



AGENDA
CITY OF GLENWOOD SPRINGS
Planning and Zoning Commission
Regular Meeting
DECEMBER 17, 2019
Council Chambers, First Floor
101 W. 8TH STREET
6:00 PM

- 1 Roll Call
- 2 Receipt of the Minutes
 - A. October 22, 2019 Meeting Minutes
 - B. November 26, 2019 Meeting Minutes
- 3 Comments from citizens appearing for items not on the agenda
- 4 Continued Items
 - A. A. 20-19-Consideration of a Code Amendment to Section 070.040.020(d)(24) of the Glenwood Springs Municipal Code regarding riparian setbacks. ITEM WILL BE CONTINUED TO JANUARY 28, 2020.
- 5 New Items
 - A. Planning Item #39-19, Roaring Fork Transportation Authority Location and Extent Review, 2307 Wulfsohn Road
 - B. Planning Item #38-19, ANB Bank Site/Architectural Plan Review, 910 Grand Avenue
- 6 Commissioner Comments
- 7 Director Comments
- 8 Adjournment



MINUTES
City of Glenwood Springs
Planning and Zoning Commission
Regular Meeting
October 22, 2019
Council Chambers, First Floor, City Hall
101 W. 8th Street
6:00PM

1. Roll Call

Present at roll call were Commissioners: George Shaver, Sumner Schachter, Tim Malloy, Marco Dehm

Absent: Ingrid Wussow, Amber Wissing, Kathryn Grosscup, and Alternates Carolyn Cipperly and Dean Kinkel

Also present were: Gretchen Ricehill, Assist. Director
Karl Hanlon, City Attorney
Anna S. Itenberg, City Attorney's Office
Kathleen Michel, Admin. Assistant

2. Receipt of [minutes](#) from the [September 24, 2019](#) regular meeting. On motion of Commissioner Malloy, seconded by Commissioner Schachter, the minutes were approved as written. Motion carried by voice vote.

3. Comments from citizens appearing for items not on the agenda. No one appeared.

4. Continued Items

20-19 – Consideration of a Code Amendment to Section 070.040.020(d)(24) of the Glenwood Springs Municipal Code regarding riparian setbacks

The Commission unanimously voted to continue the item to the November 26, 2019 meeting. Commissioner Shaver recused himself.

5. New Items

Work Session – Conceptual Review of ANB Bank-910 Grand Avenue-an approximately 10,000 square foot commercial building in the M2-Mixed Use Central Core Zoning District.

In attendance representing ANB Bank: Blake Mourer, Chad Lee, Patricia Pogge, Randy Diers, and Will Coffield. Chad Lee, attorney Balcomb and Green, reviewed the project to date. Architect Blake Mourer provided a powerpoint of the original and revised design previously reviewed by the Planning and Zoning Commission and City Council. Mr. Mourer showed the Commission proposed building elevations based on comments heard during the September 19, 2019 Council meeting.

The Commission and the ANB team discussed elements of the conceptual design including:

- Revisions to the primary Grand Avenue entrance and the secondary south entrance;
- Treatment of the northwest corner of the building;
- Cornice design elements;
- Materials and colors; and
- Landscaping and pedestrian access.

6. Commissioner Comments

The Commission discussed airport and confluence planning with City Attorney Karl Hanlon.

7. Director Comments: None.

8. Adjournment



MINUTES
City of Glenwood Springs
Planning and Zoning Commission
Regular Meeting
November 26, 2019
Council Chambers, First Floor, City Hall
101 W. 8th Street
6:00 PM

1. Roll Call

Present at roll call were Commissioners: Ingrid Wussow, George Shaver, Tim Malloy, Amber Wissing, and Carolyn Cipperly

Absent: Commissioners Marco Dehm, Kathryn Grosscup and Sumner Schachter, and Alternate Dean Kinkel

Also present were: Jenn Ooton, Asst. City Manager, Director Gretchen Ricehill, Assist. Director Anna S. Itenberg, City Attorney's Office

Commissioner Malloy made a motion to seat Alternate Commissioner Cipperly, which was seconded by Commissioner Shaver. The motion passed unanimously.

Alternate Commissioner Cipperly made a motion that Commissioner Wussow serve as the alternate chair in the absence of Commissioners Dehm and Schachter. The motion was seconded by Commissioner Malloy, and was unanimously approved.

2. Receipt of [minutes](#) from the [October 22, 2019](#) regular meeting was postponed until the December 17, 2019 meeting.

3. Comments from citizens appearing for items not on the agenda. No one appeared.

4. Continued Items

Commissioner Malloy made a motion to continue Planning Item 20-19 – Consideration of a Code amendment to Section 070.040.020(d)(24) of the Glenwood Springs Municipal Code regarding riparian setbacks to the December 17, 2019 meeting. The motion was seconded by Alternate Commissioner Cipperly. Commissioner Shaver recused himself

from the vote, which passed with three commissioners voting for the motion and no one voting no.

5. New Items

Asst. Director Ricehill provided information on background of application by Yesenia Gonzalez Hernandez for the operation of a personal care boarding home at 1713 Grand Avenue. Ricehill described the proposed project and existing conditions as well as explaining which upgrades and improvements the property would need as well as additional approvals from the State of Colorado.

Commissioner Malloy stated that he lives in the neighborhood of the proposed project and expressed concerns regarding parking, trash collection access, building permit procedure, and licensing process with the State of Colorado.

Commissioner Shaver asked about backing out of the parking spaces onto Grand Avenue. Shaver also expressed concern regarding first floor egress. Shaver also asked about the existing covenant's definition of a residence and about signage. One of the conditions for approval by staff was that the property have no signage.

Commissioner Wussow sought to clarify the exact maximum occupancy for the personal care boarding home. Ricehill explained that there would typically be 1 employee on site and that the City and State would both regulate the number of residents by the number of bedrooms on site. Commissioner Wussow Also asked about the possibility of a sunset provision on the special use permit and if there were other personal care boarding homes in Glenwood. Ricehill explained that there is currently one other personal care boarding home in Glenwood Springs.

Applicant Yesenia Gonzalez Hernandez explained her reasoning for wanting to develop the project and answered questions from commissioners regarding the project and proposed functions of the personal boarding care home. Ms. Hernandez explained the differences in levels of care and what her home would provide to its residents.

Some concerns expressed by commissioners include use of oxygen on site, proposed location of bedrooms in the basement, egress windows, traffic on Grand Avenue and its effect on resident safety, and clarifying the differences between levels of personal care.

Commissioner Wussow opened the public hearing.

Nancy Hitchcock, 1126 Pitkin Avenue, voiced her support for the application noting that there is a great need for this type of care in the community. She said that Ms. Hernandez had provided home care to her mother and that Ms. Hernandez has a passion for helping people.

Rick Davis, 11512 Highway 133, Carbondale, voiced support for more care facilities in Glenwood Springs and this project. Mr. Davis said that Ms. Hernandez has provided home care for his wife who has dementia and that Ms. Hernandez was very qualified.

Jennifer Vyhldal, 1709 Grand Avenue, said that she supports Ms. Hernandez' dream, but expressed concern that the application seemed like a business in a single-family

residence. She stated that she wants to keep the character of the neighborhood, also explained that a tree and fence on the property line would need to be addressed.

Dennis Drake, the owner of 105 Park, noted that he has a father in the VA hospital and complimented the care at the facility. He expressed concerns about the safety of this proposals, concerns about its impact to the neighborhood and about egress from the house for potential residents.

Joyce Jenkins, 340 13th Street, stated that she was a friend of Ms. Hernandez. Voiced her opinion that although there might be six persons living there, the house would physically remain the same and although a business, would still function as a residence.

Terrie Drake, 0377 Westbank and the owner of 105 Park, noted that this neighborhood has been seeing investment and that she and her husband were planning to improve their property at 105 Park, which had recently been a rental. She noted concerns about the commercial use of the property changing the neighbor and noted concerns about the property values. She asked the Planning Commission to consider that one change begets another. She noted that Ms. Hernandez is an incredible person but expressed concern about this use in this location.

In response to public comments, Ms. Hernandez spoke about working on the fence between her property and 1709 Grand Avenue and her experience working with dementia patients. In addition, questions were asked by commissioners regarding potential financing for the project. Commissioner Wussow asked for a timeline, if permit was granted. Ms. Hernandez estimated one to three years, depending on state process.

Discussion following public hearing provided more clarification on setting a sunset provision for the use of the property. Conditions could be placed on the permit such as being non-transferable or to expire with the sale of the property.

Commissioner Malloy made a motion to deny the application. Motion was seconded by Commissioner Shaver. Further discussion touched on incompatibility with neighboring uses, traffic concerns on Grand Avenue, trash collection, and concerns over administration of the facility. Following discussion, a call for a vote was made for the motion made by Malloy to deny the application. Commissioners Shaver, Malloy, Wussow, and Wissing voted yes on the motion to deny the application. Commissioner Cipperly voted no on the motion. The motion passed 4-1 to deny the application.

6. Commissioner Comments

There was discussion about future meetings regarding housing meetings and the December meeting.

7. Director Comments. Assistant City Manager/Community Development Director Jenn Ooton did not provide additional comment.

8. Adjournment



Planning and Zoning Commission Report

Date: December 17, 2019
 To: Planning and Zoning Commission
 From: Trent L. Hyatt, Senior Planner
 Subject: #39-19– Roaring Fork Transportation Authority Phase II

REQUEST	Consideration of a Location and Extent Review application for the construction of a 6,775 square foot addition to the existing 15,565 square foot maintenance facility, additional vehicle storage/circulation, retaining walls, and other site improvements.
APPLICANT	Eric Rolle, P.E./Shrewsberry
OWNER	Roaring Fork Transportation Authority
LOCATION	2307 Wulfsohn Road (PIN: 2185-053-36-002)
ZONE	Light Industrial (I1)
SURROUNDING LAND USES	North: Midland Avenue and Wulfsohn Road Rights-of-Way South: COGS Municipal Operations Center West: Vacant/BLM East: RFTA West Glenwood Park and Ride
LOT SIZE	Approximately 5.14 acres

ACTION ITEM

Per Section 070.060.050(a)/Table 060.2 of the *Glenwood Springs Municipal Code* (Code), the Planning and Zoning Commission (Commission) is the reviewing body for Location and Extent Review applications for public or quasi-public special districts for compliance with the *Glenwood Springs Comprehensive Plan* (Comp Plan). Following any approval (with or without conditions) of a Location and Extent Review, the applicant must still submit and receive approval of a grading and building applications from the City.

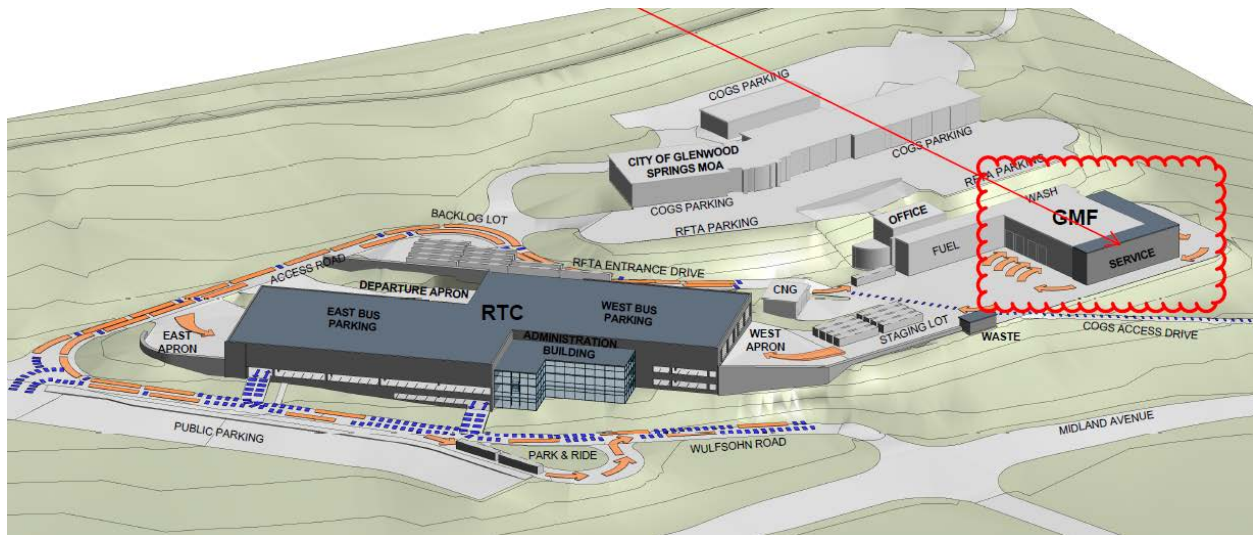
Action 1 - Location and Extent Review - allowing the construction of a 6,775 square foot addition to the existing 15,565 square foot maintenance facility, additional vehicle storage/circulation, retaining walls, and other site improvements.

Staff recommendation: Staff recommends **approval (with conditions)** of the Location and Extent Review application with the findings and conditions on page 7.

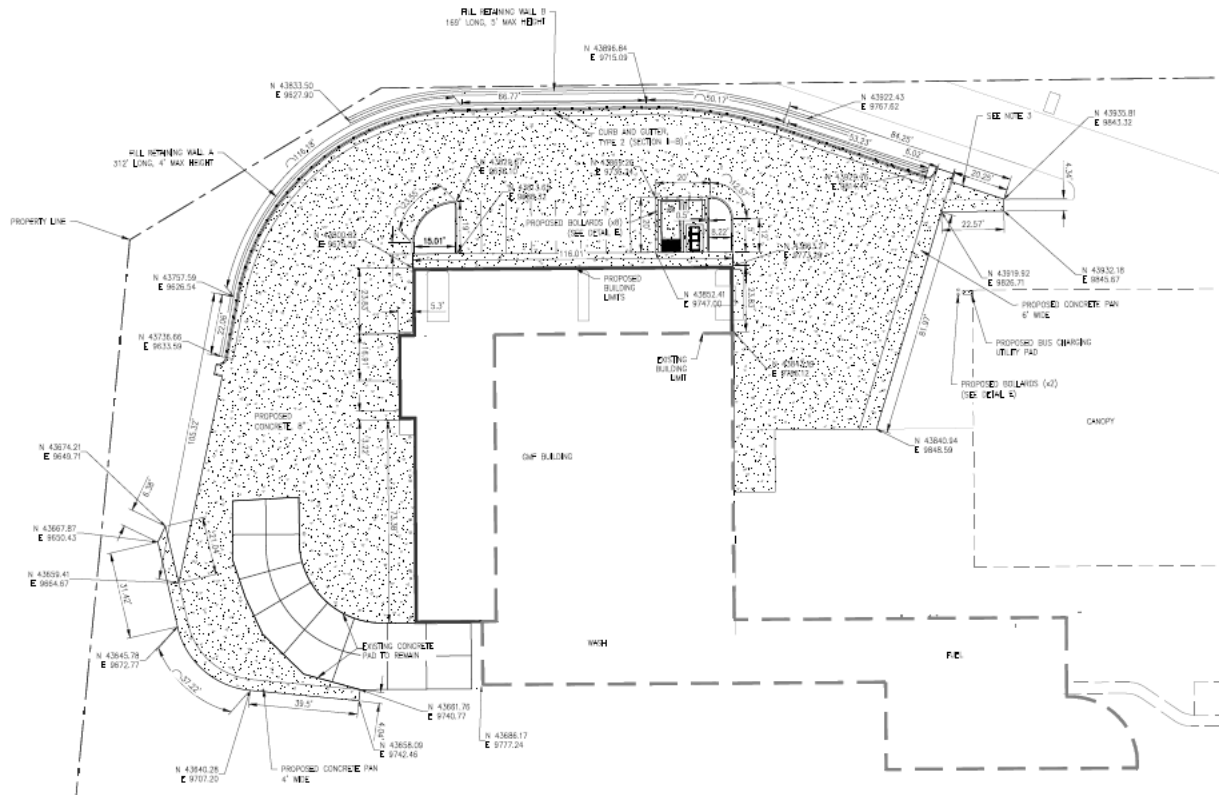
BACKGROUND/ANALYSIS

Proposal

The Roaring Fork Transportation Authority (RFTA) is in the process of implementing a 10 phase Regional Transit Center improvements plan for their facilities in Glenwood Springs. These improvements are generalized in perspective view below. As outlined in the "Description of Proposed Project" section of the attached submittal, the organization currently proposes Phase 2 of the project which focuses on an expansion of the Glenwood Maintenance Facility (GMF), whereas, Phase 1 included the construction of additional bus parking on the adjacent lot along Wulfsohn Road. Said project was reviewed by the Planning and Zoning Commission in March 2016 and completed in Fall 2017. RFTA expects to address additional phases (office renovations, a new administrative building, circulation improvements, housing, etc.) as funding allows.



Shrewsberry, on behalf of RFTA, proposes Phase 2 includes a 6,775 square foot addition to an existing 15,565 square foot maintenance facility by expanding the building footprint to the north and west of the site. Construction includes the addition of two new bus bays and an interior remodel of existing space. A new mezzanine level will accommodate office space, work stations, and conference rooms. The site is located at 2307 Wulfshon Road in the I1 zone district, where a transit terminal and station are a use by right. The attached plan set includes a site plan (a portion of which is shown below), floor plans, elevations, landscaping plan, grading and utilities plans for your review.



Development Standards

Article 070.040 of the Glenwood Springs Municipal Code (Code) outlines the development standards applicable to developments within the City. Specific areas of interest are addressed in more detail below.

Sensitive Area Protection 070.040.020

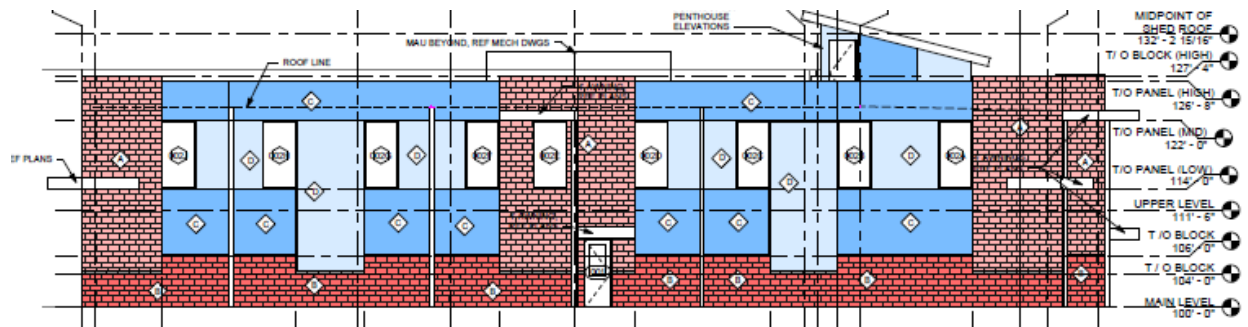
As per the "Geologic Hazards of the Glenwood Springs Metropolitan Area" maps, the subject property is subject to severe rockfall and hydrocompaction as well as moderate ancient debris flow, mudflow, and landflow deposits. The combination of said hazards, most of which result from the Eagle Valley evaporite soils at the site, would generally limit development. While the maps provide a general understanding of hazards that may impact development, a site specific "Geotechnical Evaluation" was prepared by Ground Engineering. Some mitigation measures have already been constructed for the site, namely a debris basin located above it. Still numerous additional recommendations related to building foundation, retaining wall design, and site grading activities are outlined in the site-specific geotechnical study which the applicant should adhere to.

Landscaping 070.040.040

Expansion of parking/circulation areas at the site require landscaping improvements per the Code. However, the presence of the geologic hazards outlined above make irrigation and introducing water to site soils a very risky proposition. Therefore, the applicant is only proposing limited landscaping improvements in areas that will not impact the built environment as depicted on the landscaping plan provided.

Nonresidential and Design Standards (070.040.090)

The proposed design of the addition is consistent with the existing building onsite. During our review, staff identified areas where the proposed building design is not in compliance with the applicable standards for the number of architectural elements required along each elevation. While the design does not meet the strict interpretation of the Code in terms of requiring three elements every 30 feet, the applicant revised the design to increase variations in material colors and also added projecting awnings. However, staff recommends glazing, previously provided, is replaced on proposed bus bay doors as depicted on buildings sections included in the submittal. A change in roof line is provided but not by the minimum two feet outlined in the Code. Therefore, staff recommends RFT increase the height of the roof variations provided.

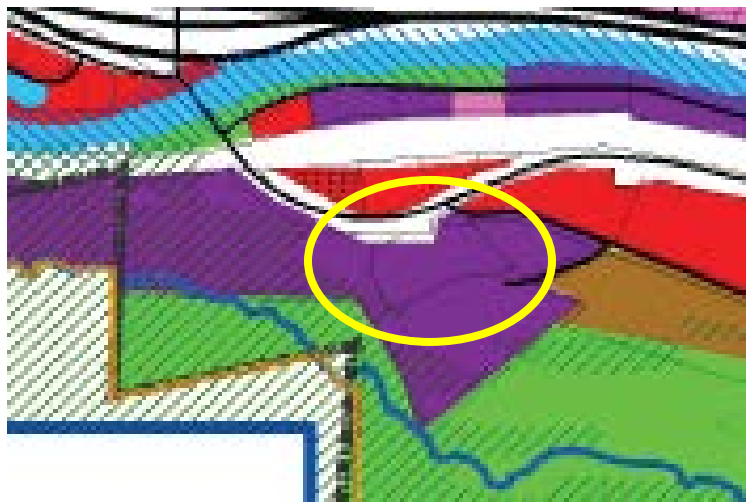


Location and Extent Review Criteria

The Location and Extent review criteria are outlined in Section 070.060.050(d)(3)e.3 of the Code and are outlined in bold italics below.

- i. Is consistent with the Comprehensive Plan and other City plans and policies;

As shown below, Map 2.1 (Future Land Use) of the Glenwood Springs Comprehensive Plan (Comp Plan) identifies the area as "Industrial" in purple. Chapter Two of the Comp Plan explains that the "Industrial" designation...accommodates heavy commercial, light industrial, and industrial uses such as manufacturing, warehousing and distributing, indoor and outdoor storage." Transit centers/bus maintenance facilities and the proposed improvements are in compliance with the designation.



Numerous community goals and related objectives and strategies outlined in the Executive Summary and subsequent chapters of the Comp Plan support this proposal. These goals are outlined in the following table.

<u>Comprehensive Plan Goal Supported</u>	<u>Objective and Strategies</u>
Promote long-term, sustainable, diverse, economic development	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Attract diverse businesses and industries (Chapter 4, Page 50) -Maintain the role as regional center (Chapter 4, Page 54) -Retain role as a regional center (Chapter 7, Page 83)
Staff Comment: While the specific proposal and/or use may not be diverse, transit plays an integral role in promoting a sustainable economy. The objectives/strategies outlined above are supported by the current application and aid in attracting diverse businesses and maintaining/retaining our regional center.	
Maintain Glenwood Springs as the regional tourism, retail, commercial, and governmental center of Garfield County	-Attract diverse businesses and industries (Chapter 4, Page 50) -Retain the long-standing tourist market (Chapter 4, Page 54) -Build on role as a regional medical and education center (Chapter 4, Page 54) -Maintain the role as regional center (Chapter 4, Page 54) -Retain role as a governmental center (Chapter 4, 56)
Staff Comment: Expanding RFTA's transit capabilities is necessary to maintain and enhance the City's status as the regional center of Garfield County. The objectives/strategies outlined above are supported by the current proposal as it aids in attracting diverse businesses, supporting tourism, and governmental services.	
Direct development to locations and building forms that are cost effective to serve	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Direct growth to areas where utilities and services can be provided efficiently (Chapter 7, Page 82) -Retain role as a regional center (Chapter 7, Page 83) -Direct growth inward (Chapter 9, Page 102)
Staff Comment: Phase II improvements are a continuation of RFTA's plans to develop the site into a regional transit center. Improvements already exist at site which are served by City's utilities which makes future improvements more cost effective. The objectives/strategies support the Comp Plan goal.	
Address transportation and provide multiple convenient travel choices	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Enhance pedestrian-friendliness while facilitating traffic (Chapter 3, Page 36)

	-Encourage reduction of single-occupant vehicles and encourage alternate travel modes through land use planning and community design (Chapter 5, Page 66) -Strengthen transit and plan for transit hubs (Chapter 5, Page 66)
Staff Comment: RFTA's current proposal and future phases are a direct response to this Comp Plan goal and the objectives/strategies outlined to achieve it.	
Support social diversity	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Require good design for mixed-use and higher density projects (Chapter 6, Page 78) -Direct growth inward (Chapter 9, Page 102) -Retain role as a regional center (Chapter 7, Page 83) -Direct growth inward (Chapter 9, Page 102)
Staff Comment: Transportation improvements allow for greater social diversity by providing all citizens the ability to move freely throughout the regions benefiting all other Comp Plan goal outlined above. This proposal impact/strengthens all the objectives/strategies outlined above are supported by the current and aid in achieving this Comp Plan goal.	

ii. Is consistent with the general purpose and intent of this Code; and

As outlined above, the proposal is not in compliance with all aspects of the City's Development Code. However, it is consistent with the general intent and purpose as outlined in Section 070.010.030 to protect public health, safety and welfare and to create the best built environment.

iii. Minimizes adverse impacts to the health, safety, and welfare of the inhabitants of the surrounding areas and the city.

While certain known geologic hazards exist at the site, compliance with the recommendations provided by the consulting engineer should limit the negative impacts associated therewith.

Reviewing Agency Comments

An overview of any comments received from referral agencies is provided below. Said comments are also attached.

Engineering Department - Comments received outline items required prior to the issuance of a grading and/or building permit in the future. Additional, comments address an ongoing drainage issue related to sediment which impacts the City's wastewater treatment plant access.

Water/Wastewater - Comments received outline the need to maintain access to the City's water treatment facility during construction, that future water lines will remain private, and the need to sanitize and test any relocate hydrants.

ACTION ALTERNATIVES AND STAFF RECOMMENDATION:

Section 070.060.030(g)(1)d outlines the review and decision procedures for applications being considered by the Commission and/or City Council stating, “[T]he applicable review body shall **approve, approve with conditions, or deny** the application **based on the applicable approval criteria** listed in the application-specific procedures. The body may also **continue** the hearing or **refer the application** to another authority as provided in 070.060.050(a)(2)c, Referral and Call-Up Procedures.”

Action 1 - Location and Extent Review - allowing the construction of a 6,775 square foot addition to the existing 15,565 square foot maintenance facility, additional vehicle storage/circulation, retaining walls, and other site improvements.

Staff Recommendation/Suggested Motion

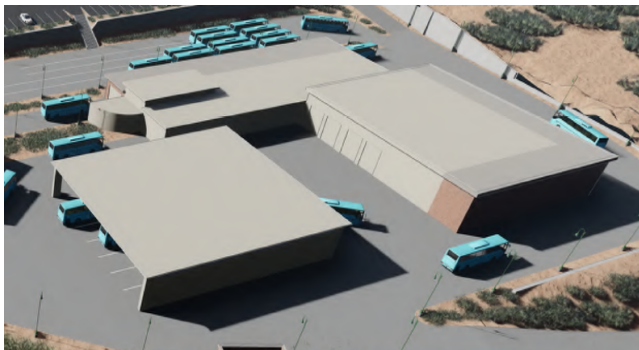
Staff recommends **approval (with conditions)** of the Site/Architectural Plan Review with the following **findings** and **conditions**:

Recommended Findings:

1. The proposal is consistent with the Comprehensive Plan and other City plans and policies;
2. The proposal is consistent with the general purpose and intent of this Code; and
3. The proposal minimizes adverse impacts to the health, safety, and welfare of the inhabitants of the surrounding areas and the city.

Recommended Conditions:

1. The applicant shall comply with/address all City staff comments prior to the issuance of a grading permit or building permit application.
2. The applicant shall revise the west and east elevation to replace glazing on bay doors.
3. The applicant shall prepare and submit an updated site improvement survey prior to submitting any excavation permit or building permit for the project.
4. The applicant shall adhere to recommendations outlined in the Geotechnical Evaluation prepared for the site by Ground Engineering.
5. Any future physical changes or improvements to the property or buildings on the parcel are subject to the review and approval of the Community Development Director for compliance with applicable requirements of the Glenwood Springs Municipal Code.
6. The applicant shall comply with all verbal representations made in the public hearings, as outlined in all application materials, and/or as revised per conditions herein and approved by the Community Development Director.



RFTA Regional Transit Center **Phase 2-GMF Renovation**

Glenwood Springs, Colorado

Sponsored By:

**Roaring Fork
Transportation Authority**



Regional Transit Center
Location and Extent Review Application
Revised Based on COGS Comments
December 09, 2019

2696 South Colorado Ave, Suite 460
Denver, Colorado 80222

Phone 720.235.0605

CO Comment Originator
CR Comment Respondee

NAME OF PROJECT: RFTA RTC GMF Renovation Phase 2
BID PACKAGE: N/A
DESIGN PACKAGE: COGS L&E Review Application -
Revisions & Comment Responses

No.	Disc	PAGE/SHEET REFERENCE	DESCRIPTION	CO	COMMENT	CR	RESPONSE	RESOLUTION DATE
Cover Sheet								
1					Please add geologic hazards disclosure provided in the project description narrative to the cover sheet. Please note, as per the Section 070.040(c) and related geologic hazard mapping, the site is located in a hazard avoidance district for which development is generally prohibited. However, the submitted geotechnical evaluation provides numerous recommendations for building and site development which will be made conditions of future building and excavation permitting.	KP	Included on revised cover sheet.	
2					Please add the floodplain statement provided in the project description narrative to the cover sheet	KP	Included on revised cover sheet.	
Project Summary Table								
1					Please add the project description table provided in the project description narrative to the cover sheet.	KP	Included on revised cover sheet.	
2					Please provide the Existing limits of disturbance in the table	KP	Included on revised cover sheet.	
3					Please call out the number of existing and proposed parking spaces	KP	Included on revised cover sheet.	
4					Please call out existing and proposed open space square footages and percentages	KP/ER	Included on revised cover sheet.	
5					Please call out existing and proposed lot coverages	KP	Included on revised cover sheet.	
6					Any bicycle parking proposed? Please clarify	ER	No bicycle parking is proposed as part of this project.	
7					Please provided existing and proposed landscaping square footage and percentages (minimum 20% required)	KP	Included on revised cover sheet.	
8					Please provided existing and proposed landscaping square footage and percentages	KP	Included on revised cover sheet.	
Site/Layout Plan								
1					While the existing plan is fine to show the detail of the proposed improvements, we still need a site plan that depicts the entirety of the subject property. You can provide a separate larger scale drawing for this if you wish	BM	New separate Site Plan provided sheet no. C00.01, as discussed with TH for clarification on 11/27: A "Site/Layout Plan" is still required, even if supplemented by contents on other sheets if needed.	
2					Please call out proposed site sidewalk (assumed) between the north side of the building and the new parking spaces	BM	Included on new Site Plan sheet no. C00.01	
3					Please call out Existing and proposed building square footages	BM	Included on new Site Plan sheet no. C00.01	

CO Comment Originator

No.	Disc	PAGE/SHEET REFERENCE	DESCRIPTION	CO	COMMENT	CR	RESPONSE	RESOLUTION DATE
4					<i>Please call out location of proposed site lighting described in the narrative</i>	BM	Included on new Site Plan sheet no. C00.01	
5					<i>Please call out open space areas/amenities (minimum 5% of the site)</i>	BM	Shown on new Site Plan sheet no. C00.01, should be noted that all landscaped areas are considered "open space" except for parking lot landscaped area. Amenities are shown on the Landscaping Plan, sheet no C09.01.	
6					<i>Please call out Landscaping</i>	BM	Included on new Site Plan sheet no. C00.01, the entire parcel's landscaping is shown. Additionally, a Landscaping sheet is provided for this project.	
7					<i>Please call out Bicycle parking</i>	BM	No bicycle parking is proposed as part of this project.	
8					<i>Please call out required (commonly depicted by a dashed line around the property boundary) and proposed building setbacks</i>	BM	Included on new Site Plan sheet no. C00.01	
9					<i>Please call out easement to City's wastewater treatment facility</i>	ER/BM	Easement documentation received from RFTA on 12/09/2019 and is included in the narrative for reference; as requested, the information will be shown in the final 100% drawings.	
10					<i>Please call out type of retaining wall proposed (i.e. MSE)</i>	BM	Included on new Site Plan sheet no. C00.01	
11					<i>Please call out fences (if applicable)</i>	BM	No fences are included as part of this project.	
12					<i>Please call out access/travel aisle widths</i>	BM/JD	Included on new Site Plan sheet no. C00.01	
					Elevations			
1					<i>Three architectural elements are required for each 30 foot horizontal section of the building. Please call out the architectural elements proposed on each side of the building (i.e. recessions/projections/reveals (minimum of two feet in depth), changes in colors, changes in materials/textures, glazing (a minimum of 30% if used as one of the three required), awnings/canopies (which extend three feet from the building), changes in roof height (a minimum of two feet)).</i>	Zehren	“Per COGS code, our Architectural solution as shown on the revised elevation sheets A02.01 and A02.02 meets 3 of the 5 required criteria, namely: 3. Change in texture and/or masonry pattern; 4. Change in building, parapet, or roofline height. If used to comply with this standard, the minimum change in roofline shall be two feet; and/or 5. Awnings, canopies, or marquees extending at least four feet beyond the building face.”	
2					<i>Roof shall not extend 50 feet in length without incorporating projections/recessions/dormers or change in height or at least two feet. Please clarify.</i>	Zehren	This should not be applicable as we have a flat roof with parapets (4.c.) Parapets shall vary by 24 minimum. This may have some structural impact for wind loading and snow drifting as our minimum parapet height is 30” so our maximum height will change to 4’6”- 5’-0”.	
3					<i>Please call out the maximum building height to the midpoint of the shed roof as opposed to the top of the second level (sheets A02.01 and A02.02).</i>	Zehren	Included on sheets A02.01 and A02.02.	

CO Comment Originator

No.	Disc	PAGE/SHEET REFERENCE	DESCRIPTION	CO	COMMENT	CR	RESPONSE	RESOLUTION DATE
4					<i>Please provide dimensions for each side of the building on each elevation</i>	Zehren	Included on sheets A02.01 and A02.02.	
5					<i>Please add the elevation coverage percentage tables provided in the project description narrative to each respective elevation sheet</i>	Zehren	Added to each sheet, A02.01 and A02.02.	
6					<i>It appears that various walls include glazing (windows/doors) not included in the tables provided. Please clarify.</i>	Zehren	Glazing included.	
7					<i>Please provide a colored elevation or a separate sheet which depicts the color of proposed building materials.</i>	Zehren	Included on sheets A02.01 and A02.02.	
8					<i>Please provide a detail of the proposed retaining walls.</i>	BM/ER/ NS	MSE retaining wall detail already included in initial L&E application package as sheet no C07.01. As discussed with TH for clarification on 11/27: the detail is supplemented with photos of the existing wall at the P&R.	
9								
10								
11								
12								
13								
					<i>Lighting Plan</i>			
1					<i>While the description of proposed site lighting is helpful, please provide an actual lighting plan for new site lighting (details sheet attached). In lieu of a full photometric plan, please provide manufacture specification sheets which confirm that lighting does not exceed five foot candles at the property line and three foot candles 10 feet perpendicular to the property line</i>	CR/AA	<i>Content provided in narrative section in revised full application package to address this comment. See section "Lighting Plan Requirements".</i>	
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11								
12								
13								
					<i>Landscaping Plan</i>			

CO Comment Originator

No.	Disc	PAGE/SHEET REFERENCE	DESCRIPTION	CO	COMMENT	CR	RESPONSE	RESOLUTION DATE
1					<i>Please revise the landscaping plan to include the items listed on the attached details sheet. While we understand it is not feasible to meet all landscaping requirements due to geologic hazards conditions at the site, we still wish to understand landscaping requirements in chart form as outlined.</i>	KP	Plan sheets have been updated to include missing items from the checklist. As described in the narrative, please note that because of the unique geological hazards, in particular, the presence of collapsible soils at the site, RFTA requests a waiver from the landscaping planting requirements of the Glenwood Springs Municipal Code, Section 070.040.050 (Landscaping, Screening, and Fencing) and proposes landscaping planting as shown on sheet C09.01 Landscaping Plan. For the purposes of the COGS L&E process, please refer to the narrative section for the requested charts.	
2					Items not applicable from Landscaping details checklist:			
3					Identify all existing trees and shrubs intended for preservation. Provide caliper sizes for all trees.	KP	There are no trees or shrubs within the project area that will need preservation.	
4					Depict and label sight triangles at all street and driveway/street intersections.		There are no street and driveway/street intersections affected by this project.	
5								
					Grading, Drainage, Erosion Control Plans			
1					<i>Please call out the construction limits as "limits of disturbance" instead.</i>	BM/KP	included on the stated sheets	
2								
3								
4								
					Other Items			
1					<i>Please send me a draft of your public notice language for review when available</i>	AA	Draft sent to Trent on 11/29 and was approved on 12/02.	
2					<i>As mentioned previously, a site improvement survey is required prior to any excavation or construction activities at the site.</i>	ER	An Site Improvement Survey (ISP) will be provided once the project is construction.	
3					<i>Please provide pictures of the existing site improvements (buildings, retaining walls, parking areas, etc.).</i>	ER	Photos of current site provided in narrative/pdf.	
4								
5								
6								
7								
8								
					Engineering Department			
1					Construction Document Submittal see attached DRAFT checklist for Construction Documents for further plan expectations.	ER	Noted.	
2					Provide narrative to address water quality, describe length of vegetated ditches prior to discharge to the Colorado River.	JD	Drainage reported has been updated with a paragraph addressing water quality.	
3					Provide S.U.E. plan per CRS 9-1.5-102 requirements or provide a stamped letter determining why this is not a Subsurface Utility Engineering-Required Project.	ER	A letter addressing this comment is included in the narrative section of the full application resubmittal.	

Shrewsberry

CO Comment Originator

No.	Disc	PAGE/SHEET REFERENCE	DESCRIPTION	CO	COMMENT	CR	RESPONSE	RESOLUTION DATE
4					The existing discharge from the concrete pan east of the Canopy has been causing maintenance issues on the bike path and Wulfsohn Road. Size and depict in plan improvements to mitigate the current drainage issue.	JD	As described in the revised narrative, the 100% design will incorporate new features to solve the problem, i.e. necessary inlets and piping will be constructed to divert all runoff westward to existing drainage features.	
5					At points of concentrated stormwater discharge provide riprap rundown for energy dissipation prior to discharge to the existing ditches.	KP	Plan sheet has been updated to address comment.	
6								
7								
8								
					<i>W/WW Department</i>			
1					The City has an access road through the RFTA property. During Construction access must always be maintained to allow normal operations for W/WW staff.	ER	Access will be maintained at all times during construction. See general notes that instruct the contractor to maintain traffic flow to the W/WW site at all times for normal operation.	
2					The proposed relocation of the water lines is considered a private water main. Although it is considered private the City will operate and maintain the fire hydrants and lead up to and including the hydrant lead valve. A 15' easement centered around hydrants and 10' easement around the lead line and valve is required.	ER	Survey will be performed to layout the utility easement post construction and information will be provided to COGS.	
3					All private water mains and hydrant leads that are being relocated will be installed, disinfected and tested to City's standards.	KP	[Notes in plan sheet reflect this requirement, see general notes stating that relocated water mains and hydrants are to be installed, disinfected, and tested to COGS standards.	
4								



Table of Contents

Section	Description
1	Planning Application Form
2	Ownership Documentation
3	Description of Proposed Project and Revised Narrative Content
4	Conceptual Drawings - Phase 2 GMF Renovation

Appendix A

RFTA RTC Traffic Analysis – 03/09/2018.

Ground Engineering Geotechnical Evaluation for RFTA GMF – 05/04/2018.

Drainage Letter for the proposed project.



Section 1

Planning Application Form



LAND USE APPLICATION

City of Glenwood Springs
Economic and Community Development Dept.
101 West 8th Street
Glenwood Springs, CO 81601
970-384-6411

Ordinance Amendments		Development Permits	
Rezoning	☐	Site/Architectural Plan Review	
Rezoning to Planned Unit Development (PUD)	☐	Administrative	☐
Annexation	☐	Minor	☐
Condominiumization	☐	Major	☐
Annexation	☐	Master Plan	☐
Street Vacation	☐	Construction Plans	☐
	☐	Location & Extent	☒
Subdivisions	☐	Right of Way Encroachment License	☐
Minor Subdivision	☐	Floodplain Development Permit	☐
Preliminary Plat	☐		☐
Final Plat	☐	Flexibility and Relief Procedures	☐
Vacation of Right-of-Way	☐	Variance	☐
	☐	Administrative Adjustment	☐
	☐	Appeal	☐

Applicant/Property Owner Information:			
Applicant		Owner	
Eric Rolle		Nicholas Senn	
Relationship to Owner		Owner	
Consultant to RFTA		Senior Project Manager, Roaring Fork Transportation Authority (RFTA)	
Applicant Address		Owner Address	
2696 South Colorado Boulevard, Suite 460, Denver, Colorado 80222		2307 Wulfsohn Rd, Glenwood Springs, CO 81601	
Phone 317.496.9125	Email Address erolle@shrewsusa.com	Phone 970-384-4862	Email Address nsenn@rfta.com

Property Information:	
Address	Parcel Number
2307 Wulfsohn Rd, Glenwood Springs, CO 81601	218505336002
Subdivision	Lot and Block Number
GLENWOOD SPRINGS MUNICIPAL	Lot: B OPERATIONS MINOR - Section: 5, Township: 6, Range: 89
Zone District ¹¹	Existing Land Use RFTA existing offices and maintenance facility - Light Industrial and Office

General Project Description:
The RTC Phase 2-GMF Renovation is intended to primarily house the maintenance staff and bus services. The Project will include renovation and addition to the existing GMF building and site improvements to support the addition. A second level mezzanine will be constructed to house additional offices.

Signatures:		
The owner or applicant must be present at the hearing. All public hearings must be properly noticed according to G.S.M.C. Section 070.010.030. Signatures of all owners of the property must appear before the application is accepted. Partnerships or corporations may have the authorized general partner or corporate officer sign the application. (Attach additional incorporation documents if necessary.) I declare under the penalty of perjury that the above information is true and correct to the best of my knowledge.	Eric J. Rolle, PE, PMP	11/05/2019
	Applicant	Date
	Nicholas A. Senn	11/05/2019
	Owner	Date
	Owner	Date



Section 2

Ownership Documentation

STATEMENT OF AUTHORITY

1. This Statement of Authority relates to an entity named Roaring Fork Transportation Authority, and is executed on behalf of the entity pursuant to the provisions of Section 38-30-172, C.R.S.2
2. The entity is a:

☐ Corporation	☐ Limited Liability Company
☐ Non-Profit Corporation	☐ General Partnership
☐ Trust	☐ Limited Partnership
☐ Business Trust	☐ Registered Limited Liability Partnership
☒ Governmental Subdivision or Agency	☐ Registered Limited Liability Limited Partnership
☐ Unincorporated Non-Profit Association	☐ Limited Partnership Association
☐ Other	
3. The entity was formed under the laws of the State of Colorado.
4. The mailing address for the entity is: 0051 Service Center Drive, Aspen CO 81611.
5. The name and position of each person authorized to execute instruments conveying, encumbering or otherwise affecting title to real property on behalf of the entity is:
 - Name: Dan Blankenship, position: Chief Executive Officer
6. (Optional)³ The authority of the foregoing person(s) to bind the entity ☒ is limited. ☐ is not limited as follows: Subject to authorization by RFTA BOARD OF Directors
7. (Optional) Other matters concerning the manner in which the entity deals with its interest(s) in real property: NONE

DATED: 11/19/18

Roaring Fork Transportation Authority, a statutory regional transportation authority

Dan Blankenship

by: Dan Blankenship

its: Chief Executive Officer

STATE OF: COLORADO

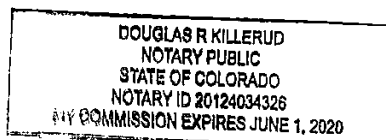
COUNTY OF: GARFIELD

The foregoing instrument was acknowledged before me on this 19 day of November, 2018. By Dan Blankenship as Chief Executive Officer of the Roaring Fork Transportation Authority, a statutory regional transportation authority.

Witness my hand and official seal.
My Commission Expires:

6/1/2020

Douglas R. Kollerud
Notary Public



¹ This form should not be used unless the entity is capable of holding title to real property.
² This Statement of Authority must be recorded to obtain the benefits of the statute.
³ The absence of any stated limitation shall be prima facie evidence that no limitation exists.

**QUIT CLAIM DEED
PUBLIC UTILITY EASEMENT**

KNOW ALL MEN BY THESE PRESENTS, that the undersigned, **ROARING FORK TRANSPORTATION AUTHORITY, "**), whose address is 51 Service Center Road, Aspen, CO 81611 (hereinafter "Grantor"), for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, has sold, conveyed, and **QUIT CLAIMED**, and by these presents does sell, convey, and **QUIT CLAIM** unto the **CITY OF GLENWOOD SPRINGS**, a Municipal Corporation, whose address is 101 West 8th Street, Glenwood Springs, Colorado, 81601 (hereinafter "Grantee"), its successors and assigns forever, a permanent, non-exclusive, underground public utility easement upon the lands of Grantor, situated in the County of Garfield, State of Colorado ("Property"), said easement being more particularly described in "**EXHIBIT A**", attached hereto and incorporated herein("Easement"). The boundary lines of said Easement shall be prolonged or shortened to begin and end on, and conform to the property lines and right-of-way lines. The above described parcel of land contains 1154 square feet, or 0.026 acres, more or less.

Grantor does hereby convey said Easement for the specific purpose of permitting Grantee the right to construct, install, reconstruct, replace, repair, and maintain underground public utilities within the above described lands, together with the right to remove any and all fences and other structures, trees, bushes, vegetation within said Easement when such is reasonably necessary for the exercise of the rights herein granted.

After the exercise, abandonment or cessation of use by Grantee of any of its rights hereunder, Grantee shall promptly restore the surface of the ground to its former condition as nearly as is practicable, including, without limitation, the restoration of any improvements, including curbs, gutters, sidewalks and/or pavement and full re-vegetation and re-grading, at the sole expense of Grantee.

Neither the extent nor use of the Easement granted herein shall be expanded or enlarged from its initial use without a specific written grant from Grantor for such expansion or enlargement.

Grantor agrees that all facilities installed by the Grantee within the Easement shall remain the property of the Grantee and shall be removable at the option of the Grantee. In the event that the extent and use of this Easement is abandoned or no longer used for the purpose described herein at any time hereafter for a period of one (1) year or more, the grant herein shall revert to the Grantor, its heirs, successors and assigns.

Grantee shall not create any change in grade that alters or otherwise fails to accommodate the natural drainage patterns on the Property and shall be prohibited from utilizing the Easement in any way that disrupts or otherwise fails to accommodate the natural drainage patterns on the Property.

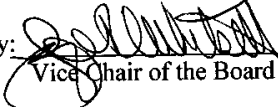
Grantee hereby agrees to defend, indemnify, and hold harmless the Grantor, its officers, agents and employees, from and against liability, claims, demands, and expenses, including reasonable costs and attorney fees, on account of injury, loss, or damage connected with any work performed or improvements constructed pursuant to this Deed, if such injury, loss, or damage is caused by, or is claimed to be caused by the negligent act, error or omission or other fault of the Grantee, its officers, contractors, agents or employees.

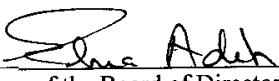
Except for the rights and privileges granted to the Grantee by this Agreement, the Grantor reserves the full, complete and uninterrupted right of ingress and egress, to construct improvements upon and to use, possess and occupy all portions of the Property encumbered by the Easement granted herein, so long as such use, possession or occupancy does not unreasonably interfere with the purposes for which the Easement is hereby granted.

TO HAVE AND TO HOLD the same, together with all and singular the appurtenances and privileges thereunto belonging or in anywise thereunto appertaining, and all the estate, right, title, interest, and claim whatsoever, of the Grantor, either in law or in equity, to the only proper use, benefit and behoof of the Grantee, its successors, and assigns forever.

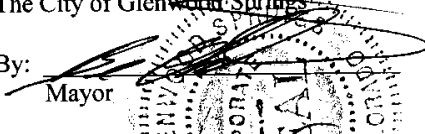
WITNESS the due execution hereof on February 19, 2009.

Grantor:
Roaring Fork Transportation Authority

By: 
Vice Chair of the Board of Directors

Attest: 
Secretary of the Board of Directors
Roaring Fork Transportation Authority

Grantee:
The City of Glenwood Springs

By: 
Mayor

Attest: 
Clerk
The City of Glenwood Springs

Back

4

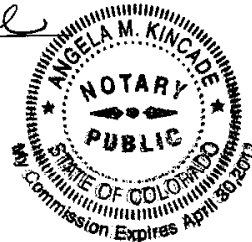
STATE OF COLORADO)
)ss.
COUNTY OF GARFIELD)

The foregoing Quit Claim Deed was acknowledged before me this 19 day of February 2009, by Jacque Whitsitt, as Chairman of the Roaring Fork Transportation Authority, and by Edna Aden, as Secretary of the Roaring Fork Transportation Authority.

Witness my hand and official seal.

My commission expires: 4/30/2011

Angela M. Kincade
Notary Public
Address:



STATE OF COLORADO)
)ss.
COUNTY OF GARFIELD)

The foregoing Quit Claim Deed was acknowledged before me this 23rd day of February 2009, by Bruce Christensen as Mayor of the City of Glenwood Springs, and by Robin Stansworth as Clerk of the City of Glenwood Springs.

Witness my hand and official seal.

My commission expires: 5/16/09

G. D.
Notary Public
Address:

101 W 8th St
Glenwood Spgs, CO





SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

GLENWOOD SPRINGS
118 W. 6TH, SUITE 200
GLENWOOD SPRINGS, CO 81601
970-945-1004
FX: 970-945-5948

ASPEN
P.O. BOX 2155
ASPEN, CO 81612
970-925-6727
FX: 970-925-4157

CRESTED BUTTE
P.O. BOX 3088
CRESTED BUTTE, CO 81224
970-349-5355
FX: 970-349-5358

**Utility Easement
Lot B
Glenwood Springs Municipal Operation Center
Minor Subdivision**

A Utility Easement being a strip of land situated in Lot B, Glenwood Springs Municipal Operation Center Minor Subdivision according to the plat recorded under Reception No. 614253 in the Garfield County Clerk and Records Office, also being in Section 5, Township 6 South, Range 89 West of the 6th P.M., City of Glenwood Springs, Garfield County, Colorado, more particularly described as follows:

Said strip of land being thirty (30') feet in width, extending fifteen (15') feet on each side of the following described centerline, in such a manner that the exterior boundary of said strip shall be lengthened or shortened as necessary to form a continuous strip within said Lot B exactly thirty (30') feet in width.

Beginning at a point on the northwesterly line of said Lot B, also being a point on Midland Avenue Right of Way, whence the second most northerly angle point for said Lot B, a No.5 Rebar and Cap, marked LS 15710 found in place, also being a point on Midland Avenue Right of Way, bears N02°31'09"E a distance of 31.74 feet along said common line between Lot B and Midland Avenue Right of Way, thence N83°35'35"E a distance of 37.60 feet to the end of said centerline, a point on the common line between Lot B and Lot C, also being a point on Wulfsohn Road Right of Way, said strip containing 1,154 square feet or 0.026 acres more or less.



Q:\2007\461.001 GWS WWTF\UtilityEase.doc

Reception #: 765883
04/07/2009 09:42:00 AM Jean Alberico
3 of 4 Rec Fee: \$21.00 Doc Fee: 0.00 GARFIELD COUNTY CO

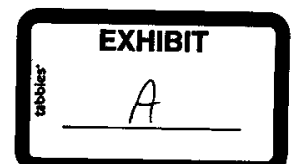
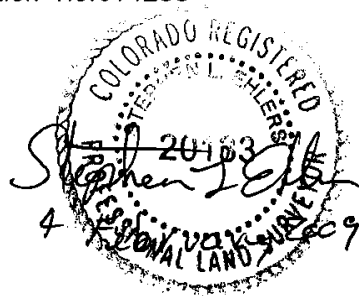
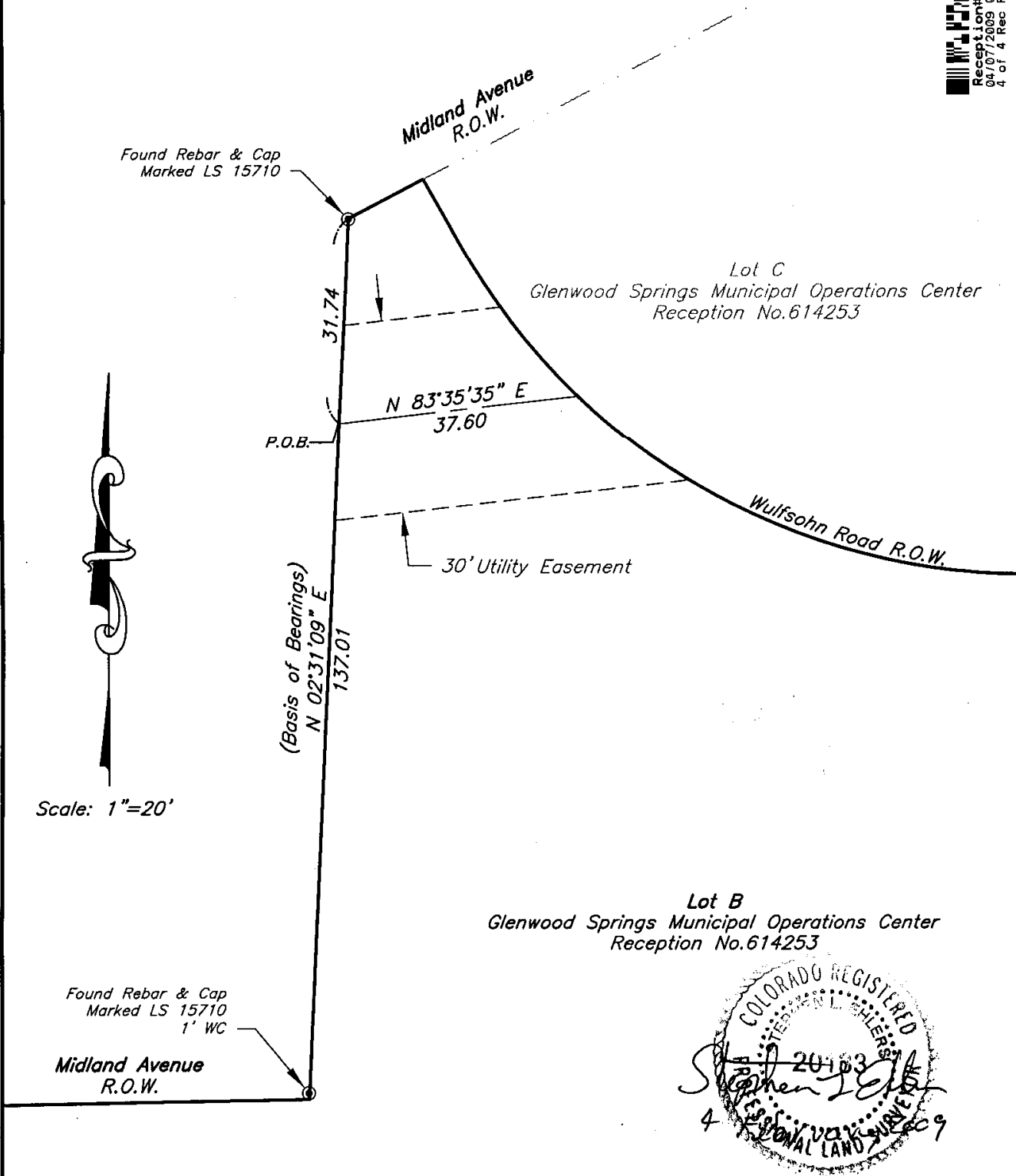


Exhibit Map
Lot B
Glenwood Springs Municipal
Operations Center
Utility Easement
Section 5
T.6S., R.89W., 6th P.M.
City of Glenwood Springs
Garfield County, Colorado

Reception# 765883
 04/07/2009 03:42:00 PM Jean Alberico
 4 of 4 Rec Fee:\$21.00 Doc Fee:0.00 GARFIELD COUNTY CO



 SCHMUESER GORDON MEYER ENGINEERS SURVEYORS	SCHMUESER GORDON MEYER, INC. 118 W. 6th Street, Suite 200 Glenwood Springs, Colorado 81601 (970) 945-1004 FAX (970) 945-5948 Aspen, Colorado (970) 925-6727 Crested Butte, CO (970) 349-5355	Utility Easement Exhibit Map			
		Job No. 2007-461.001	Date: 2/04/09	Drawn by: jlw	File: 207Measurements.dwg



SCHMUESER GORDON MEYER
ENGINEERS SURVEYORS

GLENWOOD SPRINGS
118 W. 6TH, SUITE 200
GLENWOOD SPRINGS, CO 81601
970-945-1004
FX: 970-945-5948

ASPEN
P.O. BOX 2155
ASPEN, CO 81612
970-925-6727
FX: 970-925-4157

CRESTED BUTTE
P.O. BOX 3088
CRESTED BUTTE, CO 81224
970-349-5355
FX: 970-349-5358

**Utility Easement
Lot B
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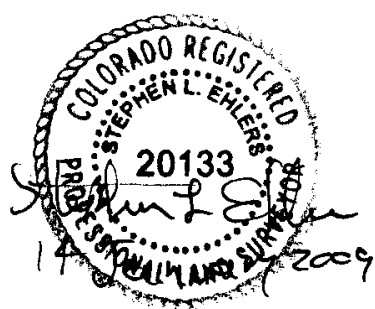
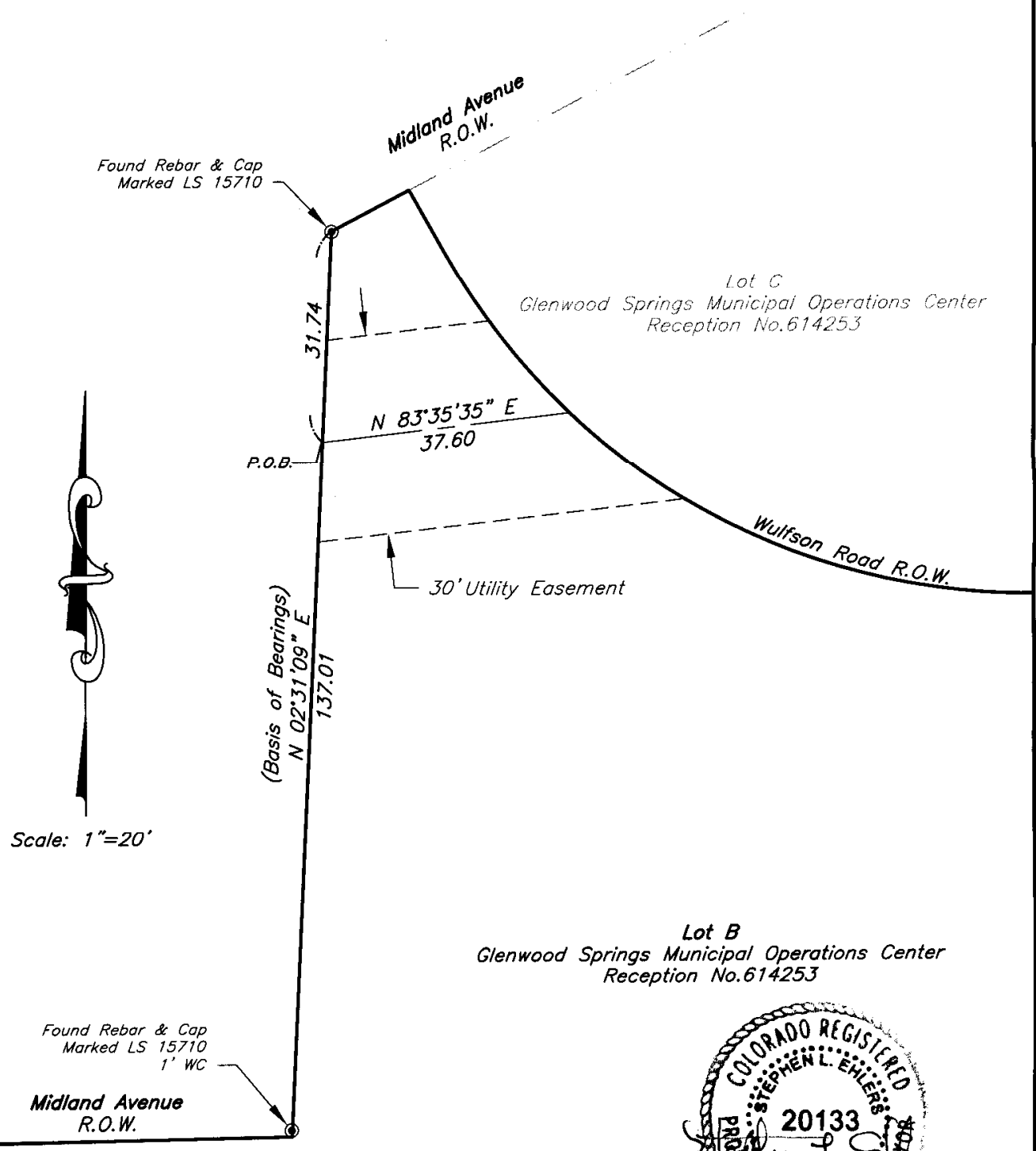
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Reception #: 761567
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1 of 2 Rec Fee: \$11.00 Doc Fee: \$0.00 GARFIELD COUNTY CO

SAME

2

Exhibit Map
Lot B
Glenwood Springs Municipal
Operations Center
Utility Easement
Section 5
T.6S., R.89W., 6th P.M.
City of Glenwood Springs
Garfield County, Colorado



SCHMUESER GORDON MEYER, INC.
1118 W. 6TH STREET, SUITE 200
GLENWOOD SPRINGS, COLORADO 81601
(970) 945-1004 FAX (970) 945-5948
ASPEN, COLORADO (970) 925-6727
CRESTED BUTTE, CO (970) 349-5355

Utility Easement Exhibit Map			
Job No. 2007-481.001	Date: 1/9/09	Drawn by: jlw	FILE:RT\assessments.dwg



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ENGINEERS SURVEYORS

GLENWOOD SPRINGS
118 W. 6TH, SUITE 200
GLENWOOD SPRINGS, CO 81601
970-945-1004
FX: 970-945-5948

ASPEN
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970-349-5355
FX: 970-349-5358

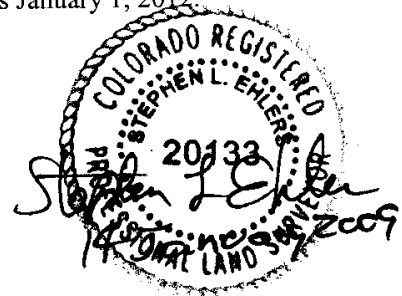
**Temporary Access Easement
Lot B
Glenwood Springs Municipal Operation Center
Minor Subdivision**

A Temporary Access Easement being a strip of land situated in Lot B, Glenwood Springs Municipal Operation Center Minor Subdivision according to the plat recorded under Reception No. 614253 in the Garfield County Clerk and Records Office, also being in Section 5, Township 6 South, Range 89 West of the 6th P.M., City of Glenwood Springs, Garfield County, Colorado, more particularly described as follows:

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The expiration date for Temporary Construction Easement is January 1, 2012.



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Reception# 761566
01/14/2009 03:17:03 PM
1 of 2 Rec Fee: \$11.00 Doc Fee: \$0.00
JEAN ALBERTICO
GARFIELD COUNTY CO

SAME

2

Exhibit Map

Lot B

Glenwood Springs Municipal
Operations Center

Temporary Access Easement

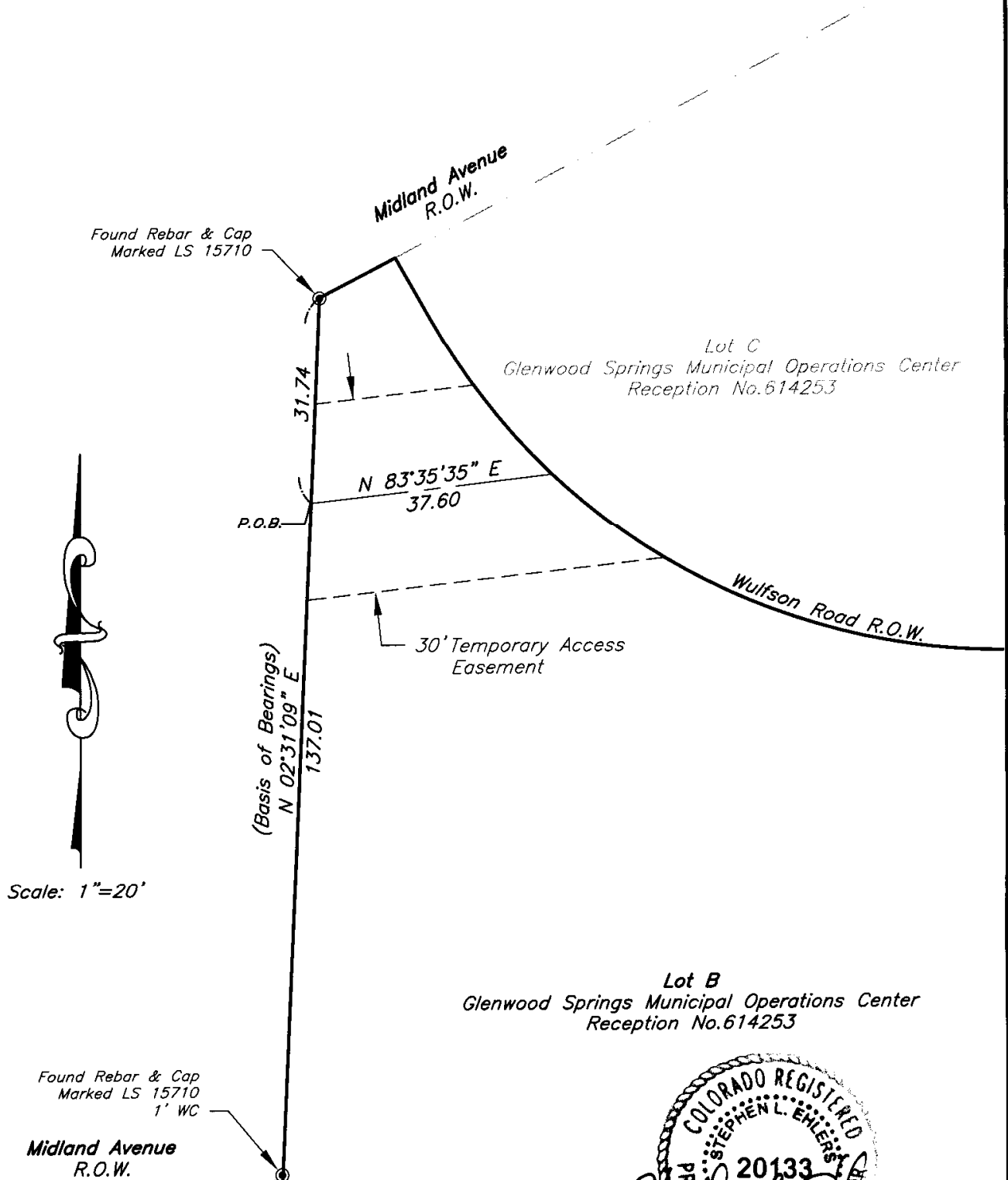
Section 5

T.6S., R.89W., 6th P.M.

City of Glenwood Springs

Garfield County, Colorado

Reception#: 761566
01/14/2009 03:17:03 PM Jean Alberico
2 of 2 Rec Fee:\$11.00 Doc Fee:0.00 GARFIELD COUNTY CO



Lot B
Glenwood Springs Municipal Operations Center
Reception No.614253



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SCHMUESER GORDON MEYER, INC.
118 W. 6TH STREET, SUITE 200
GLENWOOD SPRINGS, COLORADO 81601
(970) 945-1004 FAX (970) 945-5948
ASPEN, COLORADO (970) 925-6727
CRESTED BUTTE, CO (970) 349-5355

Temporary Access Easement
Exhibit Map

Job No. 2007-461.001

Date:

1/09/09

Drawn by: jilw

File: RTAAccessments.dwg



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ENGINEERS | SURVEYORS

RETURN TO



CLIF HYDOL SPRINGS
118 W. 6TH, SUITE 200
GLENWOOD SPRINGS, CO 81601
970-945-1004
FX: 970-945-5948

ASPEN
P.O. BOX 2155
ASPEN, CO 81612
970-925-6727
FX: 970-925-4157

CRESTED BUTTE
P.O. BOX 3088
CRESTED BUTTE, CO 81224
970-349-5355
FX: 970-349-5358

ATTN BRIAN
EDWARDS

**Temporary Construction Easement
Lot B
Glenwood Springs Municipal Operation Center
Minor Subdivision**

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Beginning at the second most northerly angle point of said Lot B, a No.5 Rebar and Cap marked LS 15710 found in place, also being a point on Midland Avenue Right of Way, thence along said right of way N62°28'35"E a distance of 13.21 feet to a point on the common line of Lot B and Lot C; thence along said line S29°23'02"E a distance of 11.11 feet; thence along said line 52.37 feet along the arc of a curve to the left, having a radius of 102.00 feet, a central angle of 29°25'04", the chord of which bears S44°17'11"E a distance of 51.80 feet; thence S05°39'53"W a distance of 62.63 feet; thence N87°28'05"W a distance of 51.63 feet to a point on the westerly line of Lot B; thence along said westerly line N02°31'09"E a distance of 100.80 feet to the point of beginning, said parcel containing 4,603 square feet or 0.106acres more or less.

The expiration date for Temporary Construction Easement is January 1, 2012.



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Reception #: 761565
01/14/2009 03:17:03 PM Jean Alberico
1 of 2 Rec Fee: \$11.00 Doc Fee: \$0.00 GARFIELD COUNTY CO

Exhibit Map

Lot B

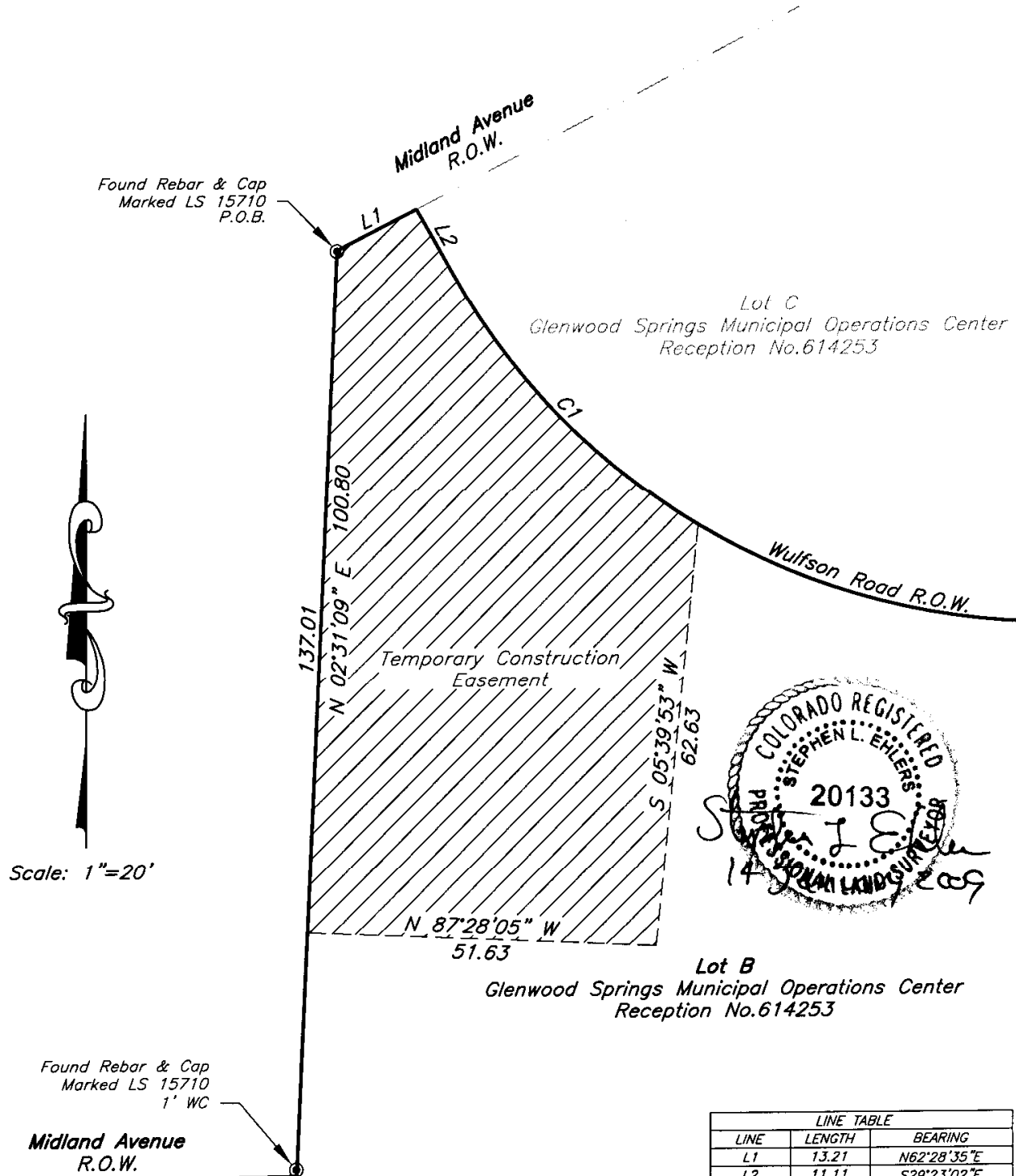
Glenwood Springs Municipal
Operations Center

Temporary Construction Easement
Section 5

T.6S., R.89W., 6th P.M.

City of Glenwood Springs
Garfield County, Colorado

Reception#: 761565
01/14/2009 03:17:03 PM Jean Alberico
2 of 2 Rec Fee:\$11.00 Doc Fee:0.00 GARFIELD COUNTY CO



LINE TABLE		
LINE	LENGTH	BEARING
L1	13.21	N62°28'35"E
L2	11.11	S29°23'02"E

CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	CHORD	BEARING	DELTA
C1	102.00	52.37	26.78	51.80	S44°17'11"E	29°25'04"



SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

SCHMUESER GORDON MEYER, INC.
118 W. 6TH STREET, SUITE 200
GLENWOOD SPRINGS, COLORADO 81601
(970) 945-1004 FAX (970) 945-5948
ASPEN, COLORADO (970) 925-6727
CRESTED BUTTE, CO (970) 349-5355

Temporary Construction Easement

Job No. 2007-461.001 Date: 1/09/09 Drawn by: jlw File: RFTAccessment.dwg

680

QUIT CLAIM DEED

THIS QUIT CLAIM DEED made this 31st day of October, 2002, between the City of Glenwood Springs, Colorado ("Glenwood Springs" or "City"), a Colorado Home Rule Municipality (hereinafter "Grantor") and Roaring Fork Transportation Authority, Aspen, Colorado ("RFTA")(hereinafter "Grantee");

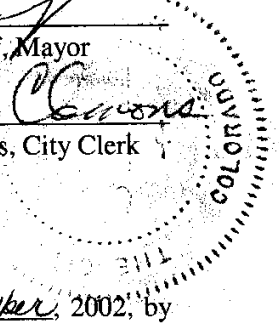
WITNESSETH:

That the Grantor, for and in consideration of Ten Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, has remised, released, sold and QUIT CLAIMED, and by these presents does remise, release, sell and QUIT CLAIM unto the Grantee, its successors and assigns, forever, all the right, title, interest, claim and demand which the Grantor has in and to the property described as Lot B of the Glenwood Springs Municipal Operations Minor Subdivision.

TO HAVE AND TO HOLD the same, together with all its appurtenances and privileges thereunto belonging or in anywise thereunto appertaining, and all the estate, right, title, interest and claim whatsoever, of the Grantor, either in law or equity, to the only proper use, benefit and behoof of the Grantee, its successors and assigns forever.

IN WITNESS WHEREOF, the Grantor has executed this deed on the date set forth above.

CITY OF GLENWOOD SPRINGS
By: Donald L. Vanderhoof
Donald L. Vanderhoof, Mayor
ATTEST: Robin S. Clemons
Robin Clemons, City Clerk



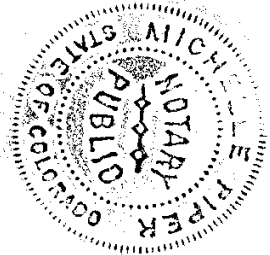
STATE OF COLORADO)
) ss.
COUNTY OF GARFIELD)

Acknowledged, subscribed and sworn to before me this 31st day of October, 2002, by Donald L. Vanderhoof, Mayor, City of Glenwood Springs.

WITNESS my hand and official seal.

My Commission expires: 01-31-03

Michelle Piro
Notary Public



Please return to: City Attorney, City of Glenwood Springs
1 101 West 8th Street, Glenwood Springs, CO 81602

319
5/1
0



560886 03/21/2000 04:05P B1177 P850 M ALSDORF
1 of 4 R 20.00 D 0.00 GARFIELD COUNTY CO

450

STATE OF COLORADO)
) ss.
COUNTY OF GARFIELD)

I, Robin S. Clemons, City Clerk for the City of Glenwood Springs, a Colorado municipal corporation, certify on this 9th day of March, 2000, that the attached facsimile of Ordinance No. 5, Series of 2000, is a complete, full, true and exact copy of the document it purports to be.

Witness my hand and the official seal of the City.

Robin S. Clemons, CMC

City Clerk

City of Glenwood Springs

289
20

ORDINANCE NO. 5

Series of 2000

**AN ORDINANCE OF THE CITY OF GLENWOOD SPRINGS,
COLORADO, PROVIDING FOR THE ANNEXATION TO THE CITY OF
THAT TERRITORY DESCRIBED IN THIS ORDINANCE AND KNOWN
AS THE CITY'S NEW MAINTENANCE AND OPERATIONS CENTER
SITE, LOCATED OUTSIDE OF BUT ADJACENT TO THE CITY OF
GLENWOOD SPRINGS AND IN THE COUNTY OF GARFIELD,
COLORADO.**

WHEREAS, the property known as the City's new Maintenance and Operations Center site is presently located adjacent to the City's corporate limits and is wholly owned by the City; and

WHEREAS, the property is eligible for annexation in this ordinance is not solely a public street or right-of-way; and

WHEREAS, the property meets all of the eligibility requirements of Sections 31-12.104 and 31-12-105 of the Colorado Revised Statutes; and

WHEREAS, Section 31-12-106(3) of the Colorado Revised Statutes states that notice and public hearing are not required for municipally-owned property; and

WHEREAS, City Council has determined it in the best interest of the City to annex the new Maintenance and Operations Center site located on Midland Avenue.

NOW, THEREFORE, IT IS ORDAINED BY THE CITY COUNCIL OF THE CITY OF GLENWOOD SPRINGS, COLORADO, THAT:

Section 1. The territory described in Exhibit A, attached hereto and made a part hereof for all purposes, is hereby annexed and made a part of the City of Glenwood Springs, Colorado. City Council finds that the territory annexed is solely owned by the City, is not a public street or right-of-way, and meets the eligibility requirements of Sections 31-12-104 and 31-12-105 of the Colorado Revised Statutes.

Section 2. In accordance with Section 31-12-113 of the Colorado Revised Statutes, the City Clerk is hereby directed to:

- A. File one (1) copy of the annexation map with the original of the annexation ordinance in her office.
- B. File for recording two (2) certified copies of the annexation ordinance, including a legal description, and map of the area annexed with the

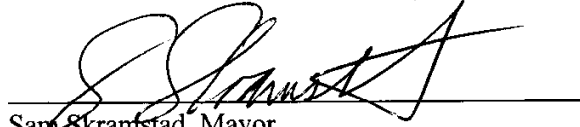


560886 03/21/2000 04:05P B1177 P852 M ALSDORF
3 of 4 R 20.00 D 0.00 GARFIELD COUNTY CO

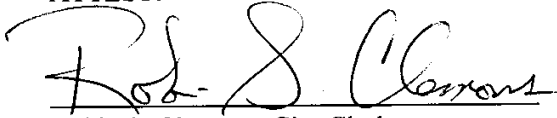
Garfield County Clerk and Recorder.

INTRODUCED, READ ON FIRST READING, PASSED AND ORDERED
PUBLISHED IN FULL THIS 12th DAY OF FEBRUARY, 2000.

CITY OF GLENWOOD SPRINGS, COLORADO

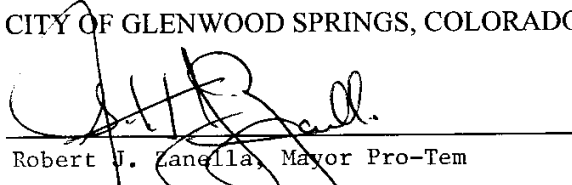

Sam Skramstad, Mayor

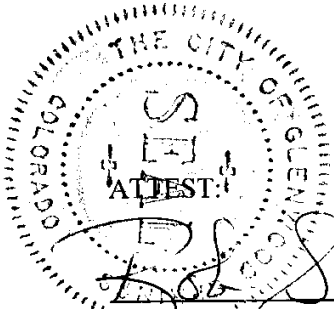
ATTEST:

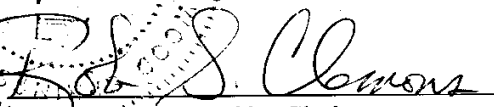

Robin S. Clemons, City Clerk

INTRODUCED, READ ON SECOND READING, ORDERED PUBLISHED BY
TITLE ONLY TO BE EFFECTIVE TEN DAYS FOLLOWING THE DATE OF SECOND
PUBLICATION THIS 2nd DAY OF MARCH, 2000.

CITY OF GLENWOOD SPRINGS, COLORADO


Robert J. Lanella, Mayor Pro-Tem




Robin S. Clemons, City Clerk



December 30, 1999
Job # 97097 B

LEGAL DESCRIPTION - EXEMPTION PARCEL

A tract of land situate in the NE 1/4 of Section 8 and the NW1/4 of Section 9, all in Township 6 South, Range 89 West of the 6th Principal Meridian being more particularly described as follows:

Beginning at a point whence the southeast corner of the SW1/4 of the NW 1/4 of said Section 9 bears S 59°45'07" E 2360.09 feet; thence N 62°49'19" E 281.27 feet; thence N 27°10'41" W 147.90 feet; thence 323.70 feet on the arc of a curve to the left, having a radius of 760.00 feet, a central angle of 24°24'13", and subtending a chord bearing N 75°01'26" E 321.26 feet; thence N 62°49'19" E 292.63 feet to the westerly right of way line of Midland Avenue; thence along the westerly right of way line of Midland Avenue the following courses:

- 1) S 21°43'32" E 150.12 feet; thence
- 2) 272.23 feet along the arc of a curve to the left, having a radius of 1165.00 feet, a central angle of 13°23'19", and subtending a chord bearing S 28°25'10" E 271.61 feet; thence
- 3) S 35°06'49" E 21.42 feet; thence
- 4) S 54°53'11" W 22.69 feet; thence
- 5) S 41°40'06" E 43.30 feet; thence
- 6) N 54°53'11" E 17.75 feet; thence
- 7) S 30°38'49" E 271.57 feet; thence
- 8) S 41°04'38" E 291.31 feet; thence
- 9) S 23°28'47" E 143.44 feet; thence
- 10) 95.89 feet along the arc of a curve to the left, having a radius of 100.00 feet, a central angle of 54°56'35", and subtending a chord bearing S 50°57'06" E 92.26 feet;

thence leaving said right-of-way line on a course bearing S 17°34'08" W 81.64 feet; thence S 12°15'32" E 109.78 feet; thence S 19°54'08" E 208.92 feet; thence S 50°07'49" E 109.72 feet; thence S 33°57'41" E 159.48 feet to the south line of the NW 1/4 of said Section 9 whence the southeast corner of the SW1/4 of the NW 1/4 of said Section 9 bears S 88°48'57" E 361.88 feet; thence N 88°48'57" W 956.62 feet along the south line of said SW1/4 of the NW 1/4 of Section 9; thence N 89°15'16" W 378.91 feet along the south line of the SE 1/4 of the NE 1/4 of said Section 8; thence N 16°27'24" W 1206.11 feet to the point of beginning, containing 37.281 acres more or less.

550886 03/21/2000 04:05P B1177 P853 M ALSDORF
4 of 4 R 20.00 D 0.00 GARFIELD COUNTY CO

EXHIBIT A

ORDINANCE NO. 5

Series of 2000

RE-RECORDED TO CORRECT
LEGAL DESCRIPTION

AN ORDINANCE OF THE CITY OF GLENWOOD SPRINGS,
COLORADO, PROVIDING FOR THE ANNEXATION TO THE CITY OF
THAT TERRITORY DESCRIBED IN THIS ORDINANCE AND KNOWN
AS THE CITY'S NEW MAINTENANCE AND OPERATIONS CENTER
SITE, LOCATED OUTSIDE OF BUT ADJACENT TO THE CITY OF
GLENWOOD SPRINGS AND IN THE COUNTY OF GARFIELD,
COLORADO.

WHEREAS, the property known as the City's new Maintenance and Operations Center
site is presently located adjacent to the City's corporate limits and is wholly owned by the City;
and

WHEREAS, the property is eligible for annexation in this ordinance is not solely a public
street or right-of-way; and

WHEREAS, the property meets all of the eligibility requirements of Sections 31-12.104
and 31-12-105 of the Colorado Revised Statutes; and

WHEREAS, Section 31-12-106(3) of the Colorado Revised Statutes states that notice and
public hearing are not required for municipally-owned property; and

WHEREAS, City Council has determined it in the best interest of the City to annex the
new Maintenance and Operations Center site located on Midland Avenue.

NOW, THEREFORE, IT IS ORDAINED BY THE CITY COUNCIL OF THE CITY OF
GLENWOOD SPRINGS, COLORADO, THAT:

Section 1. The territory described in Exhibit A, attached hereto and made a part hereof
for all purposes, is hereby annexed and made a part of the City of Glenwood Springs, Colorado.
City Council finds that the territory annexed is solely owned by the City, is not a public street or
right-of-way, and meets the eligibility requirements of Sections 31-12-104 and 31-12-105 of the
Colorado Revised Statutes.

Section 2. In accordance with Section 31-12-113 of the Colorado Revised Statutes, the
City Clerk is hereby directed to:

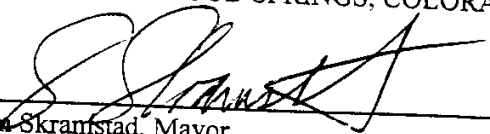
- A. File one (1) copy of the annexation map with the original of the
annexation ordinance in her office.
- B. File for recording two (2) certified copies of the annexation ordinance,
including a legal description, and map of the area annexed with the

689
20
(4)

Garfield County Clerk and Recorder.

INTRODUCED, READ ON FIRST READING, PASSED AND ORDERED
PUBLISHED IN FULL THIS 12th DAY OF FEBRUARY, 2000.

CITY OF GLENWOOD SPRINGS, COLORADO

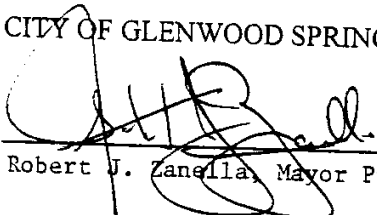

Sam Skramstad, Mayor

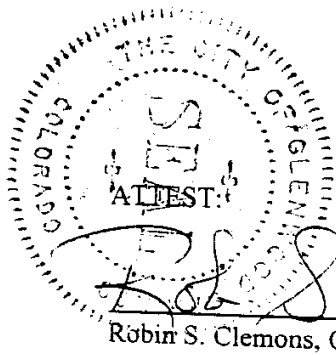
ATTEST:


Robin S. Clemons, City Clerk

INTRODUCED, READ ON SECOND READING, ORDERED PUBLISHED BY
TITLE ONLY TO BE EFFECTIVE TEN DAYS FOLLOWING THE DATE OF SECOND
PUBLICATION THIS 2nd DAY OF MARCH, 2000.

CITY OF GLENWOOD SPRINGS, COLORADO


Robert J. Zanella, Mayor Pro-Tem



Robin S. Clemons, City Clerk


581407 05/23/2001 11:18A B1255 P84 M ALSDORF
2 of 4 R 20.00 D 0.00 GARFIELD COUNTY CO

581407 05/23/2001 11:18A B1255 P83 M ALSDORF
3 of 4 R 20.00 D 0.00 GARFIELD COUNTY CO

MAP OF TERRITORY TO BE ANNEXED TO
A PARCEL OF LAND SITUATED IN THE SW1/4SW1/4 OF SECTION 5, T6S
ALL IN TOWNSHIP 6 SOUTH, RANGE 89 WEST
COUNTY OF GARFIELD, COLORADO

LEGAL DESCRIPTION

A TRACT OF LAND SITUATE IN THE SW1/4SW1/4 OF SECTION 5, THE SE1/4SE1/4 OF SECTION 6 AND IN THE NW1/4NW1/4 OF SECTION 8, ALL IN TOWNSHIP 6 SOUTH, RANGE 89 WEST OF THE 6TH PRINCIPAL MERIDIAN. IT IS THE INTENT OF THIS ANNEXATION TO ANNEX THAT PARCEL OF LAND DESCRIBED IN THE SPECIAL WARRANTY DEED RECORDED AS RECEPTION NUMBER 558800 IN BOOK 1171 AT PAGE 187 IN THE RECORDS OF THE GARFIELD COUNTY, COLORADO, CLERK AND RECORDER, SAID TRACT BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT WHEN THE SOUTHEAST CORNER OF SAID SECTION 6 BEARS N 34° 58' 58" W, 628.53 FEET; THENCE N 12° 53' 54" W, 181.17 FEET; THENCE N 19° 31' 13" W, 160.53 FEET; THENCE N 30° 38' 55" W, 522.34 FEET; THENCE N 90° 00' 00" W, 1,265.05 FEET TO THE WEST LINE OF THE SE1/4SE1/4 OF SAID SECTION 6; THENCE N 01° 07' 55" E, 670.49 FEET ALONG SAID WEST LINE; THENCE N 86° 20' 11" E, 58.27 FEET; THENCE N 83° 38' 11" E, 480.07 FEET TO A POINT ON THE RIGHT-OF-WAY LINE OF MIDLAND AVENUE; THENCE ALONG SAID RIGHT-OF-WAY LINE THE FOLLOWING SIX COURSES: S 44° 35' 36" E, 72.53 FEET; THENCE S 53° 05' 31" E, 232.27 FEET; THENCE 580.98 FEET ALONG A CURVE TO THE LEFT, SAID CURVE HAVING A RADIUS OF 880.00 FEET, A CENTRAL ANGLE OF 37° 49' 36" AND SUBTENDING A CHORD BEARING S 72° 00' 20" E, 570.49 FEET; THENCE N 89° 04' 52" E, 386.55 FEET; THENCE N 02° 31' 09" E, 137.01 FEET; THENCE N 62° 28' 35" E, 117.28 FEET; THENCE LEAVING SAID RIGHT-OF-WAY, 871.55 FEET ALONG THE ARC OF A CURVE TO THE LEFT, SAID CURVE HAVING A RADIUS OF 1,260.00 FEET, A CENTRAL ANGLE OF 39° 37' 55" AND SUBTENDING A CHORD BEARING S 50° 47' 08" E, 854.28 FEET; THENCE S 47° 17' 45" W, 1,171.28 FEET TO THE POINT OF BEGINNING.

THE ABOVE DESCRIBED PARCEL OF LAND CONTAINS 35.340 ACRES, MORE OR LESS.

OUTER BOUNDARY = 6,907.37 FEET
CONTIGUOUS BOUNDARY = 1,526.62 FEET
6 x 1,526.62 FEET = 9,159.72 FEET

THE ANNEXATION SHOWN ON THIS MAP WAS APPROVED BY ORDINANCE NUMBER _____ OF THE SERIES OF 2000, ON THE _____ DAY OF _____, 2000.
WITNESS MY HAND AND OFFICIAL SEAL OF THE CITY OF GLENWOOD SPRINGS.

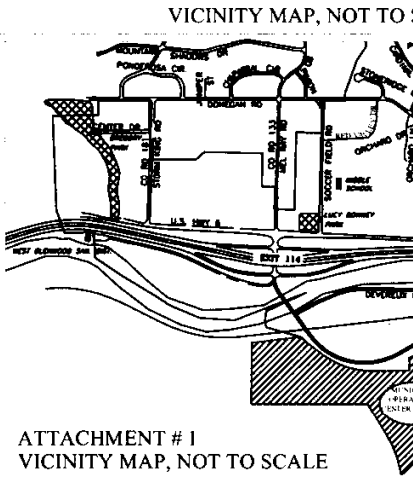
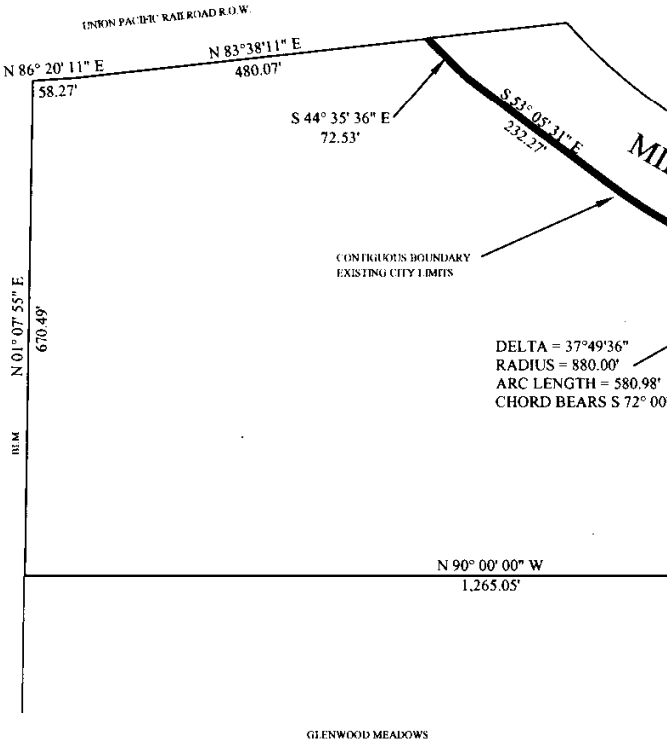
ATTEST:
ROBIN S. CLEMONS, CITY CLERK

SAM SKRAMSTAD, MAYOR

CLERK AND RECORDER'S CERTIFICATE
THIS PLAT WAS FILED FOR RECORD IN THE OFFICE OF THE CLERK AND RECORDER OF GARFIELD COUNTY AT _____ O'CLOCK _____ M., THE _____ DAY OF _____, 2000 AND IS DULY RECORDED AS RECEPTION NUMBER _____.

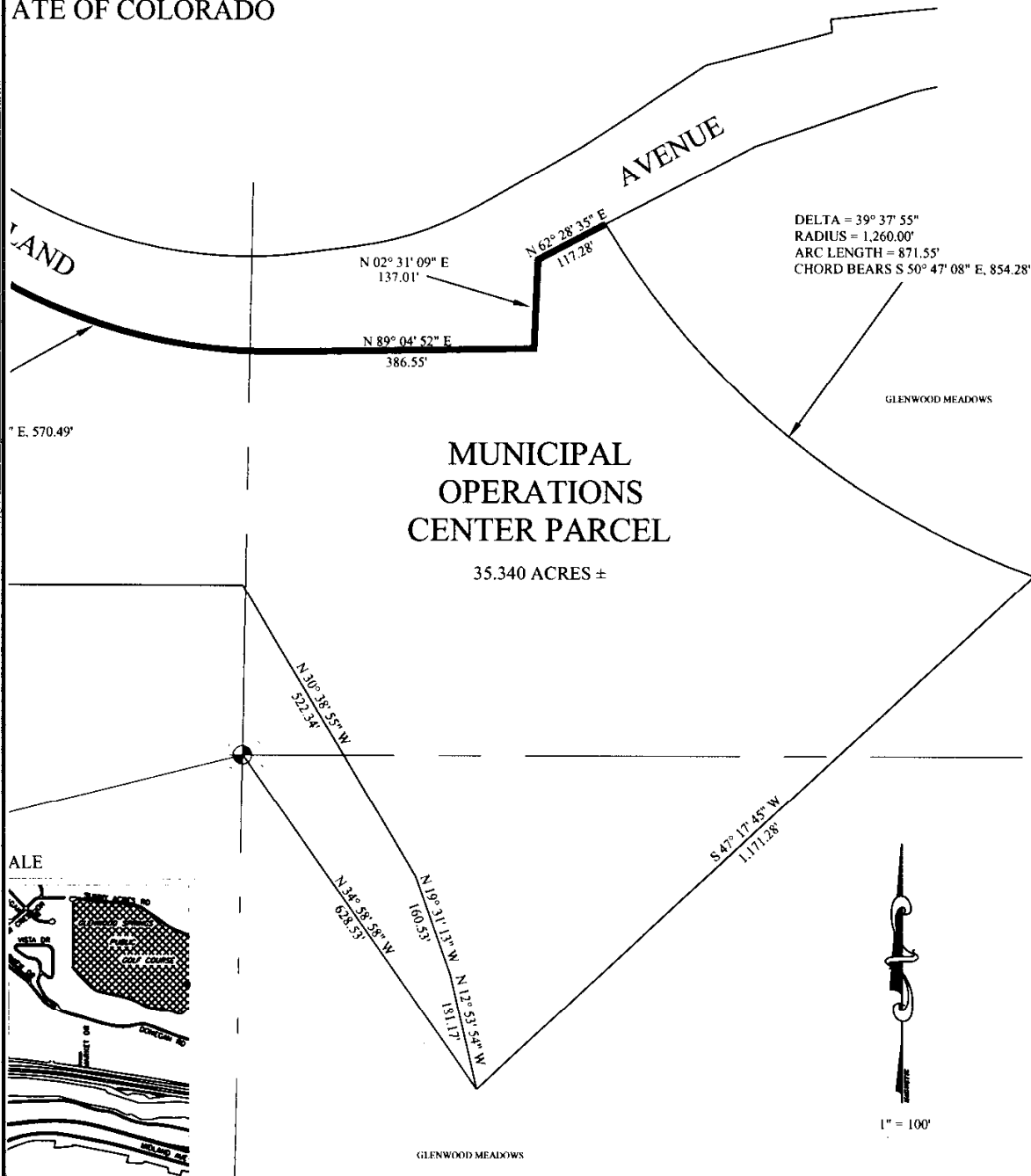
CLERK AND RECORDER

BY: _____ DEPUTY



THE CITY OF GLENWOOD SPRINGS

SE1/4SE1/4 OF SECTION 6 AND THE NW1/4NW1/4 OF SECTION 8
T1N OF THE 6TH PRINCIPAL MERIDIAN
STATE OF COLORADO



581407 05/23/2001 11:18A B1255 P86 M ALSDORF
4 of 4 R 20.00 D 0.00 GARFIELD COUNTY CO

157
Exempt

Filed for record the _____ day of _____, A.D. _____, at _____ o'clock _____ M.		RECORDER
Reception No. _____		By _____ DEPUTY.
SPECIAL WARRANTY DEED		
THIS DEED , Made on this day of <u>January 17, 2000</u> ,		
between		
GLENWOOD MEADOWS, LLC, A COLORADO LIMITED LIABILITY COMPANY		
of the County of <u>PITKIN</u> and State of <u>Colorado</u> , Grantor(s),		
and		
CITY OF GLENWOOD SPRINGS, A COLORADO HOME-RULE MUNICIPALITY		
whose legal address is : <u>806 COOPER AVENUE, GLENWOOD SPRINGS, CO 81601</u>		
of the _____ County of <u>GARFIELD</u> and State of <u>Colorado</u> , of the Grantee(s):		
WITNESS, That the Grantor, for and in consideration of the sum of (<u>\$10.00</u>)		
TEN DOLLARS ----- DOLLARS		
the receipt and sufficiency of which is hereby acknowledged, has granted, bargained, sold and conveyed, and by these presents does grant, bargain, sell, convey and confirm unto the Grantee(s), their heirs and assigns forever, all the real property, together with improvements, if any, situate, lying and being in the _____ County of <u>GARFIELD</u> and State of Colorado, described as follows:		
SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF		
also known as street number <u>MOC SITE PROPERTY, GLENWOOD SPRINGS, CO 81601</u>		
TOGETHER with all and singular and hereditaments and appurtenances thereunto belonging, or in anywise appertaining and the reversion and reversions, remainder and remainders, rents, issues and profits thereof; and all the estate, right title interest, claim and demand whatsoever of the Grantor(s), either in law or equity, of, in and to the above bargained premises, with the hereditaments and appurtenances;		
TO HAVE AND TO HOLD the said premises above bargained and described with appurtenances, unto the Grantee(s), their heirs, successors and assigns forever. The Grantor, for itself, its successors and assigns, does covenant, and agree that it shall and will WARRANT AND FOREVER DEFEND the above-bargained premises in the quiet and peaceable possession of the Grantee(s), their heirs, successors and assigns, against all and every person or persons claiming the whole or any part thereof, by, through or under the Grantor(s).		
EXCEPT GENERAL TAXES AND ASSESSMENTS FOR THE YEAR 2000 AND SUBSEQUENT YEARS, SUBJECT TO EASEMENTS, RESERVATIONS, RESTRICTIONS, COVENANTS AND RIGHTS OF WAY OF RECORD AS SET FORTH ON EXHIBIT 'B' ATTACHED HERETO AND MADE A PART HEREOF BY REFERENCE AND SUBJECT TO ALL RIGHTS OF GRANTOR RESERVED AND SET FORTH IN THAT CERTAIN MUNICIPAL OPERATIONS FACILITY SITE ACQUISITION AGREEMENT DATED DECEMBER 27, 1999.		
IN WITNESS WHEREOF the Grantor(s) have executed this deed on the date set forth above.		
GLENWOOD MEADOWS, LLC, A COLORADO LIMITED LIABILITY COMPANY		
BY: DUNRENE MANAGEMENT, INC., ITS MANAGER		
BY: ROBERT DUNCAN MACGREGOR, PRESIDENT		
STATE OF <u>Colorado</u>)) ss. County of <u>GARFIELD</u>)		
The foregoing instrument was acknowledged before me on this day of <u>January 17, 2000</u>		
by <u>ROBERT DUNCAN MACGREGOR, PRESIDENT OF DUNRENE MANAGEMENT, INC., MANAGER OF GLENWOOD MEADOWS, LLC A COLORADO LIMITED LIABILITY COMPANY</u>		
My commission expires <u>9-21-2002</u>		
Witness my hand and official seal.		
ELLEN M. LIPSCOMB NOTARY PUBLIC STATE OF COLORADO		
_____ Notary Public		
Name and Address of Person Creating New Legal Description (38-35-106.5, C.R.S.) My Commission Expires 09/21/2002		
Escrow# <u>GW233030</u>	When Recorded Return to: <u>CITY OF GLENWOOD SPRINGS, A COLORADO</u>	
Title# <u>GW233030</u>	<u>HOME-RULE MUNICIPALITY</u>	
	<u>806 COOPER AVENUE, GLENWOOD SPRINGS, CO</u>	
	<u>81601</u>	
Form No. 16, Rev 4-94. SPECIAL WARRANTY DEED (Photographic SPEC.WD.OPEN)		

EXHIBIT 'A'

DESCRIPTION

A tract of land situate in Sections 5, 6 and 8, Township 6 South, Range 89 West of the 6th Principal Meridian being more particularly described as follows:

Beginning at a point whence the southeast corner of said Section 6 bears N 34°58'58" W 628.53 feet; thence, N 12°53'54" W 181.17 feet; thence, N 19°31'13" W 160.53 feet; thence, N 30°38'55" W 522.34 feet; thence, N 90°00'00" W 1265.05 feet to the west line of the SE1/4 of the SE1/4 of said Section 6; thence, N 01°07'55" E 670.49 feet along said west line; thence, N 86°20'11" E 58.27 feet; thence, N 83°38'11" E 480.07 feet; thence, S 44°35'36" E 72.53 feet; thence, S 53°05'31" E 232.27 feet; thence, 580.98 feet along a curve with a 880.00 foot radius to the left (long chord of which bears S 72°00'20" E a distance of 570.49 feet) and a delta of 37°49'36"; thence, N 89°04'52" E 386.55 feet; thence, N 02°31'09" E 137.01 feet; thence, N 62°28'35" E 117.28 feet; thence, 871.55 feet along a curve with a 1260.00 foot radius to the left (long chord of which bears S 50°47'08" E a distance of 854.28 feet) and a delta of 39°37'55"; thence, S 47°17'45" W 1171.28 feet to the point of beginning; containing an area of 35.340 acres, more or less.

EXHIBIT 'B'

Our Order No. GW233030-2

THE EFFECT OF INCLUSIONS IN ANY GENERAL OR SPECIFIC WATER CONSERVANCY, FIRE PROTECTION, SOIL CONSERVATION OR OTHER DISTRICT OR INCLUSION IN ANY WATER SERVICE OR STREET IMPROVEMENT AREA.

WATER RIGHTS OR CLAIMS TO WATER RIGHTS.

RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED FEBRUARY 09, 1892, IN BOOK 12 AT PAGE 106.

RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED JUNE 04, 1895, IN BOOK 12 AT PAGE 367.

RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED OCTOBER 26, 1896, IN BOOK 12 AT PAGE 440.

RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED SEPTEMBER 30, 1949, IN BOOK 245 AT PAGE 268.

RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED SEPTEMBER 30, 1949, IN BOOK 245 AT PAGE 269.

RIGHT OF PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED SEPTEMBER 30, 1949, IN BOOK 245 AT PAGE 270.

RIGHT OF WAY FOR DITCHES OR CANALS CONSTRUCTED BY THE AUTHORITY OF THE UNITED STATES AS RESERVED IN UNITED STATES PATENT RECORDED JUNE 04, 1895, IN BOOK 12 AT PAGE 367.

RIGHT OF WAY FOR DITCHES OR CANALS CONSTRUCTED BY THE AUTHORITY OF THE UNITED STATES AS RESERVED IN UNITED STATES PATENT RECORDED OCTOBER 26, 1896, IN BOOK 12 AT PAGE 440.

EASEMENTS AND RIGHTS OF WAY FOR ROADS, STREETS, HIGHWAYS, DITCHES, CANALS, PIPELINES AND UTILITY LINES, INCLUDING, BUT NOT LIMITED TO:

A. DITCH RIGHT OF WAY AS DESCRIBED IN INSTRUMENT RECORDED DECEMBER 20, 1884 IN BOOK 10 AT PAGE 2.

B. RIGHT TO USE ROAD AS GRANTED TO MARY P.G. DEVEREUX IN INSTRUMENT

EXHIBIT 'B'

Our Order No. GW233030-2

RECORDED SEPTEMBER 16, 1905 IN BOOK 62 AT PAGE 103.

C. MAP AND STATMENT OF THE WULFSOHN ENLARGEMENT OF THE F.A. ATKINSON DITCH RECORDED SEPTEMBER 2, 1909 AS RECEPTION NO. 37700.

