

# Buckeye Creek Flood Mitigation

## Design Concept Report



June  
2023

prepared for  
Carson Water Conservancy District | Douglas County, NV



Date Signed: June 26, 2023

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**Appendix A** – NV5 Geospatial Survey Report of LiDAR Calibration & Quality Control Points

**Appendix B** – NRCS Soil Mapping Reports

**Appendix C** – CA Group Design Plans and Report

## List of Abbreviations

2D – Two dimensional

CLOMR – Conditional Letter of Map Revision

cfs – cubic feet per second

D16 – The average diameter of a rock particle for which 16 percent of gradation is finer by weight, mm

D50 – The average diameter of a rock particle for which 50 percent of gradation is finer by weight, mm

D84 – The average diameter of a rock particle for which 84 percent of gradation is finer by weight, mm

FCDMC – Flood Control District of Maricopa County

FEMA – Federal Emergency Management Agency

G – Gradation Coefficient

HEC-HMS – Hydrologic Engineering Center – Hydrologic Modeling System

HEC-RAS – Hydrologic Engineering Center – River Analysis System

LiDAR – Light Detection and Ranging

LOMR – Letter of Map Revision

MUSLE – Modified Universal Soil Loss Equation

NAD 83 – North American Datum of 1983

NAVD 88 – North American Vertical Datum of 1988

NDWR – Nevada Department of Water Resources

NDOT – Nevada Department of Transportation

NGVD 29 – National Geodetic Vertical Datum of 1929

NRCS – National Resources Conservation Service

NVA – Non-vegetated Vertical Accuracy

QL – Quality Level

RMSE – Root-Mean-Square Error

USDA – United States Department of Agriculture

USGS – United States Geological Survey

VVA – Vegetated Vertical Accuracy

XKSAT – Hydraulic Conductivity at Natural Saturation

# 1 INTRODUCTION

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## 1.1 PROJECT PURPOSE

The purpose of the Buckeye Creek Flood Mitigation Study is to reduce the effective Buckeye Creek 100-year discharge as much as feasible through the conceptual design of a large flood control basin.

This purpose was accomplished through the following milestone tasks:

1. Evaluate the potential locations provided by Douglas County for flood control basins (see Figure 1-1). The locations are represented by county assessor parcels.
2. Assess the viability of the basin(s) that would reduce the downstream Buckeye Creek 100-year flow from 3,940 cfs (100-year regulatory discharge) to approximately 400 cfs.
3. If basin(s) are viable, develop 15% concept design plans for the basin(s).
4. Ensure that the post-project outflow discharge is compatible with the on-going proposed Muller Parkway improvement design plans.
5. Evaluate the existing network of drainage ditches and canals downstream of Orbit Way and their capacity for the proposed outflow discharge.
6. Where capacity is inadequate, develop a conceptual channel design that would sufficiently convey the reduced outflow discharge.

## 1.2 PROJECT LOCATION

The study focus area is a portion of the Buckeye Creek watershed located from where Buckeye Creek exits the Pine Nut Mountains to immediately upstream of the U.S. Highway 395 alignment. Figure 1-1 shows the focus area relative to the entire Buckeye Creek watershed, the potential locations for flood mitigation basins, and the proposed Muller Parkway alignment.

## 1.3 EFFECTIVE FEMA FLOOD ZONES

The restudy of the Buckeye Creek watershed was completed by Manhard Consulting, LTD (Manhard) in 2012. This study remapped the effective FEMA floodplains for Buckeye Creek and Martin Slough and incorporated previous results flood risk studies for Pine Nut Creek. The current effective FEMA flood zones in the vicinity of the Buckeye Creek Flood Mitigation Study are shown in Figure 1-2. Note the Pine Nut Creek is currently being restudied, and the flood zones will change. However, Pine Nut Creek revision does not affect the current study.

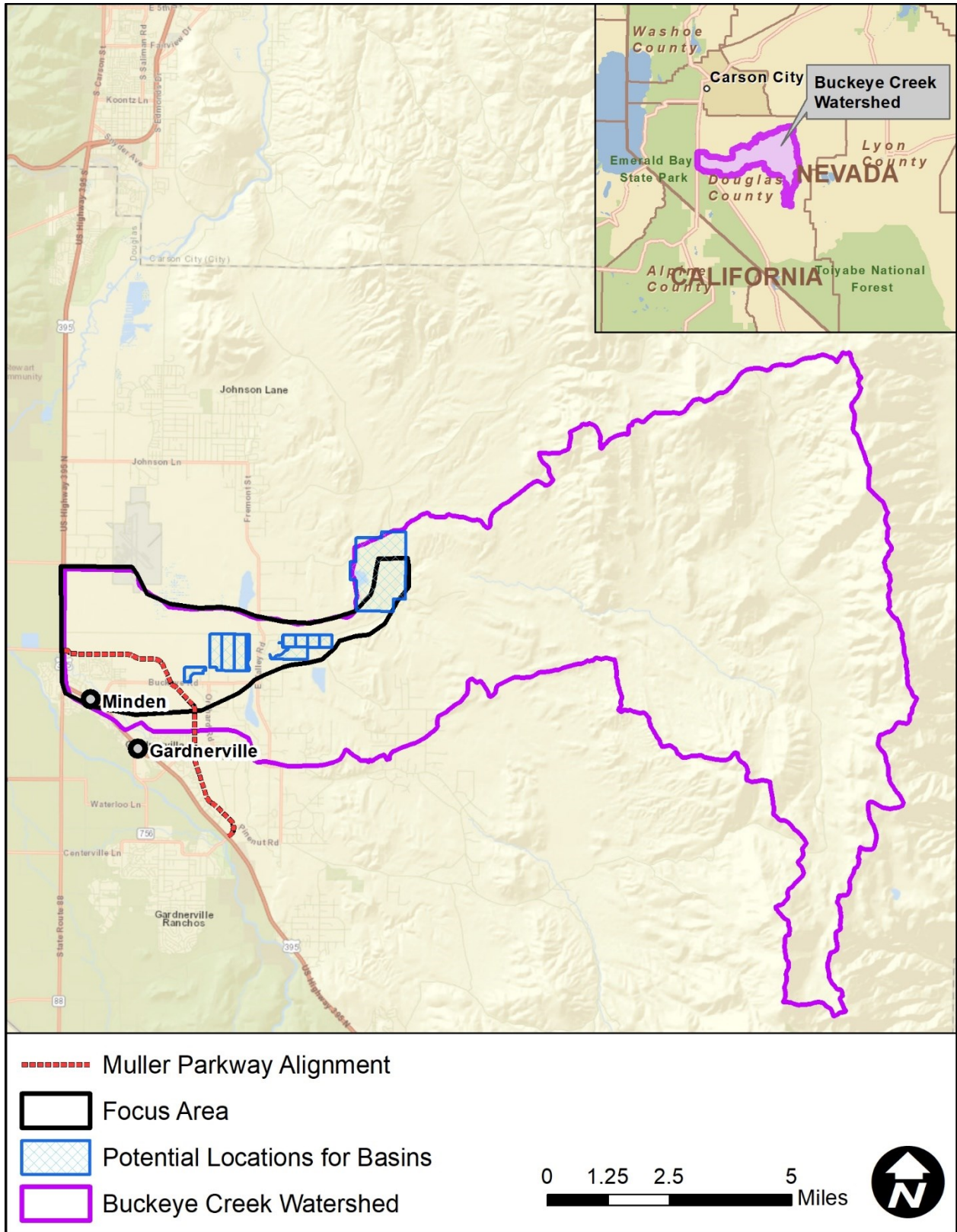


Figure 1-1. Project Location

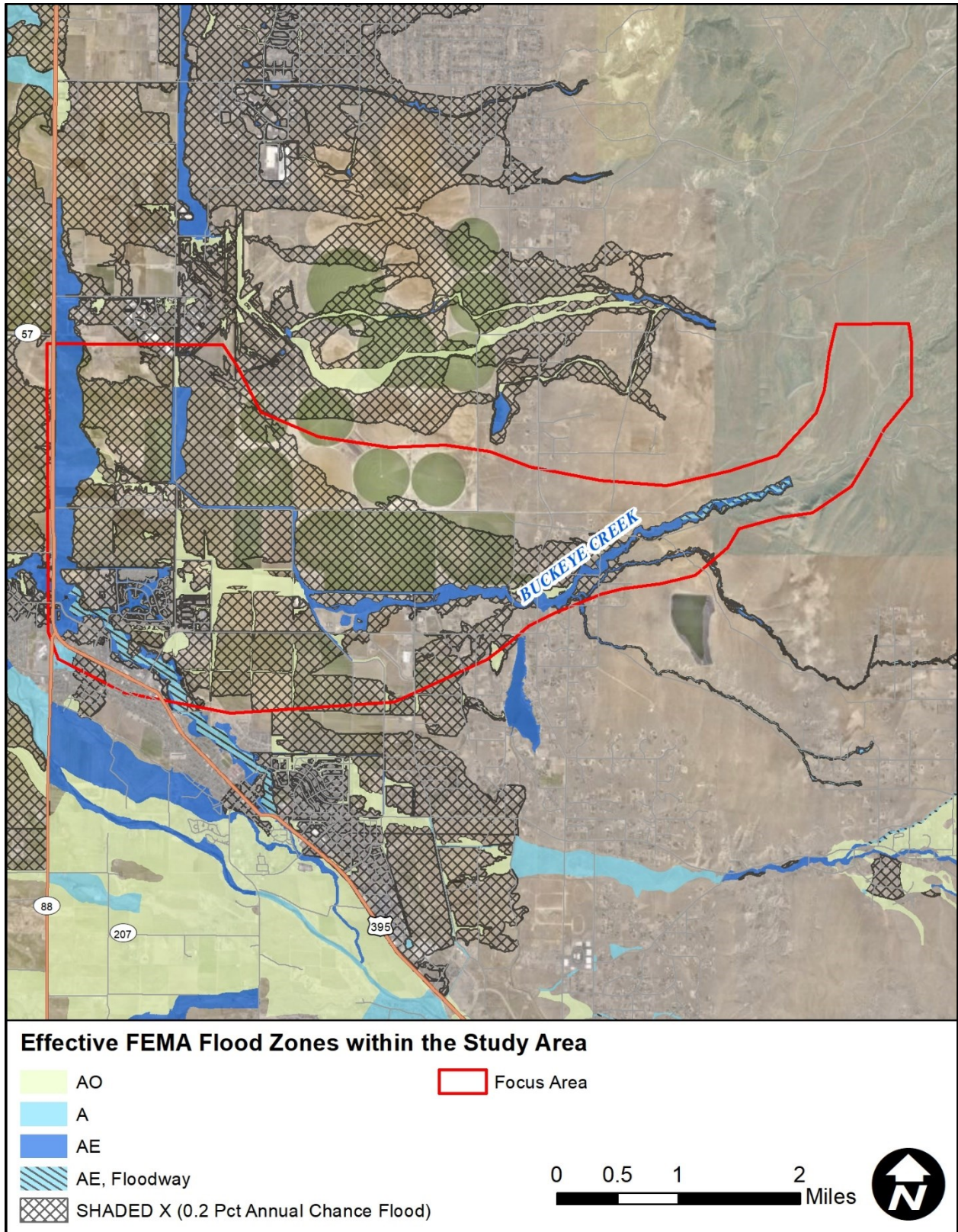


Figure 1-2. Effective FEMA Flood Zones



Table 1-1. FEMA Flood Zones in the Vicinity of the Project

Flood Zone	Definition	Flooding Type	Recurrence Interval
AO	Average depths have been determined; flood depths range from 1 to 3 feet.	Shallow sheet flow	1% chance
A	No base flood elevation is provided	Riverine	1% chance
AE	Base flood elevation (BFE) is provided	Riverine	1% chance
AE, Floodway	BFE and Floodway are provided	Riverine	1% chance
Shaded X	0.2 Percent annual chance flood hazard	Riverine, Other	0.2% chance
Unshaded X	Area of minimal flood hazard	-	-

## 2 MAPPING, SURVEY, AND FIELD RECONNAISSANCE

### 2.1 MAPPING

As a part of this project, LiDAR data was collected by aircraft at an average density of 8 pulses per square meter in April 2022. The detailed specifications for the LiDAR acquisition are shown in Table 2-1, and the accuracy of the LiDAR, as verified in the Survey Report (attached in Appendix A), is shown in Table 2-2 .

Through software processing, the mapping contractor, NV5 Geospatial, Inc. developed bare earth rasters with a 3-foot pixel resolution. These rasters were mosaiced into one continuous 3-foot bare earth raster, which became the base conditions terrain for this study.

Table 2-1. LiDAR Settings and Specifications, Reproduced from Contractor’s Scope

LiDAR Specifications Summary	
<b>Multi-Swath Pulse Density</b>	<b>≥ 8 pulses/m<sup>2</sup></b>
<b>Returns Collected Per Laser Pulse</b>	<b>Up to 4</b>
<b>Intensity Range</b>	<b>1-255</b>
<b>Swath Overlap</b>	<b>30% side-lap</b>
<b>Accuracy<sub>z</sub> (1.96 σ), slope &lt;20°</b>	<b>≤ 20 cm</b>
<b>Vertical Accuracy (σ), slope &lt;20°</b>	<b>≤ 9 cm</b>
<b>Horizontal Accuracy (σ)</b>	<b>≤ 30 cm</b>

Table 2-2. LiDAR Accuracy Assessment

Calibration Points
Average Horizontal RMSE is 0.03 feet.
Average Elevation RMSE is 0.05 feet.
Average 3-dimensional RMSE is 0.06 feet.
NVA Points
Average Horizontal RMSE is 0.03 feet.
Average Elevation RMSE is 0.05 feet.
Average 3-dimensional RMSE is 0.06 feet.
VVA Points
Average Horizontal RMSE is 0.03 feet.
Average Elevation RMSE is 0.05 feet.
Average 3-dimensional RMSE is 0.06 feet.

## 2.2 SPATIAL REFERENCE SYSTEM

All data that was generated for the Buckeye Creek Flood Mitigation Study used the horizontal control of the Nevada Coordinate System, West Zone, NAD83, while the vertical datum was the North American Vertical Datum of 1988 (NAVD 88). The units of measurement were U.S. Survey Feet.

## 2.3 SURVEY

No additional field survey was performed outside of that performed to verify the LiDAR mapping (see Section 2.1)

## 2.4 FIELD RECONNAISSANCE

Field reconnaissance was performed by JE Fuller staff on January 16, 2023 and February 22, 2023 to verify downstream (of the potential flood control basin) drainage infrastructure and to collect sediment samples for use in the sedimentation analyses (see Section 5).

As Buckeye Creek exits the Pinenut Mountains, the area surrounding the Creek becomes heavily agricultural. As such, there are numerous irrigation canals, tailwater ditches, diversions, weirs, and other hydraulic structures (see example in Figure 2-1) within the vicinity of Buckeye Creek. Therefore, the reconnaissance focused on the hydraulic infrastructure along the main corridor of Buckeye Creek.



*Figure 2-1. Example of Typical Structure Observed in the Field*

### 3 HYDROLOGY

The effective hydrology that was developed in 2012 for the effective FEMA remapping of Buckeye Creek was used for this study. The 100-year hydrographs that would impact any of the potential basin locations are shown in Figure 3-1, and the major flow corridors and their location relative to the study area and the potential basin locations are shown in Figure 3-2. Buckeye Creek is, by far, the largest inflow in this watershed as can be seen from the hydrograph comparison.

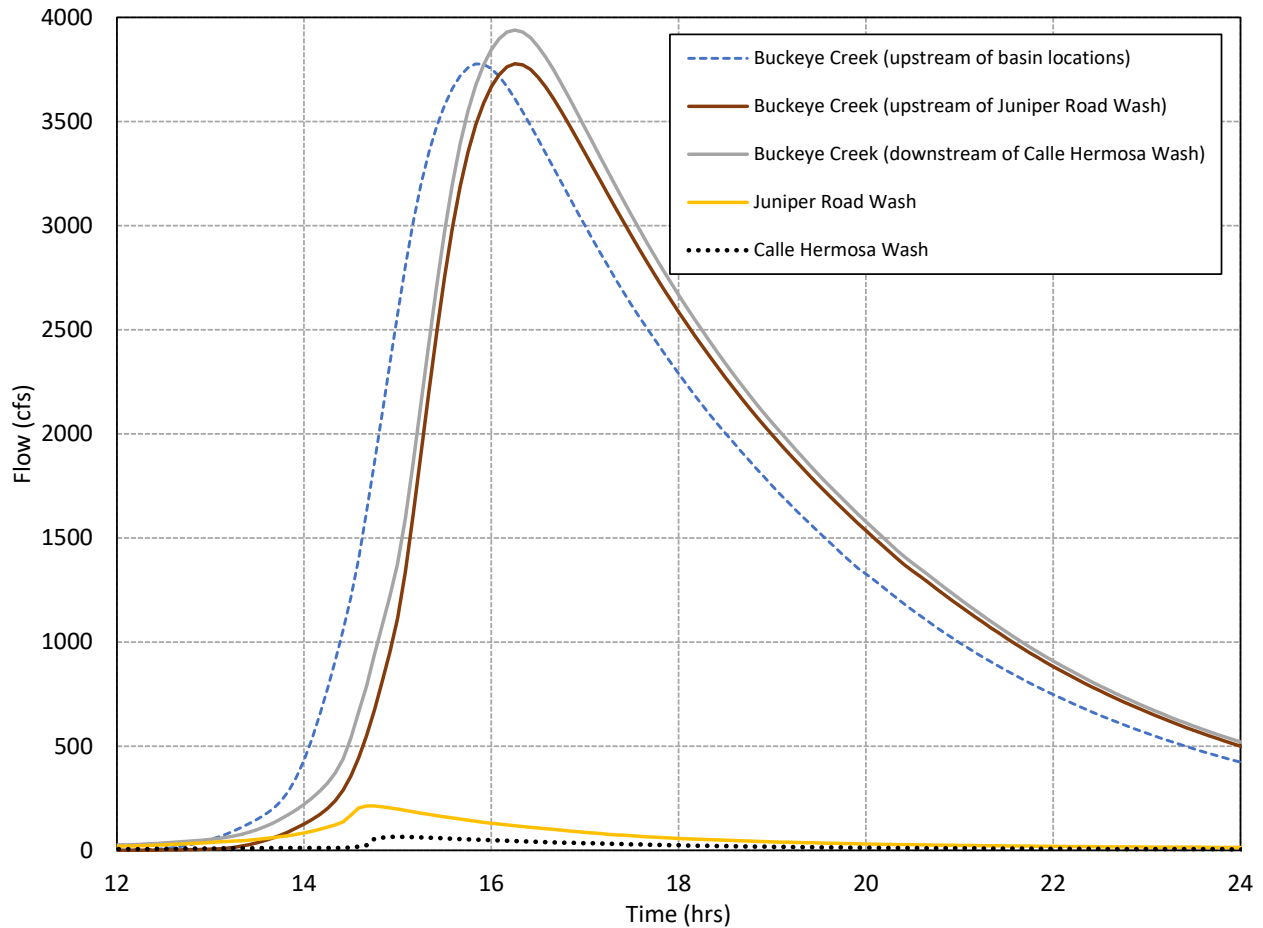


Figure 3-1. 100-year 24-hour Hydrographs for Buckeye Creek and Major Tributaries (source: Effective FEMA Study, 2012)

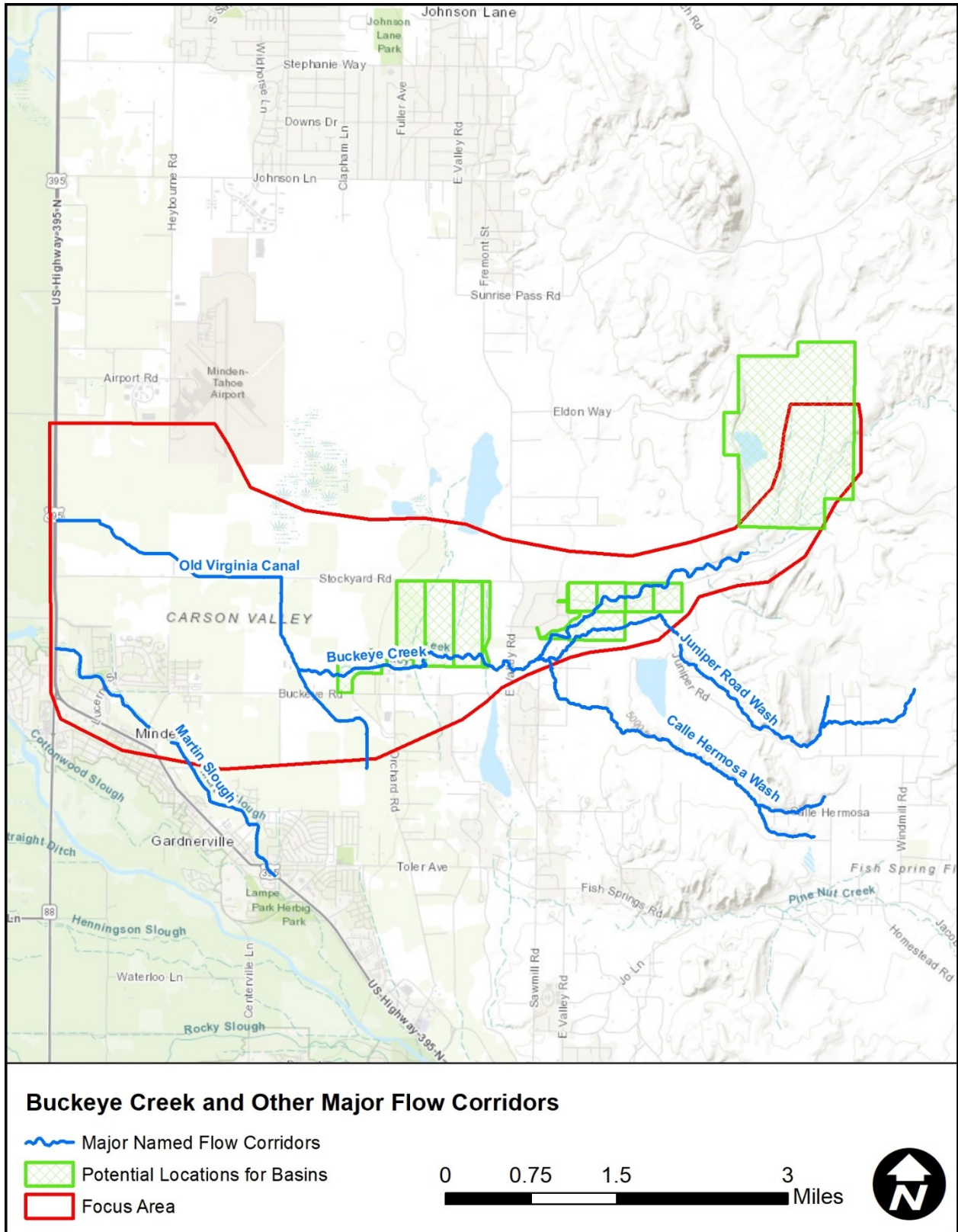


Figure 3-2. Major Flow Corridors near the Study Area

## 4 HYDRAULICS

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### 4.1 GENERAL

All hydraulic modeling was performed using HEC-RAS 2D version 6.3.1. Two models were developed for this project – one to define the base (or existing) conditions before the basin is implemented and a second proposed conditions model that incorporates the proposed basin into the model to assess potential benefits.

The existing and proposed conditions modeling focused on the primary flow path of Buckeye Creek, and are not intended to update or modify the effective FEMA modeling (Section 1.3) due to the number of agricultural hydraulic structures in the area (Section 2.4). Should Douglas County eventually authorize the project for final design, a CLOMR could be developed that would conditionally update the FEMA floodplains based on successful construction of the basin. After construction is complete, a LOMR that officially changes floodplains could be obtained. Note that neither a CLOMR nor LOMR are a part of this current design concept study.

### 4.2 BASE CONDITIONS

#### 4.2.1 Model development

The 2022 LiDAR data (see Section 2.1) served as the terrain for the base conditions model. The model mesh started with a general 80-ft cell size and significant refinements were added in two refinement regions (20- and 40-ft cells) and along forty-four breaklines (20-ft cells size with 4 repeating layers of cells) to provide more detail in areas of interest, such as channel banks, berms, or roads. One outflow boundary condition was set at the downstream (west) end of the model, and three inflow hydrographs (see Figure 3-1) were used as inflow boundary conditions at the upstream (east) end of the model. Culverts were added along the major flow path for Buckeye Creek and along US Highway 395, where data on the existing culverts were readily available in NDOT's online database<sup>1</sup>. Other structures, such as weirs and full span bridges, were not explicitly modeled in HEC-RAS. Rather, the base conditions were smoothed in these areas to approximate the channel geometry. An overview of the model domain, boundary conditions, modeled culverts, and computation points (i.e., the center point of each cell) in relation to the parcel locations that could be used for flood mitigation basins are shown in Figure 4-1. The parcels are labeled in Figure 4-1 based on a priority ranking provided by Douglas County for locating the mitigation basin.

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<sup>1</sup> <https://www.dot.nv.gov/doing-business/about-ndot/ndot-divisions/stormwater/mapping>

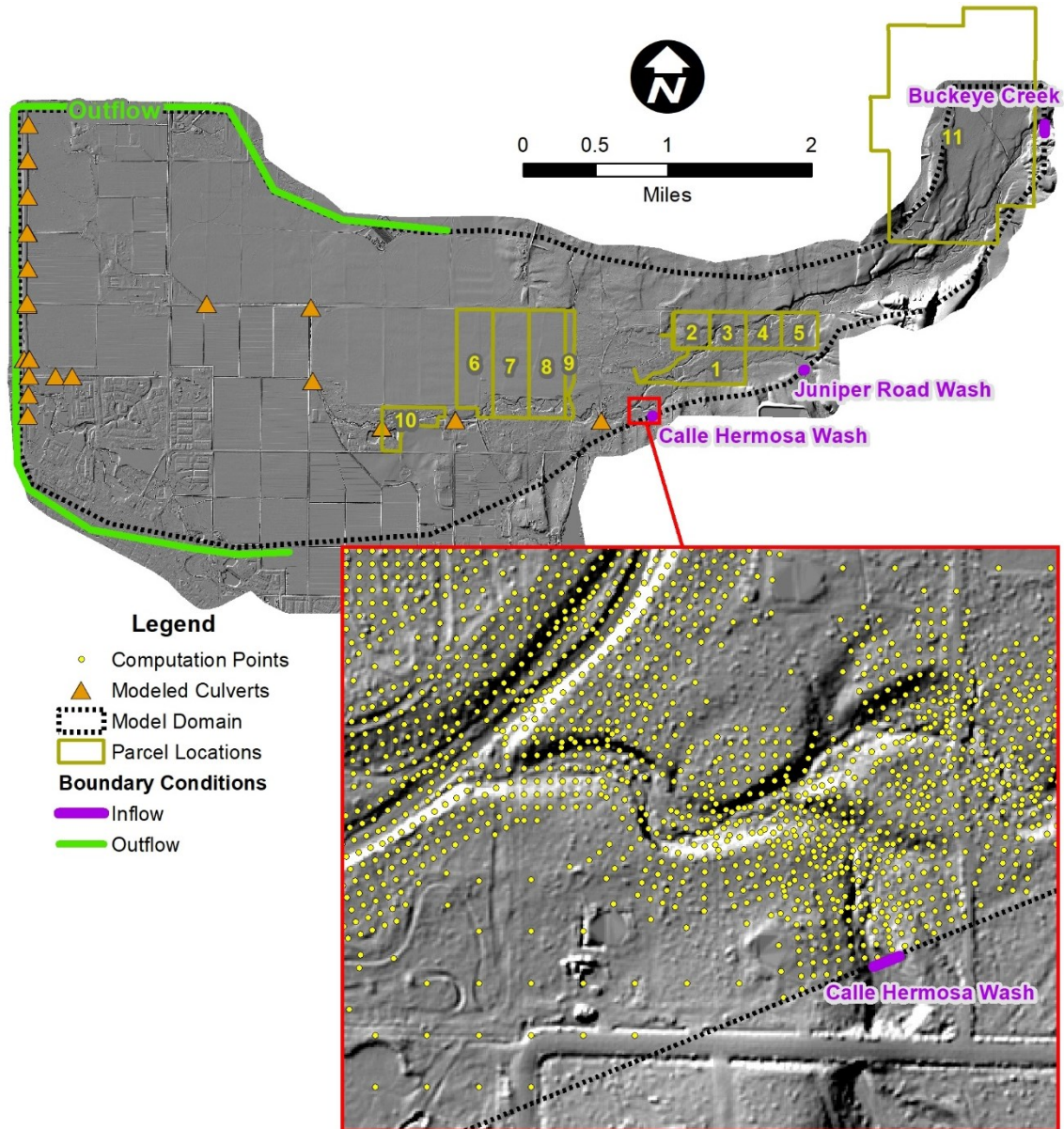


Figure 4-1. Overview of Model Domain, Boundary Conditions, and Computational Point Example

As a part of this study, a detailed surface feature (or land use) classification was developed for this study. These areas were delineated using the 2022 aerial photography, and corresponding Manning’s  $n$  values were assigned to each area based on a review of  $n$  values used in the effective FEMA modeling (Manhard, 2012), current aerial photography, watershed slope, and current site conditions. The spatial distribution of the surface feature classification is shown in Figure 4-2, while the Manning’s  $n$  values for each classification is shown in Table 4-1. Note that instead of artificially raising the terrain to model buildings, each building was given a high Manning’s  $n$  value to model the obstructive effects.

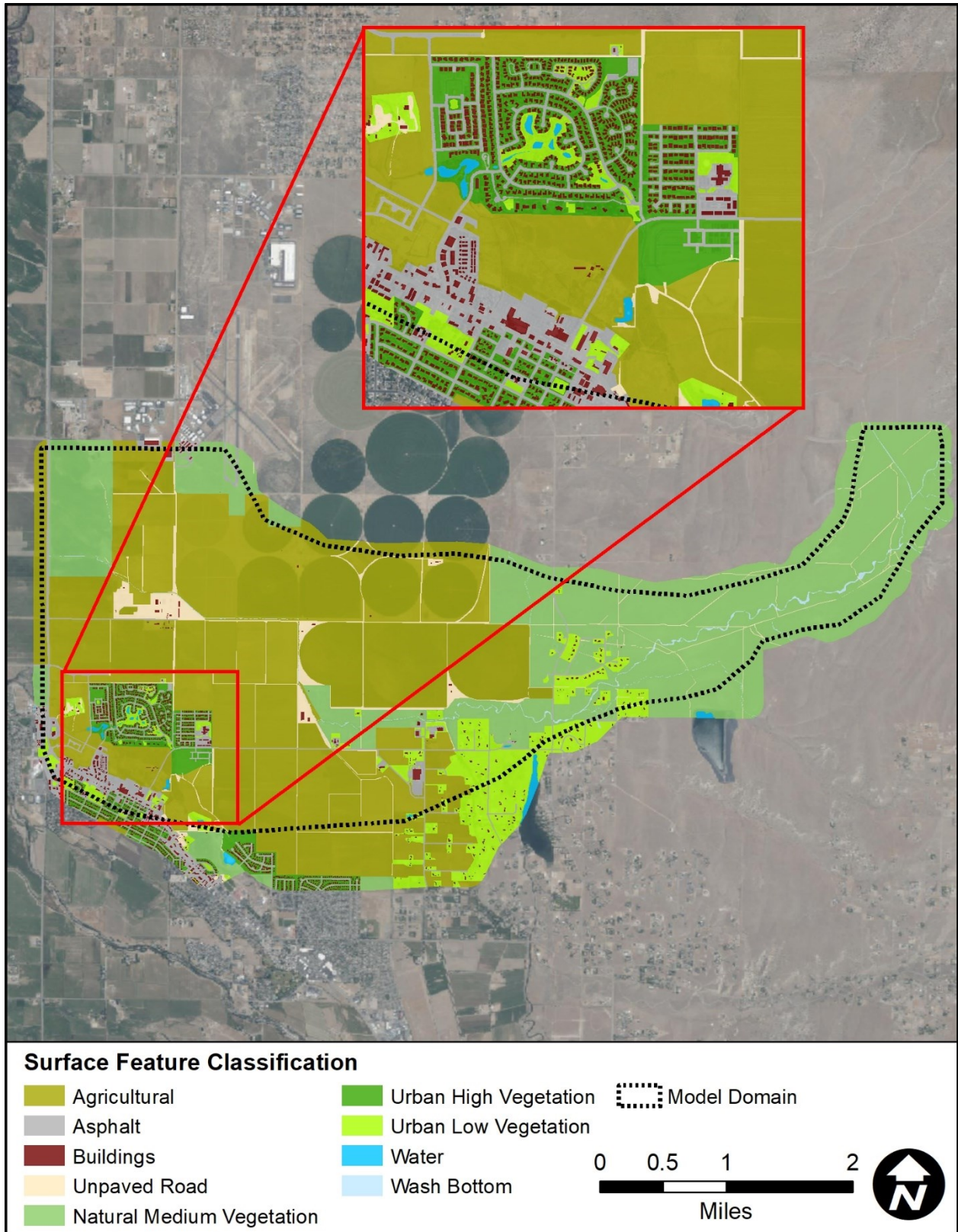


Figure 4-2. Surface Feature (or Land Use) Classification



Table 4-1. Surface Features and Corresponding Manning's n Value

Surface Feature	Manning's n
Agricultural	0.060
Asphalt	0.020
Buildings	0.200
Unpaved Road	0.026
Natural Medium Vegetation	0.070
Urban High Vegetation	0.065
Urban Low Vegetation	0.045
Water	0.040
Wash Bottom	0.060

#### 4.2.2 Model Results

Flow depth results from the base conditions HEC-RAS modeling are shown on Figure 4-3. This figure is for illustrative purposes and not practical for obtaining detailed information at site-specific locations. For more detailed information, the digital data are included in a separate deliverable which includes the HEC-RAS model where detailed results data can be queried directly in RAS Mapper.

