

July 13, 2018



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

Platte Valley, LLC
1375 Promontory Bluff View
Colorado Springs, CO 80921

Attn: Ron Waldthausen

Re: Soil, Geology and Geologic Hazard Evaluation
Lot 2, Appaloosa Hwy 24 Subdivision Filing No. 2
El Paso County, Colorado

Dear Mr. Waldthausen:

As requested, personnel of Entech Engineering, Inc. have investigated the above referenced site to evaluate the conditions with respect to geology and geologic hazards affecting development of the site. The subsurface soil conditions were previously investigated by Entech Engineering, Inc. in a Subsurface Soil Investigation, May 30, 2017 (Reference 1).

The project consists of commercial development on a 4.67-acre site. The site lies in El Paso County, Colorado, immediately east of Colorado Springs city limits. The approximate location of the site is shown on the Vicinity Location Map, Figure 1. The site as platted and proposed replat is included in Figure 2.

The topography of the site is generally flat to very gradually sloping to the southwest. No major drainages exist on the site. However, a concrete drainage channel is located along the eastern boundary of the site. The site is currently vacant. Vegetation consists of field grasses and weeds. A fill pile is located in the northern portion of the site. The site lies in a portion of Sections 7, Township 14 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The Site Plan is presented in Figure 2.

Seven test borings were drilled as part of the original Subsurface Soil Investigation (Reference 1). to evaluate the subsurface soil conditions. Three of the test borings (Test Boring Nos. 1, 2 and 3) were drilled on the subject site. The Test Boring logs and Laboratory Tests Results are included in Appendix B. Information from this report was used evaluating the site.

The scope of this report includes a geologic analysis/ evaluation of the site utilizing published geologic data, available subsurface soils information and site-specific mapping of major geologic features, and identification of geologic hazards with respect to the development with recommended mitigation techniques. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) Survey was also reviewed to evaluate the site.

Platte Valley, LLC
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SOIL AND GEOLOGIC CONDITIONS

Soil Survey

The Natural Resource Conservation Service (NRCS) (Reference 2, Figure 3), previously the Soil Conservation Service (Reference 3) has mapped one soil type on the site. Complete description of the soils is presented in Appendix C. In general, the soils consist of sandy loam. The soils are described as follows:

<u>Type</u>	<u>Description</u>
96	Truckton sandy loam, 0-3% slopes

Soils

The soils encountered in the Test Boring Nos. 1, 2 and 3 from Subsurface Soil Investigation (Reference 1) consisted of four to six feet of silty to clayey sand fill/possible fill, native silty to slightly silty and gravelly sand and sandy clay. Bedrock was not encountered in the test borings, which were drilled on the subject site to 20 feet. The upper soils were encountered at loose to medium dense states and moist conditions. The sand soils are considered to have low expansion potential. A FHA Swell pressure of 750 psf was measured on the sandy clay, indicating low expansion potential.

Groundwater

Groundwater was encountered at 20 feet in Test Boring No. 2 (Reference 1). Groundwater was not encountered in Test Boring Nos. 1 and 3, which were drilled to 20 feet. It is anticipated groundwater will not affect shallow foundations on site. Fluctuations in groundwater conditions may occur due to variations in rainfall or other factors not readily apparent at this time. Isolated sand layers within the soil profile can carry water in the subsurface. Contractors should be cognizant of the potential for the occurrence of subsurface water features during construction.

Geology

Approximately 8 miles west of the site is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within a large structural feature known as the Denver Basin. Bedrock in the area is typically gently dipping in a northerly direction. The bedrock underlying the site consists of the Dawson Formation of Cretaceous Age. The Dawson Formation typically consists of coarse-grained arkosic sandstone with interbedded layers siltstone or claystone. Overlying the Dawson Formation are deposits of man-made fill soils and soils associated with wind blown sands and water-deposited alluvial sands.

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The geology of the site was evaluated using the *Geologic Map of the Elsmere Quadrangle*, by Madole and Thorson in 2003, (Reference 4, Figure 4). The Geology for the site is presented in Figure 5. Three mappable units were identified on this site which, are described as follows:

- Qaf** **Artificial Fill of Quaternary Age:** These are man-made fill deposits associated with past grading and fill piles observed on the site. Areas of fill other than those mapped may be encountered.
- Qam** **Middle Alluvium of Quaternary Age:** This deposit typically consists of water deposited silty sands and may have clay layers. This deposit occurs as a stream terrace deposit associated with Sand Creek.
- Qes** **Eolian Sands of Quaternary Age:** These are wind-blown sands deposited by the action of prevailing winds. The materials typically consist of silty sands and may contain sandy silt layers.

ENGINEERING GEOLOGIC HAZARDS

Mapping has been performed on this site to identify areas where various geologic conditions exist of which developers should be cognizant during the planning, design and construction stages should new construction be proposed. The engineering geologic hazards identified on this site include artificial fill, loose soils, potentially expansive soils and floodplain areas. These hazards and recommended mitigation techniques are discussed as follows:

Artificial Fill

Up to six feet of possible fill was encountered in two of the borings test drilled on site. Fill was also observed on the site associated with the existing fill piles.

Mitigation: It is anticipated the fill piles will be removed during site grading. Areas of fill other than those encountered may be encountered. The fill piles are considered uncontrolled. Unless records can be obtained, other fill on the site will also be considered uncontrolled. Any uncontrolled fill encountered beneath foundations should be removed and recompacted at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. Fill mitigation should occur during individual building construction.

