Earth Engineers
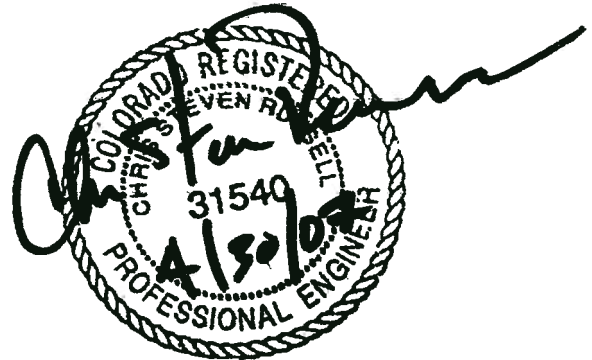
Reviewed 6/5/07

Final Drainage Report
(Preliminary Report w/ slight engineering changes - All changes noted in bold)
Fruita, Mesa County
Submittal Date: 5/22/2006
Resubmitted: 2/17.07

Report is acceptable

Drainage Impact Fee p. Appen "A"

Gewont Townhomes
NE 1/4 NE 1/4 Section 18, 1N, R2W, UM
Fruita, CO

Report prepared for:
City of Fruita

Report Prepared by:
Chris Steven Russell, PG, PE
303 North Ave.
Grand Junction, CO 81501
(970) 244-8703

Summary

Bolden numbers reflect change from preliminary drainage report

	Basin History	Basin 1	Basin 2	Composite
Acres	2.29	~~0.602~~ (0.85)	~~1.68~~ (1.35)	
Rational "C" 100 Year Composite	0.24	0.65	0.71	0.66
Rational "C" 2 Year Composite	0.18	0.61	0.68	0.63
100 Year Peak Flow	.95	~~1.26~~ (1.88)	~~4.6~~ (4.5)	6.38
2 Year Peak Flow	0.17	~~0.27~~ (0.31)	~~1.1~~ (.93)	1.24

100 Year Detention Volume: 0 cubic feet – Direct outfall to adjacent Little Salt Wash
2 Year Detention Volume: 0 cubic feet– Direct outfall to adjacent Little Salt Wash

The subject property is 2.29 acres of barren land. The project, Gewont Townhomes, is located at 215 North Coulson Street, Fruita, Colorado 81521. Historically, runoff flows from the east side of the property west towards Little Salt Wash. The site has sandy soil and is very flat. There are no visible historic channels or ditches. With this development storm water will flow to the front of homes into the gutter and into a catch basin. The catch basin will direct the water into ~~a concrete channel~~ **(12" ADS storm pipe)** which will carry this water to the edge of the property. From there the water will flow into the wash in a swale as it has historically. Storm water will also flow to the rear of the homes into a swale which will then direct the flow into the above historic swale on the bank of Little Salt Wash.

I. General Location and Description

Site and Major Basin Location

Gewont Townhomes is located in the City of Fruita, Mesa County, Colorado at 215 North Coulson Street.

The property is located north and west of existing residential properties, and south of the Family Health West multi-story assisted living residential facility. To the west is a one plus acre parcel of land that is under contract by Gewont Townhomes. This parcel contains the Little Salt Wash drainage channel.

The subject property is composed of 2.29 acres. The land proposed to be developed is flat and drains to the west an overland flow fashion. The land is currently barren earth. The SCS soil type over the proposed developed area is Ravola Clay Loam (Type B). The soil here is sandy.

II. Existing Drainage Conditions

A. Major Basin Description:

Typically surface water drainage follows a course from the area into Little Salt Wash and then into the Colorado River. At Gewont Townhomes most drainage water flows to the west into Little Salt Wash and then south to the Colorado River. The vicinity map shows that the immediate area covering this subdivision and the proximity of the Little Salt Wash and the Colorado River.

B. Site

The site covers 2.29 acres of nearly flat sandy soil. The site to the east sets at 4498' above sea level and is 4494' above sea level on the west over 520'. There is nearly a 0.8% grade. There is minimal vegetation with most bareground showing. The stormwater flows slowly towards the west with much of it percolating into the soil. Stormwater that does make to the west property line drops into Little Salt Wash.