D. FOURTH ENLARGEMENT & EXTENSION OF THE ATKINSON CANAL RECORDED DECEMBER 8, 1950 AS RECEPTION NO. 174372.

E. EASEMENTS AND RIGHTS OF WAY AS GRANTED TO THE MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY IN INSTRUMENTS RECORDED JUNE 25, 1936 IN BOOK 183 AT PAGE 430.

F. PIPELINE RIGHT OF WAY AGREEMENT RECORDED AUGUST 3, 1951 IN BOOK 259 AT PAGE 413.

G. EASEMENTS AND RIGHT OF WAY FOR RED ACRES DITCH.

H. EASEMENT AS GRANTED TO ROCKY MOUNTAIN NATURAL GAS COMPANY, INC., IN INSTRUMENT RECORDED JANUARY 31, 1962 IN BOOK 339 AT PAGE 88.

I. EASEMENTS AS GRANTED TO PUBLIC SERVICE COMPANY OF COLORADO IN INSTRUMENTS RECORDED OCTOBER 17, 1966 IN BOOK 379 AT PAGE 400 AND RECORDED FEBRUARY 13, 1967 IN BOOK 382 AT PAGE 181.

J. PERMANENT EASEMENT AS GRANTED TO THE DEPARTMENT OF HIGHWAYS, STATE OF COLORADO IN INSTRUMENT RECORDED SEPTEMBER 22, 1967 IN BOOK 388 AT PAGE 101.

NOTE: UPON RECEIPT OF A SURVEY, MEETING THE ALTA MINIMUM STANDARDS FOR CONTENT AND ACCURACY, THE EXCEPTION SHOWN ABOVE WILL BE DELETED. PROVIDED HOWEVER, THAT LAND TITLE GUARANTEE COMPANY RESERVES THE RIGHT TO ADD ANY EXCEPTIONS IT DEEMS NECESSARY FOR MATTERS DISCLOSED BY SAID SURVEY.

TERMS, CONDITIONS AND PROVISIONS OF CITY OF GLENWOOD SPRINGS ORDINANCE NO. 47 RECORDED JANUARY 03, 1996 IN BOOK 963 AT PAGE 131.

TERMS, CONDITIONS AND PROVISIONS OF CITY OF GLENWOOD SPRINGS ORDINANCE RECORDED JANUARY 03, 1996 IN BOOK 963 AT PAGE 135.

TERMS, CONDITIONS AND PROVISIONS OF RIGHT OF WAY ACQUISITION AGREEMENT RECORDED SEPTEMBER 26, 1994 IN BOOK 916 AT PAGE 864.

EASEMENTS, RIGHTS OF WAY AND OTHER MATTERS AS SHOWN ON BOUNDARY SURVEY PREPARED BY CONSTRUCTION SURVEYS, INC., DATED JUNE 28, 1996.

**WEST GLENWOOD SPRINGS SANITATION DISTRICT
SPECIAL FEE AND COST REIMBURSEMENT AGREEMENT**

This Special Fee and Cost Reimbursement Agreement is entered into by and between the WEST GLENWOOD SPRINGS SANITATION DISTRICT, whose address is P. O. Box 866, Glenwood Springs, Colorado 81602 (hereinafter "District") and GLENWOOD MEADOWS, LLC, a Colorado limited liability company, whose address is 525 East Cooper Avenue, Aspen, Colorado 81611 (hereinafter "Glenwood Meadows" or "Applicant");

W I T N E S S E T H:

WHEREAS, the District is a Colorado special district and quasi-municipal corporation formed and functioning under the authority of C.R.S. §32-1-101, *et seq.* and §31-35-401, *et seq.*, providing sanitary sewer service to the area around West Glenwood Springs, Colorado; and

WHEREAS, Glenwood Meadows is the owner of that certain real property described in Exhibit A, attached hereto and incorporated herein by this reference (the "Property"), and desires to undertake the projects or activities described in Paragraph 1, below; and

WHEREAS, the above activity or project will require the District to provide the special services and incur the costs set forth in Paragraph 2, below; and

WHEREAS, pursuant to C.R.S. §§32-1-1001(1)(d), (j-m) and §31-35-402(1)(f), the District has the authority to require reimbursement of its out-of-pocket costs in providing services to District customers, including but not limited to sewer connections, inclusions and exclusions from the District, and planning and review of line extensions and connections; and

WHEREAS, Sections 5.01, 7.04, and 8.01 of the Rules and Regulations of the District provide that the District may charge legal, engineering, publication, recording, inspection, and other fees of customers desiring services from the District; and

WHEREAS, the special fees paid and collected by virtue of this Agreement shall be used solely to pay for the cost of planning, engineering review and inspection, legal review, administrative review, and actual out-of-pocket costs incurred by the District in relation to the anticipated project; and

WHEREAS, the Board of Directors of the District and Glenwood Meadows desire to set forth their agreements and understandings concerning this matter.

NOW, THEREFORE, in consideration of the mutual covenants and promises of the parties, and for other good and valuable consideration, the adequacy and sufficiency of which is hereby acknowledged, the parties agree as follows:

1. Glenwood Meadows desires to undertake the following projects or activities involving the District or its sewer systems:

<u> </u>	Inclusion into the District
<u> </u>	Exclusion from the District
<u> X </u>	Sewer line connection
<u> </u>	Other (describe) Special Tap Fee Agreement

2. The activity or project being undertaken by Glenwood Meadows will require the District to provide the following special services or incur the following costs:

<u> X </u>	Engineering review and advice
<u> X </u>	Legal review and advice
<u> X </u>	Preparation of plats or plans
<u> X </u>	Inspections
<u> X </u>	Recording fees
<u> X </u>	Filing fees
<u> </u>	Other (describe):

3. Glenwood Meadows agrees to pay the District in full for all special services provided or actual costs incurred by the District in relation to the project or activity described above on receipt of an itemized billing for those services from the District. All such amounts are due within thirty (30) days of the date of the bill, with interest on any overdue amounts to be assessed at one percent (1%) per month. In the event that such amounts remain unpaid thirty (30) days after the date they are billed, the District reserves the right to cease supplying any and all sewer services being provided, review and processing of applications for service, inclusion, exclusion, and line extension. In the event the District is forced to pursue collection of any amounts due and unpaid under this provision, it shall be entitled to collect attorneys fees, filing, and recording fees incurred in such collection efforts in addition to the unpaid amounts due, plus interest.

4. Glenwood Meadows agrees to provide a deposit to the District in the amount of One Thousand Dollars (\$1,000) at the time of signing this Agreement. The District shall not commence to provide any of the services desired by the Applicant, or advance any further costs, until this deposit is received by the District. Further, in the event it is deemed necessary to purchase an easement or condemn an easement, Glenwood Meadows shall supplement the initial deposit in an amount to be determined by the District to pay in advance the expected amounts for such service prior to the District undertaking such services. Any amount by which the Applicant's deposit exceeds the cost assessed under this section shall be refunded to the Applicant within a reasonable time after final action has been taken on the project or applied toward the tap fees to be due under a Tap Fee Agreement to be executed by the parties. Any amount by which the deposit is less than the total costs due to the District under this Agreement shall be due and payable subject to the provisions of Paragraph 2, above.

5. The District specifically does not agree to act favorably on any application to the District made by Glenwood Meadows in exchange for payment of the special fees set forth above.

6. This Agreement constitutes the entire and complete agreement of the parties on the subject matter herein. No promise or undertaking has been made by any party, and no understanding exists with respect to the transaction contemplated, except as expressly set forth herein. All prior and contemporaneous negotiations and understandings between the parties are embodied and merged into this Agreement.

7. This Agreement may be amended from time to time by amendments made by the parties in written form and executed in the same manner as this Agreement.

8. This Agreement shall be binding upon and inure to the benefit of the parties and their assigns and successors in interest.

9. The undersigned by their signatures hereto warrant that they are fully authorized to execute this Agreement in the name of the entity for which each of them sign.

10. If any covenant, term, condition, or provision under this Agreement shall for any reason be held to be invalid or unenforceable, the invalidity or unenforceability of such covenant, term, condition, or provision shall not affect any other provision contained herein.

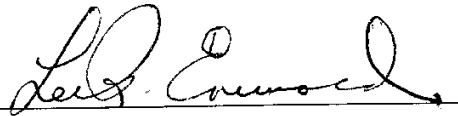
11. The parties agree and intend that this Agreement shall run with the land described in Exhibit A, attached hereto, and be a burden upon that property until final payment has been made to the District of all fees due and payable under this Agreement, or until the earlier termination of this Agreement.

IN WITNESS WHEREOF, the parties have executed this SPECIAL FEE AND COST REIMBURSEMENT AGREEMENT on the day and year adjacent to their respective signatures.

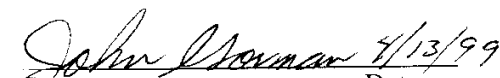
WEST GLENWOOD SPRINGS
SANITATION DISTRICT

Date: 13 APRIL 99

By


Chairman

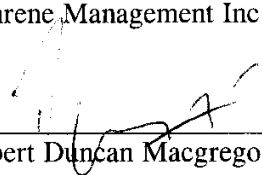
ATTEST


Secretary Date

GLENWOOD MEADOWS, LLC

By Dunrene Management Inc., Manager

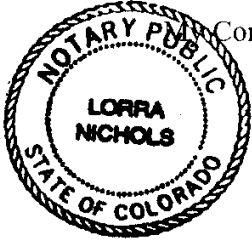
Date: _____

By 
Robert Duncan Macgregor, President

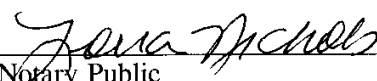
STATE OF COLORADO)
COUNTY OF Garfield) ss.

Acknowledged, subscribed, and sworn to before me this 13th day of April, 1999, by Lee Enewold, as Chairman, and by John Gorman, as Secretary, on behalf of the West Glenwood Springs Sanitation District.

WITNESS my hand and official seal.



Commission expires: 6-28-99.

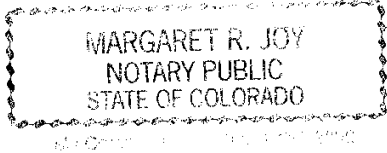

Notary Public

STATE OF COLORADO)
COUNTY OF Garfield) ss.

Acknowledged, subscribed, and sworn to before me this 13th day of March, 1999, by Robert Duncan Macgregor, as President of Dunrene Management, Inc., on behalf of Glenwood Meadows, LLC.

WITNESS my hand and official seal.

My Commission expires: 12/23/2000.



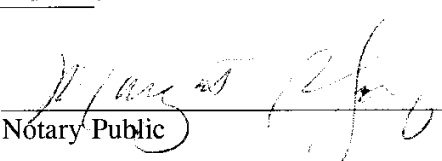

Notary Public

EXHIBIT A

Glenwood Land Company Property:

A PARCEL OF LAND SITUATED IN SECTIONS 5 AND 6, TOWNSHIP 6 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF GARFIELD, STATE OF COLORADO, SAID PARCEL BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A CONCRETE RIGHT-OF-WAY MONUMENT FOUND ON THE SOUTHERLY RIGHT-OF-WAY OF THE DENVER AND RIO GRANDE WESTERN RAILROAD WHENCE THE BLM ALUM. CAP IN PLACE AND PROPERLY MARKED FOR THE SOUTHWEST CORNER OF SAID SECTION 5 BEARS SOUTH 23°29'57" WEST 1196.71 FEET;
THENCE ALONG SAID SOUTHERLY RIGHT-OF-WAY THE FOLLOWING (3) COURSES:
THENCE SOUTH 83°38'11" WEST 901.40 FEET;
THENCE NORTH 82°19'49" WEST 103.10 FEET;
THENCE SOUTH 83°37'11" WEST 7.05 FEET LEAVING SAID SOUTHERLY RIGHT-OF-WAY;
THENCE ALONG THE NORTHERLY RIGHT-OF-WAY OF THE MIDLAND AVE. RIGHT-OF-WAY ACQUISITION THE FOLLOWING (8) COURSES:
THENCE SOUTH 42°36'53" EAST 17.15 FEET;
THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 710.00 FEET AND AN ARC LENGTH OF 677.30 FEET, THE CHORD OF WHICH BEARS SOUTH 69°56'35" EAST 651.91 FEET;
THENCE NORTH 82°43'44" EAST 80.93 FEET;
THENCE ALONG THE ARC OF A CURVE TO THE LEFT HAVING A RADIUS OF 500.00 FEET AND AN ARC LENGTH OF 194.98 FEET, THE CHORD OF WHICH BEARS NORTH 71°33'27" EAST 193.75 FEET;
THENCE NORTH 60°23'10" EAST 185.42 FEET;
THENCE NORTH 56°38'55" EAST 230.74 FEET;
THENCE NORTH 75°17'22" EAST 201.74 FEET;
THENCE NORTH 06°21'46" WEST 19.87 FEET LEAVING SAID NORTHERLY RIGHT-OF-WAY;
THENCE ALONG SAID SOUTHERLY RIGHT-OF-WAY THE FOLLOWING (3) COURSES:
THENCE SOUTH 83°38'11" WEST 132.79 FEET;
THENCE SOUTH 86°30'11" WEST 200.30 FEET;
THENCE SOUTH 83°38'11" WEST 98.60 FEET TO THE POINT OF BEGINNING.

QUITCLAIM DEED

This Quitclaim Deed dated as of 16 October, 1998 is from GLENWOOD LAND COMPANY, LLC, a Colorado limited liability company ("Grantor"), with an address of 525 East Cooper, Aspen, Colorado 81611, to GLENWOOD MEADOWS, LLC, a Colorado limited liability company ("Grantee"), with an address of 525 East Cooper, Aspen, Colorado 81611.

RECITALS

A. Grantor has conveyed to Grantee by Special Warranty Deed of even date herewith, among other things, that certain real estate described in Exhibit A attached hereto and made a part hereof.

B. Grantor now desires to convey mineral rights and other interests to Grantee.

CONVEYANCE

For \$10.00 and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor hereby remises, releases, sells and quitclaims to Grantee the following interests (collectively, the "Property"):

(i) all right, title and interest of Grantor in and to any and all oil, gas and other minerals in and under, and that may be produced from the real estate described in Exhibit A hereto;

(ii) all right, title and interest of Grantor in and to any and all easements, rights-of-way, hereditaments and other rights appurtenant to the ownership of or benefiting the real estate described in Exhibit A hereto.

To have and to hold the Property unto Grantee, and its successors and assigns, forever.

~~DATED~~ ⁱⁿ
~~EXECUTED~~ this 16 day of OCTOBER, 1998.

GLENWOOD LAND COMPANY, LLC, a
Colorado limited liability company

By: [Signature]
Name: Robert Duncan Macgregor
Title: Manager



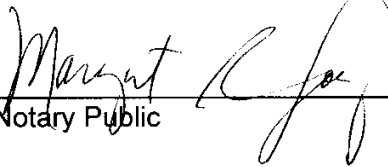
GW223043

Return to: Tom Hartner
802 Grand
GWS, CO 81601

STATE OF COLORADO)
) ss.
COUNTY OF GARFIELD)

The foregoing instrument was acknowledged before me this 10th day of November, 1998, by Robert Duncan Macgregor, as the Manager of Glenwood Land Company, LLC, a Colorado limited liability company.

Witness my hand and official seal.


Notary Public

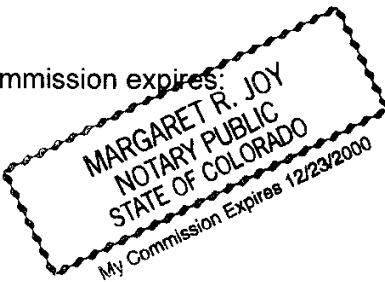
My commission expires:

MARGARET R. JOY
NOTARY PUBLIC
STATE OF COLORADO
My Commission Expires 12/23/2000

EXHIBIT A

PARCEL # 1

ALL THAT PROPERTY LOCATED IN THE NW1/4NW1/4 AND E1/2NW1/4 OF SECTION 8; THAT PORTION OF THE NE1/4 OF SAID SECTION 8 LOCATED SOUTH OF THE SOUTHERLY RIGHT OF WAY LINE OF THE MIDLAND AVENUE RIGHT OF WAY AQUISITION; THAT PORTION OF THE W1/2NW1/4 OF SECTION 9 LOCATED SOUTH OF THE SOUTHERLY RIGHT OF WAY LINE OF SAID MIDLAND AVENUE RIGHT OF WAY AQUISITION; THAT PORTION OF THE SE1/4 OF THE NW1/4 OF SAID SECTION 9 BEING TRIANGULAR IN SHAPE BOUNDED ON THE WEST BY THE WESTERLY LINE OF THE SE1/4NW1/4 OF SAID SECTION 9, ON THE NORTH BY THE SOUTHERLY LINE OF SAID MIDLAND AVENUE RIGHT OF WAY AQUISITION AND ON THE SOUTH BY THE WEST LINE OF THE RED MOUNTAIN DRIVE RIGHT OF WAY; THAT PORTION OF THE S1/2S1/2 OF SECTION 5 LOCATED SOUTH OF THE SOUTHERLY RIGHT OF WAY LINE OF SAID MIDLAND AVENUE RIGHT OF WAY AQUISITION; THAT PORTION OF THE SE1/4SE1/4 OF SECTION 6 LOCATED SOUTH OF THE SOUTHERLY RIGHT OF WAY LINE OF SAID MIDLAND AVENUE RIGHT OF WAY AQUISITION AND THE DENVER & RIO GRANDE WESTERN RAILROAD RIGHT OF WAY; ALL LOCATED IN TOWNSHIP 6 SOUTH RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN. THE PROPERTY AS MENTIONED ABOVE BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS FOR ACREAGE AS FOLLOWS:

BEGINNING AT THE SOUTH EAST CORNER OF SAID SECTION 6; THENCE S. 75 DEGREES 55'37" W, A DISTANCE OF 1316.16 FEET ALONG THE SOUTHERLY LINE OF SAID SECTION 6 TO THE EAST 1/16 CORNER COMMON TO SAID SECTIONS 6 AND 7; THENCE N 01 DEGREES 07'55" E, A DISTANCE OF 1253.02 FEET ALONG THE WEST LINE OF THE SE1/4SE1/4 OF SAID SECTION 6 TO THE SOUTHERLY RIGHT OF WAY LINE OF SAID DENVER RIO GRANDE WESTERN RAILROAD RIGHT OF WAY; THENCE ALONG SAID RIGHT OF WAY THE FOLLOWING (2) COURSES: THENCE N 86 DEGREES 20'11" E, A DISTANCE OF 58.27 FEET; THENCE N 83 DEGREES 38'11" E, A DISTANCE OF 480.07 FEET TO THE SOUTHERLY RIGHT OF WAY LINE OF SAID MIDLAND AVENUE RIGHT OF WAY AQUISITION; THENCE ALONG SAID RIGHT OF WAY THE FOLLOWING (47) COURSES, THENCE S 44 DEGREES 35'36" E, A DISTANCE OF 72.53 FEET; THENCE S 53 DEGREES 05'31" E, A DISTANCE OF 232.27 FEET; THENCE ALONG THE ARC OF A CURVE TO THE LEFT A DISTANCE OF 580.98 FEET, HAVING A RADIUS OF 880.00 FEET, THE CHORD OF WHICH BEARS S 72 DEGREES 00'20" E, A DISTANCE OF 570.49 FEET; THENCE N 89 DEGREES 04'52" E, A DISTANCE OF 386.55 FEET; THENCE N 02 DEGREES 31'09" E, A DISTANCE OF 137.01 FEET; THENCE N 62 DEGREES 28'35" E, A DISTANCE OF 379.58 FEET; THENCE N 70 DEGREES 48'52" E, A DISTANCE OF 233.79 FEET; THENCE ALONG THE ARC OF A CURVE TO THE RIGHT A DISTANCE OF 138.27 FEET, HAVING A RADIUS OF 400.00 FEET, THE CHORD OF WHICH BEARS N 80 DEGREES 43'03" E, A DISTANCE OF 137.58 FEET; THENCE S 89 DEGREES 22'47" E, A DISTANCE OF 220.22 FEET; THENCE S 04 DEGREES 05'51" W, A DISTANCE OF 84.94 FEET; THENCE S 88 DEGREES 21'25" E, A DISTANCE OF 29.12 FEET; THENCE N 84 DEGREES 12'24" E, A DISTANCE OF 200.33 FEET; THENCE N 13 DEGREES 23'18" E, A DISTANCE OF 18.04 FEET; THENCE S 79 DEGREES 22'12" E, A DISTANCE OF 693.85 FEET; THENCE S 15 DEGREES 25'14" W, A DISTANCE OF 81.35 FEET; THENCE S 72 DEGREES 50'58" E, A DISTANCE OF 30.90 FEET; THENCE S 87 DEGREES 49'17" E, A DISTANCE OF 164.69 FEET; THENCE N 47 DEGREES 19'34" E, A DISTANCE OF 37.65 FEET; THENCE S 74 DEGREES 59'10" E, A DISTANCE OF 294.83 FEET; THENCE S 08 DEGREES 06'53" E, A DISTANCE OF 62.58 FEET; THENCE S 77 DEGREES 46'27" E, A DISTANCE OF 150.75 FEET; THENCE N 14 DEGREES 20'16" E, A DISTANCE OF 62.19 FEET; THENCE S 79 DEGREES 08'31" E, A DISTANCE OF 369.05 FEET; THENCE S 18 DEGREES 40'31" E, A DISTANCE OF 29.17 FEET; THENCE S 66 DEGREES 03'20" E, A DISTANCE OF 143.01 FEET; THENCE N 25 DEGREES 40'28" E, A DISTANCE OF 42.89 FEET; THENCE S 74 DEGREES 19'33" E, A DISTANCE OF 339.00 FEET; THENCE S 76 DEGREES 23'22" E, A DISTANCE OF 559.87 FEET; THENCE ALONG THE ARC OF A CURVE TO THE RIGHT A DISTANCE OF 1104.51 FEET, HAVING A RADIUS OF 1190.00 FEET, THE CHORD OF WHICH BEARS S 48 DEGREES 18'54" E, A DISTANCE OF 1065.29 FEET; THENCE S 21 DEGREES 43'32" E, A DISTANCE OF 179.06 FEET; THENCE S 68 DEGREES 16'28" W, A DISTANCE OF 31.36 FEET; THENCE S 23 DEGREES 26'58" E, A DISTANCE OF 78.05 FEET; THENCE N 68 DEGREES 16'28" E, A DISTANCE OF 29.01 FEET; THENCE S 21 DEGREES 43'32" E, A DISTANCE OF 764.09 FEET; THENCE ALONG THE ARC OF A CURVE TO THE LEFT A DISTANCE OF 272.23 FEET, HAVING A RADIUS OF 1165.00 FEET, THE CHORD OF WHICH BEARS S 28 DEGREES 25'10" E, A DISTANCE OF 271.61 FEET; THENCE S 35 DEGREES 06'49" E, A DISTANCE OF 21.42 FEET; THENCE S 54 DEGREES 53'11" W, A DISTANCE OF 22.69 FEET; THENCE S 41 DEGREES 40'06" E, A DISTANCE OF 43.30 FEET; THENCE N 54 DEGREES 53'11" E, A DISTANCE OF 17.75 FEET; THENCE S 30 DEGREES 38'49" E, A DISTANCE OF 271.57 FEET; THENCE S 41 DEGREES 04'38" E, A DISTANCE OF 291.31 FEET; THENCE S 23 DEGREES 28'47" E, A DISTANCE OF 143.44

GW230043

EXHIBIT A

FEET THENCE ALONG THE ARC OF A CURVE TO THE LEFT A DISTANCE OF 95.96 FEET, HAVING A RADIUS OF 100.00 FEET, THE CHORD OF WHICH BEARS S 50 DEGREES 58'14" E, A DISTANCE OF 92.32 FEET; THENCE S 78 DEGREES 27'41" E, A DISTANCE OF 27.55 FEET; THENCE ALONG THE ARC OF A CURVE TO THE RIGHT A DISTANCE OF 42.95 FEET, HAVING A RADIUS OF 200.00 FEET, THE CHORD OF WHICH BEARS S 72 DEGREES 18'32" E, A DISTANCE OF 42.87 FEET; THENCE S 50 DEGREES 13'26" E, A DISTANCE OF 131.37 FEET; THENCE S 43 DEGREES 26'37" E, A DISTANCE OF 220.95 FEET; THENCE S 54 DEGREES 38'36" E, A DISTANCE OF 373.46 FEET TO THE WESTERLY RIGHT OF WAY LINE OF SAID RED MOUNTAIN DRIVE RIGHT OF WAY; THENCE ALONG SAID RIGHT OF WAY THE FOLLOWING (2) COURSES: THENCE ALONG THE ARC OF A CURVE TO THE LEFT A DISTANCE OF 35.93 FEET, HAVING A RADIUS OF 124.00 FEET, THE CHORD OF WHICH BEARS S 32 DEGREES 55'06" W, A DISTANCE OF 35.80 FEET TO THE EAST LINE OF THE SW1/4NW1/4 OF SAID SECTION 9; THENCE ALONG SAID EAST LINE S 00 DEGREES 39'40" W, A DISTANCE OF 82.52 FEET TO THE CENTER WEST 1/16 CORNER OF SAID SECTION 9; THENCE LEAVING SAID RIGHT OF WAY AND ALONG THE EAST WEST CENTER LINE OF SAID SECTION 9 N 88 DEGREES 48'57" W, A DISTANCE OF 1318.50 FEET TO THE EAST 1/4 CORNER OF SAID SECTION 8; THENCE ALONG THE EAST WEST CENTER LINE OF SAID SECTION 8 N 89 DEGREES 15'16" W, A DISTANCE OF 2735.32 FEET TO THE CENTER 1/4 CORNER OF SAID SECTION 8; THENCE CONTINUING ALONG THE EAST WEST CENTER LINE OF SAID SECTION 8 N 89 DEGREES 15'16" W, A DISTANCE OF 1363.17 FEET TO THE CENTER WEST 1/16 CORNER OF SAID SECTION 8; THENCE ALONG THE WEST LINE OF THE SE1/4NW1/4 OF SAID SECTION 8 N 01 DEGREES 13'52" E, A DISTANCE OF 1360.08 FEET TO THE NW1/16 CORNER OF SAID SECTION 8; THENCE ALONG THE SOUTH LINE OF THE NW1/4NW1/4 OF SAID SECTION 8 N 88 DEGREES 45'05" W, A DISTANCE OF 1367.66 FEET TO THE NW1/16 CORNER COMMON TO SAID SECTIONS 7 AND 8; THENCE ALONG THE WEST LINE TO THE NW CORNER OF SAID SECTION 8 N 01 DEGREES 04'56" E, A DISTANCE OF 1369.90 FEET, TO THE POINT OF BEGINNING.

PARCEL # 2

A PARCEL OF LAND SITUATED IN SECTIONS 5 AND 6, TOWNSHIP 6 SOUTH RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF GARFIELD, STATE OF COLORADO, SAID PARCEL BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT A CONCRETE RIGHT OF WAY MONUMENT FOUND ON THE SOUTHERLY RIGHT OF WAY OF THE DENVER AND RIO GRANDE WESTERN RAILROAD WHENCE THE BLM ALUM. CAP IN PLACE AND PROPERLY MARKED FOR THE SOUTHWEST CORNER OF SAID SECTION 5 BEARS S 23 DEGREES 29'57" W 1196.71 FEET; THENCE ALONG SAID SOUTHERLY RIGHT OF WAY THE FOLLOWING (3) COURSES: THENCE S 83 DEGREES 38'11" W 901.40 FEET; THENCE N 82 DEGREES 19'49" W 103.10 FEET; THENCE S 83 DEGREES 38'11" W 7.05 FEET LEAVING SAID SOUTHERLY RIGHT OF WAY; THENCE ALONG THE NORTHERLY RIGHT OF WAY OF THE MIDLAND AVE. RIGHT OF WAY ACQUISITION THE FOLLOWING (8) COURSES: THENCE S 42 DEGREES 36'53" E 17.15 FEET; THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 710.00 FEET AND AN ARC LENGTH OF 677.30 FEET, THE CHORD OF WHICH BEARS S 69 DEGREES 56'35" E 651.91 FEET. THENCE N 82 DEGREES 43'44" E 80.93 FEET; THENCE ALONG THE ARC OF A CURVE TO THE LEFT HAVING A RADIUS OF 500.00 FEET AND AN ARC LENGTH OF 194.98 FEET, THE CHORD OF WHICH BEARS N 71 DEGREES 33'27" E 193.75 FEET; THENCE N 60 DEGREES 23'10" E 185.42 FEET; THENCE N 56 DEGREES 38'55" E 230.74 FEET; THENCE N 75 DEGREES 17'22" E 201.74 FEET; THENCE N 06 DEGREES 21'46" W 19.87 FEET LEAVING SAID NORTHERLY RIGHT OF WAY; THENCE ALONG SAID SOUTHERLY RIGHT OF WAY THE FOLLOWING (3) COURSES: THENCE S 83 DEGREES 38'11" W 132.79 FEET; THENCE S 86 DEGREES 30'11" W 200.30 FEET; THENCE S 83 DEGREES 38'11" W 98.60 FEET TO THE POINT OF BEGINNING.

PARCEL # 3

A PARCEL OF LAND SITUATED SOUTHERLY OF THE DENVER & RIO GRANDE WESTERN RAILROAD (D&RGW) RIGHT OF WAY AND NORTHERLY OF THE MIDLAND AVENUE ACQUISITION RIGHT OF WAY (MIDLAND ROW), LOCATED IN THE SW1/4NW1/4 OF SECTION 9, TOWNSHIP 6 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF GARFIELD, STATE OF COLORADO, THE PARCEL BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE SOUTHEAST CORNER OF SAID PARCEL WHENCE THE BRASS CAP FOUND AT THE CENTER WEST 1/16 CORNER OF SECTION 9 BEARS S 00 DEGREES 39'40" W 281.52 FEET; THENCE N 00 DEGREES 39'40" E 418.89 FEET; ALONG THE EASTERLY BOUNDARY OF SAID PARCEL ALSO BEING THE EASTERLY LINE OF THE SW1/4NW1/4 OF SAID SECTION 9 TO THE SOUTHERLY LINE OF SAID D&RGW RIGHT OF WAY; THENCE NORTHWESTERLY ALONG THE SAID RIGHT OF WAY THE FOLLOWING (4) COURSES; N 70 DEGREES 07'49" W 195.45 FEET; THENCE N 68 DEGREES 27'19" W 235.00 FEET; THENCE S 24 DEGREES 32'11" W 25.00

GW230043

EXHIBIT A

FEET; THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 1507.40 FEET AND AN ARC DISTANCE OF 551.12 FEET, THE CHORD OF WHICH BEARS N 54 DEGREES 59'25" W 548.06 FEET; THENCE S 54 DEGREES 50'12" W 20.12 FEET ALONG THE WESTERLY BOUNDARY OF SAID PARCEL ALSO BEING THE NORTHERLY BOUNDARY OF THE MIDLAND ROW; THENCE SOUTHEASTERLY ALONG SAID NORTHERLY BONDARY THE FOLLOWING (10) COURSES; S 35 DEGREES 06'32" E 163.12 FEET; THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 950.00 FEET AND AN ARC DISTANCE OF 250.62 FEET, THE CHORD OF WHICH BEARS S 42 DEGREES 39'59" E 249.89 FEET; THENCE S 50 DEGREES 13'26" E 91.26 FEET; THENCE S 39 DEGREES 46'34" W 10.00 FEET; THENCE S 50 DEGREES 13'26" E 18.00 FEET; THENCE N 39 DEGREES 46'34" E 10.00 FEET; THENCE S 50 DEGREES 13'26" E 259.08 FEET; THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 1050.00 FEET AND AN ARC DISTANCE OF 133.74 FEET, THE CHORD OF WHICH BEARS S 46 DEGREES 34'29" E 133.65 FEET; THENCE S 42 DEGREES 55'33" E 112.05 FEET; THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 715.00 FEET AND AN ARC DISTANCE OF 198.66 FEET, THE CHORD OF WHICH BEARS S 50 DEGREES 53'08" E 198.02 FEET TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM:

A PARCEL OF LAND SITUATED IN THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 9, TOWNSHIP 6 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF GARFIELD, STATE OF COLORADO SAID PARCEL OF LAND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS

COMMENCING AT THE STREET MONUMENT AT THE INTERSECTION OF 8TH STREET AND MIDLAND AVENUE;

THENCE N 51 DEGREES 15'40" W. 681.29 FEET TO THE WEST CENTER SIXTEENTH CORNER OF SAID SECTION 9, THE TRUE POINT OF BEGINNING

THENCE N 88 DEGREES 48'57" W ALONG THE SOUTHERLY LINE OF SAID SOUTHWEST QUARTER OF THE NORTHWEST QUARTER 361.88 FEET

THENCE LEAVING SAID SOUTHERLY LINE N 33 DEGREES 57'41" W 159.48 FEET

THENCE N 50 DEGREES 07'49" W 109.72 FEET

THENCE N 19 DEGREES 54'08" W 208.92 FEET

THENCE N 12 DEGREES 15'32" W 109.78 FEET

THENCE N 17 DEGREES 34'08" E 81.85 FEET TO A POINT IN THE SOUTHERLY RIGHT OF WAY OF MIDLAND AVENUE;

THENCE THE FIVE (5) FOLLOWING COURSES ALONG SAID SOUTHERLY RIGHT OF WAY

1. S 78 DEGREES 26'55" E 27.55 FEET

2. ALONG THE ARC OF A CURVE TO THE RIGHT HAVING A RADIUS OF 200.00 FEET, A CENTRAL ANGLE 12 DEGREES 18'18" AND A DISTANCE OF 42.95 FEET (CHORD BEARS S 72 DEGREES 17'46" E 42.87 FEET)

3. S 50 DEGREES 12'40" E 131.37 FEET

4. S 43 DEGREES 25'51" E 220.96 FEET

5. S 54 DEGREES 37'50" E 373.48 FEET

THENCE ALONG THE ARC OF A NON-TANGENT CURVE TO THE LEFT HAVING A RADIUS OF 124.00 FEET, A CENTRAL ANGLE OF 16 DEGREES 35'59" AND A DISTANCE OF 35.93 FEET (CHORD BEARS S 32 DEGREES 55'06" W. 35.80 FEET) TO A POINT ON THE EASTERLY LINE OF SAID SOUTHWEST QUARTER OF THE NORTHWEST QUARTER

THENCE S 00 DEGREES 39'40" W ALONG SAID EASTERLY LINE 82.52 FEET TO THE TRUE POINT OF BEGINNING.

COUNTY OF GARFIELD
STATE OF COLORADO

CORRECTION QUIT CLAIM DEED
EXHIBIT A
May 18, 2009

A Parcel of Land being a portion of that parcel described in the Correction Bargain and Sale Deed recorded September 9, 2008 at Reception No. 755399 and also Parcel 1 of deed recorded in Book 1024 on Page 600, dated July 03, 1997 in the records of Garfield County, situated in Section 9, Township 6 South, Range 89 West of the Sixth Principal Meridian, State of Colorado, described as follows:

Commencing at the Southwest corner of Out Lot 40 as shown on the Glenwood Springs Map, dated January 1897, filed in the Garfield County records, said point also being on the West boundary of the Defiance Townsite as shown on the General Land Office Survey, dated January 16, 1883;

Thence S02°43'44"W, along said West boundary, 70.01 feet to a line 30 feet offset Southerly and distant from the centerline of the description of a centerline of road as shown on "Map of the County Road through Lot No. 3 and the N.E. ¼ of the S.W. ¼ of Section 9, T. 6 S. R. 89 W. as traveled and used since 1890, Garfield County, Colorado", map #0109 in the records of Garfield County, Colorado, being the Point of Beginning;

Thence continuing S02°43'44"W, along said West Boundary, 9.99 feet to the South right-of-way line of 7th Street per that document recorded in Book 25, Page 384 of Garfield County records;

Thence S87°16'31"E, along said South right-of-way line, 100.08 feet to the West right-of-way line of Pitkin Avenue, also being the East line of Block 41 of said Townsite;

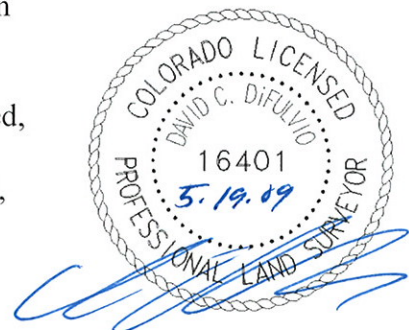
Thence S02°43'44"W, along said West right-of-way line, 110.00 feet to the Southeast corner of Lot 4, said Block 41;

Thence N87°16'31"W, along the Southerly lines Lots 1-4, said Block 41, 100.08 feet to the West boundary of said Defiance Townsite;

Thence S02°43'44"W, along said West boundary 9.45 feet to the Northwest boundary of Parcel 2, Exception 2, of said Book 1024, Page 600;

Thence S49°14'20"W, along the Northwest line of said Parcel 2, Exception No.2, 443.98 feet to the intersection of said Northwest line with the Westerly extension of the South right-of-way line of 8th Street;

Thence N87°16'32"W, along said South right-of-way line extended, 301.18 feet to the intersection of said line extended with the Easterly boundary of the "Release of Lands" recorded in Book 35, Page 137 of said Garfield County Records;



Thence N14°57'25"E along the Easterly boundary of said Book 35, Page 137, 111.51 feet to a line 30 feet offset Southeasterly, and distant, from said centerline of road described on said Map #0109;

Thence Northeasterly, along said 30 foot offset line the following seven (7) courses:

1. N44°11'25"E, 17.76 feet;
2. N66°52'25"E, 163.55 feet;
3. N61°32'25"E, 103.78 feet;
4. N56°42'25"E, 184.96 feet;
5. N61°00'25"E, 101.48 feet;
6. N71°26'25"E, 70.33 feet;
7. S87°16'35"E, 50.49 feet, to the West boundary of said Defiance Townsite and the Point of Beginning;

EXCEPTING therefrom, the following two Parcels:

Exception Parcel 1

A 30 foot strip being 15.85 feet Southeasterly and 14.15 feet Northwesterly from the centerline of the original narrow gage main track alignment of the former Denver and Rio Grande Western Railroad Aspen Branch right-of-way in Garfield County, Colorado, as shown on the Interstate Commerce Commission (ICC) Valuation Map 8 C (Colorado); Map Sheet S-1, described as follows:

Beginning at the intersection of said main track centerline with the Southerly line of the 8th Street right-of-way line extended Westerly across said Aspen Branch right-of-way;

Thence Northeasterly, along said main track centerline the following four (4) courses:

1. Northeasterly, through a central angle of 11°52'26", having a radius of 637.27 feet, along the arc of said curve 132.07 feet to the point of compound curvature of a curve concave Southeasterly;
2. Northeasterly, through a central angle of 05°08'00", having a radius of 3819.83 feet, along the arc of said curve 342.23 feet to the point of compound curvature of a curve concave Southeasterly;
3. Northeasterly, through a central angle of 09°07'00", having a radius of 1146.28 feet, along the arc of said curve 182.39 feet to the point of compound curvature of a curve concave Southeasterly;
4. Northeasterly, through a central angle of 01°19'58", having a radius of 2864.93 feet, along the arc of said curve 66.64 feet, to the South right-of-way line of 7th Street, also being on the North line of Lot 1, Block 41, of the Defiance Townsite, as shown on the General Land Office Survey, dated January 16, 1883, being the Point of Terminus, as said centerline and street right-of-way lines existed as of November, 2006,



The sidelines of the above described parcel to be extended and/or shortened to terminate at the intersecting parcel boundaries;

Exception Parcel 2

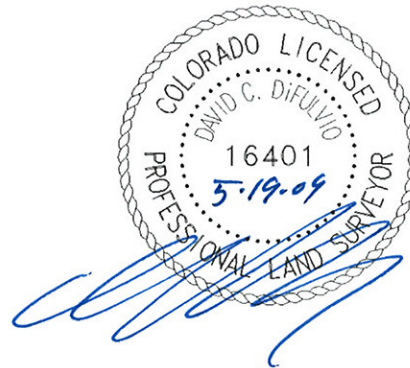
A 30 foot strip being 15 feet Westerly and 15 feet Easterly from the centerline of the West leg of the wye track of the former Denver and Rio Grande Western Railroad Aspen Branch right-of-way in Garfield County, Colorado, being Interstate Commerce Commission (ICC) Track No. 102, as shown on the ICC Valuation Map 8-A (Colorado); Map Sheet S-16a, Rv., described as follows:

Beginning at the intersection of said centerline with the Southerly line of the 8th Street right-of-way line extended Westerly across said Aspen Branch right-of-way;

Thence N21°39'44"E, along said centerline, 179.66 feet, to a line 30 feet offset Southeasterly, and distant, from centerline of road described on said Map #0109, being the Point of Terminus,

The sidelines of the above described parcel to be extended and/or shortened to terminate at the intersecting parcel boundaries.

The above description was prepared by
David C. DiFulvio, LS# 16401 for and on behalf of
Farnsworth Group, Inc.
8055 E. Tufts Ave., Suite 850
Denver, CO, 80127
(303) 692-883





January 3, 2003

Karl J. Hanlon, Esq.
Assistant City Attorney
City of Glenwood Springs
101 West 8th Street
Glenwood Springs, CO 81601

Dear Karl:

I am returning herewith fully executed IGA between the Roaring Fork Transportation Authority and the City of Glenwood Springs with respect to land exchanges.

Very truly yours,

Phyllis Kenny
Administrative Assistant

Enc.

INTERGOVERNMENTAL AGREEMENT
BETWEEN ROARING FORK TRANSPORTATION AUTHORITY
AND THE CITY OF GLENWOOD SPRINGS REGARDING LAND EXCHANGES

This Intergovernmental Agreement is made and entered into this 18 day of July, 2002, by and between the Roaring Fork Transportation Authority, Aspen, Colorado ("RFTA") and the City of Glenwood Springs, Colorado ("Glenwood Springs" or "City").

W I T N E S S E T H

WHEREAS, by Intergovernmental Agreement dated September 12, 2000, the City of Aspen, Town of Basalt, Town of Carbondale, Eagle County, City of Glenwood Springs, Pitkin County, and the Town of Snowmass Village entered into an agreement providing for the creation of the Roaring Fork Transportation Authority ("RFTA") as a political subdivision of the state of Colorado pursuant to Colorado Rural Transportation Authority Law, Title 43, Article 4, Part 6, C.R.S., which agreement ("RFTA IGA") was ratified by the electors of RFTA, at the state general election conducted on November 7, 2000; and

WHEREAS, RFTA is the owner of a portion of the railroad corridor, known as the Aspen Branch extending from Glenwood Springs to Woody Creek, Colorado (the "Corridor"); and

WHEREAS, certain obligations concerning management of the Corridor arise due to conservation easements and the status of the corridor as "railbanked," pursuant to Section 8(d) of the National Trails System Act, 16 U.S.C. §1247(d) ("Railbanking Act"); and

WHEREAS, the purposes of the Railbanking Act require preservation of railroad rights-of-ways for future reactivation of rail service; and

WHEREAS, RFTA has built a maintenance facility on land owned by the City; and

WHEREAS, the City is interested in obtaining land in the confluence area of the Roaring Fork and Colorado Rivers on the Corridor that will be owned by RFTA; and

WHEREAS, the parties wish to memorialize their agreements concerning the land swap and use of RFTA's Glenwood Maintenance Facility ("GMF") so that RFTA may occupy the GMF prior to completion of all legal the requirements for transfer of Corridor land; and

WHEREAS, an appraisal of the lands depicted in the maps attached as Exhibits A and B has indicated the values are roughly equal; and

WHEREAS, the City wishes to plan, redesign and redevelop the confluence area including properties currently owned by RFTA; and

WHEREAS, RFTA plans to develop a future transit center in the confluence area; and

WHEREAS, political subdivisions and governmental entities within the State of Colorado are authorized to contract and cooperate with one another to develop, maintain and operate mass transit systems by virtue of C.R.S. Section 29-1-201, et. seq., and Article XIV, Section 18, of the Colorado Constitution.

NOW THEREFORE, in consideration of the mutual benefits to be derived herefrom and RFTA and Glenwood Springs agree as follows:

I.

Statement of Purpose

1.1 The purpose of this Agreement is to formalize the agreement to exchange property that will be owned by RFTA with property owned by the City, on which RFTA is constructing a maintenance facility. In addition this Agreement will address planning and future exchange of properties in the confluence area of Glenwood Springs to facilitate transportation and redevelopment planning.

II.

Obligations of RFTA to Execute Deed

2.1 RFTA shall deliver to the City a quit claim deed for the property designated as Parcel 1 on the map of the confluence area designated as Exhibit A to this Agreement, being 2.42 acres, more or less.

III.

Obligations of Glenwood Springs to Execute Deed

3.1 Simultaneously with delivery of the deed for Parcel 1 the City shall deliver a quit claim deed to RFTA for the parcel at its Municipal Operations Center ("MOC") site on which the RFTA GMF is constructed.

IV.

Agreement for Exchange of Parcel 2

4.1 The parties agree to within two (2) years from the date of execution of this IGA to an exchange of properties in the confluence area. RFTA will transfer Parcel 2 shown on Exhibit A to the City, and the City will transfer land suitable for a transit center to RFTA upon the following conditions.

4.2 Within two (2) years from the date of execution the City will complete a comprehensive planning process for the confluence area which shall include the designation of an

appropriate transit facility location which shall be mutually agreed upon by the parties and each parties approval of a transit facility location shall not be unreasonably withheld.

4.3 RFTA agrees that if Parcel 2 is transferred to the City it will not be encumbered with any lease that cannot be terminated on sixty (60) days notice or less. RFTA further agrees not to transfer ownership of Parcel 2 to any other party other than the City during the term of this IGA.

4.4 The City agrees that any land exchanged for Parcel 2 will not be encumbered with lease which cannot be terminated on sixty (60) days notice or less. The City agrees that once a transit facility location is identified pursuant to Paragraph 4.1 that the City will not transfer ownership of the site to any other party other than RFTA during the term of this IGA.

4.5 If the City has not completed its' planning process and designated a transit site within two (2) years from the date of execution RFTA's obligation to transfer Parcel 2 pursuant to this IGA shall terminate.

V.

Assumption of Risk at the RFTA Maintenance Facility

5.1 Prior to delivery of the deed from Glenwood Springs for the property underlying RFTA's GMF, RFTA took possession and occupies the structures and RFTA agrees to accept any liability for damages that may arise, or have arisen, by virtue of the City's ownership of the land, or may arise, or have arisen, through acts by RFTA's employees or invitees, to the extent allowed by law.

5.2 Without waiving the privileges and immunities conferred by the Colorado Governmental Immunity Act, Section 24-10-101 *et seq.*, C.R.S., each party shall be responsible for any claims, demands or suits arising out of its own negligence. It is specifically understood and agreed that nothing contained in this paragraph or elsewhere in this Agreement shall be construed as an expressed or implied waiver by any party of its governmental immunity or the governmental acceptance by any party of liabilities arising as a result of actions which lie in tort or could lie in tort in excess of the liabilities allowable under the Colorado Governmental Immunity Act.

VI.

Effective Date

6.1 This Agreement shall be effective following signature by the authorized representative of the City and RFTA.

VII.

Term

7.1 This Agreement shall continue until terminated or changed by mutual agreement of the parties.

VIII Miscellaneous Provisions

8.1 Amendment. This Agreement may only be amended by a written agreement signed by the parties hereto.

8.2 Successors. This Agreement shall be binding upon and shall inure to the benefit of any successors to or assigns of the parties.

8.3 Severability. Should any part, term, portion or provision of this Agreement be finally decided to be in conflict with any law of the United States or of the State of Colorado, or otherwise be unenforceable or ineffectual, the validity of the remaining parts, terms, portion or provision shall be deemed severable and shall not be affected thereby, provided such remaining portions or provisions can be construed in substance to constitute the Agreement which the parties intended to enter into in the first instance.

8.4 No third party beneficiary. The rights under this Agreement shall inure solely to the benefit of the parties to this agreement, and nothing shall be construed to grant a cause of action to non-parties claiming as third party beneficiaries or otherwise.

8.5 Appropriation. This Agreement does not contain any multiple fiscal year financial obligations by either party that extends beyond its current fiscal year. Nothing herein obligates Glenwood Springs or RFTA to budget, authorize or appropriate funds for any fiscal year. This Agreement shall be construed as in compliance with the limitations of the Local Government Budget law (C.R.S. §29-1-101 *et seq.*), and the TABOR Amendment (Colorado Constitution, Article X, Sec. 20).

IN WITNESS WHEREOF, the parties hereto have signed and executed this Agreement effective as of the date and year above.

CITY of GLENWOOD SPRINGS

By: _____

ATTEST: _____

Robert S. Cleaver

ROARING FORK TRANSPORTATION AUTHORITY

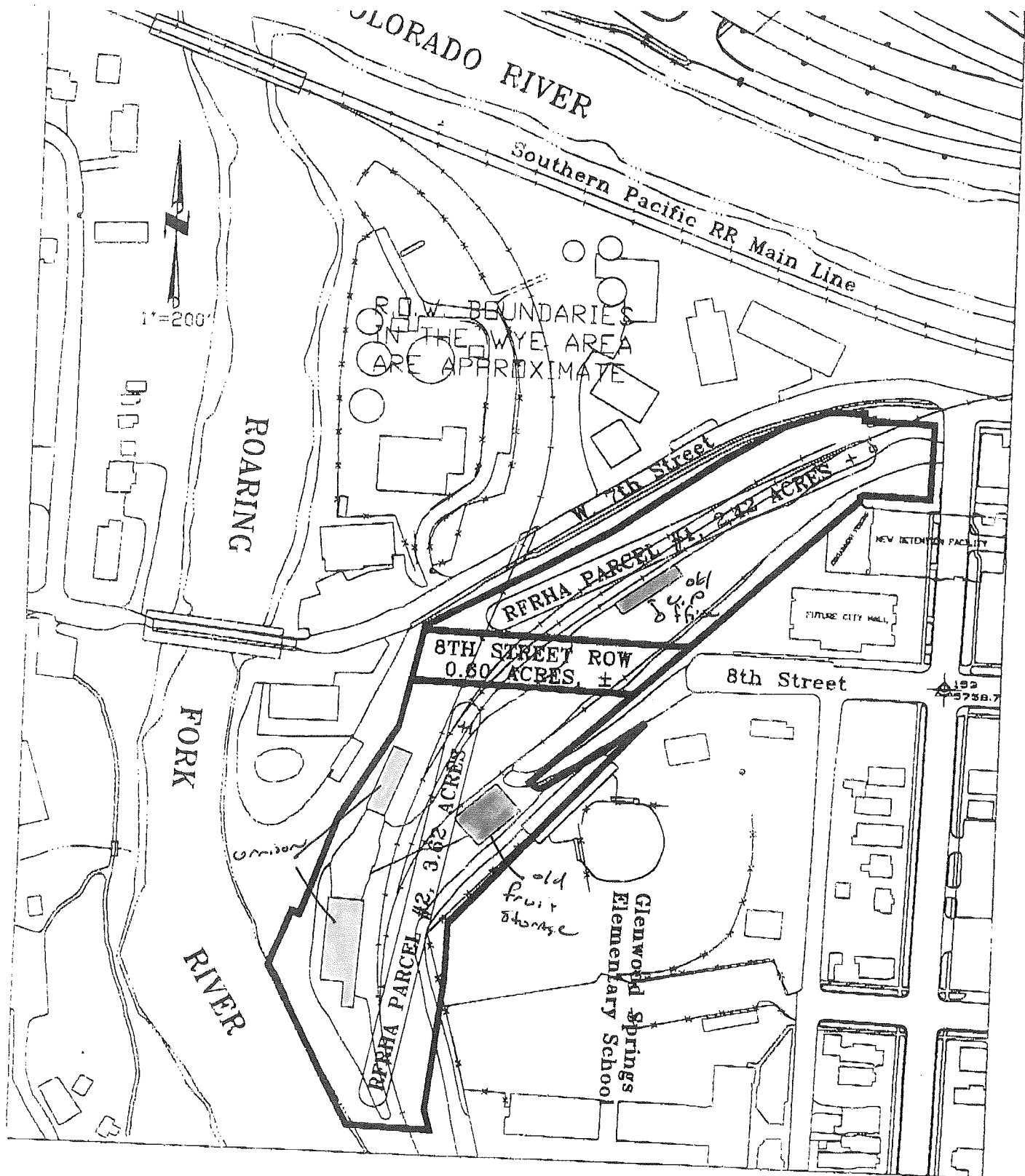
By: _____

T. Michael Manchester, Chairman
Board of Directors

ATTEST: _____

Theresa Perry
Secretary to the Board

\\Contracts\\Carbondale RTA IGA



Phyllis -
 Attach to
 Land swap
 16A

COPY

INTERGOVERNMENTAL AGREEMENT
BETWEEN ROARING FORK TRANSPORTATION AUTHORITY
AND THE CITY OF GLENWOOD SPRINGS REGARDING
THE GLENWOOD SPRINGS BUS MAINTENANCE FACILITY

This Intergovernmental Agreement is made and entered into this 20th day of NOVEMBER 2001, by and between the Roaring Fork Transportation Authority, Aspen, Colorado ("RFTA") and the City of Glenwood Springs, Colorado ("Glenwood Springs" or "City").

W I T N E S S E T H

WHEREAS, by Intergovernmental Agreement dated September 12, 2000, the City of Aspen, Town of Basalt, Town of Carbondale, Eagle County, City of Glenwood Springs, Pitkin County, and the Town of Snowmass Village entered into an agreement providing for the creation of the Roaring Fork Transportation Authority ("RFTA") as a political subdivision of the state of Colorado pursuant to Colorado Rural Transportation Authority Law, Title 43, Article 4, Part 6, C.R.S., which agreement ("RFTA IGA") was ratified by the electors of RFTA, at the state general election conducted on November 7, 2000; and

WHEREAS, RFTA is building a bus maintenance facility on land owned by the City (the "Glenwood Maintenance Facility" or "GMF") which should be ready for occupancy in December, 2001; and

WHEREAS, the parties contemplate an eventual exchange of RFTA lands with the City land underlying the GMF; and

WHEREAS, RFTA wishes to occupy the GMF prior to finalization of the land exchange; and

WHEREAS, the parties wish to assign liability for risks and insurance coverage for use and occupancy of the GMF, prior to RFTA taking a deed to the property, so that RFTA may occupy the GMF when construction is complete; and

WHEREAS, political subdivisions and governmental entities within the State of Colorado are authorized to contract and cooperate with one another to develop, maintain and operate mass transit systems by virtue of C.R.S. Section 29-1-201, et. seq., and Article XIV, Section 18, of the Colorado Constitution.

NOW THEREFORE, in consideration of the mutual benefits to be derived herefrom and RFTA and Glenwood Springs agree as follows:

I.
Statement of Purpose

1.1 The purpose of this Agreement is to allocate the potential risks associated with RFTA's occupation and use of a bus maintenance facility on land currently owned by the City.

II.
Assumption of Risk at the RFTA Maintenance Facility

2.1 Prior to delivery of the deed from Glenwood Springs for the property underlying RFTA's Glenwood Maintenance Facility, when RFTA takes possession or occupies the structures at its GMF, RFTA agrees to accept any liability for damages that may arise by virtue of ownership of the land, or may arise through acts by RFTA's employees or invitees, to the extent allowed by law.

2.2 RFTA agrees to name Glenwood Springs as an additional insured on its property insurance for RFTA's Glenwood Maintenance Facility prior to RFTA's occupancy.

2.3 Without waiving the privileges and immunities conferred by the Colorado Governmental Immunity Act, Section 24-10-101 et seq., C.R.S., each party shall be responsible for any claims, demands or suits arising out of its own negligence. It is specifically understood and agreed that nothing contained in this paragraph or elsewhere in this Agreement shall be construed as an expressed or implied waiver by any party of its governmental immunity or the governmental acceptance by any party of liabilities arising as a result of actions which lie in tort or could lie in tort in excess of the liabilities allowable under the Colorado Governmental Immunity Act.

III.
Effective Date

3.1 This Agreement shall be effective following signature by the authorized representative of the City and RFTA.

IV.
Term

4.1 This Agreement shall continue for a period of six months from the date of execution or until terminated or changed by mutual agreement of the parties.

V.
Miscellaneous Provisions

5.1 Amendment. This Agreement may only be amended by a written agreement

signed by the parties hereto.

5.2 Successors. This Agreement shall be binding upon and shall inure to the benefit of any successors to or assigns of the parties.

5.3 Severability. Should any part, term, portion or provision of this Agreement be finally decided to be in conflict with any law of the United States or of the State of Colorado, or otherwise be unenforceable or ineffectual, the validity of the remaining parts, terms, portion or provision shall be deemed severable and shall not be affected thereby, provided such remaining portions or provisions can be construed in substance to constitute the Agreement which the parties intended to enter into in the first instance.

5.4 No third party beneficiary. The rights under this Agreement shall inure solely to the benefit of the parties to this agreement, and nothing shall be construed to grant a cause of action to non-parties claiming as third party beneficiaries or otherwise.

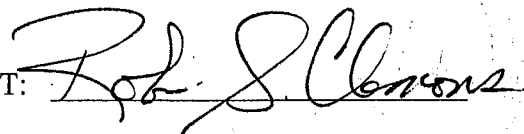
5.5 Appropriation. This Agreement does not contain any multiple fiscal year financial obligations by either party that extends beyond its current fiscal year. Nothing herein obligates Glenwood Springs or RFTA to budget, authorize or appropriate funds for any fiscal year. This Agreement shall be construed as in compliance with the limitations of the Local Government Budget law (C.R.S. §29-1-101 et seq.), and the TABOR Amendment (Colorado Constitution, Article X, Sec. 20).

5.6 Counterparts. This Agreement may be signed in identical counterparts.

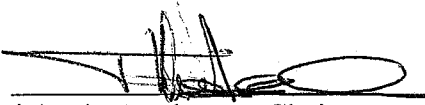
IN WITNESS WHEREOF, the parties hereto have signed and executed this Agreement effective as of the date and year above.

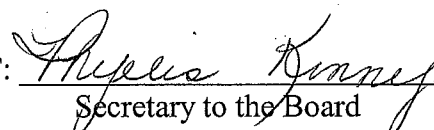
CITY of GLENWOOD SPRINGS:

By: 

ATTEST: 

ROARING FORK TRANSPORTATION AUTHORITY:

By: 
T. Michael Manchester, Chairman

ATTEST: 
Secretary to the Board

H:\Winword\IGA\Glenwood Bus maintenance facility.doc



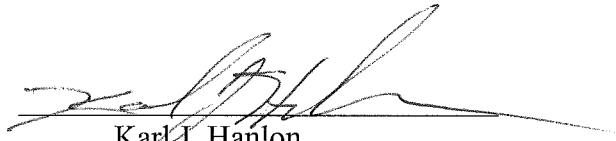
November 21, 2001

Renee Black, Esq.
0051 Service Center Drive
Aspen, CO 81611

RE: GMF IGA

Dear Renee:

Enclosed please find two originals of the GMF IGA. Please have T. Michael execute both and send back the one without Don Vanderhoof's signature (Don will execute it when it gets here, we had an administrative glitch). Thanks for your help



Karl J. Hanlon
Assistant City Attorney

RECEIVED

NOV 26 2001

R. F. T. A.



November 28, 2001

Karl J. Hanlon, Esq.
Assistant City Attorney
City of Glenwood Springs
806 Cooper Avenue
Glenwood Springs, CO 81601

Re: GMF IGA

Dear Karl:

As you requested, I am returning herewith two originals of the above-reference document which have been executed by T. Michael Manchester, RFTA Chairperson.

In addition, please be advised that a Certificate of Insurance naming the City of Glenwood Springs as an additional insured has been requested and will be directed to your attention.

Very truly yours,

Renee Black
General Counsel

Encs.

QUIT CLAIM DEED

THIS QUIT CLAIM DEED made this 31st day of October, 2002, between the City of Glenwood Springs, Colorado ("Glenwood Springs" or "City"), a Colorado Home Rule Municipality (hereinafter "Grantor") and Roaring Fork Transportation Authority, Aspen, Colorado ("RFTA")(hereinafter "Grantee");

WITNESSETH:

That the Grantor, for and in consideration of Ten Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, has remised, released, sold and QUIT CLAIMED, and by these presents does remise, release, sell and QUIT CLAIM unto the Grantee, its successors and assigns, forever, all the right, title, interest, claim and demand which the Grantor has in and to the property described as Lot B of the Glenwood Springs Municipal Operations Minor Subdivision.

TO HAVE AND TO HOLD the same, together with all its appurtenances and privileges thereunto belonging or in anywise thereunto appertaining, and all the estate, right, title, interest and claim whatsoever, of the Grantor, either in law or equity, to the only proper use, benefit and behoof of the Grantee, its successors and assigns forever.

IN WITNESS WHEREOF, the Grantor has executed this deed on the date set forth above.

CITY OF GLENWOOD SPRINGS

By: Donald L. Vanderhoof
Donald L. Vanderhoof, Mayor

ATTEST: Robin S. Clemons
Robin Clemons, City Clerk

STATE OF COLORADO)
) ss.
COUNTY OF GARFIELD)

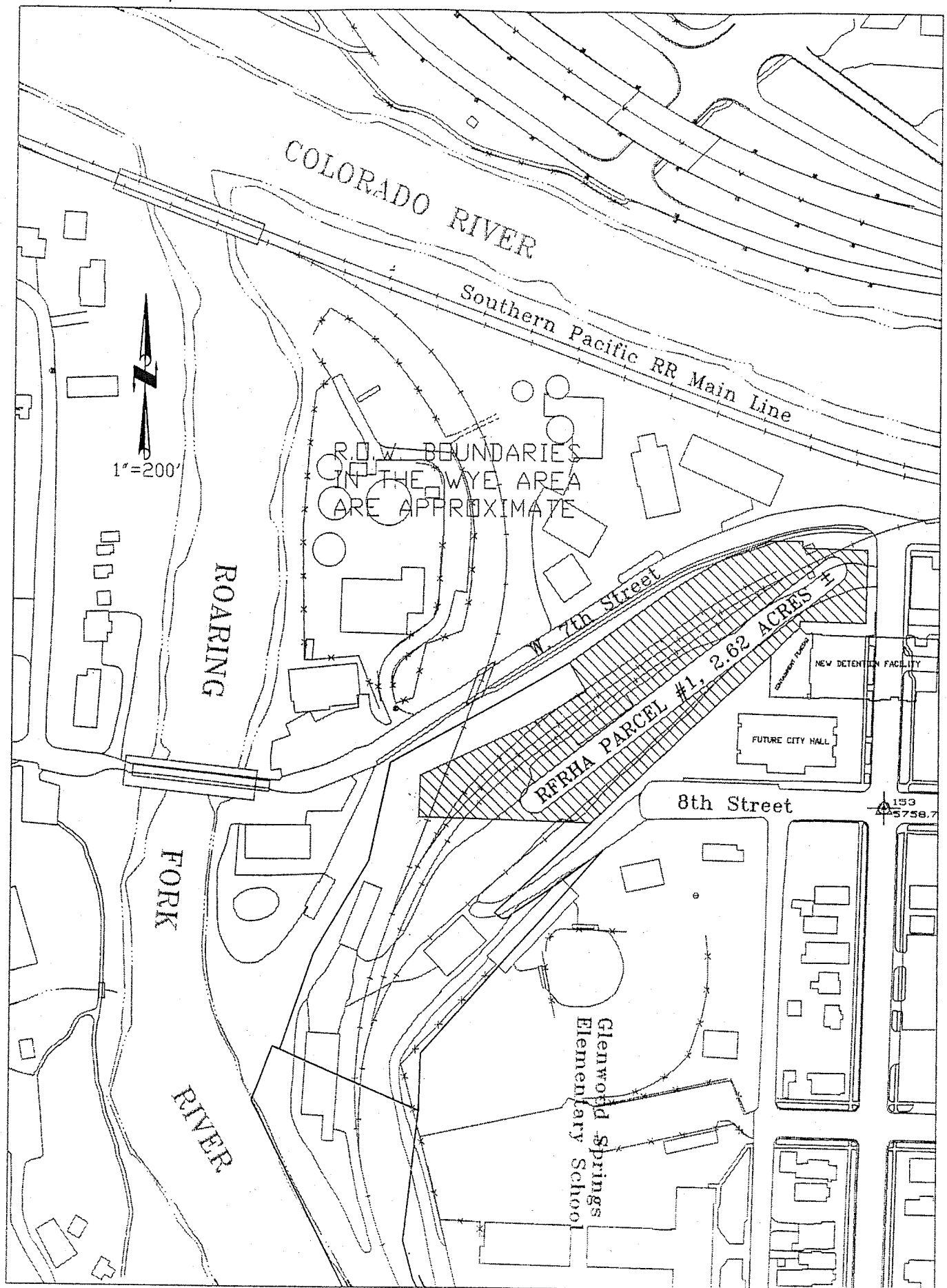
Acknowledged, subscribed and sworn to before me this 31st day of October, 2002, by Donald L. Vanderhoof, Mayor, City of Glenwood Springs.

WITNESS my hand and official seal.

My Commission expires: 01-31-03

Michelle Reg
Notary Public

Please return to: City Attorney, City of Glenwood Springs
1 101 West 8th Street, Glenwood Springs, CO 81602





Section 3

Description of Proposed Project

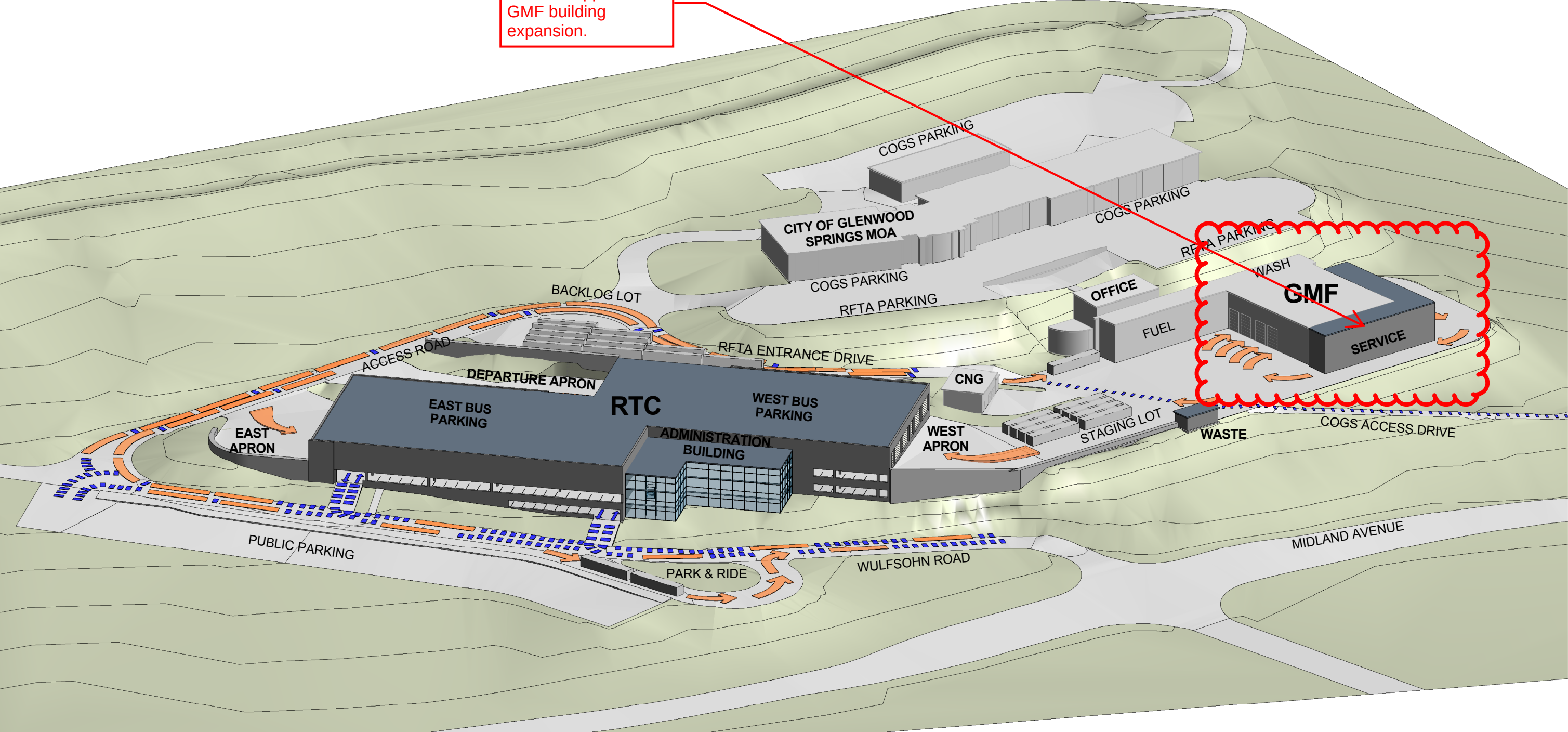
Vicinity Map - RFTA Regional Transit Center



Imagery ©2016 Google, Map data ©2016 Google 1000 ft

Measure distance
Total distance: 1.00 mi (1.61 km)

Proposed project for
this L&E application:
GMF building
expansion.





RFTA Regional Transit Center
Glenwood Springs, Colorado

Introduction

The RFTA Regional Transit Center (RTC) is planned to be a multi-phased program consisting of several projects. Phase 1 was the RTC Site Improvements and was completed in the fall of 2017. This current submission, Phase 2 is the RTC GMF Renovation project which is the subject of this Land Use (Location & Extent Review) Application. The objective of Phase 2 is to expand the Glenwood Springs Bus Maintenance Facility to accommodate RFTA's growing fleet, to improve operational efficiency and safety and accommodate program spaces at the Glenwood Springs site included in the Basis of Design (BOD).

Proposed Regional Transit Center

The success of the Bus Rapid Transit System and the projected population growth in the service area, has led RFTA to plan improvements to meet future increases in demand and to modernize facilities. RFTA's presence at this site has the potential to transcend simply being a maintenance facility and become a Regional Transit Center (RTC). This site is perfectly located for transit users to connect to other transit systems such as CDOTs "Bustang" service, Eagle Counties "Eco Transit" service, and transfer between RFTAs VelociRFTA and the future I70 BRT service. This site is also located adjacent to the Glenwood Springs trail systems which connects South to Aspen, East to the Vail valley and eventually to the west to New Castle and beyond. This connection with the local trail systems presents excellent opportunities for commuters to make that last mile connection to transit that is so difficult to achieve.

Eventually, the RTC offers RFTA the opportunity to centralize executive functions for the entire organization. The meeting facilities at the RTC could become the location where the RFTA executive staff, elected officials, the public, and vendors and consultants would meet and interact.

The overall goal for the entire site is that RFTA has the capacity, leveraging existing real estate and facility assets, to support the opportunity to realize an RTC. A summary of improvements for RFTA's overall goal in the multi-phased project are as follows:

- Indoor parking for 60 buses, which is an operational bus increase of 33% over current winter peak (76% increase over original facility design capacity).
- Inspection bays sheltered from weather for all route pull-out (no appropriate inspection accommodations are currently provided).
- A 33% increase in maintenance bays (166% increase for a full-size bus fleet).
- Significant parking capacity increase for staff and patrons

The proposed RTC facility would provide a 58,000 square feet enclosed bus parking facility, 16,000 square feet administrative office building, 8,000 square feet addition to the existing maintenance building, and renovation of the existing maintenance and office building.



Regional Transit Center Phase 1-Site Improvements

Phase 1 was completed in the fall of 2017. Phase 1 included lowering the existing grade and constructing a temporary bus parking lot just south of the West Glenwood Park. The lowering of the grade facilitates future phases of the RTC.

Regional Transit Center Phase 2-GMF Renovation

The current submission, Phase 2, includes a 6,007 square feet addition to the main (first) floor and a 768 square feet addition to the upper floor of the existing maintenance building. Total floor area of the maintenance building after the expansion project will be 22,340 square feet; inclusive of two additional maintenance bays added to the north of the existing GMF. The project includes the proposed relocation of utilities in conflict with site improvements. A second level mezzanine is proposed which will house additional offices, a conference room, breakroom, lockers and restrooms for maintenance personnel.

Regional Transit Center Phase 2-GMF Renovation Proposed Work Plan

The proposed project includes the following:

- a. Extending the existing GMF to the north approximately 23 feet to accommodate two (2) additional bays. The exterior wall proposed is CMU.
- b. Extending the existing GMF to the west to provide additional space approximately 24 feet to accommodate three (3) additional bays.
- c. Installation of a foundation system for the new addition. The foundation proposed is a spread foot under pinned with compaction grout columns consistent with existing GMF foundation system.
- d. Interior renovation of existing level 1 space including tire storage space, IT workroom, general storage units, workstations, fluid room, toolbox storage area, tool storage, parts storage, compressor room, and stairs to the second level and roof.
- e. Construction of a new second level mezzanine including office space, workstations, conference room, restrooms, facilities supply storage room, and employee locker rooms.
- f. Renovation to the Dispatch Room on the eastside of the GMF facility that will include addition of a data room and office for the Operations Director.
- g. Utilities to be relocated include electric, fire hydrants, and communication.
- h. Mechanical, electrical, plumbing, and IT improvements.



Regional Transit Center Future Phases

RFTA performed a study that evaluated the operational use and benefit of the Glenwood Springs site. As a result of this study, future phases are planned based on the availability of funding. RFTA has submitted for a BUILD grant with the Federal Transit Authority (FTA) and has received positive feedback that could lead to award and implementation of the future phases.

Future phases identified for the Glenwood Springs site are as follows:

- Phase 3** Includes Glenwood Operations Building, Bus Building 30A and associated drives and Pre-Trip Inspection Zones, Backlog Parking, and Warehouse A.
- Phase 4** Includes GMF Administration Renovation and rework of access road.
- Phase 5** Includes Bus Building 30B and associated drives and Pre-Trip Inspection Zones.
- Phase 6** Includes RFTA Administration Building with associated drives and parking.
- Phase 7** Includes Bus Wash addition and associated drives.
- Phase 8** Includes Warehouse B, associated drives and parking
- Phase 9** Includes RFTA Housing Phase 1 with associated drives and parking.
- Phase 10** Includes RFTA Housing Phase 2 with associated drives and parking.

For future phases, RFTA assumes construction sequencing as follows:

- a. Lowering of the existing grade to construct a temporary bus parking lot facilitating future development (Phase 1).
- b. The GMF renovation and associated site improvements. (Phase 2)
- c. The RFTA Entrance Drive would be constructed prior to construction of the RTC.
- d. The new RTC needs to be constructed first to allow administrative and operation functions to vacate the maintenance building. The additional space will also benefit the sequencing of construction activities at the maintenance areas.
- e. Due to the size of the RTC building and its proximity to active roadways, shoring or equivalent systems will be required to maintain service to RFTA facilities via the Access Road and the RFTA Entrance Drive.



Project Summary Table

Project Description					
Lot Size Information	Acres	Square feet	Lot Coverage	Existing (Sq Ft & %)	Proposed (Sq. Ft. & %)
	5.139	223,854		Building = 16,360 sq ft 7% Pavement = 109,737 sq ft 49%	Building = 22,340 sq ft 10% Pavement = 113,490 sq ft 51%
Limits of Disturbance	Existing (Sq & %)	Proposed (Sq. Ft. & %)	Average Slope within Limits of Disturbance	Percentage %	
	217,910 sq ft 97%	217,910 sq ft 97% Project LOD within existing LOD		5%	
Off-street Parking Spaces	Existing # Vehicle Spaces	Proposed # Vehicle Spaces	Bicycle Parking	Existing # Spaces	Proposed # Spaces
	8	8		0	0
Residential Units	# Existing Units	# Proposed Units	Non-residential Uses	Type of Use(s)	Gross Floor Area (Sq. Ft.)
	N/A	N/A		Light Industrial	GMF existing building = 16,360 sq ft Total after expansion = 22,340 sq ft
Open Space	Existing (Sq ft & %)	Proposed (Sq Ft & %)	Total Landscaped area	Existing (Sq Ft & %)	Proposed (Sq Ft & %)
	104,593 sq ft 47%	94,627 sq ft 42%		106,424 sq ft 48%	96,343 sq ft 43%
Building Height	Existing (ft)	Proposed (ft)	Total Impervious Area	Existing (Sq Ft & %)	Proposed (Sq Ft & %)
	28 ft	28 ft		126,097 sq ft 56%	135,830 sq ft 61%
Snow Storage	Required (sq ft)	Proposed (sq ft)	Other		
	N/A	600 sq ft			



Building Elevation Materials

The following charts show the type of materials and percentage of total surface area in square feet for the proposed building elevations provided in the design plan sets.

Chart No. 1

Drawing sheet number: A02.01

North Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	3233	N/A
Net* Glazing	293	9%
Net* Concrete Masonry Unit	1494	46%
Net* Corrugated Metal Siding	1456	45%

Chart No. 2

Drawing sheet number: A02.01

West Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	2116	N/A
Net* Glazing	70	6%
Net* Concrete Masonry Unit	1116	53%
Net* Corrugated Metal Siding	1000	47%

Chart No. 3

Drawing sheet number: A02.02

East Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	476	N/A
Net* Glazing	0	0%
Net* Concrete Masonry Unit	256	54%
Net* Corrugated Metal Siding	220	46%

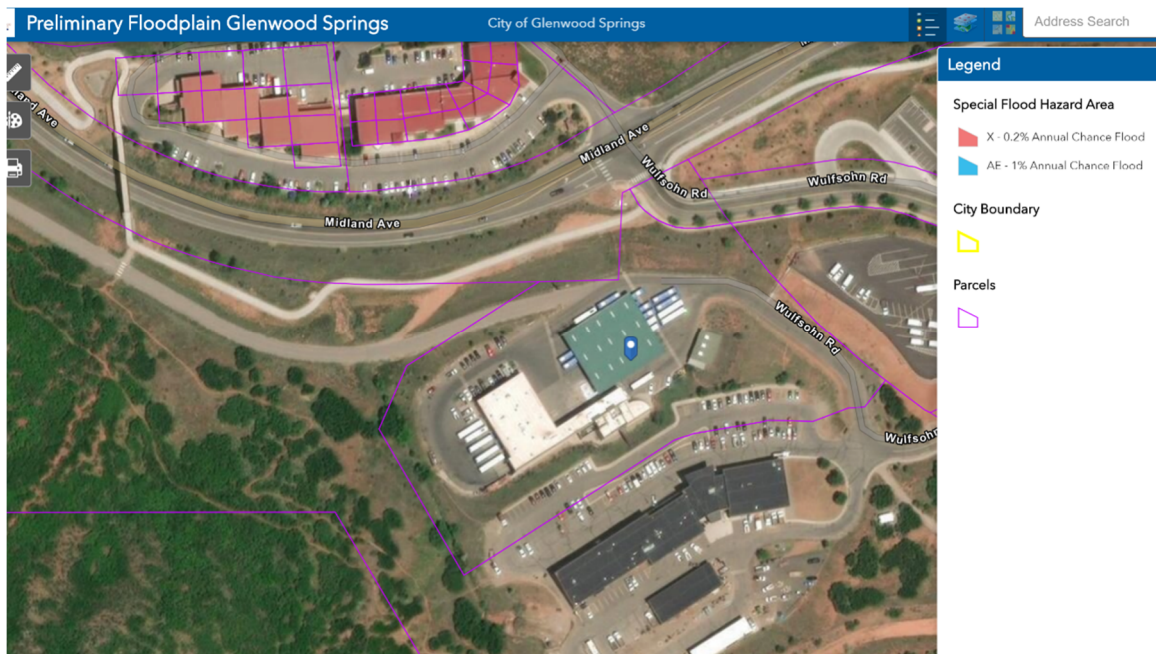
Chart No. 4

Drawing sheet number: A02.02

South Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	792	N/A
Net* Glazing	64	15%
Net* Concrete Masonry Unit	416	53%
Net* Corrugated Metal Siding	376	47%

FEMA Floodplain Statement

Referencing the FEMA Floodplain Management community map number 0802051431B, effective on 01/03/1986 the site is not within a designated floodplain as shown in this figure of the FEMA Floodplain Map:



FEMA Floodplain Map for RFTA GMF
(<http://cogs.us/324/Floodplain-Management>)

Geologic Hazards Disclosure

The property is subject to geologic hazards per the adopted mapping by the City of Glenwood Springs (COGS). As referenced from the Open-File Report 78-10 produced by cooperative effort of the COGS and the Colorado Geological Survey, Hazards to note are debris flow, hydrocompaction and related hazards (e.g. settlement or subsidence), and lesser geological hazards such as landsliding, rockfall, and corrosive soils. A final Geologic Hazard Report will be submitted upon application of a building permit. Notably, the provided Geotechnical Report (Ground Engineering, May 2018) includes a section on Geological Hazards (page 7).



Lighting

The basic function of lighting shall be to enhance the architecture as well as perform the utilitarian function of providing light for tasks and for safety. Lighting sources shall be LED unless a different source is supplied with equipment as part of a pre-manufactured assembly. Where the manufactured assembly can be requested with alternate sources, LED shall be specified. All areas monitored by security cameras shall be provided with normal and emergency lighting to the level sufficient for remote video viewing.

The lighting concept for exterior lighting shall primarily consist of pole mounted LED “Dark Sky” compliant, full cutoff luminaires. Parking lots, roadways, and pedestrian walkways shall be illuminated to a maintained average of 2-foot candles at pavement level, with an average to minimum ratio not exceeding 4:1. Pole mounted luminaires shall be located on traffic islands for protection from damage.

Notably, for the expansion of the GMF only two existing light poles are affected. These will be relocated northward and will remain within traffic islands. These lights will be LED to comply with the lighting concept mentioned above.



Landscape Plantings Recommendations

The RFTA Glenwood Springs site is known to contain surficial deposits, typically debris flow and alluvial fan deposits that are susceptible to collapsing when moisture is introduced. The site occupies a portion of a large debris flow fan descending from the steep terrain to the southwest. Due to the presence of collapsible soils at the site, the inclusion of an irrigation system in proximity to the building is not a feasible option and RFTA will make every practical effort to provide landscape screens to the best of their ability.

Landscaping and Screen design is part of the Design Build process. While at this stage in the process, the intent is to comply with the requirements of Section 070.040.050 (Landscaping, Screening, and Fencing) of the Glenwood Springs Municipal Code. It is our understanding landscape plantings will need to be provided in right-of-way areas, building foundation areas and parking lots to meet these development requirements. The table below shows the number of plant types required based on calculations following the Glenwood Springs Municipal Code, presented here for information:

Plant Type	Number Required
Trees	241
Shrubs	3854
Perennials/ Ornamental Grass	19,269

To reiterate, because of the unique geological hazards, in particular, the presence of collapsible soils at the site, RFTA requests a waiver from the landscaping planting requirements and proposes landscaping planting as shown in sheet C09.01 – Landscaping Plan for this project.

Landscape material will consist of deciduous shade and ornamental trees, coniferous trees, shrubs and perennials which will consist of flowering perennials and ornamental grasses. Landscape plantings should be plant materials native to Colorado and not on the city's prohibited tree planting list or Garfield Counties Noxious Weed list.

Overall quantities of trees, shrubs and perennials will be based proportionally on the overall lot size. Foundation plantings and drainage requirements will need to address hydro-compressible soil conditions on this site as noted in the geotechnical report. Right-of-way and perimeter plantings will consist of evergreen trees, shade trees, ornamental trees and perennials. For this project, understory plantings enhancing bank stabilization are recommended.



The following table provides a preliminary planting list based on local requirements:

Planting Type:	Planting Palette
Evergreen Tree:	▪ Ponderosa Pine (<i>Pinus ponderosa</i>) ▪ Colorado Spruce (<i>Picea pungens</i>) ▪ Norway Spruce (<i>Picea abies</i>) ▪ American Larch (<i>Larix laricina</i>)
Shade Tree:	▪ Quaking Aspen (<i>Populoides tremuloides</i>) ▪ Bur Oak (<i>Quercus macrocarpa</i>) ▪ Red Maple (<i>Acer rubrum</i>) ▪ Common Hackberry (<i>Celtis occidentalis</i>) ▪
Ornamental / Flowering Tree:	▪ Chokecherry (<i>Prunus virginiana</i>) ▪ Green Hawthorn (<i>Crataegus viridis</i>) ▪ Greene Mountain-ash (<i>Sorbus scopulina</i>) ▪ Serviceberry (<i>Amelanchier alnifolia</i>) ▪ Thinleaf Alder (<i>Alnus incana</i>) ▪
Evergreen Shrub:	▪ Little-leaf Mountain Mahogany (<i>Cercocarpus intricatus</i>) ▪ Oregon Grape-holly (<i>Mahonia repens</i>) ▪ Colorado Redcedar (<i>Juniperus scopulorum</i>) ▪ Creeping Juniper (<i>Juniperus horizontalis</i>) ▪ Bearberry (<i>Arctostaphylos uva-ursi</i>)

Planting Type:	Planting Palette
Deciduous Shrub:	▪ Mountain Ninebark (<i>Physocarpus monogynus</i>) ▪ Golden Currant (<i>Ribes aureum</i>) ▪ False Indigo (<i>Amorpha fruticosa</i>)
Ornamental Grass:	▪ Big bluestem (<i>Andropogon gerardii</i>) ▪ Blue Grama (<i>Chondrosium gracile</i>) ▪ Prairie Dropseed (<i>Sporobolus heterolepis</i>) ▪ Switchgrass (<i>Panicum virgatum</i>)
Perennial:	▪ Black-eyed Susan (<i>Rudbeckia hirta</i>) ▪ Butterfly-weed (<i>Asclepias tuberosa</i>) ▪ Colorado Blue Columbine (<i>Aquilegia caerulea</i>) ▪ Heath Aster (<i>Virgulus ericoides</i>) ▪ Lupine (<i>Lupinus argenteus</i>) ▪ Rocky Mountain Penstemon (<i>Penstemon strictus</i>) ▪ Smooth Blue Aster (<i>Aster laevis</i>)



Proposed Uses, Location of Uses, and Densities

Table 1 below list the square footage included in the current RTC Phase 2-GMF Renovation project. Total floor area of the project inclusive of the new addition is 17,873 square feet.

Floor	Existing Area (sq.ft.)	New/Additional Area (sq.ft.)
1st floor (ground)	9,571	6,007
Upper floor	1527	768
Total	11,098	6,775

Table 1-GMF Phase 2 Existing and New Square Footage



Utilities

The RFTA GMF is currently served by the utilities listed in the utilities table shown here:

Company	Name	Mailing Address
City of Glenwood Springs Colorado Electric Department	Doug Hazzard doug.hazzard@cogs.us 970-384-6353	COGS Electric Department Physical Address 2301 Wulfsohn Road Glenwood Springs, CO 81601
Black Hills Energy	Ryan Pogue bhe.cog.ucs@blackhillscorp.com 719-208-3577	96 County Road 160, Glenwood Springs, CO 81601
City of Glenwood Springs Colorado Water and Sanitation Department	Michael Hixson michael.hixson@cogs.us 970-384-6435	COGS Water and Wastewater Department Physical Address 2315 Wulfsohn Road Glenwood Springs, CO 81601
Century Link Telephone	Jason Sharp Jason.Sharpe@centurylink.com 970-328-8290	
Community Broadband Network	Michael Gardner noc@gschn.com 970-618-5550	101 West 8th Street, Glenwood Springs, CO 81601
Verizon	Marion S. Crable Sr Manager-Real Estate MTN KSMO Network Engineering marion.crable@verizonwireless.com O 913 344 2896 M 913 424 9008	Verizon Wireless 10740 Nall Avenue Suite 400 Overland Park, KS 66211
Comcast	Michael Johnson Michael_johnson@cable.comcast.com (W) 970-925-4311 (M) 970-930-4713	

Table of utility companies currently serving the RFTA GMF

Each of the utility companies listed in the table have been contacted to inform them of the proposed project and they have been provided the designs for required utility relocations.



Engineering Reports

As required, the following Engineering Reports are provided with this application in Appendix A:

1. RFTA RTC Traffic Analysis – 03/09/2018.
2. Ground Engineering Geotechnical Evaluation for RFTA GMF – 05/04/2018.
3. Drainage Letter for the proposed project.

Drainage Issue Resolution

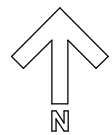
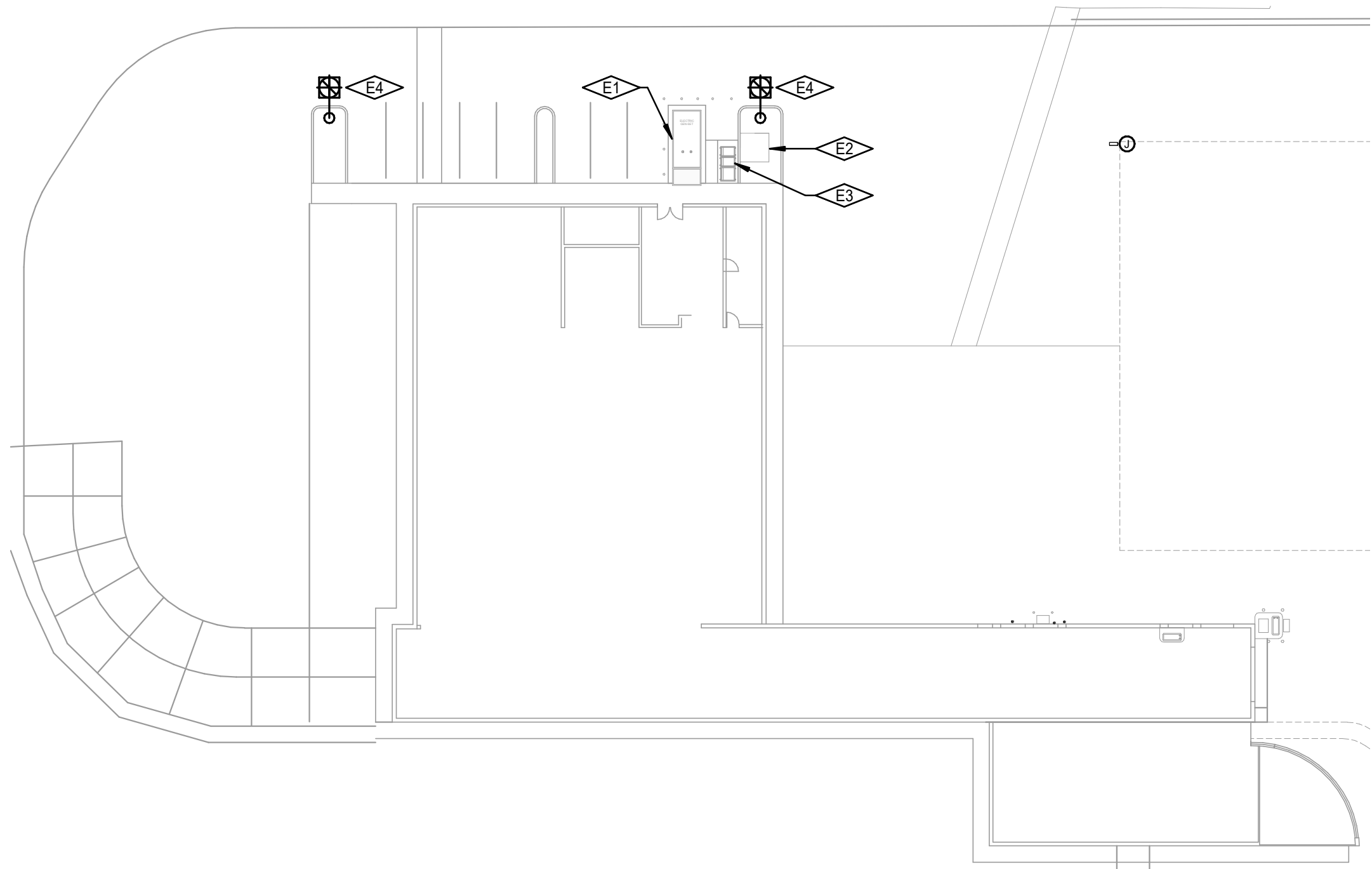
As requested the 100% design will incorporate new features to solve the drainage issue at the swale at the northeast section of the site, i.e. necessary inlets and piping will be constructed to divert all runoff westward to existing drainage features so that runoff does not proceed northward down the slope in the current situation.



Lighting Plan Requirements

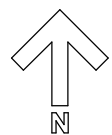
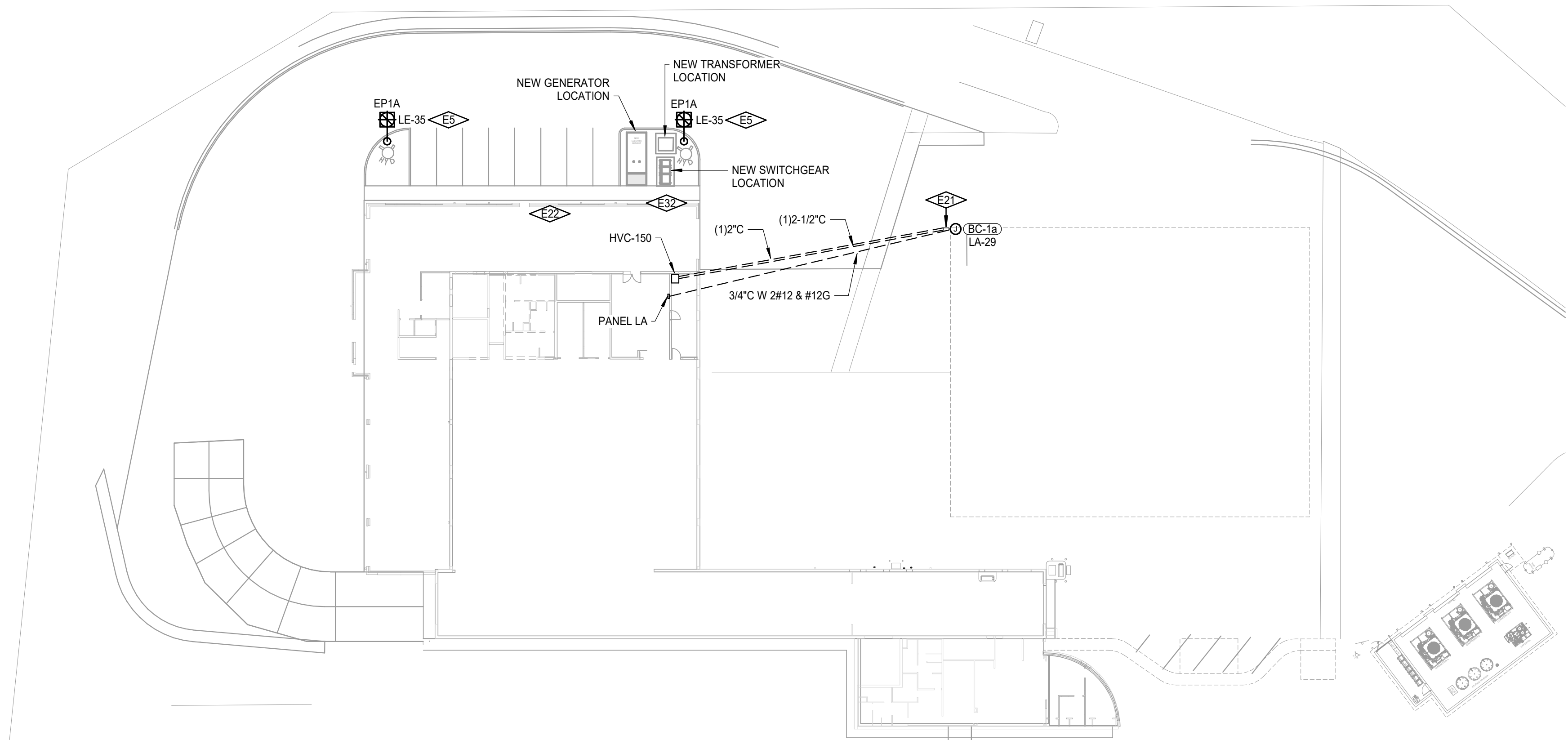
As required, lighting site plan, photometric plan and lighting manufacture specification sheets provided in the following pages:

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ELECTRICAL DEMOLITION SITE PLAN

SCALE: 1" = 30'-0"



ELECTRICAL RENOVATION SITE PLAN

SCALE: 1" = 30'-0"

KEYNOTES

E1	DISCONNECT EXISTING GENERATOR AND REMOVE EXISTING LOCATION. RELOCATE TO NEW PAD NORTH OF EXISTING LOCATION. PROVIDE NEW FEEDERS TO NEW SWITCHGEAR LOCATION ONCE GENERATORS RELOCATED. PROVIDE A TEMPORARY GENERATOR TO ALLOW FOR UTILITY TRANSFORMER RELOCATION.
E2	DISCONNECT EXISTING UTILITY TRANSFORMER AND COORDINATE WITH GLENWOOD UTILITY COMPANY FOR RELOCATION OF TRANSFORMER TO NEW PAD NORTH OF EXISTING LOCATION. REMOVE EXISTING FEEDERS FROM TRANSFORMER TO SWITCHGEAR. PROVIDE NEW FEEDERS FROM NEW TRANSFORMER LOCATION TO NEW SWITCHGEAR LOCATION ONCE SWITCHGEAR IS RELOCATED.
E3	DISCONNECT AND REMOVE SWITCHGEAR. RELOCATE TO NEW PAD NORTH OF EXISTING LOCATION. PROVIDE NEW CONNECTIONS FROM RELOCATED TRANSFORMER AND GENERATOR.
E4	REMOVE EXISTING POLE MOUNTED LUMINAIRES AND RELOCATE TO SIMILAR LOCATION NORTH OF EXISTING LOCATIONS.
E5	EXTEND LIGHTING CIRCUITING TO NEW LOCATION SHOWN AND RECONNECT. REPLACE LUMINAIRE HEAD WITH NEW LED TYPE AS SHOWN
E21	PROVIDE BUS CHARGING BOX, PART # ABB6AGC073079. PROVIDE PEDESTAL FOR MOUNTING TO SOLID SURFACE, PART #ABB6AGC069024.
E22	PROVIDE (1) #6 AWG PART # OLFLEX 4160900 (FI-OD:8.9MM), (2) X 2 TW/SH #19AWG PART # LAPP UNITRONIC LIYCY(TP) 0066262 FI-OD = 8.7MM, (8) GLASS FIBER PART # OM3 PRE-FABRICATED OPTICAL FIBER. CONDUIT SHALL BE PROVIDED WITH WIDE SWEEP BENDS.
E32	PROVIDE (2) 350 MCM PART # TF-KABLE W-RHH-RHW-2-2000V, W350-1XT, 350 MCM WITH REINFORCED ISOLATION.

NOT FOR CONSTRUCTION

THIS SET OF DRAWINGS IS DISTRIBUTED FOR THE PURPOSE OF OWNER, DESIGN TEAM, AND CONTRACTOR REVIEW. THEY ARE A WORK IN PROGRESS AND ARE NOT FINAL. THEY ARE BY THEIR NATURE INCOMPLETE. THESE DRAWINGS ARE NOT SUITABLE FOR BIDDING OR CONSTRUCTION. ANY ATTEMPT TO ESTABLISH CONSTRUCTION COSTS FROM THESE DOCUMENTS MUST BE DONE WITH EXTREME CAUTION. COST ALLOWANCES MUST BE PROVIDED FOR BOTH DESIGN ELEMENTS AND MATERIALS WHICH ARE NOT YET INDICATED ON THESE DOCUMENTS. BOTH THE OWNER AND THE CONTRACTOR SHALL CAREFULLY EVALUATE THE CONTINGENCIES ASSOCIATED WITH THIS FACET OF THE WORK, AND CARRY THE APPROPRIATE VALUE. CATOR, RUMA & ASSOCIATES HAS NO RESPONSIBILITY OR LIABILITY FOR COSTS OF CONSTRUCTION ASSOCIATED WITH DESIGN ELEMENTS AND MATERIALS NOT YET SHOWN ON THESE DOCUMENTS OR FOR ONGOING CHANGES TO THE DRAWINGS WHICH MUST OCCUR AS THE DESIGN AND DRAWINGS ARE COMPLETED.

Computer File Information			0000	Sheet Revisions			 Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	 CATOR RUMA & ASSOCIATES, CO. 896 Tabor Street, Lakewood, CO 80401 (303) 232-6200 • www.catorruma.com	As Constructed		GMF EXPANSION – PHASE 2			Project No./Code	
Print Date: 11/8/2019 9:38:19 AM				Date:					No Revisions:					Project No./Code	
Last Modification Date: 10/10/19															
Full Path: P:\2019\2019–183 RFTA GMF Expansion\Cad											ELECTRICAL SITE PLANS				
Drawing File Name:															
Revit Ver. 2019 Scale: As Shown Units: English											E01.00				

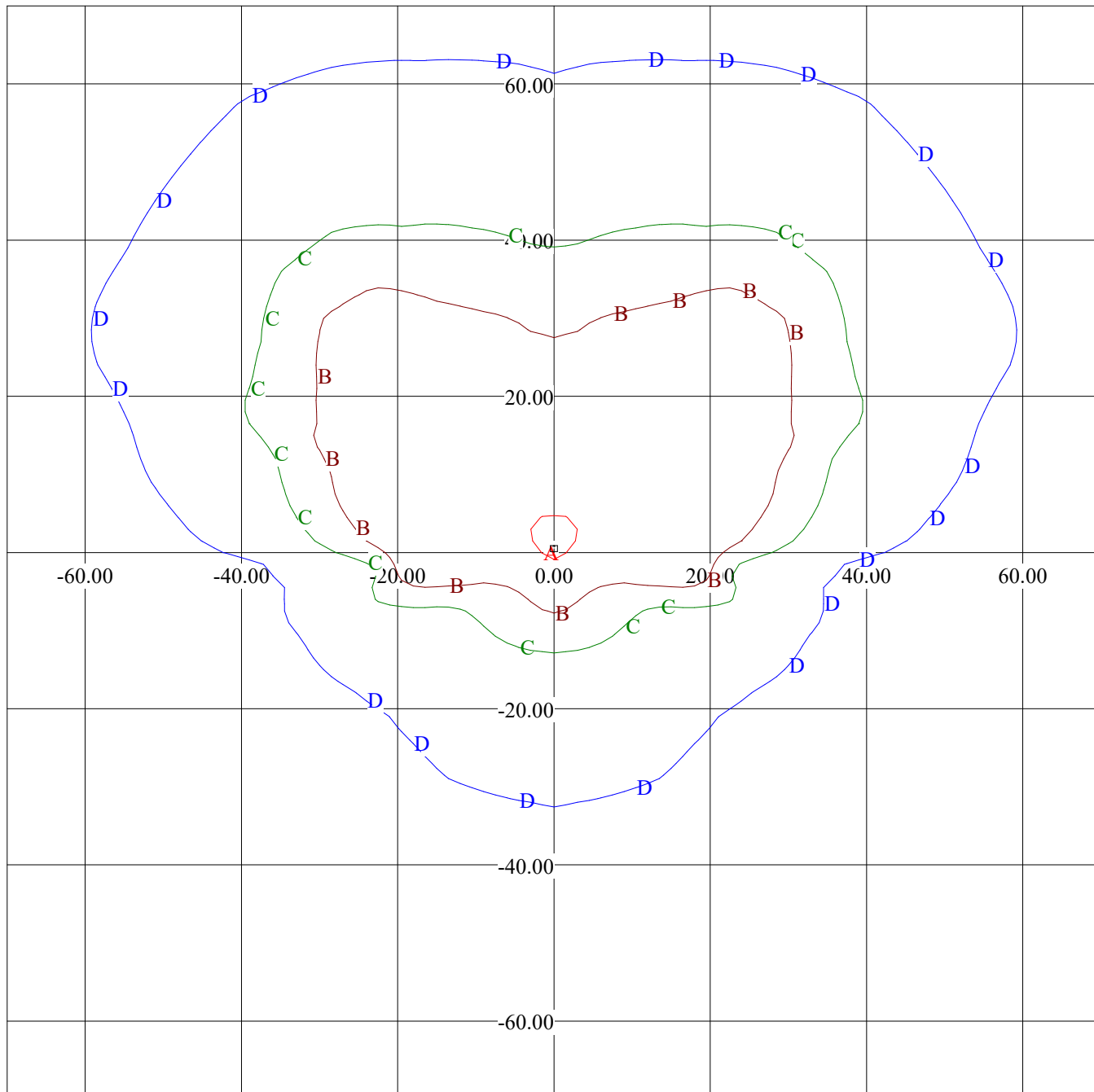
CONTOUR PLOT

Dec 03, 2019

TEST #: VP-S-36L-65-4K7-4W
CATALOG #: VPS-36L-65-4K7-4W
LAMP:
TOTAL LUMENS: 0
LLF: 0.90
ILLUM. UNITS: FC
SCALE: 1 IN= 20.0FT

NUM LUMS/ ORIENTATION: 1 lum
MOUNTING HEIGHT: 15.0'
BRACKET ARM LENGTH: 0.5'

Legend: A=5.00 B=1.00 C=0.50 D=0.10



Generated by LitePro version 2.029, which is provided and supported by Columbia Lighting, Alera, and Prescolite. Calculations are performed in accordance with IESNA procedures. Columbia, Alera, and Prescolite are not responsible for the light output of lamps and ballasts, or design variables not shown.