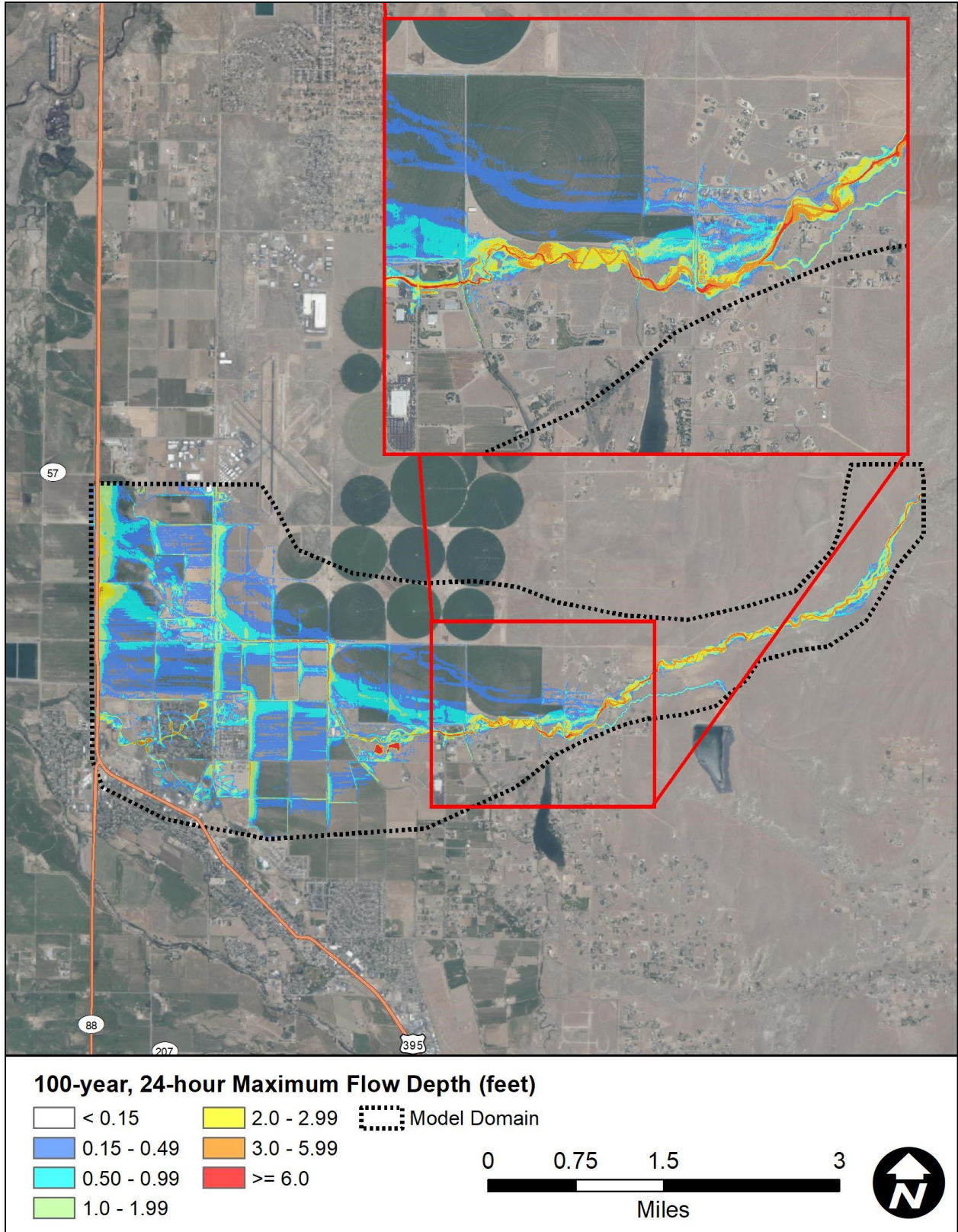


Figure 4-3. Existing Conditions 100-year 24-hour Maximum Flow Depth

## 4.3 POST-PROJECT CONDITIONS

### 4.3.1 Model development

After much discussion and close coordination, Douglas County selected Parcel 1 as the preferred location for the basin. The concept design of the basin included maximizing the available area of the parcel and designing the basin to be entirely below grade to avoid regulatory dam requirements. The base conditions terrain was updated with the proposed basin, and this combined terrain was used as the basis for the post-project model. The HEC-RAS geometry from base conditions was updated to reflect the new basin with the following modifications.

- 1) Manning's n value of 0.02 was used for the concrete channel and weir sections.
- 2) Mesh refinement regions were added in the channel sections and weir location around the basin.
- 3) Breaklines were added at topographic breaks (e.g., walls or channel banks) to ensure that these features were represented in the model.
- 4) Terrain modifications were added to the post-project terrain to better reflect vertical features (e.g., walls) that are not correctly represented in a raster.

Otherwise, the two models remained the same to ensure a direct comparison of the two results.

### 4.3.2 Model Results

Flow depth results from the post-project conditions HEC-RAS modeling are shown on Figure 4-4. As mentioned in Section 4.2.2, the HEC-RAS model is included in a separate deliverable where detailed results data can be queried directly in RAS Mapper. Please refer to Section 7 for detailed information about the project's potential benefits.

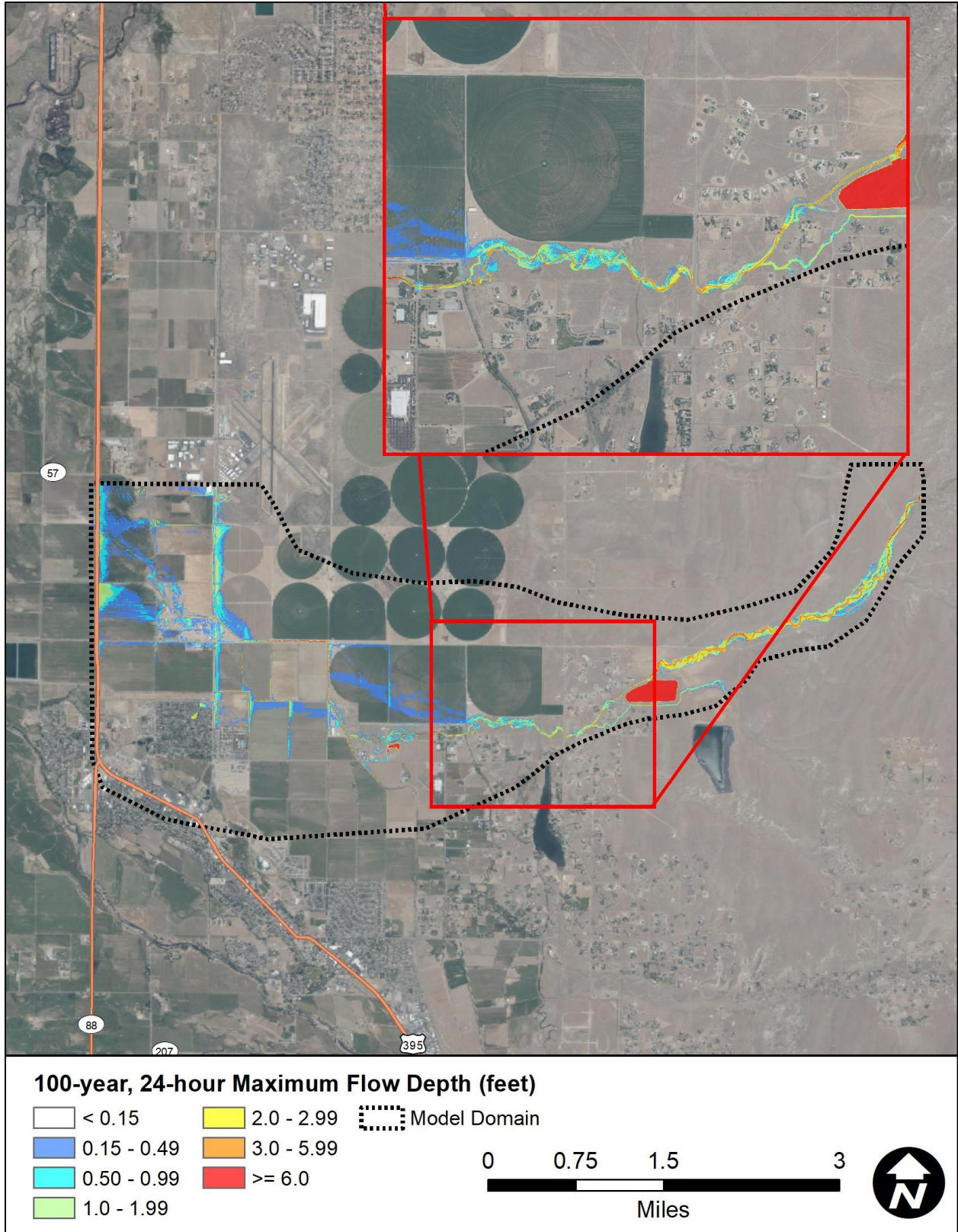


Figure 4-4. Proposed Conditions 100-year 24-hour Maximum Flow Depth

## 5 SEDIMENTATION ANALYSES

### 5.1 SEDIMENT SAMPLING

Since the proposed flood control basin captures most of the 100-year hydrograph, sedimentation analyses were performed to help evaluate the magnitude of sediment that could impact the basin. These analyses included sediment sampling and a sediment yield calculation.

Two sediment samples were collected in January 2023 to verify the type of sediment being transported by Buckeye Creek and Juniper Road Wash. All sediment samples were analyzed by mechanical sieve. The major characteristics of the sediment are tabulated in Table 5-1, while gradation curves for each sample are shown in Figure 5-1. Finally, the sampling locations are shown along with the sample IDs in Figure 5-2. Based on the sampling analysis, the sediment is consistent between the two washes and is composed primarily of sand.

Table 5-1. Characteristics of the Sediment in Buckeye Creek and Juniper Road Wash

ID	Name	Type	D16 (mm)	D50 (mm)	D84 (mm)	G
1	Buckeye Creek	Sieve Analysis	0.32	1.16	6.66	7.52
2	Juniper Road Wash	Sieve Analysis	0.55	1.68	9.51	6.97

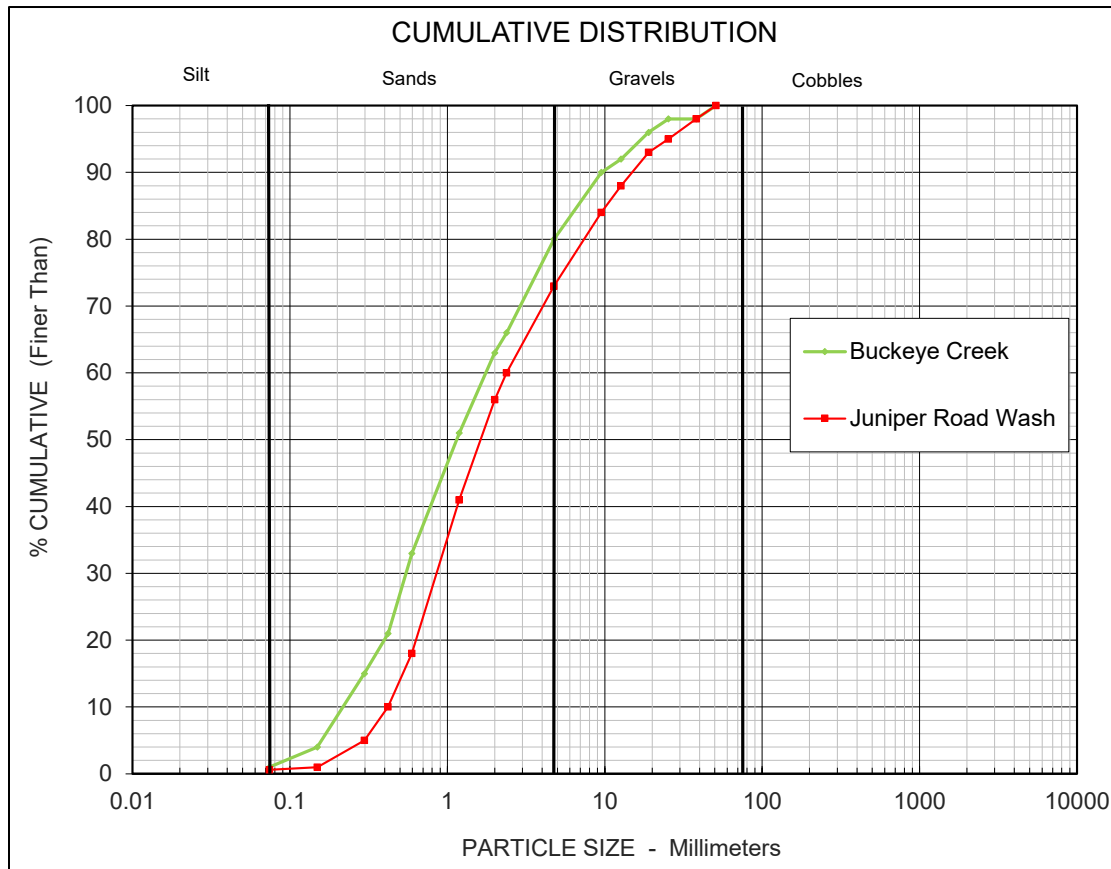


Figure 5-1. Gradation Curves for the Two Samples

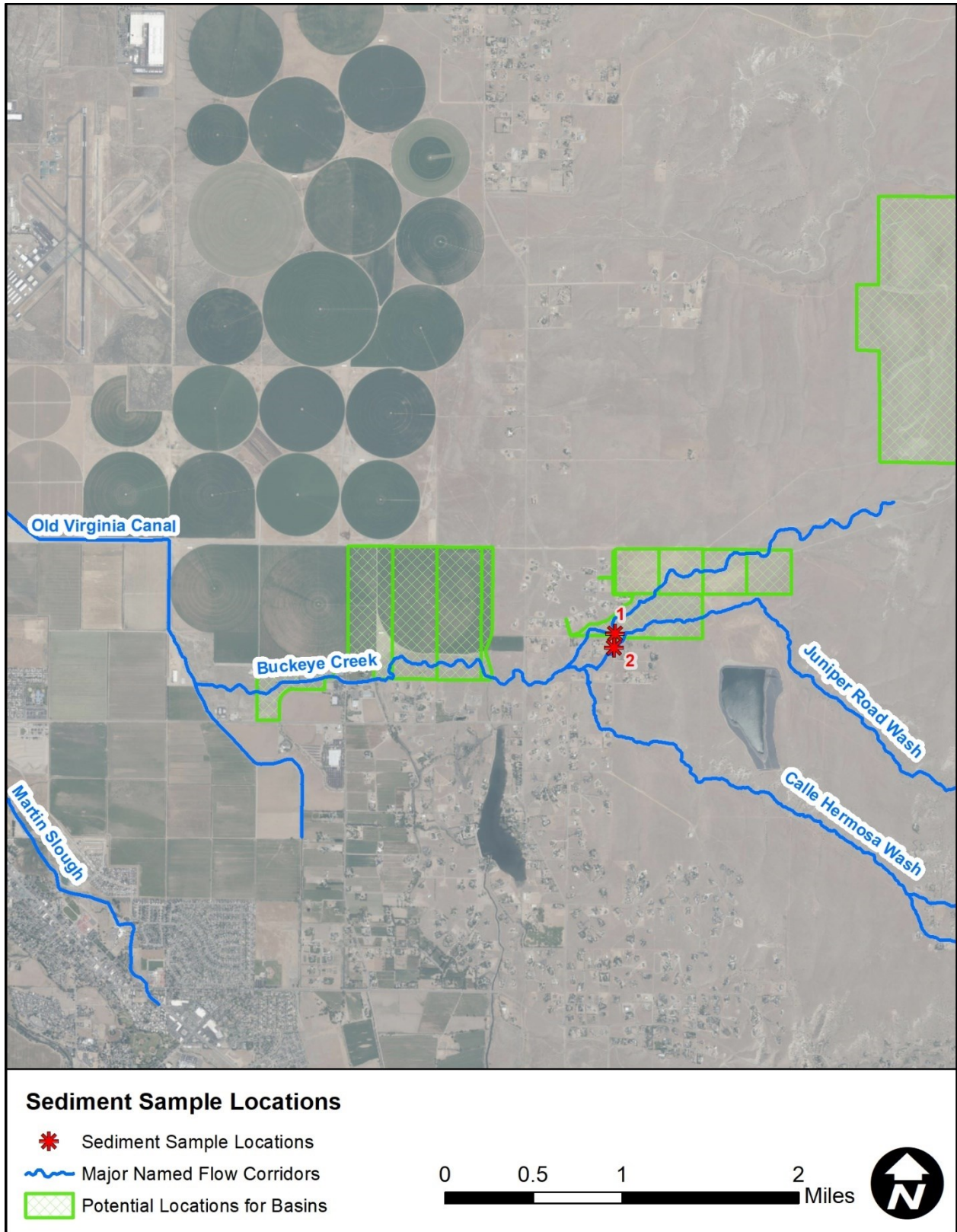


Figure 5-2. Sediment Sample Locations (Labeled with ID)

## 5.2 SEDIMENT YIELD

Sediment yield was computed for the Buckeye Watershed upstream of the proposed basin. The Modified Uniform Soil Loss Equation (MUSLE) methodology was utilized for this study.

The MUSLE approach computes soil loss for individual storm events. The following MUSLE equation, equation (FCDMC, 2018) was used in this study:

$$Y_s = \alpha(Vq_p)^\beta KLSCP$$

where:

$Y_s$  = Sediment yield

$\alpha$  = 95

$\beta$  = 0.56

K = soil erodibility factor

LS = topographic factor

C = cover management factor

P = erosion control practice factor

Sediment yield from a series of recurrence interval events (2-year through 100-year) was calculated, and the results were aggregated based on probability to arrive at an annualized sediment yield. Hydrologic data were taken both from FLO-2D results from this study as well as USGS regression equations to provide peak discharge and volume for all recurrence interval events (Table 5-2). The Soil Erodibility factor was estimated using NRCS mapped soil properties (Figure 5-3 and Appendix B). The Cover and Management factor (C) was determined using Table B.2 from the *Sediment Erosion and Design Guide* published by the Albuquerque Metropolitan Arroyo Flood Control Authority (Mussetter et al., 1994), aerial imagery, and field investigations. The Erosion Control Practice Factor was set to 1.0 to reflect no established erosion control in the contributing watersheds.





Table 5-2. Peak discharge source for MUSLE analysis

100-Year	50-Year	25-Year	10-Year	5-Year	2-Year
FEMA Effective Hydrologic Model	FEMA Effective Hydrologic Model	USGS Regression	USGS Regression	USGS Regression	USGS Regression
3,778 cfs	2,366 cfs	2,621 cfs	1,432 cfs	793 cfs	282 cfs

The FEMA effective hydrologic model included a 10-year recurrence interval discharge, however when comparing the outflow hydrographs for all the model discharges it was determined that the 10-year was anomalously low (see Figure 5-4). As a result, it was determined that the 10-year value would be obtained from the USGS Regression data. Note that the 25-year USGS regression discharge estimate is higher than the 50-year estimate from the FEMA model. This is the result of the different methodologies. If the FEMA study had included a 25-year recurrence interval estimate it would likely have been lower than the USGS regression value. Using the USGS values for the 2- to 25-year year recurrence intervals for the sediment yield estimates results in a more conservative estimate.

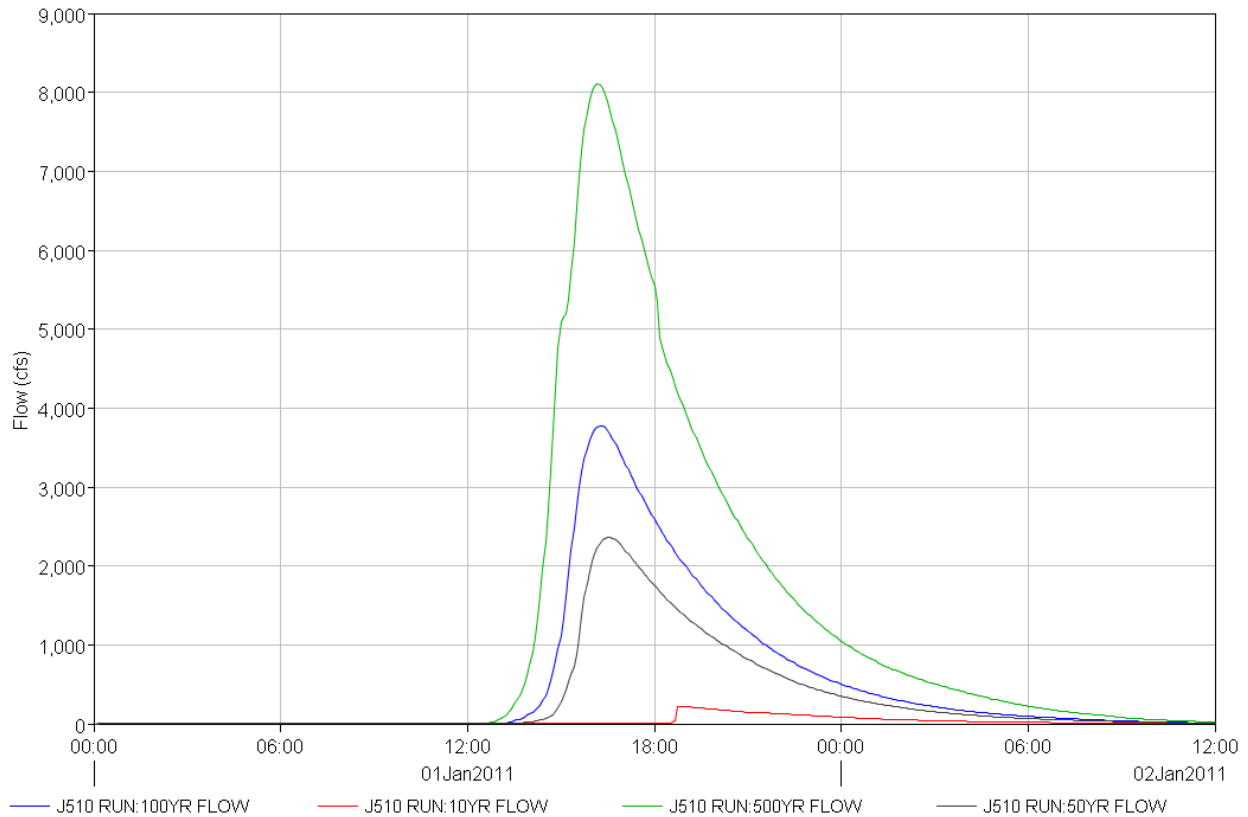


Figure 5-4. FEMA Effective HEC-HMS Model Outflow Hydrographs for Buckeye Creek near the Proposed Basin

The MUSLE methodology resulted in sediment yield estimates as shown in Table 5-3 for the recurrence interval storms listed in Table 5-2. These values were annualized to produce the yield estimates listed in Table 5-4. These estimates can be used to help define a maintenance schedule for the proposed basin. Even though the basin is an offline structure where low flow will bypass the weir, the basin will capture approximately 82% of the peak 100-year flow. Therefore, when estimating sediment inflow to the basin, it may be prudent to assume 100% efficiency. Typical design volumes for other flood control basins have been 3 times the annual load plus 1 design event. Since the Buckeye Creek basin has been designed for the 100-year, the sediment storage estimate could be:

$$3(8) + 1(58) = 82 \text{ ac-ft}$$

*Table 5-3. Sediment Yield (Y<sub>s</sub>) Estimates (ac-ft)*

100-Year	50-Year	25-Year	10-Year	5-Year	2-Year
58	34	38	19	10	3

*Table 5-4. Annualized Sediment Yield Estimates*

ac-ft/year	ac-ft/mi <sup>2</sup> /year
8	0.11

## 6 MITIGATION DESIGN

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### 6.1 FEASIBILITY ANALYSES

At the outset of the project, Douglas County identified 11 parcels where there was existing open space, the ability to obtain the necessary right-of-way to implement a large basin, and their locations were in areas where storage could be effective. In addition, the County provided a rough preference on which parcels would be most feasible.

To obtain a recommended parcel to focus on detailed conceptual design, JE Fuller performed rough grading feasibility analyses based on the following criteria:

- 1) Reduce the 100-year Buckeye Creek Flow from 3,940 cfs to approximately 400 cfs, which requires a basin with a storage capacity greater than 1,000 ac-ft.
- 2) Avoid the basin being classified as a jurisdictional dam by the Nevada Division of Water Resources, where a dam is defined as having *a crest 20 feet or higher, as measured from the downstream toe to the crest, or has a crest height less than 20 feet but will impound 20 acre-feet or more of movable material.*<sup>2</sup>
- 3) The existing groundwater was deep enough that the entire basin would remain functional.

Based on these criteria, the feasibility grading analyses eliminated most parcels due to limited size (i.e., the parcels were not large enough to provide enough storage) or the natural gradient across the parcel resulted in high volumes of over-excavation (i.e., most of the excavated volume does not translate into actual flood storage volume, just excavated soil). The final recommended parcel and the additional other locations are shown in Figure 6-1. Due to criterion 2 above, virtually all the flood storage occurs below natural grade resulting in a basin approximately 40 feet deep (i.e., the bottom elevation is approximately 4862 feet, NAVD 88) that will drain entirely by infiltration, evaporation, or, if necessary, pump. A gravity outflow does not exist for the final concept.

#### 6.1.1 Groundwater Considerations

Another criterion that was investigated for the determination of the final recommended parcel was regional depth to groundwater. A shallow groundwater level could be a limiting factor in the basin design depth. The State of Nevada Division of Water Resources (NDWR) maintains a database of active groundwater monitoring wells throughout the state. There are three active monitoring wells located near the recommended basin location. Figure 6-2 shows their location in relation to the basin parcel, and Table 6-1 lists the well metadata. The groundwater elevation log data for both wells is plotted in Figure 6-3. The log data indicates the highest average groundwater elevation between the two wells is 4,775 feet between 2013 and 2022. The maximum groundwater elevation between 2013 and 2022 was 4,780 feet in December 2013. The design elevation of the bottom of the proposed basin is 4,862 feet. This indicates the bottom of the proposed basin would be above the historical peak groundwater elevation. While a vertical datum (NAVD 88 or NGVD 29) is not explicitly listed for this elevation, the basin bottom is well above the groundwater level at these two wells using either datum.

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<sup>2</sup> <http://water.nv.gov/faq.aspx?category=Dam>

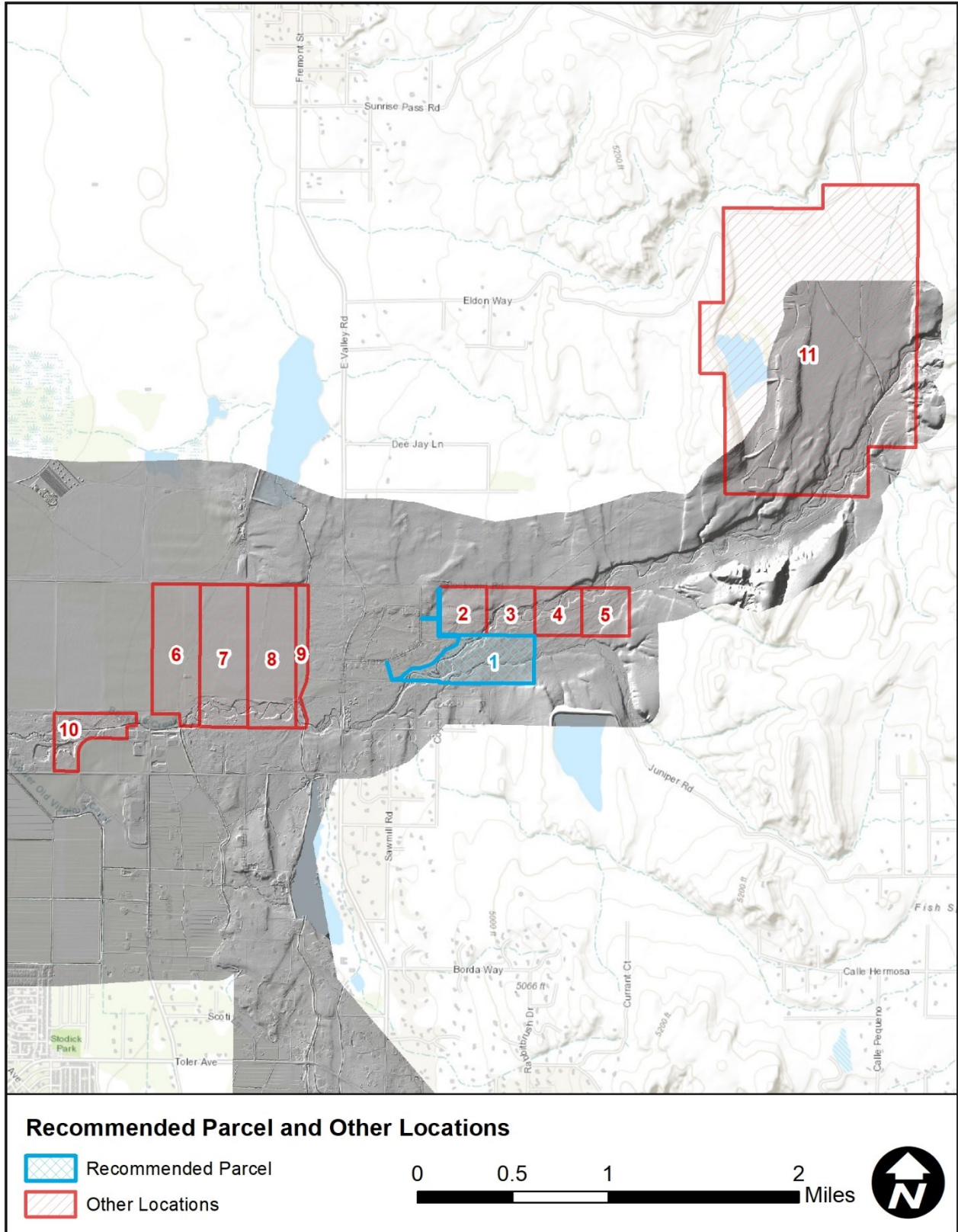


Figure 6-1. Recommended Parcel and Other Locations

Table 6-1. Groundwater Monitoring Wells near Proposed Basin

Site ID	Well Name	Site Elevation (feet)	Location Latitude	Location Longitude
105 N13 E20 27ADBA1	1760 Buckthorn	4,829.40	38.96	-119.72
105 N13 E20 27ADCB1	1720 Buckthorn	4,828.10	38.96	-119.72
105 N13 E20 26DADD1	1780 Amber Way	4,838.20	38.96	-119.70

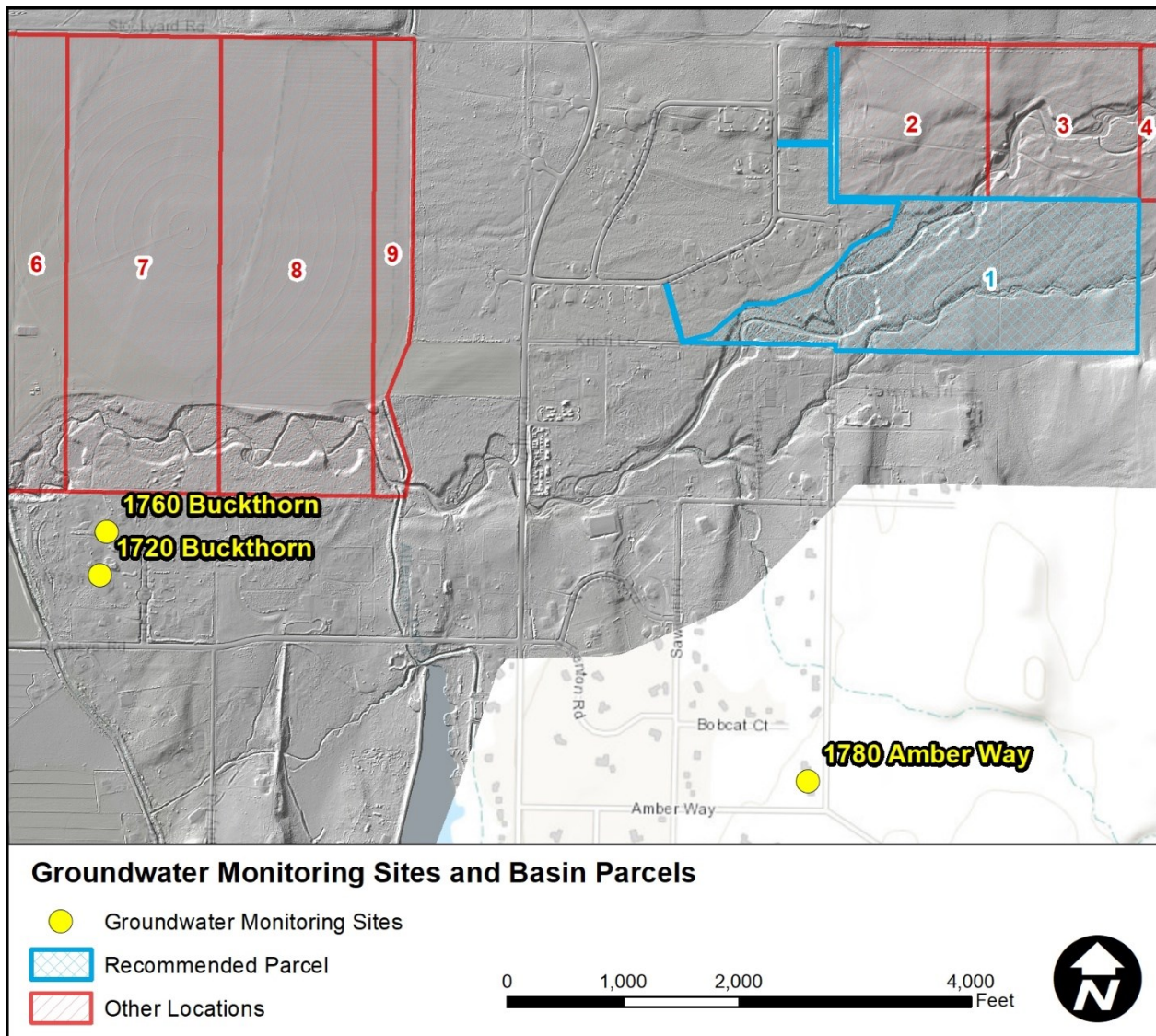


Figure 6-2. Groundwater Monitoring Wells nearest to Proposed Basin

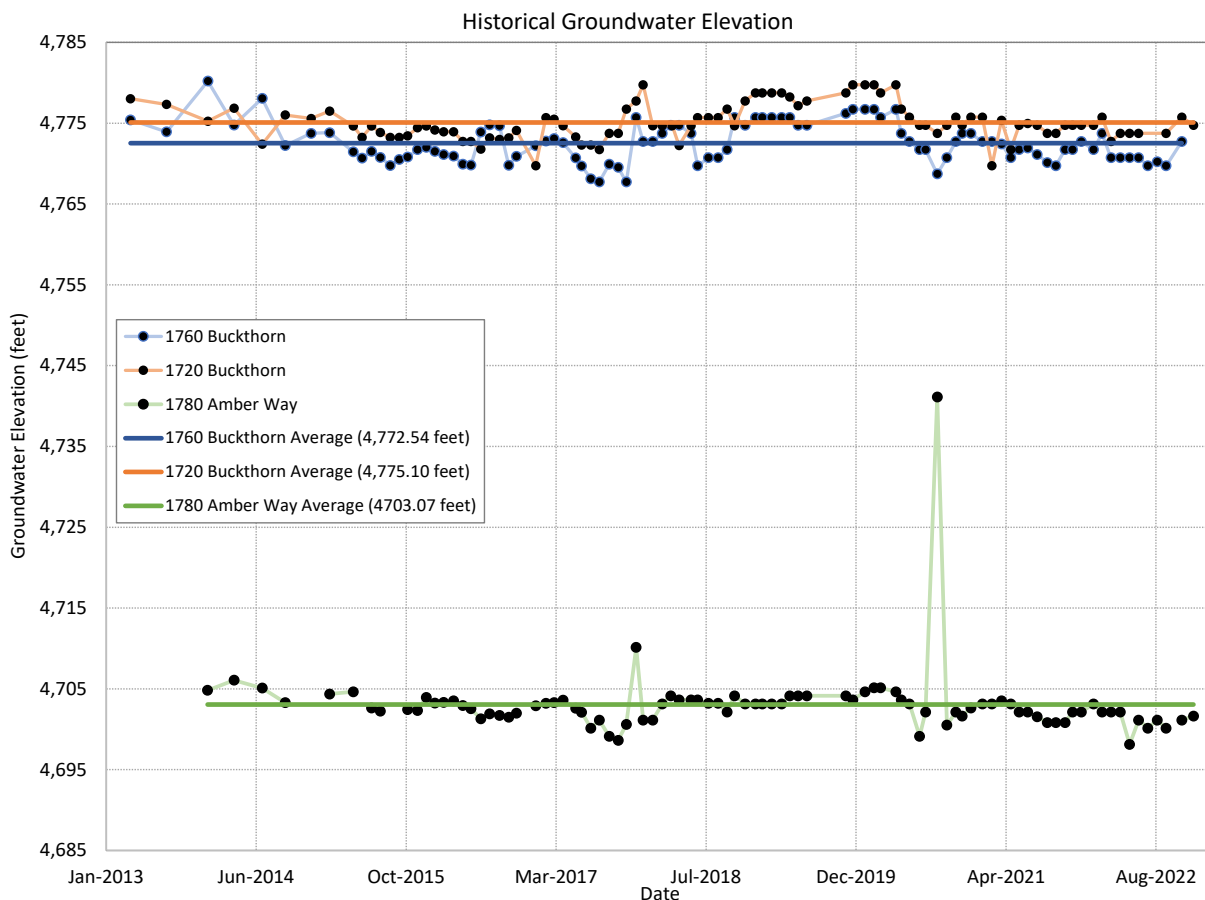


Figure 6-3. Historical Groundwater Elevation near Proposed Basin

## 6.2 CONCEPTUAL DESIGN

### 6.2.1 Basin

CA Group, under contract with JE Fuller, was tasked with developing 15% design plans for the Buckeye Creek flood control basin. The CA Group plan sets and accompanying technical report are included in Appendix B. An example design plan excerpt is shown in Figure 4. These concept designs are meant to outline costs and important design features of the proposed basin, such as:

- Juniper Road Wash was routed around the basin to avoid installation of another large concrete spillway.
- The location of the auxiliary spillway, which allows larger (than the 100-year) events to safely exit the basin to a historic flow path location.
- The proposed conditions flow rate on Buckeye Creek downstream of the basin and the two tributaries (Juniper Road Wash and Calle Hermosa Wash) is 781 cfs.

