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Final Drainage Report

Jackson Ranch Filing No. 4

December 16, 2017

Project No. 61073

PCD Project No. SF-17-016

Final Drainage Report

for

Jackson Ranch Filing No. 4

Project No. 61073

December 16, 2017

prepared for

Four Gates Land Development LLC
17435 Roller Coaster Road
Monument, CO 80132
719.488.9329

prepared by

MVE, Inc.
1903 Lelaray Street, Suite 200
Colorado Springs, CO 80909
719.635.5736

Statements and Acknowledgments

Engineer's Statement

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the applicable Master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Charles C. Crum, P.E. 01-12-18

Charles C. Crum, P.E. Colorado No. 13348 Date
For and on Behalf of MVE, Inc.

Developer's Statement

I, the developer have read and will comply with all of the requirements specified in this drainage report and plan.

Marlene J Brown 1-12-18

Marlene J. Brown, Manager Date
Four Gates Land Development LLC
17435 Roller Coaster Road
Monument, CO 80132

El Paso CountyEl Paso CountyEl Paso County

Filed in accordance with the requirements of the Drainage Criteria Manual 1 & 2, El Paso County Engineering Manual, and the Land Development Code as amended.

Approved
By:Jennifer Irvine, County Engineer
Date:01/25/2018
El Paso County Department of Public Works

Jennifer Irvine, P.E., ~~County Engineer / ECM Administrator~~ Date
El Paso County

Contents

Final Drainage Report

The purpose of this Final Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Jackson Ranch Filing No. 4 subdivision. The development project is a residential subdivision with 2.5 +/- and 5.0 +/- acre lots. The report will identify specific solutions to problems on-site and off-site resulting from the proposed project.[1] The report and included maps present results of hydrologic and drainage facilities analyses. The report will discuss the recommend drainage improvements to the site and identify drainage requirements relative to the proposed project. This report has been prepared and submitted in accordance with the requirements of the El Paso County Final Plat approval process. An Appendix is included with this report with pertinent calculations and graphs used in the facility design and drainage analyses.

1 General Location and Description

1.1 Location

The proposed Jackson Ranch Filing No. 4 site is located to the north and adjacent to Jackson Ranch Filing No. 3 and is in the Northwest One-Quarter of Section 21, Township 11 South, Range 66 West of the 6th principal meridian in unincorporated El Paso County, Colorado. The site is situated to the north of Higby Road, and to the east of Roller Coaster Road. The property is currently unplatted. A **Vicinity Map** is included in the **Appendix**.

1.2 Description of Property

Jackson Ranch Filing No. 4 site contains 31.185 ± acres of undeveloped property. The acreage will remain zoned RR-2.5 (Residential Rural District). The proposed Jackson Ranch Filing No. 4 includes 8 rural residential lots, Tract B open space and drainage area, and about 680 feet of paved roads. The road system to be constructed at this time include the remaining southern 680+/- linear feet of Jackson Ranch Court up to the end of said court.

The ground cover, which is in fair to good condition, consists of native grasses, sparse brush and areas of mature coniferous trees. The trees are concentrated on the site along a line from the center of the southern boundary of the site and along the ridge line traversing the site towards the northeast.

The existing topography on the eastern portion of the Jackson Ranch Filing No. 4 site slopes to the northeast with grades that range from 5% to 6%. The existing topography on the western portion of Jackson Ranch Filing No. 4 slopes from the east to the west at slopes of 5% to 7% into the existing channel which slopes to the northeast at a slope of about 2%. Off-site flows enter the property via ditch flow from Basin C2.2 combining with overland flow from Basin C2.3.

Soils on the site are generally conducive for land development. According to the National Resources Conservation Service, there are three (3) soil types in the immediate area of the Jackson Ranch Filing No. 4 site. Kettle Complex (map unit 40), makes up a portion of the soils in the center of the sites watershed. The Kettle Complex is deep and well drained. Permeability is rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Kettle Complex is classified as being part of Hydrologic Soil Group B.

The second type is Tomah-Crowfoot Complex (map unit 93) which makes up a the portion of the soils in the east and west portion of the site watershed with slopes of 8% to 15%. The Tomah-

1 DCM, 4-6.

Crowfoot Complex is typically deep and well drained. Permeability is moderately rapid, surface runoff is medium, and the hazard of erosion is moderate. Tomah-Crowfoot Complex is classified as being part of Hydrologic Soil Group B.

The last soil type is Ustic Torrifluvents Complex (map unit 101), makes up a very minor portion (0.1+/- acres) of the soils at the northwestern corner of the sites watershed. The Ustic Torrifluents Complex is deep and well drained. Permeability is moderate, surface runoff is slow, and the hazard of erosion is moderate to high. Ustic Torrifluvents Complex is classified as being part of Hydrologic Soil Group B.

The soil has good potential for urban development, but is prone to water and wind erosion if protective vegetation is removed and not mitigated by proper erosion control practices.[2] [3] A portion of the **Soil Map** and data tables from the National Cooperative Soil Survey are included in the **Appendix.**

No significant utilities occupy the site. There are no irrigation facilities on the site.

2 Drainage Basins and Sub-Basins

2.1 Major Basin Descriptions

Jackson Ranch Filing No. 4 site is located in the West Cherry Creek Basin of the Cherry Creek Major Drainage Basin. The basin is an unstudied drainage basin with no Drainage or Bridge fees required.

The current Flood Insurance Study of the region includes Flood Insurance Rate Maps (FIRM), effective March 17, 1997.[4] [5] The project site is included in Community Panel Number 08041C0285 F of the FIRM for El Paso County, Colorado. No part of the site is shown to be included in a 100-year flood hazard area as determined by FEMA. The project site and surrounding property is Zone X, being “Areas determined to be outside 500-year floodplain”. A portion of the current **FEMA Flood Insurance Rate Maps** is included in the **Appendix.**

Jackson Ranch Filing No. 4 development includes storm water detention as identified in the Jackson Ranch Filing No. 1 Preliminary and Final Drainage Report and in the Jackson Ranch Preliminary Drainage Report which mitigate increased storm flows that would otherwise be directed downstream through the existing drainage way.[6] [7] No new storm detention facilities are proposed.

2.2 Sub-Basin Description

2.2.1 Existing Drainage Patterns (On-Site)

The majority of the western portion western portion of the existing site drains to the existing natural channel in Tract A which traverses the total Jackson Ranch site from the southwest corner to the northern boundary of said site. An existing dam interrupts the natural channel flow about 100' northerly of the southwest corner of the proposed Jackson Ranch Filing No. 3. The dam incorporates a 12” CSP standpipe and flows are released to downstream once the water surface level reaches the stand pipe end elevation. The eastern edge of of the property drains overland and exits the eastern boundary. An **Existing Drainage Map** is included and shows existing basin delineations.

2.2.2 Off-Site Drainage Flow Patterns

There is no off-site inflow to the site except for some minor ditch flow from Basin C2.2 that flows into into the site. These overland flows combine with Basin C2.3 at the eastern portion of the site adjacent to Jackson Court..

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2 WSS El Paso County Area, Colorado.
3 OSD
4 FIS
5 FIRM, Map No. 08041C0285 F
6 JRF1
7 JR Prelim

3 Drainage Design Criteria

3.1 Development Criteria Reference

This *Final Drainage Report for Jackson Ranch Filing No. 4* has been prepared according to the report guidelines presented in the latest edition of *City of Colorado Springs/El Paso County Drainage Criteria Manual* (DCM)[8]. This *Final Drainage Report* is consistent with the Preliminary Drainage Report for Jackson Ranch. The on-site (local) hydrologic analysis is based on a collection of data from the DCM, the NRCS Web Soil Survey[9], a topographic survey of the site prepared by LWA Land Surveying, Inc., proposed residential site layout by Land Resource Associates (LRA), future land use according to RR-2.5 zoning and property boundary information provided by LWA Land Surveying, Inc.

3.2 Previous Drainage Studies

The West Cherry Creek Basin of the Cherry Creek Major Drainage Basin has not been studied.

Drainage reports for Jackson Ranch Filing No. 1 [10], Oldborough Subdivision [11], the Preliminary Drainage Report for Jackson Ranch [12], Jackson Ranch Filing No. 2 [13], and Jackson Ranch Filing No. 3 [14] were reviewed for the preparation of this Final Drainage Report.

3.3 Hydrologic Criteria

Flow rates at all design points in the subdivision with contributing areas greater than 100 acres are calculated using SCS hydrologic flow computation method in accordance with El Paso County criteria. Flow rates at all design points having contributing areas less than 100 acres are calculated using the Rational Method as described in the DCM. Flow rates were calculated for 5-year and 100-year rainfall recurrence intervals.

The Rational Method utilized 'Intensity Duration Frequency Curves' Figure 6-5 in the DCM to obtain the design rainfall values. The 'Overland Flow Equation' Page 6-18, and Manning's equation with estimated depths were used in time of concentration calculation. Table 6-6 'Runoff Coefficients for Rational Method' was utilized as a guide in estimating runoff coefficient values.

3.4 Hydraulic Criteria

The hydraulic design and analysis for the facilities in this *Final Drainage Report* have been prepared according to the provisions of the *City of Colorado Springs/El Paso County Drainage Criteria Manual* (DCM) and El Paso County Engineering Criteria Manual.[15] [16]

Jackson Ranch Filing No. 4 is a low density (rural) housing development with lot areas 2.5 acres in area and larger. Water quality treatment with Water Quality Capture Volume (WQCV) is not required for such developments in accordance with ECM section I.7.1.B.

4 Drainage Facility Design

4.1 General Concept

The proposed *Jackson Ranch Filing No. 4* project will consist of 8 rural residential lots, Tract A and Tract B open space and drainage areas, and about 836 feet of paved roads. Runoff from the western portion of this Phase will drain into Tract A. Tracts A and B are owned and maintained by the Jackson Ranch Homeowners Association for open space/drainage.

8 DCM Section 4.3 and Section 4.4
9 WSS
10 JRF1
11 Old
12 JR Prelim
13 JRF2
14 JRF3
15 DCM
16 ECM

The intent of the drainage concept presented in this report is to maintain existing drainage directions and patterns as much as practically allowable, while safely routing developed on-site storm flows through the property to the designated discharge points in accordance with El Paso County drainage criteria.

No drainage way encumbrances due to existing or proposed utilities are anticipated.

The existing drainage conditions and the proposed drainage concept are described in more detail below. Input data and results for all calculations are included in the **Appendix**. Drainage maps for the site hydrology are also included in the **Appendix**.

4.2 Specific Details

4.2.1 Existing Hydrologic Conditions

The Jackson Ranch Filing No. 4 site includes all or part of 6 sub-basins delineated in the Jackson Ranch Preliminary Drainage Report. Portions of Sub-basins B3, C3, and C4 lie within the Jackson Ranch Filing No. 4 developed area, as indicated on the attached **Existing Drainage Map**.

The **Existing Drainage Map** depicts the existing topographic mapping, drainage basin delineations, drainage patterns, adjacent roads with storm drain facilities/piping, the existing dam, and runoff quantities with a data table including drainage areas and storm water runoff flows along with storm water runoff flows.

4.2.2 Proposed Hydrologic Conditions

The Proposed Drainage basins within the Site basically mirror the Existing Basins as the proposed Roads were laid out along or near the common Drainage Basin lines. Five (5) sub-basins have been delineated in *Jackson Ranch Filing No. 4* project site for analysis and design of the developed drainage system composed of overland, road & ditch flows as indicated on the attached **Developed Drainage Map**.

Point of Interest No. 1 reflects developed off site flows from Basin B3.2b discharging from the existing swale and along a small portion of the northerly Lot 2 lot line. These storm water runoff flows combine with Basin B3.2c collect and flow in the existing swale through Lot 2, *Jackson Ranch Filing No. 4* which ultimately drains into said existing natural channel. These flows at Point of Interest No. 1 exit the western boundary and have a developed storm water flow of Q_5 = 4.6 cfs and Q_{100} = 20.8 cfs. A rock ditch check is proposed at the end of said swale within the proposed drainage easement.

Point of Interest No. 2 reflects developed storm water runoff flow rates from Basin B3.2.d and are Q_5 = 4.0 cfs and Q_{100} = 20.5 cfs. A small portion of this flow is contributed by the ditch along the western side of the Jackson Ranch Court and the ditch has been designed to accommodate the ditch flow. In general, the ditch will be a 2.5-foot deep V-channel, seeded and mulched to protect against erosion. In sections where the slope exceeds 6%, erosion control blankets will be used in conjunction with the seeding and mulching to provide further protection against erosion. A rock ditch check is proposed at the end of the road way ditch at the connection to the Tract A access leg. The combined storm water runoff flows from Basin B3.2d flow westerly and exit the subdivision along the westerly boundaries of Lots 2, 4, & 5 into the existing natural channel located within Tract A. These flows join the flows in the main drainageway flowing north. The combined discharges leaving the site at this point are Q_5 = 34 cfs and Q_{100} = 101 cfs, which represents a slight increase of 1 cfs in the 5-year event and 3 cfs in the 100-year event. The increase is insignificant and inconsequential.

Point of Interest No. 3 storm water runoff flows overland in Basin C.4 and exits the subdivision along the northern boundary of Lot 5 with a developed flow of Q_5 = 0.6 cfs and Q_{100} = 3.3 cfs.

Point of Interest No. 4 reflects developed storm water runoff flow rates from Basins C2.1, C2.2, and C.3 with combined storm water runoff of Q_5 = 6.0 cfs and Q_{100} = 26.4 cfs. A small portion of this flow is contributed by the ditch along the eastern side of the Jackson Ranch Court with in Jackson Ranch Filing No.4. The ditch has been designed to accommodate the ditch flow. In general, the ditch will be a 2.5-foot deep V-channel, seeded and mulched to protect against erosion. In sections where the

slope exceeds 6%, erosion control blankets will be used in conjunction with the seeding and mulching to provide further protection against erosion. A rock ditch check is proposed at the end of the road way ditch at the connection to the Tract B access leg. The combined storm water runoff flows northeasterly via ditch and overland flow and exits the subdivision along the easterly boundaries of Lots 5, & 6 into the existing natural channel located within Tract B and drain northerly. The ultimate flow exiting the northern boundary of the subdivision is Point of Interest No. 4 and offsite flows combined for a value of Q_5 = 66 cfs and Q_{100} = 213 cfs, which represents a slight increase of 1 cfs in the 5-year event and 4 cfs in the 100-year event. The increase is insignificant and inconsequential.

Point of Interest 5 is located along the eastern boundary of said subdivision No. 4. This point represents the overland storm water from Basin C3. This flow drains into said existing natural channel located within Tract B and drains northerly. The runoff at this point is Q_5 = 2.8 cfs and Q_{100} = 13.8 cfs.

For all lots within this Jackson Ranch Filing No. 4 that require the driveway to cross a roadside drainage ditch, the minimum size for the culvert is 18" RCP. Other approved products with equivalent or greater capacity may be used in lieu of the 18" RCP.

4.2.3 Proposed Drainage Facilities

No new flows are being added to to the adjacent Higby Road and Roller Coaster Road. The proposed new subdivision Roads will have ditches. The proposed new subdivision Roads will have ditches with rip-rap lined ditch-outs to allow runoff to enter the existing natural drainage paths where the ditch daylight to existing grades.

Detention for the site is not required. The site contains existing ponding areas which are stable and functioning. These ponding areas will not be disturbed by the project. As a result of these ponding areas, the hydrologic analysis demonstrate that the flows at the downstream discharge points are essentially the same as the existing charges.

5 Opinion of Probable Cost for Drainage Facilities

There are no costs of new drainage facilities anticipated for the Jackson Ranch Filing No. 4 development.

6 Drainage and Bridge Fees

Jackson Ranch Filing No. 4 Is located within the Cherry Creek Major Drainage Basin which is unstudied. There are no Drainage Fees or Bridge Fees adopted for this Basin. The property is being subdivided into a lots, tracts and road right-of-way.

Drainage Fee

(None Required)

Drainage Fees Due = $0.00

Bridge Fee

(None Required)

Bridge Fee Due = $0.00

7 Conclusion

This Final Drainage Report for the Jackson Ranch Filing No. 4 presents a drainage concept for this proposed subdivision. The subdivision development will function to route and convey storm runoff with the site grading and drainage facilities to be provided as part of the development. The proposed project with associated improvements will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream drainage facilities.

References

City of Colorado Springs/El Paso County Drainage Criteria Manual. City of Colorado Springs, Department of Public Works, Engineering Division; HDR Infrastructure, Inc.; El Paso County, Department of Public Works, Engineering Division (Colorado Springs: City of Colorado Springs, Revised November 1991).

Official Soil Series Descriptions. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture ("Available online at http://soils.usda.gov/technical/classification/osd/index.html", accessed December 12, 2013).

Web Soil Survey. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture ("Available online at http://websoilsurvey.nrcs.usda.gov/", accessed December 12, 2013).

Flood Insurance Rate Map. Federal Emergency Management Agency, National Flood Insurance Program (Washington D.C.: FEMA, March 17, 1997).

