Applegate Group, Inc.
Water Resource Advisors for the West

RECEIVED
MAR 27 2018
DIVISION OF RECLAMATION
MINING AND SAFETY

March 27, 2018

Mr. Michael Cunningham
Division of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, CO 80203

RE: Leyden Pit Permit No. M-1983-139; Adequacy Review No. 2 (AM01) Response

Dear Mr. Cunningham

Please find the responses to the concerns identified in the Adequacy Review No. 2 (AM01).

6.4.5 Exhibit E – Reclamation Plan

1. To ensure the reclaimed areas receive a topsoil cover of 2-4 inches, topsoil might need to be imported. As required by Rule 3.1.5(9)(c), please find the attached signed affidavit certifying the material to be imported is clean and inert, defined by Rule 1.1(20).

6.4.7 Exhibit G – Water Information

2. Additional information required to demonstrate that a Temporary Substitute Water Supply Plan will not be required is as follows:
    a. Please refer to Map 1, attached, for the source of the impounded surface water. The general drainage on the site runs from west to east with a slight northeast slope in the northern portion of the site and a slight southeast slope in the southern portion of the site. Map 1 shows two shaded polygons, these come from USGS StreamStats application. Refer to the attached StreamStats reports for both the drainage to Leyden Gulch and Moon Gulch.
    b. It is important to note that the pond area was completely dry as reported by the City of Arvada on March 8, 2018 and confirmed by Applegate on March 23, 2018 (see Figures 1-3). Nothing to this date had been done to the ponds, but to ensure proper release of precipitation in the future before final reclamation takes place, the pond area will still be breached to be able to release surface water to the natural drainage system. The surface water will be release to the natural drainage system within 72 hours of the application amendment approval. The current decision due date is March 31, 2018 unless an extension is needed or requested. The plan for this area can be found in Exhibit E – Reclamation plan of the application amendment (received November 8, 2017) with clarification in the Adequacy Review No. 1 Response (dated February 16, 2018). Refer to Map 2 for

final grading on the site, this map shows a general idea of how the pond area will be regraded to accommodate future drainage making sure to cause no harm to the homes to the east. Once the reclamation is complete, the area will be sloped and graded such that no additional water shall be impounded in the area. It is desired to extend the existing drainage swale in the southern portion of the pond area for surface runoff to continue using the already existing gulch. As discussed extensively within the Adequacy Review No. 1 Response (section 6.4.5 #4) the Urban Drainage and Flood Control District refers to the drainage system which begins near these ponds as 'Moon Gulch'. The City of Arvada would also like to add a pipe starting at the low spot of the pond area (near the middle of the area of interest) and use gravity to take some water to the north to the drainage which leads to Leyden Gulch to resemble natural drainage. As mentioned, the site will likely require importation of topsoil to maintain the 2-4 inches of clean and inert topsoil.

Figure 1. Dry pond area looking southwest. All photos taken from far northeast corner of site.

Figure 2. Dry ponds shown on the left, looking towards the south.

Figure 3. Dry ponds displayed on the right, oriented facing north.

c. As requested, the city of Arvada was able to locate a few wells on the site that were listed in the February 16, 2018 Table 2. Refer to the attachment, Map 3, to see the boreholes drilled which are associated with located wells. It is assumed that these wells match up with the monitoring wells listed within the DWR well permit map viewer (Map 4). The City of Arvada took groundwater levels during the week of March 5, 2018. Table 1 below explains the findings.

Table 1. Wells located during the City of Arvada's site visit with corresponding depth to groundwater.

Borehole Locations	Assumed Corresponding Well	Depth to Groundwater
B-101	#250168	0.5 feet
B-103	#250169	20 feet
B-104	#250171	19.5 feet
B-106	#41563-MH	7.5 feet
B-109	#250172	17.5 feet
B-120	-	11 feet

The monitoring wells were installed in 2003 as part of a feasibility study on the site. There is no monitoring data to the knowledge of the City of Arvada, Pioneer Sand Company or Applegate Group for any of these wells besides the most recent data the City of Arvada has collected.

Figure 4. Well #250171 shown as an example of wells on site, with the Area of Interest to the north in the distance, as well as, the inside of the well.

