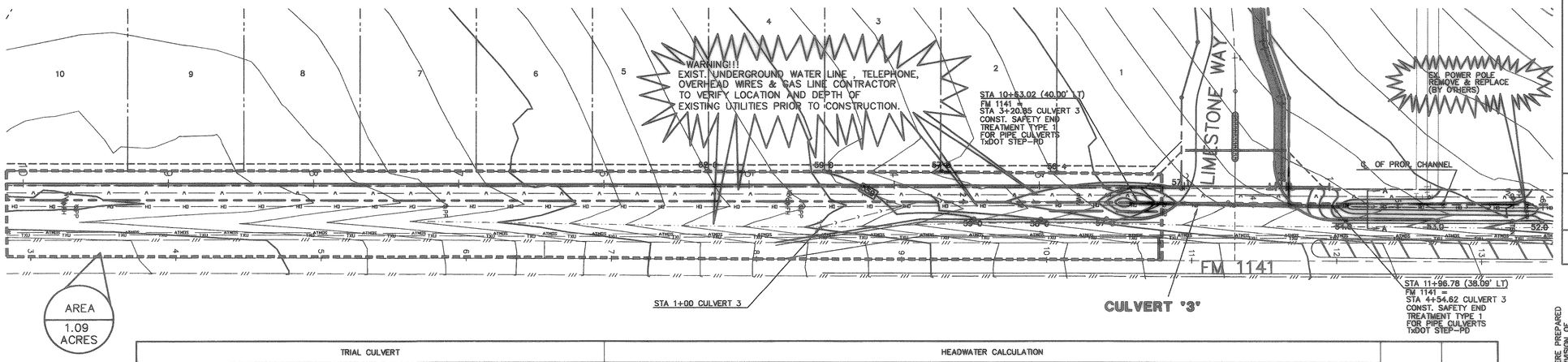
LEGEND 1

| | |
|---|---|
| TC | TOP OF CURB |
| TP | TOP OF PAVEMENT |
| CR | CURB RETURN |
| FL | FLOW LINE |
| 2+ | STREET STATION |
| | 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 |
| PP | POWER POLE |
| MH | MANHOLE |
| WV | WATER VALVE |
| TP | TELEPHONE PEDESTAL |
| WM | WATER METER |
| FH | FIRE HYDRANT |
| LP | LIGHT POLE |
| CO | CLEAN OUT |
| AC | AIR CONDITIONER |
| TV | 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 |




| TRIAL CULVERT | | | | | | | | | HEADWATER CALCULATION | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 |
| Trial Area of Opening $T.A_C = \frac{Q}{V_{max}}$ (sq. ft.) | Channel Width "W" (feet) | $\frac{T.A_C}{W}$ (feet) | AHW (feet) | Try Diameter "D" (inch) | No. Openings | Pipe Dia. "D" (inch) | Total Culvert Area "$A_C$" (sf) | "Q" Each Opening (c.f.s.) | Entrance Type | Case No. | $\frac{HW}{D}$ (figure 26) | HW (feet) | Entrance Coeff. $K_e$ | CASE III HW = H + TW − L X $S_o$ (feet) "H" (figure 28) (feet) | "TW" (feet) | L X $S_o$ (feet) | "HW" (feet) | CASE IV HW = H + $h_o$ − L X $S_o$ (feet) "H" (figure 28) (feet) | $h_o = \frac{d_c + D}{2}$ or $h_o$ = TW (use larger) $d_c$ (figure 30) (feet) | $\frac{d_c + D}{2}$ (feet) | "TW" (feet) | $h_o$ (feet) | L X $S_o$ (feet) | "HW" (feet) | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 0.86 | TRIANGULAR | – | 1.72 | 21" | 1 | 21" | 2.41 | 5.34 | 5 | I | 0.66 | 1.16 | 0.20 | 1.20 | 0.99' | 1.72 | 0.47 | 1.20 | 0.86 | 1.30 | 0.99 | 1.30 | 1.72 | 0.78 | 1.16' (INLET) | 21" RCP |

**CULVERT DESIGN CALCULATIONS**

CULVERT LOCATION: DALTON RANCH, ROCKWALL, TEXAS
LENGTH, L 133.00 FT DESIGN STORM FREQ. 100-YR
ROUGHNESS COEFF., n 0.012 MAX. VEL. 12.0 ft/sec
TAILWATER 0.99' D.S. CHANNEL WIDTH TRIANGULAR
ENTRANCE DESCRIPTION 5 DESIGN DISCHARGE 5.34 cfs

