

FINAL DRAINAGE REPORT

**WILDWOOD ACRES SUBDIVISION
FILING TWO**

FRUITA, COLORADO

PREPARED FOR:

FRUITA WILDWOOD, LLC
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PREPARED BY:

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Grand Junction, CO 81506
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Original: February 6, 2004

VEC # 4010.02-01

CERTIFICATION

I hereby certify that this Final Drainage Report for Wildwood Acres Subdivision, Filing Two, was prepared under my direct supervision.



Patrick M. O'Connor
Registered Professional Engineer
State of Colorado, #20759

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FINAL DRAINAGE REPORT

WILDWOOD ACRES SUBDIVISION, FILING TWO

I. LOCATION AND DESCRIPTION OF PROPERTY

PROPERTY LOCATION

Wildwood Acres Subdivision, in entirety, contains approximately 46.36 acres and is located in the City of Fruita, Colorado, between 17 ½ and 18 Roads, south of K 6/10 Road. The project ultimately proposes a total of 137 single family lots. Filing 1 (existing) consists of 14 lots, including a large lot encompassing a home along 18 Road. Filing 2 proposes 64 lots, and Filing 3 currently projects 59 lots. It is currently the intention to develop the site in 2 remaining Filings. The site is currently zoned “Community Residential” as is all surrounding property. The final plan shows the location of the property in relationship to the surrounding vicinity.

Existing streets in the vicinity include 18 Road to the east, 17 ½ Road to the west, and K 6/10 Road to the north. A system of urban residential streets is proposed to run through the project providing access and utility corridors in three directions. These streets will create a connection between two designated collectors (17 ½ Road and 18 Road) through existing Wildwood Estates and Hall Minor Subdivisions. A third connection is proposed to extend through another development to the north, ultimately connecting to K 6/10 Road. A walking trail and pedestrian bridge is anticipated to be constructed by the City (during future filings) below the banks of the Little Salt Wash and for connection to Little Salt Wash Park (a 23 acre community park currently under development by the City of Fruita on the property adjacent to the southeast border of the site). The surrounding land uses in the vicinity include single family dwellings on subdivided tracts and scattered undeveloped residential/rural lands on larger tracts.

DESCRIPTION OF PROPERTY

The site currently contains completed infrastructure for Filing 1, located in the southwest corner, and includes a residential structure in the southeast corner along 18 Road. Previously, the site was in an agricultural utilization with fields of irrigated livestock pasture. It was recently taken out of agricultural production to eliminate flood-irrigation which can impede the installation of underground utilities. An open drain ditch (The Denton Drain) borders the property on the north, but is contained within the adjacent property (currently in the planning stage of development). Runoff from the north is thereby intercepted by this drain ditch. The Little Salt Wash borders the property on the south. Hall Minor Subdivision lies between the eastern boundary and 18 Road. Wildwood Estates Subdivision is adjacent to the west, between the west boundary and 17 ½ Road. Topography of the property is relatively “level” in nature, sloping generally to the west and to the southwest at an average rate of less than one percent.

Based on the "Soil Survey, Grand Junction Area" (by the USDA Soil Conservation Service Series 1940, No. 19), the on-site soils are described as mainly Ravola fine sandy loam(Rc) and Ravola clay loam (Ra) with smaller areas of Billings silty clay loam (Bc) and Fruita very fine sandy loam (Fp) on 0-2% slopes. These soils are defined mainly within the hydrological soils group "B" having a moderate infiltration rate and moderate to low runoff potential.

II. EXISTING DRAINAGE CONDITIONS

MAJOR BASIN

Wildwood Acres is located within the Little Salt Wash Drainage Basin which consists of approximately 60 square miles situated between the other major watersheds of Adobe Creek and Big Salt Wash. Headwaters for this basin begin in Hunter Canyon on the south face of the Bookcliffs and eventually drain to the Colorado River near 17 ½ Road after passing through the northern and western portions of the current City Limits. A map of this basin is included in the appendix.

A defined floodplain exists along Little Salt Wash, however no Wildwood Acres residential lots are proposed within this 100 year floodplain as delineated by the July 15, 1992 Flood Insurance Rate Maps produced by FEMA (partial copy enclosed in the Appendix). These lots are also outside of the Zone "X" area of the 500 year flood. This was determined by a comparison of the flood contours provided in the FEMA mapping with the ground contours established during topographic mapping of the site during the design phase of this project. After adjustment of vertical datums for both sources, it can be seen that the 100 year flood level is well below the north top-of-bank. This top-of-bank was defined during the data collection for the topo survey and generally used to establish the southern property boundary for the lots along the wash. The area between this lot-line and the center of the wash is a tract of ground which will be dedicated to the City of Fruita for use as a conservation easement and pathway for pedestrian access along Little Salt Wash.

SITE

Currently, the property is partially developed with Filing 1 infrastructure complete and housing construction beginning for several lots. The undeveloped portions of the property were recently in an agricultural utilization and drain in a sheet-flow fashion from east to west at an average slope of approximately 0.8 percent. Runoff from the site is collected by streets existing in the recently constructed first filing. These streets collect and carry on-site runoff to the existing storm sewer in Hall Street where it then drains directly into the Little Salt Wash.

OFF-SITE IMPACTS TO THE SITE

An open drain ditch (The Denton Drain) borders the property on the north, but is contained within the adjacent property (currently in the planning stage of development) . Runoff from the north is thereby intercepted by this drain ditch. Runoff from the east is diverted by the existing residential development (Hall Minor Subdivision) and by the existing pavement crown of 18 Road. Because of the elevated roadway surface of 18 Road to the east and the large open drain ditch (Denton Drain) along the north, no offsite impacts are created for the site by areas north or east of these boundaries draining directly onto the site. Agreements with the Grand Junction Drainage District, however, require a redirection of the Denton Drain, near the north-central region of the project. This redirection will intercept runoff from the upper Denton Drain basin consisting of approximately 124 acres. The storm sewer proposed in Dean Court and Doug Court will thereby serve to drain both the northeast portions of the site and the upper Denton Drain.

III. PROPOSED DRAINAGE CONDITIONS

CHANGES IN DRAINAGE PATTERNS

No substantial change in the released drainage pattern is proposed for the site. Drainage patterns within the site will be modified to accommodate development and to better control surface flows to designated collection areas. The developed site will consist of two main basins (A and B) discharging to the south directly into the Little Salt Wash, and one other basin (C) which will discharge into Denton Drain, but then be intercepted and directed to the south, through the subdivision, into the wash along with other upstream Denton flows. Un-detained flows will follow the same path as they do now, traveling southwest into the Colorado River. Two of the three developed basins are divided into several sub-basins to determine flows to the proposed storm inlets. These calculated flows are shown in the appendix. The main storm sewer along Hall Street (the westernmost street) is necessary to carry developed flows south to the wash to reduce accumulated flows on the roadway surface and comply with stormwater criteria for maximum allowable half-street flows. This street parallels existing contours and would have been difficult to grade entirely to the south. A series of low points was, therefore, designed along the roadway to provide inlets for the storm sewer and eliminate street accumulation. Overall, the roadway is sloped slightly to the south to provide an emergency release route for surface drainage should the proposed storm sewer fail. The drain pipe is, however, designed to carry the 100 year runoff below the surface of the street.

Detailed design information is only included for storm sewers within Filings 1 & 2 for this report. Runoff directions and quantities, however, are calculated and included for all future filings and shown on the stormwater management plan included in the appendix. Discussions with the Grand Junction Drainage District indicate a desire to divert existing flows from the Denton Drain (near it's 90 degree turn to the west) southward through the development and into the Little Salt

Wash. This is proposed to be accomplished by routing a diversion pipeline along the property lines (in established easements) and roadways of this filing almost directly south to the wash while utilizing the same pipeline for discharge of the developed runoff in that particular area (Basin C, consisting of developed Basins 6 & 7). Pipe sizing is provided in this design.

OFFSITE IMPACTS FROM THE SITE

Runoff impacts from this site to downstream properties should not be adverse given the stormwater management concept proposed. Site runoff will be intercepted and prevented from sheet flowing off the site to the west by proposed streets, storm sewers, and elevated building site areas along the western boundary. Direct-discharge is recommended by the Stormwater Management Master Plan for the City of Fruita (June, 1998) for developments discharging to the Little Salt Wash. This project is in accordance with this recommendation which was developed to discharge surface runoff from sites located within the lower portions of the major basin prior to arrival of larger flows developed upstream in the majority of the watershed. In addition, development of this site will provide a storm drain "interceptor" which will divert upstream flows from the existing Denton Drain, through the project, and into Little Salt Wash, thereby providing a reduction of flows to the lower reaches of the Denton Drain.

MAINTENANCE

Access to the stormwater management facility will be by existing streets and platted tracts and easements as required. The home owners will provide maintenance responsibility for the surface improvements related to the facility. Operation and maintenance of the underground storm sewers will be the responsibility of the City of Fruita.

IV. DRAINAGE DESIGN CRITERIA AND APPROACH

REGULATIONS

The City of Grand Junction and Mesa County Stormwater Management (SWM) Manual (May 1996) was used as the basis for analysis and facility design criteria. Also utilized was information from the Stormwater Management Master Plan (June, 1998) written for the City of Fruita. Surrounding developments have been approved and constructed within the guidelines of the SWM manual, as will this development, to assure minimal impacts to the downstream properties. Haestad Methods software ("Pondpack" and "Flowmaster") was used to perform the calculations. Copies of all calculations discussed below are included in the appendix of this final report.

HYDROLOGICAL CRITERIA

Because the project is a residential development consisting of several onsite basins ranging in size from less than one acre to approximately eight acres, the "Rational Method" was used to calculate the historic and developed flow rates onsite. Runoff for the upper Denton Drain was determined using TR-55 methods given that the basin contains approximately 124 acres. As required by the "Stormwater Management (SWM) Manual", the minor storm event is considered to be the 2 year frequency storm and the major storm event is considered to be the 100 year frequency event. Developed runoff was calculated for the site (excluding direct runoff from the north bank of the wash, comprising approximately 6 acres) for each individual storm inlet basin and collectively for the 3 main developed basins.

Runoff Coefficients and intensity-duration-frequency data used in the computations were based on the most recent SWM Manual criteria defined above. Coefficients were assigned based on land use and existing hydrological soils groups.

HYDRAULIC CRITERIA

All site facilities and conveyance elements (including streets and inlets) were designed in accordance with the City of Grand Junction SWM Manual and the City of Fruita Design Standards and Construction Specifications. Peak flows were analyzed for both sides of the street and corresponding inlets to insure adequate capacity at all design points.

Open channels and pipelines were analyzed using Manning's Equation and roughness coefficients found in the SWM Manual. The storm sewer pipeline along Hall Street to the Little Salt Wash was sized to carry un-detained flows (direct discharge) of the 100 year peak.

Lag times were calculated for the upper Denton Drain basin and compared with times of concentration for the developed onsite basins (6 & 7) which will share the Denton interceptor. These lag times indicated that the peak flows for the Denton Drain will occur much later than Basin 6 & 7 peaks. In addition, information provided by the Grand Junction Drainage District indicated upstream culvert sizes of 12", each, on both legs of the upper Denton Drain (at 18 Road and K 6/10 Road). These culverts will restrict flows from the upper basin, prior to entering the Wildwood/Denton Interceptor. The combined capacity of these culverts, with 6 feet of headwater, is estimated at approximately 9 cfs (nomograph enclosed in appendix). The interceptor was therefore sized only to accommodate flows from onsite and offsite areas individually. Offsite flows are estimated at 9 cfs and Basin 7 flows are estimated at just over 6 cfs. The 18" interceptor at 1.00% slope will have a non-submerged capacity of approximately 13.5 cfs and a submerged capacity approaching 20 cfs.

V. RESULTS AND CONCLUSIONS

RUNOFF COEFFICIENTS - "C"

Bare / Agricultural	- 0.22 (2 yr.)	0.27 (100 yr.)
Developed (¼ ac./unit)	- 0.33 (2 yr.)	0.42 (100 yr.)

DIRECT-DISCHARGE "DRAINAGE IMPACT FEE"

$$D.I.F. = \$12,000 (C_{d100} - C_{h100}) A^{0.7} = \$12,000 (0.42 - 0.27) (22.103)^{0.7} = \$ 15,717.68$$

DISCHARGE TABLE

<u>BASIN</u>	<u>AREA</u>	<u>t_c (minutes)</u>	<u>Q₂ (cfs)</u>	<u>Q₁₀₀ (cfs)</u>
Basin 1-a	- 3.92 Acres	23	0.83	4.13
Basin 1-b	- 7.94 Acres	21	1.76	8.77
Basin 2-a	- 0.36 Acres	11	0.11	0.53
Basin 2-b	- 2.08 Acres	19	0.48	2.42
Basin 3-a	- 0.24 Acres	11	0.07	0.35
Basin 3-b	- 3.01 Acres	20	0.68	3.41
Basin 4-a	- 2.47 Acres	19	0.57	2.87
<u>Basin 4-b</u>	<u>- 3.19 Acres</u>	<u>20</u>	<u>0.72</u>	<u>3.62</u>
Basin A (TOTAL)	23.21 Acres	25	4.67	23.30
<u>Basin 5</u>	<u>- 4.33 Acres</u>	<u>20</u>	<u>0.97</u>	<u>4.91</u>
Basin B (TOTAL)	4.33 Acres	20	0.97	4.91
Basin 6	- 8.24 Acres	19	1.90	9.59
<u>Basin 7</u>	<u>- 4.71 Acres</u>	<u>15</u>	<u>1.23</u>	<u>6.15</u>
Basin C (Onsite)	12.95 Acres	19	3.13	15.64
Basin E (Denton)	124 Acres	66	-	20
Basin D (Restricted Culverts)		-	-	9

CONCLUSION

The developed site will discharge runoff directly to the Little Salt Wash in accordance with recommendations of the City's SWMP. This stormwater management plan is therefore in conformance with criteria established by the City.