Loose Soils

Loose soils were encountered in borings drilled on site (Reference 1). Loose soils if encountered beneath the foundation or floor slabs will require mitigation.

Mitigation: Should loose soils be encountered beneath the foundations or floor slabs, mitigation will be necessary. Overexcavation and recompaction at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. An overexcavation depth of 2 to 3 feet is anticipated.

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Expansive Soils

A layer of expansive soils was encountered in one the test borings. Expansive clays, if encountered beneath foundations, can cause differential movement in the structure foundation.

Mitigation: Should expansive soils be encountered beneath the foundation, mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements.

Floodplain Areas

Portions of the site lie within a floodplain according to the FIRM Map, No. 08041CO754F (Reference 5, Figure 6). Finished floors must be a minimum of one foot above the floodplain level. Any site grading considered should be modified to direct surface flows around the structures or roads, or carried off-site so as to not produce any areas of ponded water. Additionally, subsurface perimeter drains may be required. Specific drainage studies and exact floodplain locations are beyond the scope of this report.

RELEVANCE OF GEOLOGIC CONDITIONS TO LAND USE PLANNING

As mentioned, the proposed development will be commercial. The existing geologic and engineering geologic conditions will impose minor constraints on development and construction. The geologic conditions on the site include artificial fill, loose soils, potentially expansive soil layers and floodplain areas, which can be satisfactorily mitigated through proper engineering design and construction practices.

The upper granular soils encountered in the borings drilled on the site were encountered at loose to medium dense states. Loose or collapsible soils, if encountered beneath foundation or floor slabs, will require recompaction. Expansive layers may also be encountered in the soil on this site. Expansive soils, if encountered, will require special foundation design. These soils will not prohibit development.

Fill exists on this site that is associated with a fill pile on site and in the upper soils in two test borings. Other areas of fill may be encountered on the site. All fill piles and debris should be completely removed and prior to construction. Any uncontrolled fill encountered beneath new foundations and floor slabs will require removal and recompaction at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Groundwater was encountered at 20 feet in Test Boring No. 2. It is anticipated groundwater will not affect a shallow foundation with slab-on-grade construction and no basement construction. According to the FEMA FIRM Map No. 08041CO0754F (Reference 5, Figure 6) a portion of the site is located in a floodplain. Finished floors must be a minimum of one foot above the floodplain level. Specific drainage studies and exact floodplain locations are beyond the scope of this report.

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In summary, the recompacted granular soils will likely provide suitable support for shallow foundations. The geologic conditions encountered on site can be mitigated with proper engineering and construction practices. Specific recommendations have been made in the Subsurface Soil Investigation (Reference 1).

CLOSURE

It should be pointed out that because of the nature of data obtained by random sampling of such variable nonhomogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Any new construction considered on this site will require additional investigation. Construction and design personnel should be made familiar with the contents of this report. Specific construction and foundation recommendations will be provided when investigations are completed for any new construction.

This report has been prepared for Platte Valley, LLC for application to the proposed development in accordance with generally accepted geologic, soil and engineering practices. No other warranty expresses or implied is made.

We trust that this report has provided you with all the information that you required. Should you have any questions or require additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Reviewed by:



Logan L. Langford
Geologist

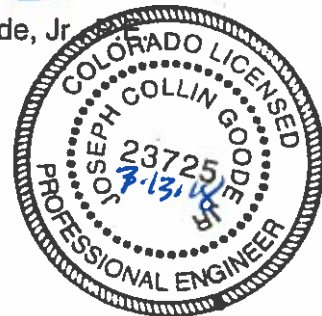
LLL/III

Encl.