Note that the following wells were not listed, found or accessible:

- 13663-F: this well is not within the permit boundary and is owned by Public Service Company of Colorado. There is no groundwater depth information for this well within the documents on the DWR's database.
- 2867-F: this well is not within the permit boundary, but is owned by the City of Arvada. This well was not located, but when constructed had a deep groundwater depth of 260 feet.
- 77923-F: this well is near the entrance of the permit boundary and was not found nor tested during the site visit. This well seems to have been constructed in 1960s and was located within the Laramie Fox Hills Aquifer.
- 250173: this well is within the permit location. Looking at the attached Map 3, it is assumed that this well could also be referred to as B-102. This well was not able to be located during the site visit.
- 250170: this well is located approximately 300 feet from well # 250169 and was not located within the field. Due to the close proximity to both wells 250169 and 250171, it is assumed groundwater level is to be around 20 feet at this well.

Note that well #250168 has a high groundwater level, only 0.5 feet below ground. This is the well near the pond area. It has been determined that the pond area may have some high groundwater, yet it is still assumed most of the water in the pond area is due to impounded surface water runoff. As mentioned, the ponds are currently dry so there is no evaporation loss which can be accounted for. It is desired to be able to backfill the ponds and start reclamation in this area as soon as possible in order to prevent any evaporation loss. It is still believed that no SWSP will be required because it is not clear when (if ever) there was any groundwater exposed due to the impounded surface water. Also, the ponds seem to show as dry more often than not, (see Adequacy Review No. 1 Response) which makes quantifying past evaporation nearly impossible. Speaking with those at the City of Arvada who are very familiar with the site, it is clear that this is a spot where most of the site's drainage ends up and becomes impounded. The City of Arvada is ready and willing to make changes to this area as soon as possible to move forward with reclamation.

A small pond to the south of the easterly ponds will need to be backfilled in because it is landlocked. The surrounding land is higher and there is no outlet system. With that, the ponds will be eliminated within 72 hours of the amendment approval.

Jason Smith, District 7 Water Commissioner, was contacted via phone and email in regards to historical water information on the site. Jason mentioned he would do more research on the site but to this date, Applegate has received no additional information regarding this site.

If there are questions regarding any piece of this Adequacy Review Response, please contact me at (303) 453-6611 or at katybilisoly@applegategroup.com.

Sincerely,
Applegate Group, Inc.