APPENDIX

1. FINAL PLANS AND SITE MAPPING

MAJOR BASIN MAP

VICINITY TOPO MAP

EXISTING CONDITIONS MAP

PRELIMINARY PLAN

GRADING PLAN

OVERALL DRAINAGE AND STORMWATER MANAGEMENT PLAN

STORM DRAIN PLAN AND PROFILE (HALL STREET)

STORM DRAIN PLAN AND PROFILE (DOUG/DEAN COURT)

F.E.M.A. FLOOD MAP

2. HYDROLOGY

“C” VALUES - (Rational Method)

“CN” NUMBERS - (TR-55 Method)

TIMES OF CONCENTRATION

DEVELOPED RUNOFF - 2 & 100 YEAR (ALL BASINS)

3. HYDRAULICS

MAXIMUM HALF-STREET CAPACITIES - GJ SWM MANUAL

MAXIMUM INLET CAPACITIES - SUMP CONDITION

MAXIMUM INLET CAPACITIES - ON-GRADE

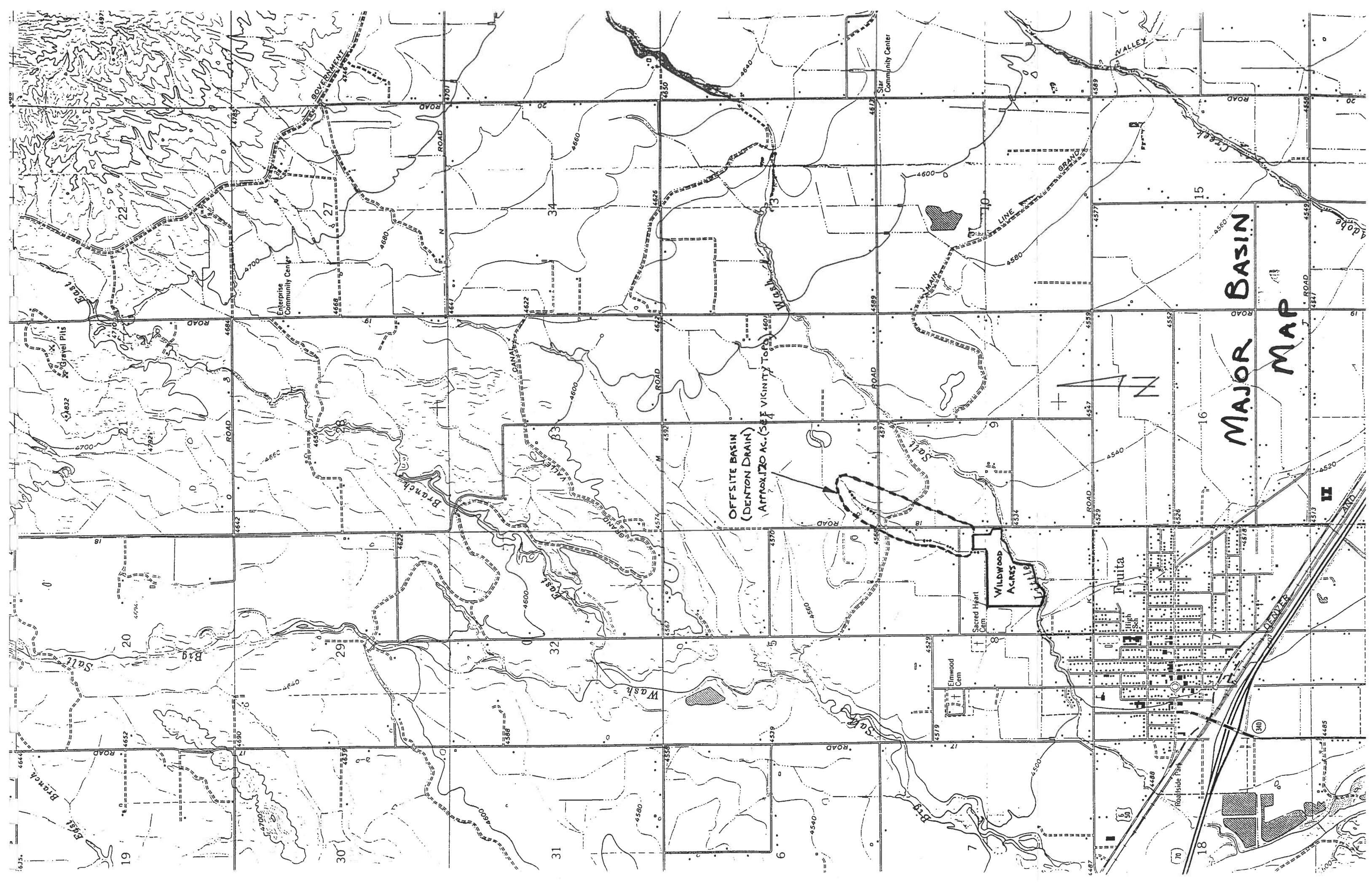
NEENAH TRIPLE-GRATE INFORMATION

DENTON DRAIN - 12" CULVERT NOMOGRAPH

STORM SEWER RATING TABLES (12", 18", AND 24")

SECTION 1

FINAL PLANS AND SITE MAPPING



MAJOR BASIN MAP



OFFSITE BASIN
(DENTON DRAIN)
APPROX. 170 AC. (SEE VICINITY TOPS)

Fruita

WILDWOOD
ACRES

Sacred Heart
Cem.

Elmwood
Cem.

High
Sch.

Roadside Park

Star
Community Center

Enterprise
Community Center

DEVER

VALLEY

70

50

300

31

30

19

16

15

6

7

29

32

20

15

17

8

18

9

18

16

19

20

13

34

27

22

4485

4520

4558

4600

4635

4526

4577

4619

4657

4540

4589

4630

4672

4554

4599

4650

4693

4570

4626

4660

4703

4600

4652

4686

4729

4660

4712

4746

4789

4690

4742

4776

4819

4570

4622

4656

4699

4500

4540

4499

4542

4487

4529

4578

4620

4488

4537

4586

4628

4540

4589

4638

4681

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4741

4660

4709

4758

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4700

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4798

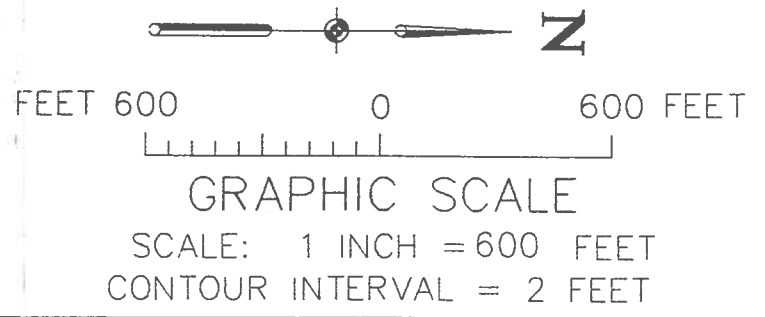
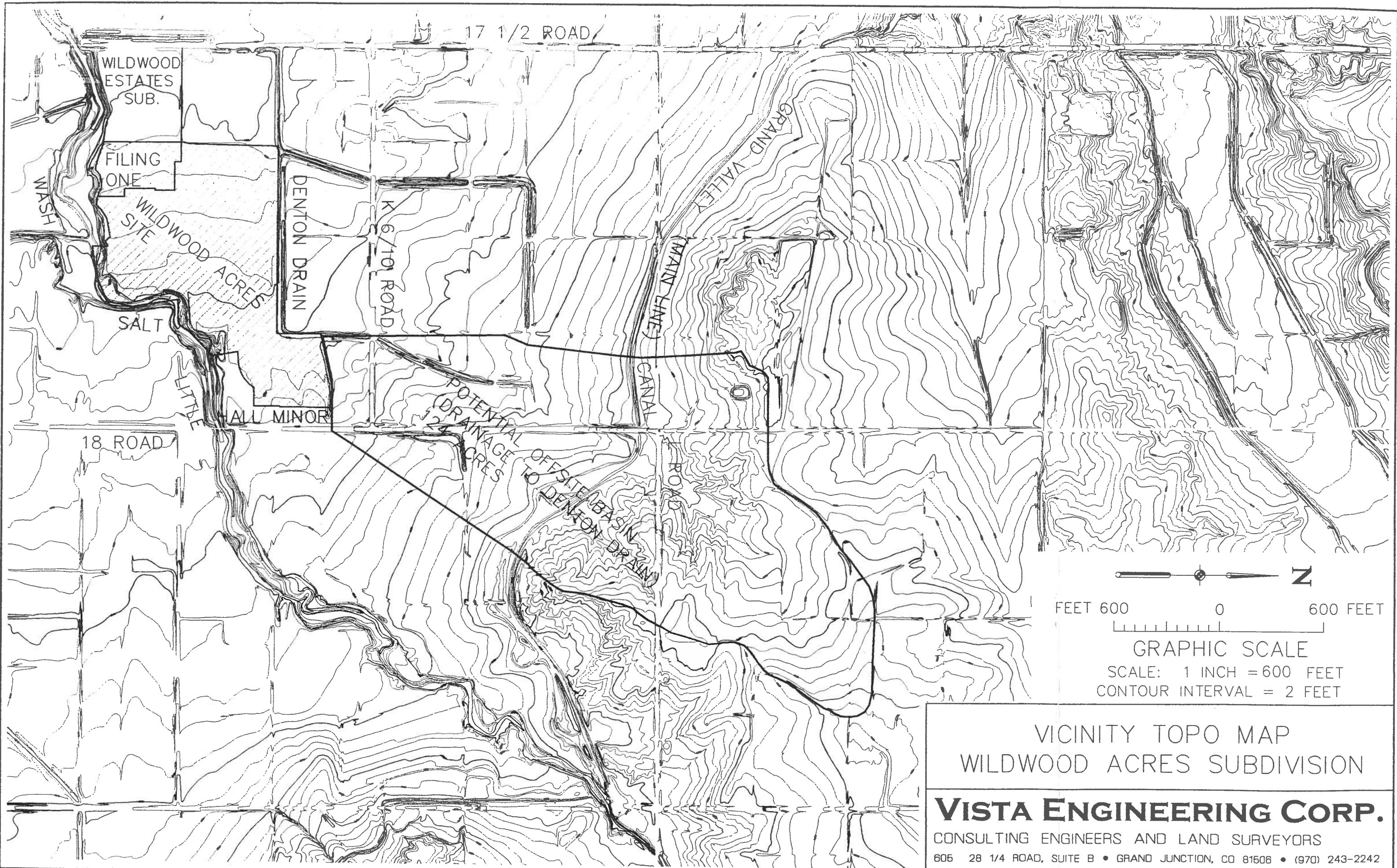
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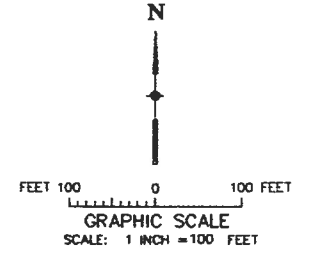
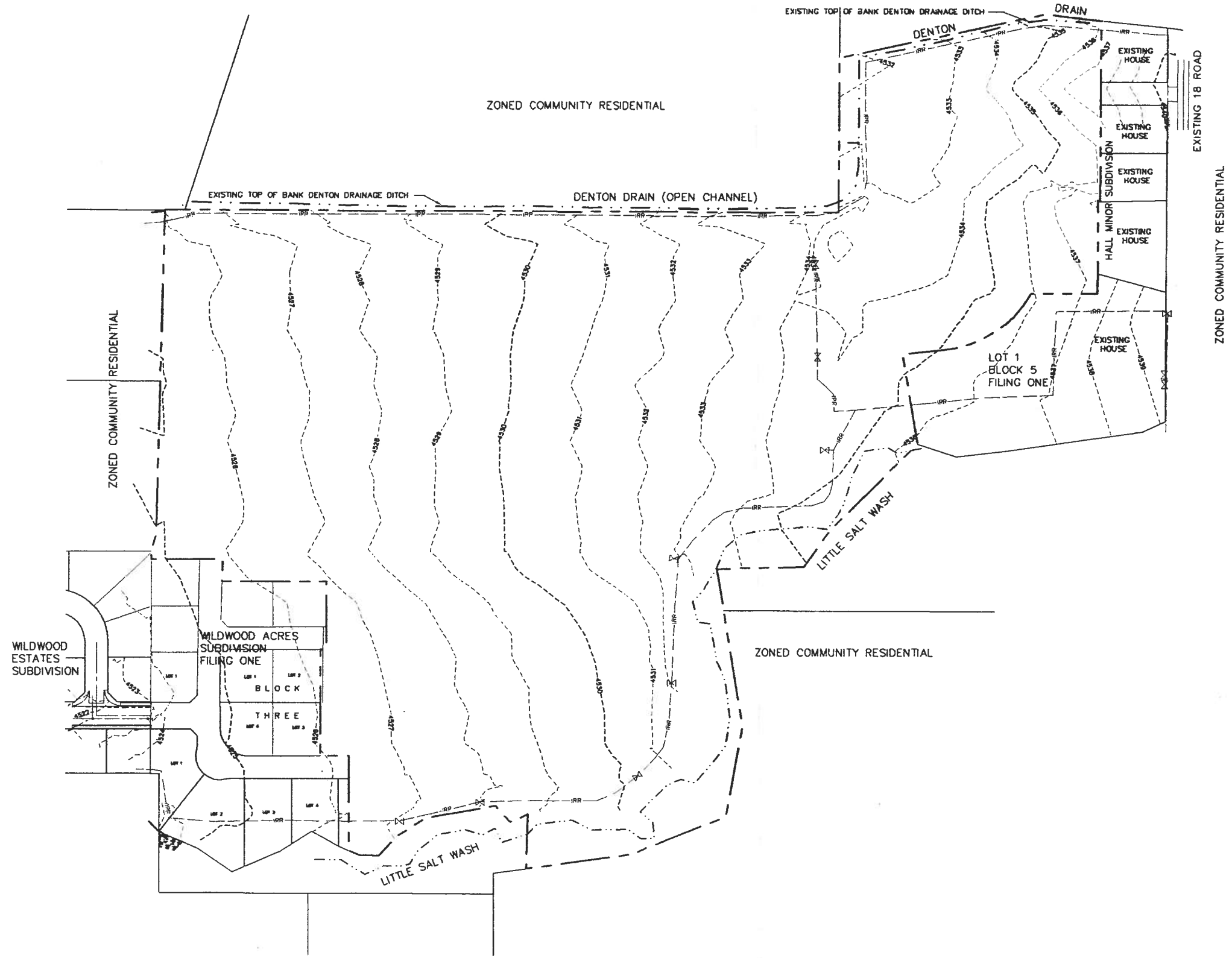
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4841



VICINITY TOPO MAP
WILDWOOD ACRES SUBDIVISION

VISTA ENGINEERING CORP.
CONSULTING ENGINEERS AND LAND SURVEYORS
606 28 1/4 ROAD, SUITE B • GRAND JUNCTION, CO 81506 • (970) 243-2242



LEGEND

- - - - - 4877 - - - - - EXISTING CONTOUR
 - - - - - IRR - - - - - EXISTING IRRIGATION

DRAWN BY: S.G.S.
 DESIGNED BY: P.M.O.
 CHECKED BY: P.M.O.

