' RT.	21.28
9	PT 106+29.25	15.16' LT.	20.94
10	PT 106+30.63	15.67' RT.	20.96
11	PCC 106+71.41	4.30' LT.	21.31
12	PCC 106+71.32	6.36' RT.	21.30
13	PCC 107+36.08	0.06' RT.	21.63
14	PCC 107+36.19	14.92' RT.	21.35
15	PRC 107+75.32	10.84' RT.	21.55

KEYNOTES:

UTILITIES, PAVING & DRAINAGE

1. ABANDON EXISTING WATER LINES AS PER SPECIFICATIONS.
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Registration No. F-754

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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 104+00 to Sta. 108+00

SCALE

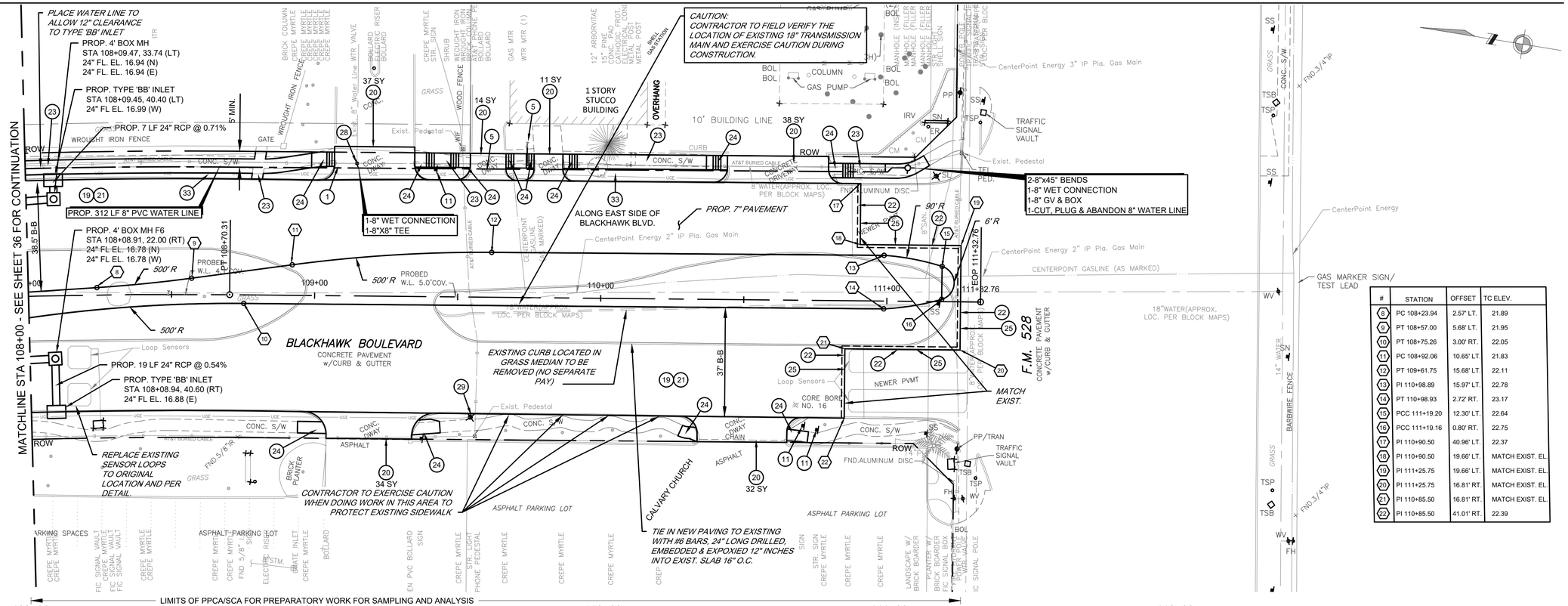
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 36 OF 111

FILE NAME

Package B New Existing Surface Updated.dwg



#	STATION	OFFSET	TC ELEV.
8	PC 108+23.94	2.57' LT.	21.89
9	PT 108+57.00	5.68' LT.	21.95
10	PT 108+75.26	3.00' RT.	22.05
11	PC 108+92.06	10.65' LT.	21.83
12	PT 109+61.75	15.68' LT.	22.11
13	PI 110+98.89	15.97' LT.	22.78
14	PT 110+98.93	2.72' RT.	23.17
15	PCC 111+19.20	12.30' LT.	22.64
16	PCC 111+19.16	0.80' RT.	22.75
17	PI 110+90.50	40.96' LT.	22.37
18	PI 110+90.50	19.66' LT.	MATCH EXIST. EL.
19	PI 111+25.75	19.66' LT.	MATCH EXIST. EL.
20	PI 111+25.75	16.81' RT.	MATCH EXIST. EL.
21	PI 110+85.50	16.81' RT.	MATCH EXIST. EL.
22	PI 110+85.50	41.01' RT.	22.39

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51. 6'-12" SIDEWALK RETAINING WALL
52. 24" SIDEWALK RETAINING WALL
53. CONTRACTOR TO PROCEED WITH CAUTION, SEE ATTACHED AT&T NOTES

FLOW DIRECTION ARROW

HDR
Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

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Houston, Texas 77081
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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER
03-02-2026

SHEET NAME

Blackhawk Blvd.
Sta. 108+00 to Sta.
111+32.76

SCALE
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 37 OF 111

FILE NAME
Package B New Existing Surface Updated.dwg

SITE DESCRIPTION

PROJECT LIMITS:

BLACKHAWK BOULEVARD FROM FM 2351 TO APPROX. 500' EAST OF PENNYSTONE WAY.
BLACKHAWK BOULEVARD FROM APPROX. 120' EAST OF THURSA LANE TO FM 528.

PROJECT DESCRIPTION:

BLACKHAWK BLVD.: REPLACEMENT OF FOUR LANE CURB AND GUTTER CONCRETE ROAD INCLUDING STORM SEWER REPLACEMENT AND WATER LINE IMPROVEMENTS.

MAJOR SOIL DISTURBING ACTIVITIES:

EXCAVATION AND EMBANKMENT FOR ROADWAY, TRENCHING & BACKFILL FOR INSTALLATION OF STORM SEWER, AND WATER LINE ADJUSTMENTS.

TOTAL PROJECT AREA (ROW/ROW)	APPROX. AREA TO BE DISTURBED
APPROX. 9.08 ACRES	APPROX. 9.08 ACRES

WEIGHTED RUNOFF COEFFICIENT (AFTER CONSTRUCTION): 0.55

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

ALL EXISTING SOILS ARE ESTIMATED TO BE 100 PERCENT COVERED WITH VARIOUS GRASSES IN MAINTAINED RESIDENTIAL ROADSIDE CONDITION.

NAME OF RECEIVING WATERS:

WATER FLOWS THROUGH ENCLOSED STORM SEWER TO CEDAR GULLY WHICH DRAINS TO CLEAR CREEK.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES

____ TEMPORARY SEEDING
__X__ PERMANENT PLANTING, SODDING, OR SEEDING
____ MULCHING
____ SOIL RETENTION BLANKET
____ BUFFER ZONES
__X__ PRESERVATION OF NATURAL RESOURCES

OTHER:
DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME WITHIN 21 DAYS.

STRUCTURAL PRACTICES:

__X__ SILT FENCES
____ HAY BALES
____ ROCK BERMS
____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____ DIVERSION INTERCEPTOR, OR PERIMETER SWALES
____ DIVERSION DIKE AND SWALE COMBINATIONS
____ PIPE SLOPE DRAINS
____ PAVED FLUMES
____ ROCK BEDDING AT CONSTRUCTION EXIT
____ TIMBER MATTING AT CONSTRUCTION EXIT
____ CHANNEL LINERS (REPAIR)
____ SEDIMENT TRAPS
____ SEDIMENT BASINS
__X__ STORM INLET SEDIMENT TRAP
____ STONE OUTLET STRUCTURES
__X__ CURBS AND GUTTERS
__X__ STORM SEWERS
____ VELOCITY CONTROL DEVICES

OTHER:
INLET PROTECTION BARRIERS TYPE III (GRAVEL BAGS) AT EXISTING & PROPOSED STAGE II INLETS.

NARRATIVE – SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

1. PROTECT EXISTING STORM SEWER SYSTEMS, INLETS, MANHOLES, AND DITCHES. INSTALL INLET PROTECTION BARRIERS AND TEMPORARY EROSION CONTROL.
2. INSTALL WATER LINE ADJUSTMENTS.
3. EXCAVATE & CONSTRUCT STORM SEWER AND BACKFILL.
4. CONSTRUCT PAVEMENT SECTION.
5. SOD DISTURBED AREAS.
6. WHEN ALL CONSTRUCTION ACTIVITIES ARE COMPLETE AND THE SITE IS STABILIZED AND APPROVED BY THE ENGINEER, REMOVE TEMPORARY SEDIMENT CONTROL.

STORM WATER MANAGEMENT:

STORM WATER DRAINAGE WILL BE PROVIDED BY INLETS AND STORM DRAINS. THIS SYSTEM WILL CARRY DRAINAGE WITHIN THE RIGHT-OF-WAY TO THE STORM SEWERS.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:

ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 14 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT. THE AREAS ADJACENT TO CREEKS AND DRAINAGE WAYS SHALL HAVE PRIORITY FOLLOWED BY DEVICES PROTECTING STORM SEWER INLETS.

INSPECTION:

AN INSPECTION WILL BE PERFORMED BY THE CONTRACTOR EVERY 14 DAYS AS WELL AS AFTER EVERY HALF INCH OR MORE OF RAIN (AS RECORDED ON A NONFREEZING RAIN GAUGE TO BE LOCATED AT THE PROJECT SITE). AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS:

ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN SECURELY LIDDED METAL DUMPS. THE DUMPSITE WILL MEET ALL LOCAL AND STATE SOLID WASTE REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM SITE WILL BE DEPOSITED IN THE DUMPSITE. THE DUMP SITE WILL BE EMPTIED AS NECESSARY OR AS REQUIRED, AND THE TRASH WILL BE HAULED TO A LOCAL DUMP. NO CONSTRUCTION WASTE WILL BE BURIED ON SITE. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON-SITE.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACE, CLEANING SOLVENTS ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, THE SPILL COORDINATOR SHOULD BE CONTACTED IMMEDIATELY.

SANITARY WASTE:

ALL SANITARY WASTE WILL BE COLLECTED FROM PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:

____ HAUL ROADS DAMPENED FOR DUST CONTROL
__X__ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
__X__ EXCESS DIRT ON ROAD REMOVED DAILY
__X__ STABILIZED CONSTRUCTION ENTRANCE

OTHER:
WASHWATER FROM ON-SITE VEHICLE/EQUIPMENT WASHING SHALL BE DISCHARGED TO A CONTROL MEASURE PRIOR TO ENTERING THE STORM SEWER.

REMARKS:
DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATER. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATERBODY OR STREAM BED.
CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS.
ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSE WORK, DEBRIS OR OTHER OBSTRUCTION PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

Ngoc Kim Le

03-02-2026

SHEET NAME

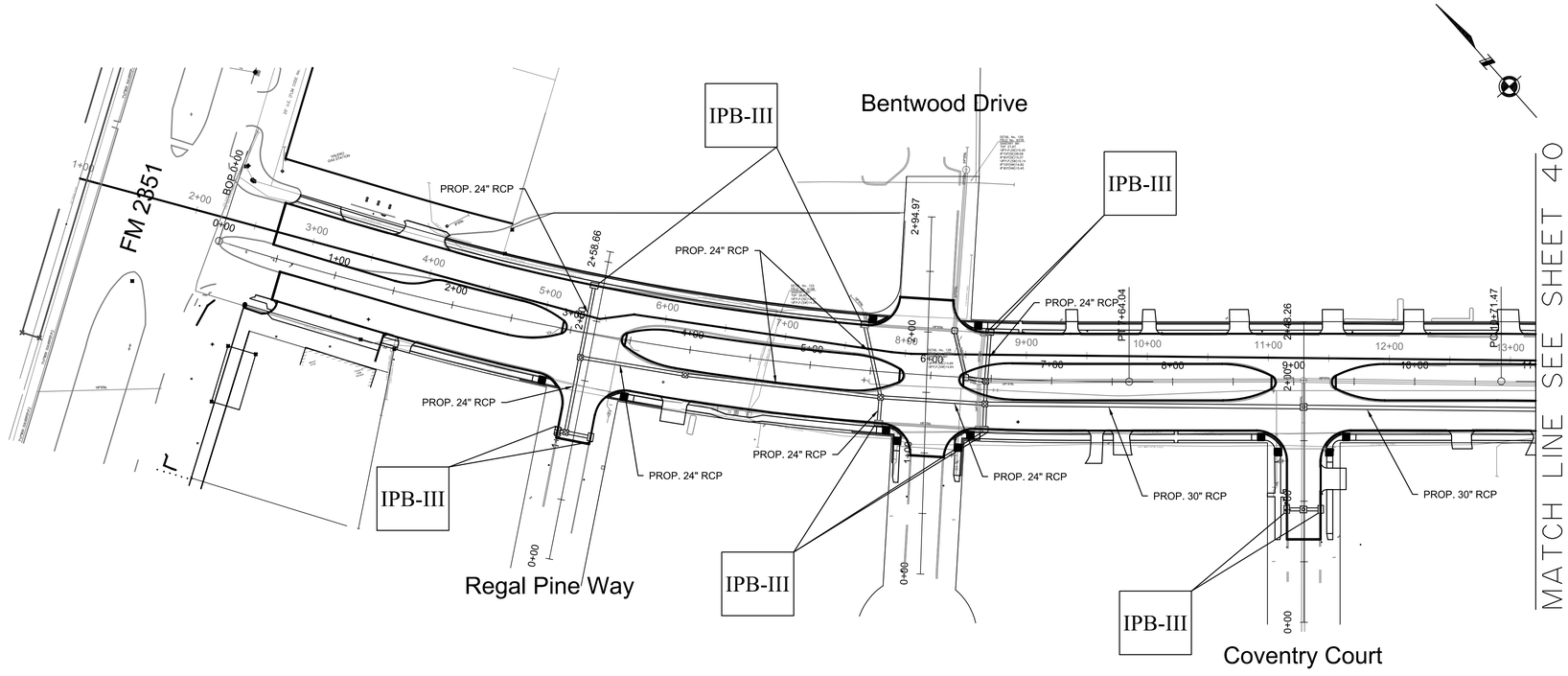
Storm Water Pollution Prevention Plan Notes

SCALE

SHEET NUMBER

SHEET 38 OF 111

FILE NAME



LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- EXISTING "A" INLET
- EXISTING "BB" INLET
- PROPOSED MANHOLE
- PROPOSED "BB" INLET
- PROPOSED "E" INLET
- PROPOSED "H-2" INLET
- IPB-III — INLET PROTECTION BARRIER TYPE III
- X—RFB—X — REINFORCED FILTER FABRIC BARRIER
- ROW IN PROJECT AREA

EROSION & SEDIMENTATION CONTROL NOTES:

1. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL INSTALL EROSION AND SEDIMENTATION CONTROLS AT LOCATION SHOWN ON PLANS FOR EXISTING CONDITIONS. CONTRACTOR SHALL ADD, DELETE AND /OR RELOCATE CONTROLS AS CONSTRUCTION PROGRESSES.
2. CONTRACTOR SHALL MAINTAIN, REPAIR AND/OR REPLACE DAMAGED EROSION AND SEDIMENTATION CONTROL SYSTEM THROUGHOUT THE DURATION OF THE CONTRACT. (NO SEPARATE PAY).
3. CONTRACTOR SHALL PROVIDE PROTECTED STORAGE AREAS FOR CHEMICALS, PAINTS, SOLVENTS, FERTILIZERS, AND OTHER POTENTIALLY TOXIC MATERIALS.
4. CONTRACTOR SHALL LOCATE FUEL/MATERIAL STORAGE AREAS AWAY FROM STORM WATER CONVEYANCE SYSTEMS. CONTRACTOR SHALL USE BERMS AROUND FUEL STORAGE AREAS. (NO SEPARATE PAY).
5. CONTRACTOR SHALL ADVISE OWNER IMMEDIATELY, VERBALLY, AND IN WRITING, OF ANY FUEL OR TOXIC MATERIAL SPILLS ONTO THE PROJECT AREA AND THE ACTION TAKEN TO REMEDY THE PROBLEM.
6. CONTRACTOR IS RESPONSIBLE FOR DISPOSING OF HIS FUELS, MATERIALS, AND CONTAMINATED EXCAVATIONS IN A LEGALLY APPROVED MANNER. (NO SEPARATE PAY). NO DISPOSAL SHALL BE PERMITTED ON PROJECT SITE.
7. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE ENVIRONMENTAL LAWS.
8. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATELY MAINTAINED SANITARY FACILITIES.
9. AT COMPLETION OF THE CONTRACT, OWNER AND/OR OWNER'S REPRESENTATIVE WITH THE CONTRACTOR SHALL EXAMINE EROSION AND SEDIMENTATION CONTROL SYSTEM BEFORE RELIEVING CONTRACTOR OF HIS MAINTENANCE RESPONSIBILITIES.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR STREET CLEANING, ON A DAILY BASIS, OF ALL MUD AND DIRT DEPOSITED ON THE EXISTING PAVEMENT DUE TO HIS CONSTRUCTION ACTIVITY.
11. INLETS AND MANHOLES THAT ARE NOT COMPLETE AND/OR ARE SUBJECT TO CONVEYING STORM WATER FLOWS ARE TO BE PROTECTED TO PREVENT SEDIMENT FROM ENTERING THE PROPOSED OR EXISTING STORM SEWER SYSTEM.
12. IF PAVING CONTRACTOR REMOVES OR PUNCTURES TIMBER GRATE TO ESTABLISH DRAINAGE, INLET MUST BE SURROUNDED BY INLET FILTER FABRIC AS SHOWN IN DETAILS.
13. FILTER FABRIC TO BE CLEANED OR REPLACED WHEN IT CEASES TO FUNCTION PROPERLY OR AS DIRECTED BY THE ENGINEER.
14. LOCATION OF CONSTRUCTION ACCESS IS APPROXIMATE. EXACT LOCATION SHALL BE BASED ON THE ACTUAL SEQUENCING OF WORK AND LOCATIONS FOR EGRESS OF THE SITE BY THE CONTRACTOR.

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LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

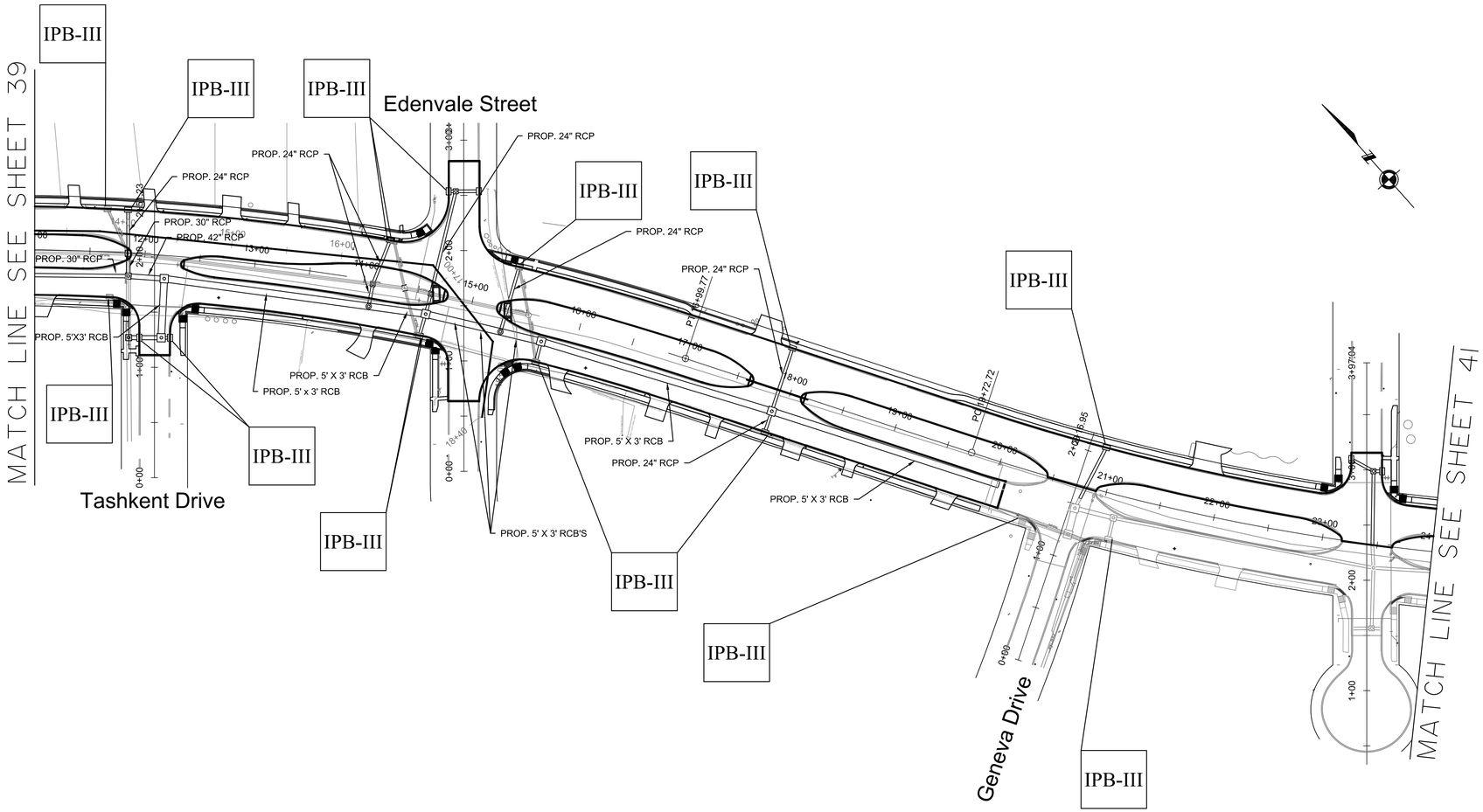
Storm Water Pollution Prevention Plan Sheet 1

SCALE	1"=60'

SHEET NUMBER

SHEET 39 OF 111

FILE NAME	Package B 17-019-31_32 SWP3 BLACKHAWK.dwg



LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- EXISTING "A" INLET
- EXISTING "BB" INLET
- PROPOSED MANHOLE
- PROPOSED "BB" INLET
- PROPOSED "E" INLET
- PROPOSED "H-2" INLET
- IPB-III — INLET PROTECTION BARRIER TYPE III
- X—(RFB)—X — REINFORCED FILTER FABRIC BARRIER
- ROW IN PROJECT AREA

EROSION & SEDIMENTATION CONTROL NOTES:

1. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL INSTALL EROSION AND SEDIMENTATION CONTROLS AT LOCATION SHOWN ON PLANS FOR EXISTING CONDITIONS. CONTRACTOR SHALL ADD, DELETE AND /OR RELOCATE CONTROLS AS CONSTRUCTION PROGRESSES.
2. CONTRACTOR SHALL MAINTAIN, REPAIR AND/OR REPLACE DAMAGED EROSION AND SEDIMENTATION CONTROL SYSTEM THROUGHOUT THE DURATION OF THE CONTRACT. (NO SEPARATE PAY).
3. CONTRACTOR SHALL PROVIDE PROTECTED STORAGE AREAS FOR CHEMICALS, PAINTS, SOLVENTS, FERTILIZERS, AND OTHER POTENTIALLY TOXIC MATERIALS.
4. CONTRACTOR SHALL LOCATE FUEL/MATERIAL STORAGE AREAS AWAY FROM STORM WATER CONVEYANCE SYSTEMS. CONTRACTOR SHALL USE BERMS AROUND FUEL STORAGE AREAS. (NO SEPARATE PAY).
5. CONTRACTOR SHALL ADVISE OWNER IMMEDIATELY, VERBALLY, AND IN WRITING, OF ANY FUEL OR TOXIC MATERIAL SPILLS ONTO THE PROJECT AREA AND THE ACTION TAKEN TO REMEDY THE PROBLEM.
6. CONTRACTOR IS RESPONSIBLE FOR DISPOSING OF HIS FUELS, MATERIALS, AND CONTAMINATED EXCAVATIONS IN A LEGALLY APPROVED MANNER. (NO SEPARATE PAY). NO DISPOSAL SHALL BE PERMITTED ON PROJECT SITE.
7. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE ENVIRONMENTAL LAWS.
8. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATELY MAINTAINED SANITARY FACILITIES.
9. AT COMPLETION OF THE CONTRACT, OWNER AND/OR OWNER'S REPRESENTATIVE WITH THE CONTRACTOR SHALL EXAMINE EROSION AND SEDIMENTATION CONTROL SYSTEM BEFORE RELIEVING CONTRACTOR OF HIS MAINTENANCE RESPONSIBILITIES.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR STREET CLEANING, ON A DAILY BASIS, OF ALL MUD AND DIRT DEPOSITED ON THE EXISTING PAVEMENT DUE TO HIS CONSTRUCTION ACTIVITY.
11. INLETS AND MANHOLES THAT ARE NOT COMPLETE AND/OR ARE SUBJECT TO CONVEYING STORM WATER FLOWS ARE TO BE PROTECTED TO PREVENT SEDIMENT FROM ENTERING THE PROPOSED OR EXISTING STORM SEWER SYSTEM.
12. IF PAVING CONTRACTOR REMOVES OR PUNCTURES TIMBER GRATE TO ESTABLISH DRAINAGE, INLET MUST BE SURROUNDED BY INLET FILTER FABRIC AS SHOWN IN DETAILS.
13. FILTER FABRIC TO BE CLEANED OR REPLACED WHEN IT CEASES TO FUNCTION PROPERLY OR AS DIRECTED BY THE ENGINEER.
14. LOCATION OF CONSTRUCTION ACCESS IS APPROXIMATE. EXACT LOCATION SHALL BE BASED ON THE ACTUAL SEQUENCING OF WORK AND LOCATIONS FOR EGRESS OF THE SITE BY THE CONTRACTOR.

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

Ngoc Kim Le
03-02-2026

SHEET NAME

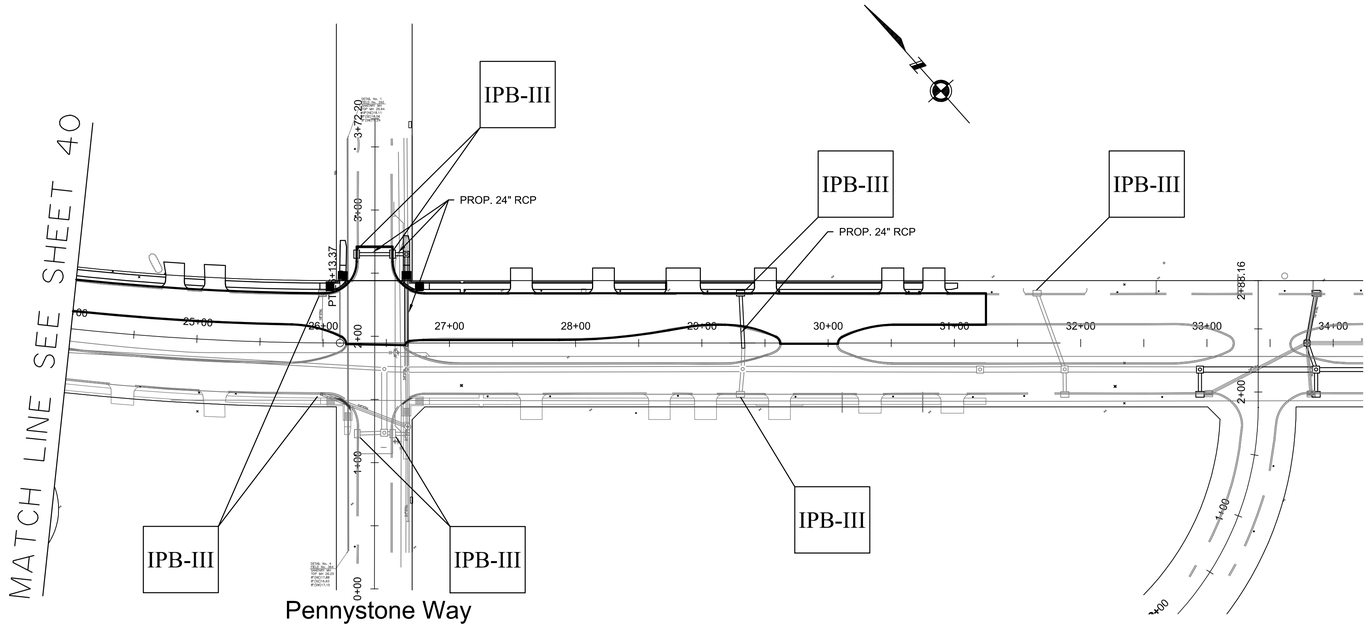
Storm Water Pollution Prevention Plan Sheet 2

SCALE 1"=60'

SHEET NUMBER

SHEET 40 OF 111

FILE NAME Package B 17-019-31_32 SWP3 BLACKHAWK.dwg



LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- EXISTING "A" INLET
- EXISTING "BB" INLET
- PROPOSED MANHOLE
- PROPOSED "BB" INLET
- PROPOSED "E" INLET
- PROPOSED "H-2" INLET
- IPB-III — INLET PROTECTION BARRIER TYPE III
- ROW IN PROJECT AREA

EROSION & SEDIMENTATION CONTROL NOTES:

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4. CONTRACTOR SHALL LOCATE FUEL/MATERIAL STORAGE AREAS AWAY FROM STORM WATER CONVEYANCE SYSTEMS. CONTRACTOR SHALL USE BERMS AROUND FUEL STORAGE AREAS. (NO SEPARATE PAY).
5. CONTRACTOR SHALL ADVISE OWNER IMMEDIATELY, VERBALLY, AND IN WRITING, OF ANY FUEL OR TOXIC MATERIAL SPILLS ONTO THE PROJECT AREA AND THE ACTION TAKEN TO REMEDY THE PROBLEM.
6. CONTRACTOR IS RESPONSIBLE FOR DISPOSING OF HIS FUELS, MATERIALS, AND CONTAMINATED EXCAVATIONS IN A LEGALLY APPROVED MANNER. (NO SEPARATE PAY). NO DISPOSAL SHALL BE PERMITTED ON PROJECT SITE.
7. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE ENVIRONMENTAL LAWS.
8. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATELY MAINTAINED SANITARY FACILITIES.
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12. IF PAVING CONTRACTOR REMOVES OR PUNCTURES TIMBER GRATE TO ESTABLISH DRAINAGE, INLET MUST BE SURROUNDED BY INLET FILTER FABRIC AS SHOWN IN DETAILS.
13. FILTER FABRIC TO BE CLEANED OR REPLACED WHEN IT CEASES TO FUNCTION PROPERLY OR AS DIRECTED BY THE ENGINEER.
14. LOCATION OF CONSTRUCTION ACCESS IS APPROXIMATE. EXACT LOCATION SHALL BE BASED ON THE ACTUAL SEQUENCING OF WORK AND LOCATIONS FOR EGRESS OF THE SITE BY THE CONTRACTOR.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

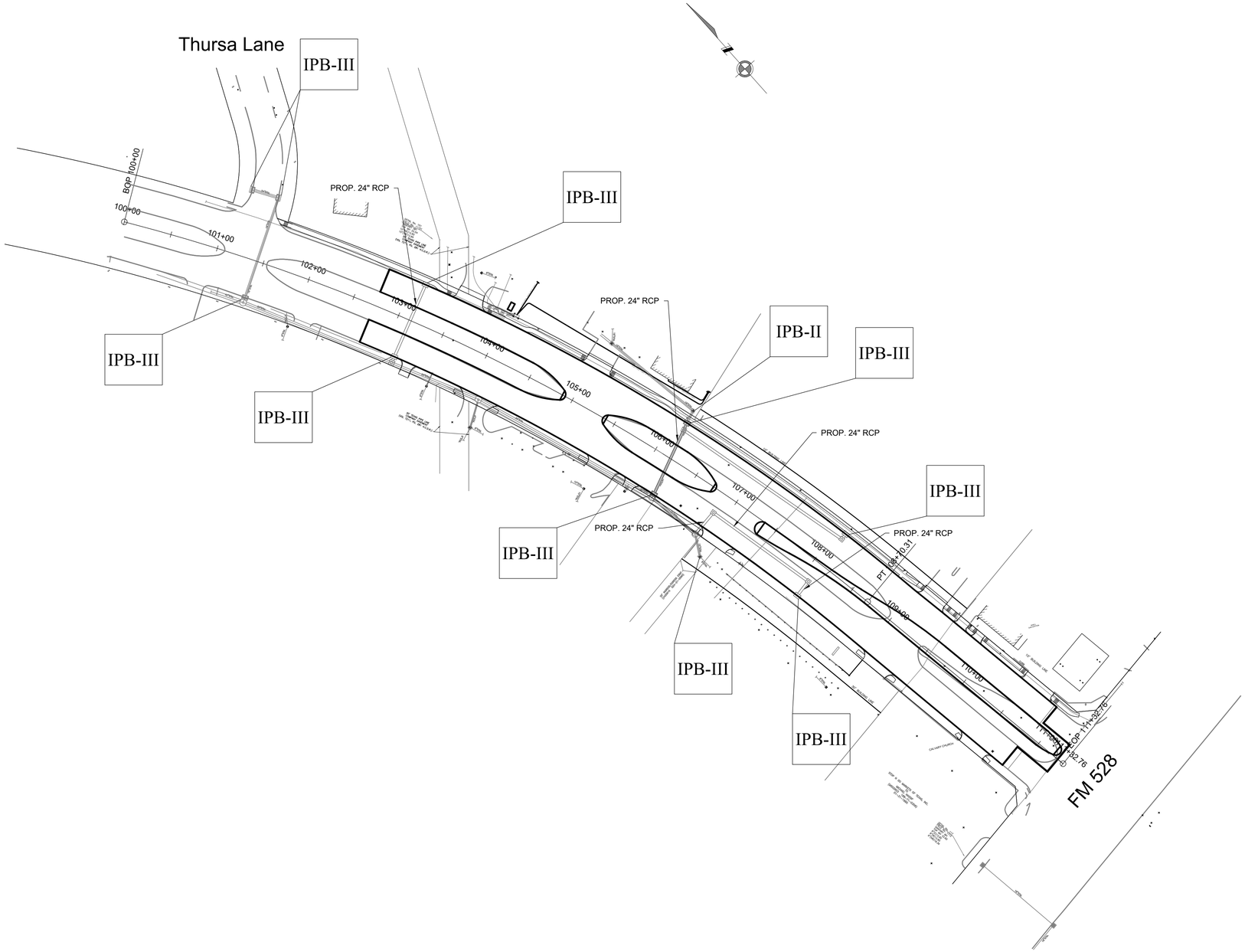
Storm Water Pollution Prevention Plan Sheet 3

SCALE	1"=60'

SHEET NUMBER

SHEET 41 OF 111

FILE NAME



LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- EXISTING "A" INLET
- EXISTING "BB" INLET
- PROPOSED MANHOLE
- PROPOSED "BB" INLET
- PROPOSED "E" INLET
- PROPOSED "H-2" INLET
- IPB-III — INLET PROTECTION BARRIER TYPE III
- RFB — REINFORCED FILTER FABRIC BARRIER
- ROW IN PROJECT AREA

EROSION & SEDIMENTATION CONTROL NOTES:

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

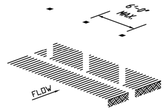
Storm Water Pollution Prevention Plan Sheet 4

SCALE 1"=60'

SHEET NUMBER

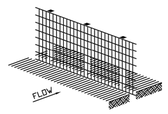
SHEET 42 OF 111

FILE NAME



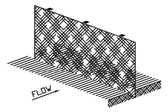
STEP 1:

SET POSTS AND EXCAVATE FOUR (4) INCH BY FOUR (4) INCH TRENCH UPSLOPE ALONG LINE OF POSTS (SEE NOTE 1).



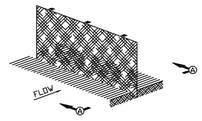
STEP 2:

SECURE WIRE FENCING TO POSTS (SEE NOTE 2).



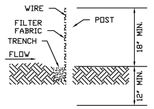
STEP 3:

ATTACH FILTER FABRIC MATERIAL TO WIRE FENCE AND EXTEND IT INTO TRENCH (SEE NOTE 3).

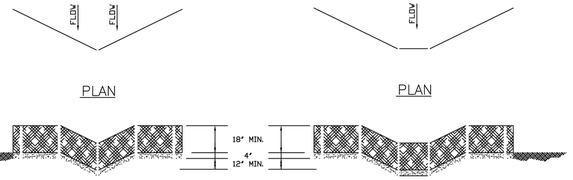


STEP 4:

BACKFILL AND COMPACT EXCAVATED SOIL (SEE NOTE 4).



SECTION "A" – "A"



V-BOTTOM DITCH PROFILE

FLAT BOTTOM DITCH PROFILE

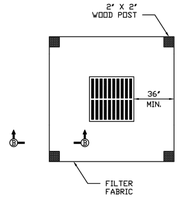
SILT FILTER FABRIC FENCE

NOTES:

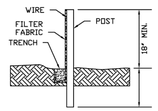
1. SET TWO (2) INCH BY TWO (2) INCH WOODEN STAKES EMBEDDED TWELVE (12) INCHES INTO GROUND. SPACING SHALL BE A MAXIMUM OF SIX (6) FEET APART FOR REINFORCED FILTER FABRIC FENCE AND A MAXIMUM OF THREE (3) FEET APART FOR NON-REINFORCED FILTER FABRIC FENCE.
2. REINFORCED FILTER FABRIC FENCE SHALL HAVE WOVEN WIRE FENCE WHICH SHALL BE FASTENED SECURELY TO FENCE POSTS.
3. FASTEN FILTER FABRIC FENCE AS FOLLOWS:
   3.1. REINFORCED FILTER FABRIC FENCE SHALL SECURELY FASTENED TO WOVEN WIRE FENCE WITH TIES SPACED EVERY TWENTY-FOUR (24) INCHES AT TOP AND MIDSECTION.
   3.2. NON-REINFORCED FILTER FABRIC FENCE SHALL BE FASTENED AT EVERY WOOD POST AT TOP AND MIDSECTION.
4. MINIMUM HEIGHT OF FILTER FABRIC SHALL BE EIGHTEEN (18) INCHES ABOVE NATURAL GROUND AND A MAXIMUM OF THIRTY-SIX (36) INCHES ABOVE NATURAL GROUND.
5. FILTER FABRIC SHALL EXTEND INTO THE FOUR (4) INCH BY FOUR (4) INCH TRENCH DOWN THE SIDE CLOSEST TO THE WOODEN POSTS, ACROSS THE BOTTOM OF THE TRENCH AND HALF WAY UP THE OPPOSITE SIDE.
6. ALL INSTALLATIONS OF SILT FENCE SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATION SECTION 02005 - FILTER FABRIC SILT FENCE.
7. METAL STAKES OR T-POSTS MAY BE USED IN LIEU OF WOOD POSTS.

SC	STABILIZED CONSTRUCTION EXIT
FF	FILTER FABRIC SILT FENCE
RFB	REINFORCED FILTER FABRIC BARRIER
IPB-I	INLET PROTECTION BARRIER TYPE I
IPB-II	INLET PROTECTION BARRIER TYPE II
IPB-III	INLET PROTECTION BARRIER TYPE III
LPIP	LOW PROFILE INLET PROTECTOR
LPIGP	LOW PROFILE INLET GRATE PROTECTOR
CW-A	CONCRETE WASHOUT AREA - ABOVE GROUND
CW-B	CONCRETE WASHOUT AREA - BELOW GROUND

SWPPP SYMBOLS



PLAN

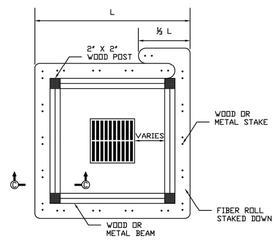


SECTION "B" – "B"

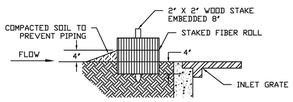
INLET PROTECTION TYPE I

NOTES:

1. MAXIMUM POST SPACING SHALL BE FOUR (4) FEET. ADDITIONAL POSTS MAY BE ADDED AS NEEDED. POSTS SHALL BE PLACED A MINIMUM AT EACH CORNER AS SHOWN.
2. PLACEMENT OF FILTER FABRIC BARRIER FROM INLET SHALL VARY ACCORDING TO SITE CONDITIONS. TYPICAL PLACEMENT SHALL BE A MINIMUM OF THIRTY-SIX (36) INCHES FROM INLET EDGE.



PLAN

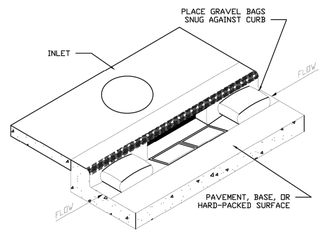


SECTION "C" – "C"

INLET PROTECTION TYPE II

NOTES:

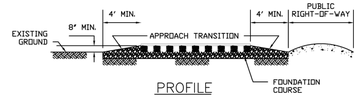
1. MAXIMUM POST SPACING SHALL BE FOUR (4) FEET. ADDITIONAL POSTS MAY BE ADDED AS NEEDED. POSTS SHALL BE PLACED A MINIMUM AT EACH CORNER AS SHOWN.
2. PLACEMENT OF FIBER ROLL FROM INLET SHALL VARY ACCORDING TO SITE CONDITIONS. TYPICAL PLACEMENT SHALL BE TWENTY-FOUR (24) INCHES FROM INLET.
3. FIBER ROLLS SHALL BE UTILIZED ONLY WHEN SITE CONDITIONS DO NOT PERMIT THE USE OF FILTER FABRIC BARRIER.
4. IF UNDERLYING MATERIAL IS BASE OR OTHER HARD-PACKED MATERIAL, THEN FIBER ROLLS MAY BE PLACED ON HARD PACKED SURFACE AND WEIGHTED DOWN WITH GRAVEL BAGS.



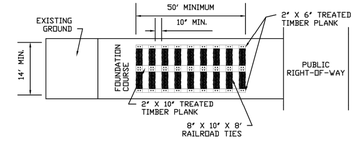
INLET PROTECTION BARRIER TYPE III

NOTES:

1. IPB TYPE III SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "B", "B-B" AND "H-2" INLETS ONLY.
2. PLACE GRAVEL BAG IN THE GUTTER ON EACH SIDE OF THE INLET OPENING. GRAVEL BAG SHALL BE PLACED TIGHTLY AGAINST THE FACE OF CURB.
3. PLACE GRAVEL BAGS AT BACK OF CURB ALONG INLET.
4. DO NOT PLACE BAGS TO BLOCK THROAT OF INLET, UNLESS DIRECTED BY THE ENGINEER AND APPROVED BY THE CITY OF FRIENDSWOOD.



PROFILE

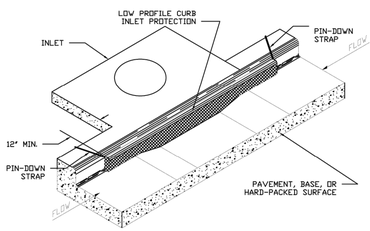


PLAN

CONSTRUCTION ACCESS TYPE I

NOTES:

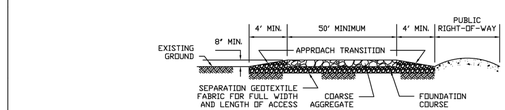
1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN FIFTY (50) FEET.
2. THICKNESS SHALL BE A MINIMUM OF EIGHT (8) INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
4. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MINIMUM, AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
5. THE TREATED TIMBER PLANKS SHALL BE ATTACHED TO THE RAILROAD TIES WITH ½" X 6" MINIMUM LAG BOLTS. OTHER FASTENERS MAY BE USED AS APPROVED BY THE CITY.
6. APPROACH TRANSITION SHALL BE A MINIMUM OF EIGHT (8) INCHES IN DEPTH AND 6:1 SLOPE MINIMUM.
7. FOUNDATION COURSE SHALL BE A MINIMUM OF SIX (6) INCHES. FOUNDATION COURSE MATERIAL SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL APPROVED BY THE CITY.
8. ACCESS SHALL BE GRADED TO PREVENT RUN-OFF FROM LEAVING SITE, ALLOWING DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
9. CONSTRUCTION ACCESS SHALL ADHERE TO CITY OF FRIENDSWOOD SPECIFICATION 02020 - STABILIZED CONSTRUCTION ACCESS, ROADS, PARKING AND WASH AREAS.
10. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION ACCESS, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
11. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMMODATE TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR TRUCK WASHING AREA.
12. STABILIZED CONSTRUCTION ACCESS SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.



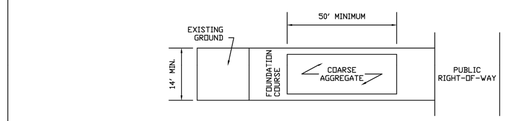
LOW PROFILE INLET PROTECTOR

NOTES:

1. LPIP SHALL BE REQUIRED IN HIGH TRAFFIC VOLUME ROADWAYS.
2. LPIP SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "H-2" INLETS ONLY.
3. LPIP SHALL EXTEND A MINIMUM OF TWELVE (12) INCHES PAST THE THROAT OPENING OF THE INLET.
4. LPIP SHALL BE PINNED DOWN BEHIND THE CURB AS SHOWN.
5. ONLY GUTTER GATOR™ OR GUTTER GUARD™ SHALL BE USED, UNLESS PREVIOUSLY APPROVED BY THE CITY ENGINEER.



PROFILE

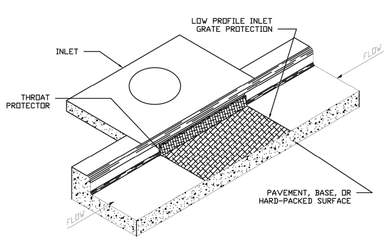


PLAN

CONSTRUCTION ACCESS TYPE II

NOTES:

1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN FIFTY (50) FEET.
2. THICKNESS SHALL BE A MINIMUM OF EIGHT (8) INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
4. APPROACH TRANSITION SHALL BE A MINIMUM OF EIGHT (8) INCHES IN DEPTH AND 6:1 SLOPE MINIMUM.
5. FOUNDATION COURSE SHALL BE A MINIMUM OF SIX (6) INCHES. FOUNDATION COURSE MATERIAL SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL APPROVED BY THE CITY.
6. ACCESS SHALL BE GRADED TO PREVENT RUN-OFF FROM LEAVING SITE.
7. CONSTRUCTION ACCESS SHALL ADHERE TO CITY OF FRIENDSWOOD SPECIFICATION 02020 - STABILIZED CONSTRUCTION ACCESS, ROADS, PARKING AND WASH AREAS.
8. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION ACCESS, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
9. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMMODATE TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR TRUCK WASHING AREA.
10. STABILIZED CONSTRUCTION ACCESS SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.



LOW PROFILE INLET GRATE PROTECTOR

NOTES:

1. LPIGP SHALL BE REQUIRED IN HIGH TRAFFIC VOLUME ROADWAYS.
2. LPIGP SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "B" AND "B-B" INLETS ONLY.
3. THROAT PROTECTION SHALL BE A MINIMUM OF 4" IN HEIGHT.
4. ONLY GRATE GATOR™ OR INLET GUARD PLUS® SHALL BE USED, UNLESS PREVIOUSLY APPROVED BY THE CITY ENGINEER.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) STANDARD DETAILS

FILE NAME: 11-SW3PSD1-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

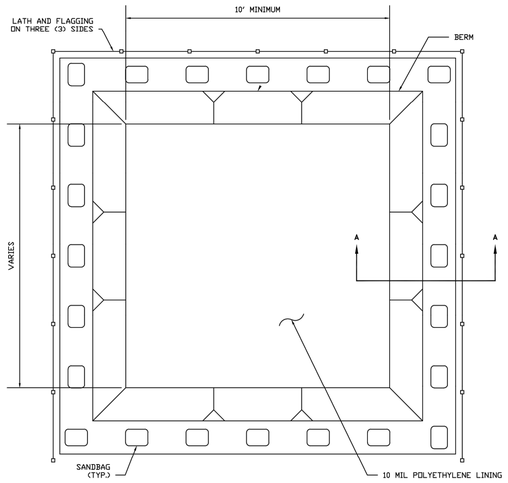
STATE OF TEXAS — NGOC KIM LE — LICENSED PROFESSIONAL ENGINEER

03-02-2026

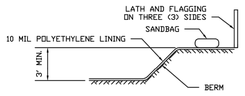
PROJECT NUMBER:

DATE SUBMITTED:

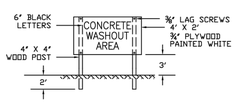
SHEET: 43 OF 111



PLAN VIEW

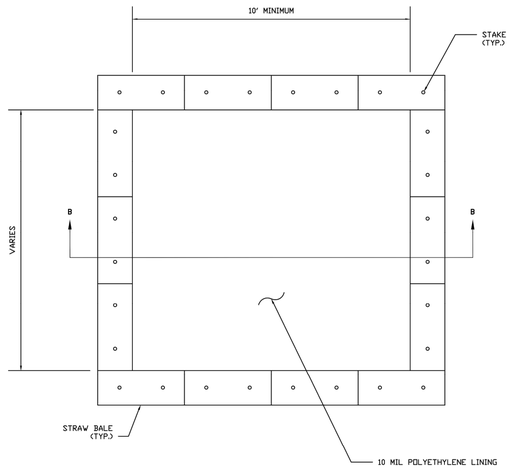


SECTION 'A-A'

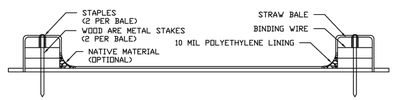


SIGN DETAIL

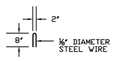
ABOVE GROUND



PLAN



SECTION 'B-B'



STAPLE DETAIL

BELOW GROUND

CONCRETE WASHOUT AREA

NOTES:

1. ACTUAL LAYOUT TO BE DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN THREE (3) FEET OF THE CONCRETE WASHOUT FACILITY.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) STANDARD DETAILS (CONT.)

FILE NAME: 12-SW3PSD2-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

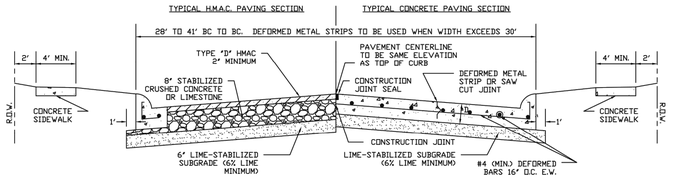
STATE OF TEXAS — NGOC KIM LE — 113782 — LICENSED PROFESSIONAL ENGINEER

03-02-2026

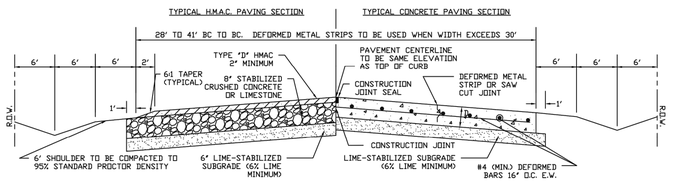
PROJECT NUMBER:

DATE SUBMITTED:

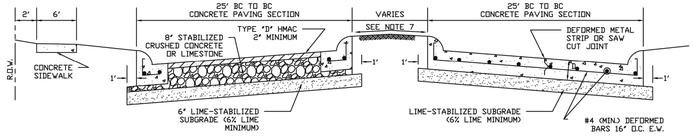
SHEET: 44 OF 111



SINGLE ROADWAY CURB SECTION



SINGLE ROADWAY OPEN DITCH SECTION

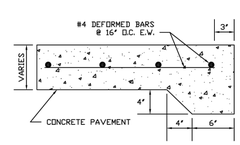


DOUBLE ROADWAY SECTION

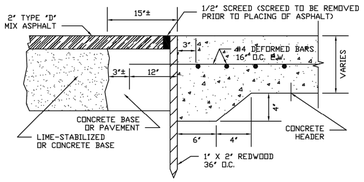
ROADWAY SECTIONS

NOTES:

1. ALL REINFORCING BAR SHALL CONFORM TO ASTM A15-54T AND A305-53T.
2. EXPANSION JOINTS SHALL BE PLACED AT THE END OF EACH CURB RETURN, AND AT A MAXIMUM SPACING OF FORTY (40) FEET WITH CONTROL JOINTS NO GREATER THAN TEN (10) FEET. THE MAXIMUM LENGTH BETWEEN LONGITUDINAL JOINTS SHALL NOT EXCEED FIFTEEN (15) FEET.
3. ALL PAVEMENT CROSS-SECTION SHALL EITHER BE HYPERBOLIC OR TANGENT CROWN. MINIMUM SLOPE SHALL BE ONE-QUARTER (¼) INCH PER FOOT.
4. MINIMUM SLOPE FOR ANY MEDIAN SHALL BE ONE-HALF (½) INCH PER FOOT.

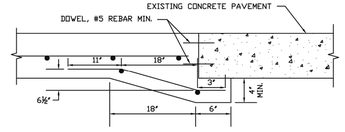


CONCRETE PAVING HEADER

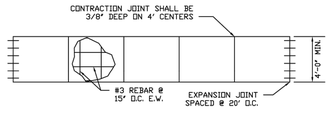


ASPHALT PAVING HEADER

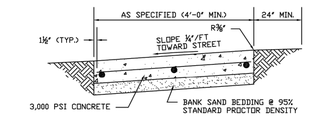
PAVING HEADERS



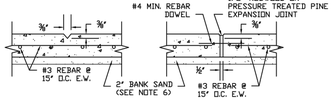
UNDERCUT DETAIL



SIDEWALK PLAN VIEW



SIDEWALK SECTION



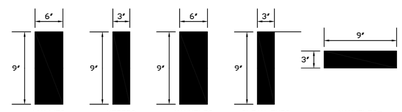
CONTRACTION JOINT

EXPANSION JOINT

SIDEWALK JOINTS

NOTES:

1. ALL EDGES SHALL BE ROUNDED WITH ¾" RADIUS.
2. CONTRACTION JOINTS SHALL BE PLACED AT 4'-0" INTERVALS.
3. CONTRACTION JOINTS SHALL BE ¾" DEEP AND HAVE TROWEL EDGE.
4. ¾" EXPANSION JOINT MATERIAL REQUIRED WHERE SIDEWALKS ABUT BUILDINGS, CURBS, DRIVEWAYS, OR EXISTING SIDEWALKS.
5. EXPANSION JOINTS SHALL BE PLACED AT 20'-0" INTERVALS.
6. 2" INCH CLEAN BANK SAND SHALL BE TAMPED TO 95% STANDARD PROCTOR.
7. WHERE NEW SIDEWALK IS PLACED AGAINST EXISTING SIDEWALK, SAW CUT EXISTING SIDEWALK TO AN EVEN STRAIGHT LINE PRIOR TO INSTALLATION OF THE NEW SIDEWALK INSTALL #4 REBAR DOWEL INTO EXISTING SIDEWALK.

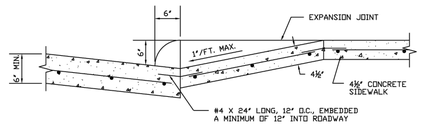


WATER LINES SANITARY SEWER STORM SEWER

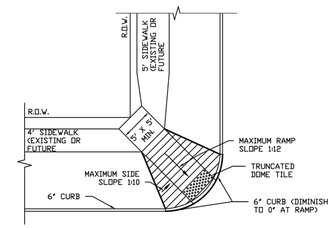
UTILITY MARKINGS

NOTES:

1. SAW CUT CURB OR EDGE AND APPLY APPROPRIATE MARKING AS LISTED BELOW.
2. WATER VALVE MARKING SHALL BE 6" X 9" IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
3. WATER METER MARKING SHALL BE 3" X 9" IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
4. SANITARY SEWER MANHOLE MARKING SHALL BE 6" X 9" IN SIZE MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
5. SANITARY SEWER CLEAN-OUT MARKING SHALL BE 3" X 9" IN SIZE AND MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
6. STORM SEWER MANHOLE MARKING SHALL BE 9" X 3" IN SIZE AND MARKED IN BLACK PAINT. *ONLY STORM SEWER MANHOLES SHALL BE MARKED NOT, INLETS.



SIDEWALK & WHEEL CHAIR RAMP SECTION

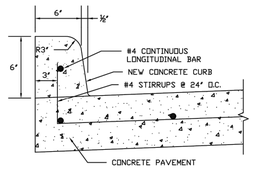


WHEELCHAIR RAMP – PLAN VIEW

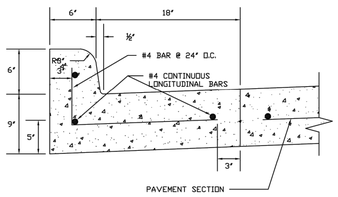
NOTES:

1. RAMP SHALL MEET ADA (AMERICANS WITH DISABILITIES ACT) AND TABA (TEXAS ARCHITECTURAL BARRIERS ACT).
2. FINISHED SURFACE OF WHEELCHAIR RAMP AND SIDE SLOPE SHALL BE GROOVED LATERALLY WITH ¼" WIDE BY ¼" DEEP GROOVES, SPACED AT 2¼" O.C. WITH BLACK BROOM FINISH. CONTRACTOR SHALL MAKE ADJUSTMENTS TO RAMPS TO FIT LOCAL CONDITION.
3. ALL CUTOUTS MUST HAVE BARRICADES INSTALLED UNTIL WHEELCHAIR RAMPS ARE COMPLETED.
4. MINIMUM CLEARANCE (WIDTH) OF RAMP SHALL BE THIRTY-SIX (36) INCHES.
5. FINISH SURFACES OF RAMP AND SIDE SLOPE SHALL BE TREATED WITH COLOR SO THAT THE SURFACES ARE IN CONTRAST WITH SURFACE COLOR OF ADJACENT SIDEWALKS AND STREETS.
6. CONTRAST COLOR OF WHEELCHAIR RAMPS AND SIDE SLOPES SHALL BE BLACK DYE PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.

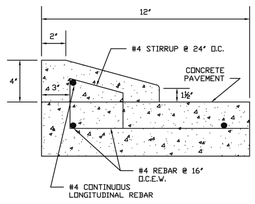
SIDEWALKS AND WHEELCHAIR RAMPS



TYPE I – 6" CONCRETE CURB



TYPE II – MONOLITHIC CONCRETE CURB AND GUTTER

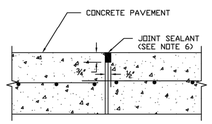


TYPE III – 4" x 12" CONCRETE CURB

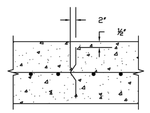
CONCRETE CURB

NOTE:

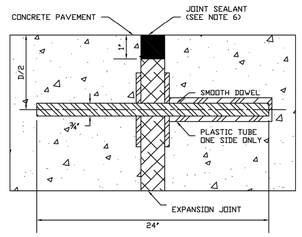
1. WHEN CONCRETE CURB IS TO BE PLACED ON EXISTING CONCRETE DOWEL IN #3 DEFORMED BARS @ 36" O.C. AND SET IN SULFUR, OR QUICK SETTING CEMENT.
2. MORTAR FINISH IS NOT REQUIRED WHEN CURB IS PLACED BY A MACHINE, BUT CURB SHALL STILL HAVE THE SAME OUTSIDE DIMENSIONS.



CONSTRUCTION JOINT



DEFORMED METAL STRIP

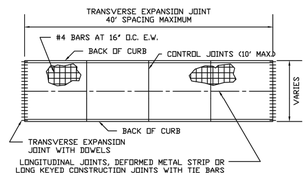


DOWEL EXPANSION JOINT

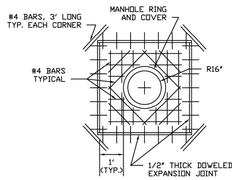
NOTES:

1. CANTILEVER TYPE, CAST MALLEABLE IRON LOAD TRANSMISSION UNIT-STARLUG MODEL D-27 OR EQUAL ON 22" O.C. ARE ACCEPTABLE ALTERNATIVES.
2. EXPANSION JOINTS SHALL BE PLACED AT THE END OF EACH CURB RETURN, AND AT A MAXIMUM OF FORTY (40) FEET WITH CONTROL JOINTS NO GREATER THAN EVERY TEN (10) FEET.
3. STAKES FOR TRANSVERSE JOINTS SHALL NOT BE PLACED CLOSER THAN 6" TO A LONGITUDINAL JOINT. THE TOP OF STAKE SHALL NOT BE LESS THAN 1¼" BELOW THE FINISH SURFACE.
4. LOCATION OF CONSTRUCTION JOINTS AND DEFORMED STRIPS MAY BE VARIED WITH THE APPROVAL OF THE CITY, TO SUIT PROPOSED CONSTRUCTION OF THE CONTRACTOR.
5. JOINTS AND SEALANTS SHALL ADHERE TO CITY OF FRIENDSWOOD TECHNICAL SPECIFICATION 02840 - CONCRETE PAVEMENT JOINTS.

