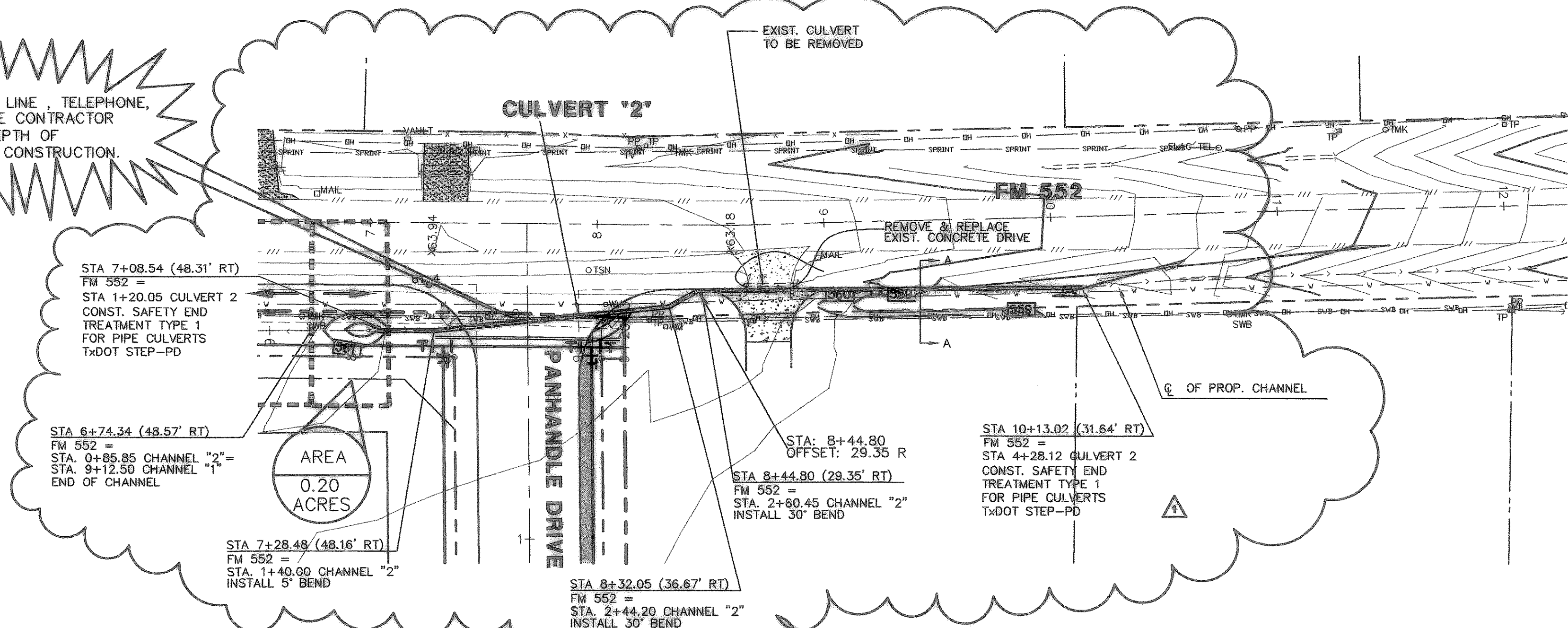


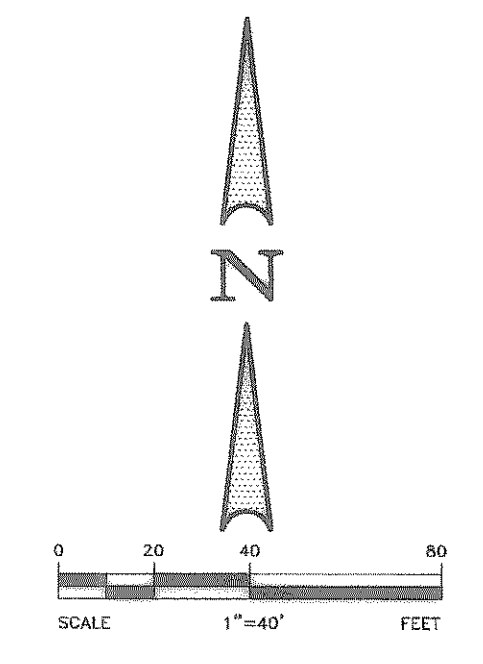
LEGEND 1

TC	TOP OF CURB
TP	TOP OF PAVEMENT
FL	FLOW LINE
2	STREET
△	HANDICAP RAMP @ STREET & STREET INTERSECTION
□	HANDICAP RAMP @ STREET & ALLEY INTERSECTION
→	FLOW ARROWS
▨	EXISTING CONCRETE PAVEMENT
▨	ASPHALT PAVING
742	PROPOSED CONTOUR LINE
742	EXISTING CONTOUR LINE
MP	POWER POLE
MH	MANHOLE
WV	WATER VALVE
TP	TELEPHONE PEDESTAL
WM	WATER METER
FH	FIRE HYDRANT
LP	LIGHT POLE
CO	CLEAN OUT
TV	AIR CONDITIONER
CB	CABLE BOX
SB	SIGNAL BOX
SP	SIGNAL POLE
SN	SIGN
SS	SANITARY SEWER
W	WATER LINE
OH	OVERHEAD POWER LINES
EBOX	ELECTRICAL BOX
TXU	TEXAS UTILITIES
SWB	SOUTH WESTERN BELL
GAS	GAS LINE
RCP	REINFORCED CONCRETE PIPE
TSN	TRAFFIC SIGNS
WMH	WATER MANHOLE
TMK	TELEPHONE MARKER
WMK	WATER MARKER
GMK	GAS MARKER

WARNING!!!
EXIST. UNDERGROUND WATER LINE, TELEPHONE, OVERHEAD WIRES & GAS LINE CONTRACTOR TO VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.