Flood Insurance Study for El Paso County, Colorado and incorporated Areas. Federal Emergency Management Agency (Washington D.C.: FEMA, March 17, 1997).

Preliminary Drainage Report, Jackson Ranch. M.V.E., Inc. (Colorado Springs, CO: , February 29, 2016).

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Final Drainage Report for Jackson Ranch FIling No. 3. M.V.E., Inc. (Colorado Springs, CO: , April 18, 2017).

Final Drainage Report for Jackson Ranch Filing No. 2. M.V.E., Inc. (Colorado Springs, CO: , May 9, 2016).

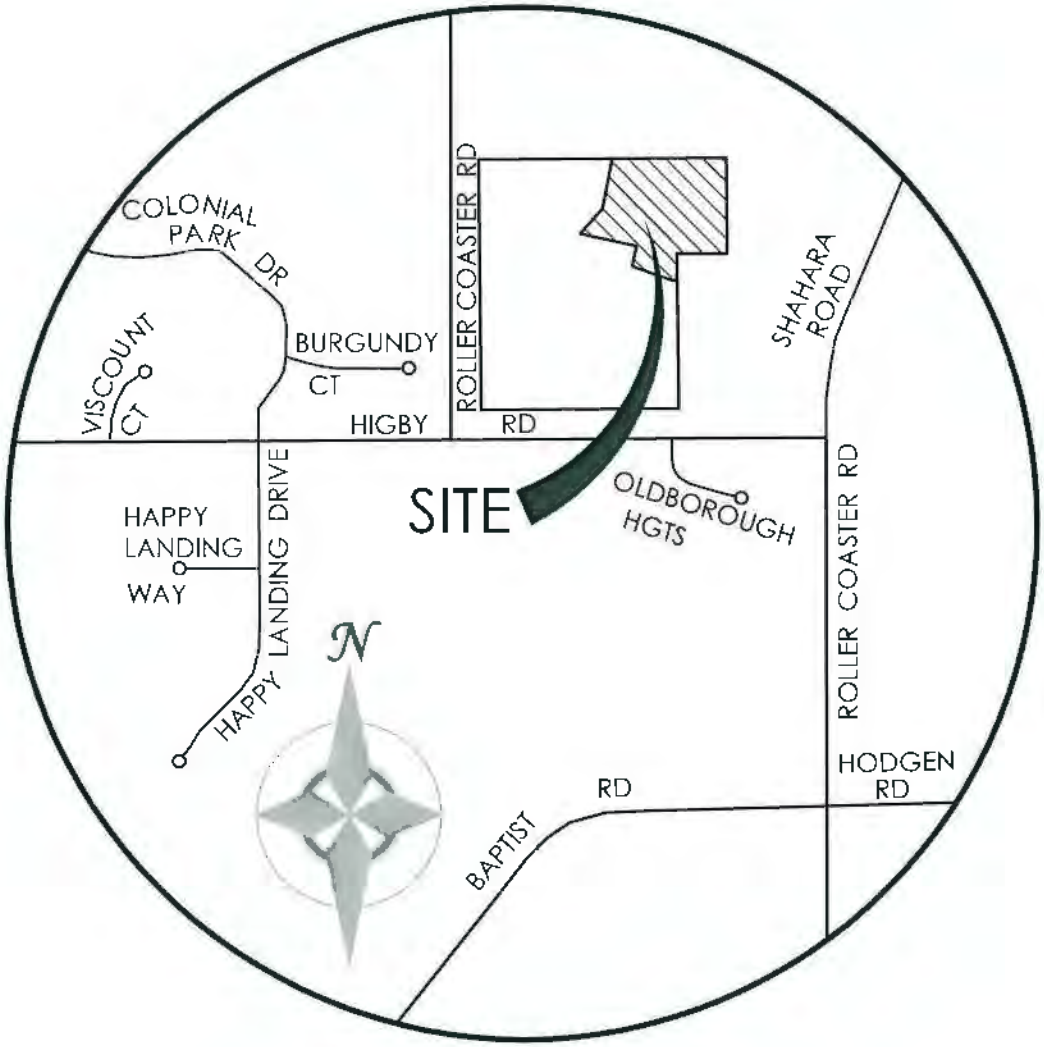
Final Drainage Report and Plan for Oldborough Subdivision. Leigh, Whitehead & Assoc (Colorado Springs, CO: , September, 2003).

El Paso County Engineering Criteria Manual. El Paso County (El Paso County, CO: , December 13, 2016).

Appendices

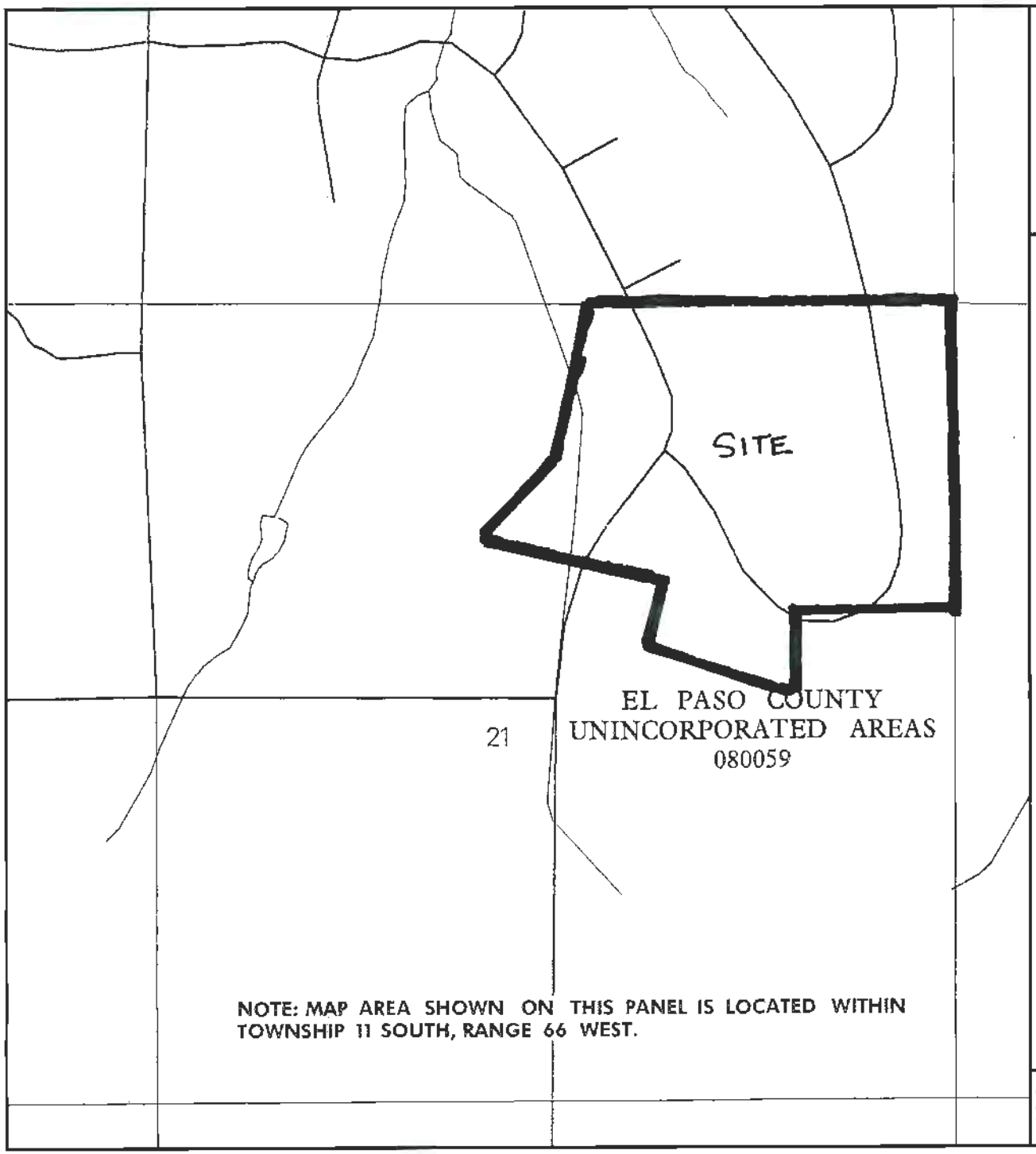
General Maps and Supporting Data

Vicinity Map
Portions of Flood Insurance Rate Map and LOMR Maps
NRCS Soil Map and Data



VICINITY MAP

NOT TO SCALE



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 11 SOUTH, RANGE 66 WEST.

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 285 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

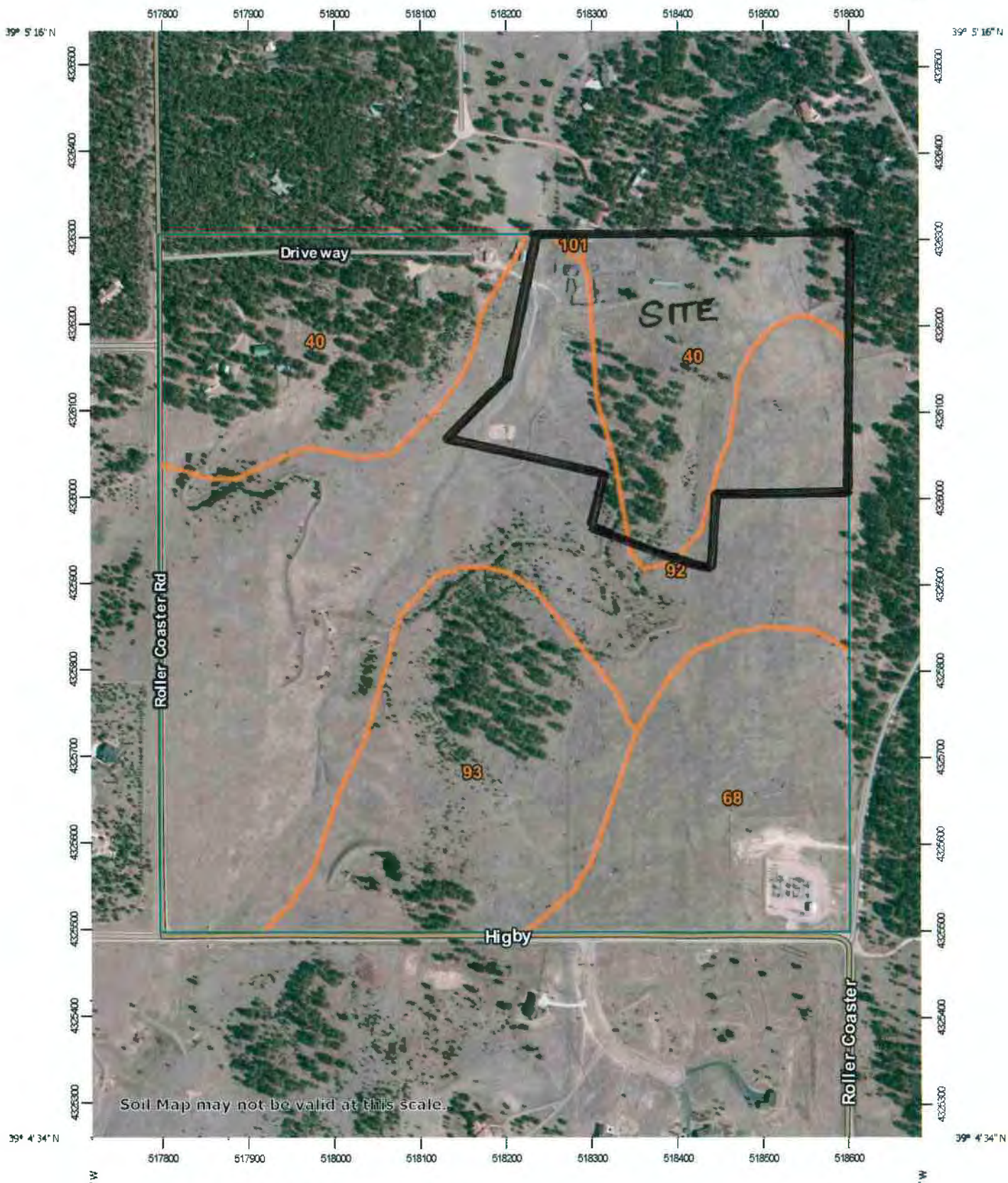
CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0285	F

MAP NUMBER
08041C0285 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

Soil Map--El Paso County Area, Colorado
(Jackson Ranch)



Map Scale: 1:6,230 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the ber scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	40.5	25.2%
68	Peyton-Pring complex, 3 to 8 percent slopes	22.9	14.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	69.0	42.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	28.4	17.6%
101	Ustic Torrifluvents, loamy	0.2	0.1%
Totals for Area of Interest		**161.0**	**100.0%**

Hydrologic Soil Group—El Paso County Area, Colorado
(Jackson Ranch)

Map Scale: 1:6,230 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

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Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	B	40.5	25.2%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	22.9	14.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	69.0	42.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	28.4	17.6%
101	Ustic Torrifluvents, loamy	B	0.2	0.1%
Totals for Area of Interest			**161.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

Depending on land use, this soil can produce habitat that is suitable for either rangeland wildlife, such as antelope, or for openland wildlife, such as pheasant, cottontail, and mourning dove. Availability of irrigation water largely determines the land use. Where no irrigation water is available, this soil is mainly used as rangeland, a use that favors rangeland wildlife. If this soil is used as rangeland, fences, livestock water developments, and proper livestock grazing use are practices that enhance habitat for rangeland wildlife. Production of crops such as wheat, corn, and alfalfa provides suitable habitat for openland wildlife, especially pheasant. Among the practices that increase openland wildlife populations are planting trees and shrubs and providing undisturbed nesting cover.

The main limitation of this soil for urban use is shrink-swell potential. Buildings and roads need to be designed to overcome this limitation. Roads need to be designed to minimize frost-heave damage. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

40—Kettle gravelly loamy sand, 3 to 8 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes; Elbeth sandy loam, 3 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; Tomah-Crowfoot loamy sands, 3 to 8 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate. A few gullies have formed in drainageways.

This soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for the production or harvesting of timber is the low available water capacity. The low available water capacity also influences seedling survival, especially in areas where understory plants are plentiful. Erosion must be kept to a minimum when harvesting timber.

This soil has good potential for mule deer, tree squirrels, cottontail rabbit, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

This soil has good potential for use as homesites. Plans for homesite development on this soil should provide for the preservation of as many trees as possible in order to maintain the esthetic value of the sites. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

41—Kettle gravelly loamy sand, 8 to 40 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Elbeth sandy loam, 8 to 15 percent slopes; Pring coarse sandy loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board

strength. Special designs for buildings and roads are required to offset these limitations. Methods of sewage disposal other than septic tank absorption fields are needed because of the limited depth to bedrock. Capability subclass VIe.

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. These gently sloping to moderately sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 3 to 8 percent slopes; Kettle gravelly loamy sand, 3 to 8 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, is a matrix of very pale brown coarse sand in which are embedded many thin bands and lamellae of pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

This complex is used as rangeland, for wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the principal limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

These soils have good potential for use as homesites. The main limitation of the Crowfoot soil is frost-action potential. Roads and streets need to be designed to minimize frost-heave damage. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass IVe.

93—Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. These moderately sloping to strongly sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 8 to 15 percent slopes; Peyton-Pring complex, 8 to 15 percent slopes; and Kettle gravelly loamy sand, 8 to 40 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, consists of a matrix of very pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

rapid, and the hazard of erosion is high. Gullies 1 foot to 3 feet deep are common.

The Bresser soil is deep and well drained. It formed in alluvium and residuum derived from arkosic sedimentary rock. Typically, the grayish brown sandy loam surface layer is very thin or has been entirely removed by erosion. The subsoil is brown sandy clay loam about 31 inches thick. The substratum is light yellowish brown loamy coarse sand to a depth of 60 inches or more.

Permeability of the Bresaer soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is high. Gullies 1 foot to 3 feet deep are common.

These soils are commonly used for grazing livestock and for wildlife habitat. Most areas of these soils are fields that were previously cropped but have either been abandoned or reseeded to grass.

These soils are suited to deep-rooted grasses. Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover from these soils. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation for establishing trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of these soils for homesites is frost-action potential, especially in areas of the Truckton soil. Special practices are needed to reduce the hazard of erosion in areas of construction where vegetation has been removed from the soils. Access roads must be designed to minimize frost-heave damage in areas of the Truckton soil. Capability subclass VIe.

101—Ustic Torrifluvents, loamy. These deep, well drained soils are on terraces and flood plains along the major drainageways. Some of the larger areas of these soils are in the Jimmy Creek Camp and Black Squirrel Creek drainageways and in the Ellicott area. Slope is 0 to 3 percent. The average annual precipitation is about 15 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown to very dark grayish brown gravelly sandy loam to clay loam 6 to 18 inches thick. The stratified underlying material, to a depth of 60 inches, ranges from heavy clay loam to sand.

Included with these soils in mapping are small areas of Blendon sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Sampson loam, 0 to 3 percent slopes.