Entech Job No. 181169
AAprojects/2018/181169 sg&ghs



Joseph C. Goode, Jr.
President

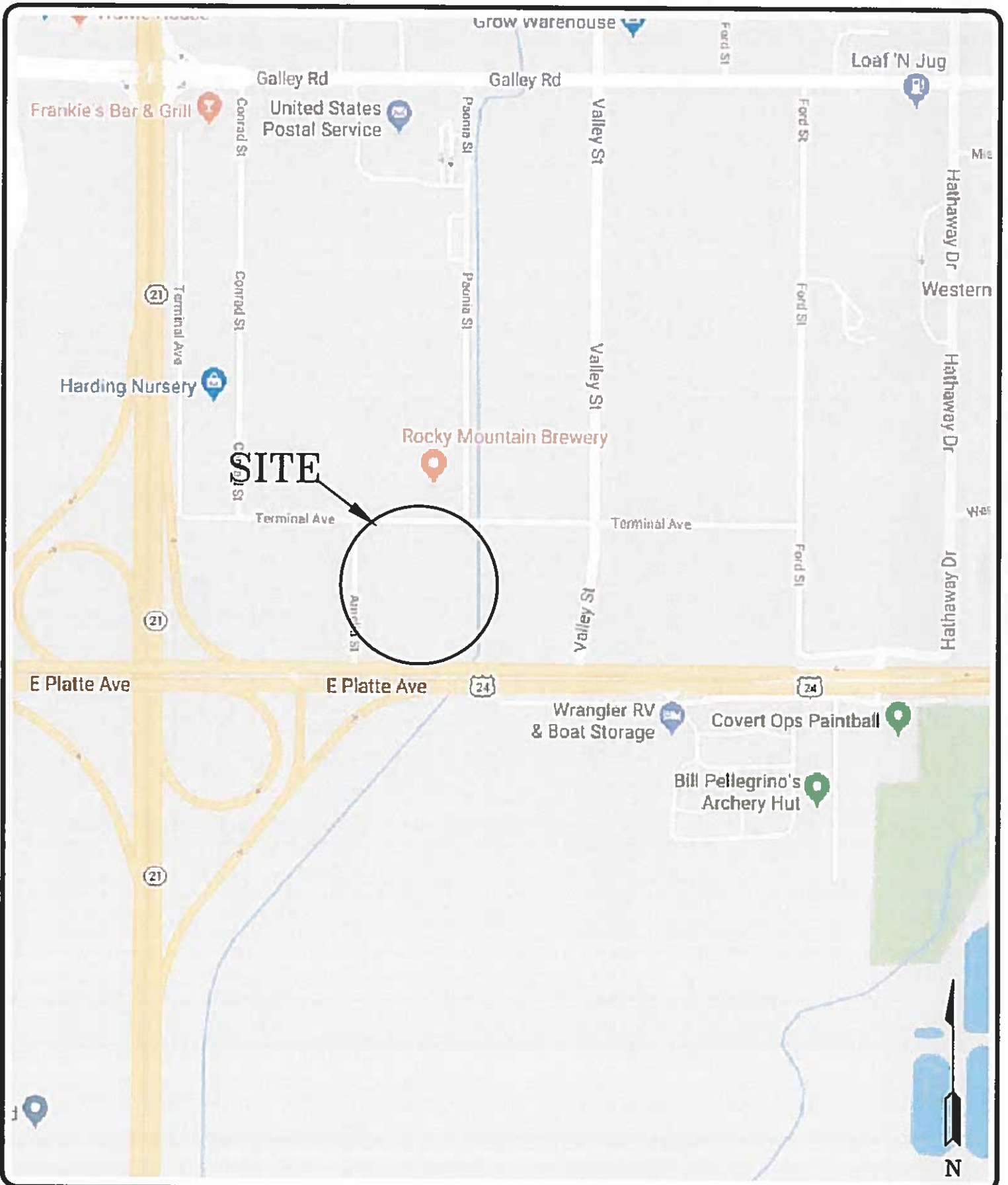


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Soil, Geology and Geologic Hazard Evaluation
Lot 2, Appaloosa Hwy 24 Subdivision Filing No. 2
El Paso County, Colorado

BIBLIOGRAPHY

1. Entech Engineering, Inc. May 30, 2007. *Preliminary Subsurface Soil Investigation, Lot 2, Appaloosa Hwy 24 Subdivision Filing No. 2, El Paso County, Colorado*. Entech Job No. 94727.
2. Natural Resources Conservation Service. September 23, 2016. *Web Soil Survey*. United States Department of Agriculture. <http://websoilsurvey.sc.egov.usda.gov>.
3. United States Department of Agriculture Soil Conservation Service. June, 1981. *Soil Survey of El Paso County Area, Colorado*.
4. Madole, R. F, Thorson, J. P. 2003. *Elsmere Quadrangle Geologic Map, El Paso County, Colorado*. Colorado Geological Survey. Open-File Report 02-2.
5. Federal Emergency Management Agency, March 17, 1997. *Flood Insurance Rate Maps for the City of Colorado Springs, Colorado*. Map Number 08041CO754F

FIGURES



ENTECH
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VICINITY MAP
 LOT 2, APPALOOSA HWY 24 SUBDIVISION
 FILING NO. 2
 EL PASO COUNTY, CO.
 FOR: PLATTE VALLEY, LLC

DRAWN:
 LLL

DATE:
 7/13/18

CHECKED:

DATE:

JOB NO.:
 181169

FIG NO.:
 1

Terminal Ave

Amelia St

96

N



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SOIL SURVEY MAP
LOT 2, APPALOOSA HWY 24 SUBDIVISION FILING
NO. 2
EL PASO COUNTY, CO.
FOR: PLATTE VALLEY, LLC