LitePro

VIPER S

SMALL VIPER LUMINAIRE

FEATURES

- Small size companion to Viper Large
- Wide choice of different LED wattage configurations
- Nine optical distributions
- Designed to replace HID lighting up to 400W MH or HPS
- Suitable for wet locations



*3000K and warmer CCTs only

CONTROL TECHNOLOGY



SPECIFICATIONS

CONSTRUCTION

- Manufactured with die cast aluminum
- Coated with a polyester finish that meets ASTM B117 corrosion test requirements and ASTM D522 cracking and loss of adhesion test requirements
- IFS polyester powder-coat electrostatically applied and thermocured. IFS finish consists of a five stage pretreatment regimen with a polymer primer sealer and top coated with a thermoset super TGIC polyester powder coat finish
- The finish meets the AAMA 2604 performance specification which includes passing a 3,000-hour salt spray test for corrosion resistance and resists cracking or loss of adhesion per ASTM D522 and resists surface impacts of up to 160 inch-pounds
- External hardware is corrosion resistant

OPTICS

- Cartridge is held together with internal brass standoffs soldered to the board so that it can be field replaced as a one-piece optical system
- One-piece silicone gasket ensures a weatherproof seal around each individual optic
- One-piece optical cartridge system consisting of an LED engine, optics, gasket and stainless steel bezel

INSTALLATION

- Mounting options for horizontal arm, vertical tenon or traditional arm mounting available. Mounting hardware included

ELECTRICAL

- Luminaire accepts 100V through 277V, 347V or 480V input 50 Hz to 60 Hz (UNV)
- Power factor is $\geq .90$ at full load
- Dimming drivers are standard, but must contact factory to request wiring leads for purpose of external dimming controls
- Component-to-component wiring within the luminaire may carry no more than 80% of rated load and is certified by UL for use at 600VAC at 90°C or higher
- Plug disconnects are certified by UL for use at 600 VAC, 13A or higher. 13A rating applies to primary (AC) side only
- Fixture electrical compartment contains all LED driver components and a push-button terminal block for AC power connections
- Optional 7-pin ANSI C136.41-2013 Twist-Lock® photo control receptacle available. Compatible with ANSI C136.41 external wireless control devices
- Ambient operating temperature -40°C to 25°C
- Surge protection: 20kA
- Lifeshield™ Circuit ([see Electrical Data](#))

CONTROLS

- Available with an optional passive infrared (PIR) motion sensor capable of detecting motion 360° around the luminaire. When no motion is detected for the specified time, the motion response system reduces the wattage to factory preset level, reducing the light level accordingly. When motion is detected by the PIR sensor, the luminaire returns to full wattage and full light output. Please contact Beacon Products if

OPTICS
STRIKE



RELATED PRODUCTS

[Viper Large](#)

project requirements vary from standard configuration

- Available with [Energeni](#) for optional set dimming, timed dimming with simple delay, or timed dimming based on time of night
- In addition, Viper can be specified with [SiteSync™ wireless control system](#) for reduction in energy and maintenance costs while optimizing light quality 24/7

CERTIFICATIONS

- DLC® (DesignLights Consortium) Qualified. Please refer to the DLC website for specific product qualifications at www.designlights.org
- Certified to UL 1598 and UL 8750
- 3G rated for ANSI C136.31 high vibration applications with MAF mounting
- IDA approved
- This product is approved by the Florida Fish and Wildlife Conservation Commission. [Separate spec available online](#)

WARRANTY

- 5 year warranty
- See [HLI Commercial and Industrial Outdoor Lighting Warranty](#) for additional information

KEY DATA	
Lumen Range	5400–16,216
Wattage Range	55–136
Efficacy Range (LPW)	100–124
Reported Life (Hours)	L70>377,000
Input Current Range (Amps)	0.1–1.1

VIPER S

SMALL VIPER LUMINAIRE

ORDERING GUIDE

Example: VPS-24L-55-4K7-4W-UNV-A-DB-TL-GENI-04-BC

CATALOG # VPS-36L-65-4K7-4W-UNV-AD-DB-7PR-TL

VPS	LED Engine	CCT/CRI ⁷	Distribution	Rotation	Voltage
Series					
VPS Viper Small	24L-55 55W, LED array 36L-65 65W, LED array 36L-80 80W, LED array 48L-110 110W, LED array 60L-136 136W, LED array	3K7 3000K, 70 CRI 4K7 4000K, 70 CRI 5K7 5000K, 70 CRI	FR Type 1/Front Row 2 Type 2 3 Type 3 4 Type 4 4W Type 4 Wide 5QM Type 5QM 5R Type 5R (rectangular) 5W Type 5W (round wide) TC Tennis Court	Blank No rotation L Optic rotation left ⁵ R Optic rotation right ⁵	UNV 120–277V 347 347V 480 480V

Mounting	Color	Control Options	Options
A Rectangular Arm (formerly RA) for square or round pole MAF Mast Arm Fitter (formerly SF2) for 2 3/8" OD horizontal arm K Knuckle (formerly PK2) limit to 30° tilt or 2 3/8" OD horizontal arm or vertical tenon WB Wall Bracket AD Universal Arm for square pole AD3 Adapter for 2.4"–4.1" round pole AD4 Adapter for 4.2"–5.3" round pole AD5 Adapter for 5.5"–5.9" round pole AD6 Adapter for 6.0"–6.5" round pole	BL Black Textured DB Dark Bronze Textured GYS Light Gray Smooth PS Platinum Silver Smooth WH White Textured CC Custom Color	7PR 7-Pin Receptacle only (shorting cap, photo control, or wireless control provided by others) 7PR-SC 7-Pin Receptacle w/Shorting Cap 7PR-TL 7-Pin Receptacle w/Twist-Lock® photo control SCP/_F Programmable Occupancy Sensor w/ daylight control ^{1,2,6} GENI-XX ENERGENI ³ SWP SiteSync Pre-Commission ^{1,4} SWPM_F SiteSync Pre-Commission w/ Sensor ^{1,2,4}	F Fusing BSP Bird Spikes BC Backshield (available for FR, 2, 3, 4, 4W Optics)

House Side Shield Accessories

- ☐ **HSS/VP-S/90-FB/XXX** 90° shield front or back
- ☐ **HSS/VP-S/90-LR/XXX** 90° shield left or right
- ☐ **HSS/VP-S/270-FB/XXX** 270° shield front or back
- ☐ **HSS/VP-S/270-LR/XXX** 270° shield left or right
- ☐ **HSS/VP-S/360/XXX** Full shield

Replace XXX with notation for desired finish color. Refer to page 8 for shield images.

Mounting Accessories

- ☐ **VPL-AD-RPA3** 2.4"–4.1" Round Pole Adapter for AD arm
- ☐ **VPL-AD-RPA4** 4.2"–5.3" Round Pole Adapter for AD arm
- ☐ **VPL-AD-RPA5** 5.5"–5.9" Round Pole Adapter for AD arm
- ☐ **VPL-AD-RPA6** 6.0"–6.5" Round Pole Adapter for AD arm

Notes:

- Not available with other wireless control or sensor options
- Specify mounting height; 8 = 8' or less, 40 = 9' to 40'
- Specify routine setting code (example: GENI-04). See [ENERGENI brochure](#) and [instructions](#) for setting table and options. Not available with sensor or SiteSync options
- Specify group and zone at time of order. See www.hubbellighting.com/sitesync for further details. Order at least one SiteSync interface accessory SWUSB or SWTAB. Each option contains SiteSync License, GUI, and Bridge Node
- Only available with FR, 2, 3, 4, 4W and 5R distributions
- Order at least one SCP-REMOTE per project location to program and control the occupancy sensor

Accessories and Services (Ordered Separately)

- ☐ **SCP-REMOTE** Remote Control for SCP/_F option. Order at least one per project to program and control the occupancy sensor
- ☐ **SWUSB*** SiteSync interface software loaded on USB flash drive for use with owner supplied PC (Windows based only). Includes SiteSync license, software and USB radio bridge node
- ☐ **SWTAB*** Windows tablet and SiteSync interface software. Includes tablet with preloaded software, SiteSync license and USB radio bridge node
- ☐ **SWBRG** SiteSync USB radio bridge node only. Order if a replacement is required or if an extra bridge node is requested
- ☐ **SW7PR+** SiteSync 7-Pin on fixture module On/Off/Dim, Daylight Sensor 120–480VAC

* When ordering SiteSync at least one of these two interface options must be ordered per project.
 + Available as a SiteSync retrofit solution for fixtures with an existing 7-pin receptacle.

Hubbell Control Solutions — Accessories (Sold Separately)

NX Distributed Intelligence™

- ☐ **NXOFM-1R1D-UNV** On-fixture Module (7-pin), On / Off / Dim, Daylight Sensor with HubbNET Radio and Bluetooth® Radio, 120–480VAC

wiSCAPE® Lighting Control

- ☐ **WIR-RME-L** On-fixture Module (7-pin or 5-pin), On / Off / Dim, Daylight Sensor with wiSCAPE Radio, 110–480VAC

For additional information related to these accessories please visit www.hubbellcontrolsolutions.com. Options provided for use with integrated sensor, please view specification sheet ordering information table for details.

VIPER S

SMALL VIPER LUMINAIRE

CONTROLS

SiteSync — Precommissioned Ordering Information:

When ordering a fixture with the SiteSync lighting control option, additional information will be required to complete the order. The SiteSync Commissioning Form or alternate schedule information must be completed. This form includes Project location, Group information, and Operating schedules. For more detailed information please visit [the SiteSync family page on our website](#) or contact Hubbell Lighting tech support at 800-888-8006.



SiteSync fixtures with Motion control (SWPM) require the mounting height of the fixture for selection of the lens.

Examples: VP-L/80L-235/4K7/3/UNV/A/DB/SWP/ SiteSync only
 VP-L/80L-235/4K7/3/UNV/A/DB/SWPM-40F/ SiteSync with Motion Control

SiteSync 7-Pin Module:

- SiteSync features in a new form
- Available as an accessory for new construction or retrofit applications (with existing 7-Pin receptacle)
- Does not interface with occupancy sensors



SW7PR

NX Distributed Intelligence™ Lighting Controls:

Supports both indoor and outdoor applications in a variety of deployment options: wired, wireless and hybrid. Integrates with and enables a wide array of luminaires including those with SpectraSync Color Tuning Technology.



NX Integrated Controls Reference								
NX Option	Sensor	Networkable	Scheduling	Occupancy	Daylight Harvesting	0-10V Dimming	On/off Control	Bluetooth® App Programming
NX Networked – Wireless								
NXOFM-1R1D-UNV	SCLNX	Yes	Yes	Yes	Yes	Yes	Yes	Yes, Bluetooth App

wiSCAPE™:

Supports remote management, monitoring and metering of outdoor wireless lighting applications such as smart campuses, smart cities, parking lots, parking lots and roadways.



wiSCAPE Reference								
wiSCAPE Option	Sensor	Networkable	Scheduling	Occupancy	Daylight Harvesting	0-10V Dimming	On/off Control	Bluetooth® App Programming
Networked – Wireless								
WIR-RME-L	WIR-RME-L	Yes	Yes	No	Yes	Yes	Yes	wiSCAPE Gateway

VIPER S

SMALL VIPER LUMINAIRE

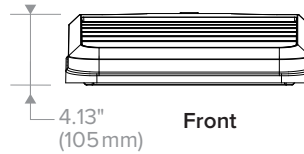
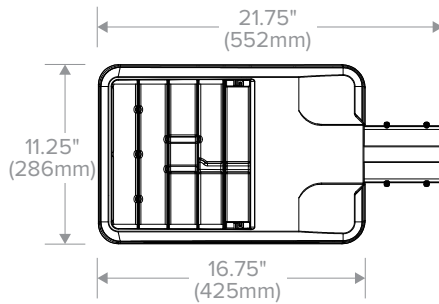
DELIVERED LUMENS

# of LEDs	DRIVE CURRENT (mA)	SYSTEM WATTS	DISTRIBUTION TYPE	5K (5000K nominal, 70 CRI)					4K (4000K nominal, 70 CRI)					3K (3000K nominal, 70 CRI)				
				LUMENS	LPW	B	U	G	LUMENS	LPW	B	U	G	LUMENS	LPW	B	U	G
24	700 mA	55W	FR	6357	118	1	0	1	6486	120	1	0	1	5804	107	1	0	1
			2	6132	114	1	0	1	6257	116	1	0	2	5599	104	1	0	1
			3	6015	111	1	0	2	6137	114	1	0	2	5492	102	1	0	2
			4	5921	110	1	0	2	6034	112	1	0	2	5400	100	1	0	2
			4W	5793	108	1	0	2	5909	110	1	0	2	5272	98	1	0	2
			5QM	6022	112	2	0	1	6145	114	2	0	1	5499	102	2	0	1
			5R	6063	112	3	0	3	6187	115	3	0	3	5536	103	3	0	3
			5W	5908	109	3	0	1	6028	112	3	0	1	5908	102	3	0	1
			TC	6183	113	1	0	1	6309	118	1	0	1	5645	105	1	0	1
36	560 mA	65W	FR	7864	121	1	0	1	8041	124	1	0	1	7189	111	1	0	1
			2	7586	117	1	0	2	7757	119	1	0	2	6934	107	1	0	2
			3	7441	114	1	0	2	7609	117	1	0	2	6802	105	1	0	2
			4	7317	110	1	0	2	7482	112	1	0	2	6688	100	1	0	2
			4W	8690	108	1	0	2	8864	110	1	0	2	7908	98	1	0	2
			5QM	7450	115	3	0	1	7618	117	3	0	1	6810	105	3	0	1
			5R	7501	115	3	0	3	7670	118	3	0	3	6857	105	3	0	3
			5W	7309	112	3	0	2	7473	115	3	0	2	6681	103	3	0	1
			TC	7864	121	1	0	1	8041	124	1	0	1	7189	111	1	0	1
36	700 mA	80W	FR	9535	118	1	0	1	9730	120	1	0	1	8706	107	1	0	1
			2	9197	114	1	0	2	9385	116	1	0	2	8398	104	1	0	2
			3	9022	111	1	0	2	9206	114	1	0	2	8238	102	1	0	2
			4	8871	110	1	0	2	9052	112	1	0	2	8100	100	1	0	2
			4W	11587	108	1	0	3	11819	110	1	0	3	10544	98	1	0	3
			5QM	9033	112	3	0	1	9217	114	3	0	1	8248	102	3	0	1
			5R	9095	112	3	0	3	9280	115	3	0	3	8304	103	3	0	3
			5W	8861	109	3	0	2	9043	112	3	0	2	8092	100	3	0	2
			TC	9275	115	1	0	1	9464	118	1	0	1	8468	105	1	0	1
48	700 mA	110W	FR	12713	118	1	0	1	12973	120	2	0	1	11608	107	1	0	1
			2	12263	114	2	0	2	12513	116	2	0	2	11197	104	2	0	2
			3	12029	111	2	0	2	12175	114	2	0	2	10984	102	1	0	2
			4	11828	110	1	0	3	12069	112	1	0	3	10800	100	1	0	2
			4W	14484	108	2	0	4	14774	111	2	0	4	13180	98	2	0	3
			5QM	12044	112	3	0	2	12290	114	3	0	2	10997	102	3	0	1
			5R	12126	112	3	0	3	12374	115	3	0	3	11072	103	3	0	3
			5W	12126	109	4	0	2	12057	112	4	0	2	10789	100	4	0	2
			TC	12366	115	1	0	2	12619	118	1	0	2	11290	105	1	0	2
60	700 mA	136W	FR	15891	117	2	0	2	16216	120	2	0	2	14511	107	2	0	1
			2	15329	113	2	0	2	15642	116	2	0	2	13997	103	2	0	2
			3	15037	111	2	0	3	15344	113	2	0	3	13730	101	2	0	3
			4	14784	109	1	0	3	15086	111	1	0	3	13500	100	1	0	3
			4W	14802	109	2	0	3	15104	112	2	0	3	13515	100	2	0	3
			5QM	15055	111	3	0	2	15362	114	3	0	2	13747	102	3	0	2
			5R	15158	112	4	0	4	15469	114	4	0	4	13841	102	4	0	4
			5W	14781	109	4	0	2	15083	111	4	0	2	13495	100	4	0	2
			TC	15458	115	1	0	2	15834	118	1	0	2	14113	105	1	0	2

VIPER S

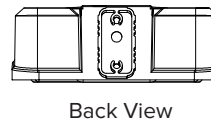
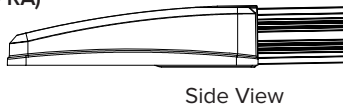
SMALL VIPER LUMINAIRE

DIMENSIONS

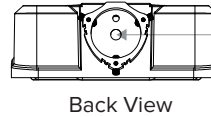
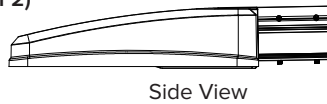


Weight	15.0 lbs (6.8 kg)
EPA	.67 ft ²

A Arm (formerly RA)

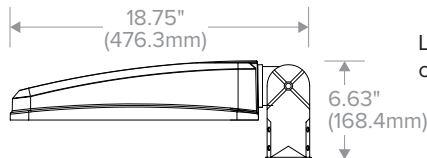


MAF (formerly SF2)



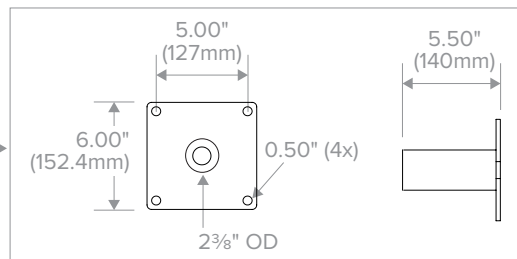
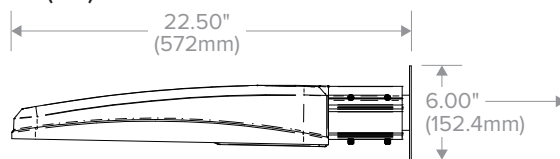
Accepts 2 3/8" OD tenon, min 5" long.

2 3/8" Adjustable Knuckle (K) (formerly PK2)

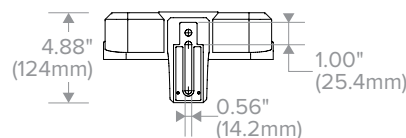
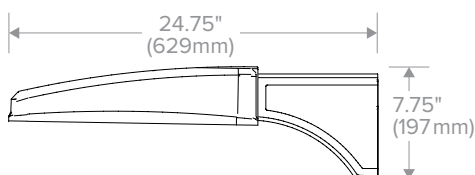


Limit to 30° tilt. Sensor, photocell and wireless controls should not be tilted above horizontal.

Wall Bracket (WB)



AD Decorative Arm


 See [page 9](#) for mounting details.

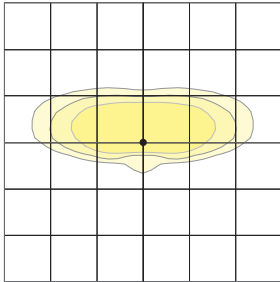
VIPER S

SMALL VIPER LUMINAIRE

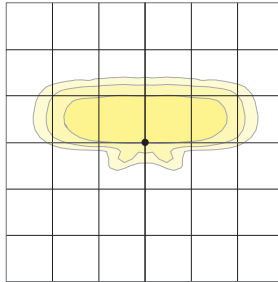
PHOTOMETRY

The following diagrams represent the general distribution options offered for this product. For detailed information on specific product configurations, see [website photometric test reports](#).

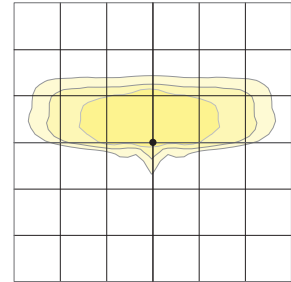
Type FR – Front Row/Auto Optic



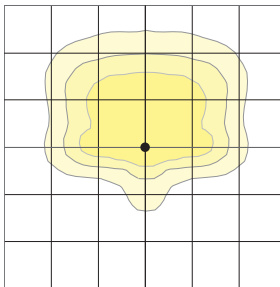
Type 2



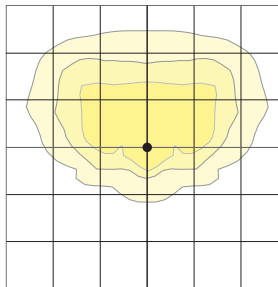
Type 3



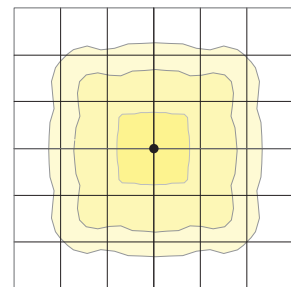
Type 4



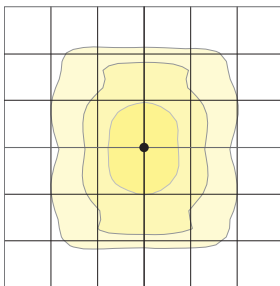
Type 4 Wide



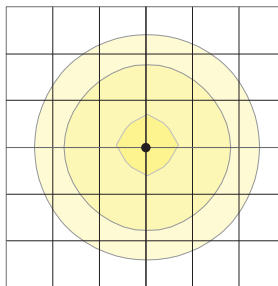
Type 5QM



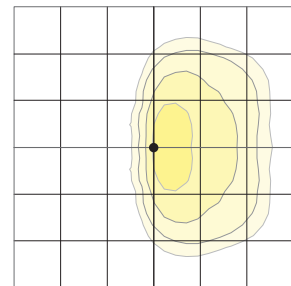
Type 5R (rectangular)



Type 5W (round wide)



Type TC



VIPER S

SMALL VIPER LUMINAIRE

ELECTRICAL DATA

# OF LEDS	NUMBER OF DRIVERS	DRIVE CURRENT (mA)	INPUT VOLTAGE (V)	SYSTEM POWER (w)	CURRENT (Amps)
24	1	700 mA	120	55	0.5
			277		0.2
			347		0.2
			480		0.1
36	1	525 mA	120	65	0.65
			277		0.28
			347		0.22
			480		0.16
	1	700 mA	120	80	0.7
			277		0.3
			347		0.2
			480		0.2
48	1	700 mA	120	110	0.9
			277		0.4
			347		0.3
			480		0.2
60	1	700 mA	120	136	1.1
			277		0.5
			347		0.4
			480		0.3

PROJECTED LUMEN MAINTENANCE						
Ambient Temp.	0	25,000	50,000	TM-21-11 60,000 ¹	100,000	Calculated L70 (HOURS)
25°C / 77°C	1	0.97	0.95	0.95	0.92	>377,000

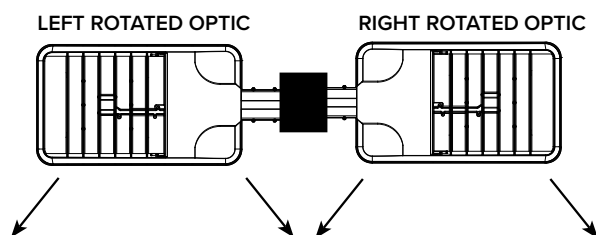
1 Projected per IESNA TM-21-11.
Data references the extrapolated performance projections for the 60 LED base model in a 25°C ambient, based on 10,000 hours of LED testing per IESNA LM-80-08.

LIFESHIELD™ CIRCUIT

Protects luminaire from excessive temperature. The device activates at a specific, factory-preset temperature and progressively reduces power over a finite temperature range. Operation is smooth and undetectable to the eye. Thermal circuit is designed to “fail on”, allowing the luminaire to revert to full power in the event of an interruption of its power supply or faulty wiring connection to the drivers. The device can co-exist with other 0–10V control devices (occupancy sensors, external dimmers, etc.)

ADDITIONAL INFORMATION

ROTATION OPTIONS



VIPER S

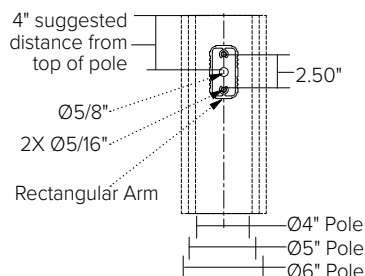
SMALL VIPER LUMINAIRE

ADDITIONAL INFORMATION (CONTINUED)

DRILL PATTERN

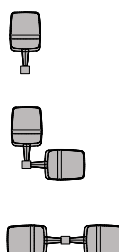
RECTANGULAR ARM (A)

Compatible with Pole drill pattern B3

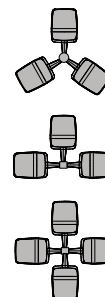


EPA

Config.	EPA
1	.67
2 @ 90°	1.06
2 @ 180°	1.34



Config.	EPA
3 @ 120°	1.68
3 @ 90°	1.73
4 @ 90°	2.12



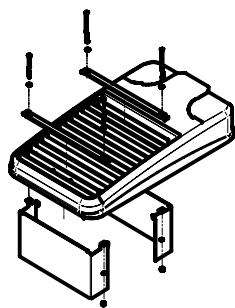
TENON TOP POLE BRACKET ACCESSORIES (ORDER SEPARATELY)

(2 3/8" OD tenon)

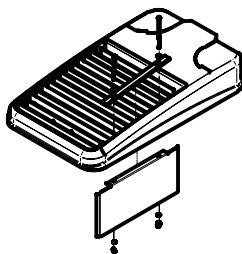
TENON TOP POLE BRACKET ACCESSORIES (Order Separately)

- ☐ **SETAVP-XX** Square tenon adapter (4 at 90°) for A - Rectangular Arm mounting option only
- ☐ **RETAVP-XX** Round tenon adapter (4 at 90°) for A - Rectangular Arm mounting option only
- ☐ **SETA2XX** Square tenon adapter (4 at 90°) for AD - Universal Arm mounting option only
- ☐ **RETA2XX** Round tenon adapter (4 at 90°) for AD3 - Universal Arm mounting option only
- ☐ **TRETA2XX** Hexagonal tenon adapter (3 at 120°) for AD - Universal Arm mounting option only

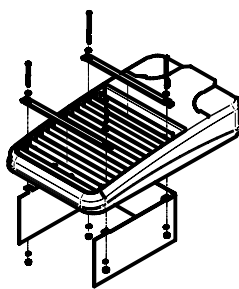
HOUSE SIDE SHIELD FIELD INSTALL ACCESSORIES



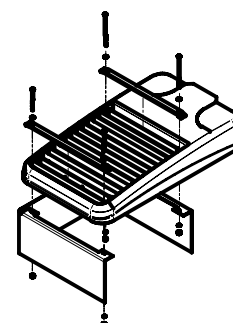
HSS/VP-S/90-FB/XXX
90° shield front or back
(2 shields shown)



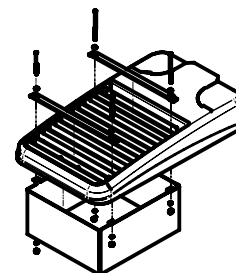
HSS/VP-S/90-LR/XXX
90° shield left or right
(1 shield shown in left orientation)



HSS/VP-S/270-FB/XXX
270° shield front or back
(1 shield shown in back orientation)



HSS/VP-S/270-LR/XXX
270° shield left or right
(1 shield shown in right orientation)



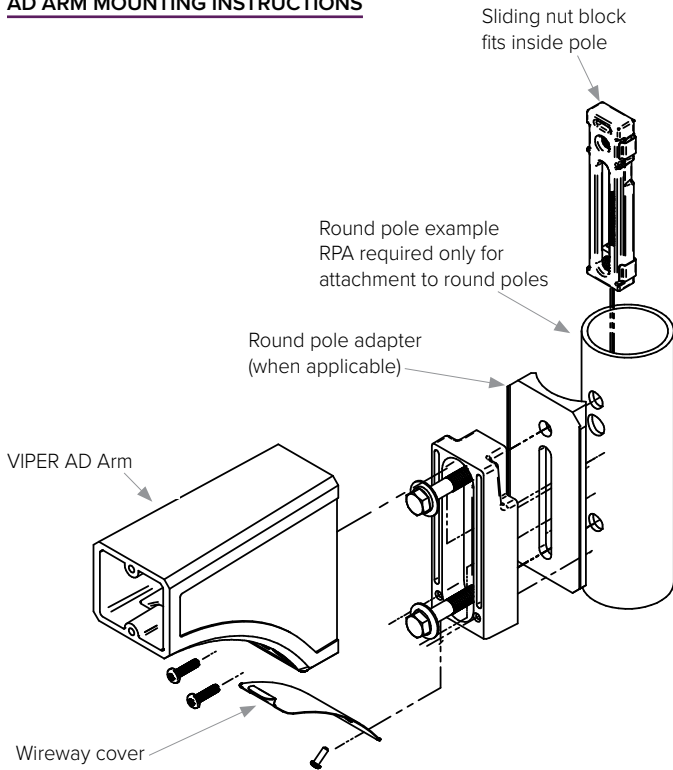
HSS/VP-S/360/XXX
Full shield
(1 shield shown)

VIPER S

SMALL VIPER LUMINAIRE

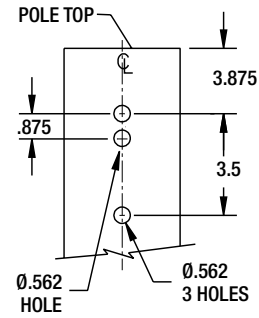
ADDITIONAL INFORMATION (CONTINUED)

AD ARM MOUNTING INSTRUCTIONS



DECORATIVE ARM (AD)

Compatible with pole drill pattern S2





Response to Engineering Review to Provide S.U.E Plan per CRS 9-1.5-102

As required, the response to engineering review to provide S.U.E. plan per CRS 9-1.5-102 is provided in the following pages:



November 27, 2019

Mr. Trent L. Hyatt
Senior Planner
City of Glenwood Springs
101 W. Eighth Street
Glenwood Springs, CO 81601

**RE: RFTA-GMF Renovation Phase 2
Response to Engineering Review to Provide S.U.E Plan per CRS 9-1.5-102**

Dear Mr. Hyatt:

Shrewsberry & Associates (Shrewsberry) is pleased to submit this response to the engineering review comment Item 3 and to provide justification that a S.U.E Plan is not required for this project.

Specifically, Item 3 review comment states the following:

"Provide S.U.E. Plan per CRS 9-1.5-102 requirements or provide a stamped letter determining why this is not a Subsurface Utility Engineering-Required Project."

CRS 9-1.5-102 (6.8) defines a subsurface utility engineering-required project to be a project that meets ***all of the conditions*** listed in the section. Below is a response and justification why all the conditions are not met and therefore a subsurface utility engineering plan is not required for the RFTA GMF Renovation Phase 2.

- a. CRS 9-1.5-102 (6.8) (b)-The project involves primarily a horizontal construction and does not involve primarily the construction of buildings.

Response

The project is primarily a vertical project consisting of the expansion of the existing Glenwood Springs Maintenance Facility. To facilitate the expansion, utilities need to be relocated. No new utility service is included in the project.

- b. CRS 9-1.5-102 (6.8) (c)(B)-Involves utility boring

Response

The project does not include any utility boring.

Summary

Based on CRS 9-1.5-102 (6.8), all conditions listed in the section must be met for the RFTA GMF Renovation Phase 2 Project to be considered a subsurface utility engineering-required project. Sections CRS 9-1.5-102 (6.8) (b) and CRS 9-1.5-102 (6.8) (c)(B) are not met. It is true that RFTA is considered



a political subdivision and the design services are being provided by a licensed professional engineer in the State of Colorado which satisfy the requirements listed in CRS 9-1.5-102 (6.8).

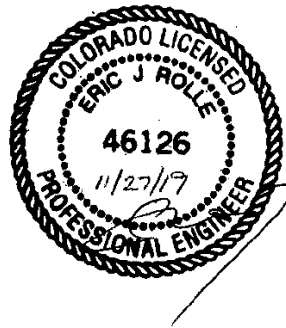
Conclusion

Based on CRS 9-1.5-102 (6.8), all conditions have not been met for the RFTA GMF Renovation Phase 2 Project to be considered a subsurface utility engineering-required project. Specifically, the requirements in sections CRS 9-1.5-102 (6.8) (b) and CRS 9-1.5-102 (6.8) (c)(B) are not met. As such, the RFTA GMF Renovation Phase 2 project should not be considered a subsurface utility engineering-required project.

Should you have any questions or comments, please don't hesitate to contact me.

Sincerely,

Eric J. Rolle, P.E., PMP
Vice President
Shrewsberry & Associates, LLC



cc: Project File: 15-0276

Attachments

ARTICLE 1.3

Low-flow Plumbing Fixtures

9-1.3-101 to 9-1.3-106. (Repealed)

Editor's note: (1) This article was added in 1989. For amendments to this article prior to its repeal in 2016, consult the 2015 Colorado Revised Statutes and the Colorado statutory explanatory note beginning on page vii in the front of this volume.

(2) Section 9-1.3-106 provided for the repeal of this article, effective September 1, 2016. (See L. 2014, pp. 1878, 1880.)

Cross references: For current provisions regarding low-efficiency plumbing fixtures, see article 7.5 of title 6.

ARTICLE 1.5

Excavation Requirements

9-1.5-101. Legislative declaration. The purpose of this article is to prevent injury to persons and damage to property from accidents resulting from damage to underground facilities by excavation. This purpose shall be facilitated through the creation of a single statewide notification system to be administered by an association of the owners and operators of underground facilities. Through the association, excavators shall be able to obtain crucial information regarding the location of underground facilities prior to excavating and shall thereby be able to greatly reduce the likelihood of damage to any such underground facility or injury to any person working at an excavation site.

Source: **L. 81:** Entire article added, p. 520, § 1, effective October 1. **L. 93:** Entire article amended, p. 498, § 1, effective September 1.

9-1.5-102. Definitions. As used in this article 1.5, unless the context otherwise requires:

(1) "ASCE 38" means the standard for defining the quality of an underground facility location as defined in the current edition of the American Society of Civil Engineers' "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data (CI/ASCE 38-02)" or an analogous successor standard as determined by the safety commission.

(1.5) "Damage" includes the penetration or destruction of any protective coating, housing, or other protective device of an underground facility, the denting or partial or complete severance of an underground facility, or the rendering of any underground facility inaccessible.

(2) "Emergency situations" includes ruptures and leakage of pipelines, explosions, fires, and similar instances where immediate action is necessary to prevent loss of life or significant damage to property, including, without limitation, underground facilities, and advance notice of proposed excavation is impracticable under the circumstances.

(3) "Excavation" means any operation in which earth is moved or removed by means of any tools, equipment, or explosives and includes augering, backfilling, boring, ditching, drilling,

grading, plowing-in, pulling-in, ripping, scraping, trenching, hydro excavating, postholing, and tunneling. "Excavation" does not include:

- (a) Routine maintenance on existing planted landscapes; or
- (b) An excavation by a rancher or a farmer, as defined in section 42-20-108.5, occurring on a ranch or farm when the excavation involves:

- (I) Any form of existing agricultural activity that is routine for that ranch or farm;
 - (II) Land clearing if the activity does not involve deep ripping or deep root removal of trees or shrubs; or

- (III) Routine maintenance of:

- (A) An existing irrigation facility if the facility has been subjected to maintenance in the previous twenty-four months; or

- (B) Existing fence lines.

(3.4) "Gravity-fed system" means any underground facility that is not pressurized and that utilizes gravity as the only means to transport its contents. These systems include sanitary sewer lines, storm sewer lines, and open-air irrigation ditches.

(3.7) "Licensed professional engineer" means a professional engineer as defined in section 12-25-102.

(4) "Notification association" or "association" means the statewide notification association of owners and operators of underground facilities created in section 9-1.5-105.

(5) (a) "Operator" or "owner" means any person, including public utilities, municipal corporations, political subdivisions, or other persons having the right to bury underground facilities in or near a public road, street, alley, right-of-way, or utility easement.

(b) "Operator" or "owner" does not include any railroad.

(6) "Person" means any individual acting on his or her own behalf, sole proprietor, partnership, association, corporation, or joint venture; the state, any political subdivision of the state, or any instrumentality or agency of either; or the legal representative of any of them.

(6.5) "Routine maintenance" means a regular activity that happens at least once per year on an existing planted landscape if earth is not disturbed at a depth of more than twelve inches by nonmechanical means or four inches by mechanical means and if the activities are not intended to permanently lessen the ground cover or lower the existing ground contours. Mechanical equipment used for routine maintenance tasks shall be defined as aerators, hand-held rototillers, soil injection needles, lawn edgers, overseeders, and hand tools.

(6.7) "Subsurface utility engineering notification" means a notice to the notification association that a project is being designed by a licensed professional engineer and that the project will include the investigation and depiction of existing underground facilities that meet or exceed the ASCE 38 standard.

(6.8) "Subsurface utility engineering-required project" means a project that meets all of the following conditions:

- (a) The project involves a construction contract with a public entity, as that term is defined in section 24-91-102;

- (b) The project involves primarily horizontal construction and does not involve primarily the construction of buildings;

- (c) (I) The project:

- (A) Has an anticipated excavation footprint that exceeds two feet in depth and that is a contiguous one thousand square feet; or

(B) Involves utility boring.

(II) For purposes of this subsection (6.8)(c), the term "two feet in depth" does not include rotomilling, and the contiguous one thousand square feet does not include fencing and signing projects.

(d) The project requires the design services of a licensed professional engineer.

(6.9) "Underground damage prevention safety commission" or "safety commission" means the enforcement authority established in section 9-1.5-104.2.

(7) "Underground facility" means any item of personal property which is buried or placed below ground for use in connection with the storage or conveyance of water or sewage, electronic, telephonic, or telegraphic communications or cable television, electric energy, or oil, gas, or other substances. "Item of personal property", as used in this subsection (7), includes, but is not limited to, pipes, sewers, conduits, cables, valves, lines, wires, manholes, and attachments thereto.

Source: **L. 81:** Entire article added, p. 520, § 1, effective October 1. **L. 93:** Entire article amended, p. 498, § 1, effective September 1. **L. 2000:** (3) and (6) amended, p. 685, § 1, effective May 23. **L. 2009:** (2) and (3) amended and (6.5) added, (HB 09-1092), ch. 38, p. 151, § 1, effective August 5. **L. 2018:** IP, (1), and (3) amended and (1.5), (3.4), (3.7), and (6.7) to (6.9) added, (SB 18-167), ch. 256, p. 1561, § 1, effective August 8.

Editor's note: Section 12 of chapter 256 (SB 18-167), Session Laws of Colorado 2018, provides that the act changing this section applies to conduct occurring on or after August 8, 2018.

9-1.5-103. Plans and specifications - notice of excavation - duties of excavators - duties of owners and operators - fee - repeal.

(1) (Deleted by amendment, L. 93, p. 499, § 1, effective September 1, 1993.)

(2) Architects, engineers, or other persons designing excavation shall obtain general information as to the description, nature, and location of underground facilities in the area of such proposed excavation and include such general information in the plans or specifications to inform an excavation contractor of the existence of such facilities and of the need to obtain information thereon pursuant to subsection (3) of this section.

(2.4) At the project owner's expense, a licensed professional engineer designing for a subsurface utility engineering-required project shall:

(a) Notify the notification association with a subsurface utility engineering notification;

(b) Either:

(I) Meet or exceed the ASCE 38 standard for defining the underground facility location in the stamped plans for all underground facilities within the proposed excavation area; or

(II) Document the reasons why any underground facilities depicted in the stamped plans do not meet or exceed ASCE 38 utility quality level B or its successor utility quality level;

(c) Attempt to achieve ASCE 38 utility quality level B or its successor utility quality level on all utilities within the proposed excavation area unless a reasonable rationale by a licensed professional engineer is given for not doing so; and

(d) Document the reasons why any underground facilities depicted in the stamped plans do not meet or exceed ASCE 38 utility quality level A or its successor utility quality level for



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2016 Colorado Revised Statutes

Title 24 - Government - State

Construction

Article 91 - Construction Contracts

With Public Entities

§ 24-91-102. Definitions

Universal Citation: CO Rev Stat § 24-91-102 (2016)

As used in this article, unless the context otherwise requires:

(1) "Acceptable securities" means:

(a) United States bonds, United States treasury notes, or United States treasury bills;

(b) General obligation or revenue bonds of this state;

(c) General obligation or revenue bonds of any political subdivision of this state;

(d) Certificates of deposit from a state or national bank or a savings and loan association insured by the federal deposit insurance corporation or its successor and having its principal office in this state.

(1.5) "Construction" includes the terms capital construction, capital renewal, and controlled maintenance as defined in section 24-30-1301.

(2) "Contractor" means any person, company, firm, or corporation which is a party to a contract with a public entity to construct, erect, alter, install, or repair any highway, public building, public work, or public improvement, structure, or system.

(3) "Public entity" means this state or a county, city, city and county, town, or district, including any political subdivision thereof.

(4) "Subcontractor" means and includes any person, company, firm, or corporation which is a party to a contract with a contractor to construct, erect, alter, install, or repair any highway, public building, public work, or public improvement, structure, or system and which, in connection therewith, furnishes and performs on-site labor with or without furnishing materials.

(5) "Substantial completion" means the date when the construction is sufficiently complete, in accordance with the contract documents, as modified by any change orders agreed to by the parties, so that the work or designated portion thereof is available for use by the owner.

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Easement To City's Wastewater Treatment Facility

Easement documentation received from RFTA on 12/09/2019 and is provided on the following page; as requested, the information will be shown in the final 100% drawings:

General Configuration of an access easement based on as-built conditions

Found #5 Rebar with Yellow Plastic Cap Stamped LS #19598

Lot A
Glenwood Springs
Municipal Operation Center
Reception No. 614253
City of Glenwood Springs

Temporary slope / construction letter of understanding

Portion of RFTA drive on Public R.O.W.

43' Access & Slope Easement

A strip of land located within Lot B, Municipal Subdivision Plat of Glenwood Springs Municipal Operations Center as recorded December 7, 2002 under Reception No. 614253, also being located in Section 5 Township 6 South, Range 89 West of the 6th, Principal Meridian, City of Glenwood Springs, County of Garfield, State of Colorado, being further described as follows:

Beginning at the Northwest corner of said Lot B from which the SE Corner of Section 6, Township 6 South, Range 89 West of the 6th, Principal Meridian bears S13°17'17"W a distance of 505.87 feet; thence along the boundary of said Lot B the following two (2) courses: N57°26'02"E a distance of 250.08 feet; thence N89°04'51"E a distance of 81.95 feet to a point on the Northerly line of an Access Easement recorded under Reception No. 614253; thence S57°26'00"W a distance of 384.82 feet; thence the Westerly boundary of said Lot B; thence along the Westerly boundary of said Lot B N23°56'20"E a distance of 77.92 feet to the point of beginning. Said strip contains 0.31 acres more or less and is subject to easements and encumbrances of record.

Found #5 Rebar with Yellow Plastic Cap Stamped LS #19598

P.O.B.

43' Access & Slope Easement

Access Easement Rec. No. 614253

Existing Access Easement to western city property to remain

Lot B
Glenwood Springs
Municipal Operation Center
Reception No. 614253
Roaring Fork Transportation Authority

Found #5 Rebar with Yellow Plastic Cap Stamped LS #19598

SE Corner Section 6

GRAPHIC SCALE



(IN FEET)
1 inch = 40 ft.

 SCHMUESER GORDON MEYER CORPORATION • 1990-2010	SCHMUESER GORDON MEYER 110 W. 1st Street, Suite 200 Glenwood Springs, Colorado 81601 PHONE: 970.435.1004 FAX: 970.435.5048 EMAIL: CGM@SGMCO.COM	City of Glenwood Springs & Roaring Fork Transportation Authority	DATE BY		Access & Slope Easement Exhibit Map	Job No. 2007-081.000 Drawn by: llc Date: 11/30/11 Page: 1

RFTA GMF Renovation Phase 2-Existing Site Improvements



Photo 1-Northwest corner of site



Photo 2-North end of the site showing parking



Photo 3-West end of site



Photo 4-Southwest end of site



Photo 5-Maintenance bay exists, looking to the southwest



Photo 6-Utility equipment pad on north end of existing GMF building



Photo 7-Emergency generator



Photo 8-Canopy, looking from the north.



Photo 9-Oil water separator pit with controls, looking from the north



Photo 10-CNG



Photo 11-Fueling and wash bay



Photo 12-Lube Room



Photo 13-Maintenance bay



Photo-14-Operations



Photo 15-Maintenance bay pit



Photo 16-Maintenance bay



Photo 17-GMF roof



Section 4

Conceptual Drawings-Phase 2 GMF Renovation

ROARING FORK TRANSPORTATION AUTHORITY
GLENWOOD MAINTENANCE FACILITY (GMF) RENOVATION - PHASE 2
RFTA CONTRACT NO.: 15-040
LOCATION AND EXTENT APPLICATION

PROJECT DESCRIPTION

THIS PROJECT INCLUDES THE RENOVATION AND ADDITION OF THE RFTA GLENWOOD MAINTENANCE FACILITY TO PRIMARILY HOUSE THE MAINTENANCE STAFF AND BUS SERVICES.

PROJECT DESCRIPTION					
LOT SIZE INFORMATION	ACRES	SQUARE FEET	LOT COVERAGE	EXISTING (SQ FT & %)	PROPOSED (SQ FT & %)
	5.1390	223,854		BUILDING: 16,360 SQ FT 7% PAVEMENT: 109,737 SQ FT 49%	BUILDING: 22,340 SQ FT 10% PAVEMENT: 113,490 SQ FT 51%
LIMITS OF DISTURBANCE	EXISTING (SQ FT & %)	PROPOSED (SQ FT & %)	AVERAGE SLOPE WITHIN LIMITS OF DISTURBANCE	PERCENTAGE %	
	217,910 SQ FT 97%	217,910 SQ FT 97% PROJECT LOD WITHIN EXISTING LOD		5%	
OFF-STREET PARKING SPACES	EXISTING # VEHICLE SPACES	PROPOSED # VEHICLE SPACES	BICYCLE PARKING	EXISTING # SPACES	PROPOSED # SPACES
	8	8		0	0
RESIDENTIAL UNITS	# EXISTING UNITS	# PROPOSED UNITS	NON-RESIDENTIAL USES	TYPE OF USE(S)	GROSS FLOOR AREA (SQ FT)
	N/A	N/A		LIGHT INDUSTRIAL (I1)	EXISTING: 16,360 SQ FT PROPOSED: 22,340 SQ FT
OPEN SPACES	EXISTING (SQ FT & %)	PROPOSED (SQ FT & %)	TOTAL LANDSCAPED AREA	EXISTING (SQ FT & %)	PROPOSED (SQ FT & %)
	104,593 SQ FT 47%	94,627 SQ FT 42%		106,424 SQ FT 48%	96,485 SQ FT 43%
BUILDING HEIGHT	EXISTING (FT)	PROPOSED (FT)	TOTAL IMPERVIOUS AREA	EXISTING (SQ FT & %)	PROPOSED (SQ FT & %)
	28 FT	28 FT		126,097 SQ FT 56%	135,830 SQ FT 61%
SNOW STORAGE	REQUIRED (SQ FT)	PROPOSED (SQ FT)	OTHER		
	N/A	600 SQ FT			

PROJECT CONTACTS

RFTA SENIOR PROJECT MANAGER:
NICK SENN 970-384-4862

RFTA PROJECT ENGINEER:
JOE BAIR 970-384-4978

SHREWSBERRY PROJECT MANAGER:
ERIC ROLLE 720-235-0605

DESIGN TEAM:

PROJECT MANAGEMENT & CIVIL ENGINEERING



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DENVER, CO 80222

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ARCHITECT



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STRUCTURAL



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MEP&T



CATOR, RUMA & ASSOCIATES, CO.
896 TABOR STREET
LAKEWOOD, CO 80401

PHONE 303-232-6200
CONTACT: JAMES LAZZERI, P.E.

VICINITY MAP



LOCATION MAP



FEMA FLOODPLAIN STATEMENT

REFERENCING THE FEMA FLOODPLAIN MANAGEMENT COMMUNITY MAP NUMBER 0802051431B, EFFECTIVE ON 01/03/1986 THE SITE IS NOT WITHIN A DESIGNATED FLOODPLAIN AS SHOWN IN THIS FIGURE OF THE FEMA FLOODPLAIN MAP:



FEMA FLOODPLAIN MAP FOR RFTA GMF
(<http://cogs.us/324/Floodplain-Management>)



Computer File Information		Sheet Revisions			As Constructed	GMF EXPANSION – PHASE 2		Project No./Code	
Print Date: 12/4/2019	0000	Date:	Comments	Init.		15 – 0276		COVER	
Last Modification Date:					No Revisions:	–	Designer: JED		
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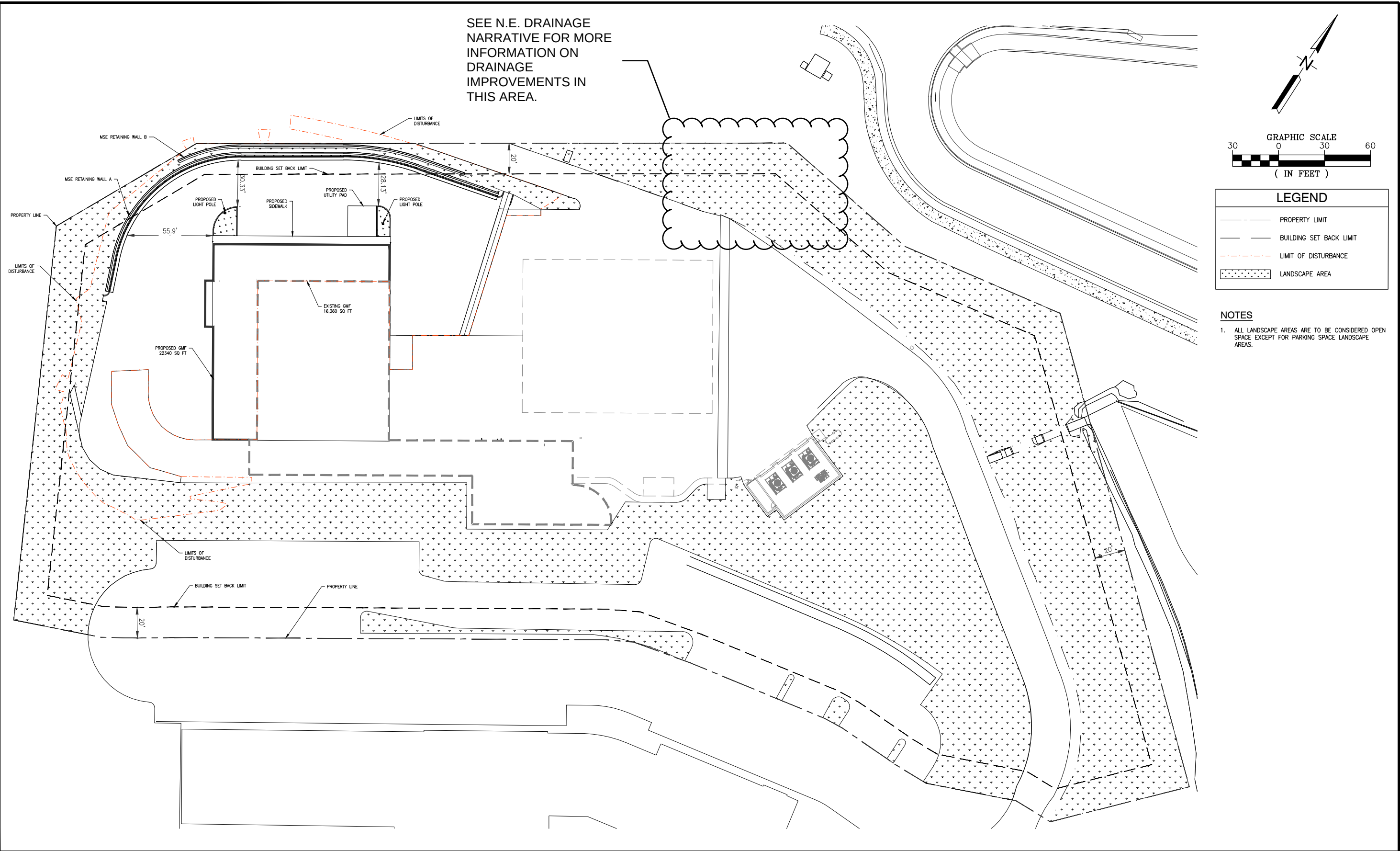
DRAWING INDEX

INDEX	
SHEET NO.	SHEET ID
C00.00	GENERAL NOTES - CIVIL
C00.01	SITE PLAN
C01.01	DEMOLITION PLAN
C02.01	GEOMETRY PLAN
C03.01	UTILITY PLAN
C04.01	GRADING PLAN
C05.01	DRAINAGE PLAN
C06.01	RETAINING WALL PLAN
C06.02	RETAINING WALL PLAN
C06.03	RETAINING WALL PLAN
C06.04	RETAINING WALL PLAN
C07.01	PAVING PLAN
C08.01	EROSION CONTROL PLAN
C09.01	LANDSCAPING PLAN
S07.01	SITE DETAILS
A00.00	PROJECT INFORMATION SHEET
A00.01	BUILDING CODE INFORMATION - NORTH
A00.02	BUILDING CODE INFORMATION - NORTH
A00.03	BUILDING CODE INFORMATION - SOUTH
A00.05	ACCESSIBILITY PLAN MAIN
A00.06	ACCESSIBILITY PLAN UPPER
A01.01	MAIN LEVEL FLOOR PLAN
A01.02	UPPER LEVEL FLOOR PLAN
A01.03	MAIN LEVEL FLOOR PLAN - SOUTH
A02.01	EXTERIOR ELEVATIONS
A02.02	EXTERIOR ELEVATIONS
A02.03	INTERIOR ELEVATIONS
A03.01	BUILDING SECTIONS
A03.02	BUILDING SECTIONS
A03.03	ENLARGED STAIR CORE
A03.04	BUILDING SECTIONS WEST

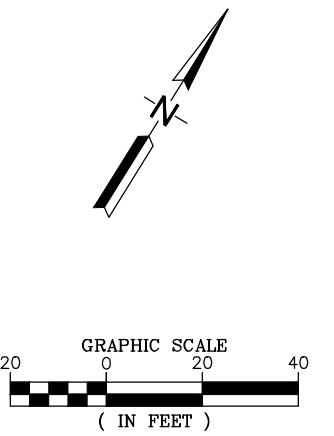
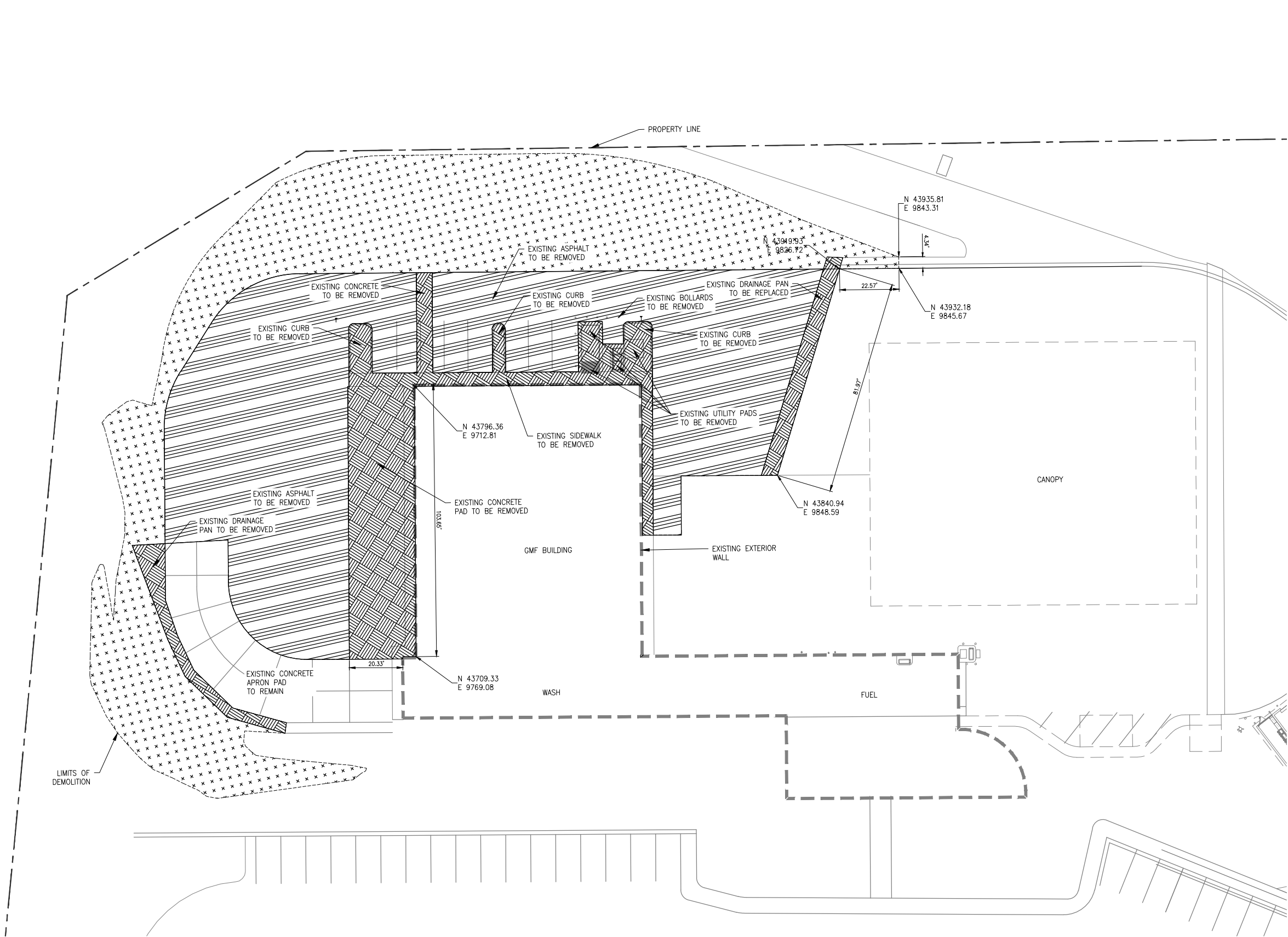
Computer File Information		Sheet Revisions			 Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	 shrewsberry 2696 S. Colorado Blvd, Ste. 460 Denver, CO 80222 720.235.0605 shrewsusa.com	As Constructed		GMF EXPANSION – PHASE 2		Project No./Code	
Print Date: 12/4/2019		Date:	Comments	Init.			No Revisions:	—	Designer: JED		15 – 0276	
Last Modification Date:							Revised:	—			INDEX	
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GENERAL PROVISIONS 1. ALL CONSTRUCTION, MATERIALS, AND WORKMANSHIP SHALL BE IN CONFORMANCE WITH THE LATEST STANDARDS AND SPECIFICATIONS OF CDOT. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FOR ANY VARIANCE TO THE CONSTRUCTION DOCUMENTS. 2. ALL REFERENCES TO ANY PUBLISHED STANDARDS, CODES, DOCUMENTS, ETC. SHALL REFER TO THE LATEST REVISION OF SAID ARTICLE, UNLESS SPECIFICALLY STATED OTHERWISE. 3. THE CONTRACTOR SHALL OBTAIN ALL APPLICABLE CODES, LICENSES, STANDARDS, SPECIFICATIONS, PERMITS, INSPECTIONS, BONDS, ETC. REQUIRED FOR CONSTRUCTION. THE COSTS IS TO BE INCLUDED WITH THE BID. ANY ADDITIONAL EXPENSES ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. 4. IT SHALL BE THE CONTRACTOR’S RESPONSIBILITY TO NOTIFY THE ENGINEER OF ANY PROBLEM IN CONFORMING TO THE APPROVED PLANS FOR ANY ELEMENT OF THE PROPOSED IMPROVEMENTS PRIOR TO CONSTRUCTION. 5. PROJECT PAY ITEMS PROVIDED ARE TO BE INCLUSIVE OF ALL WORK TO BE PERFORMED AS SHOWN. ALL WORK NOT IDENTIFIED WITH A SPECIFIC PAY ITEM SHALL BE CONSIDERED REQUIRED WORK TO COMPLETE THE PROJECT AND IS TO BE INCIDENTAL TO THE COST OF PROJECT PAY ITEMS PROVIDED. 6. WHENEVER, IN THE CONTRACT DOCUMENTS, THE WORDS "PROVIDE", "FURNISH", "INSTALL", "FURNISH AND INSTALL", OR SIMILAR WORDS ARE USED, IT SHALL BE UNDERSTOOD THAT THE INTENT OF THE CONTRACT DOCUMENTS IS TO PROVIDE FOR THE CONSTRUCTION AND COMPLETION IN EVERY DETAIL THE WORK DESCRIBED. IT IS FURTHER INTENDED THAT THE CONTRACTOR SHALL FURNISH ALL LABOR, SUPERVISION, MATERIALS, EQUIPMENT, TOOLS, TRANSPORTATION, SUPPLIES, TESTING, AND INCIDENTALS REQUIRED TO COMPLETE THE WORK IN ACCORDANCE WITH THE DRAWINGS (PLANS), SPECIFICATIONS, AND TERMS OF THE CONTRACT. 7. ELEVATIONS AND DIMENSIONS CONTAINED IN THESE PLANS ARE CALCULATED FROM EXISTING FIELD SURVEY PROVIDED BY OWNER. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL. 8. ALL MATERIALS, WORKMANSHIP, AND CONSTRUCTION OF PUBLIC IMPROVEMENTS SHALL MEET OR EXCEED THE STANDARDS AND SPECIFICATION SET FORTH IN THE CDOT STANDARD, REVISED, AND PROJECT SPECIAL SPECIFICATIONS, CDPHE, CITY OF GLENWOOD SPRINGS WATER AND SANITARY CODE, NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL SAFETY CODE, AND APPLICABLE STATE AND FEDERAL REGULATIONS. WHERE THERE IS CONFLICT BETWEEN THESE PLANS ANDTHE SPECIFICATIONS, OR ANY APPLICABLE STANDARD, THE HIGHER QUALITY STANDARD SHALL APPLY. 9. THE CONTRACTOR SHALL COMPLY WITH ALL TERMS AND CONDITIONS OF THE COLORADO PERMIT FOR STORM WATER DISCHARGE, THE STORM WATER MANAGEMENT PLAN, EROSION CONTROL PLAN, AND ALL REQUIREMENTS OF THE LOCAL DRAINAGE AUTHORITY. 10. THE CONTRACTOR SHALL SUBMIT A DETAILED LISTING OF ALL SUBMITTALS (E.G., MIX DESIGNS, MATERIAL CERTIFICATION, AND PRODUCT INFORMATION) AND SHOP DRAWINGS REQUIRED BY THE TECHNICAL SPECIFICATIONS. 11. THE CONTRACTOR SHALL PROVIDE WORKMANSHIP AND MATERIALS THAT ARE OF GOOD QUALITY AND COMPLY WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. 12. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, AND CONDUCT ALL TESTING STATED IN THE PROJECT SPECIFICATIONS AS REQUIRED BY THE ENGINEER PRIOR TO ACCEPTANCE. 13. THE CONTRACTOR SHALL PROVIDE MATERIAL SUBMITTALS FOR THE ENGINEER’S APPROVAL AT LEAST SEVEN (7) DAYS PRIOR TO ORDERING. 14. THE CONTRACTOR SHALL COORDINATE THE PHASING OF CONSTRUCTION WITH THE OWNER/ENGINEER TO MINIMIZE IMPACTS TO RFTA OPERATIONS AND FUELING. CONSTRUCTION SHALL BE CONDUCTED SUCH THAT BUS FLOW IS MAINTAINED AT ALL TIMES THROUGHOUT THE DURATION OF THE RENOVATION. AT NO TIME WILL THE CONTRACTOR BE ALLOWED TO SHUT DOWN THE GMF. 15. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER ON AVAILABLE CONSTRUCTION STAGING AREAS AND DESIGNATED CONSTRUCTION PARKING. STAGING AREAS ARE THE RESPONSIBILITY OF THE CONTRACTOR INCLUDING BUT NOT LIMITED TO UPKEEP, SAFETY, AND RESTORATION TO EXISTING CONDITIONS. 16. THE CONTRACTOR SHALL MAINTAIN TRAFFIC FLOW THROUGH THE ACCESS ROAD TO THE WATER/WASTEWATER SITE AT ALL TIMES FOR NORMAL OPERATIONS.	SAFETY & DAMAGES 17. ALL DAMAGE TO UTILITIES, PAVEMENT, EQUIPMENT, OR STRUCTURES FROM CONSTRUCTION ACTIVITIES SHALL BE IMMEDIATELY REPORTED TO THE OWNER/ENGINEER. THE OWNER/ENGINEER SHALL DETERMINE WHETHER REPAIR OR REPLACEMENT IS NECESSARY. ALL REPAIR METHODS SHALL BE SUBMITTED TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INITIATING THE WORK. REPAIRS SHALL BE MADE AT NO ADDITIONAL COST TO THE OWNER AND TO THE APPROVAL OF THE ENGINEER. 18. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS AT AND ADJACENT TO THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF WORK. THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAGMEN, OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. 19. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ASPECTS OF SAFETY INCLUDING, BUT NOT LIMITED TO, EXCAVATION, TRENCHING, SHORING, TRAFFIC CONTROL, AND SECURITY. 20. CONTRACTOR SHALL EXAMINE THE EXISTING PAVEMENTS THAT WILL BE USED FOR HAULING OF MATERIAL AND EQUIPMENT AND DETERMINE THE PAVEMENT’S ABILITY TO WITHSTAND CONTRACTOR OPERATIONS WITHOUT CAUSING DAMAGE TO THE PAVEMENT. ANY DAMAGE CAUSED BY THE CONTRACTOR SHALL BE REPAIRED BY THE CONTRACTOR TO THE APPROVAL OF THE ENGINEER AND AT NO ADDITIONAL COST TO THE OWNER.	PAVEMENT 21. ALL MATERIALS AND WORKMANSHIP ASSOCIATED WITH PAVING AND HARDSCAPE CONSTRUCTION SHALL CONFORM TO THE LATEST CDOT M&S STANDARDS AND SPECIFICATIONS. 22. ALL SITE CONCRETE SHALL BE A MINIMUM OF CLASS D WITH A 28 DAY COMPRESSIVE STRENGTH OF 4500 PSI. 23. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M213. 24. THE CONTRACTOR SHALL SAW CUT (FULL DEPTH) ALL EDGES OF EXISTING PAVEMENT THAT IS TO BE REMOVED. THE CONTRACTOR SHALL TAKE SPECIAL CARE TO CREATE A SMOOTH WORKING EDGE AND TO PLACE BACKFILL AND PAVEMENT SUCH THAT SETTLEMENT DOES NOT OCCUR. 25. THE CONTRACTOR SHALL PROTECT ALL STORM SEWER FACILITIES ADJACENT TO ANY LOCATION WHERE PAVEMENT CUTTING OPERATIONS INVOLVING WHEEL CUTTING, SAW CUTTING, OR ABRASIVE WATER JET CUTTING ARE TO TAKE PLACE. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL WASTE PRODUCTS GENERATED BY SAID CUTTING OPERATIONS ON A DAILY BASIS OR AS NEEDED THROUGHOUT THE WORKDAY. THE DISCHARGE OF ANY WATER CONTAMINATED BY WASTE PRODUCTS FROM CUTTING OPERATIONS TO THE STORM SEWER SYSTEM IS PROHIBITED.	UTILITIES 26. THE CONTRACTOR SHALL NOTIFY ALL PUBLIC UTILITY COMPANIES AND UTILITY NOTIFICATION CENTERS PRIOR TO CONSTRUCTION. THE LOCATION AND DEPTHS OF ALL EXISTING UNDERGROUND UTILITIES SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO PROCEEDING WITH CONSTRUCTION. ALL WORK PERFORMED IN THE AREA OF PUBLIC UTILITES SHALL BE PERFORMED ACCORDING TO THE REQUIREMENTS OF SAID AGENCIES. THE CONTRACTOR SHALL PROTECT, AT HIS OWN EXPENSE, ALL EXISTING UTILITIES AND BE RESPONSIBLE FOR THEIR REPAIR IF THEY ARE DAMAGED DURING CONSTRUCTION. 27. EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND SHALL NOT BE SCALED FOR EXACT LOCATION. LOCATION OF EXISTING UTILITIES AND STRUCTURES SHOWN ON THESE DRAWINGS IS BASED ON AVAILABLE INFORMATION AND IS NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL OF THE ITEMS ARE SHOWN. 28. IT IS NOT INTENDED THAT THE DRAWINGS SHOW EVERY FITTING, SUPPORTS, ETC., AND IT IS UNDERSTOOD THAT THE DRAWINGS MUST BE FOLLOWED AS CLOSELY AS CIRCUMSTANCES WILL PERMIT. THE PROPER INSTALLATION ACCORDING TO THE TRUE INTENT AND MEANING OF THE DRAWINGS, LOCAL CODES AND STANDARD PRACTICES SHALL BE PROVIDED. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO INSTALLATION. REPORT ANY PROBLEMS OR CONFLICTS TO THE ENGINEER. ANY MINOR CHANGES IN LOCATION OF EQUIPMENT, UTILITIES, PIPE, ETC., FROM THOSE LOCATIONS SHOWN ON THE DRAWINGS, SHALL BE MADE WITHOUT EXTRA COST, IF SO, DIRECTED BY THE ENGINEER BEFORE THE INSTALLATION IS MADE. 29. ALL EQUIPMENT OR MATERIAL REQUIRED, EVEN IF NOT SPECIFICALLY MENTIONED HEREIN SHALL BE PROVIDED; IT BEING UNDERSTOOD THAT A COMPLETE AND OPERATIONAL SYSTEM, SATISFACTORY TO THE ENGINEER AND THE OWNER SHALL BE PROVIDED.	30. WHEN INSTALLING NEW UTILITIES UNDER EXISTING PAVEMENT THE CONTRACTOR SHALL NEATLY SAWCUT AND REMOVE THE EXISTING PAVEMENT PRIOR TO INSTALLING THE CONDUIT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING ANY PAVEMENT REMOVED OR DAMAGED DURING THE UTILITY INSTALLATION PROCESS. ALL WORK REQUIRED TO REMOVE AND REPAIR PAVEMENT SHALL BE INCLUDED. 31. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING ALL RIM ELEVATIONS OF MANHOLES, CLEANOUTS, VALVES, METERS, ETC. TO FINISHED GRADE, UNLESS SPECIFICALLY DIRECTED OTHERWISE. 32. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE APPROPRIATE FIRE DEPARTMENT WHEN EXISTING FIRE HYDRANTS WILL BE TAKEN OUT OF SERVICE AT LEAST 48 HOURS PRIOR TO THE START OF CONSTRUCTION. 33. ALL PRIVATE WATER MAINS AND HYDRANT LEADS THAT ARE BEING RELOCATED WILL BE INSTALLED, DISINFECTED, AND TESTED TO COGS STANDARDS.	EROSION CONTROL 34. ANY CONSTRUCTION DEBRIS OR MUD DROPPED INTO MANHOLES, INLETS, PIPES, OR TRACKED ONTO EXISTING ROADWAYS SHALL BE REMOVED IMMEDIATELY BY THE CONTRACTOR. THE CONTRACTOR SHALL REPAIR ANY EXCAVATIONS OR PAVEMENT FAILURES CAUSED BY THEIR CONSTRUCTION. THE CONTRACTOR SHALL PROPERLY BARRICADE THE CONSTRUCTION SITE UNTIL CONSTRUCTION IS COMPLETE. 35. THE CONTRACTOR SHALL ASSUME COMPLETE RESPONSIBILITY FOR CONTROLLING ALL SEDIMENTATION AND EROSION OF THE PROJECT AREA. 36. EXCAVATION SLOPES SHALL BE PROTECTED AGAINST EROSION TO REDUCE THE POTENTIAL FOR SLOUGHING AND SLOPE FAILURE. 37. THE CONTRACTOR SHALL PROTECT ALL WORK AREAS AND FACILITIES FROM WATER AT ALL TIMES. AREAS AND FACILITIES SUBJECTED TO FLOODING, REGARDLESS OF THE SOURCE OF WATER, SHALL BE PROMPTLY DEWATERED AND RESTORED AT NO COST TO THE OWNER. 38. TEMPORARY FLOOD AND SEDIMENT CONTROL FACILITIES SHALL BE CONSTRUCTED OR PUT IN PLACE PRIOR TO THE COMMENCEMENT OF ANY GRADING OPERATIONS. THE CONTRACTOR WILL BE HELD LIABLE FOR ANY FLOOD DAMAGE DOWNSTREAM DUE TO RUNOFF FROM THE CONSTRUCTION SITE DURING CONSTRUCTION. 39. THE CONTRACTOR SHALL PREVENT SEDIMENT, DEBRIS AND ALL OTHER POLLUTANTS FROM ENTERING THE STORM SEWER SYSTEM DURING ALL DEMOLITION, EXCAVATION, TRENCHING, BORING, GRADING, OR OTHER CONSTRUCTION OPERATIONS THAT ARE PART OF THIS PROJECT. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR REMEDIATION OF ANY ADVERSE IMPACTS TO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM, RECEIVING WATERS, WATERWAYS, WETLANDS, AND OR OTHER PUBLIC OR PRIVATE PROPERTIES, RESULTING FROM WORK DONE AS PART OF THIS PROJECT. 40. THE CONTRACTOR SHALL REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO OR, ACCUMULATE IN THE FLOW LINES OF STORM DRAINAGE APPURTENANCES, RFTA PROPERTY, AND PUBLIC RIGHTS OF WAYS OF THE CITY OF GLENWOOD SPRINGS AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS PROJECT. ALL REMOVALS SHALL BE CONDUCTED ON A DAILY BASIS. 41. IN NO CASE SHOULD SURFACE RUNOFF BE ALLOWED TO ENTER THE WALL CONSTRUCTION AREAS, WATER BE PONDED AROUND THE WALLS, OR AGAINST STRUCTURES DURING CONSTRUCTION. 42. AT THE END OF THE CONSTRUCTION DAY, THE CONTRACTOR SHALL SLOPE THE LAST LIFT OF REINFORCED BACKFILL AWAY FROM THE WALL FACING TO DIRECT RUNOFF AWAY FROM THE WALL FACE. 43. EROSION AND SEDIMENT CONTROL 'BEST MANAGEMENT PRACTICES' SHALL BE MAINTAINED AND KEPT IN EFFECTIVE OPERATING CONDITION FOR THE DURATION OF THIS PROJECT. ALL NECESSARY MAINTENANCE AND REPAIR SHALL BE COMPLETED IMMEDIATELY UPON DISCOVERY OF ANY DEFICIENCY OR DEFECT. 44. INTERIM SITE STABILIZATION: THIS BMP IS REQUIRED TO PROVIDE A MEASURE FOR PREVENTING THE DISCHARGE OF SEDIMENT FROM CONSTRUCTION SITES WHERE OVERLOT GRADING OR OTHER SITE DISTURBANCE HAS OCCURRED. THIS BMP IS PARTICULARLY NECESSARY ON SITES WHERE CONSTRUCTION ACTIVITIES/DISTURBANCE WILL BE LIMITED TO SMALL AREAS OF THE PROJECT SITE. ACCEPTABLE BMPs INCLUDE: A)PRESERVING EXISTING VEGETATION B)SEEDING AND PLANTING C)MULCHING D)MULCHING AND SEEDING E) TEMPORARY/PERMANENT RE–VEGETATION OPERATIONS	43. WASTE MANAGEMENT/CONTAINMENT: THIS BMP REQUIRES THAT ALL CONSTRUCTION WASTES, FUELS, LUBRICANTS, CHEMICAL WASTES, TRASH, SANITARY WASTES, CONTAMINATED SOILS OR DEBRIS SHALL BE CONTAINED ON SITE, PROTECTED FROM CONTACT WITH PRECIPITATION OR SURFACE RUNOFF, PERIODICALLY REMOVED FROM THE CONSTRUCTION SITE, AND PROPERLY DISPOSED OF. 44. CONCRETE WASHOUT CONTAINMENT: WATER USED IN THE CLEANING OF CONCRETE PAVING EQUIPMENT SHALL BE DISCHARGED INTO A PREDEFINED, BERMED CONTAINMENT AREA ON THE JOB SITE. THE REQUIRED CONTAINMENT AREA IS TO BE BERMED SO THAT WASH WATER IS TOTALLY CONTAINED. WASH WATER DISCHARGED INTO THE CONTAINMENT AREA SHALL BE ALLOWED TO INFILTRATE OR EVAPORATE. DRIED CONCRETE WASTE IS REMOVED FROM THE CONTAINMENT AREA AND PROPERLY DISPOSED OF. THE DIRECT OR INDIRECT DISCHARGE OF WATER CONTAINING WASTE CONCRETE TO THE STORM SEWER SYSTEM IS PROHIBITED. 45. PERIMETER CONTROL: THIS BMP REQUIRES THAT THE CONTRACTOR INSTALL A PERIMETER CONTROL MEASURE ALONG THE EDGE OF THE CONSTRUCTION SITE, TO PREVENT, OR FILTER THE DISCHARGE OF SURFACE RUNOFF FROM THE CONSTRUCTION SITE. THE TYPE OF PERIMETER CONTROL USED SHALL BE DETERMINED BASED ON–SITE CONDITIONS AND LOCATION. MAINTENANCE AND REPAIR OF THE CONTROL MEASURE SHALL OCCUR AS NEEDED, IN A TIMELY MANNER. 46. SPILL PREVENTION /CONTAINMENT: THIS BMP DEFINES THE MEASURES PROPOSED FOR PREVENTING, CONTROLLING, OR CONTAINING SPILLS OF FUEL, LUBRICANTS, OR OTHER POLLUTANTS; AND PROTECTING POTENTIAL POLLUTANTS FROM CONTACT WITH PRECIPITATION OR RUNOFF. 47. SWEEPING: THIS BMP REQUIRES THAT IMPERVIOUS SURFACES WHICH ARE ADJACENT TO OR CONTAINED WITHIN CONSTRUCTION SITES BE SWEEP ON A DAILY BASIS OR AS NEEDED DURING THE DAY WHEN SEDIMENT AND OTHER MATERIALS ARE TRACKED OR DISCHARGED ON TO THEM. EITHER SWEEPING BY HAND OR USE OF STREET SWEEPERS IS ACCEPTABLE. STREET SWEEPERS USING WATER WHILE SWEEPING IS PREFERRED IN ORDER TO MINIMIZE DUST, FLUSHING OFF PAVED SURFACES WITH WATER IS PROHIBITED. 48. STOCKPILES: SOILS THAT WILL BE STOCKPILED FOR MORE THAN THIRTY (30) DAYS SHALL BE PROTECTED FROM WIND AND WATER EROSION WITHIN FOURTEEN (14) DAYS OF STOCKPILE CONSTRUCTION. STABILIZATION OF STOCKPILES LOCATED WITHIN 100 FEET OF RECEIVING WATERS, OR WITH SLOPES 3 TO 1 OR GREATER SHALL BE COMPLETED WITHIN SEVEN (7) DAYS FOLLOWING STOCKPILE CONSTRUCTION. STABILIZATION AND PROTECTION OF THE STOCKPILE MAY BE ACCOMPLISHED BY ANY OF THE FOLLOWING: MULCHING, TEMPORARY/PERMANENT REVEGETATION OPERATIONS, CHEMICAL SOIL STABILIZER APPLICATION OR EROSION CONTROL MATTING/GEOTEXTILES. IF STOCKPILES ARE LOCATED WITHIN 100 FEET OF RECEIVING WATERS, A DRAINAGEWAY OR THE SITE PERIMETER, ADDITIONAL SEDIMENT CONTROLS SHALL BE REQUIRED. 49. INLET PROTECTION: THIS BMP IS REQUIRED ON ALL EXISTING OR PROPOSED STORM SEWER INLETS IN THE VICINITY OF THE CONSTRUCTION SITE THAT MAY RECEIVE SITE RUNOFF. THE BMP MUST BE APPROPRIATE TO THE TYPE OF STORM INLET AND APPROPRIATE FOR THE GROUND SURFACE AT THE INLET. 50. VEHICLE TRACKING CONTROL: THIS BMP IS REQUIRED AT ALL ACCESS POINTS FOR INGRESS/EGRESS FROM OFF–SITE IMPERVIOUS SURFACES TO CONSTRUCTION SITE PERVIOUS AREAS THAT ARE USED BY VEHICULAR TRAFFIC OR CONSTRUCTION EQUIPMENT. 51. THE USE OF REBAR TO ANCHOR BEST MANAGEMENT PRACTICES, OTHER THAN PORTABLE TOILETS, IS PROHIBITED.
MATERIALS 52. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND REPLACEMENT OF ALL MATERIALS WITHIN DEDICATED RIGHT–OF–WAYS. ALL MATERIALS AND WORKMANSHIP SHALL MEET THE PROJECT CONSTRUCTION STANDARDS. 53. THE CONTRACTOR SHALL INSURE THAT ALL LOADS OF CUT AND FILL MATERIAL IMPORTED TO OR EXPORTED FROM THIS SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF THE MATERIAL DURING TRANSPORT ON PUBLIC RIGHTS–OF–WAYS. 54. STANDARD MSE BLOCKS, CAPS, LEVELING PAD, GEOGRID REINFORCEMENT BACKFILL AND DRAINAGE MATERIAL SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND GEOTECHNICAL REPORT. 55. ALL BACKFILL SOILS MUST BE COMPACTED TO 97% OR MORE OF MAXIMUM DRY DENSITY AT MOISUTRE CONTENTS WITHIN THREE PERCENT BELOW AND TWO PERCENT ABOVE OF OPIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D1557 THE MODIFIED PROCTOR. TO AN EFFECTIVE DEPTH OF THREE (3) FEET UNDER ANY CONSTRUCTION TO BE FINAL.						

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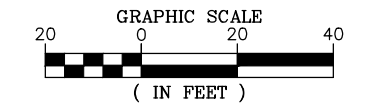
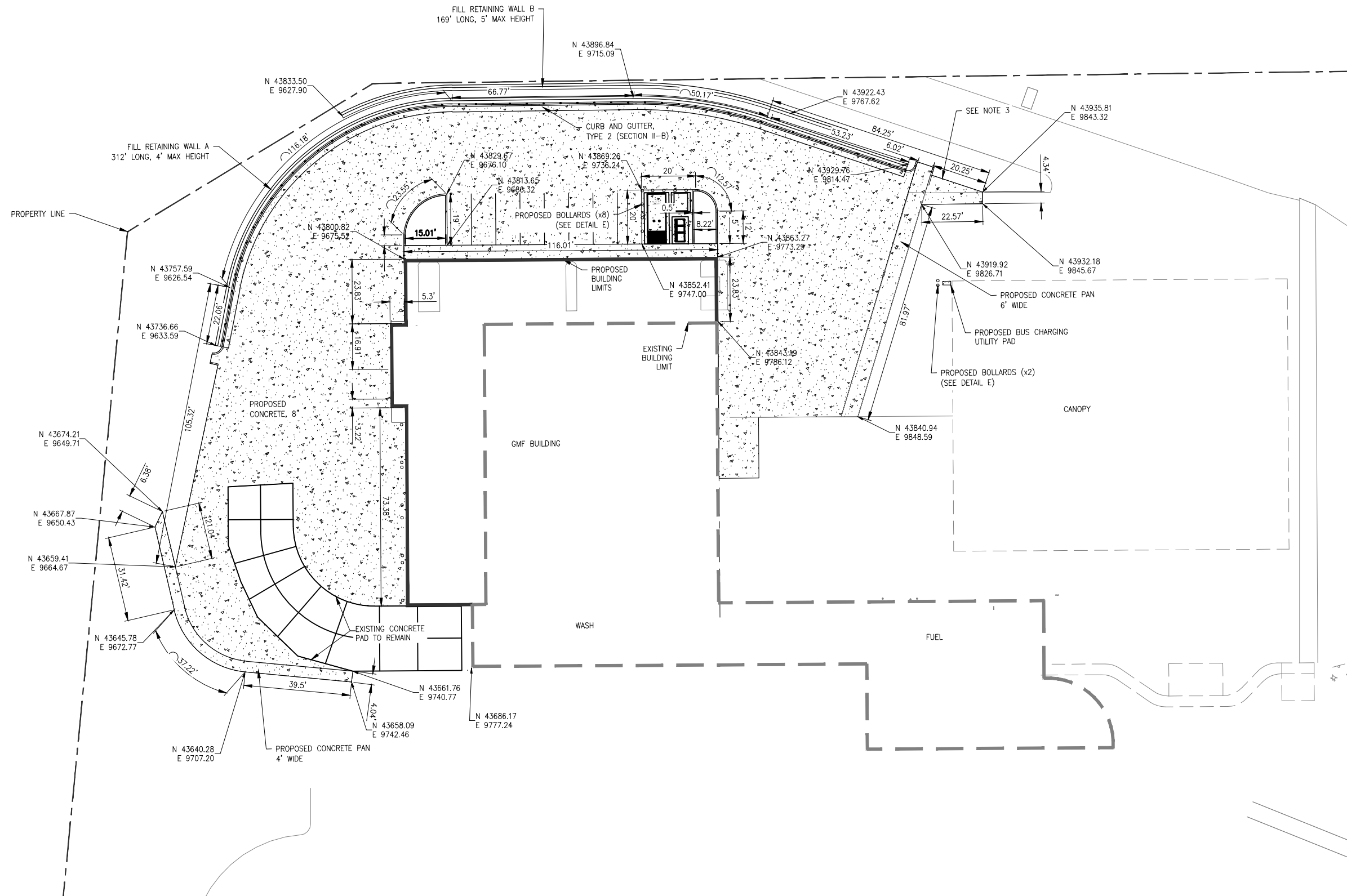
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LEGEND	
---	LIMITS OF DEMOLITION
* * * * *	CLEARING AND GRUBBING
////	ASPHALT REMOVAL
	CONCRETE REMOVAL

- NOTES**
- LIMITS OF PAVEMENT REMOVAL DIFFERING FROM PLAN SHALL BE APPROVED BY THE ENGINEER/OWNER.
 - ANY PAVEMENT DAMAGED DURING REMOVAL OUTSIDE THE PROPOSED REMOVAL LIMITS SHALL BE SQUARED OFF TO THE SATISFACTION OF THE ENGINEER AND ALL COSTS ASSOCIATED WITH THE ADDITIONAL REMOVAL AND RECONSTRUCTION SHALL BE BORNE BY THE CONTRACTOR.
 - CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER OFF-SITE DISPOSAL OF ALL WASTE MATERIALS GENERATED FROM THE PROJECT. ALL COSTS ARE INCIDENTAL TO RESPECTIVE REMOVAL BID ITEM.
 - FULL DEPTH CONCRETE PAVEMENT REMOVAL INCLUDES THE TYPICAL DEPTH OF 6" AND THE REMOVAL OF ANY UNDERLYING CONCRETE PAVEMENT.
 - FULL DEPTH ASPHALT PAVEMENT REMOVAL INCLUDES THE TYPICAL DEPTH OF 4" AND THE REMOVAL OF ANY UNDERLYING ASPHALT PAVEMENT.
 - CONTRACTOR SHALL REPAIR ANY UTILITIES DAMAGED DURING DEMOLITION AT NO ADDITIONAL EXPENSE TO THE OWNER.
 - EXACT LIMITS OF EXISTING CONCRETE APRON PAD TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR.

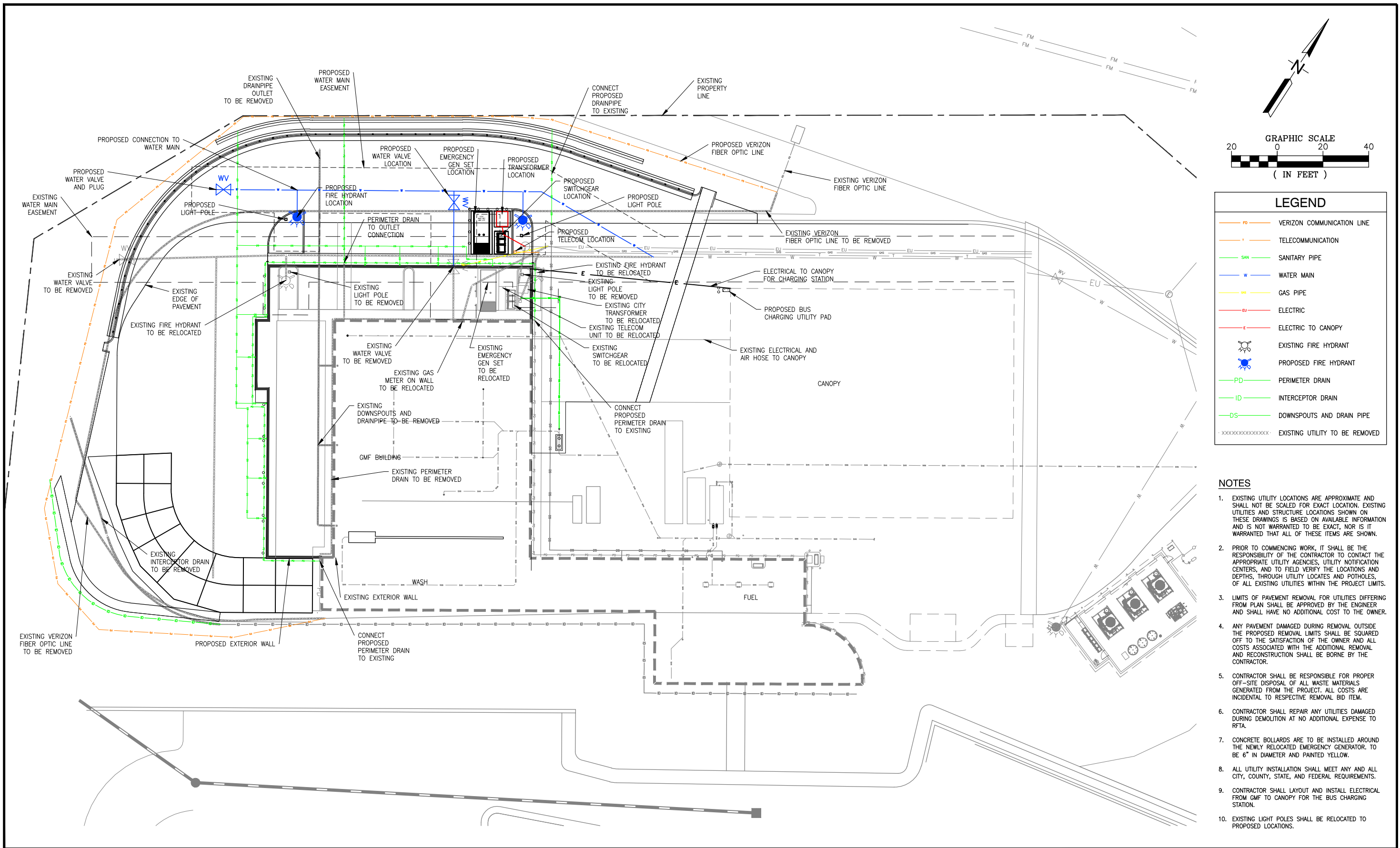
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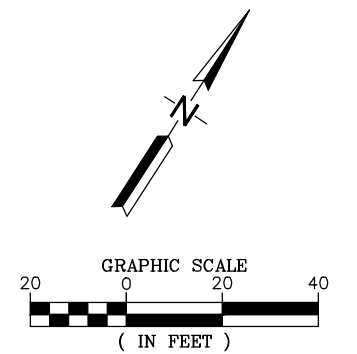
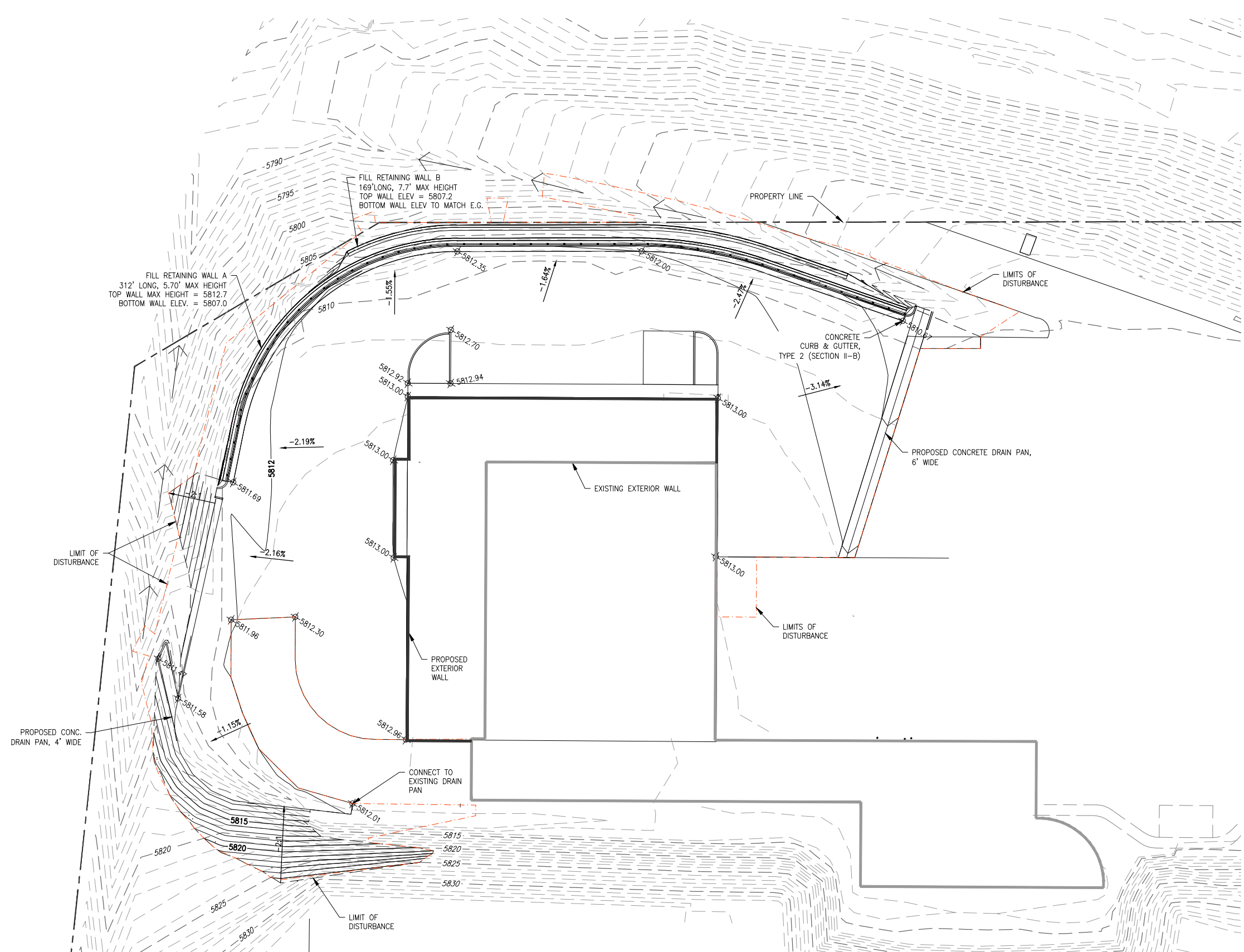
LEGEND	
	PROPOSED RETAINING WALL
	NEW GMF BUILDING WALL
	EXISTING GMF BUILDING WALL
	PROPOSED CONCRETE

- NOTES**
1. THE CONTRACTOR SHALL SUBMIT A MODIFICATION OF THE PROPOSED AREA TO THE OWNER/ENGINEER FOR APPROVAL.
 2. THE CONTRACTOR SHALL SAW CUT (FULL DEPTH) ALL EDGES OF EXISTING PAVEMENT THAT IS TO BE REMOVED. THE CONTRACTOR SHALL TAKE SPECIAL CARE TO CREATE A SMOOTH WORKING EDGE AND TO PLACE BACKFILL AND PAVEMENT SUCH THAT SETTLEMENT DOES NOT OCCUR.
 3. THE EXISTING PAVEMENT EXTENTS EAST OF THE DRAINAGE PAN ARE APPROXIMATED BASED ON SUPPLIED INFORMATION. CONTRACTOR SHALL FIELD VERIFY EXISTING PAVEMENT LOCATIONS. PAVEMENT SHALL BE AS SHOWN EAST OF THE DRAINAGE PAN UNTIL IT INTERSECTS EXISTING EOP.

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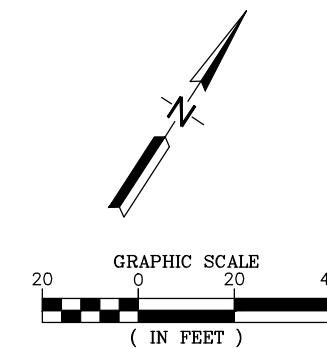
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LEGEND	
---	EXISTING CONTOURS
---	PROPOSED CONTOURS

- NOTES**
1. ALL EROSION CONTROL MEASURES SHALL BE FOLLOWED. SEE SHEET C08.01
 2. ALL EXISTING UTILITIES SHALL BE PROTECTED FROM DAMAGE AND CONTAMINATION OF ANY KIND, TO INCLUDE SILT OR SEDIMENT FOR THE DURATION OF THE PROJECT.
 3. REINFORCED FIBER MATRIX IS TO BE INSTALLED ACCORDING TO MANUFACTURERS RECOMMENDATIONS ON ALL 2:1 SLOPES
 4. PROPOSED CONTOURS REPRESENT FINAL PAVEMENT DESIGN ELEVATIONS
 5. TYPE 2 CURB, GUTTER, AND DRAINAGE PAN ARE TO BE DESIGNED PER CDOT M-609-1
 6. SEE SHEET C07.01 FOR PAVEMENT DETAILS
 7. SEE SHEET C06.01 FOR WALL DETAILS

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LEGEND

— PD —

PERIMETER DRAIN

— DS —

DOWNSPOUT DRAIN PIPE

— ID —

ID — INTERCEPTOR DRAIN

— SAN —

FLOOR DRAIN

—

EXISTING DRAIN

· · · · ·

EXISTING DRAINAGE TO BE REMOVED

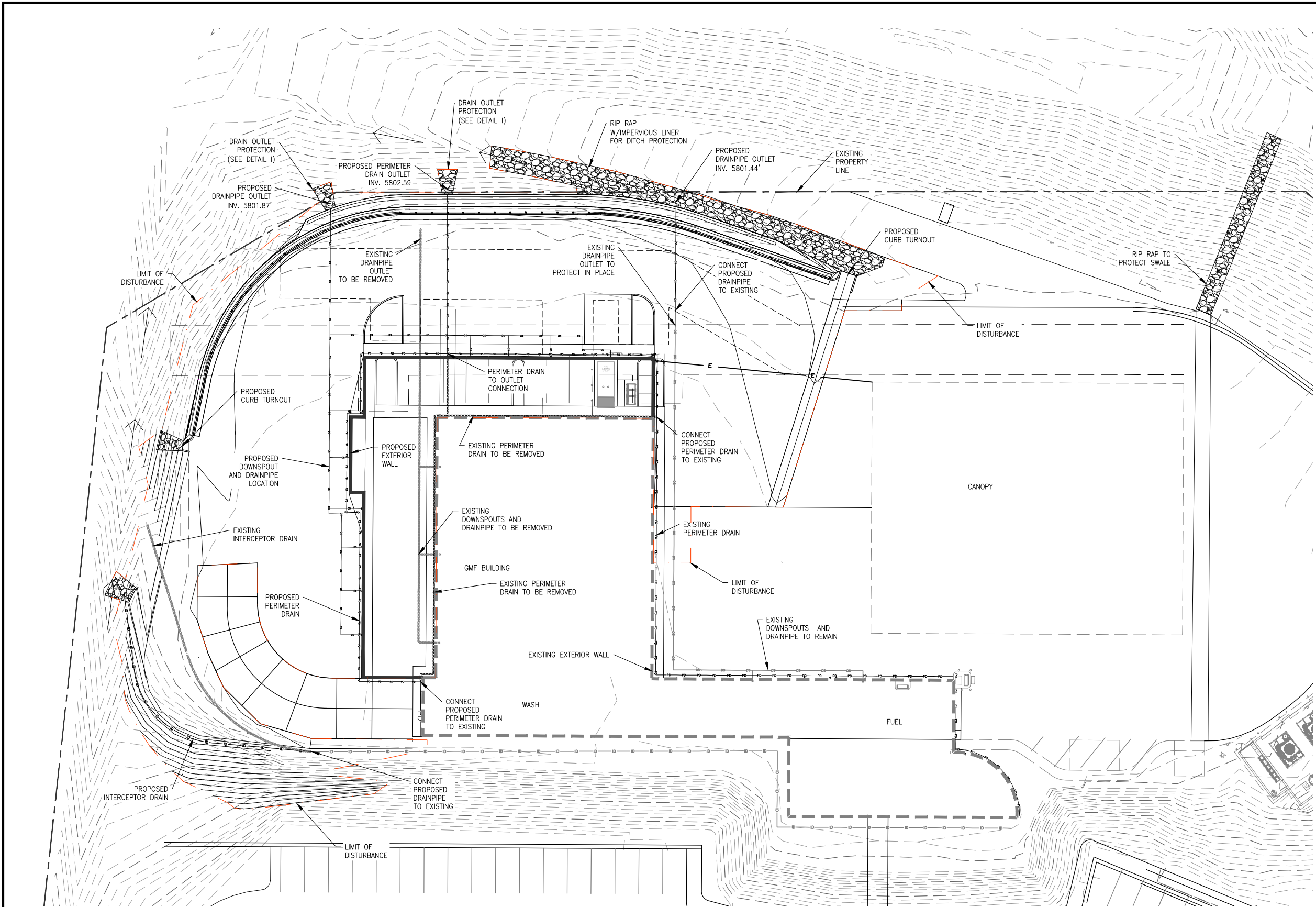
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- NOTES**
1.

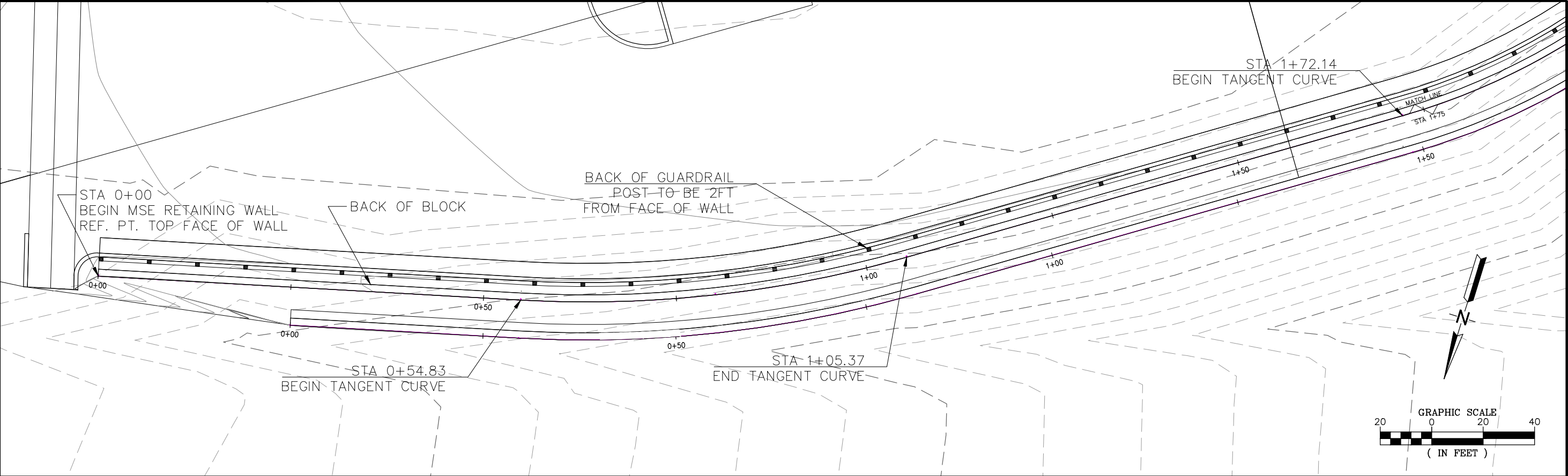
EXISTING DRAINAGE SYSTEM LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND SHALL NOT BE SCALED FOR EXACT LOCATION. LOCATION OF EXISTING DRAINAGE SYSTEM SHOWN ON THESE DRAWINGS IS BASED ON AVAILABLE INFORMATION AND IS NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL OF THESE ITEMS ARE SHOWN.
2.
- LIMITS OF PAVEMENT REMOVAL DIFFERING FROM PLAN SHALL BE APPROVED BY THE ENGINEER AND SHALL HAVE NO ADDITIONAL COST TO THE OWNER.

3.