Permeability of Ustic Torrifluvents, loamy, is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate to high. Surface runoff is slow, and the hazard of erosion is moderate to high. These soils are occasionally flooded. The hazard of soil blowing is moderate to high.

About half of the acreage of these soils is used for irrigated corn, bluegrass sod, and alfalfa and for dryfarmed wheat. The slow surface runoff reduces the need for intensive conservation measures. Most irrigated areas are in the Ellicott area and the Jimmy Camp Creek area. The rest of the acreage is used as rangeland.

These soils are suited to the production of native vegetation suitable for grazing. The soils favor tall grasses. The native vegetation is mainly big bluestem, switchgrass, junegrass, western wheatgrass, and blue grama.

To achieve needed grazing management, including periodic deferment, fences are generally arranged in such a way that access to these soils can be controlled. Reseeding on these soils is needed if the vegetation is depleted or destroyed by plowing. Water spreading is highly beneficial in suitable areas of these soils.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of these soils for urban use is the hazard of flooding. Buildings and roads should not be

built along drainageways and on flood plains. Access roads must be designed to minimize frost-heave damage. Capability subclasses IIIe, nonirrigated, and IIe, irrigated.

102—Valent sand, 1 to 9 percent slopes. This deep, nearly level to gently rolling, excessively drained soil formed in sandy eolian material on uplands. Elevation ranges from 5,100 to 5,600 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray sand about 6 inches thick. The next layer is brown sand about 6 inches thick. The substratum is pale brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Bijou loamy sand, 1 to 8 percent slopes, and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Valent soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are high.

This soil is used as rangeland and for wildlife habitat.

The native vegetation is mainly sand reedgrass, sand bluestem, blue grama, little bluestem, and needleandthread. Sand sagebrush is in the stand, but it makes up only a small part of the total ground cover. Large amounts of yucca are present in some places.

Mechanical and chemical control of sagebrush may be needed in overgrazed areas of this soil. The soil is highly susceptible to soil blowing, and water erosion occurs when the plant cover is inadequate. Interseeding is a good practice in overgrazed areas. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for homesites is the sandy nature of the soil, which makes excavation difficult. Special erosion control practices are needed during construction. Because of the rapid permeability of this soil, there is a hazard of pollution if it is used for septic tank absorption fields. Capability subclass VIe.

103—Valent sand, 9 to 20 percent slopes. This deep, excessively drained, rolling to hilly soil formed in sandy eolian material on uplands. Elevation ranges from 5,100 to 5,600 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray sand about 6 inches thick. The next layer is brown sand about 6 inches thick. The underlying material is pale brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Bijou loamy sand, 1 to 8 percent slopes; Wigton loamy sand, 1 to 8 percent slopes; and Valent sand, 1 to 9 percent slopes.

Permeability of this Valent soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is high. Blowouts are common in all areas of this soil.

This soil is used as rangeland and for wildlife habitat.

The native vegetation is mainly prairie sandreed, sand bluestem, needleandthread, and sand dropseed.

Careful grazing management is essential on this soil to prevent overgrazing, because the hazard of soil blowing is high when the protective plant cover is destroyed. Livestock watering facilities should not be located on this soil, because they cause concentrations of animals that deplete the rangeland cover. No mechanical type of conservation treatment is practical on this soil.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and the plant cover should be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

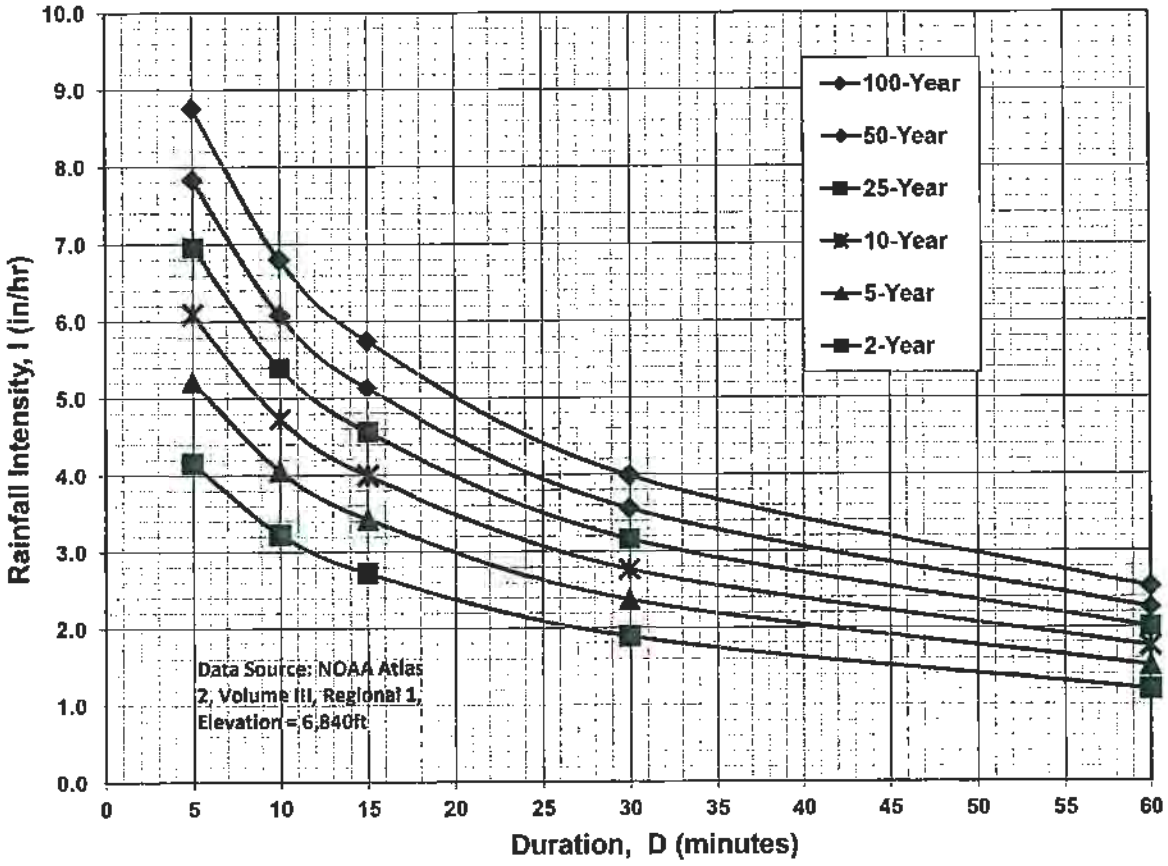
This soil is suited te wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban use are slope and the sandy texture of the soil. Special designs are needed for buildings and roads to overcome these limitations. The sandy texture of the soil causes excavation problems, mostly the caving in of cut banks. Practices are needed to control soil blowing. Because of the rapid permeability of this soil, there is a hazard of pollution if it is used for septic tank absoption fields. Capability subclass VIe.

104—Vona sandy loam, 1 to 3 percent slopes. This deep, well drained soil formed in sandy, calcareous eolian

Hydrologic Calculations

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

Job No.: **61073**
Project: **Jackson Ranch Filing No. 4**

Date: **4/21/17 12:17**
Calcs By: **D. Gorman**
Checked By:

Time of Concentration (Modified from Standard Form SF-1)

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		t_c
	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	(min)
EX B3.1	2.75	0.20	0.44	15.4%	300	6%	15.8	340	0.068	1.8	3.1	175	0.011	3.1	0.9	815	N/A	19.9
EX B3.2a	6.54	0.12	0.38	5.0%	190	10%	11.5	700	0.070	1.9	6.3	0	0.000	0.0	0.0	890	N/A	17.8
EX B3.2b	9.99	0.14	0.40	8.1%	300	7%	15.5	640	0.047	1.5	7.0	0	0.000	0.0	0.0	940	N/A	22.6
EX B3.2c	1.40	0.09	0.36	2.0%	238	9%	13.5	288	0.042	1.4	3.4	0	0.000	0.0	0.0	526	N/A	16.9
EX B3.2d	11.63	0.09	0.36	2.0%	200	6%	14.3	780	0.064	1.8	7.3	400	0.020	2.2	3.0	1380	N/A	24.6
EX C2.1	1.21	0.20	0.44	15.9%	205	3%	15.4	0	0.000	0.0	0.0	0	0.000	0.0	0.0	205	N/A	15.4
EX C2.2	6.03	0.17	0.42	12.5%	300	5%	17.1	225	0.053	1.6	2.3	540	0.017	4.3	2.1	1065	N/A	21.5
EX C2.3	8.83	0.09	0.36	2.0%	260	4%	18.9	410	0.063	1.8	3.9	0	0.000	0.0	0.0	670	N/A	22.7
EX C3	7.95	0.09	0.36	2.0%	300	3%	21.2	605	0.063	1.8	5.7	265	0.026	2.4	1.9	1170	N/A	28.8
EX C4	1.73	0.09	0.36	2.0%	300	5%	18.2	65	0.062	1.7	0.6	0	0.000	0.0	0.0	365	N/A	18.8

Job No. **61073**
Project: **Jackson Ranch Filing No. 4**
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **UDFCD**

Date: **4/21/17 12:17**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

DP	Sub-Basin	Area (Acres)	C5	Direct Runoff t_c (min)	Direct Runoff CA (Acres)	Direct Runoff I5 (in/hr)	Direct Runoff Q5 (cfs)	Combined Runoff t_c (min)	Combined Runoff CA (Acres)	Combined Runoff I5 (in/hr)	Combined Runoff Q5 (cfs)	Streetflow Slope (%)	Streetflow Length (ft)	Streetflow Q (cfs)	Pipe Flow Q (cfs)	Pipe Flow Slope (%)	Pipe Flow Mnngs n	Pipe Flow Length (ft)	Pipe Flow D_{Pipe} (in)	Travel Time Length (ft)	Travel Time v_{Dsc} (ft/s)	Travel Time t_t (min)
	EX B3.1	2.75	0.20	19.9	0.55	2.96	1.6															
	EX B3.2a	6.54	0.12	17.8	0.76	3.14	2.4															
	EX B3.2b	9.99	0.14	22.6	1.42	2.77	3.9															
	EX B3.2c	1.40	0.09	16.9	0.13	3.22	0.4															
	EX B3.2d	11.63	0.09	24.6	1.05	2.64	2.8															
	EX C2.1	1.21	0.20	15.4	0.25	3.36	0.8															
	EX C2.2	6.03	0.17	21.5	1.04	2.84	2.9															
	EX C2.3	8.83	0.09	22.7	0.79	2.76	2.2															
	EX C3	7.95	0.09	28.8	0.72	2.41	1.7															
	EX C4	1.73	0.09	18.8	0.16	3.05	0.5															
POI 1	B3.2b, B3.2c	11.39	0.14					23.5	1.54	2.71	4.2											
POI 2	B3.2d	11.63	0.09					24.6	1.05	2.64	2.8											
POI 3	C2.1, C2.2	7.24	0.18					21.0	1.28	2.88	3.7											
POI 4	C2.1, C2.2, C2.3	16.07	0.13					24.6	2.08	2.64	5.5											

Rainfall Intensity: $I = (28.5 * P1) / (10 + tc)^{0.786}$
P1: 1.5

Job No. **61073**
Project: **Jackson Ranch Fiting No. 4**
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **UDFCD**

Date: **4/21/17 12:17**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

DP	Sub-Basin	Area (Acres)	C100	Direct Runoff t_c (min)	Direct Runoff CA (Acres)	Direct Runoff I100 (in/hr)	Direct Runoff Q100 (cfs)	Combined Runoff t_c (min)	Combined Runoff CA (Acres)	Combined Runoff I100 (in/hr)	Combined Runoff Q100 (cfs)	Streetflow Slope (%)	Streetflow Length (ft)	Streetflow Q (cfs)	Pipe Flow Q (cfs)	Pipe Flow Slope (%)	Pipe Flow Mnngs n	Pipe Flow Length (ft)	Pipe Flow D_{Pipe} (in)	Travel Time Length (ft)	Travel Time V_{Osc} (ft/s)	Travel Time t_t (min)
	EX B3.1	2.75	0.44	19.9	1.21	4.97	6.0															
	EX B3.2a	6.54	0.38	17.8	2.46	5.27	13.0															
	EX B3.2b	9.99	0.40	22.6	3.95	4.65	18.4															
	EX B3 2c	1.40	0.36	16.9	0.51	5.41	2.7															
	EX B3.2d	11.63	0.36	24.6	4.19	4.43	18.5															
	EX C2.1	1.21	0.44	15.4	0.53	5.64	3.0															
	EX C2.2	6.03	0.42	21.5	2.51	4.77	12.0															
	EX C2.3	8.83	0.36	22.7	3.18	4.63	14.7															
	EX C3	7.95	0.36	28.8	2.86	4.05	11.6															
	EX C4	1.73	0.36	18.8	0.62	5.12	3.2															
POI 1	B3 2b, B3.2c	11.39	0.39					23.5	4.46	4.55	20.3											
POI 2	B3.2d	11.63	0.36					24.6	4.19	4.43	18.5											
POI 3	C2.1, C2.2	7.24	0.42					21.0	3.04	4.84	14.7											
POI 4	C2.1, C2.2, C2.3	16.07	0.39					24.6	6.22	4.43	27.6											

Rainfall Intensity: $I = (28.5 * P1) / (10 + tc)^{0.786}$
P1: 2.52

Job No.: **61073**
Project: **Jackson Ranch Filing No. 4**

Date: **4/30/17 16:52**
Calcs By: **D. Gorman**
Checked By:

Time of Concentration (Modified from Standard Form SF-1)

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		
	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	t_c (min)
DV B3.1	2.75	0.20	0.44	15.4%	300	6%	15.8	340	0.068	1.8	3.1	175	0.011	3.1	0.9	815	N/A	19.9
DV B3.2a	6.54	0.12	0.38	5.0%	190	10%	11.5	700	0.070	1.9	6.3	0	0.000	0.0	0.0	890	N/A	17.8
DV B3.2b	9.99	0.16	0.40	9.7%	300	7%	15.3	640	0.047	1.5	7.0	0	0.000	0.0	0.0	940	N/A	22.3
DV B3.2c	1.40	0.11	0.37	3.6%	238	9%	13.3	288	0.042	1.4	3.4	0	0.000	0.0	0.0	526	N/A	16.6
DV B3.2d	11.07	0.13	0.38	6.1%	200	8%	12.5	640	0.072	1.9	5.7	400	0.020	2.3	2.9	1240	N/A	21.1
DV C2.1	1.21	0.20	0.44	15.9%	205	3%	15.4	0	0.000	0.0	0.0	0	0.000	0.0	0.0	205	N/A	15.4
DV C2.2	6.03	0.17	0.42	12.5%	300	5%	17.1	225	0.053	1.6	2.3	540	0.017	4.3	2.1	1065	N/A	21.5
DV C2 3	8.66	0.09	0.36	2.0%	260	4%	18.8	410	0.063	1.8	3.9	0	0.000	0.0	0.0	670	N/A	22.7
DV C3	8.68	0.13	0.39	6.7%	300	3%	20.4	605	0.063	1.8	5.7	265	0.026	2.3	1.9	1170	N/A	28.0
DV C4	1.73	0.11	0.37	4.2%	300	5%	17.8	65	0.062	1.7	0.6	0	0.000	0.0	0.0	365	N/A	18.4

Job No. **61073**
Project: **Jackson Ranch Filing No. 4**
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **UDFCD**

Date: **4/30/17 16:52**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{Osc} (ft/s)	t_t (min)
	DV B3.1	2.75	0.20	19.9	0.55	2.96	1.6															
	DV B3.2a	6.54	0.12	17.8	0.76	3.14	2.4															
	DV B3.2b	9.99	0.16	22.3	1.55	2.78	4.3															
	DV B3.2c	1.40	0.11	16.6	0.15	3.24	0.5															
	DV B3.2d	11.07	0.13	21.1	1.41	2.87	4.0															
	DV C2.1	1.21	0.20	15.4	0.25	3.36	0.8															
	DV C2.2	6.03	0.17	21.5	1.04	2.84	2.9															
	DV C2.3	8.66	0.09	22.7	0.81	2.76	2.2															
	DV C3	8.68	0.13	28.0	1.14	2.45	2.8															
	DV C4	1.73	0.11	18.4	0.19	3.08	0.6															
POI 1	B3.2b, B3.2c	11.39	0.15					23.3	1.70	2.72	4.6											
POI 2	B3.2d	11.07	0.13					21.1	1.41	2.87	4.0											
POI 3	C4	1.73	0.11					18.4	0.19	3.08	0.6											
POI 4	C2.1, C2.2, C3	15.92	0.15					27.9	2.43	2.45	6.0											
POI 5	C3	8.68	0.13					28.0	1.14	2.45	2.8											

Rainfall Intensity: I = (28.5 * P1) / (10 + tc)^0.786
P1: 1.5

Job No. **61073**
Project: **Jackson Ranch Filing No. 4**
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **UDFCD**