DRAWN:
LLL

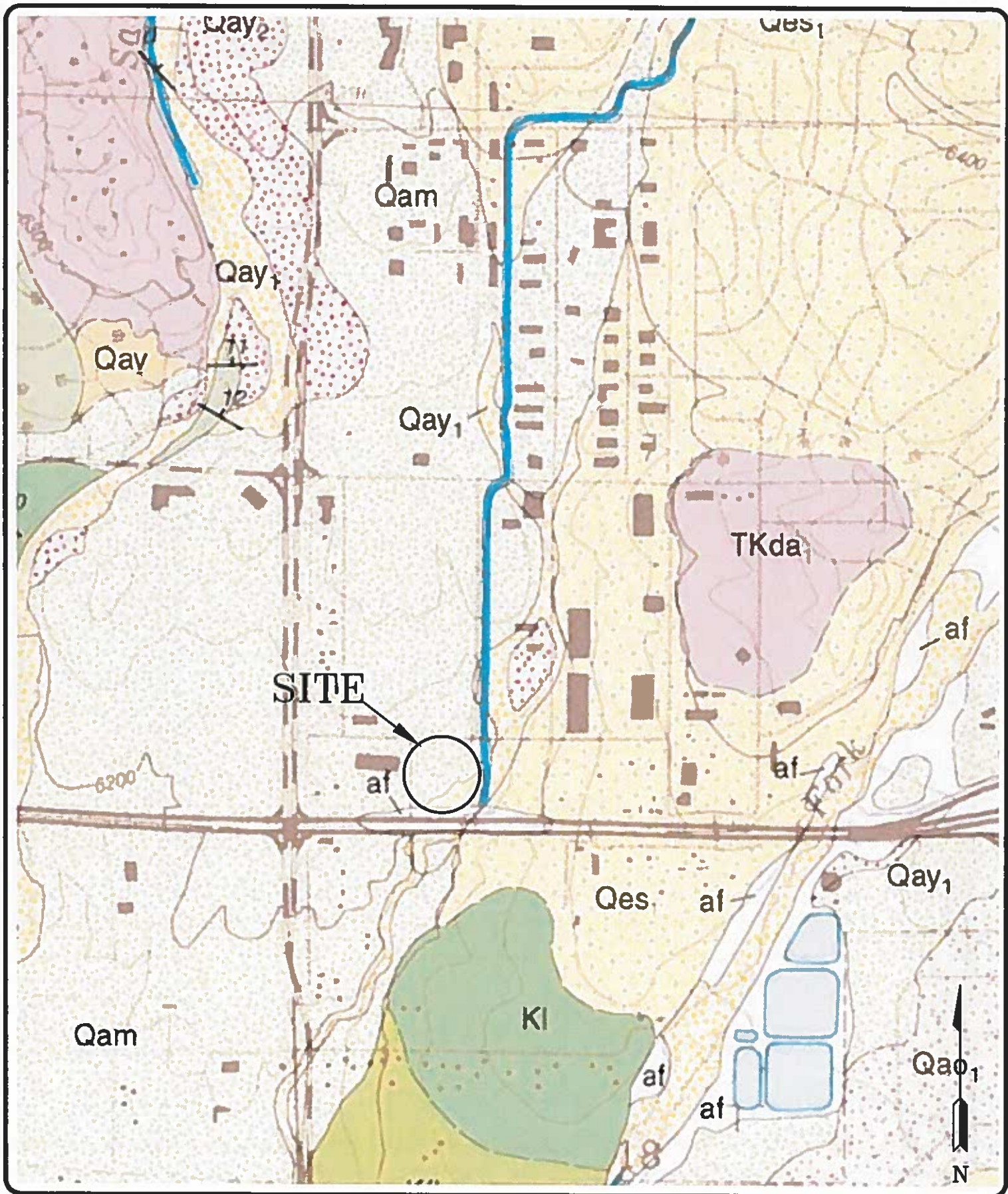
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7/13/18

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DATE:

JOB NO.:
181169

FIG NO.:
3



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ELSMERE QUADRANGLE GEOLOGY MAP
LOT 2, APPALOOSA HWY 24 SUBDIVISION
FILING NO. 2
EL PASO COUNTY, CO.
FOR: PLATTE VALLEY, LLC

DRAWN: LLL	DATE: 7/13/18	CHECKED:	DATE:
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JOB NO.:
181169

FIG NO.:
4

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood) has been established as the base flood. The flood that has a 1% chance of being equaled or exceeded in any given year. The 1% annual chance flood hazard area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AV, V, VE, X, and Y. The base flood elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet usually areas of ponding. Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet usually sheet flow on sloping terrain. Average depths determined. For areas of elevated farm buildings, velocities also determined.

ZONE AV Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently abandoned. Zone AV indicates that the former flood control system is being maintained to provide protection from the 1% annual chance or greater flood.

ZONE V Area to be protected from 1% annual chance flood by a Federal flood protection system under construction. No Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ROODWAY AREAS IN ZONE AE

The floodway is the channel of a stream, plus any adjacent floodplain areas that must be included from a levee to allow the 1% annual chance flood to be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

Areas of 0.2% annual chance flood, areas of 1% annual chance flood with average depth of less than 1 foot, or with drainage area less than 1 square mile, and areas protected by levees from 1% annual chance flood.

OTHER AREAS

Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTIHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Stream boundary

Zone D boundary

CBRS and OPA boundary

Boundary of Special Flood Hazard Area Zones and boundary of Special Flood Hazard Areas of Alluvial Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and water elevation in feet elevation in feet

Retrieved to the National Geospatial Data Archive of 7/27

(L. 31171)

From section line

Tract line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

4276200

600000 FT

005510 X

9 M 2

MAP REPOSITORY

Refer to listing of Map Repositories on Map back.