REVIEWED _____ FOR _____
 DATE: _____
 REVIEWED _____ FOR VISTA ENGINEERING CORP.
 DATE: _____

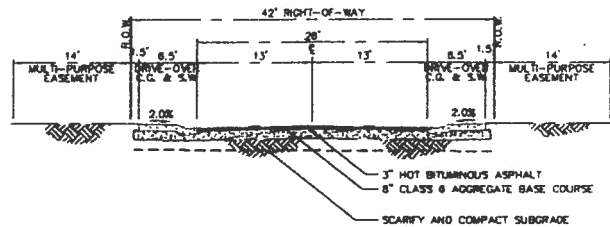
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REVISION	DATE	DESCRIPTION	BY	CHKD

FRUITA WILDWOOD, LLC
 GRAND JUNCTION, COLORADO

EXISTING CONDITIONS MAP
 WILDWOOD ACRES SUBDIVISION, FILING TWO

SCALE: 1" = 100'
 JOB NO: 400.02-01
 DATE: 2-08-04
 SHEET NO: 1 of 1



TYPICAL ROADWAY SECTION
(SUBDIVISION INTERIOR)
NOT TO SCALE

PROPOSED DEVELOPMENT
(BY OTHERS)

ZONED COMMUNITY RESIDENTIAL

DENTON DRAIN DITCH

DENTON DRAIN

ZONED COMMUNITY RESIDENTIAL

WILDWOOD
ESTATES

ZONED COMMUNITY RESIDENTIAL

FUTURE CITY PARK

ZONED COMMUNITY RESIDENTIAL

18 ROAD



FEET 100 0 100 FEET
GRAPHIC SCALE
SCALE: 1 INCH = 100 FEET

LEGEND

- W — H — EXISTING WATER LINE AND HYDRANT
- S — EXISTING SEWER LINE AND MANHOLE
- IRR — EXISTING IRRIGATION
- ● — PROPOSED SEWER LINE AND MANHOLE
- ● — PROPOSED WATER LINE & FIRE HYDRANT
- SD — PROPOSED STORM SEWER
- — PROPOSED BUILDING ENVELOPE

PUBLIC FACILITIES

- | | |
|------------------|------------------------------------|
| SANITARY SEWER | City of Fruita |
| DOMESTIC WATER | Ute Water |
| GAS AND ELECTRIC | Public Service Company of Colorado |
| TELEPHONE | US West Communications |
| CABLE TV | TCI of Western Colorado |
| STORM SEWER | Grand Junction Drainage District |
| IRRIGATION | Grand Valley Irrigation Company |

DRAWN BY: F.J.B.	REVIEWED _____ DATE: _____ FOR _____
DESIGNED BY: P.M.O.	REVIEWED _____ DATE: _____ FOR VISTA ENGINEERING CORP.
CHECKED BY: P.M.O.	

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REVISION	DATE	DESCRIPTION	BY	Q/D

FRUITA WILDWOOD, LLC
GRAND JUNCTION, COLORADO

PRELIMINARY PLAN
WILDWOOD ACRES SUBDIVISION, FILING TWO

SCALE: 1" = 100'
JOB NO: 400.02-02
DATE: 2-08-04
SHEET NO:
8 of 31

WILDWOOD ACRES SUBDIVISION
TOP-OF-CONCRETE ELEVATION TABULATION
2/06/04

LOT	BLOCK	(MINIMUM) T.C. ELEV.	LOT	BLOCK	(MINIMUM) T.C. ELEV.
1	1	4525.5	1	8	4533.1
2	1	4528.1	2	8	4533.8
3	1	4526.8	3	8	4534.0
4	1	4527.3	4	8	4533.0
5	1	4527.8			
			1	7	4533.9
			2	7	4534.9
			3	7	4538.3
			4	7	4538.3
			5	7	4538.7
			6	7	4538.3
			7	7	4538.3
			8	7	4538.3
			9	7	4538.3
			10	7	4538.3
			11	7	4538.3
			12	7	4538.3
			13	7	4538.3
			14	7	4538.3
			15	7	4538.3
			16	7	4538.3
			17	7	4538.3
			18	7	4538.3
			19	7	4538.3
			20	7	4538.3
			21	7	4538.3
			22	7	4538.3
			23	7	4538.3
			24	7	4538.3
			1	9	4533.1
			2	9	4533.8
			3	9	4534.1
			4	9	4534.4
			5	9	4534.6
			6	9	4534.9
			7	9	4533.8
			8	9	4535.5
			9	9	4538.4
			10	9	4536.5
			11	9	4536.5
			12	9	4536.3
			13	9	4536.2
			14	9	4537.7
			15	9	4538.7
			16	9	4538.4
			17	9	4537.9
			18	9	4536.7
			19	9	4538.3
			20	9	4538.4
			21	9	4538.7
			22	9	4537.1
			23	9	4537.5
			24	9	4538.3

LEGEND

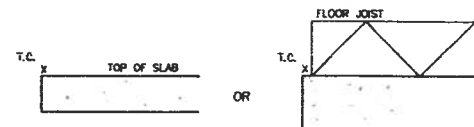
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED TOP-OF-CONCRETE ELEVATION (MINIMUM)

NOTES:

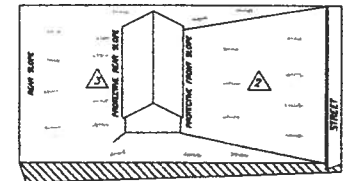
1. ELEVATION CONTOURS ARE BASED UPON A FIELD SURVEY PERFORMED BY VISTA ENGINEERING CORP..
2. MAXIMUM TOP-OF-CONCRETE ELEVATIONS SHALL NOT EXCEED LEVELS CREATING DRIVEWAY SLOPES GREATER THAN MAXIMUM ALLOWED BY CODE.



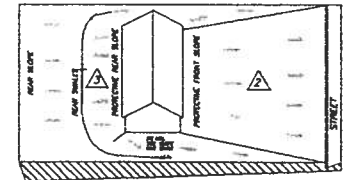
FEET 100 0 100 FEET
GRAPHIC SCALE
SCALE: 1 INCH = 100 FEET



T.C. = TOP OF CONCRETE (MINIMUM ELEVATION)
NOT TO SCALE



TYPE 'B' TYPICAL LOT GRADING



TYPE 'A' TYPICAL LOT GRADING

NOTES:

- ALL LOTS ARE TYPE 'A' UNLESS MARKED OTHERWISE ON PLAN.
- MINIMUM ELEVATION OF TC (TOP OF SLAB OR FOUNDATION) SHALL BE 1.0 FT. + 2% OF STAKE (25') MEASURED FROM FLOWLINE OF GUTTER.
- MINIMUM SIDE AND REAR SLOPES SHALL BE 8' DROP FROM FOUNDATION TO FIRST 10'.

NOTE:

TC = MINIMUM FINISHED FLOOR ELEVATION

BENCHMARK:

Horizontal Control:
C 1/4 Section B, T. 1 N., R. 2 W., Ute PM
MCSM No. 888, GPS ID No. 5312

Vista Engineering Corp. Project Control: N = 73,829.960
E = 44,820.163

SIMS Database:
N = 73,830.015
E = 44,820.139

Vertical Control:
C 1/4 Section B, T. 1 N., R. 2 W., Ute PM
MCSM No. 888, GPS ID No. 5312

Vista Engineering Corp. Project Control: Elevation = 4524.24 feet

SIMS Database: Elevation = 4524.66 feet

The Datum shift going from Vista Engineering Corp. Project Control to the SIMS Database is +0.42 feet.



CALL
1-800-922-1967
UTILITY NOTIFICATION
CENTER OF COLORADO

APPROVED FOR CONSTRUCTION:

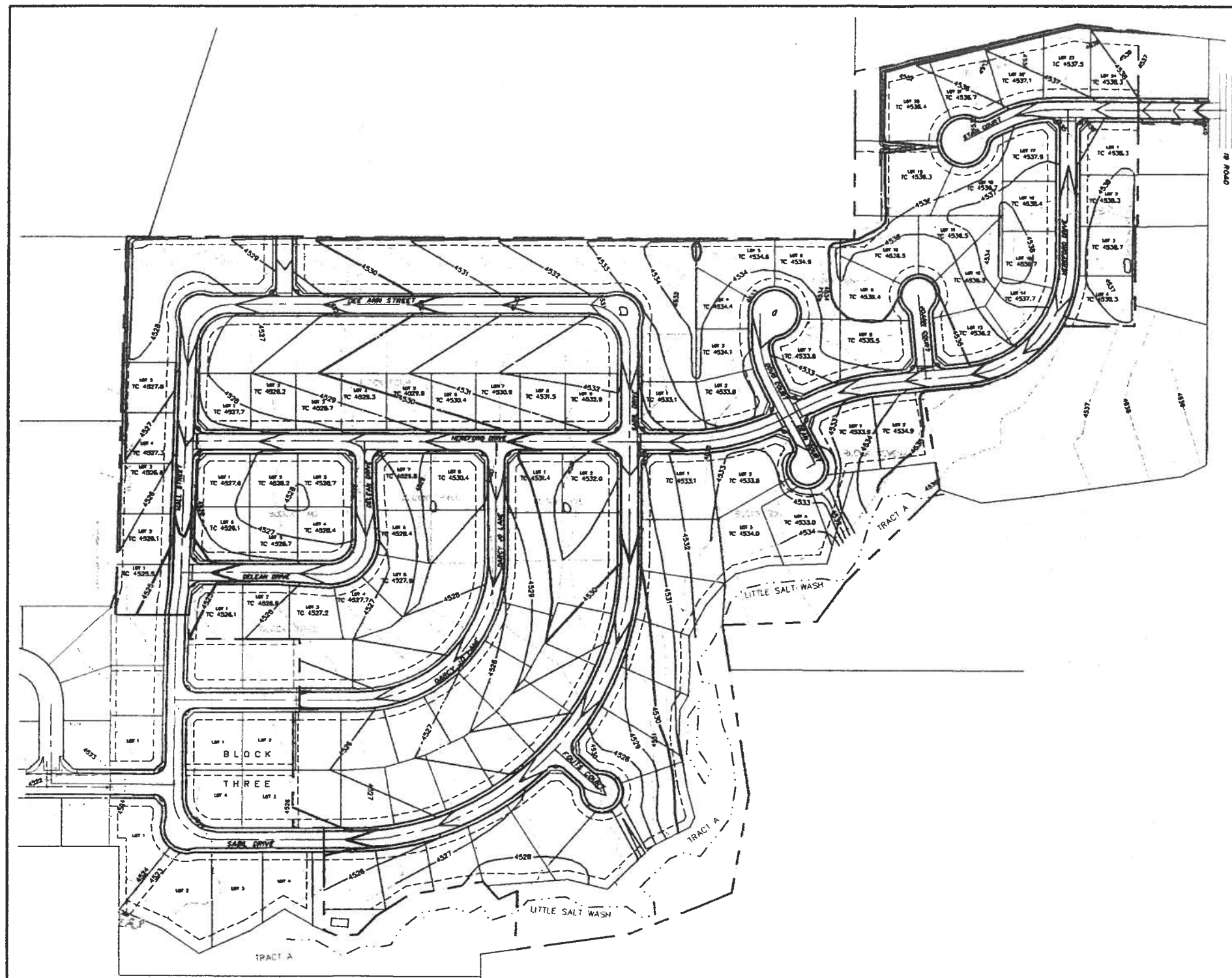
CITY OF FRUITA DATE

ACCEPTED AS CONSTRUCTED:

CITY OF FRUITA DATE

SCALE: 1" = 100' JOB NO: 400.02-01 DATE: 2-6-04

SHEET NO: 20 of 31



DRAWN BY: S.G.S.	REVIEWED _____ DATE: _____ FOR _____
DESIGNED BY: P.M.O.	REVIEWED _____ DATE: _____ FOR VISTA ENGINEERING CORP.
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605 28 1/4 ROAD, SUITE B • GRAND JUNCTION, CO 81608 • (970) 243-2242

REVISION	DATE	DESCRIPTION	BY	CHKD

FRUITA WILDWOOD, LLC
GRAND JUNCTION, COLORADO
GRADING PLAN
WILDWOOD ACRES SUBDIVISION, FILING TWO

DENTON DRAIN OFFSITE
124 AC.