Katy Bilisoly
Water Resource Engineer

Enclosures: Topsoil Affidavit, Maps 1-4, StreamStats Reports

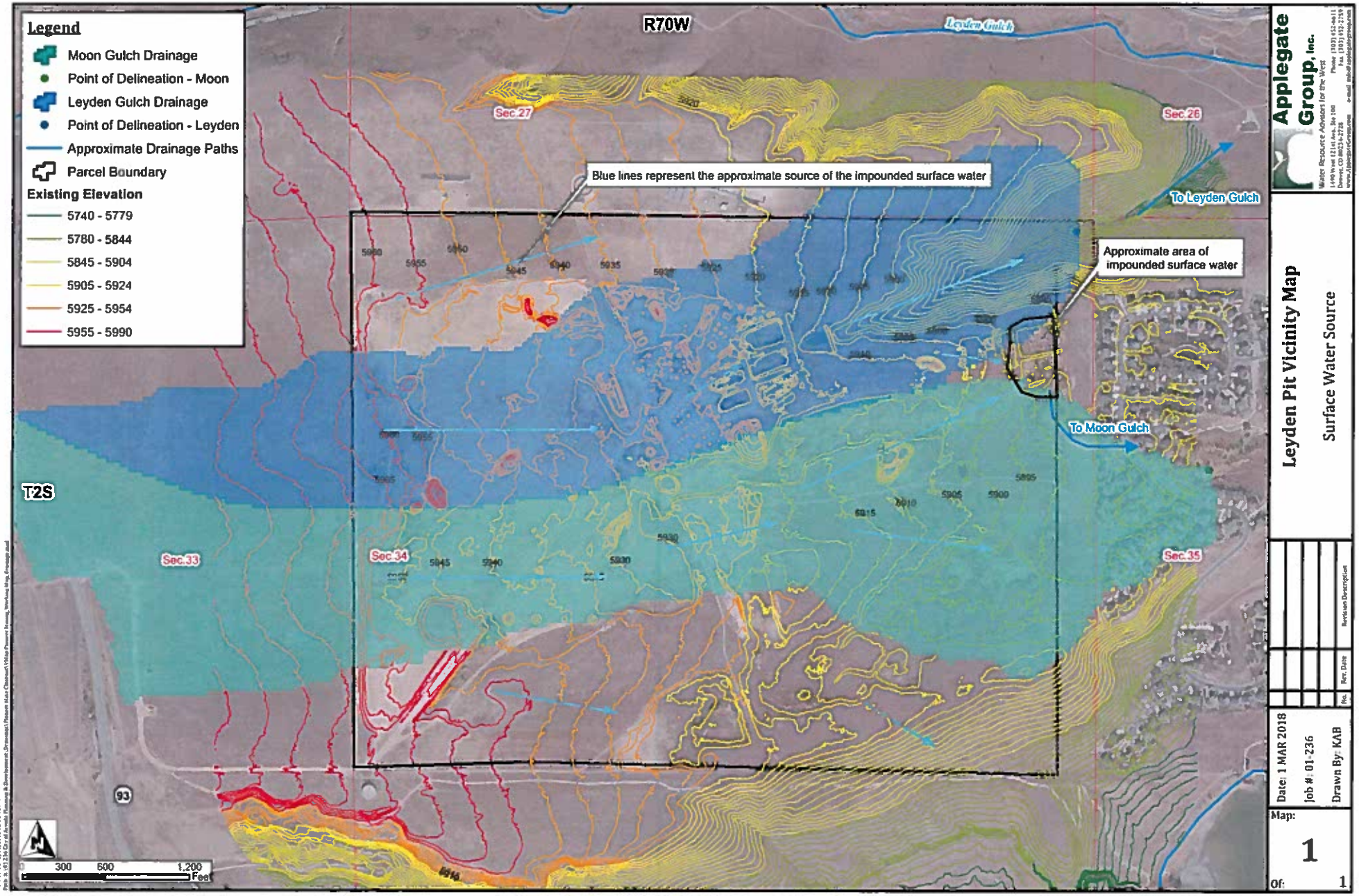
cc: Mike Applegate, Applegate Group Inc.
Jim Sullivan, City of Arvada - Utilities
Ioana Comaniciu, Division of Water Resources
AG File No. 01-236

Affidavit for Material to be Imported to the Leyden Pit, M-1983-139

THE UNDERSIGNED, states that to the best of his knowledge, the material being transported to the east ponds within the Leyden Pit (M-1983-139) for topsoil, is clean and inert as defined in Rule 1.1 (20) (Rules and Regulations of the Colorado Mined Land Reclamation Board). This affidavit stands so long as it is determined that topsoil must be imported in order to provide the desired 2 to 4 inches on top of the backfilled ponds. Note that a similar affidavit will be signed by the contactor preforming the work on the site when appropriate.