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

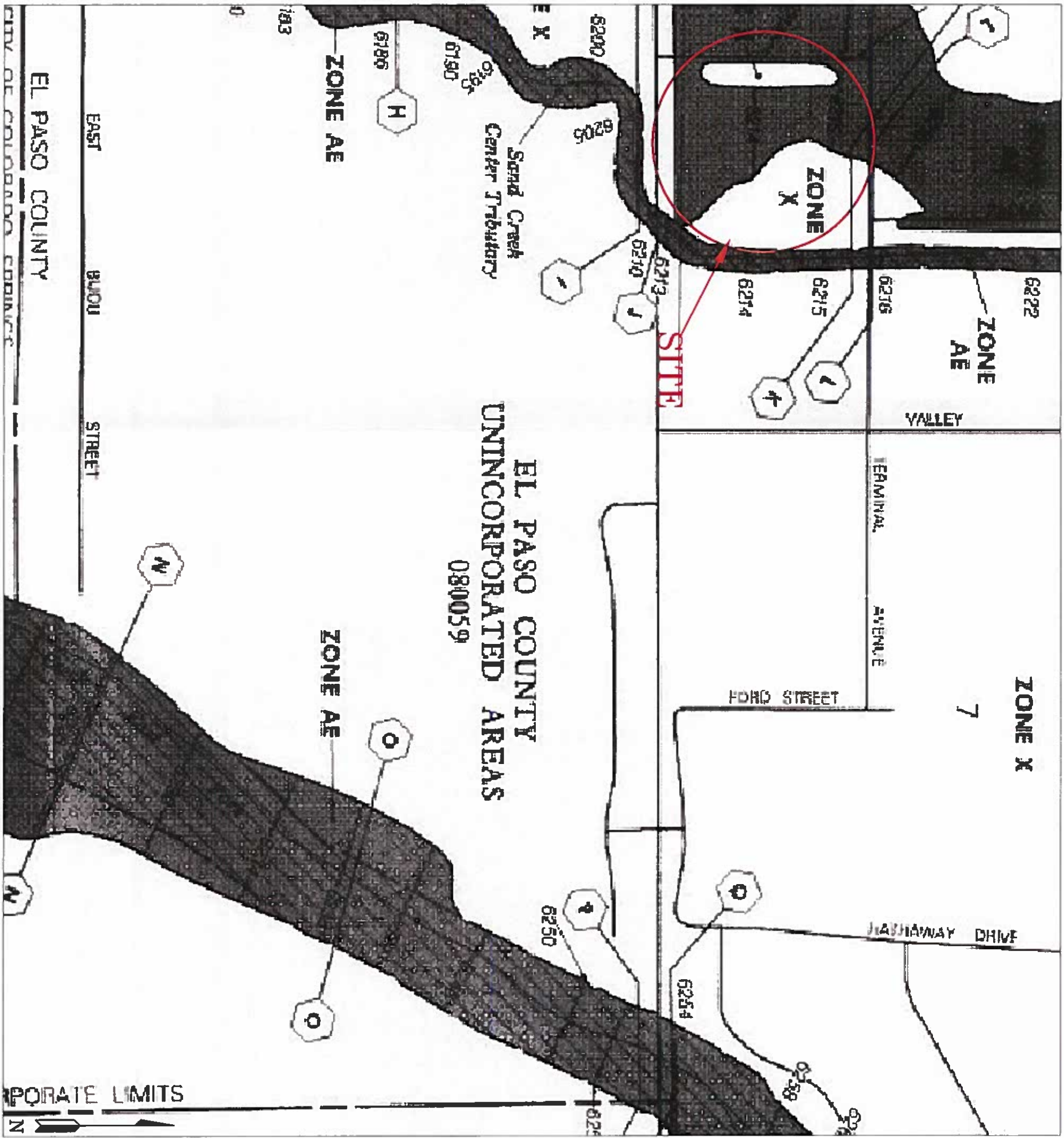
November 20, 2000

EFFECTIVE DATES OF REVISIONS TO THIS PANEL

September 10, 2004 - to change Special Flood Hazard Areas, to update map annual to reflect revised elevation and to incorporate previously issued Letter of Map Revision.

For community map revision history, refer to comparable map(s) refer to the Community Map History data located in the Flood Insurance Study report for the jurisdiction.

In determining flood insurance availability, this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6632.



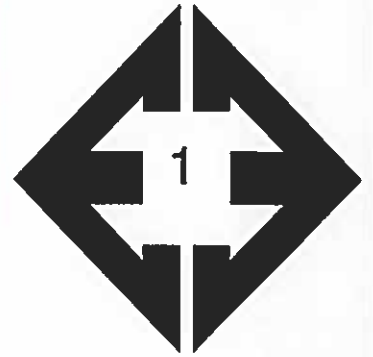
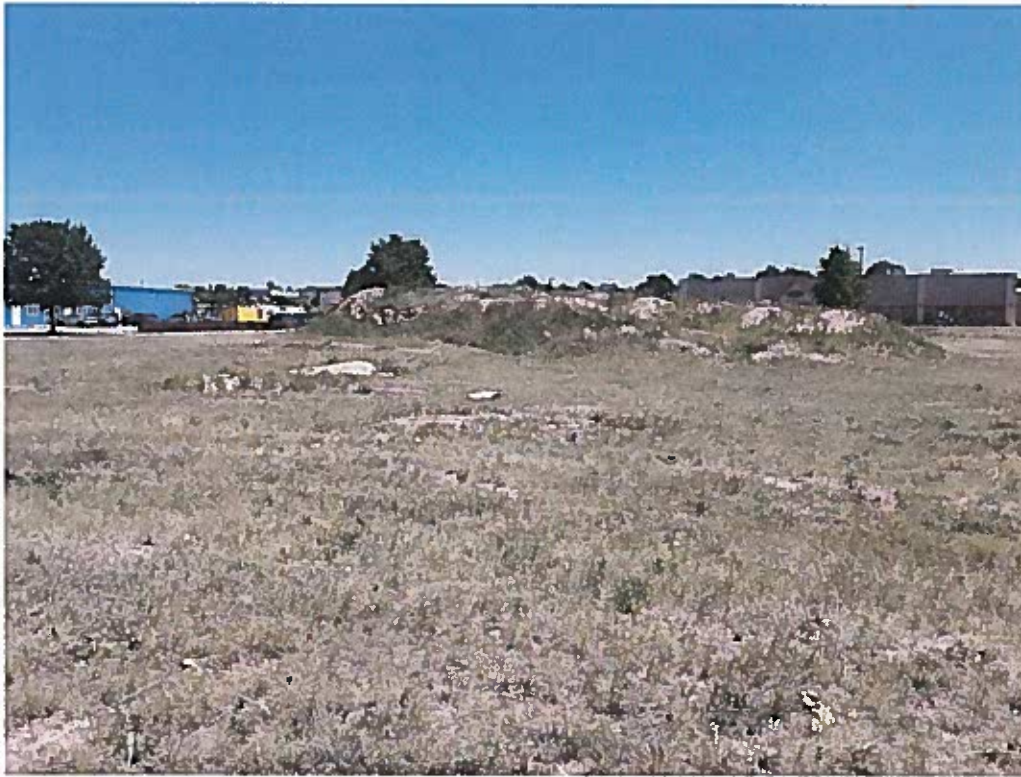
REVISION	BY