EXISTING 12" CULVERT (K 8/10 ROAD)
EST. CAPACITY = 4.5 CFS

BASIN 7
4.71 AC. (INCL. 1.19 OFFSITE)
TC=15 MIN.
Q2=1.23 CFS
Q100=8.15 CFS

BASIN E (UPPER DENTON DRAIN)
124 AC. (OFFSITE)
Q100=20 CFS PRODUCED

EXISTING 12" CULVERT (18 ROAD)
EST. CAPACITY = 4.5 CFS

BASIN 7 OUTLET DRAIN
18" HDPE
CAPACITY:
13.6 CFS (UNSUBMERGED)
20.0 CFS (SUBMERGED)

BASIN D
128.71 AC.
Q100=9 CFS
(DUE TO UPSTREAM
CULVERT RESTRICTIONS)

EXISTING DENTON DRAIN (OPEN-CHANNEL)

DENTON DRAIN INTERCEPTOR
18" HDPE
CAPACITY:
13.6 CFS (UNSUBMERGED)
20.0 CFS (SUBMERGED)

BASIN 1A
3.92 AC.
TC=23 MIN.
Q2=0.83 CFS
Q100=4.13 CFS

BASIN 1B
7.94 AC.
TC=21 MIN.
Q2=1.76 CFS
Q100=8.77 CFS

BASIN 6
8.24 AC. (INCL. 2.24 OFFSITE)
TC=19 MIN.
Q2=1.91 CFS
Q100=9.59 CFS

BASIN 2A
0.36 AC.
TC=11 MIN.
Q2=0.14 CFS
Q100=0.53 CFS

BASIN 2B
2.08 AC.
TC=15 MIN.
Q2=0.48 CFS
Q100=2.42 CFS

BASIN C
136.95 AC.
Q100=9 CFS (DENTON DRAIN) } ARRIVING
15.74 CFS (BASINS 6&7) } INDEPENDENTLY

BASIN 3A
0.24 AC.
TC=11 MIN.
Q2=0.07 CFS
Q100=0.35 CFS

BASIN 3B
3.01 AC.
TC=20 MIN.
Q2=0.68 CFS
Q100=3.41 CFS

BASIN 5
4.33 AC.
TC=20 MIN.
Q2=0.97 CFS
Q100=4.91 CFS

BASIN 4B
3.19 AC.
TC=20 MIN.
Q2=0.72 CFS
Q100=3.62 CFS

BASIN A
23.21 AC.
TC=25 MIN.
Q2=4.67 CFS
Q100=23.30 CFS

BASIN 4A
2.47 AC.
TC=19 MIN.
Q2=0.57 CFS
Q100=2.87 CFS

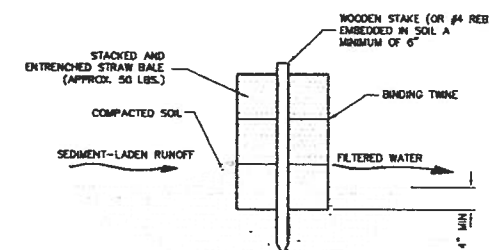
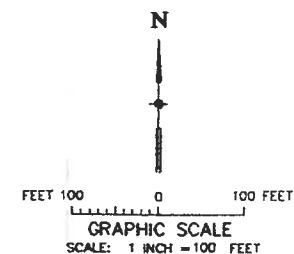
BASIN B
4.33 AC.
Q2=0.97 CFS
Q100=4.91 CFS

LEGEND

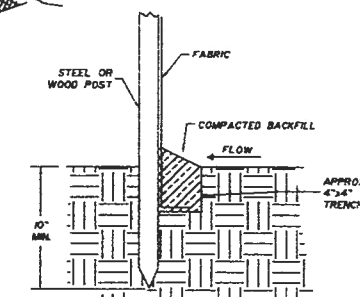
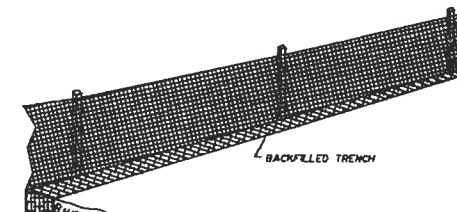
- ← FLOW DIRECTION
- EXISTING CONTOUR
- - - PROPOSED CONTOUR
- ▭ PROPOSED INLET FILTER
- ▭ BASIN BOUNDARY
- ▭ FILING BOUNDARY

NOTES:

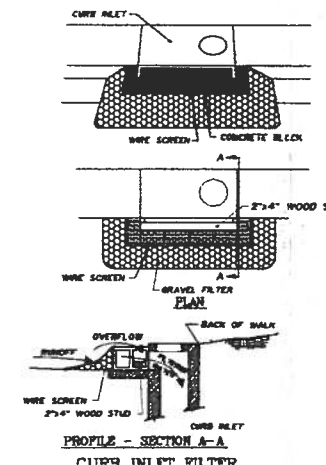
1. ELEVATION CONTOURS ARE BASED UPON A FIELD SURVEY PERFORMED BY WSTA ENGINEERING CORP.
2. MAXIMUM TOP-OF-CONCRETE ELEVATIONS SHALL NOT EXCEED LEVELS CREATING DRIVEWAY SLOPES GREATER THAN MAXIMUM ALLOWED BY CODE.



BALE INSTALLATION



SILT FENCE
N.T.S.



PROFILE - SECTION A-A
CURB INLET FILTER
N.T.S.



CULVERT OUTLET TRAP
N.T.S.

BENCHMARK:

Horizontal Control:
C 1/4 Section 8, T. 1 N., R. 2 W., Ute PM
MCSM No. 888, GPS ID No. 5312

Vista Engineering Corp. Project Control:
N = 73,829.960
E = 44,820.163

SIMS Database:
N = 73,830.015
E = 44,820.139

Vertical Control:
C 1/4 Section 8, T. 1 N., R. 2 W., Ute PM
MCSM No. 888, GPS ID No. 5312

Vista Engineering Corp. Project Control:
Elevation = 4524.24 feet

SIMS Database:
Elevation = 4524.66 feet

The Datum shift going from Vista Engineering Corp. Project Control to the SIMS Database is +0.42 feet.



CALL
1-800-922-1987
UTILITY NOTIFICATION
CENTER OF COLORADO

APPROVED FOR CONSTRUCTION:

CITY OF FRUITA DATE

ACCEPTED AS CONSTRUCTED:

CITY OF FRUITA DATE

SCALE: 1" = 100' JOB NO: 400-02-01 DATE: 2-08-04

SHEET NO:

21 of 31

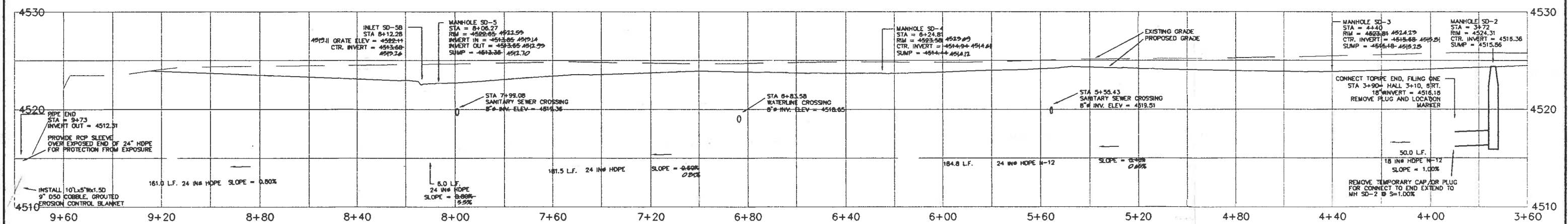
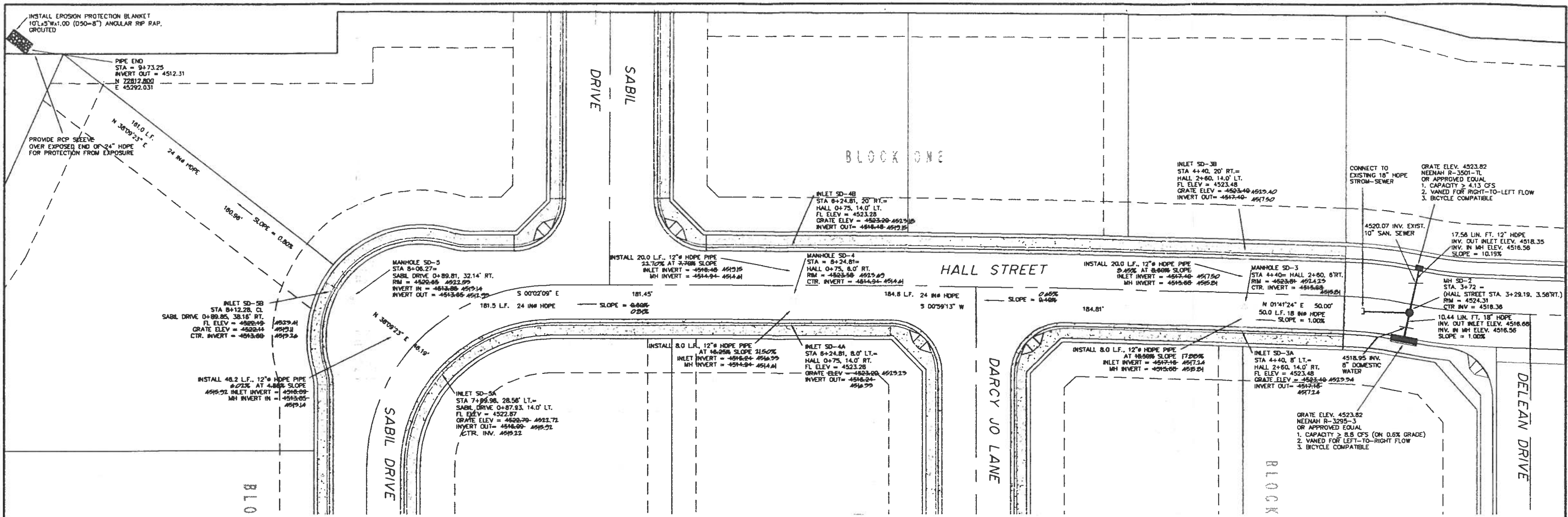
DRAWN BY: S.G.S.	REVIEWED _____ DATE: _____ FOR _____
DESIGNED BY: P.M.O.	REVIEWED _____ DATE: _____ FOR VISTA ENGINEERING CORP.
CHECKED BY: P.M.O.	

VISTA ENGINEERING CORP.
CONSULTING ENGINEERS AND LAND SURVEYORS
806 28 1/4 ROAD, SUITE B • GRAND JUNCTION, CO 81508 • (970) 243-2242

REVISION	DATE	DESCRIPTION	BY	CHKD

FRUITA WILDWOOD, LLC GRAND JUNCTION, COLORADO

OVERALL DRAINAGE AND STORMWATER MANAGEMENT PLAN
WILDWOOD ACRES SUBDIVISION, FILING TWO



BENCHMARK:
 Horizontal Control:
 C 1/4 Section B, T. 1 N., R. 2 W., Ute PM
 MCSM No. 888, GPS ID No. 5312

Vista Engineering Corp. Project Control:
 N = 73,829.960
 E = 44,820.163

SMS Database:
 N = 73,830.015
 E = 44,820.139

Vertical Control:
 C 1/4 Section B, T. 1 N., R. 2 W., Ute PM
 MCSM No. 888, GPS ID No. 5312

Vista Engineering Corp. Project Control:
 Elevation = 4524.24 feet

SMS Database:
 Elevation = 4524.66 feet

The Datum shift going from Vista Engineering Corp. Project Control to the SMS Database is +0.42 feet.



CALL
 1-800-922-1987
 UTILITY NOTIFICATION
 CENTER OF COLORADO

APPROVED FOR CONSTRUCTION

CITY OF FRUITA _____ DATE _____

ACCEPTED AS CONSTRUCTED

CITY OF FRUITA _____ DATE _____

DRAWN BY: SGS	REVIEWED _____
	DATE: _____ FOR _____
CHECKED BY: PMO	REVIEWED _____
	DATE: _____ FOR VISTA ENGINEERING CORP.

VISTA ENGINEERING CORP.
 CONSULTING ENGINEERS AND LAND SURVEYORS
 806 28 1/4 ROAD, SUITE B • GRAND JUNCTION, CO 81608 • (870) 243-2242