Finally, there may be constraints such as utility conflicts uncovered during Final Design that are outside the scope of this study. As such, a 30% contingency has been added to the cost estimates.

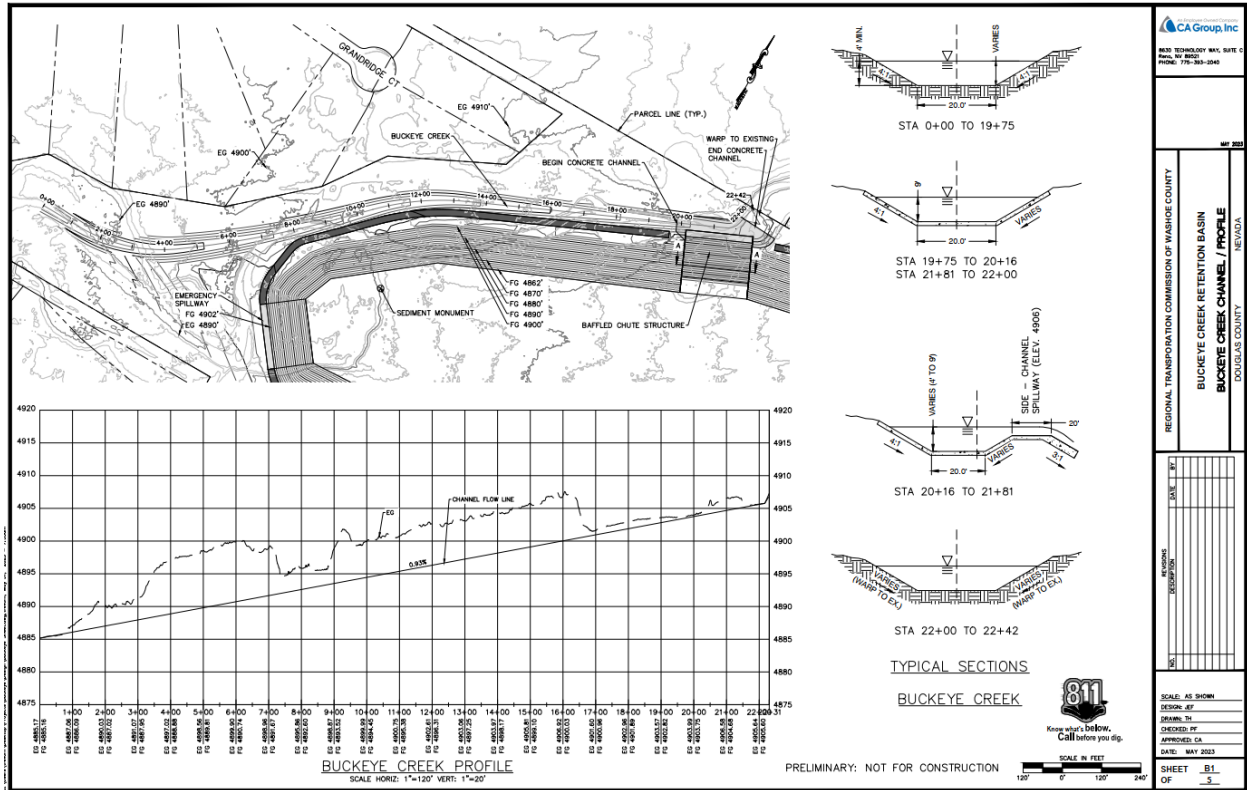


Figure 4. Design excerpt from the Design Summary Report (Appendix C)

### 6.2.2 Downstream Channel and Associated Culverts

Since the proposed basin greatly reduces the downstream 100-year flow rate from 3,940 cfs to 781 cfs, Douglas County requested a concept channel cross-section that could contain this reduced flow rate in areas where the modeling indicates breakouts could occur. Additionally, the County also requested a culvert size that would fully accommodate the reduced flow rate at the East Valley Road and Heybourne Road crossings of Buckeye Creek. There are other existing crossings, but these are generally private roads, and the reduced 100-year flow will allow the owners to obtain 100-year access at a reduced cost. The locations of the downstream channel, the two culvert crossings, and the location of the reduced peak flow are shown in Figure 6-5.

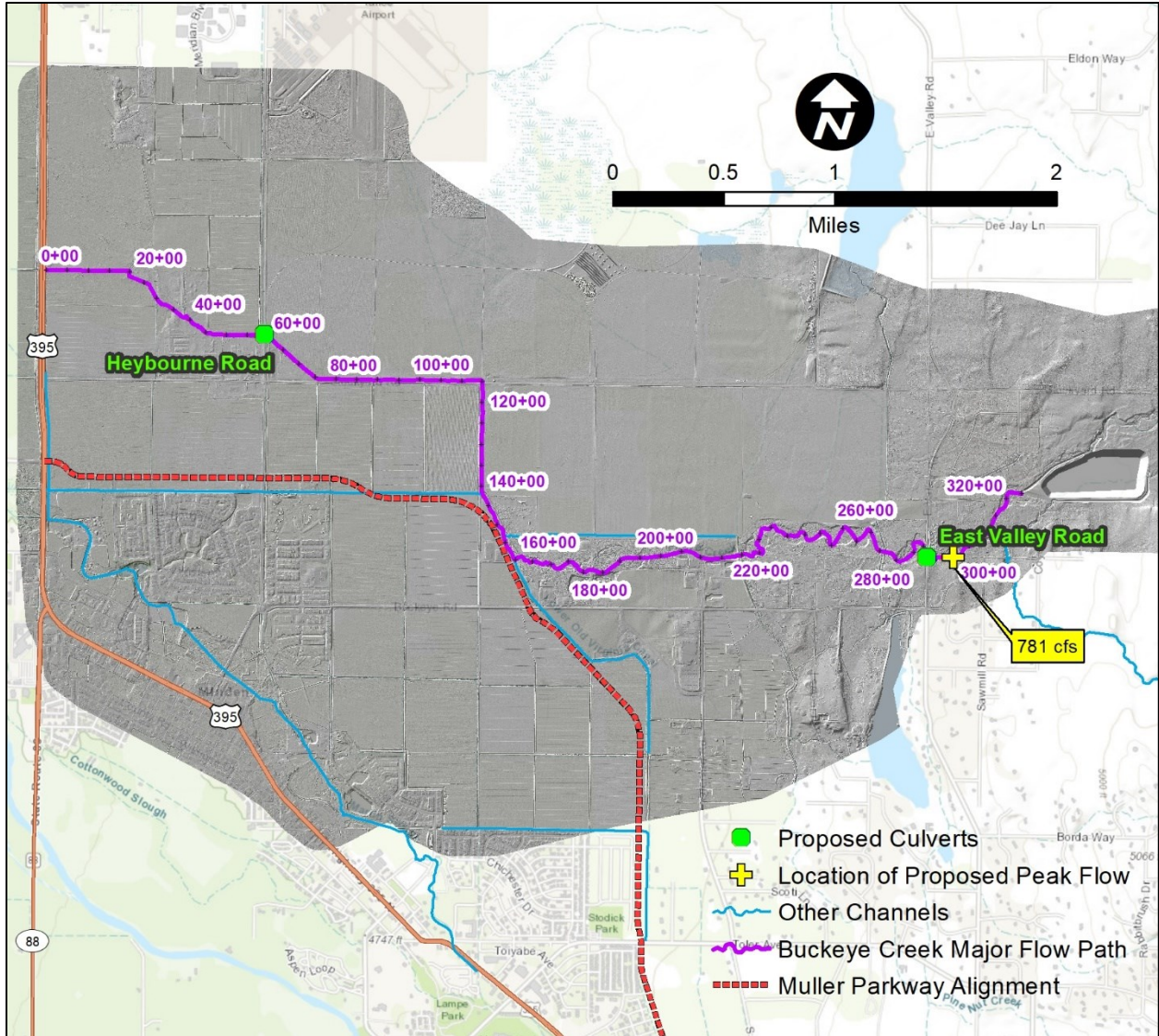


Figure 6-5. Stationing for Downstream Buckeye Creek, Improved Culvert locations, and Location of Reduced 100-year Peak Flow



### 6.2.2.1 Downstream Channel

Buckeye Creek, downstream of the proposed basin, has two distinct reaches. The first is an agricultural irrigation ditch from station 0+00 at US 395 to station 160+00, while the second is a more natural reach (with meanders) from station 160+00 to the end of the proposed channel at station 320+00. The agricultural reach has a general slope of 0.0035 ft/ft, while the natural reach has a general river slope of 0.008 ft/ft, as shown in Figure 6-6.

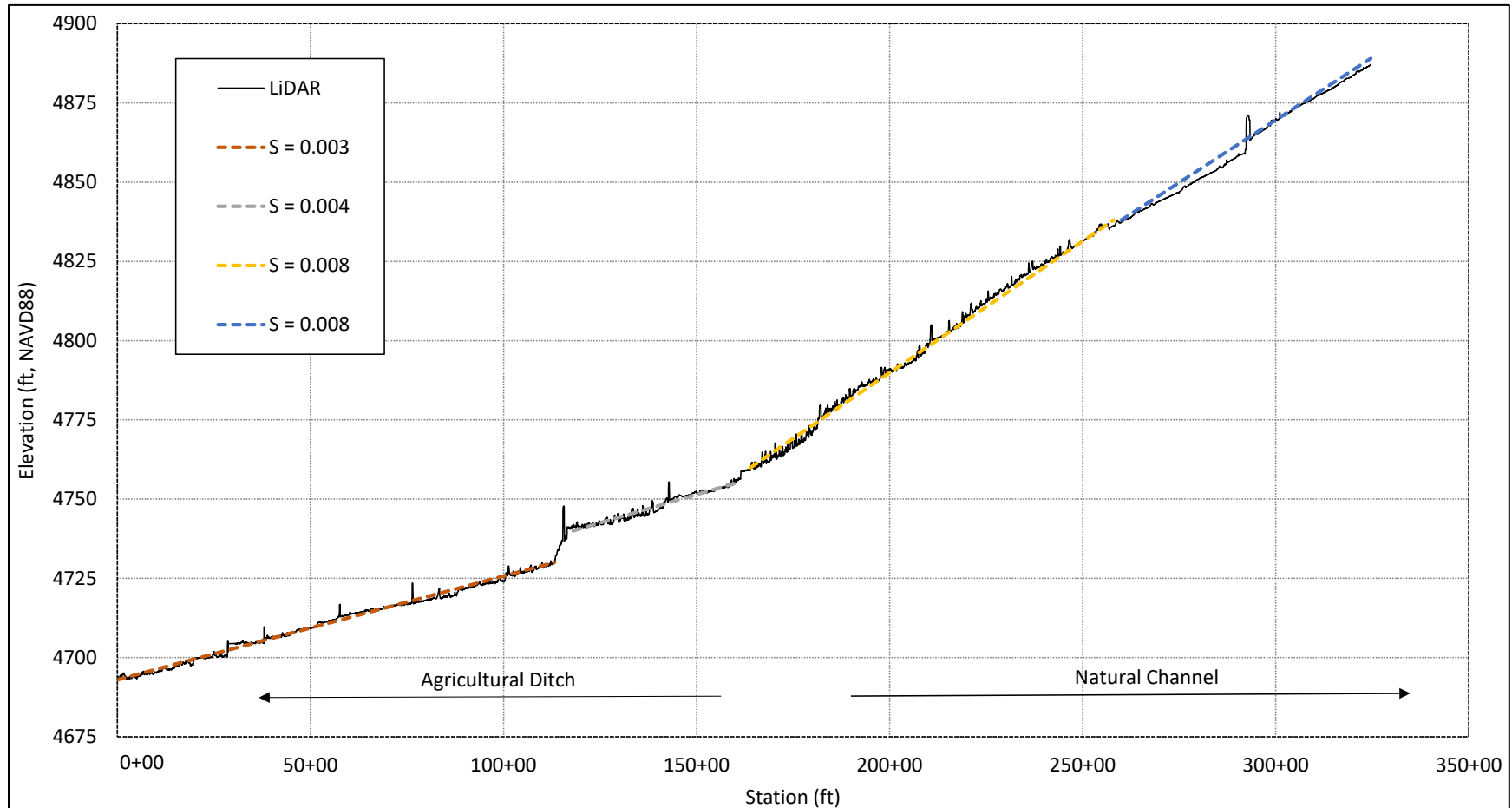


Figure 6-6. General Slope of Buckeye Creek Downstream of Basin

Since the natural reach has significant meanders and shows only minor flow breakouts around station 230+00 and around station 180+00 (see Figure 6-7), it is recommended that this channel remain in a natural condition. Berms or certified levees can be added to eliminate the breakouts, but a designed channel would need significant erosion protection to control the meanders on this steep section of Buckeye Creek.

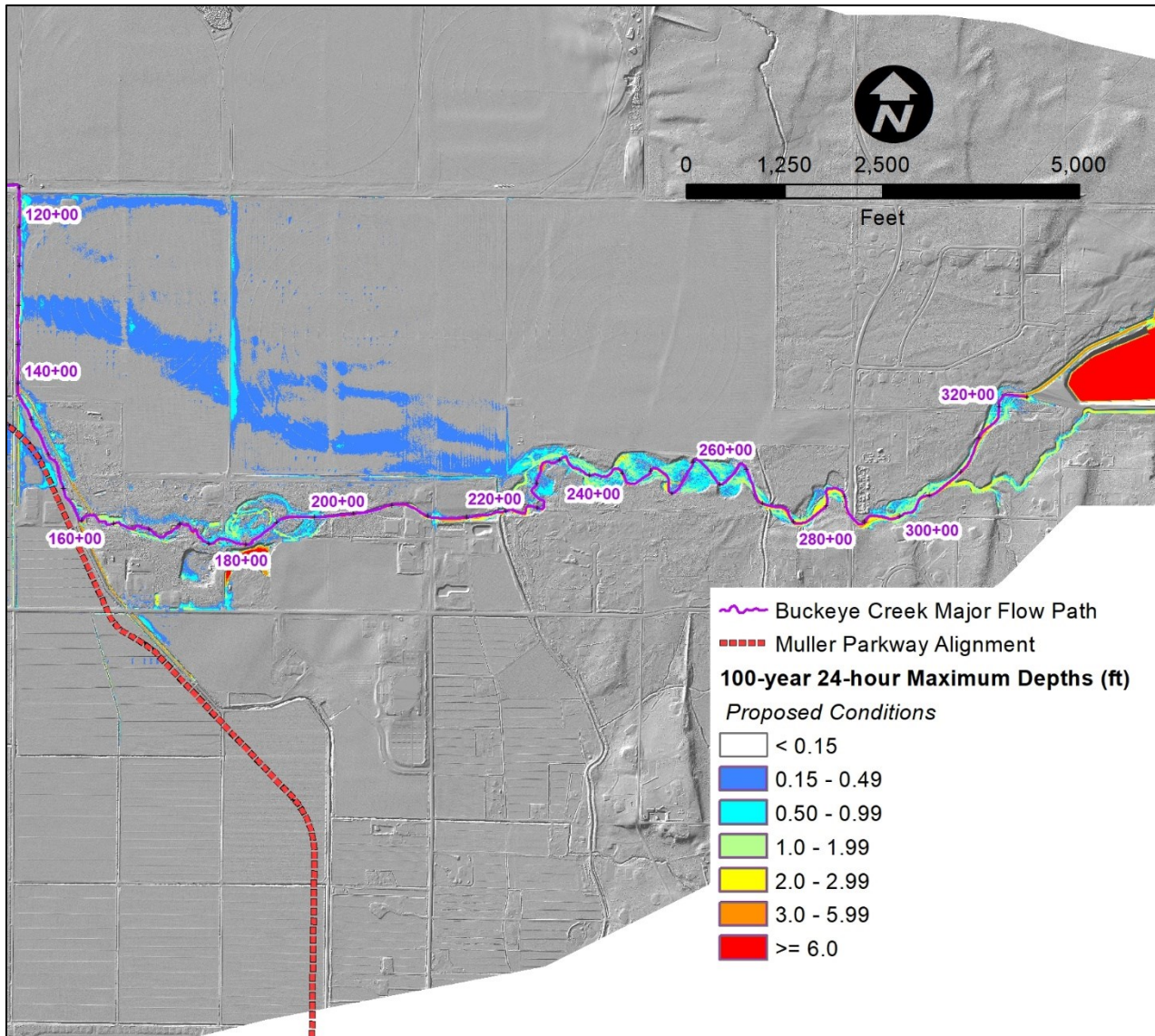


Figure 6-7. Proposed Conditions Maximum Flow Depth in Natural Reach

A concept channel cross-section was developed for the agricultural reach from station 160+00 to 0+00 at US 395 using the general slope of 0.0035 ft/ft, the Manning's n value of 0.06 that was used in the HEC-RAS modeling, and a design flow rate of 785 cfs (rounded up from 781 cfs). The concept cross-section is shown in Figure 6-8. The section was designed to keep the maximum width less than 75 feet, which appeared to be the space between the left bank of the existing channel and the edge of the current farm field. The velocities are generally non-erosive at 3.4 ft/s based on the normal depth analysis and the type of the sediment in the natural channel (see Figure 5-1). However, sediment sizes should be verified for the agricultural section during final design to assess the need for erosion protection. Note that erosion protection should be provided along the outer bank in any bends. Finally, this analysis did not include a detailed evaluation of how this concept cross-section would affect existing irrigation infrastructure along the main flow path of Buckeye Creek. It should be noted that the "natural flowpath" and channel geometry of Buckeye Creek within the agricultural section has been significantly altered over time. The natural channel and floodplain have been essentially converted into irrigation ditches and farm fields. Figure 6-8 represents a channel geometry that would be sufficient to convey the 785 cfs from the upstream reach of Buckeye Creek through the agricultural reach but would likely be too large to serve as an effective irrigation ditch.

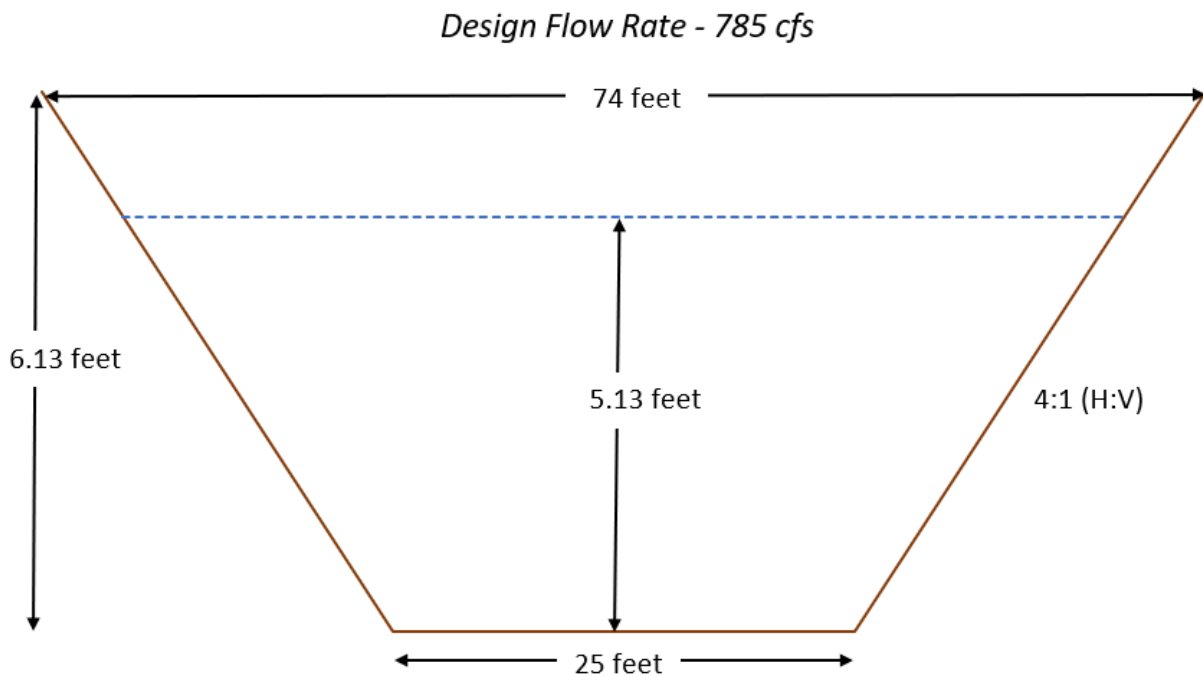


Figure 6-8. Concept Cross-section for Agricultural Reach

### 6.2.2.2 Culverts

#### East Valley Road

The existing East Valley Road crossing of Buckeye Creek is a box culvert consisting of two barrels of different sizes and elevations. One barrel is a 10-ft by 5-ft box, while the other is a 12-ft by 5-ft box. A picture of the existing culvert is shown as Figure 6-9. Based on the results from HEC-RAS 2D and HY-8 modeling, this culvert has capacity for the proposed conditions flow of 785 cfs.



*Figure 6-9. East Valley Road Box Culvert*

## Heybourne Road

The current crossing of Buckeye Creek at Heybourne Road is a private clear span bridge (see Figure 6-10). Since this reach has a flatter slope in comparison to the upstream natural section of Buckeye Creek, the culvert at this location needs to be larger than the one at East Valley Road. Based on an HY-8 analysis, a three barrel 10-ft by 5-ft box culvert can pass the proposed flow of 785 cfs with 0.54 feet of freeboard at the roadway crest.



*Figure 6-10. Heybourne Road Private Bridge*

### 6.3 FINAL DESIGN CONSIDERATIONS

Once Douglas County has authorized final design to advance the project from the present 15% conceptual plans to final, sealed plans, there are some items that should be further investigated. These are:

- 1) **Possible Pit Capture** - Since Buckeye Creek and Juniper Road Wash are alluvial channels, they tend to either shift course over time or overflow their banks during extreme events. Therefore, since all conceptual improvements are contained on Parcel 1 (see Figure 6-1), there is potential for either channel to migrate and enter the basin at unprotected (i.e., without erosion protection) locations other than the weir. If this occurs, severe erosion could occur on the unprotected slope of the basin, which could propagate upstream as the channel slope attempts to normalize. Berms or guide banks could be added to guide flow into defined inflow locations, but any raised locations have the potential to cause adverse ponding outside of Parcel 1. It is recommended that more discussion occurs with adjacent property owners for possible construction of guide banks to ensure flow reaches the defined inflow points or berms be added to protect susceptible locations of the basin and any adverse impacts (i.e., higher water surfaces) are acceptable to property owners.
- 2) **Drain Time** – The basin does not have a gravity outflow. Therefore, it is recommended that detailed infiltration testing be performed to ensure that soils at the 40-ft depth are permeable enough to allow for a reasonable drain time by infiltration alone. Based on the latest Green and Ampt infiltration parameter calculation for NDOT (JE Fuller, 2020) and the online NRCS soil information, the native soils have somewhat restrictive water transmissivity. The hydraulic conductivity at natural saturation is 0.5749 in/hr and the hydrologic soil group for the soil is Group C. Based on the National Engineering Handbook, Group C soils have:

*..moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. (USDA NRCS, 2009)*

However, these measurements are based on the surficial layer of soil. Since the basin has a 40-ft depth, the infiltration characteristics could be substantially different. Assuming the hydraulic conductivity of 0.5749 in/hr and similar infiltration rates over the entire basin bottom, it is estimated that for a 100-year recurrence interval storm the basin would completely drain in approximately 20 days. A FLO-2D model was also developed to explicitly model the time to drain by infiltration alone, and this model indicated a drain time of 425 hours or 17.7 days (see Figure 6-11). However, both estimates are rough approximations with general assumptions, and detailed groundwater modeling and soil investigations should be performed during final design.

Other items that should be considered regarding the drain time include:

- Addition of a gravity outfall at a point above the basin bottom to allow some of the volume to drain more quickly.

- A code variance would be needed to allow a drain time longer than the maximum of 48 hours that is specified in the *Design Criteria and Improvement Standards* (Douglas County, 2017).
  - The goal of the project is to reduce the regulatory FEMA 100-year flow rate on Buckeye Creek. To ensure that the drain time would not be an issue, JE Fuller contacted the review contractors for FEMA, and they indicated that there was no specific requirement for drain time in the regulations. However, since the drain time is estimated to take days, the possibility of back-to-back storms should be considered.
- 3) **Groundwater Quality** - The basin will allow for substantial infiltration of stormwater runoff to the groundwater. An investigation of how this increase in infiltration will affect the water quality should be performed during final design. Detailed water quality investigations were outside the scope of the current study.
  - 4) **Land Acquisition** – This analysis assumes that Douglas County can at some future point acquire the parcel needed for construction of the basin. Note that land acquisition costs are not included in Appendix C.
  - 5) **Capital and Maintenance Costs** – Appendix C includes a breakdown of cost estimates for construction of the basin as well as potential long-term maintenance costs. Such costs can be a prohibitive factor in implementing flood mitigation projects such as this. One of the benefits of conducting a feasibility study, such as this, is that potential components that could prohibit construction of the project are identified.

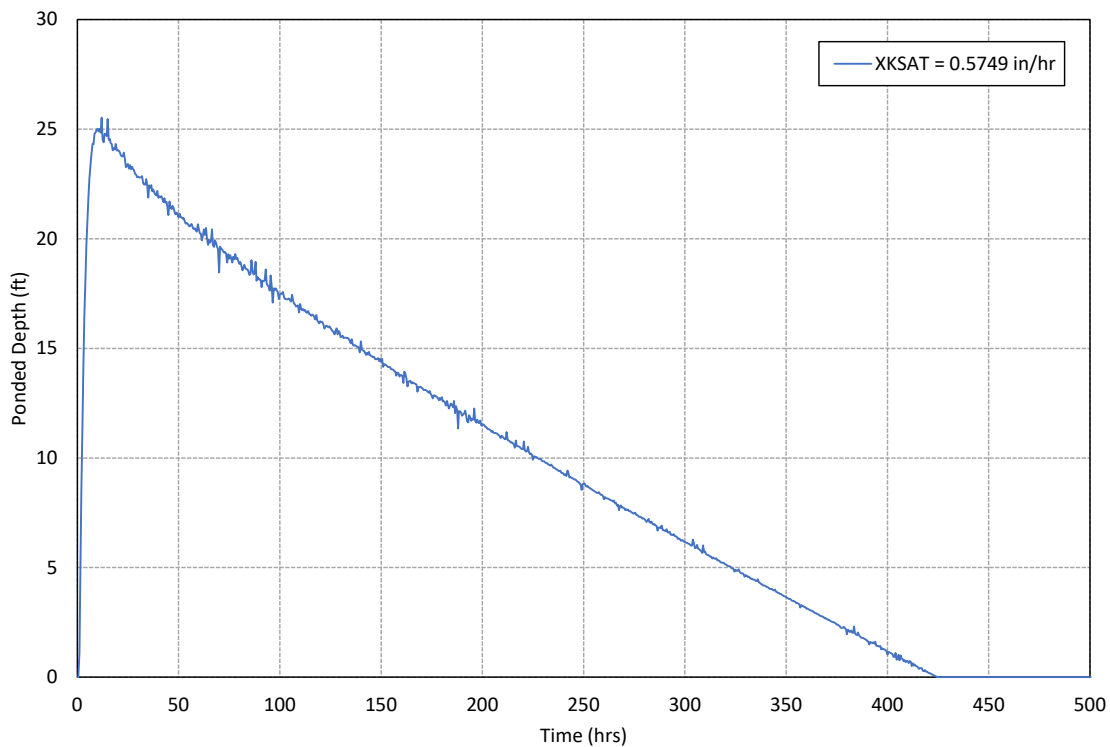


Figure 6-11. Pounded Depth in Basin over Time

## 6.4 STUDY LIMITATIONS

While the results are based on detailed topography, hydrology, and hydraulic modeling, they represent the existing conditions as of the date of the LiDAR mapping. Because of the sediment characteristics of the watershed, the topography and distribution of flow can be very dynamic.

Furthermore, this study did not analyze rain on snow events, flooding recurrence intervals greater than 100-year in any detail, or post-wildfire flooding events. These types of events are considered outside the scope of the typical area drainage master plan process. These atypical events could create hydraulic conditions that exceed standard 100-year design storm in peak flow or total runoff volume.



## 7 PROJECT BENEFITS

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The project benefits are realized in two categories: 1) the 100-year peak flow reduction and 2) the areas reclaimed from flood inundation or impacted by reduced flow depths. The effective FEMA 100-year peak flow is listed at 3,939 cfs at East Valley Road in the latest FIS. After the basin is constructed, the 100-year peak flow is reduced to 781 cfs – an 80% reduction.

With this reduced peak flow, the areas downstream of the basin that are impacted by flooding are significantly reduced. A good way to visualize the areas that are benefited by a proposed project is to use the water surface difference between the proposed and existing conditions water surface elevations as a proxy for benefit. Areas that show a reduced water surface have a benefit, while areas with an increased water surface have an adverse impact.

This comparison is shown in Figure 7-1. Areas of green are benefitted by the project; that is, these areas are impacted by a reduced water surface elevation. There are some areas that show an increased water surface, but the increases are generally small and isolated near the inlets of the two proposed channels where grading can be refined. Also, note that since the basin is very deep there are areas that show a significant water surface elevation reduction (i.e., > 10 feet). Finally, using this comparison and excluding the area of parcel 1, it is estimated that over 2,700 acres will benefit from the project with reduced water surface elevations.

### 7.1 PROJECT FEASIBILITY

As was stated previously in this report, two of the main objectives of this study were to:

1. Evaluate the potential locations provided to Douglas County for flood control basins.
2. Assess the viability of the basin(s) that would reduce the downstream Buckeye Creek 100-year flow from 3,940 cfs (100-year regulatory discharge) to approximately 400 cfs.

This feasibility study has substantially met these objectives. The post-project discharge was only 781 cfs instead of 400 cfs. However, there is a little over 12 feet of freeboard in the basin with the 781 cfs downstream discharge. This discharge could be reduced more, but adding more flow volume to the basin was not considered desirable since the drain time is already significant. Rather, the excavation volume of the basin can be reduced during final design to reduce project costs.

The cost estimates for construction and future maintenance are presented in Appendix C. It is recommended that Douglas County and the residents and businesses that will benefit from the proposed basin project begin discussions on the feasibility of the project (i.e., costs, land acquisition, etc.). It is unlikely that the County's present taxing initiatives will be sufficient to support construction, therefore other alternatives such as applying for federal grants or the creation of a local taxing district may provide funding sources.

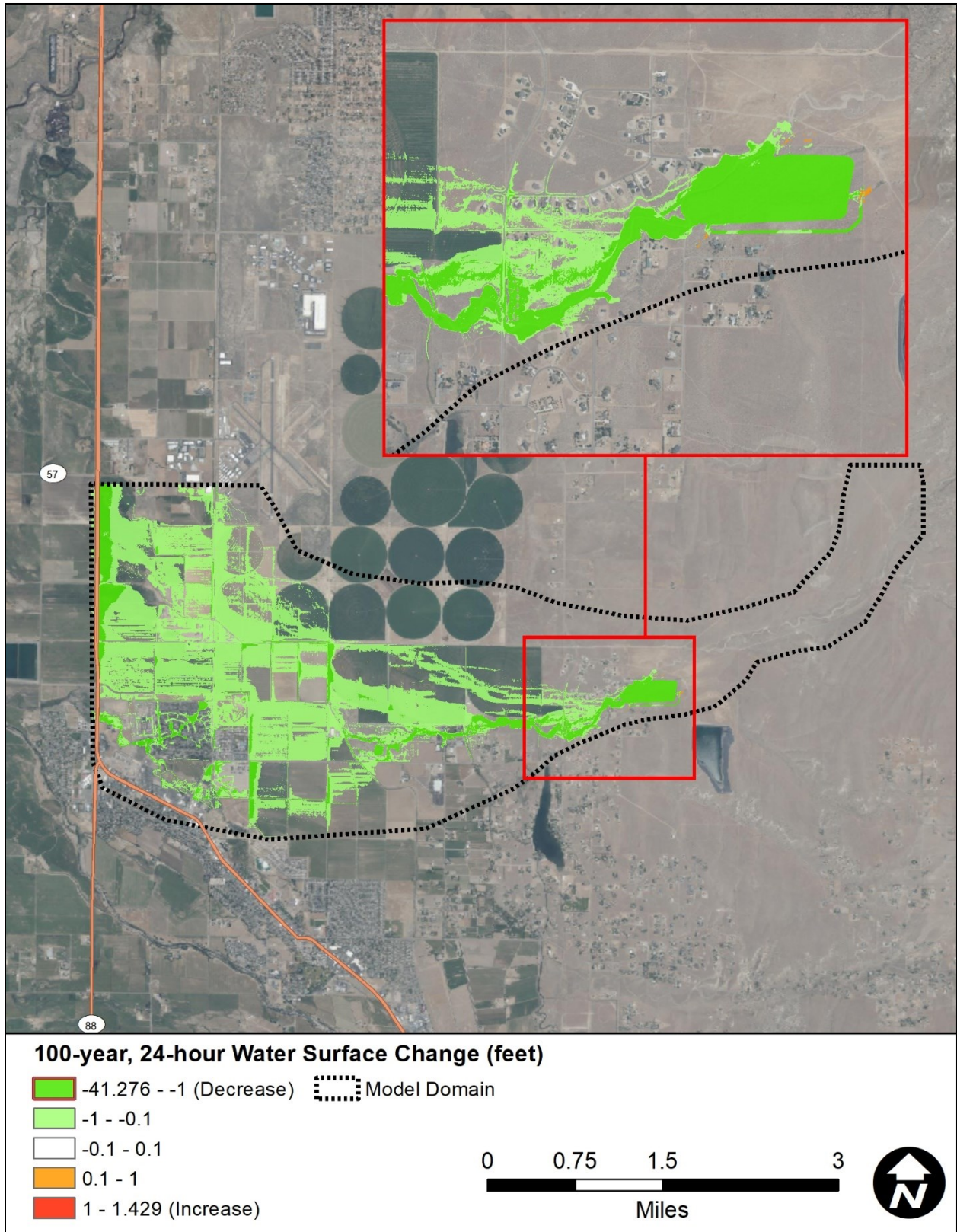


Figure 7-1. Water Surface Change during the 100-year 24-hour Event (Proposed Minus Existing)

## 8 REFERENCES

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Douglas County, 2017, Design Criteria and Improvement Standards

FCDMC, 2018, Drainage Design Manual for Maricopa County, Arizona – Hydraulics. Flood Control District of Maricopa County.