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FLOODPLAIN MAP
 LOT 2, APPALOOSA HWY 24
 SUBDIVISION FILING NO. 2
 EL PASO COUNTY, CO.
 FOR: PLATTE VALLEY, LLC

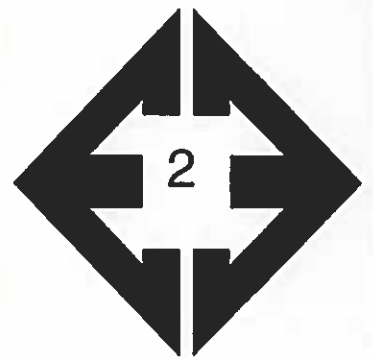
DATE	BY
7/13/18	AS SHOWN
AS SHOWN	AS SHOWN
181189	181189
6	6

APPENDIX A: Site Photographs



**Looking east from the
northwest portion of
the site.**

July 10, 2018



**Looking south from
the northwestern
portion of the site.**

July 10, 2018



**Looking east at
concrete drainage way
along the southeast
boundary of site.**

July 10, 2018



**Looking northwest
from the southeastern
portion of the site.**

July 10, 2018

APPENDIX B: Test Boring Logs and Laboratory Testing Results

TEST BORING NO. 1
 DATE DRILLED 5/14/2007
 Job # 94727

TEST BORING NO. 2
 DATE DRILLED 5/14/2007
 CLIENT MILLENNIUM DEV.
 LOCATION APPALOOSA HWY & KEY TEE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 5/15/07							WATER @ 20', 5/15/07						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN TO TAN, LOOSE TO MEDIUM DENSE, MOIST	0-4			10	8.9	2	POSS. FILL 0-4', SAND, CLAYEY TO SILTY, BROWN, MEDIUM DENSE, MOIST	0-4			22	7.4	1
	5			9	7.0	2	CLAY, SANDY, DARK BROWN, FIRM, MOIST	5			7	23.4	3
	10			16	4.1	2	SAND, GRAVELLY, SILTY TO SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST TO WET	10			12	15.4	2
VERY SILTY, FINE GRAINED, LENSES	15			19	9.2	2		15			23	3.8	2
	20			21	14.7	2		20			21	6.4	2



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

12/10 5/25/07

JOB NO.:

FIG NO.:

B-1

TEST BORING NO. 3
 DATE DRILLED 5/14/2007
 Job # 94727

TEST BORING NO. 4
 DATE DRILLED 5/15/2007
 CLIENT MILLENNIUM DEV.
 LOCATION APPALOOSA HWY & KEY TEE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 5/14/07 CAVED TO 18', 5/15/07, DRY							DRY TO 20', 5/16/07						
POSS. FILL 0-6', SAND, VERY SILTY, CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST	5			12	15.1	1	SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN TO TAN, MEDIUM DENSE, MOIST	5			15	12.7	2
	5			19	5.2	1		5			11	17.9	2
SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN TO TAN, LOOSE, MOIST	10			7	13.1	2	SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	10			10	3.7	2
	15			10	3.4	2		15			12	8.2	2
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	20							20			20	3.2	2



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

[Signature] 5/25/07

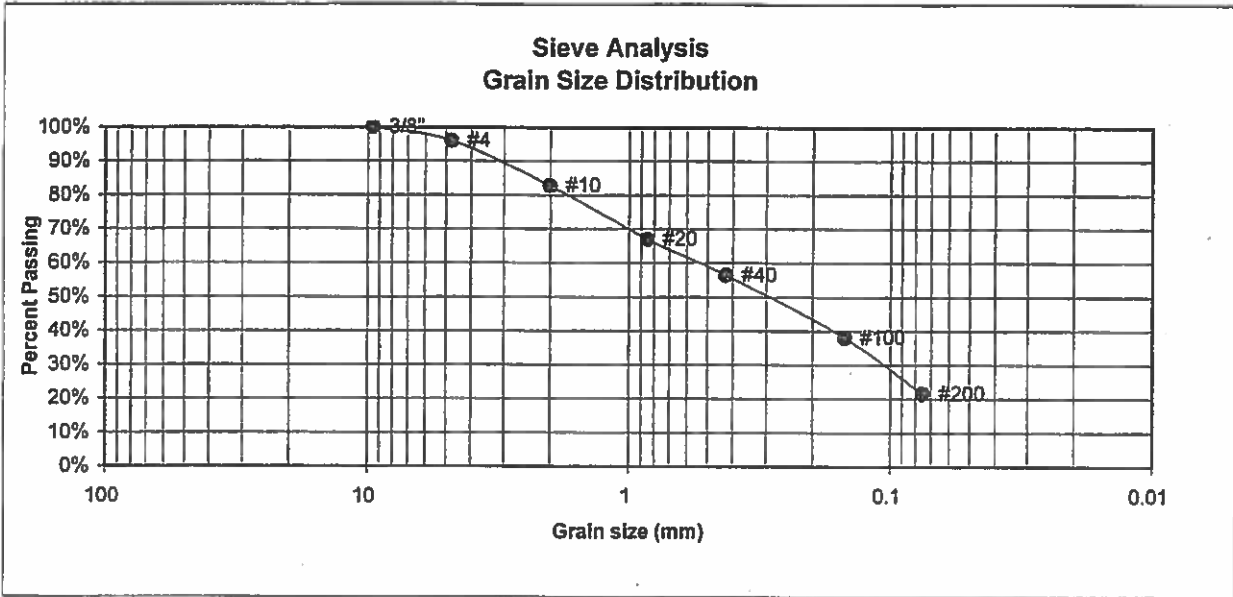
JOB NO.:

FIG NO.:

B-2

UNIFIED CLASSIFICATION SM
 SOIL TYPE # 2
 TEST BORING # 1
 DEPTH (FT) 5

CLIENT MILLENNIUM DEV.
 PROJECT APPALOOSA HWY & KEY TEE
 JOB NO. 94727
 TEST BY DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.0%
10	82.7%
20	67.0%
40	56.3%
100	38.0%
200	21.5%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



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LABORATORY TEST
 RESULTS

DRAWN:	DATE:	CHECKED: <i>DG</i>	DATE: 5/25/07
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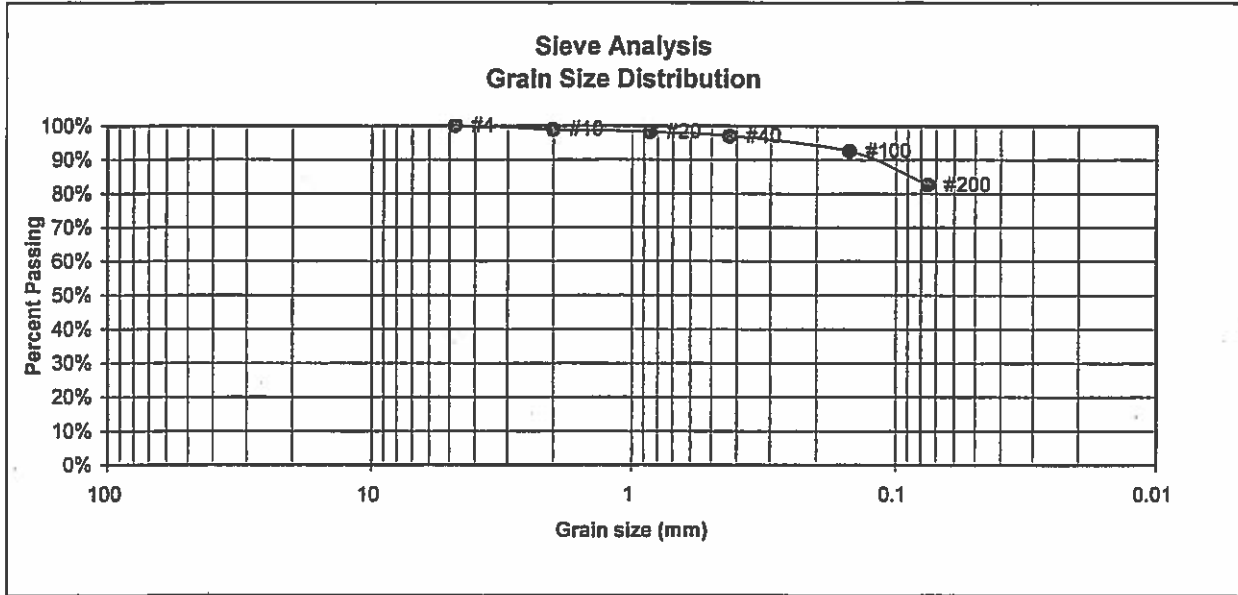
JOB NO.:

FIG NO.:

B-3

UNIFIED CLASSIFICATION CL
 SOIL TYPE # 3
 TEST BORING # 2
 DEPTH (FT) 5

CLIENT MILLENNIUM DEV.
 PROJECT APPALOOSA HWY & KEY TEE
 JOB NO. 94727
 TEST BY DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.9%
20	98.2%
40	97.0%
100	92.5%
200	82.6%

Atterberg
Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell

Moisture at start	15.9%
Moisture at finish	23.4%
Moisture increase	7.5%
Initial dry density (pcf)	96
Swell (psf)	752



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 COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST
 RESULTS