REVISION	DATE	DESCRIPTION	BY	Q/D

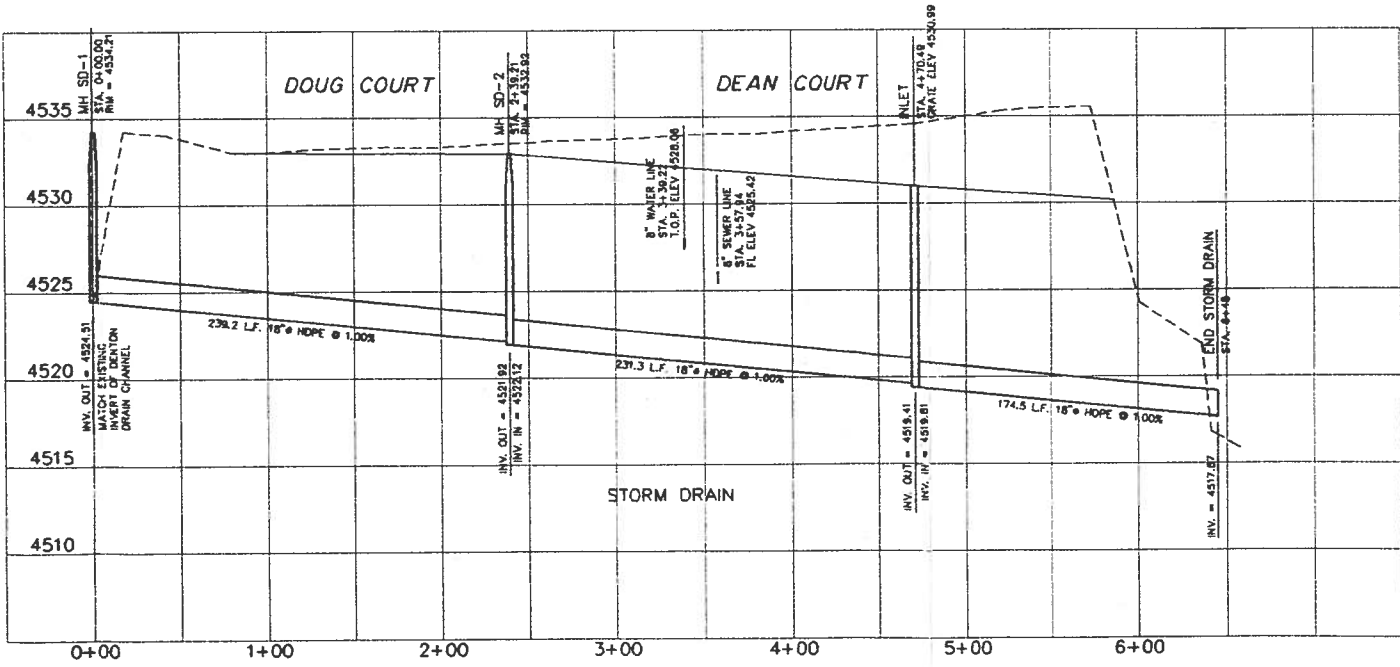
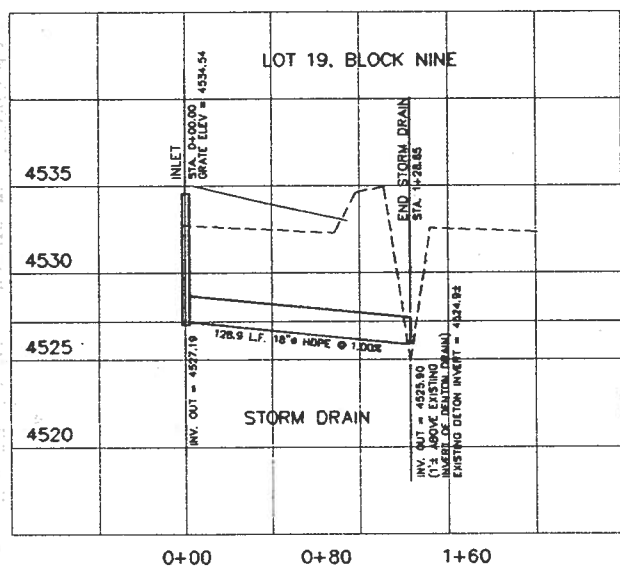
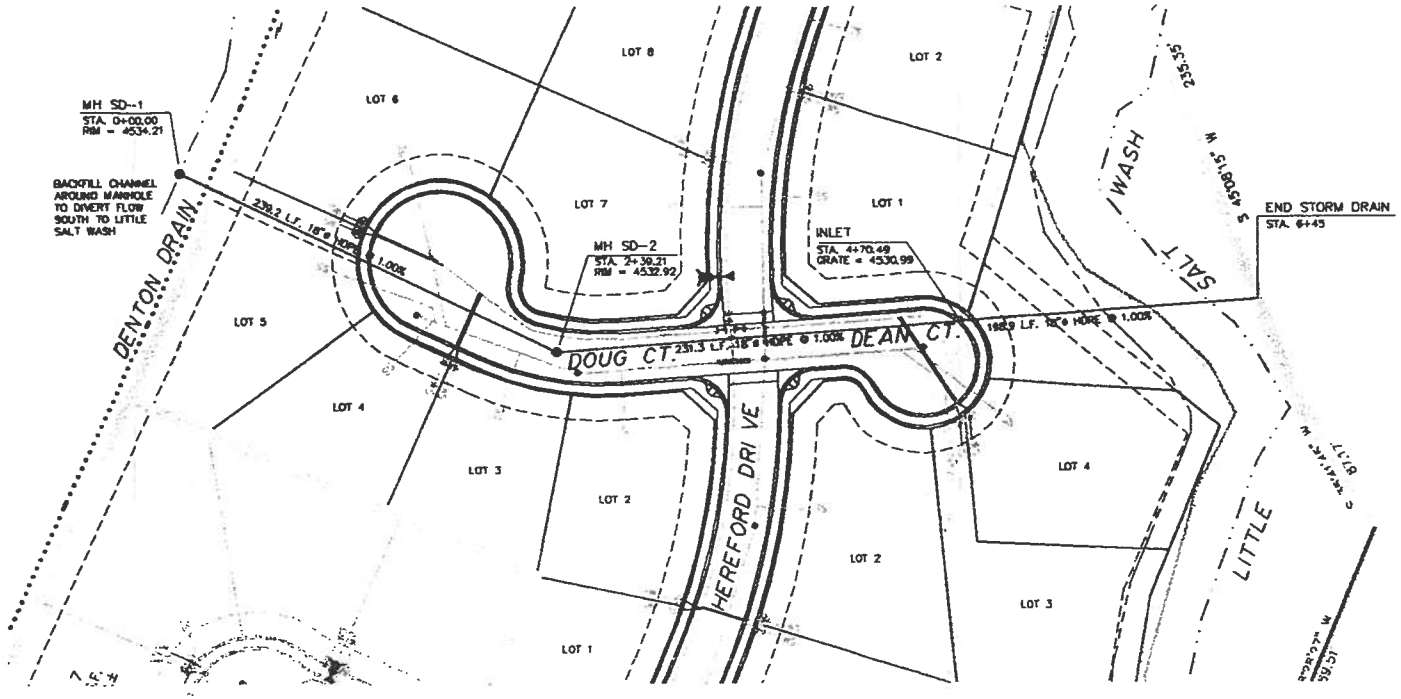
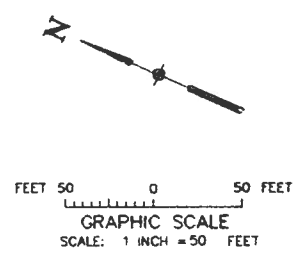
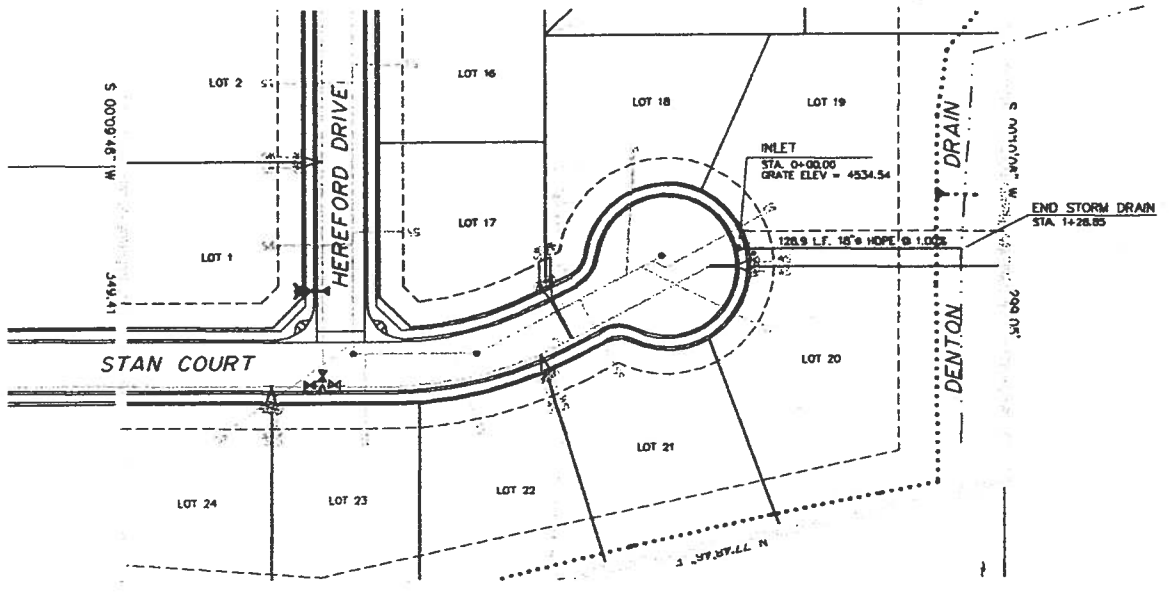
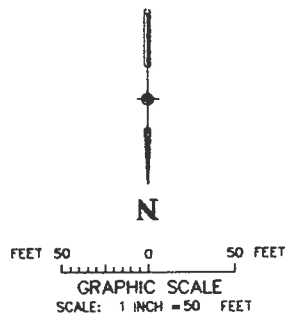
FRUITA WILDWOOD, LLC
 FRUITA, COLORADO

STORM DRAIN PLAN AND PROFILE (HALL STREET)
 WILDWOOD ACRES SUBDIVISION, FILING TWO

SCALE:
 Horiz: 1" = 20'
 Vert: 1" = 5'

DATE: 2-06-04

Project No: 4010.02-02
 SHEET NO: 22 of 31



Horizontal Control:
 C 1/4 Section B, T. 1 N., R. 2 W., Ute PM
 MCSM No. 888, GPS ID No. S312

Vista Engineering Corp. Project Control:
 N = 73,829,960
 E = 44,620,153

SIMS Database:
 N = 73,830,015
 E = 44,620,139

Vertical Control:
 C 1/4 Section B, T. 1 N., R. 2 W., Ute PM
 MCSM No. 888, GPS ID No. S312

Vista Engineering Corp. Project Control:
 Elevation = 4524.24 feet

SIMS Database:
 Elevation = 4524.66 feet

The Datum shift going from Vista Engineering Corp. Project Control to the SIMS Database is +0.42 feet.



APPROVED FOR CONSTRUCTION	
CITY OF FRUITA	DATE
ACCEPTED AS CONSTRUCTED	
CITY OF FRUITA	DATE
SCALE: Metric: 1" = 50' Verk: 1" = 5'	Project No: 4010.02-02
DATE: 2-06-04	SHEET NO: 23 of 31

DRAWN BY: F.J.B.	REVIEWED _____ DATE: _____ FOR _____
CHECKED BY: P.M.O.	REVIEWED _____ DATE: _____ FOR VISTA ENGINEERING CORP.

VISTA ENGINEERING CORP.
 CONSULTING ENGINEERS AND LAND SURVEYORS
 806 28 1/4 ROAD, SUITE B • GRAND JUNCTION, CO 81608 • (970) 243-2242

REVISION	DATE	DESCRIPTION	BY	CHK'D

FRUITA WILDWOOD, LLC
 GRAND JUNCTION, COLORADO

STORM DRAIN PLAN AND PROFILE
 WILDWOOD ACRES SUBDIVISION, FILING TWO

SECTION 2
HYDROLOGY

WILDWOOD ACRES 12/00 BAI # 40010

HISTORIC DEVELOPED
 2 YR. 0.22 0.33
 100 YR. 0.27 0.42

LAND USE OR SURFACE CHARACTERISTICS	SCS HYDROLOGIC SOIL GROUP (SEE APPENDIX "C" FOR DESCRIPTIONS)											
	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
UNDEVELOPED AREAS												
Bare ground	10-20 14-24	16-26 22-32	25-35 30-40	14-22 20-28	22-30 28-36	30-38 37-45	20-28 26-34	28-36 35-43	36-44 40-48	24-32 30-38	30-38 40-48	40-48 50-58
Cultivated/Agricultural	08-18 14-24	13-23 18-28	16-26 22-32	11-19 16-24	15-23 21-29	21-29 28-36	14-22 20-28	19-27 25-33	26-34 34-42	18-26 24-32	23-31 29-37	31-39 41-49
* Pasture	12-22 15-25	20-30 25-35	30-40 37-47	18-26 23-31	28-36 34-42	37-45 45-53	24-32 30-38	34-42 42-50	44-52 52-60	30-38 37-45	40-48 50-58	50-58 62-70
Meadow	10-20 14-24	16-26 22-32	25-35 30-40	14-22 20-28	22-30 28-36	30-38 37-45	20-28 26-34	28-36 35-43	36-44 44-52	24-32 30-38	30-38 40-48	40-48 50-58
Forest	05-15 08-18	08-18 11-21	11-21 14-24	08-16 10-18	11-19 14-22	14-22 18-26	10-18 12-20	13-21 16-24	16-24 20-28	12-20 15-23	16-24 20-28	20-28 25-33
RESIDENTIAL AREAS												
1/8 acre per unit	40-50 48-58	43-53 52-62	46-56 55-65	42-50 50-58	45-53 54-62	50-58 59-67	43-53 53-61	48-56 57-65	53-61 64-72	48-56 56-64	51-59 60-68	57-65 69-77
* 1/4 acre per unit	27-37 33-45	31-41 39-49	34-44 42-52	29-37 38-46	34-42 42-50	38-46 47-55	32-40 41-49	36-44 45-53	41-49 52-60	35-43 43-51	39-47 47-55	45-53 57-65
1/3 acre per unit	22-32 31-41	26-36 35-45	29-39 38-48	25-33 33-41	29-37 38-46	33-41 42-50	28-36 36-44	32-40 41-49	37-45 48-56	31-39 39-47	35-43 43-51	42-50 53-61
1/2 acre per unit	16-26 23-35	20-30 29-39	24-34 32-42	19-27 28-36	23-31 32-40	28-36 36-44	22-30 31-39	27-35 35-43	32-40 42-50	26-34 34-42	30-38 38-46	37-45 48-56
1 acre per unit	14-24 22-32	19-29 26-36	22-32 29-39	17-25 24-32	21-29 28-36	26-34 34-42	20-28 28-36	25-33 32-40	31-39 40-48	24-32 31-39	29-37 35-43	35-43 46-54
MISC. SURFACES												
Pavement and roofs	93 95	94 96	95 97	93 95	94 96	95 97	93 95	94 96	95 97	93 95	94 96	95 97
Traffic areas (soil and gravel)	55-65 65-70	60-70 70-75	64-74 74-79	60-68 68-76	64-72 72-80	67-75 75-83	64-72 72-80	67-75 75-83	69-77 77-85	72-80 79-87	75-83 82-90	77-85 84-92
Green landscaping (lawns, parks)	10-20 14-24	16-26 22-32	25-35 30-40	14-22 20-28	22-30 28-36	30-38 37-45	20-28 26-34	28-36 35-43	36-44 42-50	24-32 30-38	30-38 40-48	40-48 50-58
Non-green and gravel landscaping	30-40 34-44	36-46 42-52	45-55 50-60	45-55 50-60	48-56 54-62	50-58 57-65	40-48 46-54	48-56 55-63	56-64 64-72	44-52 50-58	50-58 60-68	60-68 70-78
Cemeteries, playgrounds	20-30 24-34	26-36 32-42	35-45 40-50	35-45 40-50	38-46 46-54	40-48 47-55	30-38 36-44	38-44 45-53	46-54 54-62	34-42 40-48	40-48 50-58	50-58 60-68

NOTES: 1. Values above and below pertain to the 2-year and 100-year storms, respectively.
 2. The range of values provided allows for engineering judgment of site conditions such as basic shape, homogeneity of surface type, surface depression storage, and storm duration. In general, during shorter duration storms (Tc < 10 minutes), infiltration capacity is higher, allowing use of a "C" value in the low range. Conversely, for longer duration storms (Tc > 30 minutes), use a "C" value in the higher range.
 3. For residential development at less than 1/8 acre per unit or greater than 1 acre per unit, and also for commercial and industrial areas, use values under MISC SURFACES to estimate "C" value ranges for use.

RATIONAL METHOD RUNOFF COEFFICIENTS
 (Modified from Table 4, UC-Davis, which appears to be a modification of work done by Rawls)

TABLE "B-1"

FIGURE S-4 RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL-COVER COMPLEXES (Antecedent moisture condition II, and $I_a = 0.2 S$) 12.4 AC.

2/1/04

Land use	Cover Treatment or practice	Hydrologic condition	Hydrologic soil group			
			A	B	C	D
Fallow	Straight row	----	77	86	91	94
Row crops <u>3/</u>	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	"and terraced " " "	Poor Good	66 62	74 71	80 78	82 81
Small <u>3/</u> grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured "and terraced	Poor	63	74	82	85
		Good	61	73	81	84
		Poor Good	61 59	72 70	79 78	82 81
Close-seeded legumes <u>1/</u> or rotation meadow	Straight row " "	Poor	66	77	85	89
		Good	58	72	81	85
	Contoured " "and terraced "and terraced	Poor	64	75	83	85
		Good	55	69	78	83
		Poor	63	73	80	83
		Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
		Poor	47	67	81	88
		Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods (Isolated groves on farms & ranches)		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) <u>2/</u> (hard surface) <u>2/</u>		----	72	82	87	89
		----	74	84	90	92

1/ Close-drilled or broadcast

2/ Including right-of-way

3/ Do not use adjustments for contoured or terraced treatments with storm frequencies greater than 10 years.