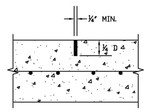
PAVEMENT JOINTS



PAVING PANEL



MANHOLE BLOCKOUT



CONTRACTION JOINT

NOTES:

1. D = DEPTH OF CONCRETE.
2. SAW-CUT CONTRACTION JOINT TO DIMENSIONS SHOWN.

PAVING CONSTRUCTION NOTES:

1. PAVEMENT AND SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISION.
2. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 A MINIMUM OF TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL TURN-OUTS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT THE BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (TMUTCD), LATEST EDITION, SHALL BE OBSERVED.
5. ALL FILL IN EXISTING RIGHTS-OF-WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN A MAXIMUM LOOSE LIFTS OF TWELVE (12) INCHES OR LESS AND COMPACTED TO A NINETYU-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH A MOISTURE CONTENT THREE PERCENT (3%) ± ONE PERCENT (1%) OF OPTIMUM MOISTURE,
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE 60, NO, 4 REBAR, SPACED AS SIXTEEN (16) INCHES ON CENTER, EACH WAY.
7. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET BACK OF CURB TO BACK OF CURB:

   8.1 MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.

   8.2 MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.
8. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET FROM BACK OF CURB TO BACK OF CURB AND MAJOR ARTERIAL THOROUGHFARES:

   9.1 MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.

   9.2 MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.
10. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF FORTY (40) FOOT INTERVALS.
11. ALL CONCRETE USED FOR PAVEMENT SHALL BE "CLASS A" CONCRETE, MINIMUM FIVE (5.0) SACKS OF CEMENT PER CUBIC YARD OF CONCRETE, 4,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS, CONCRETE USED FOR SIDEWALKS MAY BE 3,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS.
12. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE AT A MINIMUM OF SIX PERCENT(6%).
13. CONTRACTOR SHALL INSTALL STREET SIGNS AND REGULATORY SIGNS PER CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST EDITION.
14. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
15. FOR ALL CONCRETE TO BE REMOVED, SHALL BE SAW CUT ONE HALF OF THE PAVEMENT DEPTH BEFORE REMOVAL.
16. REPRESENTATIVES FROM THE CITY OF FRIENDSWOOD, THE OWNER, AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL GRADATIONS, DENSITY TESTING, LIME OPERATIONS, AND PLACEMENT OF CONCRETE OR ASPHALTIC PAVING.
17. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TESTS HAVE BEEN TAKEN.
18. BLUE REFLECTORIZED RAISED PAVEMENT MARKERS SHALL BE PLACED ADJACENT TO FIRE HYDRANT LOCATIONS AT A POINT SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY, ON THE SIDE OF THE FIRE HYDRANT (REFLECTORS SHALL FACE TRAFFIC FLOW).
19. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION, OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY OTHER SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

PAVING STANDARD DETAILS

FILE NAME: 7-PSD-2022.DWG

DATE APPROVED: MARCH, 30 2022

SCALE: NTS REVISED DATE: MARCH 2022

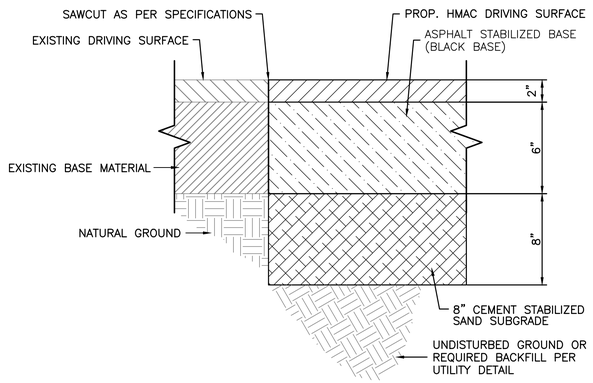
ENGINEERING DEPARTMENT

NGOC KIM LE — 03-02-2026

PROJECT NUMBER:

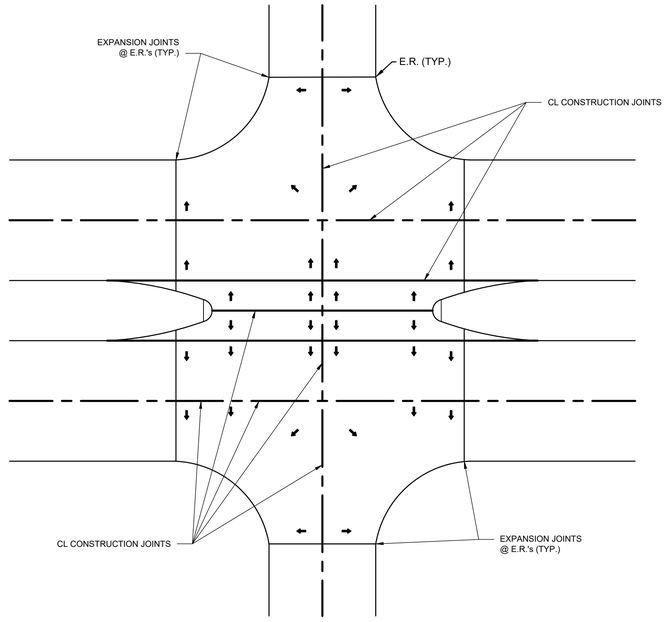
DATE SUBMITTED:

SHEET: 45 OF 111



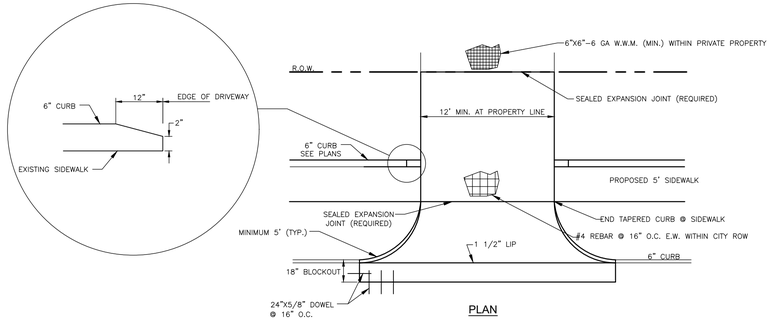
FULL DEPTH ASPHALT TRANSITION DETAIL

NOT TO SCALE

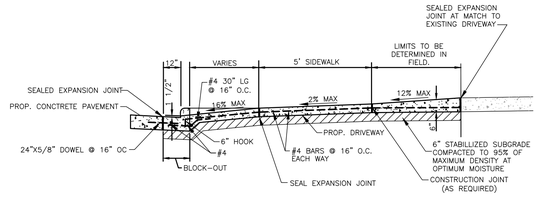


TYPICAL INTERSECTION JOINT LOCATION

NOT TO SCALE



PLAN



NOTES:

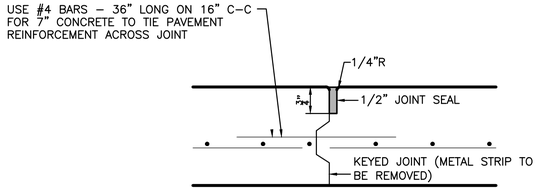
1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OFF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. CONTRACTOR SHALL COORDINATE WITH CITY AND RESIDENT IF DRIVEWAY REPLACEMENT IS PROPOSED BEYOND THE ROW DUE TO DRIVEWAY SLOPES. CONTRACTOR SHALL OBTAIN RIGHT-OF-ENTRY FORM FROM RESIDENT PRIOR TO PROCEEDING BEYOND THE ROW.
3. ALL CONCRETE SHALL BE CLASS "A" 3,500 PSI AT TWENTY-EIGHT DAYS.

PROFILE -CONCRETE STREETS

CONCRETE DRIVEWAY

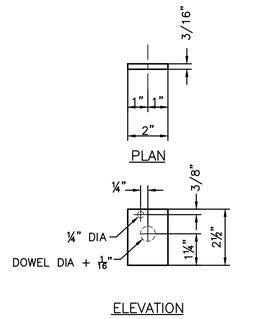
(PROPOSED CURB & GUTTER STREETS)

NOT TO SCALE



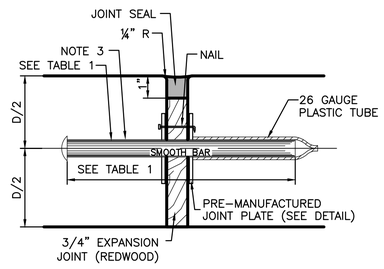
CONSTRUCTION JOINT AND SEAL DETAIL

NOT TO SCALE



JOINT PLATE DETAIL

NOT TO SCALE



SECTION

DOWEL TYPE EXPANSION JOINT

TABLE 1

PAVEMENT THICKNESS (IN)	DOWEL SIZES AND SPACINGS		
	DIAMETER (IN)	LENGTH (IN)	SPACING (IN)
7	1	18	12

EXPANSION AND CONSTRUCTION JOINT DETAILS

NOT TO SCALE

NOTES:

1. STEEL TO MEET ASTM STANDARD SPECIFICATIONS FOR CONCRETE REINFORCING BARS. UNITS TO BE SPACED ON 12" CENTERS.
2. EXPANSION JOINT TO BE PLACED AT THE END OF EACH CURB RADIUS AND SPACED AT A MAXIMUM DISTANCE OF 40 FEET.
3. CENTER DOWEL HORIZONTALLY ON JOINT.

ROADWAY EXPANSION JOINT DETAIL

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

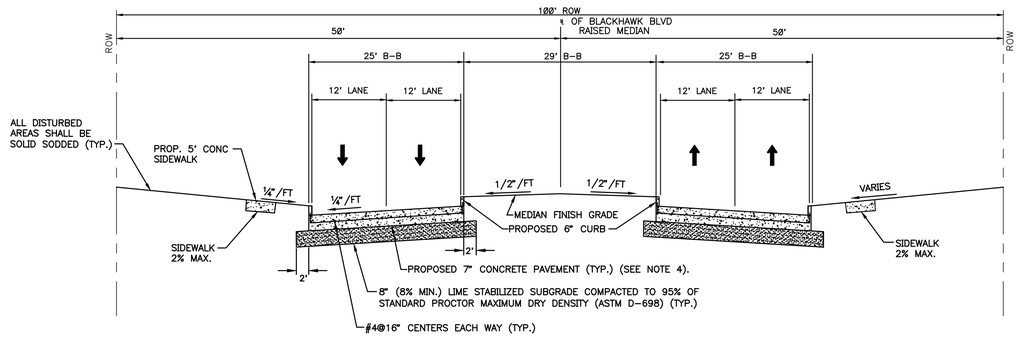
Additional Paving Details

SCALE: NTS

SHEET NUMBER

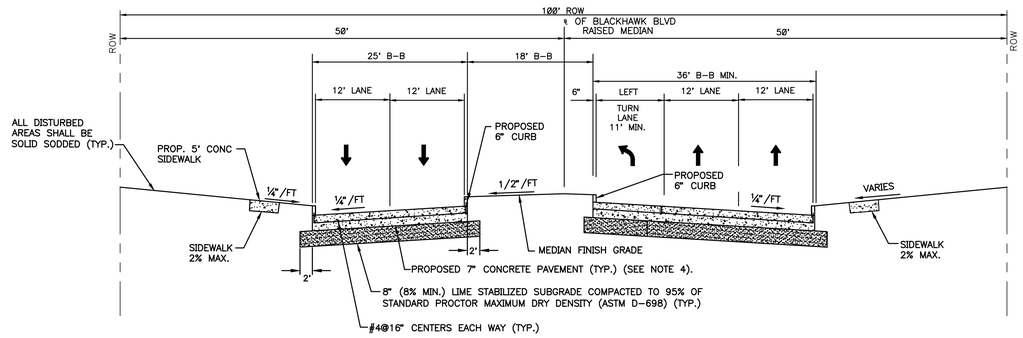
SHEET 46 OF 111

FILE NAME



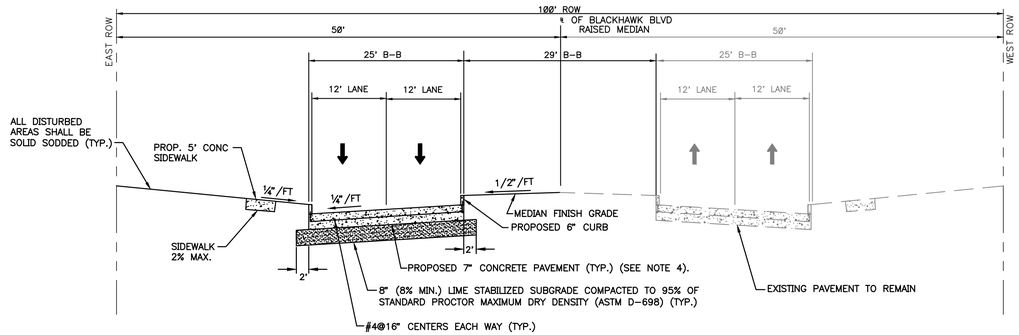
BLACKHAWK BLVD. TYPICAL DIVIDED ROADWAY SECTION

NOT TO SCALE



BLACKHAWK BLVD. TYPICAL DIVIDED ROADWAY SECTION W/ LEFT TURN LANE

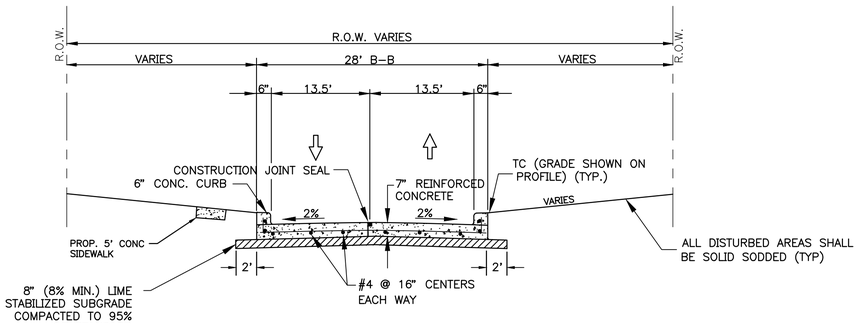
NOT TO SCALE



BLACKHAWK BLVD. TYPICAL DIVIDED ROADWAY SECTION

NOT TO SCALE

APPLIES STA. 20+10 TO STA. 31+25



CROSS STREET TYPICAL SECTION (7" CONCRETE)

NOT TO SCALE

GENERAL NOTES:

1. ALL REINFORCING STEEL SHALL CONFORM TO A.S.T.M. DESIGNATION A-615, GRADE 60.
2. THE LOCATION OF EXPANSION JOINTS MAY BE REQUIRED TO SUIT THE PROPOSED METHODS OF THE CONTRACTOR. THE MAXIMUM WIDTH BETWEEN TRANSVERSE EXPANSION JOINTS SHALL NOT EXCEED 40'-0".
3. CONTROL JOINTS SHALL BE A MINIMUM OF 1/4" WIDE AND SAW CUT TO A DEPTH OF ONE QUARTER OF PAVEMENT THICKNESS PLUS 1/2 INCH AND FILLED WITH JOINT SEALANT @ 20' MAXIMUM SPACING BETWEEN CONTROL JOINTS.
4. ALL CONCRETE USED FOR PAVEMENT SHALL BE "CLASS A" CONCRETE, MINIMUM FIVE AND ONE HALF (5 ½) SACKS OF CEMENT PER CUBIC YARD OF CONCRETE, 3500 PSI COMPRESSIVE STRENGTH AT TWENTY EIGHT (28) DAYS.
5. CLASS 'A' HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE AT A MINIMUM OF EIGHT PERCENT (8%).
6. FOR ALL CONCRETE REMOVED, A FULL DEPTH SAW-CUT SHALL BE PROVIDED PRIOR TO REMOVAL. NO SEPARATE PAY.
7. TOP OF CURB PROFILE ON PLAN & PROFILE REPRESENT CURB ON THE OUTSIDE LANE.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

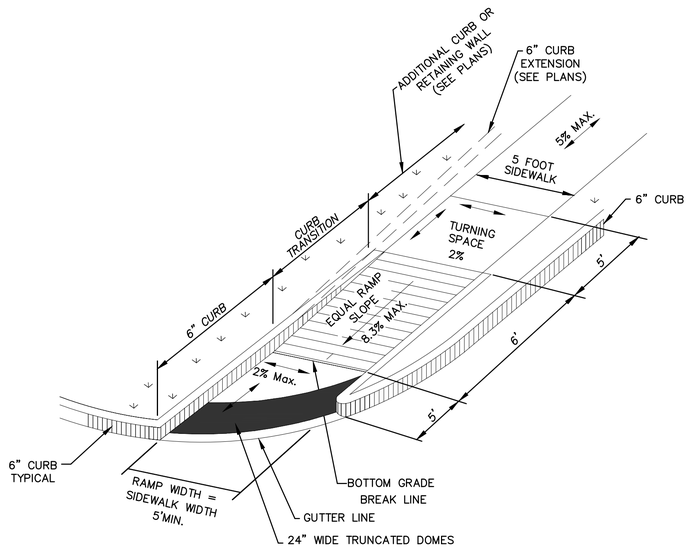
Typical Paving Sections

SCALE: NTS

SHEET NUMBER

SHEET 47 OF 111

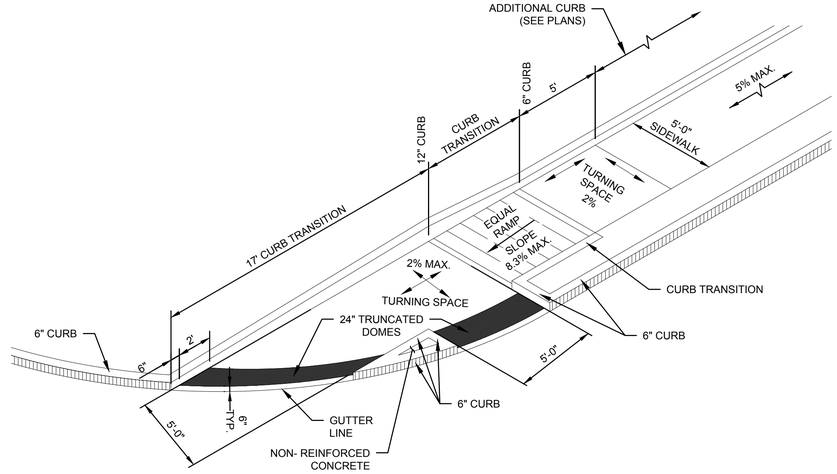
FILE NAME



CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

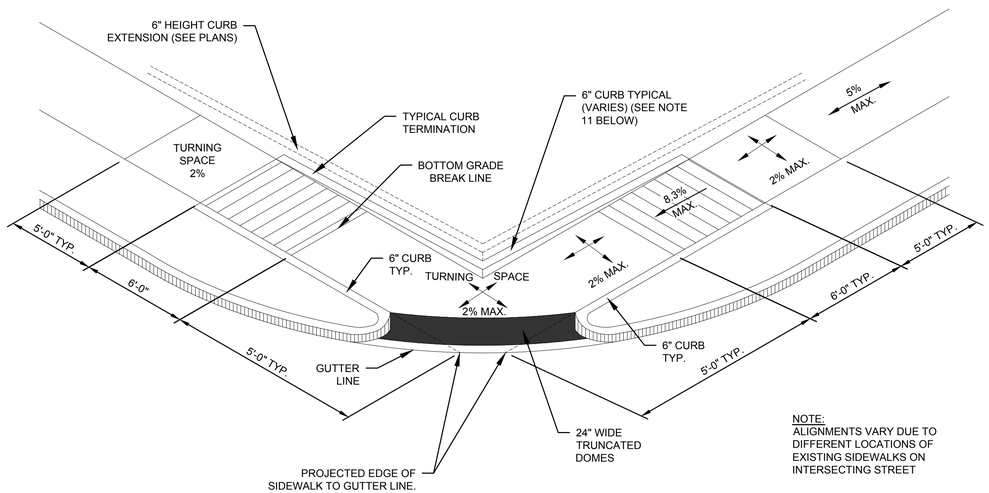
TYPE 1 WHEELCHAIR RAMP

SCALE: NOT TO SCALE



TYPE 1 MODIFIED WHEELCHAIR RAMP

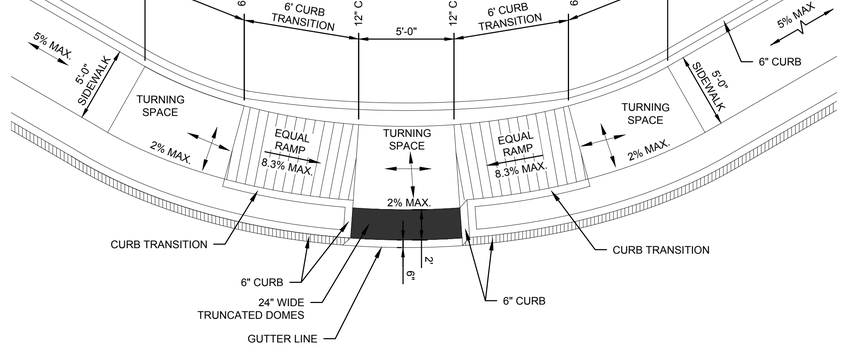
SCALE: NOT TO SCALE



NOTE:
ALIGNMENTS VARY DUE TO DIFFERENT LOCATIONS OF EXISTING SIDEWALKS ON INTERSECTING STREET

TYPE 2 WHEELCHAIR RAMP - INTERSECTING SIDEWALKS

SCALE: NOT TO SCALE



TYPE 3 WHEELCHAIR RAMP

SCALE: NOT TO SCALE

NOTES:

1. RAMP SHALL MEET ADA (AMERICANS WITH DISABILITIES ACT) AND TABA (TEXAS ARCHITECTURAL BARRIERS ACT).
2. FINISHED SURFACE OF WHEELCHAIR RAMP SLOPE SHALL BE GROOVED LATERALLY WITH 1/4" WIDE BY 1/4" DEEP GROOVES, SPACED AT 2-1/4" O.C. WITH BLACK BROOM FINISH. CONTRACTOR SHALL MAKE ADJUSTMENTS TO RAMPS TO FIT LOCAL CONDITION.
3. ALL CUTOUTS MUST HAVE BARRICADES INSTALLED UNTIL WHEELCHAIR RAMPS ARE COMPLETED.
4. MINIMUM CLEARANCE (WIDTH) OF RAMP SHALL MATCH 5'-0" SIDEWALK
5. FINISH SURFACES OF RAMP SHALL BE TREATED WITH COLOR SO THAT SURFACES ARE IN CONTRAST WITH SURFACE COLOR OF ADJACENT SIDEWALKS AND STREETS.
6. CONTRAST COLOR OF WHEELCHAIR RAMPS AND SIDE SLOPES SHALL BE BLACK DYE PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
7. ALIGNMENTS VARY DUE TO DIFFERENT LOCATIONS OF EXISTING SIDEWALKS WITHIN R.O.W. OF INTERSECTING STREETS (SEE PLANS).
8. ULTIMATE CURB HEIGHT OR RETAINING WALL HEIGHT REQUIREMENTS SHALL BE DETERMINED IN THE FIELD.
9. WHERE CURB HEIGHT CALLS FOR 12" ON PLANS, CONSTRUCT 12" CURB PER SIDEWALK CURB DETAIL. WHERE CURB HEIGHT CALLS FOR WALL TALLER THAN 12", CONSTRUCT WALL PER SIDEWALK RETAINING WALL DETAIL.
10. CURB LAYOUT ON R.O.W. SIDE @ CORNERS TYPICALLY SQUARE MAY BE ARCHED TO MATCH EXISTING LAYOUTS. (SEE PLANS)
11. CURB DETAILS ARE SHOWN ELSEWHERE IN PLANS.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

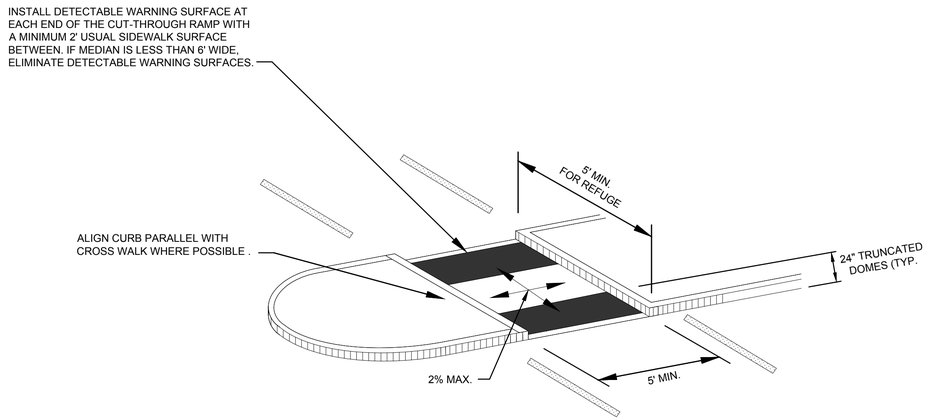
WHEELCHAIR RAMP DETAILS 1

SCALE	NTS

SHEET NUMBER

SHEET 48 OF 111

FILE NAME

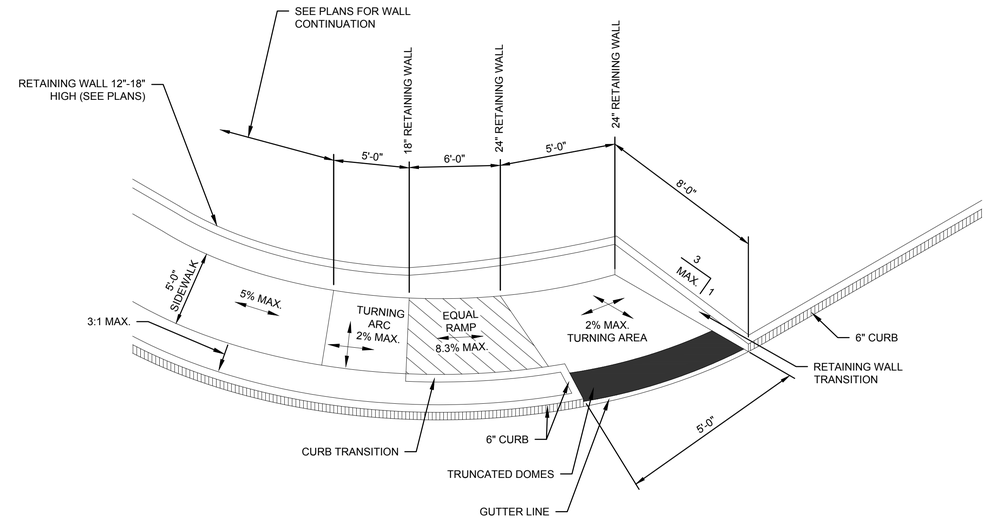


TYPE 4 WHEELCHAIR RAMP

SCALE: NOT TO SCALE

NOTES:

1. RAMP SHALL MEET ADA (AMERICANS WITH DISABILITIES ACT) AND TABA (TEXAS ARCHITECTURAL BARRIERS ACT).
2. FINISHED SURFACE OF WHEELCHAIR RAMP SLOPE SHALL BE GROOVED LATERALLY WITH 1/4" WIDE BY 1/4" DEEP GROOVES, SPACED AT 2-1/4" O.C. WITH BLACK BROOM FINISH. CONTRACTOR SHALL MAKE ADJUSTMENTS TO RAMPS TO FIT LOCAL CONDITION.
3. ALL CUTOUTS MUST HAVE BARRICADES INSTALLED UNTIL WHEELCHAIR RAMPS ARE COMPLETED.
4. MINIMUM CLEARANCE (WIDTH) OF RAMP SHALL MATCH 5'-0" SIDEWALK
5. FINISH SURFACES OF RAMP SHALL BE TREATED WITH COLOR SO THAT SURFACES ARE IN CONTRAST WITH SURFACE COLOR OF ADJACENT SIDEWALKS AND STREETS.
6. CONTRAST COLOR OF WHEELCHAIR RAMPS AND SIDE SLOPES SHALL BE BLACK DYE PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
7. ALIGNMENTS VARY DUE TO DIFFERENT LOCATIONS OF EXISTING SIDEWALKS WITHIN R.O.W. OF INTERSECTING STREETS (SEE PLANS).
8. ULTIMATE CURB HEIGHT OR RETAINING WALL HEIGHT REQUIREMENTS SHALL BE DETERMINED IN THE FIELD.
9. WHERE CURB HEIGHT CALLS FOR 12" ON PLANS, CONSTRUCT 12" CURB PER SIDEWALK CURB DETAIL. WHERE CURB HEIGHT CALLS FOR WALL TALLER THAN 12", CONSTRUCT WALL PER SIDEWALK RETAINING WALL DETAIL.
10. CURB LAYOUT ON R.O.W. SIDE @ CORNERS TYPICALLY SQUARE MAY BE ARCHED TO MATCH EXISTING LAYOUTS. (SEE PLANS)
11. CURB DETAILS ARE SHOWN ELSEWHERE IN PLANS.



TYPE 5 WHEELCHAIR RAMP

SCALE: NOT TO SCALE

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

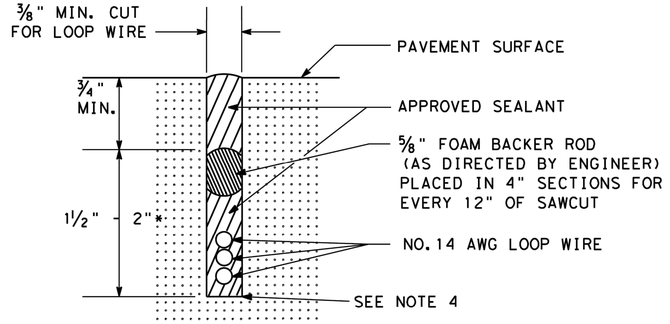
WHEELCHAIR RAMP DETAILS 2

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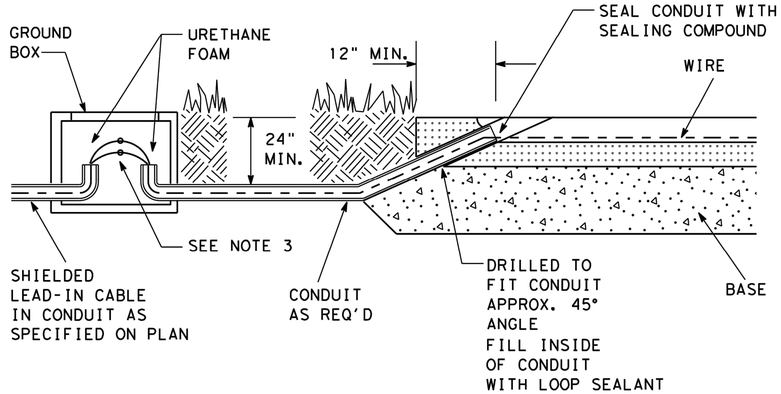
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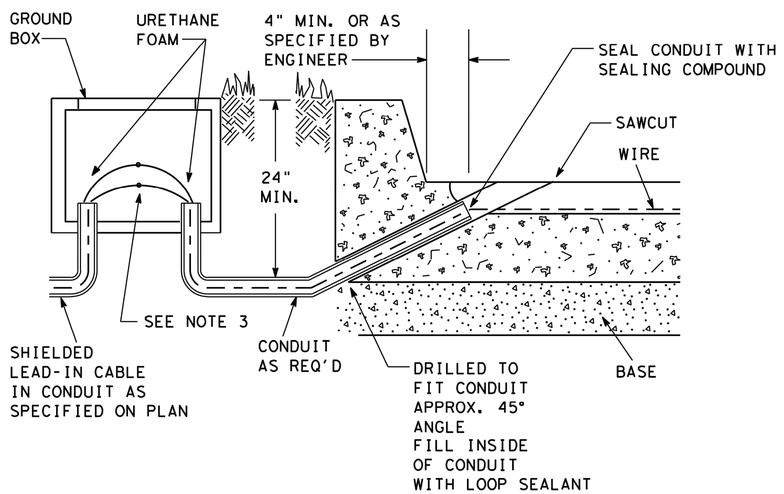


LOOP SAW CUT CROSS-SECTION

* SAWCUTS IN BRIDGE DECKS ARE TYPICALLY 1" DEPTH MAXIMUM
SAWCUTS IN BRIDGE DECKS AND ACROSS EXPANSION JOINTS
SHALL BE AS APPROVED BY ENGINEER

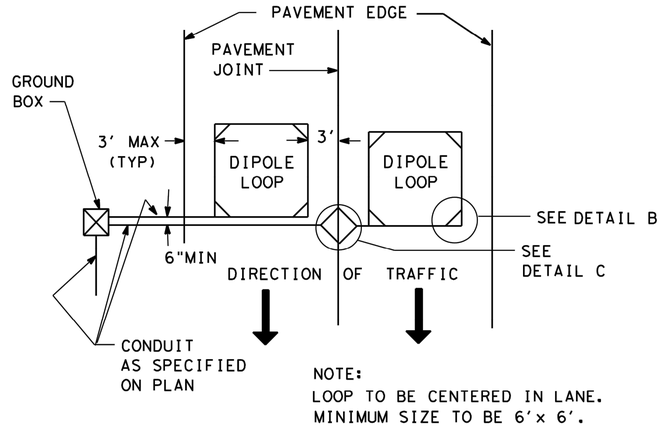


TYPICAL LEAD IN CONFIGURATION
(WITHOUT CURBING)

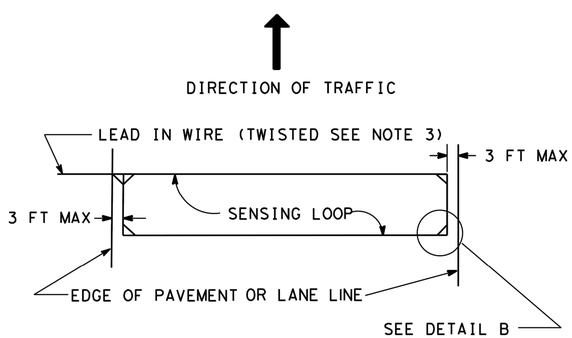


TYPICAL LEAD IN CONFIGURATION (WITH CURBING)

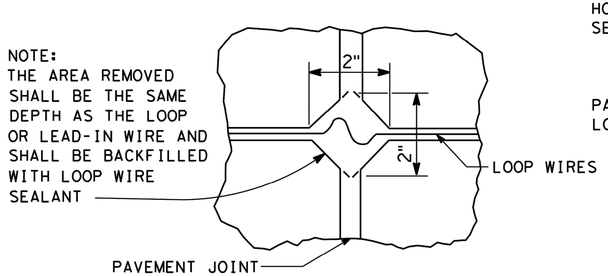
TYPE DET.	NUMBER OF LANES	LENGTH	WIDTH	TURNS OF WIRE
PULSE	1	6 FT.- 12 FT.	6 FT.	4
PULSE	2	13 FT.-26 FT.	6 FT.	3
PULSE	3	27 FT.-39 FT.	6 FT.	2
PULSE	4	40 FT.-46 FT.	6 FT.	1
PRES-ENCE	1	40 FT.	6 FT.	2



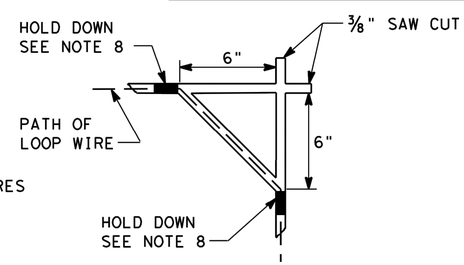
PAVEMENT JOINT DETAILS



TYPICAL LAYOUT OF DIPOLE LOOP



DETAIL C



DETAIL B

TYPICAL ALL FOUR CORNERS
(DIPOLE LOOPS)

NOTES:

1. INSTALL THE LOOP WIRES IN THE SHORTEST TIME PRACTICAL, NOT TO EXCEED 4 HOURS MAXIMUM AND SCHEDULE THIS WORK DURING OFF- PEAK HOURS TO MINIMIZE DELAY TO VEHICLE TRAFFIC.
2. CUT PAVEMENT WITH A CONCRETE SAW TO NEAT LINES AND REMOVE LOOSE MATERIAL. ENSURE A CLEAN AND DRY CUT WHEN PLACING THE SEALING COMPOUND.
3. TWIST LEAD-IN WIRES A MINIMUM OF FIVE TURNS PER FOOT AND DO NOT DISTURB THEM AFTER THE LOOP HAS BEEN TUNED. DO NOT TWIST LOOP WIRES IN SAW CUT.
4. SEAL WIRE PLACED IN THE SAW CUT BY FULLY ENCAPSULATING IT IN A SEALANT ACCEPTABLE TO THE ENGINEER. SEALING COMPOUND SHALL BE IN ACCORDANCE WITH DMS 6340.
5. INSTALL TWO-CONDUCTOR #14 SHIELDED CABLE FROM THE BASE OF A STEEL POLE OR TOP OF A WOOD POLE TO THE CONTROLLER OR AS APPROVED BY THE ENGINEER.
6. ENSURE CONNECTIONS ARE SOLDERED. SEAL SOLDER JOINT WITH SCOTCH CAST OR OTHER METHOD ACCEPTABLE TO THE ENGINEER.
7. FURNISH #14 XHHW LOOP WIRE LOOSELY ENCASED IN A FLEXIBLE VINYL OR PLASTIC TUBE. APPLY A WATERPROOF SEAL TO THE ENDS OF THE VINYL OR PLASTIC TUBING ENCASING THE WIRE IMMEDIATELY AFTER PLACING THE WIRE TO PREVENT MOISTURE FROM ENTERING THE TUBE.
8. SECURE THE LOOP WIRE IN PLACE EVERY 2 FT. WITH SHORT STRIPS OF RUBBER OR NEOPRENE FLEXIBLE TUBING OR POLYETHYLENE FOAM SEALANT BACKER APPROXIMATELY 1 IN. IN LENGTH. LEAVE STRIPS IN PLACE AND FILL THE SLOT WITH LOOP SEALER.
9. INSTALL SAWCUT OF SUFFICIENT DEPTH TO PROVIDE FOR A MINIMUM OF 1 IN. DEPTH OF SEALER OVER THE WIRE.
10. INSTALL EACH LOOP DETECTOR LEAD-IN IN A SEPARATE SAWCUT FROM THE DETECTOR TO THE EDGE OF ROADWAY. SEPARATE THE SAW CUTS AT A MINIMUM OF 6 IN. INSTALL EACH LOOP DETECTOR RUN IN A SEPARATE CONDUIT (SIZE AS REQUIRED) FROM THE EDGE OF ROADWAY TO A GROUND BOX AS SHOWN ON THE PLAN LAYOUT.
11. PLACE LOOP WIRE IN A FLEXIBLE VINYL OR POLYETHYLENE TUBING OF 0.184 IN. MINIMUM I.D., 0.031 IN. MINIMUM WALL THICKNESS AND 0.26 IN. MAXIMUM O.D., HAVING A SMOOTH BORE. ENSURE THE TUBING DOES NOT ADHERE TO THE LOOP WIRE IN ANY WAY. ENSURE TUBING IS CAPABLE OF RESISTING DETERIORATION FROM OILS, SOLVENTS AND TEMPERATURES UP TO 100° C. ENSURE TUBING IS HIGHLY ABRASION RESISTANT AND REMAINS FLEXIBLE FROM -30° C TO 100° C.

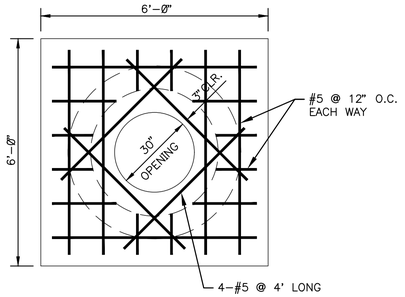
Texas Department of Transportation
Houston District

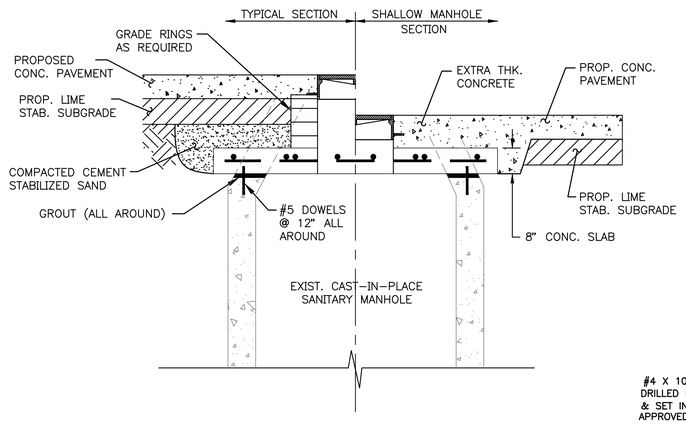
SIGNAL DETAILS/STANDARDS
LOOP DETECTOR DETAILS

LDD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2012	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 8/2004 7/2012 SPELLING	HOU	6		
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
					50

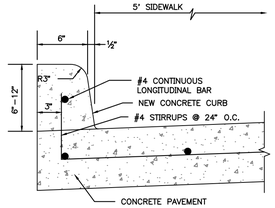
STD-M3



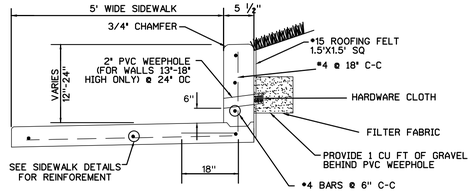


ALTERNATE SANITARY SEWER MANHOLE TOP ADJUSTMENT

SCALE: NTS



TYPE I – 6" TO 12" CONCRETE CURB



SIDEWALK RETAINING WALL SECTION

NTS

SPECIFICATION FOR GRAVEL DRAIN:

SIEVE SIZE	PERCENT FINER
3/4"	100
3/8"	55 - 100
NO. 4	15 - 100
NO. 8	0 - 50
NO. 16	0 - 15
NO. 20	0 - 5
NO. 200	0 - 5

SPECIFICATION FOR HARDWARE CLOTH:
MIN WIDTH OF MESH OPENING - 1/16"
MAX WIDTH OF MESH OPENING - 3/32"

SPECIFICATION FOR FILTER FABRIC:
MAX EQUIV OPENING SIEVE - NO. 70 SIEVE
MIN EQUIV OPENING SIEVE - NO. 100 SIEVE

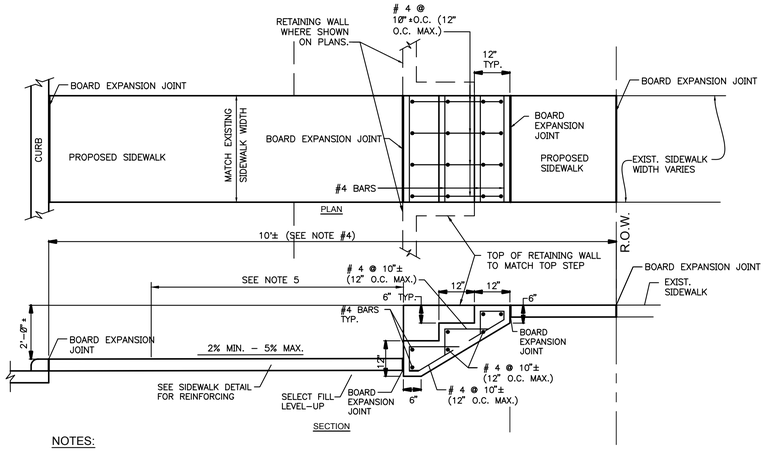
NOTE:
LOCATIONS, LENGTHS & TRANSITIONS
TO BE DETERMINED IN THE FIELD.

CURB NOTE:

AT SPECIFIC LOCATIONS (TO BE DETERMINED IN THE FIELD), IN REGARDS TO TREE ROOT PROTECTION AND PROPERTY ELEVATION, CURB HEIGHT VARIATIONS OF 6" OR 12" MAY BE REQUIRED. WHEN CURB HEIGHT REQUIRED IS 12" ADD A SECOND CONTINUOUS #4 DEF. BAR AND LENGTHEN VERTICAL STEEL TO MAINTAIN MAX. 3" FROM TOP OF CURB TO TOP OF STEEL.

VARIABLE HEIGHT SIDEWALK CURB

NTS

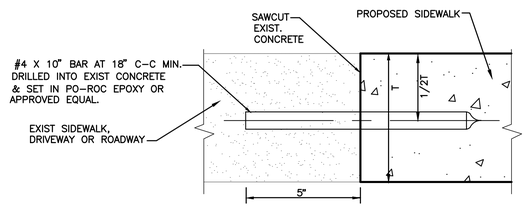


NOTES:

1. STEPS TO BE INCLUDED IN COST OF SIDEWALK.
2. STEPS OR NO STEPS ARE TO BE COORDINATED WITH PROPERTY OWNER. MAXIMUM SLOPE OF SIDEWALK WITH NO STEPS IS 5%.
3. THE NUMBER OF STEPS ARE TO BE DETERMINED IN THE FIELD.
4. LOCATION OF STEPS WITHIN R.O.W. MAY VARY AND SHALL BE COORDINATED WITH PROPERTY OWNER. SIDEWALK SHALL BE PLACED BETWEEN TOP STEP AND EXISTING SIDEWALK WHERE STEPS ARE LOCATED AWAY FROM R.O.W.
5. PUBLIC SIDE PERPENDICULAR TO STEPS SHALL BE A MINIMUM 5'-0" WIDE.

RESIDENT SIDEWALK CONNECTION TO NEW PAVEMENT DETAILS

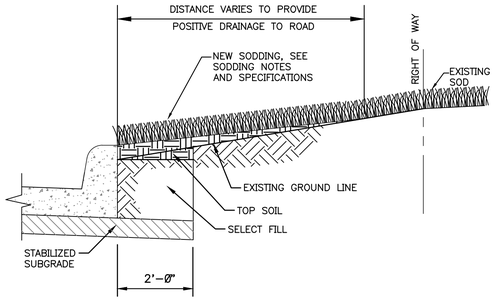
NOT TO SCALE



T = THICKNESS

PROPOSED SIDEWALK AT EXISTING CONCRETE DETAIL

NOT TO SCALE



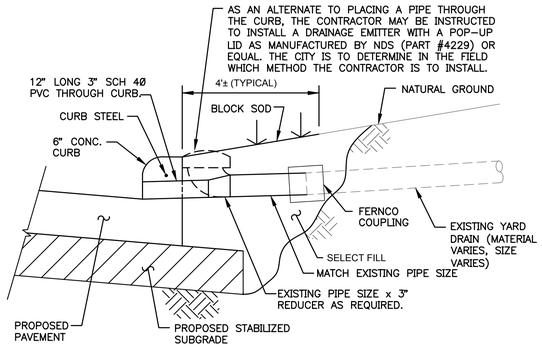
NOTE:
TO BE USED WHERE NECESSARY TO MAINTAIN POSITIVE DRAINAGE FROM YARD AREA OVER TOP OF CURB

FILL BEHIND BACK OF CURB DETAIL

NOT TO SCALE

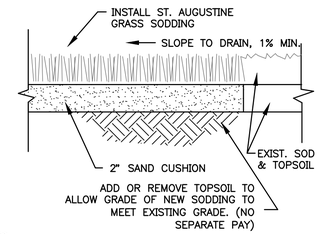
SODDING NOTES:

1. SODDING SHALL BE INSTALLED IN AREAS DISTURBED BY CONSTRUCTION.
2. CONTRACTOR SHALL REPAIR SODDING IN AREAS DAMAGED BY CONSTRUCTION.
3. IF EXISTING LANDSCAPING OTHER THAN GRASS IS WITHIN THESE AREAS, THE CONTRACTOR SHALL REBUILD OR REINSTALL THE LANDSCAPING OF THE AREA AFTER CONSTRUCTION IN AN EQUAL OR BETTER CONDITION.
4. FILL BEHIND CURBS AND SODDING SHALL BE INCIDENTAL TO CONSTRUCTION COST.



YARD DRAIN CONNECTION DETAIL

NOT TO SCALE



NOTES:

1. SODDING SHALL BE ON AREAS DISTURBED BY CONSTRUCTION.
2. SODDING LIMITS AT DITCHES SHALL BE THOSE AREAS DISTURBED BY THE GRADING PROCESS.
3. CONTRACTOR TO REPAIR SODDING IN THE AREAS DAMAGED BY CONSTRUCTION AND SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT COST.
4. IN THE EVENT EXISTING LANDSCAPING OTHER THAN GRASS IS WITHIN THESE AREAS, THE CONTRACTOR SHALL REBUILD OR REINSTALL THE LANDSCAPING OF THE AREA AFTER CONSTRUCTION IN AN EQUAL OR BETTER CONDITION.

TYPICAL GRASS SODDING DETAILS

NOT TO SCALE

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Miscellaneous Details

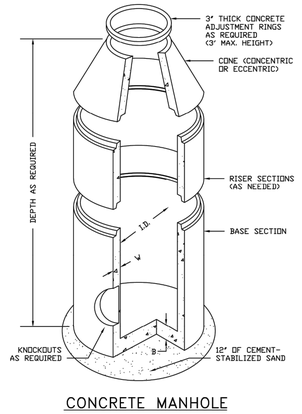
SCALE: NTS

SHEET NUMBER

SHEET 51 OF 111

FILE NAME

DIMENSIONS AND WEIGHTS			
ID SIZE (IN)	W (IN)	B (IN)	RISER WT/LF (LB)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090

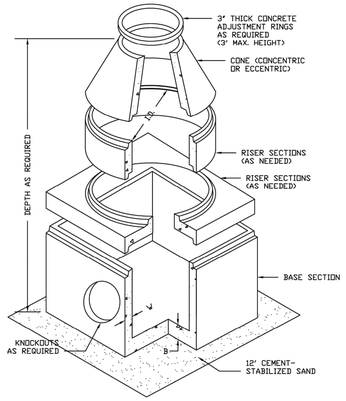


CONCRETE MANHOLE

NOTES:

1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12" OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING.
5. FOR USE WITH PIPE 72" DIAMETER AND SMALLER ONLY.

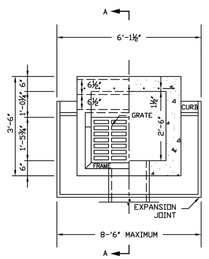
DIMENSIONS AND WEIGHTS			
ID SIZE (IN)	W (IN)	B (IN)	RISER WT/LF (LB)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090



CONCRETE JUNCTION BOX

NOTES:

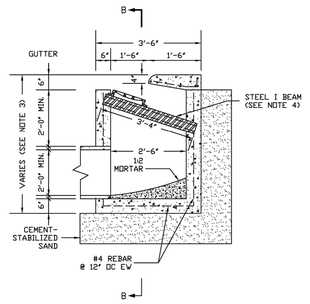
1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12" OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING.
5. WIDTH VARIES ACCORDING TO PIPE SIZE.



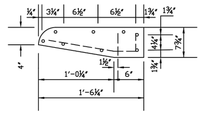
HALF PLAN HALF HORZ. SECTION



I BEAM SECTION



SECTION A–A

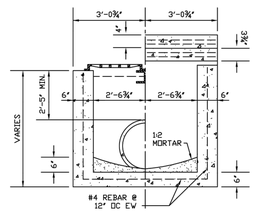


SECTION C–C

TYPE B AND B–B INLET

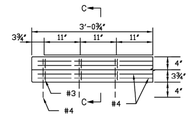
NOTES:

1. USE STANDARD CAST IRON FRAME AND GRATES.
2. LEADS SHALL LEAVE INLET AT LOCATION AND GRADE REQUIRED.
3. DIMENSION VARIES BASED ON PIPE DIAMETER AND WALL THICKNESS.
4. CENTER STEEL BEAM ON INLET AND CAST WALLS AS SHOWN (B–B INLET ONLY).
5. TYPE B AND B–B INLETS ARE FOR RESIDENTIAL USE ONLY.

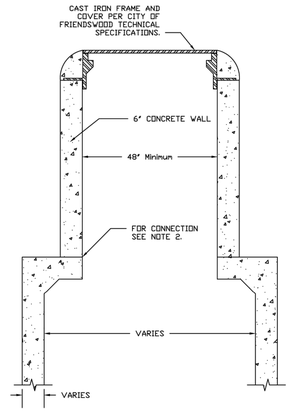


HALF FRONT ELEV. HALF SECTION

SECTION B–B



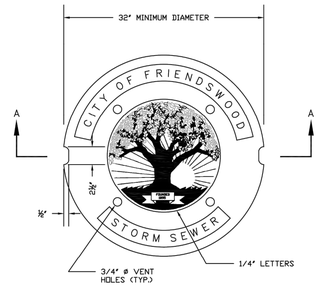
INLET TOP HALF FRONT ELEVATION



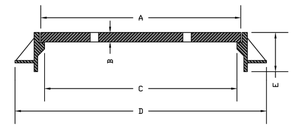
MANHOLE FOR BOX SEWERS

NOTE:

1. "C" INLET GRATE MAY BE USED IN PLACE OF MANHOLE COVER.
2. CONNECT MANHOLE TO TOP BY USING KEYWAY, DOWELING OR PRECAST JOINT.



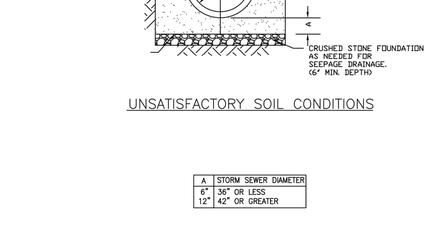
PLAN



SECTION A–A

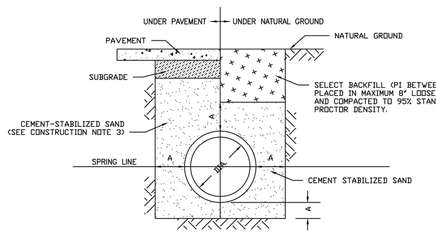
DIMENSIONS					
TYPE	A	B	C	D	E
H-2 INLET	2'-3¾"	1'-7½"	22"	3'-2¾"	6"
ALL OTHERS	32"	1'-7½"	30"	46"	6'-2"

MANHOLE FRAME AND COVER



UNSATISFACTORY SOIL CONDITIONS

A	STORM SEWER DIAMETER
6"	36" OR LESS
12"	42" OR GREATER

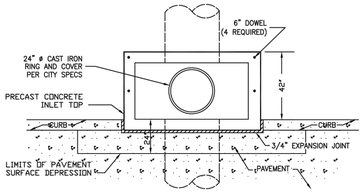


SATISFACTORY SOIL CONDITIONS

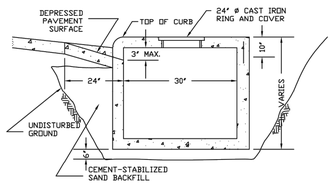
BEDDING AND BACKFILL

NOTES:

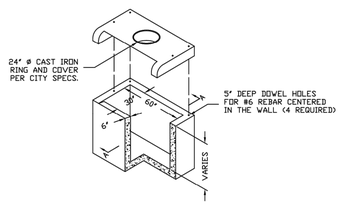
1. THE SATISFACTORY SOIL CONDITIONS METHOD SHALL BE USED FOR STORM SEWER PIPE WHERE THE SOIL CONDITIONS ARE AS FOLLOWS.
   1.A. STRATA FROM THE SPRING LINE TO 3 FT BELOW THE FLOWLINE OF THE PIPE CONSIST OF NON-WATERBEARING COHESIVE SOILS HAVING A SHEAR STRENGTH OF 1000 PSF OR GREATER.
   1.B. NO WET SAND STRATA EXIST IN AREA FROM 1 FT ABOVE THE TOP OF THE PIPE TO 3 FT BELOW THE FLOWLINE.
2. FOR ALL OTHER SOIL CONDITIONS USE THE DETAIL FOR UNSATISFACTORY CONDITIONS SHOWN ABOVE.



TYPE H-2 INLET PLAN VIEW



SECTION A – A
TYPE H-2 INLET
CROSS SECTION

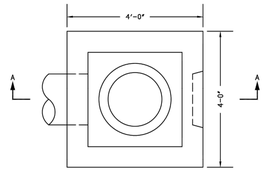


ISOMETRIC VIEW

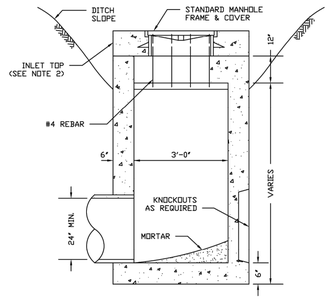
TYPE H-2 INLET

NOTES:

1. H-2 TYPE 1 LENGTH = 5'-0", H-2 TYPE 2 LENGTH 10'-0".
2. THIN WALL KNOCK-OUTS OR THRU HOLES FOR PIPE PER JOB REQUIREMENTS.
3. REFER TO PAVING DETAIL SHEET FOR INSTALLATION OF H-T TYPE 1 5'-0" CURB INLET.
4. INLET WALLS MAY BE EXTENDED USING PRECAST RISER SECTION.
5. INLET TOPS SHALL BE SECURED TO THE INLET WALL USING #6 DOWELS DRILLED AND GROUTED A MINIMUM DEPTH OF 5" INTO THE INLET WALL.
6. INLET BACKFILL SHALL BE CEMENT-STABILIZED SAND TO THE TOP OF THE INLET FIRST STAGE.
7. GRADE 60, #4 REINFORCEMENT BARS TO CONFORM TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.
8. GROUT ALL EXPOSED LIFT HOLES.



PLAN



SECTION A–A

TYPE E INLET

NOTES:

1. USE #4 REBAR IN THROAT OPENING AT 6" CENTERS.
2. CONNECT INLET TO TOP BY USING KEYWAY, DOWELING OR PRECAST JOINT.

STORM SEWER CONSTRUCTION NOTES:

1. STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS, LATEST REVISIONS.
2. ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C-76, CLASS III, TONGUE AND GROOVE, RAM-NEK JOINTS UNLESS OTHERWISE NOTED AND APPROVED BY THE CITY.
3. REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS. STORM SEWER PIPE INSTALLED UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND, (1.1 SACKS OF CEMENT PER TON OF SAND), TO THE BOTTOM OF THE SUBGRADE.
4. CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS "A" AND SHALL HAVE A MINIMUM STRENGTH OF 4000 PSI AT TWENTY-EIGHT (28) DAYS.
5. ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE AFTER PAVING IS COMPLETE.
6. MINIMUM STORM SEWER SIZE IS TWENTY-FOUR (24) INCH DIAMETER. MINIMUM ROADSIDE DITCH CULVERT IS EIGHTEEN (18) INCH DIAMETER.
7. ALL STORM SEWER MANHOLE COVERS MUST INCLUDE THE WORDS "STORM SEWER" AND "CITY OF FRIENDSWOOD" AND HAVE THE "CITY SEAL." MANHOLE COVERS SHALL BE THIRTY-TWO (32) INCHES IN DIAMETER EXCEPT AT CURB INLET COVERS WHICH ARE TWENTY-FOUR (24) INCHES.
8. CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWERS.
9. ALL INLETS, IN RESIDENTIAL DEVELOPMENTS TO BE TYPE "H-2" OR TYPE "B-B" WITH GRATES. ALL INLETS IN COMMERCIAL DEVELOPMENTS AND ON MAJOR THOROUGHFARES TO BE TYPE "H-2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF FRIENDSWOOD.
10. ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDRO-MULCHED AS PER TECHNICAL SPECIFICATION SECTION 02910 – HYDROMULCH SEEDING OR APPROVED EQUAL.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, THE CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS REMAIN OPEN AND ARE MAINTAINED TO ENSURE POSITIVE DRAINAGE. CONVEYANCES ARE NOT TO BE IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS AND ANY OTHER SUBSTANCES THAT MAY DAMAGE THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. AT COMPLETION OF WORK, THE CONTRACTOR SHALL FILL ALL LOW SPOTS, GRADE ALL RIGHTS-OF WAY, AND UTILITY EASEMENTS, AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

STORM SEWER STANDARD DETAILS

FILE NAME: 13-SWSSD1-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

FRIENDSWOOD TEXAS

DEPARTMENT OF ENGINEERING & PROJECTS

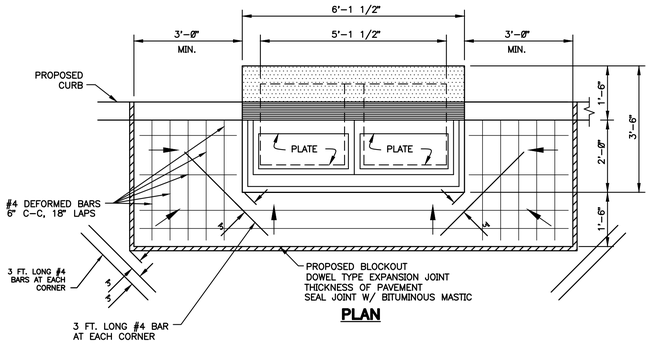
STATE OF TEXAS — NICOLE MARIE LE — 132731 — LICENSED PROFESSIONAL ENGINEER

03-02-2026

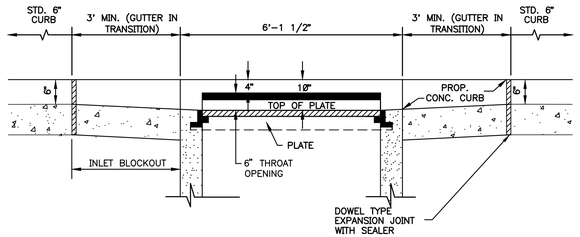
PROJECT NUMBER:

DATE SUBMITTED:

SHEET: 52 OF 111

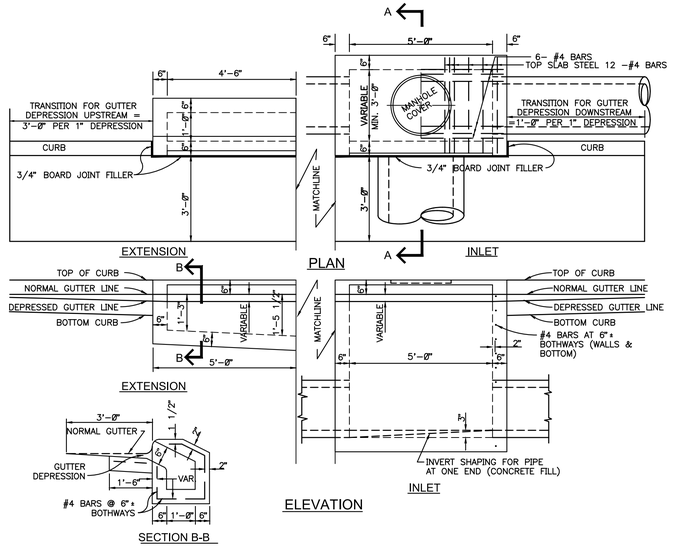


PLAN



GUTTER DEPRESSIONS FOR TYPE B-B INLET

NOT TO SCALE

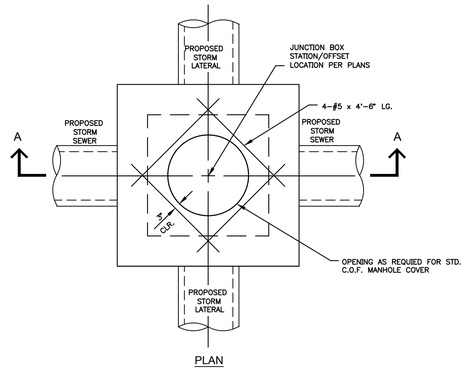


GENERAL NOTES:

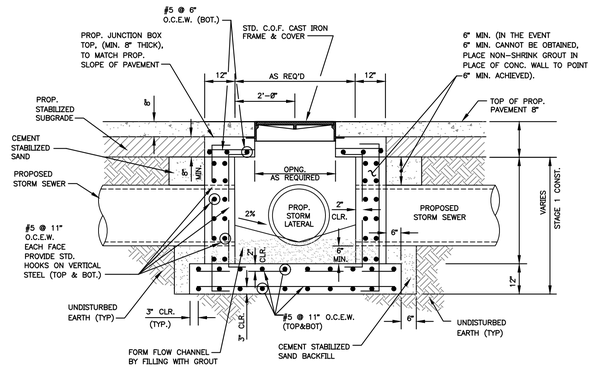
1. All concrete shall be Class A. All exposed corners shall be chamfered 3/4". Pipes shall enter inlets as shown elsewhere on plans. Slope top of inlets as directed to match graded section.
2. All materials used in casting manhole covers and ladder rung shall conform to A.S.T.M. Specifications.
3. A permissible construction joint may be placed in the inlet wall with the approval of the Engineer.
4. Manhole ring and cover shall be 23 1/2" unless otherwise specified in the plans. Connection of pipes to precast units shall be mortared as directed by the Engineer. ± But not less than six inches over highest pipe.
5. Control points for horizontal layout of inlets, all types, is the lateral center of the inlet, without regard for extensions, at the back of curb.
6. 5' Extension is not included unless called for in plans.