DRAWN:	DATE:	CHECKED: <i>DJG</i>	DATE: <i>5/25/07</i>
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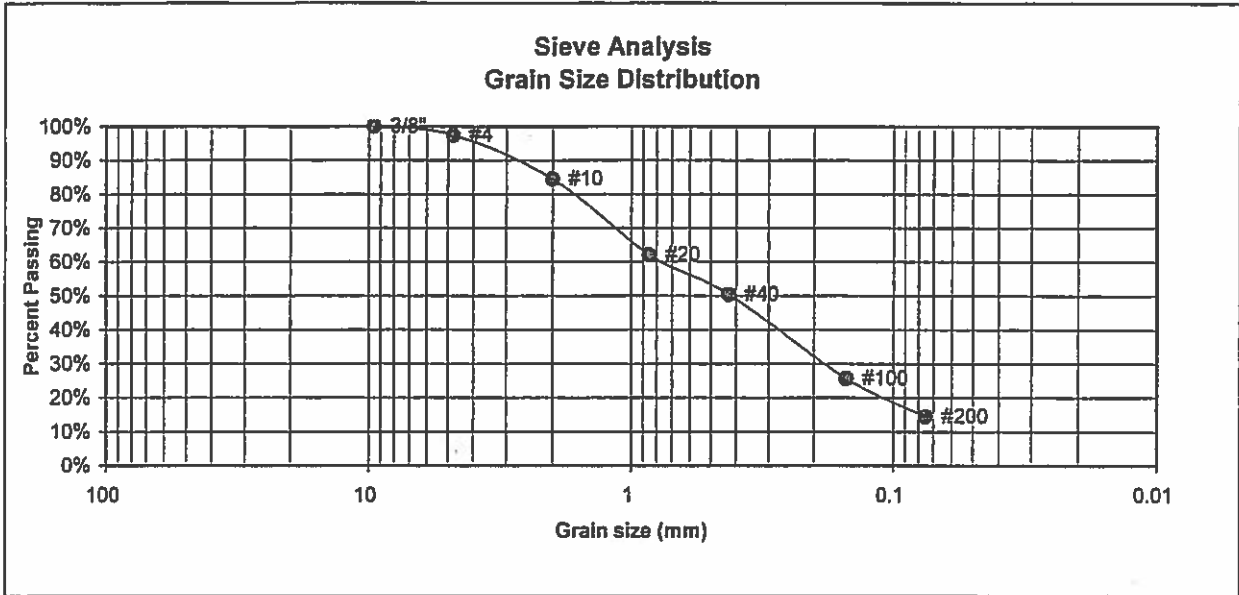
JOB NO.:

FIG NO.:

B-4

UNIFIED CLASSIFICATION SM
 SOIL TYPE # 2
 TEST BORING # 2
 DEPTH (FT) 10

CLIENT MILLENNIUM DEV.
 PROJECT APPALOOSA HWY & KEY TEE
 JOB NO. 94727
 TEST BY DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.5%
10	84.4%
20	62.1%
40	50.3%
100	25.6%
200	14.4%

Atterberg
 Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



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LABORATORY TEST
 RESULTS

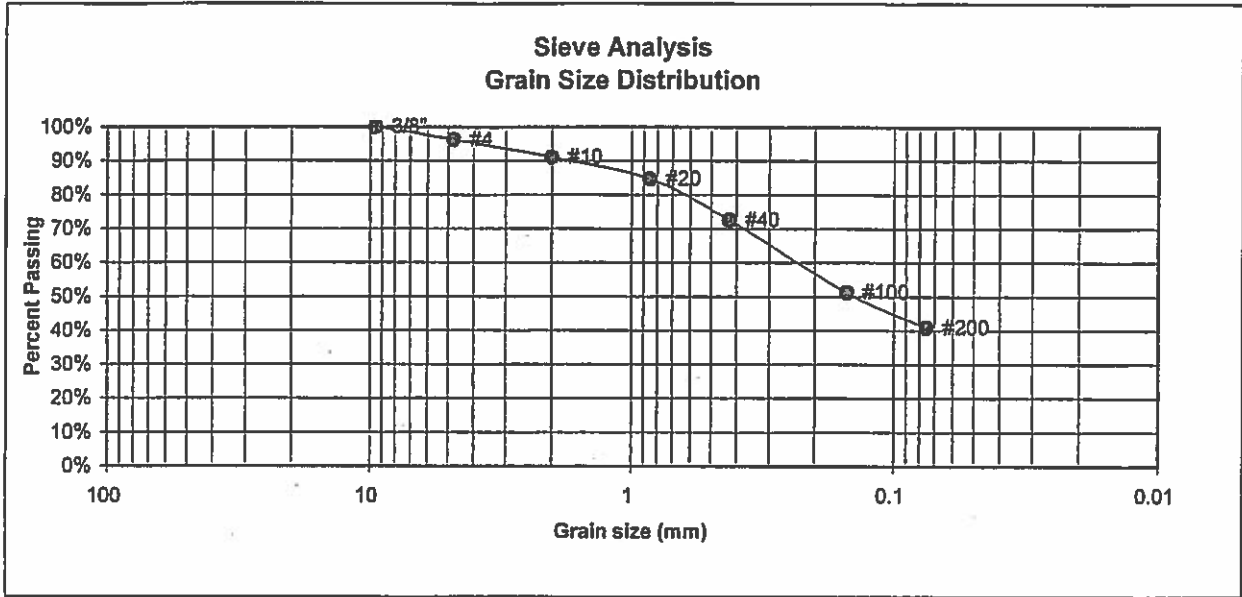
DRAWN:	DATE:	CHECKED: <i>DG</i>	DATE: <i>5/25/07</i>
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JOB NO.:

FIG NO.:

B-5

UNIFIED CLASSIFICATION	SC-SM	CLIENT	MILLENNIUM DEV.
SOIL TYPE #	1	PROJECT	APPALOOSA HWY & KEY TEE
TEST BORING #	3	JOB NO.	94727
DEPTH (FT)	2-5	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.3%
10	91.1%
20	84.6%
40	72.5%
100	51.1%
200	40.8%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	22
Plastic Index	7

Swell	
Moisture at start	7.3%
Moisture at finish	17.2%
Moisture increase	9.9%
Initial dry density (pcf)	104
Swell (psf)	61



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		<i>[Signature]</i>	5/25/07

JOB NO.:

FIG NO.:

B-6