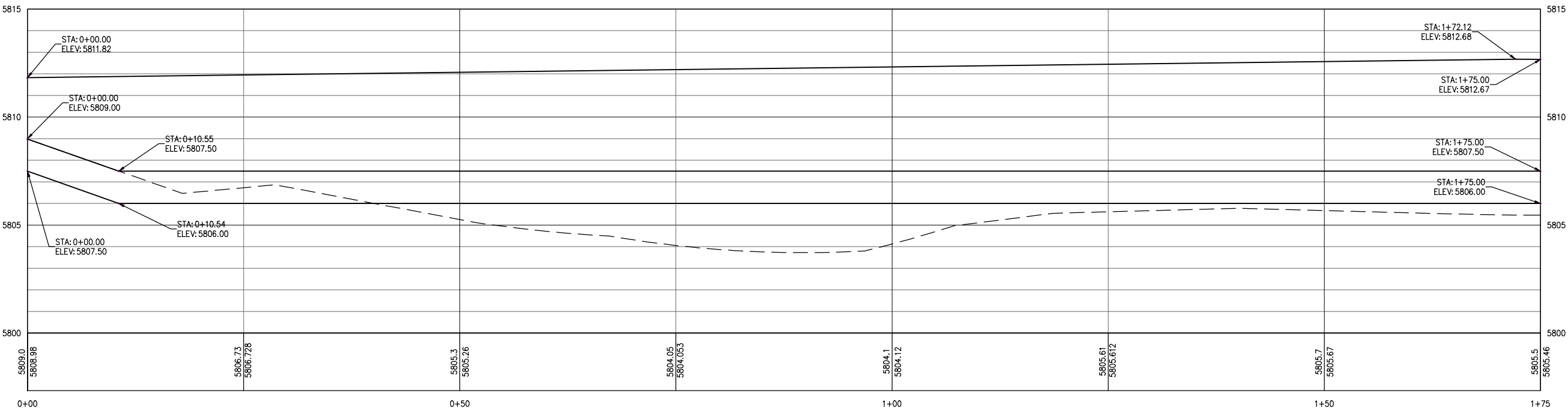
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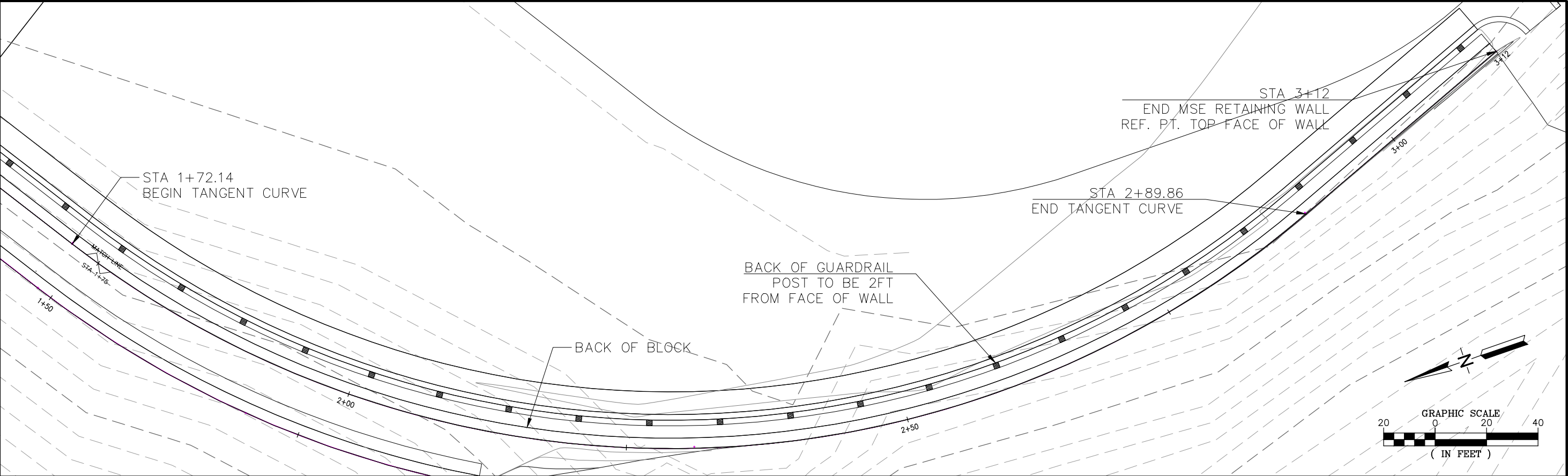
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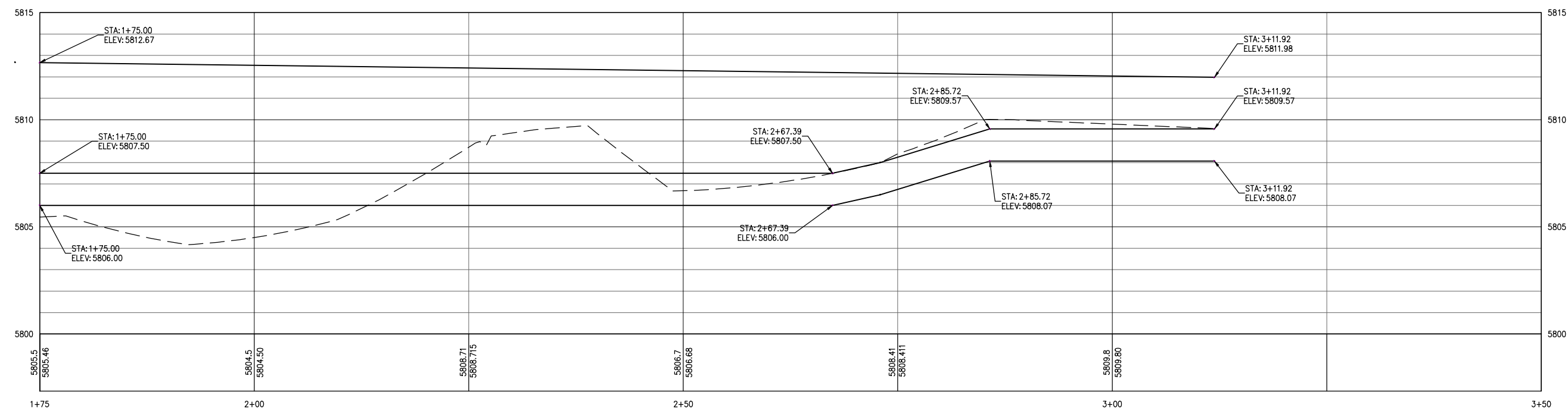
Wall A PROFILE



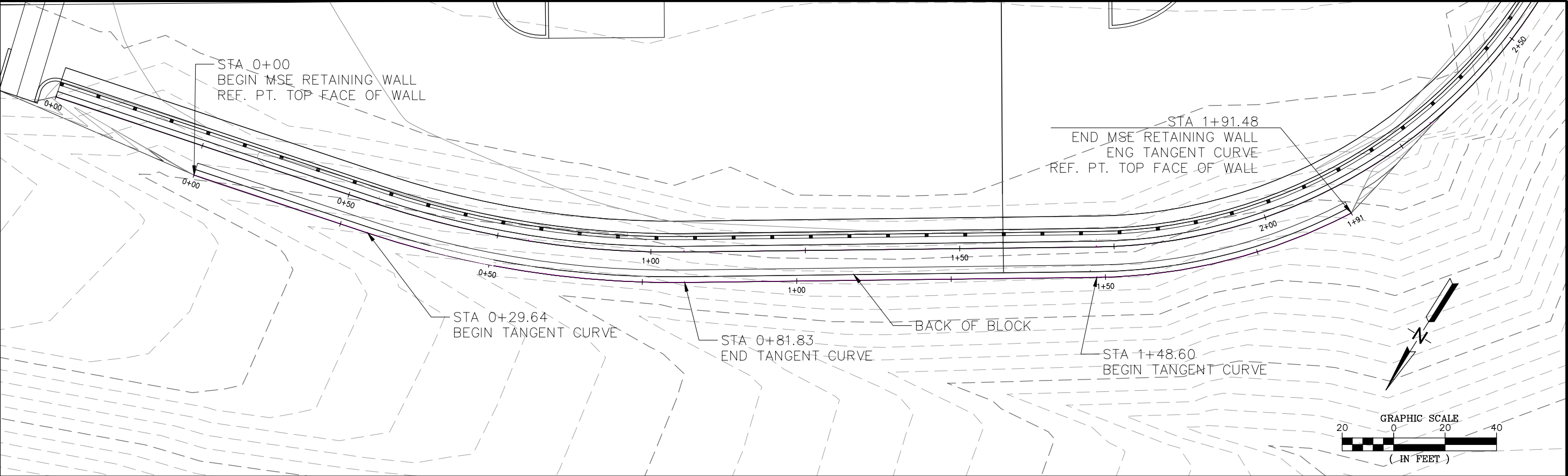
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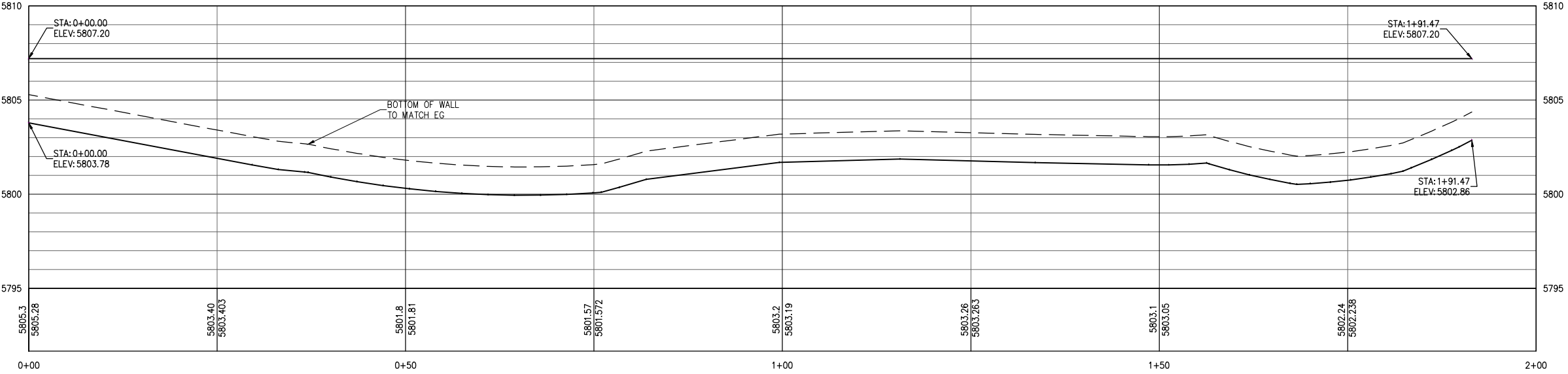
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Wall B PROFILE



Computer File Information			Sheet Revisions			 Roaring Fork Transportation Authority	 shrewsberry	As Constructed		GMF EXPANSION – PHASE 2 RETAINING WALLS PLAN AND PROFILE			Project No./Code	
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General Notes

FOR GEOTECHNICAL INFORMATION, REFER TO GEOTECHNICAL ENGINEERING REPORT NO. BY GROUND ENGINEERING CONSULTANTS. DATED MAY 4, 2018.

THE INFORMATION SHOWN ON THESE PLANS CONCERNING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 1-800-922-1987 AT LEAST 2 DAYS (NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK.

STATIONS, ELEVATIONS AND DIMENSIONS CONTAINED IN THESE PLANS ARE CALCULATED FROM A RECENT FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

Materials

NO CHANGES TO THE GEOGRID LAYOUT, LENGTH OR TYPE SHALL BE MADE WITHOUT APPROVAL FROM THE ENGINEER.

1.5
STANDARD MSE BLOCKS, CAPS, LEVELING PAD, GEOGRID REINFORCEMENT BACKFILL AND DRAINAGE MATERIAL SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS SECTION 504 – CONCRETE BLOCK FACING MSE WALLS AND THE MANUFACTURER'S CONSTRUCTION GUIDELINES, WHICHEVER IS MORE STRINGENT.

SEGMENTAL BLOCK AND CAP UNITS SHALL BE STANDARD UNITS PRODUCED BY AN AUTHORIZED PRODUCER COMPLYING WITH THE PROJECT SPECIFICATIONS.

SEGMENTAL BLOCKS SHALL BE INSTALLED TO PRODUCE A NEAR-VERTICAL FACE AS SHOWN IN THE DETAILS. BLOCK FACING COLOR SHALL BE APPROVED BY OWNER PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE SAMPLES OE THE BLOCK TO THE ENGINEER FOR REVIEW. FINAL BLOCK COLOR SHALL BE DIRECTED BY THE ENGINEER.

ALL BLOCKS AND CAP UNITS SHALL BE STORED, HANDLED AND INSTALLED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

SEE DETAIL SHEETS FOR LOCATIONS AND LENGTHS OF GEOGRID.

REINFORCED AND RETAINED BACKFILL SHALL BE CDOT STRUCTURE BACKFILL (CLASS 1).

LEVELING PAD CONCRETE SHALL BE CDOT CLASS D AND SHALL BE CURED FOR AT LEAST 12 HOURS BEFORE PLACEMENT OF THE CONCRETE BLOCKS.

EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M213.

GRADE 60 REINFORCING STEEL IS REQUIRED.

EXCAVATION AND SUBGRADE PREPARATION

THE EXCAVATION SHALL BE CARRIED TO THE EXTENTS NECESSARY TO PLACE GEOGRID AT THE REQUIRED LENGTHS.

TEMPORARY EXCAVATION SLOPES SHALL BE GRADED IN ACCORDANCE WITH OSHA GUIDELINES.

THE INTEGRITY OF THE SUBGRADE MATERIALS BENEATH THE PROPOSED WALLS SHALL BE APPROVED BY THE ENGINEER PRIOR TO ANY WALL CONSTRUCTION.

THE FOUNDATION SHALL BE PREPARED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

CONSTRUCTION

BACKFILL SHALL BE COMPACTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

ONLY LIGHTWEIGHT HAND-OPERATED COMPACTION EQUIPMENT SHALL BE USED WITH 3- FEET BEHIND THE FACING OF UNITS.

THE FIRST COURSE OF BLOCKS SHALL BE PLACED ON 1/4-INCH EXPANSION JOINT MATERIAL BETWEEN THE BLOCK AND LEVELING PAD. ALL BLOCKS SHALL BE CHECKED FOR PROPER ELEVATIONS.

GEOGRID REINFORCEMENTS SHALL BE CONTINUOUS FOR THEIR EMBEDMENT LENGTH. SPLICED CONNECTIONS WILL NOT BE ALLOWED IN THE HIGH STRENGTH AXIS.

CONST. (CONT)

GEOGRID SHALL BE ORIENTED WITH THE HIGHEST STRENGTH AXIS PERPENDICULAR TO THE WALL ALIGNMENT AND SHALL BE PLACED ACCORDING TO THE DESIGN DRAWINGS AND MANUFACTURER'S RECOMMENDATIONS.

GEOGRID REINFORCEMENT SHALL BE LAID HORIZONTALLY ON PROPERLY COMPACTED LEVEL BACKFILL. THE GEOGRID MUST BE PULLED TAUT AND ANCHORED PRIOR TO BACKFILL MATERIAL PLACEMENT ON THE GEOGRID.

A 3-INCH LAYER OF REINFORCED BACKFILL MATERIAL SHALL BE PLACED BETWEEN TWO LAYERS OF GEOGRID IN THE OVERLAPPING AREAS.

TRACKED CONSTRUCTION EQUIPMENT SHALL NOT BE ALLOWED TO OPERATED DIRECTLY UPON GEOGRID. A MINIMUM OF 6 INCHES OF BACKFILL MUST BE PLACED PRIOR TO OPERATIONS OF TRACKED VEHICLES OVER THE GEOGRID. TURNING OF TRACKED VEHICLES SHALL BE KEPT TO A MINIMUM TO PREVENT DISPLACING THE BACKFILL AND DAMAGING THE GEOGRID.

NO CHANGES TO THE GEOGRID LAYOUT, LENGTH OR TYPE SHALL BE MADE WITHOUT APPROVAL FROM THE ENGINEER.

CAP UNITS SHALL BE SECURED WITH MASONRY ADHESIVE PER BLOCK MANUFACTURER.

DRAINAGE

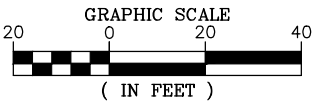
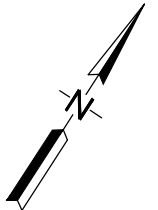
THE WALL SYSTEM AND SURROUNDING AREAS MUST BE KEPT DRY AT ALL TIMES DURING AND AFTER THE CONSTRUCTION

IN NO CASE SHOULD SURFACE RUNOFF BE ALLOWED TO ENTER THE WALL CONSTRUCTION AREAS OR WATER BE POINDED AROUND THE WALLS DURING CONSTRUCTION.

AT THE END OF THE CONSTRUCTION DAY, THE CONTRACTOR SHALL SLOPE THE LAST LIFT OF REINFORCED BACKFILL AWAY FROM THE WALL FACING TO DIRECT RUNOFF AWAY FROM THE WALL FACE.

EXCAVATION SLOPES SHALL BE PROTECTED AGAINST EROSION TO REDUCE THE POTENTIAL FOR SLOUGHING AND SLOPE FAILURE.

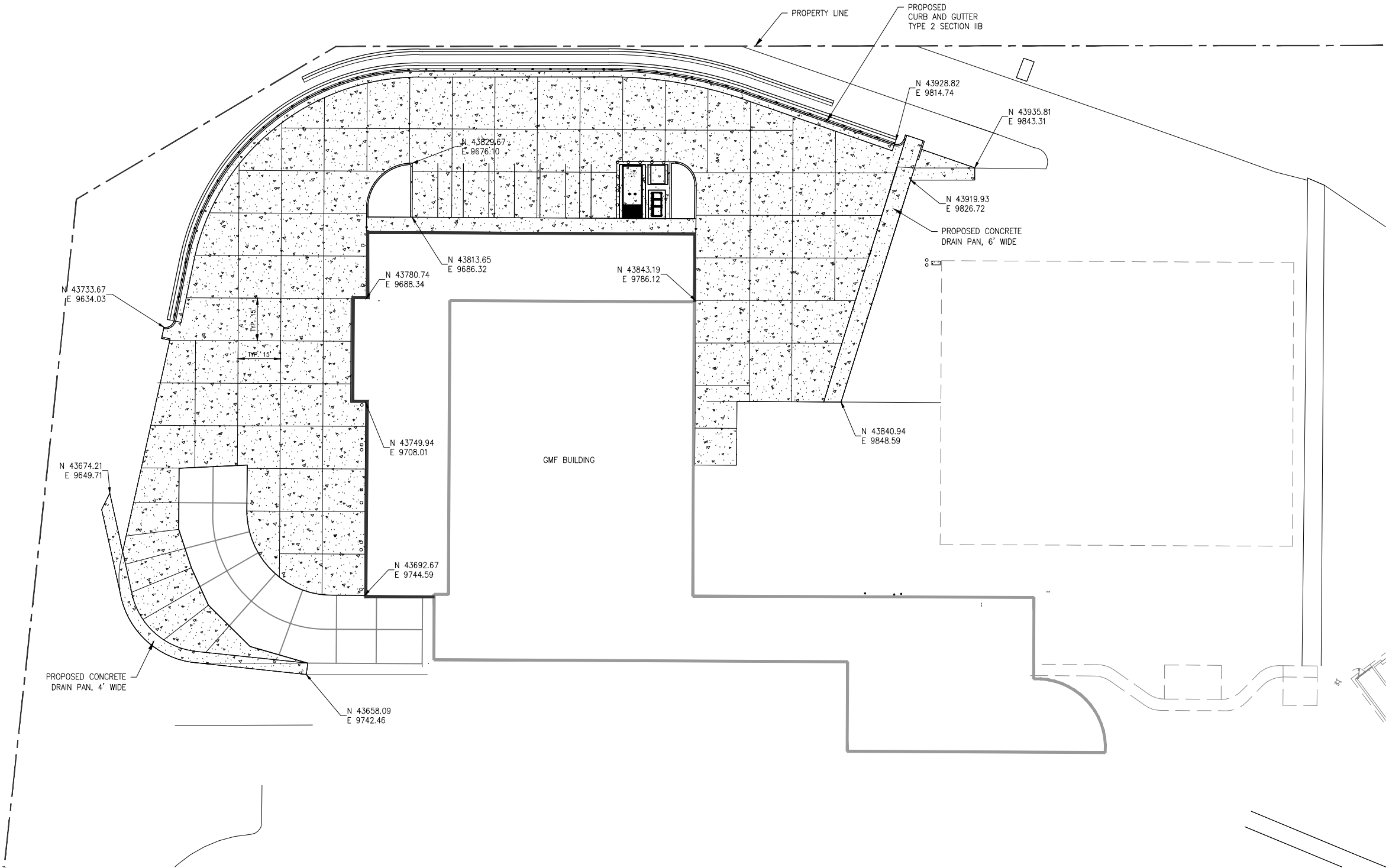
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LEGEND	
	RETAINING WALL
	PROPOSED CONCRETE PAVEMENT

NOTES

- WHERE NEW PAVEMENT IS TO ABUT EXISTING PAVEMENT, THE EXISTING PAVEMENT SHALL BE REMOVED TO A NEAT VERTICAL LINE USING A CUTTING SAW OR OTHER APPROVED METHOD.
- THE CONTRACTOR SHALL SAW CUT (FULL DEPTH) ALL EDGES OF EXISTING PAVEMENT THAT IS TO BE REMOVED. THE CONTRACTOR SHALL TAKE SPECIAL CARE TO CREATE A SMOOTH WORKING EDGE AND TO PLACE BACKFILL AND PAVEMENT SUCH THAT SETTLEMENT DOES NOT OCCUR.
- SEE DETAILS C10.01 FOR JOINT INFORMATION. ALL DETAILS ARE EQUIVALENT TO CDOT STANDARD PLAN M-412-1 FOR CONCRETE PAVEMENT JOINT DETAILS.
- STABILIZED MATERIAL UNDER CURB AND GUTTER SHALL BE PREPPED IN THE SAME MANNER AS THE ADJACENT PAVEMENT.
- ALL UNDERGROUND UTILITY CONSTRUCTION SHALL BE COMPLETED AND ACCEPTED PRIOR TO PLACING PAVEMENT.



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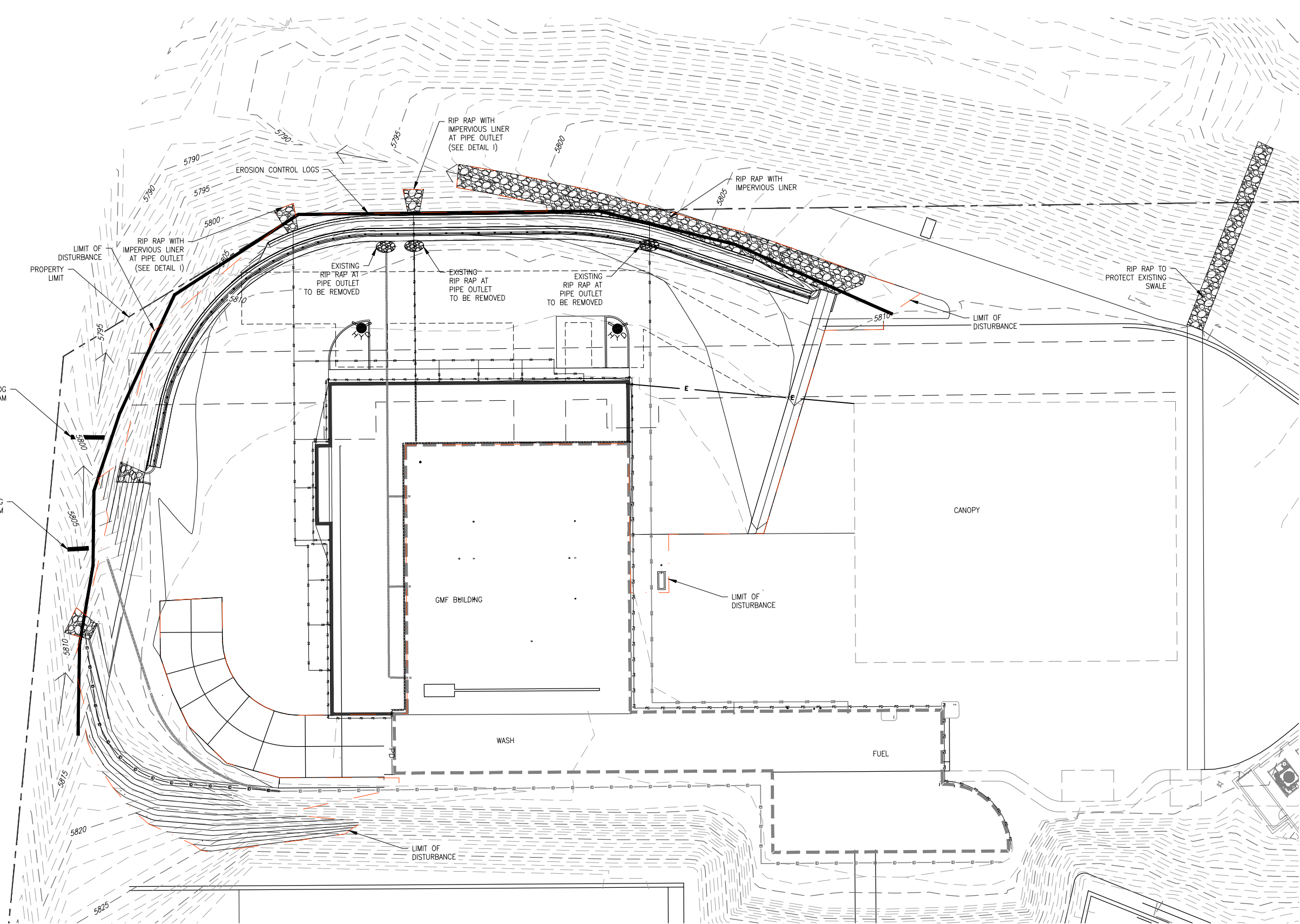

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PAVING PLAN	
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LEGEND

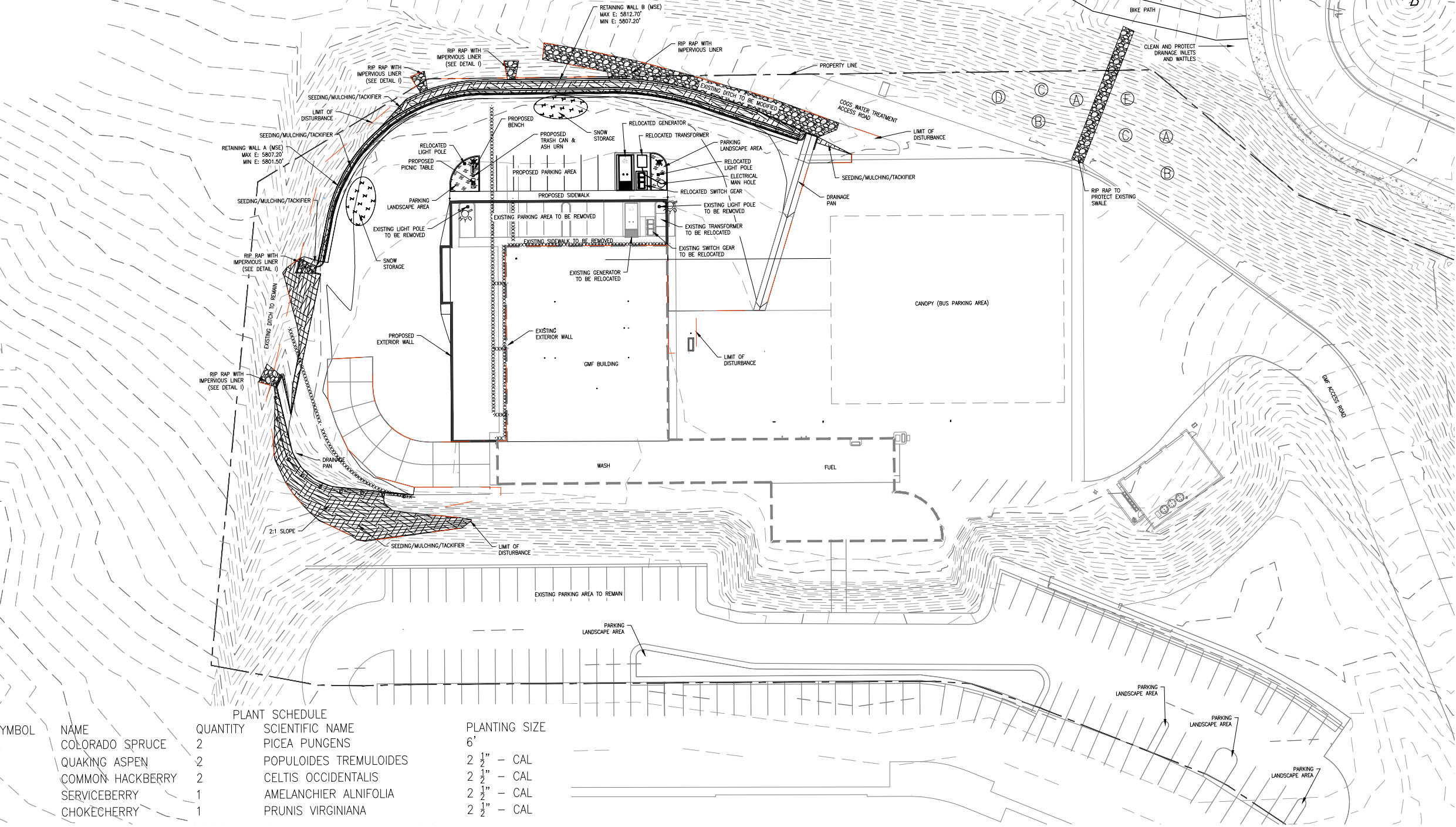
- DIRECTION OF WATER FLOW ON CONCRETE
- DIRECTION OF WATER FLOW ON SOIL
- SILT FENCE
- EROSION LOG CHECK DAM
- LIMIT OF DISTURBANCE
- CWA CONCRETE WASH OUT STRUCTURE (TO BE SHOWN BY CONTRACTOR)
- VTP VEHICLE TRACKING PAD (TO BE SHOWN BY CONTRACTOR)
- RIP RAP

- NOTES**
1. THE EROSION CONTROL PLAN REPRESENTS INTERIM BEST MANAGEMENT PRACTICES (BMPs) THAT SHALL BE INSTALLED AFTER GRADING ACTIVITIES START.
 2. ONCE DISTURBANCE OF EXISTING VEGETATION STARTS THE CONTRACTOR'S EROSION CONTROL SPECIALIST SHALL OUTLINE THE AREA WITH THE AREA OF DISTURBANCE LINE. ALL CONTROL MEASURES USED SHALL BE SHOWN ON THE EROSION CONTROL PLAN UNTIL PERMANENT STABILIZATION MEASURES ARE IN PLACE.
 3. BMPs ARE NOT DRAWN TO SCALE AND LOCATIONS ARE APPROXIMATE. THE EROSION CONTROL SPECIALIST SHALL UPDATE THE EROSION CONTROL PLAN AS BMPs ARE IMPLEMENTED.
 4. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER OFF-SITE DISPOSAL OF ALL WASTE MATERIALS GENERATED FROM THE PROJECT. ALL COSTS ARE INCIDENTAL TO RESPECTIVE REMOVAL BID ITEM.
 5. RIP RAP SHALL BE INSTALLED TO A DEPTH OF ONE FOOT AND MEET THE REQUIREMENTS OF CDOT SECTION 506.

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Last Modification Date:										Revised:	–	Designer:	JED			EROSION CONTROL PLAN	
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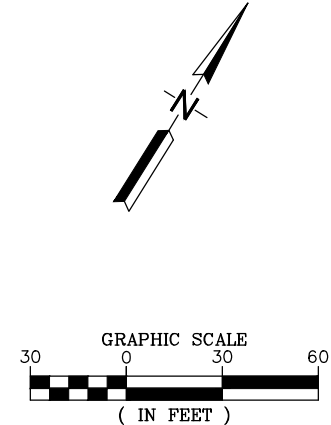
LANDSCAPE AREAS		
	TOTAL SQ FT	PERCENTAGE
TOTAL LANDSCAPE AREA	96,485	43% OF TOTAL LOT AREA
PARKING LOT LANDSCAPE AREA	2,207	7% OF TOTAL PARKING LOT AREA

LANDSCAPING NOTE: BECAUSE OF THE UNIQUE GEOLOGICAL HAZARDS, IN PARTICULAR, THE PRESENCE OF COLLAPSIBLE SOILS AT THE SITE, RFTA REQUESTS A WAIVER FROM THE LANDSCAPING PLANTING REQUIREMENTS OF THE GLENWOOD SPRINGS MUNICIPAL CODE, SECTION 070.040.050 (LANDSCAPING, SCREENING, AND FENCING) AND PROPOSES LANDSCAPING PLANTING AS SHOWN ON THIS SHEET. FOR THE PURPOSES OF THE COGS L&E PROCESS, PLEASE REFER TO THE NARRATIVE SECTION FOR THE REQUESTED CHARTS.



PLANT SCHEDULE			
SYMBOL	NAME	QUANTITY	SCIENTIFIC NAME
A	COLORADO SPRUCE	2	PICEA PUNGENS
B	QUAKING ASPEN	2	POPULOIDES TREMULOIDES
C	COMMON HACKBERRY	2	CELTIS OCCIDENTALIS
D	SERVICEBERRY	1	AMELANCHIER ALNIFOLIA
E	CHOKECHERRY	1	PRUNIS VIRGINIANA

PLANTING SIZE
6'
2 1/2" - CAL
2 1/2" - CAL
2 1/2" - CAL
2 1/2" - CAL



LEGEND	
	LANDSCAPE AREA
	LANDSCAPE ROCK
	SNOW STORAGE AREA

- NOTES**
- LANDSCAPING SHALL MEET THE REQUIREMENTS OF THE OWNER PROVIDED PROGRAM OF REQUIREMENTS (POR), CITY OF GLENWOOD SPRINGS (COGS) MUNICIPAL CODE, AND FTA REQUIREMENTS.
 - FOR SLOPES 2:1 AND GREATER, A REINFORCED FIBER MATRIX SHALL BE INSTALLED FOR PERMANENT EROSION CONTROL.
 - SEEDING SHALL BE A NATIVE MIX.
 - REFER TO THE PROGRAM OF REQUIREMENTS (POR) FOR ALL ACCEPTABLE PLANT SPECIES.
 - CONTRACTOR IS RESPONSIBLE FOR ALL MAINTENANCE OF NEW TREES, SHRUBS, AND IRRIGATIONS SYSTEMS FOR THE CONTRACT WARRANTY PERIOD. TO BE PAID FOR UNDER LANDSCAPE MAINTENANCE BID ITEM.
 - CONTRACTOR IS TO COORDINATE WITH COGS WHEN PLANNING TO PERFORM WORK ON THE COGS'S PROPERTY.
 - SWALE LOCATIONS ARE ASSUMED BASED ON THE COMBINATION OF ALL EXISTING SITE INFORMATION. THEY SHALL NOT BE DEEMED AS EXACT LOCATIONS. RIP RAP INSTALLATION IS TO FOLLOW THE EXISTING SWALE AS IS ON SITE.
 - THE CONTRACTOR SHALL CLEAN ANY AREAS AROUND DRAINAGE INLETS AND WATTLIES AT THE BASE OF SLOPE ALONG THE BIKE PATH

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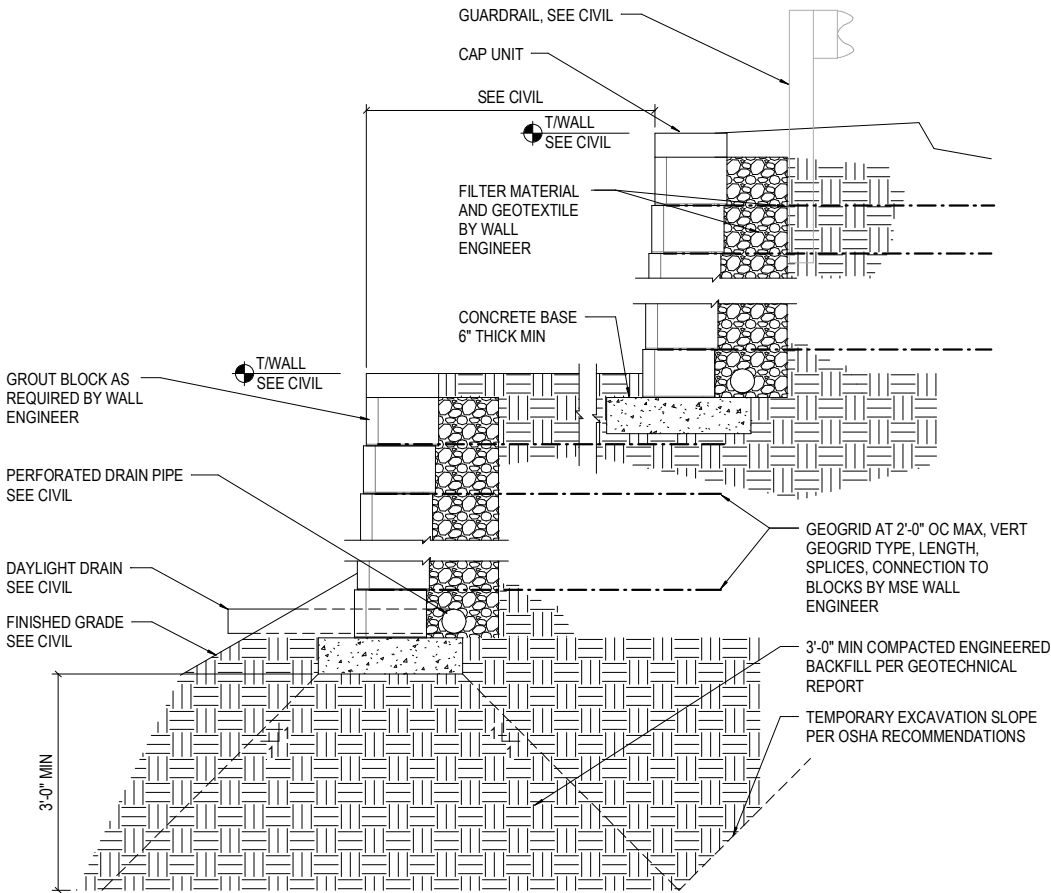


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THE EXISTING MSE WALL PHOTOS
HAVE BEEN SUPPLIED BY RFTA AND
WERE ADDED TO THIS SHEET BY
SHREWSBERRY FOR THE COGS L&E
APPLICATION PROCESS



- NOTE:**
- 1. SEE FOUNDATION NOTES FOR DESIGN CRITERIA ON SHEET S01.00
 - 2. THE MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALL SHALL BE FULLY ENGINEERED BY THE DESIGN-BUILDER.
 - 3. RETAINING WALL UNITS SHALL MATCH SIZE, COLOR, TEXTURE, AND BATTER OF EXISTING PARK AND RIDE WALLS.
 - 4. TIERED MSE WALLS SHALL BE ENGINEERED FOR INFLUENCE OF UPPER AND LOWER WALLS ON EACH OTHER.

4

NO SCALE MSE WALL SECTION

DESIGNERS: M. DANFORTH
LEAD REVIT TECH: A. CONTRERAS
DATE PRINTED: 10/29/2019 2:07:11 PM
FILE PATH: C:\Proj\MS19.0771-GMF Renovation-R19_smolloyAZPP3.rvt

MM JOB #: MS19.0771.S.01
PRINCIPAL: S. MOLLOY
EOR: S. MOLLOY
PROJECT MANAGER: M. DANFORTH

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GMF EXPANSION – PHASE 2			
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Detailer: AC			
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Project No./Code
MS19.0771.S.01
SITE DETAILS
S07.01

PROJECT DIRECTORY

OWNER

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MDanforth@martinmartin.com

PLANNING CONSULTANT

DEFINITION STUDIO
Contacts: Tom Whetstone
Voice: (720) 253-4635
E-mails: tom.whetstone@definition-studio.com

DATUM REFERENCE

DATUM = 100'-0" = 5,813.0 ABOVE SEA LEVEL = TOP OF CONC AT MAIN LEVEL

GRAPHIC SYMBOLS

2

FIRST FLOOR PLAN

DRAWING TAGS

4

2

FIRST FLOOR PLAN

DRAWING TAGS

A3.1

1/4"=1'-0"

P1

INTERIOR WALL TAG

C1

ROOF TAG

2

A2.1

DETAIL/ENLARGED PLAN BUBBLE

W1

EXTERIOR WALL TAG

F1

FLOOR TAG

R1

ROOF TAG

2

A2.1

DETAIL BUBBLE

GRID BUBBLE

DIMENSION, STAIR LEADERS

NORTH

ELEVATION

EL 114'-6"
FIN FLR

DOOR TAG

101

02

ROOM NAME

KITCHEN

103

BUILDING SECTION

ELEVATION TAG

REVISION CLOUD

REVISION TAG

BREAK LINE

SLOPE INDICATOR

GENERAL NOTES

1. DO NOT SCALE DRAWINGS.

2. DIMENSIONS ARE TO CENTERLINE OF GRID AND FACE OF CONCRETE, INTERIOR WALL DIMENSIONS ARE TO FACE OF STUD. EXTERIOR WALL DIMENSIONS ARE TAKEN TO FACE OF NAKED EXTERIOR STUD, UNLESS NOTED OTHERWISE.

3. ALL ANGLES ON PLANS ARE 90 OR 45 DEGREES, UNLESS NOTED OTHERWISE.

4. NOTIFY ARCHITECT OF ANY DISCREPANCIES OR CONFLICTS IN DOCUMENTS PRIOR TO DEMOLITION, CONSTRUCTION, OR ALTERATION OF EXISTING OR NEW STRUCTURES.

5. PROVIDE ALL NECESSARY BLOCKING IN WOOD & METAL STUD WALLS AND CEILINGS. LOCATIONS INCLUDE BUT ARE NOT LIMITED TO TOILETS, BATH ACCESSORIES, CEILING AND WALL MOUNTED ELECTRICAL FIXTURES, SHELVES, CLOSET RODS, CABINETRY, COUNTERTOPS, AND FALSE BEAMS.

6. PROVIDE ALL NECESSARY BLOCKING IN STUD WALLS AND CEILINGS. LOCATIONS INCLUDE, BUT ARE NOT LIMITED TO TOILET ACCESSORIES, CEILING AND WALL-MOUNTED ELECTRICAL FIXTURES, SHELVES, CLOSET RODS, CABINETRY, BUILT-INS, DRAPERY ROD, COUNTERTOPS, AND FALSE BEAMS.

7. PROVIDE 2X6 STUD WALLS AT ALL POCKET DOORS, PLUMBING WALLS, AND AS SHOWN IN STRUCTURAL OR ARCHITECTURAL DRAWINGS.

8. ALL ANGLES ON PLANS ARE 90 OR 45 DEGREES UNLESS NOTED OTHERWISE.

ABBREVIATIONS

AC ACQUIS

ACT ACQUIS

AD AREA DRAIN

ADJ ADJACENT

AFF ABOVE FINISH FLOOR

AFP ACOUSTIC FABRIC PANEL

ALT ALTERNATE

ALUM ALUMINIUM

ANOD ANODIZED

AP ACCESS PANEL

APPROX APPROXIMATE

ARCH ARCHITECTURAL

B&B BALL AND BURLAP

B/O BOTTOM OF

BC BACK OF CURB

BD BOARD

BLDG BUILDING

BLKG BLOCKING

BM BEAM

BOH BACK OF HOUSE

BOT BOTTOM

BRG BEARING

BRK BRICK

BRZ BRONZE

BSMT BASEMENT

BTU BRITISH THERMAL UNIT

BUR BUILT UP ROOF

BW BOTTOM OF WALL

C/C CENTER TO CENTER

CAL TREE CALIPER

CFM CUBIC FEET PER MINUTE

CIP CAST IN PLACE

CJ CONTROL JOINT

CL CENTER LINE

CLG CEILING

CLO CLOSET

CM CLEAR

CMP CORRUGATED METAL PIPE

CMU CONCRETE MASONRY UNIT

CO COL

CONC CONCRETE

CONST CONSTRUCTION

CONT CONTINUOUS

CORR CORRUGATED

CPT CARPET

CS CONCRETE SEALER

CT CERAMIC TILE

CU CUBIC

CY CUBIC YARD

D DEPTH

DD DECK DRAIN

DF DRINKING FOUNTAIN

DI DRAIN INLET

DIA DIAMETER

DIAG DIAGONAL

DIM DIMENSION

DN DOWN

DS DOWNSPOUT

DTL DETAIL

DWG DRAWING

E EXISTING

EAST EAST

EACH EACH

EA EXPOSED CONSTRUCTION

EIFS EXTERIOR INSULATION & FINISH SYSTEM

EJ EXPANSION JOINT

ELEC ELECTRICAL

ELEV ELEVATION

ELEV ELEVATOR

EM EMERGENCY

EMB EMBEDMENT

EPS EXPANDED POLYSTYRENE

EQ EQUAL

EQUIP EQUIPMENT

ESC ESCALATOR

EXIST EXISTING

EXP EXPOSED

EXPA EXPANSION

EXT EXTERIOR

FD FLOOR DRAIN

FDN FOUNDATION

FEC FIRE EXTINGUISHER CABINET

FF FINISH FLOOR

FG FIBERGLASS

FHC FIRE HOSE CABINET

FHR FIRE HOSE REEL

FIN FINISH(ed)

FL FLOOR

FLG FLASHING

FLR FLOOR

FLUOR FLUORESCENT

FOC FACE OF CONCRETE

FOF FACE OF FINISH

FOS FACE OF STUD

FR FIRE-RETARDANT

FT FEET

FTG FOOTING

GA GAUGE

GAL GALLON

GALV GALVANIZED

GC GENERAL CONTRACTOR

GI GALVANIZED IRON

GL BLK GLASS BLOCK

GL GLASS

GMMU GLASS MESH MASONRY UNIT

GND GROUND

GR GRANITE

GRD GRADE

GWB GYPSUM WALLBOARD

H&V HEATING & VENTILATION

HB HOSE BIBB

HCC HOLLOW CORE

HDW HARDWARE

HM HOLLOW METAL

HH HAND HEWN

HORZ HORIZONTAL

HP HIGH POINT

HR HOUR

HSS HIGH-STRENGTH STEEL

HT HEIGHT

ID INSIDE DIAMETER

ID INTERIOR DESIGN

IN INCHES

INCL INCLUDE

INFO INFORMATION

INSUL INSULATION \ INTERIORS

JC JANITOR CLOSET

JMB JANITOR MOP BASIN

JT JOINT

LAB LABORATORY

LAM LAMINATED

LAV LAVATORY

LB(S) POUNDS

LP LOW POINT

LT LIGHT

LTWT LIGHTWEIGHT

LVR LOUVER

MACH MACHINE

MATL MATERIAL

MAX MAXIMUM

MECH MECHANICAL

MED MEDIUM

MEZZ MEZZANINE

MFR MANUFACTURER

MH MANHOLE

MIN MINIMUM

MISC MISCELLANEOUS

MLW MILLWORK

MIN MINUTES

MO MASONRY OPENING

MR MARBLE

MTD MOUNTED

MTL METAL

(N) NEW

N NORTH

NA NOT APPLICABLE

NIC NOT IN CONTRACT

No NUMBER

NOM NOMINAL

NTS NOT TO SCALE

OA OVERALL

OC ON CENTER

OD OUTSIDE DIAMETER

OFD OVERFLOW DRAIN

OPNG OPENING

OPP OPPOSITE

OSB ORIENTED STRAND BOARD

OSF OUTSIDE FACE

OZ OUNCE

PA PAINTED

PART PARTITION

PAV PAVERS

LT POINTS OF CURVATURE

PCC PRECAST CONCRETE

PERP PERPENDICULAR

PL PLATE

PLAM PLASTIC LAMINATE

PLMB PLUMBING

SPEC SPECIFICATION

PLSTC PLASTIC

PLWD PLYWOOD

PTD PAINTED

PPL PROPERTY LINE

PAIR PAIR

PREFAB PREFABRICATE

PROJ PROJECT

PROJ PROJECTION

POUNDS PER SQUARE FOOT

PT POUNDS PER SQUARE INCH

PT PRESSURE TREATED

PVC POLYVINYL CHLORIDE

QT QUARRY TILE

QT QUART

QTY QUANTITY

R RISER

RB RESILIENT BASE

RC RESILIENT CHANNEL

RCP REFLECTED CEILING PLAN

REF REFERENCE

REFR REFRIGERATOR

REINF REINFORCED

REQD REQUIRED

REV REVISION

RM ROOM

RO ROUGH OPENING

RO RADIUS POINT

RS ROUGH SAWN

S SOUTH

SC SOLID CORE

SCH SCHEDULE

SD STORM DRAIN

SECT SECTION

SF SQUARE FEET

SHT SHEET

SIM SIMILAR

SLR STRUCTURAL INSULATION PANEL

SLR SEALER

SNK SINK

SPEC SPECIFICATION

SQ SQUARE

SS STAINLESS STEEL

SSK SERVICE SINK

STA STAINED

STD STANDARD

STIFF STIFFENER

STL STEEL

STA STAMPED

STN STONE

STOR STORAGE

SUSP SUSPENDED

T TREAD

TSS TOP OF STRUCTURAL SLAB

TSF TOP OF STRUCTURAL FLOOR

TFF TOP OF FINISH FLOOR

TC TOP OF CURB

TEL TELEPHONE TERZ TERRAZZO

THK THICKNESS

THRU THROUGH

TOB TOP OF BEAM

TOT TOP OF CONCRETE

TOW TOP OF WALL

TRANS TRANSVERSE

TRAV TRAVERSE

TS TUBULAR STEEL

TYP TYPICAL

UG UNDERGROUND

UL UNDERWRITERS LABORATORIES

UNO UNLESS NOTED OTHERWISE

UR URINAL

VB VINYL BASE

VCT VINYL COMPOSITION TILE

VERT VERTICAL

VEST VESTIBULE

VIF VERIFY IN FIELD

VNR VENEER

VWC VINYL WALL COVERING

W WEST

WC WATER CLOSET

WD WALLS

WLS WALLS

WP WATERPROOF

WPM WATERPROOF MEMBRANE

WR WATER RESISTANT

WWF WELDED WIRE FABRIC

XPS EXTRUDED POLYSTYRENE

YDS YARDS

MATERIALS LEGEND

MATERIAL HATCHES IN SECTION

FILL MATL

CONCRETE

BRICK

STONE

METAL

WOOD

INSULATION

MISC

MATERIAL HATCHES IN ELEVATION

GLAZING

CONCRETE/ PLASTER

MASONRY

WOOD

METAL

Computer File Information

Print Date: 10/25/2019 3:29:19 PM

Last Modification Date: 09/09/19

Full Path: 192696\\W.Current Documents\01.Drawings\01.Current Arch

Drawing File Name: 2696 RFTA GMF - Option 1.rvt

Revit Ver. 2019 Scale: As Shown Units: English

Sheet Revisions

Date:

Comments

Init.

As Constructed

No Revisions:

Revised:

Void:

GMF EXPANSION - PHASE 2

Designer: Designer

Detailer: Author

Sheet Subset: Subset Sheet::

Project No./Code

20192696

Project Information

Sheet A00.00

RFTA

Roaring Fork Transportation Authority

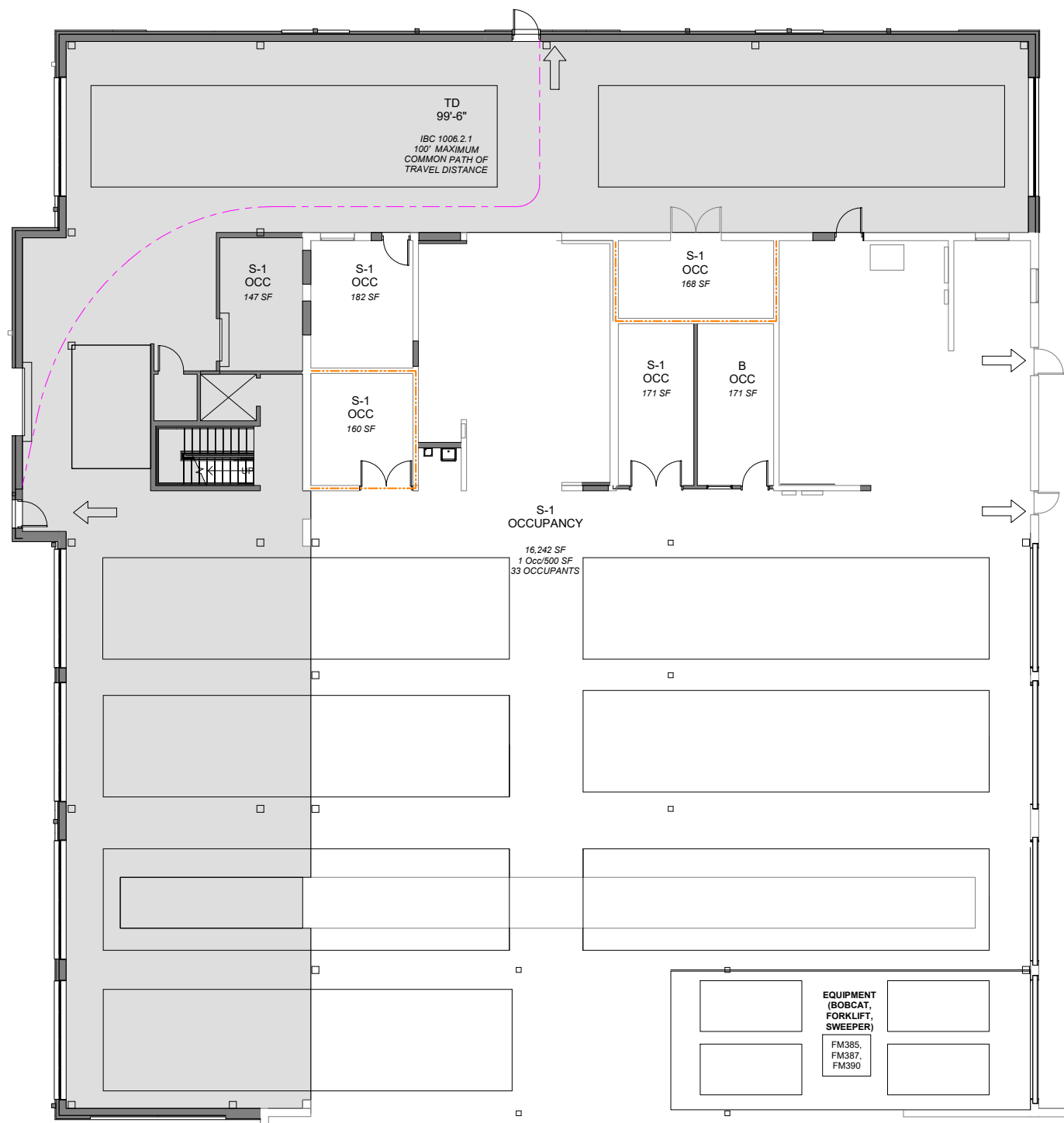
1340 Main Street
Carbondale, CO 81623
970.384.4866 procurement@rfta.com

ZEHREN

AND ASSOCIATES, INC.

48 E. Beaver Creek Blvd, Ste. 303
AVON, CO 81620
970.949.0257 zehren.com

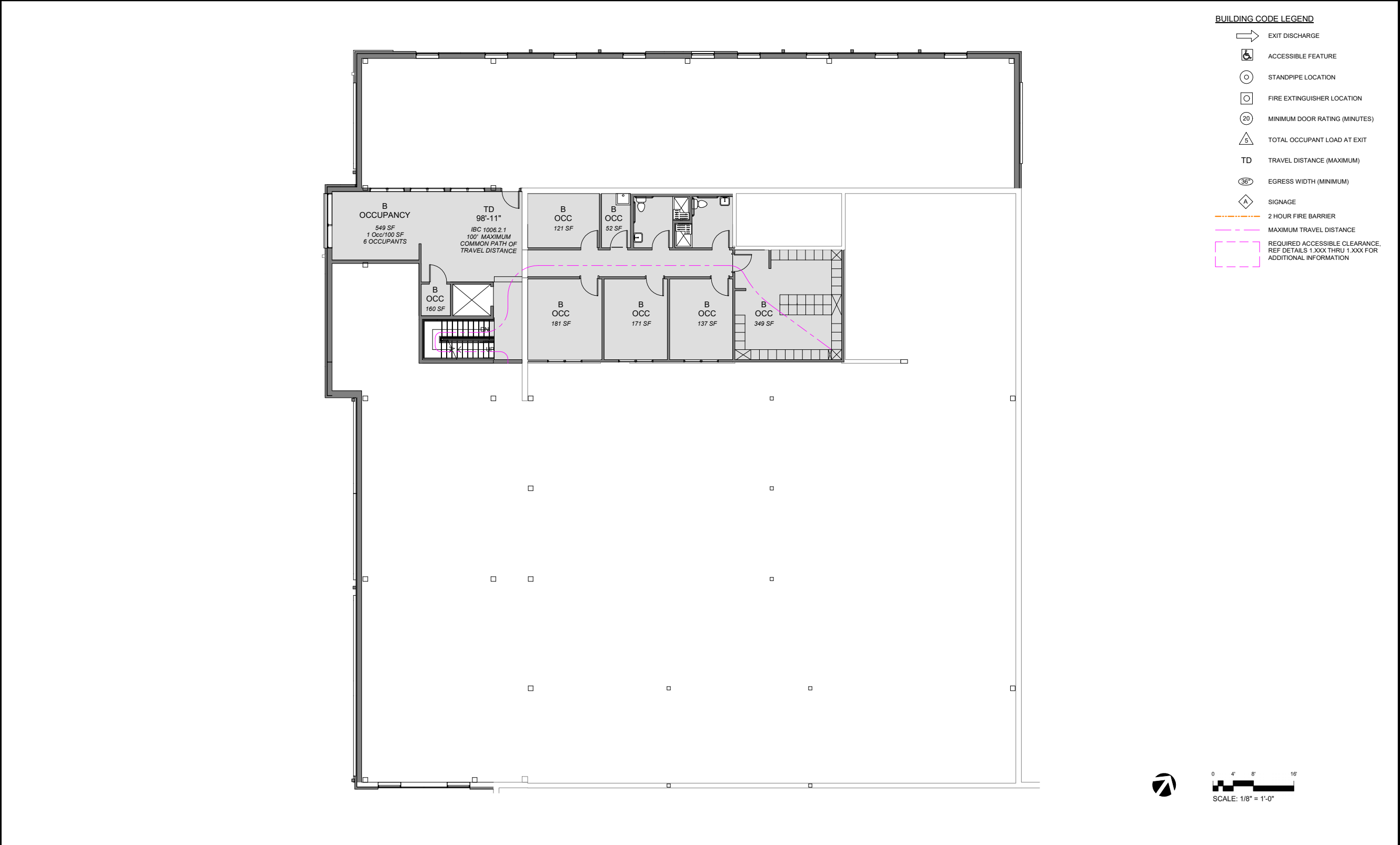
Packet Page 141



- BUILDING CODE LEGEND**
- EXIT DISCHARGE
 - ACCESSIBLE FEATURE
 - STANDPIPE LOCATION
 - FIRE EXTINGUISHER LOCATION
 - MINIMUM DOOR RATING (MINUTES)
 - TOTAL OCCUPANT LOAD AT EXIT
 - TD TRAVEL DISTANCE (MAXIMUM)
 - EGRESS WIDTH (MINIMUM)
 - SIGNAGE
 - 2 HOUR FIRE BARRIER
 - MAXIMUM TRAVEL DISTANCE
 - REQUIRED ACCESSIBLE CLEARANCE, REF DETAILS 1.XXX THRU 1.XXX FOR ADDITIONAL INFORMATION



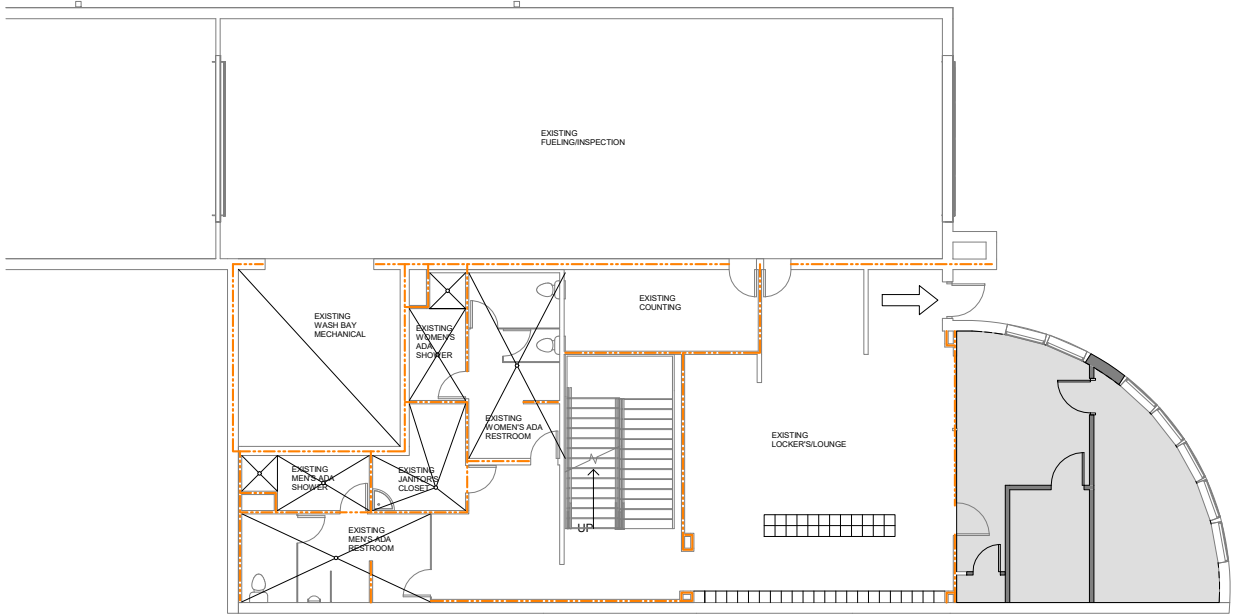
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BUILDING CODE LEGEND

- EXIT DISCHARGE
- ACCESSIBLE FEATURE
- STANDPIPE LOCATION
- FIRE EXTINGUISHER LOCATION
- MINIMUM DOOR RATING (MINUTES)
- TOTAL OCCUPANT LOAD AT EXIT
- TRAVEL DISTANCE (MAXIMUM)
- EGRESS WIDTH (MINIMUM)
- SIGNAGE
- 2 HOUR FIRE BARRIER
- MAXIMUM TRAVEL DISTANCE
- REQUIRED ACCESSIBLE CLEARANCE, REF DETAILS 1.XXX THRU 1.XXX FOR ADDITIONAL INFORMATION

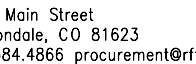
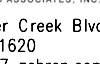


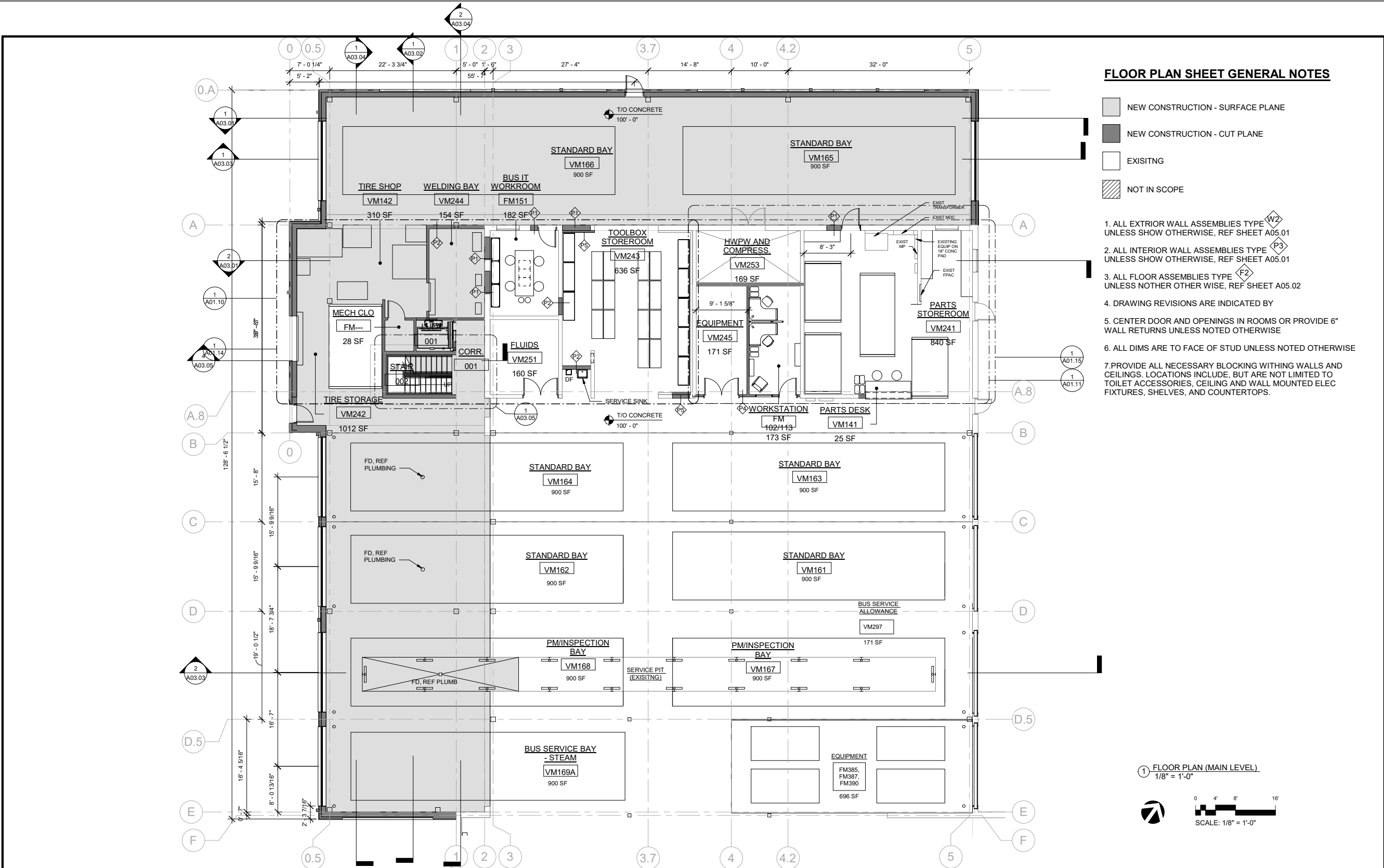
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Computer File Information			Sheet Revisions					As Constructed		GMF EXPANSION – PHASE 2		Project No./Code	
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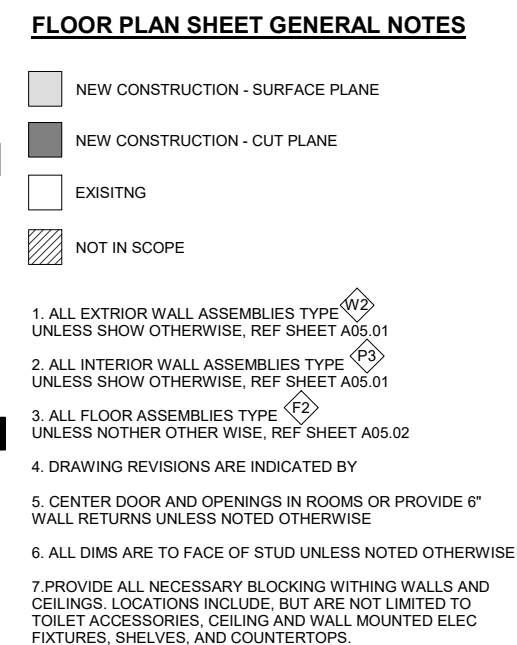
FLOOR PLAN SHEET GENERAL NOTES

- NEW CONSTRUCTION - SURFACE PLANE
 - NEW CONSTRUCTION - CUT PLANE
 - EXISTING
 - NOT IN SCOPE
- ALL EXTERIOR WALL ASSEMBLIES TYPE $\triangle W2$ UNLESS SHOW OTHERWISE, REF SHEET A05.01
 - ALL INTERIOR WALL ASSEMBLIES TYPE $\triangle P3$ UNLESS SHOW OTHERWISE, REF SHEET A05.01
 - ALL FLOOR ASSEMBLIES TYPE $\triangle F2$ UNLESS NOTHER OTHER WISE, REF SHEET A05.02
 - DRAWING REVISIONS ARE INDICATED BY
 - CENTER DOOR AND OPENINGS IN ROOMS OR PROVIDE 6" WALL RETURNS UNLESS NOTED OTHERWISE
 - ALL DIMS ARE TO FACE OF STUD UNLESS NOTED OTHERWISE
 - PROVIDE ALL NECESSARY BLOCKING WITHING WALLS AND CEILINGS. LOCATIONS INCLUDE, BUT ARE NOT LIMITED TO TOILET ACCESSORIES, CEILING AND WALL MOUNTED ELEC FIXTURES, SHELVES, AND COUNTERTOPS.

1 FLOOR PLAN (MAIN LEVEL)
1/8" = 1'-0"



Computer File Information			Sheet Revisions			 Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	 ZEHREN AND ASSOCIATES, INC. 48 E. Beaver Creek Blvd, Ste. 303 AVON, CO 81620 970.949.0257 zehren.com	As Constructed		GMF EXPANSION – PHASE 2		Project No./Code	
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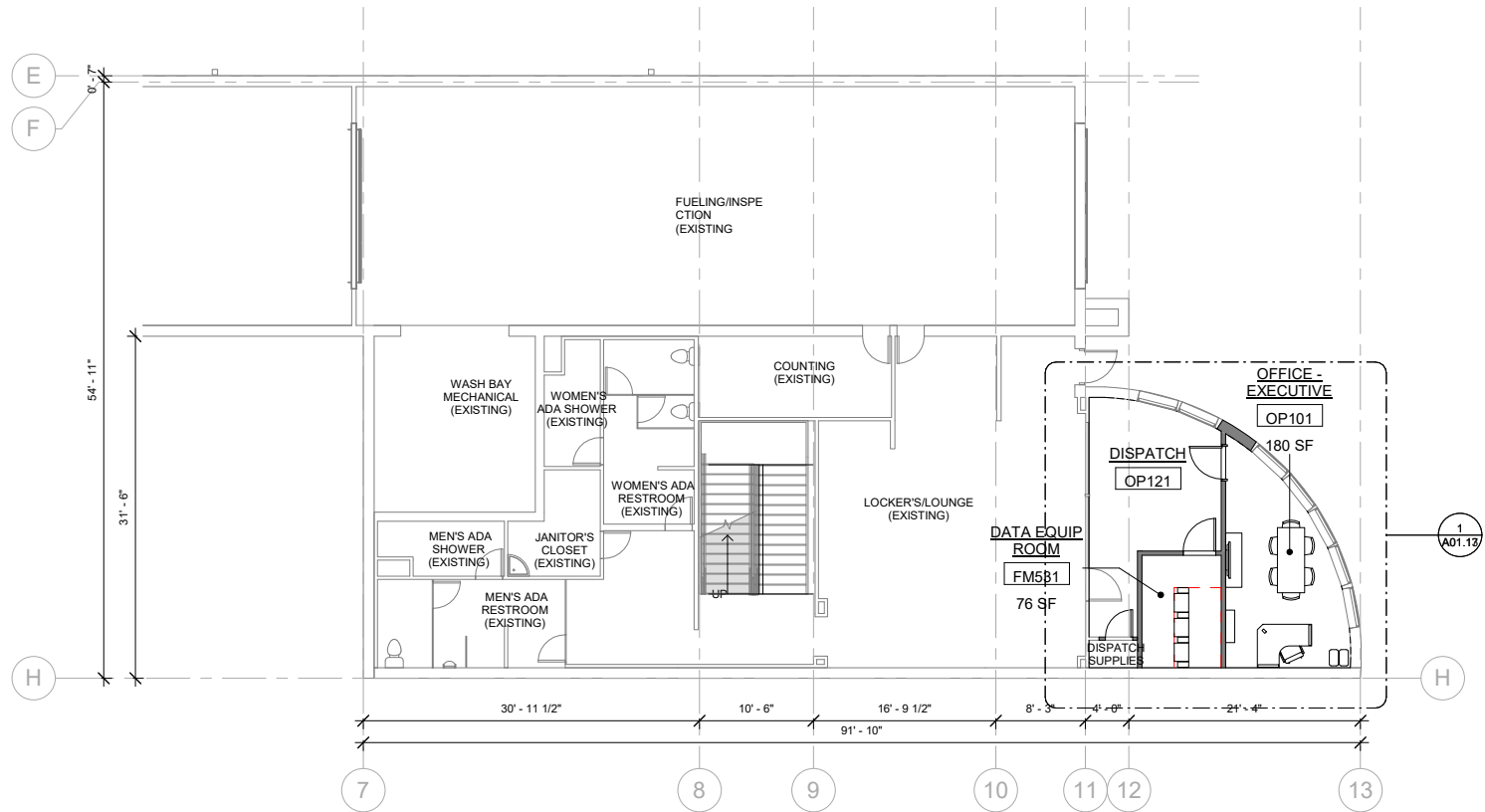


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1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com						48 E. Beaver Creek Blvd, Ste. 303 AVON, CO 81620 970.949.0257 zehren.com							

FLOOR PLAN SHEET GENERAL NOTES

- NEW CONSTRUCTION - SURFACE PLANE
- NEW CONSTRUCTION - CUT PLANE
- EXISTING
- NOT IN SCOPE

- 1. ALL EXTERIOR WALL ASSEMBLIES TYPE ^(W2) UNLESS SHOW OTHERWISE, REF SHEET A05.01
- 2. ALL INTERIOR WALL ASSEMBLIES TYPE ^(P3) UNLESS SHOW OTHERWISE, REF SHEET A05.01
- 3. ALL FLOOR ASSEMBLIES TYPE ^(F2) UNLESS NOTHER OTHER WISE, REF SHEET A05.02
- 4. DRAWING REVISIONS ARE INDICATED BY
- 5. CENTER DOOR AND OPENINGS IN ROOMS OR PROVIDE 6" WALL RETURNS UNLESS NOTED OTHERWISE
- 6. ALL DIMS ARE TO FACE OF STUD UNLESS NOTED OTHERWISE
- 7. PROVIDE ALL NECESSARY BLOCKING WITHING WALLS AND CEILINGS. LOCATIONS INCLUDE, BUT ARE NOT LIMITED TO TOILET ACCESSORIES, CEILING AND WALL MOUNTED ELEC FIXTURES, SHELVES, AND COUNTERTOPS.



1 FLOOR PLAN (MAIN LEVEL)- SOUTH
1/8" = 1'-0"



Computer File Information			Sheet Revisions			 Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	 ZEHREN AND ASSOCIATES, INC. 48 E. Beaver Creek Blvd, Ste. 303 AVON, CO 81620 970.949.0257 zehren.com	As Constructed		GMF EXPANSION – PHASE 2		Project No./Code	
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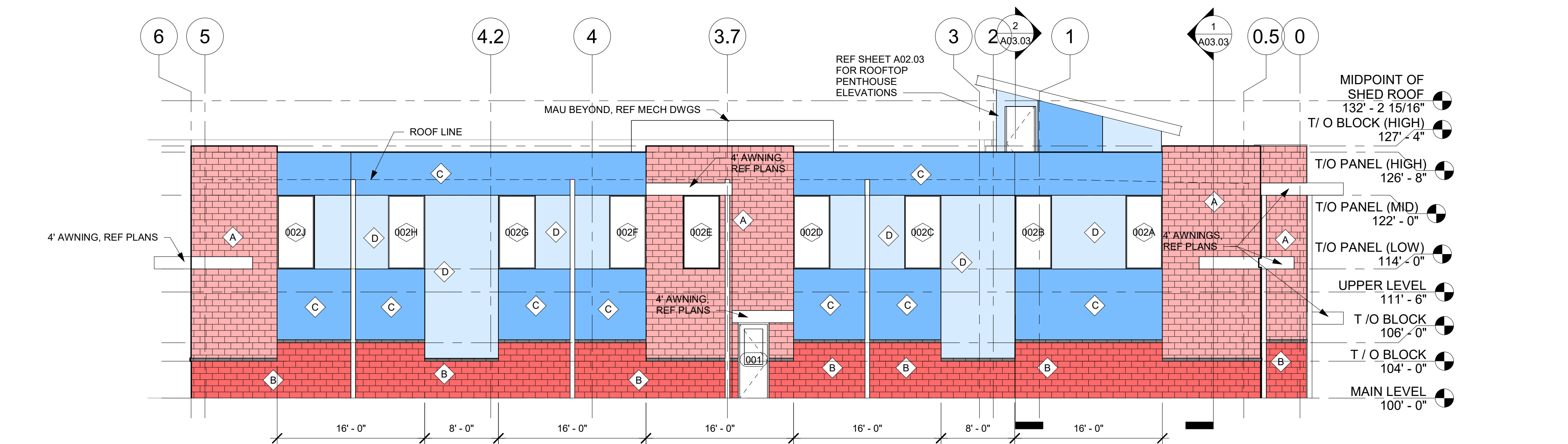
ELEVATION SHEET GENERAL NOTES

1. EXTERIOR WALL FINISHES INDICATED ON ELEVATIONS - SEE TAGS BELOW FOR MATERIALS

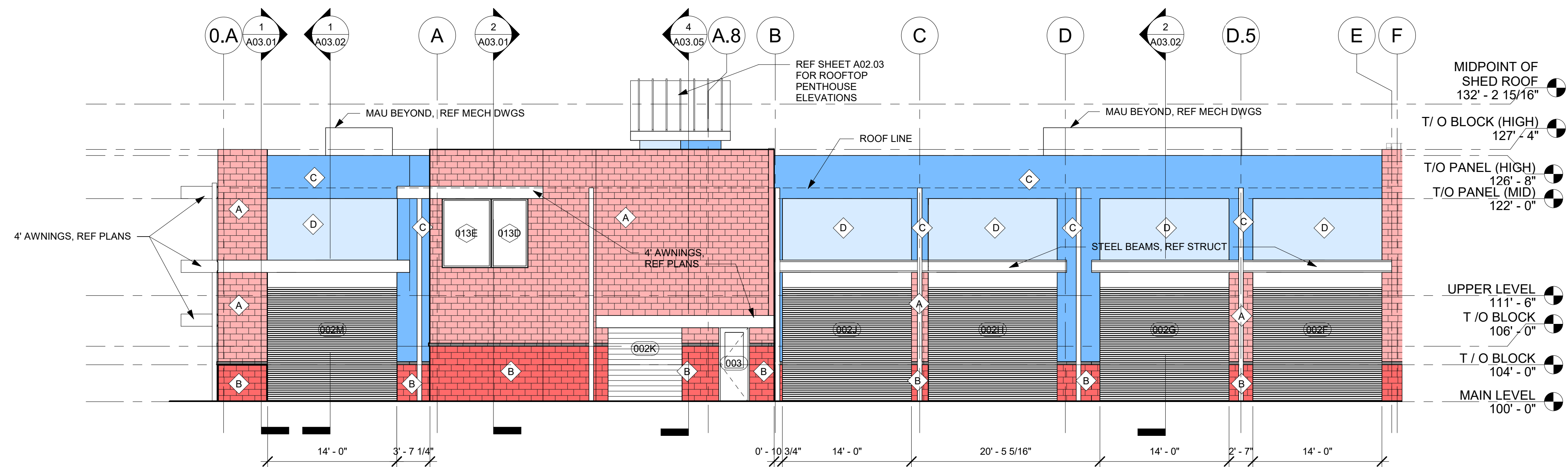
	(FIELD) CMU BLOCK - SMOOTH, TO MATCH EXISTING
	(BASE) CMU BLOCK - SPLIT FACE, TO MATCH EXISTING
	BERRIDGE HC-16 HORIZONTAL SIDING, COLOR - CHAMPAGNE
	BERRIDGE HC-16 VERTICAL SIDING, COLOR - CHAMPAGNE

2. CMU HATCH INDICATED ON THE EXTERIOR ELEVATIONS REPRESENTS LOCATION OF CMU ONLY AND SHOULD NOT BE REFERENCED FOR PATTERN, STYLE OR SIZE.

3. REFERENCE ROOF PLAN FOR LOCATIONS OF ROOF DRAINS, AND OTHER ROOF COMPONENTS NOT INDICATED ON EXTERIOR ELEVATIONS



2 NORTH ELEVATION
1/8" = 1'-0"



1 WEST ELEVATION
1/8" = 1'-0"

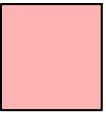
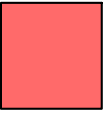
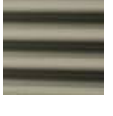
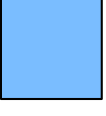
North Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	3233	N/A
Net* Concrete Masonry Unit	1494	46%
Net* Corrugated Metal Siding	1456	45%
Net* Glazing	283	9%

West Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	2116	N/A
Net* Concrete Masonry Unit	1116	53%
Net* Corrugated Metal Siding	1000	47%
Net* Glazing	70	6%

Computer File Information			Sheet Revisions					As Constructed		GMF EXPANSION – PHASE 2		Project No./Code	
Print Date: 12/6/2019 10:42:22 AM	Last Modification Date: 06/28/19	Full Path: 192696\IV.Current Documents\01.Drawings\01.Current Arch	Date:	Comments	Init.			No Revisions:	Revised:	Designer: TL		20192696	
Drawing File Name: 2696 RFTA GMF – Option 1.rvt	Revit Ver. 2019	Scale: As Shown				Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	ZEHREN AND ASSOCIATES, INC. 48 E. Beaver Creek Blvd, Ste. 303 AVON, CO 81620 970.949.0257 zehren.com	Void:		Detailer: MW		Exterior Elevations	
Units: English										Sheet Subset:	Subset Sheet::	A02.01	

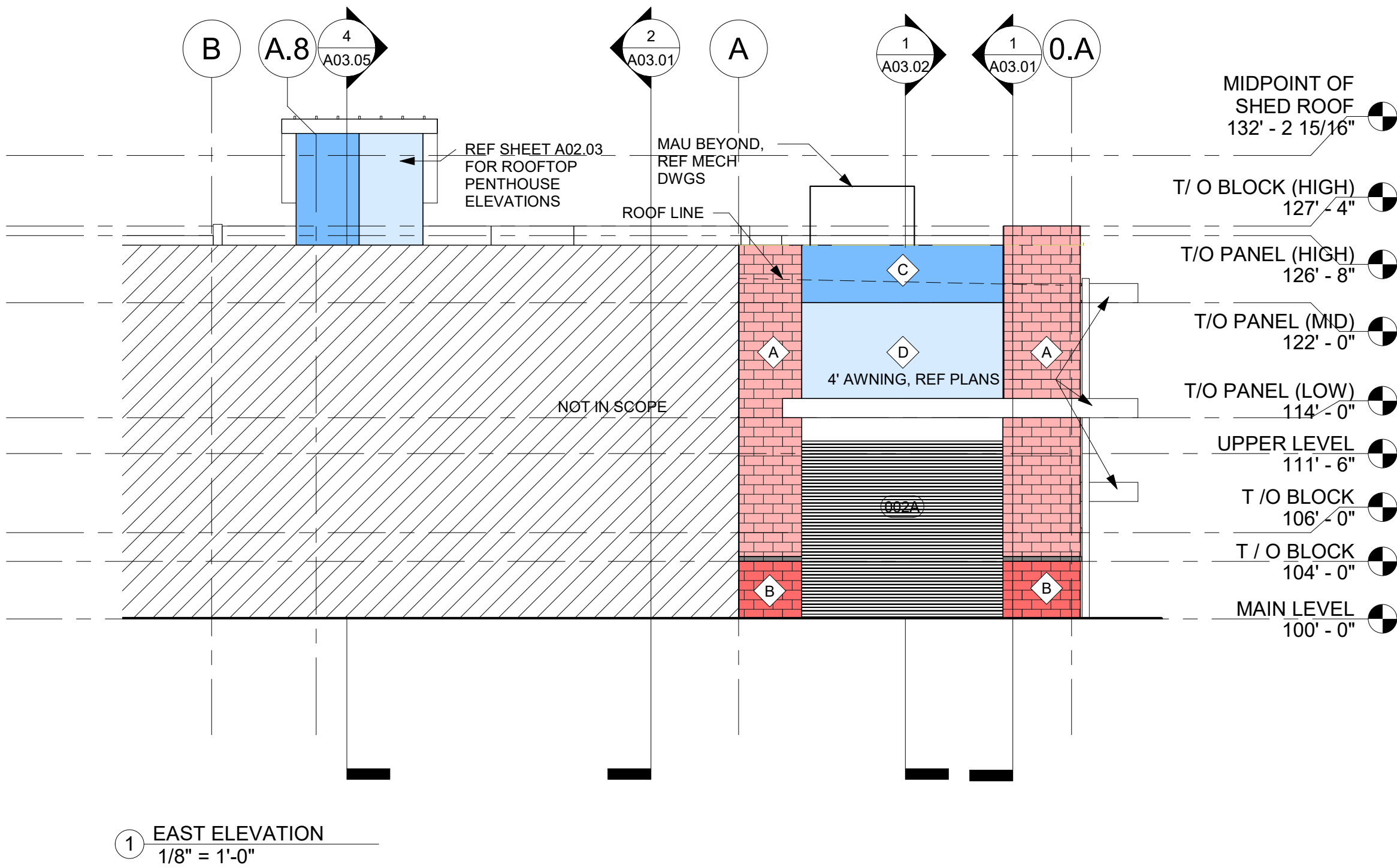
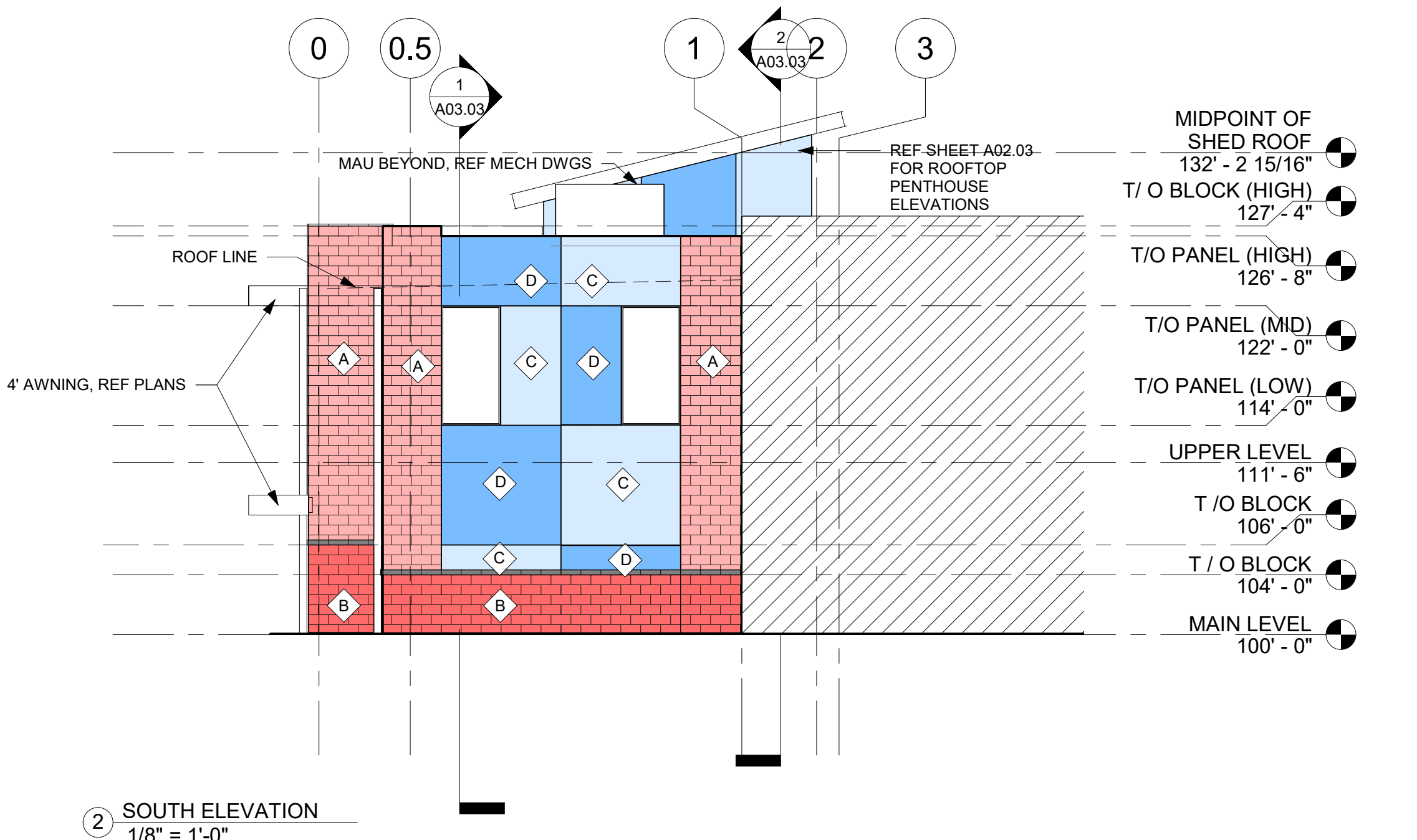
ELEVATION SHEET GENERAL NOTES

1. EXTERIOR WALL FINISHES INDICATED ON ELEVATIONS - SEE TAGS BELOW FOR MATERIALS

			(FIELD) CMU BLOCK - SMOOTH, TO MATCH EXISTING
			(BASE) CMU BLOCK - SPLIT FACE, TO MATCH EXISTING
			BERRIDGE HC-16 HORIZONTAL SIDING, COLOR - CHAMPAGNE
			BERRIDGE HC-16 VERTICAL SIDING, COLOR - CHAMPAGNE

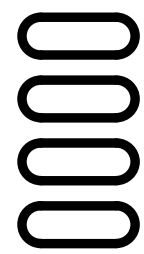
2. CMU HATCH INDICATED ON THE EXTERIOR ELEVATIONS REPRESENTS LOCATION OF CMU ONLY AND SHOULD NOT BE REFERENCED FOR PATTERN, STYLE OR SIZE.

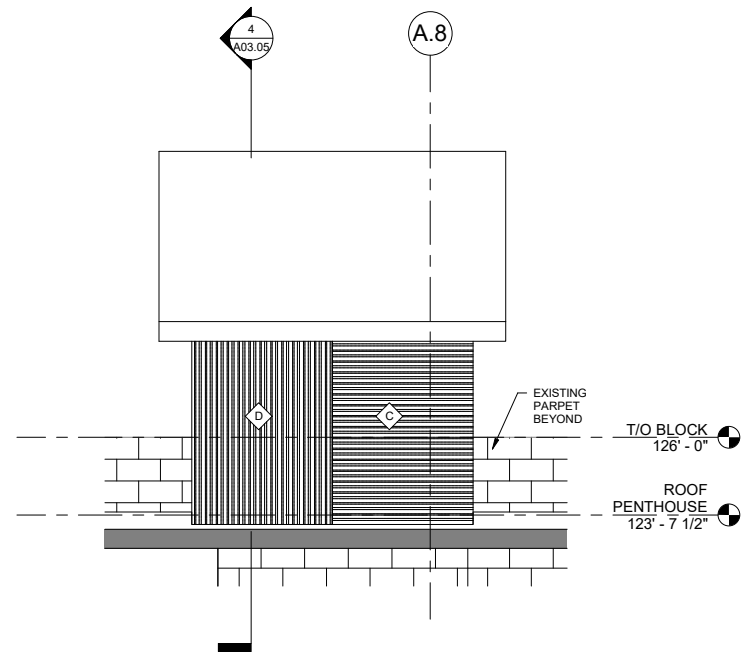
3. REFERENCE ROOF PLAN FOR LOCATIONS OF ROOF DRAINS, AND OTHER ROOF COMPONENTS NOT INDICATED ON EXTERIOR ELEVATIONS



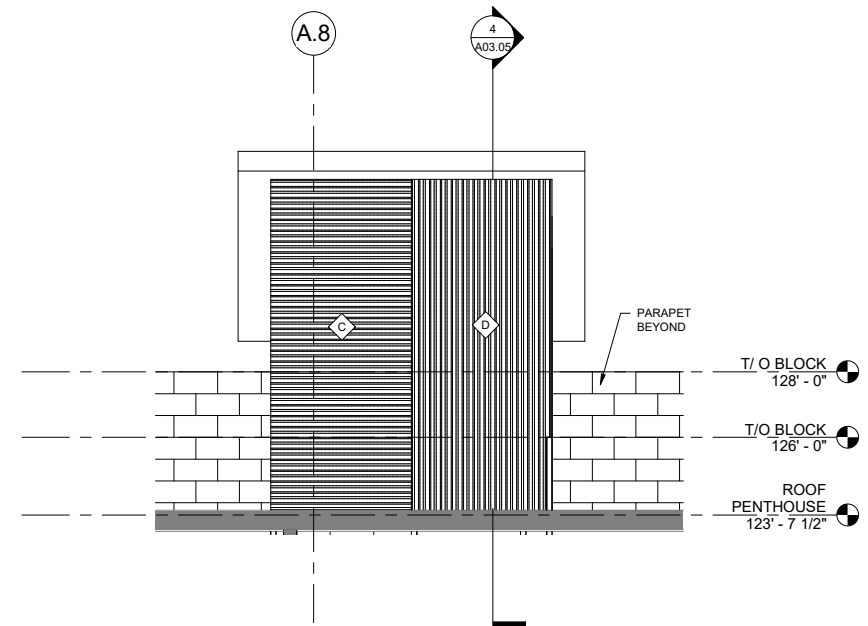
South Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	792	N/A
Net* Concrete Masonry Unit	416	53%
Net* Corrugated Metal Siding	376	47%
Net* Glazing	64	15%

East Elevation		
Description/Material	Surface Area (Sq. Ft.)	Percentage of Net
Gross of wall	476	N/A
Net* Concrete Masonry Unit	256	54%
Net* Corrugated Metal Siding	220	46%
Net* Glazing	0	0%

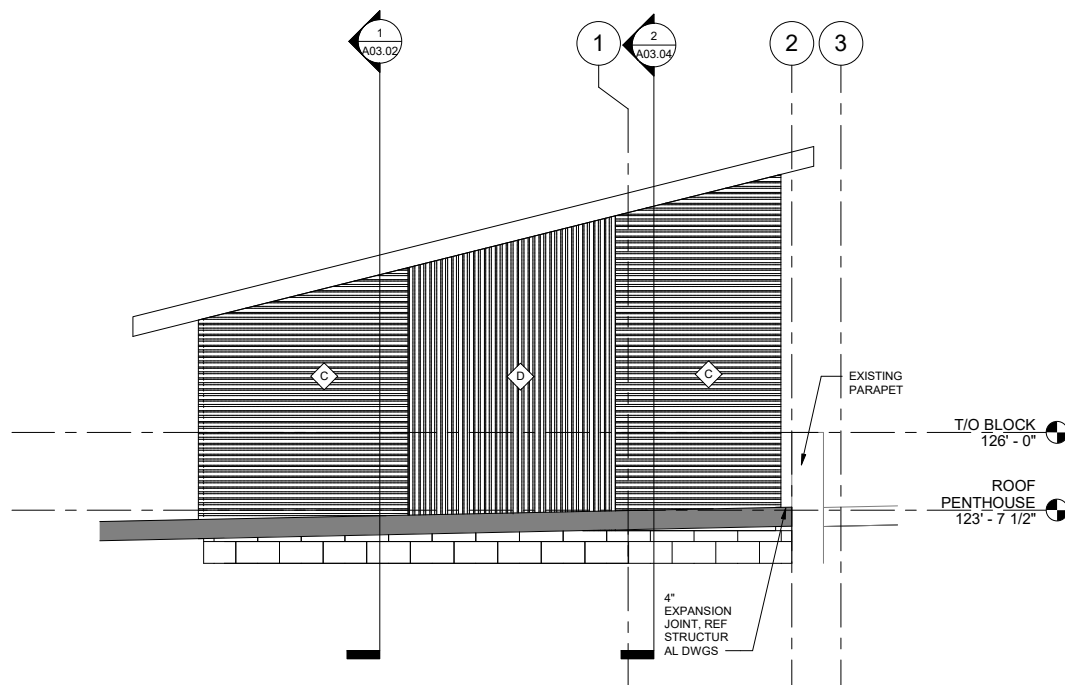
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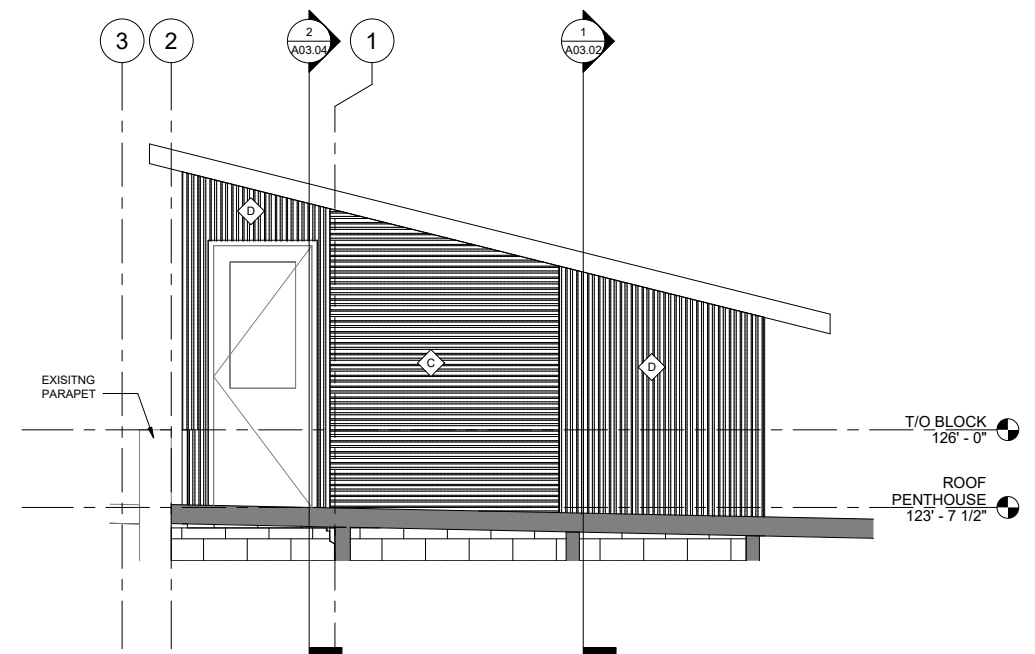
① ROOFTOP PENTHOUSE WEST
3/8" = 1'-0"



③ ROOFTOP PENTHOUSE EAST
3/8" = 1'-0"

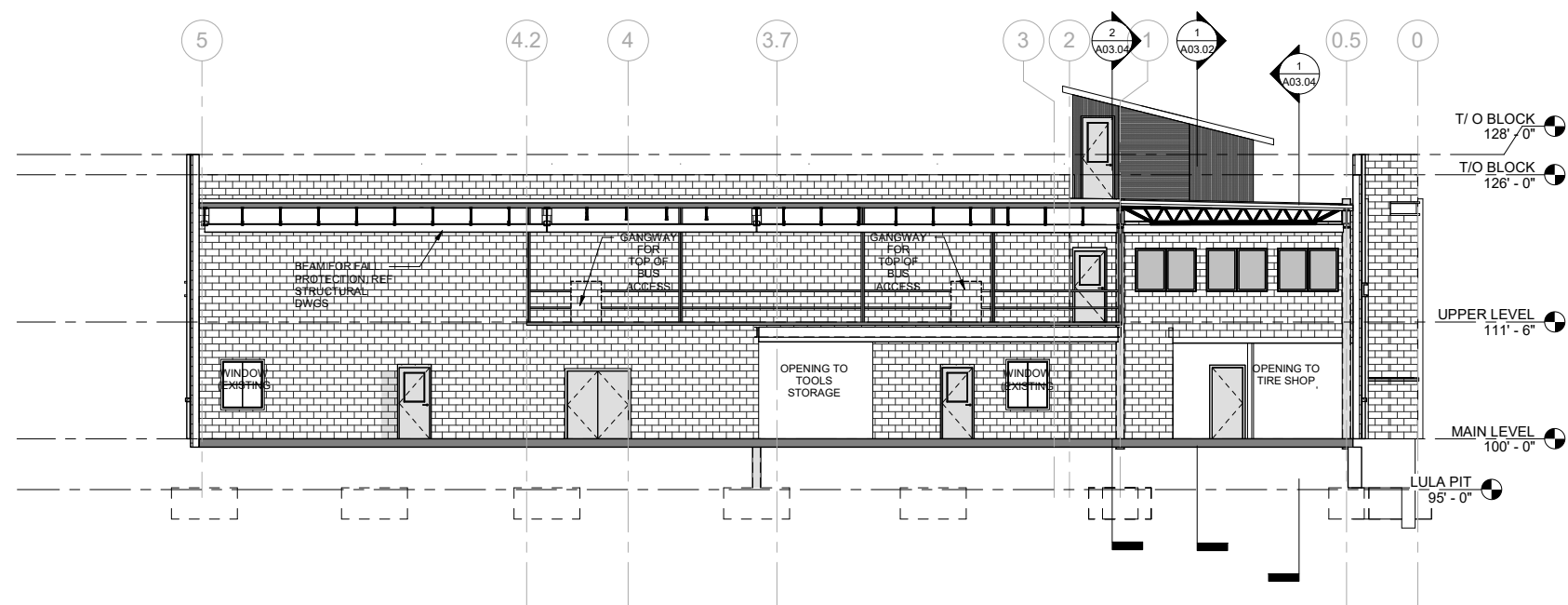


④ ROOFTOP PENTHOUSE SOUTH
3/8" = 1'-0"

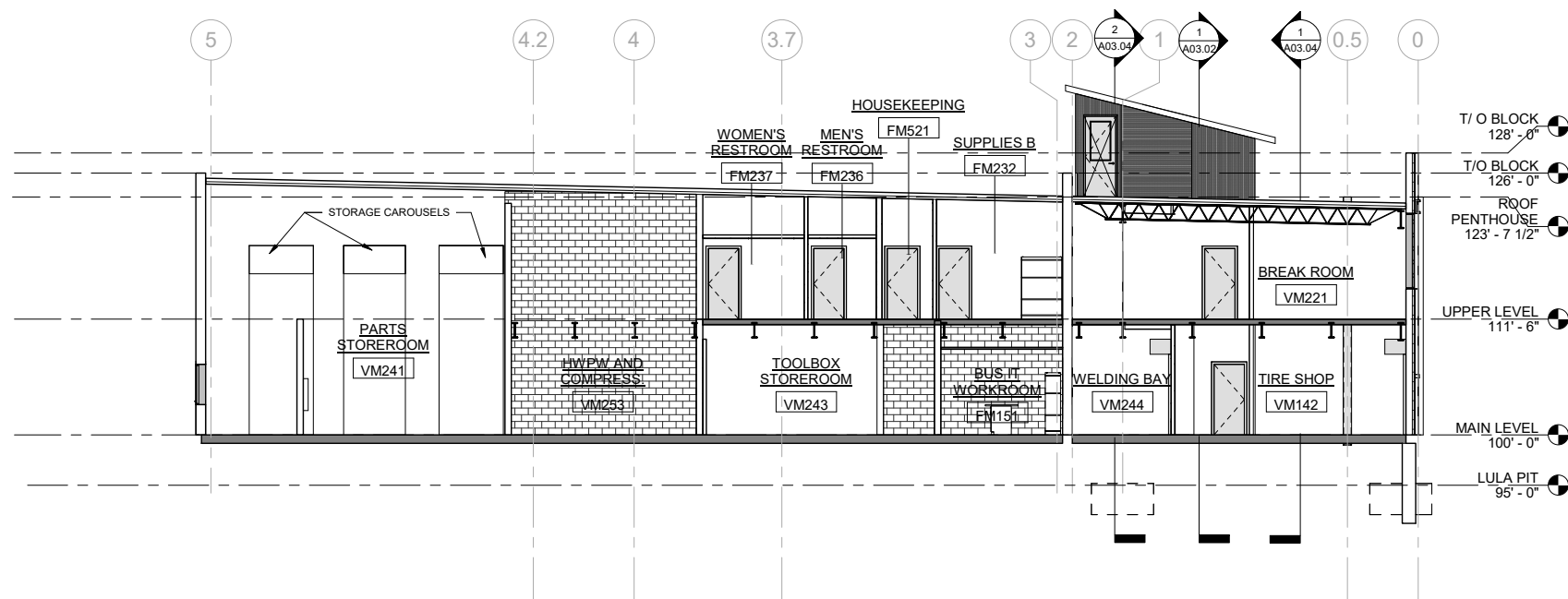


② ROOFTOP PENTHOUSE NORTH
3/8" = 1'-0"

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① BUILDING SECTION 1/A03.01
1/8" = 1'-0"



② BUILDING SECTION 2/A03.01
1/8" = 1'-0"

SECTION SHEET GENERAL NOTES

- NEW CONSTRUCTION - SURFACE PLANE
- NEW CONSTRUCTION - CUT PLANE
- EXISTING
- NOT IN SCOPE

1. BUILDING SECTIONS ARE TO SHOW GENERAL RELATIONSHIPS OF INTERIOR SPACES ONLY. SEE OTHER SHEET DRAWINGS AND DETAILS FOR ACTUAL LAYOUT, QUANTITY, AND DIMENSIONS OF COMPONENTS.

2. CONTRACTOR IS RESPONSIBLE FOR PROVIDING PROPER UNDER FRAMING TO ACHIEVE SPECIFIED CEILING HEIGHTS.

3. WATERPROOFING, INSULATION, VAPOR RETARDER, AND OTHER ASSEMBLY COMPONENTS NOT SHOW FOR CLARITY. REFER TO TYPICAL ASSEMBLY DETAILS FOR FLOOR, WALL, AND ROOF ASSEMBLIES.

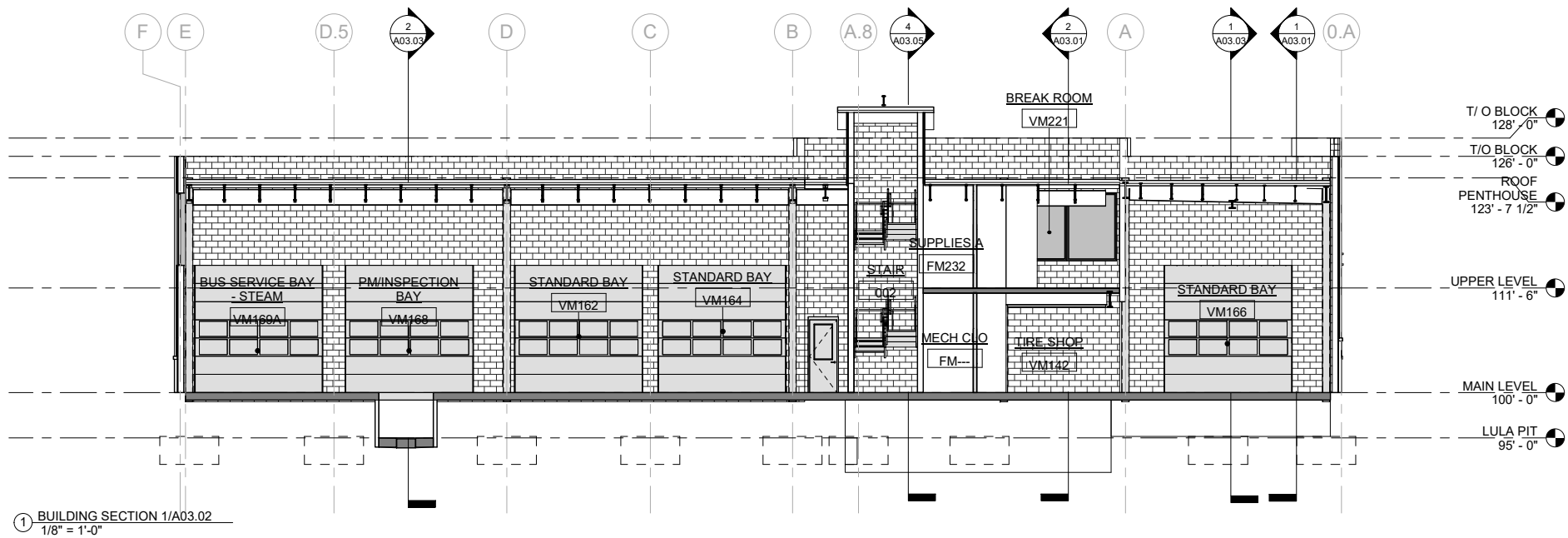
4. REFER TO STRUCT DWGS FOR FOUNDATION WALLS AND FOOTING DEPTHS.

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1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com						48 E. Beaver Creek Blvd, Ste. 303 AVON, CO 81620 970.949.0257 zehren.com								

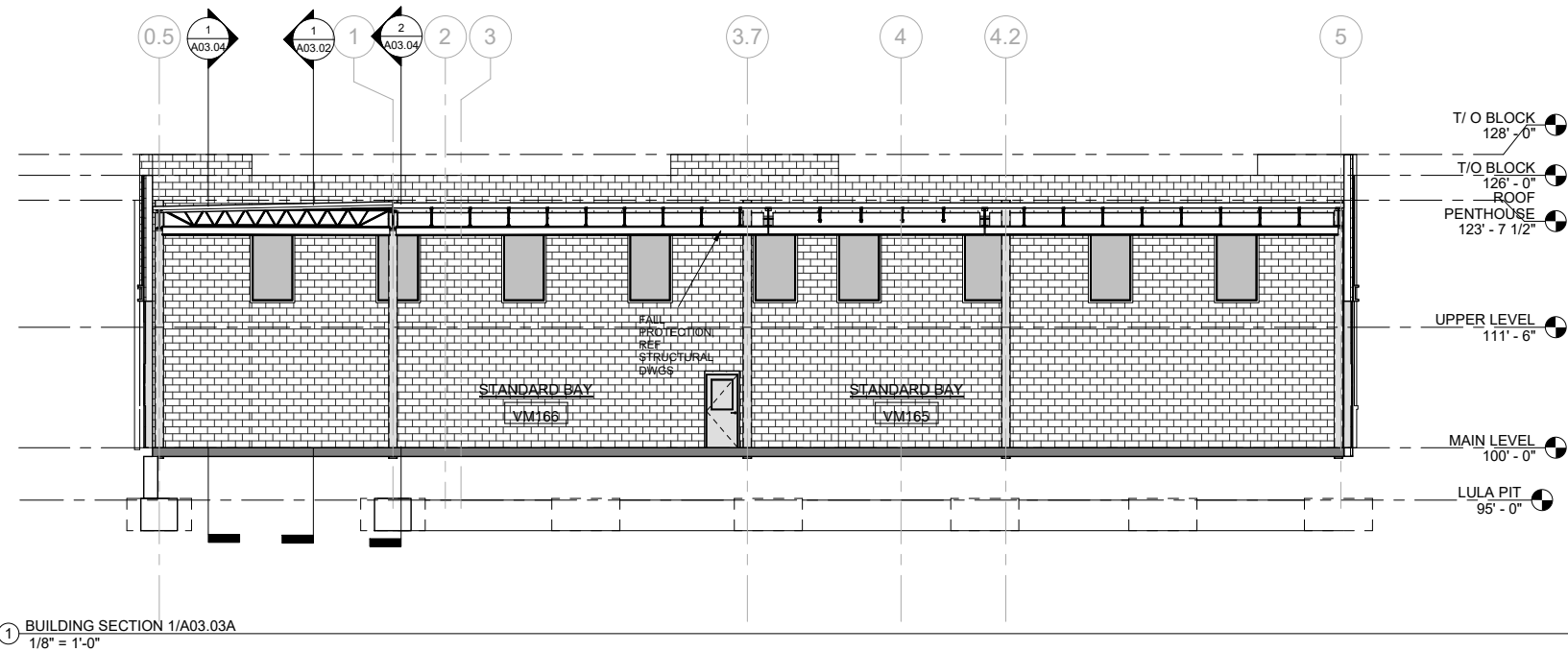
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- NEW CONSTRUCTION - CUT PLANE
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- 1. BUILDING SECTIONS ARE TO SHOW GENERAL RELATIONSHIPS OF INTERIOR SPACES ONLY. SEE OTHER SHEET DRAWINGS AND DETAILS FOR ACTUAL LAYOUT, QUANTITY, AND DIMENSIONS OF COMPONENTS.
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- 4. REFER TO STRUCT DWGS FOR FOUNDATION WALLS AND FOOTING DEPTHS.