TYPE "C" INLET DETAILS

NOT TO SCALE



PLAN

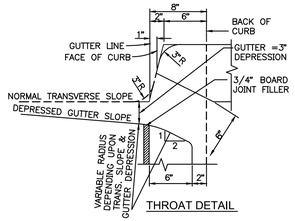


SECTION A-A

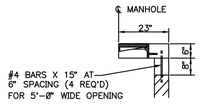
CAST-IN-PLACE STORM SEWER JUNCTION BOX DETAIL

NOT TO SCALE

(TO BE UTILIZED IN THE EVENT A PRECAST MANHOLE/JUNCTION BOX CANNOT BE APPLIED TO THE SITUATION FOUND IN THE FIELD AT NO ADDITIONAL COST TO THE PROJECT.)

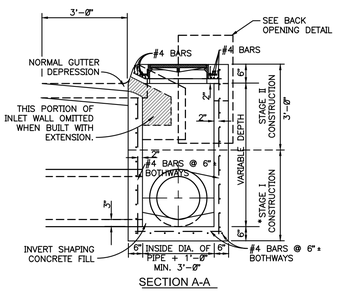


THROAT DETAIL

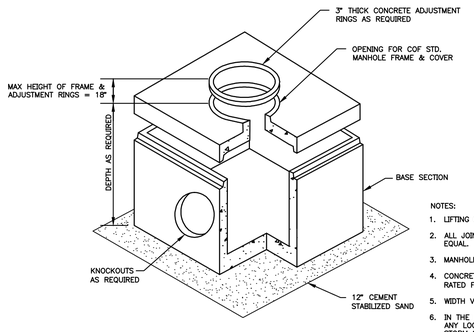


BACK OPENING DETAIL

Note: This is to be used only where specified in plans.



SECTION A-A

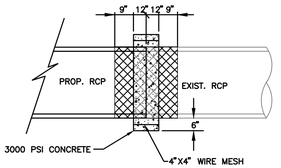


SHALLOW STORM JUNCTION BOX

NOT TO SCALE

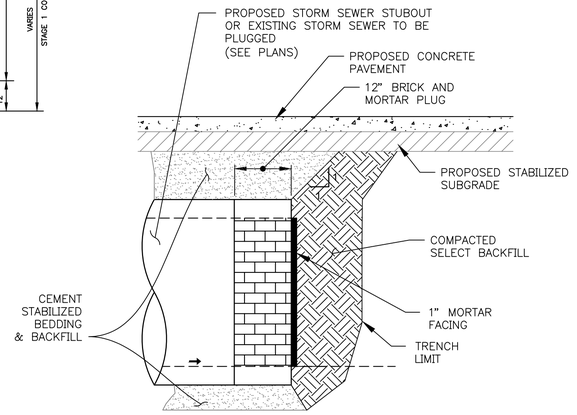
NOTES:

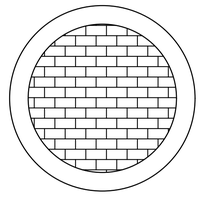
1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12 OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING (REINFORCING PER MANUFACTURER)
5. WIDTH VARIES ACCORDING TO PIPE SIZE.
6. IN THE EVENT PRECAST JUNCTION BOX CANNOT BE UTILIZED AT ANY LOCATION, CONSTRUCT JUNCTION BOX PER CAST-IN-PLACE STORM SEWER JUNCTION BOX DETAIL.



CONCRETE COLLAR CONNECTION DETAIL

NOTE:
APPLICABLE COLLAR CONNECTION TO BE INSTALLED ONLY WHERE CALLED FOR ON PLANS.





STORM SEWER PLUG

NOT TO SCALE

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
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P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Additional Storm Sewer Details

SCALE: NTS

SHEET NUMBER

SHEET 53 OF 111

FILE NAME

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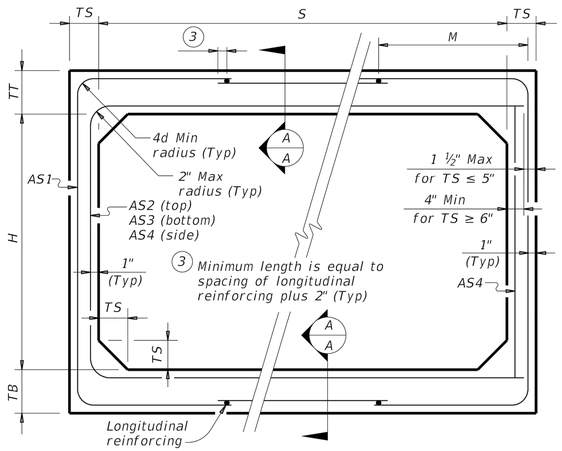
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
5	2	8	7	6	< 2	–	0.19	0.27	0.18	0.14	0.19	0.19	0.17	6.0
5	2	6	6	6	2 < 3	44	0.22	0.20	0.16	0.14	–	–	–	5.1
5	2	6	6	6	3 – 5	44	0.16	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	10	36	0.15	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	15	36	0.20	0.18	0.18	0.14	–	–	–	5.1
5	2	6	6	6	20	36	0.26	0.23	0.24	0.14	–	–	–	5.1
5	2	6	6	6	25	36	0.33	0.29	0.29	0.14	–	–	–	5.1
5	2	6	6	6	30	36	0.39	0.34	0.35	0.14	–	–	–	5.1
5	3	8	7	6	< 2	–	0.19	0.31	0.21	0.14	0.19	0.19	0.17	6.6
5	3	6	6	6	2 < 3	45	0.18	0.24	0.19	0.14	–	–	–	5.7
5	3	6	6	6	3 – 5	36	0.14	0.17	0.16	0.14	–	–	–	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	–	–	–	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	–	–	–	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	–	–	–	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	–	–	–	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	–	–	–	5.7
5	4	8	7	6	< 2	–	0.19	0.33	0.24	0.14	0.19	0.19	0.17	7.2
5	4	6	6	6	2 < 3	45	0.16	0.27	0.22	0.14	–	–	–	6.3
5	4	6	6	6	3 – 5	45	0.14	0.19	0.18	0.14	–	–	–	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	–	–	–	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	–	–	–	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	–	–	–	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	–	–	–	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	–	–	–	6.3
5	5	8	7	6	< 2	–	0.19	0.35	0.26	0.14	0.19	0.19	0.17	7.8
5	5	6	6	6	2 < 3	45	0.14	0.29	0.24	0.14	–	–	–	6.9
5	5	6	6	6	3 – 5	45	0.14	0.21	0.20	0.14	–	–	–	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	–	–	–	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	–	–	–	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	–	–	–	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	–	–	–	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	–	–	–	6.9

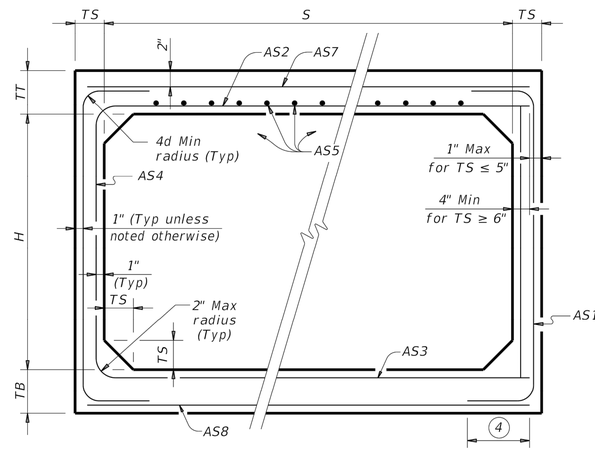
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

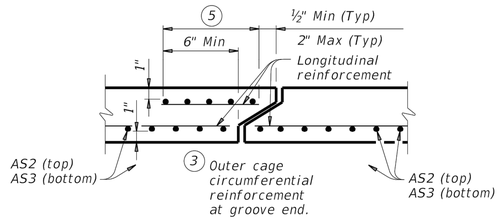
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)."

HL93 LOADING

Texas Department of Transportation

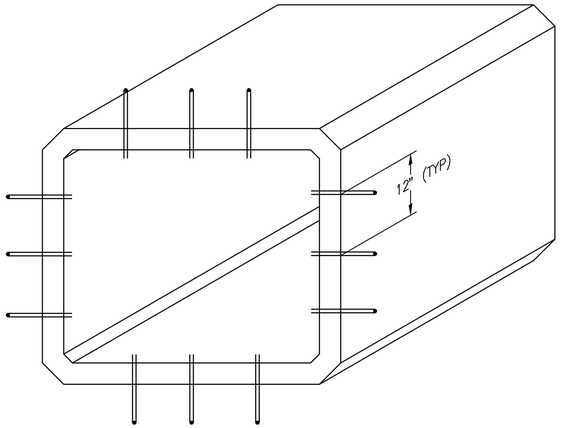
Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

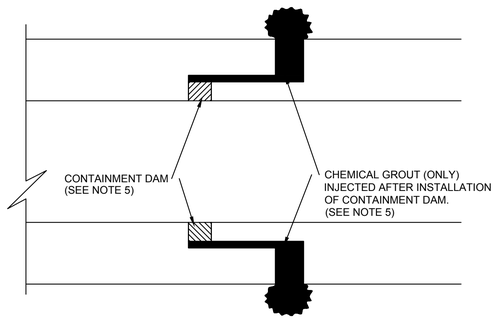
5'-0" SPAN

SCP-5

FILE: CD-SCP05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				54



JOINT REPAIR SPACING



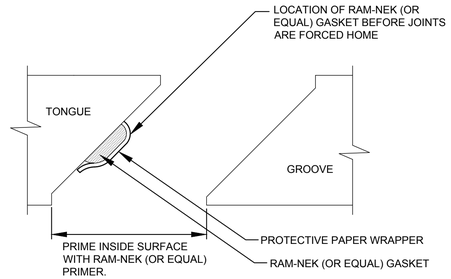
JOINT REPAIR DETAIL

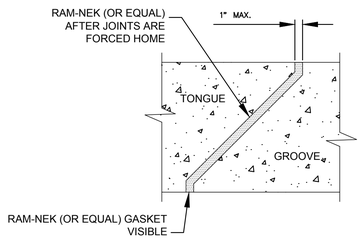
NOTES:

1. JOINT REPAIR SHALL BE PERFORMED FROM THE INSIDE OF THE STORM SEWER SYSTEM AND SHALL BE PERFORMED IN STRICT ACCORDANCE TO ALL LOCAL, STATE, AND FEDERAL LAWS. THE CONTRACTOR SHALL PROVIDE A SAFETY PLAN THAT SHALL INCLUDE BUT NOT LIMITED TO, GAS DETECTOR, TRIPOD AND WRENCH, HARNESS, VENTILATION DEVICES, ETC.
2. CONTRACTOR SHALL REMOVE ALL EXISTING FILL AND DEBRIS FROM ALL AREAS AROUND THE JOINTS TO A WIDTH OF 12" FROM CENTERLINE OF JOINT. THE FILL AND DEBRIS CAN BE TEMPORARILY PLACED ADJACENT TO THE JOINT AND BE REPLACED IN THE SAME LOCATION AT THE SAME HEIGHT AFTER REPAIR OF JOINT. FILL WILL NOT BE ALLOWED TO REMAIN IN A PILE AFTER REPAIR OF THE JOINT.
3. COFFERDAMS, SANDBAGS, PUMPS AND OTHER MEANS OF DEWATERING SHALL BE USED TO MAINTAIN THE WATER AT A LOW LEVEL. IT IS NOT NECESSARY FOR THE JOINT TO BE DRY, BUT WATER LEVEL SHALL BE MAINTAINED AT AS LOW A LEVEL AS IS PRACTICAL. FLOW IN BOX CULVERTS MUST BE CONTROLLED TO AN EXTENT THAT JOINT BEGINNING REPAIRED IS NOT INUNDATED BY WATER.
4. ALL EXISTING BITUMINOUS JOINT SEALANT MATERIAL, SHALL BE REMOVED FROM JOINTS PRIOR TO WORK. THE JOINTS SHALL BE CLEANED BY PRESSURIZED WATER BLASTERS TO TO REMOVE LOOSE DEBRIS.
5. THE JOINTS SHALL HAVE A "CONTAINMENT DAM" USED TO PROVIDE CONTAINMENT FOR THE GROUT THAT IS INJECTED BEHIND THE BOX CULVERT. THE "CONTAINMENT DAM" SHALL BE AN APPROVED CEMENTITIOUS GROUT OR SATURATED JUTE OAKUM WITH AN APPROVED CHEMICAL GROUT, AS INDICATED IN SPECIFICATIONS. CEMENTITIOUS GROUT MAY ONLY BE USED IN SECTIONS OF NON-SUBMERGED JOINTS ONLY. SATURATED JUTE OAKUM SHALL BE USED IN SUBMERGED AREAS AND MAY BE USED IN NON-SUBMERGED AREAS AS WELL. NON-SUBMERGED AREAS ARE DEFINED AS SECTIONS IN THE JOINT THAT ARE A MINIMUM OF ONE (1) FOOT ABOVE THE STANDING WATER LEVEL OF THE BOX CULVERT, AT EITHER PRE-CONSTRUCTION OR CONSTRUCTION PHASE, WHICHEVER IS HIGHER. ALL OTHER AREAS OF THE JOINT ARE CONSIDERED SUBMERGED.
6. AFTER THE INSTALLATION OF THE CONTAINMENT DAM, CHEMICAL GROUT SHALL BE PUMPED BEHIND CULVERT @ 12" SPACING STARTING AT THE MIDDLE OF THE BOTTOM JOINT UNTIL OUTCROPPING IS SEEN OR GROUT ACHIEVES A PRESSURE OF 125 PSI OR AS PER MANUFACTURERS SUGGESTED PRESSURE CRITERIA.
7. OUTCROPPED CHEMICAL GROUT MATERIAL SHALL BE REMOVED, FLUSHED TO JOINT, AND DISPOSED OF PROPERLY.
8. CLEANUP MUST BE DONE WITHOUT INORDINATE USE OF FLAMMABLE OR HAZARDOUS CHEMICALS.
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING ANY IMPEDANCE TO FLOW, SUCH AS TEMPORARY COFFERDAMS, SANDBAGS, AND EQUIPMENT FROM THE BOX CULVERTS IN THE EVENT OF RAIN.

HORIZONTAL NOTES:

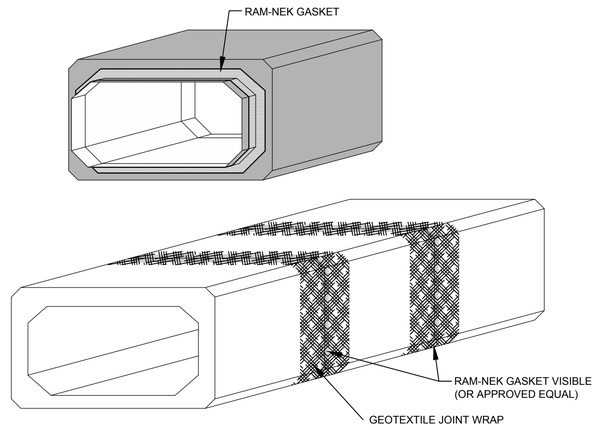
1. TRENCH CONDITIONS SHALL BE SUCH THAT PIPE JOINTING CAN BE ACCOMPLISHED WITHOUT GETTING MUD, SILT, GRAVEL OR OTHER FOREIGN MATERIALS INTO THE JOINT. GENERALLY THE TRENCH SHOULD BE DEWATERED AND HAVE A FIRM BOTTOM FREE OF MUCK.
2. PRIME JOINT AS PER MANUFACTURER'S RECOMMENDATIONS. REMOVE PROTECTIVE WRAPPER ON ONE SIDE OF PREFORMED RAM-NEK (OR EQUAL) STRIP OR COIL AND PRESS FIRMLY TO DRY, CLEAN JOINT SURFACE. BEFORE LAYING THE PIPE IN THE TRENCH, ATTACH THE GASKETS END-TO-END TO THE LEADING EDGE OF THE TONGUE OR GROOVE OF EACH PIPE JOINT, FORMING A CONTINUOUS GASKET AROUND THE CIRCUMFERENCE. REMOVE PROTECTIVE WRAPPER BEFORE JOINING PIPE SECTIONS.
3. AFTER THE GASKET IS APPLIED, THE PIPE SHOULD BE HANDLED CAREFULLY TO AVOID DISPLACING OR SOILING OF GASKET. ANY GASKET SO DISTURBED SHOULD BE REPLACED.
4. THE PIPE SHOULD BE PROPERLY ALIGNED BEFORE JOINTS ARE FORCED HOME. FOR TONGUE AND GROOVE PIPE, THE PIPE SHOULD BE PARTIALLY SUPPORTED TO MAINTAIN CONCENTRICITY UNTIL THE GASKET IS PROPERLY COMPRESSED IN THE JOINT SPACE AND SUFFICIENT PRESSURE APPLIED TO MAKE SURE THAT THE JOINT IS PROPERLY MADE.
5. LIFT HOLE PLUG SHALL BE GROUTED IN PLACE PRIOR TO BACKFILLING.
6. BACKFILLING AND COMPACTION CAN BEGIN WHEN JOINTING & GROUTING ARE COMPLETED.
7. CONTRACTOR SHALL FOLLOW APPLICATION INSTRUCTIONS PROVIDED BY THE MANUFACTURER. THE GAP BETWEEN THE FACE OF THE TONGUE AND GROOVE SHALL NOT EXCEED 1" AFTER JOINTS ARE FORCED HOME. IF JOINT GAP EXCEEDS 1" THEN JOINT SHALL BE REPAIRED AS PER JOINT REPAIR DETAIL AND SPECIFICATION. THIS IS NOT CONSIDERED A 1" AVERAGE. JOINT REPAIR SHALL BE PERFORMED ON SECTIONS OF THE JOINT THAT EXCEED 1". IF MORE THAN HALF THE JOINT EXCEEDS 1", THEN THE WHOLE JOINT SHALL BE REPAIRED (NO SEPARATE PAY SHALL BE MADE FOR JOINT REPAIR).





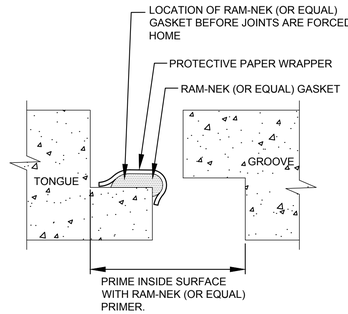
RAM-NEK GASKET INSTALLATION DETAIL

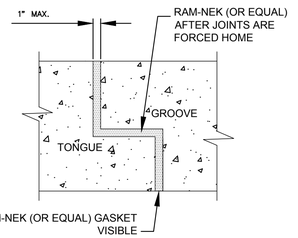
NOT TO SCALE



RAM-NEK DETAIL

NOT TO SCALE





HORIZONTAL APPLICATION

RAM-NEK GASKET INSTALLATION DETAIL

NOT TO SCALE

HDR

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

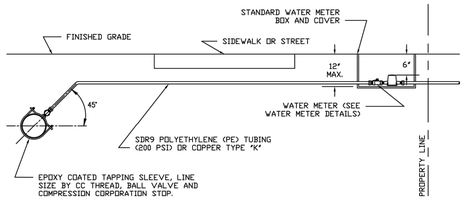
Ram-Nek Gasket Detail for Box Culverts

SCALE

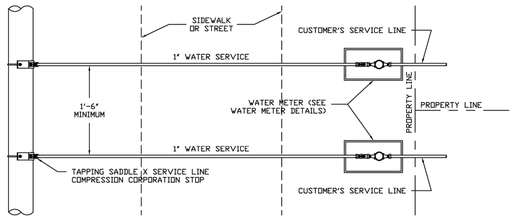
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SHEET 55 OF 111

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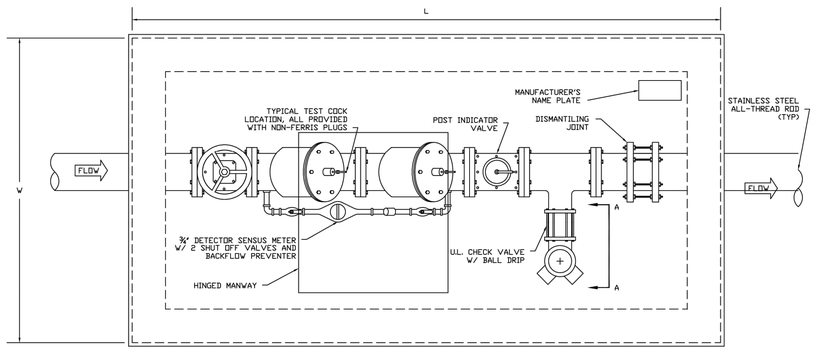


PROFILE

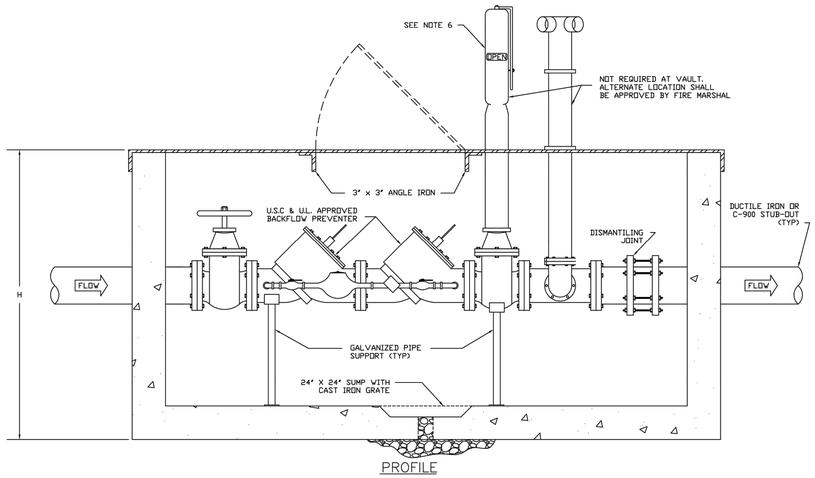


PLAN

WATER SERVICE CONNECTIONS

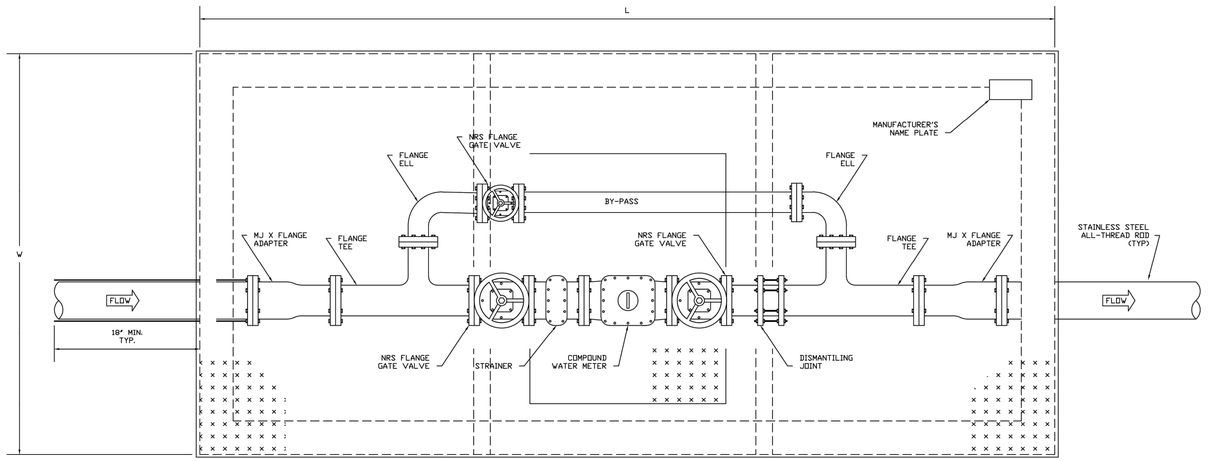


PLAN

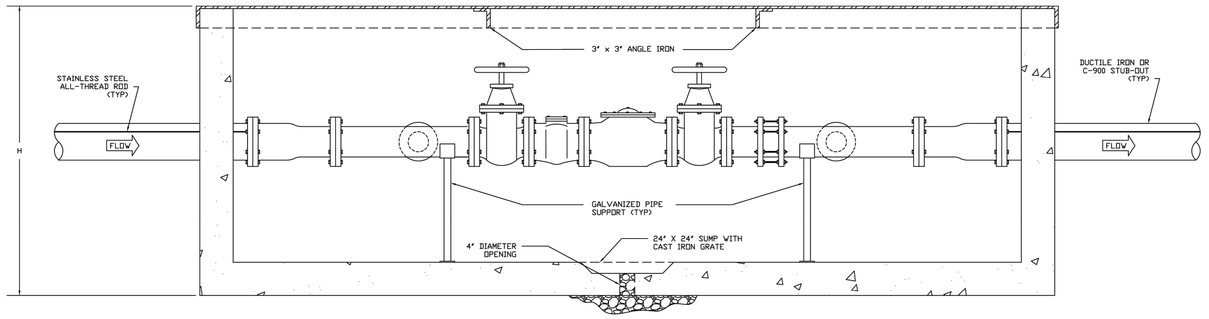


PROFILE

BACKFLOW PREVENTER WITH OPTIONAL FDC/PIV IN VAULT



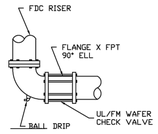
PLAN



PROFILE

METER VAULT DIMENSIONS				
PIPE SIZE	BY-PASS SIZE	L	W	H
3"	2"	8'-8"	4'-8"	4'-0"
4"	2"	8'-8"	4'-8"	4'-0"
6"	3"	8'-8"	4'-8"	4'-0"
8"	4"	11'-0"	11'-0"	4'-6"
10"	6"	11'-0"	11'-0"	4'-6"

METER VAULT



SECTION A–A

BACKFLOW PREVENTER W/ FDC AND PIV VAULT DIMENSIONS			
PIPE SIZE	L	W	H
4"	7'-10"	4'-4"	5'-6"
6"	7'-10	4'-4"	5'-6"
8"	8'-8"	5'-0"	5'-6"
10"	9'-0"	6'-0"	6'-6"

METER AND VAULT CONSTRUCTION NOTES

1. CLASS 1 CONCRETE WITH A DESIGN STRENGTH OF 4500 PSI AT 28 DAYS.
2. REINFORCING STEEL SHALL BE GRADE 60, CONFORMING TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.
3. COVER SHALL BE GALVANIZED STEEL SKID–RESISTANT FLOOR PLATE, WELDED TO 3" ANGLE IRON FRAME WITH (2) 3" X 3" ANGLE SUPPORTS (300 PSF).
4. VAULTS SHALL BE SET ON SIX (6) INCH BED OF GRAVEL FOR POSITIVE DRAINING.
5. ALL BOLTS, NUTS, AND WASHERS SHALL BE MADE OF 316 STAINLESS STEEL.
6. ALL VALVES CONTROLLING THE WATER SUPPLY FOR AN AUTOMATIC SPRINKLER SYSTEM SHALL BE ELECTRICALLY SUPERVISED AT THE FIRE ALARM CONTROL PANEL.

METER AND VAULT STANDARD DETAILS

FILE NAME: 6-MVSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS | REVISED DATE: MARCH 2022

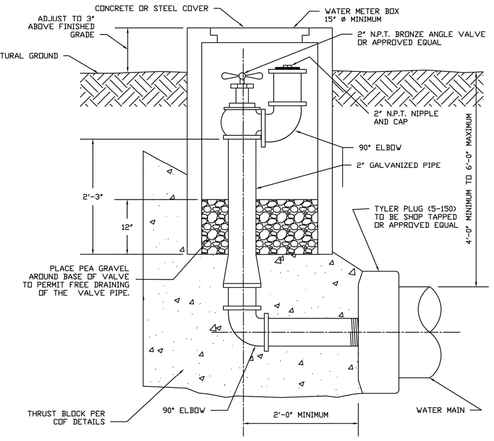
FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

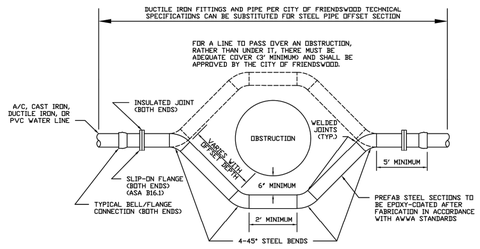
STATE OF TEXAS — NGOC KIM LE — 102782 — REGISTERED PROFESSIONAL ENGINEER

03-02-2026

PROJECT NUMBER: | DATE SUBMITTED: | SHEET: 56 OF 111



BLOW-OFF VALVE ASSEMBLY

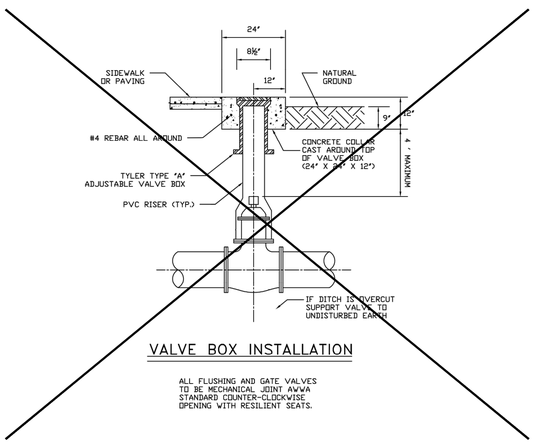


MINIMUM WALL THICKNESS FOR PIPE AND FITTINGS	
4"	0.259"
6"	0.280"
8"	0.322"
12"	0.375"

TYPICAL STEEL SECTION FITTINGS	
QTY.	DESCRIPTION
4	ø" X 45° STEEL BENDS
2	ø" BELL-FLANGE ADAPTERS
2	ø" SLIP-ON FLANGES 150#
2	ø" INSULATED JOINT KITS

STEEL PIPE OFFSET SECTION

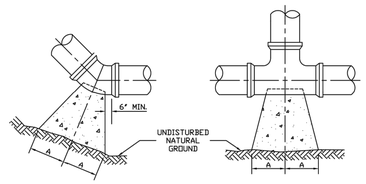
1. ALL MATERIALS AND COATINGS SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND STEEL SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. INSULATED JOINT SHALL BE MADE UP USING INSULATING GASKETS, PLASTIC BOLT SLEEVES AND WASHERS OF INSULATING GASKET MATERIAL BACKED WITH STAINLESS STEEL WASHERS OR OTHER METHODS APPROVED BY THE CITY ENGINEER.
4. NO FIELD FABRICATION OR INTERIOR COATING OF STEEL WATER PIPE OFFSETS ALLOWED.



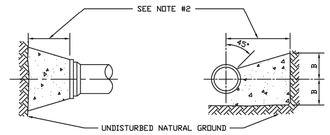
VALVE BOX INSTALLATION

ALL FLUSHING AND GATE VALVES TO BE MECHANICAL JOINT AWWA STANDARD COUNTER-CLOCKWISE OPENING WITH RESILIENT SEATS.

SIZE	90° BEND		45° BEND		22 ½° BEND		TEES		PLUGS	
	A	B	A	B	A	B	A	B	A	B
4"	10"	7"	6"	7"	3"	7"	7"	7"	10"	20"
6"	15"	10"	8"	10"	6"	8"	10"	12"	10"	21"
8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	28"
10"	28"	17"	14"	17"	10"	15"	16"	20"	14"	30"
12"	29"	21"	16"	21"	11"	18"	16"	24"	16"	41"
14"	35"	24"	18"	24"	12"	20"	22"	27"	18"	45"
16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"



BEND TEE

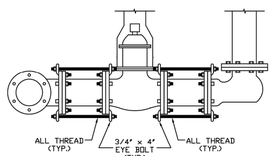


PLUG PROFILE VIEW

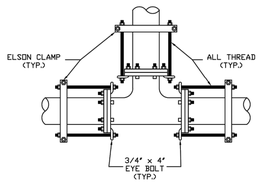
THRUST BLOCK

NOTES:

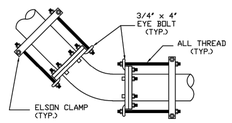
1. THRUST BLOCKS AT TRENCH FACE SHALL HAVE A MINIMUM BEARING SURFACE OF 10 SF AND THE LEAST DIMENSION SHALL BE NO SMALLER THAN 1.5 TIMES PIPE DIAMETER.
2. FROM THE BACK OF PIPE TO THE TRENCH WALL SHALL BE A MINIMUM OF 18" FOR PIPE DIAMETERS OF 10 INCHES AND LESS, AND A MINIMUM OF 24" FOR PIPE DIAMETERS OF 12 INCHES OR GREATER.
3. ALL CONCRETE SHALL BE CLASS "C", 2,500 PSI AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.



FIRE HYDRANT ASSEMBLY



TEE

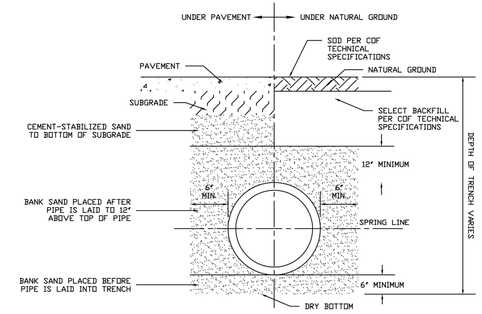


BEND

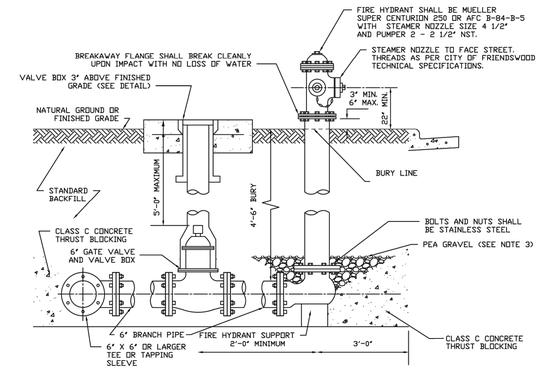
FITTING ANCHORS

NOTES:

1. MEGA-LUGS MAY BE USED IN PLACE OF ELSON CLAMPS AND ALL THREAD TO RESTRAIN JOINTS.
2. ALL NUTS, WASHERS AND ALL THREAD SHALL BE STAINLESS STEEL.



BEDDING AND BACKFILL



FIRE HYDRANT ASSEMBLY

1. RESTRAINED JOINTS SHALL BE USED (SEE FITTING ANCHOR DETAIL).
2. FIRE HYDRANTS SHALL BE AUDITED AND PAINTED ACCORDING TO THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
3. FILL PEA GRAVEL TO A MINIMUM DEPTH OF 6" OVER TOP OF FLANGE.

WATER LINE CONSTRUCTION NOTES

1. *WATER LINE CONSTRUCTION AND TESTING SHALL BE PERFORMED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.*
2. *ALL WATER MAINS SHALL HAVE A MINIMUM OF FOUR (4) FEET OF COVER MEASURED FROM CENTERLINE OF STREET OR EXISTING NATURAL GROUND, WHICHEVER DEPTH IS GREATER, UNLESS OTHERWISE NOTED.*
3. *HYDROSTATIC TESTING FOR MAIN DISTRIBUTION AND DOMESTIC SERVICES LINES SHALL BE AT ONE HUNDRED AND FIFTY (150) PSI FOR FOUR (4) HOURS AND SHALL BE WITNESSED BY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT (SECTION 01475 – TESTING PROCEDURES).*
4. *SINGLE METER SERVICE LINES SHALL BE ONE (1) INCH MINIMUM I.D., C.T.S, POLYETHYLENE, SDR-9.*
5. *CONTRACTOR TO FURNISH AND INSTALL SINGLE SERVICE METER BOXES AT FINISHED GRADE.*
6. *FIRE HYDRANT ASSEMBLIES SHALL INCLUDE ONE (1) EACH LINE SIZE BY SIX (6) INCH TEE, ONE (1) EACH SIX (6) INCH GATE VALVE AND ADJUSTABLE BOX, ONE (1) EACH FIRE HYDRANT WITH SIX (6) INCH LEAD PIPING AND TIE BACKS.*
7. *WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C500, OPEN COUNTER CLOCKWISE LEFT, EQUIPPED WITH TWO (2) INCH SQUARE OPERATING NUT.*
8. *WATER LINES FOUR (4) INCH THROUGH TWELVE (12) INCH I.D. SHALL COMPLY WITH ALL THE REQUIREMENTS OF AWWA STANDARD C900-75 CLASS 150, SDR-18 PVC, WHICH HAS AN OUTSIDE DIAMETER EQUAL TO CAST IRON PIPE OF THE SAME INSIDE DIAMETER, WITH GASKET BELL END.*
9. *ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE THRUST BLOCKING SHALL BE CLASS "C" CONCRETE WITH A MINIMUM OF 2,500 PSI COMPRESSIVE STRENGTH AFTER TWENTY-EIGHT (28) DAYS. ALL BOLTS AND NUTS AT FITTINGS AND FIRE HYDRANTS SHALL BE COVERED WITH PLASTIC BEFORE THRUST BLOCK IS PLACED.*
10. *GRAY IRON AND DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C110 AND END JOINTS OF FITTINGS AND MAIN VALVES SHALL CONFORM TO AWWA C110. ALL FITTINGS SHALL BE MECHANICAL JOINTS, CEMENT LINED OR EPOXY COATED.*
11. *MINIMUM BURY FOR ALL FIRE HYDRANT LEADS SHALL BE FOUR (4) FEET UNLESS OTHERWISE NOTED. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE.*
12. *INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANT LEADS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.*
13. *CONTRACTOR SHALL CONTACT THE CITY'S PROJECT MANAGER A MINIMUM OF SEVENTY-TWO (72) HOURS PRIOR TO START OF CONSTRUCTION.*
14. *ALL WATER LINE TRENCHES TO BE BACKFILLED TO ONE (1) FOOT ABOVE TOP OF PIPE WITH BANK SAND. TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT, BACKFILL FROM TOP OF BANK SAND TO BOTTOM OF PROPOSED SUBGRADE UNDER PAVEMENT WITH CEMENT STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND).*
15. *ALL FIRE HYDRANTS ARE TO BE LOCATED AS SHOWN ON THE PLANS AND SET THREE (3) FEET BEHIND THE CURB OR AT APPROVED LOCATION ON RURAL ROADS. ALL FIRE HYDRANTS SHALL BE OF THE DESIGNATED TYPE, AND AUDITED AND PAINTED AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.*
16. *ALL TAPPING SLEEVES SHALL BE STAINLESS STEEL FULL CIRCLE WITH MECHANICAL JOINT TAPPING SLEEVE.*
17. *THE CONTRACTOR SHALL NOT OPERATE EXISTING CITY WATER VALVES. THE CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT A MINIMUM OF TWENTY-FOUR (24) HOURS PRIOR TO ANY VALVE OPERATION NECESSARY FOR THE PROJECT. IF ANY VALVE CLOSING WILL RESULT IN INTERRUPTED SERVICE TO RESIDENTS OR BUSINESSES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO THE AFFECTED PARTIES.*
18. *FOR ALL CONSTRUCTION WATER USAGE ON THE PROJECT, A FIRE HYDRANT METER SHALL BE OBTAINED FROM THE CITY OF FRIENDSWOOD PUBLIC WORKS DEPARTMENT AT 15355 BLACKHAWK BLVD (281-996-3380). A DEPOSIT SHALL BE REQUIRED FOR THE METER AND A FEE SHALL BE CHARGED FOR ALL METERED WATER USAGE. THE CONTRACTOR SHALL SUPPLY A BACKFLOW PREVENTER FOR THE FIRE HYDRANT METER.*
19. *ALL SPRINKLER AND IRRIGATION LINES SHALL BE EQUIPPED WITH A BACKFLOW PREVENTION DEVICE ACCORDING TO IT'S APPLICATION AS REQUIRED BY TCEQ.*
20. *BLUE REFLECTORIZED PAVEMENT MARKERS SHALL BE PLACED ADJACENT TO THE FIRE HYDRANTS AND AT A POINT OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY (REFLECTOR SURFACES TO FACE TRAFFIC FLOW).*
21. *BACKFLOW PREVENTERS SHALL BE INSTALLED INSIDE THE BUILDING.*
22. *WHERE THE FIRE LINE EXCEEDS SIXTY (60) FEET FROM THE TAP TO THE RISER, THE BACKFLOW PREVENTER SHALL BE INSTALLED IN A VAULT AT THE PROPERTY LINE.*
23. *CONTROL VALVES FOR FIRE SPRINKLER SYSTEMS SHALL BE INSTALLED INSIDE THE BUILDING.*
24. *ALL VALVES CONTROLLING THE WATER SUPPLY FOR AN AUTOMATIC SPRINKLER SYSTEM SHALL BE ELECTRICALLY SUPERVISED AT THE FIRE ALARM PANEL.*
25. *ALL PUMPS, TANKS, WATER LEVELS AND TEMPERATURES, CRITICAL AIR PRESSURES, AND WATER-FLOW SYSTEMS ON ALL SPRINKLER SYSTEMS SHALL BE SUPERVISED AT THE FIRE ALARM CONTROL PANEL.*
26. *RISER ROOM FOR THE SPRINKLER SYSTEM SHALL HAVE ACCESS FROM THE EXTERIOR OF THE BUILDING OR FROM A COMMON SPACE IN THE BUILDING. AT NO TIME SHALL AN ACCESS TO A RISER ROOM BE WITHIN A TENANT SPACE UNLESS THE BUILDING IS OCCUPIED BY A SINGLE TENANT.*
27. *THE FIRE DEPARTMENT CONNECTION (FDC) SHALL BE LOCATED AWAY FROM THE BUILDING AT LEAST ONE AND ONE-HALF (1½) TIMES THE HEIGHT OF THE BUILDING.*
28. *THE FDC SHALL BE ON THE STREET SIDE OF THE BUILDING.*
29. *THE FDC SHALL HAVE KNOX BOX LOCKING FDC CAPS.*
30. *A FIRE HYDRANT SHALL BE LOCATED WITHIN ONE HUNDRED (100) FEET OF THE FDC.*
31. *INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES SHALL BE INSTALLED IN ACCORDANCE WITH IFC 2003 AND NFPA 24.*
32. *FIRE SERVICE LINES SHALL BE TESTED AT TWO HUNDRED (200) PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE CITY FIRE MARSHAL.*
33. *WORKING PLANS SHALL BE SUBMITTED FOR APPROVAL BY THE CITY FIRE MARSHAL.*
34. *WORKING PLANS SHALL BE APPROVED, INSPECTED, AND TESTED BY THE CITY FIRE MARSHAL BEFORE THE BUILDING CAN BE OCCUPIED.*
35. *ALL VALVE OPERATING NUTS SHALL BE A MAXIMUM OF FOUR (4) FEET FROM TOP OF THE VALVE BOX. ANY EXTENSIONS REQUIRED TO ACHIEVE THE MAXIMUM LENGTH SHALL BE SUPPLIED BY THE CONTRACTOR AND ARE INCIDENTAL TO THE WORK.*
36. *CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY SUBSTANCES DETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.*

WATER DISTRIBUTION STANDARD DETAILS

FILE NAME: 15-WDSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

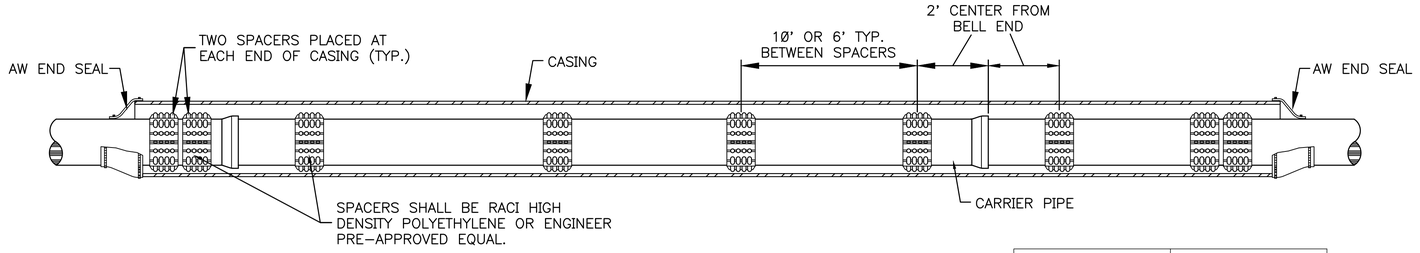
ENGINEERING DEPARTMENT

03-02-2026

PROJECT NUMBER:

DATE SUBMITTED:

SHEET: 57 OF 111



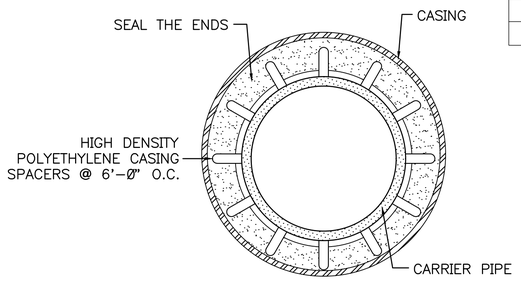
CASING SPACERS

CASING SPACERS SHALL BE USED TO INSTALL THE CARRIER PIPE INSIDE THE ENCASEMENT PIPE. CASING SPACERS SHALL FASTEN TIGHTLY ONTO THE CARRIER PIPE SO THAT WHEN THE CARRIER PIPE IS BEING INSTALLED THE SPACERS WILL NOT MOVE ALONG THE CARRIER PIPE. CASING SPACERS SHALL BE DOUBLED ON EACH END OF THE ENCASEMENT.

EACH CASING SPACER SHALL BE CAPABLE OF PROVIDING SUPPORT FOR THE CARRIER PIPE IN SERVICE AT A MAXIMUM SPACING. CALCULATIONS SHALL BE PROVIDED TO THE ENGINEER BY THE CASING SPACER MANUFACTURER SHOWING THAT THE CASING SPACER WILL SUPPORT THE SERVICE LOAD AT THE RECOMMENDED SPACING, INCLUDING A FACTOR OF SAFETY OF TWO (2). CASING SPACERS USED UNDER THIS SPECIFICATION SHALL MEET OR EXCEED THE SPECIFICATIONS DESCRIBED HEREIN AS PROJECTION TYPE CASING SPACERS.

PROJECTION TYPE CASING SPACERS SHALL BE CONSTRUCTED OF PREFORMED SECTIONS OF HIGH DENSITY POLYETHYLENE. THE FLEXIBLE SECTIONS SHALL BE JOINED TOGETHER AROUND THE PIPE TO PROVIDE A MINIMUM OF 12 PLASTIC PROJECTIONS PER SPACER SECTION. PROJECTION TYPE CASING SPACERS SHALL BE "RACI" TYPE PROJECTION SPACERS OR ENGINEER PRE-APPROVED EQUAL.

PIPE CASING SPACER DETAIL



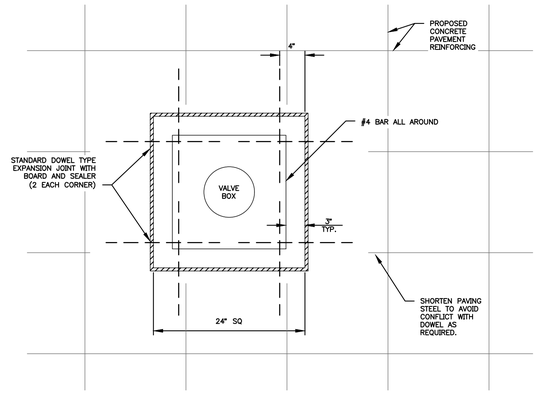
PIPE CASING SPACER SECTION

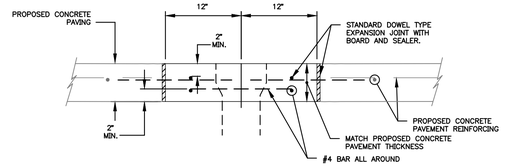
PIPE TYPE & SIZE	MAX. SPACING
PVC 4"-14"	10'
PVC 16"-30"	6'
Ductile Iron Pipe	6'

CARRIER PIPE SIZE (IN.)	MINIMUM CASING PIPE SIZE (IN.)
4	10
6	12
8	16
10	18
12	20
16	24

CASING SPACER DETAILS

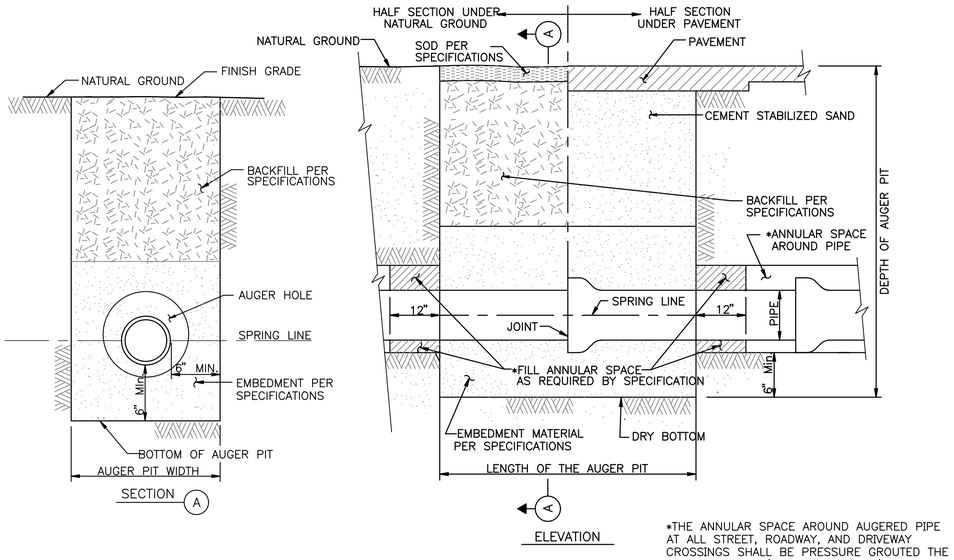
NOT TO SCALE





VALVE BOX COLLAR DETAIL

NOT TO SCALE



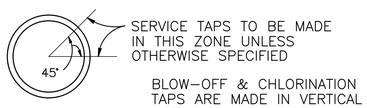
*THE ANNULAR SPACE AROUND AUGERED PIPE AT ALL STREET, ROADWAY, AND DRIVEWAY CROSSINGS SHALL BE PRESSURE GROUTED THE ENTIRE LENGTH. (NO SEPERATE PAY)

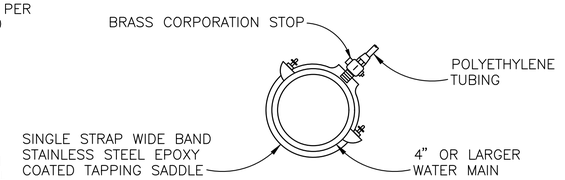
AUGER PIT AND AUGER HOLE (FOR WATER LINE ONLY)

NOT TO SCALE

PIPE TAPPING SCHEDULE			
WATER MAIN TYPE AND DIAMETER	SERVICE SIZE		
	1"	1 1/2"	2"
6" AND 8" PVC (AWWA C900)	WBSS	WBSS	WBSS

NOTE: FOR 2" DISTRIBUTION LINKS TO BE TAPPED TO NEW 8" MAIN, PROVIDE CORPORATION STOP PER SPEC'S W/CONNECTION OUTLET FOR CLASS 200 SDR 21 PVC PIPE.





SERVICE TAPS

NOT TO SCALE

Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

WATER DETAILS 1

SCALE: NTS

SHEET NUMBER

SHEET 58 OF 111

FILE NAME

		VACUUM (AI/VR)	
WATER MAIN DIAMETER	MANUFACTURER (1)	SERIES	ORIFICE SIZE
<=36"	APCO	140C	1/16
	CLAVAL	36	1/16
	PRATT	WCV 01	1/16

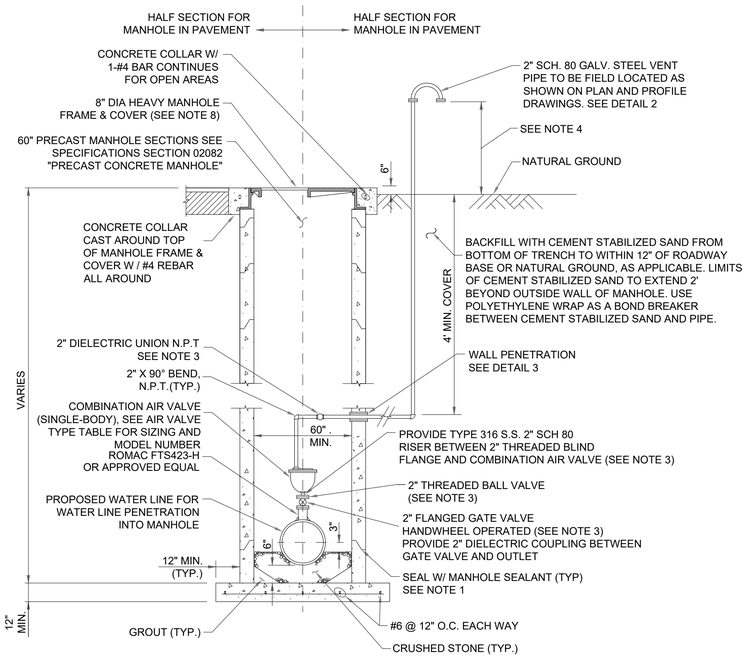
COMBINATION AIR VALVE & TYPE TABLE

(FOR WATER LINES SMALLER THAN 36" DIAMETER)

(1) OR APPROVED EQUAL.

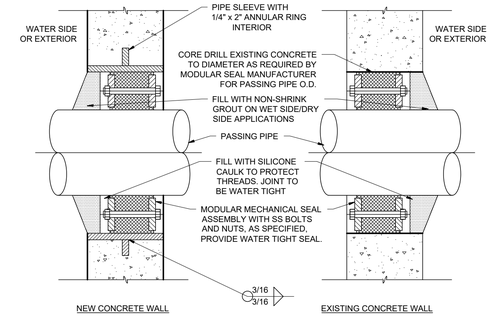
DETAIL 1 - NOTES:

1. PROVIDE RAM-NEK OR APPROVED EQUAL BETWEEN PRECAST SEGMENTS OF THE MANHOLE.
2. FOR MANHOLES DEEPER THAN 20 FEET, SAFETY CLIMBING RAIL MUST BE PROVIDED (SAF-T-CLIMB OR APPROVED EQUAL).
3. PIPING AND APPURTENANCES OF THE SAME DIAMETER AND CONSTRUCTED OF THE SAME MATERIAL AND CLASS.
4. VERIFY THAT LOCATION OF VENT PIPE SCREEN IS 1 FOOT ABOVE 100-YEAR FLOOD PLAIN ELEVATION OR 4 FEET ABOVE NATURAL GROUND WHICHEVER IS HIGHER.
5. REFER TO PLAN AND PROFILE SHEETS FOR LOCATIONS OF AIR VALVES.
6. REFER TO PAVEMENT SHEET
7. PROVIDE AN APPROVED PETROLATUM BASED TAPE ENCAPSULATING ALL BOLTS IN ACCESS MANHOLE.
8. MANHOLE FRAME AND COVER SHALL BE TRAFFIC RATED WHEN LOCATED IN PAVEMENT.



1 / 59 — COMBINATION AIR RELEASE VALVE

SCALE: NONE

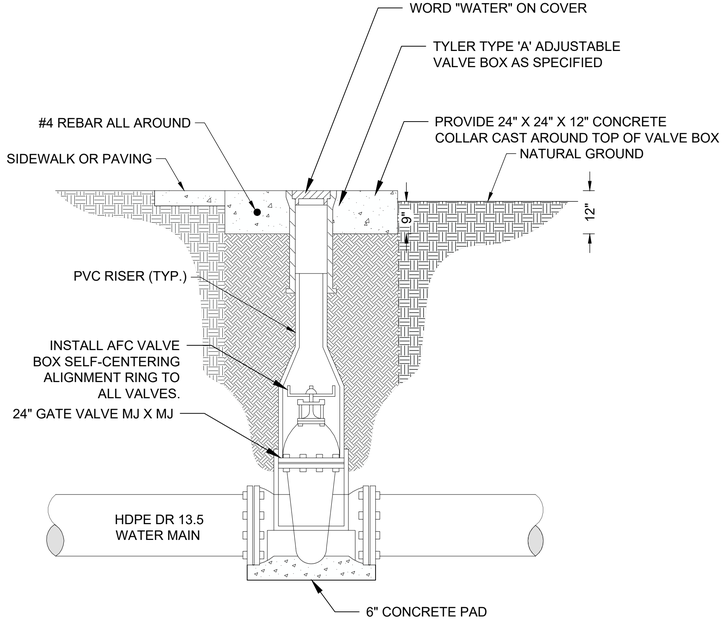


NOTES:

1. WHERE EXISTING CONCRETE STRUCTURE IS TO BE CORE DRILLED, THE CONTRACTOR SHALL ULTRASONIC TEST OR X-RAY THE AREA FOR EMBEDDED ITEMS BEFORE CORE DRILLING CAN PROCEED. IF EMBEDDED ITEMS ARE FOUND, NOTIFY THE ENGINEER IMMEDIATELY.
2. FOR NEW CONSTRUCTION, SLEEVES SHALL BE CAST INTO WALL. BLOCKOUTS AND SUBSEQUENT GROUTED IN SLEEVES WILL NOT BE PERMITTED UNLESS A KEYED WATERSTOP JOINT IS PROVIDED.
3. 6" DIAMETER SLEEVES AND SMALLER SHALL BE SCH 40 STEEL PIPE.
4. SLEEVES LARGER THAN 6" DIAMETER SHALL BE 1/4" THICK STEEL PIPE.
5. IN WALLS THICKER THAN 12", LINK SEAL SHALL BE INSTALLED AT BOTH ENDS OF THE WALL SLEEVE. SLEEVE DIAMETER SHALL BE PER LINK SEAL MANUFACTURER'S RECOMMENDATION.
6. SLEEVE SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.

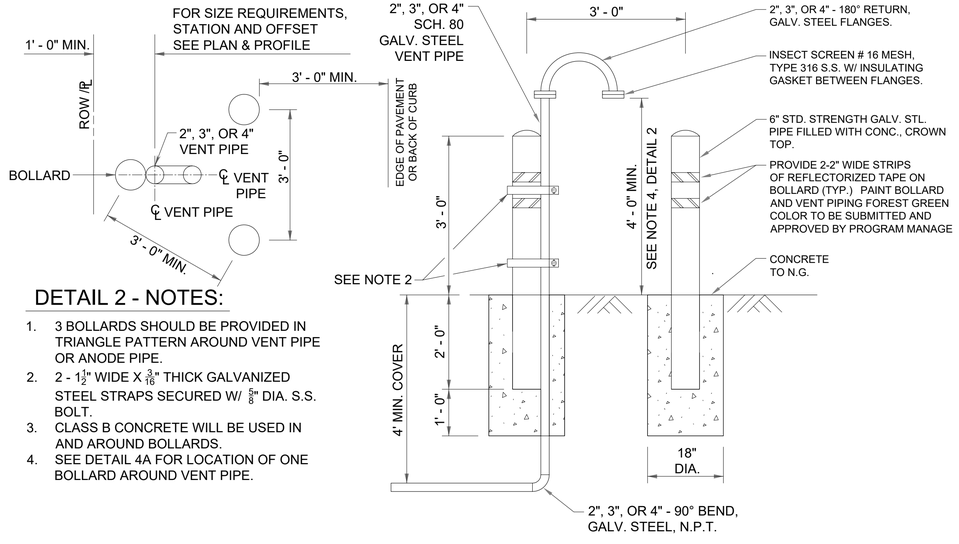
3 / 59 — WALL PENETRATION SEAL

SCALE: NONE



3 / 59 — VALVE INSTALLATION DETAIL

SCALE: NONE



DETAIL 2 - NOTES:

1. 3 BOLLARDS SHOULD BE PROVIDED IN TRIANGLE PATTERN AROUND VENT PIPE OR ANODE PIPE.
2. 2 - $1\frac{1}{2}$" WIDE X $\frac{3}{16}$" THICK GALVANIZED STEEL STRAPS SECURED W/ $\frac{5}{8}$" DIA. S.S. BOLT.
3. CLASS B CONCRETE WILL BE USED IN AND AROUND BOLLARDS.
4. SEE DETAIL 4A FOR LOCATION OF ONE BOLLARD AROUND VENT PIPE.