JE Fuller / Hydrology & Geomorphology, Inc. (JE Fuller), 2020, Modernize Hydrologic Prediction Processes by Creating Custom Statewide SSURGO Green and Ampt Parameter Database, NDOT Research Report No. 674-19-803.

Mussetter, R.A., P.F. Lagasse, and M.D. Harvey, 1994, Sediment and Erosion Design Guide. Albuquerque Metropolitan Arroyo Flood Control Authority.

Manhard Consulting, Ltd. (Manhard), 2012, Buckeye Creek Watershed Hydrology and Floodplain Analysis Technical Report, Prepared for Douglas County, NV, June 20, 2012.

NV5 Geospatial, Inc., 2022, Survey Report of LiDAR Calibration & Quality Control Points, Buckeye Creek Mitigation LiDAR Gardnerville, NV, April 20, 2022.

USDA Natural Resources Conservation Service, 2009, National Engineering Handbook Part 630. Hydrologic Soil Groups-Chapter 7, Washington DC.

## **APPENDIX A**

NV5 Geospatial Survey Report of LiDAR Calibration & Quality Control Points

April 20, 2022

# **Survey Report** of LiDAR Calibration & Quality Control Points

Buckeye Creek Mitigation LiDAR  
Gardnerville, NV

Presented to:



An Employee-Owned Company

Presented By:



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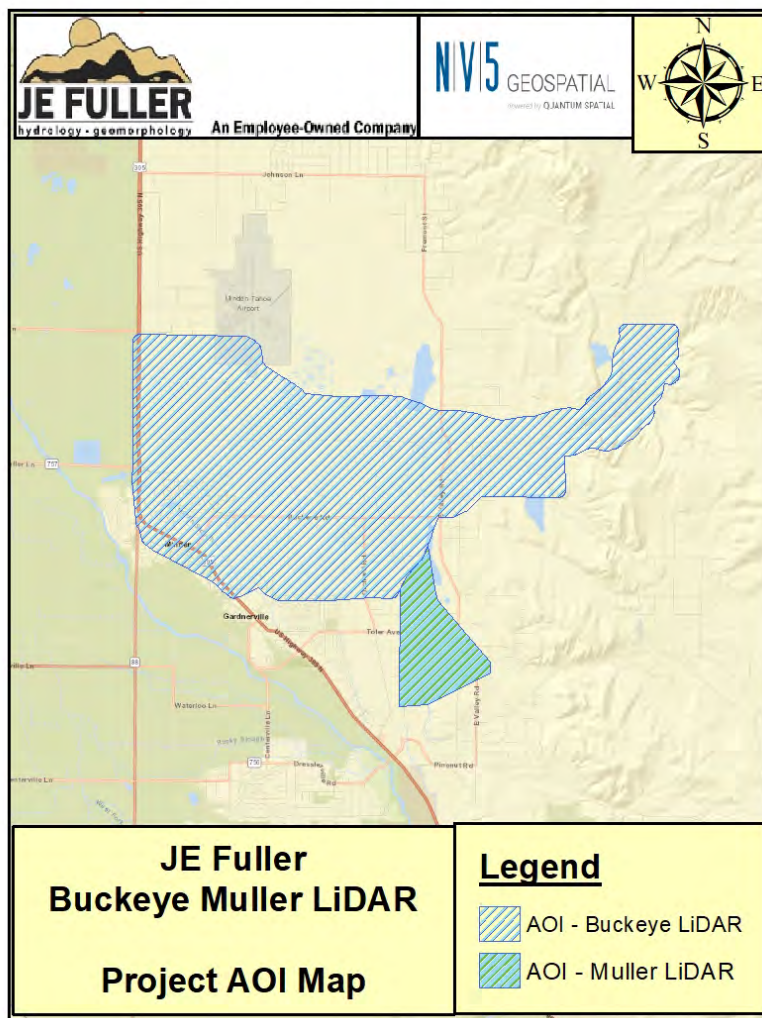
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## Introduction

NV5 Geospatial, Inc. was contracted by JE Fuller/ Hydrology & Geomorphology, Inc. to survey LiDAR calibration/quality control points in support of the Buckeye Creek Mitigation Design project. The project consisted of approximately 14.8 square miles in the Buckeye AOI and 1.4 square miles in the Muller AOI near Gardnerville, Nevada. The ground survey was performed by NV5 and their technical approach and detail of each point surveyed is included in this report.

## Project Area

The Project Area, shown in the figure below, consist of approximately 16.2 square miles.



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## Technical Approach to Imagery and LiDAR Land Cover Validation Point Selection

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NV5 Geospatial determined 5 photo-identifiable control/check points were necessary to control the LiDAR to meet the required project specifications. These point locations were strategically distributed across the imagery coverage and used to verify the project imagery met specifications.

Referencing ASPRS Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0, - November, 2014) table C.1 Recommended Number of Checkpoints based on Area, NV5 Geospatial calculated the total number of LiDAR checkpoints required for the entire project area. It was determined that 21 Non-Vegetated Vertical Accuracy (NVA) and 6 Vegetated Vertical Accuracy (VVA) points were required for the project area.

To ensure that checkpoints were distributed generally proportionate among the various vegetated land cover types, NV5 Geospatial used existing USGS Land Cover data to divide both the NVA and VVA categories among the various types, calculating the approximate number of required points in each representative type proportionate to the total project area. The resulting point classes are detailed below:

<u>NVA Class</u>	<u># of Points</u>	<u>VVA Class</u>	<u># of Points</u>
Bare Earth	11	Tall Weeds/Crops	6
Urban Area	10		

NV5 Geospatial has adopted the philosophy that each vegetative class must be well distributed throughout the project area. While points in varying classes may be near to one another, points of a single vegetative class may not. Proposed point locations are selected with this distribution methodology in mind; however, access to the entire AOI limited the distribution.



## **Survey Accuracy Requirements**

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Given that the survey accuracy of calibration and quality control check points should be 3 times more accurate than the required accuracy of the data set, NV5 Geospatial requires that calibration and NVA points are better than 3 centimeters RMSE, both horizontally and vertically, and that VVA points be better than 5 centimeters RMSE, both horizontally and vertically.

NV5 Geospatial requires the surveyed accuracy of each point must be determined through redundant measurements and/or network adjustment using procedures and methodologies that reliably and consistently result in the aforementioned accuracies.

Due to variances in reference control accuracy and adjustment, NV5 Geospatial requires that the survey methodology used be explained, so that it can be repeated if necessary.

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## **Field Survey Methodology**

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Date Range: April 10 – April 11, 2022

Equipment Used:

The field crew used a Trimble R12 dual frequency GNSS receiver as a real-time rover to obtain measurements for network confirmation.

GNSS Methodology:

The RTN surveying method was used during this project. Rinex data from the two Leica Smartnet GNSS real-time base stations were downloaded and included in a network adjustment with nearby NGS CORS. The constrained NGS base stations from the Smartnet GNSS stations are referenced to NGS NSRS.

All the GNSS information was downloaded, processed, and analyzed using Trimble Business Center version 5.60 processing software. A network was formed and adjusted.

---

## Overall Project Accuracy Statement

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All point coordinates have been reported in the North American Datum of 1983 (2011). Nevada State Plane – West zone coordinates in survey feet horizontally. Elevations are relative to the North American Vertical Datum of 1988 (NAVD 88) which were derived using the Geoid 18 model and are reported in survey feet.

### Calibration Points

Average Horizontal RMSE is 0.03 ft.

Average Elevation RMSE is 0.05 ft.

Average 3 dimensional RMSE is 0.06 ft.

### NVA Points

Average Horizontal RMSE is 0.03 ft.

Average Elevation RMSE is 0.05 ft.

Average 3 dimensional RMSE is 0.06 ft.

### VVA Points

Average Horizontal RMSE is 0.03 ft.

Average Elevation RMSE is 0.05 ft.

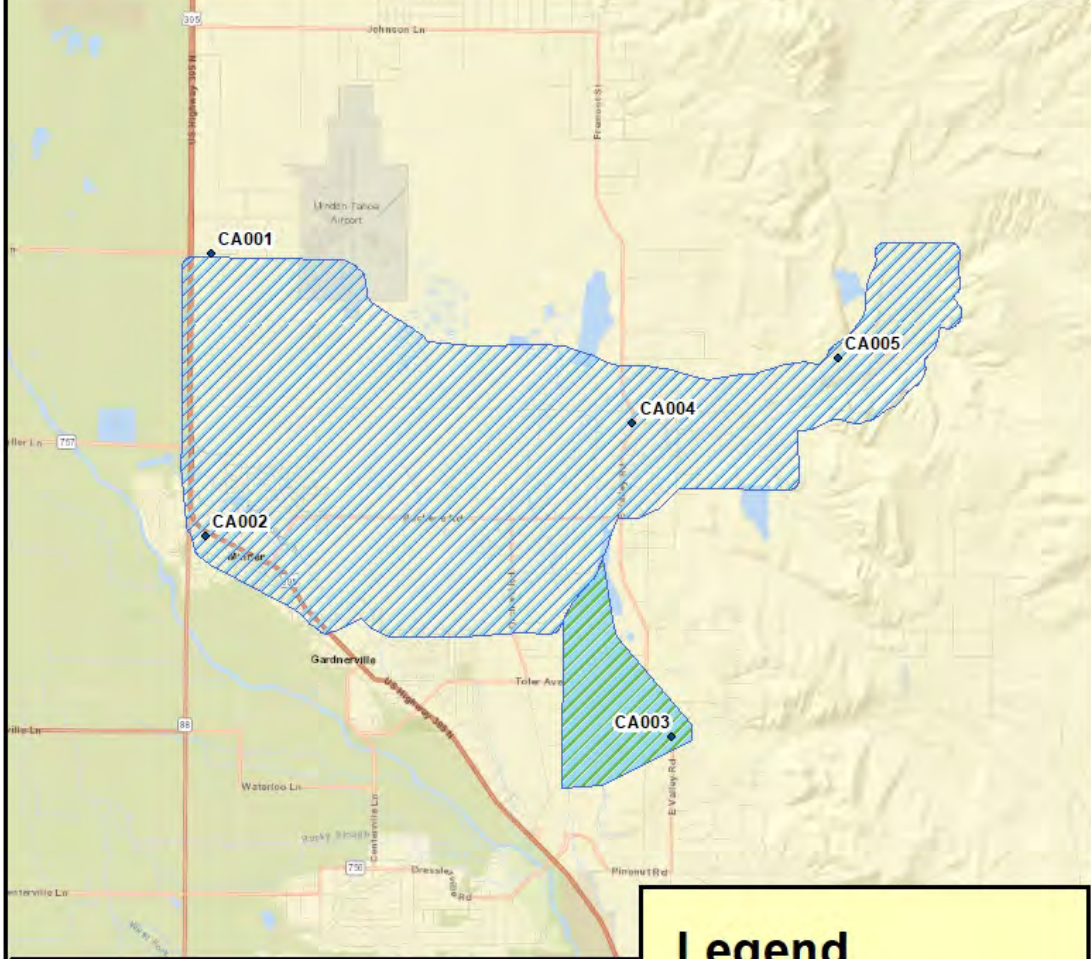
Average 3 dimensional RMSE is 0.06 ft.

## **PROJECT AOI & POINT LOCATION MAPS**





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powered by QJANTUM SPATIAL



# JE Fuller Buckeye Muller LiDAR Calibration Point Map

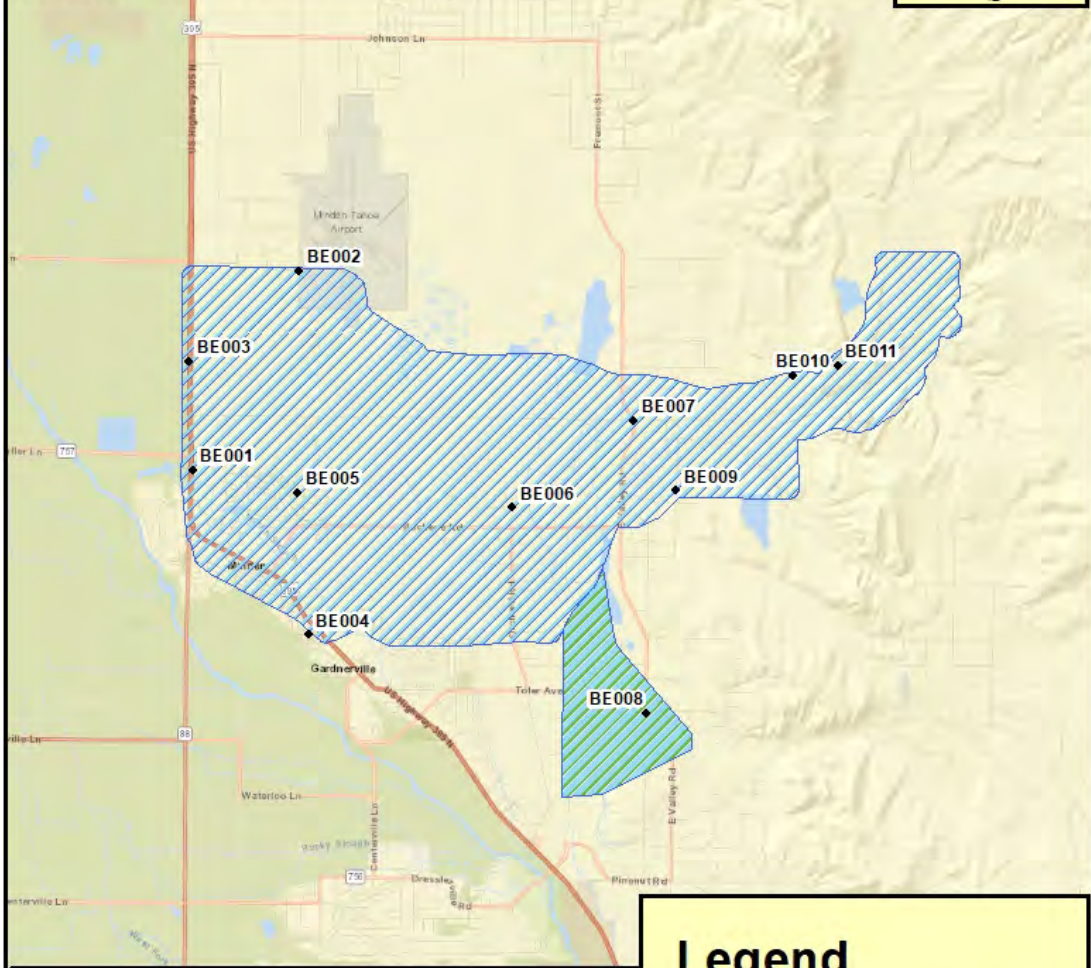
**Legend**

- Calibration Point
-  AOI - Buckeye LiDAR
-  AOI - Muller LiDAR





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**JE Fuller**  
**Buckeye Muller LiDAR**  
**Bare Earth Point Map**

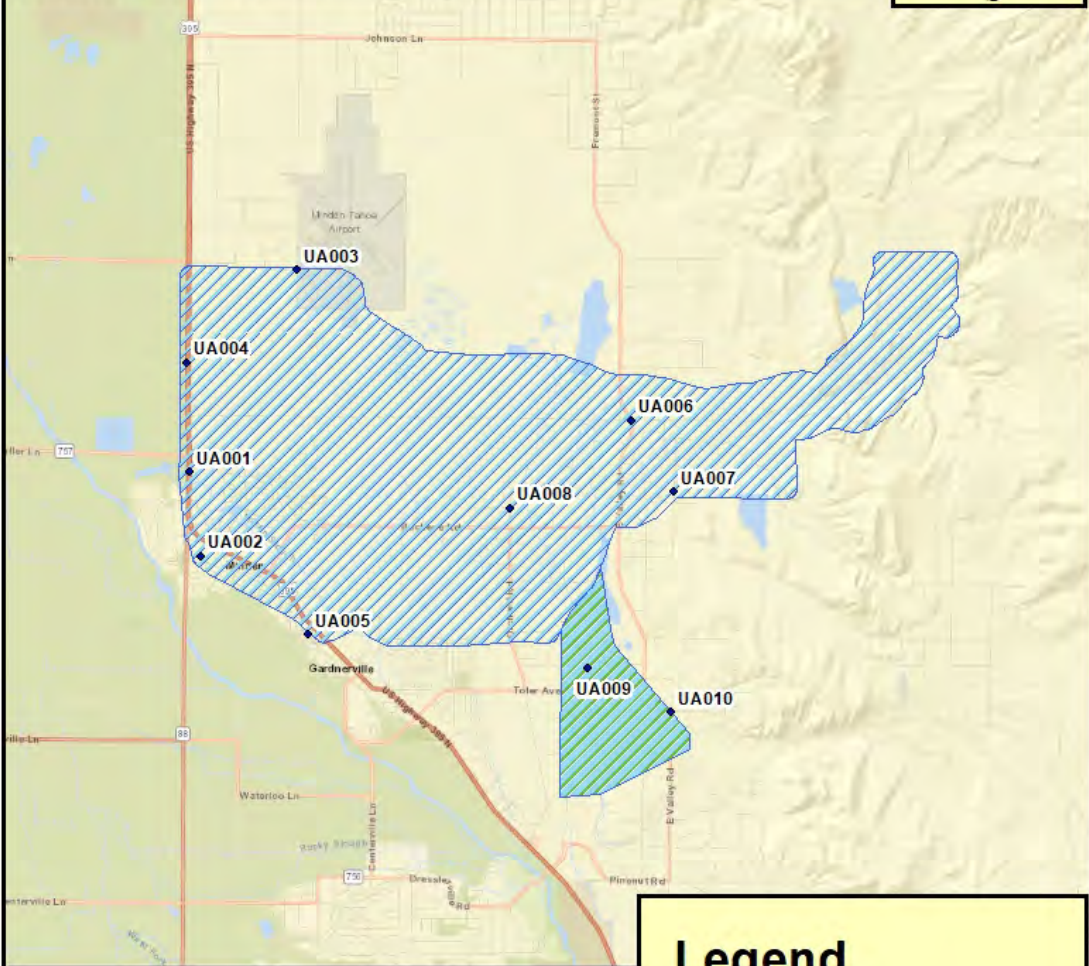
**Legend**

- Bare Earth Point
-  AOI - Buckeye LiDAR
-  AOI - Muller LiDAR



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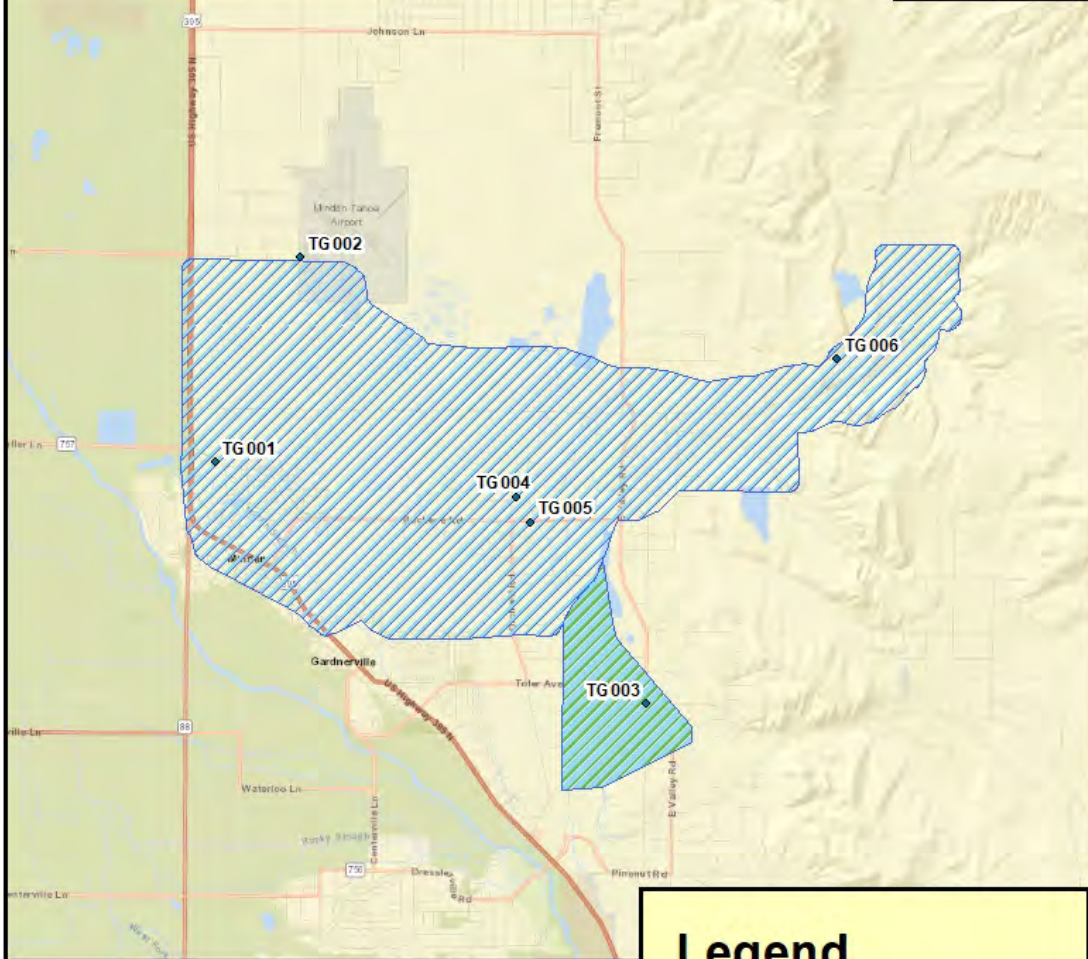
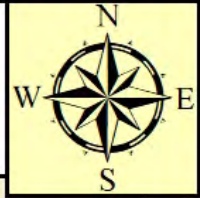
**JE Fuller**  
**Buckeye Muller LiDAR**  
**Urban Area Point Map**

**Legend**

- Urban Area Point
- AOI - Buckeye LiDAR
- AOI - Muller LiDAR





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powered by QJANTUM SPATIAL



**JE Fuller**  
**Buckeye Muller LiDAR**  
**Tall Weeds Point Map**

**Legend**

- ◆ Tall Weeds Point
-  AOI - Buckeye LiDAR
-  AOI - Muller LiDAR

## **FINAL POINT COORDINATES**



## CALIBRATION POINT COORDINATES

Horizontal Datum - NAD83(2011)  
NEVADA STATE PLANE - WEST ZONE  
Vertical Datum - NAVD 88  
Geoid - GEOID18  
Units – Survey Feet

Point ID	Northing (ft)	Easting (ft)	Elev. (ft)
CA001	14671467.64	2285679.59	4689.17
CA002	14657671.10	2285431.05	4712.72
CA003	14647890.45	2308182.58	4914.67
CA004	14663189.38	2306266.67	4877.82
CA005	14666392.90	2316284.22	5059.67

## BARE EARTH POINT COORDINATES

Horizontal Datum - NAD83(2011)  
NEVADA STATE PLANE - WEST ZONE  
Vertical Datum - NAVD 88  
Geoid - GEOID18  
Units – Survey Feet

Point ID	Northing (ft)	Easting (ft)	Elev. (ft)
BE001	14661331.13	2284770.58	4703.19
BE002	14671072.06	2289955.19	4705.77
BE003	14666631.31	2284593.62	4696.25
BE004	14653309.43	2290420.17	4736.03
BE005	14660218.92	2289893.71	4722.01
BE006	14659521.34	2300378.66	4806.28
BE007	14663737.36	2306319.91	4875.69
BE008	14649465.13	2306912.60	4908.25
BE009	14660352.45	2308384.75	4905.47
BE010	14665958.35	2314064.18	4998.93
BE011	14666434.18	2316279.67	5059.66

## URBAN AREA POINT COORDINATES

Horizontal Datum - NAD83(2011)  
NEVADA STATE PLANE - WEST ZONE  
Vertical Datum - NAVD 88  
Geoid - GEOID18  
Units – Survey Feet

Point ID	Northing (ft)	Easting (ft)	Elev. (ft)
UA001	14661245.41	2284743.90	4704.51
UA002	14657124.82	2285246.45	4711.73
UA003	14671105.72	2289943.64	4706.11
UA004	14666582.85	2284597.95	4696.78
UA005	14653314.76	2290540.96	4736.25
UA006	14663755.92	2306287.43	4875.25
UA007	14660268.85	2308353.22	4907.88
UA008	14659479.22	2300384.31	4807.16
UA009	14651707.69	2304144.39	4839.60
UA010	14649519.46	2308248.65	4920.09

**TALL WEED POINT COORDINATES**

Horizontal Datum - NAD83(2011)  
NEVADA STATE PLANE - WEST ZONE  
Vertical Datum - NAVD 88  
Geoid - GEOID18  
Units – Survey Feet

Point ID	Northing (ft)	Easting (ft)	Elev. (ft)
TG001	14661374.87	2285862.28	4704.84
TG002	14671371.55	2290017.24	4703.80
TG003	14649580.17	2306951.81	4907.24
TG004	14659705.02	2300547.77	4802.57
TG005	14658470.98	2301273.31	4812.87
TG006	14666408.65	2316240.13	5059.36

**NVA-VVA LOCATION  
ACCURACY DATA SHEETS**

## **BARE EARTH POINT LOG SHEETS**

Point ID	BE001
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14661331.130	2284770.580	4703.189

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.029 sf
RMSE Z	0.047 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE002
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	SP Nevada West
	NAD83(2011)
	NAVD88
	GEOID18
	US Survey Feet

Northing	Easting	Elevation
14671072.060	2289955.186	4705.768

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.024 sf
RMSE Z	0.055 sf
GPS Method	RTK

**PHOTOS**





Point ID	BE003
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14666631.310	2284593.617	4696.247

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.033 sf
RMSE Z	0.057 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE004
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14653309.430	2290420.169	4736.034

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.032 sf
RMSE Z	0.058 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE005
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14660218.920	2289893.713	4722.009

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.030 sf
RMSE Z	0.047 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE006
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14659521.340	2300378.658	4806.281

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.027 sf
RMSE Z	0.059 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE007
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14663737.360	2306319.905	4875.688

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.027 sf
RMSE Z	0.047 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE008
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14649465.130	2306912.603	4908.251

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-10-2022
RMSE Hz	0.033 sf
RMSE Z	0.054 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE009
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14660352.450	2308384.748	4905.473

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.026 sf
RMSE Z	0.053 sf
GPS Method	RTK

**PHOTOS**



Point ID	BE010
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

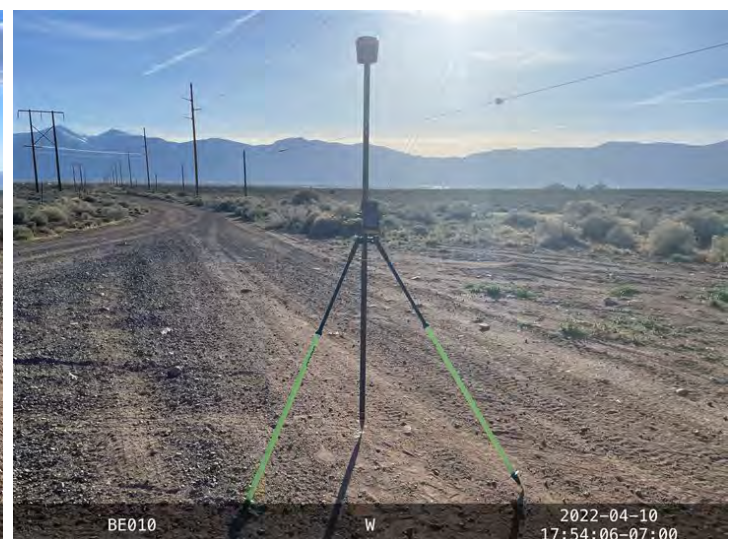
Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14665958.350	2314064.175	4998.928

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.034 sf
RMSE Z	0.060 sf
GPS Method	RTK

**PHOTOS**





Point ID	BE011
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

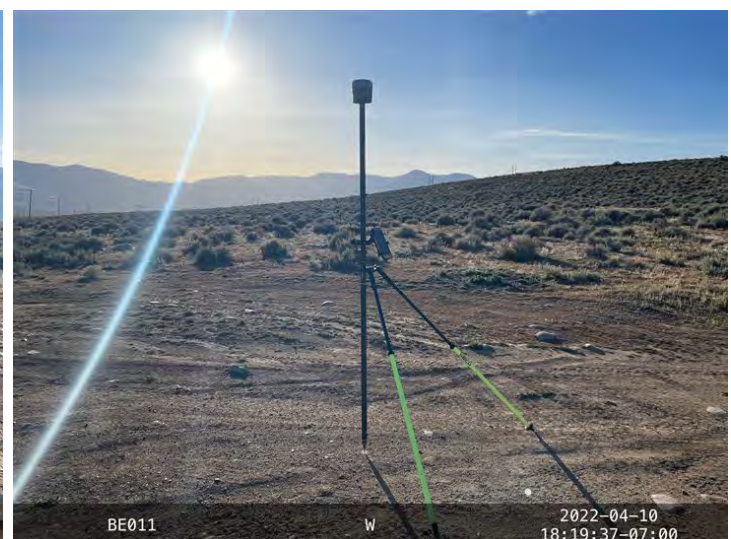
Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14666434.180	2316279.665	5059.655

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.024 sf
RMSE Z	0.053 sf
GPS Method	RTK

**PHOTOS**



## **URBAN AREA POINT LOG SHEETS**

Point ID	UA001
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14661245.410	2284743.897	4704.513

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.029 sf
RMSE Z	0.048 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA002
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14657124.820	2285246.453	4711.728

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.028 sf
RMSE Z	0.058 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA003
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

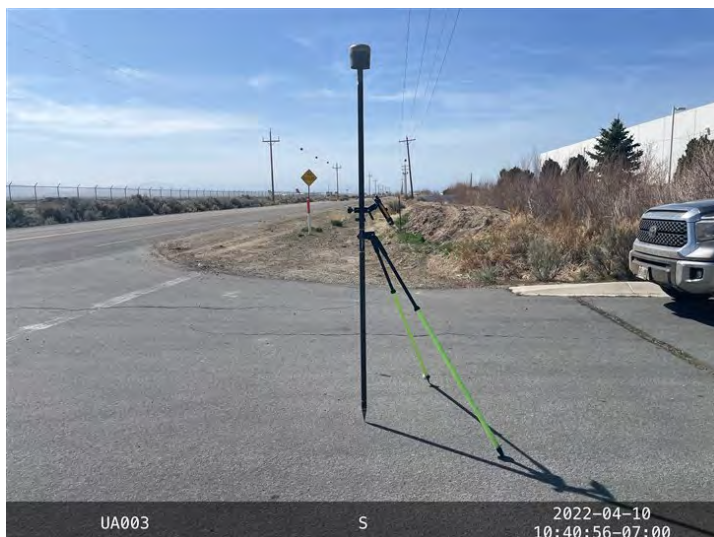
Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14671105.720	2289943.636	4706.110

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.025 sf
RMSE Z	0.055 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA004
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14666582.850	2284597.949	4696.777

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.027 sf
RMSE Z	0.056 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA005
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14653314.760	2290540.955	4736.246

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.025 sf
RMSE Z	0.059 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA006
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14663755.920	2306287.434	4875.247

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.028 sf
RMSE Z	0.055 sf
GPS Method	RTK

**PHOTOS**





Point ID	UA007
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14660268.850	2308353.216	4907.878

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.032 sf
RMSE Z	0.059 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA008
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14659479.220	2300384.310	4807.164

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.031 sf
RMSE Z	0.063 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA009
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14651707.690	2304144.386	4839.597

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-10-2022
RMSE Hz	0.032 sf
RMSE Z	0.054 sf
GPS Method	RTK

**PHOTOS**



Point ID	UA010
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14649519.460	2308248.648	4920.088

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-10-2022
RMSE Hz	0.032 sf
RMSE Z	0.050 sf
GPS Method	RTK

**PHOTOS**



## **TALL WEEDS POINT LOG SHEETS**

Point ID	TG001
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14661374.870	2285862.284	4704.840

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.032 sf
RMSE Z	0.050 sf
GPS Method	RTK

**PHOTOS**



Point ID	TG002
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Minden

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14671371.550	2290017.240	4703.799

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.025 sf
RMSE Z	0.057 sf
GPS Method	RTK

**PHOTOS**



Point ID	TG003
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

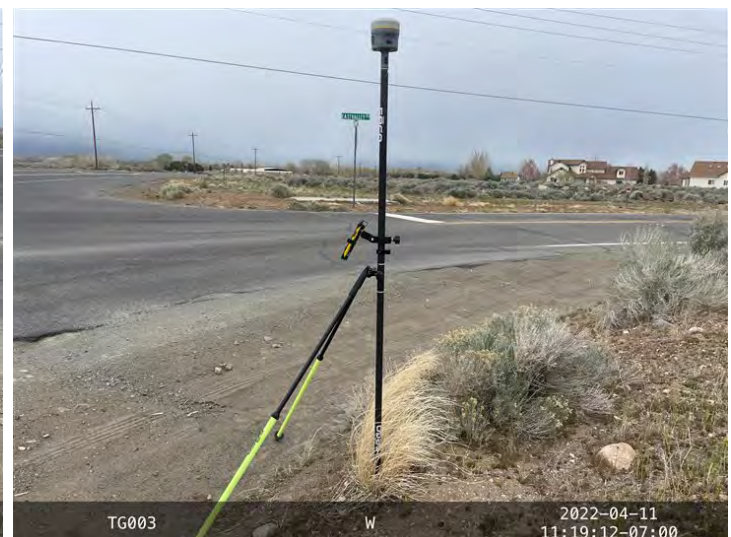
Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14649580.170	2306951.812	4907.238

