

# FINAL DRAINAGE REPORT

## ADOBE FALLS SUBDIVISION

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### I. LOCATION AND DESCRIPTION OF PROPERTY

Adobe Falls Subdivision contains approximately 40 acres and is located in the City of Fruita, Colorado, at the northwest corner of 18 ½ and I Road. It is surrounded, on all sides, by Adobe Creek Golf Course. The entire project proposes a total of 81 single family lots with intention to complete development in 2 phases. Filing One, the phase in this application, will consist of 37 lots. The site was originally zoned "South Fruita Residential", as are many of the surrounding undeveloped properties in the vicinity, but was recently approved in concept stage to a Planned Unit Development (PUD). This is a request for approval of the Preliminary/Final Plan and PUD.

Existing streets in the vicinity include 18 ½ Road immediately adjacent along the eastern border, and I Road to the south (I Road pavement currently exists only to the east and ends at the intersection of 18 ½ Road, but additional ROW is proposed along the southern border of Adobe Falls for possible western extension of this road in the future). A system of urban residential streets is proposed to run through the project providing access and utility corridors to 18 ½ Road and I Road in three locations. No external neighborhood connectivity is currently possible given the containment on all sides by Adobe Creek Golf Course. A 30' open-space tract, in addition to the 30' Half-ROW, is dedicated along the southern border to allow the open-ditch and access corridor to remain and to provide a buffer from any future roadway. Open drain-ditches encompass the property on three sides. The ditches on the north and west sides are actually contained on golf course property, and only the southern ditch actually exists within Adobe Falls boundaries. Areas totaling more than three acres of land are proposed to be dedicated for open space, including a tract located near the northern entrance which will contain a large lake with surrounding trails and other park amenities.

The site currently contains a residential structure and several outbuildings all generally located in the northeast corner along 18 ½ Road. These structures will be removed to accommodate new development. The property is irrigated and in an agricultural utilization. Surrounding land uses in the vicinity include Adobe Creek Golf Course and scattered undeveloped residential/rural lands on larger tracts which are beginning to develop into similar single family "South Fruita Residential" subdivisions. Topography of the property is relatively "level" in nature, sloping generally to the west and southwest at an average rate of less than one percent.

Existing ground cover over most of the site consists of a moderately dense stand of pasture grasses. The existing residence in the northeast corner is surrounded by bare ground and weeds. Landscaping and irrigation of the proposed open space tracts shall be installed by the developer per Landscape Plans prepared during final design. Surface maintenance of these open space tracts will ultimately become the responsibility of the Homeowners Association. Landscaping and maintenance of all single family lots will be the responsibility of the individual lot owners.

The soils at the site have been evaluated by a geotechnical analysis included within the Final Plan submittal packet and are typical silty-clays found in the area and the Valley. The soils generally consist of Billings Silty Clay and Billings Silty Clay Loams. These soils are categorized as hydrologic soils groups "C" which have slow infiltration capability and moderate to high runoff potential. This should not pose an adverse impact to development of the site.

## **II. EXISTING DRAINAGE CONDITIONS**

### **MAJOR BASIN**

Adobe Falls is located within the Newman Drain collection basin, a small independent basin just west of Adobe Creek Watershed which is one of the major basins of the Grand Valley, consisting of several square miles of basin beginning to the northeast in the "Bookcliffs Plateau". Newman Drain originates south of Interstate 70 just a few hundred feet to the east of the site. It flows west, along the south boundary of the project and empties into the Colorado River less than ½ mile to the west. Newman Drain does not have a designated floodplain within the City limits, as delineated by the July 15, 1992 Flood Insurance Rate Maps produced by FEMA (partial copy enclosed in the Appendix - Panel Number **080115 0265 B**). The proposed developed portions of Adobe Falls do not exist within any floodplain, as delineated by FEMA or current City website mapping.

### **SITE**

Topography of the property is relatively "flat" in nature, sloping generally southwest at an average rate of less than one percent. Open tailwater ditches on the north, south, and west property lines intercept flows which would enter or leave the site. Currently, surface runoff from the site flows west and south where it is collected by existing tailwater ditches which drain directly to Newman Drain

### **OFF-SITE IMPACTS TO THE SITE**

Offsite surface runoff in the vicinity is generally collected and diverted away from the site by the existing open drain-ditches surrounding the project. 18 ½ Road, an improved asphalt roadway, is directly east of the site.

### **III. PROPOSED DRAINAGE CONDITIONS**

#### **CHANGES IN DRAINAGE PATTERNS**

No major 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. Upon development, runoff will flow south and west in streets to be collected, detained, and released at a controlled rate from the detention facility proposed within the open drain ditch designated in the southwest corner of the site. This facility will consist of a detention pond and concrete release structure which will empty into the unimproved drain ditch near the west end of the site. Final calculations indicate that developed rates of release have been reduced from the runoff flowrates historically generated by the undeveloped site.