2 / 59 — VENT PIPE W / BOLLARD DETAIL

SCALE: NONE

GARVER

12141 Wickchester Lane
Suite 200, Houston, TX
77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS

STATE OF TEXAS — ARIEL CHAVEZ II — 63682 — REGISTERED — PROFESSIONAL ENGINEER

Digitally signed on 02/11/2026

FOR WATER LINE, SEE SHEET 30

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

SHEET NAME

Waterline Detail 2

SCALE: 0 10 20 30 40

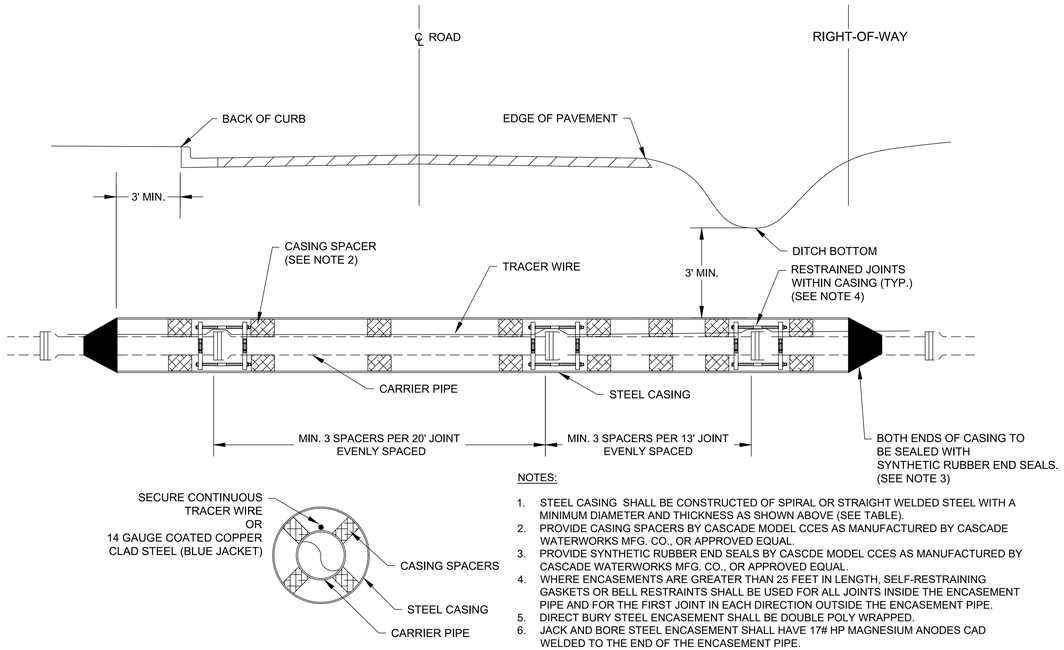
1" = 20' - H
1" = 2' - V

SHEET NUMBER

SHEET 59 OF 111

FILE NAME

FCCC_XREF-PLAN (HDR).dwg

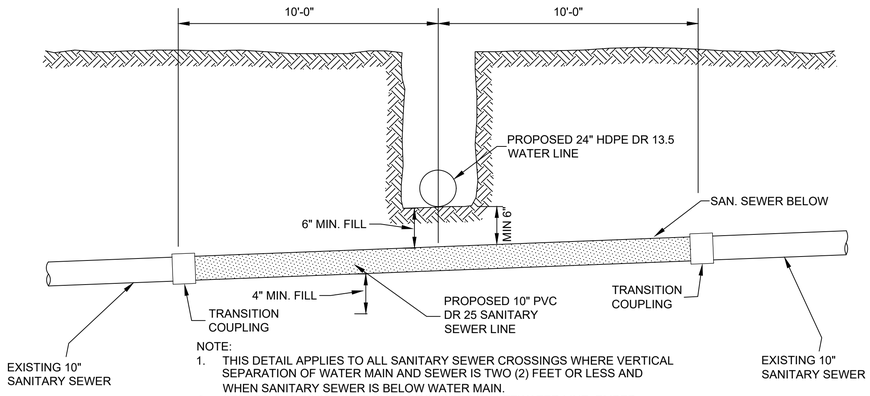


NOTES:

1. STEEL CASING SHALL BE CONSTRUCTED OF SPIRAL OR STRAIGHT WELDED STEEL WITH A MINIMUM DIAMETER AND THICKNESS AS SHOWN ABOVE (SEE TABLE).
2. PROVIDE CASING SPACERS BY CASCADE MODEL CCES AS MANUFACTURED BY CASCADE WATERWORKS MFG. CO., OR APPROVED EQUAL.
3. PROVIDE SYNTHETIC RUBBER END SEALS BY CASCDE MODEL CCES AS MANUFACTURED BY CASCADE WATERWORKS MFG. CO., OR APPROVED EQUAL.
4. WHERE ENCASEMENTS ARE GREATER THAN 25 FEET IN LENGTH, SELF-RESTRAINING GASKETS OR BELL RESTRAINTS SHALL BE USED FOR ALL JOINTS INSIDE THE ENCASEMENT PIPE AND FOR THE FIRST JOINT IN EACH DIRECTION OUTSIDE THE ENCASEMENT PIPE.
5. DIRECT BURY STEEL ENCASEMENT SHALL BE DOUBLE POLY WRAPPED.
6. JACK AND BORE STEEL ENCASEMENT SHALL HAVE 17# HP MAGNESIUM ANODES CAD WELDED TO THE END OF THE ENCASEMENT PIPE.

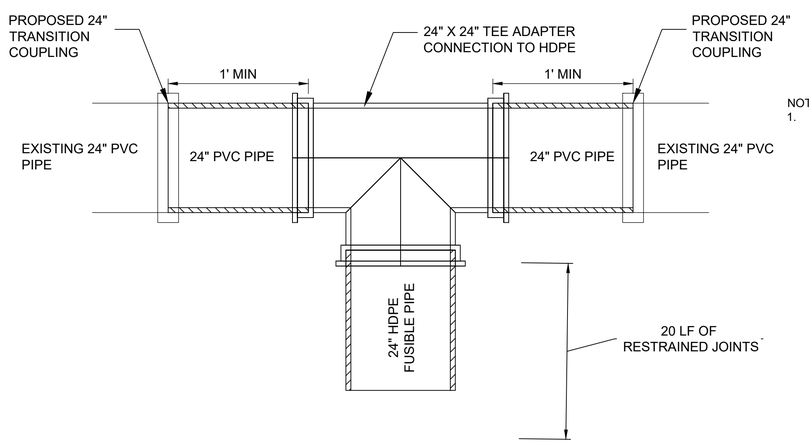
CARRIER AND CASING SIZES								
CARRIER (ID)	2"	3"	4"	6"	8"	10"	12"	14"
CASING (ID)	5"	6"	8"	12"	16"	20"	24"	30"
CASING WALL THICKNESS	0.375	0.250	0.250	0.250	0.250	0.250	0.375	0.375
CARRIER (ID)	16"	18" - 20"	24"	30"	36"	42"	48"	54"
CASING (ID)	30"	36"	42"	48"	54"	60"	66"	66"
CASING WALL THICKNESS	0.375	0.500	0.5625	0.625	0.625	0.625	0.625	0.750

1/60 STEEL ENCASEMENT
SCALE: NONE



NOTE:
1. THIS DETAIL APPLIES TO ALL SANITARY SEWER CROSSINGS WHERE VERTICAL SEPARATION OF WATER MAIN AND SEWER IS TWO (2) FEET OR LESS AND WHEN SANITARY SEWER IS BELOW WATER MAIN.
2. CENTER 1-18 FOOT JOINT OVER PROPOSED WASTEWATER LINE. EMBED WASTEWATER LINE WITH CEMENT STABILIZED SAND FOR A MINIMUM OF 20-FEET PER TEXAS COMMISSION ON ENVIRONMENTAL QUALITY CHAPTER 217 SUBCHAPTER C: CONVENTIONAL COLLECTION SYSTEMS.

3/60 SANITARY SEWER CROSSING
SCALE: NONE



NOTE:
1. ALL PIPE-TO-FITTING CONNECTIONS SHALL BE RESTRAINED MECHANICAL JOINT.

2/60 HDPE TEE ADAPTER DETAIL
SCALE: NONE

GARVER
12141 Wickchester Lane
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77079
(713) 491-8333
TX FIRM NUMBER 5713

PROJECT FOR
BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

SEE SHEETS 6 AND 7 FOR BASELINE CONTROL

Mr. Ariel Chávez II, PE, RPLS
STATE OF TEXAS
ARIEL CHAVEZ II
63882
REGISTERED
PROFESSIONAL ENGINEER
Digitally signed on 02/26/2026

FOR WATER LINE, SEE SHEET 30

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	AAC
DRAWN BY	DF

SHEET NAME
Waterline Detail 3

SCALE
0 10 20 30 40
1" = 20' - H
1" = 2' - V

SHEET NUMBER
SHEET 60 OF 111

FILE NAME
FCCC_XREF-PLAN (HDR).dwg

GENERAL NOTES FOR CONSTRUCTION SEQUENCE

1. ALL BEGINNING AND ENDING BARRICADES AND SIGNS ARE TO REMAIN IN PLACE FOR THE DURATION OF THE PROJECT.

2. ALL SIGNS, BARRICADES AND PAVEMENT MARKINGS SHALL CONFORM WITH THE BC STANDARD SHEETS, TCP SHEETS, AND THE LATEST EDITION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

3. CW20-1, G20-2 & G20-2BT SIGNS WILL BE REQUIRED AT ALL PUBLIC ROADS, AND INTERSECTIONS WITHIN LIMITS. (G20-2) SIGNS MAY BE MOUNTED ON BACK OF CW20-1, SEE BC(2)-21.

4. THE CONTRACTOR SHALL PROVIDE FOR SAFE AND CONVENIENT INGRESS AND EGRESS TO ABUTTING PROPERTY HIGHWAY, PUBLIC ROAD, AND STREET CROSSING FOR ALL VEHICLES. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN ALL CROSSINGS IN A SAFE AND PASSABLE CONDITION.

5. FOR SPACING OF SIGNS AND BARRICADES SEE "BC" & "TCP" STANDARD SHEETS OR AS DIRECTED BY THE ENGINEER.

6. THE CONTRACTOR MAY BE REQUIRED TO FURNISH ADDITIONAL BARRICADES, SIGNS, AND WARNING LIGHTS TO MAINTAIN TRAFFIC AND PROMOTE MOTORISTS SAFETY AND SUCH ADDITIONAL SIGNS AND BARRICADES SHALL BE CONSIDERED SUBSIDIARY TO THE COST OF PROJECT. (NO SEPARATE PAY).

7. ALL SIGNS SHALL BE NEW OR FRESHLY PAINTED, AND KEPT CLEAN FOR THE DURATION OF THE PROJECT.

8. ALL TRAFFIC DRUMS & EDGE LINE CHANNELIZERS SHALL BE USED IN ACCORDANCE WITH THE PLANS AND MANUFACTURER'S RECOMMENDATIONS AND SHALL HAVE A 7" PRISMATIC REFLECTOR UNIT, AS APPROVED BY THE ENGINEER. ALL MATERIALS SHALL BE CONSIDERED SUBSIDIARY TO TRAFFIC CONTROL PLAN.

9. SIGNS, PAVEMENT MARKINGS, CHANNELIZING DEVICES, AND OTHER TRAFFIC CONTROL DEVICES THAT ARE INCONSISTENT WITH INTENDED TRAVEL PATHS THROUGH THE PROJECT AREA SHALL BE REMOVED IMMEDIATELY.

10. THE CONTRACTOR WILL BE RESPONSIBLE FOR MARKING THE LOCATION OF ALL TRAFFIC CONTROL STRIPING/RAISED MARKERS AND PERMANENT STRIPING/RAISED MARKERS AS DIRECTED BY THE ENGINEER.

11. IF APPROVED FOR STREET CLOSURES, CONTRACTOR SHALL NOT HAVE TWO CONSECUTIVE INTERSECTION STREETS CLOSED AT THE SAME TIME DURING CONSTRUCTION.

12. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL DRIVEWAYS. (NO SEPARATE PAY).

13. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE THROUGHOUT THE PROJECT AT ALL TIMES. (NO SEPARATE PAY).

14. THE ADVANCE DOOR-TO-DOOR NOTICES REGARDING PROJECT INFORMATION/ CONSTRUCTION DURATION TO RESIDENTS ALONG BLACKHAWK SHALL INCLUDE A NOTE SAYING "NO PARKING ALLOWED ON BLACKHAWK BLVD FOR THE DURATION OF THE PROJECT".

GENERAL SEQUENCE OF WORK NARRATIVE

PRE-PHASE
1. PLACE ADVANCED WARNINGS AS INDICATED ON ADVANCED WARNING SIGN LAYOUT.

REFER TO TEMPORARY TRAFFIC SIGNAL WORK AT FM 528 PRIOR TO THE START OF PHASES 1 & 2

PHASE 1
1. PHASE 1 WILL CONSIST OF RECONSTRUCTING THE SOUTHBOUND LANES FROM FM THURSA LN TO FM 528.

2. PLACE TRAFFIC CONTROL DEVICES AND TEMPORARY NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS PER BC(12)-21 TO ALLOW FOR ONE LANE TRAFFIC IN EACH DIRECTION ON NORTHBOUND SIDE OF THE BOULEVARD.

3. INSTALL STORM SEWER LATERALS AND INLETS AS INDICATED ON THE PLANS. BACKFILL AND PROVIDE TEMPORARY PAVING IMMEDIATELY TO MAINTAIN ACCESS (NO SEPARATE PAY).

4. FOLLOW UP WITH PAVING ON THE INSIDE LANE WHILE MAINTAINING ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY.

5. ONCE INSIDE LANE IS COMPLETED, MAINTAIN ACCESS TO RESIDENTS, BUSINESSES, CHURCH AND CONSTRUCTION WHILE CONSTRUCTING OUTSIDE LANE.

6. CONSTRUCT THE SOUTHBOUND BLACKHAWK BLVD. AS SHOWN ON THE PLANS. ALL WORK MUST BE COMPLETED IN THIS PHASE BEFORE MOVING ON TO NEXT PHASE.

PHASE 2
1. PHASE 2 WILL CONSIST OF RECONSTRUCTING THE NORTHBOUND LANES FROM THURSA LN TO FM 582.

2. PLACE TRAFFIC CONTROL DEVICES AND TEMPORARY DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS PER BC(12)-21. SWITCH TRAFFIC TO THE NEWLY CONSTRUCTED PAVEMENT FROM PHASE 3 WITH ONE LANE IN EACH DIRECTION ON SOUTHBOUND SIDE OF THE BOULEVARD.

3. INSTALL STORM SEWER TRUNKLINE LATERALS AND INLETS AS IDICATED ON THE PLANS.

4. FOLLOW UP WITH PAVING ON THE OUTSIDE LANE, THEN INSIDE LANE WHILE MAINTAINING ACCESS TO RESIDENTS, APARTMENT COMPLEXES AND BUSINESSES.

PHASE 3
1. PHASE 3 WILL CONSIST OF RECONSTRUCTING SOUTHBOUND LANES OF BLACKHAWK BLVD FROM REGAL PINE WAY TO WEST GENEVA DRIVE AT BASELINE STA 20+25.

2. PLACE TRAFFIC CONTROL DEVICES AND TEMPORARY DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS PER BC(12)-21 TO ALLOW FOR ONE LANE TRAFFIC IN EACH DIRECTION ON THE NORTHBOUND SIDE OF THE BOULEVARD.

3. CONSTRUCT A 24-INCH WATERLINE FROM STA 17+28 TO STA 18+41 VIA OPEN CUT CONSTRUCTION. INSTALL A 24-INCH 45° HORIZONTAL BEND AT STA 17+68, TWO VERTICAL BENDS AT STA 17+85 AND 18+03, A 2-INCH AIR RELEASE VALVE AT STA 18+05, A 24-INCH GATE VALVE AT STA 18+33, AND A 24-INCH PLUG AND CLAMP AT STA 18+41. THIS WORK SHALL BE COMPLETE IN CONCURRENCE WITH PAVEMENT AND DRAINAGE IMPROVEMENTS. REFER TO SHEET 34 FOR DETAILED PLANS.

4. INSTALL STORM SEWER TRUNK LINE, LATERALS AND INLETS AS INDICATED ON THE PLANS AND CONNECT TO EXISTING SYSTEMS TO MAINTAIN DRAINAGE AT ALL TIMES. BACKFILL AND PROVIDE TEMPORARY PAVING IMMEDIATELY TO MAINTAIN ACCESS (NO SEPARATE PAY).

5. FOLLOW UP WITH PAVING ON THE INSIDE LANE WHILE MAINTAINING ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY.

6. ONCE INSIDE LANE IS COMPLETED, MAINTAIN ACCESS TO RESIDENTS AND CONSTRUCTION WHILE CONSTRUCTING OUTSIDE LANE.

7. CONSTRUCT THE SOUTHBOUND BLACKHAWK BLVD. IN STEPS AS SHOWN ON THE PLANS. ALL WORK MUST BE COMPLETED IN THIS PHASE BEFORE MOVING ON TO NEXT PHASE.

PHASE 4
1. PHASE 4 WILL CONSIST OF RECONSTRUCTING NORTHBOUND LANES OF BLACKHAWK BLVD FROM REGAL PINE WAY TO BASELINE STA 31+25, AND INSTALLING 24" WATER LINE.

2. PLACE TRAFFIC CONTROL DEVICES AND TEMPORARY DOUBLE NO-PASSING LINE CONSISTING OF RAISIED PAVEMENT MARKERS PER BC(12)-21 TO ALLOW FOR ONE LANE TRAFFIC IN EACH DIRECTION ON THE SOUTHBOUND SIDE OF THE BOULEVARD.

3. CONSTRUCT A 24-INCH WATERLINE FROM STA 5+70 TO STA 17+28 VIA OPEN CUT CONSTRUCTION. INSTALL A 24-INCH 22.5° COMBINATION BEND AT STA 5+74, A 2-INCH AIR RELEASE VALVE WITH A 1" VENT PIPE AT STA 6+00, A 24-INCH GATE VALVE AT STA 6+05, A 2- INCH AIR RELEASE VALVE AT STA 15+38, AND A 24-INCH 45° HORIZONTAL BEND AT STA 16+84. THIS WORK SHALL BE DONE IN CONCURRENCE WITH PAVEMENT AND DRAINAGE IMPROVEMENTS. REFER TO SHEETS 31 THROUGH 34 FOR DETAILED PLANS.

4. INSTALL STORM SEWER LATERALS AND INLETS AS INDICATED ON THE PLANS. BACKFILL AND PROVIDE TEMPORARY PAVING IMMEDIATELY TO MAINTAIN ACCESS (NO SEPARATE PAY).

5. FOLLOW UP WITH PAVING ON THE INSIDE LANE WHILE MAINTAINING ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY.

6. ONCE INSIDE LANE IS COMPLETED, MAINTAIN ACCESS TO RESIDENTS AND CONSTRUCTION WHILE CONSTRUCTING OUTSIDE LANE.

7. CONSTRUCT THE NORTHBOUND BLACKHAWK BLVD. IN STEPS AS SHOWN ON THE PLANS. ALL WORK MUST BE COMPLETED IN THIS PHASE BEFORE MOVING ON TO NEXT PHASE.

REFER TO TEMPORARY TRAFFIC SIGNAL WORK AT FM 2351 PRIOR TO THE START OF PHASES 5 & 6

PHASE 5
1. PHASE 5 WILL CONSIST OF RECONSTRUCTING THE SOUTHBOUND LANES FROM 2351 LN TO REGAL PINE WAY.

2. PLACE TRAFFIC CONTROL DEVICES AND TEMPORARY DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS PER BC(12)-21 TO ALLOW FOR ONE LANE TRAFFIC IN EACH DIRECTION ON THE NORTHBOUND SIDE OF THE BOULEVARD.

3. INSTALL STORM SEWER LATERALS AND INLETS AS INDICATED ON THE PLANS. BACKFILL AND PROVIDE TEMPORARY PAVING IMMEDIATELY TO MAINTAIN ACCESS (NO SEPARATE PAY).

4. FOLLOW UP WITH PAVING ON THE INSIDE LANE WHILE MAINTAINING ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY.

5. ONCE INSIDE LANE IS COMPLETED, MAINTAIN ACCESS TO RESIDENTS,BUSINESSES, CHURCH AND CONSTRUCTION WHILE CONSTRUCTING OUTSIDE LANE.

6. CONSTRUCT THE NORTHBOUND BLACKHAWK BLVD. IN STEPS AS SHOWN ON THE PLANS. ALL WORK MUST BE COMPLETED IN THIS PHASE BEFORE MOVING ON TO NEXT PHASE.

PHASE 6
1. PHASE 6 WILL CONSIST OF RECONSTRUCTING THE NORTHBOUND LANES FROM FM 2351 TO FM REGAL PINE WAY.

2. PLACE TRAFFIC CONTROL DEVICES AND TEMPORARY DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS PER BC(12)-21. SWITCH TRAFFIC ON TO THE NEWLY CONSTRUCTED PAVEMENT FROM PHASE 3 WITH ONE LANE IN EACH DIRECTION ON THE SOUTHBOUND SIDE OF THE BOULEVARD.

3. CONSTRUCT 24-INCH WATER LINE FROM STA 2+64 TO STA 5+70. CONTRACTOR TO CONSTRUCT SEGMENT OF 24-INCH WATERLINE FROM STA 2+64 TO STA 5+40 VIA TRENCH-LESS CONSTRUCTION AND 5+41 TO STA 5+70 VIA OPEN CUT CONSTRUCTION. CONSTRUCT 22.5° COMBINATION BEND AT STA 5+48. SHAFT PIT TO BE CONSTRUCTED OUTSIDE MEDIAN. WORK SHALL BE DONE IN CONCURRENCE WITH PAVEMENT AND DRAINAGE IMPROVEMENTS. REFER TO SHEETS 30 AND 31 FOR DETAILED PLANS

4. INSTALL STORM SEWER LATERALS AND INLETS AS INDICATED ON THE PLANS. BACKFILL AND PROVIDE TEMPORARY PAVING IMMEDIATELY TO MAINTAIN ACCESS (NO SEPARATE PAY).

5. FOLLOW UP WITH PAVING ON OUTSIDE LANE, THEN INSIDE LANE WHILE MAINTAINING ACCESS TO RESIDENTS, APARTMENT COMPLEXES, AND BUSINESSES.

6. ONCE INSIDE LANE IS COMPLETED, MAINTAIN ACCESS TO RESIDENTS AND CONSTRUCTION WHILE CONSTRUCTING OUTSIDE LANE.

7. CONSTRUCT THE NORTHBOUND BLACKHAWK BLVD. IN STEPS AS SHOWN ON THE PLANS. ALL WORK MUST BE COMPLETED IN THIS PHASE BEFORE MOVING ON TO NEXT PHASE.

Texas Registered
Engineering Firm F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

General Notes and Sequence of Work Narrative

SHEET 1 OF 1

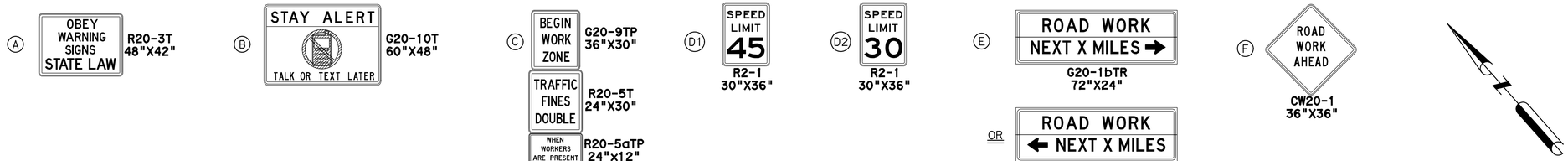
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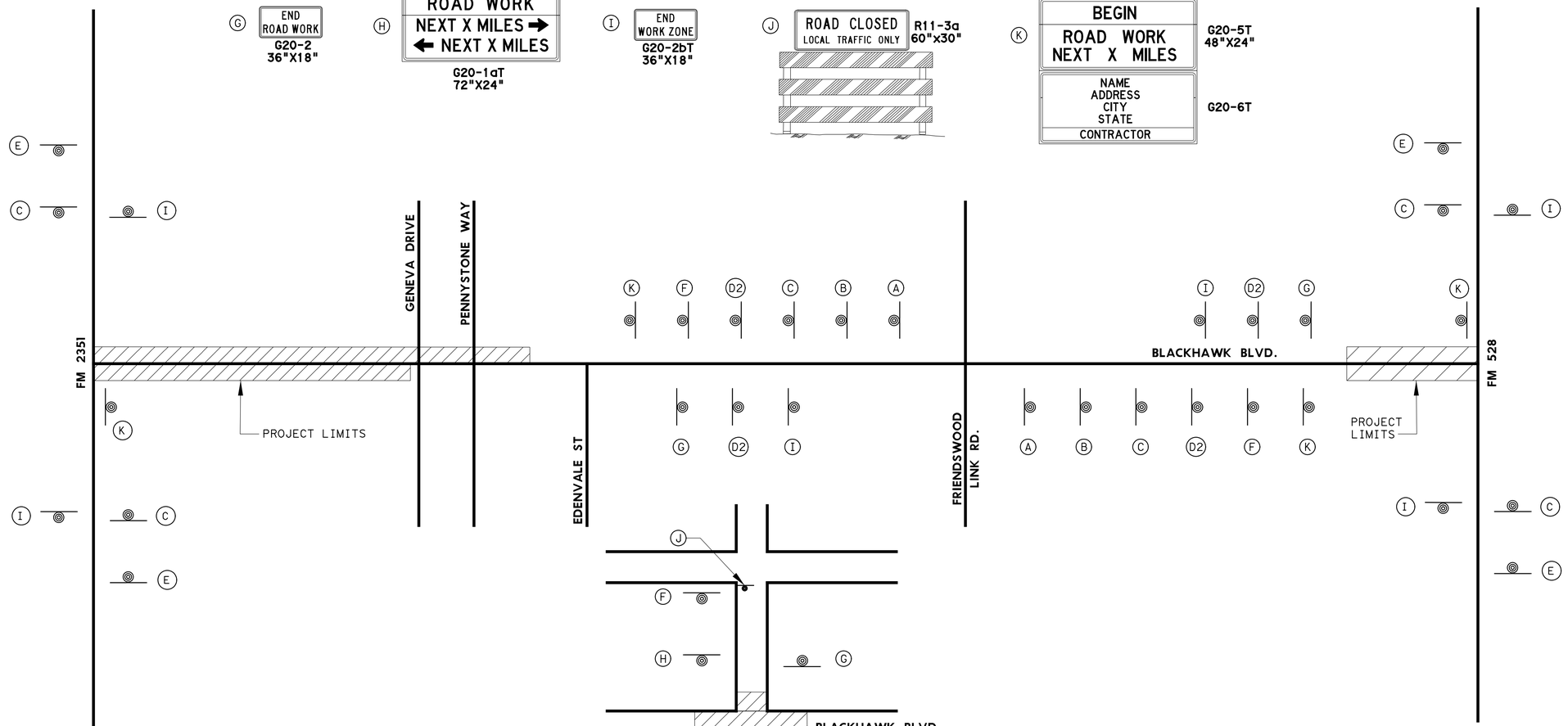
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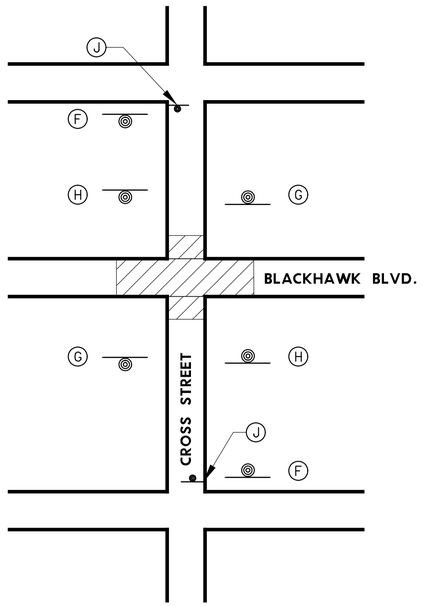
SHEET 61 OF 111

FILE NAME

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6i BLKHWK_PKG2C_TCP-GN.dgn







TYPICAL CROSS STREET ADVANCE WARNING SIGNING

NOTES:

1. POSTED SPEED LIMIT ON BLACKHAWK BLVD. AND CROSSING STREETS IS 30 MPH. CITY MAY REQUEST REDUCING SPEED LIMIT TO 20 MPH.
2. REFER TO TxDOT STANDARD BC(2)-21 AND BC(9)-21 FOR SIGN AND TAPER SPACING DISTANCES.
3. SEE "BLACKHAWK BLVD DETOUR PLAN" SHEETS FOR SIGNS TO BE PLACED ON OTHER CROSS STREETS.

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Houston, Texas 77081
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www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102102
LICENSED
PROFESSIONAL ENGINEER

Ngoc Kim Le
03-02-2026

SHEET NAME

Advance Warning Sign Layout

SHEET 1 OF 1

SCALE NTS

SHEET NUMBER

SHEET 62 OF 111

FILE NAME

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:53:03 PM SCALE: 1:80
62 BLKHWK_PKG2C_TCP-AW01.dgn



LEGEND

- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6

NOTES

1. ALL STATIONING IS FROM ℄ BLACKHAWK UNLESS OTHERWISE NOTED.
2. FOR PHASES 1 & 2 WORK SHALL BE PERFORMED IN STEPS AS NOTED IN EACH PHASING PLAN.

HDR

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Engineering Firm F-754

HDR Engineering, Inc.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Overall Layout

SHEET 1 OF 2

SCALE 0 50 100 150 200

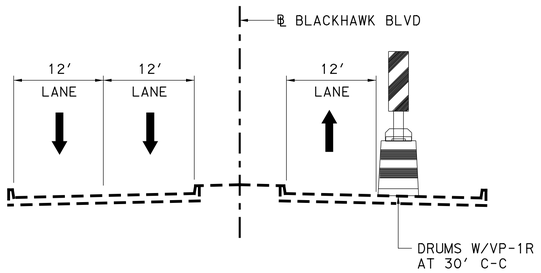
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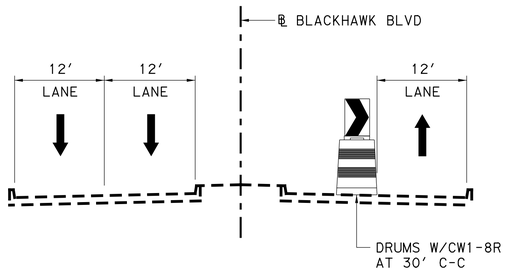
SHEET 63 OF 111

FILE NAME

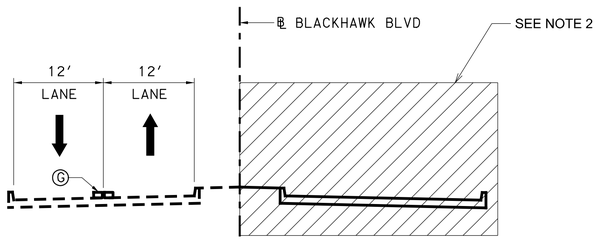
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63 BLKHWK_PKG2C_TCP-OL.dgn



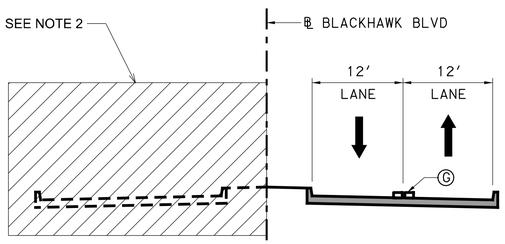
PHASE 1
SECTION A-A



PHASE 2
SECTION A-A



PHASE 1
SECTION B-B



PHASE 2
SECTION B-B

LEGEND

- CONSTRUCTION WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE
- TRAFFIC FLOW
- DRUMS
- Ⓑ TRAFFIC BUTTONS TY Y AT 5′ C-C
- Ⓒ DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS

NOTES

1. A MINIMUM OF 10′ TRAVEL LANE SHALL BE MAINTAINED IN EACH DIRECTION IN ALL PHASES.
2. IN THE CONSTRUCTION WORK ZONE, CONTRACTOR SHALL MAINTAIN ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY. THIS AREA SHOWN TO BE DELINEATED WITH DRUMS OR VERTICAL PANELS.

Texas Registered
Engineering Firm F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Typical Sections Phases 1 & 2

SHEET 3 OF 3

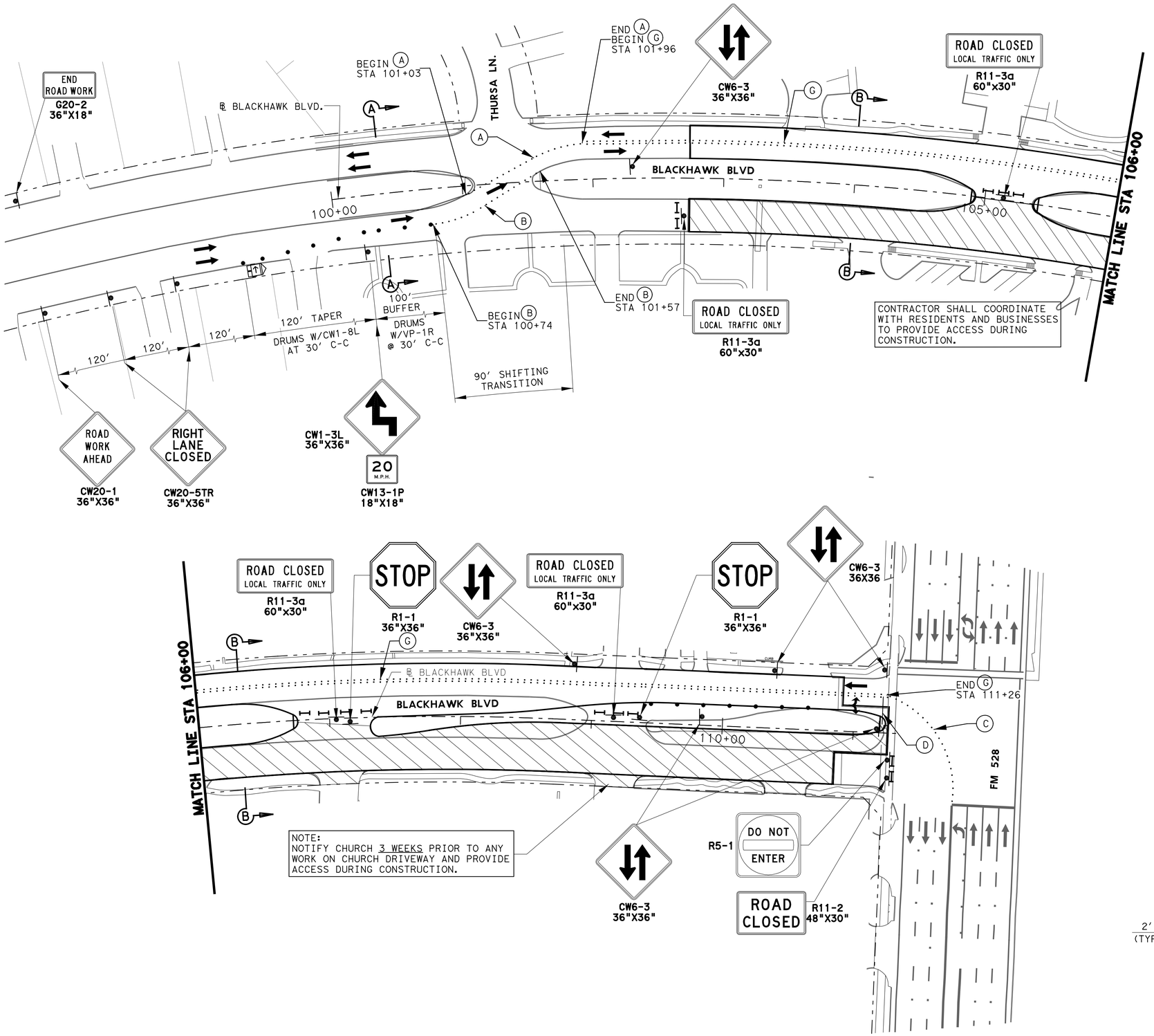
SCALE	NTS

SHEET NUMBER

SHEET 64 OF 111

FILE NAME

64 BLKHWK_PKG2C_TCP-TS03.dgn
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:53:13 PM SCALE: 1:20



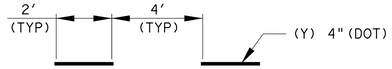
LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

(A) TRAFFIC BUTTONS TY Y AT 5' C-C
(B) TRAFFIC BUTTONS TY W AT 5' C-C
(C) WK ZN PAV MRK REMOV (Y) 4"(DOT) SEE DETAIL "A"
(D) WK ZN PAV MRK REMOV (W) 24"(SLD)
(E) ELIM EXT PAV MRK & MRKS (4")
(F) ELIM EXT PAV MRK & MRKS (6")
(G) TEMPORARY DOUBLE NO-PASSING LINE RAISED PAVEMENT MARKERS PER BC(12)-21

NOTES

1. ALL STATIONING IS FROM ℄ BLACKHAWK UNLESS OTHERWISE NOTED.
2. REFER TO TRAFFIC CONTROL PLAN INTERSECTION DETAIL FOR CROSS STREET CONSTRUCTION DETAILS.
3. REFER TO TRAFFIC CONTROL PLAN TYPICAL SECTIONS FOR LANE CONFIGURATIONS IN EACH PHASE.
4. INTERSECTIONS SHALL REMAIN OPEN AS LONG AS POSSIBLE. SEE TRAFFIC CONTROL PLAN INTERSECTION DETAIL. ONCE WORK COMMENCES AND INTERSECTION IS CLOSED, THERE SHALL BE CONTINUOUS WORK TO EXPEDITE COMPLETION AND OPENING.
5. CONTRACTOR SHALL LIMIT CONSTRUCTION ZONE NOT TO EXCEED 500 LF FOR REMOVAL AND REPLACEMENT OF PAVEMENT TO MINIMIZE RESIDENCES' INCONVENIENCE.



DETAIL "A"
NTS

HDR
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Phase 1

SHEET 1 OF 1

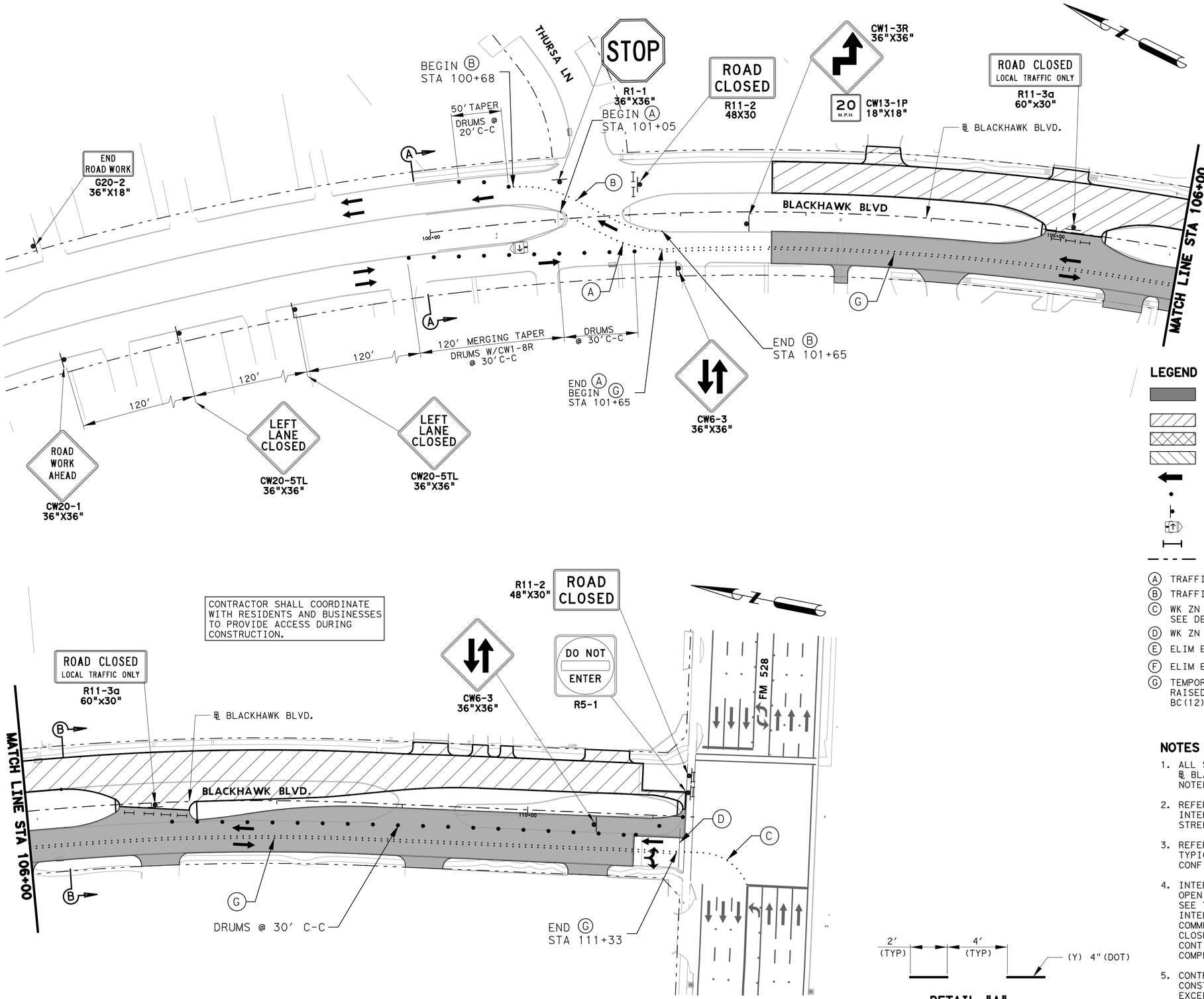
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SCALE: 1" = 40'

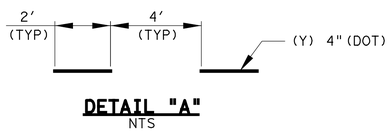
SHEET NUMBER

SHEET 65 OF 111

FILE NAME

PLOT DRIVER: $PLTDRV$
USER: $USER$
DATE: $DATE$
TIME: $TIME$
PENTABLE: $PENTBL$
SCALE: $SCALESHORT$
$FILES$





DETAIL "A"
NTS

LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

(A) TRAFFIC BUTTONS TY Y AT 5' C-C
(B) TRAFFIC BUTTONS TY W AT 5' C-C
(C) WK ZN PAV MRK REMOV (Y) 4"(DOT) SEE DETAIL "A"
(D) WK ZN PAV MRK REMOV (W) 24"(SLD)
(E) ELIM EXT PAV MRK & MRKS (4")
(F) ELIM EXT PAV MRK & MRKS (6")
(G) TEMPORARY DOUBLE NO-PASSING LINE RAISED PAVEMENT MARKERS PER BC(12)-21

NOTES

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3. REFER TO TRAFFIC CONTROL PLAN TYPICAL SECTIONS FOR LANE CONFIGURATIONS IN EACH PHASE.
4. INTERSECTIONS SHALL REMAIN OPEN AS LONG AS POSSIBLE. SEE TRAFFIC CONTROL PLAN INTERSECTION DETAIL. ONCE WORK COMMENCES AND INTERSECTION IS CLOSED, THERE SHALL BE CONTINUOUS WORK TO EXPEDITE COMPLETION AND OPENING.
5. CONTRACTOR SHALL LIMIT CONSTRUCTION ZONE NOT TO EXCEED 500 LF FOR REMOVAL AND REPLACEMENT OF PAVEMENT TO MINIMIZE RESIDENCES' INCONVENIENCE.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan Phase 2

SHEET 1 OF 1

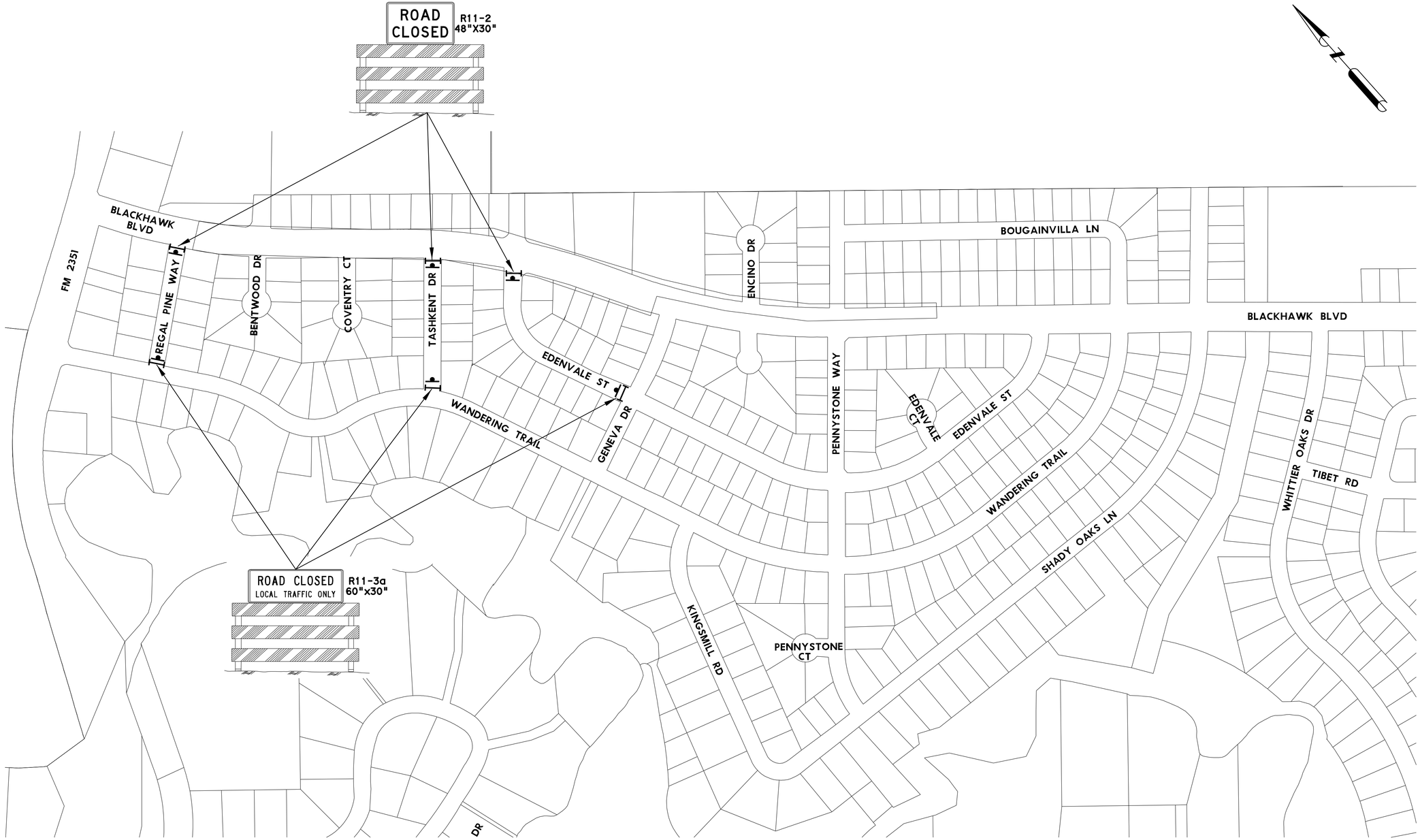
SCALE: 0 20 40 60 80
SCALE: 1" = 40'

SHEET NUMBER

SHEET 66 OF 111

FILE NAME

PLOT DRIVER: $PLTDRV$ DATE: $DATE$ TIME: $TIME$ PENTABLE: $PENTBL$ SCALE: $SCALESHORT$ $FILES$
USER: $USER$



GENERAL NOTES:

1. INTERSECTIONS SHALL REMAIN OPEN AS LONG AS POSSIBLE. SEE 'TRAFFIC CONTROL PLAN INTERSECTION DETAIL'. ONCE WORK COMMENCES AND INTERSECTION IS CLOSED, THERE SHALL BE CONTINUOUS WORK TO EXPEDITE COMPLETION AND OPENING.
2. IF APPROVED FOR STREET CLOSURES, CONTRACTOR SHALL SET UP THE DETOUR ROUTE AS SHOWN. CONTRACTOR SHALL NOT HAVE TWO CONSECUTIVE INTERSECTION STREETS CLOSED AT THE SAME TIME DURING CONSTRUCTION.
3. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE THROUGHOUT THE PROJECT AT ALL TIMES. (NO SEPARATE PAY)
4. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL DRIVEWAYS. (NO SEPARATE PAY)

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102102
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Detour Plan
Phases 3 & 4

SHEET 1 OF 1

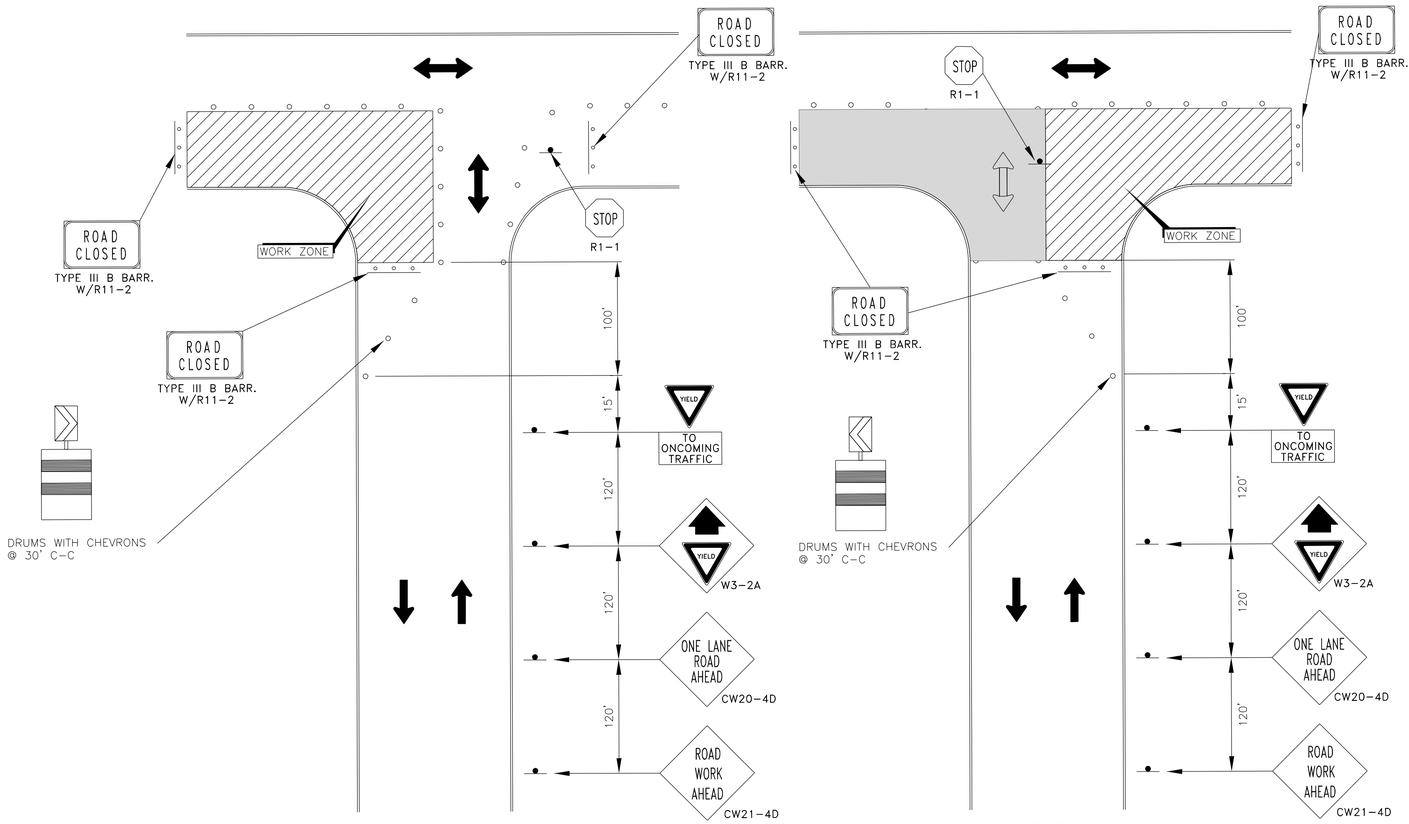
SCALE	NTS

SHEET NUMBER

SHEET 67 OF 111

FILE NAME

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: RUGONZALEZ
DATE: 9/24/2025
TIME: 2:53:23 PM
PENTABLE: BLKHWK2C TRAFF.tbl
SCALE: 1:360
67 BLKHWK_PKG2C_TCP_DETOUR PLAN.dgn



STEP I

STEP II

LEGEND:

NEW PAVEMENT COMPLETED

PROPOSED PAVEMENT

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

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STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Intersection Detail

SHEET 1 OF 1

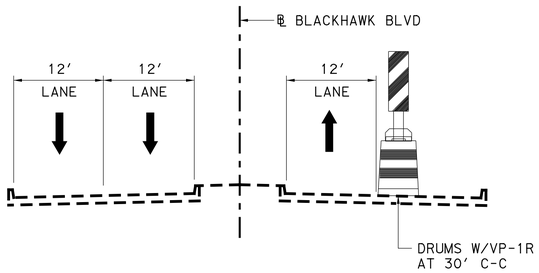
SCALE NTS

SHEET NUMBER

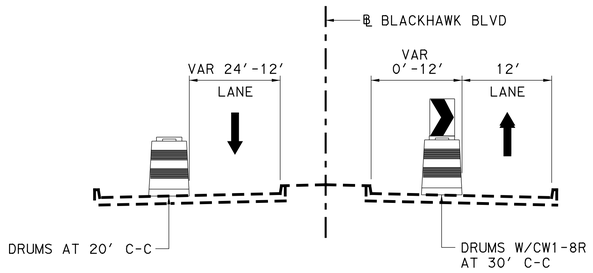
SHEET 68 OF 111

FILE NAME

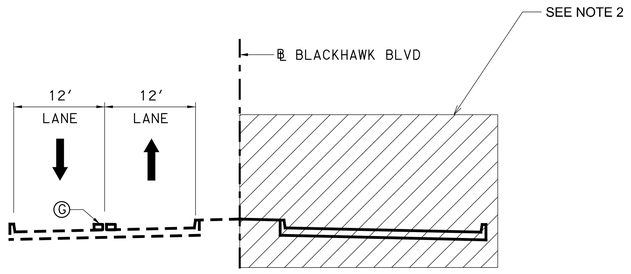
68 BLKHWK_PKG2C_INTDET.dgn
PENTABLE: BLKHWK2C TRAFF.tbl
TIME: 2:53:25 PM SCALE: 1:200
PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: RUGONZALEZ DATE: 9/24/2025



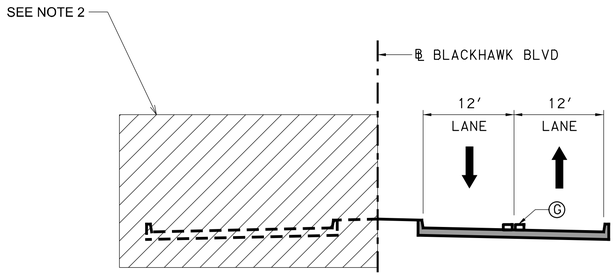
PHASE 3
SECTION A-A



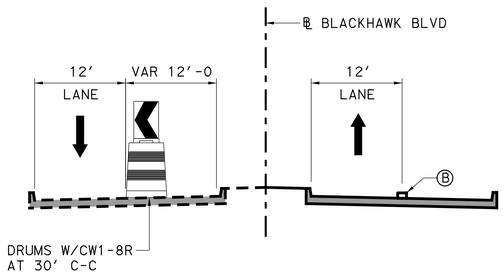
PHASE 4
SECTION A-A



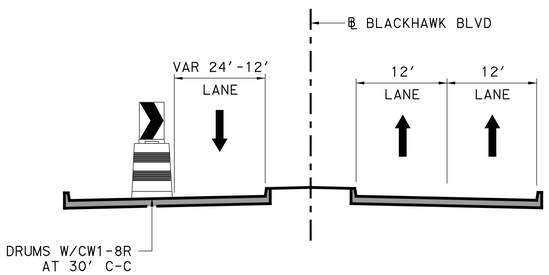
PHASE 3
SECTION B-B



PHASE 4
SECTION B-B



PHASE 3
SECTION C-C



PHASE 4
SECTION C-C

LEGEND

- CONSTRUCTION WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE
- TRAFFIC FLOW
- DRUMS
- Ⓑ TRAFFIC BUTTONS TY Y AT 5′ C-C
- Ⓖ DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS

NOTES

1. A MINIMUM OF 10′ TRAVEL LANE SHALL BE MAINTAINED IN EACH DIRECTION IN ALL PHASES.
2. IN THE CONSTRUCTION WORK ZONE, CONTRACTOR SHALL MAINTAIN ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY. THIS AREA SHOWN TO BE DELINEATED WITH DRUMS OR VERTICAL PANELS.