AS BUILT
To the best of our knowledge "Winkelmann and Associates, Inc." hereby states that this plan is "As-Built". The information is based on surveying conducted at the site and modification information provided by "the Contractor".
Winkelmann & Associates, Inc. DATE 9/25/07



Winkelmann & Associates, Inc.
CONSULTING CIVIL ENGINEERS & SURVEYORS
6700 MILLER PLAZA, SUITE 100
DALLAS, TEXAS 75230
(972) 484-7698 FAX (972) 484-7699

APPROVED: [Signature]
DATE: 9/25/07

REVISION: [Signature]
DATE: 9/25/07

CULVERT DESIGN CALCULATIONS

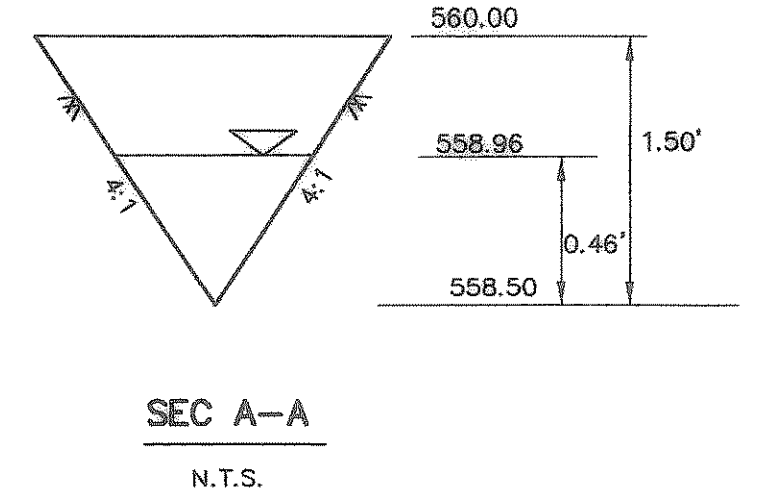
CULVERT LOCATION: DALTON RANCH, ROCKWALL, TEXAS
LENGTH, L: 120.00 FT DESIGN STORM FREQ. 100-YR
ROUGHNESS COEFF., n: 0.012 MAX. VEL. 12.0 ft/sec
TAILWATER: 0.46' D.S. CHANNEL WIDTH: TRIANGULAR
ENTRANCE DESCRIPTION: 5 DESIGN DISCHARGE: 0.98 cfs