USE, CN = 75 ±

Quick TR-55 Ver.5.46 S/N:
Executed: 17:48:42 02-02-2004 WLDWD-2.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

Wildwood Acres, Filing 2
2/1/04
DEVELOPED BASINS 1a - 7

<u>Subarea descr.</u>	<u>Tc or Tt</u>	<u>Time (hrs)</u>
DEV 1-a	Tc	0.39
DEV 1-b	Tc	0.35
DEV 2-a, 3-a	Tc	0.19
DEV 2-b	Tc	0.31
DEV 3-b	Tc	0.33
DEV 4-a	Tc	0.31
DEV 4-b	Tc	0.34
DEV 5	Tc	0.33
DEV 6	Tc	0.32
DEV 7	Tc	0.25

Quick TR-55 Ver.5.46 S/N:
Executed: 18:07:29 02-02-2004 DENTON.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

Wildwood Acres Subdivision, Filing 2
DENTON DRAIN BASIN - OFFSITE
HISTORIC CONDITION
2/1/04

<u>Subarea descr.</u>	<u>Tc or Tt</u>	<u>Time (hrs)</u>
DENTON OFFSITE	Tc	1.06

Quick TR-55 Ver.5.46 S/N:
 Executed: 18:07:29 02-02-2004 DENTON.TCT

Wildwood Acres Subdivision, Filing 2
 DENTON DRAIN BASIN - OFFSITE
 HISTORIC CONDITION
 2/1/04

Tc COMPUTATIONS FOR: DENTON OFFSITE

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		FARM	
Manning's roughness coeff., n		0.0400	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	0.700	
Land slope, s	ft/ft	0.0100	
		0.8	
$T = \frac{.007 * (n * L)}{0.5 * P2 * s}$			
	hrs	0.39	= 0.39

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	2100.0	
Watercourse slope, s	ft/ft	0.0143	
		0.5	
$Avg.V = Csf * (s)$			
where:	Unpaved Csf =	16.1345	
	Paved Csf =	20.3282	
$T = L / (3600 * V)$			
	hrs	0.30	= 0.30

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft	2.50	
Wetted perimeter, Pw	ft	14.50	
Hydraulic radius, r = a/Pw	ft	0.172	
Channel slope, s	ft/ft	0.0050	
Manning's roughness coeff., n		0.0160	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft	2700	
$T = L / (3600 * V)$			
	hrs	0.37	= 0.37

.....
 TOTAL TIME (hrs) 1.06

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:48:42 02-02-2004 WLDWD-2.TCT

Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 1-a

SHEET FLOW (Applicable to Tc only)

Segment ID 1
 Surface description YARD
 Manning's roughness coeff., n 0.0450
 Flow length, L (total < or = 300) ft 120.0
 Two-yr 24-hr rainfall, P2 in 0.700
 Land slope, s ft/ft 0.0100

$$T = \frac{0.007 * (n * L)^{0.8}}{P2^{0.5} * s^{0.4}} \text{ hrs} = 0.20$$

SHALLOW CONCENTRATED FLOW

Segment ID
 Surface (paved or unpaved)?
 Flow length, L ft 0.0
 Watercourse slope, s ft/ft 0.0000

$$\text{Avg. V} = \text{Csf} * (s)^{0.5} \text{ ft/s} = 0.0000$$

where: Unpaved Csf = 16.1345
 Paved Csf = 20.3282

$$T = L / (3600 * V) \text{ hrs} = 0.00$$

CHANNEL FLOW

Segment ID 2
 Cross Sectional Flow Area, a sq.ft 2.50
 Wetted perimeter, Pw ft 14.50
 Hydraulic radius, r = a/Pw ft 0.172
 Channel slope, s ft/ft 0.0050
 Manning's roughness coeff., n 0.0160

$$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n} \text{ ft/s} = 2.0399$$

Flow length, L ft 1350

$$T = L / (3600 * V) \text{ hrs} = 0.18$$

.....
 TOTAL TIME (hrs) 0.39

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:48:42 02-02-2004 WLDWD-2.TCT

Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 1-b

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n			0.0450
Flow length, L (total < or = 300)	ft		100.0
Two-yr 24-hr rainfall, P2	in		0.700
Land slope, s	ft/ft		0.0100
		0.8	
$T = \frac{.007 * (n*L)}{0.5 * P2 * s}$			
	hrs	0.18	= 0.18

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft		0.0
Watercourse slope, s	ft/ft		0.0000
		0.5	
Avg.V = Csf * (s)			
where:	Unpaved Csf = 16.1345	ft/s	0.0000
	Paved Csf = 20.3282		
$T = L / (3600*V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft		2.50
Wetted perimeter, Pw	ft		14.50
Hydraulic radius, r = a/Pw	ft		0.172
Channel slope, s	ft/ft		0.0050
Manning's roughness coeff., n			0.0160
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft	1250	
$T = L / (3600*V)$			
	hrs	0.17	= 0.17

.....
 TOTAL TIME (hrs) 0.35

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:48:42 02-02-2004 WLDWD-2.TCT

Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 2-a, 3-a

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n			0.0450
Flow length, L (total < or = 300)	ft		100.0
Two-yr 24-hr rainfall, P2	in		0.700
Land slope, s	ft/ft		0.0100
			0.8
$T = \frac{.007 * (n*L)}{0.5 * P2 * s}$			
	hrs	0.18	= 0.18

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft		0.0
Watercourse slope, s	ft/ft		0.0000
			0.5
Avg.V = Csf * (s)	ft/s		0.0000
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
$T = L / (3600*V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft		2.50
Wetted perimeter, Pw	ft		14.50
Hydraulic radius, r = a/Pw	ft		0.172
Channel slope, s	ft/ft		0.0050
Manning's roughness coeff., n			0.0160
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft	100	
$T = L / (3600*V)$			
	hrs	0.01	= 0.01

.....
 TOTAL TIME (hrs) 0.19

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 2-b

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n		0.0450	
Flow length, L (total < or = 300)	ft	100.0	
Two-yr 24-hr rainfall, P2	in	0.700	
Land slope, s	ft/ft	0.0100	
		0.8	
$T = \frac{.007 * (n*L)}{0.5 * P2 * s}$		hrs	0.18 = 0.18

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
		0.5	
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
$T = L / (3600*V)$		hrs	0.00 = 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft	2.50	
Wetted perimeter, Pw	ft	14.50	
Hydraulic radius, r = a/Pw	ft	0.172	
Channel slope, s	ft/ft	0.0050	
Manning's roughness coeff., n		0.0160	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$		ft/s	2.0399
Flow length, L	ft	1000	
$T = L / (3600*V)$		hrs	0.14 = 0.14

.....
 TOTAL TIME (hrs) 0.31

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 3-b

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n			0.0450
Flow length, L (total < or = 300)	ft		120.0
Two-yr 24-hr rainfall, P2	in		0.700
Land slope, s	ft/ft		0.0100
		0.8	
$T = \frac{.007 * (n * L)}{0.5 * P2 * s}$			
	hrs	0.20	= 0.20

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft		0.0
Watercourse slope, s	ft/ft		0.0000
		0.5	
$Avg.V = Csf * (s)$			
where: Unpaved Csf = 16.1345	ft/s	0.0000	
Paved Csf = 20.3282			
$T = L / (3600 * V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft		2.50
Wetted perimeter, Pw	ft		14.50
Hydraulic radius, r = a/Pw	ft		0.172
Channel slope, s	ft/ft		0.0050
Manning's roughness coeff., n			0.0160
		2/3	1/2
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft		950
$T = L / (3600 * V)$			
	hrs	0.13	= 0.13

.....
 TOTAL TIME (hrs) 0.33

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 4-a

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n		0.0450	
Flow length, L (total < or = 300)	ft	130.0	
Two-yr 24-hr rainfall, P2	in	0.700	
Land slope, s	ft/ft	0.0100	
		0.8	
$T = \frac{.007 * (n*L)}{0.5 * P2 + 0.4 * s}$			
	hrs	0.22	= 0.22

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
		0.5	
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
$T = L / (3600*V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft	2.50	
Wetted perimeter, Pw	ft	14.50	
Hydraulic radius, r = a/Pw	ft	0.172	
Channel slope, s	ft/ft	0.0050	
Manning's roughness coeff., n		0.0160	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft	700	
$T = L / (3600*V)$			
	hrs	0.10	= 0.10

.....
 TOTAL TIME (hrs) 0.31

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 4-b

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n			0.0450
Flow length, L (total < or = 300)	ft		100.0
Two-yr 24-hr rainfall, P2	in		0.700
Land slope, s	ft/ft		0.0100
		0.8	
$T = \frac{.007 * (n * L)}{0.5 * P2 * s}$			
	hrs	0.18	= 0.18

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft		0.0
Watercourse slope, s	ft/ft		0.0000
		0.5	
$Avg. V = Csf * (s)$			
where:	Unpaved Csf = 16.1345	ft/s	0.0000
	Paved Csf = 20.3282		
$T = L / (3600 * V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft		2.50
Wetted perimeter, Pw	ft		14.50
Hydraulic radius, r = a/Pw	ft		0.172
Channel slope, s	ft/ft		0.0050
Manning's roughness coeff., n			0.0160
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft	1200	
$T = L / (3600 * V)$			
	hrs	0.16	= 0.16

.....
 TOTAL TIME (hrs) 0.34

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 5

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n		0.0450	
Flow length, L (total < or = 300)	ft	120.0	
Two-yr 24-hr rainfall, P2	in	0.700	
Land slope, s	ft/ft	0.0100	
		0.8	
$T = \frac{.007 * (n * L)}{0.5 * P2 * s}$			
	hrs	0.20	= 0.20

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
		0.5	
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
$T = L / (3600 * V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft	2.50	
Wetted perimeter, Pw	ft	14.50	
Hydraulic radius, r = a/Pw	ft	0.172	
Channel slope, s	ft/ft	0.0050	
Manning's roughness coeff., n		0.0160	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft	930	
$T = L / (3600 * V)$			
	hrs	0.13	= 0.13

.....
 TOTAL TIME (hrs) 0.33

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 6

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n		0.0450	
Flow length, L (total < or = 300)	ft	150.0	
Two-yr 24-hr rainfall, P2	in	0.700	
Land slope, s	ft/ft	0.0100	
		0.8	
T =	$\frac{.007 * (n*L)}{0.5 * P2 + 0.4 * s}$	hrs	0.24 = 0.24

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
		0.5	
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft	2.50	
Wetted perimeter, Pw	ft	14.50	
Hydraulic radius, r = a/Pw	ft	0.172	
Channel slope, s	ft/ft	0.0050	
Manning's roughness coeff., n		0.0160	
V =	$\frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.0399
Flow length, L	ft	530	
T = L / (3600*V)	hrs	0.07	= 0.07

.....
 TOTAL TIME (hrs) 0.32

Quick TR-55 Ver.5.46 S/N:
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Wildwood Acres, Filing 2
 2/1/04
 DEVELOPED BASINS 1a - 7

Tc COMPUTATIONS FOR: DEV 7

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		YARD	
Manning's roughness coeff., n			0.0450
Flow length, L (total < or = 300)	ft		100.0
Two-yr 24-hr rainfall, P2	in		0.700
Land slope, s	ft/ft		0.0100
			0.8
$T = \frac{.007 * (n*L)}{0.5 * P2 * s}$			
	hrs	0.18	= 0.18

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft		0.0
Watercourse slope, s	ft/ft		0.0000
			0.5
Avg.V = Csf * (s)	ft/s		0.0000
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
$T = L / (3600*V)$			
	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2	
Cross Sectional Flow Area, a	sq.ft		2.50
Wetted perimeter, Pw	ft		14.50
Hydraulic radius, r = a/Pw	ft		0.172
Channel slope, s	ft/ft		0.0050
Manning's roughness coeff., n			0.0160
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$			
	ft/s	2.0399	
Flow length, L	ft		520
$T = L / (3600*V)$			
	hrs	0.07	= 0.07

.....
 TOTAL TIME (hrs) 0.25

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 1-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1-A	0.330	3.92	23.00	0.330	0.330	0.640	3.92	0.83

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 1-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1-A	0.330	3.92	23.00	0.330	0.420	2.510	3.92	4.13

Quick TR-55 Ver.5.46 S/N:
 Executed: 09:54:00 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 1-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd. 'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1-B	0.330	7.94						
			21.00	0.330	0.330	0.670	7.94	1.76

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 1-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd.'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1-B	0.330	7.94						
			21.00	0.330	0.420	2.630	7.94	8.77

Quick TR-55 Ver.5.46 S/N:
 Executed: 09:54:38 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 2-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd. 'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
2-A	0.330	0.36						
			11.00	0.330	0.330	0.890	0.36	0.11

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 2-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd.'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
2-A	0.330	0.36						
			11.00	0.330	0.420	3.520	0.36	0.53

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 2-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
2-B	0.330	2.08	19.00	0.330	0.330	0.700	2.08	0.48

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 2-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
2-B	0.330	2.08	19.00	0.330	0.420	2.770	2.08	2.42

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 3-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
3-A	0.330	0.24						
			11.00	0.330	0.330	0.890	0.24	0.07

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 3-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
3-A	0.330	0.24						
			11.00	0.330	0.420	3.520	0.24	0.35



Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 3-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
3-B	0.330	3.01						
			20.00	0.330	0.420	2.700	3.01	3.41

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 4-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd. 'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
4-A	0.330	2.47	19.00	0.330	0.330	0.700	2.47	0.57

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:00:03 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 4-A
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
4-A	0.330	2.47						
			19.00	0.330	0.420	2.770	2.47	2.87

Quick TR-55 Ver.5.46 S/N:
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WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 4-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
4-B	0.330	3.19						
			20.00	0.330	0.330	0.680	3.19	0.72

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:00:33 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 4-B
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd.'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
4-B	0.330	3.19						
			20.00	0.330	0.420	2.700	3.19	3.62

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:02:16 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 5
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
5	0.330	4.33						
			20.00	0.330	0.330	0.680	4.33	0.97

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:02:16 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 5
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
5	0.330	4.33						
			20.00	0.330	0.420	2.700	4.33	4.91

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:02:36 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 6
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
6	0.330	8.24						
			19.00	0.330	0.330	0.700	8.24	1.90