Date: **4/30/17 16:52**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C100	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{Design} (ft/s)	t_t (min)
	DV B3.1	2.75	0.44	19.9	1.21	4.97	6.0															
	DV B3.2a	6.54	0.38	17.8	2.46	5.27	13.0															
	DV B3.2b	9.99	0.40	22.3	4.04	4.67	18.9															
	DV B3.2c	1.40	0.37	16.6	0.52	5.44	2.8															
	DV B3.2d	11.07	0.38	21.1	4.26	4.82	20.5															
	DV C2.1	1.21	0.44	15.4	0.53	5.64	3.0															
	DV C2.2	6.03	0.42	21.5	2.51	4.77	12.0															
	DV C2.3	8.66	0.36	22.7	3.12	4.64	14.5															
	DV C3	8.68	0.39	28.0	3.36	4.12	13.8															
	DV C4	1.73	0.37	18.4	0.64	5.17	3.3															
POI 1	B3.2b, B3.2c	11.39	0.40					23.3	4.56	4.57	20.8											
POI 2	B3.2d	11.07	0.38					21.1	4.26	4.82	20.5											
POI 3	C4	1.73	0.37					18.4	0.64	5.17	3.3											
POI 4	C2.1, C2.2, C3	15.92	0.40					27.9	6.41	4.12	26.4											
POI 5	C3	8.68	0.39					28.0	3.36	4.12	13.8											

Rainfall Intensity: $I = (28.5 * P1) / (10 + tc)^{0.786}$
P1: 2.52

Main Stream
NRCS Hydrology
with Existing Ponds

Jackson Ranch Fil. No. 3 & 4
Project No. 61044 / 61073

Tc, T lag & Ia

Existing

Basin	Tc (Min)	Tc (Hr)	Tlag (Hr)	CN	Ia
OSA	55.0	0.92	0.55	64.0	0.56
OSB	52.2	0.87	0.52	61.5	0.63
OSD	60.6	1.01	0.61	61.2	0.63
A2	42.1	0.70	0.42	60.9	0.64
B2	23.1	0.39	0.23	60.4	0.65
B3	31.5	0.53	0.32	60.4	0.65
B4	25.8	0.43	0.26	60.4	0.66
C3	31.4	0.52	0.31	59.7	0.68

Proposed

Basin	Tc (Min)	Tc (Hr)	Tlag (Hr)	CN	Ia
OSA	55.0	0.92	0.55	64.0	0.56
OSB	52.2	0.87	0.52	61.5	0.63
OSD	60.6	1.01	0.61	61.4	0.63
A2	34.9	0.58	0.35	63.0	0.59
B2	22.6	0.38	0.23	70.4	0.42
B3	31.1	0.52	0.31	63.7	0.57
B4	25.1	0.42	0.25	63.4	0.58
C3	31.1	0.52	0.31	61.9	0.62

Jackson Ranch Fil. No. 3 & 4
Project No. 61044 / 61073

Existing

Basin	Area (AC)	Area (SM)
OSA	34.0	0.05313
OSB	170.0	0.26563
OSD	293.0	0.45781
A2	27.0	0.04219
B2	39.0	0.06094
B3	36.0	0.05625
B4	14.0	0.02188
C3	8.0	0.01250
Total	621.0	0.97031

Proposed

Basin	Area (AC)	Area (SM)
OSA	34.0	0.05313
OSB	170.0	0.26563
OSD	296.0	0.46250
A2	27.0	0.04219
B2	40.0	0.06250
B3	32.0	0.05000
B4	14.0	0.02188
C3	8.0	0.01250
Total	621.0	0.97031

Jackson Ranch Fil. No. 3 & 4
Project No. 61044 / 61073

Composite Curve Numbers - Existing

Basin	Total		Soil Group	
OSA	Area (AC) =	34	B	
	Area	Percent	CN	Weighted
2.5-Acre Residential	34	100%	64	64.0
Total	34	100%		
Composite CN				64.0

Basin	Total		Soil Group	
OSB	Area (AC) =	170	B	
	Area	Percent	CN	Weighted
Herbaceous Rangeland	51.9	31%	62	18.9
Meadow	51.9	31%	58	17.7
2.5 Acre Residential	13.8	8%	64	5.2
5-Acre Residential	33.6	20%	62	12.3
Farmstead	9.2	5%	74	4.0
Woods	9.6	6%	60	3.4
Total	170	100%		
Composite CN				61.5

Basin	Total		Soil Group	
OSD	Area (AC) =	293	B	
	Area	Percent	CN	Weighted
Herbaceous Rangeland	83.4	28%	62	17.6
Meadow	83.4	28%	58	16.5
5-Acre Residential	117.1	40%	62	24.8
Farmstead	2.3	1%	74	0.6
Industrial	3.0	1%	88	0.9
Woods	3.8	1%	60	0.8
Total	293	100%		
Composite CN				61.2

Basin	Total		Soil Group	
A2	Area (AC) =	27	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	5.9	22%	62	13.5
Meadow	5.9	22%	58	12.7
Farmstead	1.8	7%	74	4.9
Woods	13.4	50%	60	29.8
Total	27	100%		
Composite CN				60.9

Basin	Total		Soil Group	
B2	Area (AC) =	39	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	17.4	45%	62	27.7
Meadow	17.4	45%	59	26.3
Woods	4.2	11%	60	6.5
Total	39	100%		
Composite CN				60.4

Basin	Total		Soil Group	
B3	Area (AC) =	36	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	15.9	44%	62	27.4
Meadow	15.9	44%	59	26.1
Woods	4.2	12%	60	7.0
Total	36	100%		
Composite CN				60.4

Basin	Total		Soil Group	
B4	Area (AC) =	14	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	5.5	39%	62	24.4
Meadow	5.5	39%	59	23.2
Woods	3	21%	60	12.9
Total	14	100%		
Composite CN				60.4

Basin	Total		Soil Group	
C3	Area (AC) =	8	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	3.5	44%	62	27.1
Meadow	3.5	44%	59	25.8
Woods	0.9	11%	60	6.8
Total	7.9	99%		
Composite CN				59.7

Jackson Ranch Fil. No. 3 & 4
Project No. 61044 / 61073

Composite Curve Numbers - Proposed

Basin	Total		Soil Group	
OSA	Area (AC) =	34	B	
	Area	Percent	CN	Weighted
2.5-Acre Residential	34	100%	64	64.0
Total	34	100%		
Composite CN				64.0

Basin	Total		Soil Group	
OSB	Area (AC) =	170	B	
	Area	Percent	CN	Weighted
Herbaceous Rangeland	51.9	31%	62	18.9
Meadow	51.9	31%	58	17.7
2.5 Acre Residential	13.8	8%	64	5.2
5-Acre Residential	33.6	20%	62	12.3
Farmstead	9.2	5%	74	4.0
Woods	9.6	6%	60	3.4
Total	170	100%		
Composite CN				61.5

Basin	Total		Soil Group	
OSD	Area (AC) =	296	B	
	Area	Percent	CN	Weighted
Herbaceous Rangeland	75.9	26%	62	15.9
Meadow	75.9	26%	58	14.9
5-Acre Residential	121.1	41%	62	25.4
2.5-Acre Residential	14.0	5%	64	3.0
Farmstead	2.3	1%	74	0.6
Industrial	3.0	1%	88	0.9
Woods	3.8	1%	60	0.8
Total	296.0	100%		
Composite CN				61.4

Basin	Total		Soil Group	
A2	Area (AC) =	27	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	0.2	1%	62	0.5
Meadow	0.1	0%	58	0.2
5-Acre Residential	12.4	46%	62	28.5
2.5-Acre Residential	14.3	53%	64	33.9
Total	27	100%		
Composite CN				63.0

Basin	Total		Soil Group	
B2	Area (AC) =	36	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	3.6	10%	62	6.2
Meadow	3.6	10%	59	5.9
2.5-Acre Residential	32.8	91%	64	58.3
Total	40	111%		
Composite CN				70.4

Basin	Total		Soil Group	
B3	Area (AC) =	36	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	1.4	4%	62	2.4
Meadow	1.4	4%	59	2.3
5-Acre Residential	0	0%	62	0.0
2.5-Acre Residential	33.2	92%	64	59.0
Total	36	100%		
Composite CN				63.7

Basin	Total		Soil Group	
B4	Area (AC) =	14	B	

	Area	Percent	CN	Weighted
Herbaceous Rangeland	0.3	2%	62	1.3
Meadow	0.3	2%	59	1.3
5-Acre Residential	2.9	21%	62	12.8
2.5-Acre Residential	10.5	75%	64	48.0
Total	14	100%		
Composite CN				63.4

Basin	Total		Soil Group	
C3	Area (AC) =	8	B	
	Area	Percent	CN	Weighted
Herbaceous Rangeland	0.7	9%	62	5.4
Meadow	0.7	9%	59	5.2
5-Acre Residential	4.3	54%	62	33.3
2.5-Acre Residential	1.4	18%	64	11.2
Woods	0.9	11%	60	6.8
Total	8	100%		
Composite CN				61.9

Jackson Ranch Fil. No. 3 & 4
Project No. 61044 / 61073

Routing Elements

Rt OSA: Natural Channel
L = 1740
BW = 6'
SS=7.5
S=0.031

Rt OSB: Natural Channel
L = 1240
BW = 50'
SS=9.5
S=0.023

Rt B2: Natural Channel
L = 900
BW = 15'
SS=9.5
S=0.017

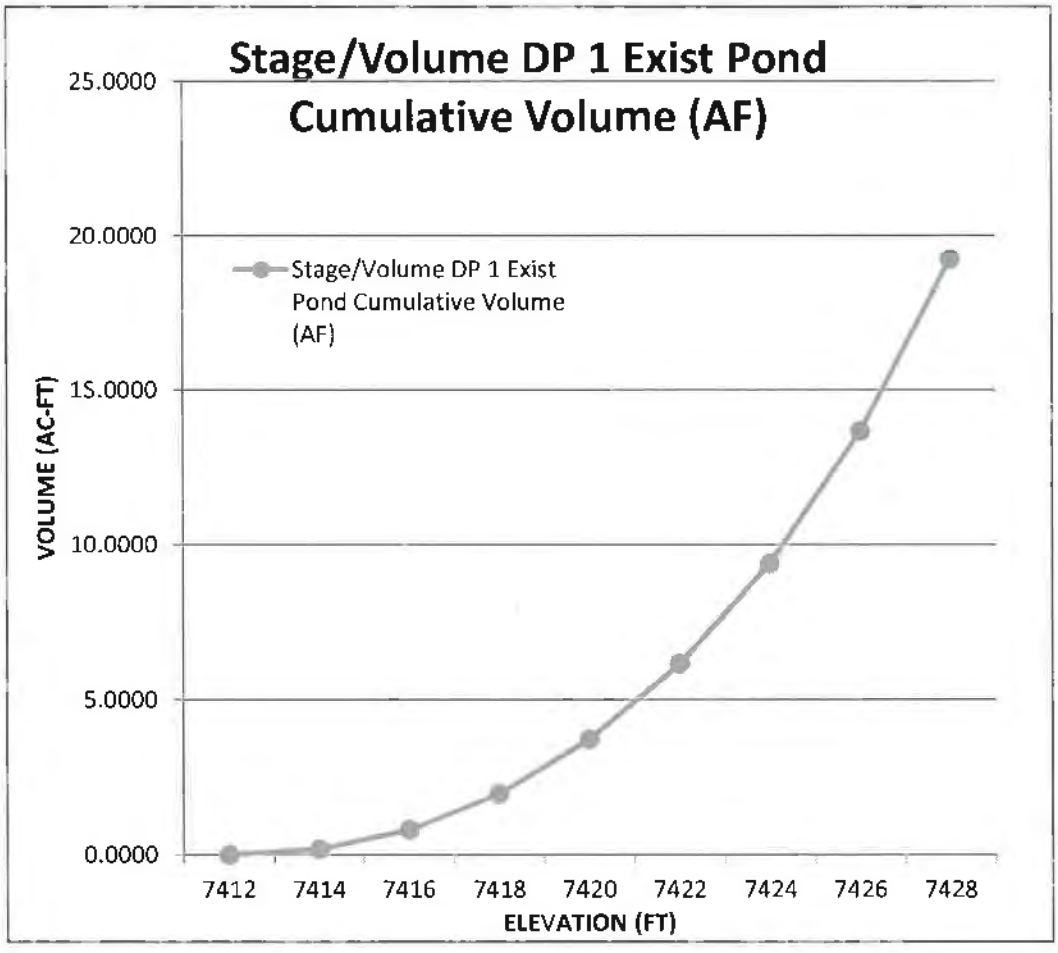
Rt B3: Natural Channel
L = 730
BW = 16'
SS=9.5
S=0.017

Rt OSD: Natural Channel
L = 250
BW = 8'
SS=6
S=0.032

Jackson Ranch Filing No. 3 and Filing No. 4
Project No. 61044/61073

Stage/Volume DP 1 Exist Pond

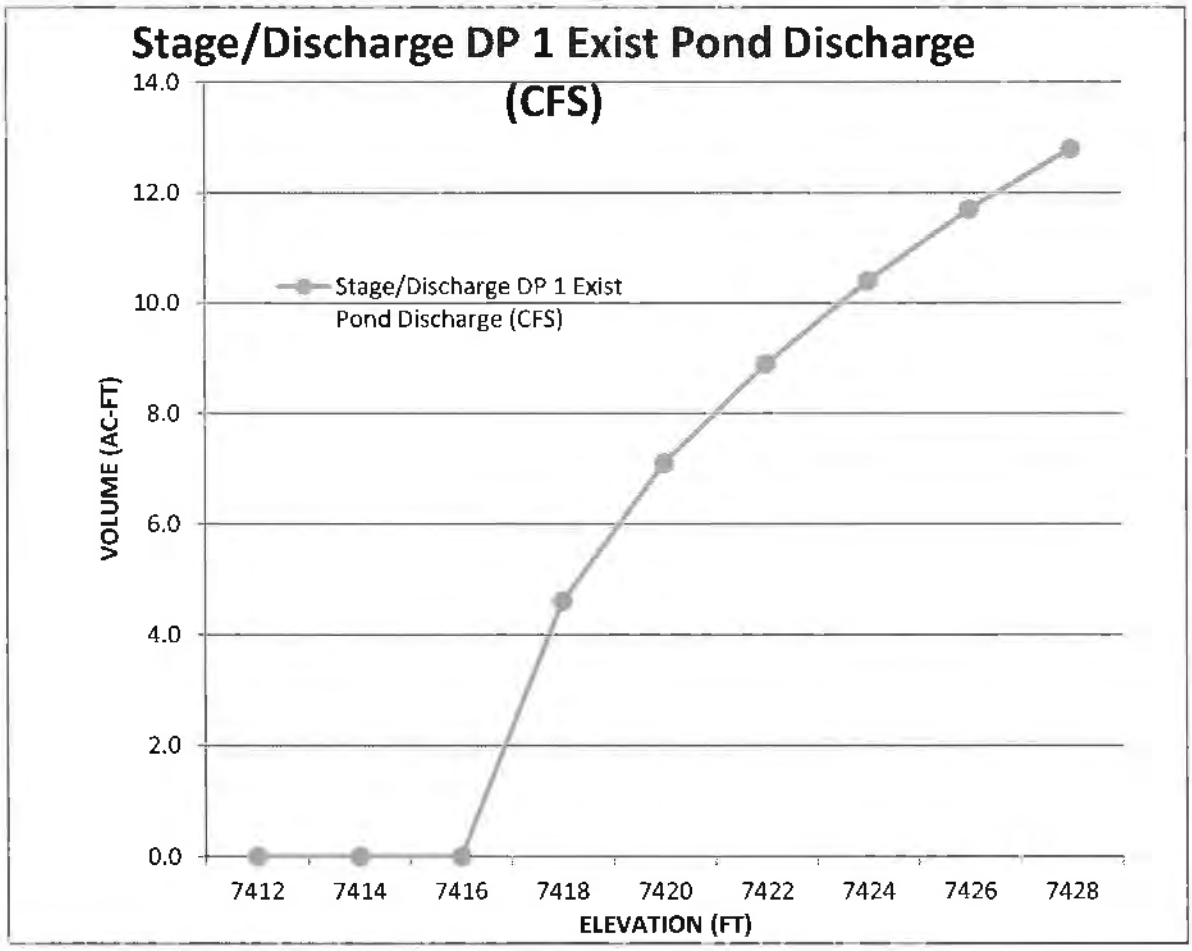
Stage	Elevation	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (AF)
0	7412	1,093	0	0	0.0000
2	7414	6,980	8,073	8,073	0.1853
4	7416	19,787	26,767	34,840	0.7998
6	7418	31,007	50,794	85,634	1.9659
8	7420	45,715	76,722	162,356	3.7272
10	7422	60,514	106,229	268,585	6.1659
12	7424	80,536	141,050	409,635	9.4039
14	7426	105,062	185,598	595,233	13.6647
16	7428	137,251	242,313	837,546	19.2274