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-10-2022
RMSE Hz	0.026 sf
RMSE Z	0.051 sf
GPS Method	RTK

**PHOTOS**





Point ID	TG004
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

Coordinate System	
SP Nevada West	
NAD83(2011)	
NAVD88	
GEOID18	
US Survey Feet	

Northing	Easting	Elevation
14659705.020	2300547.771	4802.572

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.026 sf
RMSE Z	0.049 sf
GPS Method	RTK

**PHOTOS**



Point ID	TG005
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

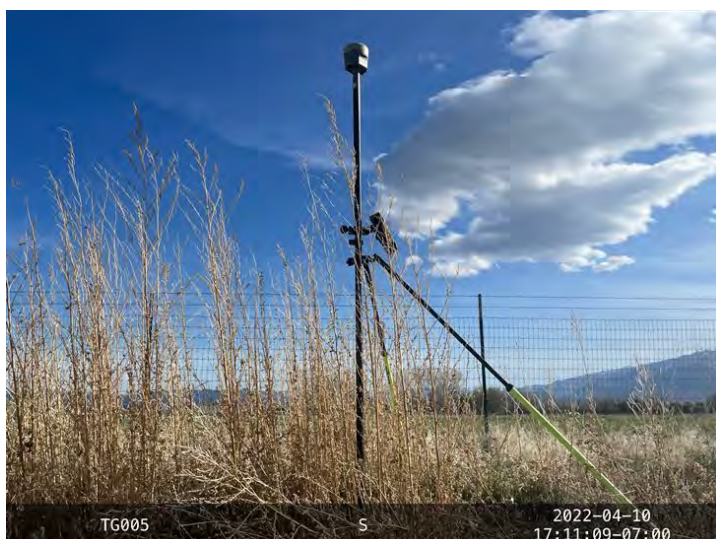
Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14658470.980	2301273.311	4812.870

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.023 sf
RMSE Z	0.064 sf
GPS Method	RTK

**PHOTOS**



Point ID	TG006
Project No.	40584
Project Name	Douglas County LiDAR
State	Nevada
County	Douglas
Quad	Gardnerville

	Aerial Target
	LiDAR Ground Control
	LiDAR QC Point
	New Control
X	Photo ID
	Published Control

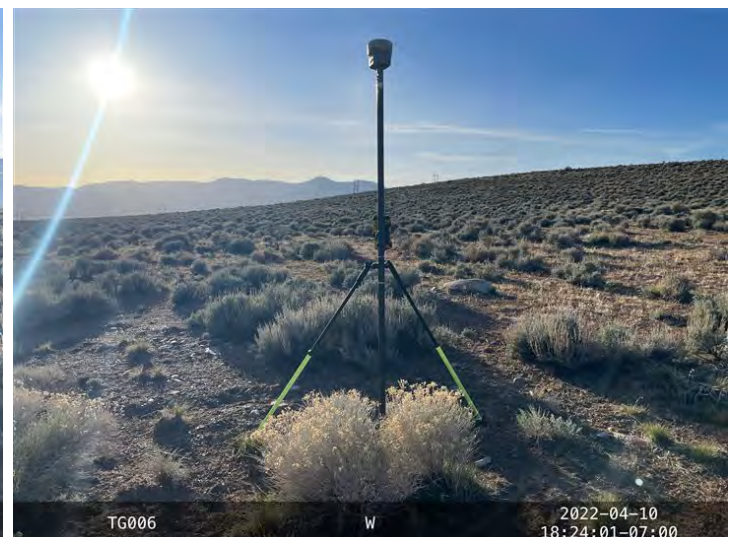
Coordinate System
SP Nevada West
NAD83(2011)
NAVD88
GEOID18
US Survey Feet

Northing	Easting	Elevation
14666408.650	2316240.129	5059.363

Operator	BK
Receiver Model	Trimble R12
Receiver S/N	1107
Antenna Height	6.562 sf

Date (MM-DD-YYYY)	04-09-2022
RMSE Hz	0.024 sf
RMSE Z	0.051 sf
GPS Method	RTK

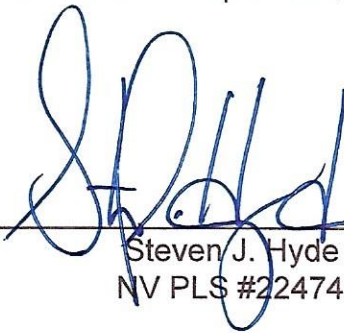
**PHOTOS**

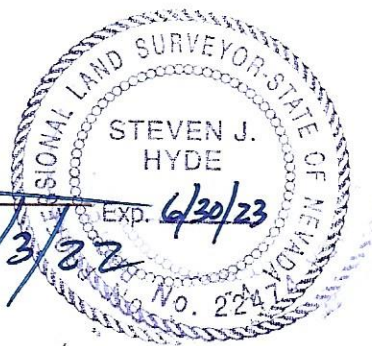


## Surveyor's Certificate

I, Steven J. Hyde, being a Licensed Professional Land Surveyor in the State of Nevada, hereby certify to the best of my professional knowledge and belief that the survey methodologies and results shown on the attached report for the State portion of the report titled Survey Report of LiDAR Calibration & Quality Control Points, Buckeye Creek Mitigation LiDAR Gardnerville, NV, dated April 20, 2022, were performed and obtained utilizing commonly acceptable survey standards, practices and procedures. The survey portion of this project was accomplished between April 10, 2022 through April 11, 2022.

I have reviewed the accuracy statements as part of my oversight and found them to meet the National Standards for Spatial Accuracy (NSSDA) shown.

  
Steven J. Hyde  
NV PLS #22474



# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

[Minor map unit components are excluded from this report]

**Map unit:** 152 - Cagle-Duco association

**Component:** Cagle (50%)

*The Cagle component makes up 50 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY069NV Shallow Clayey Summit 11-14 P.Z. PIMO/ARTRV/POA-KOMA ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Duco (40%)

*The Duco component makes up 40 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, lithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 181 - Chalco complex, 8 to 30 percent slopes

**Component:** Chalco (50%)

*The Chalco component makes up 50 percent of the map unit. Slopes are 15 to 30 percent. This component is on pediments, hills. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Chalco (35%)

*The Chalco component makes up 35 percent of the map unit. Slopes are 8 to 15 percent. This component is on pediments. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 321 - Genoa-Glean association

**Component:** Genoa (70%)

*The Genoa component makes up 70 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of residuum weathered from granite. Depth to a root restrictive layer, bedrock, lithic, is 12 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY028NV MOUNTAIN RIDGE ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Glean (15%)

*The Glean component makes up 15 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes. The parent material consists of colluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY038NV LOAMY SLOPE 14+ P.Z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.*

**Map unit:** 332 - Glean-Genoa-Rubble land association

**Component:** Glean (50%)

*The Glean component makes up 50 percent of the map unit. Slopes are 50 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY038NV LOAMY SLOPE 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Genoa (20%)

*The Genoa component makes up 20 percent of the map unit. Slopes are 4 to 15 percent. This component is on ridges. The parent material consists of residuum weathered from granite. Depth to a root restrictive layer, bedrock, lithic, is 12 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY028NV MOUNTAIN RIDGE ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 332 - Glean-Genoa-Rubble land association

**Component:** Rubble land (15%)

*Generated brief soil descriptions are created for major soil components. The Rubble land is a miscellaneous area.*

**Map unit:** 334 - Glean-Sup-Genoa association

**Component:** Glean (45%)

*The Glean component makes up 45 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY038NV LOAMY SLOPE 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Sup (25%)

*The Sup component makes up 25 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes. The parent material consists of residuum weathered from andesite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY009NV MAHOGANY SAVANNA ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Genoa (15%)

*The Genoa component makes up 15 percent of the map unit. Slopes are 15 to 30 percent. This component is on mountain slopes. The parent material consists of residuum weathered from granite. Depth to a root restrictive layer, bedrock, lithic, is 12 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY028NV MOUNTAIN RIDGE ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 482 - Indian Creek gravelly fine sandy loam, 4 to 15 percent slopes

**Component:** Indian Creek (85%)

*The Indian Creek component makes up 85 percent of the map unit. Slopes are 4 to 15 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer, duripan, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.*

**Map unit:** 483 - Indian Creek very cobbly loam, 2 to 8 percent slopes

**Component:** Indian Creek (85%)

*The Indian Creek component makes up 85 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan remnants on fan piedmonts. The parent material consists of mixed alluvium derived from igneous rock over alluvium. Depth to a root restrictive layer, duripan, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.*

**Map unit:** 592 - Minneha-Drit-Rock outcrop association

**Component:** Minneha (40%)

*The Minneha component makes up 40 percent of the map unit. Slopes are 50 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 13 to 20 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the F026XY062NV Shallow Sandy Loam Slope 10-14 P.Z PIMO-JUOS WSG:OR0502 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*



# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 592 - Minneha-Drit-Rock outcrop association

**Component:** Drit (30%)

*The Drit component makes up 30 percent of the map unit. Slopes are 50 to 75 percent. This component is on mountain slopes. The parent material consists of colluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY005NV LOAMY 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Rock outcrop (15%)

*Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.*

**Map unit:** 973 - Trid-Drit-Duco association

**Component:** Trid (45%)

*The Trid component makes up 45 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY046NV GRANITIC SLOPE 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Drit (25%)

*The Drit component makes up 25 percent of the map unit. Slopes are 50 to 75 percent. This component is on mountain slopes. The parent material consists of colluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY005NV LOAMY 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 973 - Trid-Drit-Duco association

**Component:** Duco (15%)

*The Duco component makes up 15 percent of the map unit. Slopes are 8 to 15 percent. This component is on mountains. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6069 - Cagle-Nosrac association

**Component:** Cagle (60%)

*The Cagle component makes up 60 percent of the map unit. Slopes are 8 to 50 percent. This component is on mountains on mountains. The parent material consists of colluvium derived from andesite and/or colluvium derived from tuff breccia over residuum weathered from andesite and/or residuum weathered from tuff breccia. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY069NV Shallow Clayey Summit 11-14 P.Z. PIMO/ARTRV/POA-KOMA ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent. There are no saline horizons within 30 inches of the soil surface.*

**Component:** Nosrac (25%)

*The Nosrac component makes up 25 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountains on mountains. The parent material consists of colluvium derived from volcanic rock and/or residuum weathered from volcanic rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY005NV LOAMY 12-14 P.Z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6078 - Boondock-Chalco complex, 8 to 30 percent slopes

**Component:** Boondock (50%)

*The Boondock component makes up 50 percent of the map unit. Slopes are 8 to 30 percent. This component is on pediments, semi-bolsions. The parent material consists of residuum weathered from tuff. Depth to a root restrictive layer, bedrock, paralithic, is 5 to 10 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Chalco (35%)

*The Chalco component makes up 35 percent of the map unit. Slopes are 8 to 15 percent. This component is on pediments, semi-bolsions. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*

**Map unit:** 6250 - Greenbrae fine sandy loam, 0 to 2 percent slopes

**Component:** Greenbrae (85%)

*The Greenbrae component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on alluvial fans on fan piedmonts. The parent material consists of loamy alluvium derived from granite over alluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 2s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*

**Map unit:** 6251 - Greenbrae gravelly fine sandy loam, 4 to 8 percent slopes

**Component:** Greenbrae (85%)

*The Greenbrae component makes up 85 percent of the map unit. Slopes are 4 to 8 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6264 - Haybourne loam, 0 to 2 percent slopes

**Component:** Haybourne (85%)

*The Haybourne component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on alluvial fans, fan piedmonts. The parent material consists of alluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6c. Irrigated land capability classification is 3s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.*

**Map unit:** 6291 - Holbrook gravelly fine sandy loam, 2 to 8 percent slopes

**Component:** Holbrook (85%)

*The Holbrook component makes up 85 percent of the map unit. Slopes are 2 to 8 percent. This component is on alluvial fans, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY010NV LOAMY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface.*

**Map unit:** 6302 - Holbrook-Verdico association

**Component:** Holbrook (45%)

*The Holbrook component makes up 45 percent of the map unit. Slopes are 4 to 15 percent. This component is on alluvial fans, intermontane basins. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY010NV LOAMY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6302 - Holbrook-Verdico association

**Component:** Verdico (40%)

*The Verdico component makes up 40 percent of the map unit. Slopes are 2 to 8 percent. This component is on pediments, intermontane basins. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY023NV CLAYPAN 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6326 - Indian Creek very gravelly fine sandy loam, 4 to 15 percent slopes

**Component:** Indian Creek (90%)

*The Indian Creek component makes up 90 percent of the map unit. Slopes are 4 to 15 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer, duripan, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 1 within 30 inches of the soil surface.*

**Map unit:** 6328 - Indian Creek sandy loam, 0 to 4 percent slopes

**Component:** Indian Creek (85%)

*The Indian Creek component makes up 85 percent of the map unit. Slopes are 0 to 4 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer, duripan, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6333 - Indian Creek very gravelly loam, 2 to 8 percent slopes

**Component:** Indian Creek (90%)

*The Indian Creek component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer, duripan, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 1 within 30 inches of the soil surface.*

**Map unit:** 6458 - Mimentor fine sandy loam, 0 to 2 percent slopes

**Component:** Mimentor (90%)

*The Mimentor component makes up 90 percent of the map unit. Slopes are 0 to 2 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6c. Irrigated land capability classification is 3s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 4 within 30 inches of the soil surface.*

**Map unit:** 6459 - Mimentor fine sandy loam, 4 to 8 percent slopes

**Component:** Mimentor (95%)

*The Mimentor component makes up 95 percent of the map unit. Slopes are 4 to 8 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6c. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 4 within 30 inches of the soil surface.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6557 - Phing cobbly sandy loam, 4 to 15 percent slopes

**Component:** Phing (85%)

*The Phing component makes up 85 percent of the map unit. Slopes are 4 to 15 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.*

**Map unit:** 6558 - Phing gravelly loam, 0 to 4 percent slopes

**Component:** Phing (90%)

*The Phing component makes up 90 percent of the map unit. Slopes are 0 to 4 percent. This component is on pediments, hills. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.*

**Map unit:** 6572 - Boondock-Chalco association

**Component:** Boondock (55%)

*The Boondock component makes up 55 percent of the map unit. Slopes are 30 to 50 percent. This component is on pediments, hills. The parent material consists of colluvium derived from tuff and/or residuum weathered from tuff. Depth to a root restrictive layer, bedrock, paralithic, is 5 to 10 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6572 - Boondock-Chalco association

**Component:** Chalco (15%)

*The Chalco component makes up 15 percent of the map unit. Slopes are 8 to 15 percent. This component is on pediments. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*

**Component:** Chalco (15%)

*The Chalco component makes up 15 percent of the map unit. Slopes are 15 to 30 percent. This component is on pediments. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6573 - Boondock-Chalco-Pula complex, 30 to 50 percent slopes

**Component:** Boondock (35%)

*The Boondock component makes up 35 percent of the map unit. Slopes are 30 to 50 percent. This component is on pediments, hills. The parent material consists of colluvium derived from tuff and/or residuum weathered from tuff. Depth to a root restrictive layer, bedrock, paralithic, is 5 to 10 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Chalco (25%)

*The Chalco component makes up 25 percent of the map unit. Slopes are 30 to 50 percent. This component is on pediments. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*



# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6573 - Boondock-Chalco-Pula complex, 30 to 50 percent slopes

**Component:** Pula (25%)

*The Pula component makes up 25 percent of the map unit. Slopes are 30 to 50 percent. This component is on pediments. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6580 - Pung-Phing-Chalco association

**Component:** Pung (40%)

*The Pung component makes up 40 percent of the map unit. Slopes are 15 to 30 percent. This component is on pediments. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.*

**Component:** Phing (25%)

*The Phing component makes up 25 percent of the map unit. Slopes are 8 to 15 percent. This component is on pediments. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.*

**Component:** Chalco (20%)

*The Chalco component makes up 20 percent of the map unit. Slopes are 30 to 50 percent. This component is on pediments. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY029NV ERODED SLOPE 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6602 - Reno extremely cobbly sandy loam, 2 to 8 percent slopes

**Component:** Reno (85%)

*The Reno component makes up 85 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan remnants on piedmonts. The parent material consists of alluvium derived from mixed over alluvium derived from mixed. Depth to a root restrictive layer, duripan, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY025NV CLAYPAN 10-12 P.Z., CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 5 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 5 within 30 inches of the soil surface.*

**Map unit:** 6646 - Saralegui sand, 2 to 8 percent slopes

**Component:** Saralegui (85%)

*The Saralegui component makes up 85 percent of the map unit. Slopes are 2 to 8 percent. This component is on terraces, lake plains. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY020NV SANDY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6c. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.*

**Map unit:** 6666 - Leviathan-Pung association

**Component:** Leviathan (45%)

*The Leviathan component makes up 45 percent of the map unit. Slopes are 4 to 15 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY010NV LOAMY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6666 - Leviathan-Pung association

**Component:** Pung (40%)

*The Pung component makes up 40 percent of the map unit. Slopes are 8 to 15 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY023NV CLAYPAN 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.*

**Map unit:** 6667 - Shree-Smocreek association

**Component:** Shree (70%)

*The Shree component makes up 70 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan remnants, semi-bolsons. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY010NV LOAMY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Smocreek (20%)

*The Smocreek component makes up 20 percent of the map unit. Slopes are 0 to 2 percent. This component is on stream terraces, semi-bolsons. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is rarely flooded. It is not ponded. A seasonal zone of water saturation is at 42 inches during January, February, March, December. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY030NV LOAMY BOTTOM 8-12 P.Z. ecological site. Nonirrigated land capability classification is 6w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6763 - Turria silty clay loam, 0 to 2 percent slopes

**Component:** Turria (95%)

*The Turria component makes up 95 percent of the map unit. Slopes are 0 to 2 percent. This component is on fan piedmonts, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY031NV SILTY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6c. Irrigated land capability classification is 2c. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent. There are no saline horizons within 30 inches of the soil surface.*

**Map unit:** 6819 - Waspo gravelly clay, 2 to 8 percent slopes

**Component:** Waspo (85%)

*The Waspo component makes up 85 percent of the map unit. Slopes are 2 to 8 percent. This component is on pediments on hills. The parent material consists of pedisegment derived from tuff and/or residuum weathered from tuff. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY019NV CHURNING CLAY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.*

**Map unit:** 6875 - Delmo-Tagum-Bullville association

**Component:** Delhew (40%)

*The Delhew component makes up 40 percent of the map unit. Slopes are 30 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY075NV GRAVELLY MOUNTAIN SHOULDERS 16+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6875 - Delmo-Tagum-Bullville association

**Component:** Tagum (25%)

*The Tagum component makes up 25 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY039NV CLAYPAN 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Bullville (20%)

*The Bullville component makes up 20 percent of the map unit. Slopes are 30 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY056NV SOUTH SLOPE 16+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6876 - Delmo-Dooh-Slatter association

**Component:** Delmo (45%)

*The Delmo component makes up 45 percent of the map unit. Slopes are 8 to 30 percent. This component is on mountain slopes, mountains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY078NV CLAYPAN 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Dooh (25%)

*The Dooh component makes up 25 percent of the map unit. Slopes are 15 to 50 percent. This component is on fan piedmonts, fan piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY040NV GRAVELLY LOAM 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6876 - Delmo-Dooh-Slatter association

**Component:** Slatter (15%)

*The Slatter component makes up 15 percent of the map unit. Slopes are 4 to 30 percent. This component is on mountain slopes, mountains. The parent material consists of residuum weathered from granite. Depth to a root restrictive layer, bedrock, lithic, is 4 to 10 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY028NV MOUNTAIN RIDGE ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6877 - Delmo-Dooh association

**Component:** Delmo (55%)

*The Delmo component makes up 55 percent of the map unit. Slopes are 8 to 30 percent. This component is on fan piedmonts, fan piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY078NV CLAYPAN 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Dooh (35%)

*The Dooh component makes up 35 percent of the map unit. Slopes are 15 to 50 percent. This component is on fan piedmonts, fan piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY040NV GRAVELLY LOAM 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6878 - Erastra-Nutval-Dotsolot association

**Component:** Erastra (40%)

*The Erastra component makes up 40 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6878 - Erastra-Nutval-Dotsolot association

**Component:** Nutval (30%)

*The Nutval component makes up 30 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY040NV GRAVELLY LOAM 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Dotsolot (15%)

*The Dotsolot component makes up 15 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6879 - Erastra-Dotsolot association

**Component:** Erastra (40%)

*The Erastra component makes up 40 percent of the map unit. Slopes are 30 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY069NV Shallow Clayey Summit 11-14 P.Z. PIMO/ARTRV/POA-KOMA ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Dotsolot (30%)

*The Dotsolot component makes up 30 percent of the map unit. Slopes are 30 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6879 - Erastra-Dotsolot association

**Component:** Erastra (15%)

*The Erastra component makes up 15 percent of the map unit. Slopes are 8 to 30 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6880 - Eaglerock-Erastra association

**Component:** Eaglerock (55%)

*The Eaglerock component makes up 55 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes on mountains. The parent material consists of colluvium derived from granite over residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R026XY046NV GRANITIC SLOPE 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*

**Component:** Erastra (30%)

*The Erastra component makes up 30 percent of the map unit. Slopes are 8 to 75 percent. This component is on mountain slopes on mountains. The parent material consists of colluvium derived from granite over residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.*



# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6881 - Leviathan-Dooh-Delmo association

**Component:** Leviathan (40%)

*The Leviathan component makes up 40 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY048NV LOAMY SLOPE 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Dooh (30%)

*The Dooh component makes up 30 percent of the map unit. Slopes are 30 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY040NV GRAVELLY LOAM 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Delmo (20%)

*The Delmo component makes up 20 percent of the map unit. Slopes are 4 to 30 percent. This component is on mountain slopes, mountains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY078NV CLAYPAN 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6883 - Bullville-Delhew-Bakscratch association

**Component:** Bullville (35%)

*The Bullville component makes up 35 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY056NV SOUTH SLOPE 16+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6883 - Bullville-Delhew-Bakscratch association

**Component:** Delhew (30%)

*The Delhew component makes up 30 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY038NV LOAMY SLOPE 14+ P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Bakscratch (20%)

*The Bakscratch component makes up 20 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R026XY009NV MAHOGANY SAVANNA ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6895 - Pung-Chalco-Uhaldi association

**Component:** Pung (45%)

*The Pung component makes up 45 percent of the map unit. Slopes are 4 to 15 percent. This component is on pediments, hills. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY023NV CLAYPAN 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.*

**Component:** Chalco (25%)

*The Chalco component makes up 25 percent of the map unit. Slopes are 15 to 30 percent. This component is on pediments, hills. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6895 - Pung-Chalco-Uhaldi association

**Component:** Uhaldi (15%)

*The Uhaldi component makes up 15 percent of the map unit. Slopes are 30 to 50 percent. This component is on pediments, hills. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY010NV LOAMY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.*

**Map unit:** 6901 - Calpine coarse sandy loam, 2 to 8 percent slopes

**Component:** Calpine (90%)

*The Calpine component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan piedmonts, fan piedmonts. The parent material consists of alluvium derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R026XY008NV GRANITIC FAN 10-12 P.Z. ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.*

**Map unit:** 6902 - Ackley gravelly sandy loam, 2 to 8 percent slopes

**Component:** Ackley (95%)

*The Ackley component makes up 95 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan remnants, intermontane basins. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 6c. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6903 - Uhaldi-Verdico association

**Component:** Uhaldi (45%)

*The Uhaldi component makes up 45 percent of the map unit. Slopes are 15 to 30 percent. This component is on pediments, foothills. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY010NV LOAMY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Verdico (40%)

*The Verdico component makes up 40 percent of the map unit. Slopes are 4 to 8 percent. This component is on pediments, foothills. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R026XY025NV CLAYPAN 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Map unit:** 6904 - Eaglerock-Erastra-Rock outcrop association

**Component:** Eaglerock (45%)

*The Eaglerock component makes up 45 percent of the map unit. Slopes are 15 to 50 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R026XY048NV LOAMY SLOPE 12-14 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Erastra (25%)

*The Erastra component makes up 25 percent of the map unit. Slopes are 15 to 75 percent. This component is on mountain slopes, mountains. The parent material consists of colluvium derived from granite and/or residuum weathered from granite. Depth to a root restrictive layer, bedrock, paralithic, is 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F026XY044NV Shallow Sandy Slope 10-12 P.Z. PIMO WSG:1R0601 ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

# Map Unit Description (Brief, Generated)

Douglas County Area, Nevada

**Map unit:** 6904 - Eaglerock-Erastra-Rock outcrop association

**Component:** Rock outcrop (15%)

*Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.*

**Map unit:** 6915 - Eastval gravelly sandy loam, 2 to 8 percent slopes

**Component:** Eastval (90%)

*The Eastval component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on fan remnants, fan piedmonts. The parent material consists of alluvium derived from mixed. Depth to a root restrictive layer, duripan, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY016NV LOAMY 8-10 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 2 percent.*

**Map unit:** 6997 - Waspo clay, 0 to 4 percent slopes

**Component:** Waspo (95%)

*The Waspo component makes up 95 percent of the map unit. Slopes are 0 to 4 percent. This component is on pediments, hills. The parent material consists of colluvium and/or residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 39 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY019NV CHURNING CLAY 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria.*

**Map unit:** 6999 - Surgem-Rock outcrop association

**Component:** Surgem (80%)

*The Surgem component makes up 80 percent of the map unit. Slopes are 8 to 30 percent. This component is on hills, hills. The parent material consists of residuum weathered from granodiorite. Depth to a root restrictive layer, bedrock, lithic, is 20 to 30 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R026XY023NV CLAYPAN 10-12 P.Z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.*

**Component:** Rock outcrop (10%)

*Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.*

# Physical Soil Properties

Douglas County Area, Nevada

[Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Wind Erodibility Group" and "Wind Erodibility Index" apply only to the surface layer. Absence of an entry indicates that data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
152:														
Cagle	0-4	---	---	27-35	1.05-1.30	1.40-4.00	0.16-0.17	3.0-5.9	2.0-3.0	.15	.32	3	8	0
	4-12	---	---	35-50	1.20-1.40	0.42-1.40	0.13-0.15	6.0-8.9	1.0-2.0	.15	.28			
	12-28	---	---	30-55	1.20-1.40	0.42-1.40	0.13-0.15	6.0-8.9	0.0-2.0	.15	.28			
	28-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Duco	0-2	---	---	10-20	1.35-1.50	4.00-14.00	0.07-0.08	0.0-2.9	1.0-2.0	.10	.32	1	6	48
	2-5	---	---	10-20	1.35-1.50	4.00-14.00	0.07-0.08	0.0-2.9	1.0-3.0	.24	.43			
	5-10	---	---	23-27	1.35-1.50	1.40-4.00	0.12-0.14	3.0-5.9	1.0-2.0	.20	.37			
	10-19	---	---	27-35	1.40-1.60	1.40-4.00	0.08-0.10	3.0-5.9	0.5-1.0	.10	.37			
	19-29	---	---	---	---	0.00-0.01	---	---	---	---	---			
181:														
Chalco	0-1	---	---	15-25	1.20-1.35	4.00-14.00	0.12-0.15	0.0-2.9	1.0-2.0	.17	.43	2	8	0
	1-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Chalco	0-5	---	---	10-15	1.20-1.35	14.00-42.00	0.12-0.14	0.0-2.9	0.0-2.0	.20	.37	2	5	56
	5-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
321:														
Genoa	0-4	---	---	15-20	1.30-1.50	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.05	.20	1	8	0
	4-19	---	---	20-30	1.15-1.35	1.40-4.00	0.08-0.09	0.0-2.9	1.0-2.0	.05	.28			
	19-29	---	---	---	---	0.00-0.01	---	---	---	---	---			
Glean	0-6	---	---	8-18	1.20-1.25	14.00-42.00	0.07-0.11	0.0-2.9	1.0-3.0	.10	.20	5	5	56
	6-39	---	---	8-18	1.25-1.35	14.00-42.00	0.06-0.10	0.0-2.9	0.5-2.0	.10	.37			
	39-60	---	---	8-18	1.40-1.45	14.00-42.00	0.06-0.09	0.0-2.9	0.0-1.0	.05	.24			

# Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
332:														
Glean	0-6	---	---	8-18	1.20-1.25	14.00-42.00	0.06-0.10	0.0-2.9	1.0-3.0	.05	.20	5	6	48
	6-25	---	---	8-18	1.25-1.35	14.00-42.00	0.06-0.10	0.0-2.9	0.5-2.0	.05	.20			
	25-60	---	---	8-18	1.40-1.45	14.00-42.00	0.06-0.09	0.0-2.9	0.0-1.0	.10	.24			
Genoa	0-4	---	---	15-20	1.30-1.50	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.05	.20	1	8	0
	4-19	---	---	20-30	1.15-1.35	1.40-4.00	0.08-0.09	0.0-2.9	1.0-2.0	.05	.28			
	19-29	---	---	---	---	0.00-0.01	---	---	---	---	---			
Rubble land	---	---	---	---	---	---	---	---	---	---	---	---	---	---
334:														
Glean	0-2	---	---	8-18	1.20-1.25	14.00-42.00	0.07-0.11	0.0-2.9	1.0-3.0	.10	.20	5	6	48
	2-23	---	---	8-18	1.25-1.35	14.00-42.00	0.06-0.10	0.0-2.9	0.5-2.0	.10	.37			
	23-60	---	---	8-18	1.40-1.45	14.00-42.00	0.06-0.09	0.0-2.9	0.0-1.0	.15	.43			
Sup	0-12	---	---	7-15	1.35-1.45	4.00-14.00	0.09-0.11	0.0-2.9	2.0-4.0	.15	.37	5	7	38
	12-60	---	---	5-15	1.40-1.55	14.00-42.00	0.05-0.07	0.0-2.9	0.0-1.0	.10	.28			
Genoa	0-2	---	---	15-20	1.30-1.50	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.05	.20	1	8	0
	2-19	---	---	20-30	1.15-1.35	1.40-4.00	0.08-0.09	0.0-2.9	1.0-2.0	.05	.28			
	19-29	---	---	---	---	0.00-0.01	---	---	---	---	---			
482:														
Indian Creek	0-5	---	---	8-18	1.35-1.55	14.00-42.00	0.08-0.12	0.0-2.9	0.8-2.0	.17	.37	2	5	56
	5-20	---	---	35-55	1.25-1.45	0.01-0.42	0.14-0.16	6.0-8.9	0.0-0.5	.17	.28			
	20-25	---	---	---	---	0.00-0.01	---	---	---	---	---			
	25-60	---	---	5-20	1.40-1.60	1.40-42.00	0.00-0.03	0.0-2.9	0.0-0.5	.10	.24			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
483:														
Indian Creek	0-1	35-50	30-50	8-20	1.40-1.48	14.00-42.00	0.08-0.12	0.0-1.5	0.8-2.0	.17	.49	2	7	38
	1-3	45-70	12-40	8-18	1.47-1.59	14.00-42.00	0.08-0.12	0.0-1.7	0.8-2.0	.24	.37			
	3-20	20-50	4-45	35-55	1.41-1.57	0.01-0.42	0.12-0.16	3.4-10.8	0.0-0.8	.17	.28			
	20-25	---	---	---	---	0.00-0.01	---	---	---	---	---			
	25-60	62-90	0-33	5-30	1.47-1.75	1.40-42.00	0.00-0.03	0.0-3.1	0.0-0.5	.05	.28			
592:														
Minneha	0-8	---	---	6-15	1.30-1.50	14.00-42.00	0.07-0.08	0.0-2.9	1.0-3.0	.05	.17	2	6	48
	8-18	---	---	6-15	1.35-1.55	14.00-42.00	0.05-0.07	0.0-2.9	0.8-2.0	.10	.24			
	18-60	---	---	---	---	0.42-141.00	---	---	---	---	---			
Drit	0-15	---	---	7-15	1.40-1.60	14.00-42.00	0.06-0.08	0.0-2.9	1.0-2.0	.05	.24	5	6	48
	15-60	---	---	10-18	1.45-1.65	14.00-42.00	0.06-0.08	0.0-2.9	0.0-1.0	.05	.20			
Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---	---	---
973:														
Trid	0-6	---	---	7-13	1.35-1.50	14.00-42.00	0.04-0.05	0.0-2.9	0.8-2.0	.10	.32	3	6	48
	6-34	---	---	25-30	1.25-1.45	1.40-4.00	0.04-0.06	3.0-5.9	0.8-1.0	.05	.32			
	34-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Drit	0-15	---	---	7-15	1.40-1.60	14.00-42.00	0.06-0.08	0.0-2.9	1.0-2.0	.05	.24	5	6	48
	15-60	---	---	10-18	1.45-1.65	14.00-42.00	0.06-0.08	0.0-2.9	0.0-1.0	.05	.20			
Duco	0-2	---	---	10-20	1.35-1.50	4.00-14.00	0.07-0.08	0.0-2.9	1.0-2.0	.10	.43	1	7	38
	2-5	---	---	10-20	1.35-1.50	4.00-14.00	0.07-0.08	0.0-2.9	1.0-3.0	.24	.43			
	5-10	---	---	23-27	1.35-1.50	1.40-4.00	0.12-0.14	3.0-5.9	1.0-2.0	.20	.37			
	10-14	---	---	27-35	1.40-1.60	1.40-4.00	0.08-0.10	3.0-5.9	0.5-1.0	.10	.37			
	14-24	---	---	---	---	0.00-0.01	---	---	---	---	---			



## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6069:														
Cagle	0-4	20-45	20-53	27-35	1.05-1.30	1.40-4.00	0.13-0.17	1.5-3.9	1.0-3.0	.15	.32	3	8	0
	4-12	20-45	14-45	35-50	1.20-1.40	0.42-1.40	0.13-0.15	3.7-7.7	0.5-2.0	.15	.28			
	12-28	10-45	0-60	30-55	1.20-1.40	0.42-1.40	0.13-0.15	2.3-8.8	0.0-2.0	.17	.28			
	28-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Nosrac	0-2	30-50	20-52	18-30	1.10-1.25	4.00-14.00	0.10-0.14	0.8-2.8	1.5-3.0	.10	.28	5	8	0
	2-9	20-50	18-53	22-32	1.25-1.40	1.40-4.00	0.10-0.12	1.8-4.0	1.5-3.0	.15	.28			
	9-18	20-50	16-53	25-35	1.40-1.60	1.40-4.00	0.08-0.12	1.2-3.3	0.0-2.0	.10	.32			
	18-60	20-50	20-53	18-30	1.40-1.60	4.00-14.00	0.08-0.10	0.7-2.6	0.0-0.5	.10	.32			
6078:														
Boondock	0-1	---	---	8-18	1.20-1.35	14.00-42.00	0.12-0.14	0.0-2.9	1.0-2.0	.20	.32	1	5	56
	1-6	---	---	18-35	1.15-1.50	1.40-4.00	0.16-0.18	3.0-5.9	0.0-0.5	.43	.43			
	6-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Chalco	0-3	---	---	10-15	1.35-1.50	14.00-42.00	0.11-0.13	0.0-2.9	0.0-2.0	.20	.37	2	5	56
	3-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6250:														
Greenbrae	0-2	55-75	7-32	5-18	1.42-1.48	14.00-42.00	0.09-0.12	0.3-1.9	0.7-2.0	.32	.32	5	3	86
	2-10	60-75	13-35	5-12	1.52-1.59	14.00-42.00	0.10-0.13	0.3-1.2	0.5-1.0	.37	.37			
	10-41	40-65	0-37	22-40	1.38-1.65	0.42-1.40	0.15-0.18	1.9-6.3	0.0-0.8	.24	.24			
	41-60	47-90	0-50	2-15	1.47-1.69	4.00-14.00	0.10-0.13	0.0-1.5	0.0-0.5	.20	.32			
6251:														
Greenbrae	0-2	---	---	10-18	1.40-1.55	14.00-42.00	0.09-0.12	0.0-2.9	0.7-2.0	.20	.32	5	5	56
	2-10	---	---	10-18	1.40-1.55	14.00-42.00	0.09-0.12	0.0-2.9	0.7-2.0	.20	.32			
	10-30	---	---	27-35	1.40-1.60	0.42-1.40	0.15-0.18	3.0-5.9	0.0-0.5	.24	.24			
	30-41	---	---	15-25	1.35-1.55	4.00-14.00	0.12-0.14	3.0-5.9	0.0-0.5	.20	.20			
	41-70	---	---	3-15	1.45-1.65	4.00-14.00	0.10-0.13	0.0-2.9	0.0-0.5	.20	.32			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6264:														
Haybourne	0-3	---	---	8-15	1.35-1.50	4.00-14.00	0.15-0.17	0.0-2.9	1.0-2.0	.43	.43	5	5	56
	3-15	---	---	5-15	1.35-1.50	14.00-42.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.24			
	15-25	---	---	8-18	1.35-1.55	14.00-42.00	0.10-0.12	0.0-2.9	0.0-0.5	.24	.24			
	25-60	---	---	5-12	1.45-1.65	14.00-42.00	0.07-0.10	0.0-2.9	0.0-0.5	.17	.28			
6291:														
Holbrook	0-4	---	---	10-15	1.30-1.50	14.00-42.00	0.11-0.13	0.0-2.9	1.0-3.0	.15	.24	5	5	56
	4-15	---	---	10-15	1.15-1.30	4.00-14.00	0.10-0.12	0.0-2.9	1.0-3.0	.20	.37			
	15-60	---	---	5-10	1.40-1.60	14.00-42.00	0.04-0.06	0.0-2.9	0.5-3.0	.10	.28			
6302:														
Holbrook	0-4	---	---	10-20	1.20-1.40	14.00-42.00	0.06-0.08	0.0-2.9	1.0-3.0	.05	.20	5	6	48
	4-15	---	---	10-15	1.15-1.30	4.00-14.00	0.10-0.12	0.0-2.9	1.0-3.0	.20	.37			
	15-60	---	---	5-10	1.40-1.60	14.00-42.00	0.04-0.06	0.0-2.9	0.5-3.0	.10	.28			
Verdico														
	0-2	---	---	27-33	1.30-1.45	1.40-4.00	0.17-0.19	3.0-5.9	1.0-2.0	.37	.37	3	6	48
	2-29	---	---	45-60	1.25-1.40	0.01-0.42	0.13-0.15	6.0-8.9	0.3-0.8	.24	.24			
	29-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6326:														
Indian Creek	0-1	---	---	10-20	1.25-1.45	14.00-42.00	0.08-0.10	0.0-2.9	0.8-2.0	.15	.32	2	6	48
	1-3	---	---	20-30	1.50-1.65	1.40-4.00	0.14-0.17	3.0-5.9	1.0-2.0	.20	.37			
	3-20	---	---	35-55	1.25-1.45	0.01-0.42	0.14-0.16	6.0-8.9	0.5-1.0	.17	.28			
	20-25	---	---	---	---	0.00-0.01	---	---	---	---	---			
	25-60	---	---	5-20	1.40-1.60	1.40-42.00	0.00-0.03	0.0-2.9	0.0-0.5	.10	.24			
6328:														
Indian Creek	0-4	---	---	8-18	1.35-1.55	14.00-42.00	0.08-0.12	0.0-2.9	0.8-2.0	.32	.32	2	3	86
	4-20	---	---	35-55	1.25-1.45	0.01-0.42	0.14-0.16	6.0-8.9	0.0-0.5	.17	.28			
	20-25	---	---	---	---	0.00-0.01	---	---	---	---	---			
	25-60	---	---	5-20	1.40-1.60	1.40-42.00	0.00-0.03	0.0-2.9	0.0-0.5	.10	.24			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6333:														
Indian Creek	0-1	---	---	8-18	1.35-1.55	14.00-42.00	0.08-0.09	0.0-2.9	0.8-2.0	.20	.49	2	7	38
	1-3	---	---	20-30	1.50-1.65	1.40-4.00	0.14-0.17	3.0-5.9	1.0-2.0	.20	.37			
	3-20	---	---	35-55	1.25-1.45	0.01-0.42	0.14-0.16	6.0-8.9	0.5-1.0	.17	.28			
	20-25	---	---	---	---	0.00-0.01	---	---	---	---	---			
	25-60	---	---	5-22	1.40-1.60	1.40-42.00	0.00-0.03	0.0-2.9	0.0-0.5	.10	.24			
6458:														
Mimantor	0-9	---	---	5-15	1.35-1.50	14.00-42.00	0.10-0.14	0.0-2.9	1.0-2.0	.32	.32	5	3	86
	9-24	---	---	25-35	1.30-1.50	1.40-4.00	0.14-0.16	3.0-5.9	0.5-1.0	.32	.32			
	24-36	---	---	5-15	1.40-1.60	14.00-42.00	0.11-0.13	0.0-2.9	0.0-0.5	.20	.32			
	36-60	---	---	5-15	1.40-1.60	14.00-42.00	0.11-0.13	0.0-2.9	0.0-0.5	.17	.28			
6459:														
Mimantor	0-9	---	---	5-15	1.35-1.50	14.00-42.00	0.10-0.14	0.0-2.9	1.0-2.0	.32	.32	5	3	86
	9-24	---	---	25-35	1.30-1.50	1.40-4.00	0.14-0.16	3.0-5.9	0.5-1.0	.32	.32			
	24-36	---	---	5-15	1.40-1.60	14.00-42.00	0.11-0.13	0.0-2.9	0.0-0.5	.17	.28			
	36-60	---	---	5-15	1.40-1.60	14.00-42.00	0.11-0.13	0.0-2.9	0.0-0.5	.17	.28			
6557:														
Phing	0-4	---	---	10-20	1.35-1.50	4.00-14.00	0.11-0.13	0.0-2.9	1.0-2.0	.15	.28	5	5	56
	4-9	---	---	10-20	1.30-1.50	14.00-42.00	0.11-0.13	0.0-2.9	0.8-2.0	.15	.28			
	9-31	---	---	45-60	1.25-1.40	0.42-1.40	0.12-0.16	6.0-8.9	0.0-0.5	.24	.24			
	31-60	---	---	25-45	1.45-1.65	0.42-1.40	0.15-0.19	3.0-5.9	0.0-0.5	.32	.32			
6558:														
Phing	0-4	---	---	15-25	1.40-1.60	4.00-14.00	0.13-0.15	3.0-5.9	1.0-2.0	.24	.37	5	7	38
	4-9	---	---	10-20	1.30-1.50	14.00-42.00	0.11-0.13	0.0-2.9	0.8-2.0	.15	.28			
	9-31	---	---	45-60	1.25-1.40	0.42-1.40	0.12-0.16	6.0-8.9	0.0-0.5	.24	.24			
	31-60	---	---	25-45	1.45-1.65	0.42-1.40	0.15-0.19	3.0-5.9	0.0-0.5	.32	.32			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6572:														
Boondock	0-1	---	---	8-18	1.20-1.35	14.00-42.00	0.12-0.14	0.0-2.9	1.0-2.0	.20	.32	1	5	56
	1-6	---	---	18-35	1.15-1.50	1.40-4.00	0.16-0.18	3.0-5.9	0.0-0.5	.43	.43			
	6-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Chalco	0-3	---	---	10-15	1.35-1.50	14.00-42.00	0.11-0.13	0.0-2.9	0.0-2.0	.24	.37	2	5	56
	3-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Chalco	0-4	---	---	15-25	1.20-1.35	4.00-14.00	0.12-0.15	0.0-2.9	1.0-2.0	.17	.43	2	8	0
	4-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6573:														
Boondock	0-1	---	---	8-18	1.20-1.35	14.00-42.00	0.12-0.14	0.0-2.9	1.0-2.0	.20	.32	1	5	56
	1-6	---	---	18-35	1.15-1.50	1.40-4.00	0.16-0.18	3.0-5.9	0.0-0.5	.43	.43			
	6-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Chalco	0-4	---	---	15-25	1.20-1.35	4.00-14.00	0.12-0.15	0.0-2.9	1.0-2.0	.17	.43	2	8	0
	4-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Pula	0-2	---	---	18-24	1.30-1.45	4.00-14.00	0.07-0.09	3.0-5.9	1.0-2.0	.10	.32	5	8	0
	2-32	---	---	35-45	1.30-1.50	0.42-1.40	0.06-0.07	3.0-5.9	0.0-0.5	.05	.32			
	32-60	---	---	10-25	1.35-1.55	14.00-42.00	0.03-0.05	0.0-2.9	0.0-0.5	.02	.20			
6580:														
Pung	0-6	---	---	20-25	1.25-1.45	4.00-14.00	0.14-0.16	3.0-5.9	1.0-3.0	.15	.32	5	7	38
	6-30	---	---	40-60	1.30-1.50	0.42-1.40	0.14-0.16	6.0-8.9	0.8-2.0	.20	.20			
	30-60	---	---	15-25	1.40-1.60	4.00-14.00	0.12-0.14	3.0-5.9	0.0-0.5	.20	.20			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6580:														
Phing	0-2	---	---	15-25	1.40-1.60	4.00-14.00	0.11-0.13	3.0-5.9	1.0-2.0	.15	.37	5	8	0
	2-32	---	---	45-60	1.25-1.45	0.42-1.40	0.12-0.16	6.0-8.9	0.0-0.5	.24	.24			
	32-60	---	---	25-45	1.35-1.55	1.40-4.00	0.15-0.19	3.0-5.9	0.0-0.5	.32	.32			
Chalco	0-4	---	---	15-25	1.20-1.35	4.00-14.00	0.12-0.15	0.0-2.9	1.0-2.0	.17	.43	2	8	0
	4-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6602:														
Reno	0-2	55-75	10-40	5-15	1.45-1.56	14.00-42.00	0.03-0.12	0.0-0.9	0.6-2.0	.05	.32	2	8	0
	2-8	55-75	8-37	8-18	1.51-1.56	14.00-42.00	0.09-0.13	0.3-1.5	0.6-2.0	.17	.32			
	8-16	20-65	0-40	35-60	1.45-1.64	0.01-0.42	0.10-0.16	3.6-11.8	0.5-1.0	.24	.24			
	16-27	20-65	0-40	20-50	1.41-1.60	0.01-0.42	0.14-0.16	1.3-9.2	0.5-1.0	.10	.24			
	27-37	43-70	15-50	2-22	1.56-1.59	141.00- 705.00	0.05-0.07	0.0-1.6	0.0-0.5	.20	.43			
	37-44	---	---	---	---	0.00-0.01	---	---	---	---	---			
	44-60	70-90	2-27	3-8	1.61-1.68	42.00-141.00	0.05-0.07	0.0-0.5	0.0-0.5	.05	.15			
6646:														
Saralegui	0-4	---	---	1-5	1.60-1.75	42.00-141.00	0.05-0.07	0.0-2.9	0.8-2.0	.10	.10	5	1	220
	4-36	---	---	8-18	1.60-1.70	14.00-42.00	0.11-0.13	0.0-2.9	0.5-2.0	.20	.20			
	36-51	---	---	8-12	1.50-1.70	14.00-42.00	0.07-0.12	0.0-2.9	0.0-0.5	.15	.28			
	51-60	---	---	8-12	1.50-1.70	14.00-42.00	0.07-0.12	0.0-2.9	0.0-0.5	.24	.24			
6666:														
Leviathan	0-9	---	---	10-18	1.40-1.60	1.40-4.00	0.08-0.10	0.0-2.9	1.0-3.0	.10	.24	5	6	48
	9-44	---	---	27-35	1.40-1.60	1.40-4.00	0.09-0.12	3.0-5.9	0.5-1.0	.10	.20			
	44-65	---	---	27-35	1.40-1.60	1.40-4.00	0.09-0.12	3.0-5.9	0.5-1.0	.05	.20			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6666:														
Pung	0-2	---	---	20-25	1.20-1.40	4.00-14.00	0.14-0.16	3.0-5.9	1.0-3.0	.15	.32	5	7	38
	2-6	---	---	20-27	1.25-1.45	1.40-4.00	0.14-0.16	3.0-5.9	1.0-3.0	.37	.37			
	6-11	---	---	27-38	1.30-1.45	1.40-4.00	0.17-0.19	3.0-5.9	0.8-2.0	.32	.32			
	11-30	---	---	40-60	1.20-1.40	0.42-1.40	0.14-0.16	6.0-8.9	0.8-2.0	.20	.20			
	30-60	---	---	15-25	1.35-1.55	4.00-14.00	0.12-0.14	3.0-5.9	0.0-0.5	.37	.37			
6667:														
Shree	0-1	---	---	10-20	1.25-1.45	14.00-42.00	0.08-0.10	0.0-2.9	1.0-2.0	.10	.28	5	6	48
	1-7	---	---	15-25	1.20-1.40	4.00-14.00	0.10-0.12	0.0-2.9	1.0-2.0	.15	.37			
	7-10	---	---	17-27	1.25-1.35	4.00-14.00	0.06-0.08	0.0-2.9	1.0-2.0	.05	.37			
	10-26	---	---	27-35	1.25-1.45	1.40-4.00	0.06-0.09	3.0-5.9	0.5-1.5	.05	.20			
	26-60	---	---	10-25	1.35-1.50	14.00-42.00	0.05-0.07	0.0-2.9	0.0-0.5	.02	.20			
Smocreek	0-11	---	---	18-27	1.20-1.40	4.00-14.00	0.15-0.18	0.0-2.9	1.0-3.0	.49	.49	5	6	48
	11-60	---	---	25-35	1.40-1.60	1.40-4.00	0.15-0.20	2.9-5.9	0.5-3.0	.43	.43			
6763:														
Turria	0-2	---	---	27-35	1.30-1.45	1.40-4.00	0.19-0.21	3.0-5.9	1.0-2.0	.37	.37	5	6	48
	2-12	---	---	25-35	1.30-1.50	1.40-4.00	0.17-0.20	3.0-5.9	0.5-1.0	.32	.32			
	12-60	---	---	15-25	1.35-1.55	4.00-14.00	0.18-0.20	3.0-5.9	0.0-0.5	.49	.49			
6819:														
Waspo	0-7	15-45	6-40	45-60	1.18-1.38	0.01-0.42	0.15-0.18	6.7-12.6	0.5-1.8	.17	.28	3	5	56
	7-24	15-45	6-40	45-60	1.18-1.38	0.01-0.42	0.15-0.18	6.3-12.4	0.0-1.0	.28	.28			
	24-60	---	---	---	---	0.01-0.42	---	---	---	---	---			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6875:														
Delhew	0-4	---	---	8-12	1.25-1.45	14.00-42.00	0.06-0.08	0.0-2.9	2.0-3.0	.05	.10	5	3	86
	4-13	---	---	8-12	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-3.0	.10	.20			
	13-20	---	---	14-18	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.05	.17			
	20-33	---	---	14-18	1.35-1.50	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.02	.17			
	33-60	---	---	8-12	1.40-1.55	14.00-42.00	0.04-0.06	0.0-2.9	0.5-1.0	.05	.24			
Tagum	0-2	---	---	10-15	1.25-1.45	14.00-42.00	0.04-0.06	0.0-2.9	2.0-3.0	.10	.24	3	6	48
	2-5	---	---	10-15	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-3.0	.10	.24			
	5-10	---	---	18-20	1.30-1.50	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.10	.20			
	10-30	---	---	20-25	1.35-1.50	1.40-4.00	0.07-0.09	0.0-2.9	0.5-2.0	.10	.24			
	30-60	---	---	---	---	0.01-0.40	---	---	---	---	---			
Bullville	0-4	---	---	10-15	1.25-1.45	14.11-42.34	0.04-0.06	0.0-2.9	2.0-3.0	.05	.24	3	6	48
	4-11	---	---	18-25	1.35-1.50	1.41-4.23	0.06-0.08	0.0-2.9	1.0-3.0	.05	.20			
	11-25	---	---	20-25	1.35-1.50	1.41-4.23	0.06-0.08	0.0-2.9	0.5-2.0	.05	.32			
	25-60	---	---	---	---	0.00-0.42	---	---	---	---	---			
6876:														
Delmo	0-3	---	---	10-15	1.30-1.45	14.00-42.00	0.06-0.08	0.0-2.9	1.0-2.0	.10	.28	5	6	48
	3-6	---	---	10-15	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.10	.28			
	6-13	---	---	35-50	1.30-1.45	0.42-1.40	0.06-0.08	3.0-6.0	1.0-2.0	.10	.28			
	13-26	---	---	35-50	1.30-1.45	0.42-1.40	0.06-0.08	3.0-6.0	1.0-2.0	.02	.20			
	26-61	---	---	25-35	1.40-1.60	1.40-4.20	0.06-0.08	0.0-2.9	0.5-1.0	.05	.20			
Dooh	0-5	---	---	10-18	1.15-1.35	14.00-42.00	0.05-0.07	0.0-2.9	2.0-4.0	.05	.20	5	6	48
	5-15	---	---	18-27	1.35-1.50	4.00-14.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.24			
	15-28	---	---	27-35	1.30-1.50	1.40-4.20	0.07-0.09	0.0-2.9	1.0-2.0	.05	.20			
	28-61	---	---	27-35	1.40-1.55	1.40-4.20	0.07-0.09	0.0-2.9	0.3-0.8	.05	.20			

# Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6876:														
Slatter	0-3	---	---	10-15	1.35-1.50	14.00-42.00	0.06-0.08	0.0-2.9	1.0-3.0	.05	.32	1	8	0
	3-7	---	---	18-25	1.35-1.50	1.40-4.20	0.07-0.09	0.0-2.9	1.0-2.0	.05	.32			
	7-18	---	---	---	---	0.01-0.42	---	---	---	---	---			
6877:														
Delmo	0-3	---	---	12-18	1.35-1.50	14.00-42.00	0.04-0.06	0.0-2.9	1.0-2.0	.05	.24	5	8	0
	3-6	---	---	10-15	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.10	.28			
	6-13	---	---	35-50	1.30-1.45	0.42-1.40	0.06-0.08	3.0-6.0	1.0-2.0	.10	.28			
	13-26	---	---	35-50	1.30-1.45	0.42-1.40	0.06-0.08	3.0-6.0	1.0-2.0	.02	.20			
	26-61	---	---	25-35	1.40-1.60	1.40-4.20	0.06-0.08	0.0-2.9	0.5-1.0	.05	.20			
Dooh	0-5	---	---	10-18	1.15-1.35	14.00-42.00	0.04-0.06	0.0-2.9	2.0-4.0	.05	.20	5	8	0
	5-10	---	---	18-27	1.35-1.50	4.00-14.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.24			
	10-28	---	---	27-35	1.30-1.50	1.40-4.20	0.07-0.09	0.0-2.9	1.0-2.0	.02	.20			
	28-61	---	---	27-35	1.40-1.55	1.40-4.20	0.07-0.09	0.0-2.9	0.3-0.8	.02	.20			
6878:														
Erastra	0-3	---	---	8-18	1.25-1.45	14.00-42.00	0.04-0.06	0.0-2.9	2.0-3.0	.05	.24	2	8	0
	3-7	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	7-11	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	11-14	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	14-60	---	---	---	---	0.42-1.40	---	---	---	---	---			
Nutval	0-7	---	---	10-15	1.15-1.35	14.00-42.00	0.04-0.06	0.0-2.9	2.0-3.0	.05	.20	5	8	0
	7-23	---	---	18-25	1.30-1.50	4.00-14.00	0.08-0.10	0.0-2.9	1.0-2.0	.05	.17			
	23-60	---	---	18-25	1.40-1.55	4.00-14.00	0.07-0.09	0.0-2.9	0.5-0.8	.10	.20			
	60-70	---	---	---	---	0.01-0.42	---	---	---	---	---			



# Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6878:														
Dotsolot	0-7	---	---	8-18	1.25-1.45	14.00-42.00	0.06-0.09	0.0-2.9	2.0-3.0	.05	.28	2	6	48
	7-10	---	---	18-27	1.35-1.50	4.00-14.00	0.07-0.10	0.0-2.9	0.5-2.0	.10	.32			
	10-19	---	---	18-27	1.35-1.50	4.00-14.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.32			
	19-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6879:														
Erastra	0-3	---	---	8-18	1.25-1.45	14.00-42.00	0.04-0.06	0.0-2.9	2.0-3.0	.05	.24	2	8	0
	3-7	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	7-11	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	11-14	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	14-60	---	---	---	---	0.42-1.40	---	---	---	---	---			
6880:														
Eaglerock	0-2	58-75	8-37	5-18	1.42-1.55	14.00-42.00	0.07-0.09	0.2-1.6	2.0-5.0	.10	.28	3	6	48
	2-5	58-75	8-37	5-18	1.43-1.57	14.00-42.00	0.09-0.12	0.3-1.9	1.0-4.0	.28	.28			
	5-12	30-60	22-50	18-27	1.41-1.55	1.40-4.00	0.08-0.10	0.9-2.3	0.5-2.0	.15	.37			
	12-19	45-75	0-37	18-27	1.45-1.64	1.40-4.00	0.08-0.10	0.9-2.3	0.5-2.0	.10	.32			
	19-31	45-75	0-35	18-27	1.45-1.60	1.40-4.00	0.08-0.10	0.9-2.3	0.5-2.0	.10	.32			
	31-60	---	---	---	---	0.01-0.42	---	---	---	---	---			

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6880:														
Erastra	0-3	60-75	10-32	8-18	1.38-1.60	14.00-42.00	0.04-0.06	0.2-0.7	2.0-3.0	.05	.28	2	8	0
	3-7	52-75	2-30	12-27	1.47-1.60	1.40-4.00	0.06-0.10	0.3-1.4	0.5-2.0	.05	.28			
	7-11	52-75	2-30	12-27	1.47-1.60	1.40-4.00	0.06-0.10	0.3-1.4	0.5-1.0	.05	.28			
	11-14	52-75	2-30	12-27	1.47-1.60	1.40-4.00	0.06-0.10	0.3-1.4	0.5-1.0	.05	.28			
	14-60	---	---	---	---	0.42-1.40	---	---	---	---	---			
6881:														
Leviathan	0-9	---	---	10-18	1.40-1.60	1.40-4.00	0.08-0.10	0.0-2.9	1.0-3.0	.10	.24	5	6	48
	9-44	---	---	27-35	1.40-1.60	1.40-4.00	0.09-0.12	3.0-5.9	0.5-1.0	.10	.20			
	44-65	---	---	27-35	1.40-1.60	1.40-4.00	0.09-0.12	3.0-5.9	0.5-1.0	.05	.20			
Dooh	0-5	---	---	10-18	1.15-1.35	14.00-42.00	0.05-0.07	0.0-2.9	2.0-4.0	.05	.20	5	6	48
	5-10	---	---	18-27	1.35-1.50	4.00-14.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.24			
	10-28	---	---	27-35	1.30-1.50	1.40-4.20	0.07-0.09	0.0-2.9	1.0-2.0	.02	.20			
	28-61	---	---	27-35	1.40-1.55	1.40-4.20	0.07-0.09	0.0-2.9	0.3-0.8	.02	.20			
Delmo	0-3	---	---	10-15	1.30-1.45	14.00-42.00	0.06-0.08	0.0-2.9	1.0-2.0	.10	.28	5	6	48
	3-6	---	---	10-15	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.10	.28			
	6-13	---	---	35-50	1.30-1.45	0.42-1.40	0.06-0.08	3.0-6.0	1.0-2.0	.10	.28			
	13-26	---	---	35-50	1.30-1.45	0.42-1.40	0.06-0.08	3.0-6.0	1.0-2.0	.02	.20			
	26-61	---	---	25-35	1.40-1.60	1.40-4.20	0.06-0.08	0.0-2.9	0.5-1.0	.05	.20			
6883:														
Bullville	0-4	---	---	10-15	1.25-1.45	14.11-42.34	0.04-0.06	0.0-2.9	2.0-3.0	.05	.24	3	6	48
	4-11	---	---	18-25	1.35-1.50	1.41-4.23	0.06-0.08	0.0-2.9	1.0-3.0	.05	.20			
	11-25	---	---	20-25	1.35-1.50	1.41-4.23	0.06-0.08	0.0-2.9	0.5-2.0	.05	.32			
	25-60	---	---	---	---	0.00-0.42	---	---	---	---	---			

# Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6883:														
Delhew	0-4	---	---	10-15	1.30-1.45	14.00-42.00	0.06-0.08	0.0-2.9	1.0-2.0	.10	.20	5	6	48
	4-13	---	---	8-12	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-3.0	.10	.20			
	13-20	---	---	14-18	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.05	.17			
	20-33	---	---	14-18	1.35-1.50	14.00-42.00	0.05-0.07	0.0-2.9	1.0-2.0	.02	.17			
	33-60	---	---	8-12	1.40-1.55	14.00-42.00	0.04-0.06	0.0-2.9	0.5-1.0	.05	.24			
Bakscratch	0-2	---	---	8-12	1.25-1.45	14.00-42.00	0.04-0.06	0.0-2.9	2.0-4.0	.05	.28	2	8	0
	2-7	---	---	8-12	1.25-1.45	14.00-42.00	0.05-0.07	0.0-2.9	1.0-3.0	.15	.32			
	7-18	---	---	12-18	1.30-1.50	14.00-42.00	0.05-0.07	0.0-2.9	0.8-2.0	.05	.28			
	18-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6895:														
Pung	0-2	---	---	20-25	1.20-1.40	4.00-14.00	0.14-0.16	3.0-5.9	1.0-3.0	.15	.32	5	7	38
	2-6	---	---	20-27	1.25-1.45	1.40-4.00	0.14-0.16	3.0-5.9	1.0-3.0	.37	.37			
	6-11	---	---	27-38	1.30-1.45	1.40-4.00	0.17-0.19	3.0-5.9	0.8-2.0	.32	.32			
	11-30	---	---	40-60	1.20-1.40	0.42-1.40	0.14-0.16	6.0-8.9	0.8-2.0	.20	.20			
	30-60	---	---	15-25	1.35-1.55	4.00-14.00	0.12-0.14	3.0-5.9	0.0-0.5	.37	.37			
Chalco	0-5	---	---	10-15	1.20-1.35	4.00-14.00	0.08-0.09	0.0-2.9	1.0-2.0	.20	.49	2	7	38
	5-15	---	---	40-60	1.25-1.45	0.01-0.42	0.12-0.15	6.0-8.9	0.0-0.5	.24	.24			
	15-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Uhaldi	0-2	---	---	20-25	1.35-1.55	4.00-14.00	0.12-0.14	3.0-5.9	1.0-2.0	.17	.37	3	7	38
	2-5	---	---	20-25	1.35-1.55	4.00-14.00	0.12-0.14	3.0-5.9	1.0-2.0	.20	.37			
	5-24	---	---	27-35	1.35-1.55	1.40-4.00	0.16-0.17	3.0-5.9	0.5-2.0	.17	.37			
	24-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6901:														
Calpine	0-21	---	---	5-15	1.40-1.50	14.00-42.00	0.09-0.12	0.0-2.9	3.0-7.0	.17	.17	5	3	86
	21-46	---	---	5-15	1.50-1.65	14.00-42.00	0.10-0.13	0.0-2.9	1.0-2.0	.20	.20			
	46-81	---	---	4-10	1.60-1.70	42.00-141.00	0.05-0.09	0.0-2.9	0.5-1.0	.24	.24			

# Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6902:														
Ackley	0-10	---	---	2-8	1.35-1.50	14.00-42.00	0.08-0.12	0.0-2.9	1.0-2.0	.20	.32	5	5	56
	10-34	---	---	18-27	1.30-1.50	4.00-14.00	0.13-0.16	3.0-5.9	0.5-1.0	.37	.37			
	34-60	---	---	8-15	1.40-1.60	14.00-42.00	0.09-0.12	0.0-2.9	0.0-0.5	.32	.32			
6903:														
Uhaldi	0-2	---	---	20-25	1.35-1.55	4.00-14.00	0.06-0.08	3.0-5.9	1.0-2.0	.15	.37	3	8	0
	2-5	---	---	20-25	1.35-1.55	4.00-14.00	0.12-0.14	3.0-5.9	1.0-2.0	.20	.37			
	5-24	---	---	27-35	1.35-1.55	1.40-4.00	0.16-0.17	3.0-5.9	0.5-2.0	.17	.37			
	24-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Verdico	0-2	---	---	20-25	1.30-1.45	4.00-14.00	0.13-0.14	3.0-5.9	1.0-2.0	.24	.43	3	7	38
	2-29	---	---	45-60	1.25-1.40	0.01-0.42	0.13-0.15	6.0-8.9	0.3-0.8	.24	.24			
	29-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6904:														
Eaglerock	0-2	---	---	10-18	1.30-1.50	14.00-42.00	0.07-0.09	0.0-2.9	3.0-5.0	.10	.20	3	6	48
	2-5	---	---	5-15	1.40-1.50	14.00-42.00	0.09-0.12	0.0-2.9	3.0-5.0	.24	.24			
	5-31	---	---	18-27	1.30-1.50	1.40-4.00	0.08-0.10	0.0-2.9	0.5-2.0	.15	.37			
	31-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
Erastra	0-3	---	---	8-18	1.25-1.45	14.00-42.00	0.04-0.06	0.0-2.9	2.0-3.0	.05	.24	2	8	0
	3-7	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	7-11	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.28			
	11-14	---	---	18-27	1.35-1.50	1.40-4.00	0.07-0.10	0.0-2.9	0.5-2.0	.05	.24			
	14-60	---	---	---	---	0.42-1.40	---	---	---	---	---			
Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---	---	---

## Physical Soil Properties

Douglas County Area, Nevada

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
6915:														
Eastval	0-3	---	---	5-15	1.35-1.55	14.00-42.00	0.08-0.12	0.0-2.9	0.6-2.0	.17	.32	3	5	56
	3-9	---	---	20-35	1.35-1.55	1.40-4.20	0.15-0.18	3.0-5.9	0.5-1.0	.28	.28			
	9-18	---	---	35-50	1.20-1.40	0.42-1.41	0.14-0.16	6.0-8.9	0.5-1.0	.32	.32			
	18-22	---	---	20-35	1.35-1.55	1.40-4.20	0.15-0.18	3.0-5.9	0.5-1.0	.28	.28			
	22-31	---	---	---	---	0.00-0.01	---	---	---	---	---			
	31-61	---	---	5-10	1.50-1.65	42.00-141.00	0.04-0.06	0.0-2.9	0.0-0.5	.05	.15			
6997:														
Waspo	0-6	---	---	45-60	1.15-1.35	0.01-0.42	0.15-0.18	6.0-8.9	0.5-1.0	.24	.24	3	4	86
	6-24	---	---	45-60	1.20-1.40	0.01-0.42	0.15-0.18	6.0-8.9	0.0-0.8	.24	.24			
	24-60	---	---	---	---	0.01-0.42	---	---	---	---	---			
6999:														
Surgem	0-6	---	---	10-15	1.50-1.70	14.00-42.00	0.05-0.07	0.0-2.9	0.8-2.0	.05	.28	2	8	0
	6-24	---	---	35-50	1.35-1.55	0.42-1.40	0.10-0.12	3.0-5.9	0.0-0.8	.05	.28			
	24-34	---	---	---	---	0.42-141.00	---	---	---	---	---			
Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---	---	---

## **APPENDIX B**

NRCS soils mapping reports

## RUSLE2 Related Attributes

Douglas County Area, Nevada

[This report shows only the major soils in each map unit]

Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
152:							
Cagle	50	D	.32	3	35.4	33.6	31.0
Duco	40	D	.32	1	65.4	19.6	15.0
181:							
Chalco	50	D	.43	2	42.1	37.9	20.0
Chalco	35	D	.37	2	67.3	20.2	12.5
321:							
Genoa	70	D	.20	1	67.2	15.3	17.5
Glean	15	A	.20	5	67.4	19.6	13.0
332:							
Glean	50	A	.20	5	67.4	19.6	13.0
Genoa	20	D	.20	1	67.2	15.3	17.5
Rubble land	15	---	---	---	---	---	---
334:							
Glean	45	A	.20	5	67.4	19.6	13.0
Sup	25	B	.37	5	45.6	43.4	11.0
Genoa	15	D	.20	1	67.2	15.3	17.5
482:							
Indian Creek	85	D	.37	2	66.9	20.1	13.0
483:							
Indian Creek	85	D	.49	2	44.0	41.0	15.0
592:							
Minneha	40	D	.17	2	66.2	23.3	10.5
Drit	30	A	.24	5	65.7	23.3	11.0
Rock outcrop	15	---	---	---	---	---	---
973:							
Trid	45	C	.32	3	66.6	23.4	10.0
Drit	25	A	.24	5	65.7	23.3	11.0

## RUSLE2 Related Attributes

Douglas County Area, Nevada

Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
973:							
Duco	15	D	.43	1	44.3	40.7	15.0
6069:							
Cagle	60	D	.32	3	35.0	34.0	31.0
Nosrac	25	C	.28	5	40.0	30.0	30.0
6078:							
Boondock	50	D	.32	1	71.3	16.7	12.0
Chalco	35	D	.37	2	70.9	16.6	12.5
6250:							
Greenbrae	85	C	.32	5	70.0	16.0	14.0
6251:							
Greenbrae	85	C	.32	5	69.6	16.4	14.0
6264:							
Haybourne	85	B	.43	5	45.3	43.2	11.5
6291:							
Holbrook	85	B	.24	5	70.9	16.6	12.5
6302:							
Holbrook	45	B	.20	5	66.3	18.7	15.0
Verdico	40	D	.37	3	33.5	36.5	30.0
6326:							
Indian Creek	90	D	.32	2	68.8	16.2	15.0
6328:							
Indian Creek	85	D	.32	2	67.4	19.6	13.0
6333:							
Indian Creek	90	D	.49	2	45.4	41.6	13.0
6458:							
Mimentor	90	C	.32	5	68.5	21.5	10.0
6459:							
Mimentor	95	C	.32	5	68.5	21.5	10.0
6557:							
Phing	85	C	.28	5	65.9	19.1	15.0



## RUSLE2 Related Attributes

Douglas County Area, Nevada

Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
6558:							
Phing	90	C	.37	5	42.1	37.9	20.0
6572:							
Boondock	55	D	.32	1	71.3	16.7	12.0
Chalco	15	D	.37	2	67.3	20.2	12.5
Chalco	15	D	.43	2	42.1	37.9	20.0
6573:							
Boondock	35	D	.32	1	71.3	16.7	12.0
Chalco	25	D	.43	2	42.1	37.9	20.0
Pula	25	C	.32	5	41.6	37.4	21.0
6580:							
Pung	40	C	.32	5	39.8	37.7	22.5
Phing	25	C	.37	5	42.1	37.9	20.0
Chalco	20	D	.43	2	42.1	37.9	20.0
6602:							
Reno	85	D	.32	2	65.0	25.0	10.0
6646:							
Saralegui	85	A	.10	5	95.5	1.5	3.0
6666:							
Leviathan	45	C	.24	5	66.8	19.2	14.0
Pung	40	C	.32	5	39.8	37.7	22.5
6667:							
Shree	70	C	.28	5	68.8	16.2	15.0
Smocreek	20	C	.49	5	36.5	41.5	22.0
6763:							
Turria	95	C	.37	5	18.1	50.9	31.0
6819:							
Waspo	85	D	.28	3	22.0	28.0	50.0
6875:							
Delhew	40	A	.10	5	84.5	5.5	10.0

## RUSLE2 Related Attributes

Douglas County Area, Nevada

Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
6875:							
Tagum	25	C	.24	3	68.6	19.4	12.0
Bullville	20	C	.24	3	68.3	19.2	12.5
6876:							
Delmo	45	C	.28	5	68.6	19.4	12.0
Dooh	25	C	.20	5	67.1	18.9	14.0
Slatter	15	D	.32	1	68.3	19.7	12.0
6877:							
Delmo	55	C	.24	5	65.6	18.4	16.0
Dooh	35	C	.20	5	67.1	18.9	14.0
6878:							
Erastra	40	D	.24	2	68.1	18.9	13.0
Nutval	30	B	.20	5	68.6	19.4	12.0
Dotsolot	15	D	.28	2	67.9	19.1	13.0
6879:							
Erastra	40	D	.24	2	68.1	18.9	13.0
Dotsolot	30	D	.28	2	67.9	19.1	13.0
Erastra	15	D	.24	2	68.1	18.9	13.0
6880:							
Eaglerock	55	C	.28	3	67.0	23.0	10.0
Erastra	30	D	.28	2	67.0	22.0	11.0
6881:							
Leviathan	40	C	.24	5	66.8	19.2	14.0
Dooh	30	C	.20	5	67.1	18.9	14.0
Delmo	20	C	.28	5	68.6	19.4	12.0
6883:							
Bullville	35	C	.24	3	68.3	19.2	12.5
Delhew	30	A	.20	5	68.6	19.4	12.0

## RUSLE2 Related Attributes

Douglas County Area, Nevada

Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
6883:							
Bakscratch	20	D	.28	2	67.8	22.2	10.0
6895:							
Pung	45	C	.32	5	39.8	37.7	22.5
Chalco	25	D	.49	2	45.7	41.8	12.5
Uhaldi	15	C	.37	3	39.8	37.7	22.5
6901:							
Calpine	90	A	.17	5	67.8	22.2	10.0
6902:							
Ackley	95	B	.32	5	65.6	29.4	5.0
6903:							
Uhaldi	45	C	.37	3	39.8	37.7	22.5
Verdico	40	D	.43	3	39.8	37.7	22.5
6904:							
Eaglerock	45	C	.20	3	66.8	19.2	14.0
Erastra	25	D	.24	2	68.1	18.9	13.0
Rock outcrop	15	---	---	---	---	---	---
6915:							
Eastval	90	D	.32	3	66.9	23.1	10.0
6997:							
Waspo	95	D	.24	3	18.2	29.3	52.5
6999:							
Surgem	80	D	.28	2	67.9	19.6	12.5
Rock outcrop	10	---	---	---	---	---	---

## **APPENDIX C**

CA Group Design Plans and Report



# Buckeye Creek Retention Basin Design Summary And Life-Cycle Cost Analysis

June 26, 2023

Prepared For:

JE Fuller Hydrology & Geomorphology  
8400 S Kyrene Road, Suite 201  
Tempe, AZ 85284

Prepared By:



CA Group  
8630 Technology Way, Suite C  
Reno, NV 89521

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## Appendix

- Cost Estimate
- Maintenance Cost Estimate
- Conceptual Plans



**6/26/2023**

## Introduction

JE Fuller (JEF) has been under contract with the Carson Water Subconservancy District to evaluate alternatives to reduce 100-Year flooding on Buckeye Creek, in Douglas County. The most promising alternative is to provide a retention basin adjacent to Buckeye Creek, on the east side of Coyote Road near Grandview Parkway (shown in Figures 1 and 2 below). CA Group is supporting JEF by providing the preliminary plans and life cycle cost analysis (LCCA) to support the design. This report summarizes the preliminary design efforts, cost estimates, and the life-cycle cost analysis.