III. Proposed Drainage Conditions

It is proposed to let all stormwater leave the property at developed rates. The first 100 feet of Gewont Lane will drain back into Coulson Street. This is approximately where the houses begin. The only flow that will enter Coulson is associated with the area of the 100 feet of 36.5' wide street (0.08 acre). To the west of the grade break, the stormwater for the 16 lots flows to the west. The stormwater generated from the front of the lots will flow into the street and mostly to the west in the street gutter. The gutter flow collects in a low spot in the cul de sac. ~~Here it flows into a storm grate and exits under the sidewalk into a concrete channel. The channel is 5' wide on the bottom to allow it to be used as a sidewalk.~~ **From the single storm grate (Elevation 4496') the water enters the storm box with the pipe invert at (Elevation 4494'). The storm water then flows 210' to the bank of the Little Salt Wash. Here, at the bank, the 12" pipe invert elevation is 4485' (Elevation 4485'). It is anticipated that at least (2) manholes will have to be placed. The average slope of the pipe is 4%. Erosion control (rip rap) may be placed at the outlet.** The stormwater from the rear of the lots flows into a grassed swales which carries stormwater westward towards the wash. This water exits the property and enters an existing drainage pattern in the bank of Little Salt Wash. ~~The concrete channel also exits into this existing pattern.~~ The bank may be stabilized for erosion.

A. Facility Design Issues

The finished floor elevations for the lots south of this storm sewer drain have been designated on the Grading and Drainage Plan. The storm channel inlet is a curb cut located in the cul-de-sac. Runoff here flows directly into the ~~concrete channel~~ **(12" ADS pipe to the wash)**

B. Maintenance Issues

It is proposed that the streets and storm grate be maintained by the City of Fruita. Appropriate easements will be dedicated on the plat to allow for maintenance of these facilities. The channel area should be maintained by the homeowners association.

IV. Design Criteria & Approach

A. General Considerations

B. Hydrology

All hydrology calculation methods used in this study are presented in SWMM. The study's conveyance design rainfall is based on critical concentrations as referenced in the SWMM manual. The historic rainfall intensities are noted in calculations. The 100 year developed rainfall intensity is 3.2 inches/hour, the two year developed rainfall intensity is 0.72 inches/hour for Basin 1. The 100 year developed rainfall intensity is 3.8 inches/hour, the two year developed rainfall intensity is 0.91 inches/hour for Basin 1.

The Rational Method was used. Runoff was calculated using :

$Q = CIA$

Where: Q = Runoff (cfs)
C = Runoff Coefficient
I = Rainfall Intensity (in/hr)
A = Area (acre)

C numbers were taken from the SWMM Manual, Table B-1, for Type B soil (Ravola Loam), 0% to 2% slope, assuming bare ground & pavement.

Rainfall intensity was calculated using equations supplied in the SWMM manual for the 2 and 100 year events.

C. Hydraulics

All hydraulic calculation methods used in this study are presented in SWMM. Capacities of open channel/pipe were calculated Chezy-Manning relationship assuming no head and normal flow.

V Appendices

Appendix A

<u>Summary of Input- Output of Hydrologic Data</u>

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100 Year Detention Volume: 0 cubic feet – Direct outfall to adjacent Little Salt Wash
2 Year Detention Volume: 0 cubic feet– Direct outfall to adjacent Little Salt Wash

Final Calculations are not included since the preliminary calculation were not significantly changed.

6/5/07 Drainage Impact Fee:

Weighted Ave. c_{100} = $\frac{(0.65 \times 0.85) + (0.71 \times 1.35)}{2.2}$

= 0.69

Fee = $\$14,364 \, (0.69 - 0.24) \, 2.29^{.7}$ = $14,364 \, (0.45) \, 1.786$

= $~~\$14,384.44~~$ 11,524.44

Appendix B

Calculations, Maps, and Tables

Gewont Rear Lot Drainage

The flow in the rear of the lots is 1.39 cfs for the 100 year. The hieght of water at this flowrate is 4". The ditch is designed to be 4" on the east side and 10" deep on the west side. I recommend that the ditch is used instead of pipe to safegauard against plugging of pipe openings with organic and soil materials.

This program estimates the width and depth of flow in a right triangular channel.
Routine by C.S. Russell, P.E. 1997 (use at your own risk)

$Q := 1.39$ flowrate in CFS

$n := 0.025$ Manning Coefficient

$s := .005$ Slope

$\beta := \tan\left(\dfrac{.333}{14}\right)$ Bank Angle - sloping edge
hieght of berm

$\beta = 1.363 \, deg$

$d := .1$ Channel Depth (Ft) - start of iteration

$$f := \text{root}\left[Q - \frac{1.49}{n} \cdot \left(\frac{\dfrac{1}{2} \cdot \dfrac{d}{\tan(\beta)} \cdot d}{\dfrac{d}{\sin(\beta)} + d} \right)^{\frac{2}{3}} \cdot \left(\frac{1}{2} \cdot \frac{d}{\tan(\beta)} \cdot d \right) \cdot \sqrt{s}, d \right]$$