Jackson Ranch Filing No. 3 and Filing No. 4
Project No. 61044/61073

Stage/Discharge DP 1 Exist Pond

Stage	Elevation	12" pipe Discharge (CFS)
0	7412	0.0
2	7414	0.0
4	7416	0.0
6	7418	4.6
8	7420	7.1
10	7422	8.9
12	7424	10.4
14	7426	11.7
16	7428	12.8

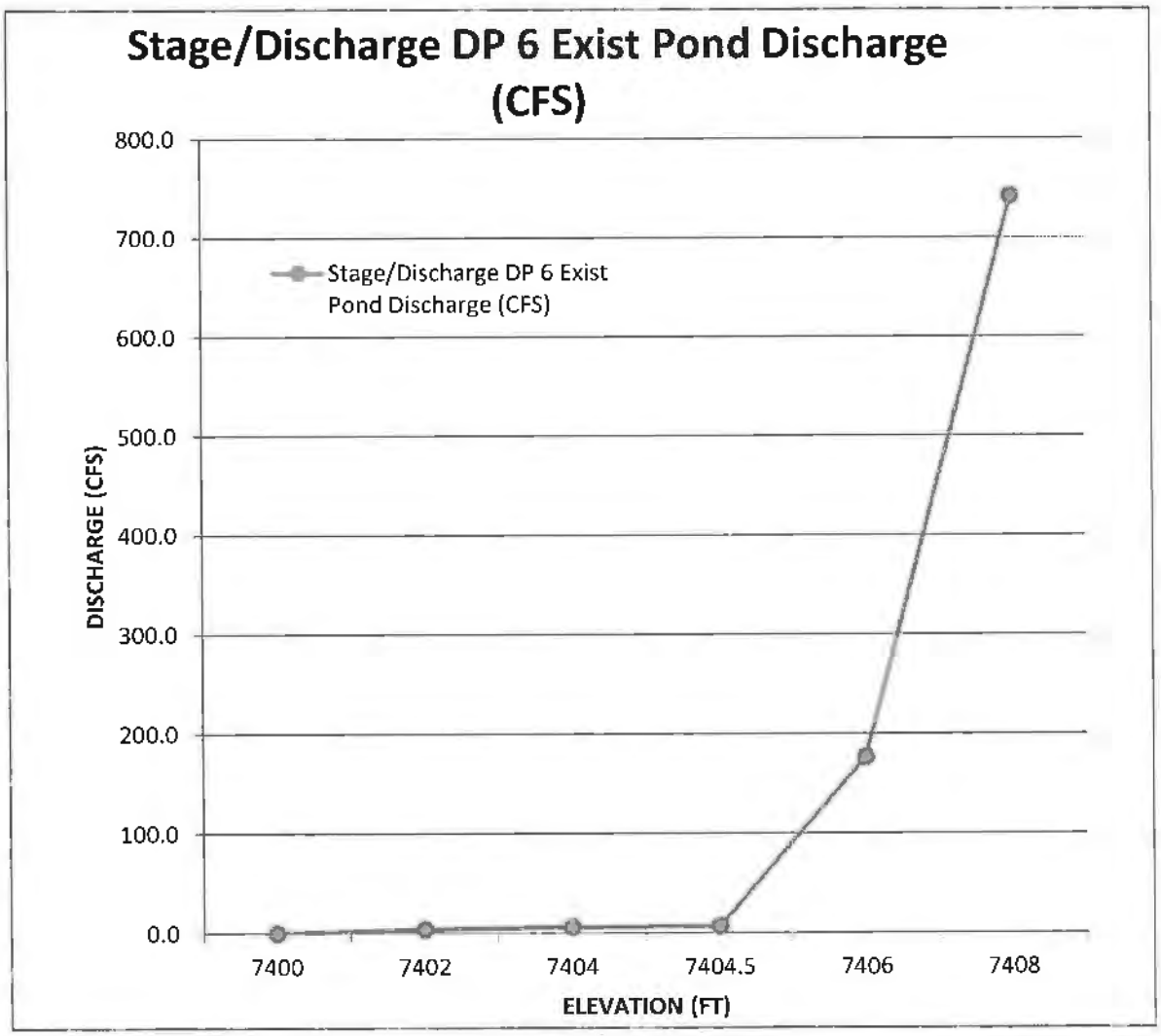


	Stage [ft]	Area [ft^2]	Volume [ft^3]	User Defined Discharge [cfs]	2*Vol [ft^3]	Filtration Media Orifice [cfs]	Orifice Plate [cfs]	Vertical Orifice #1 [cfs]	Vertical Orifice #2 [cfs]
7416	0.00	19787	0		0	0.00	0.00	0.00	0.00
7417	1.00	25397	22592		45,184	0.00	0.00	2.67	0.00
7418	2.00	31007	50794		101,588	0.00	0.00	4.64	0.00
7419	3.00	38361	85478		170,956	0.00	0.00	5.98	0.00
7420	4.00	45715	127516		255,032	0.00	0.00	7.07	0.00
7421	5.00	53114	176931		353,861	0.00	0.00	8.02	0.00
7422	6.00	60514	233745		467,490	0.00	0.00	8.87	0.00
7423	7.00	70525	299264		598,529	0.00	0.00	9.64	0.00
7424	8.00	80536	374795		749,590	0.00	0.00	10.36	0.00
7425	9.00	92709	461462		922,925	0.00	0.00	11.03	0.00
7426	10.00	105062	562383		1,120,766	0.00	0.00	11.66	0.00
7427	11.00	121156	673502		1,347,004	0.00	0.00	12.25	0.00
7428	12.00	137251	802706		1,605,412	0.00	0.00	12.82	0.00

Jackson Ranch Filing No. 3 and Filing No. 4
Project No. 61044/61073

Stage/Discharge DP 6 Exist Pond

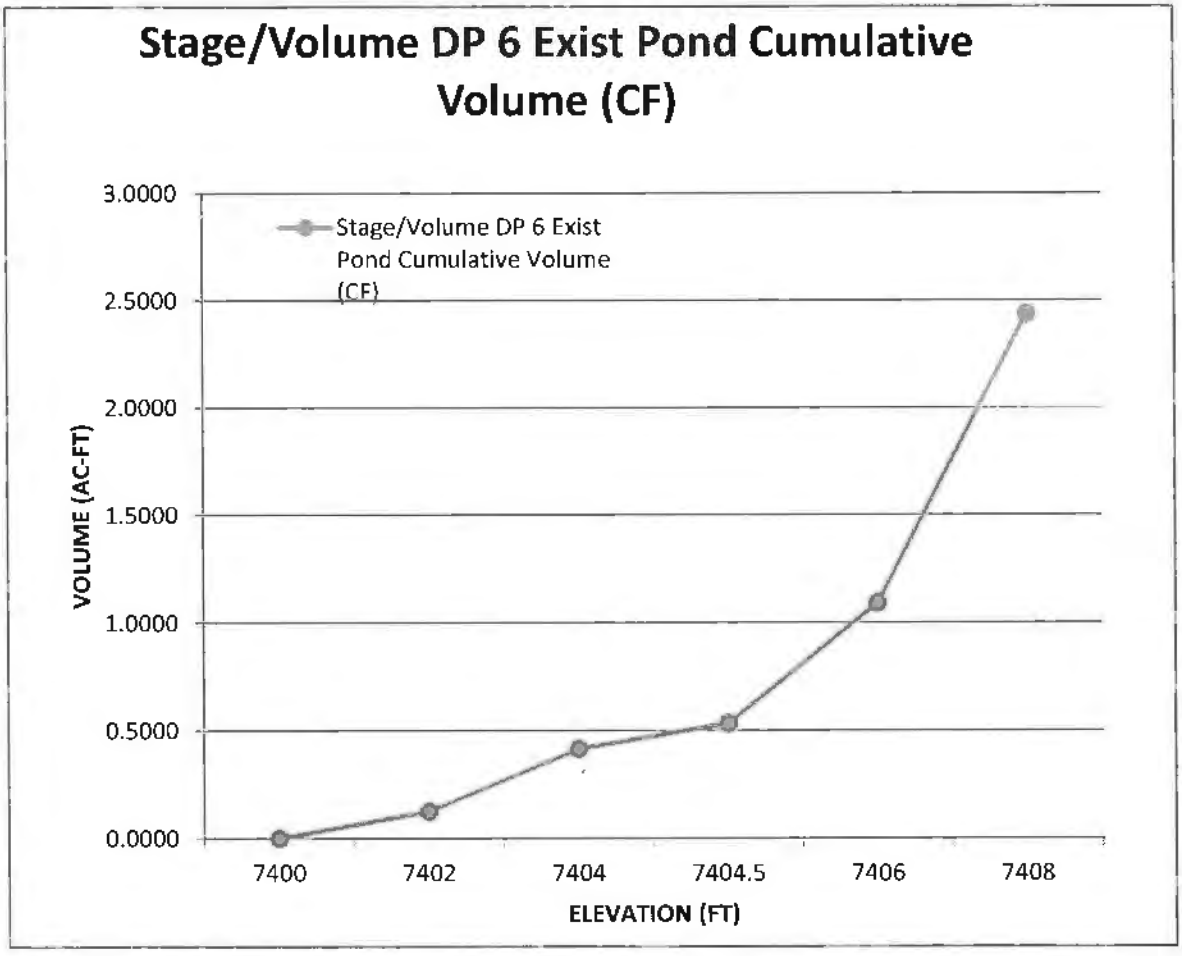
Stage	Elevation	12" pipe & outlet weir	Discharge (CFS)
0	7400		0.0
2	7402		4.0
4	7404		6.2
4.5	7404.5		6.7
6	7406		176.4
8	7408		741.5



Jackson Ranch Filing No. 3 and Filing No. 4
Project No. 61044/61073

Stage/Volume DP 6 Exist Pond

Stage	Elevation	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CF)
0	7400	1,176	0	0	0.0000
2	7402	4,253	5,429	5,429	0.1246
4	7404	8,396	12,649	18,078	0.4150
4.5	7404.5	12,130	5,132	23,210	0.5328
6	7406	20,312	24,332	47,541	1.0914
8	7408	38,334	58,646	106,187	2.4377

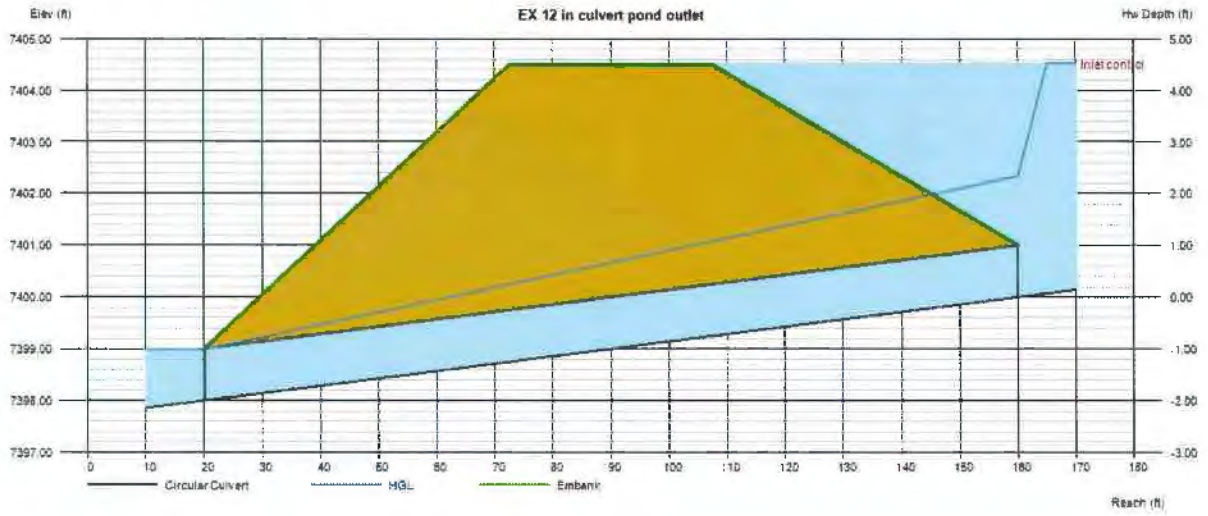


Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Nov 18 2017

EX 12 in culvert pond outlet

Invert Elev Dn (ft)	= 7398.00	**Calculations**	
Pipe Length (ft)	= 140.00	Qmin (cfs)	= 1.00
Slope (%)	= 1.43	Qmax (cfs)	= 7.00
Invert Elev Up (ft)	= 7400.00	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 12.0		
Shape	= Circular	**Highlighted**	
Span (in)	= 12.0	Qtotal (cfs)	= 7.00
No. Barrels	= 1	Qpipe (cfs)	= 6.67
n-Value	= 0.011	Qovertop (cfs)	= 0.33
Culvert Type	= Circular Corrugate Metal Pipe	Veloc Dn (ft/s)	= 8.52
Culvert Entrance	= Projecting	Veloc Up (ft/s)	= 8.49
Coeff. K,M,c,Y,k	= 0.034, 1.5, 0.0553, 0.54, 0.9	HGL Dn (ft)	= 7398.99
		HGL Up (ft)	= 7402.34
Embankment		Hw Elev (ft)	= 7404.52
Top Elevation (ft)	= 7404.50	Hw/D (ft)	= 4.52
Top Width (ft)	= 35.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 25.00		



Q			Veloc		Depth	
Total	Pipe	Over	Dn	Up	Dn	Up
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)
1.00	1.00	0.00	1.68	3.20	8.52	5.04
1.50	1.50	0.00	2.34	3.65	9.11	6.22
2.00	2.00	0.00	2.96	4.04	9.62	7.24
2.50	2.50	0.00	3.56	4.42	10.06	8.12
3.00	3.00	0.00	4.13	4.80	10.45	8.90
3.50	3.50	0.00	4.70	5.20	10.79	9.59
4.00	4.00	0.00	5.28	5.64	11.08	10.16
4.50	4.50	0.00	5.86	6.11	11.31	10.63
5.00	5.00	0.00	6.46	6.63	11.50	11.00
5.50	5.50	0.00	7.07	7.00	11.63	12.00
6.00	6.00	0.00	7.68	7.64	11.73	12.00
6.50	6.50	0.00	8.31	8.28	11.80	12.00
7.00	6.67	0.33	8.52	8.49	11.82	12.00

HGL			
Dn	Up	Hw	Hw/D
(ft)	(ft)	(ft)	
7398.71	7400.42	7400.62	0.62
7398.76	7400.52	7400.81	0.81
7398.80	7400.60	7400.99	0.99
7398.84	7400.68	7401.17	1.17
7398.87	7400.74	7401.35	1.35
7398.90	7400.80	7401.63	1.63
7398.92	7400.85	7401.97	1.97
7398.94	7400.89	7402.35	2.35
7398.96	7400.92	7402.77	2.77
7398.97	7401.23	7403.25	3.24
7398.98	7401.68	7403.76	3.76
7398.98	7402.17	7404.32	4.32
7398.99	7402.34	7404.52	4.52

Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Nov 18 2017

DP6 EX Poind Overflow Wier

Trapezoidal Weir

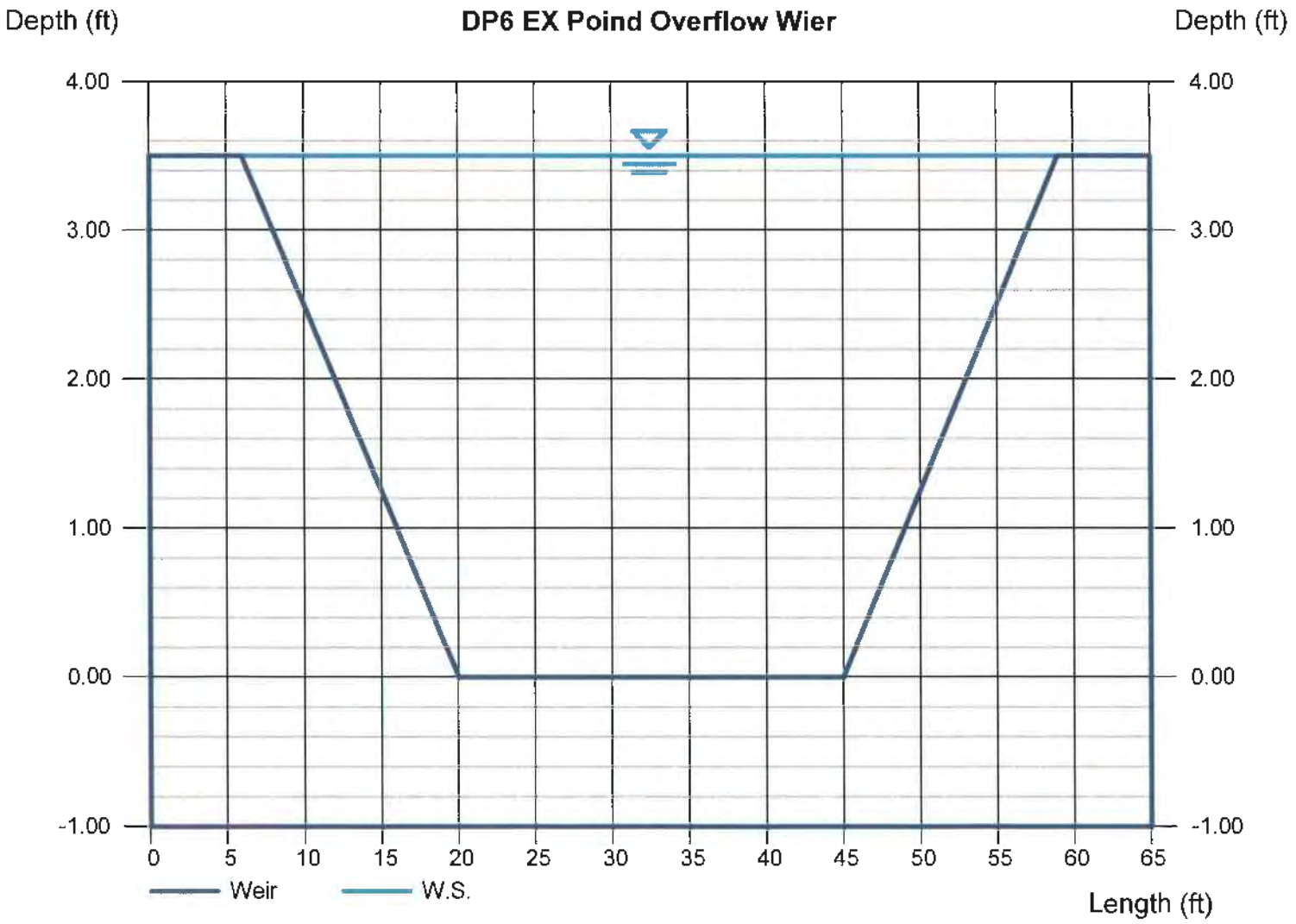
Crest	= Sharp
Bottom Length (ft)	= 25.00
Total Depth (ft)	= 3.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 7