3-19-18

Jim Sullivan Date
Director of Utilities
The City of Arvada



Applegate Group, Inc.
Water Resource Advisors for the West

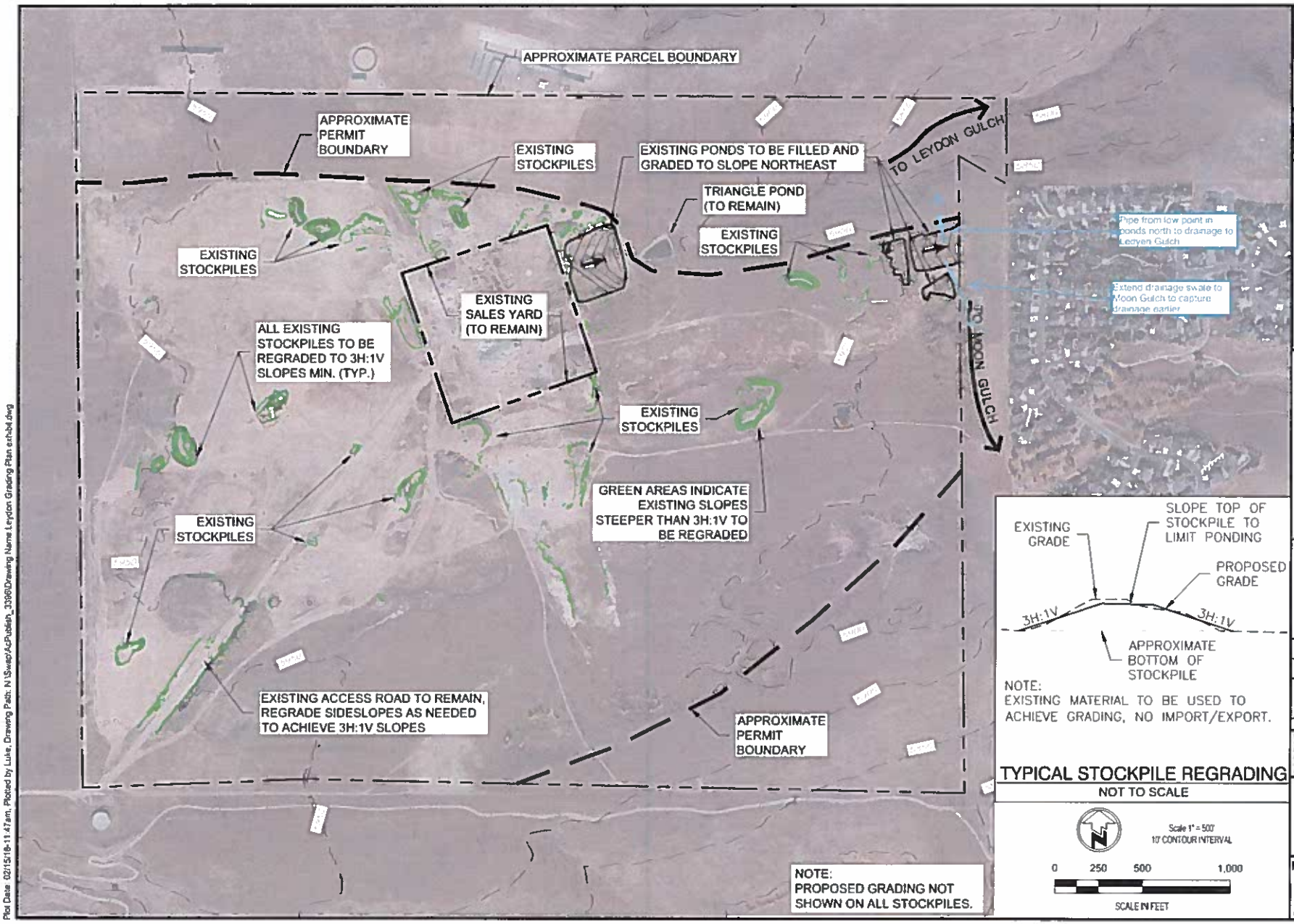
Leyden Pit Vicinity Map

Surface Water Source

No.	Rev. Date	Revision Description

Date: 1 MAR 2018
Job #: 01-236