HDR

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Typical Sections Phases 3 & 4

SHEET 1 OF 3

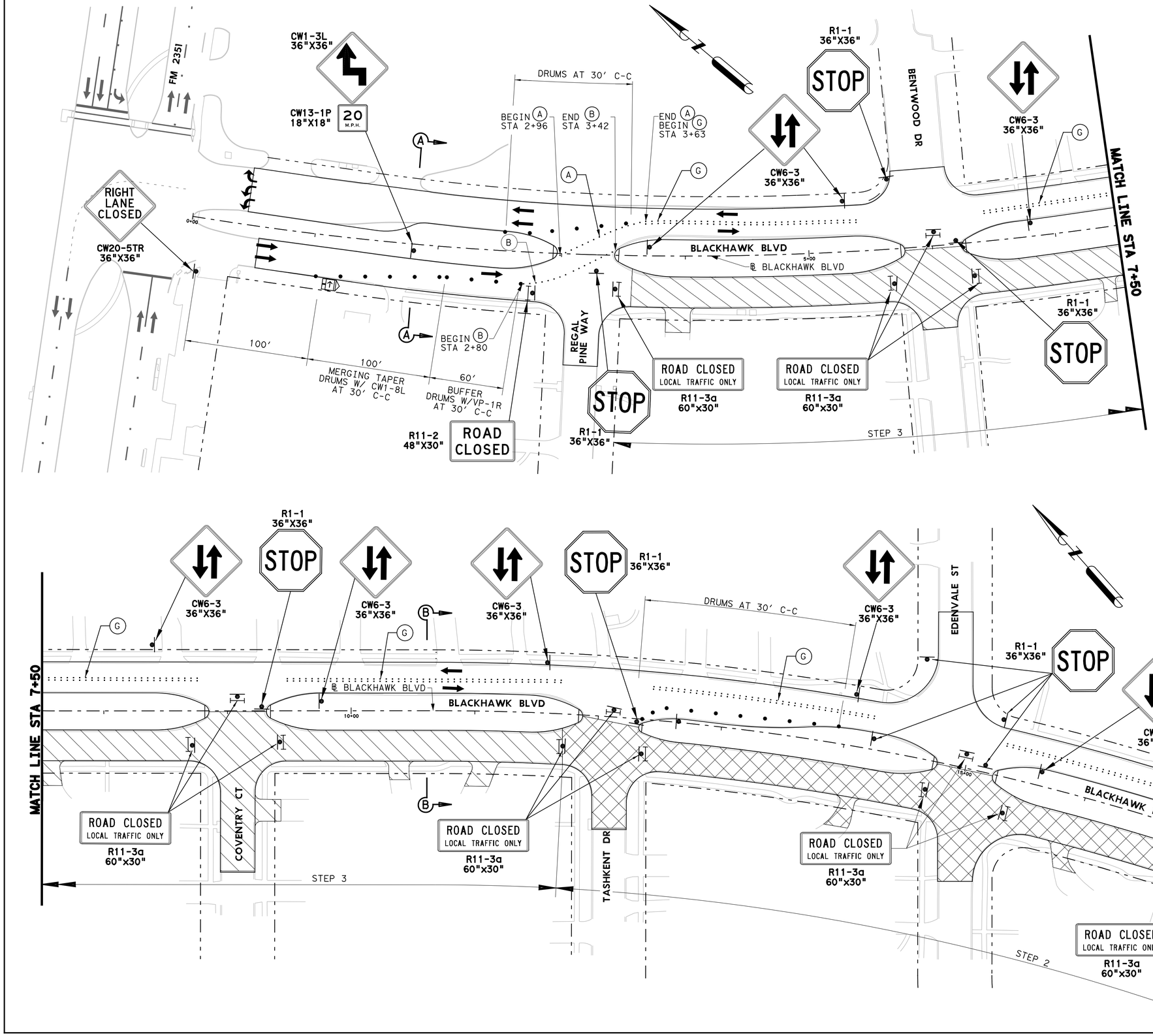
SCALE	NTS

SHEET NUMBER

SHEET 69 OF 111

FILE NAME

69 BLKHWK_PKG2C_TCP-TSOI.dgn
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:53:28 PM SCALE: 1:20



LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

(A) TRAFFIC BUTTONS TY Y AT 5' C-C
(B) TRAFFIC BUTTONS TY W AT 5' C-C
(C) WK ZN PAV MRK REMOV (Y) 4"(DOT) SEE DETAIL "A"
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NOTES

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102102
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Phase 3
Sta 0+00 to Sta 17+86

SHEET 1 OF 2

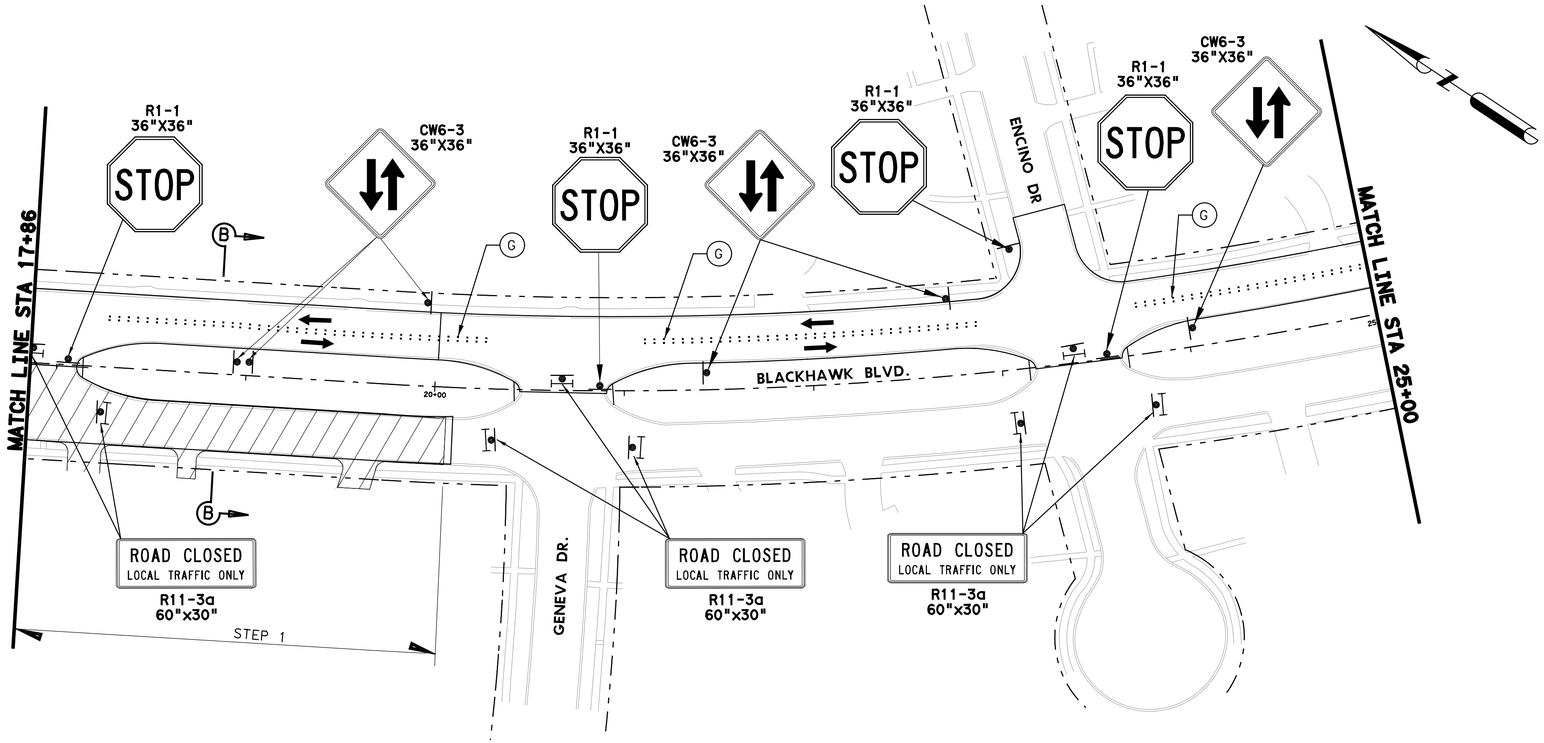
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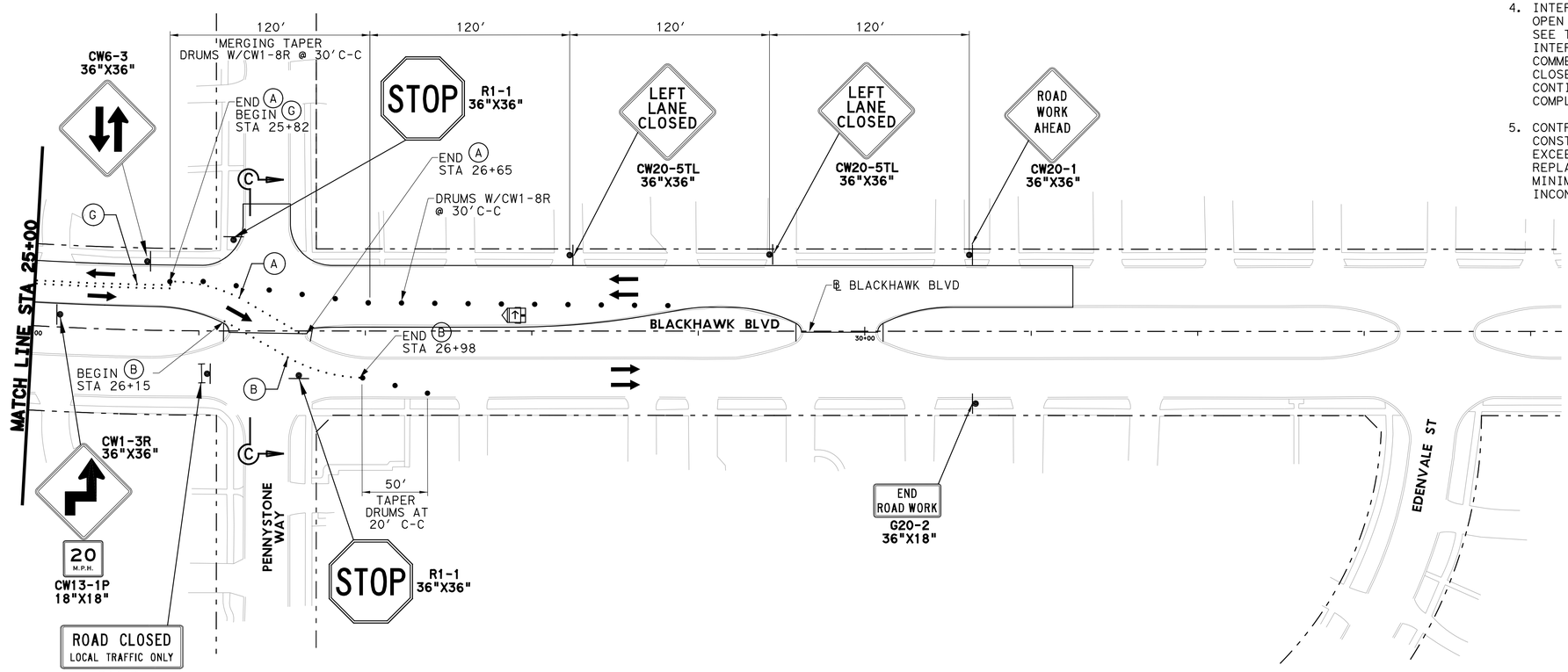
SHEET NUMBER

SHEET 70 OF 111

FILE NAME

...\70 BLKHWK_PKG2C_TCP-PH3-01.dgn
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: TXDOT.tbl
USER: BRCROOK DATE: 12/10/2025 TIME: 7:56:27 AM SCALE: 1:80





LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

(A) TRAFFIC BUTTONS TY Y AT 5' C-C
(B) TRAFFIC BUTTONS TY W AT 5' C-C
(C) WK ZN PAV MRK REMOV (Y) 4"(DOT) SEE DETAIL "A"
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER
03-02-2026

SHEET NAME

Traffic Control Plan
Phase 3
Sta 17+86 to End

SHEET 2 OF 2

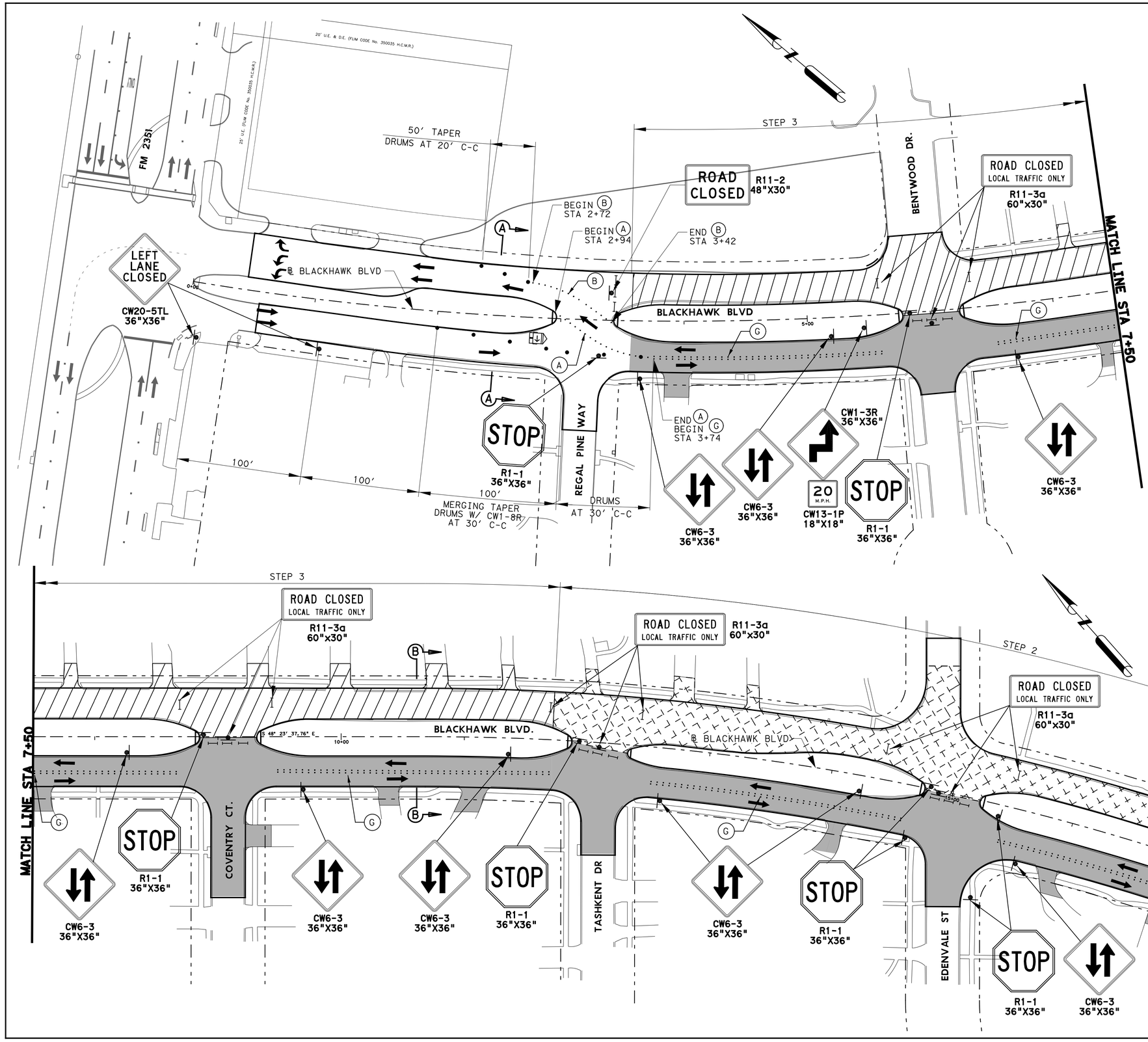
SCALE: 1" = 40'

SHEET NUMBER

SHEET 71 OF 111

FILE NAME

...\7\ BLKHWK_PKG2C_TCP-PH3-02.dgn
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: TXDOT.tbl
USER: BRCROOK DATE: 12/10/2025 TIME: 7:56:30 AM SCALE: 1:80



LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

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PROJECT FOR

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STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

Ngoc Kim Le
03-02-2026

SHEET NAME

Traffic Control Plan
Phase 4
Sta 0+00 to Sta 17+86

SHEET 1 OF 2

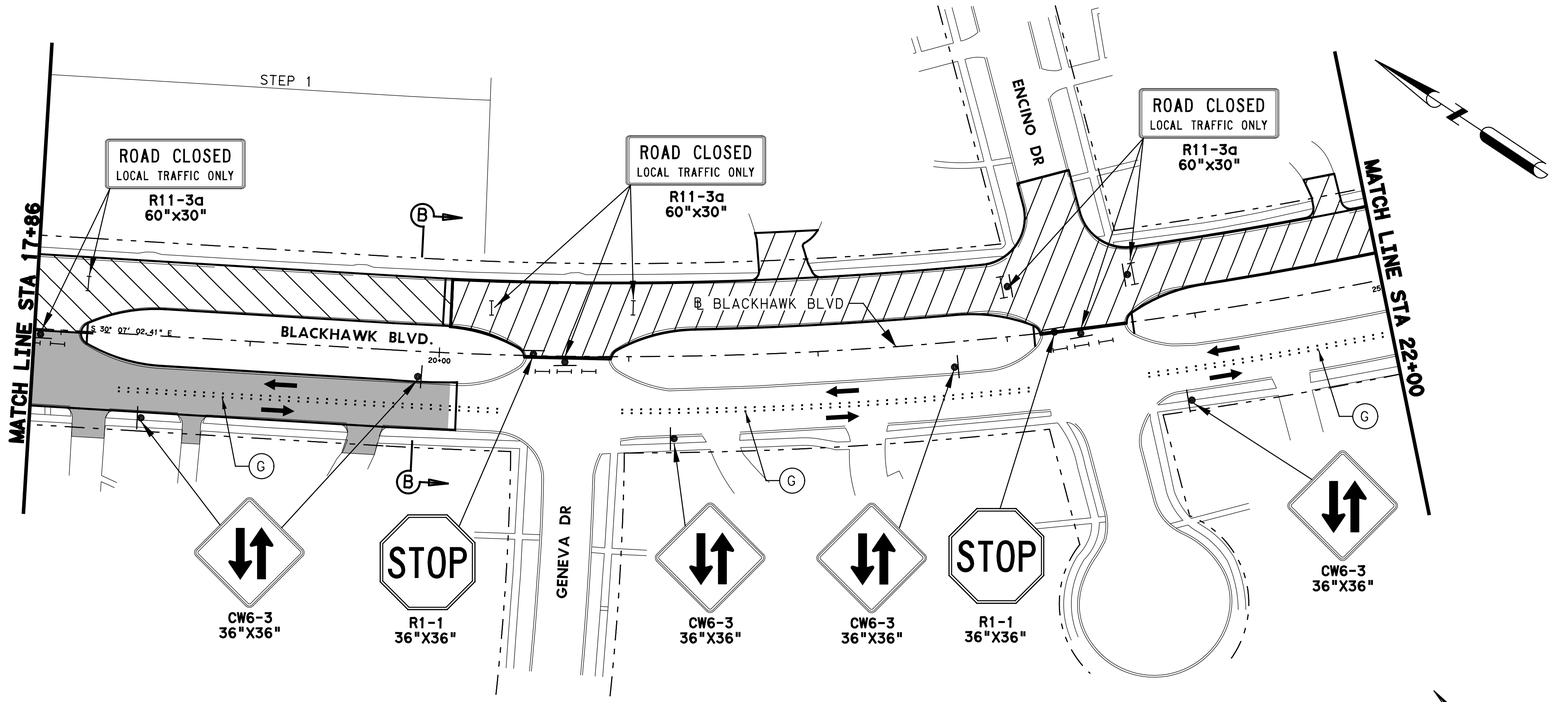
SCALE: 1" = 40'

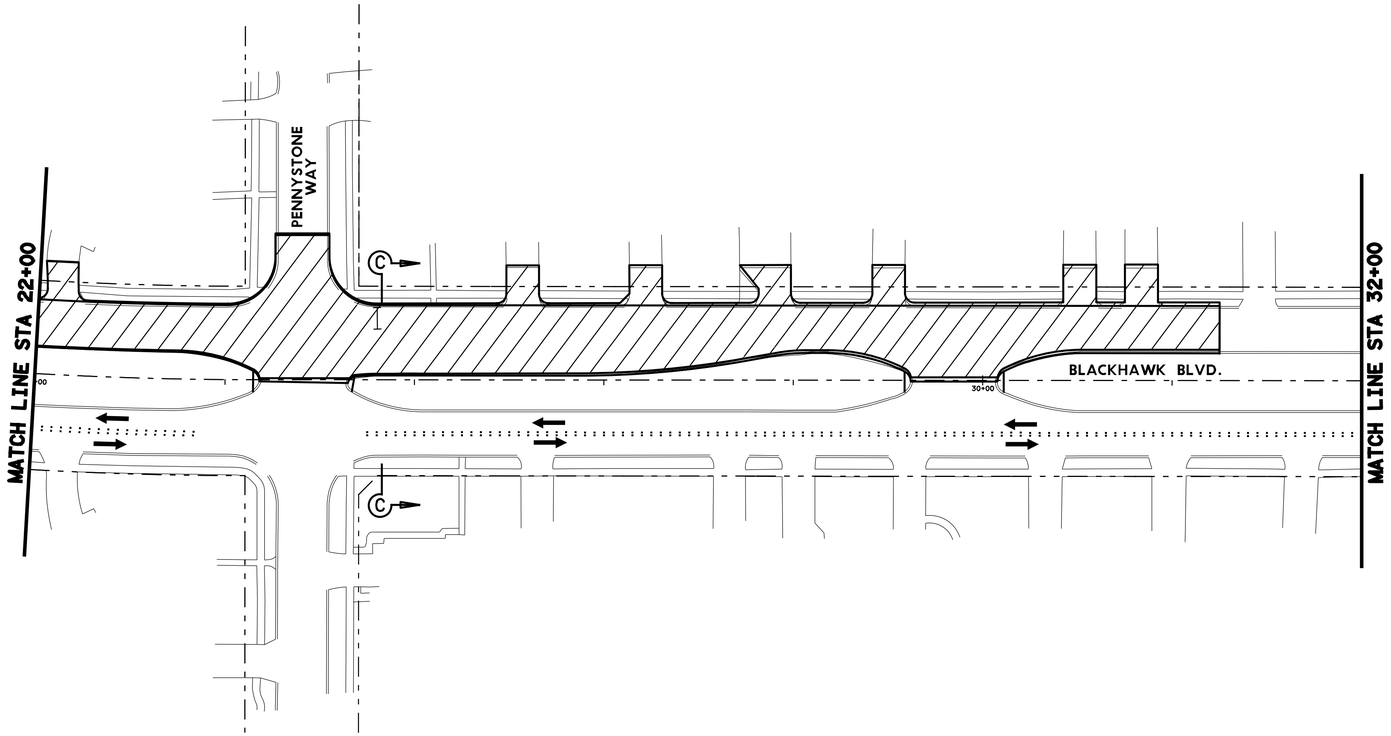
SHEET NUMBER

SHEET 72 OF 111

FILE NAME

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:53:52 PM SCALE: 1:80
72 BLKHWK_PKG2C_TCP-PH4-01.dgn





LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

(A) TRAFFIC BUTTONS TY Y AT 5′ C-C
(B) TRAFFIC BUTTONS TY W AT 5′ C-C
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(G) TEMPORARY DOUBLE NO-PASSING LINE RAISED PAVEMENT MARKERS PER BC(12)-21

NOTES

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3. REFER TO TRAFFIC CONTROL PLAN TYPICAL SECTIONS FOR LANE CONFIGURATIONS IN EACH PHASE.
4. INTERSECTIONS SHALL REMAIN OPEN AS LONG AS POSSIBLE. SEE TRAFFIC CONTROL PLAN INTERSECTION DETAIL. ONCE WORK COMMENCES AND INTERSECTION IS CLOSED, THERE SHALL BE CONTINUOUS WORK TO EXPEDITE COMPLETION AND OPENING.
5. CONTRACTOR SHALL LIMIT CONSTRUCTION ZONE NOT TO EXCEED 500 LF FOR REMOVAL AND REPLACEMENT OF PAVEMENT TO MINIMIZE RESIDENCES' INCONVENIENCE.

HDR
Texas Registered Engineering Firm F-754

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Houston, Texas 77081
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Phase 4
Sta 17+86 to Sta 32+00

SHEET 2 OF 2

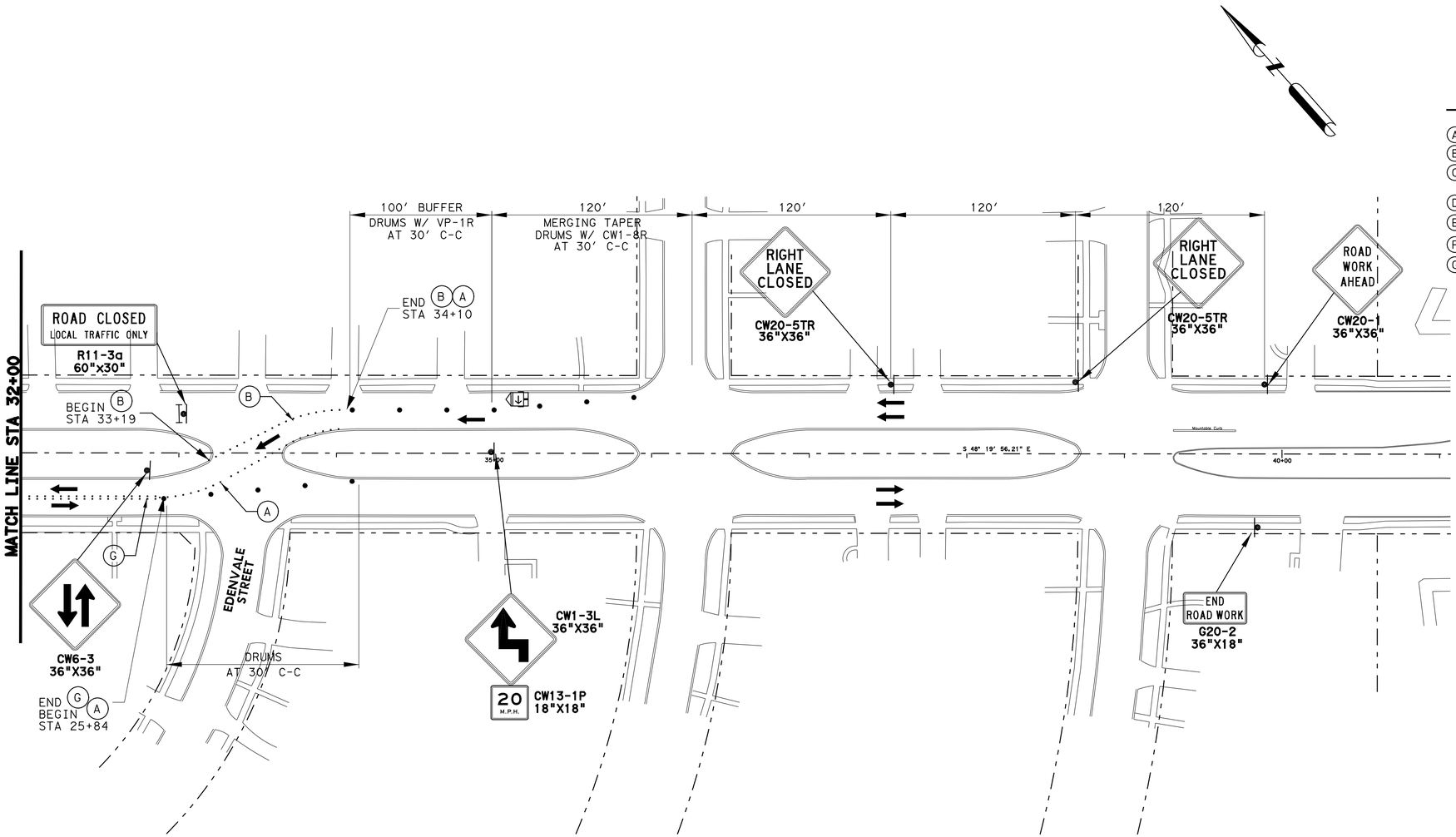
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SHEET NUMBER

SHEET 73 OF 111

FILE NAME

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USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:00 PM SCALE: 1:80
73 BLKHWK_PKG2C_TCP-PH4-02.dgn



LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

(A) TRAFFIC BUTTONS TY Y AT 5' C-C
(B) TRAFFIC BUTTONS TY W AT 5' C-C
(C) WK ZN PAV MRK REMOV (Y) 4"(DOT) SEE DETAIL "A"
(D) WK ZN PAV MRK REMOV (W) 24"(SLD)
(E) ELIM EXT PAV MRK & MRKS (4")
(F) ELIM EXT PAV MRK & MRKS (6")
(G) TEMPORARY DOUBLE NO-PASSING LINE RAISED PAVEMENT MARKERS PER BC(12)-21

NOTES

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Phase 4
Sta 32+00 to End

SHEET 2 OF 2

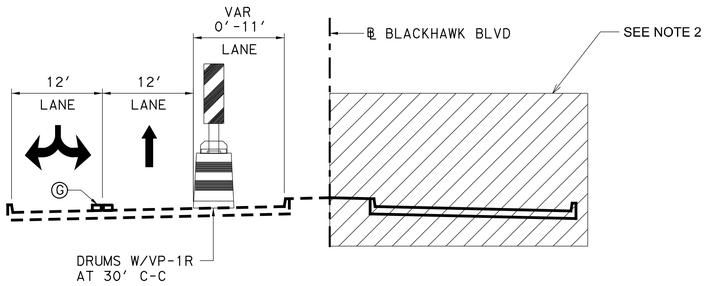
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SHEET NUMBER

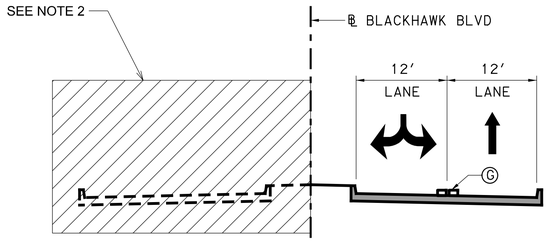
SHEET 73A OF 111

FILE NAME

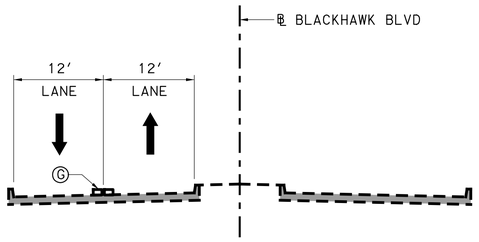
73A BLKHWK_PKG2C_TCP-PH4-03.dgn
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DATE: 9/25/2025
USER: RUGONZALEZ
PLOT DRIVER: TXDOT_PDF_BW.pltcfg



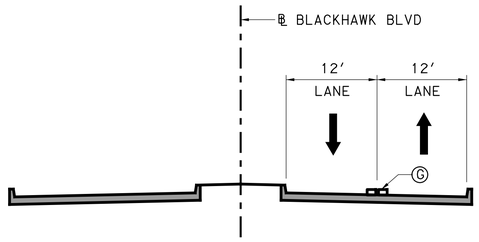
PHASE 5
SECTION A-A



PHASE 6
SECTION A-A



PHASE 5
SECTION B-B



PHASE 6
SECTION B-B

LEGEND

- CONSTRUCTION WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE
- TRAFFIC FLOW
- DRUMS
- Ⓑ TRAFFIC BUTTONS TY Y AT 5′ C-C
- Ⓒ DOUBLE NO-PASSING LINE CONSISTING OF RAISED PAVEMENT MARKERS

NOTES

1. A MINIMUM OF 10′ TRAVEL LANE SHALL BE MAINTAINED IN EACH DIRECTION IN ALL PHASES.
2. IN THE CONSTRUCTION WORK ZONE, CONTRACTOR SHALL MAINTAIN ONE LANE OF TRAFFIC FOR RESIDENTS AND CONSTRUCTION ACCESS ONLY. THIS AREA SHOWN TO BE DELINEATED WITH DRUMS OR VERTICAL PANELS.

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Typical Sections Phases 5 & 6

SHEET 2 OF 3

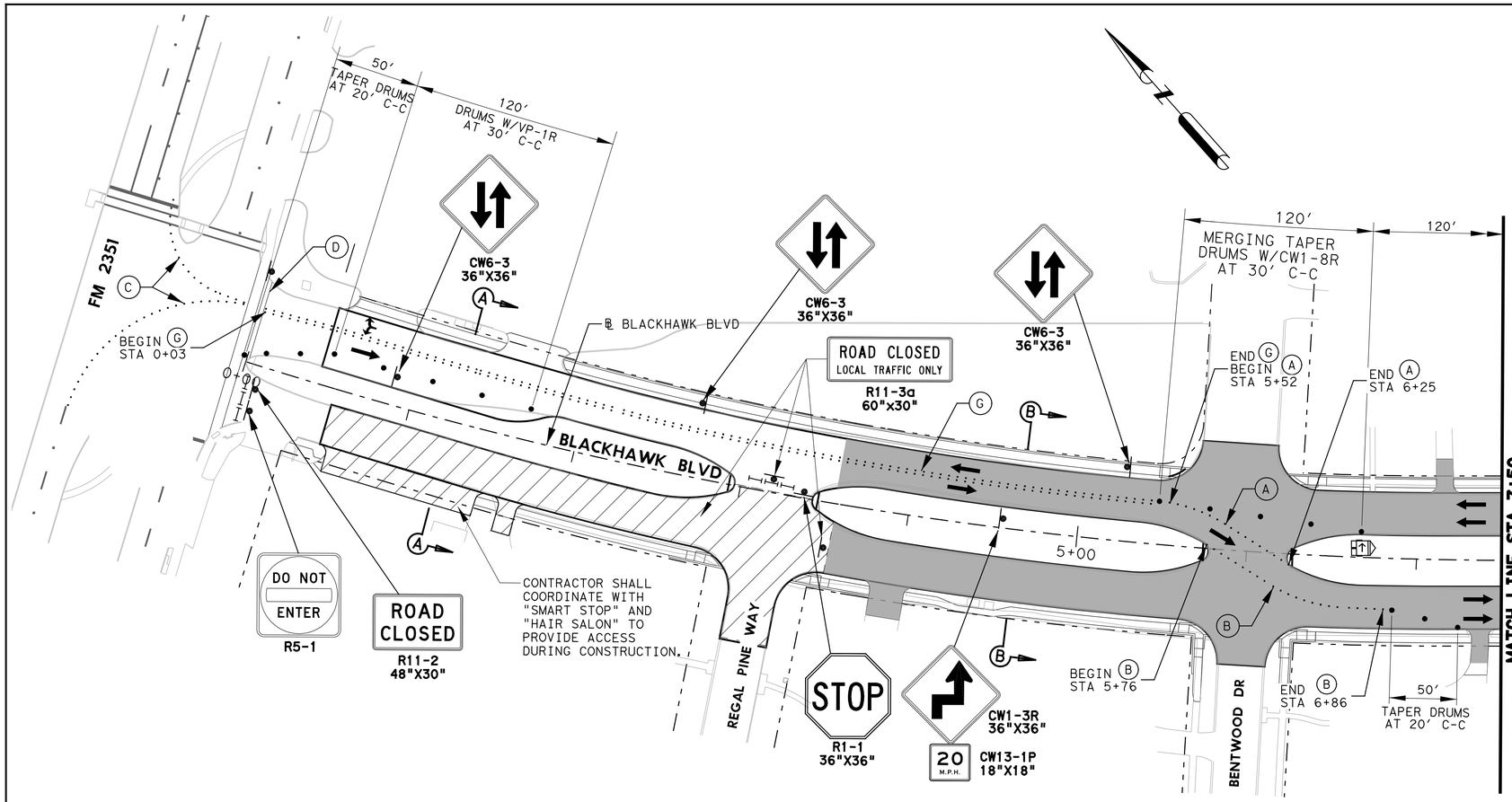
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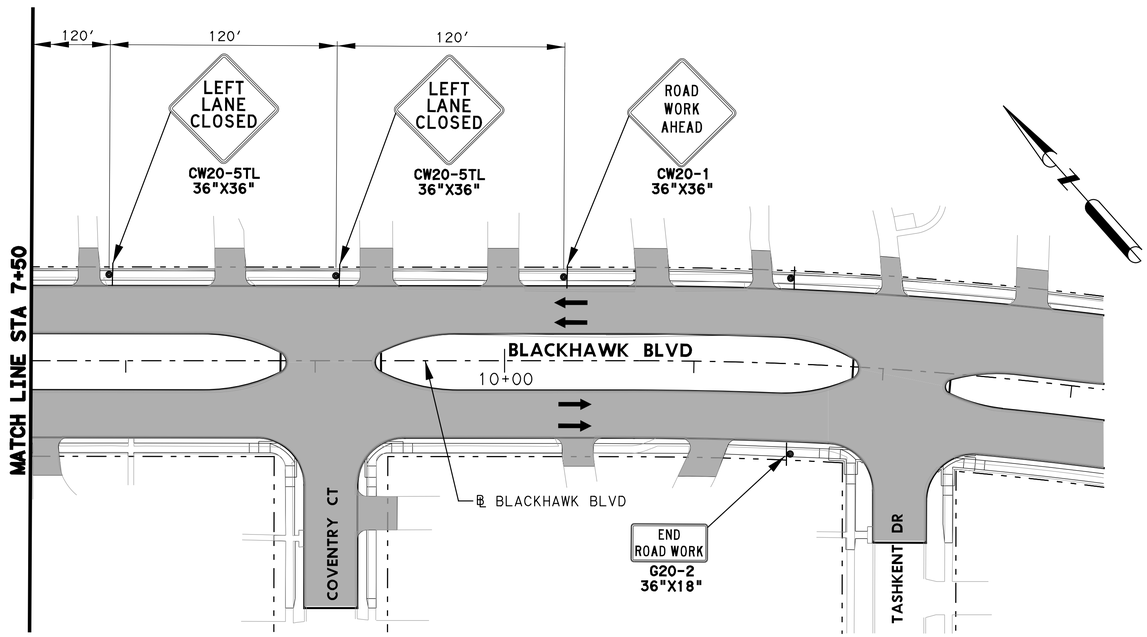
SHEET NUMBER

SHEET 74 OF 111

FILE NAME

74 BLKHWK_PKG2C_TCP-TSO2.dgn
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TIME: 2:54:03 PM SCALE: 1:20
PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: RUGONZALEZ DATE: 9/24/2025





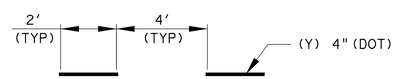
LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

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(C) WK ZN PAV MRK REMOV (Y) 4"(DOT) SEE DETAIL "A"
(D) WK ZN PAV MRK REMOV (W) 24"(SLD)
(E) ELIM EXT PAV MRK & MRKS (4")
(F) ELIM EXT PAV MRK & MRKS (6")
(G) TEMPORARY DOUBLE NO-PASSING LINE RAISED PAVEMENT MARKERS PER BC(12)-21

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DETAIL "A"
NTS

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PROJECT FOR

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MARK	DATE	DESCRIPTION

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STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Phase 5

SHEET 1 OF 1

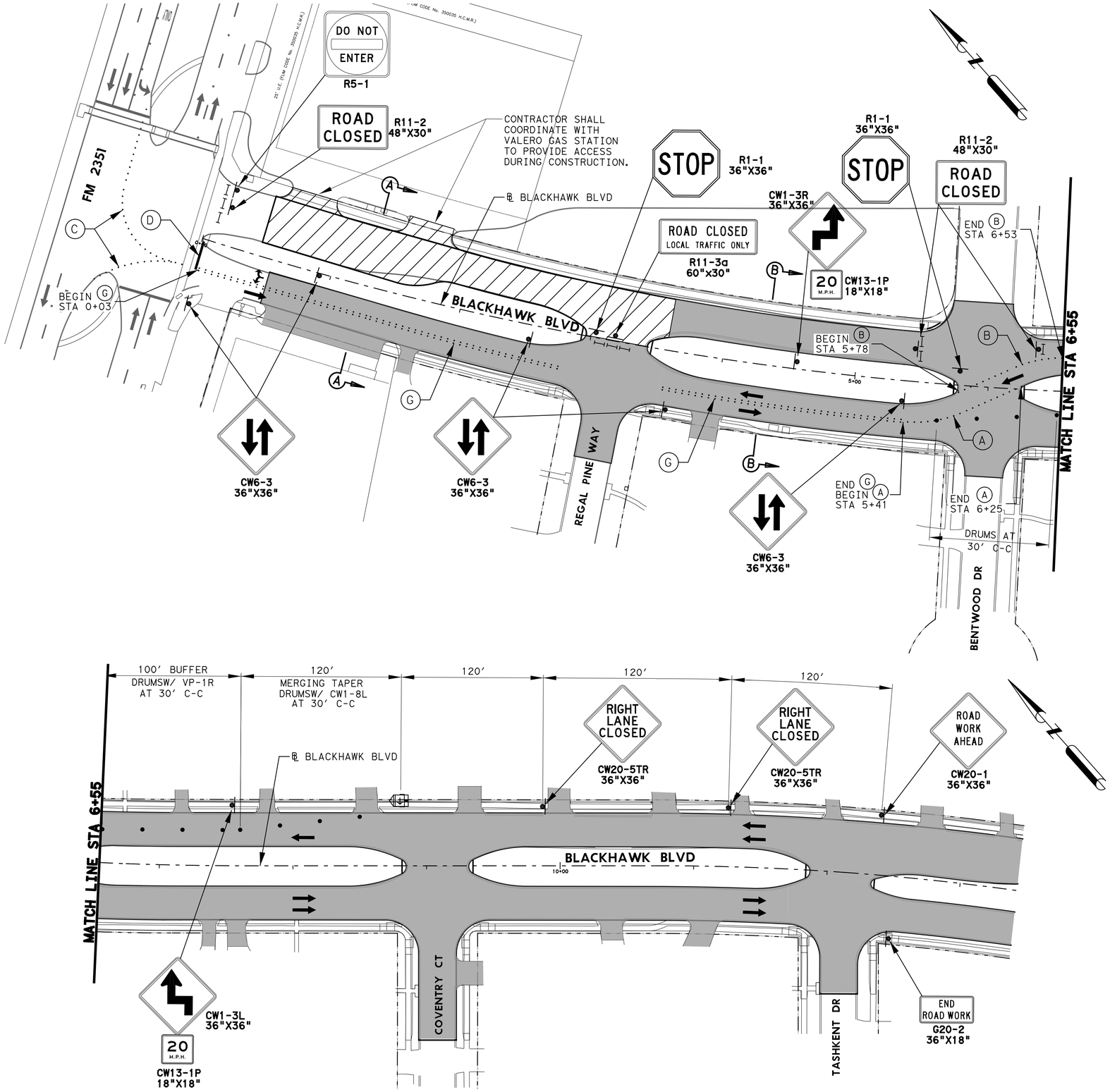
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SCALE: 1" = 40'

SHEET NUMBER

SHEET 75 OF 111

FILE NAME

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USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:12 PM SCALE: 1:80
75 BLKHWK_PKG2C_TCP-PH5.dgn



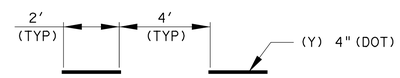
LEGEND

- CONSTRUCTED IN PREVIOUS PHASE
- WORK ZONE
- WORK ZONE
- WORK ZONE
- TRAFFIC FLOW
- DRUMS
- GROUND MOUNTED SIGN
- FLASHING ARROW BOARD
- TYPE III BARRICADE
- EXIST ROW

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DETAIL "A"
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Traffic Control Plan
Phase 6

SHEET 1 OF 1

SCALE 0 20 40 60 80
SCALE: 1" = 40'

SHEET NUMBER

SHEET 76 OF 111

FILE NAME

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:5 PM SCALE: 1:80
76 BLKHWK_PKG2C_TCP-PH6.dgn

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DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

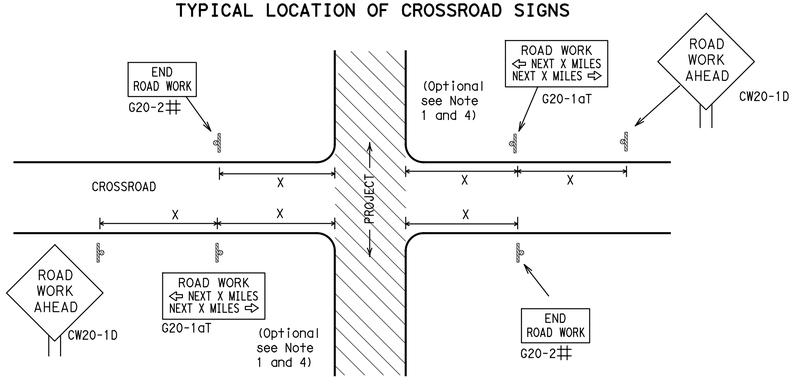
BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	DIST	COUNTY		SHEET NO. 77

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DATE:
FILE:

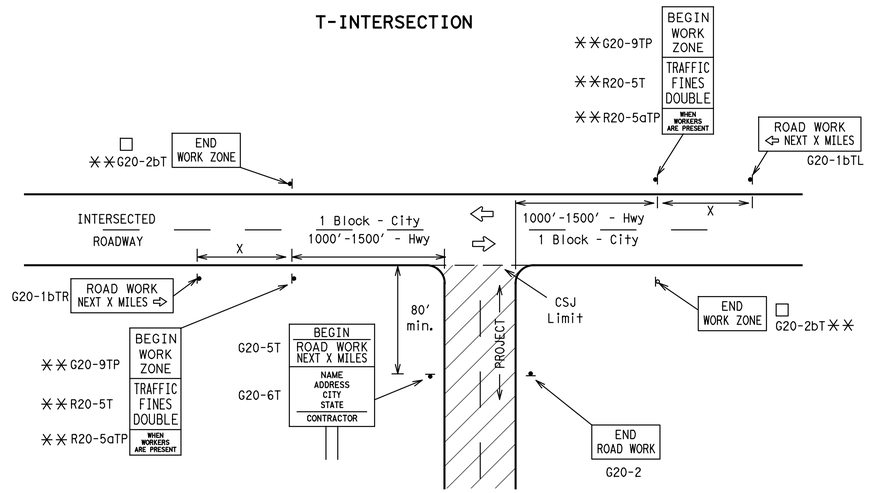
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

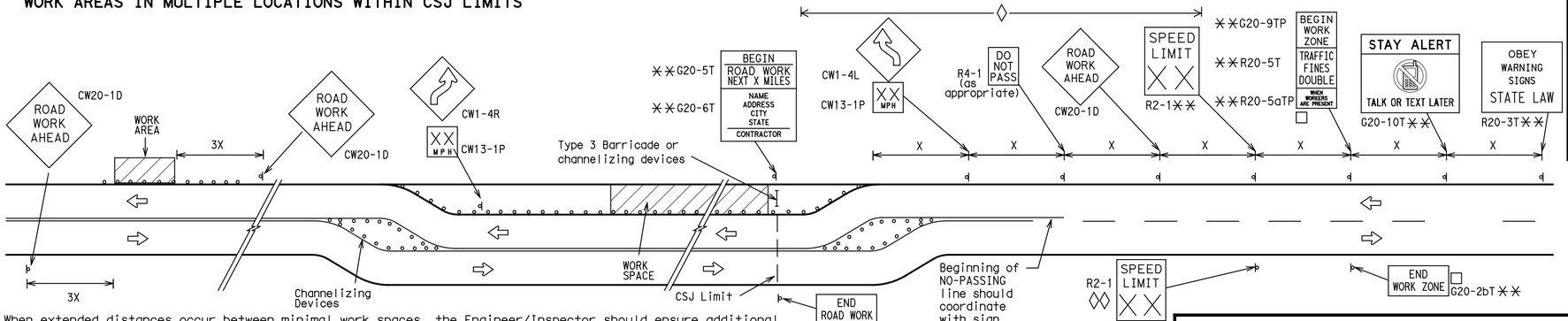
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

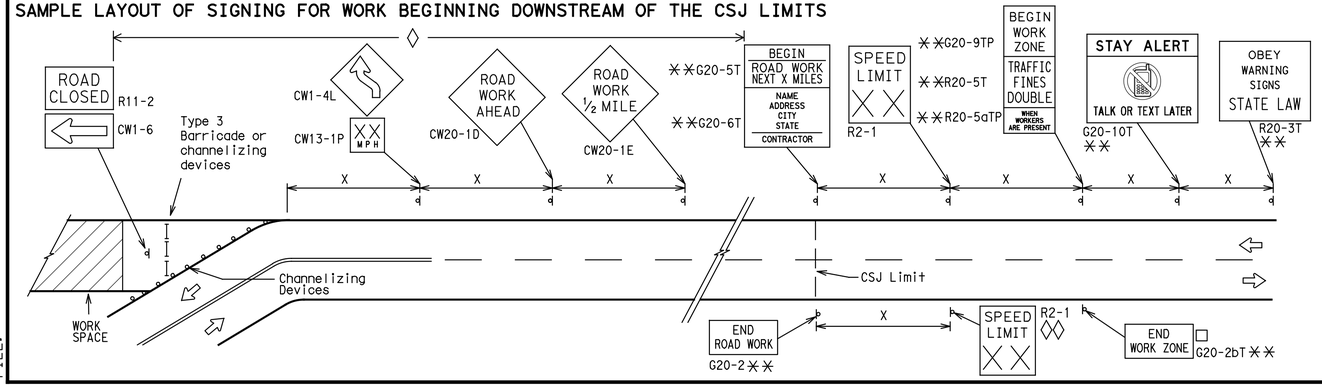
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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7-13 5-21				78

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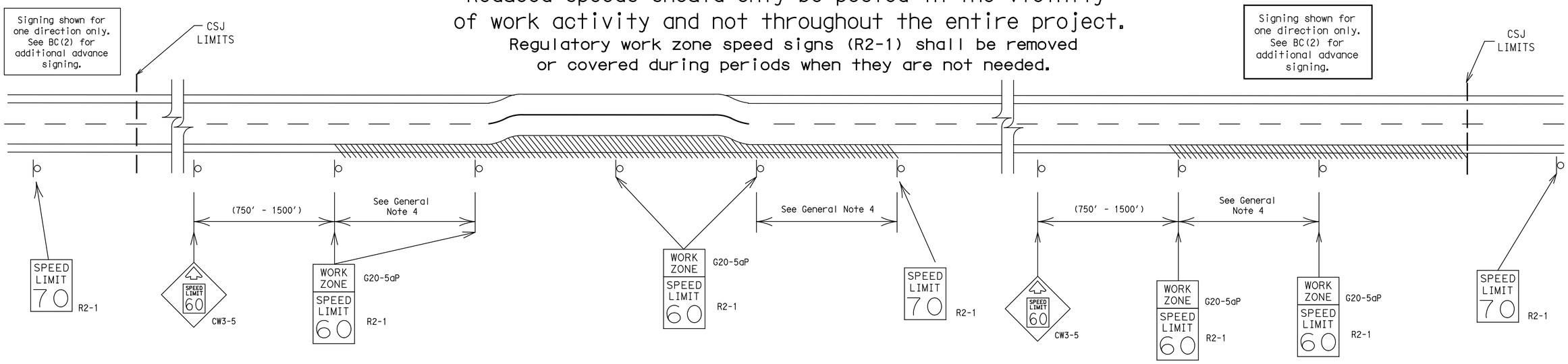
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

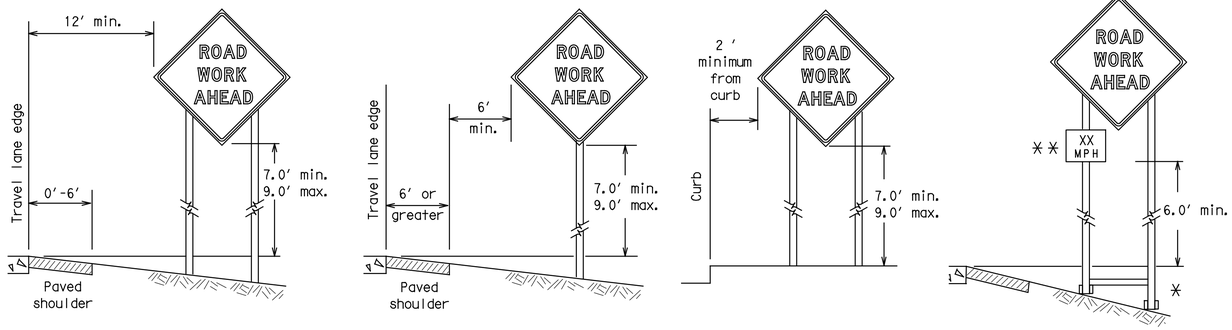
BC(3)-21

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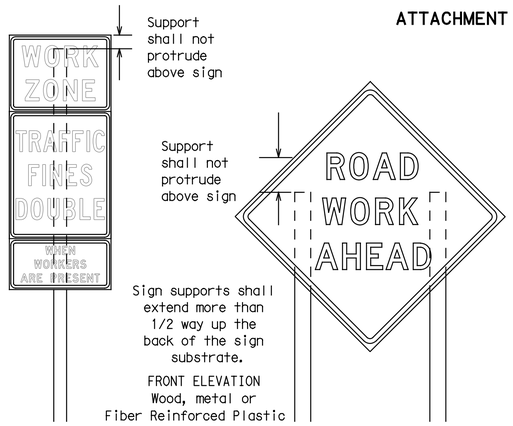
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



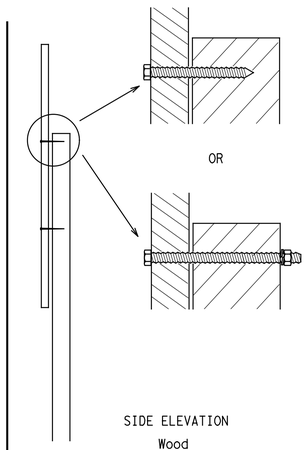
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic



SIDE ELEVATION
Wood

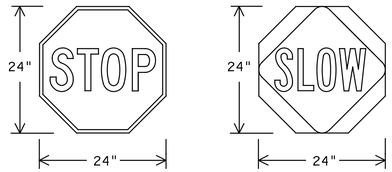
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6′ to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets.The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height,the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

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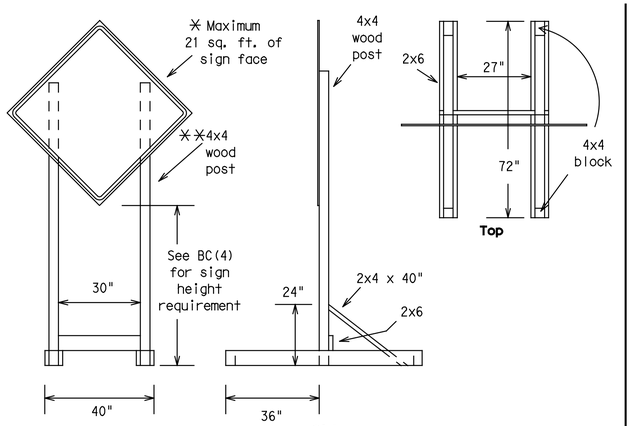
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

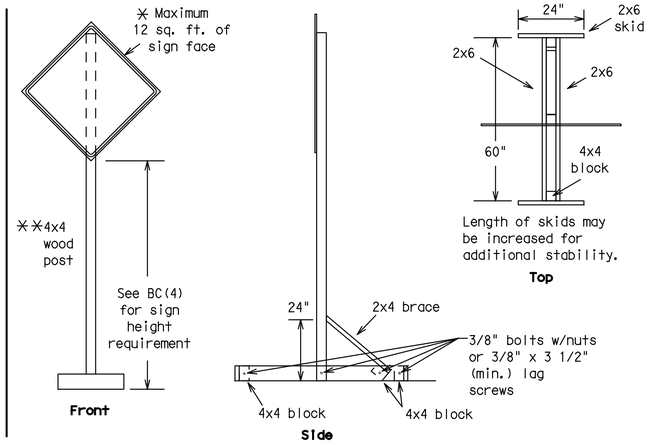
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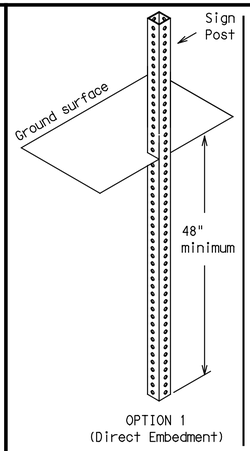
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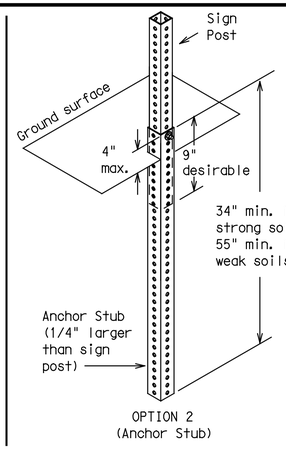


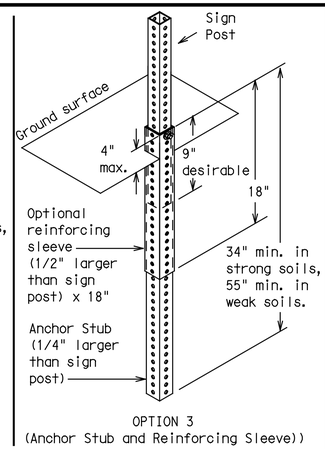


SKID MOUNTED WOOD SIGN SUPPORTS

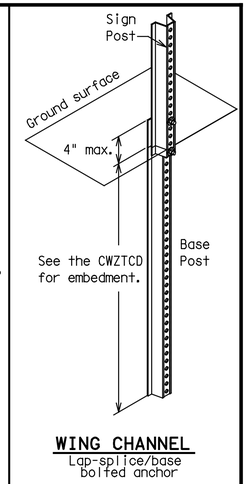
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







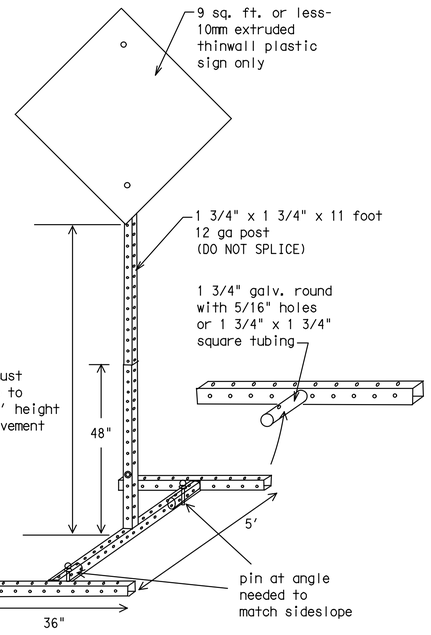
PERFORATED SQUARE METAL TUBING

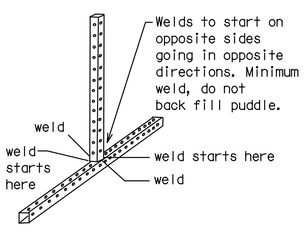


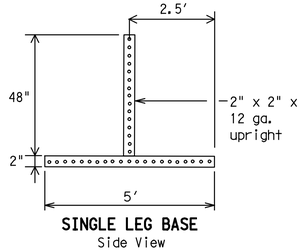
WING CHANNEL
Lap-splice/base bolted anchor

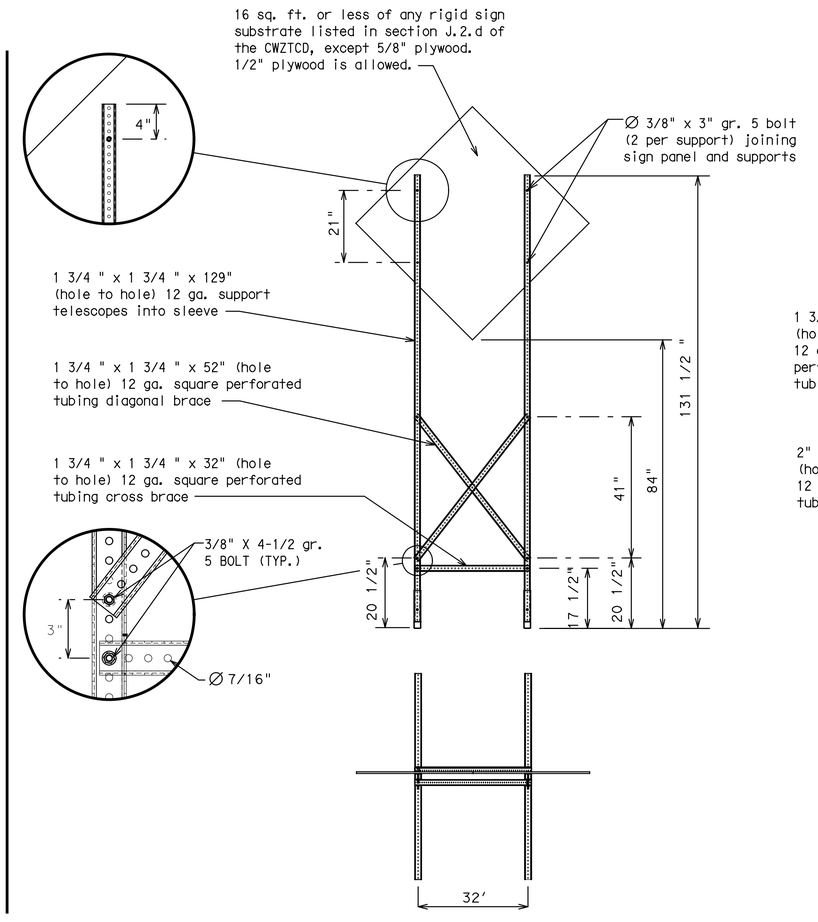
GROUND MOUNTED SIGN SUPPORTS

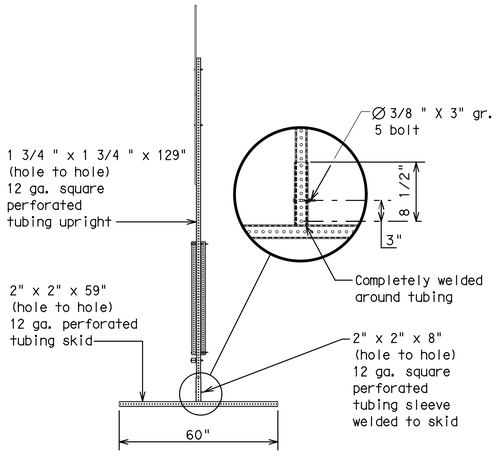
Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.











SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

□ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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7-13 5-21				81

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT ✳

✳ LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE ✳

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

✳✳ Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

✳✳ See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

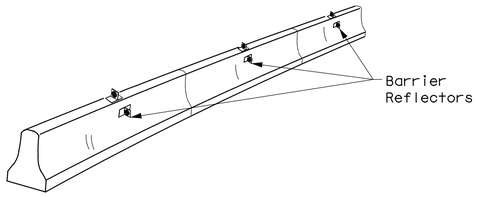
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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
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7-13 5-21				82

100

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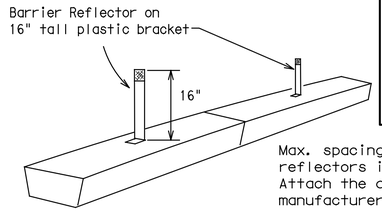
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1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



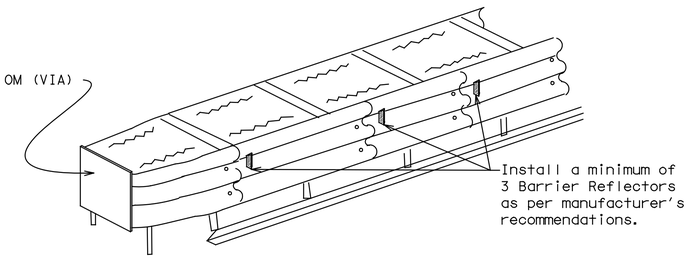
CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

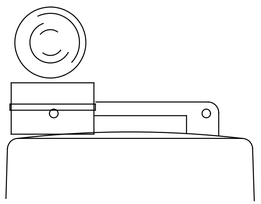
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

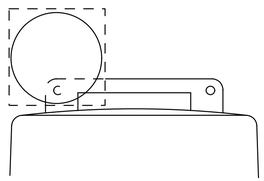
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

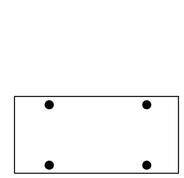
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

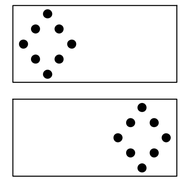
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:

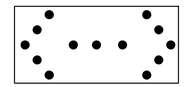


4 CORNER CAUTION

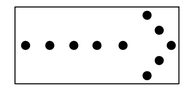
OR



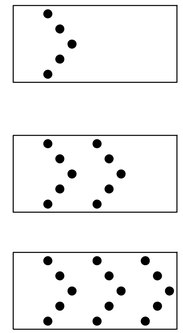
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



RIGHT/LEFT ARROW
(right arrow shown; left is similar)



RIGHT/LEFT SEQUENTIAL CHEVRON
(right chevron shown; left is similar)

5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-21

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101

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

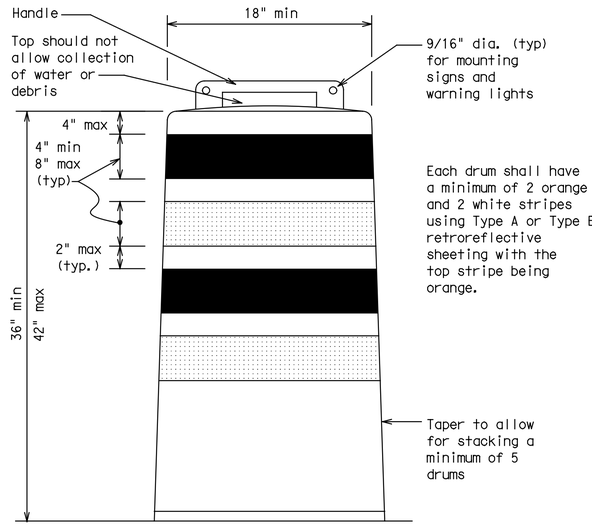
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

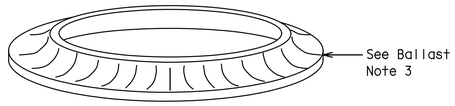
RETROREFLECTIVE SHEETING

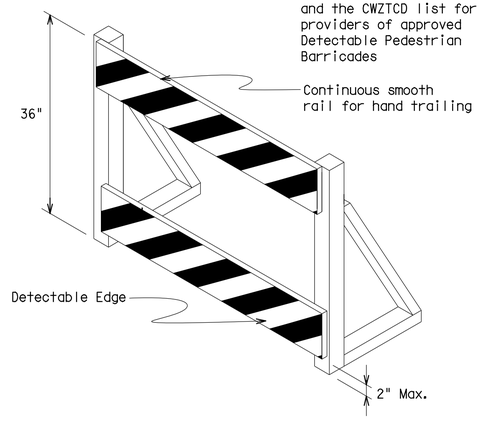
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

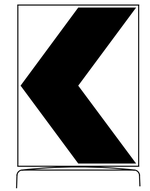




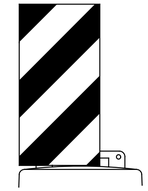


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

.