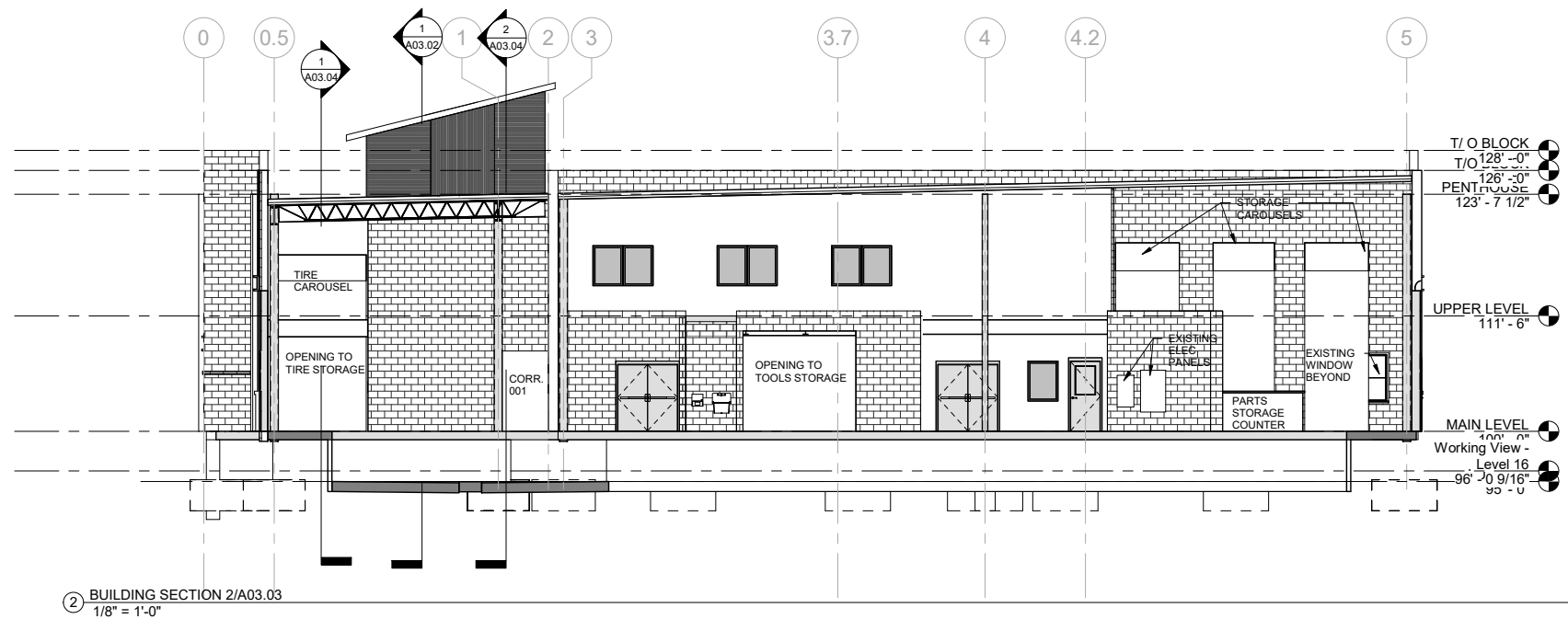


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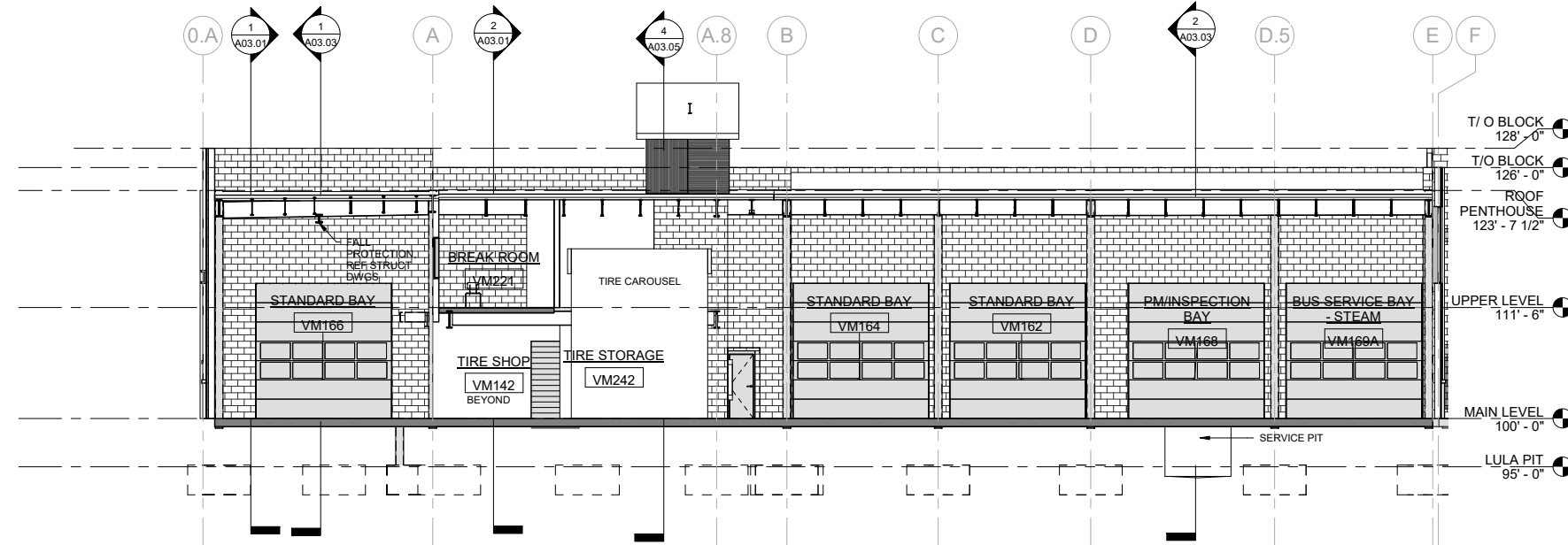


SECTION SHEET GENERAL NOTES

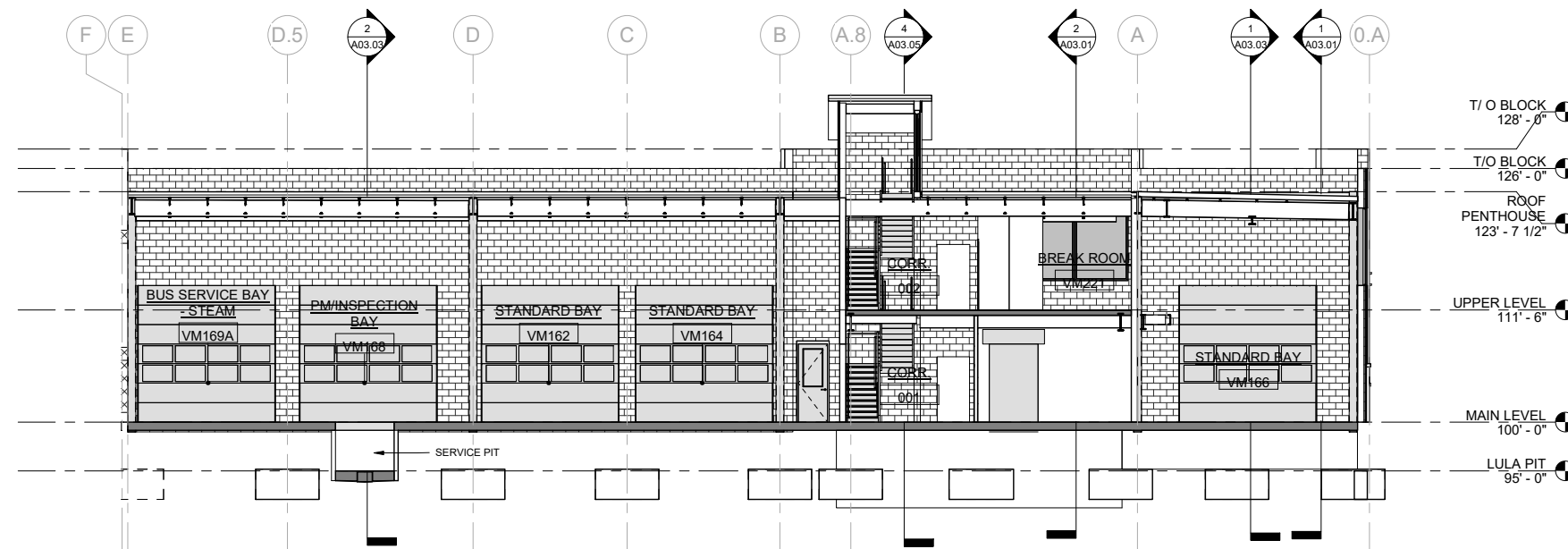
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 - NEW CONSTRUCTION - CUT PLANE
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1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com						48 E. Beaver Creek Blvd, Ste. 303 AVON, CO 81620 970.949.0257 zehren.com								



① BUILDING SECTION 1/A03.4
1/8" = 1'-0"



② BUILDING SECTION 2/A03.04
1/8" = 1'-0"

SECTION SHEET GENERAL NOTES

- NEW CONSTRUCTION - SURFACE PLANE
- NEW CONSTRUCTION - CUT PLANE
- EXISTING
- NOT IN SCOPE

1. BUILDING SECTIONS ARE TO SHOW GENERAL RELATIONSHIPS OF INTERIOR SPACES ONLY. SEE OTHER SHEET DRAWINGS AND DETAILS FOR ACTUAL LAYOUT, QUANTITY, AND DIMENSIONS OF COMPONENTS.

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RFTA
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1340 Main Street
Carbondale, CO 81623
970.384.4866 procurement@rfta.com

ZEHREN
AND ASSOCIATES, INC.
48 E. Beaver Creek Blvd, Ste. 303
AVON, CO 81620
970.949.0257 zehren.com



Appendix A

Engineering Reports



Regional Transit Center (RTC)

Glenwood Springs, Colorado

Traffic Analysis



RFTA #2015-15-040-001
Prepared by Shrewsberry
3/9/18

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- B Traffic Counts
- C Capacity Analysis
- D Signal Warrants



1. Executive Summary

The Roaring Fork Transportation Authority (RFTA) Glenwood Springs Maintenance Facility (GMF) is located near the intersection of Wulfsohn Road and Midland Avenue. The facility currently maintains 45 buses along with some administrative offices. RFTA plans to expand the facility, increasing the number of operating buses from 45 to 60, by renovating the existing site. A full description is outlined in the *Feasibility Study*¹ and Program of Requirements (POR).

1.1 External Site Analysis

As part of the expansion, traffic from various on-site sources is expected to increase as well. The *Feasibility Study*¹ provides information regarding additional traffic generated by the facility.

- Bus traffic will be expanded from 45 to 60 operating buses during the winter peak season.
- Bus drivers will also increase from 45 to 60 per day.
- Maintenance staff will increase from 21 to 28.
- Between the on-site parking garage and the park and ride lot on Wulfsohn Road, parking for employees and the public will increase from 85 spaces to 234 spaces combined.
- The quantity of administrative staff will remain at the same levels as today.

The additional bus and public trips were assigned to the intersection of Wulfsohn Road and Midland Avenue according to the trip distribution methodology. Operations analysis was conducted for the following scenarios:

- 2017 Base Year, existing conditions
- 2020 Opening Year, no-build conditions
- 2020 Opening Year with the RFTA expansion
- 2040 Future Year, no-build conditions
- 2040 Future Year with the RFTA expansion

The results of the capacity analysis are virtually unchanged throughout the scenarios, including the RFTA expansion. All Level of Service (LOS) results fall within the recommended range for urban or rural areas, and no improvements to the intersection are needed based on operations.

A signal warrant was examined for the study intersection. No signal is justified; however, the warrant thresholds are approaching warrants in 2040, with six of eight hours satisfied.

1.2 Recommendations

No improvements to the intersection of Midland Avenue and Wulfsohn Road are needed to mitigate the effects of the additional RFTA traffic. The intersection should be monitored for additional growth and a signal installed if and when warranted.

¹ *Regional Transit Center (RTC) Glenwood Springs, Colorado Feasibility Study*. Shrewsberry with Iron Horse Architects, November 16, 2016.



2. Preparer Qualifications

I certify that this TRAFFIC ANALYSIS has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

Jill Palmer
Shrewsberry & Associates, LLC



Eric Rolle, PE
Colorado PE 46126
Shrewsberry & Associates, LLC



3. Site Conditions

RFTA's Glenwood Springs Maintenance Facility is located near the intersection of Wulfsohn Road and Midland Avenue. The facility maintains 45 buses, which are fueled, washed, repaired, and parked on-site. Some administrative and support staff offices are located on site as well.



Figure 1 - Existing Facility

The intersection of Wulfsohn Road and Midland Avenue is controlled by a two-way stop. Midland Avenue is the major roadway with free-flowing traffic. It is classified as a principal arterial² and provides a crossing of the Colorado River and access to Interstate 70 to the west. Wulfsohn Road and an opposing commercial driveway to the north are stop-controlled. Wulfsohn Road is classified as a local street.

Posted speeds on Midland Avenue are 25 mph west of Wulfsohn Road and 35 mph to the east. The posted speed on Wulfsohn Road is 25 mph³. The Midland Avenue approaches each have a left-turn lane and a through lane, and the eastbound approach has a right-turn lane. The Wulfsohn Road approach has a single shared lane for northbound traffic. The commercial driveway has two lanes on the southbound approach.

RFTA plans to expand the facility, increasing the number of operating buses from 45 to 60, by renovating the existing site. More about the planned expansion is outlined in the *Feasibility Study*⁴.

² Glenwood Springs Long Range Transportation Plan 2015-2035

³ Google Earth Imagery dated October 2012

⁴ Regional Transit Center (RTC) Glenwood Springs, Colorado Feasibility Study. Shrewsbury with Iron Horse Architects, November 16, 2016.

4. Trip Generation, Distribution, and Assignment

As part of the expansion, traffic from various on-site sources is expected to increase as well. The Feasibility Study⁵ provides the following information regarding additional traffic generated by the facility.

- Bus traffic will be expanded from 45 to 60 operating buses during the winter peak season.
- Bus drivers will also increase from 45 to 60 per day.
- Maintenance staff will increase from 21 to 28.
- Between the on-site parking garage and the park and ride lot on Wulfsohn Road, parking for the public will increase from 85 spaces to 324 spaces combined.
- The quantity of administrative staff will remain at the same levels as today.

4.1 Trip Generation

For the increased bus traffic, the Feasibility Study⁵ offers precise numbers for trip generation. During the peak hours of the facility, expansion to 60 operating buses translates to four additional buses exiting the facility in the morning and three additional buses entering the facility in the evening.

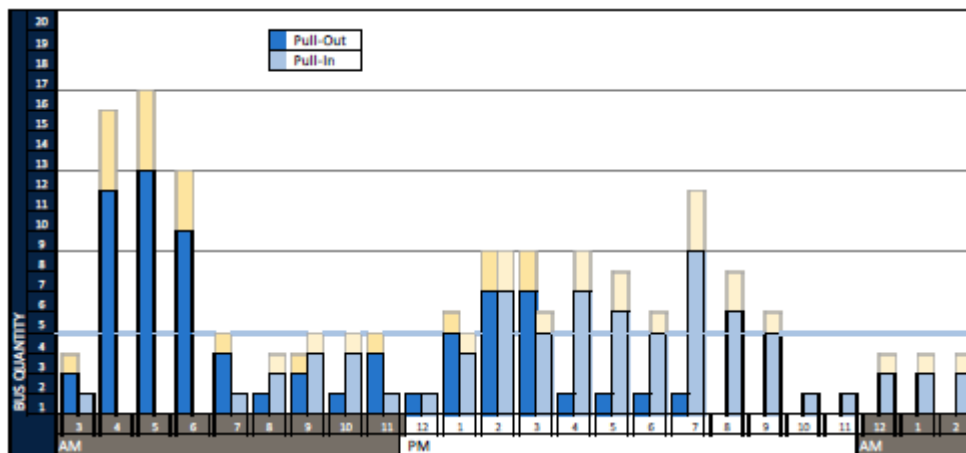


Figure 2. Proportionally Expanded 60-Bus Pull-in and Pull-out Schedule (Feasibility Study Figure 3.12)

The maintenance staff expansion was based on current shift times, assuming three new staff on the 8:00 AM to 4:00 PM shift and two each on the second and third shifts.

For the public parking expansion, Trip Generation⁶ was used to calculate the increase traffic from the public. While the site design is underway, the determination has not been made exactly how many parking spaces will be provided on the maintenance facility site, below the bus garage, and how many will be constructed at the existing park and ride facility that is across from the maintenance facility on

⁵ Regional Transit Center (RTC) Glenwood Springs, Colorado Feasibility Study. Shrewsberry with Iron Horse Architects, November 16, 2016.

⁶ Trip Generation, 10th Edition, Institute of Transportation Engineers, 2016.

Wulfsohn Road. Traffic from both the garage and park and ride lot will impact the intersection of Wulfsohn Road and Midland Avenue in the same way.

Trip Generation⁶ equations for Land Use #90, Park and Ride Lot, were used to calculate the net increase in traffic. First, the trips generated by the existing 85-space facility were calculated. Then trips by the expanded 324-space facility were calculated. The difference between the two is the net increase in traffic caused by the expansion. This net increase results in 202 trip ends in the morning peak of the facility (170 entering, 32 exiting) and 105 trip ends in the evening peak of the facility (26 entering, 79 exiting). Trip generation calculations are shown in Appendix A.

4.2 Trip Distribution

The trips were distributed to area roadways using a different methodology for each source of traffic, using information provided by RFTA where available. Calculations are shown in Appendix A.

The current bus routing has some buses traveling west to Midland Avenue (resulting in northbound left turns), while others travel south on Wulfsohn Road (exiting the study area). Buses return using this route in the opposite direction (resulting in Midland Avenue eastbound right turns). One route has buses traveling eastbound Midland Avenue past Wulfsohn Road (resulting in eastbound through traffic).

For the traffic study, it was assumed that all additional buses will travel west on Midland Avenue and return in the opposite direction (resulting in northbound left turns and eastbound right turns at the study intersection). This assumption neglects those buses traveling south on Wulfsohn Road, which do not impact the study intersection of Midland Avenue and Wulfsohn Road. Therefore, this conservative distribution results in a worst-case traffic scenario.

Public traffic was distributed based on the location of population centers and proximity to other park and ride lots. Using this assumption, 90% of traffic was distributed to and from Midland Avenue west of Wulfsohn Road. The remaining 10% of traffic was distributed to Wulfsohn Road, not impacting the study intersection.

4.3 Trip Assignment

The additional bus and public trips were assigned to the study intersection according to the trip distribution methodology. Calculations of trip assignment are shown in Appendix A. The new trips were added to existing traffic before proceeding with the capacity analysis.



5. Capacity Analysis

Operations analysis was conducted using Synchro 10, which is based on HCM 6th Edition⁷ methodology. Capacity and level of service (LOS) were calculated for the intersection of Wulfsohn Road and Midland Avenue. The LOS ratings indicate the average control delay for each movement or approach, with A being the least delayed and F indicating the most congested conditions. For urban areas, during peak periods, a LOS D or better is generally considered acceptable. Table 1 lists the average control delay thresholds for both signalized and unsignalized intersections.

Level of Service	Unsignalized Control Delay (Seconds per Vehicle)	Signalized Control Delay (Seconds per Vehicle)
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

Table 1. Level of Service Criteria for Intersections

Traffic counts were collected on November 30, 2017 from 4:00 AM to 8:00 PM at the intersection of Wulfsohn Road and Midland Avenue. Traffic data is included in Appendix B.

The purpose of the operational analysis is to investigate the impact that the RFTA maintenance facility expansion has on the intersection of Wulfsohn Road and Midland Avenue. Operations analysis was conducted for the following scenarios:

- 2017 Base Year, existing conditions
- 2020 Opening Year, no-build conditions
- 2020 Opening Year with the RFTA expansion
- 2040 Future Year, no-build conditions
- 2040 Future Year with the RFTA expansion

Two sources of traffic growth will impact the intersection over time. One source is background growth, or the natural increase of traffic in the area due to increasing population and jobs. The forecasted years' traffic volumes were developed using an annual background growth rate of 2.0%. As a conservative measure, this exceeds the regionally projected traffic growth rate of 1.8% per year⁸. The future year no-build conditions include this background growth.

The second source of traffic growth is site-specific development in the immediate vicinity of the intersection. Specifically, the planned expansion of the RFTA maintenance facility will increase the

⁷ Highway Capacity Manual 6th Edition; A Guide for Multimodal Mobility Analysis. Transportation Research Board, Washington, D.C., 2016.

⁸ 2040 Regional Transportation Plan, Intermountain Transportation Planning Region, 2015.



traffic through the intersection, as described in the trip generation section. Other developable land is available near the intersection, but no imminent plans for development are known.

The analysis was conducted during the peak hours of facility traffic, which differs from the peak hours of adjacent street traffic. The peak operation of the RFTA facility is 5:00-6:00 AM and 7:00-8:00 PM. This difference is because RFTA buses are on the street during the peak hours of general traffic, so the RFTA peak hours are before and after the adjacent street peak hours.

The results of the capacity analysis are summarized in Table 2, and the full reports are included in Appendix C. The results are virtually unchanged throughout the scenarios, with only the northbound movement dropping from LOS B to LOS C in the 2040 PM Peak with the RFTA expansion. All LOS results fall within the recommended range for urban or rural areas, and no improvements to the intersection are needed based on traffic operations.

Intersection Control		EB			WB			NB			SB		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2017 Base Year	AM	A	ff	ff	A	ff	ff	B			A	A	
	PM	A	ff	ff	A	ff	ff	B			B	A	
2020 No-Build	AM	A	ff	ff	A	ff	ff	B			A	A	
	PM	A	ff	ff	A	ff	ff	B			B	A	
2020 + site	AM	A	ff	ff	A	ff	ff	B			A	A	
	PM	A	ff	ff	A	ff	ff	B			B	A	
2040 No-Build	AM	A	ff	ff	A	ff	ff	B			A	A	
	PM	A	ff	ff	A	ff	ff	B			B	A	
2040 + site	AM	A	ff	ff	A	ff	ff	B			A	A	
	PM	A	ff	ff	A	ff	ff	C			B	A	

*ff denotes free flowing traffic, no level of service is calculated

Table 2. Level of Service Results



6. Signal Warrant Analysis

A signal warrant analysis was prepared at the intersection of Wulfsohn Road and Midland Avenue using FHWA criteria⁹ for Warrant 1, Eight Hour Vehicle Volume. Full signal warrant calculations are shown in Appendix D. Because of the results of the capacity analysis, only the highest-volume scenario was considered for a possible traffic signal:

- 2040 Future Year with the RFTA expansion

The results of the warrant analysis for the highest-volume scenario show that no traffic signal is warranted. To satisfy Warrant 1, eight hours of traffic volume thresholds must be met for one of three conditions. For Condition A, no hours are met. For Condition B, six hours are met, which is fewer than the eight hours required. For the combination of Conditions A and B, two of eight hours are met.

As such, no signal is justified at the intersection of Wulfsohn Road and Midland Avenue based on traffic volumes in the horizon year of the analysis.

⁹ 2009 Manual on Uniform Traffic Control Devices (MUTCD) with Revisions 1 and 2, Federal Highway Administration, 2012.



7. Recommendations

The expansion of the maintenance facility, and the resulting traffic, will have minimal impact on the intersection of Wulfsohn Road and Midland Avenue. No improvements are needed to mitigate the effects of the additional traffic. No traffic signal is warranted or recommended for the intersection.

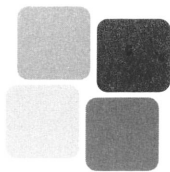
However, the warrant thresholds were approaching warrants in 2040, with six of eight hours satisfied. The intersection should be monitored for additional growth and a signal installed if and when warranted.



Appendix A

Trip Generation, Trip Distribution, and Trip Assignment





shrewsberry

Project Name: RFTA POR

Project No: 15-0276

Description: Trip Distribution + Assignment

Recorded By: JP

Date: 1/2/18 p.1/5

Checked By: MPS

Date: 1/5/18

RFTA Routes - Buses only - Existing
Direction of travel

H= Hogback/Rifle

AM Peak 2 exiting < 1 to midland W ✓
1 to Wulfsohn E ✓

PM Peak 2 entering < 1 from midland W ✓
1 from Wulfsohn E ✓

RG= Ride Glenwood

AM Peak 0 buses

PM Peak 1 entering → 1 from Wulfsohn E ✓
+ 2 midland EB thru

L= Local Valley

AM Peak 2 exiting - 2 to Wulfsohn E ✓

PM Peak 5 stop at Park + Ride but keep going ✓
(turn around)

BRT= Velocity RFTA

AM Peak 6 exiting to P+R then Wulfsohn E ✓

PM Peak 4 entering from P+R via Wulfsohn E

RFTA Peak

5:00 -

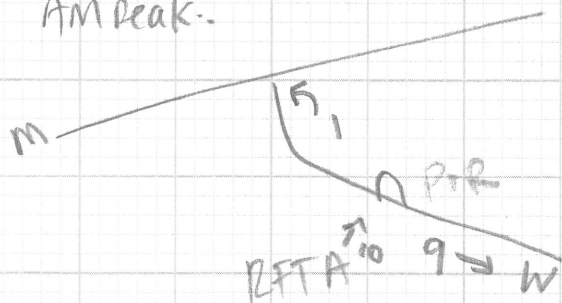
6:00 AM

and

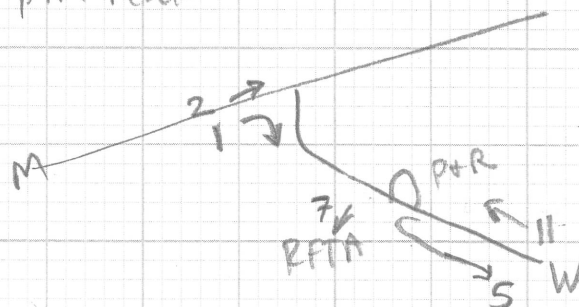
7:00 -

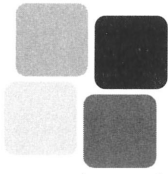
8:00 PM

AM Peak:



PM Peak:





shrewsberry

Project Name: RFTA POR

Project No: 15-0276

Description: Trip Distribution + Assignment

Recorded By: JP

Date: 1/23/18 p. 2/5

Checked By: MPS

Date: 1/24/18

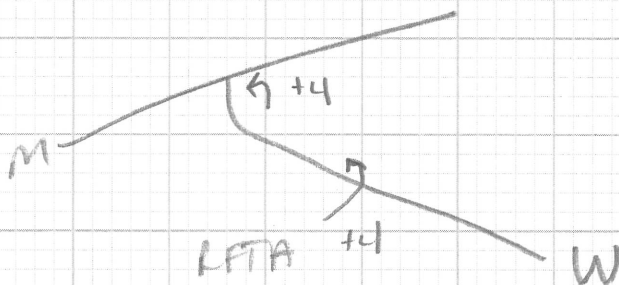
Expanded bus service:

AM Peak: +4 buses, all pull-out

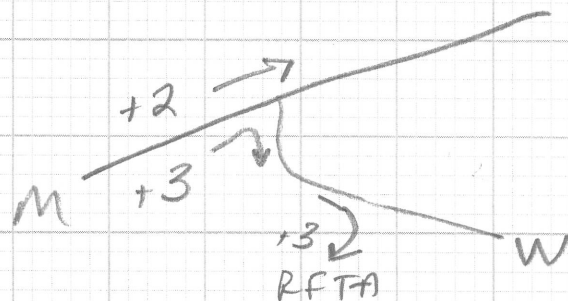
PM Peak: +3 buses, all pull-in

Assume all expansion buses go thru the Midland/Wulfsohn intersection - worst case scenario for the intersection

AM Peak



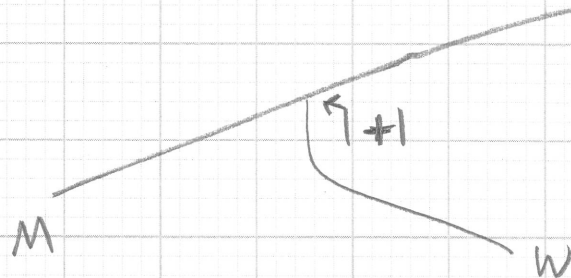
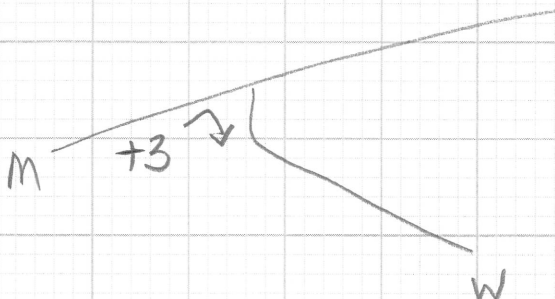
PM Peak

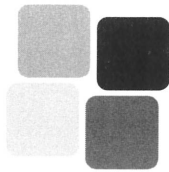


Expanded bus drivers:

AM Peak +3 enter

PM Peak +1 exit





shrewsberry

Project Name: RFTA POR

Project No: 15-0276

Description: Trip Generation

Recorded By: [Signature]

Date: 1/23/18 p.3/5

Checked By: MPS

Date: 1/24/19

LV #90 Park and Ride Lot

Existing 85 spaces (on site + P+R Lot)

Proposed 324 total spaces (garage + P+R paddies)
(239 New Spaces)

AM Peak of Generator

$T = 0.85X - 73.83$ 84% entering

PM Peak of Generator

$T = 0.44x + 5.74$ 24% entering

AM Peak

Existing

$T = 0.85(85) - 73.83$

$T = -1.58 \rightarrow$ Negligible

Proposed

$T = 0.85(324) - 73.83$

$T = 202$ trips

170 entering
32 exiting

PM Peak

Existing

$T = 0.44(85) + 5.74$

$T = 43$ Trips 10 entering
33 exiting

Proposed

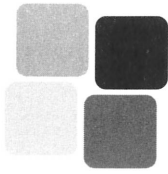
$T = 0.44(324) + 5.74$

$T = 148$ trips

36 entering
112 exiting

Net increase

+26 entering
+79 exiting



shrewsberry

Project Name: RFTA POR

Project No: 15-0276

Description: Trip Distribution + Assignment

Recorded By: [Signature]

Date: 1/23/18 P. 4/5

Checked By: MPS

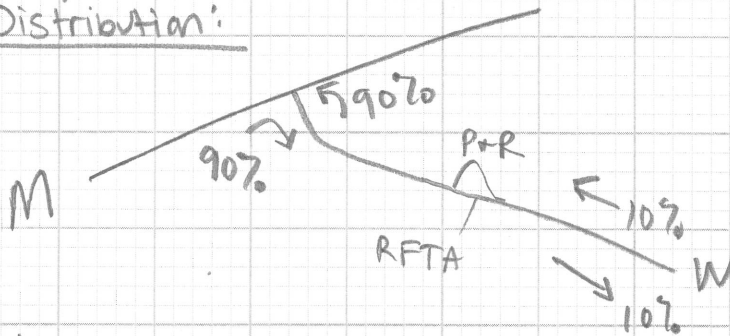
Date: 1/24/18

Park + Ride - Net increase

AM Peak 170 entering
32 exiting

PM Peak 26 entering
79 exiting

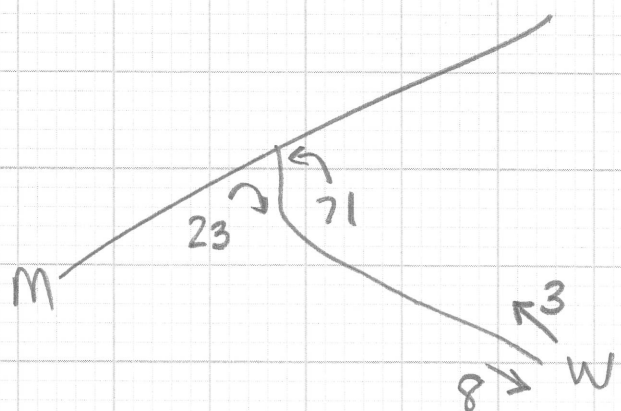
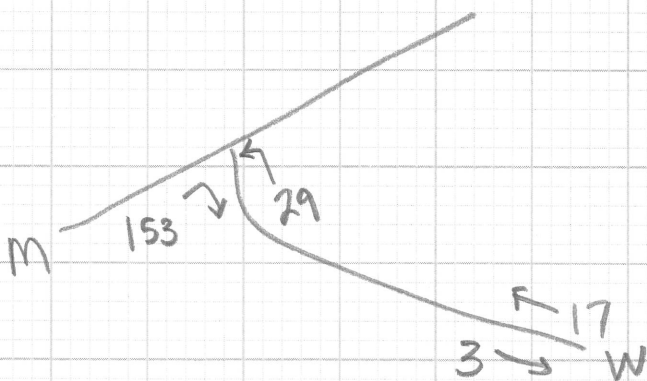
Trip Distribution:



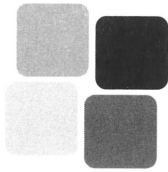
Trip Assignment:

AM Peak

PM Peak



Expanded Maintenance Staff:
None during these peak hours



shrewsberry

Project Name: RPTA POR

Project No: 15-0276

Description: Trip Assignment

Recorded By: JP

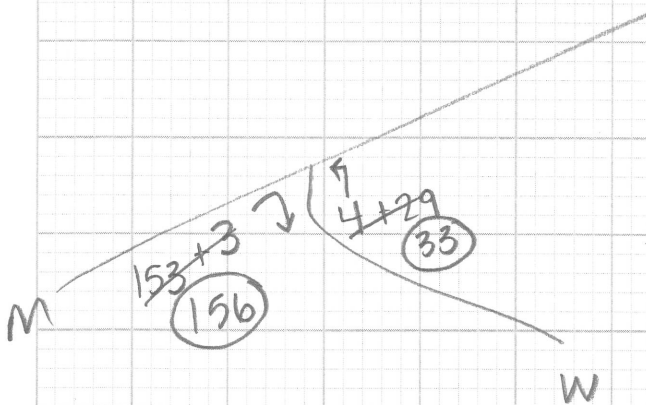
Date: 1/23/18 p.5/5

Checked By: MPS

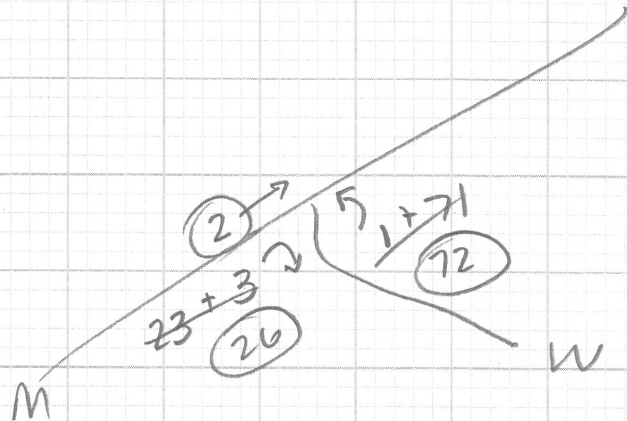
Date: 1/24/18

Total new traffic = Buses + drivers + Maint. Staff (0) +
office staff (0) + General Public
(Park + Ride)

Total trip assignment
AM Peak



PM Peak

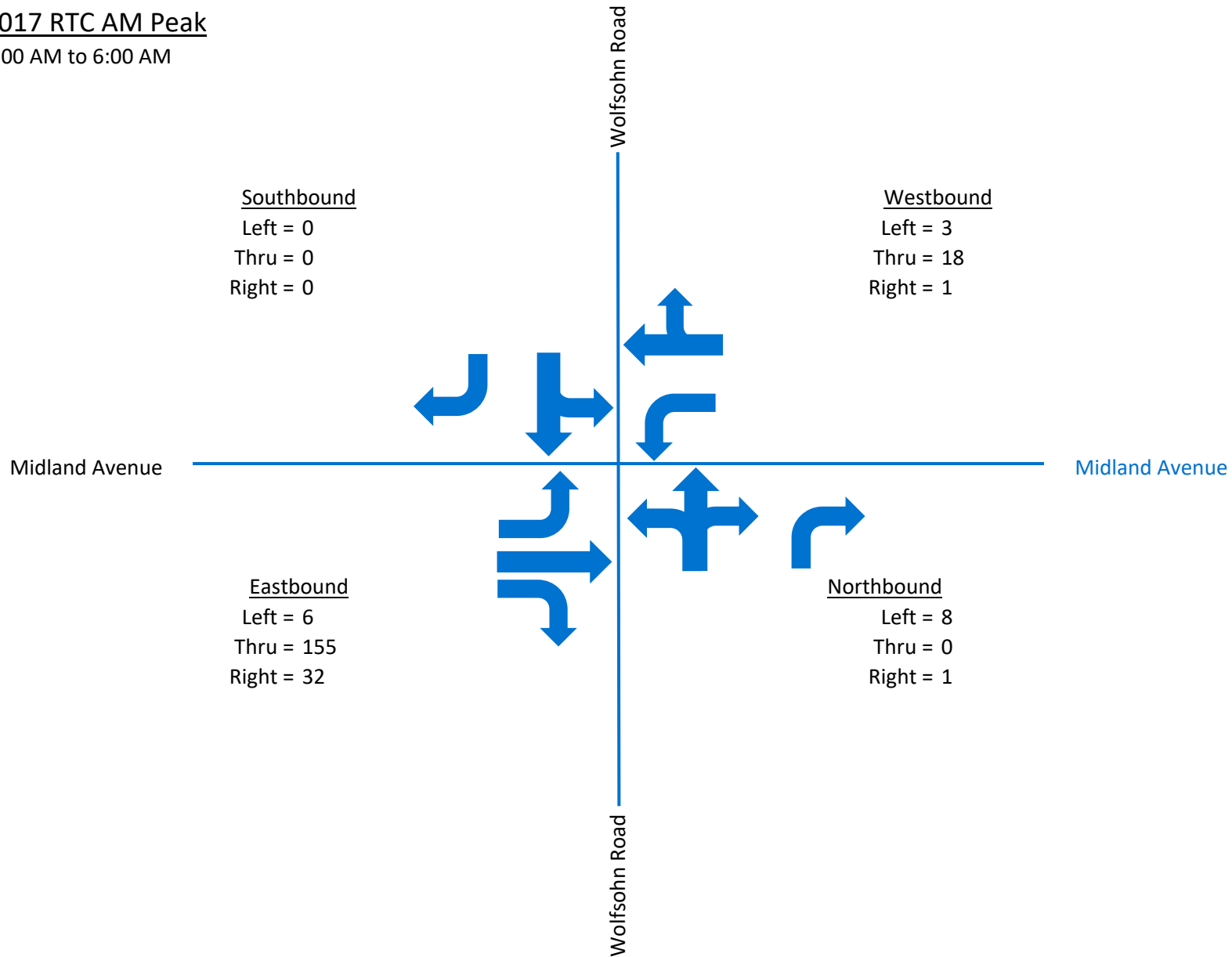


Appendix B

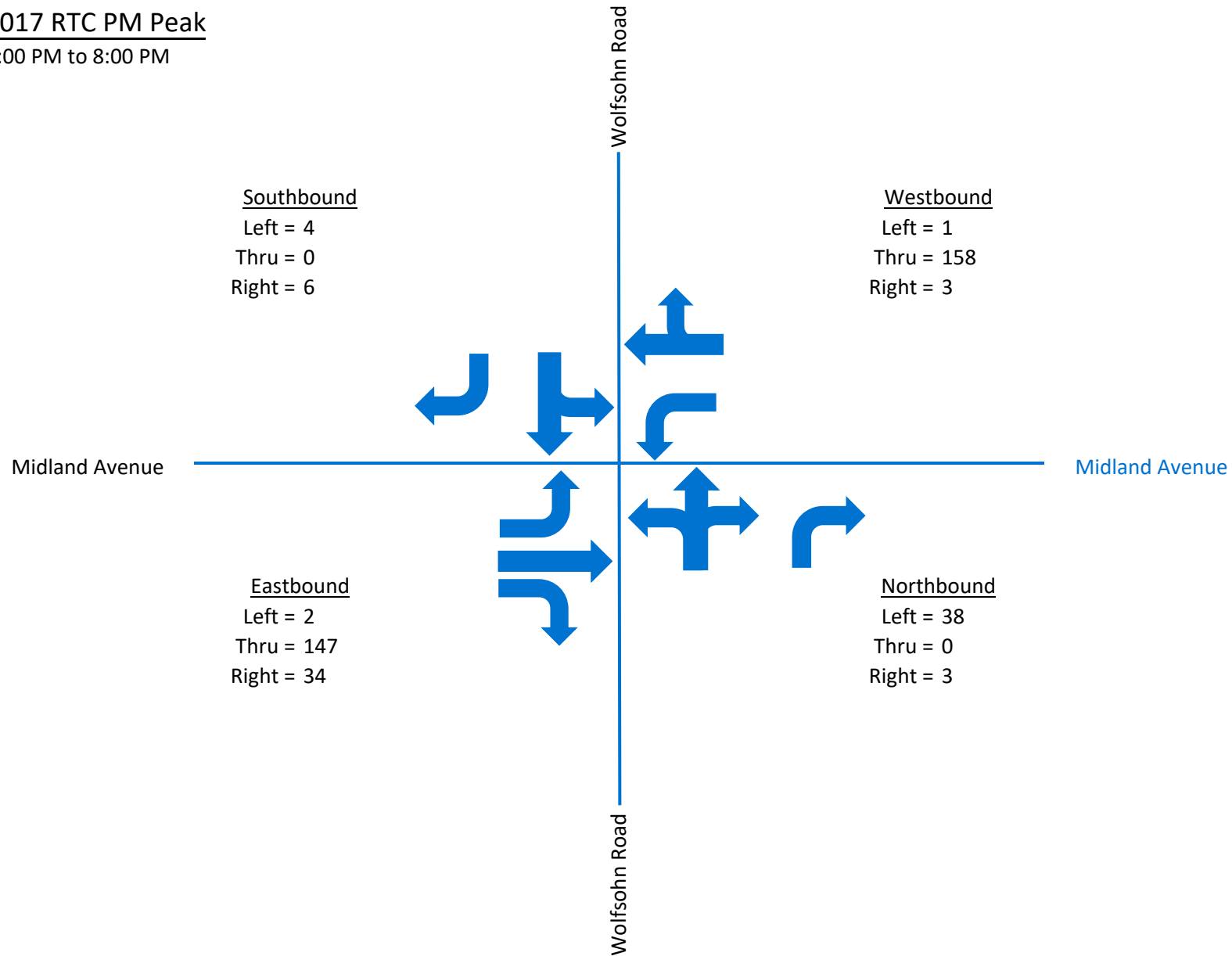
Traffic Counts

Source: Video

2017 RTC AM Peak
5:00 AM to 6:00 AM



2017 RTC PM Peak
7:00 PM to 8:00 PM



Leg Direction Start Time	Wulfsohn Rd Southbound					Midland Ave Westbound					Wulfsohn Rd Northbound					Midland Ave Eastbound					Int Total
	Right	Thru	Left	U-Turn	App Total	Right	Thru	Left	U-Turn	App Total	Right	Thru	Left	U-Turn	App Total	Right	Thru	Left	U-Turn	App Total	
2017-11-30 04:00:00	0	0	0	0	0	0	2	1	0	3	0	0	4	0	4	4	3	0	0	7	14
2017-11-30 04:15:00	0	0	0	0	0	0	3	2	0	5	0	0	0	0	0	3	2	0	0	5	10
2017-11-30 04:30:00	0	0	0	0	0	0	4	2	0	6	0	0	4	0	4	1	6	0	0	7	17
2017-11-30 04:45:00	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1	13	1	0	15	17
2017-11-30 05:00:00	0	0	0	0	0	0	4	2	0	6	0	0	2	0	2	2	17	1	0	20	28
2017-11-30 05:15:00	0	0	0	0	0	0	4	1	0	5	1	0	3	0	4	9	35	0	0	44	53
2017-11-30 05:30:00	0	0	0	0	0	1	6	0	0	7	0	0	1	0	1	9	42	2	0	53	61
2017-11-30 05:45:00	0	0	0	0	0	0	4	0	0	4	0	0	2	0	2	12	61	3	0	76	82
2017-11-30 06:00:00	0	0	0	0	0	0	17	1	0	18	0	0	5	0	5	10	42	2	0	54	77
2017-11-30 06:15:00	0	0	0	0	0	3	14	0	0	17	1	0	0	0	1	9	75	3	0	87	105
2017-11-30 06:30:00	0	0	1	0	1	1	20	1	0	22	0	0	2	0	2	13	75	6	0	94	119
2017-11-30 06:45:00	2	0	2	0	4	7	20	1	0	28	0	0	1	0	1	25	104	3	0	132	165
2017-11-30 07:00:00	1	1	2	0	4	0	27	0	0	27	0	0	2	0	2	12	72	3	0	87	120
2017-11-30 07:15:00	2	0	0	0	2	0	44	0	0	44	0	0	9	0	9	8	100	4	0	112	167
2017-11-30 07:30:00	3	0	3	0	6	4	46	0	0	50	0	0	3	0	3	9	156	4	0	169	228
2017-11-30 07:45:00	1	0	1	0	2	0	39	0	0	39	0	1	6	0	7	13	155	0	0	168	216
2017-11-30 08:00:00	0	1	2	0	3	1	50	0	0	51	0	0	3	0	3	12	121	7	0	140	197
2017-11-30 08:15:00	0	0	3	0	3	5	50	0	0	55	2	0	7	0	9	10	104	2	0	116	183
2017-11-30 08:30:00	0	0	0	0	0	6	30	0	0	36	1	0	6	0	7	14	85	1	2	102	145
2017-11-30 08:45:00	0	0	2	0	2	2	51	2	0	55	1	1	6	0	8	18	88	4	0	110	175
2017-11-30 09:00:00	1	1	12	0	14	0	35	0	0	35	0	0	8	0	8	12	90	5	0	107	164
2017-11-30 09:15:00	4	0	1	0	5	8	42	1	0	51	2	1	6	0	9	17	80	9	0	106	171
2017-11-30 09:30:00	3	3	5	0	11	4	46	0	0	50	0	0	2	0	2	9	97	4	0	110	173
2017-11-30 09:45:00	0	0	3	0	3	8	52	0	0	60	2	1	6	0	9	16	81	4	0	101	173
2017-11-30 10:00:00	2	0	3	0	5	5	39	2	0	46	1	0	5	0	6	14	71	4	0	89	146
2017-11-30 10:15:00	1	0	5	0	6	7	44	0	0	51	1	0	10	0	11	13	76	5	0	94	162
2017-11-30 10:30:00	3	1	3	0	7	3	53	2	0	58	0	0	8	0	8	9	75	5	0	89	162
2017-11-30 10:45:00	5	2	4	0	11	4	65	1	0	70	1	0	5	0	6	22	81	1	0	104	191
2017-11-30 11:00:00	7	0	5	0	12	4	69	0	0	73	0	1	8	0	9	16	74	1	0	91	185
2017-11-30 11:15:00	1	0	6	0	7	5	46	1	0	52	0	2	6	0	8	13	104	4	0	121	188
2017-11-30 11:30:00	4	0	11	0	15	7	72	1	0	80	0	0	4	0	4	12	87	0	0	99	198
2017-11-30 11:45:00	7	0	2	0	9	4	77	1	0	82	3	0	5	0	8	18	83	5	0	106	205
2017-11-30 12:00:00	7	1	7	0	15	3	72	2	0	77	1	0	19	0	20	15	101	6	0	122	234
2017-11-30 12:15:00	7	1	3	0	11	2	79	1	0	82	1	0	7	0	8	19	86	2	1	108	209
2017-11-30 12:30:00	3	2	2	0	7	4	83	2	0	89	0	0	16	0	16	19	86	6	0	111	223
2017-11-30 12:45:00	5	0	4	0	9	6	93	1	0	100	1	2	10	0	13	13	119	4	0	136	258
2017-11-30 13:00:00	1	0	5	0	6	3	89	2	0	94	1	0	14	0	15	19	95	2	0	116	231
2017-11-30 13:15:00	4	0	7	0	11	7	84	1	0	92	1	0	14	0	15	13	95	4	0	112	230
2017-11-30 13:30:00	1	0	5	0	6	5	73	1	0	79	0	0	10	0	10	14	96	5	1	116	211
2017-11-30 13:45:00	5	1	3	0	9	3	85	2	0	90	0	1	6	0	7	25	61	9	0	95	201

Leg Direction Start Time	Wulfsohn Rd Southbound					Midland Ave Westbound					Wulfsohn Rd Northbound					Midland Ave Eastbound					Int Total
	Right	Thru	Left	U-Turn	App Total	Right	Thru	Left	U-Turn	App Total	Right	Thru	Left	U-Turn	App Total	Right	Thru	Left	U-Turn	App Total	
2017-11-30 14:00:00	3	0	6	0	9	3	103	0	0	106	1	0	14	0	15	18	84	1	0	103	233
2017-11-30 14:15:00	6	1	5	0	12	5	104	0	0	109	1	0	6	0	7	13	77	1	0	91	219
2017-11-30 14:30:00	1	0	5	0	6	6	82	0	0	88	1	1	15	0	17	12	98	1	0	111	222
2017-11-30 14:45:00	5	0	6	0	11	9	127	1	0	137	1	0	11	0	12	7	72	1	0	80	240
2017-11-30 15:00:00	3	1	5	0	9	5	129	2	0	136	0	0	12	0	12	13	79	1	0	93	250
2017-11-30 15:15:00	8	2	4	0	14	6	121	1	0	128	2	2	13	0	17	15	96	2	0	113	272
2017-11-30 15:30:00	4	0	2	0	6	6	129	1	0	136	0	0	31	0	31	17	91	1	0	109	282
2017-11-30 15:45:00	3	1	3	0	7	4	128	0	0	132	0	0	18	0	18	25	92	2	0	119	276
2017-11-30 16:00:00	4	1	0	0	5	7	141	0	0	148	0	0	11	0	11	17	81	3	0	101	265
2017-11-30 16:15:00	6	0	5	0	11	4	146	0	0	150	0	0	11	0	11	13	81	4	0	98	270
2017-11-30 16:30:00	3	0	6	0	9	2	133	2	0	137	2	1	16	0	19	12	77	3	0	92	257
2017-11-30 16:45:00	5	1	5	0	11	2	137	0	0	139	0	0	15	0	15	17	79	0	1	97	262
2017-11-30 17:00:00	5	2	3	0	10	3	183	3	0	189	1	0	15	0	16	15	105	1	0	121	336
2017-11-30 17:15:00	2	0	4	0	6	6	138	0	0	144	0	0	10	0	10	9	78	2	0	89	249
2017-11-30 17:30:00	3	0	2	0	5	1	129	0	0	130	0	0	9	0	9	12	70	0	0	82	226
2017-11-30 17:45:00	2	0	1	0	3	1	94	0	0	95	1	0	12	0	13	14	72	3	0	89	200
2017-11-30 18:00:00	3	5	2	0	10	1	100	0	0	101	0	0	17	0	17	8	59	1	0	68	196
2017-11-30 18:15:00	4	5	2	1	12	7	90	0	2	99	1	0	20	0	21	9	47	3	0	59	191
2017-11-30 18:30:00	8	0	8	0	16	5	60	1	2	68	0	0	11	0	11	20	55	1	0	76	171
2017-11-30 18:45:00	3	0	1	0	4	2	68	0	0	70	0	0	10	0	10	6	45	1	0	52	136
2017-11-30 19:00:00	3	0	0	0	3	0	41	0	0	41	1	0	7	0	8	13	37	0	0	50	102
2017-11-30 19:15:00	1	0	3	0	4	2	39	1	0	42	1	0	10	0	11	7	43	1	0	51	108
2017-11-30 19:30:00	1	0	0	0	1	0	42	0	0	42	0	0	8	0	8	10	36	0	0	46	97
2017-11-30 19:45:00	1	0	1	0	2	1	36	0	0	37	1	0	13	0	14	4	31	1	0	36	89
Grand Total	167	33	191	1	392	211	4233	46	4	4494	35	14	551	0	600	808	4779	165	5	5757	11243
% Approach	42.60%	8.42%	48.72%	0.26%		4.70%	94.19%	1.02%	0.09%		5.83%	2.33%	91.83%	0.00%		14.04%	83.01%	2.87%	0.09%		
% Total	1.49%	0.29%	1.70%	0.01%	3.49%	1.88%	37.65%	0.41%	0.04%	39.97%	0.31%	0.12%	4.90%	0.00%	5.34%	7.19%	42.51%	1.47%	0.04%	51.21%	
Lights	159	32	189	1	381	207	4121	41	4	4373	29	13	482	0	524	765	4647	158	4	5574	10852
% Lights	95.21%	96.97%	98.95%	100.00%	97.19%	98.10%	97.35%	89.13%	100.00%	97.31%	82.86%	92.86%	87.48%	0.00%	87.33%	94.68%	97.24%	95.76%	80.00%	96.82%	96.52%
Single-Unit Trucks	8	1	1	0	10	4	65	4	0	73	1	1	16	0	18	17	62	6	1	86	187
% Single-Unit Trucks	4.79%	3.03%	0.52%	0.00%	2.55%	1.90%	1.54%	8.70%	0.00%	1.62%	2.86%	7.14%	2.90%	0.00%	3.00%	2.10%	1.30%	3.64%	20.00%	1.49%	1.66%
Articulated Trucks	0	0	1	0	1	0	23	0	0	23	0	0	4	0	4	1	23	1	0	25	53
% Articulated Trucks	0.00%	0.00%	0.52%	0.00%	0.26%	0.00%	0.54%	0.00%	0.00%	0.51%	0.00%	0.00%	0.73%	0.00%	0.67%	0.12%	0.48%	0.61%	0.00%	0.43%	0.47%
Buses	0	0	0	0	0	0	24	1	0	25	5	0	49	0	54	25	47	0	0	72	151
% Buses	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.57%	2.17%	0.00%	0.56%	14.29%	0.00%	8.89%	0.00%	9.00%	3.09%	0.98%	0.00%	0.00%	1.25%	1.34%

Appendix C

Capacity Analysis



HCM 6th TWSC
3: Wulfsohn Road/Wolfsohn Road & Midland Avenue

2017 Base Year
RTC AM Peak

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	155	32	3	18	1	8	0	1	0	0	0
Future Vol, veh/h	6	155	32	3	18	1	8	0	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	64	67	38	75	25	67	100	25	100	100	100
Heavy Vehicles, %	0	1	3	0	0	0	38	0	0	0	0	0
Mvmt Flow	12	242	48	8	24	4	12	0	4	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	28	0	0	290	0	0	308	310	242	334	356	26
Stage 1	-	-	-	-	-	-	266	266	-	42	42	-
Stage 2	-	-	-	-	-	-	42	44	-	292	314	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.48	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.48	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.48	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.842	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1599	-	-	1283	-	-	580	608	802	623	573	1056
Stage 1	-	-	-	-	-	-	667	692	-	978	864	-
Stage 2	-	-	-	-	-	-	888	862	-	720	660	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1599	-	-	1283	-	-	574	599	802	614	565	1056
Mov Cap-2 Maneuver	-	-	-	-	-	-	574	599	-	614	565	-
Stage 1	-	-	-	-	-	-	662	686	-	970	859	-
Stage 2	-	-	-	-	-	-	882	857	-	711	655	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	1.7	11	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	618	1599	-	-	1283	-	-	-	-
HCM Lane V/C Ratio	0.026	0.008	-	-	0.006	-	-	-	-
HCM Control Delay (s)	11	7.3	-	-	7.8	-	-	0	0
HCM Lane LOS	B	A	-	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-	-

HCM 6th TWSC
3: Wulfsohn Road/Wolfsohn Road & Midland Avenue

2017 Base Year
RTC PM Peak

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	147	34	1	158	3	38	0	3	4	0	6
Future Vol, veh/h	2	147	34	1	158	3	38	0	3	4	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	85	65	25	94	38	73	100	75	33	100	50
Heavy Vehicles, %	0	3	5	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	173	52	4	168	8	52	0	4	12	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	176	0	0	225	0	0	367	365	173	389	413	172
Stage 1	-	-	-	-	-	-	181	181	-	180	180	-
Stage 2	-	-	-	-	-	-	186	184	-	209	233	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1412	-	-	1356	-	-	593	566	876	574	532	877
Stage 1	-	-	-	-	-	-	825	754	-	826	754	-
Stage 2	-	-	-	-	-	-	820	751	-	798	716	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1412	-	-	1356	-	-	582	563	876	569	529	877
Mov Cap-2 Maneuver	-	-	-	-	-	-	582	563	-	569	529	-
Stage 1	-	-	-	-	-	-	823	752	-	824	752	-
Stage 2	-	-	-	-	-	-	806	749	-	792	714	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.2			11.7			10.4		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	596	1412	-	-	1356	-	-	569	877
HCM Lane V/C Ratio	0.094	0.003	-	-	0.003	-	-	0.021	0.014
HCM Control Delay (s)	11.7	7.6	-	-	7.7	-	-	11.5	9.2
HCM Lane LOS	B	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.1	0

HCM 6th TWSC
3: Wulfsohn Road/Wolfsohn Road & Midland Avenue

2020 No Build
RTC AM Peak

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	155	32	3	18	1	8	0	1	0	0	0
Future Vol, veh/h	6	155	32	3	18	1	8	0	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	64	67	38	75	25	67	100	25	100	100	100
Heavy Vehicles, %	0	1	3	0	0	0	38	0	0	0	0	0
Mvmt Flow	13	257	51	8	25	4	13	0	4	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	29	0	0	308	0	0	326	328	257	354	377	27
Stage 1	-	-	-	-	-	-	283	283	-	43	43	-
Stage 2	-	-	-	-	-	-	43	45	-	311	334	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.48	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.48	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.48	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.842	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1597	-	-	1264	-	-	564	594	787	605	558	1054
Stage 1	-	-	-	-	-	-	652	681	-	976	863	-
Stage 2	-	-	-	-	-	-	887	861	-	704	647	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1597	-	-	1264	-	-	558	586	787	595	550	1054
Mov Cap-2 Maneuver	-	-	-	-	-	-	558	586	-	595	550	-
Stage 1	-	-	-	-	-	-	647	676	-	968	858	-
Stage 2	-	-	-	-	-	-	881	856	-	695	642	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			1.7			11.2			0		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	602	1597	-	-	1264	-	-	-	-
HCM Lane V/C Ratio	0.028	0.008	-	-	0.007	-	-	-	-
HCM Control Delay (s)	11.2	7.3	-	-	7.9	-	-	0	0
HCM Lane LOS	B	A	-	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-	-

HCM 6th TWSC
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Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	147	34	1	158	3	38	0	3	4	0	6
Future Vol, veh/h	2	147	34	1	158	3	38	0	3	4	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	85	65	25	94	38	73	100	75	33	100	50
Heavy Vehicles, %	0	3	5	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	183	55	4	178	8	55	0	4	13	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	186	0	0	238	0	0	388	385	183	411	436	182
Stage 1	-	-	-	-	-	-	191	191	-	190	190	-
Stage 2	-	-	-	-	-	-	197	194	-	221	246	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1401	-	-	1341	-	-	574	552	865	555	517	866
Stage 1	-	-	-	-	-	-	815	746	-	816	747	-
Stage 2	-	-	-	-	-	-	809	744	-	786	706	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1401	-	-	1341	-	-	563	549	865	550	514	866
Mov Cap-2 Maneuver	-	-	-	-	-	-	563	549	-	550	514	-
Stage 1	-	-	-	-	-	-	813	744	-	814	745	-
Stage 2	-	-	-	-	-	-	795	742	-	780	704	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.2	12	10.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	577	1401	-	-	1341	-	-	550	866
HCM Lane V/C Ratio	0.103	0.003	-	-	0.003	-	-	0.023	0.015
HCM Control Delay (s)	12	7.6	-	-	7.7	-	-	11.7	9.2
HCM Lane LOS	B	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.1	0

HCM 6th TWSC
3: Wulfsohn Road/Wolfsohn Road & Midland Avenue

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Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	164	190	3	19	1	41	0	1	0	0	0
Future Vol, veh/h	6	164	190	3	19	1	41	0	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	64	75	38	75	25	75	100	25	100	100	100
Heavy Vehicles, %	0	1	3	0	0	0	58	0	0	0	0	0
Mvmt Flow	12	256	253	8	25	4	55	0	4	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	29	0	0	509	0	0	323	325	256	452	576	27
Stage 1	-	-	-	-	-	-	280	280	-	43	43	-
Stage 2	-	-	-	-	-	-	43	45	-	409	533	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.68	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.68	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.68	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	4.022	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1597	-	-	1066	-	-	535	596	788	521	431	1054
Stage 1	-	-	-	-	-	-	620	683	-	976	863	-
Stage 2	-	-	-	-	-	-	846	861	-	623	528	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1597	-	-	1066	-	-	529	586	788	513	424	1054
Mov Cap-2 Maneuver	-	-	-	-	-	-	529	586	-	513	424	-
Stage 1	-	-	-	-	-	-	615	678	-	968	856	-
Stage 2	-	-	-	-	-	-	840	854	-	615	524	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.8	12.5	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	541	1597	-	-	1066	-	-	-	-
HCM Lane V/C Ratio	0.108	0.008	-	-	0.007	-	-	-	-
HCM Control Delay (s)	12.5	7.3	-	-	8.4	-	-	0	0
HCM Lane LOS	B	A	-	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	-	-

HCM 6th TWSC
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RTC PM Peak

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	158	62	1	167	3	112	0	3	4	0	6
Future Vol, veh/h	2	158	62	1	167	3	112	0	3	4	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	85	66	25	94	38	73	100	75	33	100	50
Heavy Vehicles, %	0	3	22	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	186	94	4	178	8	153	0	4	12	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	186	0	0	280	0	0	390	388	186	433	478	182
Stage 1	-	-	-	-	-	-	194	194	-	190	190	-
Stage 2	-	-	-	-	-	-	196	194	-	243	288	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1401	-	-	1294	-	-	573	550	861	537	489	866
Stage 1	-	-	-	-	-	-	812	744	-	816	747	-
Stage 2	-	-	-	-	-	-	810	744	-	765	677	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1401	-	-	1294	-	-	563	547	861	532	486	866
Mov Cap-2 Maneuver	-	-	-	-	-	-	563	547	-	532	486	-
Stage 1	-	-	-	-	-	-	810	742	-	814	745	-
Stage 2	-	-	-	-	-	-	796	742	-	759	675	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.2			13.8			10.6		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	568	1401	-	-	1294	-	-	532	866
HCM Lane V/C Ratio	0.277	0.003	-	-	0.003	-	-	0.023	0.014
HCM Control Delay (s)	13.8	7.6	-	-	7.8	-	-	11.9	9.2
HCM Lane LOS	B	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0.1	0

HCM 6th TWSC
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Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	155	32	3	18	1	8	0	1	0	0	0
Future Vol, veh/h	6	155	32	3	18	1	8	0	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	64	67	38	75	25	67	100	25	100	100	100
Heavy Vehicles, %	0	1	3	0	0	0	38	0	0	0	0	0
Mvmt Flow	18	354	70	12	35	6	17	0	6	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	41	0	0	424	0	0	452	455	354	490	522	38
Stage 1	-	-	-	-	-	-	390	390	-	62	62	-
Stage 2	-	-	-	-	-	-	62	65	-	428	460	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.48	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.48	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.48	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.842	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1581	-	-	1146	-	-	462	504	694	492	462	1040
Stage 1	-	-	-	-	-	-	568	611	-	954	847	-
Stage 2	-	-	-	-	-	-	866	845	-	609	569	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1581	-	-	1146	-	-	454	493	694	480	452	1040
Mov Cap-2 Maneuver	-	-	-	-	-	-	454	493	-	480	452	-
Stage 1	-	-	-	-	-	-	562	604	-	944	839	-
Stage 2	-	-	-	-	-	-	857	837	-	597	563	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	1.8	12.6	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	497	1581	-	-	1146	-	-	-	-
HCM Lane V/C Ratio	0.047	0.011	-	-	0.01	-	-	-	-
HCM Control Delay (s)	12.6	7.3	-	-	8.2	-	-	0	0
HCM Lane LOS	B	A	-	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-	-

HCM 6th TWSC
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RTC PM Peak

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	147	34	1	158	3	38	0	3	4	0	6
Future Vol, veh/h	2	147	34	1	158	3	38	0	3	4	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	85	65	25	94	38	73	100	75	33	100	50
Heavy Vehicles, %	0	3	5	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	252	76	6	245	12	76	0	6	18	0	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	257	0	0	328	0	0	536	533	252	568	603	251
Stage 1	-	-	-	-	-	-	264	264	-	263	263	-
Stage 2	-	-	-	-	-	-	272	269	-	305	340	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1320	-	-	1243	-	-	459	456	792	437	416	793
Stage 1	-	-	-	-	-	-	746	694	-	747	694	-
Stage 2	-	-	-	-	-	-	738	690	-	709	643	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1320	-	-	1243	-	-	446	451	792	431	412	793
Mov Cap-2 Maneuver	-	-	-	-	-	-	446	451	-	431	412	-
Stage 1	-	-	-	-	-	-	742	691	-	743	691	-
Stage 2	-	-	-	-	-	-	718	687	-	701	640	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.2			14.5			11.7		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	460	1320	-	-	1243	-	-	431	793
HCM Lane V/C Ratio	0.178	0.004	-	-	0.005	-	-	0.041	0.022
HCM Control Delay (s)	14.5	7.7	-	-	7.9	-	-	13.7	9.6
HCM Lane LOS	B	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.1	0.1

HCM 6th TWSC
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RTC AM Peak

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	226	203	4	26	1	45	0	1	0	0	0
Future Vol, veh/h	9	226	203	4	26	1	45	0	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	64	75	38	75	25	75	100	25	100	100	100
Heavy Vehicles, %	0	1	3	0	0	0	58	0	0	0	0	0
Mvmt Flow	18	353	271	11	35	4	60	0	4	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	39	0	0	624	0	0	448	450	353	586	719	37
Stage 1	-	-	-	-	-	-	389	389	-	59	59	-
Stage 2	-	-	-	-	-	-	59	61	-	527	660	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.68	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.68	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.68	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	4.022	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1584	-	-	967	-	-	437	508	695	425	357	1041
Stage 1	-	-	-	-	-	-	536	612	-	958	850	-
Stage 2	-	-	-	-	-	-	829	848	-	538	463	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1584	-	-	967	-	-	430	497	695	415	349	1041
Mov Cap-2 Maneuver	-	-	-	-	-	-	430	497	-	415	349	-
Stage 1	-	-	-	-	-	-	530	605	-	947	841	-
Stage 2	-	-	-	-	-	-	820	839	-	529	458	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1.9			14.6			0		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2			
Capacity (veh/h)	440	1584	-	-	967	-	-	-	-			
HCM Lane V/C Ratio	0.145	0.011	-	-	0.011	-	-	-	-			
HCM Control Delay (s)	14.6	7.3	-	-	8.8	-	-	0	0			
HCM Lane LOS	B	A	-	-	A	-	-	A	A			
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	-	-			

HCM 6th TWSC
3: Wulfsohn Road/Wolfsohn Road & Midland Avenue

2040 with Site
RTC PM Peak

Intersection												
Int Delay, s/veh	4.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	217	76	1	231	4	127	0	4	6	0	9
Future Vol, veh/h	3	217	76	1	231	4	127	0	4	6	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	40	95	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	85	66	25	94	38	73	100	75	33	100	50
Heavy Vehicles, %	0	3	22	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	255	115	4	246	11	174	0	5	18	0	18
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	257	0	0	370	0	0	536	532	255	587	642	252
Stage 1	-	-	-	-	-	-	267	267	-	260	260	-
Stage 2	-	-	-	-	-	-	269	265	-	327	382	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1320	-	-	1200	-	-	459	456	789	424	395	792
Stage 1	-	-	-	-	-	-	743	692	-	749	697	-
Stage 2	-	-	-	-	-	-	741	693	-	690	616	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1320	-	-	1200	-	-	446	452	789	418	392	792
Mov Cap-2 Maneuver	-	-	-	-	-	-	446	452	-	418	392	-
Stage 1	-	-	-	-	-	-	739	689	-	745	695	-
Stage 2	-	-	-	-	-	-	722	691	-	682	613	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.1			18.1			11.9		
HCM LOS							C			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2			
Capacity (veh/h)	452	1320	-	-	1200	-	-	418	792			
HCM Lane V/C Ratio	0.397	0.005	-	-	0.003	-	-	0.043	0.023			
HCM Control Delay (s)	18.1	7.7	-	-	8	-	-	14	9.7			
HCM Lane LOS	C	A	-	-	A	-	-	B	A			
HCM 95th %tile Q(veh)	1.9	0	-	-	0	-	-	0.1	0.1			

Appendix D

Signal Warrants

ANALYSIS OF WARRANTS FOR TRAFFIC SIGNALS (2040 Future Year)

Location:	Major Street: <u>Midland Avenue</u>	Minor Street: <u>Wulfsohn Road</u>	Date: <u>12/20/2017</u>
Major Street Approach Lanes:	<u>1</u>	Minor Street Approach Lanes: <u>1</u>	By: <u>MPS</u>
Major Street Posted Speed:	<u>35/25</u> MPH	Minor Street Posted Speed: <u>25</u> MPH	Date of Count: <u>2040 Projected</u>
Major Street 85th % Speed:	<u><35</u> MPH		

Time	Major Street Two-Way Volume - 50% of Right Turns	Minor Street Highest Volume Approach - 50% of Right Turns	Pedestrian Crossing Major Street	WARRANT 1		WARRANT 1		WARRANT 4		WARRANT 1, combination of Conditions A and B, 80%					
				Condition A: 8-Hour Vehicular Volume		Condition B: Interruption of Continuous Traffic		Minimum Pedestrian Volume		Condition A: 8-Hour Vehicular Volume		Condition B: Interruption of Continuous Traffic		Minimum Pedestrian Volume	
				MINIMUM VEHICULAR VOLUMES											
				Major 500 (1)	Minor 150 (1)	Major 750 (1)	Minor 75 (1)	Major 600 (3)	Peds. 150	Major 400 (1)	Minor 120 (1)	Major 600 (1)	Minor 60 (1)	Major 480 (3)	Peds. 120
				600 (2)	200 (2)	900 (2)	100 (2)	1000 (4)		480 (2)	160 (2)	720 (2)	80 (2)	800 (4)	
				MINIMUM VEHICULAR VOLUMES WHEN 85th % SPEED IS GREATER THAN 40 MPH											
				350 (1) 420 (2)	105 (1) 140 (2)	525 (1) 630 (2)	53 (1) 70 (2)	420 (3) 700 (4)	105	280 (1) 340 (2)	84 (1) 112 (2)	420 (1) 500 (2)	42 (1) 56 (2)	340 (3) 560 (4)	84
7:00AM - 8:00AM	1015	48		1	0	1	0			1	0	1	0		
8:00AM - 9:00AM	923	39		1	0	1	0			1	0	1	0		
9:00AM - 10:00AM	853	43		1	0	1	0			1	0	1	0		
10:00AM - 11:00AM	823	44		1	0	1	0			1	0	1	0		
11:00AM - 12:00PM	971	49		1	0	1	0			1	0	1	0		
12:00PM - 1:00PM	1147	82		1	0	1	1			1	0	1	1		
1:00PM - 2:00PM	1096	69		1	0	1	0			1	0	1	1		
2:00PM - 3:00PM	1155	75		1	0	1	1			1	0	1	1		
3:00PM - 4:00PM	1346	117		1	0	1	1			1	0	1	1		
4:00PM - 5:00PM	1353	85		1	0	1	1			1	0	1	1		
5:00PM - 6:00PM	1338	132		1	0	1	1			1	1	1	1		
6:00PM - 7:00PM	836	123		1	0	1	1			1	1	1	1		
				0		6				2		7			
				NO		NO				NO					

(1) one lane approach

(2) two lane approach

(3) undivided roadway

(4) divided roadway

SOURCE: *Manual on Uniform Traffic Control Devices with Revisions 1 and 2; Federal Highway Administration, 2009*

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Maintenance Facility
Glenwood Springs, Colorado
Revision 1**



Prepared For:

Shrewsberry

**2696 South Colorado Boulevard, Suite 585
Denver, Colorado 80202**

Attention: Mr. Eric Rolle

Job Number: 17-3061

May 4, 2018

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PURPOSE AND SCOPE OF STUDY

This report presents the results of a geotechnical evaluation performed by GROUND Engineering Consultants, Inc. (GROUND) for Shrewsberry, in support of project planning and initial design of the proposed expansion of the Roaring Fork Transportation Authority maintenance facility at 2307 Wulfsohn Road in Glenwood Springs, Colorado. Our study was conducted in general accordance with GROUND's Proposal No. 1617-0048 Revised2, dated March 17, 2017.

A field exploration program was conducted to obtain information about the subsurface conditions. Material samples obtained during the subsurface exploration were tested in the laboratory to provide data on the engineering characteristics of the on-site soils. The results of the field exploration and laboratory testing are presented herein.

Additional information was obtained from other geotechnical evaluations of the site or nearby locations. These included HP Geotek (2001)¹, GROUND (2009)², CTL|Thompson (2010)³ and Yeh & Associates, Inc. (2015, 2016)^{4, 5} provided by Shrewsberry. Parties utilizing this report should review these reports and others relevant to the site.

This report has been prepared to summarize the data obtained and to present our findings and conclusions based on the proposed development/improvements and the subsurface conditions encountered. Proposed design parameters and a discussion of engineering considerations related to the proposed improvements for project planning and initial design are included herein. This report should be understood and utilized in

¹ HP Geotech, 2001, *Geotechnical Study, Proposed RTA Facility, Wulfsohn Ranch, Glenwood Springs, Colorado, Job No. 100 848-1, prepared for FCI Constructors, Inc., dated February 27.*

² GROUND Engineering Consultants, Inc., 2009, *Limited Subsurface Exploration Program, Site Reconnaissance and Geotechnical Findings, Roaring Fork Transportation Authority, Bus Maintenance Center, Possible Building Movement/Displacement Assessment, Glenwood Springs, Colorado, Job No. 09-6021, prepared for ARC Integrated Program Maintenance, dated October 22.*

³ CTL|Thompson, 2010, *Geotechnical Exploration and Evaluation, Potential Foundation and Floor Slab Remediation, RFTA Glenwood Maintenance Facility, Glenwood Springs, Colorado, Project No. GS05451-130, prepared for MW Golden Constructors, dated June 11.*

⁴ Yeh & Associates, Inc., 2016, *Final Report, Geotechnical Investigation, RFTA West Glenwood Springs Park n Ride, Pavement and Retaining Wall Recommendations, Glenwood Springs, Colorado, Project No. 214-244, prepared for SGM, Inc., dated July 30.*

⁵ Yeh & Associates, Inc., 2016, *Geotechnical Investigation, RFTA West Glenwood Springs, Retaining Wall Design/Build Recommendations, Glenwood Springs, Colorado, Project No. 215-141, prepared for SGM, Inc., dated January 31.*

its entirety and supplemented, as necessary. Specific sections of the text, drawings, graphs, tables, and other information contained within this report are intended to be understood in the context of the entire report. This includes the *Closure* section of the report which outlines important limitations on the information contained herein.

This report was prepared for project planning and design purposes of Shrewsberry, RFTA and the design-build teams based on our understanding of the project at the time of preparation of this report. The data, conclusions, opinions, and geotechnical parameters provided herein should not be construed to be sufficient for other parties or other purposes not specifically related to the design of the project.

The design-build team(s) utilizing this report should evaluate carefully the information and geotechnical parameters presented in this report. They must be understood to be based on the necessarily limited amount of geotechnical exploration and testing performed by GROUND. Deviations between what was reported herein and the actual surface and/or subsurface conditions may exist, and in some cases those deviations may be significant. We understand that foundation and floor systems, and general geotechnical approaches not discussed in this report may be considered by the design-build team(s). GROUND will be available to discuss our findings and conclusions upon request. To the extent that the parameters and other considerations herein are utilized in project design, however, the design-build team(s) are responsible to assess their applicability to their selected designs and obtain additional geotechnical exploration, testing and analyses, as necessary.

PROPOSED CONSTRUCTION

We understand that the proposed expansion will entail construction of a large, multi-story parking garage and administrative building on the east pad that likely will include two levels below or partially below grade, and at least one level above grade. Bus arrival and departure aprons (ramps) are planned for that building. The expansion will also include an addition on the northwest and southwest sides of the existing maintenance building. Structural loads for the proposed buildings and additions are anticipated to be moderate to high.

Other planned improvements include several retaining walls, repair and/or replacement of existing pavements, and construction of additional pavements. We also understand

that underground utility lines will be installed to serve the new building, and that the buildings will be surrounded by flatwork as well as by limited, local landscaping.

Additionally, we anticipate that material cuts and fills on the order of 20 feet may be required to achieve project lines and grades.

If the proposed construction differs significantly from that described above, GROUND should be notified to re-evaluate our conclusions and parameters.

Performance Expectations Based on our experience in the project area, and conversations with Shrewsberry and RFTA, post-construction, foundation and floor movements on the order of 1 inch typically are acceptable and anticipated by owners, as are the resultant distress and maintenance measures.

We anticipate that movements of somewhat greater magnitude (2 to 4 inches) are acceptable and anticipated for flatwork and ancillary structures near the buildings. Assuming that traffic speeds will be relatively low, still greater movements (4+ inches locally) are acceptable and anticipated for the pavements.

GROUND will be available to discuss the risks and remedial approaches outlined in this report, as well as other potential approaches, upon request if post-construction movements of these magnitudes are not acceptable and anticipated.

SITE CONDITIONS

At the time of our subsurface exploration, the project site consisted of the existing maintenance facility and was bordered by Wulfsohn Road to the north and east, undeveloped land to the south and west, and Midland Avenue to the north. Undeveloped land and commercial facilities occupied the greater project area.



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The ground surface at the project site was generally covered by topsoil,⁶ asphalt and concrete pavement, and gravel surfacing. The slopes at the project site were generally relatively gentle to moderate and descended to the north and east locally. Relatively steep slopes and retained slopes were observed locally. Relatively steep slopes, approximately 20 feet in height, were observed along the west and south sides of eastern, asphalt paved parking area and were un-vegetated. Relatively steep, vegetated slopes were also observed along the southern margin of the site, and descended away from the site displaying approximately 40 feet of relief.

Additionally, relatively steep slopes, showing signs of previous mass wasting events (debris flows, mud flows, etc.) were observed to the south of the site as shown in the photograph at right. The top of the slope is approximately 2000 feet higher in elevation than the site and is approximately 4,700 feet to the south of the site.



The existing buildings at the project site – as repaired after prior settlement – appeared to be performing in a relatively satisfactory manner, given their apparent age. Additionally, some project pavements, primarily parking areas and areas that received high volumes of turning bus traffic, showed significant signs of distress, including alligator cracking and rutting. Other project pavement appeared to be performing in a relatively satisfactory manner, given their apparent age. Landscaping was also observed on site and included mature and juvenile trees, shrubs, and other relatively small vegetation.

⁶ 'Topsoil' as used herein is defined geotechnically. The materials so described may or may not be suitable for landscaping or as a growth medium for such plants as may be proposed for the project.

SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted December of 2017. Seven (7) test holes were drilled with a conventional, truck-mounted drilling rig advancing 115mm ODEX drilling equipment to evaluate the subsurface conditions as well as to retrieve samples for laboratory testing and analysis for this scope. Of these, 5 test holes were drilled within or the near the proposed bus parking garage building footprint to depths between approximately 56 and 150 feet below existing grade. The remaining 2 test holes were drilled near the proposed maintenance building addition footprint to depths of about 76 to 101 feet. A GROUND engineer directed the subsurface exploration, logged the test holes in the field, and prepared the samples for transport to our laboratory.



Samples of the subsurface materials were retrieved with a 2-inch I.D. California liner sampler. The samplers were driven into the substrata with blows from a 140-pound hammer falling 30 inches, a procedure similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depths at which the samples were obtained and associated penetration resistance values are shown on the test hole logs.

The approximate locations of the test holes are shown in Figure 1. Logs of the test holes are presented in Figure 2. Explanatory notes and a legend for the logs are provided in Figure 3. More detailed logs of the test holes are provided in Appendix A.

The test holes are hung to approximate relative elevation in Figure 2, based on taking the elevation at Test Hole 3 to be '100' and estimating the elevation differentials in the field. Because of the significant elevation differentials across the site, in GROUND's opinion, the test hole locations and elevations should be determined more precisely by surveying. More precisely determined elevations may require modification of some

parameters in this report. If surveyed elevations are made available to GROUND, we will be available to review and update our findings and conclusions.

LABORATORY TESTING

Samples retrieved from our test holes were examined and visually classified in the laboratory by the project engineer. Laboratory testing of soil samples included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses, and Atterberg limits. Swell – consolidation, water-soluble sulfate, and a suite of corrosivity tests were completed on selected samples, as well. Laboratory tests were performed in general accordance with applicable ASTM protocols. Results of the laboratory testing program are summarized in Tables 1 and 2. A gradation plot is provided in Figure 4.

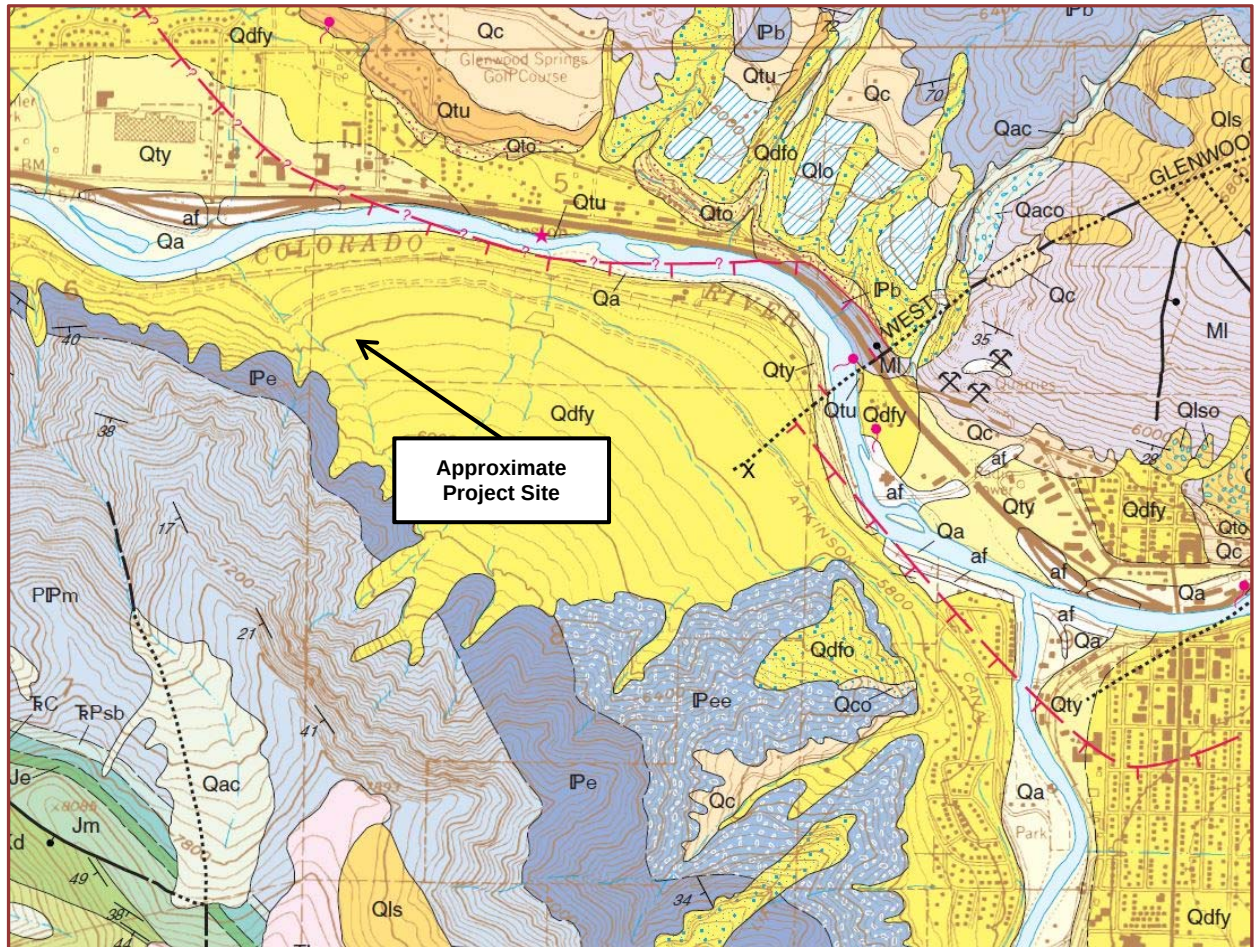
GEOLOGIC SETTING AND GEOLOGIC HAZARDS

Geologic Setting - Published geologic maps, e.g., Kirkham, Streufert, Cappa, Shaw, Allen, and Schroeder (2009)⁷ depict the site as underlain by Holocene Younger Debris Flow Deposits (**Qdfy**). The surficial materials are mapped as underlain by the Middle Pennsylvanian Eagle Valley Evaporite (**IPee**). A portion of that map is reproduced below.

The surficial, Younger Debris Flow Deposits consist of sands, gravels, silts and cobbles, with varying proportions of boulders and clays. These deposits approach or 200 feet in thickness in the upper portions of the debris flow fan, but thin downslope toward the river. Debris flow deposits typically are poorly consolidated and commonly are subject to hydro-consolidation ('collapse') upon loading and wetting. Additionally, the large clasts (cobbles and boulders), commonly present in the debris flow deposits, can be awkward or difficult to handle.

⁷ Kirkham, R.M., Streufert, R.K., Cappa, J.A., Shaw, C.A., Allen, J.L., and Schroeder, T.J. II, 2009, *Geologic Map of the Glenwood Springs Quadrangle, Garfield County, Colorado*: Colorado Geological Survey, Map Series MS-38, scale 1:24,000

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The Eagle Valley Evaporite in the project area consists largely of gypsum, anhydrite, halite, and mudstone (claystone and siltstone), sandstone, limestone, dolomite, and shale, interbedded on various scales. Beds of the Eagle Valley Evaporite are often very hard and difficult to excavate. Additionally, many materials present in the Eagle Valley Evaporite are subject to dissolution and are known to generate sink holes.⁸

Geologic Hazards

Expansive Soils Swelling clayey soils and bedrock change volume in response to changes in moisture content that can occur seasonally, or in response to changes in land use, including development. Expansion potentials vary with moisture contents,

⁸ For example, in 2003, a sinkhole formed along the northern shoulder of Midland Avenue north the Target store, about ¾ mile east of the site. This sinkhole was backfilled by the City of Glenwood Springs.

density, and details of the clay chemistry and mineralogy. Swelling soils beneath a structure can cause significant damage. The swell potential in any particular area can vary markedly both laterally and vertically. Moisture changes also occur unpredictably, resulting in conditions that cannot always be forecast.

The shallow earth materials underlying the site generally consisted of silty and clayey sands and gravels. The plasticity of the site soils ranged from non- to moderately plastic. A swell of 1.1 percent was measured in a sample of site soils. (See Table 1.) In our experience, limited potentials for swell should be anticipated at the site and adjacent areas.

Collapsible Soils Certain surficial deposits in the Glenwood Springs area, typically debris flow and alluvial fan deposits, are known to be susceptible to hydro-consolidation or “collapse.” Hydro-consolidation consists of a significant volume loss due to re-structuring of the constituent grains of the soil to a more compact arrangement upon wetting and loading. Typically, the resultant volume loss is realized strongly differentially beneath a given structure. As with swelling soils, post-construction volume changes in the foundation soils can damage buildings and other improvements.

The project site occupies a portion of a large debris flow fan descending from the steep terrain to the southwest. The native soils encountered during our subsurface exploration program are interpreted by GROUND to be debris flow deposits. These materials have been mapped by White (2002)⁹ as collapsible. Additionally, the Lincoln-Devore (1978)¹⁰ study depicts the area as being within the severe hazard zone for hydro-consolidation in site soils. A severe hazard zone is described as having “a high probability of major and / or rapid settlement, accompanied by local piping and slope instability due to soil structure disruption.”

Swell and consolidation testing performed on samples of site soils obtained for this evaluation indicated consolidations upon wetting up to 5.9 percent. Still greater consolidations – on the order of 8 and 9 percent – were reported Yeh & Associates, Inc. (2015, 2016) and measured by GROUND – in excess of 7 percent – farther east on the

⁹ White, J.L., 2002, *Collapsible soils and evaporite karst hazards map of Roaring Fork River corridor, Garfield, Eagle and Pitkin Counties, Colorado*: Colorado Geological Survey Map Series MS-34, scale 1:50,000.

¹⁰ Lincoln-Devore Engineers and Geologists, 1978, *Geologic Hazards of the Glenwood Springs Metropolitan Area – Garfield County, Colorado*: Colorado Geological Survey Open File Report 78-10.

same debris flow fan. Consolidations of more than 13 percent were measured in samples as deep as 40 feet by GROUND (2009) at locations near the RFTA bus maintenance building on this site for a preliminary study addressing distress to that facility.

Thus, the potential for soil “collapse” at this site is relatively high and should be considered in all aspects of project design and construction.

Radon Testing for the possible presence of radon gas prior to project development does not yield useful results regarding the potential accumulation of radon in completed structures. Radon accumulations typically are found in basements or other enclosed portions of buildings built in areas underlain at relatively shallow depths by granitic crystalline rock. The likelihood of encountering radon in concentrations exceeding applicable health standards on the subject site, underlain by relatively deep soils and sedimentary bedrock, is significantly lower.

Radon testing should be performed in each building on-site, after construction is completed. Proper ventilation usually is sufficient to mitigate potential radon accumulations. Building designs should accommodate such ventilation for all building areas.

Seismic Activity / Faulting Neither site reconnaissance nor review of available geologic maps indicated the trace of an active or potentially active fault traversing or immediately adjacent to the site. Therefore, the likelihood of surface fault rupture at the site is considered to be relatively low.

However, several sets of fault structures are mapped within 2 miles of the project site and include the unnamed faults along the Grand Hogback Monocline, the Dolan Gulch Fault, and the Glenwood Fault (Kirkham and Rogers, 1981¹¹; Kirkham and others, 2009,¹² Colorado Geological Survey, 2008¹³). The most recent movement of these faults appears to have occurred in the Pliocene or Miocene.⁸ The risk of this fault giving rise

¹¹ Kirkham, R.M., and W. P. Rogers, 1981, *Earthquake Potential in Colorado, A Preliminary Evaluation*, Colorado Geological Survey, Bulletin 43.

¹² Kirkham, R.M., Streufert, R.K., Cappa, J.A., Shaw, C.A., Allen, J.L., and Schroeder, T.J. II, 2009, *Geologic Map of the Glenwood Springs Quadrangle, Garfield County, Colorado*: Colorado Geological Survey, Map Series MS-38, scale 1:24,000

¹³ Colorado Geological Survey, 2008, *Preliminary Quaternary Fault and Fold Database, and Map Server*, <http://geosurvey.state.co.us/Default.aspx?tabid=453>.

to damaging, earthquake-induced ground motions at the site is considered to be relatively low given the magnitudes of previously recorded events in the project area and last known movements of the fault.

Compared with other regions of Colorado, recorded earthquake frequency in the project area is moderate.

Slope Stability and Erosion Colton and others (1975)¹⁴, as well as larger scale geologic maps providing coverage of the site that were reviewed for this study, did not depict landslide deposits on or adjacent to the subject site. However, a geologic map by Kirkham and others (2009)⁷ depicts the site as being underlain by debris flow deposits as discussed above. Therefore, it is GROUND's opinion that the risk of slope stability hazards (debris flows, rock falls, landslides, etc.) associated with the steep slopes to the south and southwest is relatively high. Additionally, the Lincoln-Devore (1978)⁶ depicts the western portion of the site as being with the zone of significant rock fall hazard. According the study, criteria for this zone "include (a) an identifiable source area for rocks and (b) the presence of fallen rocks with intermediate diameters of 2 feet or more." However, debris flow basins have been constructed upslope of the facility and the proposed improvements. As far as we are aware, those basins have been effective in preventing debris flows and other materials dislodged from the overlying slopes from reaching the site.

Slopes local to the site, were generally gentle to moderate, with several steep and retained slopes, as discussed in the *Site Conditions* section of this report. Therefore, the likelihood of project developments being affected by existing large scale, unanticipated slope instabilities local to the site is considered low to moderate. Because relatively large cuts and fills are planned for the site the risk of slope instability may be increased. Therefore, proposed or modified slopes should be analyzed for stability, as appropriate.

Flooding The subject property is approximately 900 feet south of the southern bank of the Colorado River and is approximately 130 feet higher in elevation. Significant fluctuation in the flow of streams can be expected during seasonal run periods and after large precipitation events, especially in the drainages upslope and south of the project

¹⁴ Colton, R.B., J.A. Holligan, and L.W. Anderson, 1975, *Preliminary Map of Landslide Deposits, Denver 1° x 2° Quadrangle, Colorado*, U.S. Geological Survey, Miscellaneous Field Studies Map MF-705.

site. However, the project site is not shown on current FEMA Flood Insurance Rate Maps reviewed. Therefore the risk of flooding appears to be low. However, the site and proposed grade changes should be evaluated by a civil engineer in this regard.

Mining Activity and Mining Related Subsidence Review of U.S. Geological Survey geologic maps covering the site, such as Kirkham and others (2009)⁷ and other available, published maps depicting areas of mining, do not indicate past mining activities on or adjacent to the subject parcel. Additionally, no evidence of past mining activity was identified at the project site during our subsurface exploration program.

Considering the information presented above, the risk of potential for surface subsidence associated with consolidation of former mine workings (as opposed dissolution/karst related) at depth appears to be low.

Dissolution Related Subsidence Geologic maps such as Kirkham and others (2009)⁷ and White (2002)⁵ indicate that the Eagle Valley Evaporite underlies the project site beneath the surficial deposits. This formation includes evaporite (salt, gypsum, etc.) deposits, limestones, or other materials vulnerable to subsurface dissolution. Therefore, the likelihood of sinkholes and subsidence (associated with such rock formations; not mine related) or other hazards related to subsurface dissolution appears to be high in the project area as a whole. In addition to the 2003 sinkhole noted above, we understand that similar features have developed on or near the project site, and in some cases, have historically been backfilled by debris, and other readily available materials.

The risk of a sinkhole developing within the footprint of a given building during its design life, however, is significantly lower, but it is not zero. The risk of sinkhole development at the site is broadly similar to that in much of Glenwood Springs.

SUBSURFACE CONDITIONS

Conditions Encountered in the Test Holes In general, the surface of the test holes approximately 2½ to 7 inches of asphalt¹⁵ were penetrated before native silty sands and gravels that extended to depths of approximately 127 feet below existing grade. Beneath the native silty sands and gravels, clayey sands and gravels were encountered and extended to the depths explored. At Test Hole 4 approximately 6 inches of topsoil¹⁶ were encountered at the surface overlying the native silty sands and gravels and at Test Hole 7 approximately 3 inches of gravel surfacing was encountered overlying the native silty sands and gravels.

We interpret the native silty sands and gravels to be debris flow deposits and the clayey sands and gravels to be older debris flow deposits interbedded with alluvial deposits.

Fill soils were not recognized in the test holes, but fills may be present across portions of the site, due the previous development of the site. The precise determination of fill depths is difficult in small diameter test holes and therefore, logged fill depths should be considered approximate. Delineation of the complete lateral and vertical extents of the fills at the site and their compositions was beyond our present scope of services. If more detailed information regarding fill extents and compositions at the site are of significance, they should be evaluated using test pits.

Cobbles and boulders up to 5 feet in dimension were encountered in test holes and larger sized clasts may be encountered in existing soils on site.

Silty Sands and Gravels generally consisted of clean to silty, fine to coarse sands and gravels with cobbles and boulders and local clays. They were dry to wet, non- to moderately plastic, loose to very dense, red to red brown and dark red brown. Wood and other plant material was noted locally in the upper portions of this section.

¹⁵ Asphalt thicknesses are difficult to determine with precision in small diameter test holes. If existing pavement thicknesses are of significance to the project, then additional, larger diameter test holes should be drilled.

¹⁶ 'Topsoil' as used herein is defined geotechnically. The materials so described may or may not be suitable for landscaping or as a growth medium for such plants as may be proposed for the project.

Clayey Sands and Gravels generally consisted of clean to clayey, fine to coarse sands and gravels with cobbles and boulders and local silts. They were dry to wet, non- to moderately plastic, dense to very dense, brown to gray brown in color.

Groundwater was encountered in Test Hole 1 at a depth of 115 feet below existing grade or a relative elevation of -19 feet at the time of drilling. The test holes were immediately backfilled due to safety concerns. Groundwater levels can be expected to fluctuate in response to annual and longer-term cycles of precipitation, irrigation, surface drainage, land use, and the development of transient, perched water conditions.

Swell-Consolidation Testing of selected samples of the on-site materials recovered from the test holes indicated consolidations of up to about 5.9 percent and swells up about 1.1 percent under various surcharge loads approximating in-place overburden pressures. (See Table 1.)

SEISMIC CLASSIFICATION

Based on extrapolation of available data to depth and our experience in the project area, we consider the site likely to meet the criteria for a Seismic Site Classification of **D** according to the 2012/15 IBC classification (Table 1613.5.2). (Exploration and/or shear wave velocity testing to a depth of 100 feet or more was not part of our present scope of services.) If, however, a quantitative assessment of the site seismic properties is desired, then shear wave velocity testing should be performed.

Using longitude and latitude coordinates obtained from Google Earth and the USGS's Seismic Design Maps Tool (<http://geohazards.usgs.gov/designmaps/us/application.php>), the project area is indicated to possess an S_{DS} value of **0.336** and an S_{D1} value of **0.132** for the site latitude and longitude and a Site Class of D. It is GROUND's opinion that these values for Site Class D are appropriate for use in design.

GEOTECHNICAL CONSIDERATIONS FOR DESIGN

The conclusions and parameters provided in this report were based on the data presented herein, our experience in the general project area with similar structures, and our engineering judgment with regard to the applicability of the data and methods of forecasting future performance. A variety of engineering parameters were considered as indicators of potential future soil movements. Our parameters and conclusions were based on our judgment of “likely movement potentials,” (i.e., the amount of movement likely to be realized if site drainage is generally effective, estimated to a reasonable degree of engineering certainty) as well as our assumptions about the owner’s willingness to accept geotechnical risk. “Maximum possible” movement estimates necessarily will be larger than those presented herein. They also have a significantly lower likelihood of being realized in our opinion, and generally require more expensive measures to address. We encourage Shrewsberry and the owner, upon receipt of this report, to discuss these risks and the geotechnical alternatives with us.

In addition to the risks and remedial approaches presented in this report, Shrewsberry and the owner also must understand the risk-cost trade-offs addressed by the civil and structural engineering disciplines in order to direct his design team to the portion of the Higher Cost / Lower Risk – Lower Cost / Higher Risk spectrum in which this project should be designed. If these risks are not understood, it is critical that additional information or clarification be requested so that the owner’s expectations reasonably can be met.

Depth of Wetting at the Site The “depth of wetting” (the depth to which foundation soils will gain moisture and experience volume change over the design-life of a structure) estimated for a given site strongly affects the anticipated performance of structures at that site. Based on the data obtained at this site and our experience with similar geotechnical settings, a ‘depth of wetting’ of 20 feet was used to develop geotechnical recommendations for foundation system design. A depth of wetting of 20 feet is equal to or greater than the depth of wetting found at about 72 percent of the sites in the Front Range area of Colorado evaluated in a study by Walsh and others (2009).¹⁷

¹⁷ Walsh, K.D., C.A. Colby, W.N. Houston and S.A. Houston, 2009, *Method for Evaluation of Depth of Wetting in Residential Areas*, Journal of Geotechnical and Geoenvironmental Engineering, American Society of Civil Engineers, Vol. 135, No. 2, pp. 169 – 176.

Given the environmental and geologic differences between the Colorado Front Range and the greater Glenwood Springs area, it is GROUND's opinion that a depth of wetting of 20 feet will be more conservative for this site in the Glenwood Springs area than it would be for a similar site in the Front Range.

'Depths of wetting' of 30, 40 or 70 feet or more have been considered (e.g., Chao and others, 2006)¹⁸ and have been encountered locally in the field. Depths of wetting of such magnitudes, however, generally are in unusual geologic conditions such as steeply dipping sedimentary bedrock, or identified forensically in unusual circumstances such as a pipe leak that has remained un-repaired for an extended period. In our experience, such deep 'depths of wetting' are considered only rarely in engineering consulting practice in more typical geologic settings.

GROUND considers a 20-foot depth of wetting to be appropriately conservative for the proposed project and geologic environment. However, if Shrewsberry or RFTA prefers that a more conservative (or less conservative) 'depth of wetting' be used to develop geotechnical parameters for design, a geotechnical engineer should be retained to revise the parameters herein.

Geotechnical Risks As discussed in the *Geologic Setting And Geologic Hazards* section of this report, because of the presence of Eagle Valley Evaporite materials underlying the site, the proposed improvements are susceptible to sinkholes, etc. We understand that the risk of sinkhole development is understood by and accepted by the owner. GROUND is available to discuss further sinkhole and subsidence related risks, upon request. Otherwise, we have assumed that no further mitigative measures in that regard will be undertaken.

Similarly, although the proposed improvements are vulnerable, in principle, to rock falls and debris flows, etc., debris basins are in-place upslope of the site. Their continued effectiveness requires routine maintenance, however. The effectiveness of these basins and maintenance measures to date should be assessed during design by a civil engineer, and additional measures undertaken as appropriate. No further measures in

¹⁸ Chao, K-C, D.D. Overton, and J.D. Miller, 2006, *The Effects of Site Conditions on the Predicted Time Rate of Heave, Unsaturated Soils 2006*, American Society of Civil Engineers, Special Publication No. 147, pp. 2086 – 2097.

that regard are provided herein. GROUND is available to discuss this concern upon request.

Hydro-consolidation or 'collapse' of debris fan deposit soils is, in GROUND's opinion, the primary geotechnical constraint on design of the proposed improvements. The consolidation potentials exceed those for swell significantly. The measured potentials for consolidation upon wetting, together with the selected depth of wetting were used to develop estimates of likely, post-construction movements.

The geotechnical conditions at the site entail significantly greater than typical risks of post-construction movements of improvements and resultant distress compared to many other sites in the project vicinity. Effective control of surface waters during and after construction is critical to achieving the intended performance of project improvements, as prior damage at the site demonstrates. In GROUND's opinion, the design-build team(s) should retain or include a geotechnical engineer to facilitate interpretation and application of the information and parameters in this report into project design.

Likely Post-construction Movements Based on the our data, the selected depth of wetting and our experience with similar sites, we estimate improvements supported directly on the existing site soils are subject to likely, post-construction, vertical movements of 7 to 9 inches where improvements bear directly on the site earth materials. Lateral movements will result as well. Foundation and slab/flatwork movements of these magnitudes can result in significant damage. Nearly all of the proposed improvements are vulnerable in this regard.

Movements of this magnitude have been encountered previously in the project area and increased maintenance measures should be anticipated compared to similar facilities in the area but not on a deep section of collapsible soils. In this setting, maintenance measures will include the periodic removal and replacement of improvements not supported on deep foundations.

GROUND considers several approaches to reduce post-construction movements at this site to be geotechnically feasible. A discussion of those methods and the corresponding reduced estimates of post-construction movements is provided below. (It should be noted that the estimates provided in this report do not include any movements that may result from sinkholes or similar features.)

General Foundation and Floor Types Due to the potential for hydro-consolidation in the existing site soils, the site soils will need to be improved (or replaced) in order to reduce estimates of likely post-construction movements in shallow foundations. Deep foundations bearing beneath the soils vulnerable to hydro-consolidation, however, is the most positive approach to reducing post-construction movements. Deep foundation systems likely will be quite deep at this site, however, based on assessment of the associated risks.

Supporting the proposed buildings and addition on deep, driven H-pile foundations, and providing them with structural floors also supported on piles will yield estimates of likely post-construction movements of about ½ inch. At minimum, such systems should bear below the selected depth of wetting. The risk of post-construction movements exceeding this estimate will tend to decrease with increasing pile length / bearing depth, as will the capacities of the piles. Geotechnical parameters for a driven H-pile foundation system are provided in the *Drive Pile Foundations* section of this report and geotechnical parameters for a Structural Floor or provided in the *Structural Floors* section of this report.

Both mat foundations and spread footing foundations appear feasible geotechnically, if the site soils are improved. Similarly, slab-on-grade floors also appear feasible if the site soils are improved by the methods discussed below. More detailed parameters for shallow foundations and for slab-on-grade floors are provided in *Shallow Foundations* and *Slab-on-Grade Floors* sections of this report.

In GROUND's opinion, there are several available options to improve the soils so that shallow foundations and/or slab-on-grade floors may be acceptable. These include

- Excavating the existing soils beneath a structure to a depth of at least 15 feet below footing bearing elevation, and replacing them with properly compacted fill. (The existing soils generally appeared suitable for re-use as compacted fill after removal of debris, boulders, etc.) We estimate that likely post-construction, vertical movements for structures supported on such fill sections would be approximately 1 inch. This estimate assumes that effective site drainage is established and maintained; such fill sections will not remove the all of the soils that are susceptible to hydro-consolidation. We consider the risk of post-construction movements in

excess of this estimate to be relatively low, but it is not zero and increases dramatically if site drainage is ineffective. A deeper remedial fill section can reduce this risk.

- Densifying the soils in-place using rammed aggregate piers. This would be done by a specialty designer/installer using the information from this report and from other studies at the site. Installation of rammed aggregate piers densifies the surrounding soils to the selected depth, increasing bearing capacity and reducing estimates of post-construction settlements for elements supported on them. Rammed aggregate piers also can be placed to densify the soils for slab-on-grade floors, typically on a wider spacing than beneath footings.