Drawn By: KAB

Map: 1 Of: 1



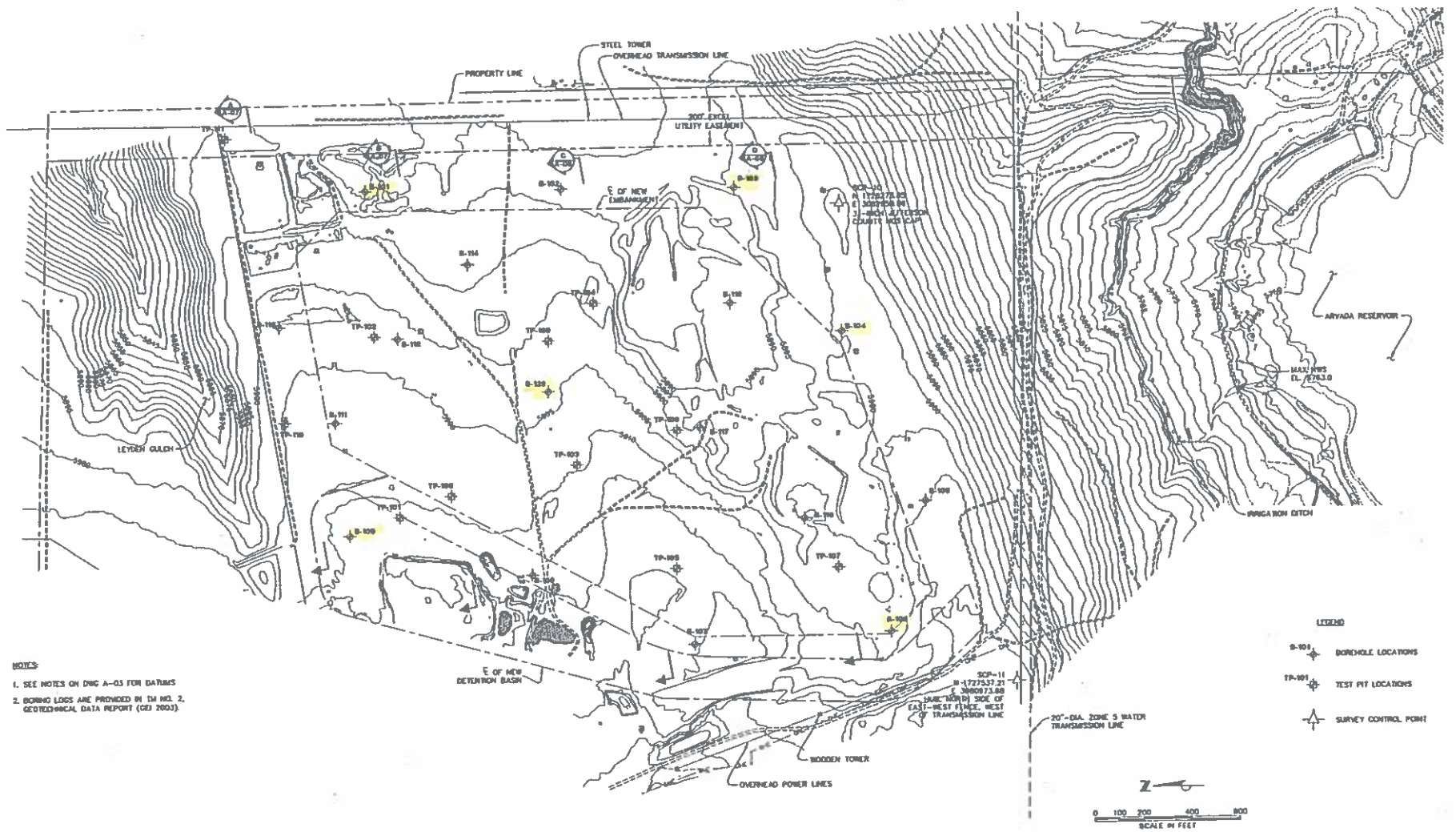
Applegate Group, Inc.

GRADING PLAN AND BACKFILLING

Map 2

4

Plot Date: 02/15/16-11:47am, Plotted by: Luke, Drawing Path: N:\Swep\Ac\Publish_3366\Drawing Name:Leydon Grading Plan exhibit.dwg



NOTES:

1. SEE NOTES ON DWG A-03 FOR DATUMS
2. BORING LOGS ARE PROVIDED IN TM NO. 2, GEOTECHNICAL DATA REPORT (GEI 2003).

50% COMPLETION SUBMITTAL

NOVEMBER 2003

NO.	DATE	ISSUE/REVISION	BY	CHK	APPR

DESIGNED	MPH
DRAWN	BPL
REVIEWED	JRT
APPROVED	RJH
GEI PROJ. NO.	00036

GEI Consultants, Inc.
ENGLEWOOD • COLORADO

CITY OF ARVADA

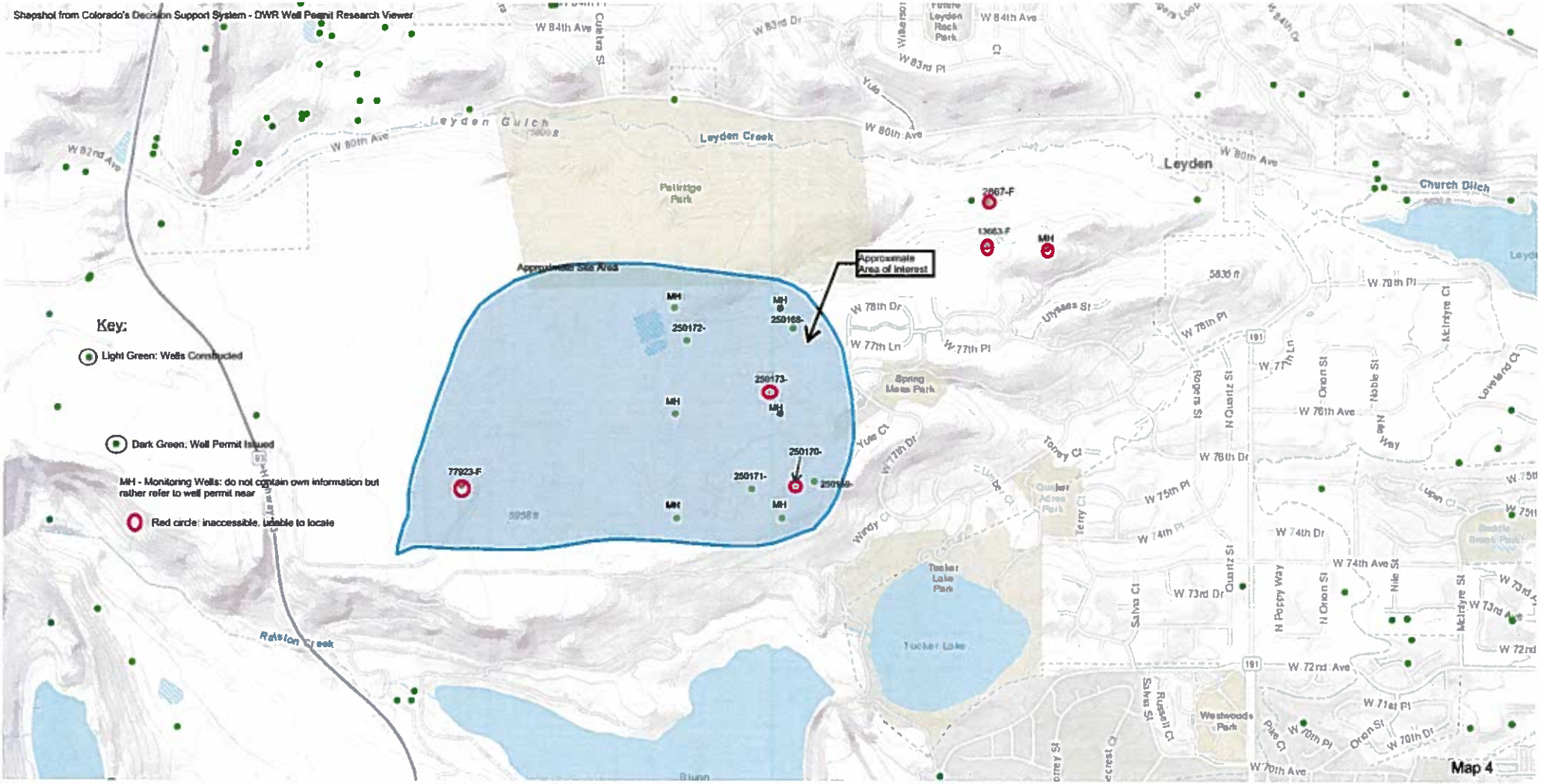
HIGHWAY 93 DAM AND RESERVOIR PROJECT ARVADA, COLORADO