$f = 0.252$ Hieght of Water in Right Triangle at steep edge

$w := \dfrac{f}{\tan(\beta)}$ Width of Water in Right Triangle on sloping side

$Afull := \dfrac{1}{2} \cdot f \cdot w$ $w = 10.587$

Calculate Hydraulic Radius and Velocity

$rHfull := \dfrac{Afull}{(f + w)}$ **ft** $Vfull := \dfrac{1.49}{n} \cdot rHfull^{\frac{2}{3}} \cdot \sqrt{s}$ $Vfull = 1.043$ **ps**

                                                                check $Qfull := Vfull \cdot Afull$

$Lc := 515 \cdot ft$

                                                                                $Qfull = 1.39$

Recycled Asphalt Path.

Gazebo

FOUND 1" ALUMINUM CAP IN CONCRETE PLS 27279

FOUND 1" ALUMINUM CAP IN CONCRETE PLS 27279

43.44 gpm

30.00'

NORTH COULSON STREET

FRUITA Plat Bou

0.109 Acres 4761 sf

586.30 gpm

28.99 gpm

Sewont Lane
Dedicated By This Plat

LOT 2

LOT 1

0.146 Acres 6354 sf

0.058 Acres 3637 sf
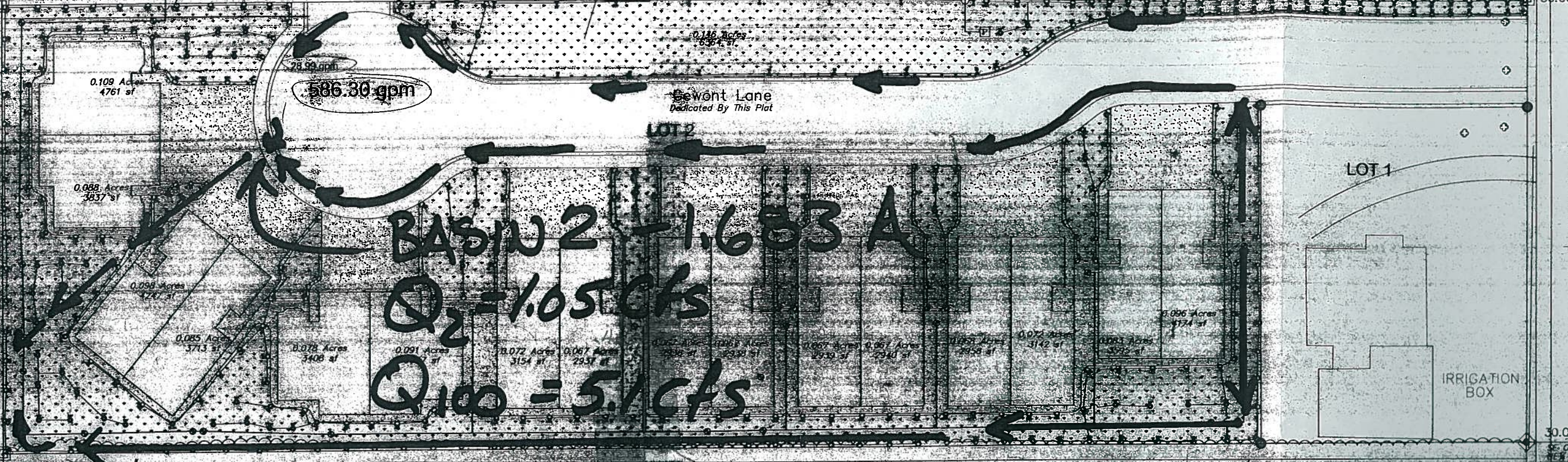
BASIN 2 = 1.683 A
$Q_2 = 1.05$ cfs
$Q_{100} = 5.1$ cfs

0.096 Acres 4134 sf

IRRIGATION BOX

SOUTH FLOW TO WASH

0.085 Acres 3713 sf

0.078 Acres 3408 sf

0.091 Acres

0.072 Acres 3154 sf

0.067 Acres 2937 sf

4.6

30.00'

West Pabor Av WEST

BASIN 1 = 0.602 A
$Q_2 = 0.27$ cfs

DOLAN SUBDIVISION
Plat Book 12, Page 205

$Q_{100} = 1.66$ cfs

Total
$Q_2 = 1.32$ cfs   A = 2.29 A] DEVELOPED

$Q_{100} = 6.76$ cfs

HISTORICAL
$Q_2 = 0.17$ cfs
$Q_{100} = 0.948$ cfs

BASIN MAP