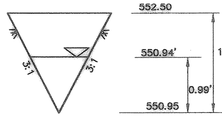
| | |
|---|---|
| RDWY. ELEV. 555.59 | U.S. CULV. F.L. 552.87 |
| U.S. CULV. F.L. 552.87 | D.S. CULV. F.L. 551.15 |
| DIFFERENCE 2.72' | DIFFERENCE 1.72' |
| REQ'D. FREEBOARD 1.0 FT. | CULV. SLOPE, $S_o$ = DIFF. FT. / LENGTH FT. |
| ALLOW. HEADWATER 1.72' FT. | $S_o = \frac{1.72}{133} = 1.29\%$ |

**DOWNSTREAM CHANNEL CALCULATIONS**

$Q_{100}$ = 5.34 cfs
n = 0.035
SIDE SLOPE (RT.) = 3:1
SIDE SLOPE (LT.) = 3:1
LONGITUDINAL SLOPE = 0.50%
DEPTH OF FLOW = 0.99 ft
AVERAGE VELOCITY = 1.82 fps

**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.

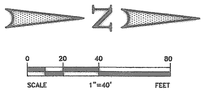



SEC A–A
N.T.S.

AREA = 1.09 AC
$Q_{100}$ = 5.34 c.f.s.
n = 0.035
S = 0.05%
d = 0.99'
$V_{overage}$ = 1.82 ft/sec
$Q_{CAP}$ = 17.67 c.f.s.

$Q_{100} = (C)^*(I)^*(A)$
C = 0.50
I = 9.80
A = 1.09

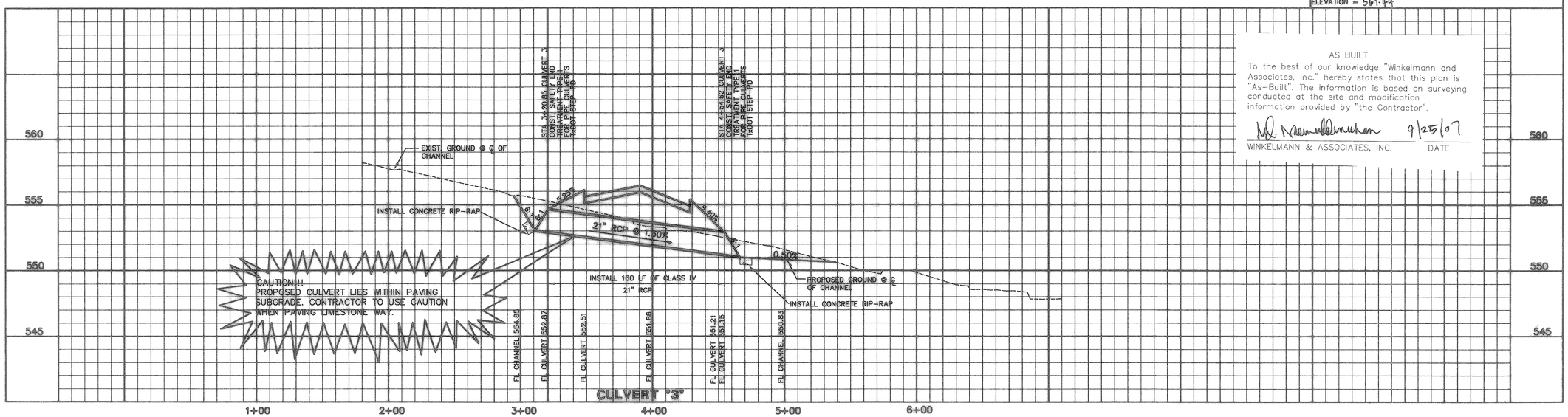
$Q_{100} = (0.50)^*(9.80)^*(1.09)$
$Q_{100}$ = 5.34 c.f.s.




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

**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




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

THESE CONSTRUCTION PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF MD. NAIM UDDIN KHAN, REGISTERED PROFESSIONAL ENGINEER NO. 87776.
9/18/06

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

APPROV. | REVISION | DATE | NO.

Winkelmann & Associates, Inc.
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JOHN W. GLASS SURVEY ABSTRACT No. 88
CITY OF ROCKWALL
ROCKWALL COUNTY, TEXAS

D R HORTON
4306 MILLER ROAD, SUITE A
ROWLETT, TEXAS 75088
214-607-4244

# CULVERT PLAN, PROFILE & CALCULATIONS CULVERT 3

Scale : H: 1"=40' V: 1"=4' | Date : 09/08/06
Designed By : RS
Drawn By : RS
Checked By : NK
File : 40709CUL.DWG | View : CUL3
Project No. : 40709.00

SHEET 31 OF 45