Figure 1 – Vicinity Map

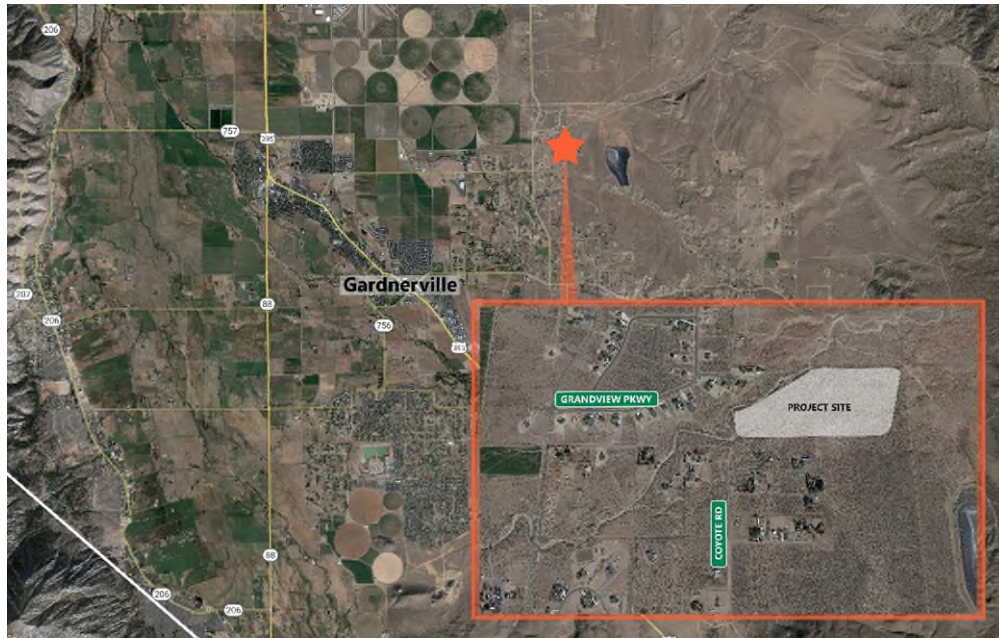


Figure 2 – Location Map



## Preliminary Design

JEF has developed a concept to divert the higher flood flows from Buckeye Creek into an adjacent retention basin by constructing a concrete channel for a portion of the creek with a side-channel spillway into the retention basin (See Conceptual Plans in the Appendix). The spillway width and elevation were designed to allow most of the flows to enter the basin, and only low flows continue down Buckeye Creek. The peak 100-Year flow for Buckeye Creek is 3,766 cfs. After the spillway structure, approximately 800 cfs will continue down the creek in an earthen channel (see plans in the appendix). Velocities in the earthen channel are approximately five feet per second.

A side-channel spillway is proposed on the south side of Buckeye Creek that will direct a large amount of flood flows into the retention basin (see plans in the appendix). The basin excavation was graded to maximize the available area and keep the retention basin as shallow as possible. The basin was graded over a surface area of approximately 34 acres and on average is approximately 44 feet deep.

The area upstream of the concrete lined channel is proposed to be graded to quickly warp back to the existing channel in an effort to limit the project within the single parcel. It would be preferable to obtain a temporary or permanent easement upstream and provide a smoother transition back to the natural channel. It would also be preferable to place riprap upstream of the concrete channel to prevent any channel migration or erosion in this area.

The side-channel spillway will direct approximately 3,000 cfs into the basin over a 44-foot drop. A United States Bureau of Reclamation Type IX baffled chute spillway is proposed to safely convey the flows to the bottom of the basin.

The basin is designed to accommodate the 100-Year flood event with a minimum of one foot of freeboard. An area at the west edge of the retention basin has been graded to provide an emergency spillway should flows exceed the retention basin capacity. The maintenance road here has also been improved with a concrete section to provide additional erosion protection.

The retention basin will also encroach into an existing natural watercourse, Juniper Road Wash, along the south end of the basin. This wash will be re-aligned in an earthen channel around the south edge of the basin. The 100-year peak flow is estimated to be 211 cfs, and velocities in the channel are less than four feet per second and are not erosive.

A maintenance road is provided around the basin's perimeter, as well as a graded road to provide access to the bottom of the basin.

Sediment monitors are proposed at each end of the basin to reference the original basin floor elevation. The design of the side-channel spillway will convey the heavier bed load sediment downstream, however, a significant suspended sediment load may enter the basin over the weir. As this accumulates, maintenance staff/inspectors can easily identify the amount of sediment accumulated and where to restore the basin floor.



JEF has completed sediment calculations and have determined, on average, approximately eight acre-feet of sediment could be generated from the watershed annually. Assuming the entire sediment load will be collected in the retention basin is conservative in that the majority of the bed load and some of the suspended load will be conveyed in the channel section and bypass the retention basin. However, for this conceptual level, the entire sediment load is assumed to be collected.

All disturbed areas, except for the maintenance road, concrete structures, and the basin floor are proposed to be seeded to minimize erosion.

## Preliminary Cost Estimates

A preliminary cost estimate was prepared for the conceptual design and is estimated to be 43 million dollars. A cost estimate breakdown of items is included in the Appendix. The cost estimate does not include any land acquisition costs.

## Life Cycle Cost Analysis

A 20-year LCCA was completed for the preliminary concept.

Maintenance activities were estimated to be required every five years on average. These costs were averaged to a yearly cost and are shown in **Table 1** (see O&M cost estimate in appendix). Inspection of the facility should be performed after every flooding event, and appropriate maintenance and sediment removal performed as necessary.

**Table 1 – Yearly Maintenance Costs**

Item	Yearly Cost (\$)
Channel maintenance – vegetation and debris removal	2,400
Retention basin slope maintenance – seeding, reshaping	1,200
Sediment Removal and Disposal	90,370
Maintenance Road resurfacing	1,200
Fencing repairs	280
<b>Total</b>	<b>95,450</b>

All project and maintenance costs were projected out for a 20-Year life cycle cost. Present Value of discounted life-cycle costs (in 2023 dollars) were estimated for the anticipated years in service from the years 2025 to 2044. A 7% real discount rate was used to quantify annual

costs and convert those costs to a Net Present Value (NPV). There are no items that were considered to have a salvage value. Table 2 presents the 20-Year life cycle cost.

**Table 2 – 20-Year Life Cycle Cost Analysis**

Item	Cost (\$)
Construction Costs	43,000,000
20-Year O&M*	1,062,000
Salvage Value	0
Total Cost	44,062,000

\* Net Present Value

# Appendix

# Cost Estimate

Buckeye Creek					
Construction Cost Estimate					
Item No.	Item Description	Quantity	Unit	Unit Price	Total Price
107.01	Traffic Control	1	LS	\$ 5,000.00	\$5,000
200.01	Mobilization	1	LS	\$ 100,000.00	\$100,000
200.03	Contractor Construction Survey	1	LS	\$ 30,000.00	\$30,000
201.01	Clearing and Grubbing	85	AC	\$ 2,100.00	\$178,500
211.01	Seeding	52	AC	\$ 1,500.00	\$78,000
302.04	Type 2 Aggregate Base (maintenance road around basin)	2,350	CY	\$ 47.00	\$110,450
302.04	Type 2 Aggregate Base (maintenance access ramp)	200	CY	\$ 47.00	\$9,400
302.04	Type 2 Aggregate Base (under Buckeye concrete section)	265	CY	\$ 47.00	\$12,455
302.04	Type 2 Aggregate Base (under Type IX Baffled Chute)	730	CY	\$ 47.00	\$34,310
303.01	Channel Excavation (Buckeye Creek)	50,000	CY	\$ 9.00	\$450,000
303.01	Channel Excavation (Juniper Road Wash)	28,000	CY	\$ 9.00	\$252,000
	Retention Basin Excavation	3,740,000	CY	\$ 7.00	\$26,180,000
	8' Chain Link	6,460	IF	\$ 6.00	\$38,760
327.02	14' Wide Missouri Gate	1	EA	\$ 1,000.00	\$1,000
	Concrete (Buckeye Creek)	265	CY	\$ 600.00	\$159,000
	Concrete (Type IX Baffled Chute)	1,680	CY	\$ 1,000.00	\$1,680,000
	Sediment monitors	2	EA	\$ 2,000.00	\$4,000
637.01	Dust Control	1	LS	\$ 3,000.00	\$3,000
637.02	NPDES Discharge Permit	1	LS	\$ 3,400.00	\$3,400
				Construction Cost	\$29,329,275
				Contingency (30%)	\$8,798,783
				Design Costs (10%)	\$2,932,928
				Construction Engineering (7%)	\$2,053,049
				<b>Total Cost</b>	<b>\$43,114,034</b>
All unit costs are estimated from local contractor bid summaries and bid proposals					

# Maintenance Cost Estimate

## Buckeye Creek Retention Operations and Maintenance Costs

	Recurrence (years)	Man/equipment Hours	unit	Cost/unit	Total	Avg/year
Channel maintenance – vegetation and debris removal	5	80	hours	\$150	\$12,000	\$2,400
Retention basin slope maintenance – seeding, reshaping	5	40	hours	\$150	\$6,000	\$1,200
Sediment Removal	1	12910	cubic yards	\$7	\$90,370	\$90,370
Maintenance Road resurfacing	5	40	hours	\$150	\$6,000	\$1,200
Fencing repairs	5	20	hours	\$70	\$1,400	\$280
Total						\$95,450

Maintenance hours include equipment and operator

Sediment removal assumes 8 acre feet of sediment annually

All unit costs are estimated from local contractor bid summaries and bid proposals

# Conceptual Plans

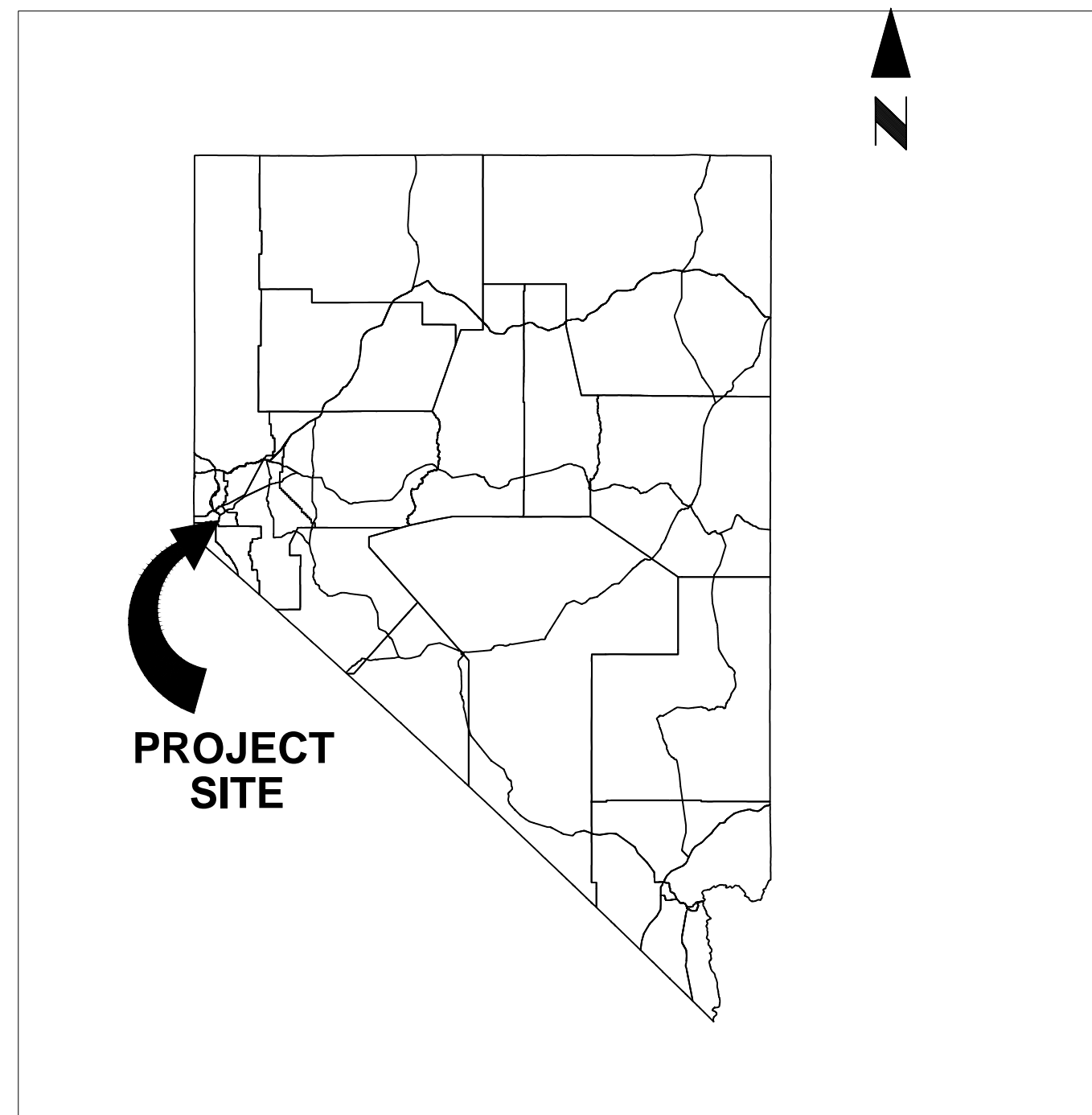


# DOUGLAS COUNTY BUCKEYE CREEK RETENTION BASIN

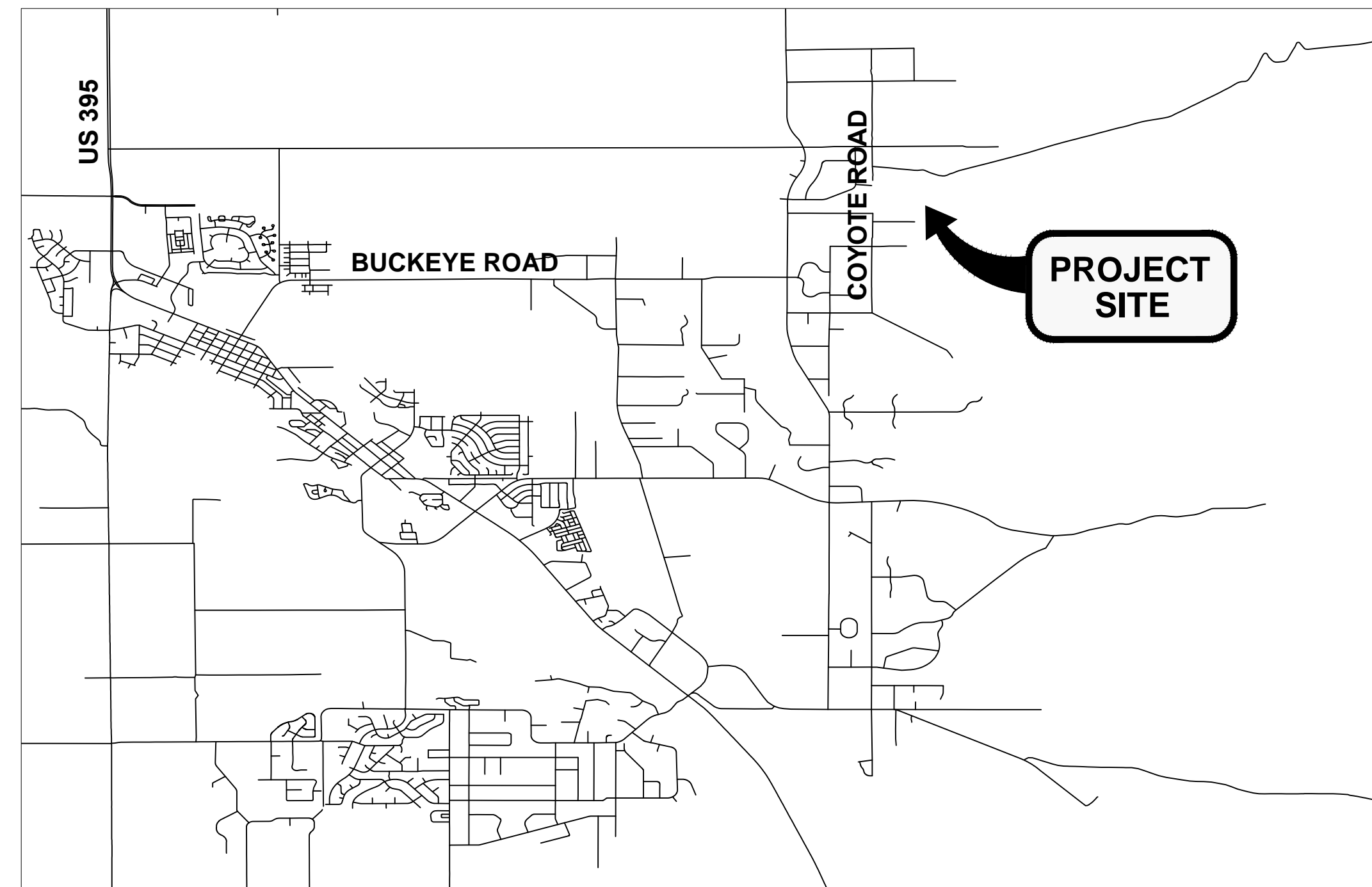
An Employee Owned Company  
**CA Group, Inc**  
8630 TECHNOLOGY WAY, SUITE C  
RENO, NV 89521  
PHONE: 775-393-2040

MAY 2023

LOCATION MAP



VICINITY MAP



OWNER/DEVELOPER:  
DOUGLAS COUNTY  
ATT:  
1594 ESMERALDA AVE.  
P.O.BOX 218  
MINDEN, NV 89502

CIVIL ENGINEER:



8630 TECHNOLOGY WAY, SUITE C  
RENO, NEVADA 89521  
PH: 775-393-2040

SHEET OF INDEX:

<u>SHEET NUMBER</u>	<u>SHEET TITLE</u>
T1	TITLE
P1	PLAN VIEW
B1	BUCKEYE CREEK CHANNEL/PROFILE
J1	JUNIPER ROAD WASH CHANNEL/PROFILE
D1	DETAIL SHEET



Know what's below.  
**Call before you dig.**

REGIONAL TRANSPORTATION COMMISSION OF WASHOE COUNTY  
**BUCKEYE CREEK RETENTION BASIN**  
TITLE SHEET  
DOUGLAS COUNTY NEVADA

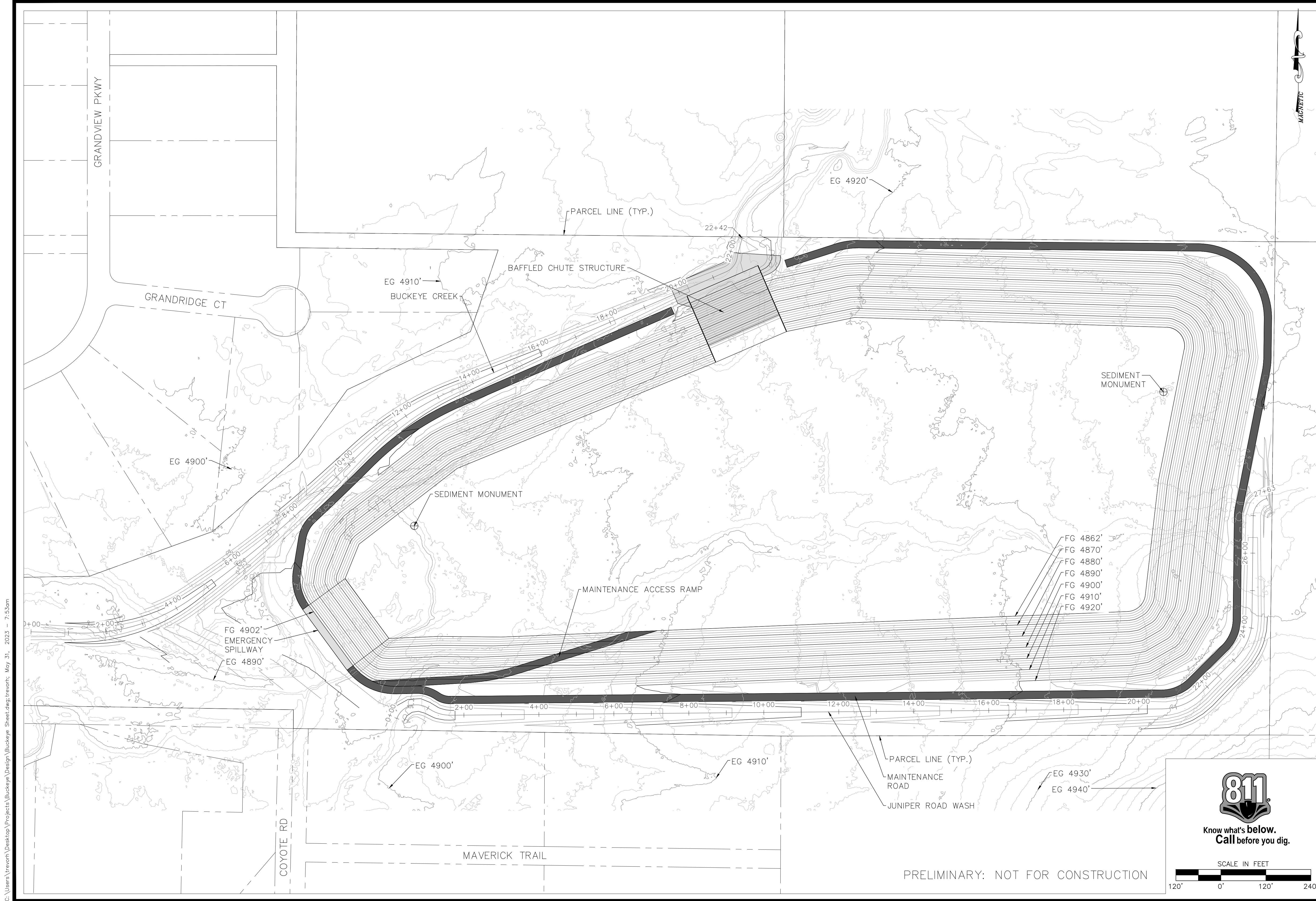
REVISIONS	DESCRIPTION	DATE	BY
NO.			

SCALE: AS SHOWN  
DESIGN: JEF  
DRAWN: TH  
CHECKED: PF  
APPROVED: CA  
DATE: MAY 2023

PRELIMINARY: NOT FOR CONSTRUCTION

SHEET T1  
OF 5

H:\0280 (Buckeye Creek Mitigation) sub to J.E. Fuller\Preliminary Report\Plans\Title Sheet.dwg; Trevor; May 31, 2023 -- 7:53am



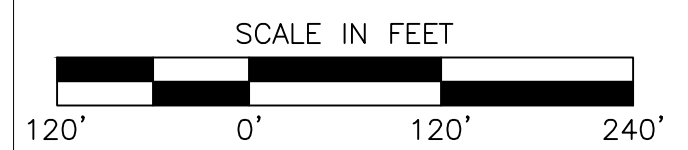
NO.	REVISIONS DESCRIPTION	DATE	BY

SCALE: AS SHOWN  
 DESIGN: JEF  
 DRAWN: TH  
 CHECKED: PF  
 APPROVED: CA  
 DATE: MAY 2023

**SHEET P1**  
**OF 5**

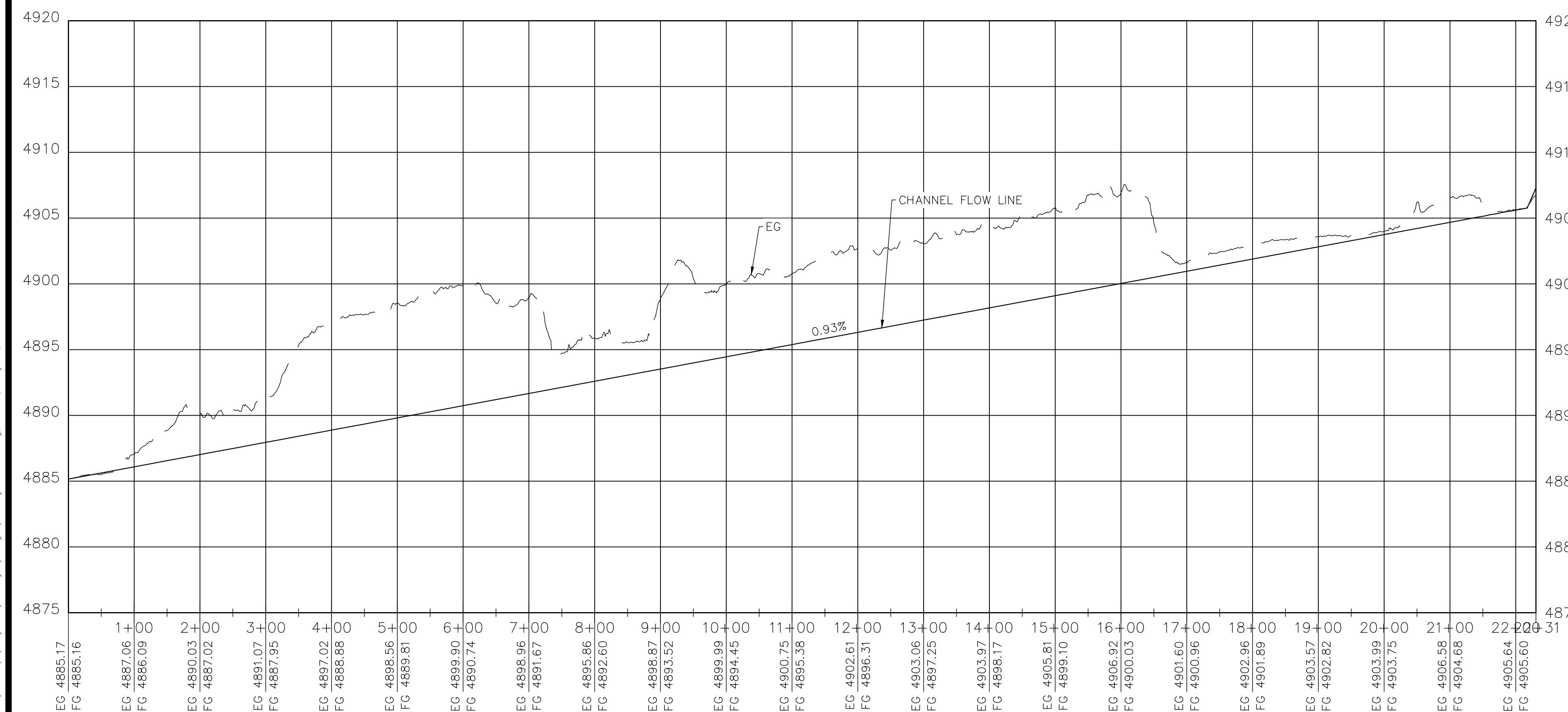
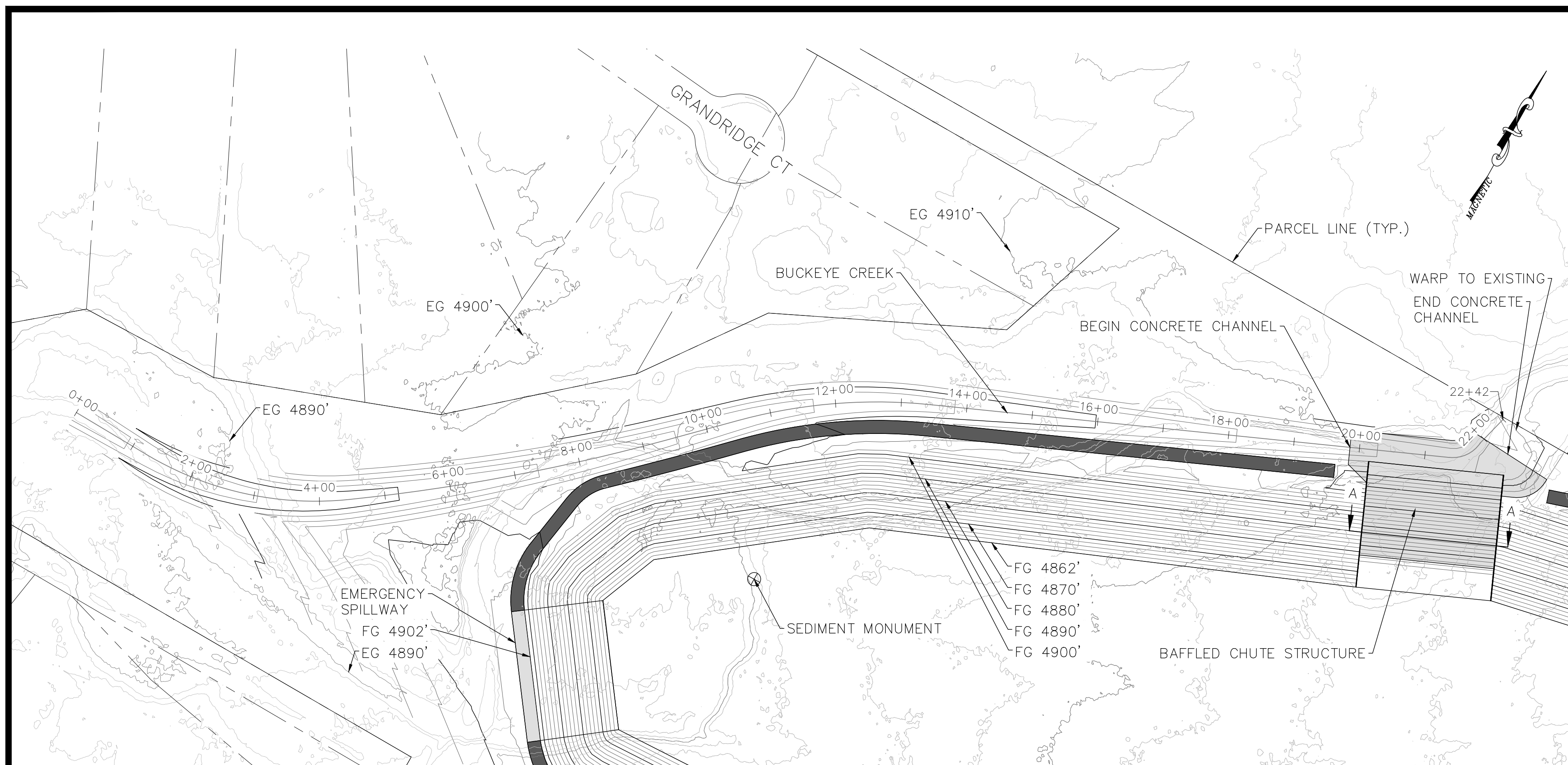


Know what's below.  
 Call before you dig.