PLAN OF EXISTING CONDITIONS, BOREHOLE LOCATIONS AND SURVEY CONTROL

A-06

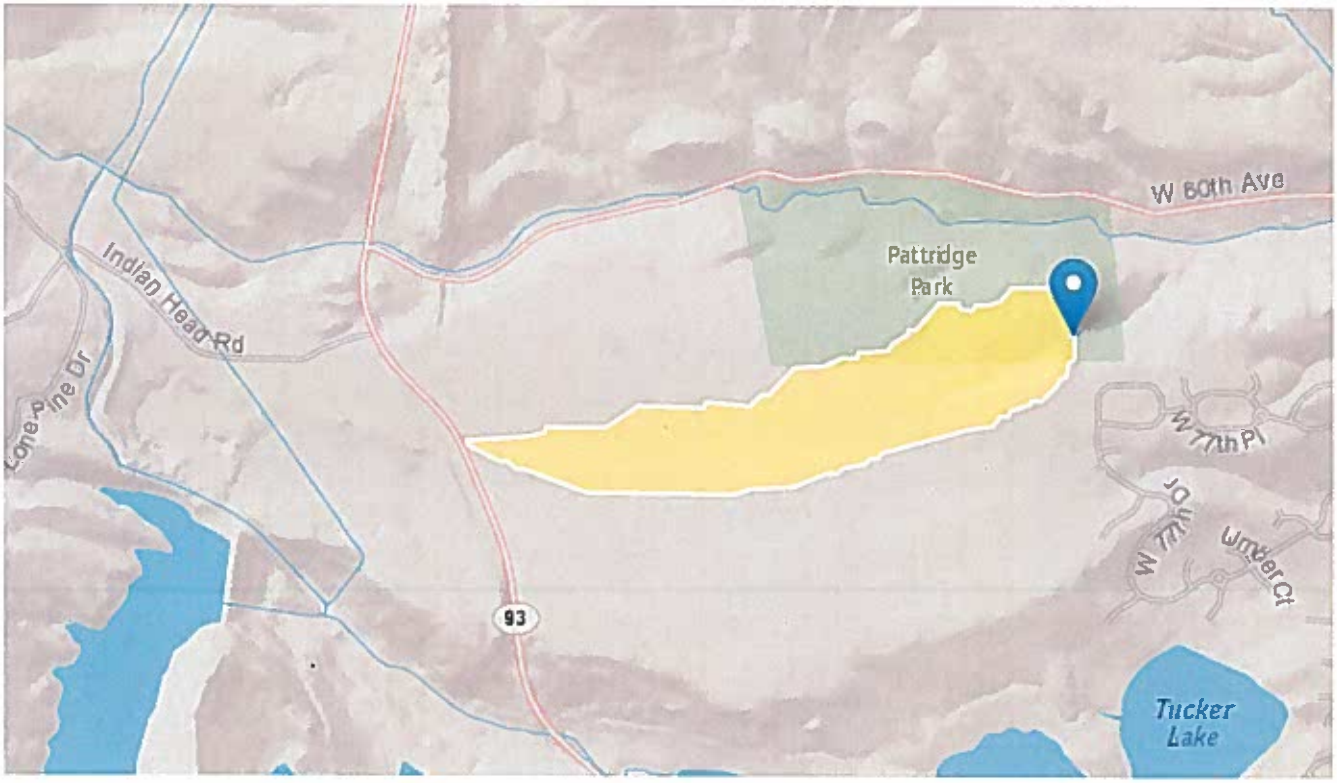
SHEET __ OF __

NOT FOR CONSTRUCTION


Snapshot from Colorado's Decision Support System - DWR Well Permit Research Viewer
Key:
Light Green: Wells Constructed
Dark Green: Well Permit Issued
MH - Monitoring Wells: do not contain own information but rather refer to well permit near
Red circle: inaccessible, unable to locate
Approximate Area of Interest
Approximate Site Area
250172-
250168-
250173-
250170-
250171-
77923-F
2867-F
13663-F
MH
Leyden
Leyden Creek
Leyden Gulch
Church Ditch
Tucker Lake
Tucker Lake Park
Spring Mesa Park
Quarter Acres Park
Westwoods Park
Raisin Creek
W 84th Ave
W 83rd Dr
W 83rd Pl
W 82nd Ave
W 80th Ave
W 78th Dr
W 78th Pl
W 77th Ln
W 77th Pl
W 76th Ave
W 75th Pl
W 74th Pl
W 74th Dr
W 74th Ave
W 73rd Dr
W 72nd Ave
W 71st Pl
W 70th Pl
W 70th Dr
W 70th Ave
Ulysses St
Yuma Ct
Tenney Ct
Terry Ct
Windy Ct
Sahra Ct
Sahra St
Russell Ct
Pike Ct
Orion St
Noble St
Nile St
Lowland Ct
McIntyre Ct
N Poppy Way
N Quintz St
Roberts St
Map 4

StreamStats Report

Region ID: CO
Workspace ID: CO20180326154310916000
Clicked Point (Latitude, Longitude): 39.84123, -105.20340
Time: 2018-03-26 09:39:05 -0600



To Leyden Gulch

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.3	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years		inches
STATSCLAY	Percentage of clay soils from STATSGO		percent
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	5792	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area		square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation		inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils		percent	9.87	37.5
OUTLETELEV	Elevation of Gage		feet	4290	8270