Resultant bearing capacities and other foundation design parameters, as well as estimates of likely post-construction movement would be provided by the designer/installer. We anticipate that allowable bearing pressures of 5,000 or 6,000 psf and associated movement estimates of less than 1 inch could be achieved.

The following firms can be contacted with regard to rammed aggregate piers:

- Ground Improvement Engineering, 816 / 421 – 4334 for “geo-piers.”
- Hayward Baker, Inc., 303 / 469 – 1136 for “vibro-piers.”

Other firms may be available, as well. Like a compacted fill section, extending the zone of densified soils to greater depths would tend to reduce the likelihood of post-construction movement estimates to be exceeded.

- Similar in effect to using rammed aggregate piers improving the soils, compaction grouting can be used to densify the site soils. Compaction grouting also is performed by a specialty designer/contractor.

GROUND estimates that if compaction grouting were performed to a depth of 30 feet below the lowest level floor (10 feet below the depth of wetting), then estimates of post-construction movement on the order of 1 inch could be achieved. Actual grouting program design, resultant bearing capacities and estimates of likely post-construction movements would be provided by the designer/contractor.

The following firms can be contacted with regard to compaction grouting:

- Hayward Baker, Inc., 303 / 469 – 1136
- Nicolson, 303 / 926 – 0411

Other compaction grouting firms may be available, as well. Again, increasing the depth of the zone of soils densified by compaction grouting would tend to reduce the likelihood of post-construction movement estimates to be exceeded.

DRIVEN PILE FOUNDATION SYSTEMS

It should be noted that the depths discussed herein refer to the existing ground surface at the time of our subsurface exploration. The contractor should make appropriate allowance for any changes in grades between the time of GROUND's field work and the time of pile installation. Lowering grades may not be sufficient to reduce driven pile lengths, however. Additionally, the following parameters are based on the conditions encountered in the test holes and should be confirmed by additional geotechnical studies prior to construction.

It should be noted that none of the pile lengths tabulated below reach local bedrock. Therefore, debris fan deposits with the potential for hydro-consolidation ("collapse") will remain beneath them with the potential for greater than anticipated settlements if those soils become wetted. Therefore, more deeply driven piles also will have a lesser risk of such greater settlements than less deeply driven piles.

Geotechnical Parameters for H-Pile Foundation Design

- 1) Driven piles to support the building should consist of heavy steel H-sections. We anticipate that HP 12 x 53, HP 12 x 74, HP 12 x 84, HP 14 x 89 sections will be used. Selection of pile size should consider anticipated pile depths.
- 2) Based on the strength of the sand and gravel layer underlying the site, the maximum pile load should not exceed a maximum service stress of **12,500 psi** for 50 ksi steel using the steel pile cross-sectional area.

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- 3) The piles should be driven to practical refusal to achieve full capacity. However, examples of pile tip depth and estimated capacity are tabulated below for planning purposes for several pile sizes.

ANTICIPATED CAPACITY AND ANTICIPATED CORRESPONDING DEPTHS

Capacity	Depth			
	HP 12 x 53	HP 12 x 74	HP 12 x 84	HP 14 x 89
80 kips	45 feet	40 feet	45 feet	35 feet
140 kips	60 feet	60 feet	55 feet	50 feet
200 kips	85 feet	70 feet	70 feet	70 feet

Due to the inherent variability in the characteristics of the site soils as well as the depth to the sand and gravel layer, once a design pile length / tip elevation has been determined, the contractor should be prepared to advance the piles to depths at least 10 feet greater than the design depth.

It is critical at this site that a test pile program be performed prior to general installation to inform anticipated driving depths with the actual piles and driving equipment selected. Pile dynamic testing or other testing should be performed to confirm that design capacities are being achieved.

- 4) Post-installation down-drag on the piles will result from the 'collapse' of overburden materials through which the piles will be driven. Down-drag may be estimated as an equivalent fluid pressure of **29 pcf** applied to the box perimeter of the **H-pile between depths of 3 and 20 feet.***

* 20 feet or the design depth of wetting if different from 20 feet

- 5) Geotechnical parameters for design of piles to resist lateral loads are provided in the *Lateral Loads* section of this letter.
- 6) Lateral resistance to horizontal forces also can be resisted by battered piles. It is normal to assume a battered pile can resist the same axial load as a vertical pile

of the same type and size driven to the same depth. The vertical and horizontal components of the load will depend on the batter inclinations.

Pile batters should not exceed 1:4 (horizontal : vertical).

- 7) Groups of closely spaced driven piles will require an appropriate reduction of the estimated capacities. Reduction of axial capacity generally can be avoided by spacing driven piles **at least 3 diameters** center to center. At this spacing or greater, no reduction in axial capacities or horizontal soil modulus values is required. The capacities of drilled piers spaced more closely than 3 diameters center to center should be reduced. Reduction factors can be obtained from the plot provided on Figure 5.

Linear arrays of driven piles, however, must be spaced **at least 8 diameters** center to center to avoid reductions in lateral capacity when loaded in line with the array (parallel to the line connecting the driven pile centers). The lateral capacities of piles in linear arrays spaced more closely than 8 diameters should be reduced. Reduction factors can be obtained from the plot provided on Figure 6.

- 8) Uplift on driven piles should be limited to 25 percent of the indicated vertical load capacities.
- 9) In order to allow pile dynamic testing (See below.) welded pile splices should be specified and compression splices not allowed.

Driven H-pile Installation Considerations

- 10) Driven H-piles should be installed per Section 502 of the current edition/revision of the CDOT *Standard Specifications for Road and Bridge Construction*.
- 11) Pre-construction condition surveys and vibration monitoring should be considered to assess the potential for damaging nearby improvements.
- 12) Each pile should be reinforced with a commercial, heavy duty, pile tip.

- 13) The pile-driving hammer should develop a minimum of **26,000 foot-pounds** of energy per blow for HP 10 x 57 piles and **42,000 foot-pounds** for HP 12 x 74 piles. However, the hammer generally should not develop more than **2,500 foot-pounds per square inch** of cross sectional area (e.g., 54,500 foot-pounds for HP 12 x 74 piles).
- 14) After the actual pile type and proposed hammer have been selected, a geotechnical engineer should be retained to perform a Wave Equation Analysis to determine if the driving hammer is sized adequately for the type of pile selected and the soils and bedrock materials into which the piles will be driven.
- 15) Pile dynamic testing should be performed using a pile driving analyzer (PDA) and signal matching at the start of pile installation to:
- Assess the condition of the pile,
 - Evaluate the efficiency of the hammer,
 - Measure the driving stress in the pile,
 - Determine the static capacity of the pile, and
 - Establish the pile driving criteria for required static capacity, or penetration into the sands and gravels. If dynamic testing is not performed, piles may be driven to greater depths than those needed to achieve capacity.

Pile dynamic testing should be performed during driving, prior to placement of concrete in the pile.

- 16) In addition, we suggest that a test pile installation program be performed to define better the driving conditions, appropriate pile hammer energy, installation depth, and refusal conditions.

Lateral loading tests performed at the start of pile installation also can be beneficial.

- 17) Where a pile cannot be advanced to at least the approximate, anticipated tip depth, it should be evaluated with regard to its capacity by the geotechnical engineer and the structural engineer.

SHALLOW FOUNDATIONS ON IMPROVED SOIL

Geotechnical Parameters for Shallow Foundation Design

- 1) Footings or a mat foundation should bear on a section of properly compacted fill soils or otherwise improved soils as discussed in the *Geotechnical Considerations for Design* section of this report.
- 2) We anticipate that footings or a mat foundation bearing on a properly compacted fill section may be designed for allowable bearing pressure of **2,500 psf**. Higher allowable bearing pressures may be possible, but likely will need to be verified by testing of the soils after construction (i.e., load testing).

We anticipate soils improved by rammed aggregate piers or compaction grouting, may be designed for an allowable bearing pressure to be determined by the rammed aggregate pier or compaction grouting designer / installer, as appropriate.

In order to reduce differential settlements between footings along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle differentially.

- 3) Spread footings should have a minimum lateral dimension of **16 inches** for linear strip footings and **24 inches** for isolated pad footings. Actual footing dimensions should be determined by the structural engineer.
- 3) Footings generally should bear at 3½ feet below lowest adjacent finished grade for protection against frost. Where a below-grade level is present, no additional deepening of the footings is needed for frost protection.
- 4) Continuous foundation walls should be reinforced as designed to span an unsupported length of at least **10 feet**.
- 5) Geotechnical parameters for passive resistance to lateral foundation loads are provided in the *Lateral Earth Pressures* section of this report. The coefficient for frictional resistance to lateral loads should be determined by the rammed aggregate pier designer / installer.

- 6) Connections of all types must be flexible and/or adjustable to accommodate the anticipated, post-construction movements of the structure.

Shallow Foundation Construction

- 7) The contractor should take adequate care when making excavations not to compromise the bearing or lateral support for nearby improvements.
- 8) Footing / mat foundation excavation bottoms may expose loose, organic, or otherwise deleterious materials, including debris. Firm materials may become disturbed by the excavation process. All such unsuitable materials should be excavated and the foundations deepened.
- 9) Foundation-supporting soils may be disturbed or deform excessively under the wheel loads of heavy construction vehicles as the excavations approach footing bearing levels. Construction equipment should be as light as possible to limit development of this condition. The movement of vehicles over proposed foundation areas should be restricted.
- 10) All foundation subgrade should be properly compacted with a vibratory plate compactor prior to placement of concrete.
- 11) Fill placed against the sides of the footings should be properly compacted in accordance with the *Project Earthwork* section of this report.

STRUCTURAL FLOORS

We anticipate that structural floors will be utilized where the lowest level floors will be office space or similar applications. A structural floor should be utilized where appropriate as the floor system resulting in the least potential for post-construction floor movement, including differential movement. Entryway floor slabs and other exterior flatwork also should be constructed as structural floors where differential movements between the building and exterior flatwork is a concern.

A structural floor should be supported on grade beams and driven H-piles (or alternate foundation systems) in the same manner as the building structure. Requirements for the number and position of additional piers to support the floors will depend upon the span,

design load, and structural design, and should be developed by the structural engineer. Geotechnical information for design and installation of drilled piers are provided above. Additionally, it should be noted that structural floors tend to be flexible and move elastically under live loads. Building design also should account for floor movements of this type.

A structural floor should be constructed to spanning above a well-ventilated crawl space. The crawl space should be adequately sized to allow access to and maintenance of utility piping if placed beneath the floor. Piping connections through floors, grade beams, or foundation walls should allow for differential movement between the piping and the floor.

Alternatively, a structural floor may be constructed over a **6-inch** or thicker continuous void form; however, in our experience this entails a higher risk relative to constructing the floor over a crawl space, primarily related to effective construction and void collapse. Where a void form is used, appropriate protections should be provided to prevent soil from intruding laterally into the void.

A vapor barrier meeting ASTM E-1745 (Class "A") should be considered for installation below all structurally supported floors and if utilized, should be properly attached/sealed to foundation walls/drilled piers above the void material. The sheet material should not be attached to horizontal surfaces such that condensate might drain to wood or corrodible metal surfaces.

Use of polyethylene ("poly") sheeting as a vapor barrier is not suggested. Polyethylene ("poly") sheeting (even if 15 mils in thickness which polyethylene sheeting commonly is not) does not meet the ASTM E-1745 criteria and is not suggested for use as vapor barrier material. It can be easily torn and/or punctured, does not possess the necessary tensile strength, gets brittle, tends to decompose over time, and has a relatively high permeance.

New buildings generally lack ventilation due primarily to systematic efforts to construct air-tight, energy-efficient structures. Therefore, areas such as crawl spaces beneath structural floors are typically areas of elevated humidity which never completely dry. This condition can be aggravated in some locations by shallow groundwater or a perched groundwater condition, which can result in saturated soils within several feet of

the finished building pad grade. Persistently warm, humid conditions in the presence of cellulose, which is found in many typical construction materials, creates an ideal environment for the growth of molds, fungi, and mildew. Published data suggest links between molds and illnesses. Therefore, crawl spaces beneath structural floors should be provided with adequate, active ventilation systems or other active mechanisms such as specially designed HVAC systems to reduce the potential for mold, fungus and mildew growth. Crawl spaces should be inspected periodically so that remedial measures can be taken in a timely manner, should mold, fungus, or mildew be present and require removal.

The owner must be willing to accept the risks of potential mold, fungus, and mildew growth when electing to utilize a structural floor system. Additionally, the contractor is solely responsible for the means and methods during construction including adequate ventilation, and any observation or testing performed during construction does not relieve the contractor of that responsibility.

All plumbing lines should be carefully tested before operation. Where utility lines enter through the floor, positive bond breaks should be provided. Utility lines can be displaced by soils and bedrock movements, which are not reflected in the building. Design and installation of associated fixtures should accommodate this potential differential movement, which could be on the order of 10 inches or more.

SLAB-ON-GRADE FLOORS

We anticipate that lowest level of the parking garage and similar building areas intended for vehicles or storage, etc., likely will be provided with slab-on-grade floors. A slab-on-grade floor is a higher risk, but commonly used, alternative to a structural floor. The geotechnical parameters below may be used for design of slab-on-grade floors for the proposed buildings or portions of buildings. ACI Sections 301/302/360 provide guidance regarding concrete slab-on-grade design and construction.

Geotechnical Parameters for Design of Slab-on-Grade Floors

- 1) A slab-on-grade floor should bear on a section of properly compacted fill soils or otherwise improved soils as discussed in the *Geotechnical Considerations for Design* section of this report.

The selected fill section should extend at full thickness across floor and at least **20 feet** laterally beyond the floor perimeter.

The thickness of the remedial fill section should be taken from the bottom of the slab + gravel layer system. (If the gravel layer is not installed, the remedial fill section should be correspondingly thickened.)

Anticipated criteria for fill placement and compaction are provided in the *Project Earthwork* section of this report.

- 2) Floor slabs should be adequately reinforced. Floor slab design, including slab thickness, concrete strength, jointing, and slab reinforcement should be developed by a structural engineer.
- 3) An allowable vertical modulus of subgrade reaction (**Kv**) of **150 tcf** (145 to 174 pci) may be used for design of a concrete, slab-on-grade floor bearing on the selected section of properly compacted fill. If compaction grouting or rammed aggregate piers are selected to improve the site soils, the appropriate soil improvement designer should be consulted regarding the appropriate Kv values for design.

These values are for a 1-foot x 1-foot plate; they should be adjusted for slab dimension.

- 4) Floor slabs should be separated from all bearing walls and columns with slip joints, which allow unrestrained vertical movement.

Slip joints should be observed periodically, particularly during the first several years after construction. Slab movement can cause previously free-slipping joints to bind. Measures should be taken to assure that slab isolation is maintained in order to reduce the likelihood of damage to walls and other interior improvements.

- 5) Concrete slabs-on-grade should be provided with properly designed control joints.

ACI, AASHTO, and other industry groups provide guidelines for proper design and construction concrete slabs-on-grade and associated jointing. The design and construction of such joints should account for cracking as a result of shrinkage, curling, tension, loading, and curing, as well as proposed slab use. Joint layout based on the slab design may require more frequent, additional, or deeper joints, and should reflect the configuration and proposed use of the slab.

Particular attention in slab joint layout should be paid to areas where slabs consist of interior corners or curves (e.g., at column blockouts or reentrant corners) or where slabs have high length to width ratios, significant slopes, thickness transitions, high traffic loads, or other unique features. The improper placement or construction of control joints will increase the potential for slab cracking.

- 6) Interior partitions resting on floor slabs should be provided with slip joints so that if the slabs move, the movement cannot be transmitted to the upper structure. This detail is also important for wallboards and doorframes. Slip joints should allow **2 inches or more** of vertical, differential movement. Accommodation for differential movement also should be made where partitions meet bearing walls.
- 7) Post-construction heave may not displace slab-on-grade floors and utility lines in the soils beneath them to the same extent. Design of floor penetrations, connections and fixtures should accommodate **up to 2 inches** of differential movement.
- 8) Moisture can be introduced into a slab subgrade during construction and additional moisture will be released from the slab concrete as it cures. GROUND recommends placement of a properly compacted layer of free-draining gravel, 4 or more inches in thickness, beneath the slabs. This layer will help distribute floor slab loadings, ease construction, reduce capillary moisture rise, and aid in drainage.

The free-draining gravel should contain **less than 5 percent** material passing the No. 200 Sieve, **more than 50 percent** retained on the No. 4 Sieve, and a maximum particle size of **2 inches**.

The capillary break and the drainage space provided by the gravel layer also may reduce the potential for excessive water vapor fluxes from the slab after construction as mix water is released from the concrete.

We understand, however, that professional experience and opinion differ with regard to inclusion of a free-draining gravel layer beneath slab-on-grade floors. If these issues are understood by the owner and appropriate measures are implemented to address potential concerns including slab curling and moisture fluxes, then the gravel layer may be deleted.

- 9) A vapor barrier beneath a building floor slab can be beneficial with regard to reducing exterior moisture moving into the building, through the slab, but can retard downward drainage of construction moisture. Uneven moisture release can result in slab curling. Elevated vapor fluxes can be detrimental to the adhesion and performance of many floor coverings and may exceed various flooring manufacturers' usage criteria.

Per the 2006 ACI *Location Guideline*, a vapor barrier is required under concrete floors when that floor is to receive moisture-sensitive floor covering and/or adhesives, or the room above that floor has humidity control.

Therefore, in light of the several, potentially conflicting effects of the use vapor-barriers, the owner and the architect and/or contractor should weigh the performance of the slab and appropriate flooring products in light of the intended building use, etc., during the floor system design process and the selection of flooring materials. Use of a plastic vapor-barrier membrane may be appropriate for some building areas and not for others.

In the event a vapor barrier is utilized, it should consist of a minimum 15 mil thickness, extruded polyolefin plastic (no recycled content or woven materials), maintain a permeance less than 0.01 perms per ASTM E-96 or ASTM F-1249, and comply with ASTM E-1745 (Class "A"). Vapor barriers should be installed in accordance with ASTM E-1643.

Polyethylene ("poly") sheeting (even if 15 mils in thickness which polyethylene sheeting commonly is not) does not meet the ASTM E-1745 criteria and is not

recommended for use as vapor barrier material. It can be easily torn and/or punctured, does not possess necessary tensile strength, gets brittle, tends to decompose over time, and has a relatively high permeance.

Construction Considerations for Slab-on-Grade Floors

- 10) Loose, soft, or otherwise unsuitable materials exposed on the prepared surface on which the floor slab will be cast should be excavated and replaced with properly compacted fill.
- 11) The fill section beneath a slab should be of uniform thickness.
- 12) Concrete floor slabs should be constructed and cured in accordance with applicable industry standards and slab design specifications.
- 13) All plumbing lines should be carefully tested before operation. Where plumbing lines enter through the floor, a positive bond break should be provided.

FOUNDATION WALLS

We understand that the proposed structure will have a below grade level. The following parameters and considerations should be used for foundation walls.

Wall Design Parameters Equivalent fluid pressures for use in design of foundation walls are provided in the *Lateral Loads* section of this report.

If select, granular fill is placed as foundation wall backfill, in order to realize the (lower) value for that material, then the select, granular fill should be placed behind the wall to a minimum distance equal or greater than half of the wall height. In such cases, a relatively low permeability soil (rather than the select, granular soil) should comprise the upper **1 foot** of the wall backfill to reduce infiltration into the backfill or other measures taken to reduce surface water infiltration. It may be necessary to import soil for this purpose.

Parameters for fill placement and compaction are provided in the *Project Earthwork* section of this report.

Foundation Wall Drainage As outlined in the *Subsurface Drainage* section of this report, a foundation wall should be provided with an underdrain at or below the base of the wall. Drainage elements backing the wall should convey water into the underdrain system. Damp-proofing should be applied to foundation wall exteriors as appropriate.

Foundation Wall Construction Considerations Wall backfill soils should be compacted properly, but the contractor should take care regarding compaction methods and efforts so that excessive lateral pressures on the walls do not result.

Some settlement of wall backfill will occur even where the material was placed and compacted correctly. This settlement likely will be differential, increasing with depth of fill. Re-grading to re-establish effective surface drainage away from the building should be anticipated.

Where shallowly founded structures or pavements are to be placed on backfilled zones, the associated risks should be understood by the owner. Structural design, pipe connections, etc., should take into account (differential) foundation wall backfill settlements. A geotechnical engineer should be retained to provide design parameters where improvements are placed in backfilled areas as such improvements are identified.

RETAINING WALLS

Both cantilevered walls and mechanically stabilized earth (MSE) walls appear feasible at this site to support grade changes. Given the potentials for post-construction settlements of structures at this site, because MSE walls are relatively flexible and more tolerant of post-construction strains, their use, particularly small-block MSE walls, appear to be a better option for most applications at this facility.

Cantilevered Walls The foundation systems outlined in the *Driven Pile Foundation Systems* and the *Shallow Foundations On Improved Soil* sections of this report are applicable to cantilevered walls, as well.

The parameters provided in the *Lateral Loads* section of this report may be used for design of cantilevered retaining walls at the site. The actual values used, however, must be verified by the contractor by additional testing at the time of wall construction. Wall

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design should incorporate any upward sloping backfills, live loads such as traffic, construction equipment, material stockpiles, etc., and other surcharge pressures.

MSE Walls An MSE wall system will bear at shallow depths but is flexible and, in our experience, will be relatively tolerant of total and differential post-construction movements. Therefore, an MSE wall should bear on a section of properly compacted fill that extends to a depth of **3 or more feet** below wall bearing elevation at the toe of the wall. The remedial fill section should extend at a uniform thickness beneath the entire reinforced zone of the wall and to **at least 3 feet** laterally beyond that zone. Geotechnical parameters for fill placement and compaction are provided in the Project Earthwork section of this report.

Bearing capacity for an MSE retaining wall should be developed by the wall designer based on the width of the wall reinforced zone using the parameters presented below for retaining wall design and Meyerhoff or other appropriate bearing capacity methods. Movement potential and services limit states should be evaluated by the wall designer based on the soil conditions and anticipated wall bearing pressure. If soil improvements for bearing capacity and/or service limits are considered necessary, a geotechnical engineer should be retained to provide additional parameters and considerations.

Based on the available geotechnical data, we anticipate that the wall subgrade materials will typically consist of sands and clays. The estimated soil parameters for use in the retaining wall design for on-site material is summarized in the following table, and must be verified prior to and during the wall construction.

Material Type	Moist Unit Weight (pcf)	Internal Friction Angle (degrees)
Site Soils	125	30
CDOT Class 1 Structure Backfill	135	34

It should be noted that soil strength could be significantly reduced if the soils become wetted, and earth pressures realized that are greater than those tabulated above.

Therefore, effective surface drainage near the wall should be included in project design, and drainage should be maintained effectively after construction.

Wall Backfill Wall backfill materials should be selected by the wall designer. Where select, granular fill is called for, it should meet the requirements of CDOT Class 1 Structure Backfill, unless specified otherwise by the wall designer. We do not anticipate that significant volumes of the existing site soils will be suitable for use as retaining wall backfill.

Wall Drainage Retaining walls should be provided with appropriate drain systems, as developed by the wall designer. Wall drains should be designed to discharge into appropriate drainage structures. It likely will be necessary for the design-build team to coordinate the completion of wall drain systems between the retaining wall contractor and earthwork contractor. Regular maintenance should be provided to ensure that the system continues to function effectively.

Because of the soil conditions, drainage systems for an MSE wall should include a 'blanket' drain beneath the entire base of the reinforced zone and a 'chimney' drain placed on the back cut slope behind the reinforced zone. Both the blanket and chimney drains should consist of a layer of free-draining gravel at least 12 inches in thickness, isolated from the silty site soils by a layer of non-woven filter fabric (MiraFi® 140N or the equivalent).

The free-draining gravel should be naturally occurring (not recycled) material with **5 percent or less** passing the No. 200 Sieve and **50 percent or more** retained on the No. 4 Sieve, and have a maximum particle size of **2 inches**.

Like other components of a wall drainage system, the blanket and chimney drains should discharge into an appropriate drainage structure.

LATERAL LOADS

Equivalent Fluid Weights and Friction Coefficients The following equivalent fluid pressures may be used for the design of shallow foundations for project foundation walls.

Where the full passive soil pressure is used to resist lateral loads, it should be understood that significant lateral strains will be required to mobilize the full value indicated above, likely 1 inch or more. A reduced passive pressure can be used for reduced anticipated strains, however, as tabulated below. In GROUND's opinion, cohesion should be considered to be **0 psf** for both on-site soils and Class 1 Structure Backfill.

EQUIVALENT FLUID WEIGHTS (DRAINED CONDITION)

<u>Backfill Material</u>	<u>Condition</u>				<u>Friction Coefficient</u>
	<u>Active</u>	<u>At-Rest</u>	<u>Passive</u>	<u>Passive</u> (½ in. ± Strain)	
Site Soils	42 pcf	63 pcf	335 psf (to a maximum of 3,350 psf)	200 psf (to a maximum of 2,000 psf)	0.38
Select, Granular Fill (CDOT Class 1 Structure Backfill)	39 pcf	60 pcf	-	-	0.45

The active and at-rest earth unit weights provided above assume well drained conditions behind the wall and a horizontal backfill surface. Wall design should incorporate any upward sloping backfills, live loads such as construction equipment, material stockpiles, etc., and other surcharge pressures. The build-up of hydrostatic pressures behind a wall also will increase lateral earth pressures on the walls.

The criteria for CDOT Class 1 Structure Backfill are tabulated in the *Project Earthwork* section of this report.

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Also note that the values provided above were based on a moist unit weight (γ') of 125 pcf and an angle of internal friction (ϕ) of 30 degrees for the on-site soils, and a γ' of 135 pcf and ϕ of 34 degrees, respectively, for CDOT Class 1 Structure Backfill and are un-factored. Appropriate factors of safety should be included in design calculations by the structural engineer.

Deep Foundations Resisting Lateral Loads Based on the data obtained for this study and our experience with similar sites and conditions, the following parameters may be used in lateral load analysis using “L-Pile” or a similar computer program. Geotechnical parameters for input into that program are tabulated below for the same simplified soil / bedrock profile. These include, unit wet weights (γ'), angles of internal friction (ϕ), cohesion (c), for the earth materials, as well as values for strain at 50 percent of failure stress (ϵ_{50}) and horizontal soil modulus (k). Again, resistance to lateral loads should be neglected in the upper **3 feet** of soils, whether fill or native.

Note the following table utilizes relative elevation as previously discussed in this report, not depth below existing grade.

GEOTECHNICAL PARAMETERS FOR LATERAL LOAD ANALYSIS USING L-PILE

Soil / Bedrock Material	Approximate Elevation Range	Parameter	Value
Native Soils (model as Sand without Free Water)	3 feet below FFE - -19 feet	γ'	125 pcf (0.0723 pci)
		ϕ	30 degrees
		k	0.311×10^6 pcf (180 pci)
Native Soils (model as Sand with Free Water)	< -19 feet	γ'	62.4 pcf (0.0362 pci)
		ϕ	30 degrees
		k	0.207×10^6 pcf (120 pci)

WATER-SOLUBLE SULFATES

The concentration of water-soluble sulfates measured in selected samples of site soils up to approximately 0.01 percent by weight. (See Table 2.) Such concentrations of soluble sulfates represent a **negligible** environment for sulfate attack on concrete exposed to these materials. Degrees of attack are based on the scale of 'negligible,' 'moderate,' 'severe' and 'very severe' as described in the "Design and Control of Concrete Mixtures," published by the Portland Cement Association (PCA). The Colorado Department of Transportation (CDOT) utilizes a corresponding scale with four classes of severity of sulfate exposure (Class 0 to Class 3) as described in the table below.

Although the results of laboratory testing indicate a negligible environment, the source material for the alluvial fan contains high concentration of sulfates (i.e., gypsum and other evaporite deposits). Therefore, it is GROUND's opinion that additional water-soluble sulfate testing should be performed.

REQUIREMENTS TO PROTECT AGAINST DAMAGE TO
CONCRETE BY SULFATE ATTACK FROM EXTERNAL SOURCES OF SULFATE

Severity of Sulfate Exposure	Water-Soluble Sulfate (SO_4^{--}) In Dry Soil (%)	Sulfate (SO_4) In Water (ppm)	Water Cementitious Ratio (maximum)	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1500	0.45	Class 1
Class 2	0.21 to 2.00	1501 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,001 or greater	0.40	Class 3

SOIL CORROSIVITY

Data were obtained to support an initial assessment of the potential for corrosion of ferrous metals in contact with earth materials at the site, based on the conditions at the time of GROUND's evaluation. The test results are summarized in Table 2.

Soil Resistivity In order to assess the "worst case" for mitigation planning, samples of materials retrieved from the test holes were tested for resistivity in the laboratory, after

being saturated with water, rather than in the field. Resistivity also varies inversely with temperature. Therefore, the laboratory measurements were made at a controlled temperature. Measurement of electrical resistivity indicated values between approximately 1,800 and 15,967 ohm-centimeters in samples of site soils.

pH Where pH is less than 4.0, soil serves as an electrolyte; the pH range of about 6.5 to 7.5 indicates soil conditions that are optimum for sulfate reduction. In the pH range above 8.5, soils are generally high in dissolved salts, yielding a low soil resistivity.¹⁹ Testing indicated pH values of about 7.8.

Reduction-Oxidation testing indicated red-ox potential between approximately -74 and -77 millivolts. Such low potential typically creates a more corrosive environment.

Sulfide Reactivity testing indicated 'trace' and 'positive' results in the site soils. The presence of sulfides in the soils suggests a more corrosive environment.

Corrosivity Assessment The American Water Works Association (AWWA) has developed a point system scale used to predict corrosivity. The scale is intended for protection of ductile iron pipe but is valuable for project steel selection. When the scale equals 10 points or higher, protective measures for ductile iron pipe are indicated. The AWWA scale is presented below.

The soil characteristics refer to the conditions at and above pipe installation depth. We anticipate that drainage at the site after construction will be effective. Nevertheless, based on the values obtained for the soil parameters, the fill and native soils appear to comprise a severely corrosive environment for ferrous metals (16½ points).

If additional information or evaluation is needed regarding soil corrosivity, then the American Water Works Association or a corrosion engineer should be contacted. It should be noted, however, that changes to the site conditions during construction, such as the import of other soils, or the intended or unintended introduction of off-site water, might alter corrosion potentials significantly.

¹⁹ American Water Works Association ANSI/AWWA C105/A21.5-05 Standard.

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Table A.1 Soil-Test Evaluation

<u>Soil Characteristic / Value</u>	<u>Points</u>
Soil Resistivity	
<1,500 ohm-cm	10
1,500 to 1,800 ohm-cm	8
1,800 to 2,100 ohm-cm	5
2,100 to 2,500 ohm-cm	2
2,500 to 3,000 ohm-cm	1
>3,000 ohm-cm	0
pH	
0 to 2.0	5
2.0 to 4.0	3
4.0 to 6.5	0
6.5 to 7.5	0 *
7.5 to 8.5	0
>8.5	3
Redox Potential	
< 0 (negative values)	5
0 to +50 mV	4
+50 to +100 mV	3½
> +100 mV	0
Sulfide Reactivity	
Positive	3½
Trace	2
Negative	0
Moisture	
Poor drainage, continuously wet	2
Fair drainage, generally moist	1
Good drainage, generally dry	0

* If sulfides are present and low or negative redox-potential results (< 50 mV) are obtained, add three (3) points for this range.

PROJECT EARTHWORK

The earthwork criteria below are based on our interpretation of the geotechnical conditions encountered in the test holes. Where these criteria differ from applicable municipal specifications, e.g., for trench backfill compaction along a public utility line, the latter should be considered to take precedence.

General Considerations Project grading should be performed as early as possible in the construction sequence to allow settlement of fills and surcharged ground to be realized to the greatest extent prior to subsequent construction.

Prior to earthwork construction, existing construction debris, vegetation, and other deleterious materials should be removed and disposed of off-site. Relic underground utilities should be abandoned in accordance with applicable regulations, removed as necessary, and properly capped.

Use of Existing Fill Soils Fill materials were not recognized in the test holes during subsurface exploration, but may be encountered on site. We anticipate that in general, the existing fill soils will be geotechnically suitable for re-use in project fills. Because the fill soils were sampled and tested, however, it is possible that some may not be suitable for re-use as compacted fill, due to the presence of deleterious materials such as trash, organic material, coarse cobbles and boulders, or construction debris. Excavated fill materials should be evaluated and tested, as appropriate, with regard to re-use.

Use of Existing Native Soils Based on the samples retrieved from the test holes, we anticipate that the existing site soils free of organic materials, coarse cobbles, boulders, or other deleterious materials will be suitable, in general, for re-use as compacted fill.

Fragments of rock and cobbles, (as well as inert construction debris, e.g., concrete or asphalt) up to **6 inches** in maximum dimension may be included in project fills, in general. Such materials should be evaluated on a case-by-case basis where identified during earthwork.

The contractor should anticipate encountering significant proportions of unsuitably coarse materials (coarse cobbles and boulders) from excavated site soils. These materials can be placed / wasted in non-structural areas as approved by RFTA.

Imported Fill Materials Materials imported to the site as (common) fill should be free of organic material, and other deleterious materials. Imported material should exhibit **less than 25 percent** passing the No. 200 Sieve and a plasticity index of **10 or less**. Materials proposed for import should be approved prior to transport to the site.

Material to be imported to the site as select, granular fill should meet the criteria for CDOT Class 1 Structure Backfill (tabulated below).

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CDOT CLASS 1 STRUCTURE BACKFILL

Sieve Size or Parameter	Acceptable Range
2-inch	100% passing
No. 4	30% to 100% passing
No. 50	10% to 60% passing
No. 200	5% to 20% passing
Liquid Limit	≤ 35
Plasticity Index	≤ 6

Soils proposed for import as select, granular fill should be tested and approved prior to transport to the site.

Fill Platform Preparation Prior to filling, the top **12 inches** of in-place materials on which fill soils will be placed (except for utility trench bottoms where bedding will be placed) should be scarified, moisture conditioned and properly compacted in accordance with the criteria below to provide a uniform base for fill placement.

If surfaces to receive fill expose loose, wet, soft, or otherwise deleterious material, additional material should be excavated, or other measures taken to establish a firm platform for filling. A surface to receive fill must be effectively stable prior to placement of fill, including trench bottoms prior to placement of bedding.

General Considerations for Fill Placement Fill soils should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted.

No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Where soils on which foundation elements will be placed are exposed to freezing temperatures or repeated freeze – thaw cycling during construction – commonly due to water ponding in foundation excavations – bearing capacity typically is reduced and/or settlements increased due to the loss of density in the supporting soils. After periods of freezing conditions, the contractor should re-work areas affected by the formation of ice to re-establish adequate bearing support.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. Materials that are not properly moisture conditioned may exhibit significant pumping, rutting, and deflection at moisture contents near optimum and above. The contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Compaction areas should be kept separate, and no lift should be covered by another until relative compaction and moisture content within the specified ranges are obtained.

Compaction Criteria Soils placed as fill should be compacted to **97 or more percent** of the maximum dry density at moisture contents **within 3 percent below and 2 above percent** of the optimum moisture content as determined by ASTM D1557, the 'modified Proctor.'

It should be noted that given the silt content of the site soils, achieving appropriate density when placing the soils at moisture contents above the optimum may be difficult.

Also, the moisture contents of the native soils generally were quite low. The contractor should be prepared to obtain and apply sufficient water to complete project earthwork.

Settlements Settlements will occur in newly filled ground, typically on the order of 1 to 2 percent of the fill depth, where fills are properly compacted. (Settlement from fill densification is distinct from remaining potential for volume change in native soils beneath the fill.) For a 12-foot fill, for example, that corresponds to a total settlement of about 2 inches. If fill placement is performed properly and is tightly controlled, in GROUND's experience the majority (on the order of 60 to 80 percent) of that settlement typically will take place during earthwork construction, provided the contractor achieves the compaction levels indicated herein. The remaining potential settlements likely will take several months or longer to be realized, and may be exacerbated if these fills are subjected to changes in moisture content.

Cut and Filled Slopes Permanent, graded slopes supported by local soils up to **20 feet** in height should be constructed no steeper than **2 : 1** (horizontal : vertical). Minor raveling or surficial sloughing should be anticipated on slopes cut at this angle until vegetation is well re-established. Surface drainage should be designed to direct water away from slope faces into designed drainage pathways or structures.

Steeper slope angles and heights may be possible but will require detailed slope stability analysis based on final proposed grading plans. A geotechnical engineer should be retained to evaluate this on a case-by-case basis.

To achieve adequate compaction on filled slopes, it may be beneficial to over-build the slopes and then trim them back.

Slope Creep Final grading plans for the project likely will include slopes that are 10 or more feet in height. In our experience, the silty, local soils supporting the slopes will tend to 'relax' or 'creep' downslope with time. Improvements placed in proximity to the tops-of-slope can be displaced and/or rotated by these soil movements with associated (typically limited) distress. Curbs, pavements, flatwork, fences, and other improvements that are intolerant of this displacement and potential distress should be set back from the tops-of-slope or anchored below the zone of 'active' or 'creeping' soils: typically about 4 feet.

Bulking and Shrinking For planning purposes, at least 12 percent shrinkage should be anticipated during handling and placement of site soils during earthwork. We understand, however, that shrinkages as high as 17 percent have been reported in similar soils in the project area.

EXCAVATION CONSIDERATIONS

Excavation Difficulty Coarse cobbles and boulders are common in the local debris fan deposits. The test holes for this study were advanced by means of conventional, truck-mounted, geotechnical drilling equipment using air percussion (ODEX) drilling methods to allow them to be advanced through the cobbles and boulders. In the test holes, cobbles and boulders were relatively common and boulders up to 5 feet in dimension were encountered. Therefore the contractor should be prepared to excavate, handle, process and export such materials. Additionally, due to the nature of the deposits underlying the project site, the contractor should anticipate that cobbles and boulders, larger than those described in the report, may be present in the site soils. For planning purposes, approximately 25 percent cobbles and boulders should be anticipated in site soils. Therefore, greater than typical efforts and equipment wear should be anticipated to excavate, handle and place these materials.

Similarly, although not recognized in the test holes, coarse materials including debris that may be difficult or awkward to excavate may be encountered locally in existing site fill soils.

Temporary Excavations and Personnel Safety Excavations in which personnel will be working must comply with all applicable OSHA Standards and Regulations, particularly CFR 29 Part 1926, OSHA Standards-Excavations, adopted March 5, 1990. The contractor's "responsible person" should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. GROUND has provided the information in this report solely as a service to Shrewsberry and is not assuming responsibility for construction site safety or the contractor's activities.

The contractor should take care when making excavations not to compromise the bearing or lateral support for any adjacent, existing improvements.

Temporary, un-shored excavation slopes up to **15 feet** in height, in general, should be cut no steeper than **1½ : 1** (horizontal : vertical) in the on-site soils in the absence of seepage. Some surface sloughing may occur on the slope faces at these angles. Should site constraints prohibit the use of the above-indicated slope angle, temporary shoring should be used. GROUND is available to provide shoring design upon request.

Groundwater and Surface Water Groundwater was measured in the Test Hole 1 at a depth of 115 feet below existing grade or a relative elevation of -19 feet. Therefore, groundwater (other than limited volumes of perched water) is not anticipated in relatively shallow project excavations.

Should seepage or flowing groundwater be encountered in project excavations, the slopes should be flattened as necessary to maintain stability or a geotechnical engineer should be retained to evaluate the conditions. The risk of slope instability will be significantly increased in areas of seepage along excavation slopes.

The contractor should take pro-active measures to control surface waters during construction and maintain good surface drainage conditions to direct waters away from excavations and into appropriate drainage structures. A properly designed drainage swale should be provided at the tops of the excavation slopes. In no case should water be allowed to pond near project excavations.

Temporary slopes should also be protected against water flowing down them. Water flow down slopes will result in erosion, sloughing and piping, and could lead to a slope failure.

UTILITY LATERAL INSTALLATION

The measures and criteria below are based on GROUND's evaluation of the local, geotechnical conditions. Where the parameters herein differ from applicable municipal requirements, the latter should be considered to govern.

Pipe Support The bearing capacity of the site soils appeared adequate, in general, for support of typical utility lines. The pipes + contents are less dense than the soils which will be displaced for installation. Therefore, in general GROUND anticipates no significant pipe settlements in these materials where properly bedded from loading alone. Significant settlements can develop from hydro-compactive soils collapse at this site, however.

Trench bottoms may expose existing fill soils, or soft, loose, or otherwise deleterious materials. Firm materials may be disturbed by the excavation process. All such unsuitable materials should be excavated and replaced with properly compacted fill. Where existing fill soils are left in place, locally greater pipe settlements may result, causing "bellies" in the pipes.

Areas allowed to pond water will require excavation and replacement with properly compacted fill. The contractor should take particular care to ensure adequate support near pipe joints which are less tolerant of extensional strains.

Where thrust blocks are needed, the parameters provided in the *Lateral Loads* section of this report may be used for design.

Trench Backfilling Some settlement of compacted soil trench backfill materials should be anticipated, even where all the backfill is placed and compacted correctly. Typical settlements are on the order of 1 to 2 percent of fill thickness. However, the need to compact to the lowest portion of the backfill must be balanced against the need to protect the pipe from damage from the compaction process. Some thickness of backfill may need to be placed at compaction levels lower than specified (or smaller compaction

equipment used together with thinner lifts) to avoid damaging the pipe. Protecting the pipe in this manner can result in somewhat greater surface settlements. Therefore, although other alternatives may be available, the following options are presented for consideration:

Controlled Low Strength Material Because of these limitations, a conservative approach consists of backfilling the entire depth of the trench (both bedding and common backfill zones) with “controlled low strength material” (CLSM), i.e., a lean, sand-cement slurry, “flowable fill,” or similar material along all trench alignment reaches with low tolerances for surface settlements.

CLSM used as pipe bedding and trench backfill should exhibit a 28-day unconfined compressive strength between **50 to 150 psi** so that re-excavation is not unusually difficult.

Placement of the CLSM in several lifts or other measures likely will be necessary to avoid ‘floating’ the pipe. Measures also should be taken to maintain pipe alignment during CLSM placement.

Compacted Soil Backfilling Where compacted soil backfilling is employed, using the site soils or similar materials as backfill, the risk of backfill settlements entailed in the selection of this higher risk alternative must be anticipated and accepted by the designer and RFTA.

We anticipate that the on-site soils excavated from trenches will be suitable, in general, for use as common trench backfill within the above-described limitations. Backfill soils should be free of vegetation, organic debris and other deleterious materials. Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) coarser than 3 inches in maximum dimension should not be incorporated into trench backfills.

Soils placed for compaction as trench backfill should be conditioned to a relatively uniform moisture content, placed and compacted in accordance with the parameters in the *Project Earthwork* section of this report.

Pipe Bedding Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. Bedding should be brought up uniformly on both sides of the pipe to reduce differential loadings.

As discussed above, the use of CLSM or similar material in lieu of granular bedding and compacted soil backfill should be considered where the tolerance for surface settlement is low. (Placement of CLSM as bedding to at least 12 inches above the pipe can protect the pipe and assist construction of a well-compacted conventional backfill, although possibly at an increased cost relative to the use of conventional bedding.)

If granular bedding is specified, the contractor should not anticipate that significant volumes of on-site soils will be suitable for that use. Materials proposed for use as pipe bedding should be tested for suitability prior to use.

With regard to potential migration of fines into granular pipe bedding, design and installation should follow ASTM D2321, Appendix X1.8. If the granular bedding does not meet filter criteria for the enclosing soils, then non-woven filter fabric (e.g., Mirafi® 140N, or the equivalent) should be placed around the bedding to reduce migration of fines into the bedding which can result in severe, local surface settlements. Where this protection is not provided, settlements can develop/continue several months or years after completion of the project. In addition, clay or concrete cut-off walls should be installed to interrupt the granular bedding section to reduce the rates and volumes of water transmitted along the sewer alignment which can contribute to migration of fines.

Other Considerations Because of the potential for collapsible soil settlements to result in significant, extensional strains to utility pipes, pipes should be provided with restrained joints to reduce the potential for failure at joints. Connections to the building or other structures on deep foundations should be flexible and easily replaced or adjusted. Non-pressurized lines should be evaluated periodically for deformations such as pipe 'bellies' that would impair their efficiency, and appropriate repairs made. Maintenance plans should anticipate greater than typical utility line maintenance and replacement.

SURFACE DRAINAGE

The site soils are relatively stable with regard to moisture content – volume relationships at their existing moisture contents. Other than the anticipated, post-placement settlement of fills, post-construction soil movements will result primarily from the introduction of water into the soils underlying the proposed structure, hardscaping and pavements. Based on the site surface and subsurface conditions encountered in this study, we do not anticipate a rise in the local water table sufficient to approach grade beam or floor elevations. Therefore, wetting of the soils likely will result from infiltrating surface waters (precipitation, irrigation, etc.), and water flowing along constructed pathways such as bedding in utility pipe trenches.

The following drainage measures should be followed both for during construction and as part of project design. The facility should be observed periodically to evaluate the surface drainage and identify areas where drainage is ineffective. Routine maintenance of site drainage should be undertaken throughout the design life of the proposed facility – routine maintenance may include the removal and replacement of improvements so that proper drainage may be re-established. If these measures are not implemented and maintained effectively, the movement estimates provided in this report could be exceeded.

- 1) Wetting or drying of the underslab areas should be avoided during and after construction. Permitting increases/variations in moisture to the adjacent or supporting soils may result in increased total and/or differential movements.
- 2) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils of buildings, walls, etc., or into retaining wall backfill. Underdrains should not be relied upon in surface drainage design to collect and discharge surface waters.

A minimum slope of **12 inches in the first 10 feet** in the areas not covered with pavement or concrete slabs should be established. For areas covered with asphalt pavement or concrete slabs, slopes **should comply with ADA requirements where required**. Increasing slopes to a **minimum of 3 percent in the first 10 feet** in the areas covered with pavement or concrete slabs will

reduce, but not eliminate, the potential for moisture infiltration and subsequent volume change of the underling soils.

In no case should water be allowed to pond near or adjacent to foundation elements, hardscaping, etc.

- 3) Drainage also should be established and maintained to direct water away from sidewalks and other hardscaping, retaining walls, as well as utility trench alignments which are not tolerant of increased post-construction movements.

The ground surface near foundation elements should be able to convey water away readily. Cobbles or other materials that tend to act as baffles and restrict surface flow should not be used to cover the ground surface near the foundations.

Where the ground surface does not convey water away readily, additional post-construction movements and distress should be anticipated.

- 4) In GROUND's experience, it is common during construction that in areas of partially completed paving or hardscaping, bare soil behind curbs and gutters, and utility trenches, water is allowed to pond after rain or snow-melt events. Wetting of the subgrade can result in loss of subgrade support and increased settlements / increase heave. By the time final grading has been completed, significant volumes of water can already have entered the subgrade, leading to subsequent distress and failures. The contractor should maintain effective site drainage throughout construction so that water is directed into appropriate drainage structures.
- 5) In no case should water be permitted to pond adjacent to or on sidewalks, hardscaping, or other improvements as well as utility trench alignments, which are likely to be adversely affected by moisture-volume changes in the underlying soils or flow of infiltrating water.
- 6) Roof downspouts and drains, if used, should discharge well beyond the perimeter of the structure foundation, or be provided with positive conveyance

off-site for collected waters. Downspouts should not be routed to discharge into an underdrain system.

If roof downspouts and drains are not used, then surface drainage design should anticipate concentrated volumes of water adjacent to the buildings.

- 7) Irrigation water – both that applied to landscaped areas and over-spray – commonly is a significant cause of distress to improvements. Where (near-) saturated soil conditions are sustained, distress to nearby improvements should be anticipated.

To reduce to potential for such distress, vegetation requiring watering should be located **10 or more feet** from a building perimeter, retaining wall, flatwork, or other improvements. Irrigation sprinkler heads should be deployed so that applied water is not introduced near or into foundation/subgrade soils. Landscape irrigation should be limited to the minimum quantities necessary to sustain healthy plant growth.

Use of drip irrigation systems can be beneficial for reducing over-spray beyond planters. Drip irrigation also can be beneficial for reducing the amounts of water introduced to building foundation soils, but only if the total volumes of applied water are controlled with regard to limiting that introduction. Controlling rates of moisture increase beneath the foundations, floors and other improvements should take higher priority than minimizing landscape plant losses.

Where plantings are desired within 10 feet of the building, plants should be placed in water-tight planters, constructed either in-ground or above-grade, to reduce moisture infiltration in the surrounding subgrade soils. Planters should be provided with positive drainage and landscape underdrains.

As an alternative involving only a limited increase in risk, the use of water-tight planters may be replaced by local shallow underdrains beneath the planter beds.

- 8) Plastic membranes should not be used to cover the ground surface near the building without careful consideration of other components of project drainage. Plastic membranes can be beneficial to directing surface waters away from the

building and toward drainage structures. However, they effectively preclude evaporation and transpiration of shallow soil moisture. Therefore, soil moisture tends to increase beneath a continuous membrane. Where plastic membranes are used, additional shallow, subsurface drains should be installed.

Perforated “weed barrier” membranes that allow ready evaporation from the underlying soils may be used.

- 9) Regular maintenance will be required to maintain effective surface drainage. Maintenance should be anticipated to include removal and replacement of sidewalk stones, curb and gutter, sections of pavement, etc., to restore effective drainage.

SUBSURFACE DRAINAGE

As a component of project civil design, properly functioning, subsurface drain systems (“underdrains”) can be beneficial for collecting and discharging saturated subsurface waters. Although the subsurface drainage system anticipated for this project may consist of perimeter underdrains along the building perimeter and underdrains constructed beneath floor system, they are addressed as underdrains herein.

Underdrains will not collect water infiltrating under unsaturated (vadose) conditions, or moving via capillarity, however. In addition, if not properly constructed and maintained, underdrains can transfer water into foundation soils, rather than remove it. This will tend to induce heave or settlement of the subsurface soils, and may result in distress. Underdrains can, however, provide an added level of protection against relatively severe post-construction movements by draining saturated conditions near individual structures should they arise, and limiting the volume of wetted soil.

Because not all of the collapsible soils will be removed and replaced, the proposed construction should be protected by an underdrain system. Damp-proofing should be applied to the exteriors of below-grade elements. The provision of Tencate MiraFi® G-Series backing (or comparable wall drain provisions) on the exteriors of (some) below-grade elements may be appropriate, depending on the intended use.

GROUND is available to discuss the above options and as well as other underdrain alternatives upon request.

Geotechnical Parameters for Underdrain Design Where an underdrain system is included in project drainage design, design should incorporate the parameters below. The actual underdrain layout, outlets, and locations should be developed by a civil engineer. Typical, cross-section details of an underdrain for this project are provided in Figures 7 and 8.

An underdrain system should be tested by the contractor after installation and after placement and compaction of the overlying backfill to verify that the system functions properly.

- 1) An underdrain system for a building should consist of perforated, rigid, PVC collection pipe at least **4 inches** in diameter, non-perforated, rigid, PVC discharge pipe at least **4 inches** in diameter, free-draining gravel, and filter fabric.
- 2) The free-draining gravel should be naturally occurring (not recycled) material with **5 percent or less** passing the No. 200 Sieve and **50 percent or more** retained on the No. 4 Sieve, and have a maximum particle size of **2 inches**.
- 3) Each collection pipe should be surrounded on the sides and top (only) with **6 or more inches** of free-draining gravel.

The gravel surrounding the collection pipe(s) should be wrapped with filter fabric (Mirafi 140N® or the equivalent) to reduce the migration of fines into the drain system.

- 4) The underdrain system should be designed to discharge at least **10 gallons per minute** of collected water.
- 5) The high point(s) for the collection pipe flow lines should be below the grade beam or shallow foundation bearing elevation as shown on the detail. Multiple high points can be beneficial to reducing the depths to which the system would be installed.

The collection and discharge pipe for the underdrain system should be laid on a slope as determined by the underdrain designer.

Underdrain 'clean-outs' should be provided at intervals of no more than **150 feet** to facilitate maintenance of the underdrains. Clean-outs also should be provided at collection and discharge pipe elbows of **60 degrees or more**.

- 6) The underdrain discharge pipes should be connected to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. We suggest that collected waters be discharged directly into the storm sewer system, if possible.
- 7) Regular maintenance of the underdrain systems should be performed to insure that the system continues work properly.

PAVEMENT SECTIONS

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings.

Standard practice in pavement design describes a typical flexible pavement section as a "20-year" design pavement. However, a pavement should not be anticipated to remain in satisfactory condition without routine maintenance and rehabilitation procedures performed throughout the life of the pavement.

Pavement sections for the RFTA-maintained pavements at the subject facility were developed in general accordance with the guidelines and procedures of the American Association of State Highway and Transportation Officials (AASHTO) and local pavement construction practice.

Subgrade Materials Our data indicate that the shallow soils at the site classify primarily as A-1-b to A-4 soils in accordance with the AASHTO classification system, with group index values of 0. Soils with these classifications typically provide excellent to fair subgrade support.

A resilient modulus of 6,800 psi (equivalent to an R-Value of about 30) was estimated to be representative of the silty site soils and was used in the development of the pavement sections. If the upper 2+ feet of pavement subgrade, as constructed, exhibit a significantly higher resilient modulus or R-Value, then thinner pavement sections likely can be developed.

It is important to note that significant decreases in soil support have been observed as the moisture content increases above the optimum. Pavements that are not properly drained may experience a loss of the soil support and subsequent reduction in pavement life.

Anticipated Traffic The design 20-year, equivalent 18-kip single axle loadings (ESAL₁₈'s) were calculated using traffic data provided by Shrewsberry and CDOT loading parameters. These data indicated an average total of 512 vehicles per day over the design life of the pavement, for the areas that will receive both passenger vehicle and bus traffic. Of these vehicles, 172 vehicles were indicated to be busses. For the areas to receive only passenger vehicle traffic an average total of 340 vehicles per day over the design life of the pavement was indicated. Based on these data, a design value for flexible pavements of approximately 824,900 ESAL₁₈'s was calculated (20,586,000 ESAL₁₈'s for rigid pavements) for areas to receive bus and passenger vehicle traffic. For the areas to receive only passenger vehicle traffic, a design value for flexible pavements of approximately 21,900 ESAL₁₈'s was calculated (32,900 ESAL₁₈'s for rigid pavements) for areas to receive passenger vehicle traffic. These traffic loadings were used in design of the pavement structures for the RFTA Maintenance Facility Additions.

If design traffic loadings differ or change significantly from these assumed values, GROUND should be notified to re-evaluate the pavement sections below.

Pavement Sections The soil resilient modulus and the ESAL values were used to determine the required structural number for the project pavements which then was then used to develop the pavement sections based on the DARWin™ computer program that solves the 1993 AASHTO pavement equations. A reliability level of 85 percent and a terminal serviceability of 2.0 were utilized for design of the pavement sections. A structural coefficient of 0.44 was used for hot bituminous asphalt and 0.12 was used for

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aggregate base course. The minimum pavement sections for a 20-year design are tabulated below.

Minimum Pavement Sections

<i>Location</i>	<i>Composite Section</i>	<i>Rigid Section</i>
	<i>(inches Asphalt / inches Aggregate Base)</i>	<i>(inches Concrete / inches Aggregate Base)</i>
Passenger Vehicle Traffic Areas	3 / 6	6 / 6
Bus and Heavy Vehicle Routes, All Turning Areas		8 / 6

Truck loading and unloading areas, fire lanes, trash collection areas, as well as other pavement areas subjected to repeated turning stresses or heavy truck traffic should be provided with rigid pavements consisting of **8 or more inches** of portland cement concrete. All concrete sections should be underlain by **6 inches** of properly compacted CDOT Class 6 Aggregate Base Course.

Pavement Materials Asphalt pavement should consist of a bituminous plant mix composed of a mixture of aggregate and bituminous material. Asphalt mixture(s) should meet the requirements of a job-mix formula established by a qualified engineer as well as applicable CDOT design requirements.

Aggregate gradation **S** (nominal $\frac{3}{4}$ -inch) and binder type **PG58-22** should be used for the lower lift(s), and gradation **SX** (nominal $\frac{1}{2}$ -inch) and binder type **PG64-28** for the top lift. Alternate binder types may be appropriate, however, based on local availability.

For the lower (S) lift(s), lift thicknesses generally should be between **2¼ and 3½ inches**. The top (SX) lift generally should be between **2 and 3 inches** in thickness.

Aggregate base material should meet the criteria of CDOT Class 6 Aggregate Base Course. Base course should be placed in and compacted in accordance with the standards in the *Project Earthwork* section of this report.

Pavement concrete should consist of a plant mix composed of a mixture of aggregate, portland cement and appropriate admixtures meeting the requirements of a job-mix formula established by a qualified engineer as well as applicable CDOT design requirements design requirements. Concrete should have a minimum modulus of rupture of third point loading of **650 psi**. Normally, concrete with a 28-day compressive strength of 4,500 psi should develop this modulus of rupture value. The concrete should be air-entrained with approximately 6 percent air and should have a minimum cement content of **6 sacks per cubic yard**. Maximum allowable slump should be **4 inches**.

These concrete mix design criteria should be coordinated with other project requirements including any criteria for sulfate resistance presented in the *Water-Soluble Sulfates* section of this report. To reduce surficial spalling resulting from freeze-thaw cycling, we suggest that pavement concrete meet the requirements of CDOT Class P concrete. In addition, the use of de-icing salts on concrete pavements during the first winter after construction will increase the likelihood of the development of scaling. Placement of flatwork concrete during cold weather so that it is exposed to freeze-thaw cycling before it is fully cured also increases its vulnerability to scaling. Concrete placing during cold weather conditions should be blanketed or tented to allow full curing. Depending on the weather conditions, this may result in 3 to 4 weeks of curing, and possibly more.

Concrete pavements should contain sawed or formed joints. CDOT and various industry groups provide guidelines for proper design and concrete construction and associated jointing. In GROUND's opinion, all concrete pavement joints at this facility should be fully tied and doweled. Example layouts for joints, as well as ties and dowels, which may be applicable, can be found in CDOT's M standards, found at the CDOT website: <http://www.dot.state.co.us/DesignSupport/>. PCA, ACI and ACPA publications also provide useful guidance in these regards. Joint spacings less than the 15-foot maximum indicated in in CDOT's M standards, e.g., 10 feet or 12 feet, may be beneficial to reduce concrete cracking.

Subgrade Preparation Although subgrade preparation to a depth of 12 inches is common in the general project area, the local soils are sufficiently expansive that we do not consider 12 inches to be a sufficient depth of subgrade preparation. Remedial earthwork to any depth will not prevent pavement distress on these soils, but will tend to

reduce it and improve perceived rideability. At this site, it is likely that greater than typical maintenance measures, including the removal and replacement of pavements will be required.

Remedial Earthwork Due to the presence of collapsible soils at the site, the pavements should be constructed on a section of properly moisture-conditioned and compacted fill at least **3 feet** in thickness or a thickness that completely removes and replaces any local undocumented fill soils, whichever is greater. This section assumes that a) traffic speeds in the parking areas and driveways will be relatively slow, and b) the facility owner will be tolerant of significant total and differential pavement post-construction movements (on the order of several inches) and the associated maintenance costs that are necessary to re-establish effective drainage, replace distressed pavement, etc. The as-constructed R-value or resilient modulus of the upper 2 feet of this remedial section should be assessed to confirm that an R-value of at least 30 or an in-place resilient modulus of at least 6,800 psi has been achieved. Where it has not been achieved, the as-constructed fill soils should be replaced with properly compacted material that meets one of these criteria.

It must be understood that a 3-foot fill section will leave a great thickness of collapsible debris fan deposits in place beneath the pavements. The fill section is beneficial primarily to slow infiltration into the underlying native soils. Therefore, effective site drainage, crack sealing, etc., are important for good pavement performance and to limit increases in pavement maintenance.

Additionally, if a performance like project floors as discussed in other sections of this report is desired, for example at a drop-off / pick-up location, then a pavement should be constructed as a floor.

Criteria for placement and compaction of fill are provided in the *Project Earthwork* section of this report.

Subgrade preparation of the selected depth should extend the full width of the pavement from back-of-curb to back-of-curb. The subgrade for any sidewalks and other project hardscaping also should be prepared in the same manner.

Geotechnical criteria for fill placement and compaction are provided in the *Project Earthwork* section of this report. The contractor should be prepared to either dry the subgrade materials or moisten them, as needed, prior to compaction.

Proof Rolling Immediately prior to paving, the subgrade should be proof rolled with a heavily loaded, pneumatic tired vehicle. Areas that show excessive deflection during proof rolling should be excavated and replaced and/or stabilized. Areas allowed to pond prior to paving will require significant re-working prior to proof-rolling. Establishment of a firm paving platform (as indicated by proof rolling) is an additional requirement beyond proper fill placement and compaction. It is possible for soils to be compacted within the limits indicated in the *Project Earthwork* section of this report and fail proof rolling, particularly in the upper range of moisture content.

Temporary Fire Truck Access Commonly, construction sites are required by local fire departments to provide temporary access for emergence response. It has been GROUND's experience these access drives are to provide support for trucks weighing up to 90,000 pounds and are typically desired to be gravel/aggregate-surfaced.

Based on our experience, a temporary section consisting of at least 12 inches of aggregate meeting the requirements of CDOT Class 5 or Class 6 Aggregate Base Course or at least 8 inches of CDOT Class 5 or Class 6 Aggregate Base Course over a layer of stabilization geotextile/geofabric, such as Mirafi® RS380i or the equivalent, could be utilized provided the Owner understands that this section is for temporary access during construction only and is not a replacement or an equal alternate to the pavement section(s) that was indicated previously. The aggregate base course placed for this purpose should be compacted to at least 95 percent of the maximum modified Proctor dry density. It should be noted that the aggregate base course sections indicated above are not intended to support fire truck outriggers without cribbing or similar measures.

It should be understood that with any aggregate surface, shoving and displacement of the granular materials should be expected during repetitive vehicular/equipment loading. Therefore, regular maintenance should be implemented to ensure proper surface and subsurface drainage, repair distressed/damaged areas, and re-establish grades. Application of additional aggregate may be required in this regard. Additionally, the

ability of the aggregate temporary access drive to accommodate loads as indicated above is directly related to the quality of the subgrade materials on which the aggregate is placed, not only on the aggregate section. If water infiltrates these areas, additional rutting and other distress, including a reduction in capacity, will result, requiring additional maintenance.

Additional Observations The collection and diversion of surface drainage away from paved areas is extremely important to the satisfactory performance of the pavements. The subsurface and surface drainage systems should be carefully designed to ensure removal of the water from paved areas and subgrade soils. Allowing surface waters to pond on pavements will cause premature pavement deterioration. Where topography, site constraints, or other factors limit or preclude adequate surface drainage, pavements should be provided with edge drains to reduce loss of subgrade support. The long-term performance of the pavement also can be improved greatly by proper backfilling and compaction behind curbs, gutters, and sidewalks so that ponding is not permitted and water infiltration is reduced.

Landscape irrigation in planters adjacent to pavements and in “island” planters within paved areas should be carefully controlled or differential heave and/or rutting of the nearby pavements will result. Drip irrigation systems are suggested for such planters to reduce over-spray and water infiltration beyond the planters. Enclosing the soil in the planters with plastic liners and providing them with positive drainage also will reduce differential moisture increases in the surrounding subgrade soils.

In our experience, infiltration from planters adjacent to pavements is a principal source of moisture increase beneath those pavements. This wetting of the subgrade soils from infiltrating irrigation commonly leads to loss of subgrade support for the pavement with resultant accelerating distress, loss of pavement life and increased maintenance costs. This is particularly the case in the later stages of project construction after landscaping has been emplaced but heavy construction traffic has not ended. Heavy vehicle traffic over wetted subgrade commonly results in rutting and pushing of flexible pavements, and cracking of rigid pavements. In relatively flat areas where design drainage gradients necessarily are small, subgrade settlement can obstruct proper drainage and yield increased infiltration, exaggerated distress, etc. (These considerations apply to project flatwork, as well.)

Also, GROUND's experience indicates that longitudinal cracking is common in asphalt-pavements generally parallel to the interface between the asphalt and concrete structures such as curbs, gutters, or drain pans. Distress of this type is likely to occur even where the subgrade has been prepared properly and the asphalt has been compacted properly.

The anticipated traffic loading does not include excess loading conditions imposed by heavy construction vehicles. Consequently, heavily loaded concrete, lumber, and building material trucks can have a detrimental effect on the pavement.

Most pavements will not remain in satisfactory condition and achieve their "design lives" without regular maintenance and rehabilitation procedures performed throughout the life of the pavement. Maintenance and rehabilitation measures preserve, rather than improve, the structural capacity of the pavement structure. Therefore, an effective program of regular maintenance should be developed and implemented to seal cracks, repair distressed areas, and perform thin overlays throughout the lives of the pavements. The greatest benefit of pavement overlaying will be achieved by overlaying sound pavements that exhibit little or no distress.

Crack sealing should be performed at least annually and a fog seal/chip seal program should be performed on the pavements every 3 to 4 years. After approximately 8 to 10 years after construction, patching, additional crack sealing, and asphalt overlay may be required. Prior to overlays, it is important that all cracks be sealed with a flexible, rubberized crack sealant in order to reduce the potential for propagation of the crack through the overlay. If actual traffic loadings exceed the values used for development of the pavement sections, however, pavement maintenance measures will be needed on an accelerated schedule.

EXTERIOR FLATWORK

We anticipate that the exteriors of proposed buildings and other portions of the site will be provided with concrete flatwork. Like other site improvements, flatwork will experience post-construction movements as soil moisture contents increase after construction and distress likely will result. The following measures will help to reduce damages to these improvements, but will not prevent all movements. Critical flatwork including at entrances and exits should be constructed as a structural floor spanning or a

void or a crawlspace in a similar manner to project floors. In other areas where performance like project floors as discussed in other sections of this report is desired, project exterior flatwork should be constructed as a floor. Such areas should be identified by RFTA and likely will include flatwork that is adjacent to buildings.

- 1) Remedial earthwork to prepare flatwork subgrades is subject to the same factors discussed in the *Pavement Sections* section of this report, and should be undertaken to the same depth.
- 2) Prior to placement of flatwork, a proof roll should be performed to identify areas that exhibit instability and deflection. The deleterious soils in these areas should be removed and replaced with properly compacted fill. The contractor should take care to achieve and maintain compaction behind curbs to reduce differential sidewalk settlements. Passing a proof roll is an additional requirement to placing and compacting the subgrade fill soils within the specified ranges of moisture content and relative compaction in the *Project Earthwork* section of this report. Subgrade stabilization may be cost-effective in this regard.
- 3) Flatwork should be provided with control joints extending to an effective depth and spaced no more than **10 feet** apart, both ways. Narrow flatwork, such as sidewalks, likely will require more closely spaced joints.
- 4) In no case should exterior flatwork extend to under any portion of the building where there is less than **10 inches** of vertical clearance between the flatwork and any element of the building. Exterior flatwork in contact with brick, rock facades, or any other element of the building can cause damage to the structure if the flatwork experiences movements.

Construction and Drainage Between Buildings and Pavements Proper design, drainage, construction and maintenance of the areas between individual buildings and parking/driveway areas are critical to the satisfactory performance of the project. Sidewalks, entranceway slabs and roofs, fountains, raised planters and other highly visible improvements commonly are installed within these zones, and distress in or near these improvements is common. Commonly, proper soil preparation in these areas receives little attention during overlot construction because they fall between the building and pavement areas which typically are built with heavy equipment. Subsequent

landscaping and hardscape installation often is performed by multiple sub-contractors with light or hand equipment, and necessary over-excavation and soil processing is not performed. Consequently, subgrade soil conditions commonly deviate significantly from specified ranges. Therefore, the contractor should take particular care with regard to proper subgrade preparation in the immediate building exteriors.

Concrete Scaling Climatic conditions in the project area including relatively low humidity, large temperature changes and repeated freeze – thaw cycles, make it likely that project sidewalks and other exterior concrete will experience surficial scaling or spalling. The likelihood of concrete scaling can be increased by poor workmanship during construction, such as ‘over-finishing’ the surfaces. In addition, the use of de-icing salts on exterior concrete flatwork, particularly during the first winter after construction, will increase the likelihood of scaling. Even use of de-icing salts on nearby roadways, from where vehicle traffic can transfer them to newly placed concrete, can be sufficient to induce scaling. Typical quality control / quality assurance tests that are performed during construction for concrete strength, air content, etc., do not provide information with regard to the properties and conditions that give rise to scaling.

Removal and replacement of concrete that exhibits scaling may be required, even if the material was within specification and placed correctly. The contractor should be aware of the local conditions and requirements and be prepared to take measures to reduce the potential for scaling and/or replace concrete that scales.

In GROUND’s experience, the measures below can be beneficial for reducing the likelihood of concrete scaling. It must be understood, however, that because of the other factors involved, including weather conditions and workmanship, surface damage to concrete can develop, even where all of these measures were followed. Also, the mix design criteria should be coordinated with other project requirements including criteria for sulfate resistance presented in the *Water-Soluble Sulfates* section of this report.

- 1) Maintaining a maximum water/cement ratio of 0.45 by weight for exterior concrete mixes.
- 2) Include Type F fly ash in exterior concrete mixes as 20 percent of the cementitious material.

- 3) Specify a minimum, 28-day, compressive strength of 4,500 psi for all exterior concrete.
- 4) Including 'fibermesh' in the concrete mix also may be beneficial for reducing surficial scaling.
- 5) Cure the concrete effectively at uniform temperature and humidity. This commonly will require fogging, blanketing and/or tenting, depending on the weather conditions. As long as 3 to 4 weeks of curing may be required, and possibly more.
- 6) Avoid placement of concrete during cold weather so that it is not exposed to freeze-thaw cycling before it is fully cured.
- 7) Avoid the use of de-icing salts on given reaches of flatwork through the first winter after construction.

We understand that commonly it may not be practical to implement some of these measures for reducing scaling due to safety considerations, project scheduling, etc. In such cases, additional costs for flatwork maintenance or reconstruction should be incorporated into project budgets.

Frost and Ice Considerations Nearly all soils other than relatively coarse, clean, granular materials are susceptible to loss of density if allowed to become saturated and exposed to freezing temperatures and repeated freeze – thaw cycling. The formation of ice in the underlying soils can result in heaving of pavements, flatwork, and other hardscaping ("ice jacking") in sustained cold weather up to 3 inches or more. This heaving can develop relatively rapidly. A portion of this movement typically is recovered when the soils thaw, but due to loss of soil density, some degree of displacement will remain. This can result even where the subgrade soils were prepared properly.

Where hardscape movements are a design concern, e.g., at doorways, replacement of the subgrade soils with 3½ or more feet of clean, coarse sand or gravel should be considered or supporting the element on foundations similar to the building and spanning over a void. Detailed guidance in this regard can be provided upon request. It should be noted that where such open graded granular soils are placed, water can

infiltrate and accumulate in the subsurface relatively easily, which can lead to increased settlement or heave from factors unrelated to ice formation. Therefore, where a section of open graded granular soils are placed, a local underdrain system should be provided to discharge collected water. GROUND will be available to discuss these concerns upon request.

CLOSURE

Materials Testing RFTA and/or the design-build team should consider retaining a geotechnical engineer to perform materials testing during construction. The performance of such testing or lack thereof, however, in no way alleviates the burden of the contractor or subcontractor from constructing in a manner that conforms to applicable project documents and industry standards. The contractor or pertinent subcontractor is ultimately responsible for managing the quality of his work; furthermore, testing by the geotechnical engineer does not preclude the contractor from obtaining or providing whatever services that he deems necessary to complete the project in accordance with applicable documents.

Limitations This report has been prepared for Shrewsberry and RFTA as it pertains to project planning, and design and bid development for the proposed maintenance facility addition as described herein. It should not be assumed to contain sufficient information for other parties or other purposes. Shrewsberry, has agreed to the terms, conditions, and liability limitations outlined in the proposal between Shrewsberry and GROUND. Reliance on our report by the design-build team(s) for the project is granted under the same terms, conditions and liability limitations. Reliance upon our report is not granted to any other party. Requests for other third-party reliance should be directed to GROUND in writing; granting reliance by GROUND is not guaranteed.

In addition, GROUND has assumed that project construction will commence by Fall 2018. Any changes in project plans or schedule should be brought to the attention of a geotechnical engineer, in order that the geotechnical conclusions in this report may be re-evaluated and, as necessary, modified, due to (potential) changes in the site, project plans and/or the state of geotechnical practice.

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The geotechnical conclusions in this report were based on subsurface information from a limited number of exploration points, as shown in Figure 1, as well as the means and methods described herein. Subsurface conditions were interpolated between and extrapolated beyond these locations. It is not possible to guarantee the subsurface conditions are as indicated in this report. Actual conditions exposed during construction may differ from those encountered during site exploration. This variability should be anticipated by the design-build contractor who, therefore, should obtain such additional geotechnical information as necessary to address such concerns.

In addition, a sub-contractor who obtains information from this report for development of his scope of work or cost estimates does so solely at his own risk and may find the geotechnical information in this report to be inadequate for his purposes or find the geotechnical conditions described herein to be at variance with his experience in the greater project area. The contractor should obtain the additional geotechnical information that is necessary to develop his workscope or cost estimates with sufficient precision. This includes, but is not limited to, information regarding excavation conditions, earth material usage, current depths to groundwater, etc. Because of the necessarily limited nature of the subsurface exploration performed for this study, the contractor should be allowed to evaluate the site using test pits or other means to obtain additional subsurface information to prepare his bid.

If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, a geotechnical engineer should be retained at once, so that our conclusions for this site may be re-evaluated in a timely manner and dependent aspects of project design can be modified, as necessary.

The materials encountered on-site were stable at their natural moisture content, but may change volume or lose bearing capacity or stability with changes in moisture content. Performance of the proposed structure and pavement will depend on implementation of the measures outlined in this report and on proper maintenance after construction is completed. Water is a significant cause of volume change in soils and rock, and the subject site is more than typically vulnerable in this regard. Allowing moisture infiltration may result in movements which will exceed estimates provided herein and should therefore be expected by Shrewsberry, RFTA and the design-build team.

ALL DEVELOPMENT CONTAINS INHERENT RISKS. It is important that ALL aspects of this report, as well as the estimated performance (and limitations with any such estimations) of proposed improvements are understood by Shrewsberry, RFTA and others utilizing this report. Utilizing the geotechnical parameters and measures herein for planning, design, and/or construction constitutes understanding and acceptance of the conclusions with regard to risk and other information provided herein, associated improvement performance, as well as the limitations inherent within such estimates. Ensuring correct interpretation of the contents of this report by others is not the responsibility of GROUND. If any information referred to herein is not well understood, it is imperative that Shrewsberry contact the author or a GROUND principal immediately. We will be available to meet to discuss the risks and remedial approaches presented in this report, as well as other potential approaches, upon request.

This report was prepared in accordance with generally accepted soil and foundation engineering practice in the Garfield County area at the date of preparation. The parameters provided herein are in general accordance with the City of Glenwood Springs' uniform codes. Applicable codes at the time of construction may contain criteria regarding performance of structures and/or site improvements which may differ from those provided herein. Our office should be contacted regarding any apparent disparity.

GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or conclusions contained herein. Because of numerous considerations that are beyond GROUND's control, the economic or technical performance of the project cannot be guaranteed in any respect.

This document, together with the concepts and conclusions presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Re-use of, or improper reliance on this document without written authorization and adaption by GROUND Engineering Consultants, Inc., shall be without liability to GROUND Engineering Consultants, Inc.

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GROUND appreciates the opportunity to complete this portion of the project and welcomes the opportunity to provide Shrewsberry or the owner with a proposal for construction observation and materials testing.

Sincerely,

GROUND Engineering Consultants, Inc.



Ben Fellbaum, P.G.



Reviewed by Brian H. Reck, P.G., C.E.G., P.E.



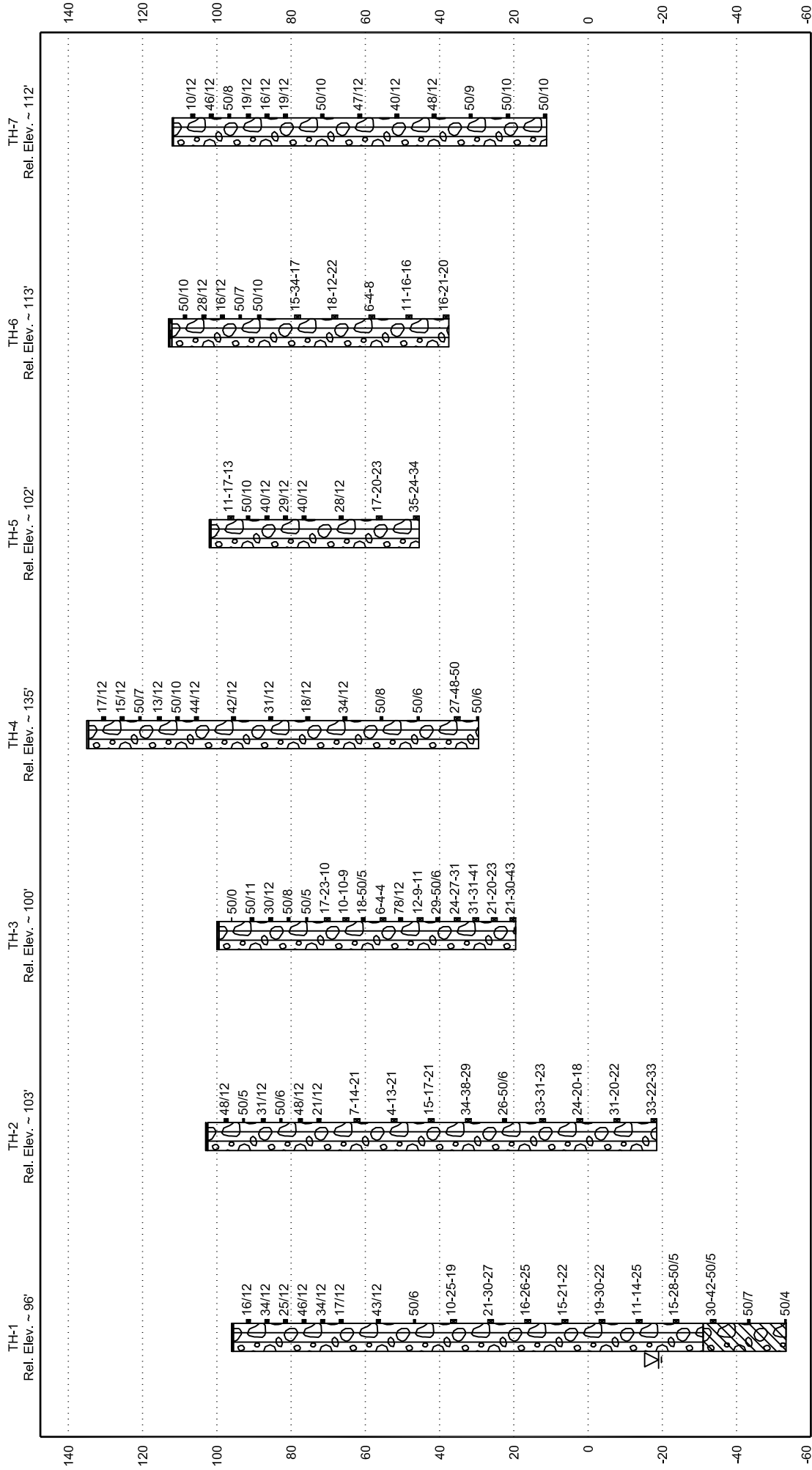
GOOGLE EARTH AERIAL IMAGE (06/23/2017)



- 1  Indicates test hole number and approximate location.

(Not to Scale)

GROUND ENGINEERING CONSULTANTS		
LOCATION OF TEST HOLES		
JOB NO.: 17-3061	FIGURE: 1	
CADFILE NAME: 3061SITE.DWG		



LOGS OF TEST HOLES

JOB NO.: 17-3061

FIGURE: 2

CADFILE NAME: 3061SITE.DWG

LEGEND:



Topsoil



Road Base



Asphalt



Silty Sands and Gravels: Clean to silty, fine to coarse sands and gravels with cobbles and boulders and local clays. They were dry to wet, non- to moderately plastic, loose to very dense, red to red brown and dark red brown. Wood and other plant material was noted locally in the upper portions of this section.



Clayey Sands and Gravels: Clean to clayey, fine to coarse sands and gravels with cobbles and boulders and local silts. They were dry to wet, non- to moderately plastic, dense to very dense, brown to gray brown in color.



Drive sample, 2-inch I.D. California liner sample

23/12

Drive sample blow count, indicates 23 blows of a 140-pound hammer falling 30 inches were required to drive the sampler 12 inches.



Drive sample, 1-3/8 inch I.D. standard sample

20/25/30

Drive sample blow count, indicates 20, 25, and 30 blows of a 140-pound hammer falling 30 inches were required to drive the sampler 18 inches.



Depth to water level.

NOTES:

- 1) Test holes were drilled on 12/11 through 12/15/2017 with 115mm diameter ODEX augers.
- 2) Locations of the test holes were measured approximately by pacing from features shown on the site plan provided.
- 3) Elevations of the test holes were measured relative to site features and the logs of the test holes are hung to relative elevations.
- 4) The test hole locations and elevations should be considered accurate only to the degree implied by the method used.
- 5) The lines between materials shown on the test hole logs represent the approximate boundaries between material types and the transitions may be gradual.
- 6) Groundwater level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.
- 7) The material descriptions on this legend are for general classification purposes only. See the full text of this report for descriptions of the site materials and related information.
- 8) All test holes were immediately backfilled upon completion of drilling, unless otherwise specified in this report.

GROUND

ENGINEERING CONSULTANTS

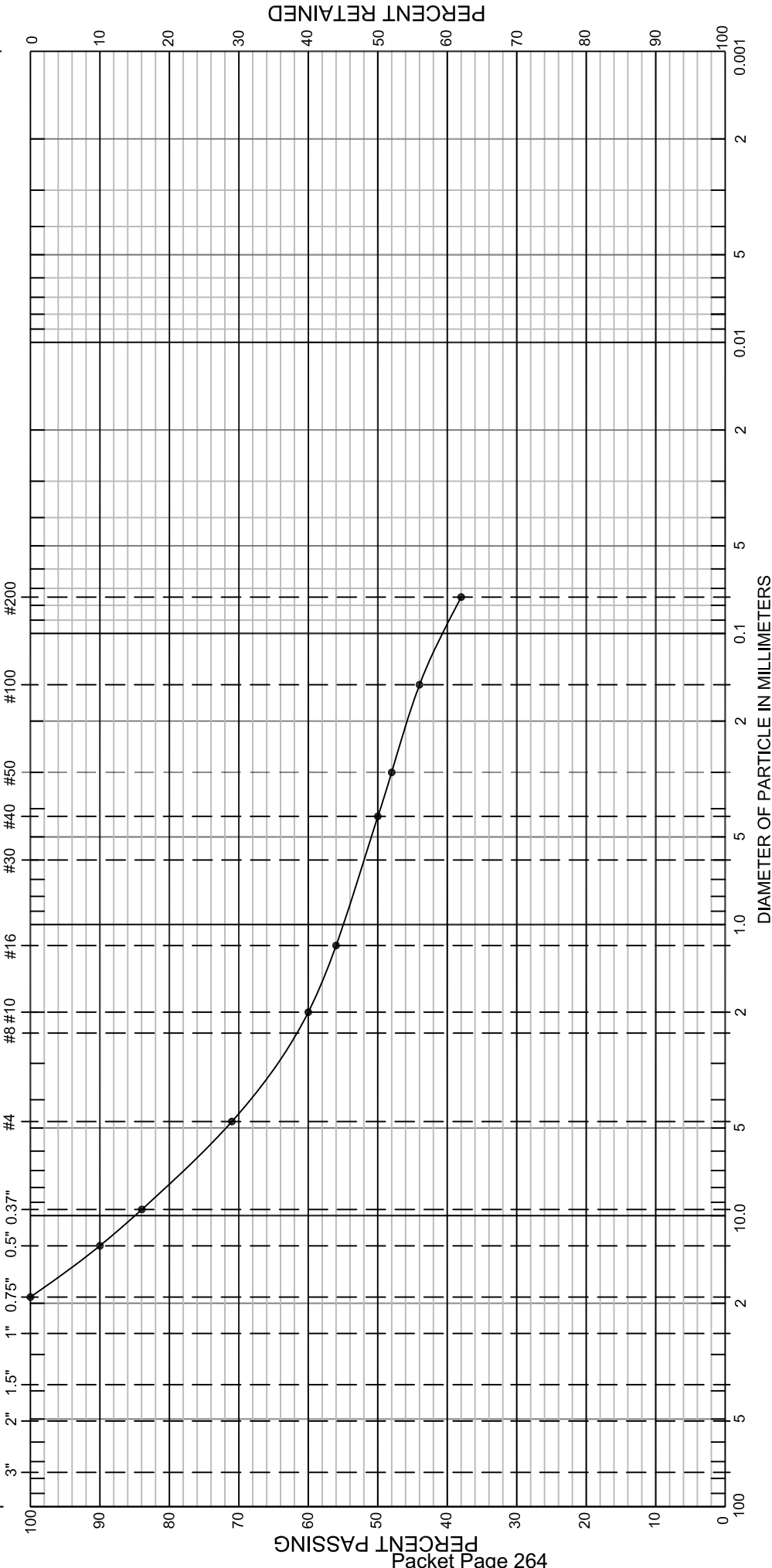
LEGEND AND NOTES

JOB NO.: 17-3061

FIGURE: 3

CADFILE NAME: 3061LEG.DWG

SIEVE ANALYSIS: ASTM C 136 with C 117 or D 1140			HYDROMETER ANALYSIS: ASTM D 422		
Sieve Openings			Time Readings		
U.S. Standard Sieves					

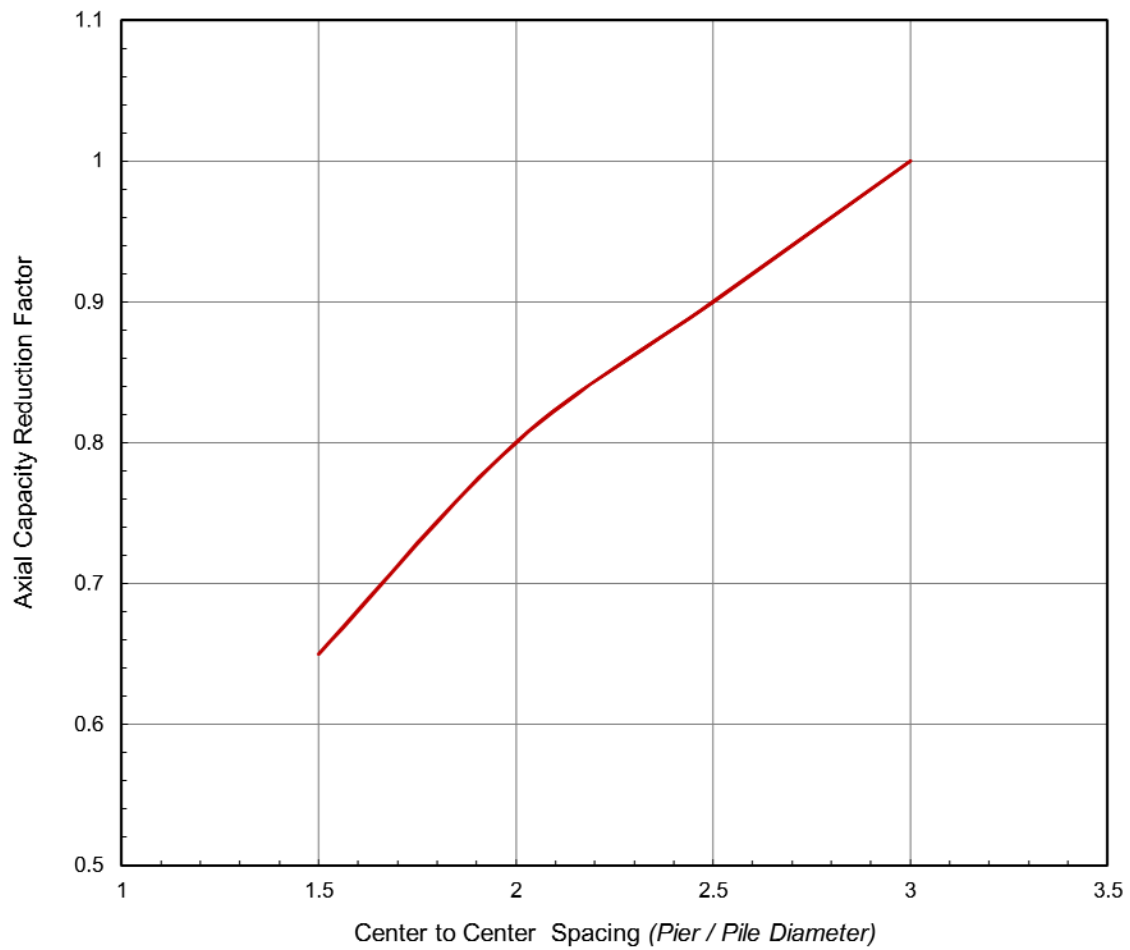


COBBLES	Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY
	GRAVEL		SAND				

GROUND
ENGINEERING CONSULTANTS

GRADATION TEST RESULTS
JOB NO.: 17-3061 FIGURE: 4
CADFILE NAME: 3061GRAD.DWG

Sample Location: Test Hole 1 at 129 feet	Gravel: 29 %	Sand: 33 %	Silt and Clay: 38 %
Sample Description: Silty, Clayey SAND with Gravel; A-4(0)	LL = 24	PI = 5	



Axial Capacity Reductions as Functions of Closely Spaced Pier / Pile Elements.

The graph above provides estimated reductions in total axial capacity for closely spaced piers.

Pier / Pile reductions should be interpolated from the graph above.

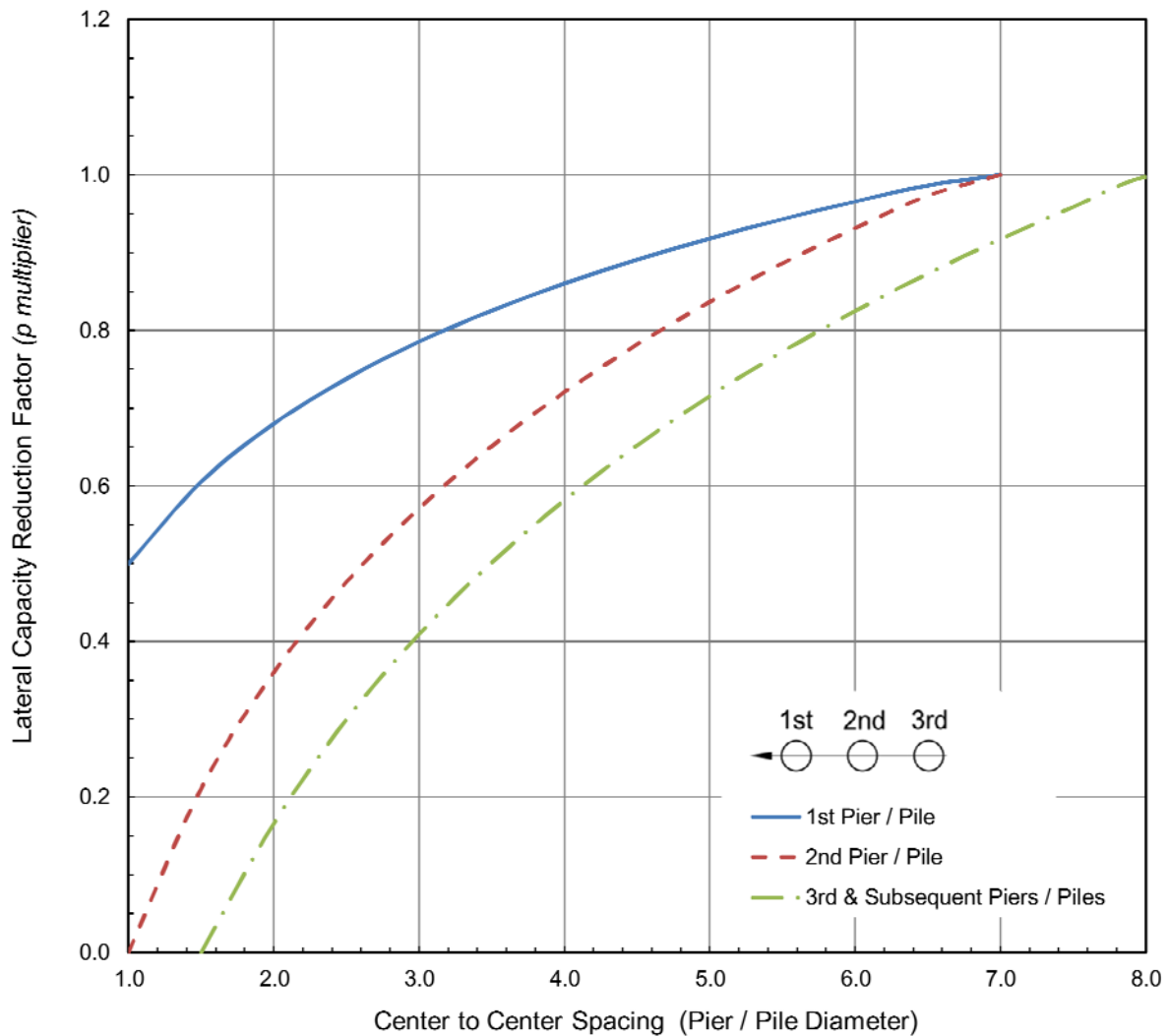
GROUND ENGINEERING CONSULTANTS

AXIAL CAPACITY
REDUCTION FACTORS
FOR CLOSELY SPACED PIERS / PILES

JOB NO.: 17-3061

FIGURE: 5

CADFILE NAME: 3061APR.DWG



Lateral Capacity Reductions (p multipliers) as Functions of Closely Spaced Pier / Pile Elements

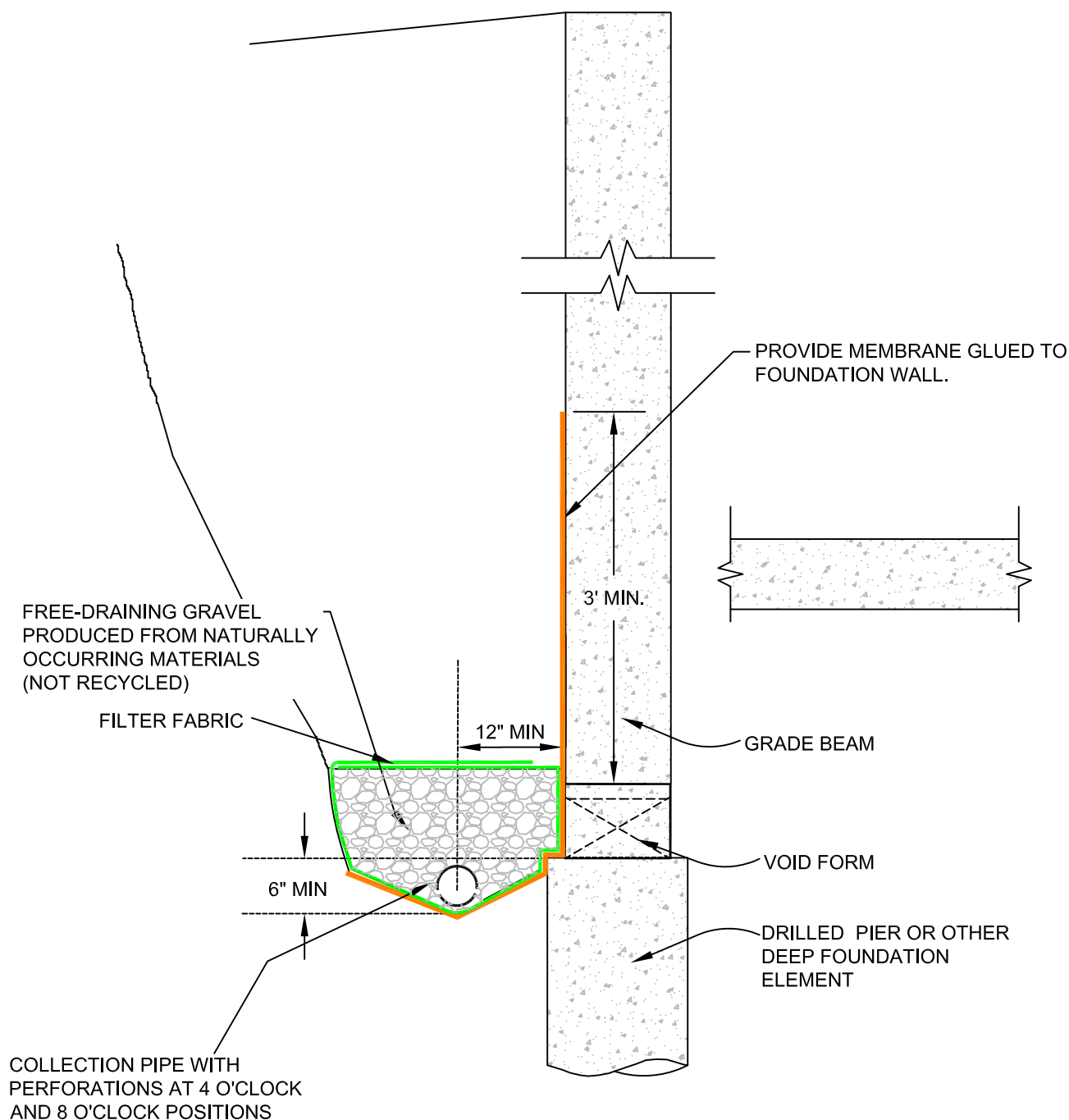
The "1st" or "lead" pier / pile is the element that leads movement in the direction that the lateral load will cause the piers to deflect, as shown .

For lateral loads oriented perpendicular to the row of piers / piles, use the 1st pier / pile p-multiplier.

Pier / Pile reductions should be interpolated from the graph above.

Figure to be reproduced in color for clarity.

GROUND ENGINEERING CONSULTANTS	
LATERAL CAPACITY REDUCTION FACTORS FOR CLOSELY SPACED PIERS / PILES	
JOB NO.: 17-3061	FIGURE: 6
CADFILE NAME: 3061LLPR.DWG	



SEE TEXT FOR ADDITIONAL INFORMATION

AT THE TIME OF PREPARATION OF THIS TYPICAL DETAIL, BUILDING AND DRAINAGE PLANS HAD NOT BEEN DEVELOPED FULLY. MODIFICATION OF THE DETAIL MAY BE NECESSARY AS PART OF FINAL DESIGN. GROUND CAN BE CONTACTED BY THE CIVIL ENGINEER IN THIS REGARD

NOTES:

1. THIS IS NOT A DESIGN-LEVEL DRAWING. IT SHOULD BE USED SOLELY FOR GENERAL INFORMATIONAL PURPOSES ONLY. ACTUAL UNDERDRAIN DESIGN SHOULD BE COMPLETED BY OTHERS.
2. THE UNDERDRAIN SYSTEM MUST BE TESTED BY THE CONTRACTOR AFTER INSTALLATION AND BACKFILLING TO VERIFY THAT IT FUNCTIONS PROPERLY.
3. INCLUSION OF THIS FIGURE IN CONSTRUCTION DOCUMENTS IS DONE SO AT THE DOCUMENT PREPARER'S RISK.
4. REPRODUCTION OF THIS DOCUMENT SHOULD BE IN COLOR.

Packet Page 267

GROUND

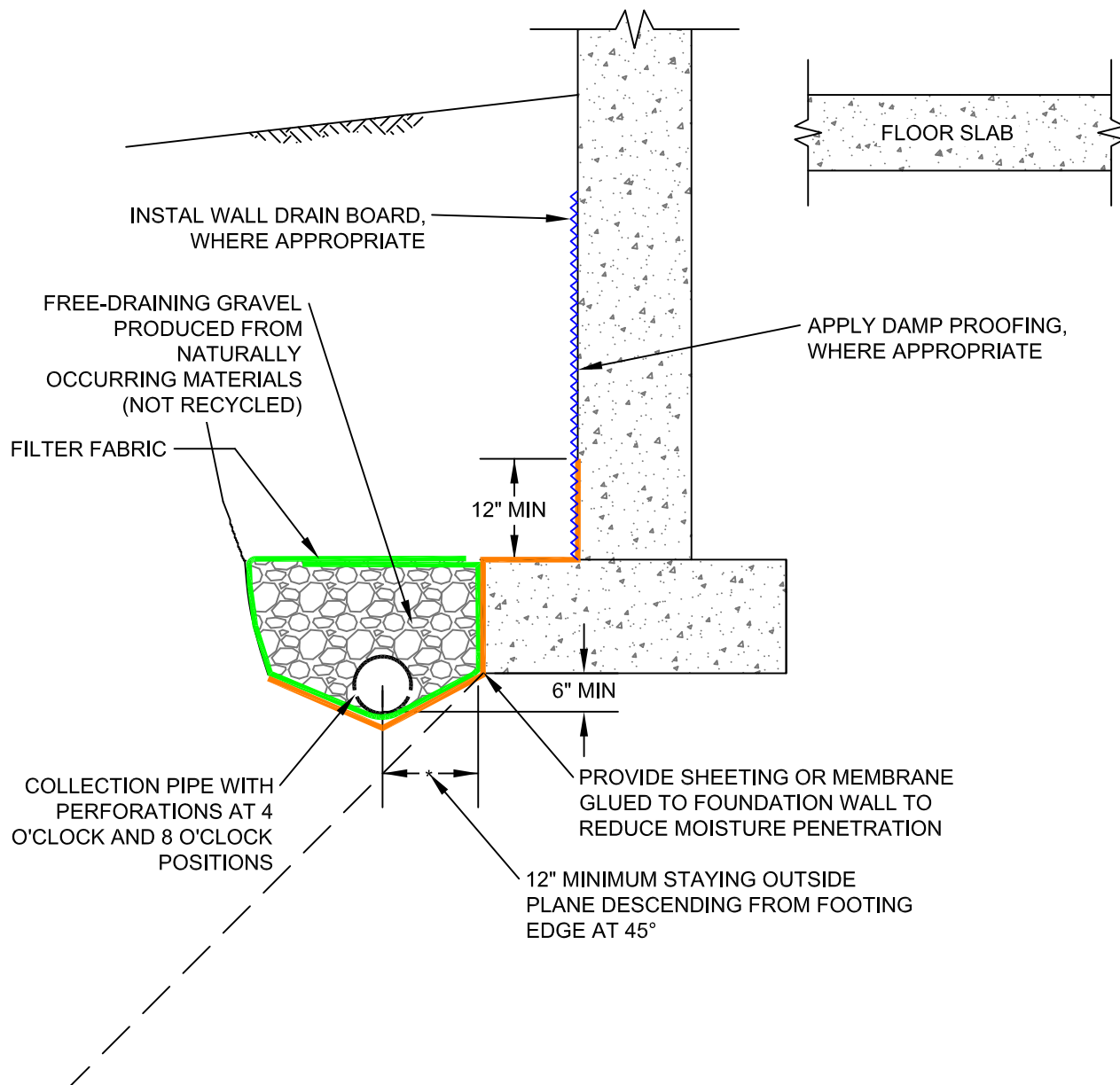
ENGINEERING CONSULTANTS

TYPICAL UNDERDRAIN DETAIL
FOR DEEP FOUNDATIONS

JOB NO: 17-3061

FIGURE: 7

CADFILE NAME: 3061DRAIN01.DWG



SEE TEXT FOR ADDITIONAL INFORMATION

NOTES:

1. THIS IS NOT A DESIGN-LEVEL DRAWING. IT SHOULD BE USED SOLELY FOR GENERAL INFORMATION PURPOSES ONLY. ACTUAL UNDERDRAIN DESIGN SHOULD BE COMPLETED BY OTHERS.
2. THE UNDERDRAIN SYSTEM MUST BE TESTED BY THE CONTRACTOR AFTER INSTALLATION AND BACKFILLING TO VERIFY THAT IT FUNCTIONS PROPERLY.
3. INCLUSION OF THIS FIGURE IN CONSTRUCTION DOCUMENTS IS DONE SO AT THE DOCUMENT PREPARER'S RISK.
4. REPRODUCTION OF THIS DOCUMENT SHOULD BE IN COLOR.