Highlighted

Depth (ft)	= 3.50
Q (cfs)	= 734.81
Area (sqft)	= 136.50
Velocity (ft/s)	= 5.38
Top Width (ft)	= 53.00



Depth	Q	Area
(ft)	(cfs)	(sqft)
(7405) 0.50	29.15	13.50
1.00	87.42	29.00
(7406) 1.50	169.71	46.50
2.00	275.32	66.00
(7407) 2.50	404.38	87.50
3.00	557.34	111.00
(7408) 3.50	734.81	136.50

Veloc	TopWidth	Energy
(ft/s)	(ft)	(ft)
2.16	29.00	0.57
3.01	33.00	1.14
3.65	37.00	1.71
4.17	41.00	2.27
4.62	45.00	2.83
5.02	49.00	3.39
5.38	53.00	3.95

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *               JUN   1998             *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   13JAN18  TIME  19:32:28  *
 *                                      *
 ****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID        Stream through Jackson Ranch PN: 61044 & 61073
   2          ID        Jackson Ranch undeveloped and with current development upstream
   3          ID        Existing ponds in place
   4          ID        5 yr and 100 Year, NRCS 24-hr Type II Storm, FN: jrexpnd2.dat
              *DIAGRAM
   5          IT       5       0       0     300
   6          IO       5       0
   7          JR    PREC     .60     1.0

   8          KK  SB-OSB
   9          KM        RUNOFF - Sub-basin OSB
  10          BA   0.266
  11          IN      15
  12          PB     4.4
```

```
   13          PC  0.0000  0.0020  0.0050  0.0080  0.0110  0.0140  0.0170  0.0200  0.0230  0.0260
   14          PC  0.0290  0.0320  0.0350  0.0380  0.0410  0.0440  0.0480  0.0520  0.0560  0.0600
   15          PC  0.0604  0.0680  0.0720  0.0760  0.0800  0.0850  0.0900  0.0950  0.1000  0.1050
   16          PC  0.1100  0.1150  0.1200  0.1260  0.1330  0.1400  0.1470  0.1550  0.1630  0.1720
   17          PC  0.1810  0.1910  0.2030  0.2180  0.2360  0.2570  0.2830  0.3870  0.6630  0.7070
   18          PC  0.7350  0.7580  0.7760  0.7910  0.8040  0.8150  0.8250  0.8340  0.8420  0.8490
   19          PC  0.8560  0.8630  0.8690  0.8750  0.8810  0.8870  0.8930  0.8980  0.9030  0.9080
   20          PC  0.9130  0.9180  0.9220  0.9260  0.9300  0.9340  0.9380  0.9420  0.9460  0.9500
   21          PC  0.9530  0.9560  0.9590  0.9620  0.9650  0.9680  0.9710  0.9740  0.9770  0.9800
   22          PC  0.9830  0.9860  0.9890  0.9920  0.9950  0.9980  1.0000
   23          LS   0.63    61.5
   24          UD   0.52

   25          KK  RT-OSB
   26          KM       ROUTE FLOW from sub-basin OSB to DP-1 POND
   27          RD   1240   0.023    .035           TRAP      50     9.5

   28          KK   SB-B2
   29          KM       RUNOFF - Sub-basin B2
   30          BA  0.061
   31          LS   0.65    60.4
   32          UD   0.23

   33          KK   DP-1
   34          KM       COMBINE FLOW from RT-OSB and SB-B2
   35          HC      2

   36          KK   DB-1
   37          KM       ROUTE INFLOW at DP-1 through EXISTING DP-1 POND
   38          RS      1    ELEV    7412
   39          SQ      0       0       0       0       0     4.6     7.1     8.9    10.4
   40          SE   7412    7414    7416    7418    7420    7422    7424    7426    7428
   41          SV      0  0.1853  0.7998  1.9659  3.7272  6.1659  9.4039 13.6647 19.2274

   42          KK   RT-1
   43          KM       ROUTE OUTFLOW from DB-1 to DP-2
   44          RD    900   0.017    .035           TRAP      15     9.5
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   45          KK   SB-B3
   46          KM       RUNOFF - Sub-basin B3
   47          BA    .056
   48          LS   0.65    60.4
   49          UD   0.32

   50          KK   DP-2
   51          KM       COMBINE FLOW from RT-1 and SB-B3
   52          HC      2
```

```
 53          KK    RT-2
 54          KM        ROUTE OUTFLOW from DP-2 to DP-5
 55          RD     730   0.017    .035            TRAP      16     9.5

 56          KK   SB-B4
 57          KM        RUNOFF - Sub-basin B4
 58          BA    .022
 59          LS    0.66     60.4
 60          UD    0.26

 61          KK    CO-5
 62          KM        COMBINE FLOW from RT-2 and SB-B4
 63          HC       2

 64          KK  SB-OSA
 65          KM        RUNOFF - Sub-basin OSA
 66          BA   0.053
 67          LS    0.56     64.0
 68          UD    0.55

 69          KK  RT-OSA
 70          KM        ROUTE FLOW from SB-OSA to DP-5
 71          RD    1740   0.031    .035            TRAP       6     7.5

 72          KK   SB-A2
 73          KM        RUNOFF - Sub-basin A2
 74          BA   0.042
 75          LS    0.64     60.9
 76          UD    0.42

 77          KK    DP-5
 78          KM        COMBINE FLOW from SB-A2, RT-OSA and C-5
 79          HC       3

 80          KK    DP-6
 81          KM        RUNOFF - Sub-basin OSD (DP-6)
 82          BA   0.458
 83          LS    0.63     61.2
 84          UD    0.61
```



```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 85          KK    DB-6
 86          KM        ROUTE INFLOW at DP-6 through EXISTING DP-6 POND
 87          RS       1    ELEV    7400
 88          SQ       0     4.0     6.2     6.7   176.4   741.5
 89          SE    7400    7402    7404  7404.5    7406    7408
 90          SV       0  0.1246  0.4150  0.5328  1.0914  2.4377

 91          KK    RT-6
```

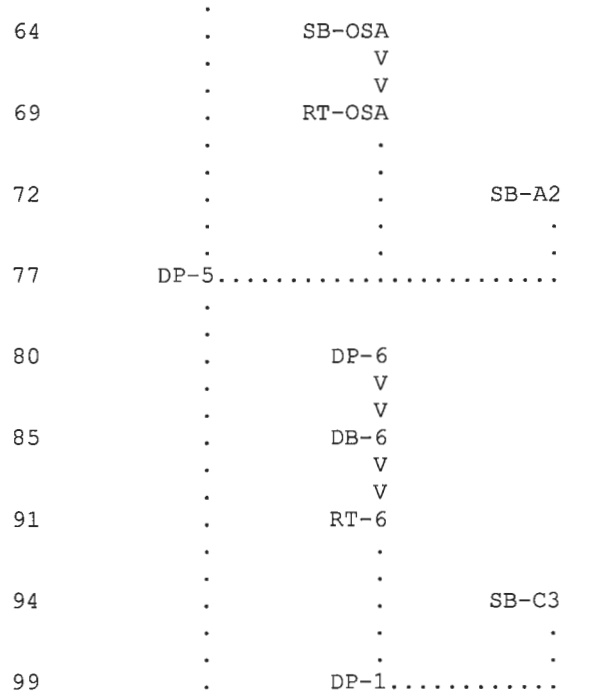
```
 92           KM        ROUTE OUTFLOW from DB-6 to DP-7
 93           RD     250   .032    .035             TRAP       8       6

 94           KK   SB-C3
 95           KM        RUNOFF - Sub-basin C3
 96           BA   0.013
 97           LS    0.68    59.7
 98           UD    0.31

 99           KK    DP-1
100           KM        COMBINE FLOW from RT-6 and SB-C3
101           HC       2
102           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8      SB-OSB
              V
              V
    25      RT-OSB
              .
              .
    28        .       SB-B2
              .           .
              .           .
    33      DP-1...........
              V
              V
    36      DB-1
              V
              V
    42      RT-1
              .
              .
    45        .       SB-B3
              .           .
              .           .
    50      DP-2...........
              V
              V
    53      RT-2
              .
              .
    56        .       SB-B4
              .           .
              .           .
    61      CO-5...........
              .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*             VERSION 4.1               *
*                                       *
*  RUN DATE   13JAN18  TIME  19:32:28   *
*                                       *
*****************************************
```

```
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*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Stream through Jackson Ranch PN: 61044 & 61073
Jackson Ranch undeveloped and with current development upstream
Existing ponds in place
5 yr and 100 Year, NRCS 24-hr Type II Storm, FN: jrexpnd2.dat

6 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

```
      IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                      ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE   24.92 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                        NPLAN          1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                      .60      1.00
1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                  FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                                        RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN              RATIO 1  RATIO 2
                                                           .60      1.00

 HYDROGRAPH AT
+                SB-OSB       .27     1   FLOW            42.      134.
                                          TIME          12.50    12.42

 ROUTED TO
+                RT-OSB       .27     1   FLOW            42.      133.
                                          TIME          12.58    12.50

 HYDROGRAPH AT
+                 SB-B2       .06     1   FLOW            15.       47.
                                          TIME          12.17    12.17

  2 COMBINED AT
+                  DP-1       .33     1   FLOW            47.      152.
```

				TIME	12.50	12.42
ROUTED TO						
+	DB-1	.33	1	FLOW	4.	10.
				TIME	18.75	18.42
			** PEAK STAGES IN FEET **			
			1	STAGE	7421.59	7426.93
				TIME	18.83	18.42
ROUTED TO						
+	RT-1	.33	1	FLOW	4.	10.
				TIME	19.00	18.50
HYDROGRAPH AT						
+	SB-B3	.06	1	FLOW	11.	36.
				TIME	12.25	12.25
2 COMBINED AT						
+	DP-2	.38	1	FLOW	11.	36.
				TIME	12.25	12.25
ROUTED TO						
+	RT-2	.38	1	FLOW	11.	36.
				TIME	12.33	12.25
HYDROGRAPH AT						
+	SB-B4	.02	1	FLOW	5.	16.
				TIME	12.17	12.17
2 COMBINED AT						
+	CO-5	.40	1	FLOW	15.	50.
				TIME	12.25	12.25
HYDROGRAPH AT						
+	SB-OSA	.05	1	FLOW	10.	29.
				TIME	12.50	12.50
ROUTED TO						
+	RT-OSA	.05	1	FLOW	10.	29.
				TIME	12.58	12.58
HYDROGRAPH AT						
+	SB-A2	.04	1	FLOW	7.	24.
				TIME	12.33	12.33
3 COMBINED AT						
+	DP-5	.50	1	FLOW	29.	94.
				TIME	12.33	12.33
HYDROGRAPH AT						
+	DP-6	.46	1	FLOW	64.	206.

```
                                        TIME        12.58    12.50

 ROUTED TO
+                   DB-6       .46     1   FLOW          64.     206.
                                           TIME        12.58    12.58

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     7405.01  7406.10
                                           TIME        12.58    12.58

 ROUTED TO
+                   RT-6       .46     1   FLOW          64.     205.
                                           TIME        12.58    12.58

 HYDROGRAPH AT
+                  SB-C3       .01     1   FLOW           3.       8.
                                           TIME        12.25    12.25

  2 COMBINED AT
+                   DP-1       .47     1   FLOW          65.     209.
                                           TIME        12.58    12.58
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                    PEAK

                                (MIN)      (CFS)      (MIN)      (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
            RT-OSB  MANE         4.50     41.78    751.50       .49      5.00     41.59    755.00         .49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6917E+01 EXCESS= .0000E+00 OUTFLOW= .6907E+01 BASIN STORAGE= .2478E-01 PERCENT ERROR=   -.2


          FOR PLAN = 1  RATIO=  .00
            RT-OSB  MANE         4.24    133.45    750.76      1.41      5.00    133.23    750.00        1.41

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2008E+02 EXCESS= .0000E+00 OUTFLOW= .2006E+02 BASIN STORAGE= .4228E-01 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
              RT-1  MANE         5.00      3.65   1140.00       .17      5.00      3.65   1140.00         .17

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3053E+01 EXCESS= .0000E+00 OUTFLOW= .3015E+01 BASIN STORAGE= .3959E-01 PERCENT ERROR=    .0
```

```
          FOR PLAN = 1  RATIO=  .00
              RT-1  MANE         5.00      9.60   1115.00       .54      5.00      9.60   1115.00         .54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9600E+01 EXCESS= .0000E+00 OUTFLOW= .9517E+01 BASIN STORAGE= .8710E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-2  MANE         3.50     11.24    738.50       .21      5.00     11.13    740.00         .21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4393E+01 EXCESS= .0000E+00 OUTFLOW= .4362E+01 BASIN STORAGE= .3292E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-2  MANE         3.37     35.98    735.57       .66      5.00     35.73    735.00         .66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1358E+02 EXCESS= .0000E+00 OUTFLOW= .1351E+02 BASIN STORAGE= .7179E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RT-OSA  MANE         5.00      9.59    755.00       .56      5.00      9.59    755.00         .56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1585E+01 EXCESS= .0000E+00 OUTFLOW= .1582E+01 BASIN STORAGE= .6040E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
            RT-OSA  MANE         5.00     28.53    755.00      1.55      5.00     28.53    755.00        1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4398E+01 EXCESS= .0000E+00 OUTFLOW= .4393E+01 BASIN STORAGE= .1035E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE          .68     64.09    755.67       .48      5.00     63.84    755.00         .48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1171E+02 EXCESS= .0000E+00 OUTFLOW= .1171E+02 BASIN STORAGE= .6092E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE          .50    205.50    755.42      1.38      5.00    205.47    755.00        1.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3381E+02 EXCESS= .0000E+00 OUTFLOW= .3380E+02 BASIN STORAGE= .1260E-01 PERCENT ERROR=    .0
```

*** NORMAL END OF HEC-1 ***

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   13JAN18  TIME  19:32:55   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID        Stream through Jackson Ranch PN: 61044 & 61073
   2          ID        Jackson Ranch developed and with current development upstream
   3          ID        Existing ponds in place
   4          ID        5 yr and 100 Year, NRCS 24-hr Type II Storm, FN: jrpppnd2.dat
              *DIAGRAM
   5          IT       5       0       0     300
   6          IO       5       0
   7          JR    PREC     .60     1.0

   8          KK  SB-OSB
   9          KM        RUNOFF - Sub-basin OSB
  10          BA   0.266
  11          IN      15
  12          PB     4.4
```

```
   13          PC  0.0000  0.0020  0.0050  0.0080  0.0110  0.0140  0.0170  0.0200  0.0230  0.0260
   14          PC  0.0290  0.0320  0.0350  0.0380  0.0410  0.0440  0.0480  0.0520  0.0560  0.0600
   15          PC  0.0604  0.0680  0.0720  0.0760  0.0800  0.0850  0.0900  0.0950  0.1000  0.1050
   16          PC  0.1100  0.1150  0.1200  0.1260  0.1330  0.1400  0.1470  0.1550  0.1630  0.1720
   17          PC  0.1810  0.1910  0.2030  0.2180  0.2360  0.2570  0.2830  0.3870  0.6630  0.7070
   18          PC  0.7350  0.7580  0.7760  0.7910  0.8040  0.8150  0.8250  0.8340  0.8420  0.8490
   19          PC  0.8560  0.8630  0.8690  0.8750  0.8810  0.8870  0.8930  0.8980  0.9030  0.9080
   20          PC  0.9130  0.9180  0.9220  0.9260  0.9300  0.9340  0.9380  0.9420  0.9460  0.9500
   21          PC  0.9530  0.9560  0.9590  0.9620  0.9650  0.9680  0.9710  0.9740  0.9770  0.9800
   22          PC  0.9830  0.9860  0.9890  0.9920  0.9950  0.9980  1.0000
   23          LS    0.63    61.5
   24          UD    0.52