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:02:36 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 6
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd.'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
6	0.330	8.24						
			19.00	0.330	0.420	2.770	8.24	9.59

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:02:59 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 7
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
7	0.330	4.71						
			15.00	0.330	0.330	0.790	4.71	1.23

Quick TR-55 Ver.5.46 S/N:
 Executed: 10:02:59 02-02-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN 7
 2/1/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd. 'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
7	0.330	4.71						
			15.00	0.330	0.420	3.110	4.71	6.15

Quick TR-55 Ver.5.46 S/N:
 Executed: 11:15:27 02-03-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN A (COMBINED BASINS 1-A THRU 4-B)
 2/2/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd. 'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
A (COMB.)	0.330	23.21						
			25.00	0.330	0.330	0.610	23.21	4.67

Quick TR-55 Ver.5.46 S/N:
 Executed: 11:15:27 02-03-2004

WILDWOOD ACRES, FILING 2
 DEVELOPED BASIN A (COMBINED BASINS 1-A THRU 4-B)
 2/2/04

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1.2727
 Adj. 'C' = Wtd.'C' x 1.2727

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
A (COMB.)	0.330	23.21	25.00	0.330	0.420	2.390	23.21	23.30

>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

DENTON DRAIN - OFFSITE
 WILDWOOD ACRES, FILING 2
 2/01//04
 EXCLUDING ONSITE BASINS

CALCULATED
 DISK FILE: DENTON .GPD

Drainage Area	(acres)	124	---	>	0.1938 sq.mi.
Runoff Curve Number	(CN)	75			
Time of Concentration, Tc	(hrs)	1.06			
Rainfall Distribution	(Type)	II			
Pond and Swamp Areas	(%)	0	---	>	0.0 acres

	Storm #1	Storm #2	Storm #3
	-----	-----	-----
Frequency (years)	2	100	
Rainfall, P, 24-hr (in)	0.7	2.01	
Initial Abstraction, Ia (in)	0.667	0.667	0.667
Ia/p Ratio	0.952	0.332	0.000
Unit Discharge, * qu (csm/in)	155	264	0
Runoff, Q (in)	0.00	0.39	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	20	0

Summary of Computations for qu

Ia/p	#1	0.500	0.300	0.000
C0	#1	2.203	2.465	0.000
C1	#1	-0.516	-0.623	0.000
C2	#1	-0.013	-0.117	0.000
qu (csm)	#1	154.794	281.508	0.000
Ia/p	#2	0.500	0.350	0.000
C0	#2	2.203	2.419	0.000
C1	#2	-0.516	-0.616	0.000
C2	#2	-0.013	-0.088	0.000
qu (csm)	#2	154.794	253.114	0.000
* qu (csm)		155	264	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
 If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

$$qp \text{ (cfs)} = qu(\text{csm}) * \text{Area}(\text{sq.mi.}) * Q(\text{in.}) * (\text{Pond \& Swamp Adj.})$$

Quick TR-55 Version: 5.46 S/N:

>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

DENTON DRAIN - OFFSITE
WILDWOOD ACRES, FILING 2
2/01//04
INCLUDING ONSITE BASIN 7

CALCULATED
DISK FILE: DENTON .GPD

Drainage Area (acres) 128.71----> 0.2011 sq.mi.
Runoff Curve Number (CN) 75
Time of Concentration, Tc (hrs) 1.06
Rainfall Distribution (Type) II
Pond and Swamp Areas (%) 0 ----> 0.0 acres

	Storm #1	Storm #2	Storm #3
	-----	-----	-----
Frequency (years)	2	100	
Rainfall, P, 24-hr (in)	0.7	2.01	
Initial Abstraction, Ia (in)	0.667	0.667	0.667
Ia/p Ratio	0.952	0.332	0.000
Unit Discharge, * qu (csm/in)	155	264	0
Runoff, Q (in)	0.00	0.39	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	20	0

Summary of Computations for qu

Ia/p #1	0.500	0.300	0.000
C0 #1	2.203	2.465	0.000
C1 #1	-0.516	-0.623	0.000
C2 #1	-0.013	-0.117	0.000
qu (csm) #1	154.794	281.508	0.000
Ia/p #2	0.500	0.350	0.000
C0 #2	2.203	2.419	0.000
C1 #2	-0.516	-0.616	0.000
C2 #2	-0.013	-0.088	0.000
qu (csm) #2	154.794	253.114	0.000
* qu (csm)	155	264	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(\text{qu}) = \text{C0} + (\text{C1} * \log(\text{Tc})) + (\text{C2} * (\log(\text{Tc}))^2)$$
$$\text{qp (cfs)} = \text{qu(csm)} * \text{Area(sq.mi.)} * \text{Q(in.)} * (\text{Pond \& Swamp Adj.})$$

Quick TR-55 Version: 5.46 S/N:

>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<

DENTON DRAIN - OFFSITE
WILDWOOD ACRES, FILING 2
2/01//04
INCLUDING ONSITE BASINS 6 AND 7

CALCULATED
DISK FILE: DENTON .GPD

Drainage Area	(acres)	136.95	---	0.2140	sq.mi.
Runoff Curve Number	(CN)	75			
Time of Concentration, Tc	(hrs)	1.06			
Rainfall Distribution	(Type)	II			
Pond and Swamp Areas	(%)	0	---	0.0	acres

	Storm #1	Storm #2	Storm #3
	-----	-----	-----
Frequency (years)	2	100	
Rainfall, P, 24-hr (in)	0.7	2.01	
Initial Abstraction, Ia (in)	0.667	0.667	0.667
Ia/p Ratio	0.952	0.332	0.000
Unit Discharge, * qu (csm/in)	155	264	0
Runoff, Q (in)	0.00	0.39	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	0	22	0

Summary of Computations for qu

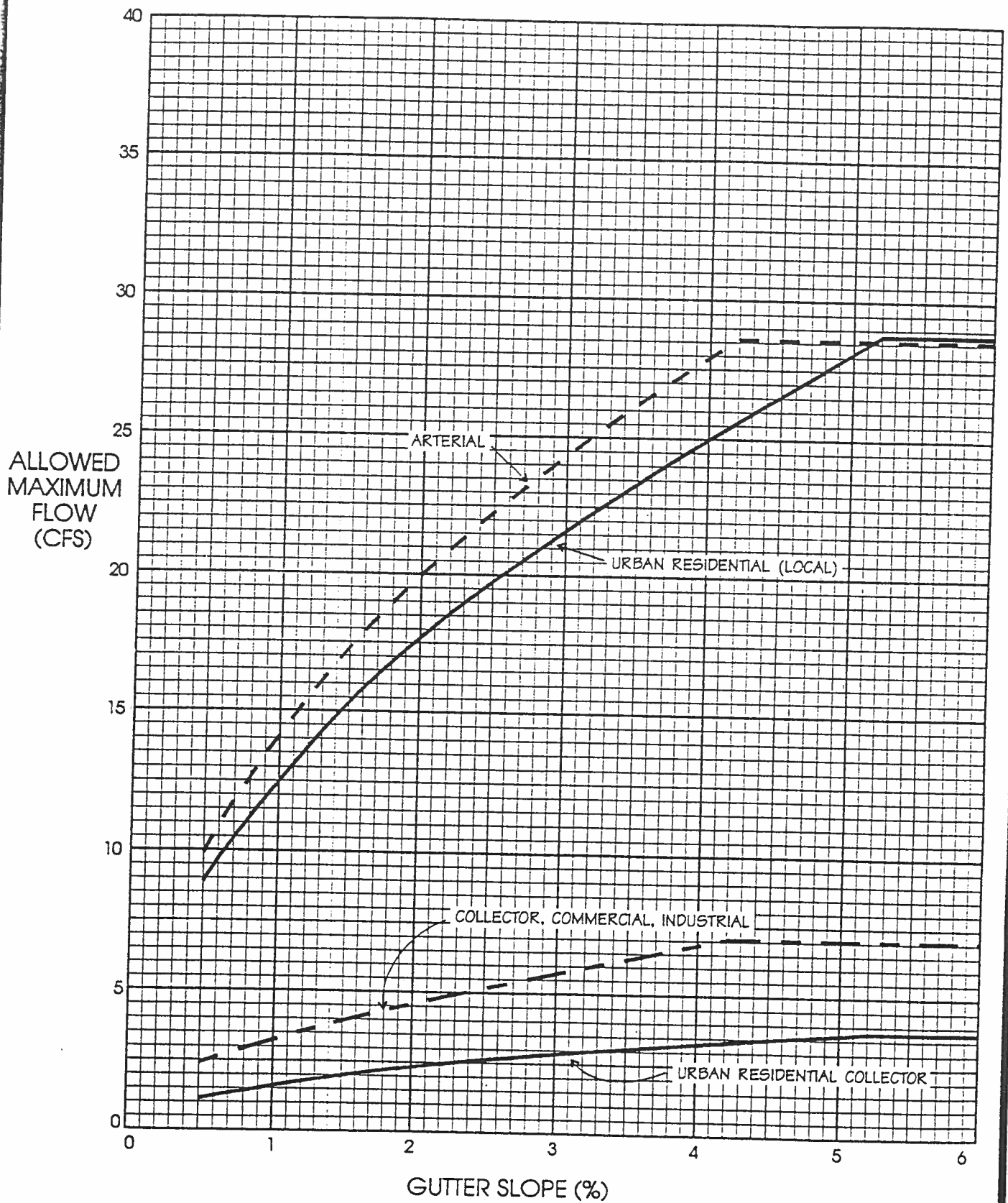
Ia/p	#1	0.500	0.300	0.000
C0	#1	2.203	2.465	0.000
C1	#1	-0.516	-0.623	0.000
C2	#1	-0.013	-0.117	0.000
qu (csm)	#1	154.794	281.508	0.000
Ia/p	#2	0.500	0.350	0.000
C0	#2	2.203	2.419	0.000
C1	#2	-0.516	-0.616	0.000
C2	#2	-0.013	-0.088	0.000
qu (csm)	#2	154.794	253.114	0.000
* qu (csm)		155	264	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$
$$qp \text{ (cfs)} = qu(\text{csm}) * \text{Area}(\text{sq.mi.}) * Q(\text{in.}) * (\text{Pond \& Swamp Adj.})$$

SECTION 3

HYDRAULICS

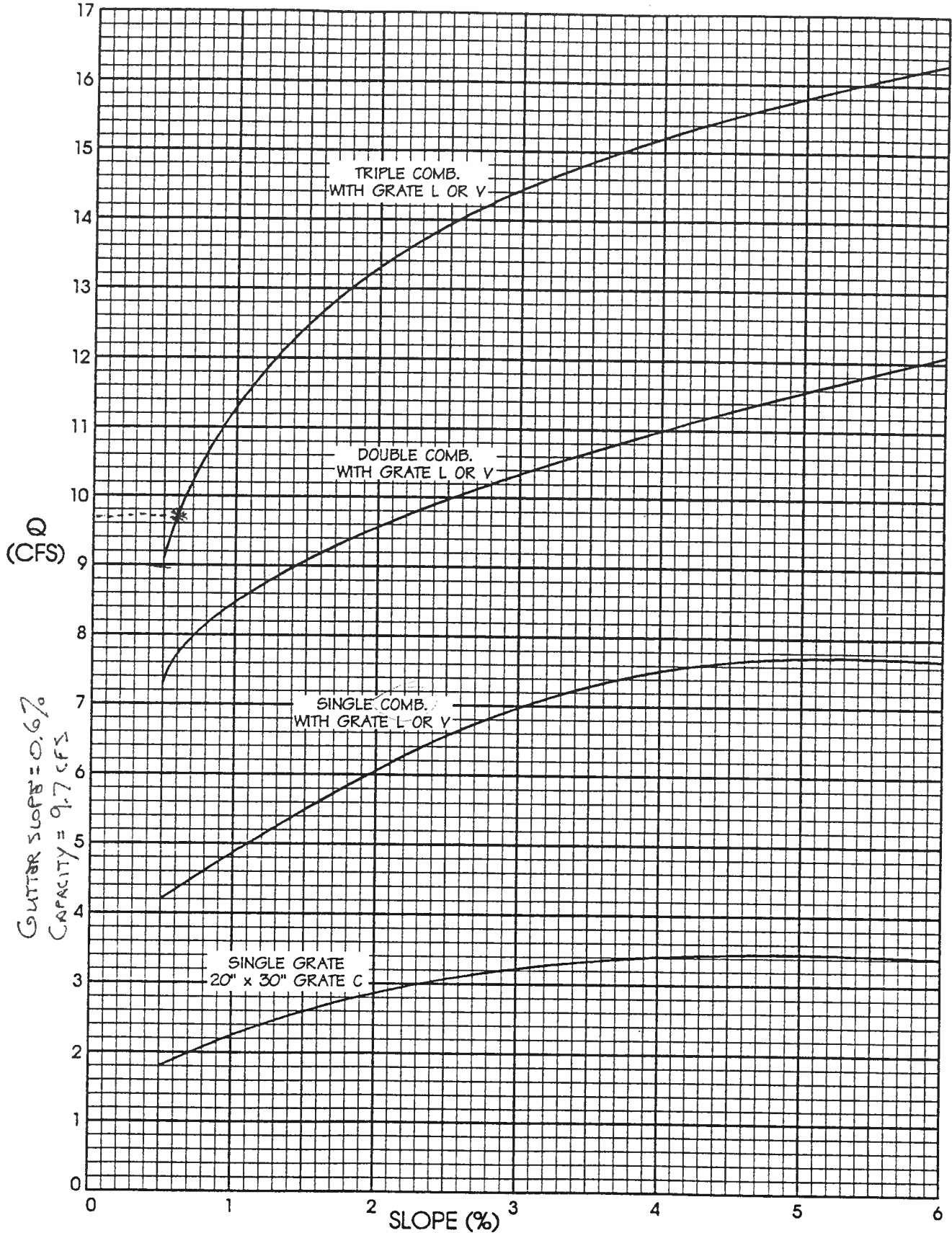


MAXIMUM HALF STREET FLOWS ($S_x=2\%$, $n=0.016$)
 (Based upon Figures G-3 and G-4)

FIGURE "G-5"

ROAD TYPE	COMBINATION INLET CAPACITY (CFS)					
	SINGLE		DOUBLE		TRIPLE	
	2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
Urban Residential (local)	6.4	13	9.5	22	12.7	31
Residential Collector, Commercial and Industrial Streets	3.2	13	4.9	22	6.5	31
Collector Streets (3000 - 8000 ADT)	2.7	13	4.0	22	5.3	31
Principal and Minor Arterials	6.0	13	9.0	22	12.0	31
<p>Inlet capacities shown above are based upon: 1) use of non-curved vane grates (similar to HEC-12 P-17$\frac{1}{8}$-4 grates; 2) HEC-12 procedures; 3) clogging factors per Section VI; and 4) City/County standard inlets with 2-inch radius on curb face and type C grates. Capacities shown for 2-year storms are based upon depths allowed by maximum street inundation per Figure "G-3". The 100-year capacities are based upon a ponded depth of 1.0 foot. Note that only combination inlets are allowed in sag or sump conditions.</p>						
MAXIMUM INLET CAPACITIES: SUMP OR SAG CONDITION				TABLE "G-1"		

INLET CAPACITIES PROVIDED ARE BASED UPON FIGURE "G-4", MAXIMUM ALLOWED FLOW CONDITIONS, SMF ENGINEERING CORP.'S HEC-12 SOFTWARE, CLOGGING FACTORS PRESENTED IN SECTION VI, AND CITY/COUNTY STANDARD INLETS.