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

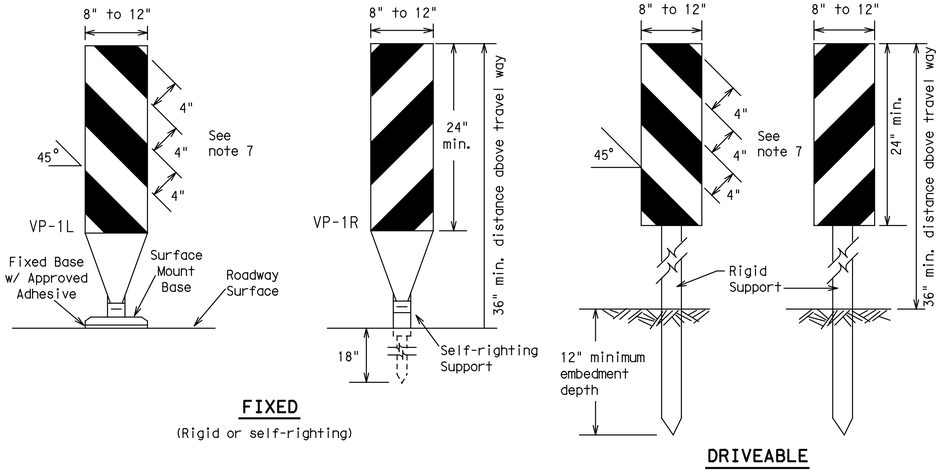
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7-13				

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FIXED
(Rigid or self-righting)

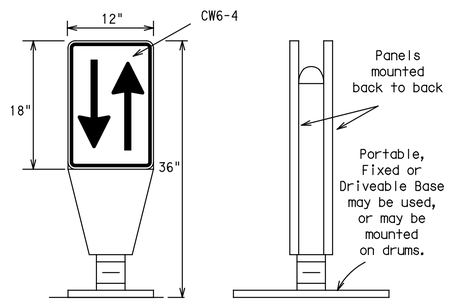
DRIVEABLE

(Rigid or self-righting)

PORTABLE

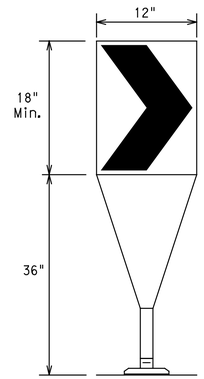
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ✻✻			Suggested Maximum Spacing of Channelizing Devices	
		10′ Offset	11′ Offset	12′ Offset	On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′
35		205′	225′	245′	35′	70′
40		265′	295′	320′	40′	80′
45	L = WS	450′	495′	540′	45′	90′
50		500′	550′	600′	50′	100′
55		550′	605′	660′	55′	110′
60		600′	660′	720′	60′	120′
65		650′	715′	780′	65′	130′
70		700′	770′	840′	70′	140′
75		750′	825′	900′	75′	150′
80		800′	880′	960′	80′	160′

✻✻Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

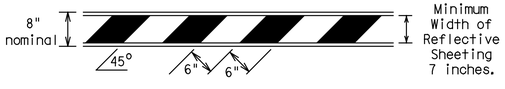
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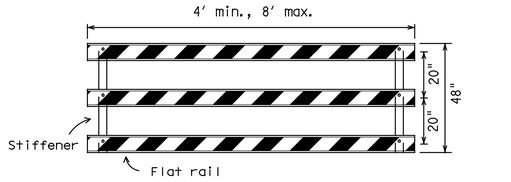
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



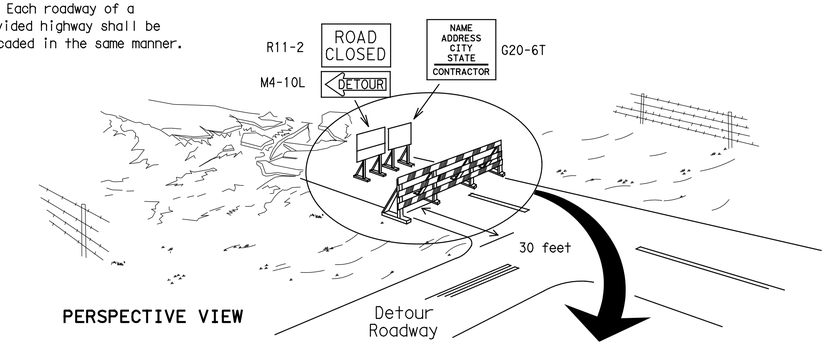
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

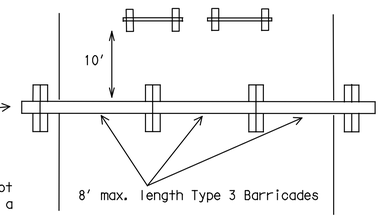
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

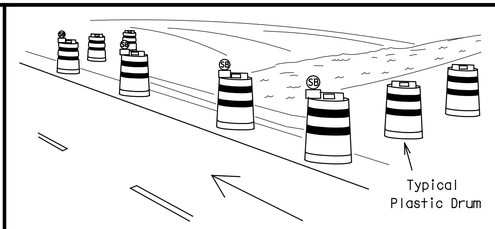
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

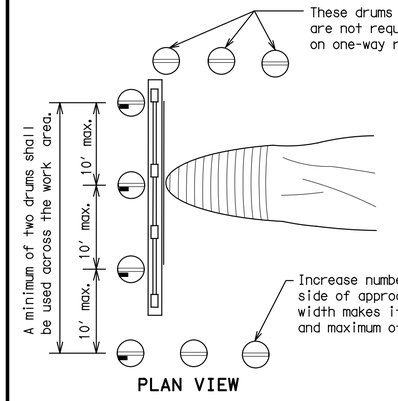
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

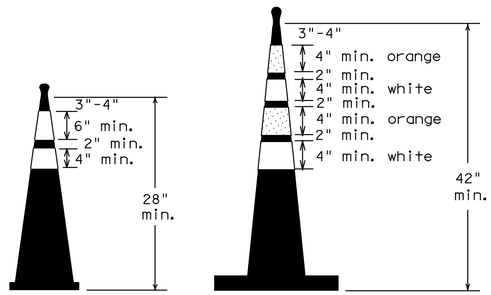
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



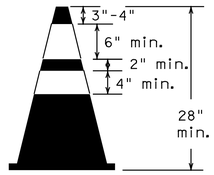
PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

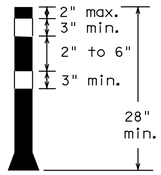
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

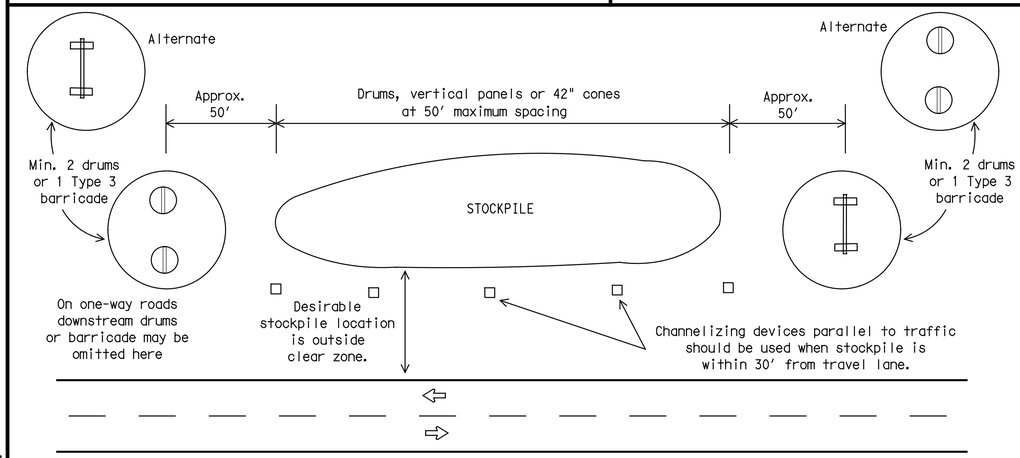


Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

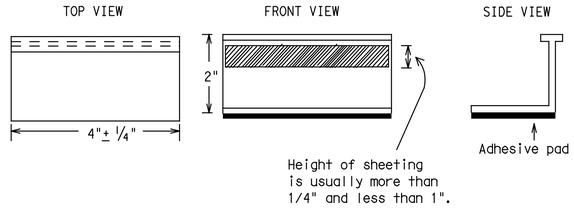
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

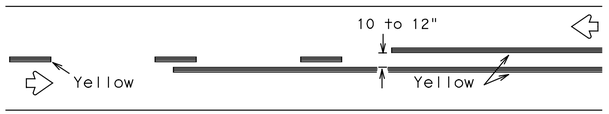
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-98 9-07 5-21				
1-02 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14				87

105

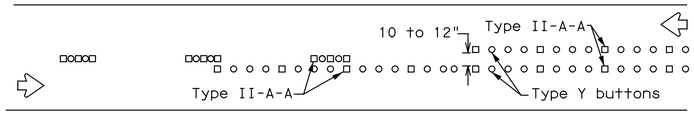
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DATE:
FILE:

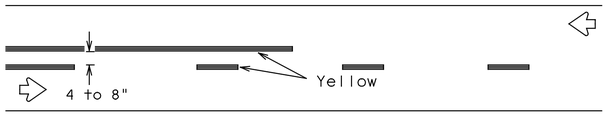
PAVEMENT MARKING PATTERNS



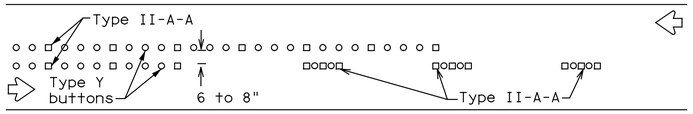
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



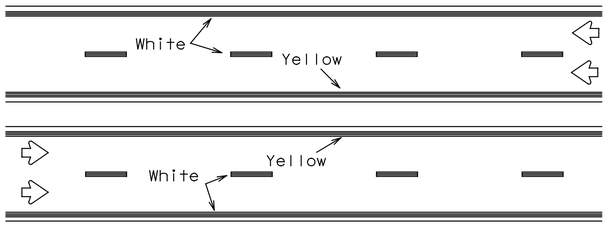
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



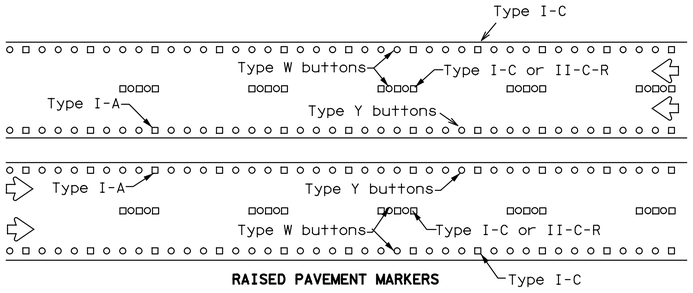
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



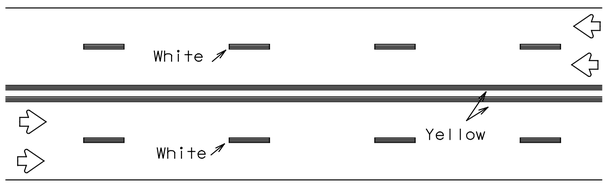
REFLECTORIZED PAVEMENT MARKINGS



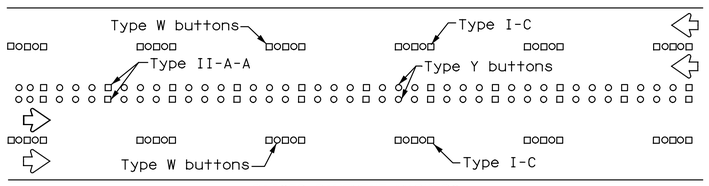
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



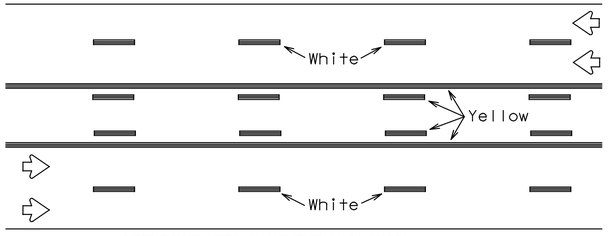
REFLECTORIZED PAVEMENT MARKINGS



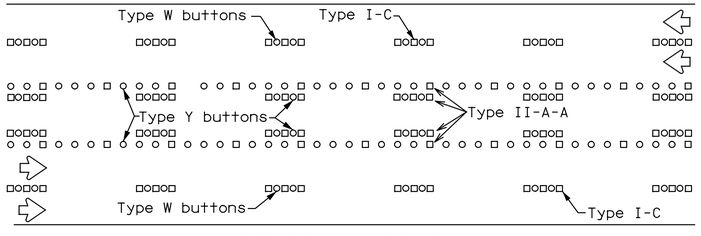
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

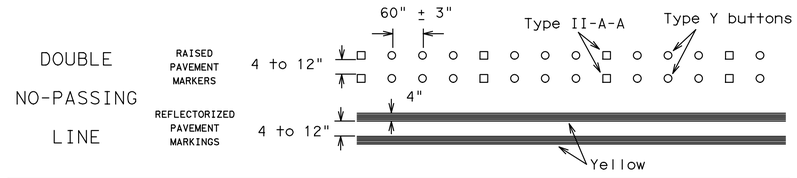
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

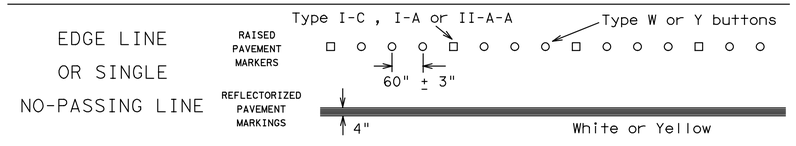
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

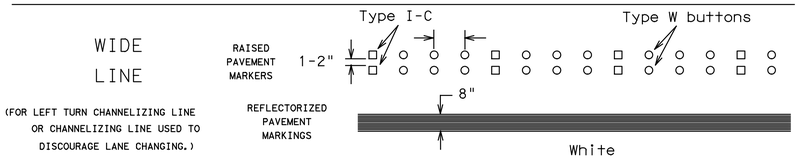


EDGE LINE OR SINGLE NO-PASSING LINE



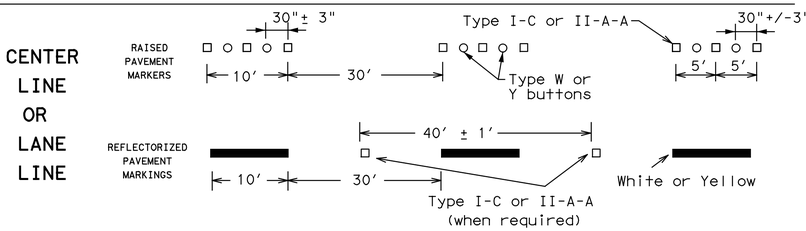
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

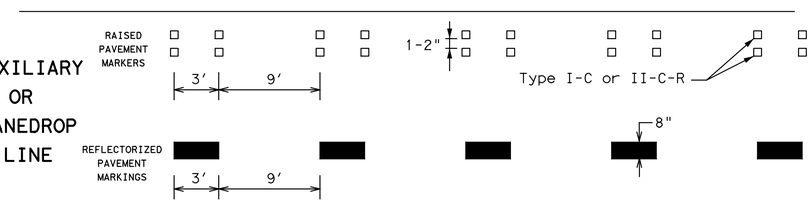


BROKEN LINES

CENTER LINE OR LANE LINE

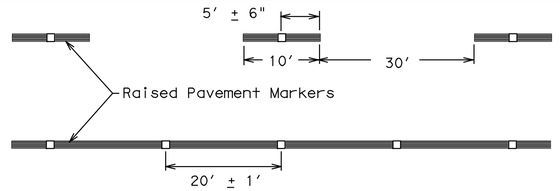


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

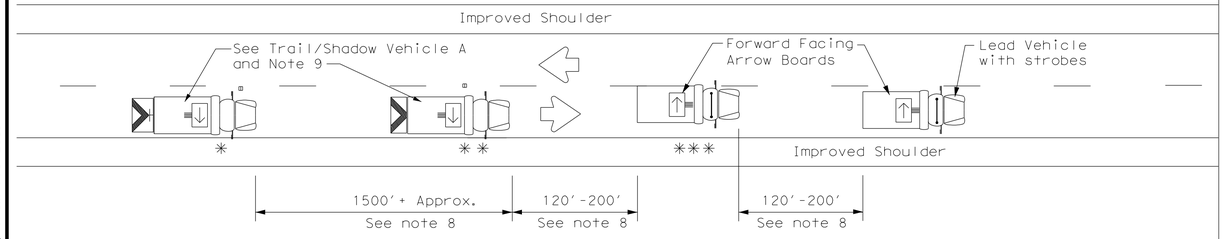
BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	DIST	COUNTY		SHEET NO. 88

106

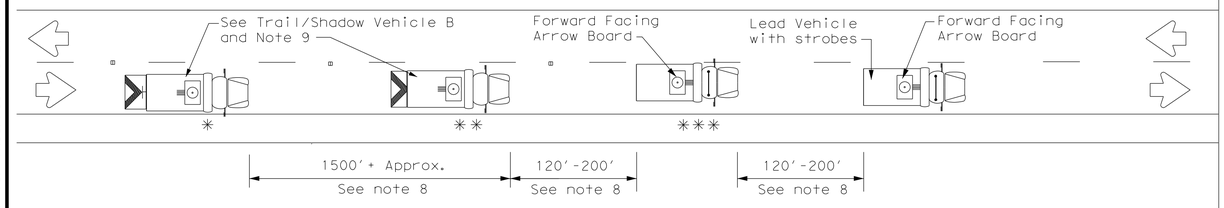
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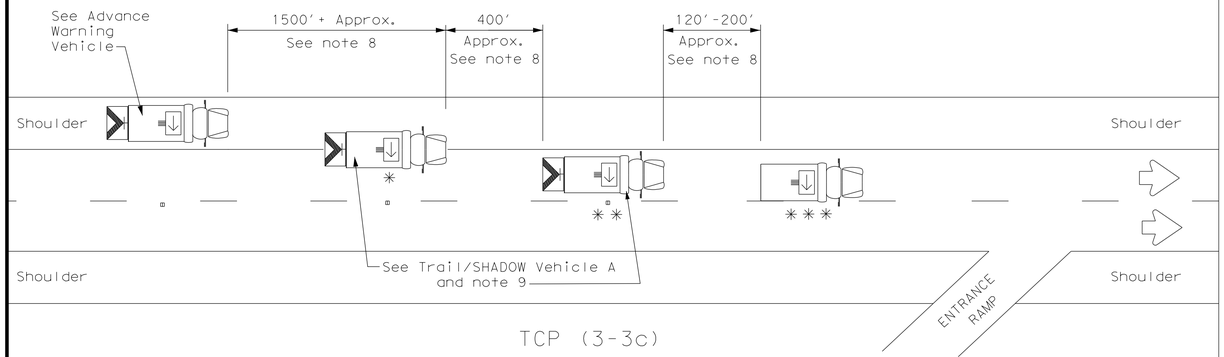
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



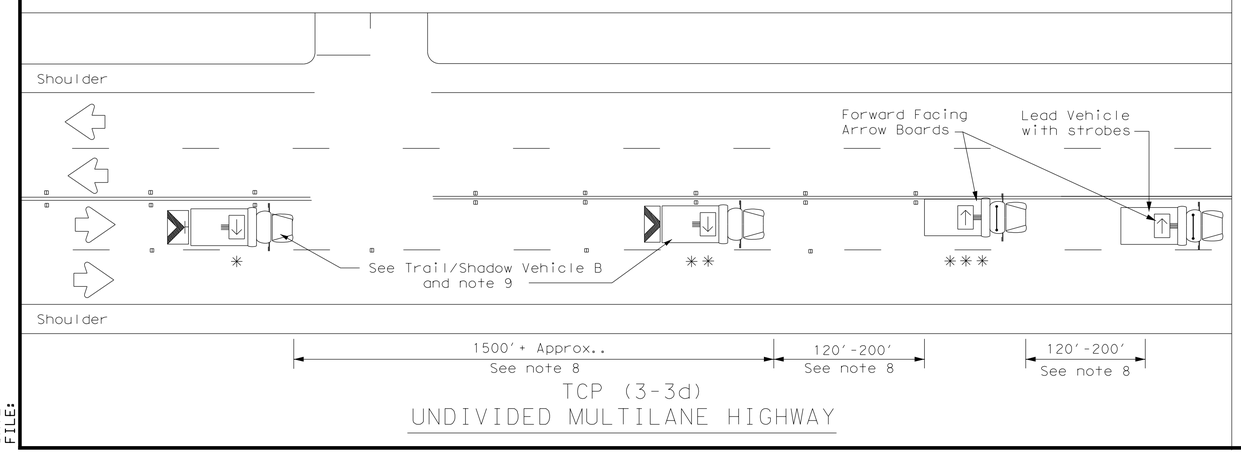
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



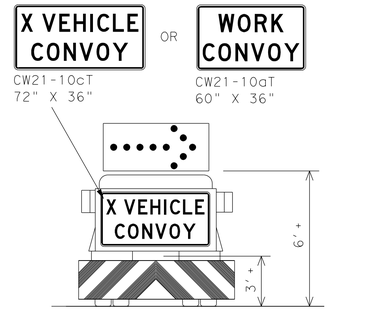
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



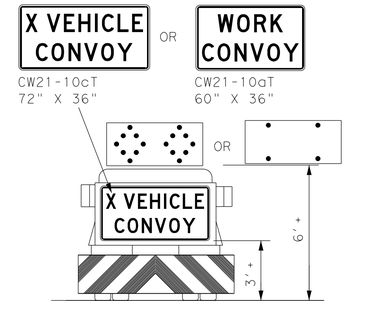
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



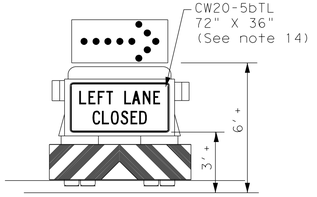
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

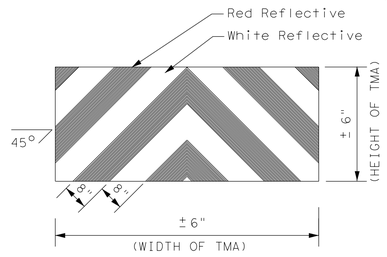


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
* *	Shadow Vehicle		
* * *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

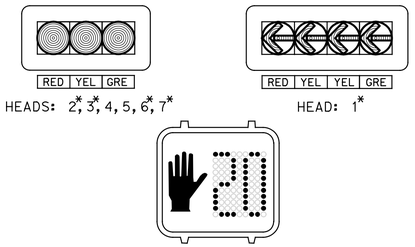
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL TCP(3-3)-14

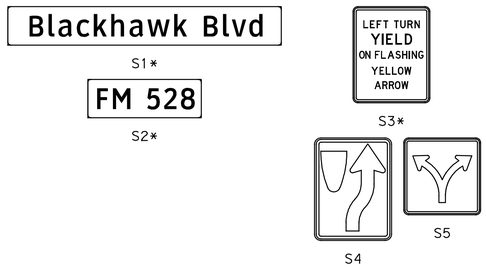
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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13				89
1-97 7-14				

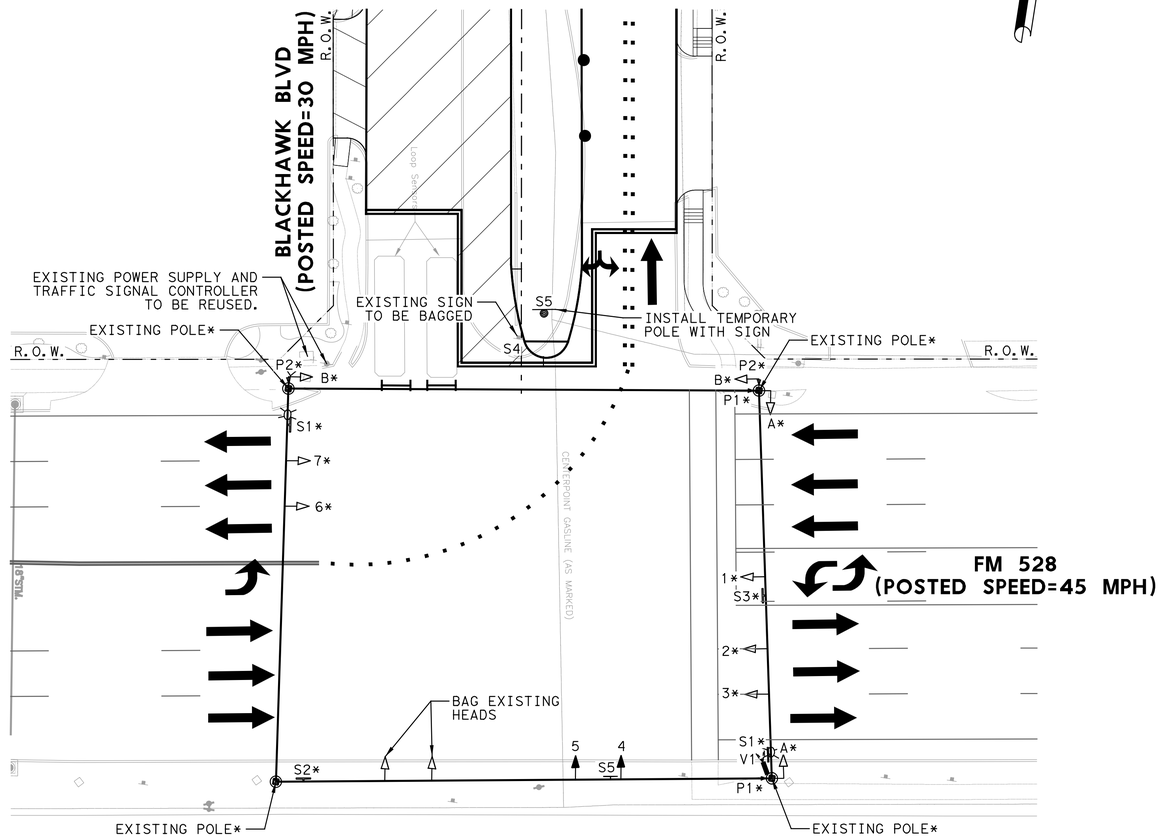
SIGNAL HEAD LEGEND



* EXISTING SIGNAL EQUIPMENT TO BE REUSED OR MAINTAINED.

SIGN LEGEND





LEGEND

- EXIST. SIGNAL POLE
- EXIST. SPAN WIRE
- EXIST. SIGNAL HEAD
- EXIST. PED HEAD
- EXIST. PUSH BUTTON
- EXIST. SIGN ON SPAN WIRE
- TEMP. SIGNAL HEAD
- TEMP. CAMERA
- TEMP. GROUND MOUNTED SIGN
- EXIST. GROUND BOX
- EXIST. GROUND MOUNTED SIGN
- EXIST. UTILITY POLE
- EXIST. LIGHT POLE
- EXIST. FIRE HYDRANT
- EXIST. WATER VALVE
- OE — EXIST. OVERHEAD ELECTRIC
- E — EXIST. ELECTRIC LINE
- G — EXIST. GAS LINE
- W — EXIST. WATER LINE
- SS — EXIST. STORM SEWER LINE
- RIGHT OF WAY
- TYPE III BARRICADE
- WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE

NOTES:

1. KEEP EXISTING SIGNAL POLES IN PLACE THROUGHOUT ALL PHASES OF TEMPORARY TRAFFIC CONTROL. WHERE POSSIBLE, REUSE EXISTING TRAFFIC SIGNAL CONTROLLER, POWER SOURCE, SIGNAL HEADS, SIGNS, AND PREEMPTION DEVICES FOR TEMPORARY SIGNALS.
2. PRETIME PEDESTRIAN CROSSING TO FACILITATE PEDESTRIAN SAFETY THROUGH THE CONSTRUCTION AREAS.
3. COIL CABLE TO ALLOW FOR HEAD SHIFT DURING ALL PHASES OF CONSTRUCTION.
4. INSTALL TEMPORARY SIGNAL HEADS 4 AND 5.
5. INSTALL TEMPORARY VIDEO CAMERA V1.
6. BAG EXISTING SIGNAL HEADS AND SIGNS CALLED OUT HEREIN.
7. INSTALL TEMPORARY SIGN S5.
8. REFER TO TCP PHASE 1 FOR STRIPING DETAILS.

Texas Registered Engineering Firm F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS — THIRUMAL REDDY EDULAKANTI — 121179 — LICENSED PROFESSIONAL ENGINEER — 2026.02.02 09:36:48 -06'00'

SHEET NAME

Traffic Control Plan Phase 1 Temporary Signal Layout

SHEET 1 OF 1

SCALE: 1" = 20'

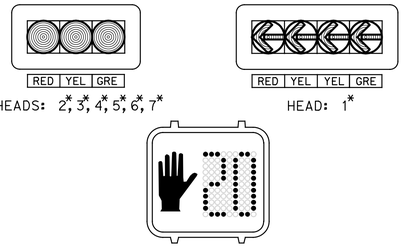
SHEET NUMBER

SHEET 90 OF 111

FILE NAME

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C_TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:25 PM SCALE: 1:40
90_BLKHWK_PKG2C_TCP-TSGNL-PHI.dgn

SIGNAL HEAD LEGEND



HEADS: 2*, 3*, 4*, 5*, 6*, 7*

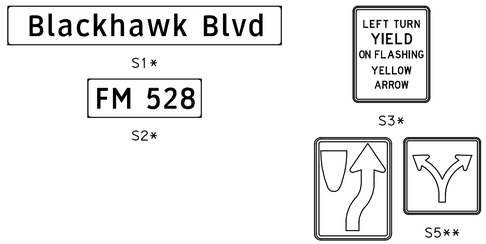
HEAD: 1*

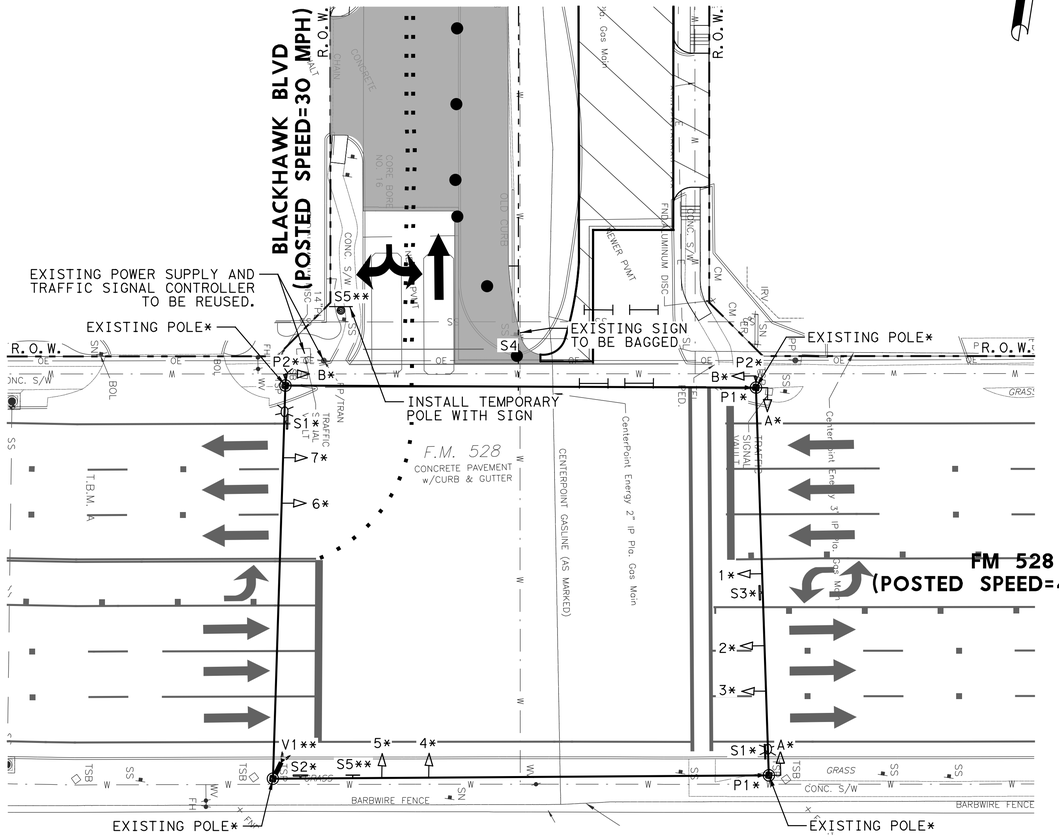
HEADS: A*, B*

* EXISTING SIGNAL EQUIPMENT TO BE REUSED OR MAINTAINED.

** SIGNAL EQUIPMENT TO BE REUSED FROM PREVIOUS TCP PHASE. PLEASE RELOCATE AS SHOWN ON THIS PLAN SHEET.

SIGN LEGEND





LEGEND

- EXIST. SIGNAL POLE
- EXIST. SPAN WIRE
- EXIST. SIGNAL HEAD
- EXIST. PED HEAD
- EXIST. PUSH BUTTON
- EXIST. SIGN ON SPAN WIRE
- TEMP. SIGNAL HEAD
- TEMP. CAMERA
- TEMP. GROUND MOUNTED SIGN
- EXIST. GROUND BOX
- EXIST. GROUND MOUNTED SIGN
- EXIST. UTILITY POLE
- EXIST. LIGHT POLE
- EXIST. FIRE HYDRANT
- EXIST. WATER VALVE
- EXIST. OVERHEAD ELECTRIC
- EXIST. ELECTRIC LINE
- EXIST. GAS LINE
- EXIST. WATER LINE
- EXIST. STORM SEWER LINE
- RIGHT OF WAY
- TYPE III BARRICADE
- WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE

NOTES:

1. KEEP EXISTING SIGNAL POLES IN PLACE THROUGHOUT ALL PHASES OF TEMPORARY TRAFFIC CONTROL. WHERE POSSIBLE, REUSE EXISTING TRAFFIC SIGNAL CONTROLLER, POWER SOURCE, SIGNAL HEADS, SIGNS, AND PREEMPTION DEVICES FOR TEMPORARY SIGNALS.
2. PRETIME PEDESTRIAN CROSSING TO FACILITATE PEDESTRIAN SAFETY THROUGH THE CONSTRUCTION AREAS.
3. COIL CABLE TO ALLOW FOR HEAD SHIFT DURING ALL PHASES OF CONSTRUCTION.
4. REMOVE TEMPORARY SIGNAL HEADS 4 AND 5.
5. INSTALL TEMPORARY VIDEO CAMERA V1.
6. BAG EXISTING SIGNAL HEADS AND SIGNS CALLED OUT HEREIN.
7. INSTALL TEMP SIGN S5.
8. REFER TO TCP PHASE 10 FOR STRIPING DETAILS.

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Texas Registered Engineering Firm F-754

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4828 Loop Central Drive, Suite 700
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P 713.622.9264 F 713.622.9265
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
THIRUMAL REDDY EDULAKANTI
121179
LICENSED PROFESSIONAL ENGINEER
09/26/2025

SHEET NAME

Traffic Control Plan Phase 2
Temporary Signal Layout

SHEET 1 OF 1

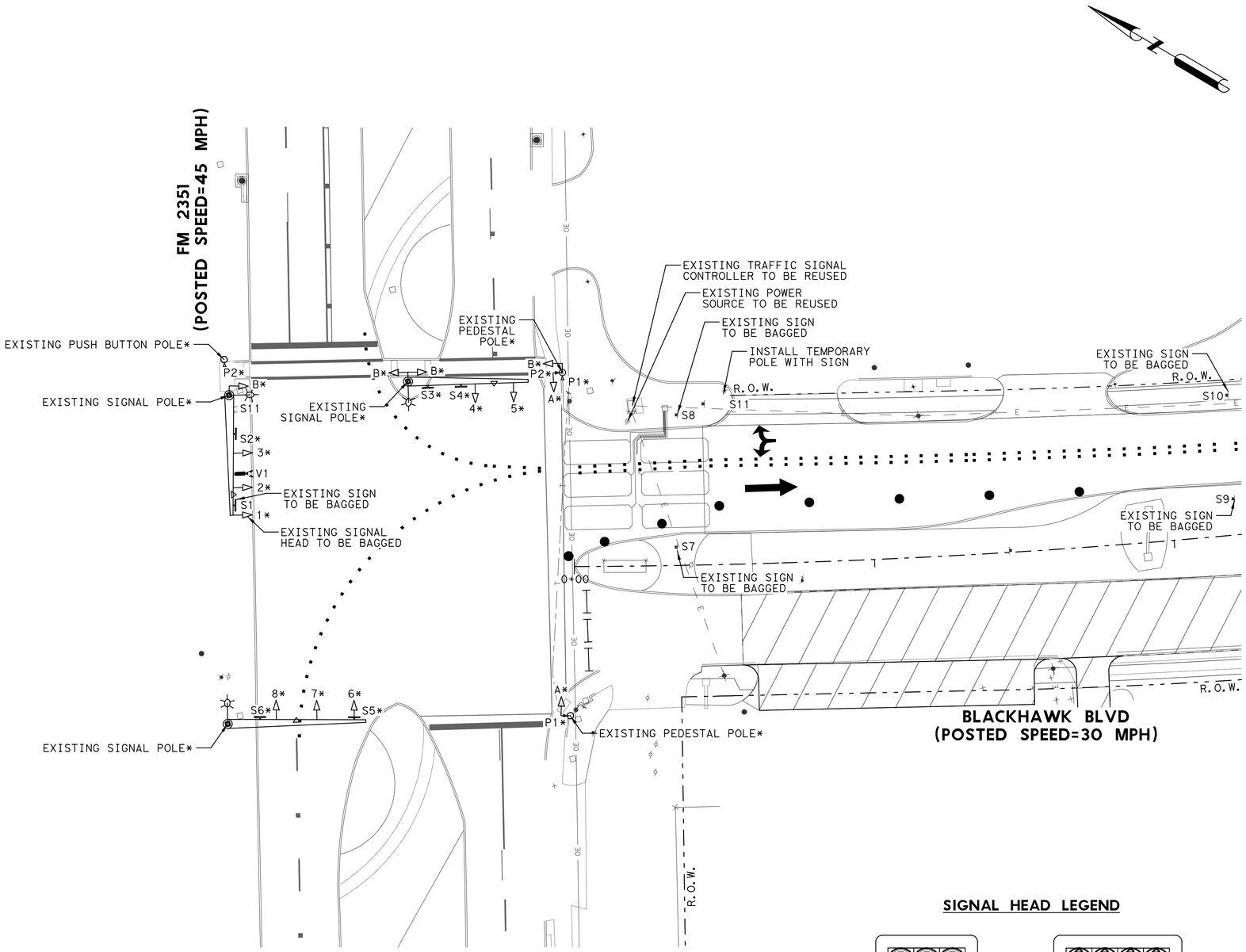
SCALE: 1" = 20'

SHEET NUMBER

SHEET 91 OF 111

FILE NAME

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C_TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:35 PM SCALE: 1:40
91 BLKHWK_PKG2C_TCP-TSGNL-PH2.dgn



LEGEND

- EXIST. SIGNAL POLE AND MAST ARM
- EXIST. PUSH BUTTON POLE
- EXIST. SIGNAL HEAD
- EXIST. PED HEAD
- EXIST. PUSH BUTTON
- EXIST. SIGN ON MAST ARM
- EXIST. PREEMPTION
- TEMP. SIGNAL HEAD
- TEMP. CAMERA
- TEMP. GROUND MOUNTED SIGN
- EXIST. GROUND BOX
- EXIST. GROUND MOUNTED SIGN
- EXIST. MANHOLE
- EXIST. UTILITY POLE
- EXIST. LIGHT POLE
- EXIST. FIRE HYDRANT
- EXIST. WATER VALVE
- OE — EXIST. OVERHEAD ELECTRIC
- E — EXIST. ELECTRIC LINE
- G — EXIST. GAS LINE
- T — EXIST. TELEPHONE LINE
- W — EXIST. WATER LINE
- SS — EXIST. STORM SEWER LINE
- RIGHT OF WAY
- TYPE III BARRICADE
- WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE

NOTES:

1. KEEP EXISTING SIGNAL POLES IN PLACE THROUGHOUT ALL PHASES OF TEMPORARY TRAFFIC CONTROL. WHERE POSSIBLE, REUSE EXISTING TRAFFIC SIGNAL CONTROLLER, POWER SOURCE, SIGNAL HEADS, SIGNS, AND PREEMPTION DEVICES FOR TEMPORARY SIGNALS.
2. PRETIME PEDESTRIAN CROSSING TO FACILITATE PEDESTRIAN SAFETY THROUGH THE CONSTRUCTION AREAS.
3. COIL CABLE TO ALLOW FOR HEAD SHIFT DURING ALL PHASES OF CONSTRUCTION.
4. INSTALL TEMPORARY VIDEO CAMERA V1.
5. BAG EXISTING SIGNAL HEADS AND SIGNS CALLED OUT HEREIN.
6. INSTALL TEMPORARY SIGN S11.
7. REFER TO TCP PHASE 5 FOR STRIPING DETAILS.

SIGNAL HEAD LEGEND

RED | YEL | GRE

HEADS: 1*, 2*, 3*, 4*, 5*, 7*, 8*

RED | YEL | GRE

HEAD: 6*

LED COUNTDOWN PED SIGNAL

HEADS: A*, B*

SIGN LEGEND

S1 — ONLY | ONLY

S4

S11

S2* — FM 2351

S5 — LEFT TURN SIGNAL

S3, S6 — Blackhawk Blvd

S7, S8, S9, S10 — ONLY | ONLY | ONLY

* EXISTING SIGNAL EQUIPMENT TO BE REUSED OR MAINTAINED.

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Engineering Firm F-754

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Houston, Texas 77081
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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
THIRUMAL REDDY EDULAKANTI
121179
LICENSED
PROFESSIONAL ENGINEER
2025.09.24 10:45:15 -05'00'

SHEET NAME

Traffic Control Plan Phase 5
Temporary Signal Layout

SHEET 1 OF 1

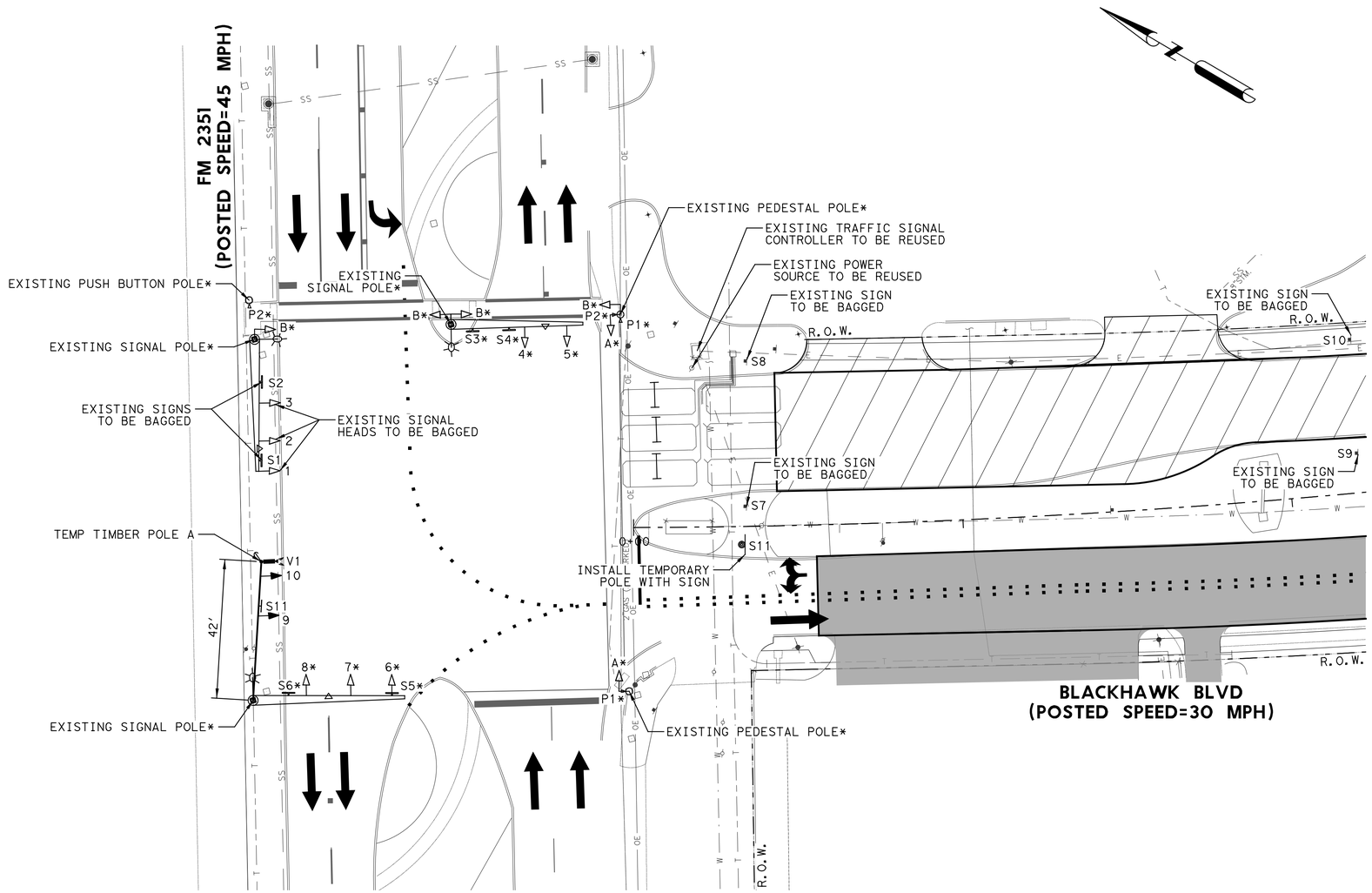
SCALE: 0 10 20 30 40
SCALE: 1" = 20'

SHEET NUMBER

SHEET 92 OF 111

FILE NAME

92 BLKHWK_PKG2C_TCP-TSGNL-PH5.dgn
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: BLKHWK2C TRAFF.tbl
USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:38 PM SCALE: 1:40



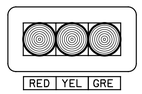
LEGEND

- EXIST. SIGNAL POLE AND MAST ARM
- EXIST. PUSH BUTTON POLE
- EXIST. SIGNAL HEAD
- EXIST. PED HEAD
- EXIST. PUSH BUTTON
- EXIST. SIGN ON MAST ARM
- EXIST. PREEMPTION
- TEMP. SIGNAL HEAD
- TEMP. CAMERA
- TEMP. SIGN ON SPAN WIRE
- TEMP. TIMBER POLE
- TEMP. SPAN WIRE
- TEMP. GUY WIRE
- TEMP GROUND MOUNTED SIGN
- EXIST. GROUND BOX
- EXIST. GROUND MOUNTED SIGN
- EXIST. MANHOLE
- EXIST. UTILITY POLE
- EXIST. LIGHT POLE
- EXIST. FIRE HYDRANT
- EXIST. WATER VALVE
- OE — EXIST. OVERHEAD ELECTRIC
- E — EXIST. ELECTRIC LINE
- G — EXIST. GAS LINE
- T — EXIST. TELEPHONE LINE
- W — EXIST. WATER LINE
- SS — EXIST. STORM SEWER LINE
- RIGHT OF WAY
- TYPE III BARRICADE
- WORK ZONE
- CONSTRUCTED IN PREVIOUS PHASE

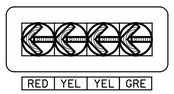
NOTES:

1. KEEP EXISTING SIGNAL POLES IN PLACE THROUGHOUT ALL PHASES OF TEMPORARY TRAFFIC CONTROL. WHERE POSSIBLE, REUSE EXISTING TRAFFIC SIGNAL CONTROLLER, POWER SOURCE, SIGNAL HEADS, SIGNS, AND PREEMPTION DEVICES FOR TEMPORARY SIGNALS.
2. PRETIME PEDESTRIAN CROSSING TO FACILITATE PEDESTRIAN SAFETY THROUGH THE CONSTRUCTION AREAS.
3. COIL CABLE TO ALLOW FOR HEAD SHIFT DURING ALL PHASES OF CONSTRUCTION.
4. INSTALL TEMPORARY TIMBER POLE AND SPAN WIRE.
5. INSTALL TEMPORARY VIDEO CAMERA V1.
6. INSTALL TEMPORARY SIGNAL HEADS 9 AND 10.
7. INSTALL TEMPORARY SIGNS S2 AND S11.
8. BAG EXISTING SIGNAL HEADS AND SIGNS CALLED OUT HEREIN.
9. REFER TO TCP PHASE 6 FOR STRIPING DETAILS.

SIGNAL HEAD LEGEND



HEADS: 1*, 2*, 3*, 4*, 5*, 7*, 8*, 9, 10



HEAD: 6*



LED COUNTDOWN PED SIGNAL

HEADS: A*, B*

* EXISTING SIGNAL EQUIPMENT TO BE REUSED OR MAINTAINED.

SIGN LEGEND



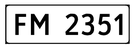
S1



S4



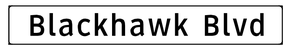
S11



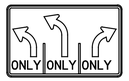
S2



S5



S3, S6



S7, S8, S9, S10

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	



SHEET NAME

Traffic Control Plan Phase 6
Temporary Signal Layout

SHEET 1 OF 1

SCALE 0 10 20 30 40
SCALE: 1" = 20'

SHEET NUMBER

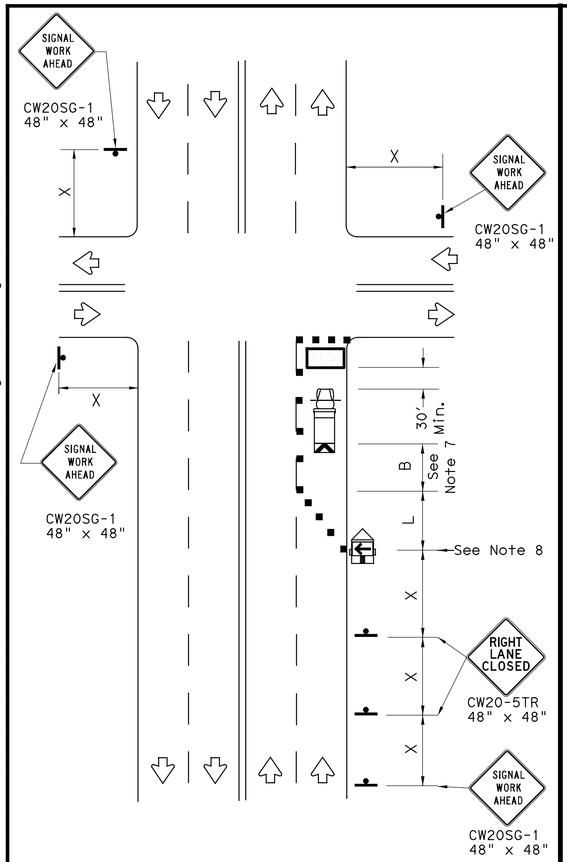
SHEET 93 OF 111

FILE NAME

93 BLKHWK_PKG2C_TCP-TSGNL-PH6.dgn
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USER: RUGONZALEZ DATE: 9/24/2025 TIME: 2:54:41 PM SCALE: 1:40

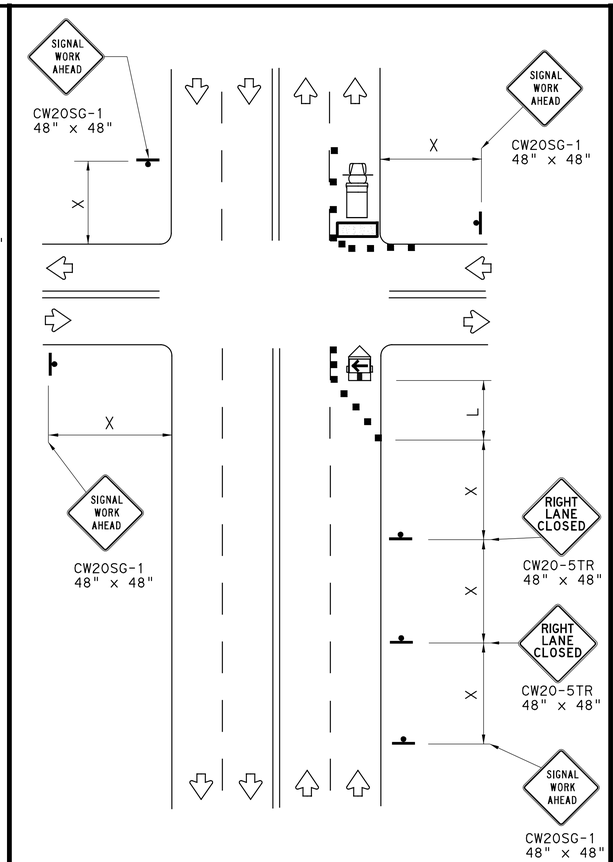
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DATE:
FILE:



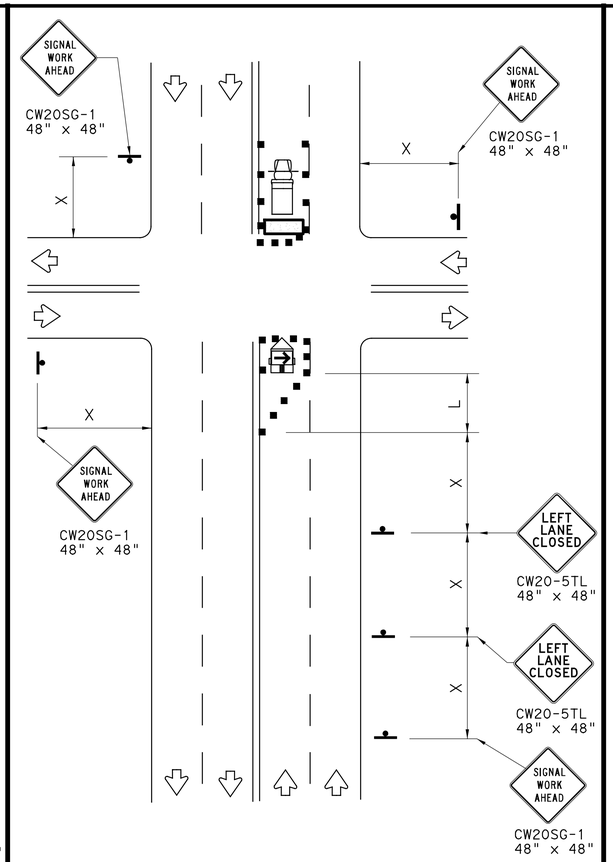
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

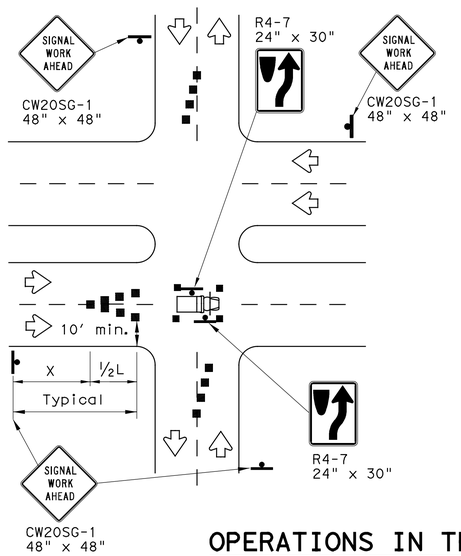
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

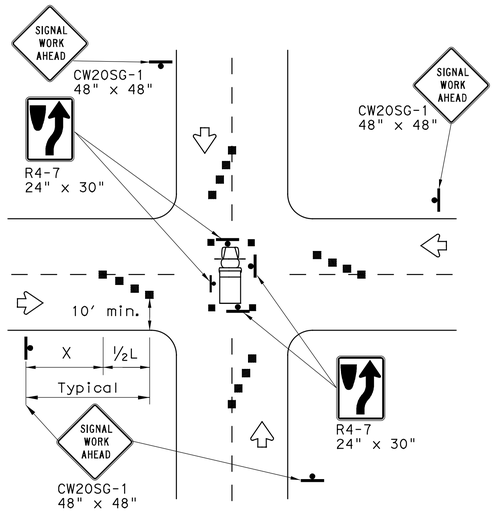
Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′	120′	90′
35		205′	225′	245′	35′	70′	160′	120′
40		265′	295′	320′	40′	80′	240′	155′
45	L=WS	450′	495′	540′	45′	90′	320′	195′
50		500′	550′	600′	50′	100′	400′	240′
55		550′	605′	660′	55′	110′	500′	295′
60		600′	660′	720′	60′	120′	600′	350′
65		650′	715′	780′	65′	130′	700′	410′
70		700′	770′	840′	70′	140′	800′	475′
75		750′	825′	900′	75′	150′	900′	540′

✳ Conventional Roads Only

✳✳ Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation

Traffic Operations Division Standard

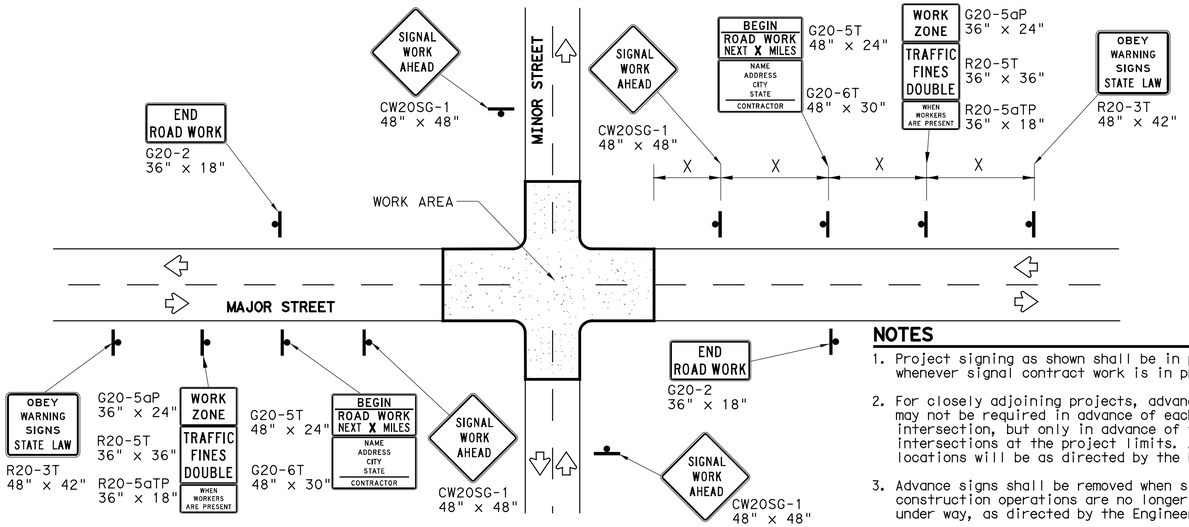
TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03				94

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DATE:
FILE:



TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

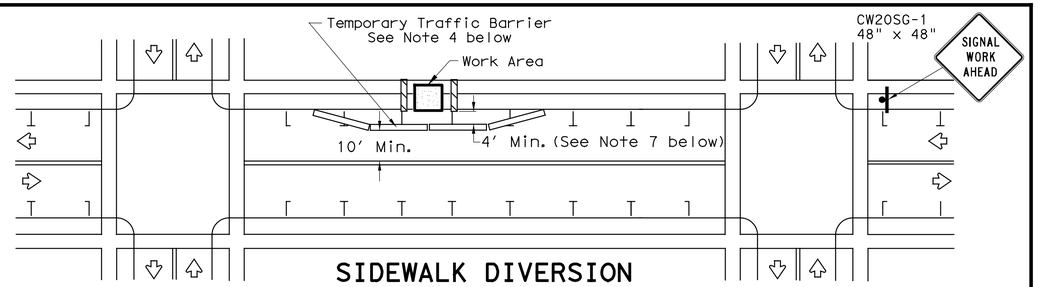
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber, such as tire inner tubes, shall not be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fastners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

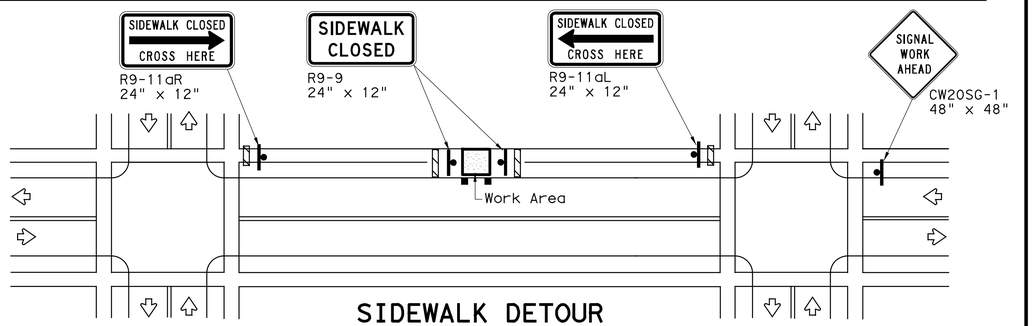
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

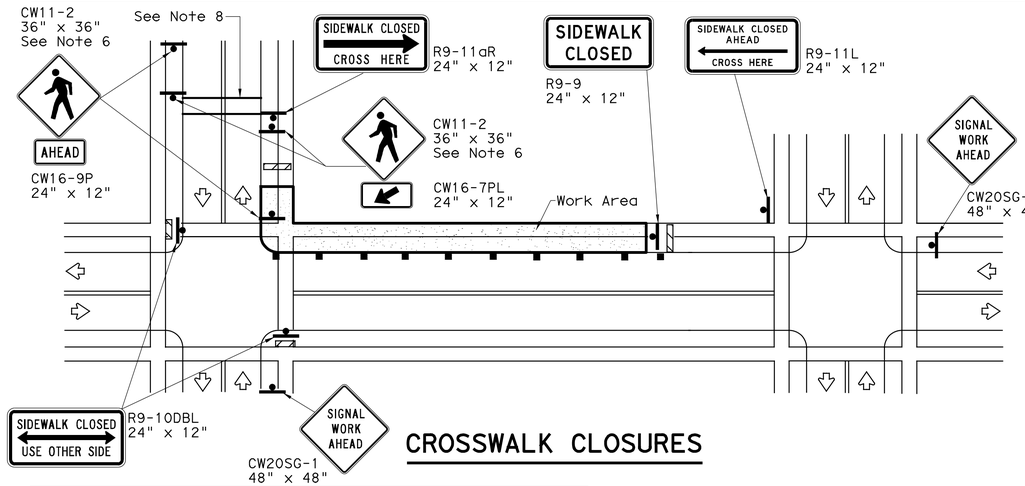
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

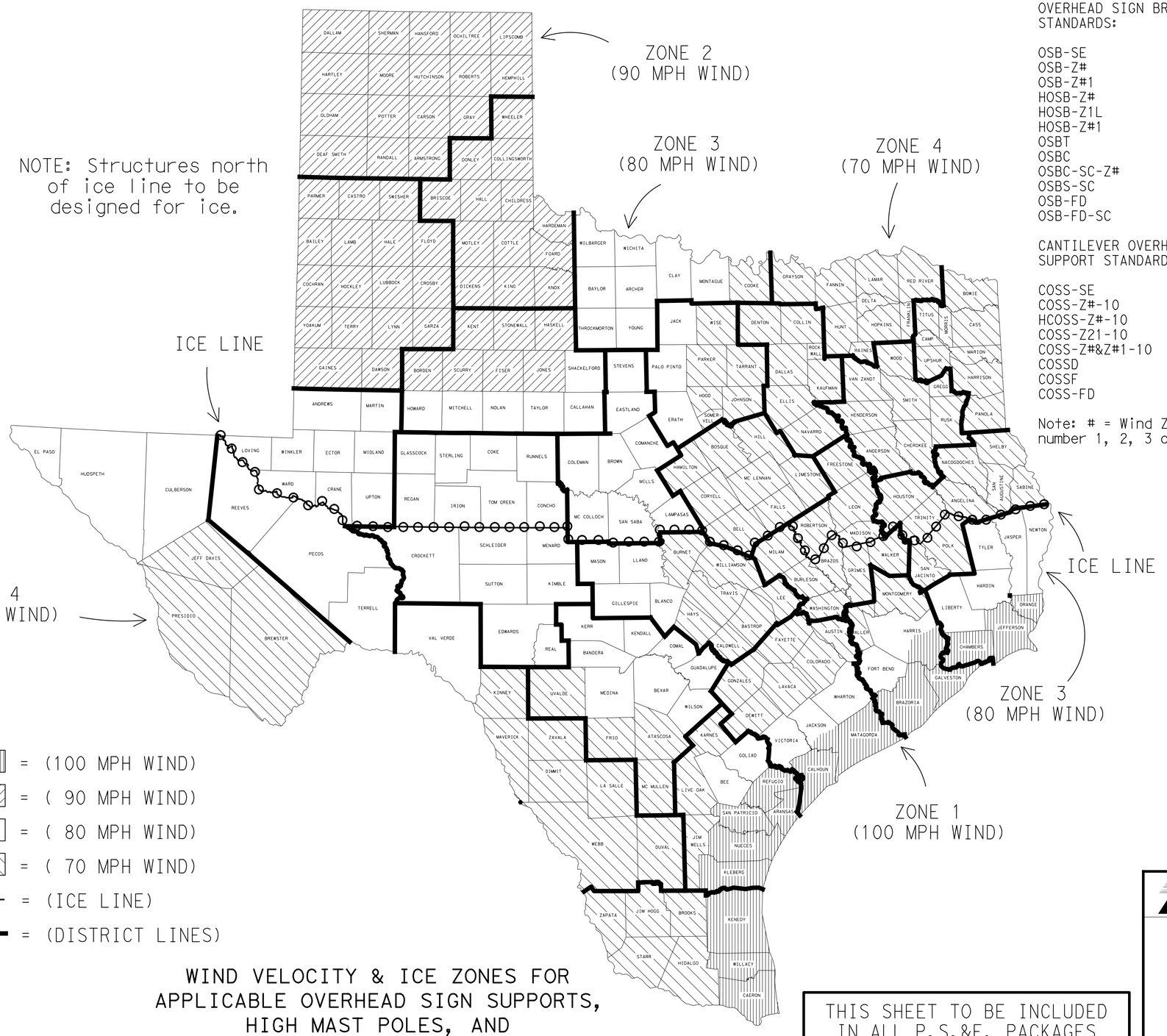
TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03				95

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LEGEND

ZONE 1 - = (100 MPH WIND)
ZONE 2 - = (90 MPH WIND)
ZONE 3 - = (80 MPH WIND)
ZONE 4 - = (70 MPH WIND)
= (ICE LINE)
= (DISTRICT LINES)

APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

OSB-SE
OSB-Z#
OSB-Z#1
HOSB-Z#
HOSB-Z1L
HOSB-Z#1
OSBT
OSBC
OSBC-SC-Z#
OSBS-SC
OSB-FD
OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

COSS-SE
COSS-Z#-10
HCOSS-Z#-10
COSS-Z21-10
COSS-Z#&Z#1-10
COSSD
COSSF
COSS-FD

Note: # = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

HMIP-98
HMIF-98

WALKWAYS AND BRACKETS STANDARDS:

SWW
SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

SP-80
SP-100
SMA-80
SMA-100
DMA-80
DMA-100
MA-C
MAC(ILSN)
MAD-D
TS-FD
LUM-A
CFA
LMA
TS-C
MA-DPD

FOR HARRIS CO. ONLY
Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY
Zone line is just North of SH 616.