ROWY. ELEV. 562.74 U.S. CULV. F.L. 559.51
U.S. CULV. F.L. 559.51 D.S. CULV. F.L. 558.49
DIFFERENCE: 3.23' DIFF. FT. / LENGTH FT.
REQ'D. FREEBOARD: 1.0 FT. CULV. SLOPE, S₀ = 0.51%
ALLOW. HEADWATER: 2.23' FT. S₀ = 1.02 / 199.4 = 0.51%

DOWNSTREAM CHANNEL CALCULATIONS

Q₁₀₀ = 0.98 cfs
n = 0.035
SIDE SLOPE (L & RT.) = 4:1
LONGITUDINAL SLOPE = 0.50%
DEPTH OF FLOW = 0.46 ft
AVERAGE VELOCITY = 1.16 fps

Trial Area of Opening T.A.C. (sq. ft.)	Channel Width "W" (feet)	DEPTH RANGE D.R.		POSSIBLE CULVERT SIZES						INLET CONTROL (Using Figure 26)				OUTLET CONTROL (Using Figure 28 & 30)								The Greater Controlling Head Water (Inlet or Outlet) (feet)	SELECTED CONDUIT SIZE			
		T.A.C. / W	AHW	No.	Pipe Dia. "D" (inch)	Total Culvert Area "A _c " (sf)	"Q" Each Opening (c.f.s.)	Entrance Type	Case No.	HW / D (figure 26)	HW (feet)	Entrance Coeff. K _e	CASE III HW = H + TW - L X S ₀ (feet)				CASE IV HW = H + h ₀ - L X S ₀ (feet)									
		(feet)	(feet)	Openings	(inch)	(sf)	(c.f.s.)					"H" (figure 28)	"TW" (feet)	L X S ₀ (feet)	"HW" (feet)	"H" (figure 28)	h ₀ = d _c + D / 2 (figure 28)	d _c + D / 2 (figure 30)	"TW" (feet)	h ₀ (feet)	L X S ₀ (feet)			"HW" (feet)		
0.08	TRIANGULAR	-	2.81'	18"	1	18"	1.77	0.98	5	I	0.20	0.30	0.20	2.50	0.38	1.38	1.50	2.50	0.20	0.85	0.38	0.85	1.38	1.97	1.97" (OUTLET)	18" RCP



NOTE: FIG. 26, 28 & 30 ARE THE NOMOGRAPHS OF BUREAU OF PUBLIC ROADS, JAN. 1963, PAGE NO. G-26, G-28, G-30

AREA = 0.20 AC
Q₁₀₀ = 0.98 c.f.s.
n = 0.035
S = 0.05%
d = 0.46'
V_{average} = 1.16 ft/sec
Q_{cap} = 68.33 c.f.s.