   25          KK  RT-OSB
   26          KM        ROUTE FLOW from sub-basin OSB to DP-1 POND
   27          RD    1240   0.023    .035            TRAP      50     9.5

   28          KK   SB-B2
   29          KM        RUNOFF - Sub-basin B2
   30          BA   0.063
   31          LS    0.58    63.4
   32          UD    0.23

   33          KK    DP-1
   34          KM        COMBINE FLOW from RT-OSB and SB-B2
   35          HC       2

   36          KK    DB-1
   37          KM        ROUTE INFLOW at DP-1 through EXISTING DP-1 POND
   38          RS       1    ELEV    7412
   39          SQ       0       0       0       0       0     4.6     7.1     8.9    10.4
   40          SE    7412    7414    7416    7418    7420    7422    7424    7426    7428
   41          SV       0  0.1853  0.7998  1.9659  3.7272  6.1659  9.4039 13.6647 19.2274

   42          KK    RT-1
   43          KM        ROUTE OUTFLOW from DB-1 to DP-2
   44          RD     900   0.017    .035            TRAP      15     9.5
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   45          KK   SB-B3
   46          KM        RUNOFF - Sub-basin B3
   47          BA    .050
   48          LS    0.57    63.7
   49          UD    0.31

   50          KK    DP-2
   51          KM        COMBINE FLOW from RT-1 and SB-B3
   52          HC       2
```

```
          53          KK    RT-2
          54          KM        ROUTE FLOW from DB-2 to DP-5
          55          RD     730   0.017    .035            TRAP      16     9.5

          56          KK   SB-B4
          57          KM        RUNOFF - Sub-basin B4
          58          BA    .022
          59          LS    0.58    63.4
          60          UD    0.25

          61          KK    CO-5
          62          KM        COMBINE FLOW from RT-2 and SB-B4
          63          HC       2

          64          KK  SB-OSA
          65          KM        RUNOFF - Sub-basin OSA
          66          BA   0.053
          67          LS    0.56    64.0
          68          UD    0.55

          69          KK  RT-OSA
          70          KM        ROUTE FLOW from SB-OSA to DP-5
          71          RD    1740   0.031    .035            TRAP       6     7.5

          72          KK   SB-A2
          73          KM        RUNOFF - Sub-basin A2
          74          BA   0.042
          75          LS    0.59    63.0
          76          UD    0.35

          77          KK    DP-5
          78          KM        COMBINE FLOW from SB-A2, RT-OSA and C-5
          79          HC       3

          80          KK    DP-6
          81          KM        RUNOFF - Sub-basin OSD (DP-6)
          82          BA   0.463
          83          LS    0.63    61.4
          84          UD    0.61
```



```
     LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          85          KK    DB-6
          86          KM        ROUTE INFLOW at DP-6 through EXISTING DP-6 POND
          87          RS       1    ELEV    7400
          88          SQ       0     4.0     6.2     6.7   176.4   741.5
          89          SE    7400    7402    7404  7404.5    7406    7408
          90          SV       0  0.1246  0.4150  0.5328  1.0914  2.4377

          91          KK    RT-6
```

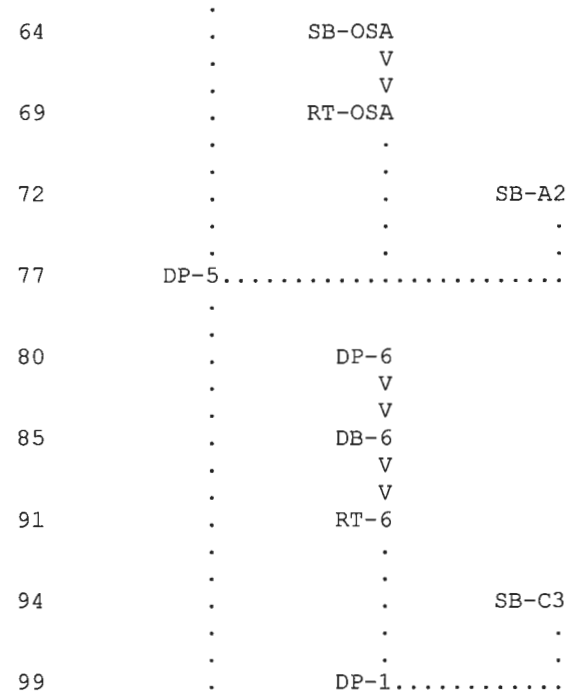
```
 92           KM        ROUTE OUTFLOW from DB-6 to DP-7
 93           RD     250   .032    .035             TRAP       8       6

 94           KK   SB-C3
 95           KM        RUNOFF - Sub-basin C3
 96           BA   0.013
 97           LS    0.62    61.9
 98           UD    0.31

 99           KK    DP-1
100           KM        COMBINE FLOW from RT-6 and SB-C3
101           HC       2
102           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8      SB-OSB
              V
              V
    25      RT-OSB
              .
              .
    28        .       SB-B2
              .           .
              .           .
    33      DP-1.............
              V
              V
    36      DB-1
              V
              V
    42      RT-1
              .
              .
    45        .       SB-B3
              .           .
              .           .
    50      DP-2.............
              V
              V
    53      RT-2
              .
              .
    56        .       SB-B4
              .           .
              .           .
    61      CO-5.............
              .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   13JAN18  TIME  19:32:55   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Stream through Jackson Ranch PN: 61044 & 61073
Jackson Ranch developed and with current development upstream
Existing ponds in place
5 yr and 100 Year, NRCS 24-hr Type II Storm, FN: jrpppnd2.dat

```
   6 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
```

```
      IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE   24.92 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .60      1.00
1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                          TIME TO PEAK IN HOURS


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN              RATIO 1  RATIO 2
                                                          .60     1.00

 HYDROGRAPH AT
+                 SB-OSB       .27     1   FLOW           42.      134.
                                            TIME         12.50    12.42

 ROUTED TO
+                 RT-OSB       .27     1   FLOW           42.      133.
                                            TIME         12.58    12.50

 HYDROGRAPH AT
+                  SB-B2       .06     1   FLOW           18.       54.
                                            TIME         12.17    12.17

  2 COMBINED AT
+                   DP-1       .33     1   FLOW           49.      156.
```

				TIME	12.50	12.42
ROUTED TO						
+	DB-1	.33	1	FLOW	4.	10.
				TIME	18.58	18.42
			** PEAK STAGES IN FEET **			
			1	STAGE	7421.70	7427.11
				TIME	18.58	18.42
ROUTED TO						
+	RT-1	.33	1	FLOW	4.	10.
				TIME	18.67	18.50
HYDROGRAPH AT						
+	SB-B3	.05	1	FLOW	13.	37.
				TIME	12.25	12.25
2 COMBINED AT						
+	DP-2	.38	1	FLOW	13.	37.
				TIME	12.25	12.25
ROUTED TO						
+	RT-2	.38	1	FLOW	12.	37.
				TIME	12.33	12.25
HYDROGRAPH AT						
+	SB-B4	.02	1	FLOW	6.	18.
				TIME	12.17	12.17
2 COMBINED AT						
+	CO-5	.40	1	FLOW	18.	54.
				TIME	12.25	12.25
HYDROGRAPH AT						
+	SB-OSA	.05	1	FLOW	10.	29.
				TIME	12.50	12.50
ROUTED TO						
+	RT-OSA	.05	1	FLOW	10.	29.
				TIME	12.58	12.58
HYDROGRAPH AT						
+	SB-A2	.04	1	FLOW	9.	29.
				TIME	12.25	12.25
3 COMBINED AT						
+	DP-5	.50	1	FLOW	33.	101.
				TIME	12.33	12.25
HYDROGRAPH AT						
+	DP-6	.46	1	FLOW	66.	210.

```
                                    TIME        12.58    12.50

 ROUTED TO
+                   DB-6       .46     1    FLOW          65.     209.
                                            TIME        12.58    12.58

                                   ** PEAK STAGES IN FEET **
                                   1    STAGE     7405.02  7406.12
                                            TIME        12.58    12.58

 ROUTED TO
+                   RT-6       .46     1    FLOW          65.     209.
                                            TIME        12.58    12.58

 HYDROGRAPH AT
+                  SB-C3       .01     1    FLOW           3.       9.
                                            TIME        12.25    12.25

  2 COMBINED AT
+                   DP-1       .48     1    FLOW          66.     213.
                                            TIME        12.58    12.58
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                (MIN)      (CFS)      (MIN)      (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
            RT-OSB  MANE         4.50      41.78    751.50       .49      5.00     41.59    755.00         .49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6917E+01 EXCESS= .0000E+00 OUTFLOW= .6907E+01 BASIN STORAGE= .2478E-01 PERCENT ERROR=   -.2


          FOR PLAN = 1  RATIO=  .00
            RT-OSB  MANE         4.24     133.45    750.76      1.41      5.00    133.23    750.00        1.41

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2008E+02 EXCESS= .0000E+00 OUTFLOW= .2006E+02 BASIN STORAGE= .4228E-01 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
              RT-1  MANE         5.00       3.90   1125.00       .18      5.00      3.90   1125.00         .18

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3294E+01 EXCESS= .0000E+00 OUTFLOW= .3255E+01 BASIN STORAGE= .4085E-01 PERCENT ERROR=    .0
```

```
          FOR PLAN = 1  RATIO=  .00
              RT-1  MANE          5.00       9.74   1115.00        .55       5.00       9.74   1115.00         .55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9759E+01 EXCESS= .0000E+00 OUTFLOW= .9675E+01 BASIN STORAGE= .8805E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-2  MANE          4.51      12.46    735.54        .23       5.00      12.45    740.00         .23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4719E+01 EXCESS= .0000E+00 OUTFLOW= .4688E+01 BASIN STORAGE= .3400E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-2  MANE          3.35      37.53    736.55        .68       5.00      37.38    735.00         .68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1375E+02 EXCESS= .0000E+00 OUTFLOW= .1368E+02 BASIN STORAGE= .7256E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RT-OSA  MANE          5.00       9.59    755.00        .56       5.00       9.59    755.00         .56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1585E+01 EXCESS= .0000E+00 OUTFLOW= .1582E+01 BASIN STORAGE= .6040E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
            RT-OSA  MANE          5.00      28.53    755.00       1.55       5.00      28.53    755.00        1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4398E+01 EXCESS= .0000E+00 OUTFLOW= .4393E+01 BASIN STORAGE= .1035E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE           .68      65.24    756.11        .48       5.00      64.98    755.00         .48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1192E+02 EXCESS= .0000E+00 OUTFLOW= .1191E+02 BASIN STORAGE= .6244E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE           .49     208.98    755.45       1.39       5.00     208.95    755.00        1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3436E+02 EXCESS= .0000E+00 OUTFLOW= .3435E+02 BASIN STORAGE= .1262E-01 PERCENT ERROR=    .0
```

*** NORMAL END OF HEC-1 ***

Hydraulic Calculations

M.V E., Inc
Date 10/25/2017
Project: 61073
Jackson Ranch-F4

Ditch Velocities & Erosion Protection

Ditch Data:
S. Slope H 4.0
S. Slope H 3.0
Manning's n 0.030

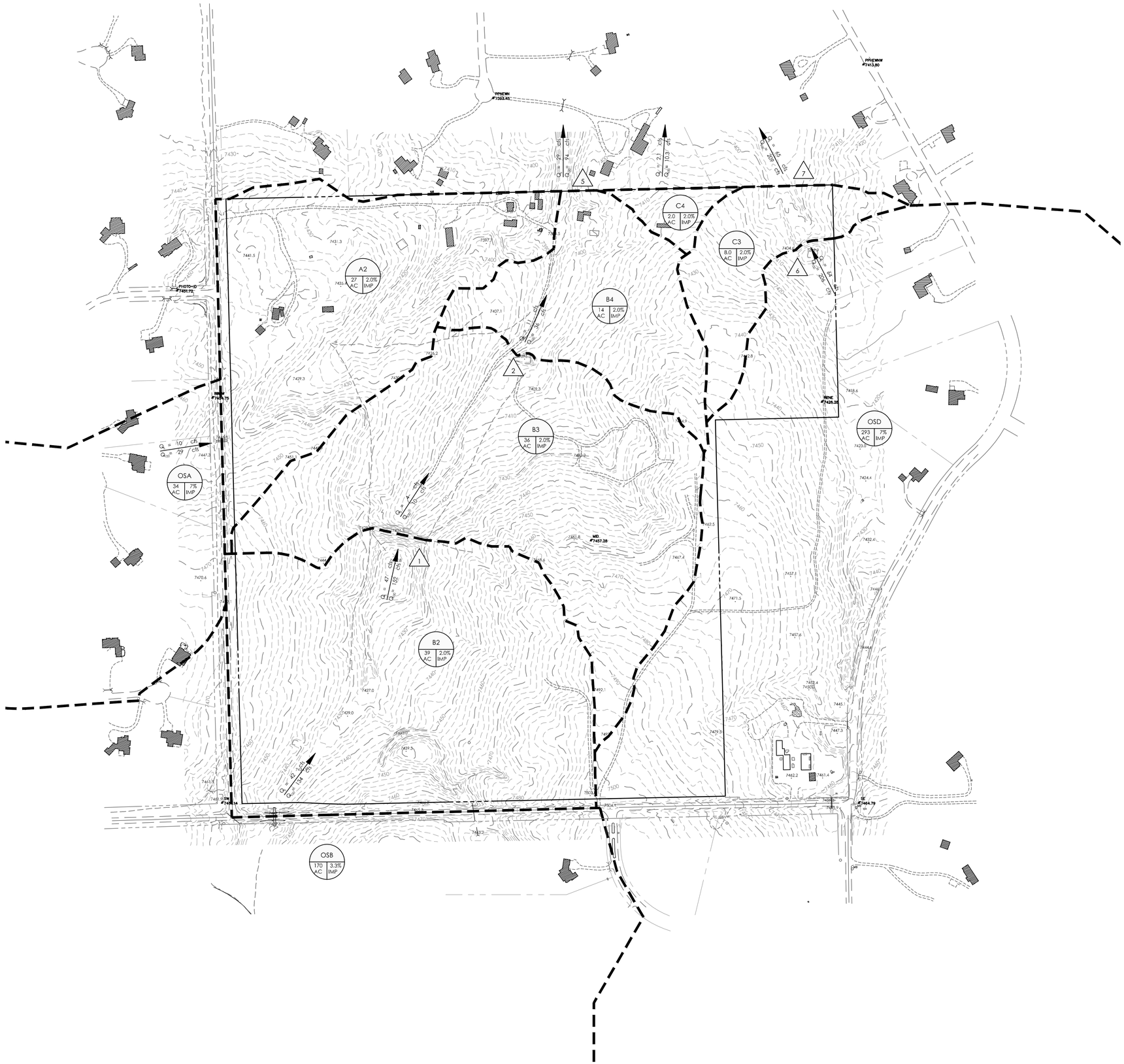
Permissible Velocities by Soil Type:
40- Kettle gravelly loam 3.5 fps
92 - Tomah-Crowfoot 3.5 fps

Permissible Velocities by Grass Linings:
Grass-legume mixture (0-5%) 4.0 fps
Grass-legume mixture (5-10%) 3.0 fps
> > >

Sub-basin Designation	Road Name	Stations	Full Sub-Basin Area (Ac)	Full Sub-Basin Q_{100} (cfs)	Partial Sub-Basin Area (Ac)	Ditch Flow Q_{100} (cfs)	Max. Longit. Ditch Slope in Reach (ft/ft)	Ditch Flow Depth (ft)	Ditch Flow Area (ft^2)	**Ditch Flow Velocity (ft/sec)**	Permissible Velocity (ft/sec)	**Ditch Protection Required?**
B3.2d	JR CT	14+00L - 25+11.85L	11.10	20.5	1.33	2.5	0.060	1.0	3.4	**0.7**	3.0	**no**
C3	JR CT	20+66.78R - 25+11.85R	8.70	13.8	0.52	0.8	0.060	0.7	1.5	**0.5**	3.0	**no**

Report Maps

Existing Drainage Map
Developed Drainage Map



LEGEND

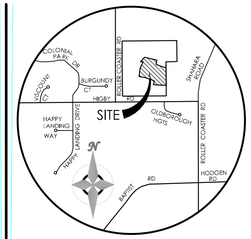
- PROPERTY LINE
- EASEMENT LINE
- LOT LINE
- BUILDING SETBACK LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BARBED WIRE FENCE
- TREE (EVERGREEN/DECID.)