WIND VELOCITY & ICE ZONES FOR APPLICABLE OVERHEAD SIGN SUPPORTS, HIGH MAST POLES, AND TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of Fastest Mile Wind Velocity at 33 feet height.

THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES

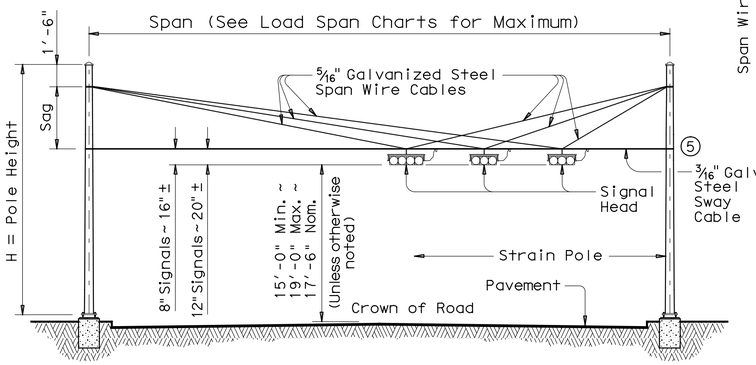
WV & IZ-14

FILE: windice.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS				
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	DIST	COUNTY		SHEET NO.
				96

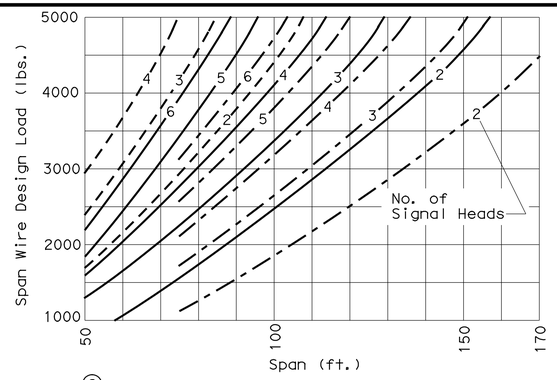
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STRAIN POLE DESCRIPTION	Pole Type	Foundation Type	Maximum Permissible Span Wire Load (lbs.)
26′ Pole	A	36-A	4900
30′ Pole	B	36-A	4300
30′ Pole with Lum.	B	36-A	4000
30′ Pole with 20′ Mast Arm	C	36-B	4400
30′ Pole with 24′ Mast Arm	C	36-B	4000
30′ Pole with 28′ Mast Arm	C	36-B	3600
30′ Pole with 32′ Mast Arm	C	36-B	3300
30′ Pole with 36′ Mast Arm	C	36-B	2900
30′ Pole with 20′ Mast Arm & Lum.	C	36-B	4100
30′ Pole with 24′ Mast Arm & Lum.	C	36-B	3800
30′ Pole with 28′ Mast Arm & Lum.	C	36-B	3400
30′ Pole with 32′ Mast Arm & Lum.	C	36-B	3000
30′ Pole with 36′ Mast Arm & Lum.	C	36-B	2500
34′ Pole	D	36-B	5200
34′ Pole with Lum.	D	36-B	4900

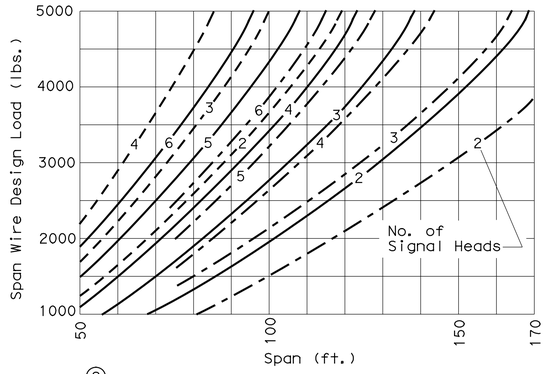
② Numbers on Load Span Charts indicate the number of signal heads on the span. The total span wire design load is based on one 5-section head and one or more additional 3-section head(s). Design wind pressures on cables are assumed as 1.6 lb/ft. Weight of span wire cables (one per signal head) is assumed as 0.65 lb/ft which includes an allowance for conductor cables and miscellaneous hardware. The effect of the sway cable on load distribution is ignored as it is assumed to break at design wind conditions. When a pole supports 2 spans, the span wire design loads for both spans should be added vectorially to determine the design load for that pole.



STRAIN POLE ELEVATIONS HORIZONTAL SIGNALS



② SIGNALS WITH 12-INCH LENS

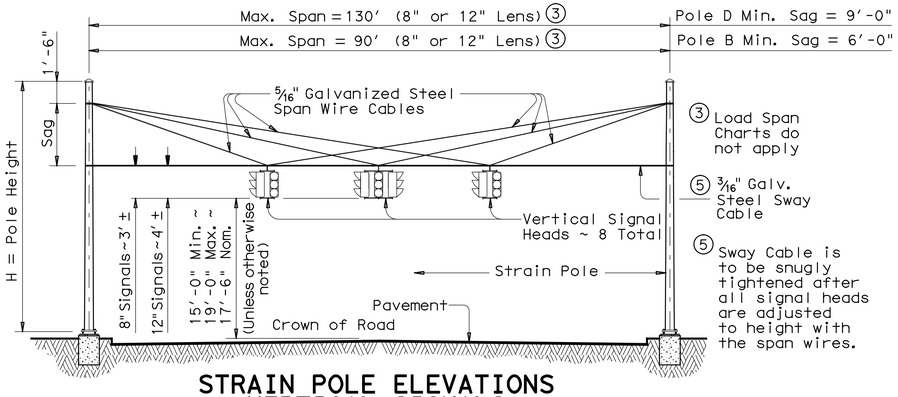


② SIGNALS WITH 8-INCH LENS

Signal Head Type	Wt. Per Head	Wind Area ⬙
5-Section, 12" Lens	125 lbs	9.6 sq. ft.
5-Section, 8" Lens	70 lbs	4.8 sq. ft.
3-Section, 12" Lens	75 lbs	5.64 sq. ft.
3-Section, 8" Lens	45 lbs	3.0 sq. ft.

⬙ Effective projected design wind area (actual area times drag coefficient)

- - - - - - - - Sag = 4′-6" (26′ or 30′ Pole)
———— Sag = 8′-0" (30′ or 34′ Pole)
— — — — Sag = 11′-6" (34′ Pole)



STRAIN POLE ELEVATIONS VERTICAL SIGNALS

(Mast arms are not used with vertical signals)

Pole Type	ROUND POLES				POLYGONAL POLES			
	D_B	D_T	④thk	H	D_B	D_T	④thk	H
	in.	in.	in.	ft.	in.	in.	in.	ft.
A	12.5	8.9	.239	26	13.0	9.0	.239	26
B	13.5	9.3	.239	30	14.0	9.0	.239	30
C	15.5	11.3	.239	30	16.0	11.0	.239	30
D	15.5	10.7	.239	34	16.0	11.0	.239	34

D_B = Pole Base O.D. D_T = Pole Top O.D. H = Pole Height

④ Thickness shown are minimum, thicker materials may be used.

SHIPPING PARTS LIST

Poles (Without Traffic Signal Arm)

Pole Type	Strain poles with Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap, 2 clamp-on simplex and 1 pipe plug.			Strain poles without Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap and 1 pipe plug.		
	Description	Designation	Quantity	Description	Designation	Quantity
A				26′ Strain Pole	SP 26 A-100	
B	30′ Strain Pole	SPL 30 B-100		30′ Strain Pole	SP 30 B-100	
D	34′ Strain Pole	SPL 34 D-100		34′ Strain Pole	SP 34 D-100	

Poles (With Traffic Signal Arm)

Pole Type	Strain poles with Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap, clamp-on simplex and 3 pipe plugs.			Strain poles without Luminaire: Ship each pole with the following hardware attached: handhole at base, pole cap and 3 pipe plugs.		
	Description	Designation	Quantity	Description	Designation	Quantity
C	30′ SPw/TS Arm	SPL 30 C-100		30′ SPw/TS Arm	SP 30 C-100	

Traffic Signal Arms (For Type C poles)

Nominal Arm Length	Type I Arm (1 Signal): Ship each Type I Arm with the following hardware attached: 2 CGB Connectors, 1 clamp with bolts and washers		Type II Arm (2 Signals): Ship each Type II Arm with the following hardware attached: ① 1 Bracket Assembly, 3 CGB Connectors and 1 clamp with bolts and washers		Type III Arm (3 Signals): Ship each Type III Arm with the following hardware attached: ① 2 Bracket Assemblies, 4 CGB Connectors and 1 clamp with bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24 II -100			
28	28I-100		28 II -100			
32			32 II -100		32 III -100	
36			36 II -100		36 III -100	

Anchor Bolt Assemblies (1 per pole)

Templates may be removed for shipment.

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ¾"	3′-10"	
2"	4′-3"	

Each Anchor Bolt Assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Luminaire Arms

Nominal Arm Length	Quantity
8′ Arm	

① See Sheet "DMA-100"

SHEET 1 OF 2

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES

(100 MPH WIND ZONE)

SP-100(1)-12

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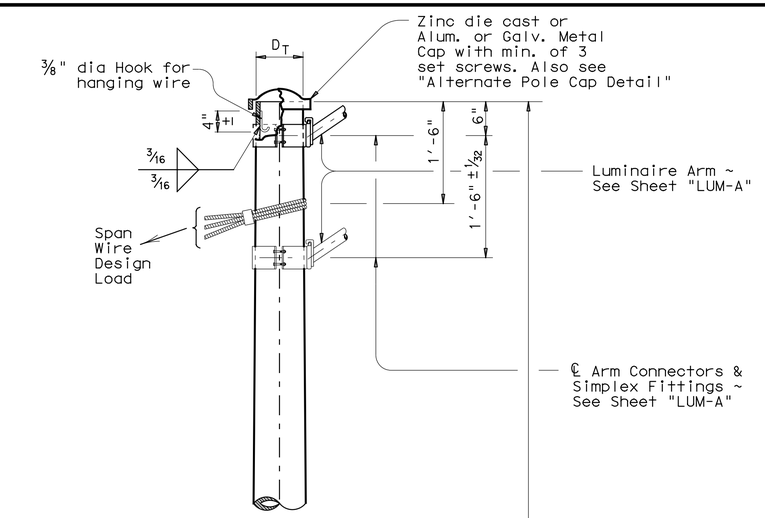
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REVISIONS	CONT	SECT	JOB	HIGHWAY
6-96				
1-12	DIST	COUNTY		SHEET NO.
				97

121A

DATE: $DATE$

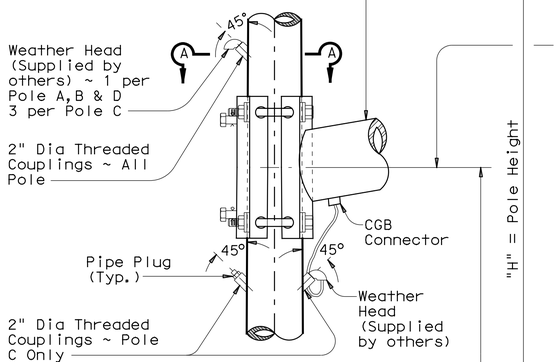
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DATE: $DATE$



DETAIL A

DETAIL B

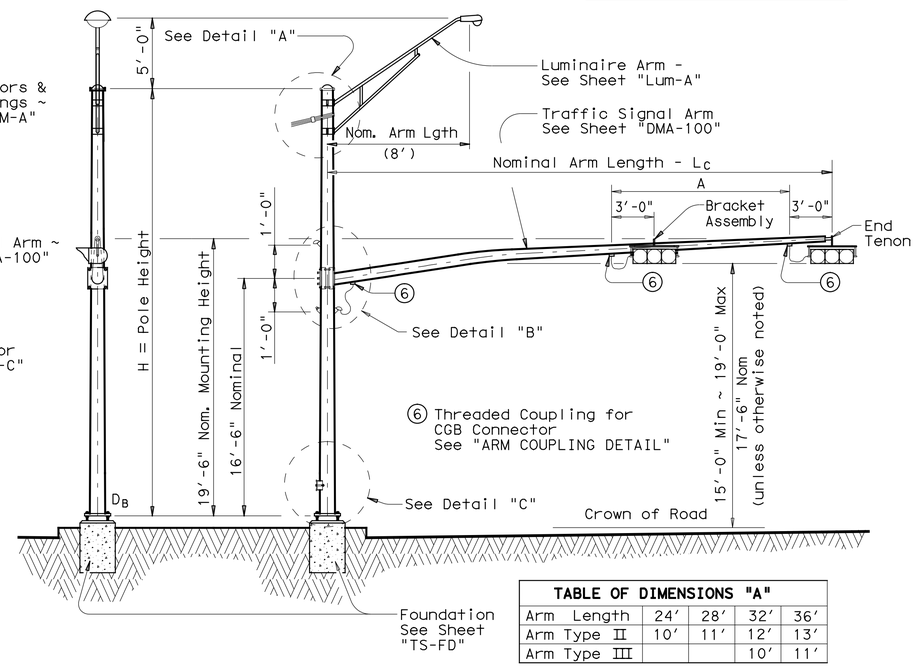


DETAIL C

POLE ELEVATION

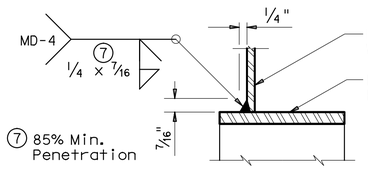
SECTION B-B

ALTERNATE POLE CAP DETAIL

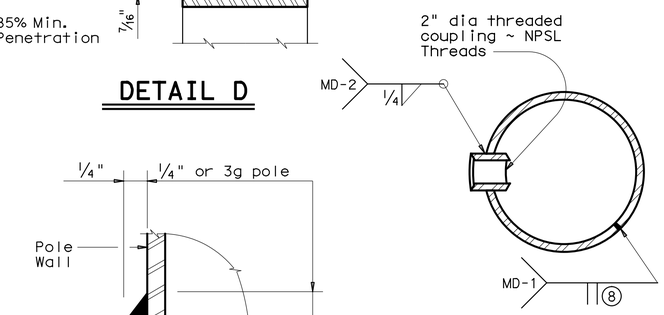


STRUCTURE ASSEMBLY

TABLE OF DIMENSIONS "A"				
Arm Length	24′	28′	32′	36′
Arm Type II	10′	11′	12′	13′
Arm Type III			10′	11′

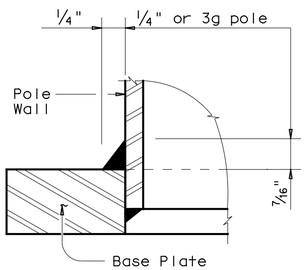


DETAIL D



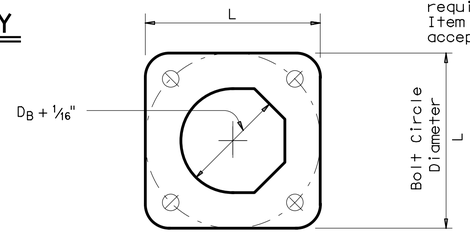
SECTION A-A

(Pole Coupling and Seam Weld Details)

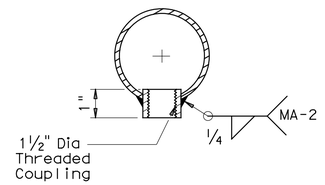


DETAIL E

⑧ 60% Min. penetration, except 100% penetration within 6" of circumferential base welds.



BASE PLATE PLAN



ARM COUPLING DETAIL

MATERIALS	
Round Shafts or Polygonal Shafts ⑨	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ⑩
Plates ⑨	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 except where noted
Pin Bolts	ASTM A325
Pipe ⑨	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Steel Cable	ASTM A475, 7 Wire Utilities Grade
Misc. Hardware	Galvanized steel or stainless steel or as noted

⑨ ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

⑩ ASTM A1011 SS Gr.50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor. The maximum permissible span wire design loads tabulated are calculated at a stress load of 1.4 times the basic allowable stress. A simultaneous wind on the pole, mast arm, and luminaire is also included.

See standard sheet "DMA-100" for details of clamp-on traffic signal arms, sheet "MA-C" for traffic signal arm connection details, sheet "LUM-A" for luminaire arm and connection details, and sheet "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Foundation Type	Anchor Bolt Diameter	Bolt Hole Diameter	Bolt Circle Diameter	Base ℙ Dim. L x T
36-A	1 3/4"	2"	19"	19" x 1 3/4"
36-B	2"	2 1/4"	21"	21" x 2"

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES

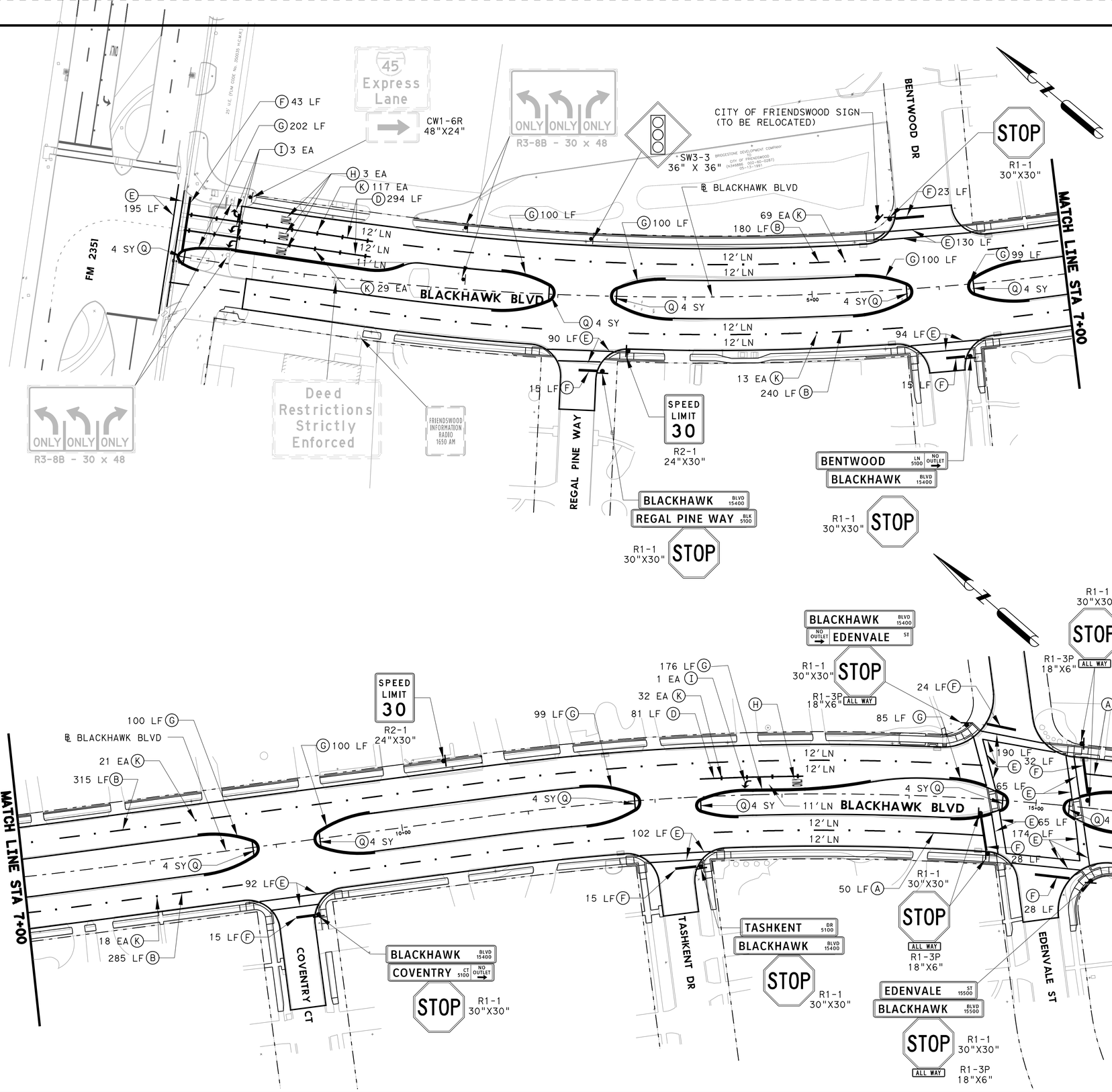
(100 MPH WIND ZONE)

SP-100(2)-12

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DN: MS	CK: JSY	DW: BR	CK: JSY
REVISIONS	CONT	SECT	JOB	HIGHWAY
6-96 1-12				
	DIST	COUNTY		SHEET NO.
				98

121B



NOTES

1. ALL STATIONING IS FROM ℄ BLACKHAWK UNLESS OTHERWISE NOTED.
2. ALL SIGNS & PAVEMENT MARKINGS TO BE PER TMUTCD LATEST EDITION AND CITY OF FRIENDSWOOD PERMANENT PAVEMENT MARKING DETAIL SHEET.
3. BLOCK NO.'S AND STREET NAMES SHOWN SHALL BE FIELD VERIFIED AND REVIEWED BY THE CITY WITH STREET NAME SUBMITTAL PRIOR TO FABRICATION OF SIGN PANELS.
4. REFLECTORIZED RAISED PAVEMENT MARKERS TY II B-B SHALL LINE UP WITH THE FIRE HYDRANT ON NORTHBOUND AND SOUTHBOUND.
5. ALL EXISTING TRAFFIC REGULATORY AND WARNING SIGNS SHALL BE REMOVED UNLESS SHOWN TO REMAIN.
6. ALL OTHER EXISTING SPECIAL SIGNS SUCH AS NEIGHBORHOOD WATCH SIGNS, PRIVATE UTILITY SIGNS, BUSINESS SIGNS, ETC., SHALL BE PROTECTED DURING CONSTRUCTION AND/OR REMOVED AND REINSTALLED AFTER CONSTRUCTION. (NO SEPARATE PAY, INCIDENTAL TO TRAFFIC CONTROL PLAN)
7. ALL ESPLANADE NOSING AND CURBS IN LEFT TURN STORAGE BAYS SHALL BE PAINTED WITH YELLOW REFLECTORIZED PAINT AND SHALL COMPLY WITH TMUTCD, ADA, TAS AND COF STANDARDS.

LEGEND

- (A) REFL PAV MRK TY I (W)(4")(SLD)
- (B) REFL PAV MRK TY I (W)(4")(BRK)
- (C) REFL PAV MRK TY I (W)(4")(DOT)
- (D) REFL PAV MRK TY I (W)(8")(SLD)
- (E) REFL PAV MRK TY I (W)(12")(SLD)
- (F) REFL PAV MRK TY I (W)(24")(SLD)
- (G) REFL PAV MRK TY I (Y) (MEDIAN NOSE CURBING)
- (H) REFL PAV MRK TY I (W)(WORD)
- (I) REFL PAV MRK TY I (W)(ARROW)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-C-R
- (L) REFL PAV MRKR TY II-B-B
- (M) REFL PAV MRK TY I (Y)(4")(SLD)
- (N) REFL PAV MRK TY I (Y)(4")(BRK)
- (P) REFL PAV MRK TY I (W)(6")(SLD)
- (Q) REFL PAV MRK TY I (B) (MEDIAN NOSING AREA)
- (R) REFL PAV MRK TY I (Y)(24")(SLD)

EXIST ROW

PROP GROUND MOUNTED SIGN

EXIST SIGN TO REMAIN

HDR

Texas Registered Engineering Firm F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Pavement Markings & Signing
Sta 0+00 to Sta 15+75

SHEET 1 OF 2

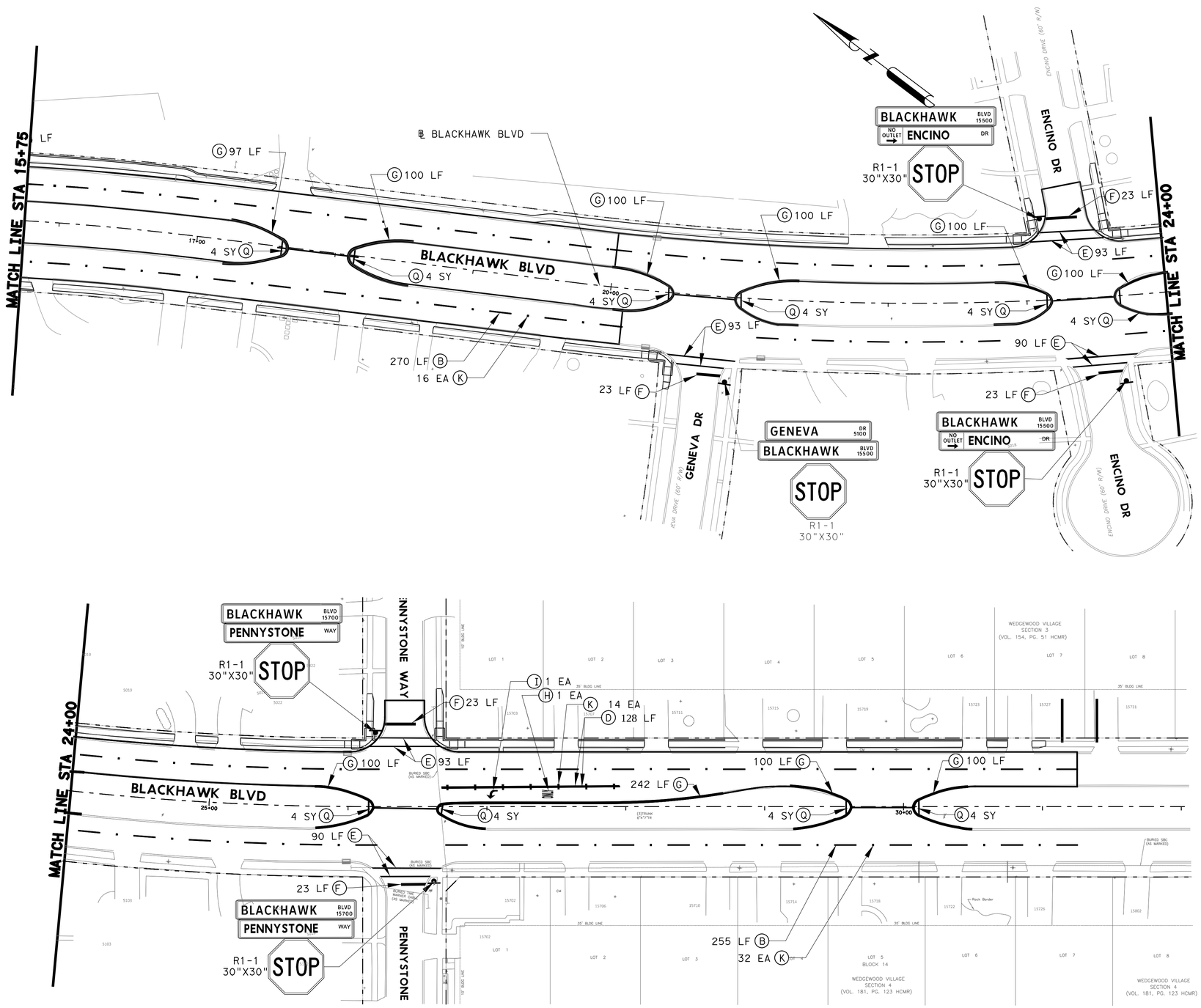
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SHEET NUMBER

SHEET 99 OF 111

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NOTES

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LEGEND

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- (P) REFL PAV MRK TY I (W)(6")(SLD)
- (Q) REFL PAV MRK TY I (B) (MEDIAN NOSING AREA)
- (R) REFL PAV MRK TY I (Y)(24")(SLD)

EXIST ROW

PROP GROUND MOUNTED SIGN

SPEED LIMIT 30 EXIST SIGN TO REMAIN

HDR

Texas Registered Engineering Firm F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Pavement Markings & Signing
Sta 17+00 to Sta 31+25

SHEET 2 OF 2

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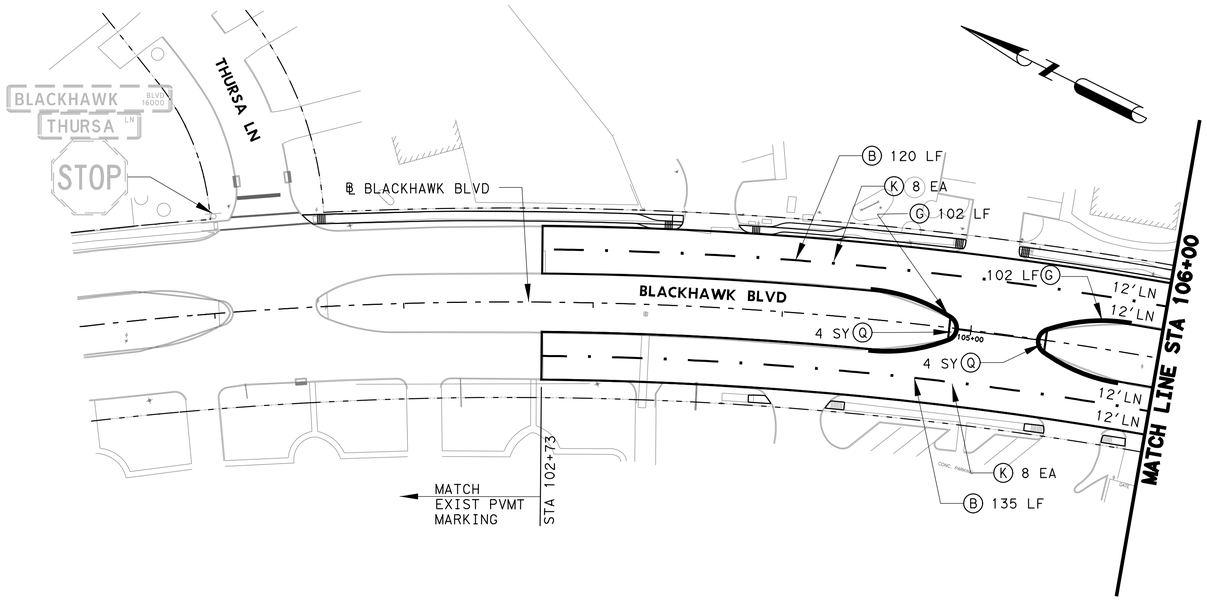
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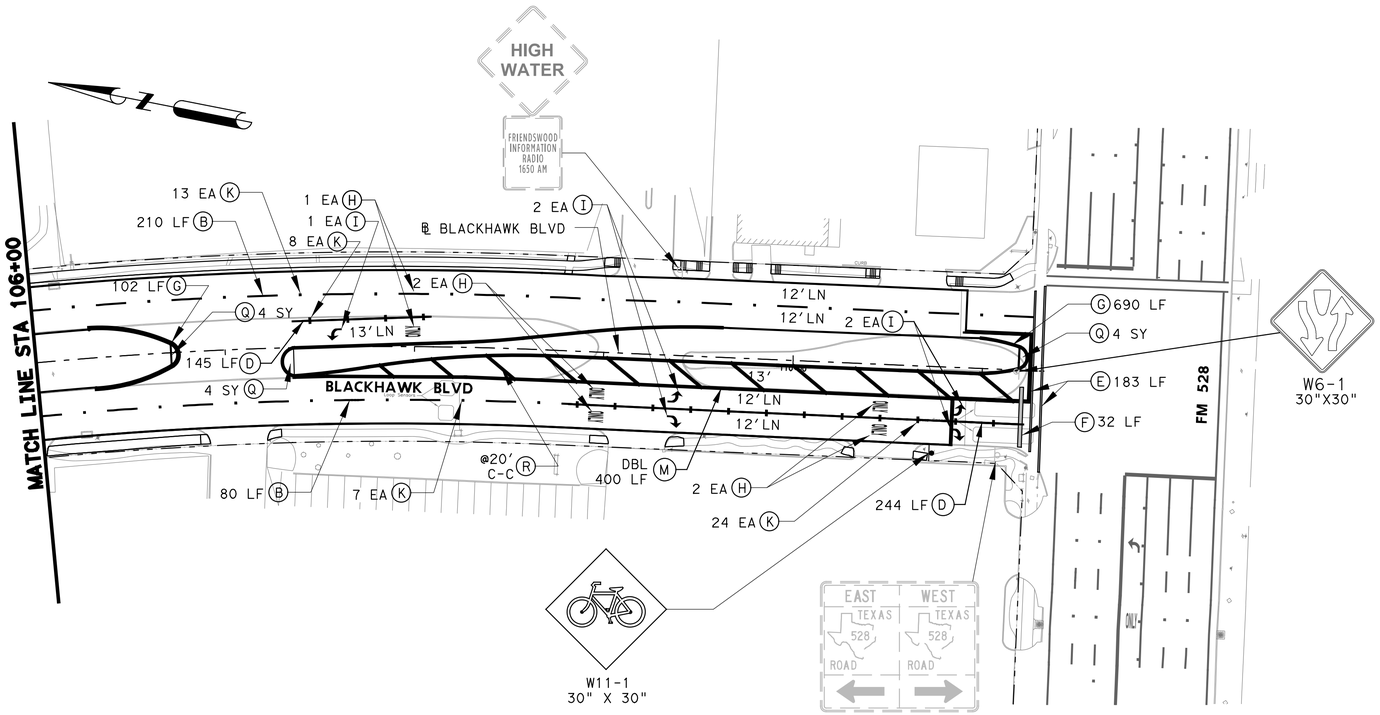
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90% SUBMITTAL





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4. REFLECTORIZED RAISED PAVEMENT MARKERS TY II B-B SHALL LINE UP WITH THE FIRE HYDRANT ON NORTHBOUND AND SOUTHBOUND.
5. ALL EXISTING TRAFFIC REGULATORY AND WARNING SIGNS SHALL BE REMOVED UNLESS SHOWN TO REMAIN.
6. ALL OTHER EXISTING SPECIAL SIGNS SUCH AS NEIGHBORHOOD WATCH SIGNS, PRIVATE UTILITY SIGNS, BUSINESS SIGNS, ETC., SHALL BE PROTECTED DURING CONSTRUCTION AND/OR REMOVED AND REINSTALLED AFTER CONSTRUCTION. (NO SEPARATE PAY, INCIDENTAL TO TRAFFIC CONTROL PLAN)
7. ALL ESPLANADE NOSING AND CURBS IN LEFT TURN STORAGE BAYS SHALL BE PAINTED WITH YELLOW REFLECTORIZED PAINT AND SHALL COMPLY WITH TMUTCD, ADA, TAS AND COF STANDARDS.

LEGEND

- (A) REFL PAV MRK TY I (W)(4")(SLD)
- (B) REFL PAV MRK TY I (W)(4")(BRK)
- (C) REFL PAV MRK TY I (W)(4")(DOT)
- (D) REFL PAV MRK TY I (W)(8")(SLD)
- (E) REFL PAV MRK TY I (W)(12")(SLD)
- (F) REFL PAV MRK TY I (W)(24")(SLD)
- (G) REFL PAV MRK TY I (Y) (MEDIAN NOSE CURBING)
- (H) REFL PAV MRK TY I (W)(WORD)
- (I) REFL PAV MRK TY I (W)(ARROW)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-C-R
- (L) REFL PAV MRKR TY II-B-B
- (M) REFL PAV MRK TY I (Y)(4")(SLD)
- (N) REFL PAV MRK TY I (Y)(4")(BRK)
- (P) REFL PAV MRK TY I (W)(6")(SLD)
- (Q) REFL PAV MRK TY I (B) (MEDIAN NOSING AREA)
- (R) REFL PAV MRK TY I (Y)(24")(SLD)

EXIST ROW

PROP GROUND MOUNTED SIGN

EXIST SIGN TO REMAIN

HDR

Texas Registered Engineering Firm F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	
DRAWN BY	

STATE OF TEXAS
NGOC KIM LE
102192
LICENSED
PROFESSIONAL ENGINEER

03-02-2026

SHEET NAME

Pavement Marking & Signing
Sta 102+73 to Sta 111+32

SHEET 1 OF 1

SCALE 0 20 40 60 80

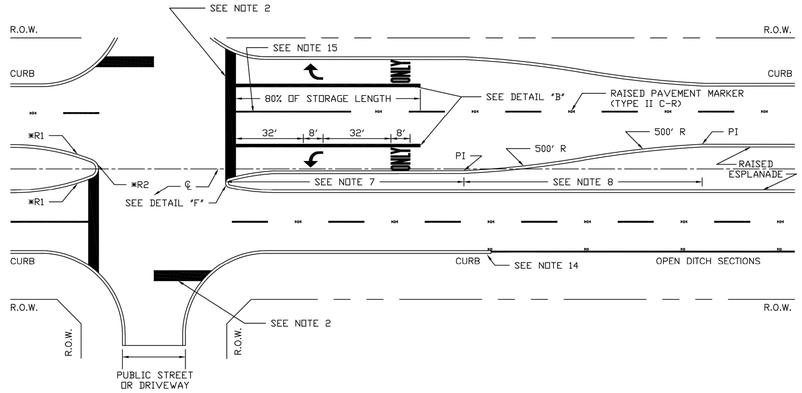
SCALE: 1" = 40'

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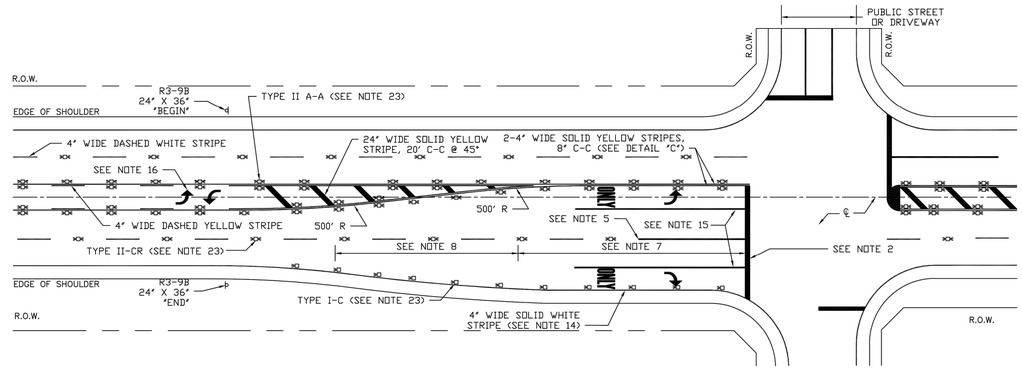
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FILE NAME

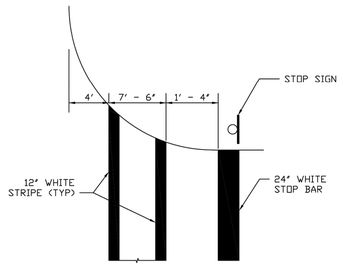
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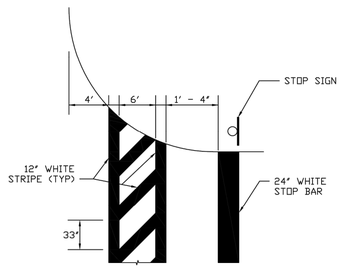
TYPICAL RAISED ESPLANADE SECTION



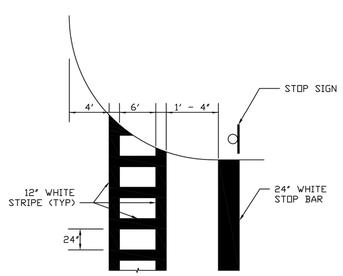
TYPICAL TWO-WAY LEFT TURN SECTION



STANDARD TYPE



SCHOOL ZONE TYPE 1



SCHOOL ZONE TYPE 2

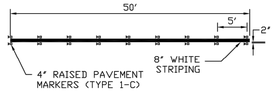
TYPICAL CROSSWALK PLACEMENT

ESPLANADE	*R1	*R2
<8'	N/A	W/2
8'-38'	90°	W/5
>38'	N/A	15'

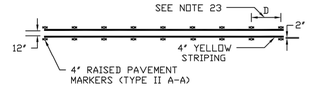
RADIUS DIMENSIONS



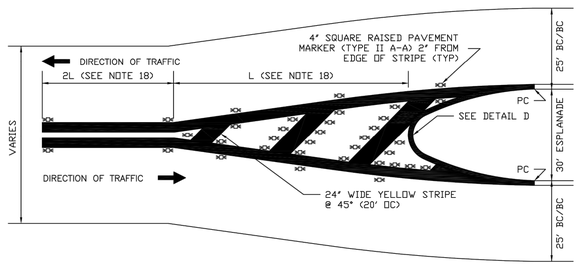
DETAIL A



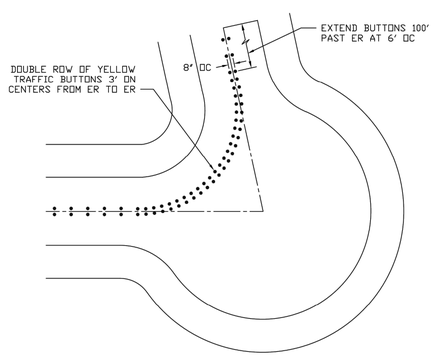
DETAIL B



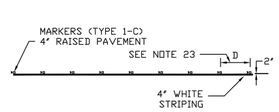
DETAIL C



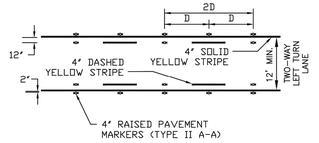
UNDIVIDED STREET TO ESPLANADE SECTION



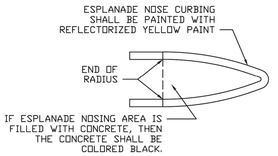
TYPICAL BUTTON DETAIL FOR CURVES ≥ 60°



DETAIL D



DETAIL E



ESPLANADE NOSING PLAN VIEW



TYPICAL CURB SECTION

DETAIL F

NOTE:

1. PAINT FROM THE BACK OF THE CURB TO THE GUTTER LINE.

PERMANENT PAVEMENT MARKING CONSTRUCTION NOTES:

1. IF A CROSSWALK IS REQUIRED, SEE TYPICAL CROSSWALK PLACEMENT DETAIL AND CONFIRM WITH CITY TYPE TO BE USED AND LOCATION OF CROSSWALK.
2. ALL INTERSECTIONS WHERE A STOP SIGN/SIGNAL IS LOCATED SHALL HAVE A STOP BAR. STOP BARS SHALL BE LOCATED 1'-4" BEHIND CROSSWALKS, WHERE PEDESTRIAN CROSSWALKS ARE PROVIDED. STOP BARS SHALL BE 24" WIDE SOLID WHITE STRIPE EXTENDING ACROSS ALL APPROACH LANES TO INDICATE THE POINT AT WHICH THE STOP IS INTENDED OR REQUIRED TO BE MADE.
3. CROSSWALKS SHALL BE A MINIMUM INSIDE WIDTH OF 5'. AT LOCATIONS WHERE ADDITIONAL VISIBILITY IS REQUIRED, WHERE TRAFFIC CONTROL DEVICES ARE NOT PRESENT, CONTINENTAL TYPE CROSSWALKS SHALL BE USED.
4. NOT ALL INTERSECTIONS ARE FOUR-WAY STOP CONTROLLED. AS SUCH, NOT ALL STRIPING AND MARKINGS MAY APPLY.
5. ON APPROACH TO INTERSECTION – BEGINNING WITH STOP BAR, INSTALL A 4" WIDE SOLID WHITE LINE FOR 50' FROM BACK OF STOP BAR, SKIP 25' AND BEGIN NORMAL LANE LINE.
6. ON EXIT FROM INTERSECTION – BEGINNING WITH THE CROSSWALK, OR 12' FROM CURB LINE OF INTERSECTING STREET, INSTALL 4" SOLID WHITE LINE FOR 50' AND BEGIN NORMAL LANE LINE.
7. TURN STORAGE BAYS SHALL BE A MINIMUM OF 100' FOR MINOR STREETS AND 150' FOR MAJOR STREETS.
8. TRANSITIONS TO STORAGE BAYS SHALL BE A MINIMUM OF 100', THOUGH 160' IS DESIRABLE.
9. ALL STREET CROSSINGS SHALL COMPLY WITH T.A.S AND A.D.A DETAILS AND CRITERIA.
10. PAVEMENT SURFACE AREAS PRIOR TO PLACEMENT OF PAVEMENT MARKINGS, AND/OR RAISED PAVEMENT MARKERS SHALL BE CLEANED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS (COFTS). AREAS SHALL BE FREE OF CURING MEMBRANE, DIRT, GREASE, LOOSE AND/OR FLAKING EXISTING MARKERS AND OTHER FORMS OF DEBRIS. SURFACES SHALL BE DRY BEFORE APPLYING PAVEMENT MARKINGS OR RAISED PAVEMENT MARKERS.
    - 10.1. CONCRETE SURFACES SHALL BE CLEANED BY ABRASIVE BLASTING MEDIUM.
    - 10.2. ASPHALTIC PAVEMENT SURFACES SHALL BE CLEANED BY BRUSHING,WASHING, COMPRESSED AIR, AND/OR HIGH-PRESSURE WATER.
11. ALL PAVEMENT MARKINGS AT INTERSECTIONS SHALL BE THERMOPLASTIC IN ACCORDANCE WITH C.O.F.T.S. APPROVED PRODUCTS LIST.
12. ALL PAVEMENT MARKINGS SHALL BE SHOWN ON THE APPROVED CONSTRUCTION PLANS. ALL PAVEMENT MARKINGS SHALL BE RETRO-REFLECTIVE MATERIAL APPLIED TO ROAD SURFACE IN A MOLTEN STATE BY SCREED/EXTRUSION, SUSPENDED EXTRUSION OR SPRAY MEANS, WITH A SURFACE APPLICATION OF GLASS BEADS.
13. ALL ESPLANADE NOSING, AND CURBS IN LEFT TURN STORAGE BAYS SHALL BE PAINTED WITH YELLOW REFLECTORIZED PAINT AND SHALL COMPLY WITH T.M.U.T.C.D., A.D.A, T.A.S, AND C.O.F.T.S STANDARDS, AND ALL REVISIONS THEREOF.
14. ALL ROADWAYS WITHOUT A CURB SHALL HAVE A 4" SOLID WHITE REFLECTORIZED STRIPE 12" INSIDE THE EDGE OF THE PAVEMENT (SEED DETAIL D).
15. INTERSECTIONS HAVING TWO LANES IN ONE DIRECTION SHALL SEPARATE LANES BY INSTALLING AN 8" SOLID WHITE STRIPE FROM STOP BAR TO EIGHTY PERCENT (80%) OF TURN STORAGE BAY LENGTH (SEE DETAIL B).
16. REPEAT CENTER TURN ARROWS AT APPROXIMATELY EVERY 1000' THROUGHOUT TWO-WAY CENTER TURN LANE.
17. ALL PAVEMENT MARKINGS, AND/OR RAISED PAVEMENT MARKERS SHALL COMPLY WITH T.M.U.T.C.D., A.D.A., T.A.S., AND C.O.F.T.S. AND ALL REVISIONS THEREOF.
18. TRANSITIONS FROM UNDIVIDED TO DIVIDED AND/OR ESPLANADE SECTIONS:
    - 18.1 FOR SPEEDS 45 MPH AND GREATER USE L=W*S.
    - 18.2 S = POSTED OR STATUTORY SPEED LIMIT.
    - 18.3 W = WIDTH OF CENTER LANE OR ESPLANADE OR OFFSET DISTANCE.
    - 18.4 MINIMUM L IN URBAN AREAS SHALL BE 100'.
    - 18.5 MINIMUM L IN RURAL AREAS SHALL BE 200'.
    - 18.6 L SHALL BE EXTENDED AS REQUIRED FOR SIGHT DISTANCE CONDITIONS.
19. THE COLOR OF RAISED PAVEMENT MARKERS UNDER DAYLIGHT AND NIGHTTIME CONDITIONS SHALL CONFORM TO THE COLOR OF THE MARKING FOR WHICH THEY SERVE AS A POSITIONING GUIDE OR FOR WHICH THEY SUPPLEMENT OR SUBSTITUTE.
20. ALL TRAFFIC BUTTONS AND RAISED PAVEMENT MARKERS SHALL BE INSTALLED ADJACENT TO STRIPES AT APPROXIMATELY 2" FROM EDGE OF BUTTON/MARKER TO STRIPE.
21. ALL BUTTONS AND RAISED PAVEMENT MARKERS SHALL BE INSTALLED WITH AN APPROVED EPOXY.
22. A BLUE REFLECTORIZED RAISED PAVEMENT MARKER (TYPE II B-B) SHALL BE SET 6" OFF CENTERLINE OF ROADWAY OR PAVEMENT STRIP ON THE ADJACENT SIDE OF ALL FIRE HYDRANTS.
23. SPACING OF RAISED PAVEMENT MARKERS TYPE II A-A, TYPE II C-R AND TYPE I-C:
    - 23.1 IN STORAGE BAYS AND TRANSITIONS TO STORAGE BAYS D=5' O.C.
    - 23.2 IN CURVES D=20' O.C.
    - 23.3 IN NORMAL ROADWAY D=40' O.C.
24. ALL MARKINGS SHALL HAVE A UNIFORM CROSS-SECTION, AND THE DENSITY AND QUALITY OF THE MARKINGS SHALL BE UNIFORM THROUGHOUT THEIR THICKNESS.
25. PAVEMENT MARKINGS, BUTTONS AND RAISED PAVEMENT MARKERS THAT ARE NOT IN ALIGNMENT OR SEQUENCE, AS SHOWN IN THE DRAWINGS OR STATED IN THE PROJECTS' SPECIFICATIONS SHALL BE REMOVED AND REPLACED AT THE CONTRACTORS' EXPENSE.
26. FOR SKEW INTERSECTIONS AND STREET WIDTHS NOT SHOWN, COORDINATE WITH THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411

PERMANENT PAVEMENT MARKING STANDARD DETAILS

FILE NAME: 8-PPMSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

CITY OF FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

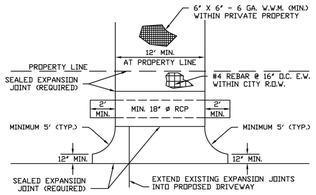
REGISTERED PROFESSIONAL ENGINEER — NGOC ANH LE — 103782 — LICENSED — STATE OF TEXAS

03-02-2026

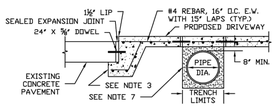
PROJECT NUMBER:

DATE SUBMITTED:

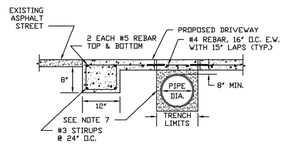
SHEET: 102 OF 111



PLAN – ALL STREETS



PROFILE – CONCRETE STREETS

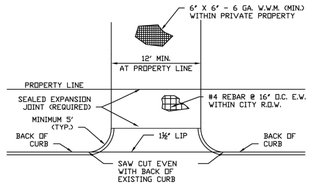


PROFILE – ASPHALT STREETS

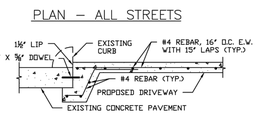
RESIDENTIAL CONCRETE DRIVEWAY
(OPEN DITCH STREETS)

NOTES:

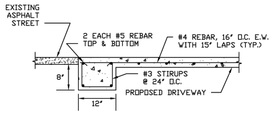
1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. 1½" LIP (CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4" X 12" MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF FRIENDSWOOD PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS "A", 4,000 PSI AT TWENTY-EIGHT DAYS.
7. USE MATERIAL AND DIMENSION AS SPECIFIED IN STORM SEWER DETAILS FOR TRENCH WIDTHS AND BACKFILL.
8. NO MORE THAN ONE (1) DRIVEWAY ON LOTS WITH LESS THAN 120' OF FRONTAGE.