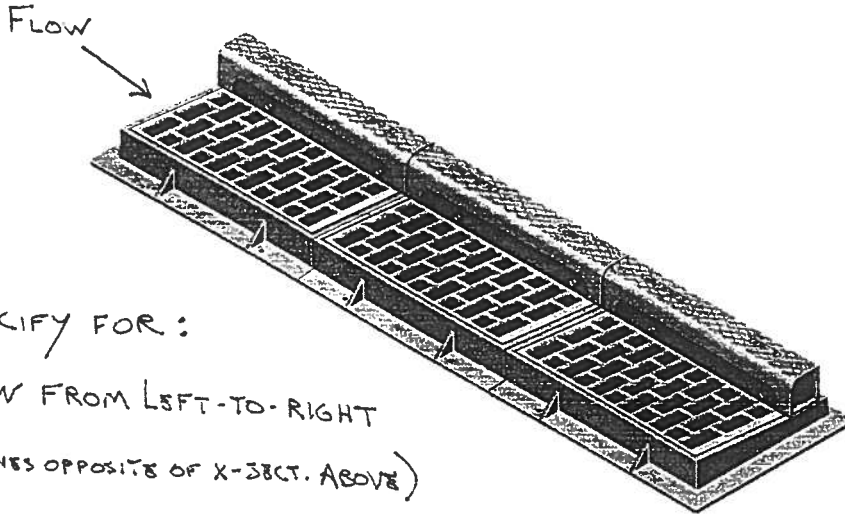
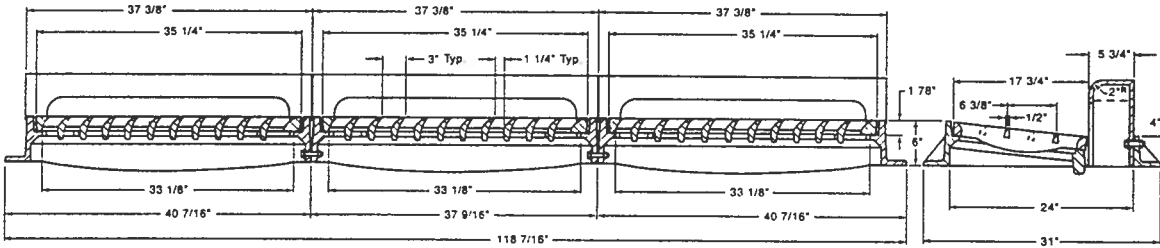
MAXIMUM INLET CAPACITIES: ON-GRADE
URBAN RESIDENTIAL (LOCAL)

FIGURE "G-7a"

**NOTE: When specifying or ordering grates—
Please refer to "CHOOSING THE PROPER INLET GRATE" on pages 108 and 109.**

**R-3295-3
Triple Unit Frame, Grate, Curb Box**

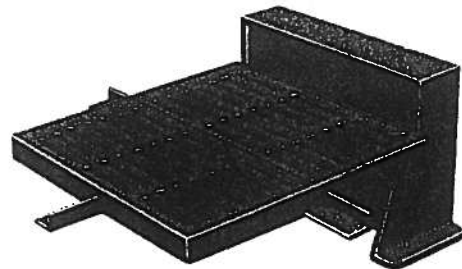
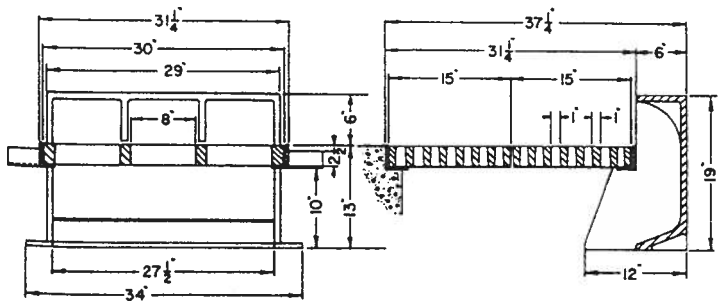
Heavy Duty



**R-3297-1
Curb Inlet Frame, Grate, Curb Box**

Heavy Duty

Fabricated steel frame. Gray iron grates and curb box.
Available with Type "L" grate.



culvert in question, the minimum size is satisfactory for the full 100-year design discharged in inlet control. If the headwater is too high, a larger size must be selected corresponding to the maximum permissible headwater. Now check for possible outlet control, as follows.

Outlet Control. Using the size selected for inlet control enter Fig. 4-22, 4-23, 4-24 or 4-25 to determine the headwater depth in outlet control. If the depth here is greater than that for inlet control, the culvert is assumed to be in outlet control and the higher depth applies.

Wall roughness factors used are stated on the flow charts. For other values of "n," use an adjusted value for length, L' , calculated by the formula

$$L' = L \left(\frac{n'}{n} \right)^2 \dots \dots \dots (14)$$

where L = Actual length
 n' = Actual value of Manning's n
 n = Value of Manning's n shown on chart.

Using L' on the length scales in the charts, adjust the result for the Manning's n desired.

The appropriate k_e curve is selected for the entrance condition desired. Typical values of k_e are found in Table 4-9, page 156.

If the culvert is in outlet control and the headwater exceeds the allowable, a larger size can be selected corresponding to acceptable headwater depth. In such a case, alternate solutions should be considered for corrugated steel structures with lower roughness coefficients. See Table 4-10. A smaller size of paved pipe or helical pipe may be satisfactory.

Entrance conditions should also be considered. It may be economical to use a more efficient entrance than planned if a size difference results. Check the lowest k_e curve results.

Structural Plate Factors. Values of Manning's n for Structural Plate Pipe determined in the 1968 full-scale field measurements reported in Table 4-11 are shown for convenience on Figs. 4-24 and 4-25 together with the corresponding adjusted L value to be used. This data was not a part of the Federal Highway Administration charts, which were published in 1963.

OTHER CLASSES OF CULVERTS

This design procedure utilizes 10-year and 100-year flood discharge. Obviously there are culvert requirements of less importance which do not warrant these frequencies. Maximum, or design discharges for less critical culverts may be based on 25 or even 10-year floods. This is a matter of hydrology and is discussed briefly in Section A of this chapter. But, whatever the flood frequency is chosen for the design discharge, the rationale presented here is still usable. The culvert design may be balanced by requiring no static head at entrance for a lower frequency flood discharge than the design discharge frequency.

EXISTING 12" CMP CULVERTS ENTERING
 DENTON DRAIN @ 18 ROAD AND K 1/10 ROAD
 PER JOHN BALLAGH (G.J. DRAIN. DIST.) 2/2/04

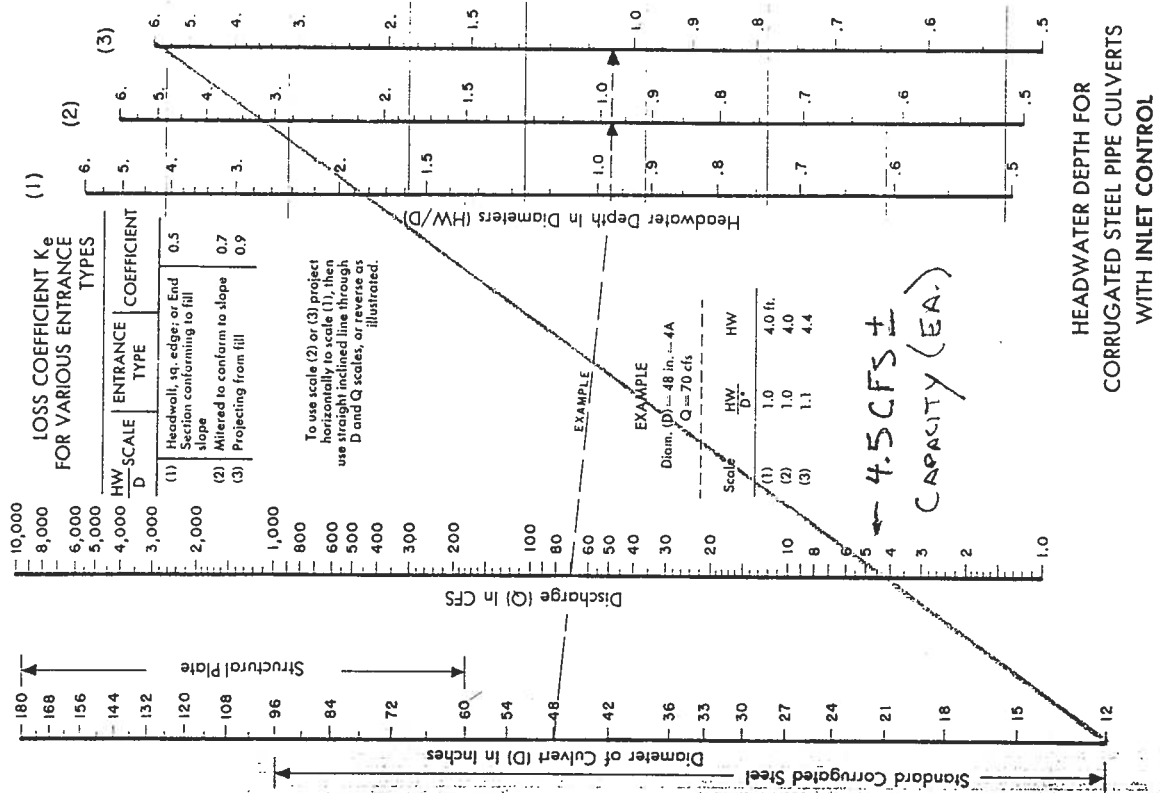


Fig. 4-18. Inlet control nomograph for corrugated steel pipe culverts. The manufacturers recommend keeping HW/D to a maximum of 1.5 and preferably to no more than 1.0.

12" CMP CULVERT WITH INLET CONTROL

18" HALL STREET STORM SEWERS
Rating Table for Circular Channel

Project Description	
Project File	c:\haestad\fmw\wildwood.fm2
Worksheet	STORM SEWER - INTERCEPTOR (GJDD)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.010
Depth	1.50 ft
Diameter	18.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.050000	0.005000 ft/ft

Rating Table	
Channel Slope (ft/ft)	Discharge (cfs)
0.005000	9.66
0.010000	13.65
0.015000	16.72
0.020000	19.31
0.025000	21.59
0.030000	23.65
0.035000	25.55
0.040000	27.31
0.045000	28.97
0.050000	30.53

**18" HALL STREET STORM SEWER
Rating Table for Circular Channel**

Project Description	
Project File	c:\haestad\fmw\wildwood.fm2
Worksheet	STORM SEWER - INTERCEPTOR (GJDD)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.010
Depth	1.50 ft
Diameter	18.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.050000	0.005000 ft/ft

Rating Table	
Channel Slope (ft/ft)	Discharge (cfs)

0.005000	9.66	
0.010000	13.65	← 1.00% (DENTON INTERCEPTOR + BASIN 7 OUTLET) UNSUBMERGED
0.015000	16.72	
0.020000	19.31	
0.025000	21.59	← 2.4% (DENTON INTERCEPTOR - SUBMERGED)
0.030000	23.65	
0.035000	25.55	
0.040000	27.31	
0.045000	28.97	
0.050000	30.53	

24" HDPE STORM SEWER - INTERCEPTOR - HALL STREET (EXISTING)
 Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\wildwood.fm2
Worksheet	STORM SEWER - INTERCEPTOR (GJDD)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Mannings Coefficient	0.010
Channel Slope	0.005000 ft/ft
Depth	2.00 ft
Diameter	24.00 in

Results		
Discharge	20.79	cfs
Flow Area	3.14	ft ²
Wetted Perimeter	6.28	ft
Top Width	0.6e-7	ft
Critical Depth	1.63	ft
Percent Full	100.00	
Critical Slope	0.005025	ft/ft
Velocity	6.62	ft/s
Velocity Head	0.68	ft
Specific Energy	2.68	ft
Froude Number	0.16e-3	
Maximum Discharge	22.37	cfs
Full Flow Capacity	20.79	cfs
Full Flow Slope	0.005000	ft/ft
Flow is subcritical.		

Table
Rating Table for Circular Channel

Project Description	
Project File	c:\haestad\fmw\wildwood.fm2
Worksheet	STORM SEWER - INTERCEPTOR (GJDD)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.010
Depth	2.00 ft
Diameter	24.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.050000	0.005000 ft/ft

Rating Table	
Channel Slope (ft/ft)	Discharge (cfs)
0.005000	20.79
0.010000	29.41
0.015000	36.02
0.020000	41.59
0.025000	46.50
0.030000	50.94
0.035000	55.02
0.040000	58.82
0.045000	62.38
0.050000	65.76

12" HALL STREET STORM SEWERS - LATERALS FROM INLETS
 Rating Table for Circular Channel TO MAIN LINE IN HALL ST.

Project Description	
Project File	c:\haestad\fmw\wildwood.fm2
Worksheet	STORM SEWER - INTERCEPTOR (GJDD)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.010
Depth	1.00 ft
Diameter	12.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.050000	0.005000 ft/ft

Rating Table	
Channel Slope (ft/ft)	Discharge (cfs)
0.005000	3.27
0.010000	4.63
0.015000	5.67
0.020000	6.55
0.025000	7.32
0.030000	8.02
0.035000	8.66
0.040000	9.26
0.045000	9.82
0.050000	10.36