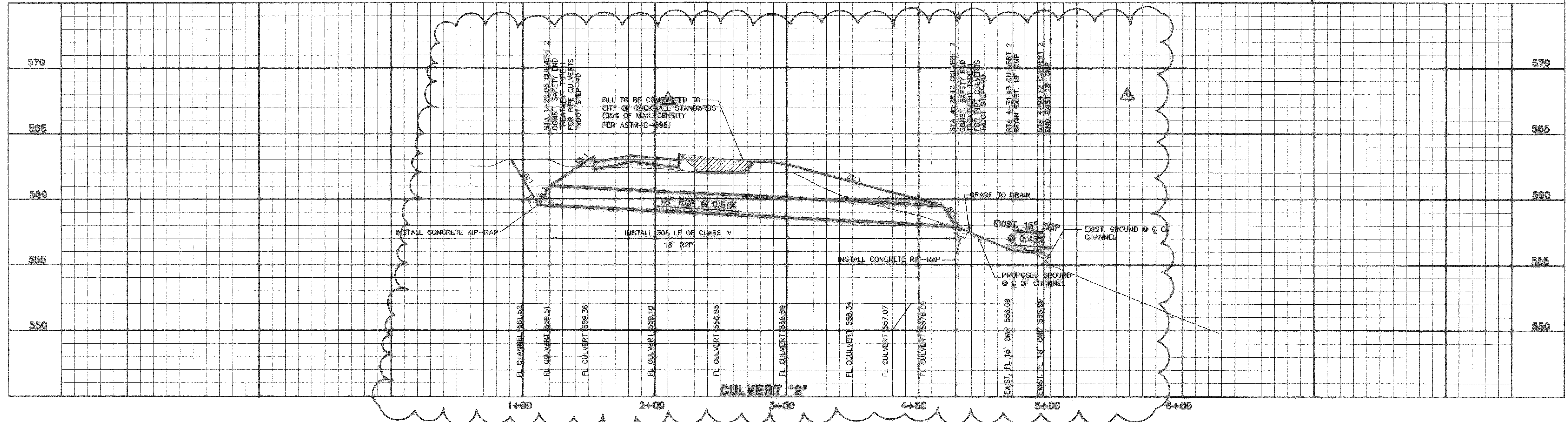
Q₁₀₀ = (C)(I)(A) Q₁₀₀ = (0.50)(9.80)(0.20)
C = 0.50 I = 9.80
A = 0.20 Q₁₀₀ = 0.98 c.f.s.

BENCHMARK 1 USGS Monument—stamped Boren 1986
Located approximately 1.25 miles east of Rockwall at the Rockwall Municipal Airport, in the north end of a circular grass area at the end of a taxiway.
ELEVATION = 574.77

BENCHMARK 2 USGS Monument—5" cap stamped N 1495/1986
Located 24.6 feet west of the center of a paved road leading to the Rockwall Municipal Airport, 16.4 feet south of a utility pole with a transformer and light, 2 feet west of the north leg of a sign. Access to datum point is through a 5 inch logo cap.
ELEVATION = 567.44

CAUTION !!! UNDERGROUND UTILITIES

EXISTING UTILITIES AND UNDERGROUND FACILITIES INDICATED ON THESE PLANS HAVE BEEN LOCATED FROM REFERENCE INFORMATION SUPPLIED BY VARIOUS OWNERS OF THE FACILITIES. THE ENGINEER DOES NOT ACCEPT THE RESPONSIBILITY FOR THE UTILITY LOCATIONS SHOWN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY BOTH HORIZONTALLY AND VERTICALLY THE LOCATION OF ALL EXISTING UTILITIES AND UNDERGROUND FACILITIES PRIOR TO CONSTRUCTION, TO TAKE NECESSARY PRECAUTIONS IN ORDER TO PROTECT ALL FACILITIES ENCOUNTERED, AND TO NOTIFY THE ENGINEER PROMPTLY OF ALL CONFLICTS OF THE WORK WITH EXISTING FACILITIES. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION. ANY DAMAGE BY THE CONTRACTOR TO EXISTING UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE. CONTACT ALL POSSIBLE UTILITY AND UNDERGROUND FACILITY OWNERS.



THESE CONSTRUCTION PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF MD. NAIM UDDIN KHAN, REGISTERED PROFESSIONAL ENGINEER NO. 87776

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY MD. NAIM UDDIN KHAN, P.E. #87776

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CITY OF ROCKWALL
ROCKWALL COUNTY, TEXAS
D R HORTON
4306 MILLER ROAD, SUITE A
ROWLETT, TEXAS 75088
214-807-4244

CULVERT PLAN, PROFILE & CALCULATIONS

Scale: 1" = 40'
Designed By: RS
Drawn By: RS
Checked By: DWG
File: 40709CUL.DWG View: CUL2
Project No.: 40709.00

SHEET 30 OF 45

Date: 02/05/07