PLAN – ALL STREETS



PROFILE – CONCRETE STREETS

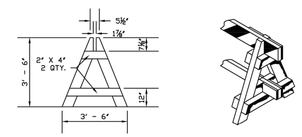


PROFILE – ASPHALT STREETS

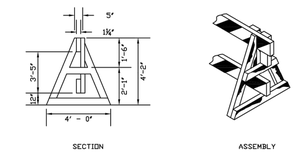
RESIDENTIAL CONCRETE DRIVEWAY
(CURB & GUTTER STREETS)

NOTES:

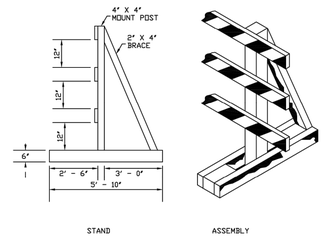
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"A" FRAME STAND

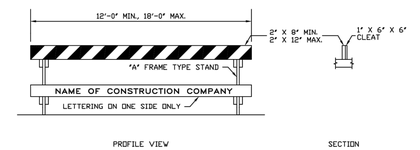


MODIFIED "A" FRAME STAND

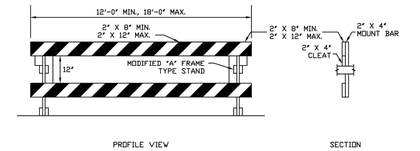


SKID & POST STAND

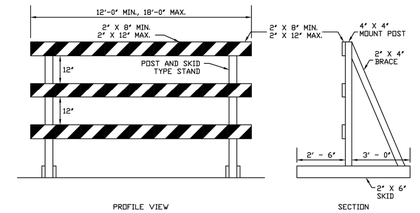
BARRICADE STANDS



TYPE I BARRICADE



TYPE II BARRICADE

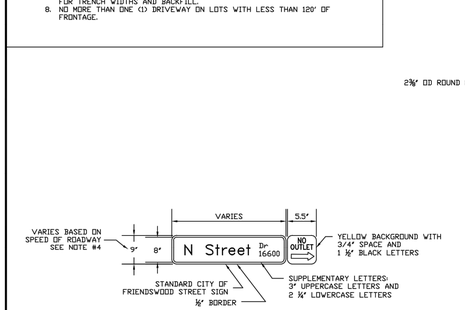


TYPE III BARRICADE

TEMPORARY BARRICADES

BARRICADE CONSTRUCTION NOTES:

1. BARRICADES SHALL BE CONSTRUCTED OF CLEAN SOUND LUMBER SURFACED ON TWO SIDES CUT TO THE NOMINAL DIMENSION SHOWN ON THESE DETAILS. BARRICADES SHALL BE PAINTED WITH TWO (2) COATS OF AN APPROVED BRAND OF WHITE PAINT TO PROVIDE THOROUGH COVERAGE AND A UNIFORM WHITE COLOR. THE PAINT FOR BARRICADE STRIPES SHALL BE AN APPROVED BRAND OF RED OR ORANGE AND WHITE PAINT APPLIED TO PROVIDE UNIFORM COLOR, AND THEY SHALL BE REFLECTORIZED.
2. REFLECTORIZATION FOR BARRICADES OR SIGNS MAY BE BY MEANS OF APPROVED REFLECTIVE COATINGS ON THE SIGN BACKGROUND WHICH SHALL CONSIST OF EITHER GLASS BEADS ON PAINT, REFLECTIVE SHEETING, REFLECTIVE LIQUID, OR RETRO-DIRECTIVE REFLECTORS. THE RETRO-DIRECTIVE REFLECTORS MAY BE EITHER GLASS OR CRYSTAL PLASTIC REFLECTOR BUTTONS. ALL REFLECTING ELEMENTS SHALL REFLECT WHITE LIGHT, UNLESS OTHERWISE INDICATED IN THE DETAILS.
3. ALL BARRICADES EXTENDING ACROSS MOVING LANES OR FOR DELINEATION THROUGH A PROJECT SHALL BE SUPPLEMENTED BY LIGHTS, PLACED SO AS NOT TO INTERFERE WITH THE VISIBILITY OF REFLECTOR BUTTONS OR REFLECTORIZED SURFACES. THESE LIGHTS SHALL BE MAINTAINED IN CONTINUOUS OPERATION FROM SUNSET TO SUNRISE AND SHALL BE OF THE FLASHING ELECTRIC TYPE, WITH THE RATE OF FLASHING BETWEEN SEVENTY (70) AND ONE HUNDRED-TWENTY (120) FLASHES PER MINUTE. FLASHING ELECTRIC LIGHTS SHALL NOT BE CONNECTED IN SERIES. ALL LIGHTS SHALL BE OF THE COLOR YELLOW.
4. BARRICADE TYPE III SHALL BE TREATED WITH EIGHT POUND (8 LB.) PENTACHLOROPHENOL (OR SIMILAR TREATMENT ALLOWED BY AWPA) WOOD PRESERVATIVE AND PAINTED WITH A PRIME COAT CONSISTING OF SPAR VARNISH VEHICLE ALUMINUM PAINT, FOLLOWED WITH ONE (1) COAT OF EXTERIOR GRADE WHITE PAINT STRIPED WITH ALTERNATE DIAGONAL ORANGE OR RED REFLECTIVE STRIPES WHERE SPECIFIED.
5. BARRICADES FOR CONSTRUCTION SHALL BE ALTERNATE ORANGE AND WHITE STRIPES SLOPING DOWNWARD AT AN ANGLE OF FORTY-FIVE DEGREES (45°) IN THE DIRECTION TRAFFIC IS TO PASS. BARRICADES USED OTHER THAN FOR CONSTRUCTION SHALL BE ALTERNATE RED AND WHITE STRIPES. THE ORANGE AND WHITE, AND RED AND WHITE MARKINGS SHALL NOT BE INTERMIXED IN THE SAME INSTALLATION AREA.
6. PERMANENT BARRICADES SHALL HAVE RED AND WHITE STRIPING.
7. TEMPORARY CONSTRUCTION BARRICADES SHALL HAVE ORANGE AND WHITE STRIPING.
8. SIGNS FOR BARRICADES SHALL BE MADE FROM WOOD, HARDBOARD, METAL OR PLASTIC CONFORMING WITH THESE REQUIREMENTS:
   - 8.1. METAL OR PLASTIC – SIGNS SHALL CONSIST OF STEEL, ALUMINUM ALLOY, OR PLASTIC WITH SUFFICIENT THICKNESS TO RETAIN RIGIDITY UNDER NORMAL CONDITIONS.
   - 8.2. WOOD – SIGN STOCK SHALL BE TWO INCH (2") STOCK B & B GRADE, KILN-DRIED LUMBER, OR EQUAL, OR WATERPROOF RESIN-BONDED EXTERIOR GRADE PLYWOOD, DOUGLAS FIR PLYWOOD ASSOCIATION OR EQUAL. ALL WOODEN SIGNS CONSTRUCTED OF TWO (2) OR MORE BOARDS SHALL HAVE A ONE INCH (1") BY SIX INCH (6") CLEAT FASTENED TO THE BACK OF THE SIGN AT EACH END AND EXTENDING FULL DEPTH OF THE SIGN. IN ADDITION TO CLEATS, THE BOARDS SHALL BE FASTENED TOGETHER WITH ONE-HALF INCH (½") CORRUGATED FASTENERS SPACED AT NOT MORE THAN TWELVE INCH (12") CENTERS DRIVEN FROM THE BACK OF THE SIGN. IT IS RECOMMENDED THAT WOOD USED FOR SIGNS BE TREATED WITH EITHER CHROMATED ZINC CHLORIDE, WOLMAN SALTS OR PENTACHLOROPHENOL. ALL WOOD PRESERVATIVES SHALL BE OF A TYPE WHICH WILL PROHIBIT THE BLEEDING OF PRESERVATIVE THROUGH PAINT COATINGS.
   - 8.3. HARDBOARD – SIGN STOCK SHALL BE TEMPERED DUOLUX, THREE-EIGHTHS INCH (⅜") NOMINAL THICKNESS, LAMINATED WITH WATERPROOF CASEIN GLUE, OR EQUAL.
9. REGULATORY SIGN LETTERING SHALL BE WELL-DEFINED, REFLECTIVE, OPEN ROUNDED TYPE CAPITAL LETTERS, AS APPROVED BY THE JOINT COMMITTEE ON UNIFORM TRAFFIC CONTROL DEVICES AND PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

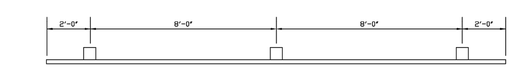


STREET SIGN WITH NO OUTLET DESIGNATION MINIMUM REQUIREMENTS

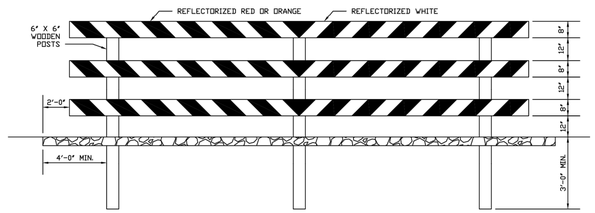
TYPICAL SIGN MOUNT DETAIL

NOTES:

1. SIGN MATERIAL CONSISTS OF PRESSURE ACTIVATED WHITE BACKING MADE OF SUPER HIGH DENSITY OR DIAMOND/PRISMATIC VINYL WITH MINIMUM TEN (10) YEAR REFLECTIVITY WARRANTY. LETTERING CUT OUT OF SIGN MAKING FILM E.S.M. OR 3M TRANSPARENT VINYL SHEETING CUT ON CAD SIGN PLOTTER.
2. SIGN BLANKS SHALL BE .080" FLAT TRAFFIC GRADE (5052) ALUMINUM.
3. STREET NAME SIGN BLANKS SHALL BE COVERED WITH WHITE DIAMOND/PRISMATIC VINYL. LETTERS IN FONT TYPE "B", CUT OUT OF GREEN TRANSPARENT VINYL SHALL BE PLACE OVER THE WHITE DIAMOND/PRISMATIC VINYL TO PROJECT WHITE LETTERING WITH GREEN BACKGROUND.
4. PER TMUTCD, ALL POST-MOUNTED STREET NAME SIGNS ON MULTI-LANE ROADWAYS WITH A SPEED LIMIT MORE THAN 40 MPH SHALL USE AN 8" INITIAL UPPER CASE LETTER AND 6" LOWER CASE LETTERING. POST-MOUNTED SIGNS ON MULTI-LANE ROADWAYS WITH A SPEED LIMIT OF 40 MPH OR LESS SHALL USE A 6" INITIAL UPPER CASE LETTER AND 4.5" LOWER CASE LETTERING. ALL CUL-DE-SAC STREETS SHALL HAVE A SIGN WITH A "NO OUTLET" DESIGNATION.
5. NO OUTLET SIGN TO BE REMOVED IF STREET BECOMES A THRU STREET.
6. STOP SIGNS SHALL BE RED 3M REFLECTIVE COATING ON WHITE DIAMOND/PRISMATIC VINYL BACKING. SEE TMUTCD FOR STOP SIGN SIZE REQUIREMENTS.
7. SIGN POST SHALL BE 2¾" O.D., 16 GAUGE GALVANIZE 120 CPOZ STEEL POST G90, TEN (10) FEET LONG.
8. SIGN POST SHALL BE MOUNTED WITH "POS-LOK" OR SIMILAR SYSTEM CONSISTING OF 27" GALVANIZED SLEEVE AND REMOVABLE WEDGE.



PLAN

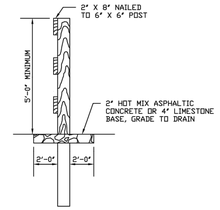


FRONT VIEW

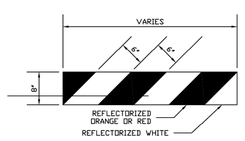
PERMANENT TYPE III BARRICADE

NOTE:

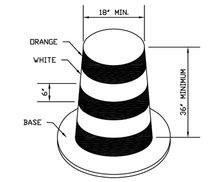
1. USE ORANGE AND WHITE REFLECTORIZED STRIPES DURING CONSTRUCTION ONLY. ALL OTHER TIMES RED AND WHITE REFLECTORIZED STRIPES SHALL BE USED.



SIDE VIEW



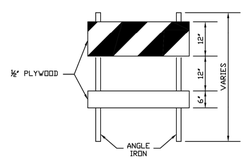
STRIPING



BARREL DETAIL

NOTES:

1. TWO (2) WHITE STRIPES SHALL BE REFLECTORIZED AND SHALL BE 4" TO 8".
2. FLASHING OR STEADY BURN LIGHTS SHALL BE USED ON BARRICADES, PANELS AND BARRELS AS NEEDED.
3. METAL BARRELS ARE NOT PERMITTED.



PORTABLE TYPE I BARRICADE

BARRICADE AND MISCELLANEOUS DETAILS

FILE NAME: 4-BAMSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS REVISED DATE: MARCH 2022

FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

STATE OF TEXAS – TRENT M. WYNNE – 104967 – LICENSED PROFESSIONAL ENGINEER

03-02-2026

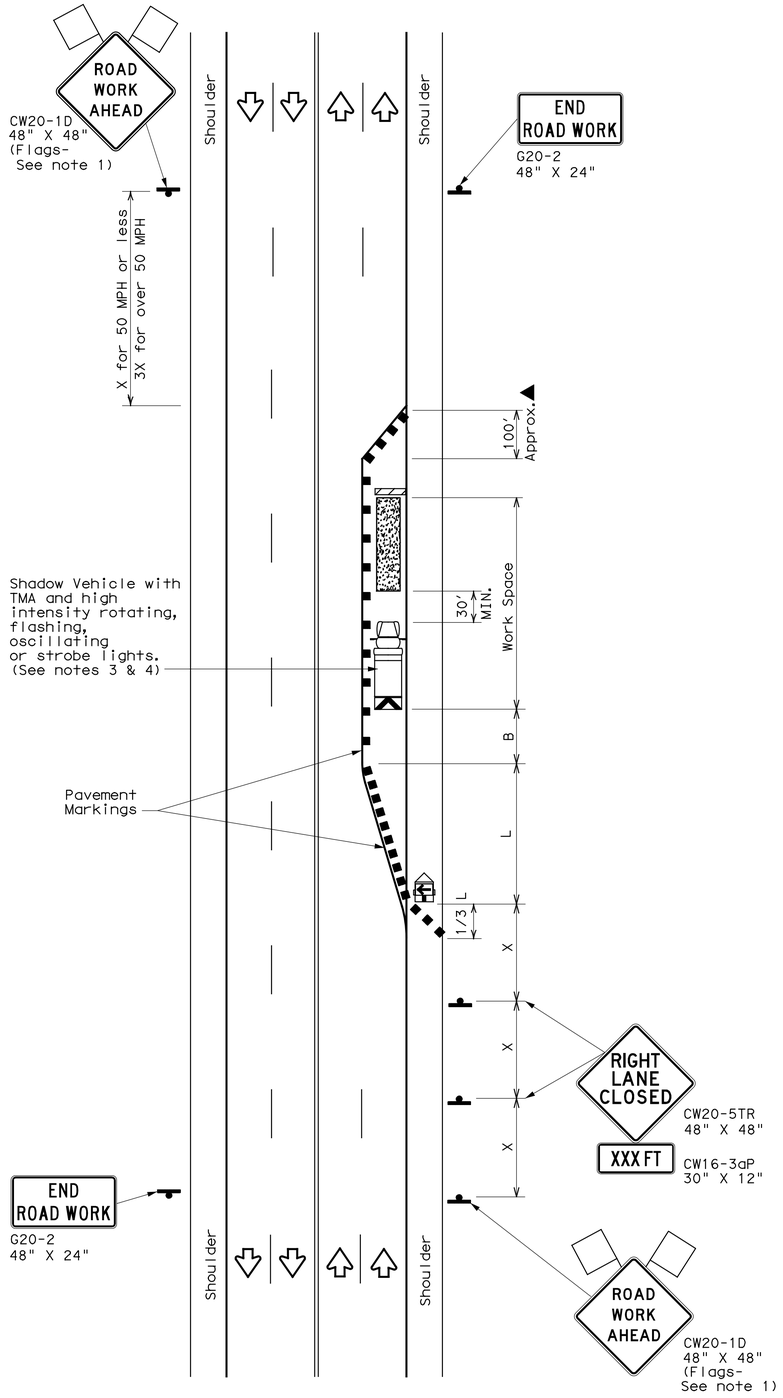
PROJECT NUMBER:

DATE SUBMITTED:

SHEET: 103 OF 111

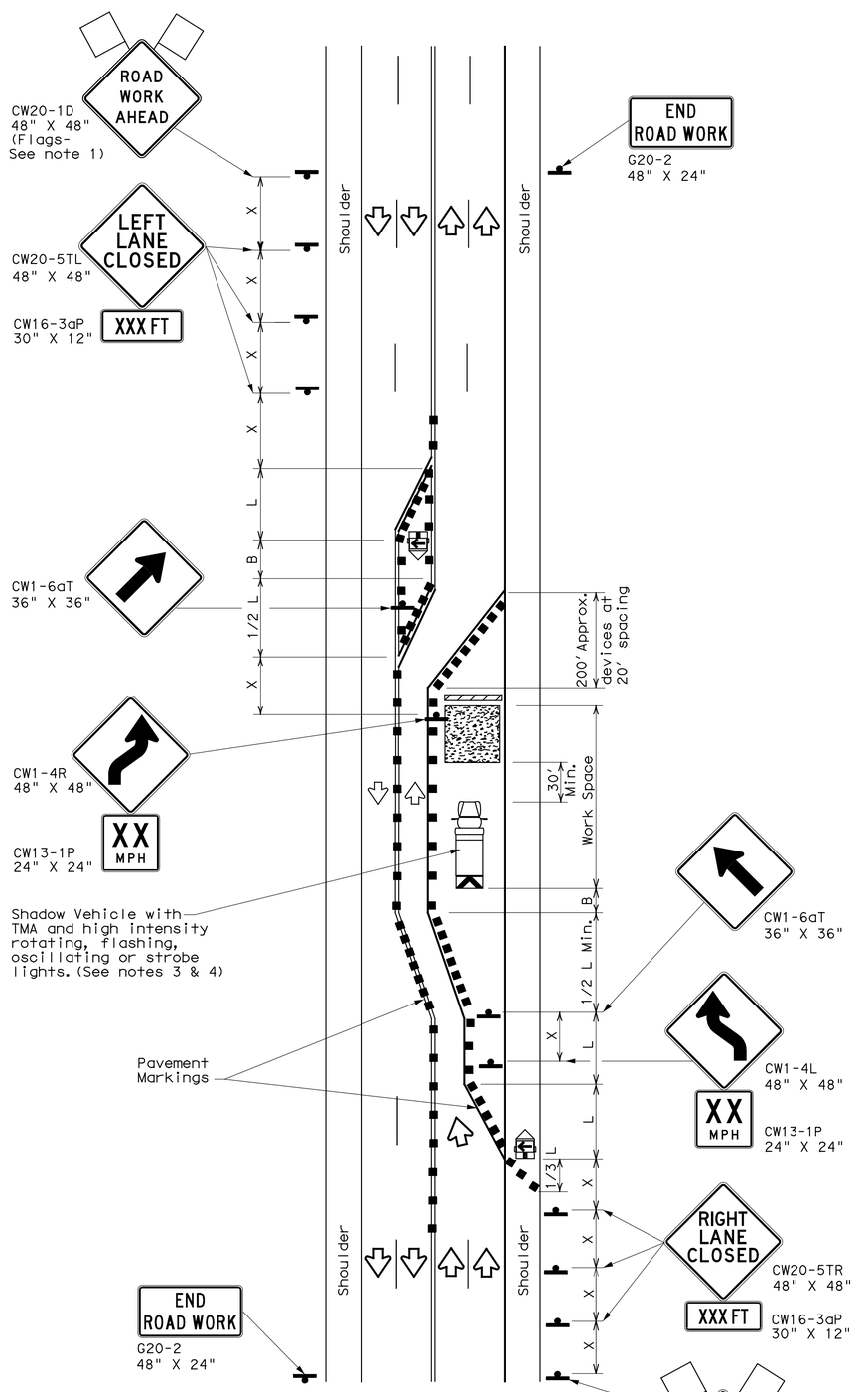
DISCLAIMER:
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DATE:
FILE:



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew eposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

6. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-5b)

7. Conflicting pavement markings shall be removed for long-term projects.

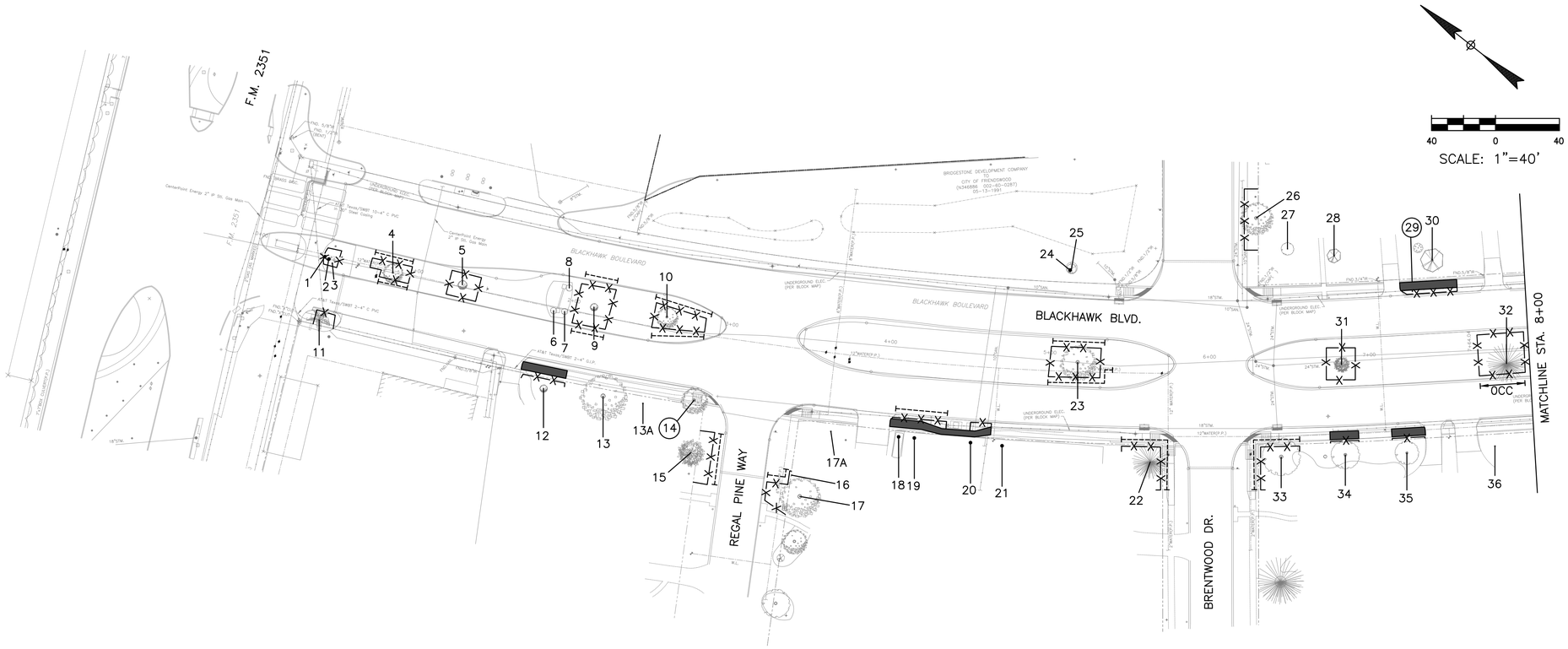
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12				
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18				104



Tree No.	Location	Description	Comments	Treatment
1	Esplanade	12" Crepe Myrtle		Clearance prune, Fence
2	Esplanade	12" Crepe Myrtle		Clearance prune, Fence
3	Esplanade	12" Crepe Myrtle		Clearance prune, Fence
4	Esplanade	12" Live Oak		Root prune for street, Fence, Clearance prune
5	Esplanade	11" Nuttal Oak		Clearance prune, Fence
6	Esplanade	5" Savannah Holly	Freeze damage, Dead, no protection warranted	
7	Esplanade	5" Savannah Holly	Freeze damage, Dead, no protection warranted	
8	Esplanade	5" Savannah Holly	Freeze damage, Dead, no protection warranted	
9	Esplanade	13" Live Oak		Root prune for street, Fence, Clearance prune
10	Esplanade	18" Live Oak		Root prune for street, Fence, Clearance prune
11	15306 Blackhawk	5' Sago		Fence
12	5102 Regal Pine	13" Live Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
13	5102 Regal Pine	24" Willow Oak	20' stump, Poor, Private tree, No protection warranted	
13A	5102 Regal Pine	4" Shumard Oak	Private tree	Clearance prune
14	5102 Regal Pine	18" Willow Oak	Trunk decay, Hazardous, Remove for ramp	Remove tree
15	5102 Regal Pine	16" Cedar Elm	Private tree	Clearance prune, Fence
16	5103 Regal Pine	4" Crepe Myrtle	Private tree	Clearance prune, Fence
17	5103 Regal Pine	24" Live Oak	Private tree	Root prune for water connection, Fence, Clearance prune
17A	5103 Regal Pine	10" Crepe Myrtle	Private tree	Clearance prune
18	5103 Regal Pine	22" American Elm	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
19	5103 Regal Pine	12" Crepe Myrtle	Private tree	Clearance prune, Fence
20	5103 Regal Pine	15" Crepe Myrtle	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
21	5102 Bentwood Drive	18" Post Oak	Tree has been removed	
22	5102 Bentwood Drive	19" Pine	Private tree	Root prune for walk, Fence, Clearance prune
23	Esplanade	23" Live Oak	Trunk scars	Root prune for street, Fence, Clearance prune
24	Not available	15" Sugarberry	Private tree, will not be impacted	
25	Not available	10" Gum Bumelia	Tree has been removed	
26	15403 Blackhawk	24" Live Oak	Private tree	Fence
27	15403 Blackhawk	12" Pear	Private tree, will not be impacted	
28	15403 Blackhawk	12" Magnolia	Private tree, will not be impacted	
29	15407 Blackhawk	12" Crepe Myrtle	Remove for wider walk	Remove tree
30	15407 Blackhawk	13" Magnolia	Private tree	Clearance prune, Fence
31	Esplanade	8" Cedar Elm		Clearance prune, Fence
32	Esplanade	22" Pine		Zero Curb cutback, Fence, Clearance prune
33	5103 Bentwood	25" Pecan	Private tree	Root prune for walk, Fence, Clearance prune
34	5103 Bentwood	14" Pear	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
35	5103 Bentwood	14" Pecan	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
36	5102 Coventry Court	15" Crepe Myrtle	Private tree	Clearance prune

TREE PRESERVATION PLAN LEGEND

- TREE NUMBER/LOCATION
- TREE TO BE REMOVED
- TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- REPLACEMENT PLANTING SPECIES AND SIZE/TYPE
- OCC — ZERO CUTBACK CURB
- SIDEWALK ON GRADE
- CHECKERPLATE SECTION

NOTE:

1. THIS TREE PROTECTION PLAN WAS DEVELOPED WITH INFORMATION PROVIDED BY DESIGN ENGINEER IN DRAWINGS DATED DECEMBER 2025. THE PLAN CONSIDERS ALL FITTINGS, VERTICAL OFFSETS AND AREAS OF NECESSARY EXCAVATION. CHANGES MADE TO DESIGN MAY COMPROMISE THE TREE PROTECTION PLAN. REFER SPECIFICATIONS 01560P. CONDITION OF EACH TREE IS BASED ON VISUAL EVALUATION AT TIME OF DESIGN. CONDITION AND STRUCTURAL INTEGRITY OF EACH TREE IS NOT GUARANTEED BY DESIGNER AT ANY POINT IN THE FUTURE, AS ENVIRONMENTAL AND MAINTENANCE INFLUENCES ON EACH TREE CAN NOT BE DETERMINED BY DESIGNER.
2. IN AREAS WHERE INDIVIDUAL TREES HAVE NOT BEEN TIED IN BY SURVEY APPROXIMATE LOCATION IS INDICATED ON TPP WITH A DOT AND TREE NUMBER. ACCURACY OF REPRESENTED LOCATION IS NOT GUARANTEED BY CN KOEHL URBAN FORESTRY, INC.
3. THE CONTRACTOR'S ARBORIST WILL MARK LOCATIONS OF THE NEW TREES TO BE PLANTED AND OBTAIN APPROVAL BY CITY ENGINEER AND CITY FORESTER BEFORE PURCHASING OR EXCAVATING PLANTING HOLE OF EACH TREE.

HDR
Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 700
Houston, Texas 77081
P 713.622.9264 F 713.622.9265
www.hdrinc.com

PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

FRIENDSWOOD TEXAS

C.N. Koehl
Urban Forestry, Inc.
210 Stone Bush Ct. ◦ Katy, Texas 7749
281-391-0022 ckoehl@koehlurbanforestry.com

APPROVED: Craig N Koehl 01-19-2026

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

SHEET NAME

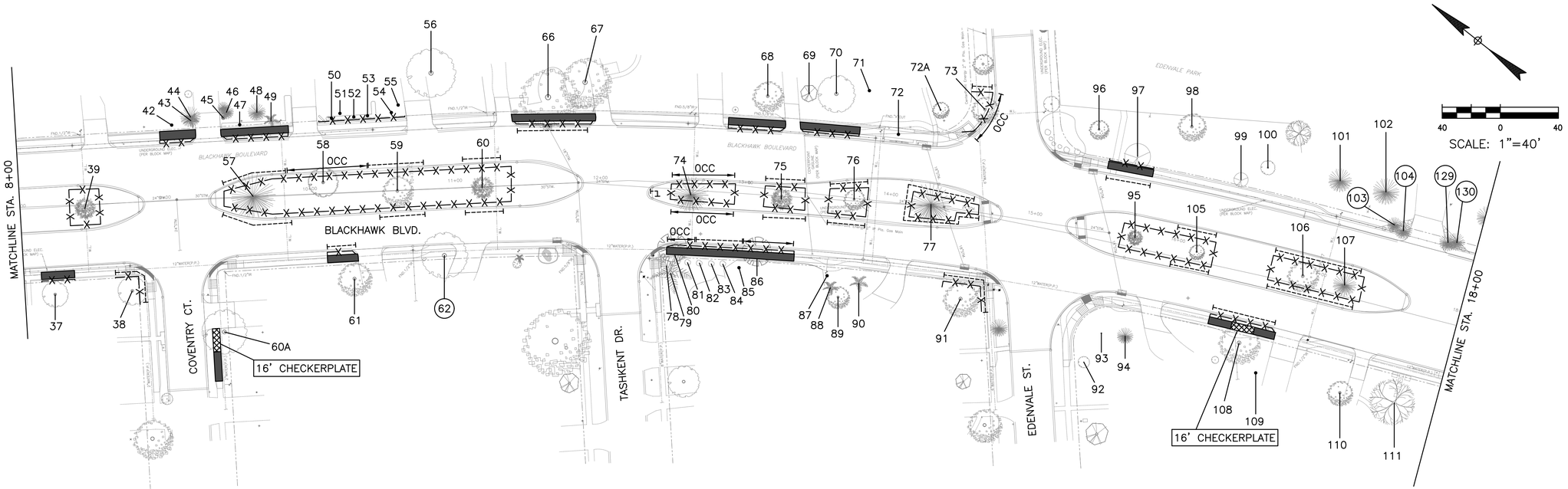
TREE PROTECTION PLAN
SHEET 1 OF 7

SCALE 0 20 40 60 80

SHEET NUMBER

SHEET 105 OF 111

FILE NAME



Tree No.	Location	Description	Comments	Treatment
37	5102 Coventry Court	18" Pecan	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
38	5102 Coventry Court	21" Pecan	Private tree	Root prune for walk, Fence, Clearance prune
39	Esplanade	10" Cedar Elm		Clearance prune, Fence
42	15415 Blackhawk	4" Saucer Magnolia	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
43	15419 Blackhawk	5' Sago	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
44	15419 Blackhawk	12" Pine	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
45	15419 Blackhawk	10" Pine	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
46	15419 Blackhawk	14" Pine	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
47	15419 Blackhawk	3" Burford Holly		Clearance prune, Fence
48	15419 Blackhawk	12" Pine	Private tree, will not be impacted	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
49	15419 Blackhawk	5" Juniper	Private tree	Fence
50	15423 Blackhawk	10" Arborvitae	Private tree	Clearance prune, Fence
51	15423 Blackhawk	10" Arborvitae	Private tree	Clearance prune, Fence
52	15423 Blackhawk	10" Arborvitae	Private tree	Clearance prune, Fence
53	15423 Blackhawk	10" Arborvitae	Private tree	Clearance prune, Fence
54	15427 Blackhawk	5" Juniper	Private tree	Fence
55	15427 Blackhawk	5" Juniper	Private tree	Fence
56	15427 Blackhawk	36" Pecan	Private tree	Clearance prune
57	Esplanade	25" Pine		Root prune for street, Fence, Clearance prune
58	Esplanade	20" Pecan		Zero Curb cutback, Fence, Clearance prune
59	Esplanade	21" Pecan		Root prune for street, Fence, Clearance prune
60	Esplanade	17" Cedar Elm		Root prune for street, Fence, Clearance prune
60A	5103 Coventry Court	32" American Elm		16' checkerplate, Zero curb cutback, Fence, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Clearance prune
61	5103 Coventry Court	22" Water Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune
62	5102 Tashkent	26" Pecan	Remove for ADA sloped walks	Remove tree
66	15431 Blackhawk	33" Live Oak	40% dieback, Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune
67	15435 Blackhawk	35" Live Oak	Private tree, will not be impacted	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune
68	15439 Blackhawk	26" Live Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
69	Not available	12" Magnolia	Suppressed, Private tree	
70	Not available	28" Pecan	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
71	Not available	12" Magnolia	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
72	Not available	20" Pecan	Tree has been removed	
72A	Not available	13" Live Oak	Private tree	Clearance prune
73	Not available	18" Live Oak		Zero curb cutback, Fence, Bore waterline, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Clearance prune
74	Esplanade	23" Pine		Zero Curb cutback, Fence, Clearance prune
75	Esplanade	12" Cedar Elm		Root prune for street, Fence, Clearance prune
76	Esplanade	17" Live Oak		Root prune for street, Fence, Clearance prune
77	Esplanade	28" Pine		Root prune for street, Root prune for storm, Fence, Clearance prune

NOTE:

1. THIS TREE PROTECTION PLAN WAS DEVELOPED WITH INFORMATION PROVIDED BY DESIGN ENGINEER IN DRAWINGS DATED DECEMBER 2025. THE PLAN CONSIDERS ALL FITTINGS, VERTICAL OFFSETS AND AREAS OF NECESSARY EXCAVATION. CHANGES MADE TO DESIGN MAY COMPROMISE THE TREE PROTECTION PLAN. REFER SPECIFICATIONS 01560P. CONDITION OF EACH TREE IS BASED ON VISUAL EVALUATION AT TIME OF DESIGN. CONDITION AND STRUCTURAL INTEGRITY OF EACH TREE IS NOT GUARANTEED BY DESIGNER AT ANY POINT IN THE FUTURE, AS ENVIRONMENTAL AND MAINTENANCE INFLUENCES ON EACH TREE CAN NOT BE DETERMINED BY DESIGNER.
2. IN AREAS WHERE INDIVIDUAL TREES HAVE NOT BEEN TIED IN BY SURVEY APPROXIMATE LOCATION IS INDICATED ON TPP WITH A DOT AND TREE NUMBER. ACCURACY OF REPRESENTED LOCATION IS NOT GUARANTEED BY CN KOEHL URBAN FORESTRY, INC.
3. THE CONTRACTOR'S ARBORIST WILL MARK LOCATIONS OF THE NEW TREES TO BE PLANTED AND OBTAIN APPROVAL BY CITY ENGINEER AND CITY FORESTER BEFORE PURCHASING OR EXCAVATING PLANTING HOLE OF EACH TREE.

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- —X—X— TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- REPLACEMENT PLANTING SPECIES AND SIZE/TYPE
- —OCC— ZERO CUTBACK CURB
- SIDEWALK ON GRADE
- CHECKERPLATE SECTION

Tree No.	Location	Description	Comments	Treatment
78	5103 Tashkent	6" Juniper	Private tree	Clearance prune
79	5103 Tashkent	6' Palm	Private tree, will not be impacted	
80	5103 Tashkent	10" Crepe Myrtle		Zero curb cutback, Fence, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Clearance prune
81	5103 Tashkent	4" Pecan	90% dieback, Private tree	
82	5103 Tashkent	2" Ligustrum	90% dieback, Private tree	
83	5103 Tashkent	2" Ligustrum	90% dieback, Private tree	
84	5103 Tashkent	2" Ligustrum	90% dieback, Private tree	
85	5103 Tashkent	25" Pecan	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune
86	5103 Tashkent	12" Crepe Myrtle		Zero curb cutback, Fence, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Clearance prune
87	15502 Edenvale	4" Pecan	Private tree	Clearance prune
88	15502 Edenvale	2' Sago	Private tree, will not be impacted	
89	15502 Edenvale	15" Live Oak	Private tree	Clearance prune
90	15502 Edenvale	3' Sago	Private tree, will not be impacted	
91	15502 Edenvale	24" Live Oak	Private tree	Root prune for walk, Fence, Clearance prune
92	15503 Blackhawk	10" Pear	Private tree, will not be impacted	
93	15503 Blackhawk	4" Crepe Myrtle	Private tree, will not be impacted	
94	15503 Blackhawk	12" Pear	Private tree	Clearance prune
95	Esplanade	11" Cedar Elm		Clearance prune, Fence
96	15525 Blackhawk	13" Live Oak	Private tree	Clearance prune
97	15525 Blackhawk	24" Sugarberry	Cavities, Poor, Private tree	Root prune for street, Fence, Clearance prune
98	15525 Blackhawk	24" Sugarberry	Private tree	Clearance prune
99	15525 Blackhawk	10" Sugarberry	Tree has been removed	
100	15525 Blackhawk	8" Green Ash	Private tree, will not be impacted	
101	15525 Blackhawk	16" Pear	Tree has been removed	
102	15525 Blackhawk	24" Pear	Tree has been removed	
103	15525 Blackhawk	6' Palm	Remove for ADA sloped walks	Remove tree
104	15525 Blackhawk	3' Sago	Remove for ADA sloped walks	Remove tree
105	Esplanade	20" Live Oak		Root prune for street, Fence, Clearance prune
106	Esplanade	22" Live Oak		Root prune for street, Fence, Clearance prune
107	Esplanade	12" Pine		Root prune for street, Fence, Clearance prune
108	15503 Blackhawk	27" Live Oak	Private tree	16' checkerplate, Root prune for street, Fence, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Clearance prune
109	15506 Blackhawk	36" Live Oak	Private tree	Fence, Clearance prune
110	15510 Blackhawk	22" Live Oak	Private tree	Clearance prune
111	15510 Blackhawk	30" Willow Oak	Private tree, 50% dieback, Poor, will not be impacted	
129	15525 Blackhawk	3' Sago	Remove for ADA sloped walks	Remove tree
130	15525 Blackhawk	5' Palm	Remove for ADA sloped walks	Remove tree

HDR

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Registration No. F-754

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

C.N. Koehl
Urban Forestry, Inc.
210 Stone Bush Ct. ◦ Katy, Texas 7749
281–391–0022 ckoehl@koehlurbanforestry.com
APPROVED: Craig N. Koehl 01–19–2026

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

SHEET NAME

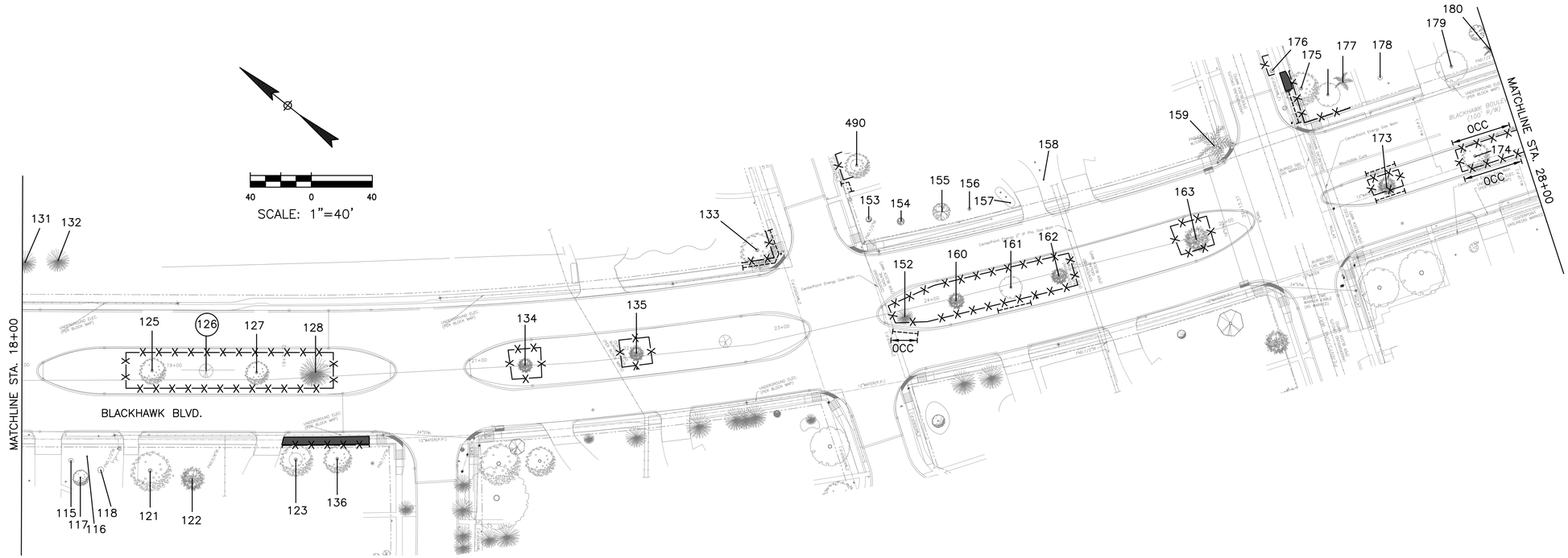
TREE PROTECTION PLAN
SHEET 2 OF 7

SCALE 0 20 40 60 80

SHEET NUMBER

SHEET 106 OF 111

FILE NAME



NOTE:

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TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- —X—X— TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- REPLACEMENT PLANTING SPECIES AND SIZE/TYPE
- 0CC — 0CC — ZERO CUTBACK CURB
- SIDEWALK ON GRADE
- CHECKERPLATE SECTION

Tree No.	Location	Description	Comments	Treatment
115	15514 Blackhawk	3" Leyland Cypress	Tree has been removed	
116	15514 Blackhawk	4" Crepe Myrtle	Private tree, will not be impacted	
117	15514 Blackhawk	10" Water Oak	Private tree, will not be impacted	
118	15514 Blackhawk	5" Silver Maple	Private tree, will not be impacted	
121	15518 Blackhawk	25" Shumard Oak	Private tree	Clearance prune
122	15518 Blackhawk	18" Cedar Elm	Private tree, will not be impacted	
123	5102 Geneva	18" Live Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
125	Esplanade	18" Live Oak		Fence, Clearance prune
126	Esplanade	11" Sugarberry	Root rot, Structurally compromised, Remove	Remove tree
127	Esplanade	14" Live Oak		Fence, Clearance prune
128	Esplanade	26" Pine		Fence, Clearance prune
131	15525 Blackhawk	20" Pear	40% dieback, Private tree	
132	15525 Blackhawk	18" Pear	40% dieback, Private tree	
133	5918 Encino	26" Live Oak	Private tree	Root prune for walk, Fence, Clearance prune
134	Esplanade	10" Cedar Elm	Ball moss	Bore waterline, Clearance prune, Fence
135	Esplanade	11" Cedar Elm	Ball moss	Bore waterline, Clearance prune, Fence
136	5102 Geneva	23" Live Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
152	Esplanade	11" Pine		Bore waterline, Root prune for street, Zero Curb cutback, Fence, Clearance prune
153	5019 Encino	4" Shumard Oak	Thin canopy, Private tree	
154	5019 Encino	14" Tallow	Private tree	Clearance prune
155	5019 Encino	13" Tallow	Private tree	Clearance prune
156	5019 Encino	3" Mimosa	Private tree, will not be impacted	
157	5019 Encino	5" Crepe Myrtle	Private tree	Clearance prune
158	5022 Pennystone	5" Crepe Myrtle	Private tree	Clearance prune
159	5022 Pennystone	20' Palm	Tree has been removed	
160	Esplanade	10" Cedar Elm		Bore waterline, Clearance prune, Fence
161	Esplanade	17" Arizona Ash		Bore waterline, Root prune for street, Fence, Clearance prune
162	Esplanade	10" Cedar Elm		Bore waterline, Root prune for street, Fence, Clearance prune
163	Esplanade	13" Cedar Elm		Bore waterline, Root prune for street, Fence, Clearance prune
173	Esplanade	11" Cedar Elm	Ball moss	Root prune for street, Fence, Clearance prune
174	Esplanade	18" Live Oak		Zero Curb Cutback, Fence, Clearance prune
175	15703 Blackhawk	23" Live Oak	Private tree	Root prune for storm, Demo-Form-Pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
176	15703 Blackhawk	10" Crepe Myrtle		Clearance prune, Fence
177	15703 Blackhawk	19" Cedar Elm	Private tree	Fence, Clearance prune
178	15703 Blackhawk	4" Arizona Ash	Private tree, will not be impacted	
179	15707 Blackhawk	20" Arizona Ash	Tree has been removed	
180	15707 Blackhawk	1' Sago	Private tree, will not be impacted	

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APPROVED: Craig N Koehl 01-19-2026

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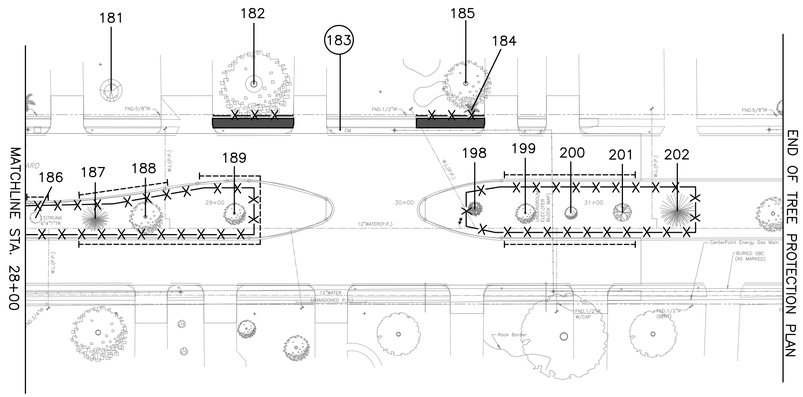
TREE PROTECTION PLAN
SHEET 3 OF 7

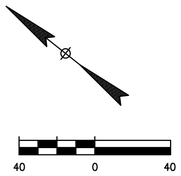
SCALE 0 20 40 60 80

SHEET NUMBER

SHEET 107 OF 111

FILE NAME





SCALE: 1"=40'

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- —X—X— TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- REPLACEMENT PLANTING SPECIES AND SIZE/TYPE
- 0CC — ZERO CUTBACK CURB
- SIDEWALK ON GRADE
- CHECKERPLATE SECTION

NOTE:

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Tree No.	Location	Description	Comments	Treatment
181	15711 Blackhawk	16" Red Maple	Tree has been removed	
182	15715 Blackhawk	33" Arizona Ash	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
183	15719 Blackhawk	6" Crepe Myrtle	Remove for walk	Remove tree
184	15723 Blackhawk	2' Sago	Private tree	Clearance prune
185	15723 Blackhawk	30" Live Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
186	Esplanade	13" Citrus	Tree has been removed	
187	Esplanade	14" Pine		Root prune for street, Fence, Clearance prune
188	Esplanade	16" Live Oak		Root prune for street, Fence, Clearance prune
189	Esplanade	20" Live Oak		Root prune for storm, Root prune for street, Fence, Clearance prune
198	Esplanade	11" Winged Elm		Clearance prune, Fence
199	Esplanade	11" Shumard Oak		Root prune for street, Fence, Clearance prune
200	Esplanade	23" Live Oak		Root prune for street, Fence, Clearance prune
201	Esplanade	12" Tallow		
202	Esplanade	17" Pine		Root prune for street, Fence, Clearance prune

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PROJECT FOR

BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

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Urban Forestry, Inc.
210 Stone Bush Ct. • Katy, Texas 7749
281-391-0022 ckoehl@koehlurbanforestry.com

APPROVED: Cory N Koehl 01-19-2026

MARK	DATE	DESCRIPTION

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CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

SHEET NAME

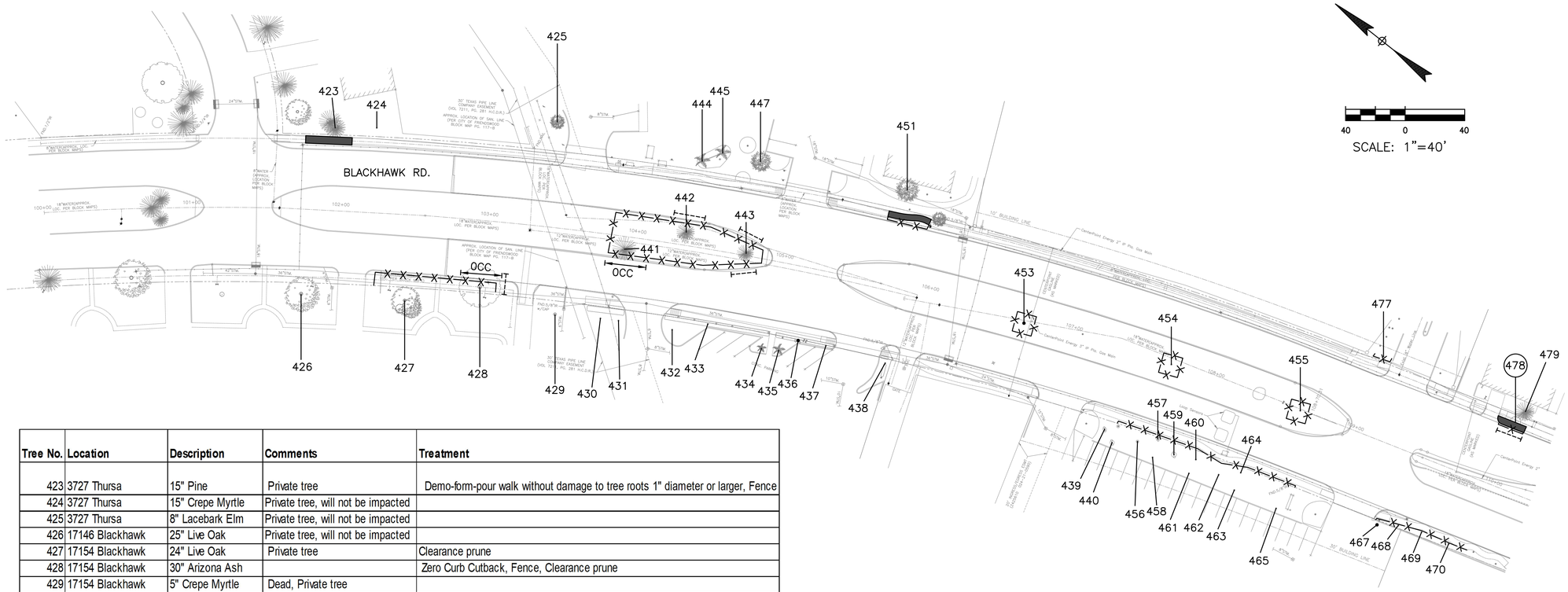
TREE PROTECTION PLAN
SHEET 4 OF 7

SCALE 0 20 40 60 80

SHEET NUMBER

SHEET 108 OF 111

FILE NAME



Tree No.	Location	Description	Comments	Treatment
423	3727 Thursa	15" Pine	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
424	3727 Thursa	15" Crepe Myrtle	Private tree, will not be impacted	
425	3727 Thursa	8" Lacebark Elm	Private tree, will not be impacted	
426	17146 Blackhawk	25" Live Oak	Private tree, will not be impacted	
427	17154 Blackhawk	24" Live Oak	Private tree	Clearance prune
428	17154 Blackhawk	30" Arizona Ash		Zero Curb Cutback, Fence, Clearance prune
429	17154 Blackhawk	5" Crepe Myrtle	Dead, Private tree	
430	Not available	4" Crepe Myrtle	Private tree, will not be impacted	
431	Not available	4" Crepe Myrtle	Private tree, will not be impacted	
432	Not available	6" Crepe Myrtle	Private tree, will not be impacted	
433	Not available	6" Crepe Myrtle	Private tree	Clearance prune
434	Not available	3' Palm	Private tree, will not be impacted	
435	Not available	3' Palm	Private tree, will not be impacted	
436	Not available	8" Crepe Myrtle	Private tree	Clearance prune
437	Not available	6" Crepe Myrtle	Private tree	Clearance prune
438	Not available	6" Crepe Myrtle	Private tree	Clearance prune
439	Not available	12" Crepe Myrtle	Private tree	Clearance prune
440	Not available	12" Crepe Myrtle	Private tree	Clearance prune
441	Esplanade	15" Pine		Zero Curb Cutback, Fence, Clearance prune
442	Esplanade	12" Pine		Root prune for street, Fence, Clearance prune
443	Esplanade	12" Pine		Root prune for street, Fence, Clearance prune
444	Not available	3' Sago	Tree has been removed	
445	Not available	3' Sago	Tree has been removed	
447	Not available	18" Lacebark Elm	Tree has been removed	
451	Not available	12" Lacebark Elm	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Bore waterline, Clearance prune

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- —X—X— TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- REPLACEMENT PLANTING SPECIES AND SIZE/TYPE
- 0CC — ZERO CUTBACK CURB
- SIDEWALK ON GRADE
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Tree No.	Location	Description	Comments	Treatment
453	Esplanade	4" Crepe Myrtle		Fence
454	Esplanade	4" Crepe Myrtle		Fence
455	Esplanade	6" Crepe Myrtle		Fence
456	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
457	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
458	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
459	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
460	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
461	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
462	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
463	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
464	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
465	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
467	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
468	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
469	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
470	Not available	12" Crepe Myrtle	Private tree	Clearance prune, Fence
477	Not available	6" Crepe Myrtle	Private tree	Clearance prune, Fence
478	Not available	12" Arborvitae		Root prune for street, Fence, Clearance prune
479	Not available	15" Pine	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence

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APPROVED: Craig N. Koehl 01–19–2026

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

SHEET NAME

TREE PROTECTION PLAN
SHEET 5 OF 7

SCALE 0 20 40 60 80

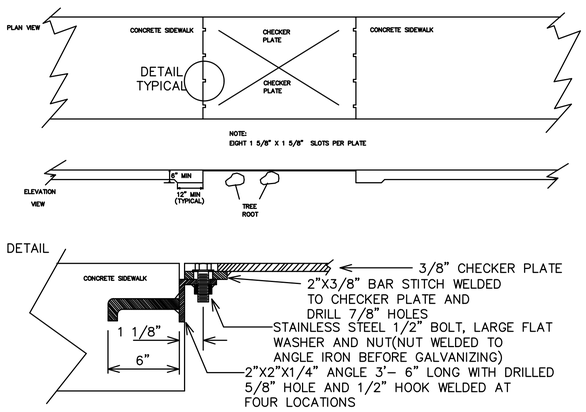
SHEET NUMBER

SHEET 109 OF 111

FILE NAME

TREE REMOVAL LIST

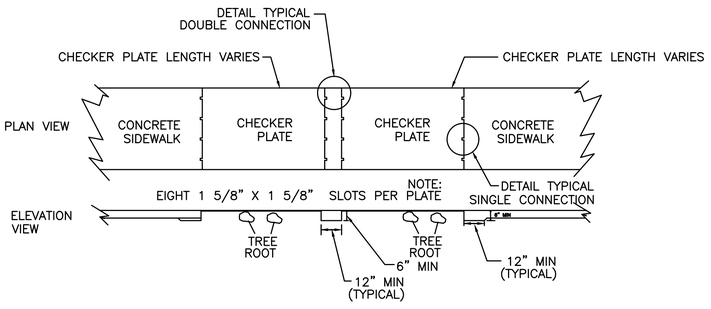
Tree No.	Location	Description	Comments
14	5102 Regal Pine	18" Willow Oak	Trunk decay, Hazardous, Remove for ramp
29	15407 Blackhawk	12" Crepe Myrtle	Remove for wider walk
62	5102 Tashkent	26" Pecan	Remove for ADA sloped walks
103	15525 Blackhawk	6' Palm	Remove for ADA sloped walks
104	15525 Blackhawk	3' Sago	Remove for ADA sloped walks
126	Esplanade	11" Sugarberry	Root rot, Structurally compromised, Remove
129	15525 Blackhawk	3' Sago	Remove for ADA sloped walks
130	15525 Blackhawk	5' Palm	Remove for ADA sloped walks
183	15719 Blackhawk	6" Crepe Myrtle	Remove for walk

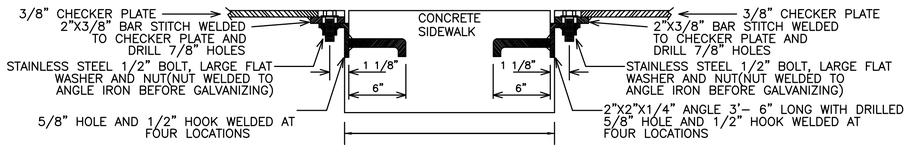


CHECKERPLATE DETAIL-SINGLE CONNECTION

NOT TO SCALE

NOTE:
ALL IRONWORK TO BE HOT DIPPED GALVINIZED EXCEPT AS NOTED.

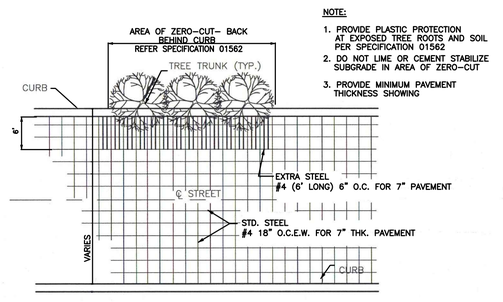




CHECKERPLATE DETAIL-DOUBLE CONNECTION

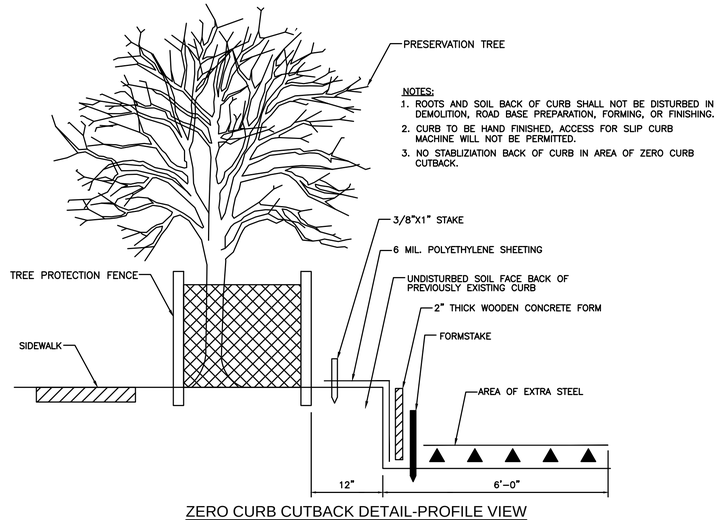
NOT TO SCALE

NOTE:
ALL IRONWORK TO BE HOT DIPPED GALVINIZED EXCEPT AS NOTED.



ZERO CURB CUTBACK DETAIL
EXTRA STEEL BEHIND CURB

NOT TO SCALE



ZERO CURB CUTBACK DETAIL-PROFILE VIEW

NOT TO SCALE

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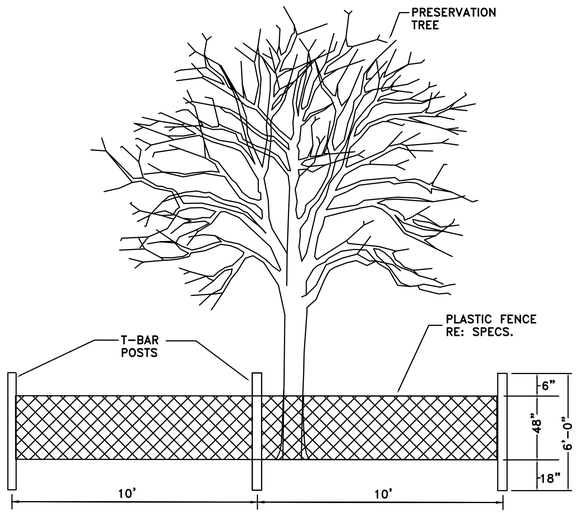
TREE PROTECTION PLAN
SHEET 6 OF 7

SCALE 0 20 40 60 80

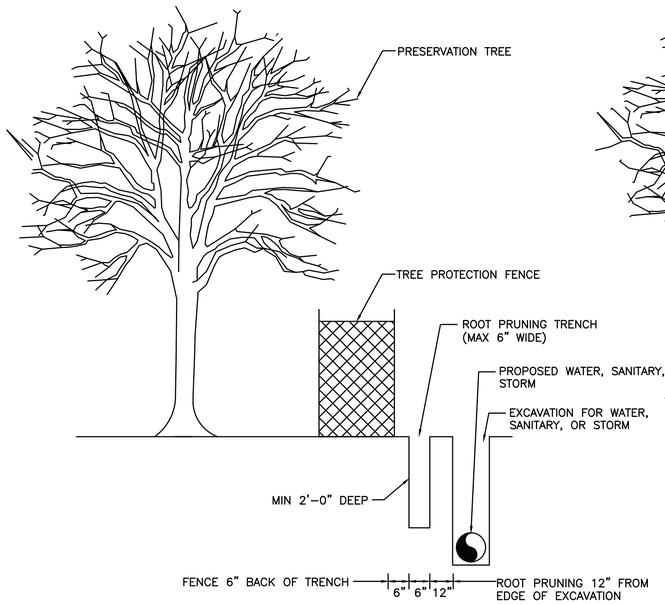
SHEET NUMBER

SHEET 110 OF 111

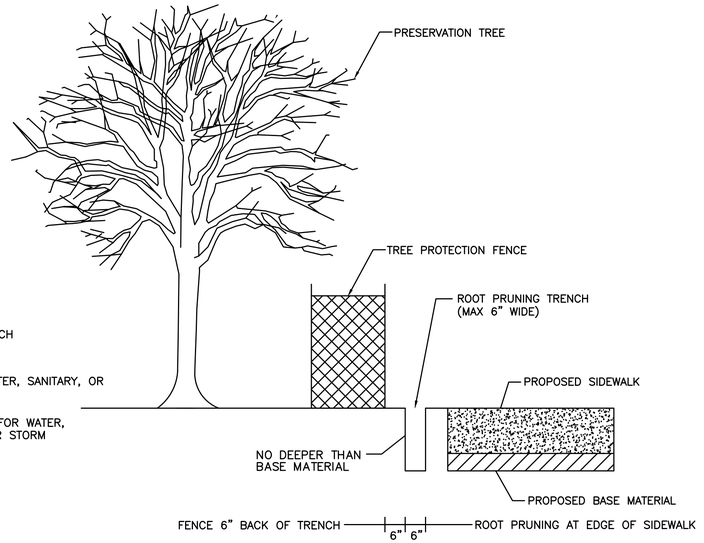
FILE NAME



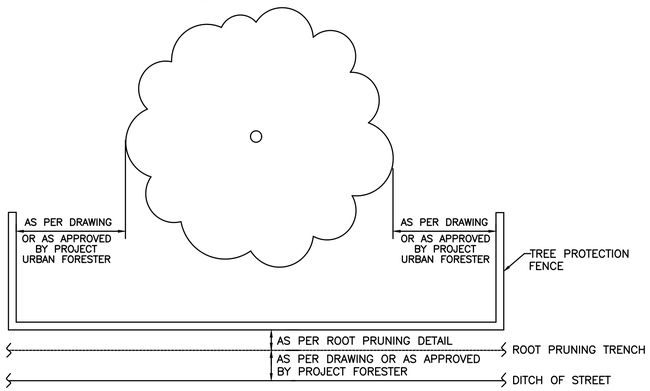
TREE PROTECTION FENCING DETAIL A
NOT TO SCALE



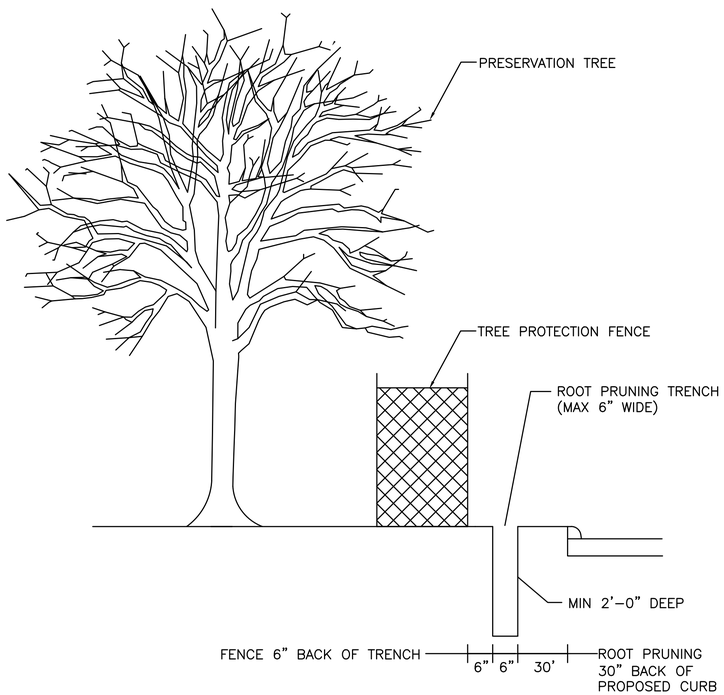
ROOT PRUNE FOR WATER, SANITARY, OR STORM LINE
NOT TO SCALE



ROOT PRUNE FOR SIDEWALK
NOT TO SCALE



TREE PROTECTION FENCING DETAIL B
NOT TO SCALE



ROOT PRUNE FOR STREET-CURB & GUTTER - NO 0CC
NOT TO SCALE

HDR
Texas P.E. Firm
Registration No. F-754

HDR Engineering, Inc.

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Houston, Texas 77081
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PROJECT FOR
BLACKHAWK BOULEVARD RECONSTRUCTION PHASE II REPACKAGE C

C.N. Koehl
Urban Forestry, Inc.
210 Stone Bush Ct. ◦ Katy, Texas 7749
281-391-0022 ckoehl@koehlurbanforestry.com

APPROVED: Craig N. Koehl 01-19-2026

MARK	DATE	DESCRIPTION

PROJECT NUMBER	10390880
CHECKED BY	R. Kumar
DRAWN BY	G.S. Fuller

SHEET NAME

TREE PROTECTION PLAN
SHEET 7 OF 7

SCALE 0 20 40 60 80

SHEET NUMBER

SHEET 111 OF 111

FILE NAME