#### **MAINTENANCE**

Access to the stormwater management facility will be by platted streets and easements, as required. A Home Owners Association will be formed to provide maintenance responsibility for the surface improvements related to the facility. Operation and maintenance of the underground storm sewers will ultimately be the responsibility of the City of Fruita.

### **IV. DRAINAGE DESIGN CRITERIA AND APPROACH**

#### **REGULATIONS**

The Mesa County Stormwater Management (SWM) Manual (May 1996) was used as the basis for analysis and facility design criteria. No master drainage plan has been completed for the area, to our knowledge. This development was designed, and is intended to be constructed, within the guidelines of the SWM manual to assure minimal impacts to downstream properties.

#### **HYDROLOGIC CRITERIA**

Because the project is a residential development containing sub-basins less than 25 acres, the "Rational Method" was initially used to calculate the historic and developed flow rates. This method, however, proved to be unsatisfactory for the entire site of 40 acres (as discussed in the SWM Manual) and is not recommended for use. The SCS Unit Hydrograph Method was then utilized to establish peak flows and pond sizing. 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.

Runoff Coefficients, intensity-duration-frequency data, and SCS Type II rainfall distribution data used in the computations were based on the most recent SWM Manual criteria defined above (May, 1996). Coefficients were assigned based on land use and hydrologic soils group. Haestad Methods software ("Pondpack") was used to perform the calculations.

## HYDRAULIC CRITERIA

All site facilities and conveyance elements were designed in accordance with the Mesa County SWM Manual and the City of Fruita Design Standards and Construction Specifications.

Open channels and pipelines were analyzed using Manning's Equation and roughness coefficients found in the SWM Manual. Haestad Flowmaster Software was used to perform the calculations. Relevant copies of these calculations are included in this report.

Capacity of the stormwater discharge pipe from the pond to the wash was oversized to accommodate flows greater than the attenuated developed flows produced by the routing. This will allow larger flows to overflow into the grate located at the top of the outlet structure and pass to the wash should the area experience a storm greater than the 100 year event.

The total 100-year developed peak runoff was generally less than the capacity of the Urban Residential Street (per SWM manual), therefore, no underground storm sewer was required, and no direct sub-basin calculations were necessary.

## V. RESULTS AND CONCLUSIONS

### AREA

Site - 40.0 Acres

| <u>RUNOFF COEFFICIENTS - "C"</u>     | <u>2 year</u> | <u>100 year</u> |
|--------------------------------------|---------------|-----------------|
| Historic (asphalt, concrete, roofs)  | 0.93          | 0.95            |
| Historic (pasture)                   | 0.23          | 0.29            |
| Historic (bare)                      | 0.24          | 0.30            |
| Historic (gravel drive)              | 0.68          | 0.76            |
| <b>Historic (composite)</b>          | <b>0.25</b>   | <b>0.30</b>     |
| Developed (asphalt, concrete, roofs) | 0.93          | 0.95            |
| Developed (landscaped)               | 0.24          | 0.30            |
| <b>Developed (composite)</b>         | <b>0.50</b>   | <b>0.55</b>     |

SCS "CN" NUMBERS

|                            |    |
|----------------------------|----|
| Roofs/concrete/asphalt     | 98 |
| Gravel areas and drives    | 89 |
| Bare ground (around house) | 87 |
| Pasture                    | 74 |
| Lawns/Landscaping          | 74 |



TIMES OF CONCENTRATION

|               |   |            |
|---------------|---|------------|
| Existing Site | - | 37 minutes |
| Developed     | - | 29 minutes |

RUNOFF (All Flows are C.F.S.)

|          | Historic<br>Undeveloped Site | Developed<br>Site (undetained) | Developed<br>(Detained/Released) |
|----------|------------------------------|--------------------------------|----------------------------------|
| 2 Year   | 0.01                         | 0.29                           | 0.10                             |
| 100 Year | 9.72                         | 23.14                          | 7.38                             |

*0.76 of Q<sub>H</sub>*

DETENTION VOLUMES - Belhaven Detention Pond - Top of Pond: 4504.00

| <u>Storm</u> | <u>Volume (ft<sup>3</sup>)</u> | <u>High Water Elev.</u> | <u>Released Flows</u> |
|--------------|--------------------------------|-------------------------|-----------------------|
| 2 Yr.        | 1,612                          | 4500.18                 | 0.10 cfs              |
| 100 Yr.      | 35,763                         | 4502.76                 | 7.38 cfs              |

CONCLUSION

The detention facility will attenuate developed flows and discharge runoff into Newman Drain generally along historic routes after detention. In accordance with criteria outlined in the Mesa County SWM Manual, increased peak runoff rates produced onsite by the developed condition will be controlled by the proposed detention facility and released at rates less than historic.