GROUND

ENGINEERING CONSULTANTS

TYPICAL UNDERDRAIN DETAIL
FOR SHALLOW FOUNDATIONS

JOB NO.: 17-3061

FIGURE: 8

CADFILE NAME: 3061DRAIN02.DWG



TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Test Hole No.	Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation		Percent Passing No. 200 Sieve	Atterberg Limits		Percent Swell (Surcharge Pressure)	USCS Classification	AASHTO Classification (GI)	Soil or Bedrock Type
	Depth (feet)				Gravel (%)	Sand (%)		Liquid Limit	Plasticity Index				
1	4		9.4	SD	-	-	48	24	1	-	SM	A-4 (0)	Silty SAND
1	9		5.8	118.1	-	-	30	22	1	-	SM	A-2-4 (0)	Silty SAND with Gravel
1	19		5.3	SD	-	-	17	NV	NP	-0.1 (1,100 psf)	SM	A-1-b (0)	Silty SAND with Gravel
1	29		-	-	-	-	-	-	-	-0.5 (3,000 psf)	SM	A-1-b (0)	Silty SAND with Gravel
1	69		2.0	SD	-	-	16	21	3	-	SM	A-1-b (0)	Silty SAND with Gravel
1	129		11.7	SD	29	33	38	24	5	-	SC-SM	A-4 (0)	Silty, Clayey SAND with Gravel
2	30		3.4	117.4	-	-	34	22	2	-0.1 (3,700 psf)	SM	A-2-4 (0)	Silty SAND
2	50		2.7	SD	-	-	20	22	19	-	SC	A-2-6 (0)	Clayey SAND with Gravel
2	80		2.7	SD	-	-	19	23	4	-	SC-SM	A-1-b (0)	Silty, Clayey SAND with Gravel
2	120		5.7	SD	-	-	13	NV	NP	-	SM	A-1-b (0)	Silty SAND with Gravel
3	34		2.2	SD	-	-	22	NV	NP	-	SM	A-1-b (0)	Silty SAND with Gravel
3	49		-	-	-	-	-	-	-	-0.1 (5,800 psf)	SM	A-2-4 (0)	Silty SAND with Gravel
3	54		3.0	SD	-	-	27	NV	NP	-	SM	A-2-4 (0)	Silty SAND with Gravel
3	79		3.6	SD	-	-	22	NV	NP	-	SM	A-2-4 (0)	Silty SAND with Gravel
4	10		11.9	116.7	-	-	33	26	5	-	SC-SM	A-2-4 (0)	Silty, Clayey SAND
4	19		7.9	111.0	-	-	32	24	1	-	SM	A-2-4 (0)	Silty SAND
4	39		2.6	SD	-	-	50	25	5	-	CL-ML	A-4 (0)	Silty CLAY with Sand and Gravel

SD = Sample Disturbed, NV = Non-Viscous, NP = Non-Plastic



TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Test Hole No.	Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation		Percent Passing No. 200 Sieve	Atterberg Limits		Percent Swell (Surcharge Pressure)	USCS Classification	AASHTO Classification (GI)	Soil or Bedrock Type
	Depth (feet)				Gravel (%)	Sand (%)		Liquid Limit	Plasticity Index				
4	69		-	-	-	-	-	-	-	-3.2 (4,800 psf)	SC-SM	A-1-b (0)	Silty, Clayey SAND with Gravel
5	5		1.9	SD	-	-	18	22	5	-	SC-SM	A-1-b (0)	Silty, Clayey SAND with Gravel
5	15		1.7	SD	-	-	9	18	1	-	SP-SM	A-1-b (0)	SAND with Silt and Gravel
5	25		2.4	SD	-	-	23	22	2	-	SM	A-1-b (0)	Silty SAND with Gravel
6	4		8.1	SD	-	-	37	25	7	1.1 (500 psf)	SC-SM	A-4 (0)	Silty, Clayey SAND
6	9		6.5	SD	-	-	21	28	7	-0.1 (1,100 psf)	SC-SM	A-2-4 (0)	Silty, Clayey SAND with Gravel
6	19		2.4	SD	-	-	8	22	2	-	SP-SM	A-1-b (0)	SAND with Silt and Gravel
6	34		2.6	SD	-	-	14	NV	NP	-	SM	A-1-b (0)	Silty SAND with Gravel
6	54		2.3	SD	-	-	18	22	4	-	SC-SM	A-1-b (0)	Silty, Clayey SAND with Gravel
6	74		2.9	SD	-	-	12	23	1	-	SP-SM	A-1-b (0)	SAND with Silt and Gravel
7	10		6.2	117.3	-	-	26	23	2	-	SM	A-2-4 (0)	Silty SAND with Gravel
7	15		-	-	-	-	-	-	-	-2.2 (1,900 psf)	SM	A-2-4 (0)	Silty SAND
7	20		5.5	SD	-	-	35	23	3	-	SM	A-2-4 (0)	Silty SAND
7	25		-	-	-	-	-	-	-	-2.9 (3,100 psf)	SM	A-2-4 (0)	Silty SAND
7	30		6.0	113.2	-	-	31	22	2	-4.0 (3,700 psf)	SM	A-2-4 (0)	Silty SAND
7	50		3.8	SD	-	-	14	NV	NP	-5.9 (6,000 psf)	SM	A-1-b (0)	Silty SAND with Gravel
7	80		1.9	SD	-	-	12	22	1	-	SP-SM	A-1-b (0)	SAND with Silt and Gravel
7	100		1.3	SD	-	-	7	22	2	-	SP-SM	A-1-b (0)	SAND with Silts and Gravel

SD = Sample Disturbed, NV = Non-Viscous, NP = Non-Plastic



TABLE 2
SUMMARY OF SOIL CORROSION TEST RESULTS

Sample Location		Water Soluble Sulfates (%)	pH	Redox Potential (mV)	Sulfides Content	Resistivity (ohm-cm)	USCS Classification	Soil or Bedrock Type
Test Hole No.	Depth (feet)							
4	19	<0.01	7.8	-74	Positive	6,145	SM	Silty SAND
5	10	0.01	7.8	-77	Trace	1,800	SM	Silty SAND
7	15	<0.01	7.8	-75	Positive	15,967	SM	Silty SAND

Job No. 17-3061

Appendix A

Detailed Logs of the Test Holes

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/12/17 COMPLETED 12/12/17

GROUND ELEVATION 96 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:
 AT TIME OF DRILLING 115.00 ft / Elev -19.00 ft

NOTES _____

AFTER DRILLING N / A --- N / A

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
96	0		Approximately 2.5 inches asphalt pavement. Approximately 3 inches road base.											
91	5		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to wet, red to red brown.	 CAL	16/12	9.4	SD			48	24	1		
86	10			 CAL	34/12	5.8	118.1			30	22	1		
81	15			 CAL	25/12									
76	20			 CAL	46/12	5.3	SD			17	NV	NP	0.1 @ 1,100	
71	25			 CAL	34/12									
66	30			 CAL	17/12								0.5 @ 3,000	
61	35													

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CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
61	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to wet, red to red brown. (continued)											
56	40			 CAL	43/12									
51	45													
46	50			 CAL	50/6									
41	55													
36	60			 SS	10-25-19 (44)									
31	65													
26	70			 SS	21-30-27 (57)	2.0	SD			16	21	3		
21	75													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
21	75		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to wet, red to red brown. (continued)											
16	80			X SS	16-26-25 (51)									
11	85													
6	90			X SS	15-21-22 (43)									
1	95													
-4	100			X SS	19-30-22 (52)									
-9	105													
-14	110			X SS	11-14-25 (39)									
-19	115													

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON\MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

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CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
-19	115										Liquid Limit	Plasticity Index		
			Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to wet, red to red brown. (continued)											
-24	120			SS	15-28-50/5"									
-29	125													
-34	130		Clayey, SANDS and GRAVELS with Cobbles; Fine to coarse grained, non to moderately plastic, dense to very dense, very moist to wet, gray brown to brown.	SS	30-42-50/5"	11.7	SD	29	33	38	24	5		
-39	135													
-44	140			CAL	50/7									
-49	145													
				CAL	50/4									

Bottom of borehole at 149.3 feet.

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/13/17 COMPLETED 12/13/17

GROUND ELEVATION 103 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:

AT TIME OF DRILLING --- Not Encountered

AFTER DRILLING N / A --- N / A

NOTES _____

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
103	0		Approximately 6.75 inches asphalt pavement.											
98	5		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to dense, red to red brown.	CAL	48/12									
93	10			CAL	50/5									
88	15			CAL	31/12									
83	20			CAL	50/6									
78	25			CAL	48/12									
73	30			CAL	21/12	3.4	117.4			34	22	2	0.1 @ 3,700	
68	35													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
68	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to dense, red to red brown. <i>(continued)</i>											
63	40			X SS	7-14-21 (35)									
58	45													
53	50			X SS	4-13-21 (34)	2.7	SD			20	22	19		
48	55													
43	60			X SS	15-17-21 (38)									
38	65													
33	70			X SS	34-38-29 (67)									
28	75													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
28	75		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to dense, red to red brown. (continued)											
23	80			SS	26-50/6"	2.7	SD			19	23	4		
18	85													
13	90			SS	33-31-23 (54)									
8	95													
3	100			SS	24-20-18 (38)									
-2	105													
-7	110			SS	31-20-22 (42)									
-12	115													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
-12	115													
-17	120		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to dense, red to red brown. <i>(continued)</i>											
				SS	33-22-33 (55)	5.7	SD			13	NV	NP		

Bottom of borehole at 121.5 feet.

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/11/17 COMPLETED 12/11/17

GROUND ELEVATION 100 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:

AT TIME OF DRILLING --- Not Encountered

AFTER DRILLING N / A --- N / A

NOTES _____

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
100	0		Approximately 7 inches asphalt pavement.											
95	5		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to moist, loose to very dense, red to red brown.	CAL	50/0									
90	10			CAL	50/11									
85	15			CAL	30/12									
80	20			CAL	50/8									
75	25			CAL	50/5									
70	30			SS	17-23-10 (33)									
65	35			SS	10-10-9	2.2	SD			22	NV	NP		

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
65	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to moist, loose to very dense, red to red brown. (continued)		(19)									
60	40			SS	18-50/5"									
55	45			SS	6-4-4 (8)									
50	50			CAL	78/12								0.1 @ 5,800	
45	55			SS	12-9-11 (20)	3.0	SD			27	NV	NP		
40	60			SS	29-50/6"									
35	65			SS	24-27-31 (58)									
30	70			SS	31-31-41 (72)									
25	75			SS	21-20-23									

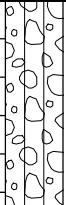
(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
25	75										Liquid Limit	Plasticity Index		
			Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to moist, loose to very dense, red to red brown. (continued)		(43)									
20	80			 SS	21-30-43 (73)	3.6	SD			22	NV	NP		

Bottom of borehole at 80.5 feet.

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/14/17 COMPLETED 12/14/17

GROUND ELEVATION 135 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:

AT TIME OF DRILLING --- Not Encountered

AFTER DRILLING N / A --- N / A

NOTES _____

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
135	0		Approximately 6 inches topsoil.											
130	5		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to very dense, red to dark red brown, wood and other plant material was present in the upper 27 feet.	CAL	17/12									
125	10			CAL	15/12	11.9	116.7			33	26	5		
120	15			CAL	50/7									
115	20			CAL	13/12	7.9	111.0			32	24	1		
110	25			CAL	50/10									
105	30			CAL	44/12									
100	35													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
100	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to very dense, red to dark red brown, wood and other plant material was present in the upper 27 feet. (continued)											
95	40			✖ CAL	42/12	2.6	SD			50	25	5		
90	45													
85	50			✖ CAL	31/12									
80	55													
75	60			✖ CAL	18/12									
70	65													
65	70			✖ CAL	34/12								3.2 @ 4,800	
60	75													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
60	75										Liquid Limit	Plasticity Index		
			Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to very moist, medium dense to very dense, red to dark red brown, wood and other plant material was present in the upper 27 feet. (continued)											
55	80			CAL	50/8									
50	85													
45	90			CAL	50/6									
40	95													
35	100			SS	27-48-50 (98)									
30	105			SS	50/6"									

Bottom of borehole at 105.5 feet.

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/13/17 COMPLETED 12/13/17

GROUND ELEVATION 102 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:

AT TIME OF DRILLING --- Not Encountered

AFTER DRILLING N / A --- N / A

NOTES _____

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
102	0													
			Approximately 2.25 inches asphalt pavement. Approximately 3 inches road base. Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, no- to slightly plastic, dry to moist, dense, red to red brown.											
97	5			SS	11-17-13 (30)	1.9	SD			18	22	5		
92	10			CAL	50/10									
87	15			CAL	40/12	1.7	SD			9	18	1		
82	20			CAL	29/12									
77	25			CAL	40/12	2.4	SD			23	22	2		
72	30													
67	35													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
67	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, no- to slightly plastic, dry to moist, dense, red to red brown. (continued)	 CAL	28/12									
62	40													
57	45			 SS	17-20-23 (43)									
52	50													
47	55			 SS	35-24-34 (58)									

Bottom of borehole at 56.5 feet.

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON\MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/15/17 COMPLETED 12/15/17

GROUND ELEVATION 113 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:

AT TIME OF DRILLING --- Not Encountered

AFTER DRILLING N / A --- N / A

NOTES _____

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
113	0		Approximately 3.5 inches asphalt pavement. Approximately 7 inches road base. Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to moist, red to red brown to white.											
108	5			CAL	50/10	8.1	SD			37	25	7	1.1 @ 500	
103	10			CAL	28/12	6.5	SD			21	28	7	0.1 @ 1,100	
98	15			CAL	16/12									
93	20			CAL	50/7	2.4	SD			8	22	2		
88	25			CAL	50/10									
83	30													
78	35			SS	15-34-17	2.6	SD			14	NV	NP		

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
78	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to moderately plastic, dry to moist, red to red brown to white. (continued)		(51)									
73	40													
68	45			SS	18-12-22 (34)									
63	50													
58	55			SS	6-4-8 (12)	2.3	SD			18	22	4		
53	60													
48	65			SS	11-16-16 (32)									
43	70													
38	75			SS	16-21-20	2.9	SD			12	23	1		

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
38	75				(41)									

Bottom of borehole at 75.5 feet.

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

DATE STARTED 12/14/17 COMPLETED 12/14/17

GROUND ELEVATION 112 ft HOLE SIZE 5 inch

DRILLING CONTRACTOR Authentic

NORTHING _____

DRILLING METHOD ODEX

EASTING _____

LOGGED BY BAF CHECKED BY BHR

GROUND WATER LEVELS:

AT TIME OF DRILLING --- Not Encountered

AFTER DRILLING N / A --- N / A

NOTES _____

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
112	0		Approximately 3 inches gravel. Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to moist, dark red to red to red brown.											
107	5			CAL	10/12									
102	10			CAL	46/12	6.2	117.3			26	23	2		
97	15			CAL	50/8								2.2 @ 1,900	
92	20			CAL	19/12	5.5	SD			35	23	3		
87	25			CAL	16/12								2.9 @ 3,100	
82	30			CAL	19/12	6.0	113.2			31	22	2	4.0 @ 3,700	
77	35													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

GROUND LOG - GROUND TEMPLATE.GDT - 1/11/18 14:46 - C:\USERS\CLINTON.MYERS\DESKTOP\CURRENT PROJECT\3061.GPJ

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
											Liquid Limit	Plasticity Index		
77	35		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to moist, dark red to red to red brown. (continued)											
72	40			✂ CAL	50/10									
67	45													
62	50			✂ CAL	47/12	3.8	SD			14	NV	NP	5.9 @ 6,000	
57	55													
52	60			✂ CAL	40/12									
47	65													
42	70			✂ CAL	48/12									
37	75													

(Continued Next Page)

CLIENT Shrewsberry

PROJECT NAME RFTA Glenwood Springs Maintenance Facility

GROUND PROJECT #: 17-3061

PROJECT LOCATION Glenwood Springs, CO

Elevation (ft)	Depth (ft)	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Blow Count CAL=12" Typ SS=18" Typ	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	ATTERBERG LIMITS		% Swell at Surcharge (psf)	Unconfined Strength (psf)
37	75		Silty SAND and GRAVEL with Cobbles and Boulders; Fine to coarse grained, non- to slightly plastic, dry to moist, dark red to red to red brown. (continued)											
32	80			✂ CAL	50/9	1.9	SD			12	22	1		
27	85													
22	90			✂ CAL	50/10									
17	95													
12	100			✂ CAL	50/10	1.3	SD			7	22	2		

Bottom of borehole at 100.8 feet.

DRAINAGE LETTER



11-27-2019

City of Glenwood Springs
Ryan Johnson
Assistant City Engineer
101 W. 8th Street
Glenwood Springs, CO 81601

RE: Glenwood Maintenance Facility Phase 2 Improvements Project – Drainage Narrative REV. 1

Dear Mr. Johnson:

Site and building improvements to Roaring Fork Transportation Authority's (RFTA) Glenwood Maintenance Facility (GMF) will increase the impervious area on site so this narrative is to address that increase, show capacity of the downstream structure, and prove that new detention is not necessary.

The existing site was analyzed in a drainage report by High Country Engineering (HCE) in 2000; this narrative is supplemental to that report which is attached for reference. HCE designated the watershed that flows to the GMF to be "Basin D" and our analysis maintains that designation but slightly adjusts its limits. The Basin D watershed has changed since the writing of that 2000 report to include the construction of the Debris Flow Basin South of the City of Glenwood Springs (COGS) Municipal Operations Center (MOC) and with the construction of the access road out to the water treatment plant on the north side of the GMF site. With the construction of the access road, a 36" culvert was installed to convey flow from Basin D under the access road to the north, and eventually to the Colorado River. All of the new Basin D (as of this letter) drains to the 36" access road culvert. Much of Basin D's area remains undisturbed and only the GMF and MOC areas have seen development.

The proposed work for this project includes the expansion of the GMF building to the north and west, new retaining walls on the north side of the site, as well as, the reconstruction and expansion of the bus drives around the north and west side of the GMF building. These improvements have increased the impervious area around the GMF building while the rest of the Basin D has remained as existing. The impervious area for Basin D saw an increase from 4.20 acres in the existing condition to 4.42 acres in the proposed condition which is a minor increase of 5.2%. This means the impervious increase, for Basin D as a whole, was from 4.54% impervious to 4.78% impervious.

Basin D has an overall area of 92.5 acres. The Rational Method ($Q=CiA$) was used to calculate the 25 year storm peak flow for both the proposed and existing conditions in order to compare pre and post-construction flows at the upstream side of the access road culvert. The land use coefficient, C, was found in the Urban Storm Drainage Criteria Manual Table 6-5 from the Urban Drainage and Flood Control District using Hydrologic Soil Group C. The C-value for Basin D saw a negligible increase from 0.347 in the existing condition to 0.348 in the proposed. In order to calculate the intensity (i), the Time of Concentration (TOC) of Basin D was found using the methodology laid out in CDOT's Drainage Manual Chapter 7. The TOC path is the longest path water could have to travel within the basin. This path remains the same in the proposed situation as it is in the existing and begins at the top of Basin D



at the far south edge (see attached Watershed Basin D Drainage sheet). Calculations for TOC and the related Peak Flow Rates (Q) are included below. The site saw a negligible change in both; the TOC decreased from 16.77 minutes in the existing to 16.76 minutes in the proposed and the Peak Flow Rates for a 25 year storm increased from 92.60 cfs in the existing to 92.89 cfs in the proposed.

HY-8 was used to analyze the existing and proposed capacity of the 36" access road culvert that is directly receiving the peak flows calculated above. The channel and roadway parameters were estimated based on surveyed surface and information from RFTA and culvert inverts were assumed since no surveyed inverts were available for this structure. Based on the analysis, the 36" culvert is able to contain both the existing and proposed 25 year storm peak flows below the road crossing elevation which means no overtopping for that storm. See the attached HY-8 reports.

Water quality is very important to the City of Glenwood Springs and has been considered for this improvement project. Since this site no longer supports cattle and sheep grazing, we are primarily focusing on the turbidity of runoff aspect of water quality. Turbidity is the amount of suspended material in the water. Both the ditches along the west side and the north side of the project are lined with vegetation which provide a suspended solids removal efficiency of 20-40%. Both of these water conveyance systems will improve water quality onsite and both are longer than 300 feet. Downstream of the ditches and the 36" access road culvert runoff leaves the RFTA site. Downstream of the 36" culvert, all site water flows to the Colorado River. The flow path to the river includes at least 700 feet of vegetation lined swale at an approximate slope of 5%. This long swale will provide an additional suspended solids removal. Using the above described combination of multiple vegetated flow paths it is anticipated that water quality at outfall will be sufficient.

Overall, the added impervious areas are minor and produce only a 0.3% increase in the peak flows from the 25 year storm in the proposed condition. The current project limits do not allow for additional detention without significant change in scope. Therefore, we proposed that no new detention is needed and the existing access road culvert retains the needed capacity to function properly.

Sincerely,

Jordan Diemer, PE
Project Engineer
Shrewsberry & Associates, LLC

Table of Contents

Figures:

- Watershed Basin D Drainage
- Existing Impervious Area
- Proposed Impervious Area

Hydrology:

- Existing Condition
- Proposed Condition

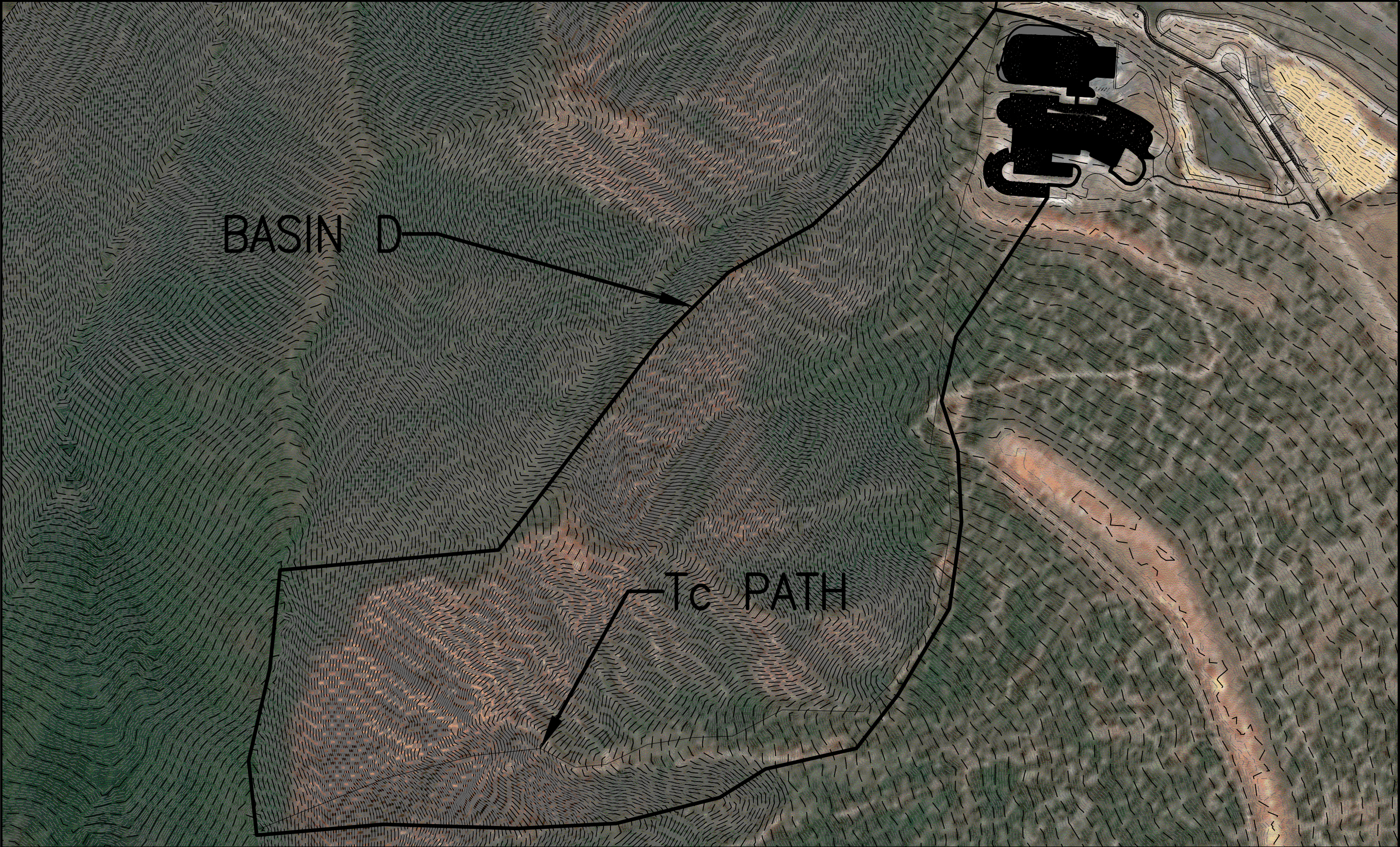
HY-8 Reports:

- Existing Condition
- Proposed Condition

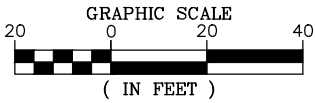
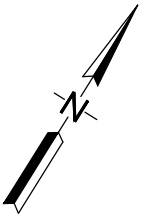
Appendix:

- IDF Table
- IDF Graph
- USDCM Table 6-5, Runoff Coefficients
- 2000 Drainage Report, High Country Engineering

Figures



Computer File Information		Sheet Revisions			 Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	 shrewsberry 2696 S. Colorado Blvd, Ste. 460 Denver, CO 80222 720.235.0605 shrewsusa.com	As Constructed		GMF EXPANSION – PHASE 2 BASIN D DRAINAGE		Project No./Code	
Print Date:	10/31/2019	Date:	Comments	Init.			No Revisions:	–	–		–	
Last Modification Date:							Revised:	–	Designer:		–	
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Drawing File Name:									Sheet Subset:		Subset Sheet::	of
Acad Ver. 2015	Scale: As Shown Units: English										Sheet Number C05.01	

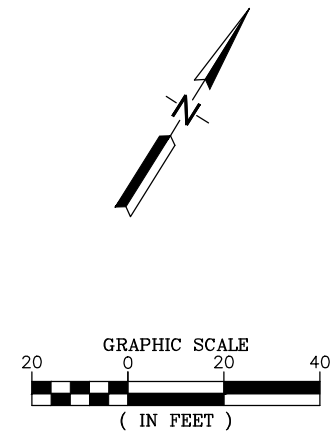


LEGEND	
	PAVEMENT
	ROOFING

Computer File Information			Sheet Revisions					As Constructed		GMF EXPANSION – PHASE 2 EXISTING IMPERVIOUS AREA			Project No./Code	
Print Date:	10/31/2019		Date:	Comments	Init.			No Revisions:	–	Designer:			–	
Last Modification Date:								Revised:	–	Detailer:			–	
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Drawing File Name:										Subset Sheet::		of		
Acad Ver. 2015	Scale: As Shown	Units: English												

RF
Roaring Fork Transportation Authority
1340 Main Street
Carbondale, CO 81623
970.384.4866 procurement@rfta.com

shrewsberry
2696 S. Colorado Blvd, Ste. 460
Denver, CO 80222
720.235.0605 shrewsusa.com



LEGEND	
	IMPERVIOUS AREA
	NEW PROPOSED IMPERVIOUS AREA
	ROOFING

Computer File Information			Sheet Revisions					As Constructed		GMF EXPANSION – PHASE 2 PROPOSED IMPERVIOUS AREA			Project No./Code	
Print Date:	10/31/2019		Date:	Comments	Init.			No Revisions:	–	Designer:			–	
Last Modification Date:								Revised:	–				–	
Full Path:	\\Project Files\2015\15-0276\CADD\Design							Void:	–	Detailer:				
Drawing File Name:										Sheet Subset:				
Acad Ver. 2015	Scale: As Shown	Units: English				1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	2696 S. Colorado Blvd, Ste. 460 Denver, CO 80222 720.235.0605 shrewsusa.com			Subset Sheet::	of		Sheet Number C05.03	

Hydrology – Existing Condition

Designed By: JED
Checked By: _____
Watershed: Basin D

Date: 10/30/2019
Date: _____



1) EXISTING AREA (A)

1. Impervious Area, A_i	sq. ft.	183,096
2. Pervious Area, A_p	sq. ft.	3,847,032
3. Total Watershed Area, $A_t = A_i + A_p$	sq. ft.	4,030,128
4. Impervious Area, A_i	acres	4.20
5. Pervious Area, A_p	acres	88.32
6. Total Watershed Area, $A_t = A_i + A_p$	acres	92.52
7. Percent Impervious	%	4.54
8. Runoff Coefficient, C (UDFCD Table 6-5, 25 year, Soil Group C)		0.347

Designed By: JED
 Checked By:
 Watershed: Basin D

Date: 10/30/2019
 Date:



1) EXISTING TIME OF CONCENTRATION (CDOT Method) (T_c)

Overland Flow

1. Runoff Coefficient, C (UDFCD Table 6-5)
2. Distance of Flow, D (max 500')
3. Average slope of basin in percent, S
4. Time in Minutes, T_i

Segment ID	A		
		0.35	
ft		500	
%		38.19	
min		9.11	= 9.11

Channel Flow

5. Distance of Flow path in Miles, L
6. Elevation difference from beginnin of channel to site
7. Time in minutes, T_t

Segment ID	B		
mi		0.83	
ft		1416	
min		7.66	= 7.66

Pipe Flow

20. Pipe Diameter, D
21. Pipe Slope, s
22. Length of Pipe, L
23. Manning's Roughness Coefficient, n
24. Velocity, $V = 0.593 * D^{2/3} * s^{1/2} / n$
25. $T_t = L / (3600 * V)$

Segment ID			
ft			
ft/ft			
ft			
		0.012	
Compute V	ft/s		
Compute T_t	hr		= 0

26. Watershed or Subarea T_c or T_t

Hours	0.28
Minutes	16.77

Designed By: JED
Checked By: _____
Watershed: Basin D

Date: 10/30/2019
Date: _____



shrewsberry

1) EXISTING PEAK FLOW (Rational Method) (Q)

1. Runoff Coefficient, C (Rational)

2. Intensity, i

3. Area of watershed, A

Using $T_c = 16.77$ in/hr
acres

0.347
2.884
92.52

25 Yr Storm, Peak Flow, $Q = C \cdot i \cdot A$

= 92.60 cfs

Hydrology – Proposed Condition

Designed By: JED
Checked By: _____
Watershed: Basin D

Date: 10/30/2019
Date: _____



1) PROPOSED AREA (A)

1. Impervious Area, A_i	sq. ft.	192,744
2. Pervious Area, A_p	sq. ft.	3,837,384
3. Total Watershed Area, $A_t = A_i + A_p$	sq. ft.	4,030,128
4. Impervious Area, A_i	acres	4.42
5. Pervious Area, A_p	acres	88.09
6. Total Watershed Area, $A_t = A_i + A_p$	acres	92.52
7. Percent Impervious	%	4.78
8. Runoff Coefficient, C (UDFCD Table 6-5, 25 year, Soil Group C)		0.348

Designed By: JED
 Checked By:
 Watershed: Basin D

Date: 10/30/2019
 Date:



1) PROPOSED TIME OF CONCENTRATION (CDOT Method) (T_c)

Overland Flow

1. Runoff Coefficient, C (UDFCD Table 6-5)
2. Distance of Flow, D (max 500')
3. Average slope of basin in percent, S
4. Time in Minutes, T_i

Segment ID	A		
		0.348	
ft		500	
%		38.19	
min		9.10	= 9.10

Channel Flow

5. Distance of Flow path in Miles, L
6. Elevation difference from beginnin of channel to site
7. Time in minutes, T_t

Segment ID	B		
		0.83	
mi		1416	
ft		7.66	= 7.66

Pipe Flow

20. Pipe Diameter, D
21. Pipe Slope, s
22. Length of Pipe, L
23. Manning's Roughness Coefficient, n
24. Velocity, $V = 0.593 * D^{2/3} * s^{1/2} / n$
25. $T_t = L / (3600 * V)$

Segment ID			
ft			
ft/ft			
ft		0.012	
ft/s			
hr			= 0

26. Watershed or Subarea T_c or T_t
- | | |
|---------|-------|
| Hours | 0.28 |
| Minutes | 16.76 |

Designed By: JED
Checked By: _____
Watershed: Basin D

Date: 10/30/2019
Date: _____



shrewsberry

1) PROPOSED PEAK FLOW (Rational Method) (Q)

1. Runoff Coefficient, C (Rational)

2. Intensity, i

3. Area of watershed, A

Using $T_c = 16.76$ in/hr
acres

0.348
2.885
92.52

25 Yr Storm, Peak Flow, $Q = C \cdot i \cdot A$

= **92.89** cfs

HY-8 Culvert Analysis Report

Crossing Discharge Data - Existing

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 92.6 cfs

Maximum Flow: 92.6 cfs

Table 1 - Summary of Culvert Flows at Crossing: Access Rd Culvert - Existing

Headwater Elevation (ft)	Total Discharge (cfs)	Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5782.25	0.00	0.00	0.00	1
5783.15	9.26	9.26	0.00	1
5783.68	18.52	18.52	0.00	1
5784.08	27.78	27.78	0.00	1
5784.44	37.04	37.04	0.00	1
5784.80	46.30	46.30	0.00	1
5785.21	55.56	55.56	0.00	1
5785.70	64.82	64.82	0.00	1
5786.26	74.08	74.08	0.00	1
5786.91	83.34	83.34	0.00	1
5787.64	92.60	92.60	0.00	1
5788.00	96.86	96.86	0.00	Overtopping

Rating Curve Plot for Crossing: Access Rd Culvert - Existing

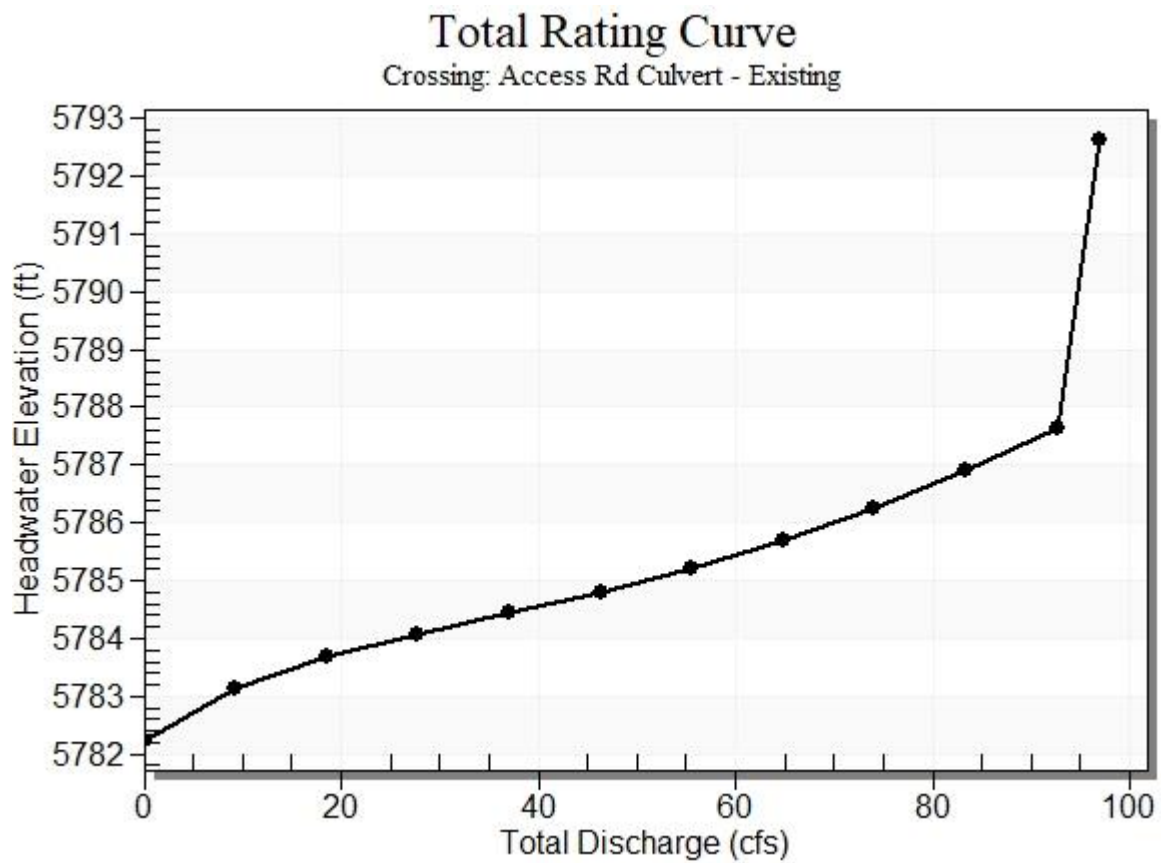


Table 2 - Culvert Summary Table: Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5782.25	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
9.26	9.26	5783.15	0.897	0.385	1-S2n	0.512	0.817	0.568	0.215	7.277	4.041
18.52	18.52	5783.68	1.425	1.008	1-S2n	0.769	1.234	0.891	0.324	8.520	5.207
27.78	27.78	5784.08	1.830	1.660	1-S2n	0.980	1.545	1.160	0.411	9.366	6.017
37.04	37.04	5784.44	2.187	0.0*	1-S2n	1.169	1.819	1.401	0.486	10.056	6.652
46.30	46.30	5784.80	2.552	0.053	1-S2n	1.351	2.049	1.620	0.553	10.705	7.179
55.56	55.56	5785.21	2.964	0.114	5-S2n	1.529	2.245	1.823	0.614	11.339	7.636
64.82	64.82	5785.70	3.446	0.171	5-S2n	1.708	2.401	2.010	0.671	11.984	8.040
74.08	74.08	5786.26	4.009	0.224	5-S2n	1.900	2.511	2.187	0.724	12.699	8.401
83.34	83.34	5786.91	4.657	0.275	5-S2n	2.120	2.591	2.358	0.775	13.448	8.731
92.60	92.60	5787.64	5.387	0.322	5-S2n	2.453	2.520	2.502	0.822	14.288	9.034

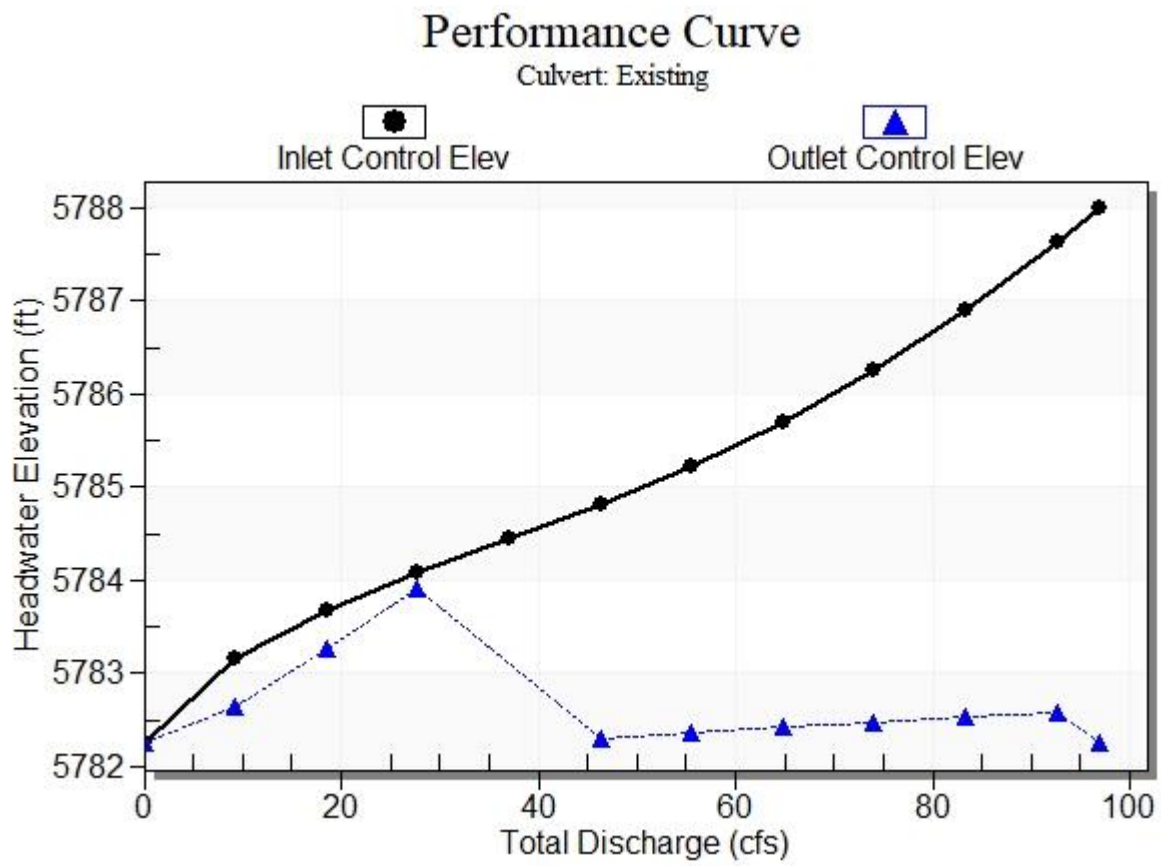
* Full Flow Headwater elevation is below inlet invert.

Straight Culvert

Inlet Elevation (invert): 5782.25 ft, Outlet Elevation (invert): 5781.75 ft

Culvert Length: 30.00 ft, Culvert Slope: 0.0167

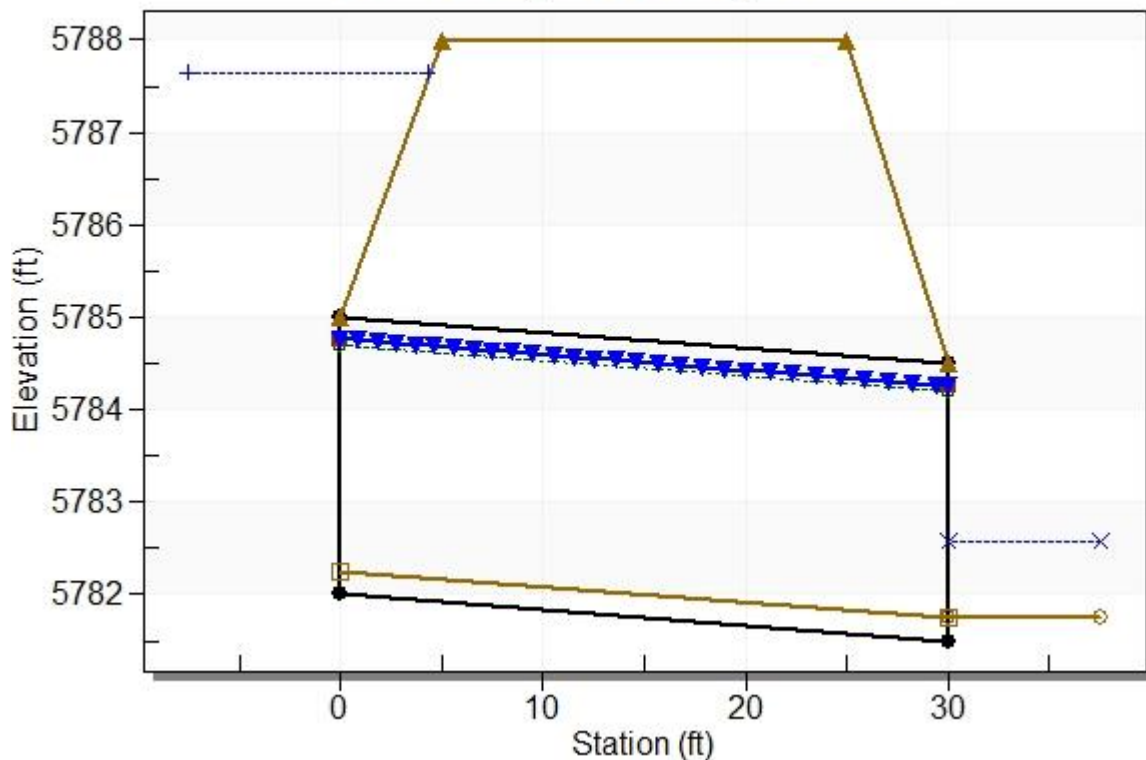
Culvert Performance Curve Plot: Existing



Water Surface Profile Plot for Culvert: Existing

Crossing - Access Rd Culvert - Existing, Design Discharge - 92.6 cfs

Culvert - Existing, Culvert Discharge - 92.6 cfs



Site Data - Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5782.00 ft

Outlet Station: 30.00 ft

Outlet Elevation: 5781.50 ft

Number of Barrels: 1

Culvert Data Summary - Existing

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 3.00 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0120 (bottom)

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Access Rd Culvert - Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	5781.75	0.00	0.00	0.00	0.00
9.26	5781.97	0.22	4.04	1.34	1.58
18.52	5782.07	0.32	5.21	2.02	1.68
27.78	5782.16	0.41	6.02	2.56	1.74
37.04	5782.24	0.49	6.65	3.03	1.79
46.30	5782.30	0.55	7.18	3.45	1.82
55.56	5782.36	0.61	7.64	3.83	1.85
64.82	5782.42	0.67	8.04	4.19	1.87
74.08	5782.47	0.72	8.40	4.52	1.89
83.34	5782.52	0.77	8.73	4.83	1.91
92.60	5782.57	0.82	9.03	5.13	1.92

Tailwater Channel Data - Access Rd Culvert - Existing

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 3.00 (1:1)

Channel Slope: 0.1000

Channel Manning's n: 0.0400

Channel Invert Elevation: 5781.75 ft

Roadway Data for Crossing: Access Rd Culvert - Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 600.00 ft

Crest Elevation: 5788.00 ft

Roadway Surface: Gravel

Roadway Top Width: 20.00 ft

Crossing Discharge Data - Proposed

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 92.89 cfs

Maximum Flow: 92.89 cfs

Table 4 - Summary of Culvert Flows at Crossing: Access Rd Culvert - Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5782.25	0.00	0.00	0.00	1
5783.15	9.29	9.29	0.00	1
5783.68	18.58	18.58	0.00	1
5784.08	27.87	27.87	0.00	1
5784.44	37.16	37.16	0.00	1
5784.81	46.45	46.45	0.00	1
5785.22	55.73	55.73	0.00	1
5785.71	65.02	65.02	0.00	1
5786.27	74.31	74.31	0.00	1
5786.93	83.60	83.60	0.00	1
5787.66	92.89	92.89	0.00	1
5788.00	96.86	96.86	0.00	Overtopping

Rating Curve Plot for Crossing: Access Rd Culvert - Proposed

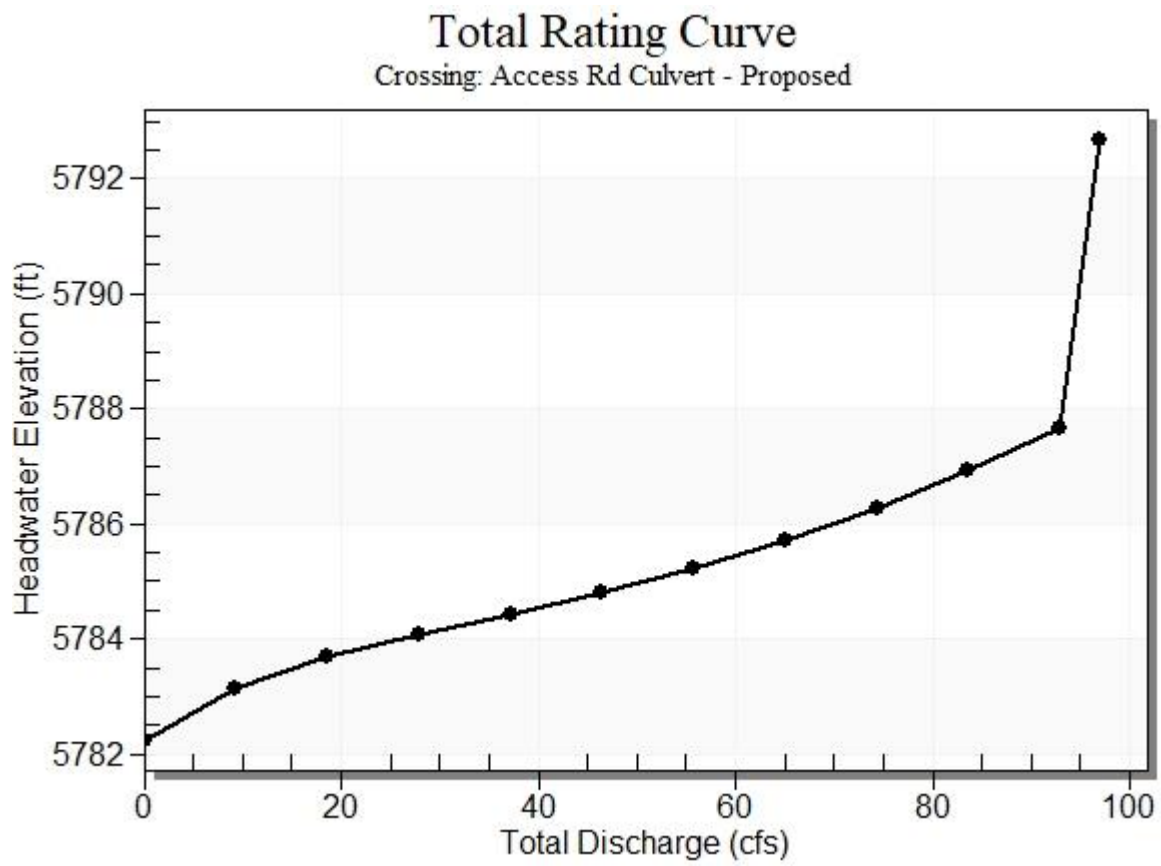


Table 5 - Culvert Summary Table: Proposed

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	5782.25	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
9.29	9.29	5783.15	0.899	0.387	1-S2n	0.513	0.819	0.569	0.216	7.281	4.045
18.58	18.58	5783.68	1.428	1.011	1-S2n	0.770	1.236	0.893	0.325	8.526	5.214
27.87	27.87	5784.08	1.833	1.667	1-S2n	0.982	1.548	1.162	0.412	9.374	6.024
37.16	37.16	5784.44	2.191	0.0*	1-S2n	1.172	1.822	1.404	0.487	10.064	6.657
46.45	46.45	5784.81	2.558	0.054	1-S2n	1.354	2.053	1.623	0.554	10.715	7.187
55.73	55.73	5785.22	2.973	0.115	5-S2n	1.532	2.248	1.826	0.615	11.352	7.644
65.02	65.02	5785.71	3.457	0.172	5-S2n	1.712	2.405	2.014	0.672	11.997	8.048
74.31	74.31	5786.27	4.024	0.226	5-S2n	1.905	2.514	2.191	0.726	12.716	8.409
83.60	83.60	5786.93	4.676	0.276	5-S2n	2.127	2.593	2.362	0.776	13.470	8.740
92.89	92.89	5787.66	5.411	0.324	5-S2n	2.466	2.515	2.504	0.824	14.327	9.043

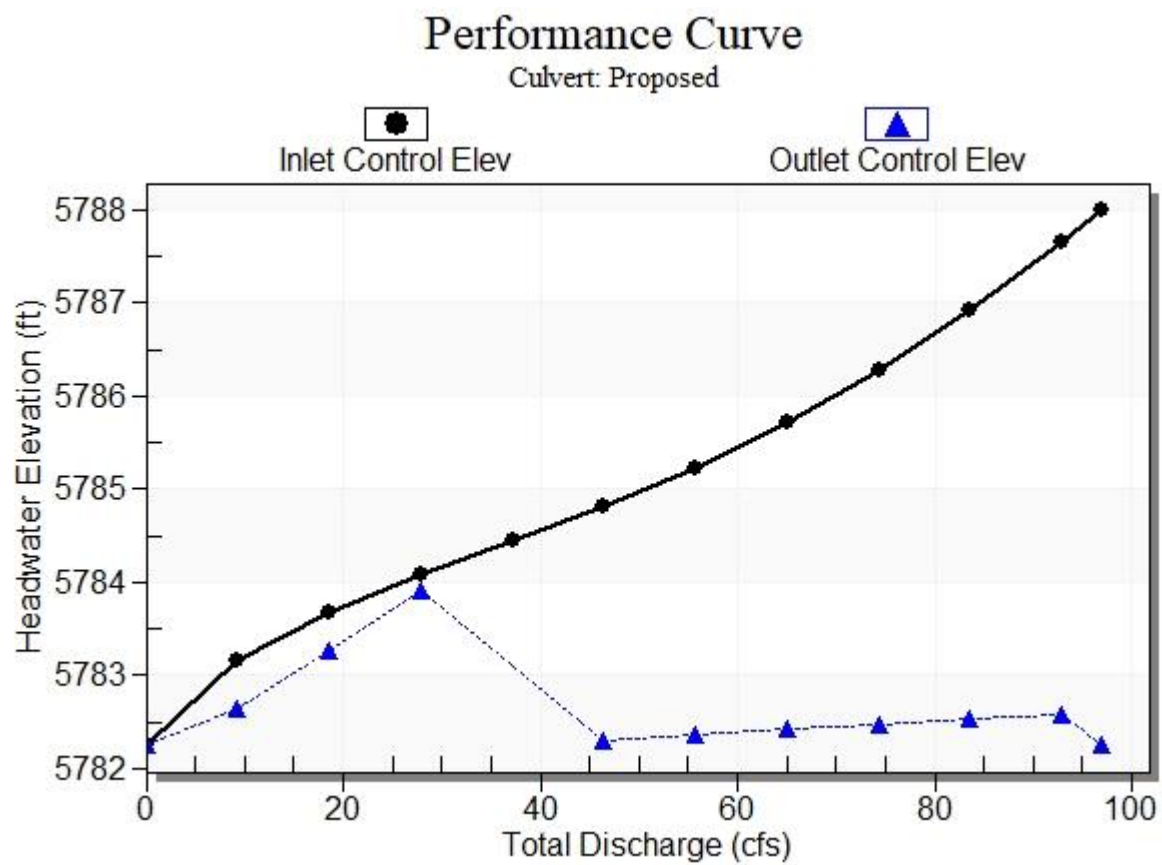
* Full Flow Headwater elevation is below inlet invert.

Straight Culvert

Inlet Elevation (invert): 5782.25 ft, Outlet Elevation (invert): 5781.75 ft

Culvert Length: 30.00 ft, Culvert Slope: 0.0167

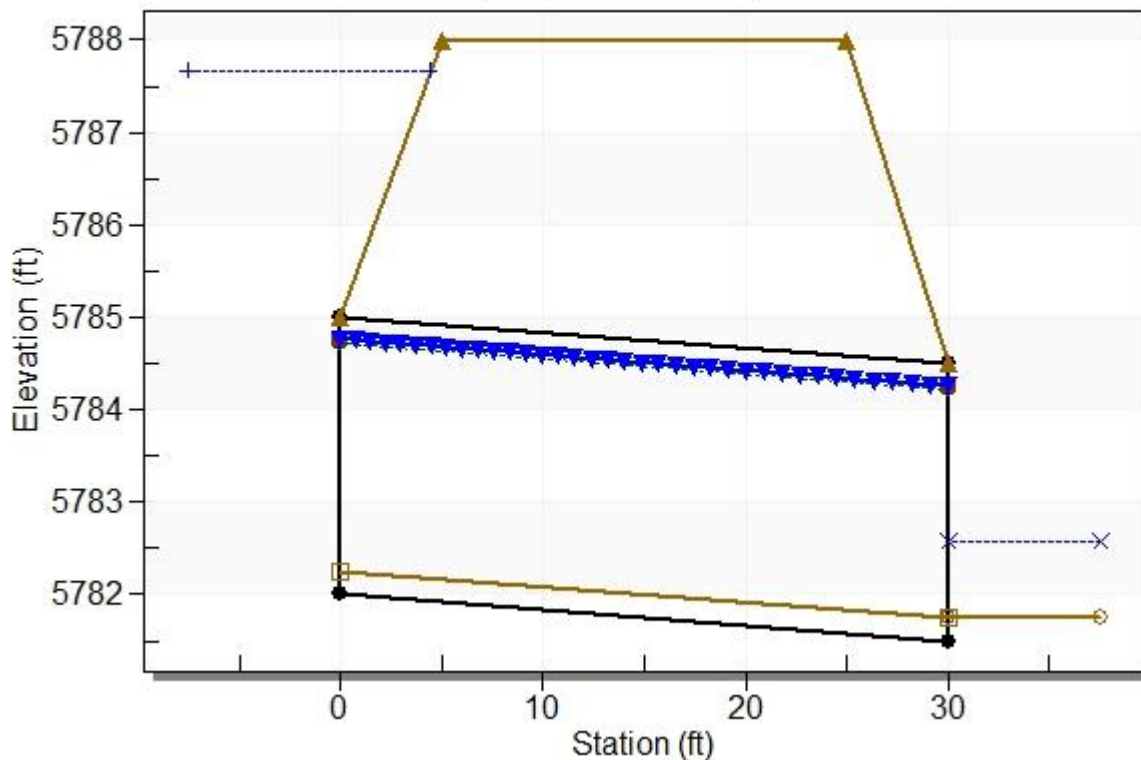
Culvert Performance Curve Plot: Proposed



Water Surface Profile Plot for Culvert: Proposed

Crossing - Access Rd Culvert - Proposed, Design Discharge - 92.9 cfs

Culvert - Proposed, Culvert Discharge - 92.9 cfs



Site Data - Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 5782.00 ft

Outlet Station: 30.00 ft

Outlet Elevation: 5781.50 ft

Number of Barrels: 1

Culvert Data Summary - Proposed

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 3.00 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0120 (bottom)

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: Access Rd Culvert -

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	5781.75	0.00	0.00	0.00	0.00
9.29	5781.97	0.22	4.05	1.35	1.58
18.58	5782.07	0.32	5.21	2.03	1.68
27.87	5782.16	0.41	6.02	2.57	1.74
37.16	5782.24	0.49	6.66	3.04	1.79
46.45	5782.30	0.55	7.19	3.46	1.82
55.73	5782.37	0.62	7.64	3.84	1.85
65.02	5782.42	0.67	8.05	4.20	1.87
74.31	5782.48	0.73	8.41	4.53	1.89
83.60	5782.53	0.78	8.74	4.84	1.91
92.89	5782.57	0.82	9.04	5.14	1.92

Proposed)**Tailwater Channel Data - Access Rd Culvert - Proposed**

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 3.00 (1:1)

Channel Slope: 0.1000

Channel Manning's n: 0.0400

Channel Invert Elevation: 5781.75 ft

Roadway Data for Crossing: Access Rd Culvert - Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 600.00 ft

Crest Elevation: 5788.00 ft

Roadway Surface: Gravel

Roadway Top Width: 20.00 ft

Appendix

The 2-, 25-, and 100-year storms are needed for drainage designs. The IDF curves provided in the figures below are based upon data in the Precipitation-Frequency Atlas of the United States, Midwestern States, NOAA Atlas 14, Volume 8 (NOAA 2013).

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.44 (1.14-1.86)	2.11 (1.67-2.74)	3.17 (2.50-4.12)	4.00 (3.13-5.22)	5.06 (3.77-6.78)	5.84 (4.26-7.97)	6.56 (4.62-9.22)	7.26 (4.88-10.5)	8.09 (5.22-12.1)	8.66 (5.48-13.3)
10-min	1.06 (0.834-1.36)	1.55 (1.22-2.00)	2.32 (1.82-3.01)	2.93 (2.29-3.82)	3.71 (2.76-4.97)	4.28 (3.11-5.83)	4.81 (3.38-6.75)	5.31 (3.57-7.69)	5.92 (3.82-8.87)	6.34 (4.01-9.76)
15-min	0.856 (0.676-1.11)	1.26 (0.996-1.63)	1.89 (1.48-2.45)	2.38 (1.86-3.11)	3.02 (2.24-4.04)	3.48 (2.53-4.74)	3.91 (2.75-5.49)	4.32 (2.90-6.26)	4.82 (3.11-7.21)	5.16 (3.26-7.93)
30-min	0.578 (0.458-0.748)	0.822 (0.650-1.06)	1.20 (0.946-1.56)	1.50 (1.17-1.95)	1.87 (1.39-2.50)	2.14 (1.56-2.91)	2.39 (1.68-3.34)	2.62 (1.76-3.79)	2.89 (1.87-4.32)	3.08 (1.95-4.73)
60-min	0.385 (0.304-0.498)	0.510 (0.403-0.661)	0.706 (0.556-0.917)	0.858 (0.672-1.12)	1.05 (0.785-1.41)	1.19 (0.871-1.63)	1.32 (0.931-1.86)	1.45 (0.973-2.09)	1.59 (1.03-2.38)	1.69 (1.07-2.60)
2-hr	0.240 (0.192-0.306)	0.305 (0.244-0.389)	0.406 (0.323-0.519)	0.484 (0.384-0.624)	0.586 (0.442-0.772)	0.659 (0.486-0.885)	0.727 (0.518-1.00)	0.791 (0.538-1.13)	0.868 (0.567-1.28)	0.921 (0.589-1.40)
3-hr	0.187 (0.151-0.237)	0.227 (0.183-0.287)	0.289 (0.232-0.367)	0.338 (0.269-0.431)	0.402 (0.307-0.527)	0.449 (0.335-0.599)	0.494 (0.355-0.678)	0.537 (0.369-0.761)	0.590 (0.389-0.865)	0.628 (0.404-0.943)
6-hr	0.123 (0.100-0.153)	0.140 (0.114-0.174)	0.168 (0.136-0.210)	0.191 (0.154-0.240)	0.224 (0.174-0.292)	0.250 (0.190-0.331)	0.276 (0.201-0.375)	0.302 (0.211-0.425)	0.338 (0.226-0.490)	0.365 (0.237-0.540)
12-hr	0.076 (0.063-0.093)	0.086 (0.071-0.106)	0.104 (0.086-0.129)	0.120 (0.098-0.148)	0.141 (0.111-0.182)	0.158 (0.122-0.207)	0.176 (0.130-0.236)	0.194 (0.137-0.269)	0.219 (0.148-0.313)	0.238 (0.156-0.347)
24-hr	0.046 (0.039-0.056)	0.053 (0.044-0.064)	0.065 (0.054-0.078)	0.075 (0.062-0.091)	0.089 (0.071-0.113)	0.100 (0.078-0.129)	0.112 (0.084-0.149)	0.125 (0.089-0.170)	0.141 (0.097-0.199)	0.154 (0.103-0.221)
2-day	0.028 (0.024-0.033)	0.032 (0.027-0.038)	0.038 (0.032-0.046)	0.044 (0.037-0.053)	0.053 (0.043-0.066)	0.060 (0.047-0.076)	0.067 (0.051-0.087)	0.074 (0.054-0.100)	0.085 (0.059-0.118)	0.093 (0.063-0.131)
3-day	0.021 (0.018-0.024)	0.024 (0.020-0.028)	0.029 (0.024-0.034)	0.033 (0.028-0.039)	0.039 (0.032-0.049)	0.044 (0.035-0.056)	0.050 (0.038-0.064)	0.055 (0.040-0.073)	0.062 (0.044-0.086)	0.068 (0.046-0.095)
4-day	0.017 (0.015-0.020)	0.019 (0.017-0.023)	0.023 (0.020-0.028)	0.027 (0.023-0.032)	0.032 (0.026-0.039)	0.036 (0.029-0.045)	0.040 (0.031-0.051)	0.044 (0.032-0.058)	0.050 (0.035-0.068)	0.054 (0.037-0.075)
7-day	0.012 (0.010-0.014)	0.013 (0.011-0.015)	0.016 (0.014-0.018)	0.018 (0.015-0.021)	0.021 (0.017-0.025)	0.023 (0.019-0.028)	0.025 (0.020-0.032)	0.028 (0.021-0.037)	0.031 (0.022-0.042)	0.034 (0.023-0.047)
10-day	0.009 (0.008-0.011)	0.010 (0.009-0.012)	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.013-0.019)	0.018 (0.014-0.022)	0.019 (0.015-0.024)	0.021 (0.016-0.028)	0.024 (0.017-0.032)	0.026 (0.018-0.035)
20-day	0.006 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.011 (0.009-0.014)	0.013 (0.010-0.015)	0.014 (0.010-0.017)	0.015 (0.011-0.020)	0.016 (0.011-0.021)
30-day	0.005 (0.005-0.006)	0.006 (0.005-0.006)	0.007 (0.006-0.008)	0.007 (0.007-0.008)	0.009 (0.007-0.010)	0.009 (0.008-0.011)	0.010 (0.008-0.012)	0.011 (0.008-0.014)	0.012 (0.009-0.015)	0.013 (0.009-0.017)
45-day	0.004 (0.004-0.005)	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.006-0.009)	0.008 (0.007-0.010)	0.009 (0.007-0.011)	0.010 (0.007-0.012)	0.010 (0.007-0.013)
60-day	0.004 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.007 (0.006-0.009)	0.008 (0.006-0.009)	0.008 (0.006-0.011)	0.009 (0.006-0.011)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

Figure 4-1. Tabular Representation of Point Precipitation Frequency Estimates (NOAA Atlas 14, Volume 8, Version 2; Glenwood Springs, Colorado; Latitude 39.5455°, Longitude -107.326°, Elevation 5788.02 feet)

PF graphical

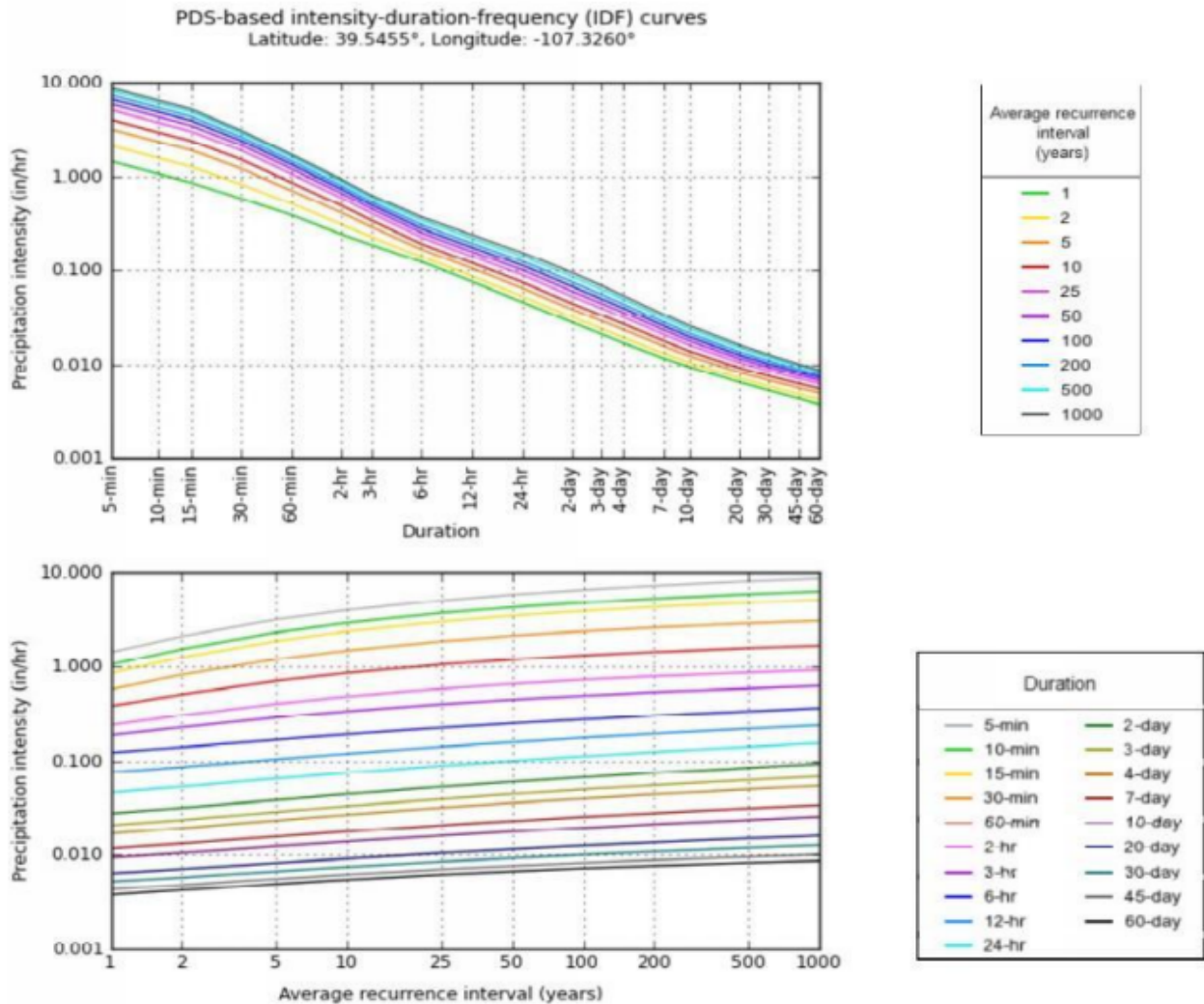


Figure 4-2. Graphical Representation of Point Precipitation Frequency Estimates (NOAA Atlas 14, Volume 8, Version 2; Glenwood Springs, Colorado; Latitude 39.5455°, Longitude -107.326°, Elevation 5788.02 feet)

Table 6-5. Runoff coefficients, *c* (continued)

Total or Effective % Impervious	NRCS Hydrologic Soil Group C						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.05	0.15	0.33	0.40	0.49	0.59
5%	0.03	0.08	0.17	0.35	0.42	0.5	0.6
10%	0.06	0.12	0.21	0.37	0.44	0.52	0.62
15%	0.1	0.16	0.24	0.4	0.47	0.55	0.64
20%	0.14	0.2	0.28	0.43	0.49	0.57	0.65
25%	0.18	0.24	0.32	0.46	0.52	0.59	0.67
30%	0.22	0.28	0.35	0.49	0.54	0.61	0.68
35%	0.26	0.32	0.39	0.51	0.57	0.63	0.7
40%	0.3	0.36	0.43	0.54	0.59	0.65	0.71
45%	0.34	0.4	0.46	0.57	0.62	0.67	0.73
50%	0.38	0.44	0.5	0.6	0.64	0.69	0.75
55%	0.43	0.48	0.54	0.63	0.66	0.71	0.76
60%	0.47	0.52	0.57	0.65	0.69	0.73	0.78
65%	0.51	0.56	0.61	0.68	0.71	0.75	0.79
70%	0.56	0.61	0.65	0.71	0.74	0.77	0.81
75%	0.6	0.65	0.68	0.74	0.76	0.79	0.82
80%	0.65	0.69	0.72	0.77	0.79	0.81	0.84
85%	0.7	0.73	0.76	0.79	0.81	0.83	0.86
90%	0.74	0.77	0.79	0.82	0.84	0.85	0.87
95%	0.79	0.81	0.83	0.85	0.86	0.87	0.89
100%	0.83	0.85	0.87	0.88	0.89	0.89	0.9

DRAINAGE REPORT
FOR
MUNICIPAL OPERATIONS COMPLEX
AND
RTA BUS MAINTENANCE FACILITIES
GLENWOOD SPRINGS, COLORADO

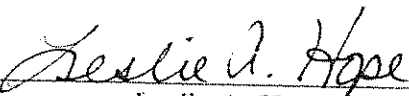
HCE JOB NO. 2000063.01
and
HCE JOB NO. 2011008.56

Revised: March 2, 2001

Revised: January 29, 2001

November 9, 2000

Prepared by:



Leslie A. Hope, P.E.
Project Manager

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Erosion Control Detail Sheet	
FEMA Floodplain Map	
SCS Soils Survey	
Lincoln DeVore's Geological Hazards of the Glenwood Springs Metropolitan Areas	
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I. INTRODUCTION

The proposed Municipal Operations Center (M.O.C.) is approximately 17.43 acres located along the Midland Avenue bypass in West Glenwood Springs. See the enclosed Vicinity Map, Figure 1.

The Colorado River is located to the north of the proposed development. This project is not affected by the 100 year floodplain of the Colorado River. There is one primary off-site drainage basin that is located to the south of this project. This basin is relatively small, steep, non-vegetated, and possibly subject to mitigatable debris flow events.

The stormwater and debris flow calculations for the off-site basins are provided in the Appendix. The off-site basin limits and the designations are from the Glenwood Meadows Drainage Study prepared by High Country Engineering, Inc. (dated June 5, 2000, HCE #2000063.01). A 24 hour, 25 year storm event has been adopted for the minor storm and the 24 hour, 100 year event was used for the major event in accordance with the City of Glenwood Springs Regulations. The culverts handling primarily on-site flows will be sized for the 25 year storm event. The stormwater facilities accommodating both on-site and off-site flows will be designed based on the 100 year storm event.

II. HYDROLOGY

The basic hydrologic methods for the smaller basins were based on the Soil Conservation Service publication "Procedures for Determining Peak Flows in Colorado" (1980). Further discussion of the offsite drainage hydrology and hydraulics are contained in the Off-Site Basins section of this report. Peak flows from the offsite basins will be primarily rainfall derived.

The report prepared by ESA Geotechnical Consultants, Final Report – Drainage and Debris Control Plan for the City of Glenwood Springs, Colorado, dated January 1983, was used as a reference for the debris flow calculations. Also, the drawings prepared by Lincoln DeVore, Geological Hazards of the Glenwood Springs Metropolitan Area, dated December 1977, were used as a basis for determining the debris flow hazards for this site.

III. OFF-SITE DRAINAGE BASINS

Hydrology. The offsite drainage basin (to the south of the site) vary from an elevation of 7900 feet at their upper ends to approximately 5750 feet along Midland Avenue. Stream gage record analysis in western Colorado¹ indicates that elevation 7500 feet is approximately the dividing elevation between rainfall derived critical flood events (below 7500 feet) and snowmelt derived events (above 7500 feet). This characteristic is also indicated in the Simons, Li & Associates hydrology report. Based on these reports, the basin should be considered as governed by rainfall runoff. Therefore, its basic hydrology was performed using the SCS method. The offsite basin designated as D is from the

¹"Magnitude and Frequency of Floods in the Western United States, Part 9, Colorado River Basin," U.S. Geological Survey, 1966.

Glenwood Meadows Drainage Study. This basin appears to exhibit the characteristics of debris flow basins, including a steep channel with minimal vegetation. To mitigate potential damage to on-site improvements during debris flow events, we are proposing a vegetated settling basin. This structure will reduce the flow velocities to enhance sedimentation and will trap the larger debris.

Offsite Basin D will be routed through the development, discharging at approximately the historic location along Midland Avenue. The channels through the site will be sized for the 100 year storm (without the bulking factor). Berms are recommended along the outside bends of the channel to provide for superelevation of the stormwater flows.

As noted in the enclosed calculations, a bulking factor of 2.4 has been applied to the 100 year stormwater runoff. This means that the stormwater flows calculated by the SCS method have been increased by 2.4 times to account for the additional bulk that could be accumulated during a debris flow event. These flows were used to size the channels discharging to the settling ponds. This bulking factor is based on the report prepared by ESA Geotechnical Consultants, dated January 1983.

This report included a graph, which is included in the Appendix, that provides debris loading factors based on the water and solids concentration in the debris flow. The solids concentration for a debris flow event was assumed to be 50% in this report. Greater solid concentrations are considered to be landslides and do not behave as a flowing liquid. Also, the particles that are greater than 6 inches in diameter are assumed to be approximately 50% of the total debris volume. Thus, the proposed settling pond will be sized based on determining 25% of the total volume of the 100 year storm water event.

According to the Lincoln DeVore's Geological Hazards of the Glenwood Springs Metropolitan Areas, the proposed site contains areas within debris flow fans with severe to slight. The severe hazard areas for the debris fans are primarily areas above 5,900' elevation. The report recommends utilizing mitigative measures for these basins. The debris flow settling ponds will be installed at the base of the steep hills to increase deposition of materials prior to entering the development.

IV. DRAINAGE PLAN

Runoff Control, Treatment and Best Management Practices

Historical agriculture practices on this site include cattle and sheep grazing. The ranch livestock activities have historically contributed surface water contamination to the aquifer. The proposed development will eliminate the risk of contamination from livestock, and proper fertilizer application and sprinkler systems in the open spaces will minimize the excessive infiltration into the groundwater and subsurface soils.

The first structural best management practice will be constructing detention basins or settling ponds. We are proposing installing a settling pond at the northeast corner of the site. The efficiency of suspended solids removal for grass-lined swales is approximately 20-40%. The detention pond's removal efficiency is 50-70% of the suspended solids. In addition, the treatment ponds will have "baffled" outlets (like a conventional grease trap) to help retain any floating materials that the stormwater runoff may have picked up. These floating materials include oils, greases, trash, etc. Grass-lined swales and settling ponds "provide sufficient travel time so as to encourage the removal

of suspended solids before runoff leaves the site.”

The settling pond will also be valuable during the project's construction. During construction, some erosion can be expected from the disturbed areas of the site. The sediment laden runoff during this period will flow into the settling pond system which will then act as part of an erosion control system.

A National Pollution Discharge Elimination System (NPDES) permit will be required for this project.

The NPDES permit will be obtained prior to any construction activities.

Detention of the difference in peak stormwater flows for the existing condition versus the developed condition will not be necessary for this site. The increase in stormwater runoff due to development would be a negligible increase to the flows of the Colorado River. However, the stormwater flows from this development will be treated, as described above, prior to discharging into the River. Also, the debris flow settling basin, which contains over 300,000 cubic feet of storage, will attenuate peak developed flows from the site (and reduce the flows to below historic rates).

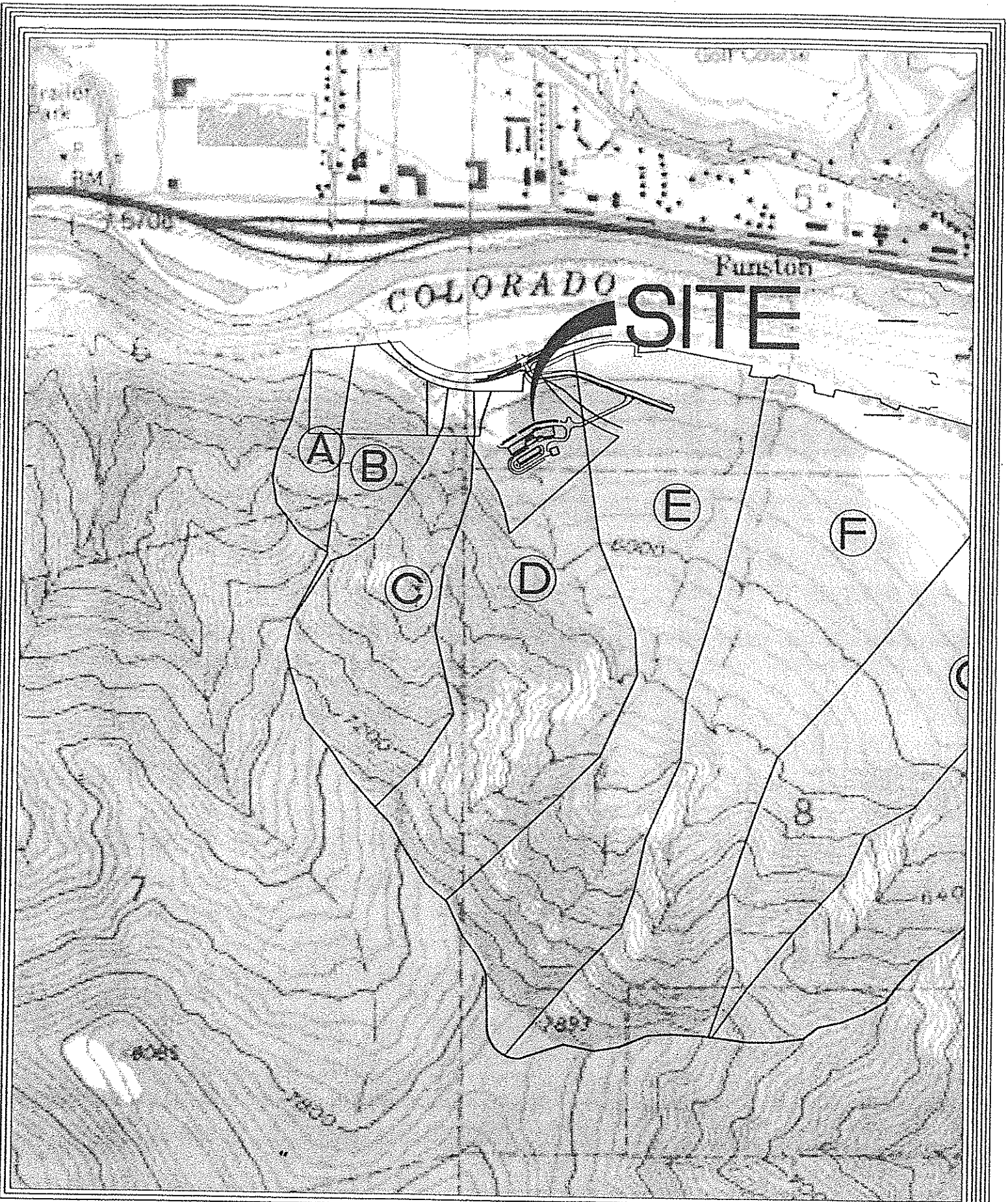
Culverts

Culverts are sized for the minor storm event (25 year storm) where an acceptable overflow area is available. However, in some areas culverts must be part of the major drainage system and thus are sized for the expected 100 year flows.

Culvert sizes and inverts are shown on the Grading and Drainage Plan. Since all maximum head water depths are expected to be less than 1.5 times the pipe diameter, exit velocities will be reasonable, requiring only minor protective measures such as short sections of rip-rap. The culvert sizing and calculations are provided in the Appendix.

V. SUMMARY

The preliminary plan for the Municipal Operations Center recommends many types of drainage improvements and structures, all of which will act together to convey expected surface runoff across the site while mitigating impacts to expected building types or the environment.

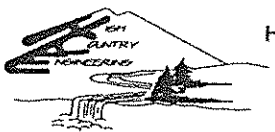
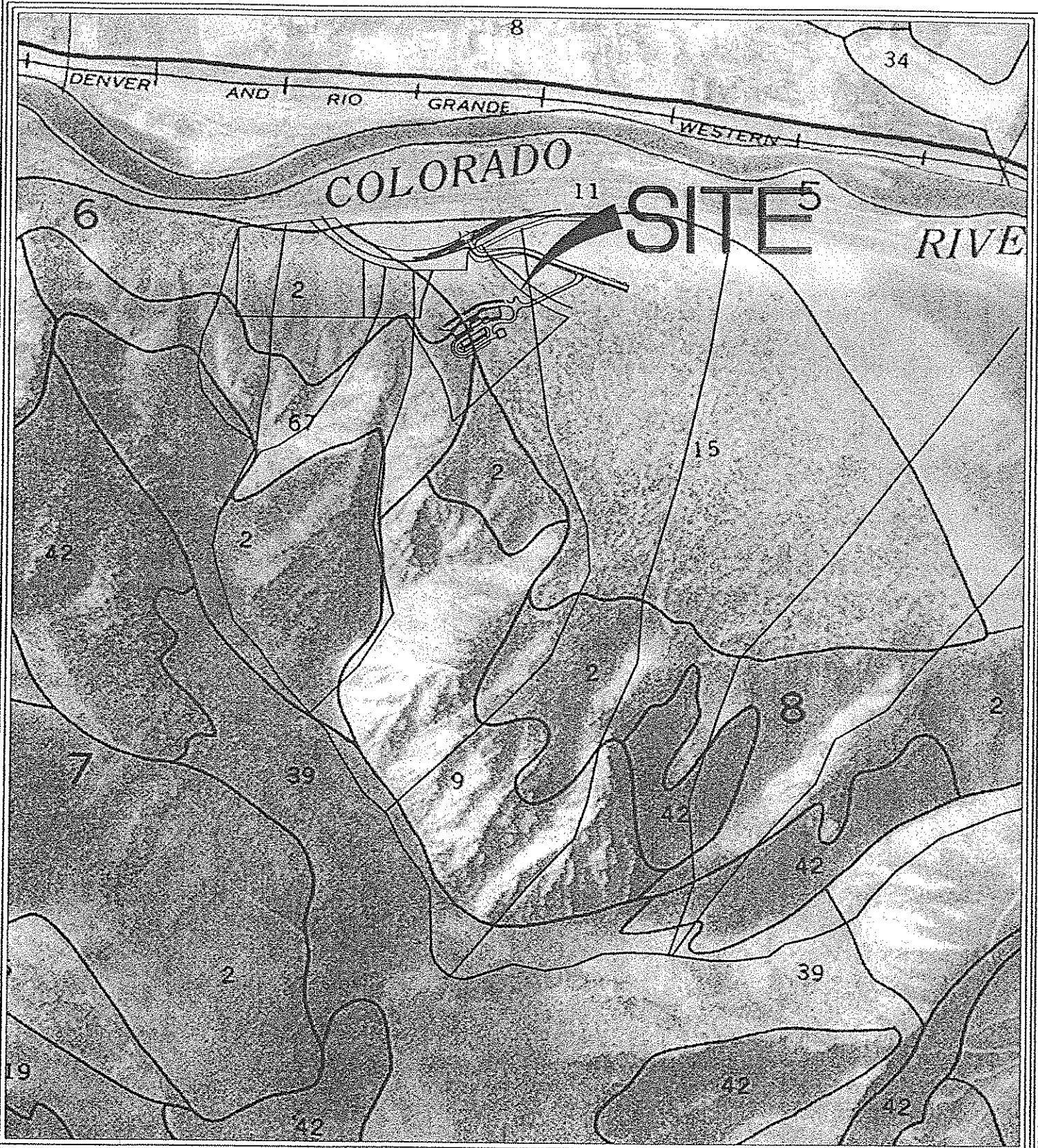


HIGH COUNTRY ENGINEERING, INC.
 923 COOPER AVENUE
 GLENWOOD SPRINGS, CO 81601
 (970) 945-8676

GLENWOOD SPRINGS, CO
 M.O.C.
 OFF SITE BASIN MAP

1" = 1000'

DES. LAH	CK.	FILE NO.	SHEET
DR.	DATE 11/9/00	2000063.01	OF



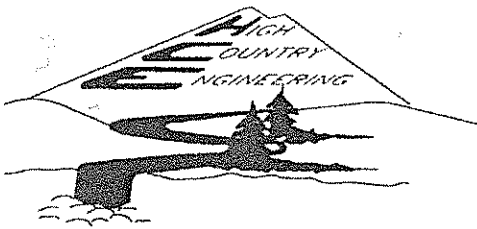
HIGH COUNTRY ENGINEERING, INC.
923 COOPER AVENUE
GLENWOOD SPRINGS, CO 81601
(970) 945-8676

GLENWOOD SPRINGS, CO
M.O.C.
OFF SITE BASIN MAP

1" = 1000'

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APPENDIX

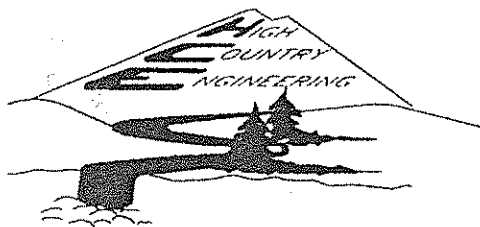


Project Glenwood Meadows Job No. 2000031,01

By JAN Date 5/31/00 Ck'd by _____ Date _____

Subject Drainage Basins Page _____ of _____

Drainage Basin	Basin Limits Area	Based on USGS Quad's		
A	15,035 ac			
B	22,870 ac			
C	57.664			
D	110.537			
E	120.419			
F	157.413			
G	104.702			
H	119.199			
I	15.998			
Soils Types	Per SCS Mapping			
Basin	Type	Hydrologic Type		
A	2, 67 E rock outcropping 25%	C/D		
B	2, 67	C/D		
C	2, 67	C/D		
D	2, 67, 15, 9 E steep slopes	C/D, B, D		
E	15, 2, 9	B, C/D, D		
F	11, 15, 2, 42, 9, 39	B, B, C/D, B, D, C		
G	11, 15, 2, 42 (a little 67)	B, B, C/D, B, C/D		
H	11, 2, 42, 67	B, C/D, B, C/D		
I	67	C/D		



Project Glenwood Meadows Job No. 2000031.01

By LGH Date 5/31/00 Ck'd by _____ Date _____

Subject Drainage Calcs Page _____ of _____

Time of Concentration
Mostly Shallow Concentrated Flow

Basin A

Length $\approx 1660'$

Slope $\approx \frac{6840 - 5760}{1660} = 0.65 \text{ ft/ft}$

Mannings $n = 0.13$ for rangeland - natural conditions - or use unpaved

$T_c = 0.1 \text{ hr}$ (minimum T_c)

Basin B

Length $\approx 2250'$

Slope $\approx \frac{7000 - 5720}{2250} = 0.57 \text{ ft/ft}$

use unpaved for natural conditions

$T_c = 0.1 \text{ hr}$ (minimum)

Basin C

Length = 3300

Slope = $\frac{7520 - 5760}{3300} = 0.53 \text{ ft/ft}$

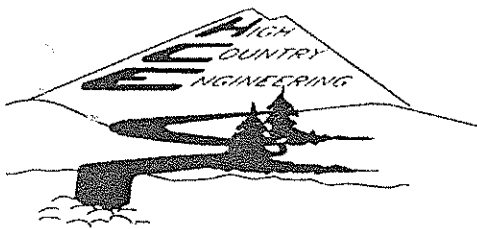
$T_c = 0.1 \text{ hr}$ (minimum)

* Basin D

Length = 5000'

Slope = $\frac{7680 - 5760}{5000} = 0.38 \text{ ft/ft}$

$T_c = 0.14 \text{ hr}$



Project Glenwood Meadows Job No. 2000031.01
 By L.H. Date 5/31/00 Ck'd by _____ Date _____
 Subject Drainage Calc Page _____ of _____

Curve Number

Basin A: Rangeland in Fair Condition c/d soils CN=82

Basin B: Rangeland in Fair Condition c/d soils CN=82

Basin C: Rangeland in Fair Condition c/d soils CN=82

* Basin D: Rangeland in Fair Condition use closer to C soils CN=80

Basin E: Rangeland in Fair Condition use C soils CN=79

Basin F: Rangeland in Fair Condition use high B/C CN=77

Basin G: Rangeland in Fair Condition use high B/C soils CN=77

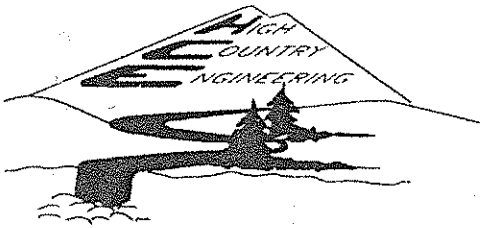
Basin H: Rangeland in Fair Condition use C soils CN=79

Basin I: Rangeland in Fair Condition use c/d CN=82

* Using SCS TR55- Tabular Method

Precipitation = 2.0" for 25yr, 24 hr
 2.4" for 100yr, 24 hr

<u>Basin</u>	<u>Q₂₅ cfs</u>	<u>Q₁₀₀ cfs</u>
A	14.7	21.3
B	22.4	32.4
C	56.5	81.6
D	92.7	137.4
E	70.3	107.0
F	76.9	120.7
G	51.2	80.3
H	92.3	138.6
I	15.7	22.7



Project Glenwood Meadows Job No. 2000031.01

By LAT Date 5/31/00 Ck'd by _____ Date _____

Subject Drainage Cakes Page _____ of _____

These basins may be subject to debris flows. A typical bulking factor used for Debris Flows = 2.4

Basin 100 yr Bulk'd Debris Flows (cfs)

A

51

B

78

C

196

X D

330

E

257

F

290

G

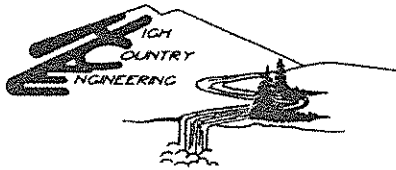
193

H

333

I

55



Project M.O.C. Site Job No. 2000 063.01

By Latt Date 11/9/00 Ck'd by _____ Date _____

Subject WQCV Page _____ of _____

The water quality capture volume consists of the first 0.5" over the entire site:

$$\frac{0.5"}{12} \times 17.43 \text{ ac} \times \frac{43560 \text{ ft}^2}{1 \text{ ac}} = 31,635 \text{ cf}$$

TR-55 Tabular Hydrograph Method

Input Summary

Description
 GLENWOOD MEADOWS - BASIN D - 25 YEAR STORM
 Rainfall Distribution Type II
 Ia/P Interpolation On
 Total Area 110.537 ac

Peak Time 12.10 hrs
 Peak Flow 92.73 cfs

Given Input Data:

Subarea	D/S Subareas	Area (ac)	CN	Tc (hrs)	Tt (hrs)	Rainfall (in)
D		110.537	80	0.14	0.00	2.0000

Support Data:

Messages:

Info: Time of Concentration rounded to 0.10 hrs in row <1>.

TR-55 Tabular Hydrograph Method

Input Summary

Description
 GLENWOOD MEADOWS - BASIN D - 100 YEAR STORM
 Rainfall Distribution Type II
 Ia/P Interpolation On
 Total Area 110.537 ac

Peak Time 12.10 hrs
 Peak Flow 137.44 cfs

Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (hrs)	Tt (hrs)	Rainfall (in)
D		110.537	80	0.14	0.00	2.4000

Support Data:

Messages:
 Info: Time of Concentration rounded to 0.10 hrs in row <1>.

GLENWOOD SPRINGS, M.O.C.

HCE PROJECT NO. 2000063.01

DATE: January 29, 2001

(Basin Designation from Glenwood Meadows Drainage Study)

Off-Site Basin D - Sizing the Settling Basins for the 100 Year Debris Flow Event

Curve Number (CN) =	80	
Precipitation (100 year) =	2.4 inches	
Inches of Runoff =	0.82	From "Procedures for Determining Peak Flows in Colorado"
Area of Basin =	82.44 acres	
Volume of Storm =	245391 cf	
Volume Needed =	122695 cf	Based on 50% concentration of the storm being debris and 50% of the debris being greater than 6".

Off-Site Basin D - Sizing the Settling Basins for the 25 Year Debris Flow Event

Curve Number (CN) =	80	
Precipitation (25 year) =	2 inches	
Inches of Runoff =	0.56	From "Procedures for Determining Peak Flows in Colorado"
Area of Basin =	82.44 acres	
Volume of Storm =	167584 cf	
Volume Needed =	83792 cf	Based on 50% concentration of the storm being debris and 50% of the debris being greater than 6".

TR-55 Tabular Hydrograph Method
Input Summary

Description
 GLENWOOD MEADOWS - BASIN D - 25 YEAR STORM- DEVELOPED
 Rainfall Distribution Type II
 Ia/P Interpolation On
 Total Area 110.537 ac

 Peak Time 12.10 hrs
 Peak Flow 112.70 cfs

Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (hrs)	Tt (hrs)	Rainfall (in)
0	D	110.537	83	0.14	0.00	2.000

Support Data:

Subarea Name: D, Row: 1

Composite Runoff Curve Number Calculator

Description	Area (ac)	Curve Number
EXISTING	82.440	80
MOC/PARKING/BUSINE	28.097	90
Total Area ----->	110.537	83 <----- Weighted CN

Messages:

Info: Time of Concentration rounded to 0.10 hrs in row <1>.

TR-55 Tabular Hydrograph Method
Input Summary

Description
 GLENWOOD MEADOWS - BASIN D - 100 YEAR STORM - DEVELOPED
 Rainfall Distribution Type II
 Ia/P Interpolation On
 Total Area 110.537 ac

 Peak Time 12.10 hrs
 Peak Flow 161.96 cfs

Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (hrs)	Tt (hrs)	Rainfall (in)
0	D	110.537	83	0.14	0.00	2.400

Support Data:

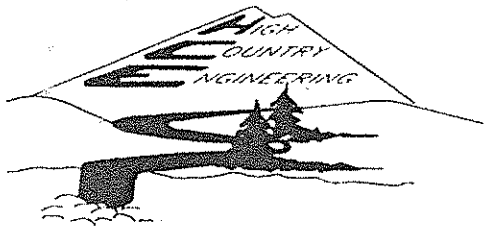
Subarea Name: D, Row: 1

Composite Runoff Curve Number Calculator

Description	Area (ac)	Curve Number
EXISTING	82.440	80
MOC/PARKING/BUSINE	28.097	90
Total Area ----->	110.537	83 <----- Weighted CN

Messages:

Info: Time of Concentration rounded to 0.10 hrs in row <1>.



Project Glenwood Meadows Job No. 2000 031.01

By RAH Date 6/5/00 Ck'd by _____ Date _____

Subject Drainage Calcs Page _____ of _____

PROPOSED CONDITIONS

Basins A, B & C will be basically unchanged

* Basin D

Total Area = 110.537 ac (same as existing conditions)

Portion of Basin above elev. 6000' = 82.44 ac CN = 80 (Existing)

Remainder = Development - MOC CN = 92

Park N Ride CN = 88

Business/Institutional CN = 90

} Use CN = 90

$$\text{Weighted CN} = \frac{(80)(82.44) + (90)(28.097)}{110.537} = \underline{\underline{83}}$$

Precipitation - Same as existing conditions 2.0" for 25yr 2.4" for 100yr

Time of Concentration - approximately the same

$$Q_{25} = 116.6 \text{ cfs}$$

$$Q_{100} = 146.7 \text{ cfs}$$

Basin E

Total Area = 120.419 ac

Portion of Basin above 6000' elev. = 72.2 ac CN = 79 (Existing)

Remainder - Development -

Land use 5 - Business/Institutional CN = 90

Land use 6 - Business/Institutional CN = 90

Land use 9 - Multifamily Residential CN = 85

Land use 4 - Office/Business CN = 90

} use CN = 89

$$\text{Weighted CN} = \frac{(79)(72.2) + (89)(48.219)}{(120.419)} = \underline{\underline{83}}$$

Precipitation - Same as existing conditions

Time of Concentration - approximately the same

$$Q_{25} = 97.6 \text{ cfs}$$

$$Q_{100} = 140.9 \text{ cfs}$$

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness	Uncoated steel		Concrete	
20 ^a . Cryaquolls					ft		in					
21 ^a . Cushman	C	None	---	---	>5.0	---	20-40	Rippable	Low	High	Low.	
Lazear	D	None	---	---	>6.0	---	10-20	Hard	Low	High	Low.	
22 ^a . Daleman	C	None	---	---	>6.0	---	20-40	Hard	Moderate	High	Moderate	
23 ^a . Detra	B	None	---	---	>6.0	---	40-60	Hard	Moderate	High	Low.	
24 ^a . Dollard	C	None	---	---	>6.0	---	20-40	Rippable	Low	High	Low.	
Rock outcrop.												
25 ^a . Etoc	B	None	---	---	>6.0	---	>60	---	Moderate	Low	Low.	
26 ^a . Farlow	B	None	---	---	>6.0	---	40-60	Hard	Low	High	Low.	
Rock outcrop.												
27 ^a . Halaquepts												
28, 29, 30, 31 ^a . Heidt	C	None	---	---	>5.0	---	>60	---	Low	High	High.	
32 ^a . Holderness Variant	C	None	---	---	>6.0	---	>60	---	Moderate	High	Low.	
33, 34 ^a . Lidefonso	B	None	---	---	>6.0	---	>60	---	Low	High	Low.	
35 ^a . Lidefonso	B	None	---	---	>6.0	---	>60	---	Low	High	Low.	
Lazear	D	None	---	---	>6.0	---	10-20	Hard	Low	High	Low.	
36, 37 ^a . Lisul	D	None	---	---	>5.0	---	10-20	Hard	Low	High	Low.	
38 ^a . Lisul	D	None	---	---	>5.0	---	10-20	Hard	Low	High	Low.	
Starnon	D	None	---	---	>5.0	---	10-20	Hard	Moderate	High	Low.	

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES

(The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern.)

Soil name and map symbol	Hydro- logic group	FLOODING			WATER TABLE			SEASON			Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness	Potential frost action	Uncoated steel	Concrete	
1. Arroyo Variant	C	None	---	---	>6.0	---	>60	---	Low	High	Low.	
* 2. Arle	C	None	---	---	---	---	---	---	---	---	---	
3. Anseri	D	None	---	---	>6.0	---	20-40	Rippable	Low	Moderate	Low.	
4. Rock outcrop.	D	None	---	---	>6.0	---	10-20	Hard	Low	High	Low.	
5. Arvada	B	None	---	---	>6.0	---	>60	---	Low	High	Moderate.	
6. Ascalon	B	None	---	---	>6.0	---	>60	---	Moderate	Moderate	Low.	
7. Ascalon	B	None	---	---	>6.0	---	>60	---	Moderate	Moderate	Low.	
8. Atencio	B	None	---	---	>6.0	---	>60	---	Low	High	Low.	
9. Azeltine	B	None	---	---	>6.0	---	>60	---	Low	High	Low.	
* 9. Badland	B	None	---	---	>6.0	---	>60	---	Low	High	Low.	
* 10. Begay	B	None	---	---	>6.0	---	>60	---	Low	High	Low.	
11. Bucklen	D	None	---	---	>6.0	---	>60	---	Low	High	Low.	
12. Inchau	C	None	---	---	>6.0	---	10-20	Rippable	Moderate	High	Low.	
* 13, 14, 15. Chilton	B	None	---	---	>6.0	---	20-40	Rippable	Moderate	High	Low.	
16. Chilton	C	None	---	---	>6.0	---	>60	---	Low	Moderate	Low.	
17. Cochetopa	C	None	---	---	>6.0	---	>60	---	Moderate	High	Low.	
18, 19. Cochetopa	C	None	---	---	>6.0	---	>60	---	Moderate	High	Low.	
20. Jerry	C	None	---	---	>6.0	---	>60	---	Moderate	High	Low.	

See footnote at end of table.

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TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Loading			High water table			Soilrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Depth	Hardness		Uncoated steel	Concrete
* 39 Jerry	C	None	---	---	>6.0	---	>50	---	---	Moderate	High	Moderate
40, 41 Kim	B	None	---	---	>6.0	---	>60	---	---	Low	High	Low
* 42 Laughier	B	None	---	---	>6.0	---	>60	---	---	Moderate	High	Low
43 Limon	C	None	---	---	>6.0	---	>50	---	---	Low	High	Moderate
44 Morval	B	None	---	---	>6.0	---	>60	---	---	Moderate	Moderate	Low
45 Korval	B	None	---	---	>6.0	---	>60	---	---	Moderate	Moderate	Low
46, 47 Nhill	B	None	---	---	>6.0	---	>60	---	---	Moderate	High	Low
48 Northwater	B	None	---	---	>6.0	---	>60	---	Hard	Moderate	Moderate	Low
49, 50, 51 Olney	B	None	---	---	>6.0	---	>60	---	---	Low	Moderate	Low
52 Parachute	B	None	---	---	>6.0	---	>60	20-40	Rippable	Moderate	Moderate	Low
53 Parachute	B	None	---	---	>6.0	---	>60	20-40	Rippable	Moderate	Moderate	Low
54, 55, 56 Potts	B	None	---	---	>6.0	---	>60	---	---	Low	High	Moderate
57, 58, 59 Potts	B	None	---	---	>6.0	---	>60	---	---	Low	High	Moderate
60, 61 Rhone	B	None	---	---	>6.0	---	>60	---	---	Low	High	Low
62 Rock outcrop. Torriorthenis.	B	None	---	---	>6.0	---	>60	40-60	Rippable	Moderate	Moderate	Low

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Depth	Hardness		Uncoated steel	Concrete
63----- Silas	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	in	---	Moderate---	High-----	Low.
64----- Tanna	C	None-----	---	---	>6.0	---	20-40	Rippable	---	Low-----	High-----	Low.
65*----- Torrifluvents												
66*----- Torriorthents.												
Canborthids.												
Rock outcrop.												
67----- Torriorthents.												
Rock outcrop.												
68, 69, 70----- Vale	B	None-----	---	---	>6.0	---	>60		---	Moderate---	Moderate	Low.
71*----- Villa Grove	D	None-----	---	---	>6.0	---	>60		---	Moderate---	High-----	Low.
Zoltay-----	C	None-----	---	---	>6.0	---	>60		---	Moderate---	High-----	Low.
72----- Wann	B	Occasional	Brief-----	Apr-Jul	2.0-3.0	Apr-Jul	>60		---	High-----	High-----	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

Included with this soil in mapping are small areas of Detra soils and Rock outcrop. These areas make up about 5 to 10 percent of the map unit.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. Surface runoff is medium, and the erosion hazard is moderate.

This soil is used mainly for wildlife habitat and limited grazing.

The native vegetation on this soil is mainly Gambel oak, serviceberry, elk sedge, and bromes.

When range condition deteriorates, forbs and woody shrubs increase. When the range is in poor condition, Kentucky bluegrass, undesirable weeds, and annual plants are abundant. Properly managing grazing maintains and improves range condition.

Mule deer, elk, cottontail rabbit, wild turkey, and blue grouse find habitat on this soil.

Community development and sanitary facilities are limited by steep slopes and low strength.

This soil is in capability subclass Vile, nonirrigated.

2—Arle-Ansari-Rock outcrop complex, 12 to 65 percent slopes. This complex consists of strongly sloping to steep soils and Rock outcrop on mountainsides and sloping alluvial fans. Elevation ranges from 5,500 to 7,500 feet. The soils formed in alluvium derived from red-bed shale and sandstone. The average annual precipitation is about 16 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

The Arle soil makes up about 45 percent of the complex, the Ansari soil makes up about 35 percent, and Rock outcrop makes up about 20 percent.

The Arle soil is moderately deep and well drained. Typically, the surface layer is reddish brown very stony loam about 10 inches thick. The subsoil and substratum are reddish brown very stony loam about 22 inches thick. Soft reddish brown sandstone and shale are at a depth of 32 inches.

Permeability of the Arle soil is moderate, and available water capacity is low. Effective rooting depth is about 20 to 40 inches. Surface runoff is medium, and the erosion hazard is severe.

The Ansari soil is shallow and well drained. Typically, the surface layer is reddish brown loam about 10 inches thick. The substratum is reddish brown stony loam. Bedrock is hard, reddish brown sandstone.

Permeability of the Ansari soil is moderate, and available water capacity is low. Effective rooting depth is about 10 to 20 inches. Surface runoff is rapid, and the erosion hazard is severe.

Rock outcrop is mainly red sandstone.

This complex is used mainly for grazing and wildlife habitat.

The native vegetation on the Arle soil is mainly wheatgrass, Indian ricegrass, mountainmahogany, and sago-

brush. The native vegetation on the Ansari soil is mainly Indian ricegrass, wheatgrass, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition.

Mule deer, rabbit, and grouse find habitat on these soils.

Use of this complex for community development or as a source of construction material is limited mainly by depth to rock, steep slopes, thin layers of borrow material, and large stones. Special design can overcome these limitations. Drainage and structures to control runoff from snowmelt reduce erosion around construction sites and roads.

This complex is in capability subclass Vile, nonirrigated.

3—Arvada loam, 1 to 6 percent slopes. This deep, well drained, sloping soil is on fans and high terraces (fig. 4). Elevation ranges from 5,100 to 6,200 feet. This soil formed in highly saline alluvium derived from sandstone and shale. The average annual precipitation is about 12 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is strongly alkaline or very strongly alkaline, pale brown loam about 3 inches thick. The subsoil is brown silty clay loam about 14 inches thick. The substratum is light brown or brown silty clay loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Limon, Kim, Heldt, and Wann soils. Also included are some soils that are high in salt.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Organic matter content of the surface layer is low. Surface runoff is medium, and the erosion hazard is moderate.

This soil is used mainly for wildlife habitat, limited grazing, and some irrigated farming.

Irrigated crops produce very poorly because the soil takes water in very slowly and is droughty. Leaching is needed to remove excess salts if this soil is to be irrigated. Soil amendments containing sulphur are helpful in leaching the salt.

The native vegetation on this soil is mainly saltgrass, alkali sacaton, and greasewood.

When range condition deteriorates, forbs and shrubs increase. Properly managing grazing maintains and improves range condition. Seeding improves range in poor condition. Western wheatgrass, alkali sacaton, and fall wheatgrass are suitable for seeding. Preparing a seedbed and drilling the seed are good practices. Irrigating new seedlings is necessary for successful establish-

Arle = C

Ansari = D

and the lower part is brown gravelly sandy loam about 5 inches thick. The substratum is sand, cobbles, and gravel to a depth of 60 inches.

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

The Azeltine soil is deep and well drained. Typically, the surface layer is reddish gray gravelly sandy loam about 8 inches thick. The underlying layer is reddish brown gravelly sandy loam about 10 inches thick. The substratum is calcareous sand, gravel, and cobbles to a depth of 60 inches or more.

Permeability of the Azeltine soil is moderately rapid, and water capacity is very low. Effective rooting depth is about 60 inches or more. Surface runoff is slow, and the erosion hazard is slight.

These soils are used mainly for grazing and crops. Alfalfa, small grains, potatoes, and grass-legume hay are the main crops.

This soil is irrigated mainly by flooding. Grassed waterways and minimum tillage prevent serious erosion. Cover crops or stubble mulching in dryfarmed areas also reduce erosion.

The native vegetation on these soils is mainly wheatgrass, sagebrush, and needleandthread.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices. Reducing brush improves the range.

Pheasant, dove, rabbit, squirrel, and some deer find food and shelter on these soils, mainly in areas of crops.

Use of this soil for community development or as a source of construction material is limited by the large stones. Special design is needed for septic tank absorption fields because of seepage and the possibility of polluting ground water.

This complex is in capability subclass IVs, irrigated, and VI, nonirrigated.

9—Badland. This broadly defined unit consists of steep and very steep, nearly barren land dissected by many intermittent drainage channels that have cut into the soft shale and sandstone of the Green River Formation and into the soft shale and siltstone of the Wasatch, Mancos, and Mesa Verde Formations. Badland occurs throughout the survey area, mainly on steep foothills and mountainsides that have outcrops of shale or sandstone.

About 85 percent or more of the area is unvegetated. The water erosion hazard is very severe, and erosion is active.

About 15 percent of this map unit is small, isolated areas of Lazear, Tanna, and Dollard soils. These soils have only a sparse plant cover, mainly scattered pinyon and juniper. The value for grazing is very limited. The trees provide a little protection and cover for livestock and wildlife.