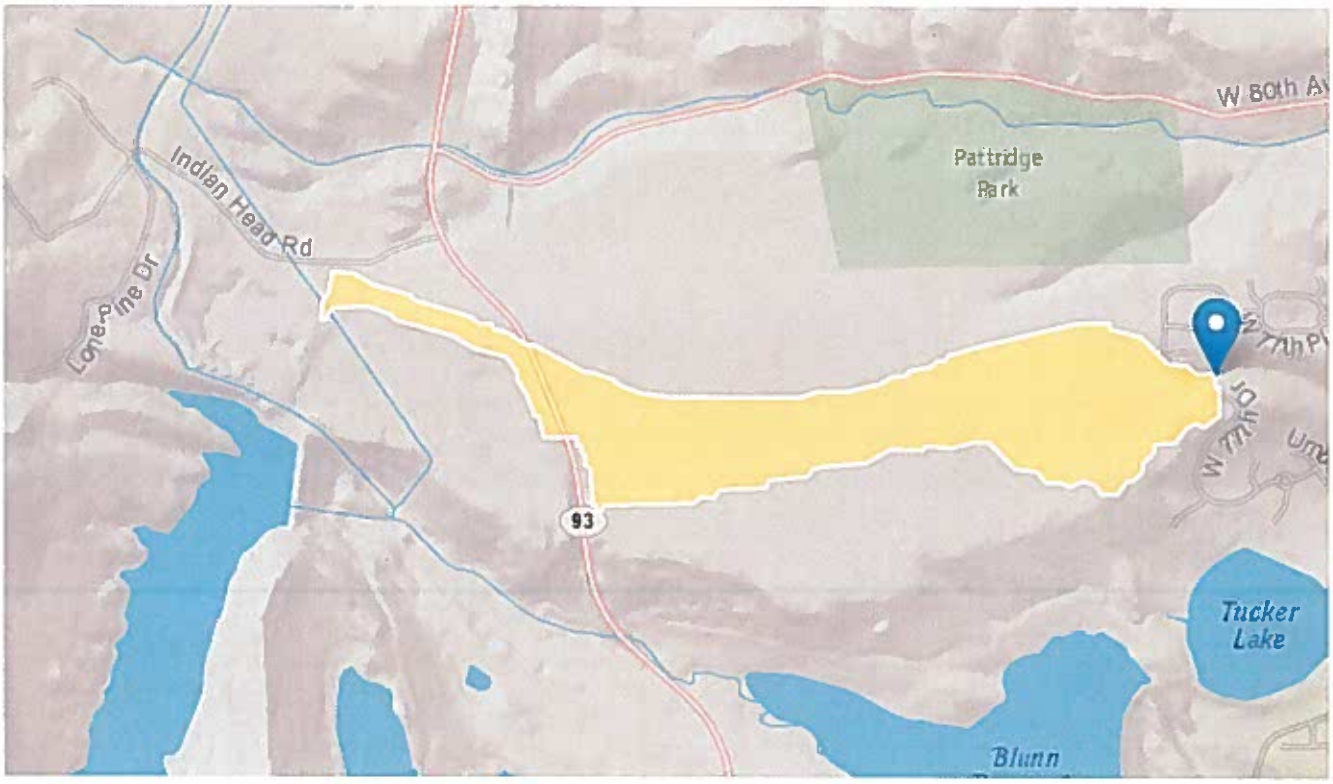
Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

Statistic	Value	Unit

Peak-Flow Statistics Citations

StreamStats Report

Region ID: CO
Workspace ID: CO20180326150211185000
Clicked Point (Latitude, Longitude): 39.83659, -105.20001
Time: 2018-03-26 08:58:06 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.42	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.33	inches
STATSCLAY	Percentage of clay soils from STATSGO	33.2	percent
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	5839	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.42	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.33	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	33.2	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	5839	feet	4290	8270

Peak-Flow Statistics Disclaimers [Foothills Region Peak Flow 2016 5099]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

Statistic	Value	Unit
2 Year Peak Flood	18.7	ft^3/s
5 Year Peak Flood	60	ft^3/s
10 Year Peak Flood	106	ft^3/s
25 Year Peak Flood	186	ft^3/s
50 Year Peak Flood	264	ft^3/s
100 Year Peak Flood	363	ft^3/s
200 Year Peak Flood	482	ft^3/s
500 Year Peak Flood	675	ft^3/s

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A.,2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (http://dx.doi.org/10.3133/sir20165099)