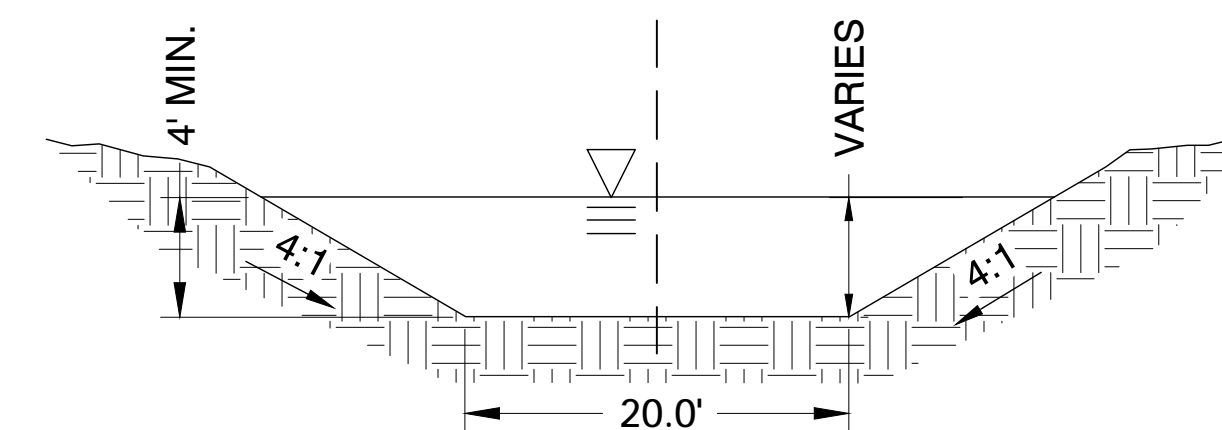


PRELIMINARY: NOT FOR CONSTRUCTION

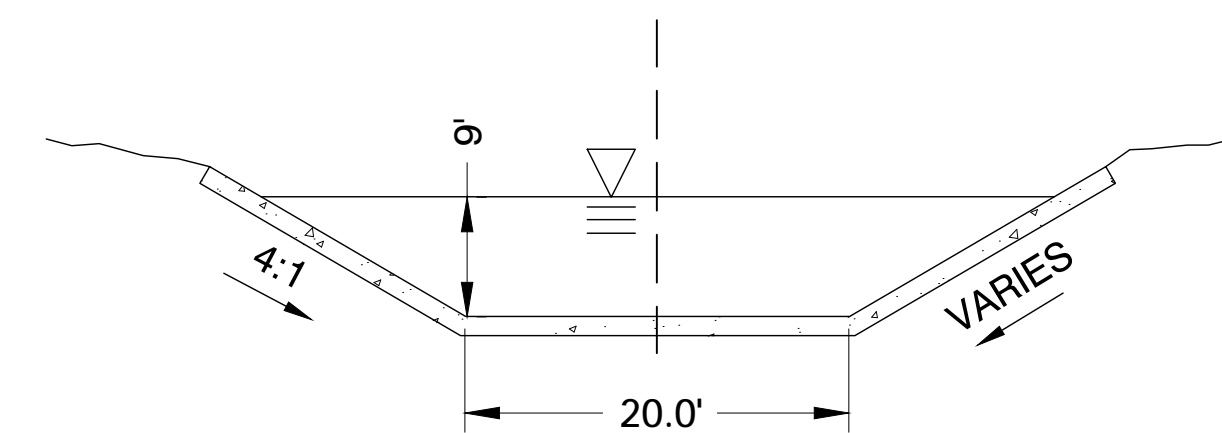
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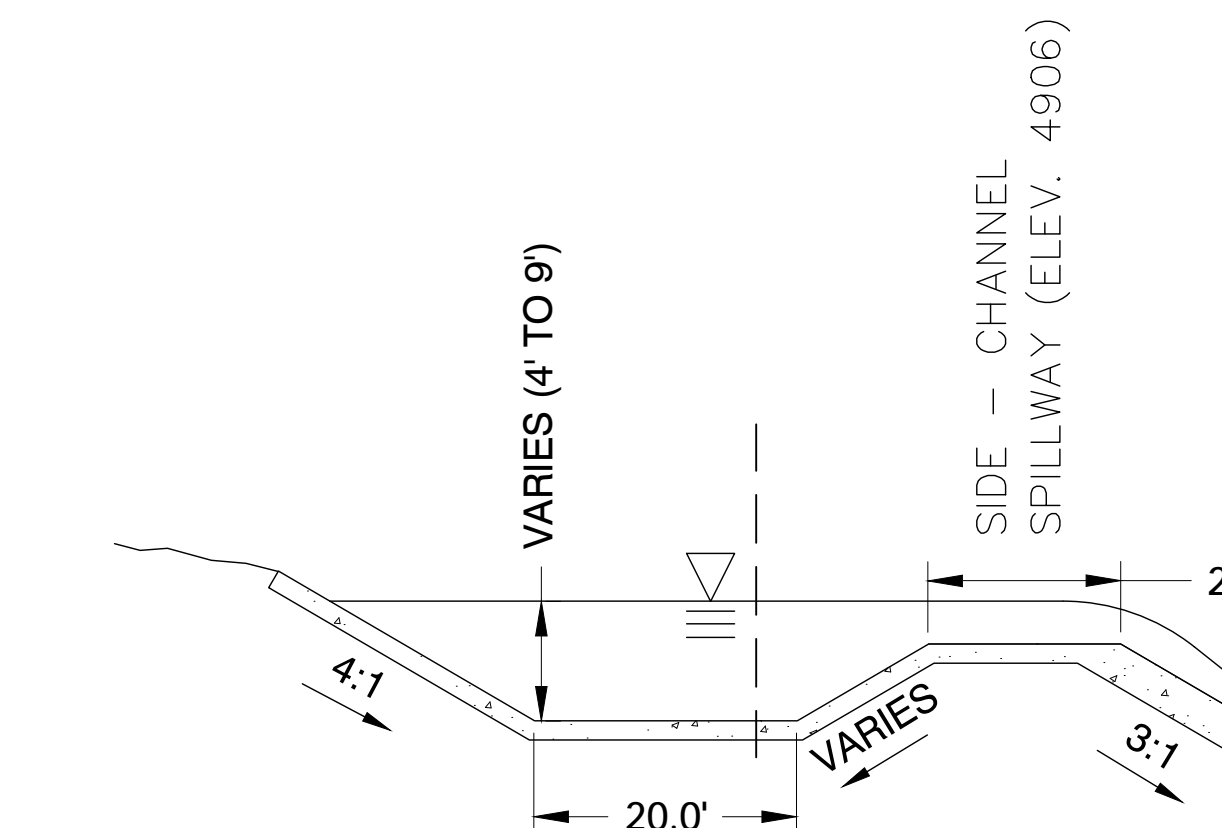
BUCKEYE CREEK PROFILE  
SCALE HORIZ: 1"=120' VERT: 1"=20'



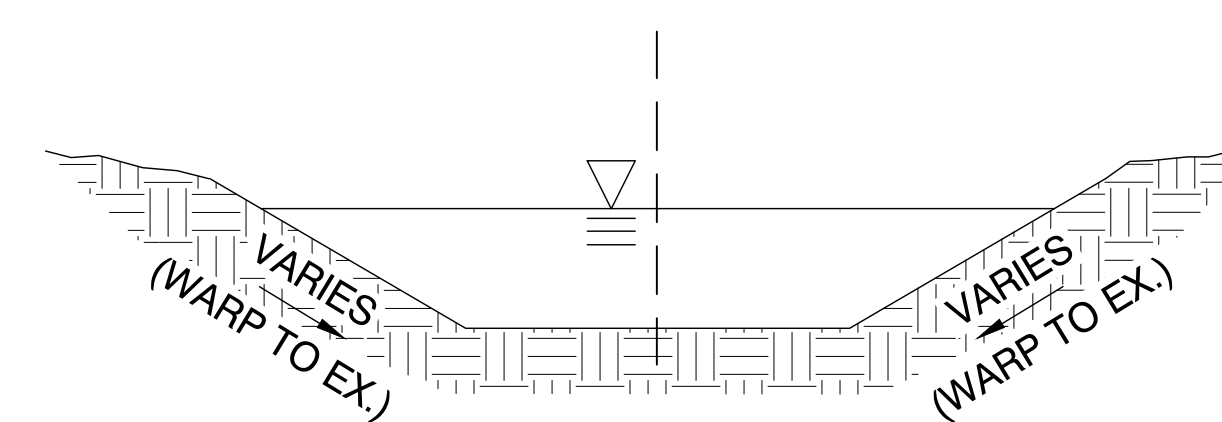
STA 0+00 TO 19+75



STA 19+75 TO 20+16  
STA 21+81 TO 22+00



STA 20+16 TO 21+81



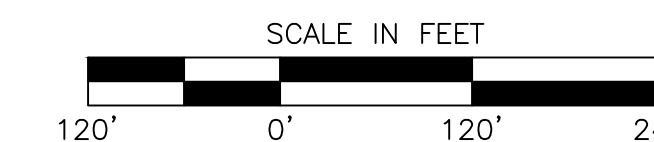
STA 22+00 TO 22+42

TYPICAL SECTIONS  
BUCKEYE CREEK



Know what's below.  
Call before you dig.

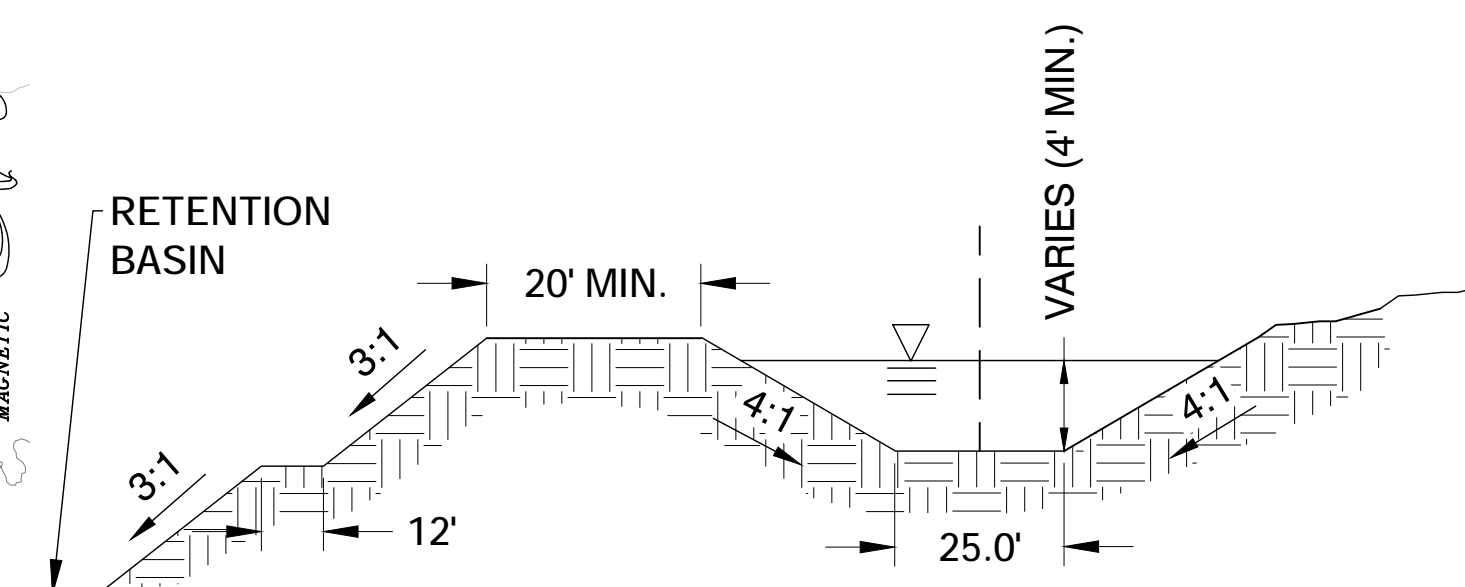
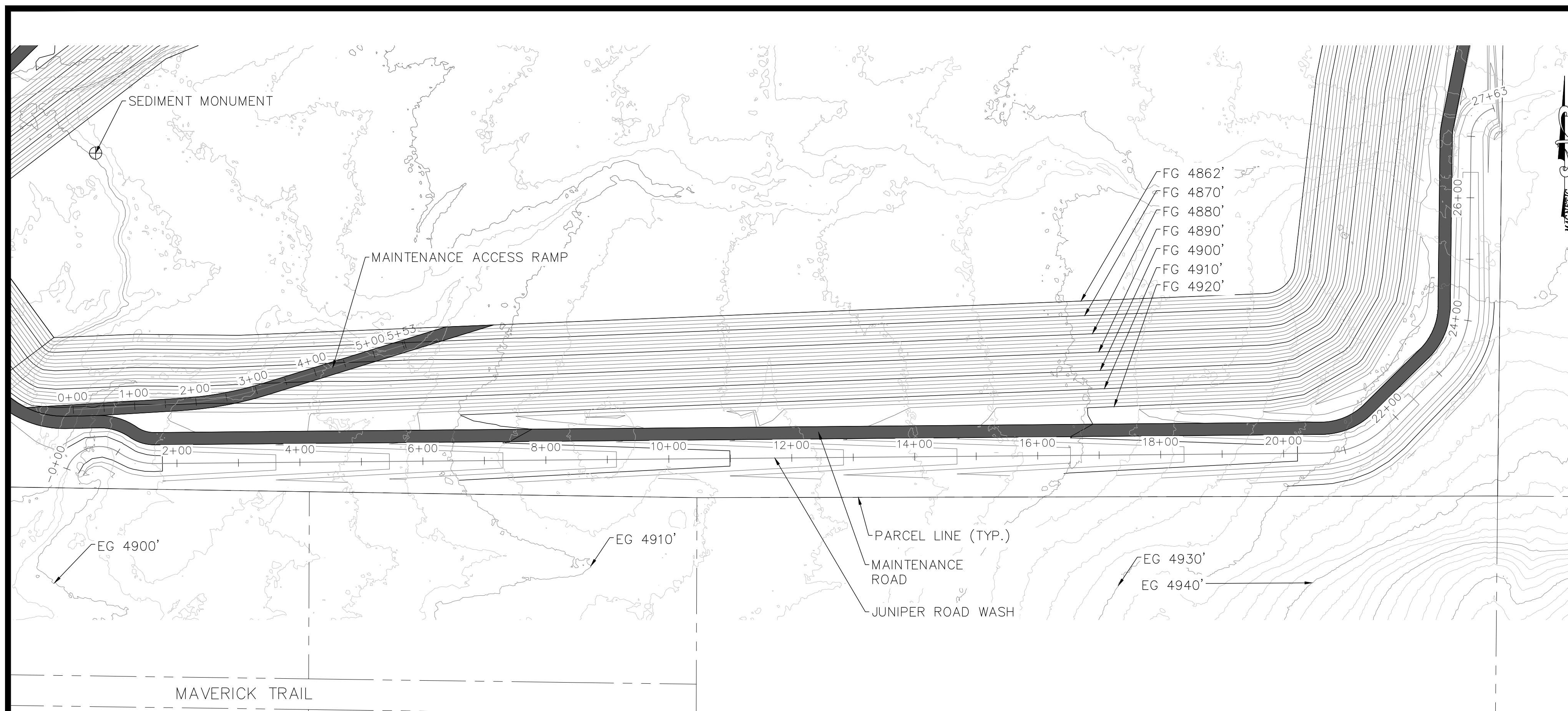
PRELIMINARY: NOT FOR CONSTRUCTION



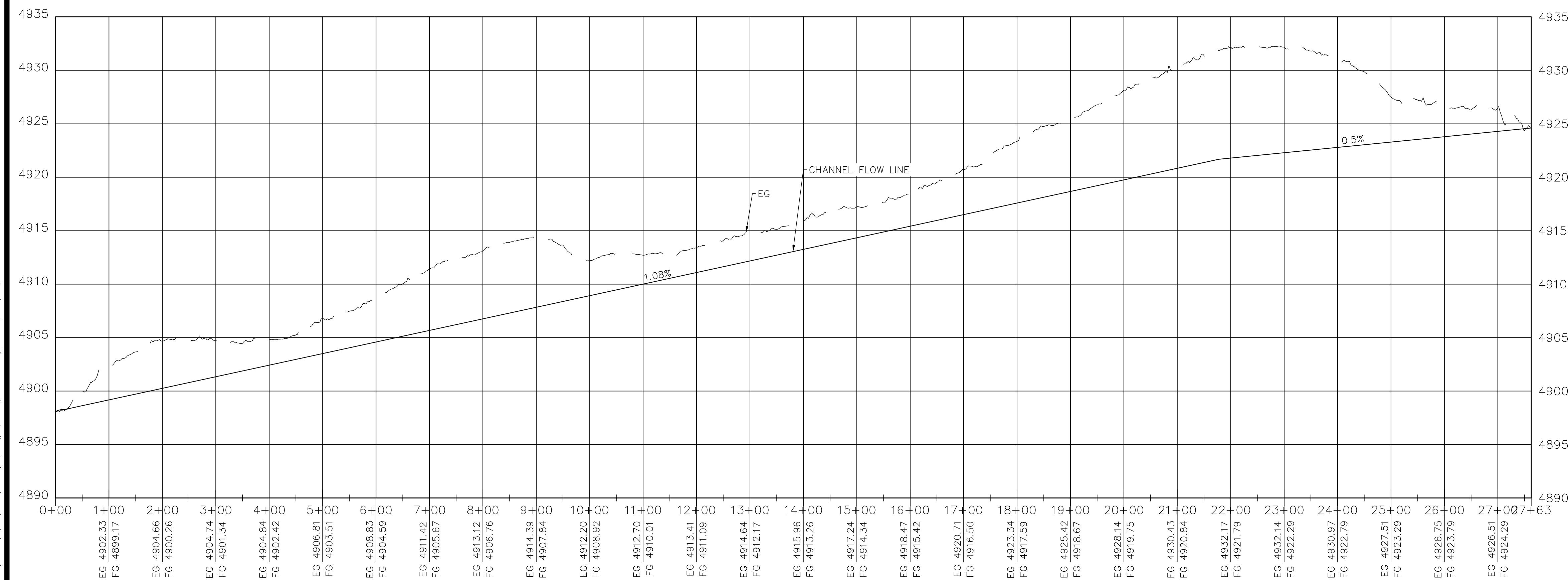
NO.	REVISIONS DESCRIPTION	DATE	BY

SCALE: AS SHOWN  
DESIGN: JEF  
DRAWN: TH  
CHECKED: PF  
APPROVED: CA  
DATE: MAY 2023

SHEET **B1**  
OF **5**

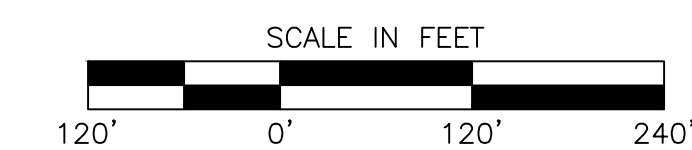


STA 0+00 TO 27+63  
TYPICAL SECTION  
JUNIPER ROAD WASH



JUNIPER ROAD WASH PROFILE  
SCALE HORIZ: 1"=120' VERT: 1"=20'

PRELIMINARY: NOT FOR CONSTRUCTION



Know what's below.  
Call before you dig.

REGIONAL TRANSPORTATION COMMISSION OF WASHOE COUNTY

BUCKEYE CREEK RETENTION BASIN

JUNIPER WASH ROAD / PROFILE

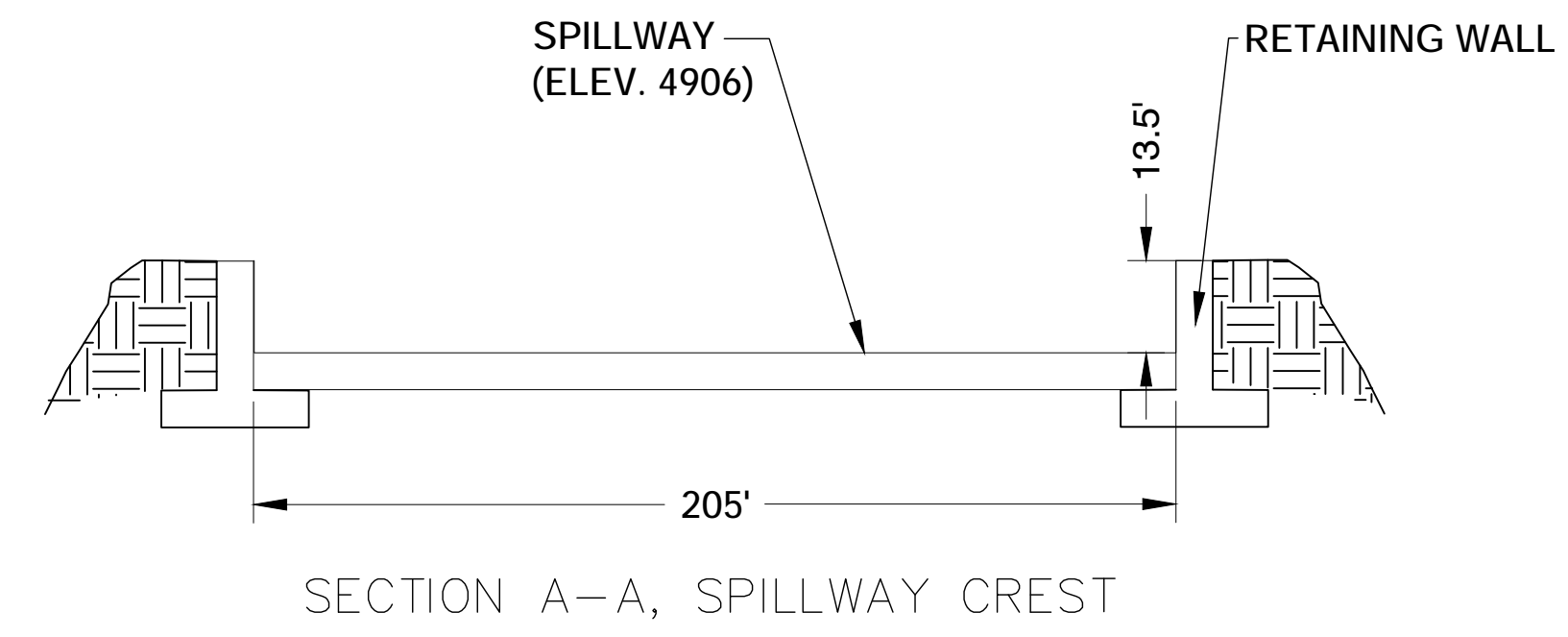
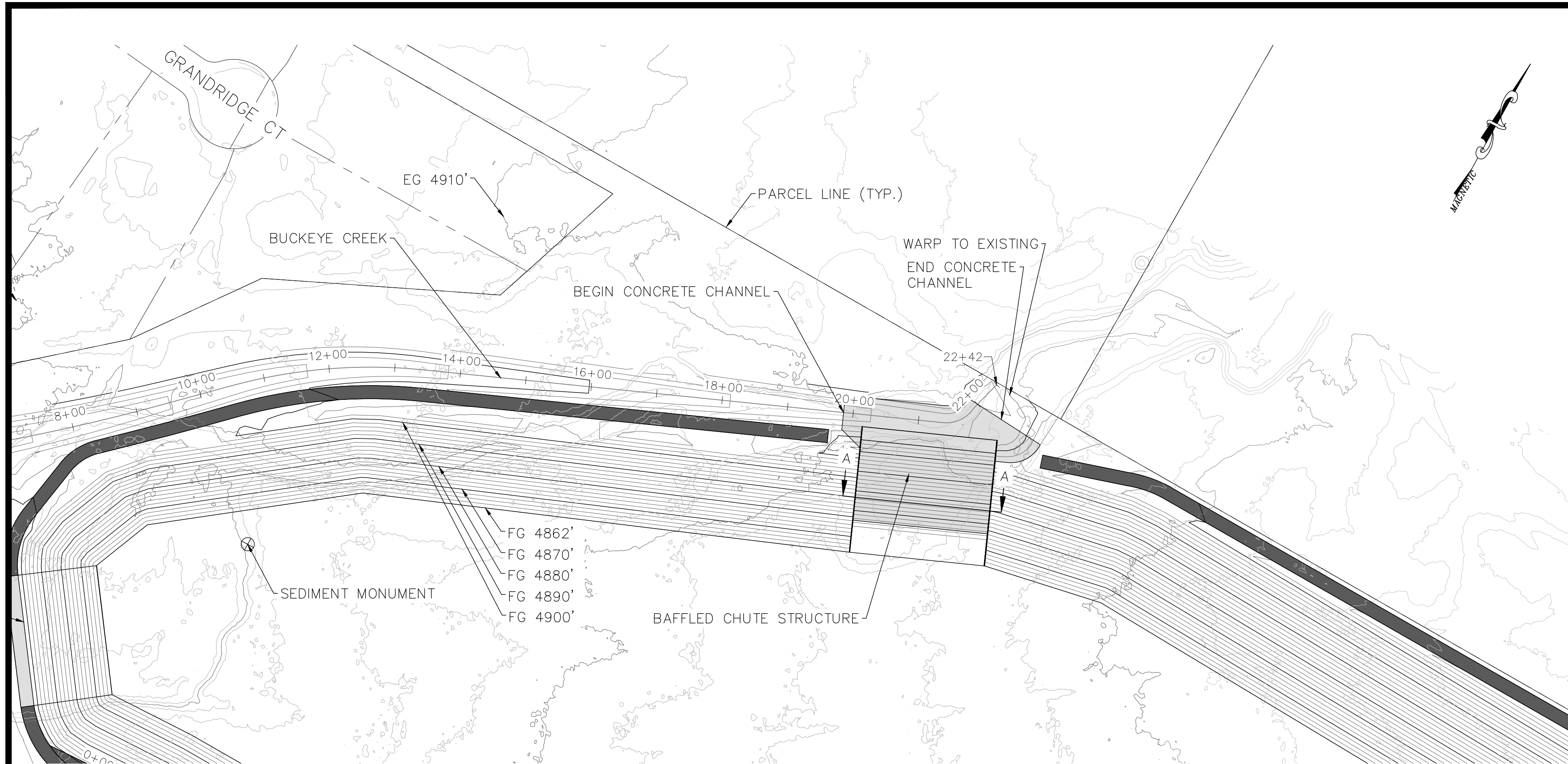
DOUGLAS COUNTY NEVADA

NO.	REVISIONS DESCRIPTION	DATE	BY

SCALE: AS SHOWN  
DESIGN: JEF  
DRAWN: TH  
CHECKED: PF  
APPROVED: CA  
DATE: MAY 2023

SHEET **J1**  
OF **5**

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An Employee Owned Company  
**CA Group, Inc**  
8630 TECHNOLOGY WAY, SUITE C  
RENO, NV 89521  
PHONE: 775-393-2040

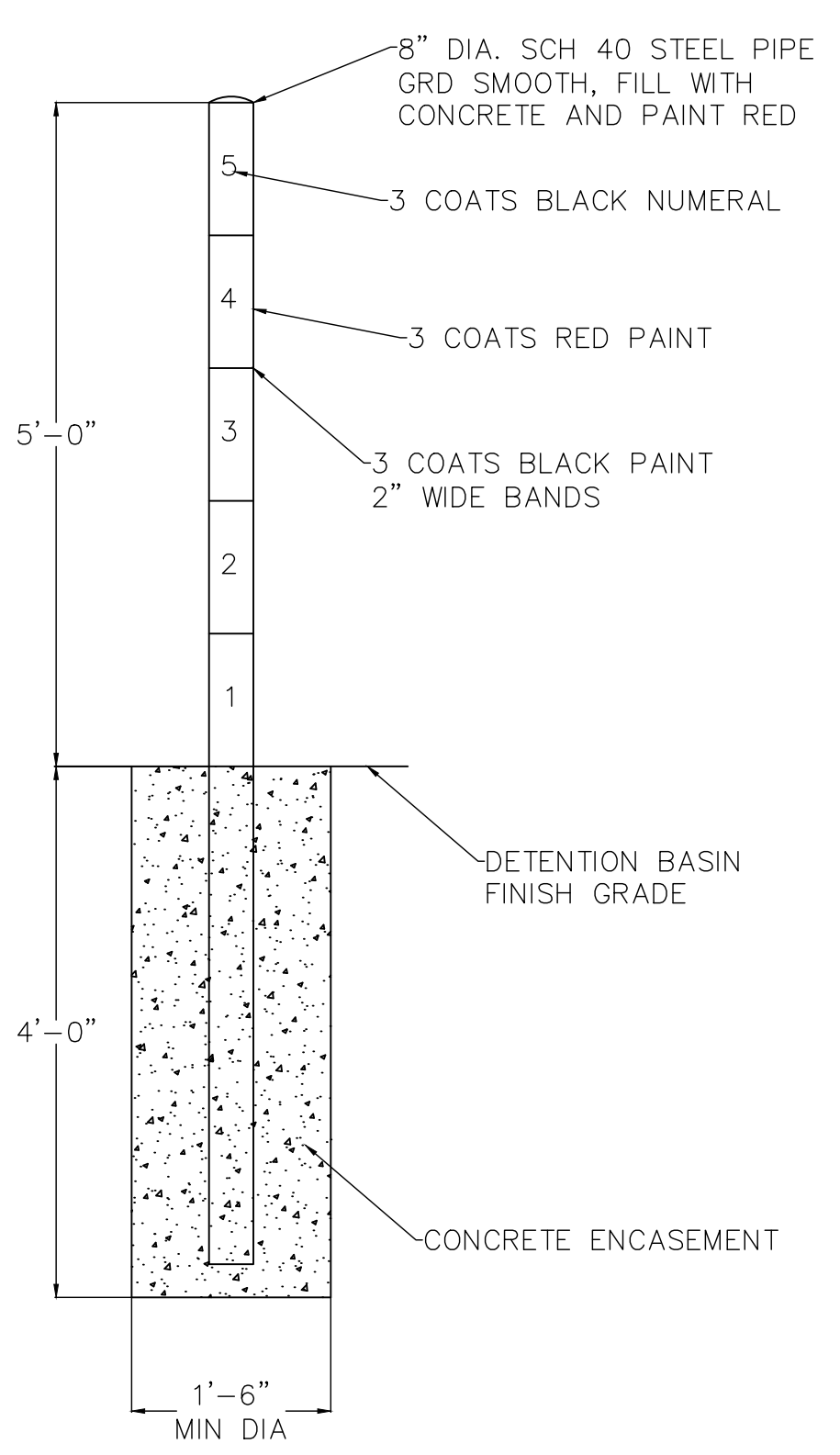
MAY 2023

REGIONAL TRANSPORTATION COMMISSION OF WASHOE COUNTY  
**BUCKEYE CREEK RETENTION BASIN**  
DETAIL SHEET  
DOUGLAS COUNTY NEVADA

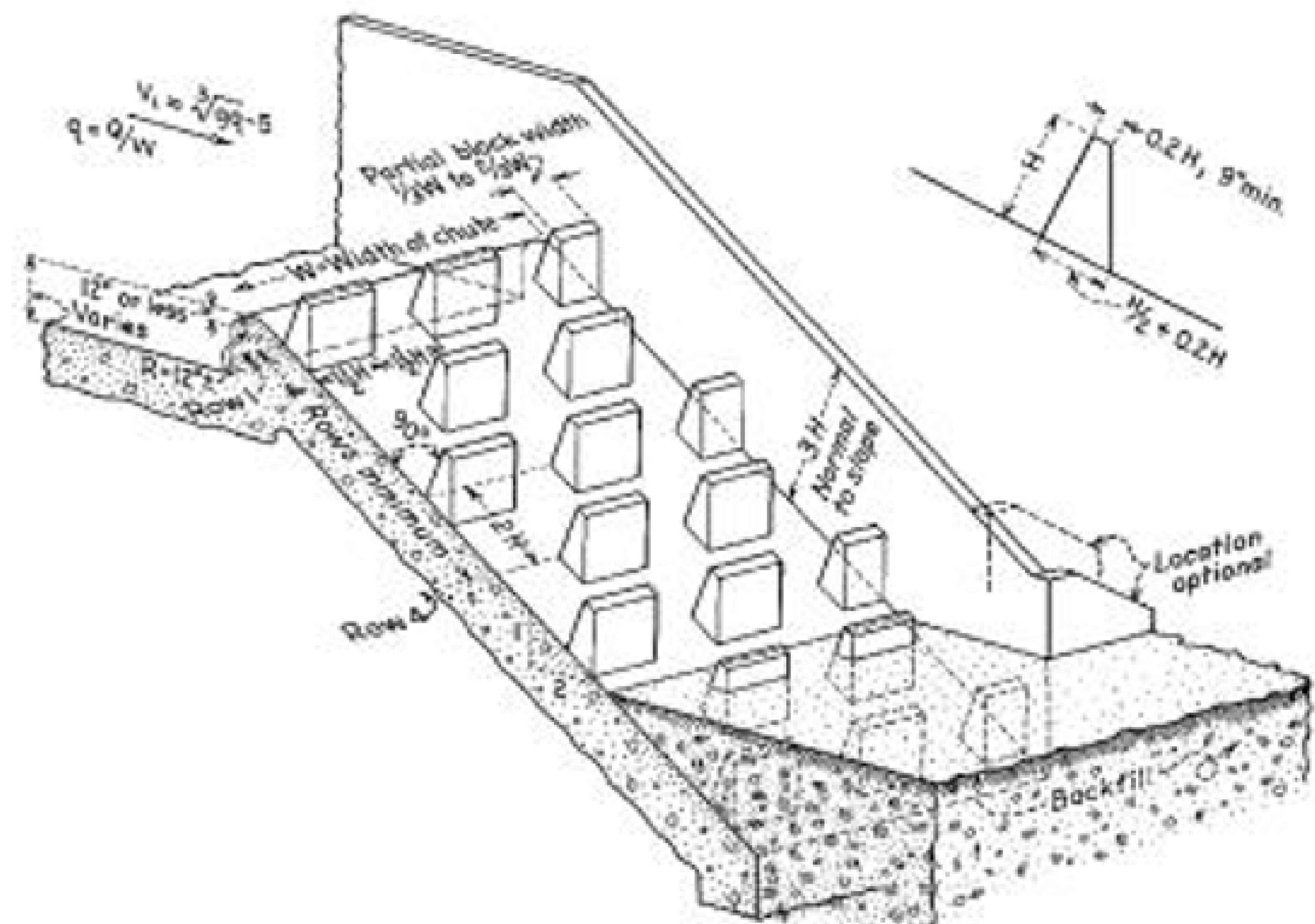
NO.	REVISIONS DESCRIPTION	DATE	BY

SCALE: AS SHOWN  
DESIGN: JEF  
DRAWN: TH  
CHECKED: PF  
APPROVED: CA  
DATE: MAY 2023

SHEET **D1**  
OF **5**



SEDIMENT DEPTH MARKER  
SCALE: NTS



BAFFLED CHUTE STRUCTURE  
SCALE: NTS

PRELIMINARY: NOT FOR CONSTRUCTION

**811**  
Know what's below.  
Call before you dig.  
SCALE IN FEET  
120' 0' 120' 240'

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