PROPOSED

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- Q_5 = 19.0 cfs, Q_{100} = 60.0 cfs — GENERAL FLOW/DIRECTION
- 1.5% — SLOPE DIRECTION AND GRADE
- A1 — 1.2 AC, 50% IMP — BASIN LABEL: AREA IN ACRES, PERCENT IMPERVIOUS
- 1 — POINT OF INTEREST



VICINITY MAP

NOT TO SCALE

BENCHMARK

1" = 200' 1:2,400

MVE, INC. ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY ____ _____
AS-BUILTS BY
CHECKED BY ____ _____

JACKSON RANCH
EXISTING

MAIN STREAM
NRCS HYDROLOGY

MVE PROJECT 61044
MVE DRAWING EX-DR-Map-all

December 16, 2017
SHEET 1 **OF** 2

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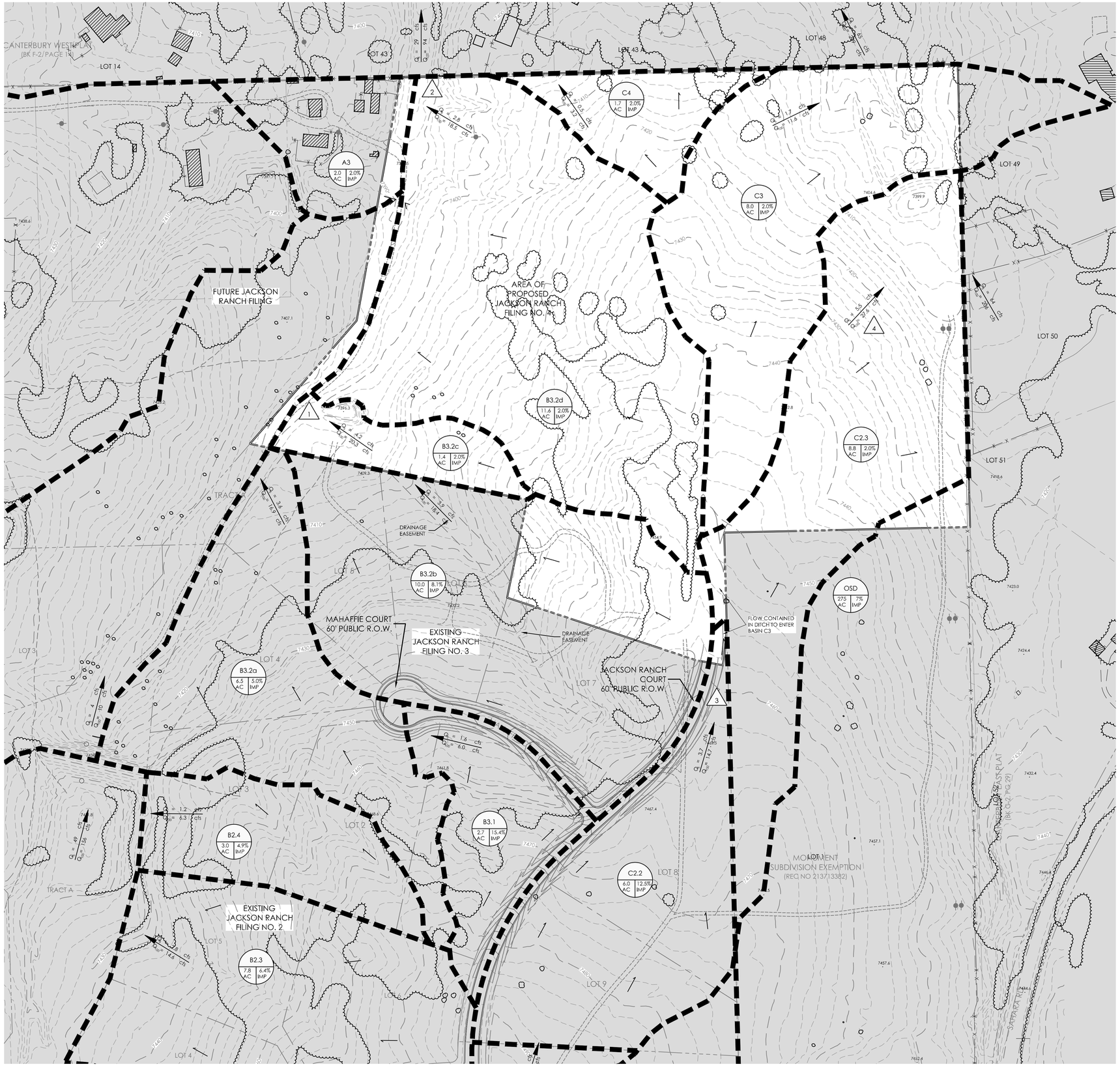


LEGEND

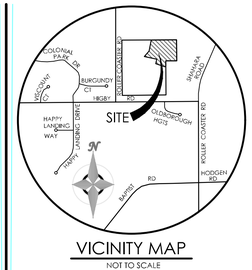
- PROPERTY LINE
- EASEMENT LINE
- LOT LINE
- BUILDING SETBACK LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BARBED WIRE FENCE
- TREE (EVERGREEN/DECID.)

PROPOSED

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- Q_5 = 19.0 cfs / Q_{100} = 60.0 cfs — GENERAL FLOW/DIRECTION
- 1.5% — SLOPE DIRECTION AND GRADE
- A1 — 1.7 AC | 50% IMP — BASIN LABEL, AREA IN ACRES, PERCENT IMPERVIOUS
- 1 — POINT OF INTEREST



VICINITY MAP
NOT TO SCALE

BENCHMARK

1" = 100' 1:1,200

EXISTING DRAINAGE SUMMARY TABLE					
POINT OF INTEREST/ BASIN(S)		AREA (AC)	Tc (MIN.)	RUNOFF Q5 (CFS)	RUNOFF Q100 (CFS)
	B3.1	2.7	19.9	1.6	6.0
	B3.2a	6.5	17.8	2.4	13.0
	B3.1, B3.2a	9.3	22.9	3.6	16.9
	B3.2b	10.0	22.6	3.9	18.4
	B3.2c	1.4	16.9	0.4	2.7
POI 1	B3.2b, B3.2c	11.4	23.5	4.2	20.3
POI 2	B3.2d	11.6	24.6	2.8	18.5
	C2.1	1.2	15.4	0.8	3.0
	C2.2	6.0	21.5	2.9	12.0
POI 3	C2.1, C2.2	7.2	21.0	3.7	14.7
	C2.3	8.8	22.7	2.2	14.7
POI 4	C2.1, C2.2, C3	16.1	24.6	5.5	27.6
	C3	8.0	28.8	1.7	11.6
	C4	1.7	18.8	0.5	3.2

MVE, INC.
ENGINEERS SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

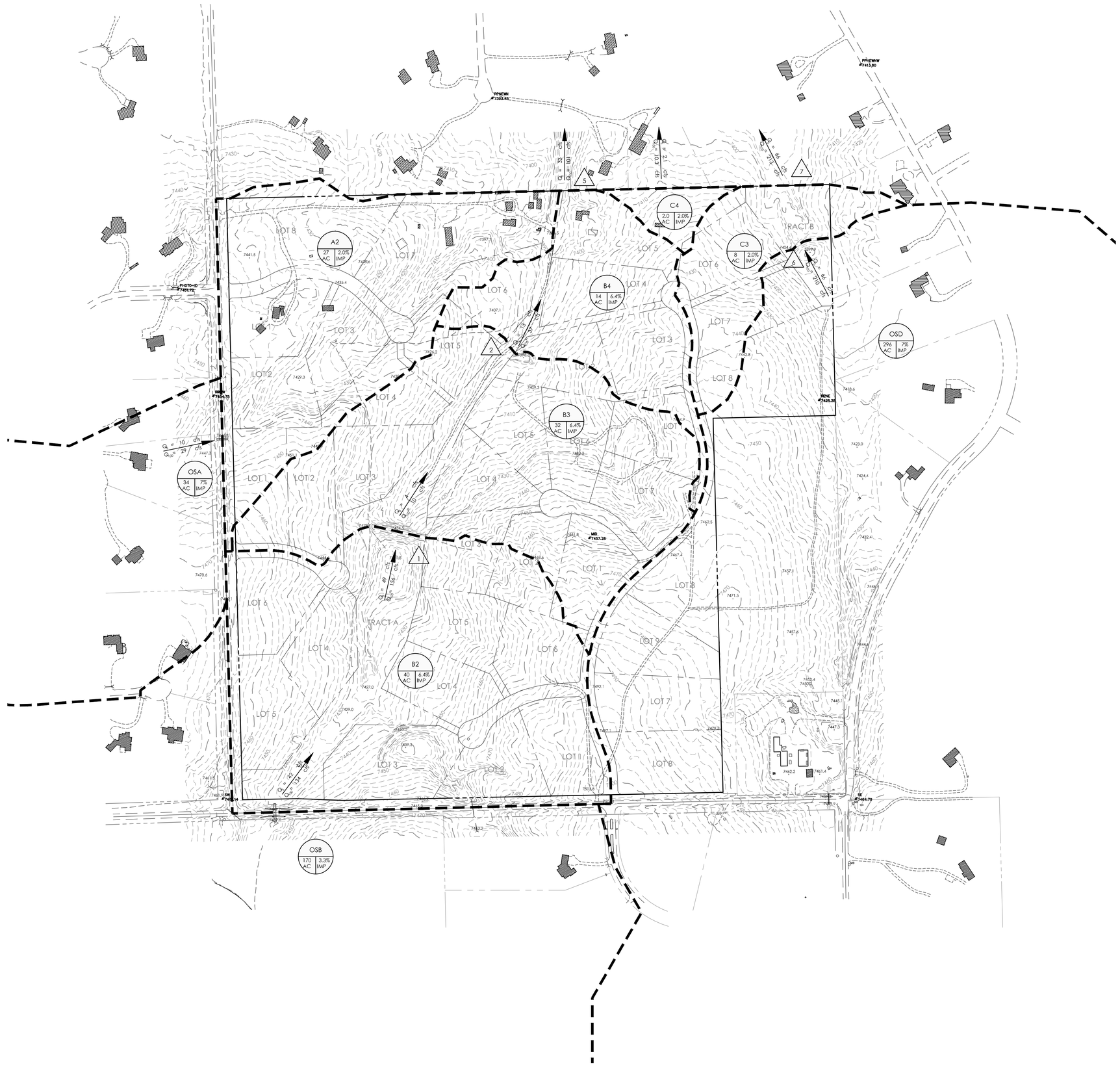
DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

JACKSON RANCH
FILING NO. 4

EXISTING
DRAINAGE MAP

MVE PROJECT 61073
MVE DRAWING EX-DR-MapF4

December 16, 2017
SHEET 1 **OF** 2



LEGEND

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- EASEMENT LINE
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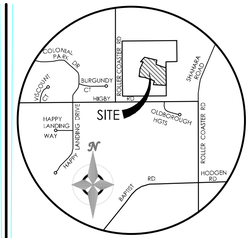
- 1 — POINT OF INTEREST



VICINITY MAP

NOT TO SCALE

BENCHMARK

1" = 200' 1:2,400

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CHECKED BY

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DEVELOPED

MAIN STREAM
NRCS HYDROLOGY

MVE PROJECT 61044
MVE DRAWING PP-DR-Map-all

December 16, 2017
SHEET 2 **OF** 2

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LEGEND

- PROPERTY LINE
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- A1 — 1.0 AC, 50% IMP — BASIN LABEL: AREA IN ACRES, PERCENT IMPERVIOUS
- 1 — POINT OF INTEREST

FLOODPLAIN STATEMENT:

A PORTION OF THE SUBJECT PROPERTY IS LOCATED WITHIN FEMA DESIGNATED SPECIAL FLOOD HAZARD AREA (SFHA) ZONE X (AREAS OF 500-YEAR FLOOD; AREAS OF 100-YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD) AS INDICATED ON THE FLOOD INSURANCE RATE MAP (FIRM) FOR EL PASO COUNTY, COLORADO AND INCORPORATED AREAS - MAP NUMBER 08041C0741 F, EFFECTIVE MARCH 17, 1997. THE STRUCTURES WILL BE CONSTRUCTED MORE THAN 1.0 FEET ABOVE THE ADJACENT FEMA BASE FLOOD ELEVATION.

MAP NOTES:

1. ALL BEARINGS USED HEREIN ARE BASED ON AN ASSUMED BEARING BETWEEN A NO. 4 REBAR WITH NO CAP AT THE NORTHEAST CORNER AND A NO. 5 REBAR WITH NO CAP AT THE SOUTHEAST CORNER OF THE SUBJECT PROPERTY. THE ASSUMED BEARING BETWEEN THOSE MONUMENTS IS S 17° 11' 24" E, PER THE RECORDED PLAT OF AIR PRODUCTS SUBDIVISION.

2. ELEVATIONS SHOWN ON THIS MAP ARE RELATIVE TO THE NORTHEAST CORNER OF THE SUBJECT PROPERTY, MONUMENTED WITH AN ALUMINUM CAP HAVING ILLEGIBLE MARKINGS. ELEVATION = 5816.25 (ASSUMED DATUM).

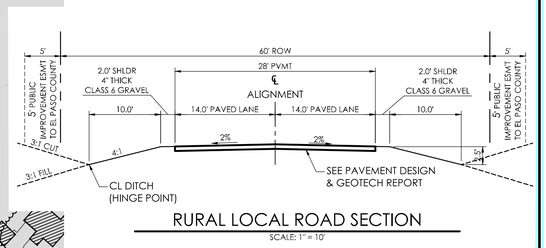
3. THE EXISTING TOPOGRAPHY SHOWN ON THIS PLAN WAS PREPARED BY ROCKY MOUNTAIN LAND SERVICES, INC. AND DATED AUGUST 14, 2014.

4. ALL EXISTING UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM UTILITY MAIN RECORD MAPS, UTILITY SERVICE LOCATION MAPS OBTAINED FROM COLORADO SPRINGS UTILITIES AND SURFACE EVIDENCE AS SURVEYED IN THE FIELD. THE LOCATION OF UTILITIES AS SHOWN ARE APPROXIMATE. ALL UTILITIES MAY NOT BE SHOWN OR MAY NOT HAVE BEEN LOCATED. BELOW GROUND UTILITY LOCATIONS WERE NOT PERFORMED.

EASEMENTS FOR DRAINAGE:

UNLESS SHOWN GREATER IN WIDTH, SIDE AND REAR LOT LINES ARE HEREBY PLATTED WITH A TEN (10) FOOT EASEMENT FOR DRAINAGE AND PUBLIC UTILITIES ONLY. FRONT LOT LINES ARE HEREBY PLATTED WITH A FIFTEEN (15) FEET EASEMENT FOR DRAINAGE AND PUBLIC UTILITIES ONLY. TRACTS A AND B ARE DRAINAGE AND PUBLIC UTILITY EASEMENT IN ITS ENTIRETY AND THE NORTH, EAST AND SOUTHEAST SUBDIVISION BOUNDARY IS HEREBY PLATTED WITH A THIRTY FOOT EASEMENT FOR DRAINAGE AND PUBLIC UTILITIES ONLY. WITH THE SOLE RESPONSIBILITY FOR MAINTENANCE BEING VESTED WITH THE PROPERTY OWNERS.

LOTS 1 AND 2 CONTAIN PLATTED DRAINAGE AND NO BUILD AREAS TO ACCOMMODATE OFFSITE AS WELL AS ONSITE DRAINAGE.

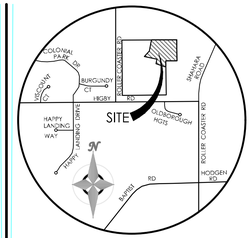


RURAL LOCAL ROAD SECTION

SCALE: 1" = 10'

DEVELOPED DRAINAGE SUMMARY TABLE

POINT OF INTEREST/ BASIN(S)		AREA (AC)	Tc (MIN.)	RUNOFF Q5 (CFS)	RUNOFF Q100 (CFS)
	B3.1	2.7	19.9	1.6	6.0
	B3.2a	6.5	17.8	2.4	13.0
	B3.1, B3.2a	9.3	22.9	3.6	16.9
	B3.2b	10.0	22.3	4.3	18.9
	B3.2c	1.4	16.6	0.5	2.8
POI 1	B3.2b, B3.2c	11.4	23.3	4.6	20.8
POI 2	B3.2d	11.1	21.1	4.0	20.5
	C2.1	1.2	15.4	0.8	3.0
	C2.2	6.0	21.5	2.9	12.0
POI 3	C4	1.7	18.4	0.6	3.3
	C2.3	8.7	22.7	2.2	14.5
POI 4	C2.1, C2.2, C3	15.9	27.9	6.0	26.4
POI 5	C3	8.7	28	2.8	13.8



VICINITY MAP

NOT TO SCALE

BENCHMARK

1" = 100' 1:1,200

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DEVELOPED
DRAINAGE MAP

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MVE DRAWING PP-DR-MapF4

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SHEET 2 OF 2