Badland is unsuitable for community development.

Badland is in capability subclass VIII, nonirrigated.

10—Begay sandy loam, 1 to 6 percent slopes. This deep, well drained, nearly level to gently rolling soil is on alluvial fans and sides of valleys. Elevation ranges from 5,000 to 6,500 feet. This soil formed in alluvium derived from red-bed sandstone and shale. The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is red or yellowish red sandy loam about 14 inches thick. The subsoil is yellowish red fine sandy loam about 10 inches thick. The substratum is yellowish red stony sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Olney and Ascalon soils that have slopes of 6 to 12 percent. These areas make up about 5 to 10 percent of the map unit.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches. Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for some irrigated pasture and hay and for grazing. Small acreages of wheat, barley, and oats are grown.

Flooding and sprinklers are suitable for irrigating this soil. This soil is droughty and needs frequent irrigation to mature crops. Controlling the rate of water application reduces piping and erosion.

The native vegetation on this soil is mainly wheatgrass, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Cottontail rabbit, squirrel, mourning dove, chukar, and some mule deer find habitat on this soil.

Use of this soil for community development and as a source of construction material is limited by seepage, large stones, and excess fines.

This soil is in capability subclasses IIIe, irrigated, and IVe, nonirrigated.

11—Begay sandy loam, 6 to 12 percent slopes. This deep, well drained, moderately sloping to rolling soil

is on alluvial fans and sides of valleys. Elevation ranges from 5,000 to 6,500 feet. This soil formed in alluvium derived from red-bed sandstone and shale. The average annual precipitation is about 15 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is red or yellowish red sandy loam about 10 inches thick. The substratum is yellowish red stony sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Olney and Ascalon soils that have slopes of 6 to 12 percent. These areas make up about 5 to 10 percent of the map unit.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches. Surface runoff is moderate, and the erosion hazard is severe.

This soil is used mainly for irrigated pasture and hay and for grazing.

Flooding and sprinklers are suitable for irrigating this soil. This soil is droughty and needs frequent irrigation to mature crops. Controlling the rate of water application reduces piping and erosion.

The native vegetation on this soil is mainly wheatgrass, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush is often necessary to improve deteriorated range. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Cottontail rabbit, squirrel, mourning dove, chukar, and some mule deer find habitat on this soil.

Use of this soil for community development and as a source of construction material is limited by large stones, seepage, and steep slopes.

This soil is in capability subclass IVe, irrigated and nonirrigated.

B

12—Bucklon-Inchau loams, 25 to 50 percent slopes. These moderately sloping to very steep soils are on ridges and mountainsides. Elevation ranges from 7,000 to 9,500 feet. These soils formed in sandstone and shale residuum. The average annual precipitation is about 18 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is less than 75 days.

The Bucklon soil makes up about 55 percent of the map unit, and the Inchau soil makes up about 35 percent. The Bucklon soil is on the more steep, convex parts of the landscape, and the Inchau soil is on the slightly concave parts.

The Bucklon soil is shallow and well drained. An organic layer is on the surface in some areas. Typically,

the surface layer is dark grayish brown loam about 5 inches thick. The underlying material is dark grayish brown clay loam and grayish brown loam about 10 inches thick. Shale and sandstone bedrock is at a depth of 15 inches.

Permeability of the Bucklon soil is slow above bedrock. Available water capacity is very low. Effective rooting depth is about 10 to 20 inches. Surface runoff is medium, and the erosion hazard is severe.

The Inchau soil is moderately deep and well drained. An organic layer is on the surface in some areas. Typically, the surface layer is grayish brown loam about 3 inches thick. The upper part of the subsoil is dark grayish brown and yellowish brown clay loam about 15 inches thick, and the lower part is yellowish brown gravelly clay loam about 18 inches thick. Sandstone and shale bedrock is at a depth of 36 inches.

Permeability of the Inchau soil is moderate above bedrock, and available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the erosion hazard is severe.

Included with these soils in mapping are small areas of Cochetopa, Cimarron, and Jerry soils. The Cochetopa and Jerry soils have slopes of 25 to 50 percent. The Cimarron soils are in small drainageways and have slopes of 2 to 12 percent. These areas make up 5 to 10 percent of the map unit.

These soils are used mainly for wildlife habitat and limited grazing.

The native vegetation on these soils is mainly Gambel oak, elk sedge, and bromes.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, Kentucky bluegrass, undesirable woods, and annual plants are numerous. Properly managing grazing maintains and improves range condition.

Mule deer, elk, snowshoe rabbit, squirrel, and blue grouse find habitat on these soils.

Community development is limited by steep slopes, depth to rock, and low strength.

This complex is in capability subclass VII, nonirrigated.

13—Chilton channery loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on alluvial fans and sides of valleys. Elevation ranges from 5,000 to 6,500 feet. This soil formed in alluvium derived from red-bed shale and sandstone. The average annual precipitation is about 14 inches, the average annual air temperature is about 46 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is reddish brown channery loam about 13 inches thick. The substratum is reddish brown, light brown, and pink very channery sandy loam and very cobbly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Begay and Morval soils. The Begay soils have slopes of

1 to 6 percent. The Morval soils are in higher lying areas and have slopes of 3 to 12 percent. These areas make up 10 to 15 percent of the map unit.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for wildlife habitat, limited grazing, and some irrigated hay and pasture.

The native vegetation on this soil is mainly wheatgrass, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Mule deer, cottontail rabbit, squirrel, and wild turkey find habitat on this soil.

Community development is limited by the large stones.

This soil is in capability subclass IVe, nonirrigated.

14—Chilton channery loam, 6 to 12 percent slopes

This deep, well drained, rolling soil is on alluvial fans and sides of valleys. Elevation ranges from 5,000 to 6,500 feet. This soil formed in alluvium derived from red-bed shale and sandstone. The average annual precipitation is about 14 inches, the average annual air temperature is about 46 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is reddish brown channery loam about 13 inches thick. The substratum is reddish brown, light brown, and pink very channery sandy loam and very cobbly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Begay and Morval soils. The Begay soils have slopes of 6 to 12 percent. The Morval soils are in higher lying areas and have slopes of 3 to 12 percent. These areas make up 10 to 15 percent of the map unit.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for wildlife habitat and grazing.

The native vegetation on this soil is mainly wheatgrass, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for

seeding. Preparing a seedbed and drilling the seed are good practices.

Mule deer, cottontail rabbit, squirrel, and wild turkey find habitat on this soil.

Community development is limited by slope and large stones.

This soil is in capability subclass VIc, nonirrigated.

15—Chilton channery loam, 12 to 25 percent slopes. This deep, well drained, moderately steep to hilly soil is on alluvial fans and sides of valleys. Elevation ranges from 5,000 to 6,500 feet. This soil formed in alluvium derived from red-bed shale and sandstone. The average annual precipitation is about 14 inches, the average annual air temperature is about 46 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is reddish brown channery loam about 13 inches thick. The substratum is reddish brown, light brown, and pink very channery sandy loam and very cobbly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Begay and Morval soils that have slopes of less than 12 percent. These areas make up 10 to 15 percent of the map unit.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the erosion hazard is severe.

This soil is used mainly for wildlife habitat and grazing.

The native vegetation on this soil is mainly wheatgrass, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition in the less sloping areas. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Mule deer, cottontail rabbit, squirrel, and wild turkey find habitat on this soil.

Community development is limited by steep slopes and large stones. Cut slopes should be revegetated immediately to reduce erosion and prevent gullying.

This soil is in capability subclass VIc, nonirrigated. B

16—Cimarron loam, 2 to 12 percent slopes. This deep, well drained, nearly level to undulating soil is in narrow mountain valleys and drainageways. Elevation ranges from 7,500 to 9,000 feet. This soil formed in alluvium derived from basalt. The average annual precipitation is about 18 inches, the average annual air temperature is 39 degrees F, and the frost-free period is less than 75 days.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is grayish brown silty

harvesting. The low available water capacity affects survival of seedlings.

Mule deer, snowshoe hare, and some blue grouse find habitat on this soil.

Community development is severely limited by shallow depth to bedrock and very steep slopes.

This soil is in capability subclass VIIe, nonirrigated.

38—Irigul-Starman channery loams, 5 to 50 percent slopes. This complex is on ridge crests and mountainsides. Elevation ranges from 7,800 to 9,000 feet. The soils formed in residuum from sandstone and marlstone. The average annual precipitation is about 20 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is less than 75 days.

The Irigul soil makes up about 55 percent of the unit, and the Starman soil makes up about 30 percent. The Irigul soil is on mountainsides and the less windswept parts of the landscape, and the Starman soil is on ridge crests.

The Irigul soil is shallow and well drained. Typically, the surface layer is grayish brown channery loam about 6 inches thick. The underlying material is yellowish brown extremely channery sandy clay loam about 11 inches thick. Hard, fractured sandstone is at a depth of 17 inches.

Permeability of the Irigul soil is moderate, and available water capacity is very low. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the erosion hazard is slight.

The Starman soil is shallow and well drained. Typically, the surface layer is brown, calcareous channery loam about 3 inches thick. The underlying material is very pale brown, strongly calcareous extremely channery loam. Bedrock is at a depth of 13 inches.

Permeability of the Starman soil is moderate, and available water capacity is very low. Effective rooting depth is about 10 to 20 inches. Surface runoff is medium, and the erosion hazard is slight.

Included with these soils in mapping are small areas of Parachute soils in small depressions. These areas make up about 5 to 15 percent of the map unit.

These soils are used mainly for limited grazing and wildlife habitat.

The native vegetation on the Irigul soil is mainly wheatgrass, bluegrass, mountainmahogany, and serviceberry. The native vegetation on the Starman soil is mainly wheatgrass, penstemon, goldenweed, and buckwheat.

When range condition deteriorates, forbs and low growing shrubs increase. Properly managing grazing maintains and improves range condition.

Mule deer, wild horses, snowshoe hare, and blue grouse find habitat on these soils.

Community development is limited by steep slopes and shallow depth to rock.

This complex is in capability subclass VIIe, nonirrigated.

39—Jerry loam, 12 to 50 percent slopes. This deep, well drained, strongly sloping to steep soil is on mountainsides. Elevation ranges from 7,000 to 9,500 feet. This soil formed in alluvium derived from sandstone, shale, and basalt. The average annual precipitation is about 20 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is less than 75 days.

Typically, the surface layer is dark grayish brown loam about 3 inches thick. The subsoil is yellowish brown and light brown cobbly clay loam about 37 inches thick. The substratum is light brown cobbly clay to a depth of 60 inches.

Included with this soil in mapping are small areas of Tanna and Dollard soils at lower elevations. These areas make up 5 to 10 percent of the map unit.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for limited grazing and wildlife habitat.

The native vegetation on this soil is mainly Gambel oak, bromes, and elk sedge.

When range is in poor condition, Kentucky bluegrass, undesirable weeds, and annual plants are numerous. Properly managing grazing maintains and improves range condition.

Mule deer, elk, blue grouse, gray squirrel, and wild turkey find habitat on these soils.

Community development is limited by high shrink-swell potential, steep slopes, and low strength. Building sites and roads need good drainage. This soil slumps when saturated or if cut deep.

This soil is in capability subclass VIIa, nonirrigated.

40—Kim loam, 3 to 6 percent slopes. This deep, well drained, gently to sloping soil is on alluvial fans and benches. Elevation ranges from 5,000 to 6,000 feet. This soil formed in alluvium derived from shale and sandstone. The average annual precipitation is about 12 inches, the average annual air temperature is about 46 degrees F, and the average frost-free period is about 125 days.

Typically, the surface layer is yellowish brown or light yellowish brown loam about 17 inches thick. The underlying material is light brownish gray loam to a depth of 60 inches. In places the underlying material is stratified with fine sandy loam.

Included with this soil in mapping are small areas of Arvada and Olney soils that have slopes of 3 to 6 percent. These areas make up 5 to 15 percent of the map unit.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more.

Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for crops, hay, and pasture. Alfalfa, small grains, and grass or grass-legume mixtures are grown.

This soil is irrigated by flooding or furrows. Sprinklers are also suitable. Drop structures in ditches control water and prevent excessive ditch erosion.

The native vegetation on this soil is mainly wheatgrasses, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Cottontail rabbit, ground squirrel, and pheasant find habitat on this soil.

Use of this soil for community development and as a source of construction material is limited by low strength.

This soil is in capability subclasses IIle, irrigated, and IVc, nonirrigated.

41—Kim loam, 6 to 12 percent slopes. This deep, well drained, moderately sloping to rolling soil is on alluvial fans and benches. Elevation ranges from 5,000 to 6,000 feet. This soil formed in alluvium derived from shale and sandstone. The average annual precipitation is about 12 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 125 days.

Typically, the surface layer is yellowish brown or light yellowish brown loam about 17 inches thick. The underlying material is light brownish gray loam to a depth of 60 inches. In places the underlying material is stratified with fine sandy loam.

Included with this soil in mapping are small areas of Arvada and Potts soils that have slopes of 6 to 12 percent. These areas make up 5 to 15 percent of the map unit.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for crops, hay, and pasture. Alfalfa, small grains, and grass or grass-legume mixtures are grown.

This soil is irrigated by flooding and furrows. Sprinklers are also suitable. Drop structures in irrigation ditches control water and prevent excessive ditch erosion. Keeping the soil in hay or pasture at least three-fourths of the time helps to control erosion.

The native vegetation on this soil is mainly wheatgrass, needleandthread, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition. Crested wheatgrass, western wheatgrass, and Russian wildrye are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Cottontail rabbit, ground squirrel, and pheasant find habitat on this soil.

Use of this soil for community development and as a source of construction material is limited by low strength and steep slopes.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

42—Lamphier loam, 15 to 50 percent slopes. This deep, well drained, steep soil is on fans and mountainsides. Elevation ranges from 7,500 to 10,000 feet. This soil formed in residuum from sandstone and shale. The average annual precipitation is about 21 inches, the average annual air temperature is about 40 degrees F, and the frost-free period is less than 75 days.

Typically, the surface layer is dark brown loam about 30 inches thick. The underlying material is reddish brown and dark reddish brown loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Almy soils and Rock outcrop. The Almy soils are at lower elevations. These areas make up 5 to 10 percent of the map unit.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is slight.

This soil is used mainly for grazing, wildlife habitat, and recreation.

The native vegetation is aspen and an understory of bromes, elk sedge, wildrye, wheatgrass, peavine, columbine, snowberry, serviceberry, and chokecherry.

When the understory vegetation deteriorates, forbs, shrubs, and Kentucky bluegrass increase. Properly managing grazing maintains and improves the understory vegetation.

This soil is suited to production of quaking aspen. It can produce 4,050 cubic feet of wood per acre or 6,800 board feet of timber from a fully stocked, even-aged stand of 80-year-old trees. At the present there is no commercial harvest of the aspen. Steep slopes affect harvesting, and special attention is needed to reduce soil loss during harvest.

Mule deer, elk, blue grouse, and snowshoe rabbit find habitat on this soil.

Septic tank filter fields, community development, and roads are limited by steep slopes. Surface runoff from snowmelt increases the erosion hazard on cuts and fills. Seeding reduces the erosion hazard. Roads can be de-

RIFLE AREA, COLORADO

signed to provide surface drainage outlets for large amounts of snowmelt.

This soil is in capability subclass VIIe, nonirrigated.

43—Limon silty clay loam, 3 to 12 percent slopes.

This deep, well drained, gently sloping to strongly sloping soil is on alluvial fans and sides of valleys. Elevation ranges from 5,000 to 6,500 feet. This soil formed in fine textured, calcareous sediment derived from shale. The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 125 days.

Typically, the surface layer is light brownish gray silty clay loam about 11 inches thick. The underlying material is light brownish gray and light gray silty clay loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Arvada and Heldt soils that have slopes of 3 to 12 percent. These soils make up 10 to 15 percent of the map unit.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the erosion hazard is moderate.

This soil is used mainly for grazing, wildlife habitat, and some irrigated hay and pasture.

This soil is usually irrigated by flooding. This soil takes in water slowly. Length of run and slope should be carefully determined. This soil compacts easily when wet. Green manure crops and tillage help to maintain tilth.

The native vegetation on this soil is mainly wheatgrass, sagebrush, and rabbitbrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition. Western wheatgrass, streambank wheatgrass, and crested wheatgrass are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Cottontail rabbit, pheasant, and squirrel find habitat on this soil.

Use of this soil for community development, for sanitary facilities, and as a source of construction material is limited by the high clay content, shrink-swell potential, and low strength. Dwellings and roads can be designed to reduce these limitations.

This soil is in capability subclasses IVs, irrigated, and VIe, nonirrigated.

44—Morval loam, 3 to 12 percent slopes. This deep, well drained, gently sloping to rolling soil is on mesas and sides of valleys. Elevation ranges from 6,500 to 8,000 feet. This soil formed in reworked alluvium derived from basalt and sandstone. The average annual precipitation is about 15 inches, the average annual air tem-

perature is about 44 degrees F, and the average frost-free period is about 100 days.

Typically, the surface layer is brown loam about 5 inches thick. The upper part of the subsoil is brown light brown clay loam about 12 inches thick, a lower part is light brown stony clay loam about 10 inches thick. The substratum is pink stony loam.

Included with this soil in mapping are small areas of Villa Grove, Zoltay, and Tridell soils. Villa Grove, Zoltay soils are on the steeper parts of the land. Tridell soils have accumulations of calcium carbonate. These areas make up about 15 percent of the map unit.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is moderate.

This soil is used mainly for grazing. A small area is used for hay and pasture (fig. 8). Irrigated areas are used for alfalfa, grass-legume mixtures, and oats or corn.

Flooding, furrows, and sprinklers are suitable for irrigating this soil. Flooding is well suited to alfalfa, hay, and small grains. Sprinklers minimize soil loss.

The native vegetation on this soil is mainly lelandthread, wheatgrass, and sagebrush.

When range condition deteriorates, forbs and shrubs increase. When the range is in poor condition, undesirable weeds and annual plants are numerous. Properly managing grazing maintains and improves range condition. Reducing brush improves the range. Seeding improves range in poor condition. Pubescent wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Preparing a seedbed and drilling the seed are good practices.

Cottontail rabbit, mule deer, and grouse find habitat on this soil.

Community development and recreation are limited by shrink-swell potential, frost action, and low strength.

This soil is in capability subclass IVe, irrigated nonirrigated.

45—Morval-Tridell complex, 6 to 25 percent slopes. These moderately sloping to hilly soils are on alluvial fans and sides of mesas. Elevation ranges from 6,500 to 8,000 feet. The soils formed in reworked alluvium derived from basalt and sandstone. The average annual precipitation is about 15 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 100 days.

The Morval soil makes up about 55 percent of the complex and the Tridell soil makes up about 30 percent. Morval soil is on the less sloping parts of the landscape and the Tridell soil is on the sides of mesas.

The Morval soil is deep and well drained. Typically the surface layer is brown loam about 5 inches thick. The upper part of the subsoil is brown and light brown loam and stony clay loam about 12 inches thick, and the lower part is light brown stony clay loam about 10 inches thick. The substratum is pink stony loam.

66—Torriorthents-Camborthids-Rock outcrop complex, steep. This broadly defined unit consists of exposed sandstone and shale bedrock, loose stones, and soils that are shallow to deep over sandstone and shale bedrock and stony basaltic alluvium. This complex occurs throughout the survey area. The soils and outcrops are moderately steep to very steep. Slope ranges from 15 to 70 percent.

Torriorthents make up about 45 percent of the complex, Camborthids make up 20 percent, and Rock outcrop makes up 15 percent. The Torriorthents are on foothills and mountainsides below Rock outcrop. The moderately steep Camborthids are on lower toe slopes and concave open areas on foothills and mountainsides.

Torriorthents are shallow to moderately deep. They are generally clayey to loamy and contain variable amounts of gravel, cobbles, and stones. The surface is normally covered with stones weathered from the higher-lying Rock outcrop. South of the Colorado River, basaltic stones and cobbles are on the surface.

Camborthids are shallow to deep. They are generally clayey to loamy and have slightly more clay in the subsoil than in the surface layer. The surface layer is light colored. The profile is normally free of stones, but scattered basalt stones, cobbles, and sandstone fragments are on the surface.

The Rock outcrop is mainly Mesa Verde sandstone and Wasatch shale. Some areas are covered with basaltic boulders and stones. Small areas of limestone outcrops and exposed gypsum are in the eastern part of the survey area.

Included in mapping are small, isolated areas of Hidesonso, Lazear, Ansari, Begay, Heldt, and Dollard soils. These intermittent areas make up 10 to 20 percent of this map unit.

This complex is used for grazing, wildlife habitat, and recreation.

The stones on the surface and the steep slopes make this complex unsuitable for crops. Some areas can be reseeded to pasture by broadcast seeding. Other planting methods are made difficult by the stones and slopes.

The native vegetation includes wheatgrasses, bluegrasses, Indian ricegrass, needlegrasses, bitterbrush, mountainmahogany, sagebrush, and an overstory of pinyon and juniper.

The value of grazing is fair. The vegetation should be managed to maintain wood production and limited grazing. Selectively thinning the pinyon and juniper improves grazing and provides firewood and posts. Steep slopes, moderate to severe erosion hazard, and slow regrowth of trees affect harvesting and management.

Most of this complex is a prime wintering area for deer. Rabbits, coyote, and a few elk also find food and cover on this complex.

Building is limited by steep slopes and stoniness. These limitations can be overcome by appropriate design and construction.

This complex is in capability subclass VIIc, nonirrigated.

67—Torriorthents-Rock outcrop complex, steep. This broadly defined unit consists of exposed sandstone and shale bedrock and stony soils that are shallow to moderately deep over sandstone and shale and stony basaltic alluvium. Areas of this complex occur throughout the survey area. The soils and outcrops are moderately steep to very steep. Slope ranges from 15 to 70 percent.

Torriorthents make up about 60 percent of this complex, and Rock outcrop makes up 25 percent. The Torriorthents are on foothills and mountainsides below the Rock outcrop.

Torriorthents are generally clayey to loamy and contain variable amounts of gravel, cobbles, and stones. The surface is normally covered with stones weathered from the higher-lying Rock outcrop. South of the Colorado River, stones and cobbles of basalt are on the surface.

The Rock outcrop is mainly Mesa Verde sandstone and Wasatch shale. Some areas are covered with basaltic boulders and stones. Small areas of limestone outcrops and exposed gypsum are in the eastern part of the survey area.

Included in mapping are small isolated areas of Hidesonso, Lazear, Ansari, Gaynor, Tridell, and Nihil soils. These intermittent areas make up 10 to 15 percent of this map unit.

This complex is used for limited grazing, wildlife habitat, and recreation.

Because of the stones on the surface, the Rock outcrop, and the steep slope, this complex is unsuited to crops.

The native vegetation includes wheatgrass, bluegrass, Indian ricegrass, needlegrass, bitterbrush, sagebrush, mountainmahogany and an overstory of pinyon and juniper.

The vegetation should be managed to maintain wood production and limited grazing. Selectively thinning the pinyon and juniper improves grazing and provides firewood and posts. Steep slopes, moderate to severe erosion hazard, and slow regrowth of trees affect harvesting and management.

Most of this complex is a prime wintering area for deer. Rabbits, coyote, and a few elk also find food and cover on this complex.

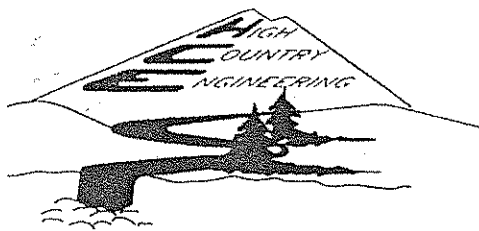
Community development is limited by the Rock outcrop, steep slopes, and stoniness. These limitations can be overcome by appropriate design and construction.

This complex is in capability subclass VIIc, nonirrigated.



68—Vale silt loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on mesas, terraces, and alluvial fans. Elevation ranges from 5,000 to 7,200 feet. This soil formed in calcareous eolian material. The





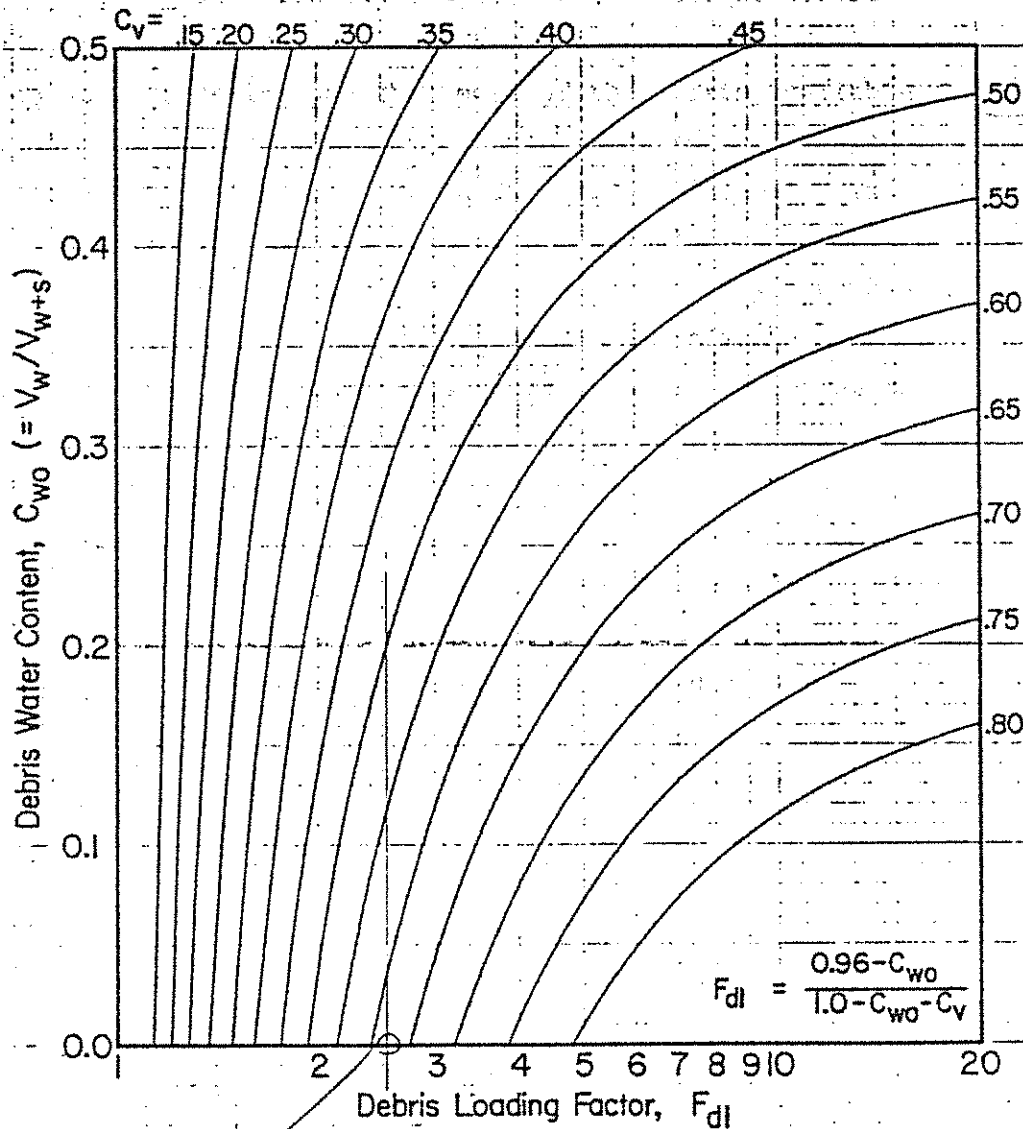
Project _____ Job No. _____

By _____ Date _____ Ck'd by _____ Date _____

Subject _____ Page _____ of _____

Lincoln DeVore Study		HCE Study	
W-17		I	(only a portion of III)
W-18		H	
W-19		G	
W-20		F	
W-21		E	
W-22		C+D	
W-23		A+B	(only a portion of 23)
Classification of Debris Fan Deposits + Hazards per Lincoln DeVore 12/1977 <u>Geologic Hazards of the Glenwood Springs Metropolitan Area</u>			
<u>Basin</u>			
W-17	adf - ancient debris flow, mud flow + landslide deposits Qcw (2) + (3) - colluvial wedge + deposits w/ moderate to slight hazards		
W-18	Qdf (1), (2) + (3) - debris fans w/ severe + moderate + slight hazards Severe was from $\approx$ 5850' up to top of basin		
W-19	Qdf (1), (2) + (3) $\nearrow$ severe was from 5900' up to top of basin		
W-20	$\nearrow$ same		
W-21	$\nearrow$ same severe was from 5925' up to top of basin		
W-22	$\nearrow$ same		
W-23	Qcw (2) - colluvial wedge w/ moderate hazards		

Chart for floodwater containing 4%
segment by volume



TO USE: Enter with initial water content of soil and debris, move horizontally to desired solids concentration, and move vertically down to obtain debris loading factor. Multiple water discharge by debris loading factor to obtain debris discharge.

~2.4

ESA Geotechnical Consultants
Fort Collins, Colorado

Glenwood Springs Drainage & Debris Control Plan
DISCHARGE CORRECTION FACTORS

Checked by ED. J. Morris Date 10/27/02 Project No. G208 Figure No. II-1
Approved by W.C. H. Date 12/16/02

CHANNEL SIZING FOR OFFSITE BASIN
M.O.C. SITE - HCE #2000063.01
Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	92.70 cfs 25 YEAR OFFSITE BASIN
Slope	0.010 ft/ft
Manning's n	0.0240
Height	30.0000 in
Bottom width	12.0000 in
Left slope	3.000 ft/ft
Right slope	3.000 ft/ft

Computed Results:

Depth	24.4908 in
Velocity	6.3770 fps
Flow area	14.54 ft2
Flow perimeter	166.8934 in
Hydraulic radius	12.5427 in
Top width	158.9448 in
Area	21.25 ft2
Perimeter	201.7367 in
Percent full	81.6360 %

CHANNEL SIZING FOR OFFSITE BASIN
M.O.C. SITE - HCE #2000063.01
Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	137.40 cfs 100 YEAR OFFSITE BASIN
Slope	0.010 ft/ft
Manning's n	0.0240
Height	30.0000 in
Bottom width	12.0000 in
Left slope	3.000 ft/ft
Right slope	3.000 ft/ft

Computed Results:

Depth	28.6794 in
Velocity	7.0369 fps
Flow area	19.53 ft ²
Flow perimeter	193.3847 in
Hydraulic radius	14.5393 in
Top width	184.0766 in
Area	21.25 ft ²
Perimeter	201.7367 in
Percent full	95.5981 %

CHANNEL SIZING FOR OFFSITE BASIN - BULKED FLOWS
M.O.C. SITE - HCE #2000063.01
Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	330.00 cfs 100 YEAR BULKED OFFSITE FLOW
S	
Slope	0.010 ft/ft
Manning's n	0.0240
Height	48.0000 in
Bottom width	18.0000 in
Left slope	3.000 ft/ft
Right slope	3.000 ft/ft

Computed Results:

Depth	39.6292 in
Velocity	8.7598 fps
Flow area	37.67 ft2
Flow perimeter	268.6374 in
Hydraulic radius	20.1936 in
Top width	255.7755 in
Area	54.00 ft2
Perimeter	321.5787 in
Percent full	82.5609 %

CULVERT SIZING FOR 25 YEAR STORM
Culvert Calculator

Entered Data:

Shape	Circular
Number of Barrels	1
Solving for	Headwater
Chart Number	2
Scale Number	2
Chart Description	CORRUGATED METAL PIPE CULVERT
Scale Decsription	MITERED TO CONFORM TO SLOPE
Flowrate	92.70 cfs 25 YEAR OFFSITE FLOW
Manning's n	0.0120
Roadway Elevation	107.00 ft
Inlet Elevation	100.00 ft
Outlet Elevation	99.50 ft
Diameter	48.0000 in
Length	50.00 ft
Entrance Loss	0.0000
Tailwater	0.01 ft

Computed Results:

Headwater	105.23 ft From Inlet
Slope	0.010 ft/ft
Velocity	12.93 fps

CULVERT SIZING FOR OFFSITE BASIN
M.O.C. SITE - HCE #2000063.01
Culvert Calculator

Entered Data:

Shape	Circular
Number of Barrels	1
Solving for	Headwater
Chart Number	2
Scale Number	2
Chart Description	CORRUGATED METAL PIPE CULVERT
Scale Description	MITERED TO CONFORM TO SLOPE
Flowrate	137.40 cfs 100 YEAR OFFSITE BASIN
Manning's n	0.0120
Roadway Elevation	109.00 ft
Inlet Elevation	100.00 ft
Outlet Elevation	99.50 ft
Diameter	54.0000 in
Length	50.00 ft
Entrance Loss	0.0000
Tailwater	0.01 ft

Computed Results:

Headwater	106.86 ft From Inlet
Slope	0.010 ft/ft
Velocity	14.24 fps

GLENWOOD SPRINGS M.O.C.
OFFSITE BASIN CHANNEL CALCULATOR
Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	69.00 cfs HALF Q100
Slope	0.010 ft/ft
Manning's n	0.0240
Height	48.0000 in
Bottom width	24.0000 in
Left slope	2.000 ft/ft
Right slope	2.000 ft/ft

Computed Results:

Depth	22.5829 in
Velocity	6.3612 fps
Flow area	10.85 ft ²
Flow perimeter	124.9937 in
Hydraulic radius	12.4963 in
Top width	114.3315 in
Area	40.00 ft ²
Perimeter	238.6625 in
Percent full	47.0476 %

Critical Information

Critical depth	23.1281 in
Critical slope	0.009 ft/ft
Critical velocity	6.1149 fps
Critical area	11.28 ft ²
Critical perimeter	127.4319 in
Critical hydraulic radius	12.7510 in
Critical top width	116.5123 in
Specific energy	2.51 ft
Minimum energy	2.89 ft
Froude number	1.0511
Flow condition	Supercritical

Culvert Calculator

Entered Data:

Shape	Circular
Number of Barrels	1
Solving for	Headwater
Chart Number	1
Scale Number	1
Chart Description	CONCRETE PIPE CULVERT; NO
BEVELED RING ENTRANCE	
Scale Description	SQUARE EDGE ENTRANCE WITH
HEADWALL	
Flowrate	69.00 cfs Half 100 year Pe
ak Discharge	
Manning's n	0.0100 Assuming ADS-N12
Roadway Elevation	110.00 ft
Inlet Elevation	100.00 ft
Outlet Elevation	99.50 ft
Diameter	42.0000 in
Length	50.00 ft
Entrance Loss	0.0000
Tailwater	0.01 ft

Computed Results:

Headwater	104.46 ft From Inlet
Slope	0.010 ft/ft
Velocity	13.78 fps

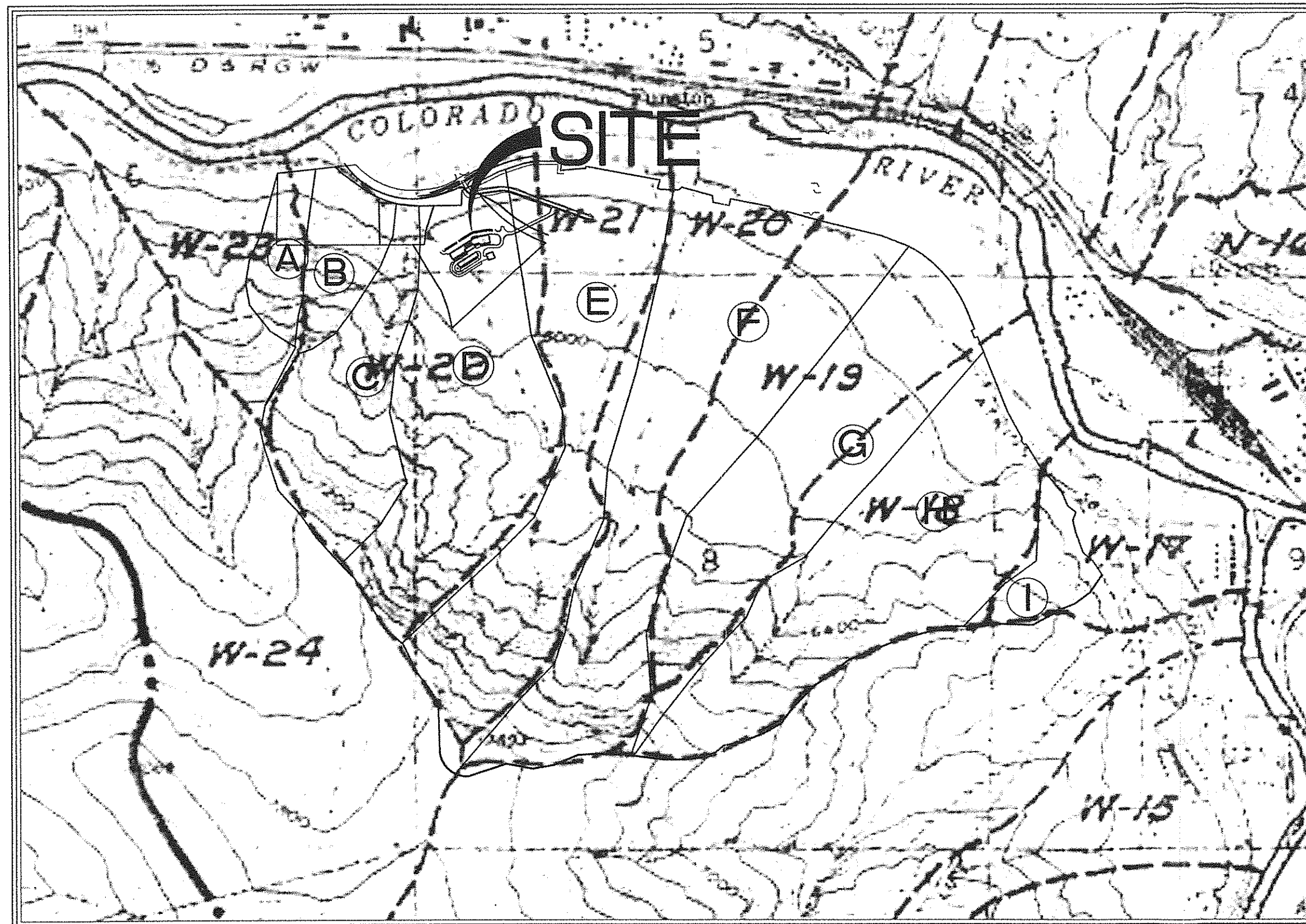
Messages:

Inlet head > Outlet head.
 Computing Inlet Control headwater.
 Solving Inlet Equation 26.
 Solving Inlet Equation 28.
 Headwater: 104.46 ft

AREA CALCULATIONS OF MOC AND RTA

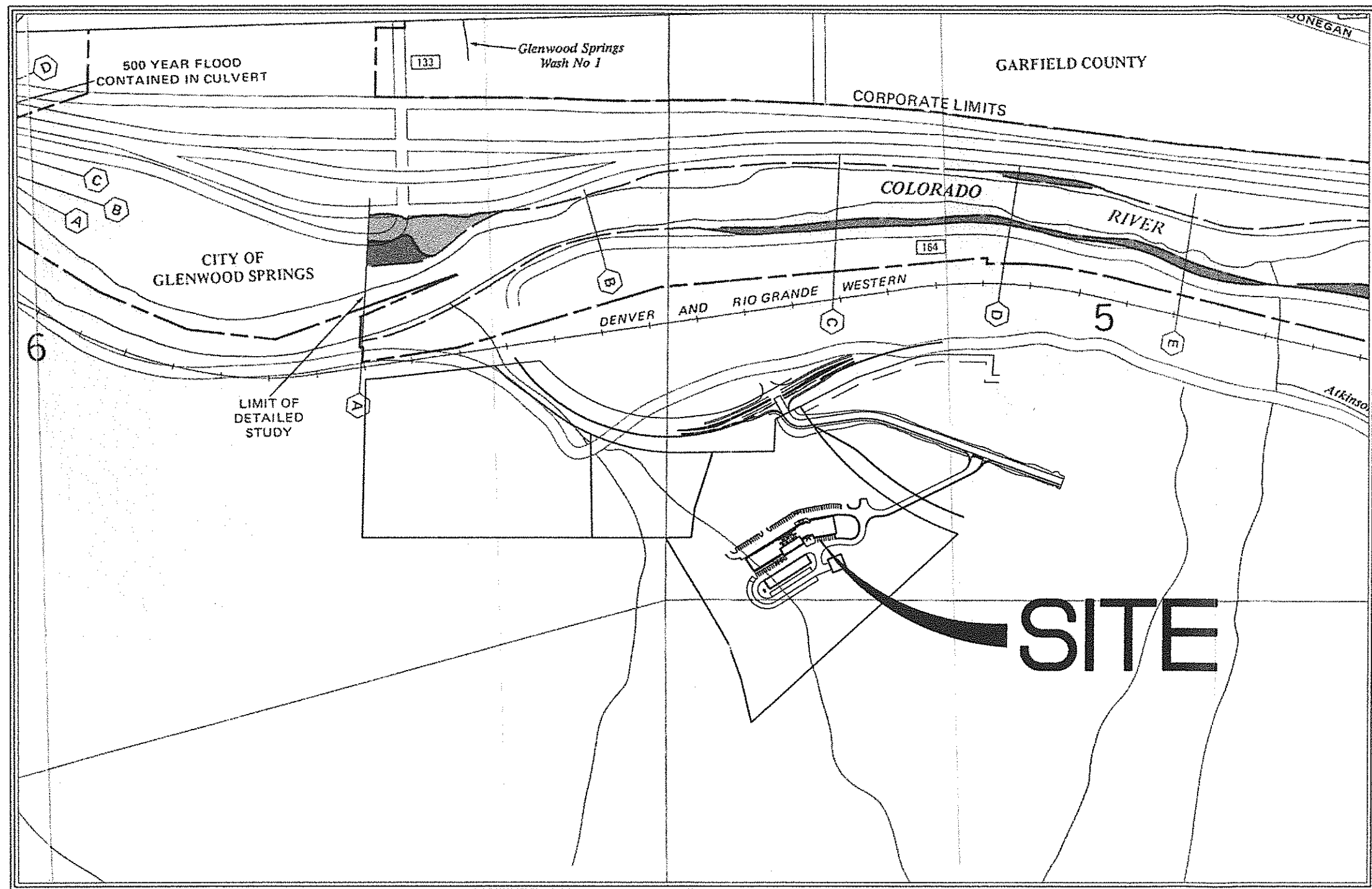
	MOC	RTA	Units
Buildings	34936.96	16820.33	S.F.
Total Impervious Area (including Bldg.)	200754.73	127896.1	S.F.

K:\Qproductul File\2000\063\ Impervious Area Calcs.xls



1"=1000'

THE CITY OF GLENWOOD SPRINGS GLENWOOD SPRINGS, CO GLENWOOD SPRINGS, M.O.C. OFFSITE DRAINAGE BASIN MAP FOR EXISTING CONDITIONS		HIGH COUNTRY ENGINEERING, INC. 923 COOPER AVENUE GLENWOOD SPRINGS, CO 80601 PH: (970) 945-9876 FX: (970) 945-2555		DES. LAH DR. LAH CK. LAH DATE 01/27/01 FILE: VICINITY	NO. DATE REVISION BY
PROJECT NO. 2000063.01					
SHEET OF					



SCALE 1"=500'

DES.	LAH	NO.	DATE	REVISION	BY
DR.	LAH				
CK.	JOH				
DATE	1/27/01				
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CK.	JOH				
DATE	1/27/01				
FILE	FEMA				

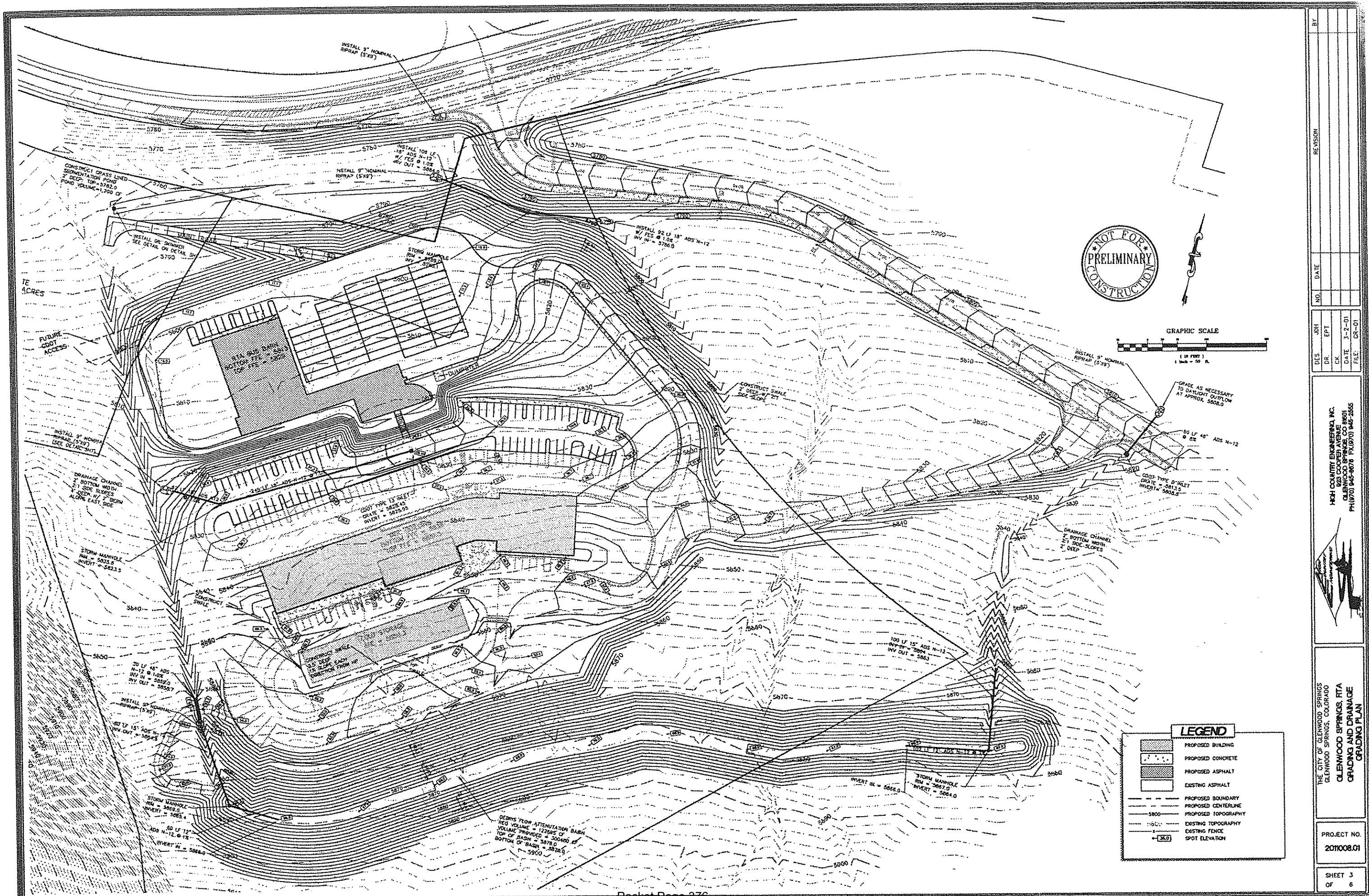
HIGH COUNTRY ENGINEERING, INC.
923 COOPER AVENUE
GLENWOOD SPRINGS, CO 81601
PH (970) 945-8876 FX (970) 945-2555



THE CITY OF GLENWOOD SPRINGS
GLENWOOD SPRINGS, CO
GLENWOOD SPRINGS, M.O.C.
FEMA MAP FOR EXISTING CONDITIONS

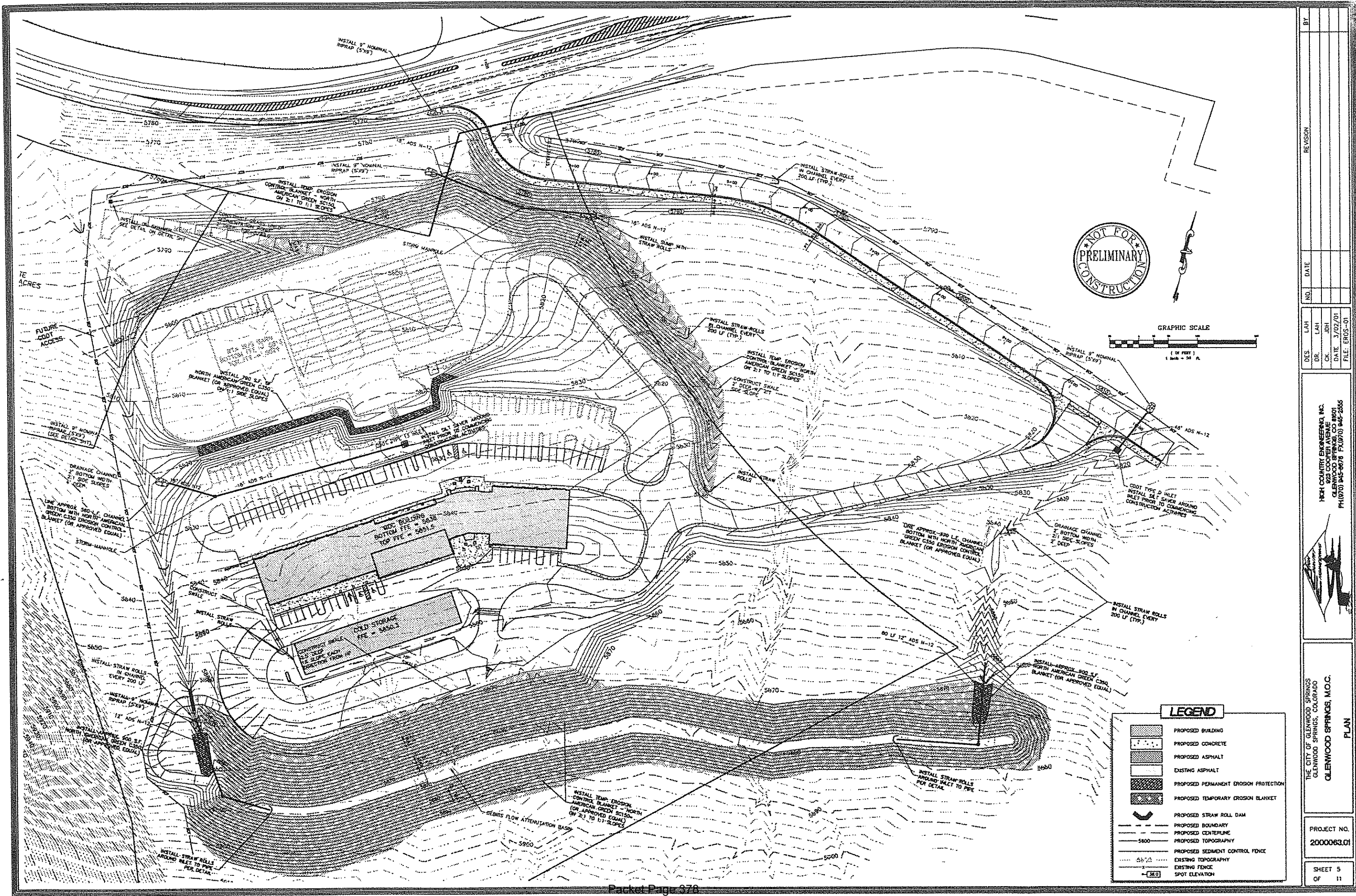
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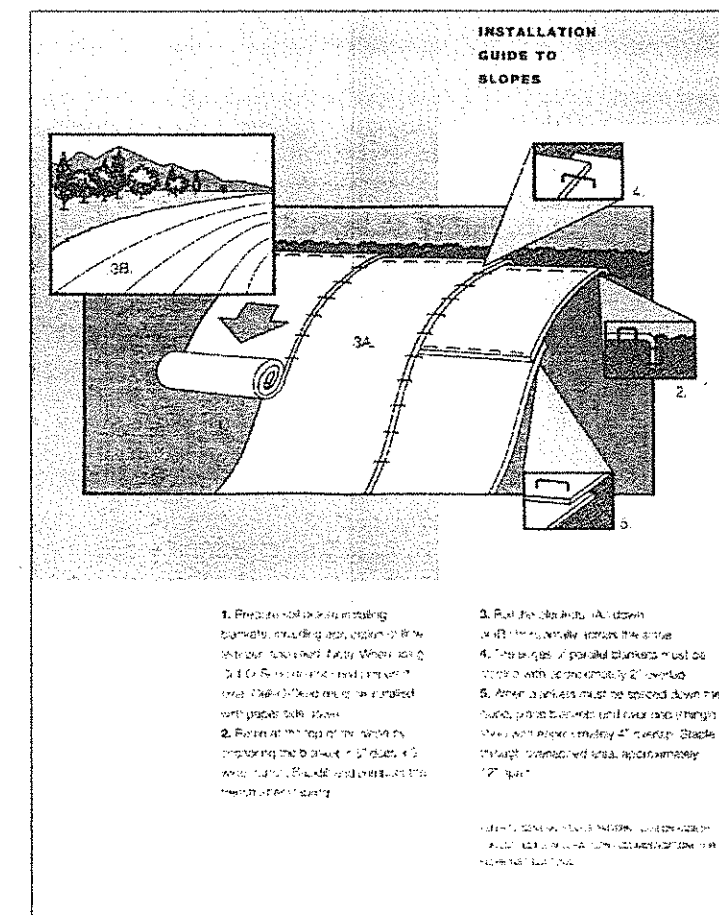
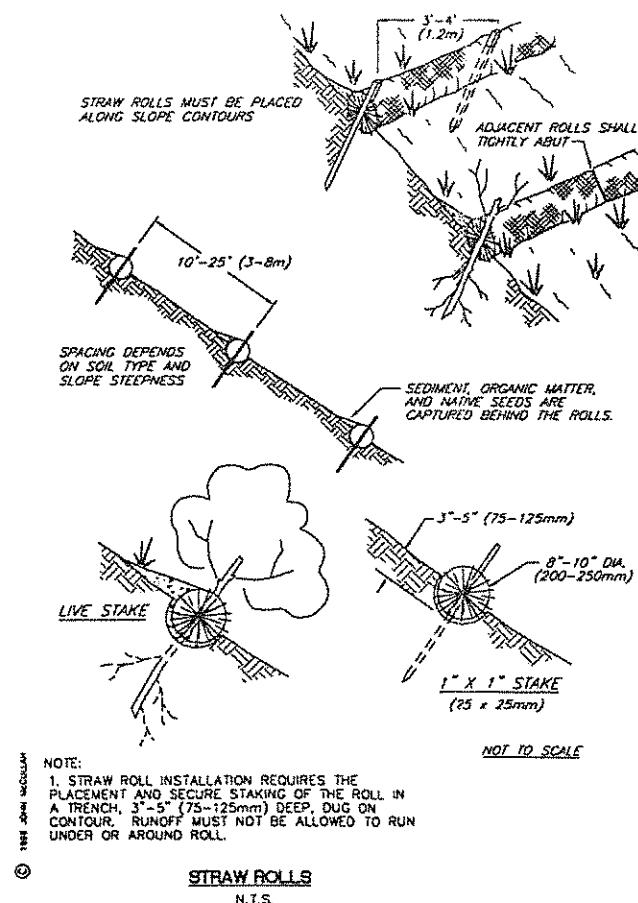
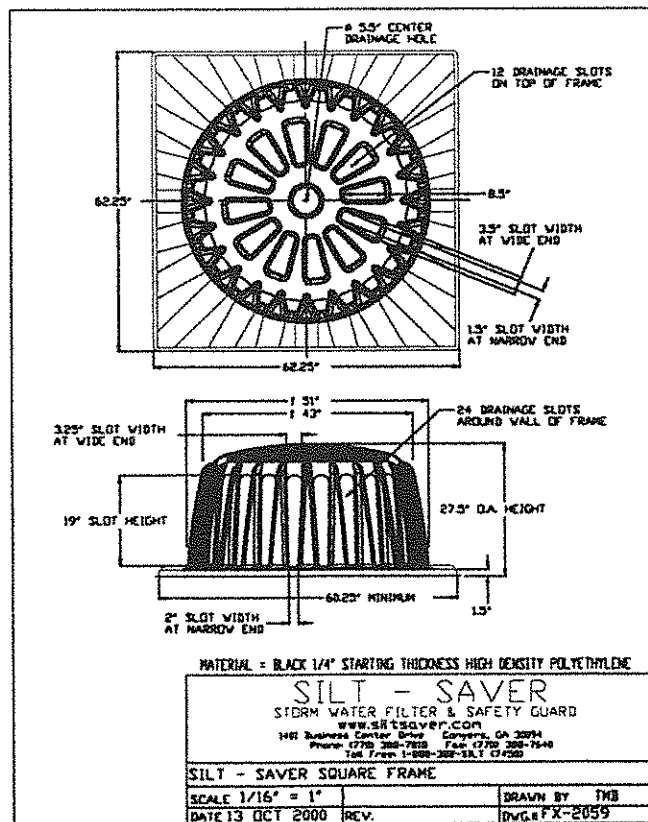
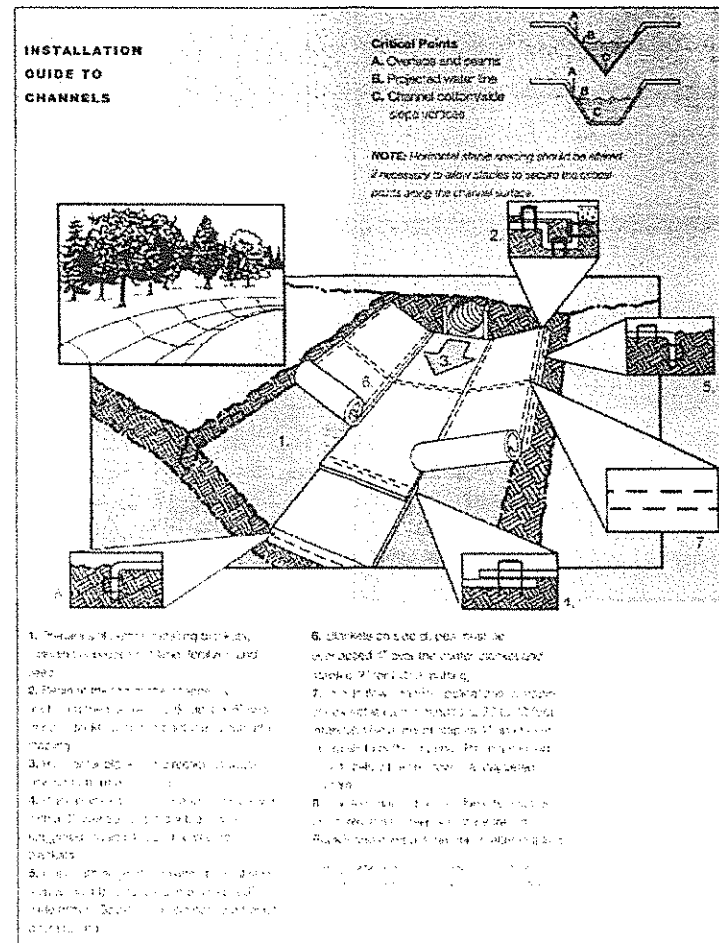
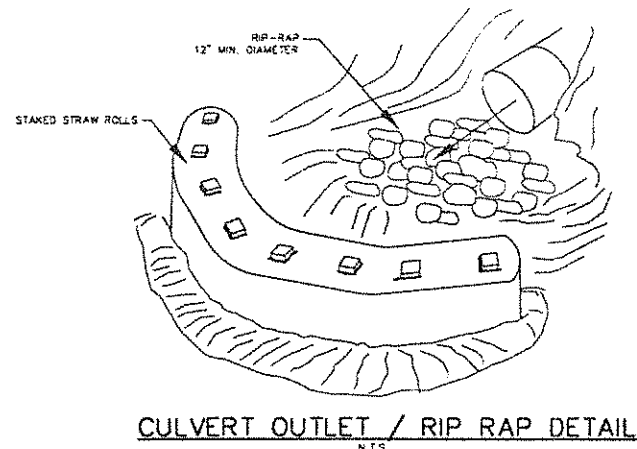
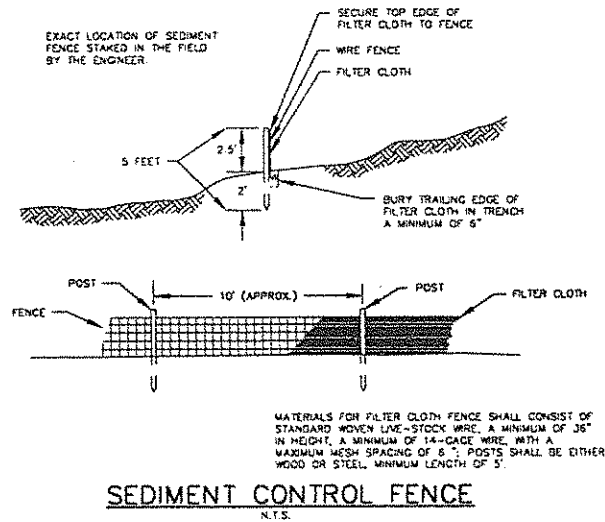
SHEET
OF



THE CITY OF GLENWOOD SPRINGS GLENWOOD SPRINGS, COLORADO PROJECT NO. 207008.01 SHEET 3 OF 6		 HIGH COUNTRY ENGINEERING, INC. 523 COOPER AVENUE GLENWOOD SPRINGS, CO 81601 PH (970) 440-6676 FAX (970) 440-2655 FILE: CR-01		NO. DATE DTS J011 DR. EPT CK. DATE 3-2-01 FILE: CR-01		REVISION BY
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North Elevation













Water/Wastewater (W/WW) Department Comments

Planning Item: 37-19 RFTA Phase II Land Use Referral
Applicant: RFTA
Owner: RFTA
Location: 2307 Wulfsohn Rd.
Parcel: 218505336002
Date of Comments: 11/20/19

The following are W/WW Department comments based on the application package dated November 5, 2019 and the department review meeting held on November 18, 2019.

W/WW Department Comments

- The City has an access road through the RFTA property. During Construction access must always be maintained to allow normal operations for W/WW staff.
- The proposed relocation of water lines is considered a private water main. Although it is considered private the City will operate and maintain the fire hydrants and leads up to and including the hydrant lead valve. A 15' easement centered around hydrants and 10' easement around the lead line and valve is required.
- All private water mains and hydrant leads that are being relocated will be installed, disinfected and tested to City standards

W/WW Department Contact Information:

- o Mike Hoffman – 384-6343 (W/WW Information)
- o Utility Billing – 384-6400 (Account setup; Water Meter Purchase)
- o Community Development Department – 384-6411 (Improvements Fees)

From: [Kale Popp](#)
To: [Mike Hoffman](#)
Subject: RE: RFTA Fire Hydrant Questions
Date: Wednesday, December 04, 2019 7:35:27 AM

Mike,

Thank you for the timely response. I believe you have answered all my questions that I have. If anything comes up I will let you know.

Thanks again,

Kale Popp, EI

Project Engineer – Transportation Engineering



2696 South Colorado Boulevard, Suite 460, Denver, Colorado 80222

(d) 720.457.2186 (c) 219.869.8375

(e) kpopp@shrewsusa.com | www.shrewsusa.com

CINCINNATI | DENVER | GARY | INDIANAPOLIS | LOUISVILLE | WASHINGTON, D.C.

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From: Mike Hoffman <mike.hoffman@cogs.us>
Sent: Wednesday, December 4, 2019 7:33 AM
To: Kale Popp <kpopp@shrewsusa.com>
Cc: Jordan Diemer <jdiemer@shrewsusa.com>; Arthur Antoine <aantoine@shrewsusa.com>
Subject: RE: RFTA Fire Hydrant Questions

Kale,

1. We will require new hydrants to be installed.
2. It can be allowed depending on age or condition of the hydrants. The hydrants on the RFTA property are from 2001 making them almost 19yrs old. The city has been maintaining them since the installation. The last service of the hydrants was this year in September.
3. The water department will not be conducting any work for this project other than observing the installation of pipe, apparatuses and testing requirements.

Let me know if you have any further questions.

Mike Hoffman
Water & Wastewater Dept.
City of Glenwood Springs
2315 Wulfshon Rd
Glenwood Springs, CO. 81601
mike.hoffman@cogs.us
(W) 970-384-6343
(C) 970-989-3902

From: Kale Popp <kpopp@shrewsusa.com>
Sent: Tuesday, December 03, 2019 1:35 PM
To: Mike Hoffman <mike.hoffman@cogs.us>
Cc: Jordan Diemer <jdiemer@shrewsusa.com>; Arthur Antoine <aantoine@shrewsusa.com>
Subject: RFTA Fire Hydrant Questions

Mike,

I am currently working on the RFTA GMF building expansion project. Below I have a few questions concerning the fire hydrants within the project scope:

1. With relocating the fire hydrants, will we be able to reuse them?
2. Is it common practice to reuse fire hydrants as long as they are meeting code? Only asking because I assume you do not know the current condition of the RFTA fire hydrants.
3. If we are unable to reuse the fire hydrants, would we need to quantify them for our project or would they be included with the cost of any work that the water department would conduct?

Thank you for any clarification that you can give,

Kale Popp, EI

Project Engineer – Transportation Engineering



2696 South Colorado Boulevard, Suite 460, Denver, Colorado 80222

(d) 720.457.2186 (c) 219.869.8375

(e) kpopp@shrewsusa.com | www.shrewsusa.com

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**Engineering
Department**

**Ryan Johnson
Asst. City
Engineer**

Date: November 22, 2019

To: Community Development

**Re: RFTA Facility Expansion, 2307 Wulfsohn Road, Location and Extent
Review**

Please see the following comments from Engineering on the items submitted for the proposed building expansion.

Prior to Building Permit or Grading Permit Issuance:

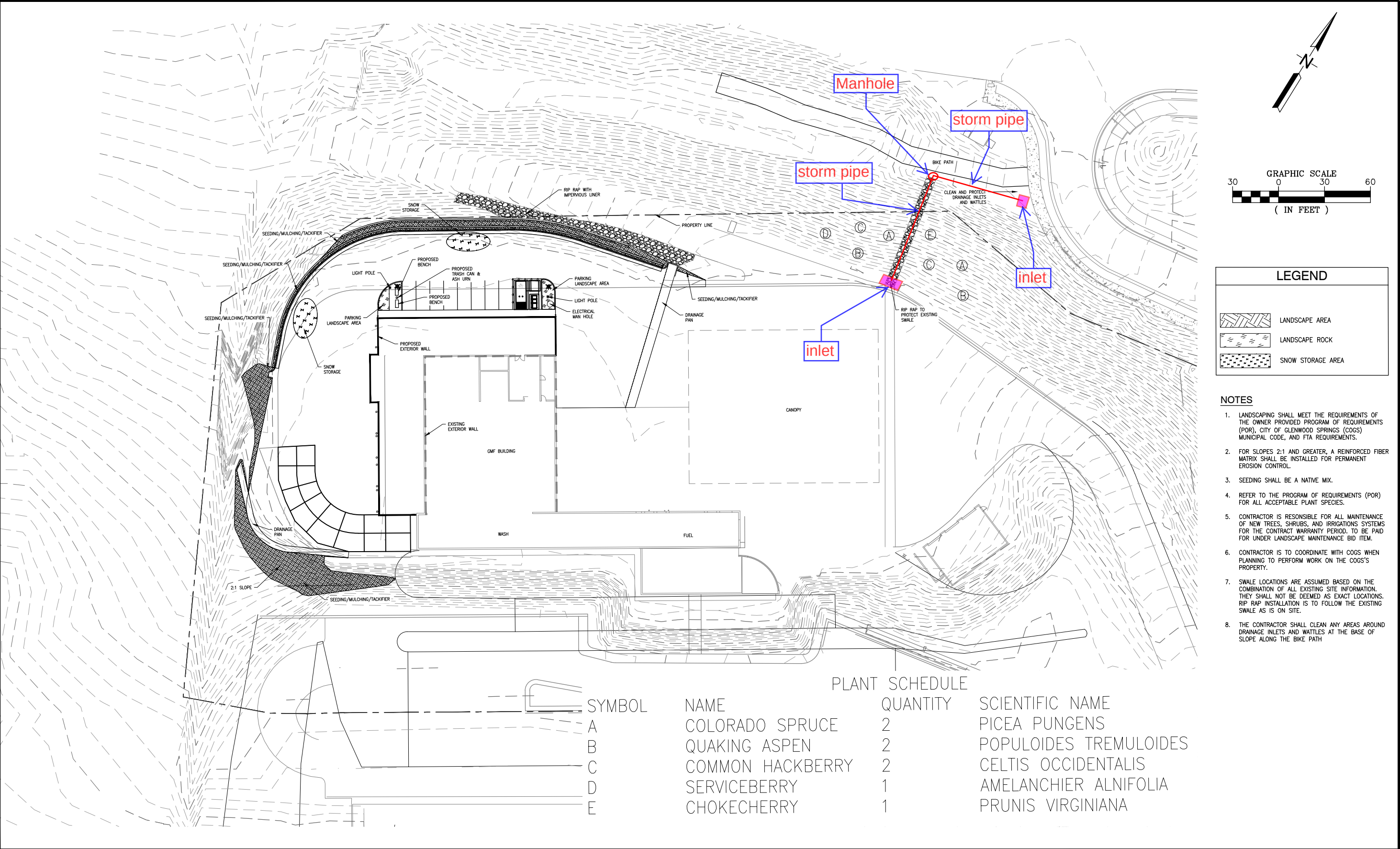
1. Construction Document Submittal see attached DRAFT checklist for Construction Documents for further plan expectations.
2. Submit Final Drainage Report/letter.
 - a. Provide narrative to address water quality, describe length of vegetated ditches prior to discharge to the Colorado River.
3. Provide S.U.E. plan per CRS 9-1.5-102 requirements or provide a stamped letter determining why this is not a Subsurface Utility Engineering-Required Project.
4. At points of concentrated stormwater discharge provide riprap rundown for energy dissipation prior to discharge to the existing ditches.
5. See the attached plan markup. The existing discharge from the concrete pan east of the Canopy has been causing maintenance issues on the bike path and Wulfsohn Road. Size and depict in plan improvements to mitigate the current drainage issue.

Information only:

6. A grading permit from engineering will be required when this project goes to construction.
7. Disturbance over one (1) acre in size will require a CDPHE Construction Stormwater Discharges Permit.
8. Access to the wastewater treatment plant road should be maintained at all times during construction.

To closeout Permitting and have a Certificate of Occupancy issued, the city will require:

9. As-Built plans with an Improvement Survey Plat (ISP)
10. Signed/Stamped certification letter for drainage improvements verifying that the site was built per plan and verifying detention/ water quality pond volumes where applicable.
11. Signed/Stamped certification letter for retaining wall improvements verifying that the walls were constructed in accordance with the plans and details.



Computer File Information			Sheet Revisions			 Roaring Fork Transportation Authority 1340 Main Street Carbondale, CO 81623 970.384.4866 procurement@rfta.com	 shrewsberry 2696 S. Colorado Blvd, Ste. 460 Denver, CO 80222 720.235.0605 shrewsusa.com	As Constructed		GMF EXPANSION – PHASE 2 LANDSCAPING PLAN			Project No./Code	
Print Date: 10/30/2019			Date:	Comments	Init.			No Revisions:	—	Designer: JD			—	
Last Modification Date:								Revised:	—	Detailer: KP			—	
Full Path: \\Project Files\2015\15-0276\CADD\Design								Void:	—	Sheet Subset:		Subset Sheet:: of	Sheet Number C09.01	
Drawing File Name:														
Acad Ver. 2015	Scale: As Shown	Units: English												



Planning and Zoning Commission Report

Date: December 17, 2019
To: Planning and Zoning Commission
From: Trent L. Hyatt, Senior Planner
Subject: #38-19– ANB Bank

REQUEST	Site/Architectural Plan Review for the construction of a 9,706 square foot bank/office building
APPLICANT	Will Coffield, Realty Management Group
OWNER	ANB Bank
LOCATION	910 Grand Avenue (PIN: 2185-094-21-002)
ZONE	C2 Core Mixed Use Corridor District
SURROUNDING LAND USES	North: Commercial office/USFS South: Commercial office East: Grand Avenue/CO Highway 82 right-of-way West: Alley/mixed commercial and residential
LOT SIZE	Approximately 22,712 square feet (0.52 acres)

ACTION ITEM

Per Section 070.060.050(a)/Table 060.2 of the *Glenwood Springs Municipal Code* (Code), the Planning and Zoning Commission (Commission) is the reviewing body for *Minor* Site/Architectural Plan review applications which include 9 to 24 new dwelling units and/or 10,000 to 30,000 gross square feet of nonresidential space. Being less than 10,000 square feet, the current proposal would generally be an administrative review but Section 070.060.050(a)(2)c.1 of the Code allows for Director referral to the Commission. The decision was made to refer the application to the Commission for review due to significant public interest and discussion surrounding the application. Following any approval (with or without conditions) of the Site/Architectural Review, the applicant must still submit and receive approval of a Construction Plans application from City staff prior to submitting a building permit application.

The Commission considered a similar use but substantially different design proposal at its July 23, 2019 meeting but voted unanimously to deny the application. An appeal of the decision was upheld by City Council on September 19, 2019. Following the appeal decision, the applicant considered comments received from both bodies, various stakeholder groups, and the public. Additionally, a work session was held with the Commission on October 22, 2019 to better understand their desire for a future revised application.

Action 1 - Site/Architectural Plan Review – to allow for the construction of a 9,706 square foot bank/office building.

Staff recommendation: *Staff recommends **approval (with conditions)** of the Site/Architectural Plan Review with the findings and conditions on page 8.*

BACKGROUND/ANALYSIS

Proposal

On behalf of ANB Bank, Will Coffield of Realty Management Group proposes the construction of a 9,706 square foot bank/office building at 910-918 Grand Avenue. The site is located in the Downtown Core within the M2 Mixed-Use Core zone district, where a bank/office is a use by right. Redevelopment of the site includes the demolition of two circa 1915 buildings (pictured below), expansion of an existing surface parking lot, landscaping, sidewalk, grading, and drainage improvements, etc. The attached plan set includes a site plan (a portion of which is shown below), floor plans, elevations, landscaping plan, grading and utilities plans for your review.



Existing west elevation (photo credit: Google Maps)

Development Standards

Section 070.040 of the *Glenwood Spring Municipal Code* (Code) outlines the development standards for all land use applications. Staff provides an overview of the various applicable standards below.

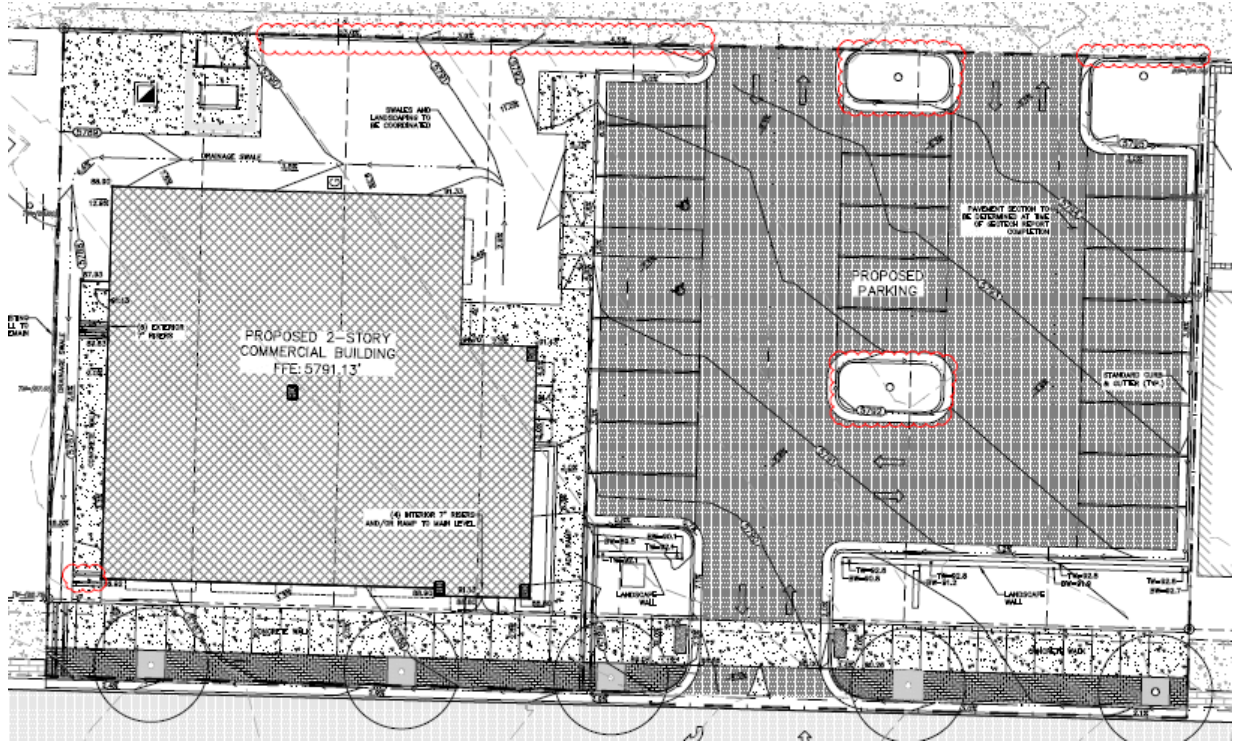
Common Open Space/Landscaping, Screening, and Retaining Walls

Properties within the M2 zone district are exempt from the common open space requirements of Section 070.040.040(c)/Table 040.3. Similarly, the zone district does not require landscaping coverage of a certain percentage of the site. However, the proposal includes 4,430 square feet of landscaping which covers 18 percent of the site.

Off Street Parking and Loading

The subject property is located within the City's General Improvement District (GID). Developments in the GID are exempt from the parking requirements which are outlined in the Section 070.030.020(e)/Table 030.1 Table of Allowed Uses. As depicted in the site plan below, the applicant plans to expand the existing parking area at the south end of the parcel to include 21 parking spaces, landscape islands, an 11+ foot wide landscape buffer and screen wall, and pavers

adjacent to Grand Avenue. Bicycle parking is also provided.



Nonresidential and Mixed-Use Site and Building Design

Section 070.040.090 of the Code addresses various layout and design elements intended to ensure that new development in the City relates to the physical site characteristics, is built to a human scale, and provides safe and efficient circulation. As mentioned above, the building is substantially different in style and feel than the previous design proposed by the applicant and was heavily

influenced by comment received along the way. The focus of the west/Grand Avenue elevation is the ground level primary entrance (shown at right) to the building which is accentuated by a building projection and an awning which is larger than others on the same

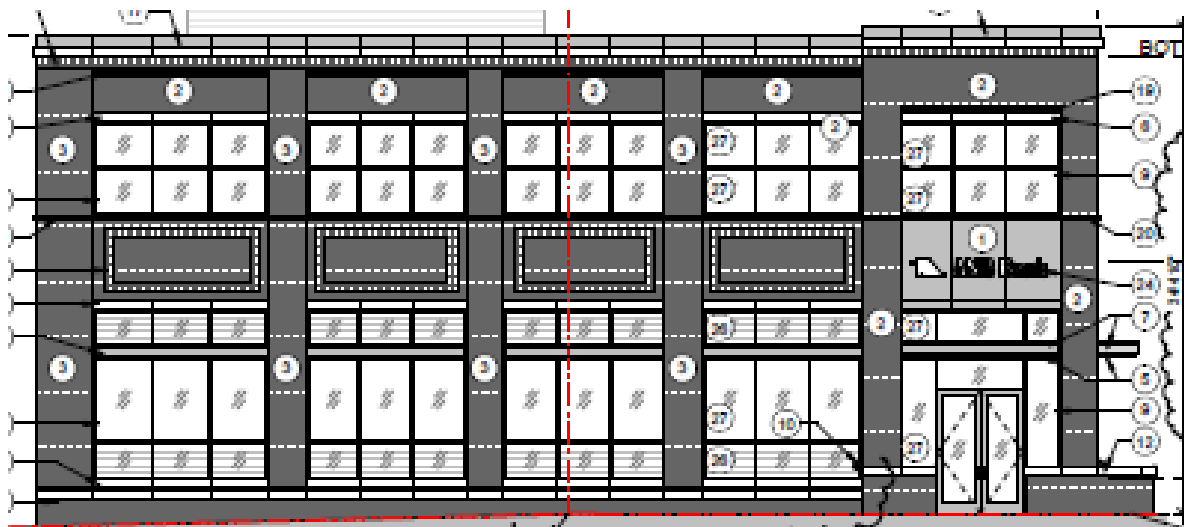


elevation. Brick ornamentation between the first and second floors is a similar feature found throughout the Downtown Core which adds a pleasing aesthetic to the building. Additionally, pilasters between window bays nicely break up the mass of the building façade. Other applicable

requirements have been incorporated into the site and building design such as the horizontal and vertical articulation (variations in materials and colors, projections/recessions, etc.). Because of the location in the Downtown Core certain additional design characteristics apply including height and building scale relative to the block face, distinction between lower and upper floors, and commercial-oriented design. A color rendering of the design is provided below. Attached elevations (sheet 4 of 11) explain all of the design elements incorporated.

Staff's review did, however, find some aspects of the proposal which were not in absolute compliance with certain standards. Section 070.040.090(d)(6)a, Downtown Core supplemental site design standards, requires "[A] minimum of 75 percent of the building edge shall be located adjacent to the sidewalk edge (e.g. zero setback)". While the door awning provides a zero setback for approximately 15 percent of the front of the building, most of the wall is setback 3.7 feet from the property line, exclusive of the entrance section which is setback 2.2. feet. Additionally, Section 070.040.090(e)(7)g.3 requires that 65 to 80 percent of the first floor primary façade be transparent glass and the proposal provides only 62 percent.

Instead of making changes to proposed design, the applicant is requesting alternative equivalent compliance (AEC) per Section 070.040.090(c)(2). The approval criteria for AEC shall be considered by the Commission and are listed in bold italics below. The applicant's response to the criteria are attached.



- 1. Achieves the intent of the subject standard to the same or better degree than the subject standard;***
- 2. Advances the goals and policies of this Code to the same or better degree than the subject standard;***
- 3. Results in benefits to the community that are equivalent to or exceed benefits associated with the subject standard; and***
- 4. Imposes no greater impacts on adjacent properties than would occur through compliance with the specific requirements of this Code.***

While the aspects of the design outlined above do not meet the strict interpretation of the Code,

the proposal certainly meets the intent and, in our opinion, provides a better solution by allowing the building to incorporate pilasters, ornamentation, and a more prominent entrance. Additionally, it allows plantings adjacent to the sidewalk which soften the building for pedestrians and adjacent property owners. Additional glazing would require larger windows which, in our opinion, would result in a modern look that is inconsistent with the general character of buildings in the Downtown Core.

Approval Criteria

A Major Site/Architectural Plan Review application must adhere to the approval criteria outlined in Section 070.060.050(6) of the Code as outlined in ***bold italics*** below. Other language is provided by staff.

a. The site/architectural plan is consistent with the general purpose and intent of this Code;

The proposal is consistent with the general purpose and intent of the Code regarding guarding against natural hazards, efficient development, compatible design, and addressing impacts.

b. The site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;

As outlined above, staff found that the proposal is consistent with the dimensional, design, development, and all other standards of the Code exclusive of the AEC discussion included herein where the applicant's proposal provides a better alternative design that would otherwise be required by the Code.

c. The site/architectural plan is consistent with any previously approved plat, PUD, or any other precedent land use approval; and

Not applicable.

d. The site/architectural plan is consistent with the Comprehensive Plan and other adopted City policies and plans.

e.

As shown at right, Map 2.1 Future Land Use – North Portion of the City of the Glenwood Springs (shown at right) of the Comprehensive Plan (Comp Plan) identifies the area as Commercial in red and Downtown by the purple asterisk. According to the Comp Plan, the Commercial designation “...provides a wide range of general retail goods and services for both regional and local markets, in attached and freestanding structures.” Downtown is described as “...intended to reflect the character of the historic Downtown and yet



allow additional uses that will strengthen and expand the core of the community including retail, offices, restaurants, residences, lodging, and civic uses. Pedestrian friendly design and a mix of uses are expected.” The current proposal is in compliance with the map designations and descriptions.

Numerous community goals and related objectives and strategies outlined in the Executive Summary and subsequent chapters of the Comp Plan. These goals are outlined in the following table.

<u>Comprehensive Plan Goal Supported</u>	<u>Objective and Strategies</u>
Promote long-term, sustainable, diverse, economic development	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Attract diverse businesses and industries (Chapter 4, Page 50) -Maintain the role as regional center (Chapter 4, Page 54) -Retain role as a regional center (Chapter 7, Page 83)
Staff Comment: While a bank use may not be diverse, the use plays an integral role in promoting a sustainable economy. The objectives/strategies outlined above are supported by the current application and aid in attracting diverse businesses by creating opportunity for new and expanding businesses helping to maintain/retain our City as a regional center.	
Maintain Glenwood Springs as the regional tourism, retail, commercial, and governmental center of Garfield County	-Attract diverse businesses and industries (Chapter 4, Page 50) -Maintain the role as regional center (Chapter 4, Page 54) -Retain role as a governmental center (Chapter 4, 56)
Staff Comment: Banking aids in maintaining the City’s status as the commercial center of Garfield County. The objectives/strategies outlined above are supported by the current application and help to attract diverse businesses by creating opportunity for them. In return, this helps to maintain/retain our City as a regional center.	
Preserve small town character while maintaining the livability of Glenwood Springs and increasing the vibrancy and commercial success of the downtown	-Enhance pedestrian–friendliness while facilitating traffic (Chapter 3, Page 36) -Direct growth inward (Chapter 9, Page 102)
Staff Comment: Infill/redevelopment, as proposed, makes improvements more cost effective. The design of the project is in character with those surrounding the site and is a result of significant public discussion design which has gained support throughout the process. Therefore, the objectives/strategies associated with the project support the Comp Plan goal.	
Direct development to locations and building forms that are cost effective to serve	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Direct growth to areas where utilities and

	services can be provided efficiently (Chapter 7, Page 82) -Retain role as a regional center (Chapter 7, Page 83) -Direct growth inward (Chapter 9, Page 102)
Staff Comment: Infill/redevelopment, as proposed, makes improvements more cost effective. Therefore, the objectives/strategies associated with the project support the Comp Plan goal.	
Support social diversity	-Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Require good design for mixed-use and higher density projects (Chapter 6, Page 78) -Direct growth inward (Chapter 9, Page 102) -Retain role as a regional center (Chapter 7, Page 83) -Direct growth inward (Chapter 9, Page 102)
Staff Comment: Banks provide the lending needed for the construction and purchasing of all housing types. Additionally, they help establish new and expand existing businesses in the community. The design of the project is a result of significant public discussion design which has gained support throughout the process. Infill/development allows for easier access to goods/services for the entire community.	

Reviewing Agency Comments

An overview of any comments received from referral agencies is provided below. Said comments are also attached.

Downtown Development Authority – Comments outline gratitude to the applicant for their work in meeting the requests of the agency through the process. Additionally, a recommendation is made for the incorporation of the accessible ramp into the perspective drawing provided, plant placement recommendations, and drainage swale design.

Engineering – Comments received outline necessary access permit revisions, question about emergency services movements, and numerous items the applicant must address at the Construction Plans review phase., need for a demolition plan, and necessary revisions to the site and grading plans.

Historic Preservation Commission – Comments include requests to move the marquee to top of the transom, to maintain a zero-foot setback, and concerns about the second-floor windows sizes along the west and north elevations.

Parks and Recreation – Comments received outline recommendations for alternate plant species selections, the need for an irrigation plan, and desired alternatives to tree grates.

ACTION ALTERNATIVES AND STAFF RECOMMENDATION:

Section 070.060.030(g)(1)d outlines the review and decision procedures for applications being considered by the Commission and/or City Council stating, “[T]he applicable review body shall

approve, approve with conditions, or deny the application **based on the applicable approval criteria** listed in the application-specific procedures. The body may also **continue** the hearing or **refer the application** to another authority as provided in 070.060.050(a)(2)c, Referral and Call-Up Procedures.”

Action 1 - Site/Architectural Plan Review – to allow for the construction of a 9,706 square foot bank/office building.

Staff Recommendation/Suggested Motion

Staff recommends **approval (with conditions)** of the Site/Architectural Plan Review with the following **findings** and **conditions**:

Recommended Findings:

1. The request for architectural equivalence compliance for building setback and percentage of glazing along the west elevation achieves the intent of the subject standards to the same or better degree than the subject standards, advances the goals and policies of this Code to the same or better degree than the subject standards, results in benefits to the community that are equivalent to or exceed benefits associated with the subject standards, and impose no greater impacts on adjacent properties than would occur through compliance with the specific requirements of the Code.
2. The site/architectural plan is consistent with the general purpose and intent of this Code;
3. The site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;
4. The site/architectural plan is not in conflict with precedent land use approvals; and
5. The site/architectural plan is substantially consistent with the Comprehensive Plan and other adopted City policies and plans.

Recommended Conditions:

1. The applicant shall comply with/address all City staff comments related to specific Code requirements prior to approval of a Construction Plans application.
2. Any future physical changes or improvements to the property or buildings on the parcel are subject to the review and approval of the Community Development Director for compliance with applicable requirements of the Glenwood Springs Municipal Code.
3. The applicant shall comply with all verbal representations made in the public hearings, as outlined in all application materials, and/or as revised per conditions herein and approved by the Community Development Director.
4. Prior to submitting a building permit application, the applicant shall enter into a development agreement with the City.
5. Prior to submitting a building permit application, the applicant shall submit a engineer’s estimate of all public improvement and submit a financial security therefor.

SECTION: 9 TOWNSHIP: 6 RANGE: 89 SUBDIVISION: ORIGINAL TWNSTE. GLENWOOD BLOCK: 24 LOT: 7 THRU: LOT: 14

GWS SURVEY MONUMENT, CETERLINE 8TH & MIDLAND

GWS SURVEY MONUMENT, CETERLINE 8TH & BLAKE

N88°28'02"W 643.39'

N01°31'35"E 162.12'

8TH STREET

1000.13'

N01°31'35"E

116.97' TIE

9TH STREET

216.25' TIE

10TH STREET

GRAND AVENUE

COOPER AVENUE

BLAKE AVENUE

FOUND 'X' CUT IN CONCRETE, 1.79" WITNESS CORNER, NW CORNER LOT 6 BLOCK 37

FOUND 1" BRASS PLUG, SW CORNER LOT 7, BLOCK 4

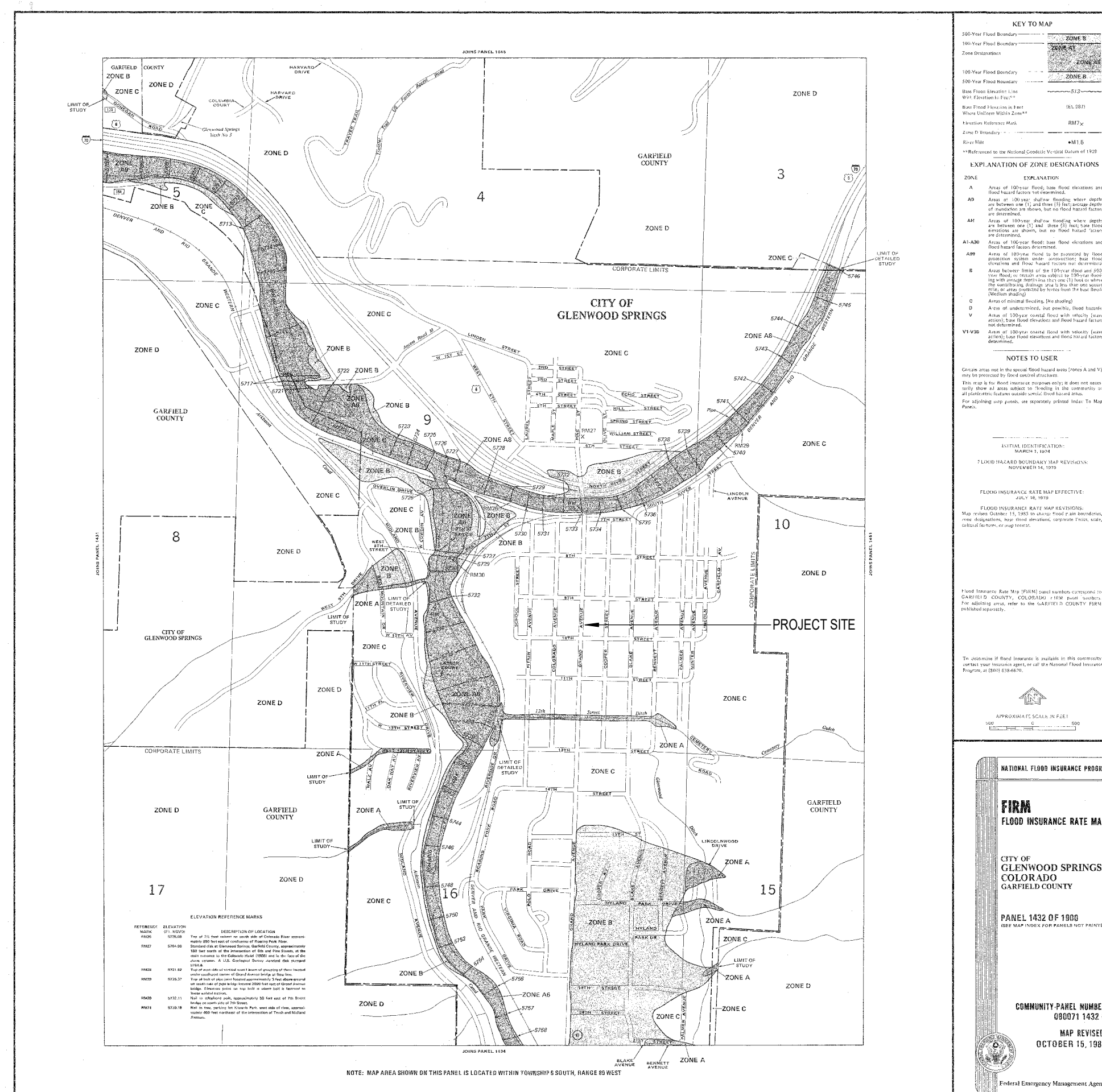
N

BASIS OF BEARINGS
SCALE: 1" = 200'

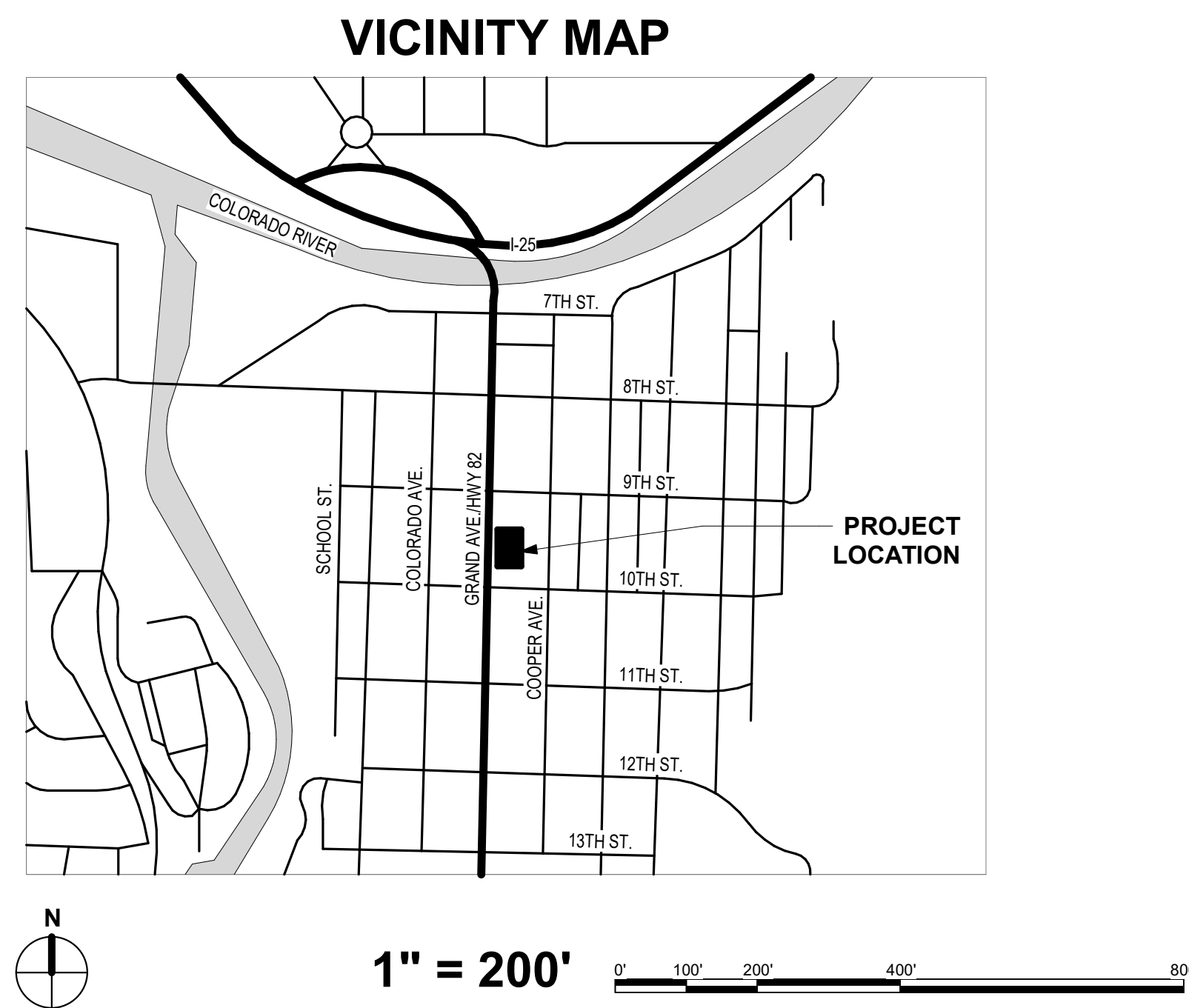
0' 100' 200' 400' 800'

ELEVATION = 5792.40 FEET

SITE IS NOT LOCATED IN FEMA FLOODPLAIN ZONE C - AREA OF MINIMAL FLOODING . SEE FEMA MAP 080071 1432 C DATED: OCTOBER 15, 1985 BELOW.



ANB - GLENWOOD SPRINGS



SHEET INDEX - SITE / ARCHITECTURAL PLAN REVIEW	
Sheet Number	Sheet Name
1 OF 11	COVER SHEET
2 OF 11	SITE PLAN
3 OF 11	PRELIMINARY GRADING PLAN
4 OF 11	CONCEPTUAL ARCHITECTURAL PLANS
5 OF 11	CONCEPTUAL ARCHITECTURAL PLANS
6 OF 11	PRELIMINARY LANDSCAPE PLAN
7 OF 11	LIGHTING PLAN
8 OF 11	MATERIALS BOARD
9 OF 11	CIVIL SITE DETAILS
10 OF 11	GWS FIRE DEPARTMENT VEHICLE TRACKING
11 OF 11	COLOR RENDERINGS

- A. FENCES, WALLS, SIGNS AND ACCESSORY STRUCTURES ARE SUBJECT TO SEPARATE REVIEWS AND PERMITS.
- B. ANGLES NOT SHOWN ARE EITHER 90 DEGREES OR A SUPPLEMENT OF THE ANGLE INDICATED.
- C. PARKING SPACES FOR PERSONS WITH DISABILITIES WILL BE CLEARLY DELINEATED WITH UPRIGHT SIGNS.
- D. APPROVAL FOR THIS PLAN DOES NOT CONSTITUTE OR IMPLY COMPLIANCE WITH ADA REQUIREMENTS.
- E. SITE(S) SHALL BE LANDSCAPED PRIOR TO ISSUANCE OF A FINAL CERTIFICATE OF OCCUPANCY (CO) DURING THE GROWING SEASON OF APRIL 1ST TO OCTOBER 1ST, AT ALL OTHER TIMES THE INDIVIDUAL SITES SHALL BE LANDSCAPED WITHIN 45 (FORTY-FIVE) DAYS OF THE START OF THE FOLLOWING GROWING SEASON.
- F. ALL LANDSCAPE AREAS SHALL BE IRRIGATED WITH UNDERGROUND AUTOMATIC IRRIGATION SYSTEM. THE IRRIGATION SYSTEM IS TO HAVE A RAIN SENSOR SHUTOFF INSTALLED.

Project Description					
Lot Size Information	.52 Acres	22,712 Sq. Ft.	Lot Coverage (Level 1 GS)	15,000 Sq. Ft. & 75% Existing	4,853 Sq. Ft. & 21% Proposed
Limits of Disturbance	22,712 Sq. Ft. & 100% Existing	22,712 Sq. Ft. & 100% Proposed	Average Slope Within Limits of Disturbance	6%	
Off-Street Parking Spaces	16 Vehicle Spaces Existing	None Required. 21 Vehicle Spaces Proposed, including 2 ADA	Bicycle Parking	0 Spaces Existing	4 Spaces Proposed
Residential Units	0 Units Existing	4 Units Proposed	Non-Residential Uses	B - Business	9,706 Gross Sq. Ft. Proposed
Open Space	0 Sq. Ft. & 0% Existing	2,796 Sq. Ft. & 12% Proposed	Total Landscaped Area	0 Sq. Ft. & 0% Existing	4,430 Sq. Ft. & 18% Proposed
Building Height	20'-0" - 25'-0" Existing	32'-0" to top of Parapet 37'-0" to top of Mechanical Screen	Total Impervious Area	22,712 Sq. Ft. & 100% Existing	10,501 Sq. Ft. & 46% Proposed
Snow Storage	0 Sq. Ft. Required	360 Sq. Ft. Provided in 2 parking spaces	Other		

THIS PROPERTY IS SUBJECT TO GEOLOGIC HAZARDS PER THE ADOPTED MAPPING BY THE CITY OF GLENWOOD SPRINGS. HAZARDS TO NOTE ARE SLOPE, SOIL, AND DEBRIS FLOW. A FINAL GEOLOGIC HAZARD REPORT WILL BE SUBMITTED UPON APPLICATION OF A BUILDING PERMIT.

3033 E. 1st Ave, Suite 305
Denver, CO 80206
303-394-5531
Will Coffield - wcoffield@realtygp.com

**ANB Bank
Glenwood
Springs**

**NOT FOR
CONSTRUCTION**

[illegible]

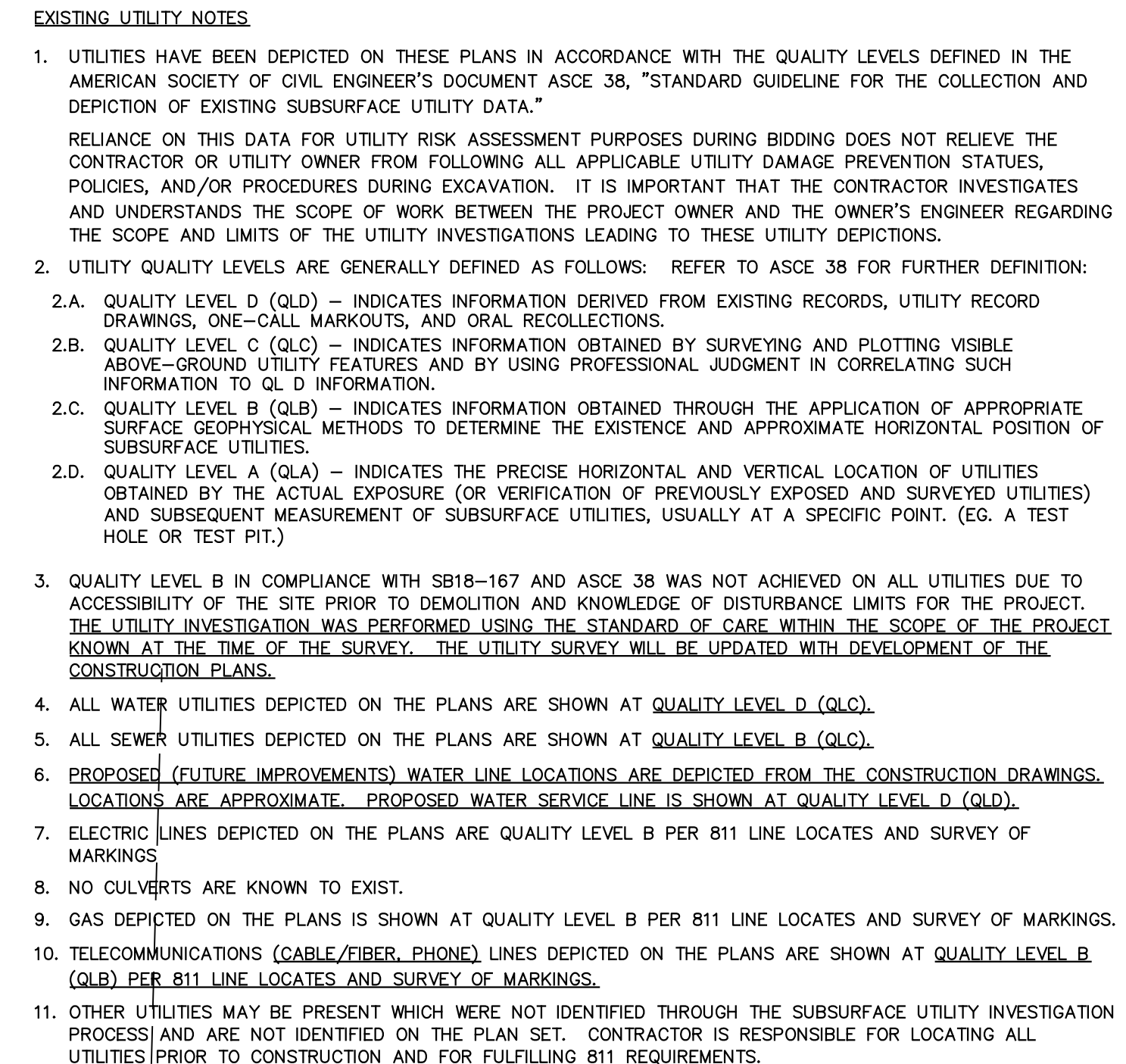
COVER SHEET

scale: $6'' = 1'-0''$

1 OF 11



ANB - GLENWOOD SPRINGS



UTILITY NOTES

1. ALL MATERIALS AND WORKSMANSHIP SHALL BE IN CONFORMANCE WITH THE CITY OF GLENWOOD SPRINGS MUNICIPAL CODE OR CITY ENGINEERING STANDARDS OR AWWA STANDARDS AND SPECIFICATIONS, LATEST REVISIONS, IF NO SPECIFICATION EXISTS IN THE CITY CODE. ALL WORK SHALL BE INSPECTED AND APPROVED BY PERSONNEL OF THE CITY OF GLENWOOD SPRINGS WATER DEPARTMENT.
2. THERE SHALL BE A MINIMUM COVER OF 5.5 FEET OVER ALL WATER SERVICES LINES. ALL OTHER SHALLOW UTILITIES WILL BE 2' MINIMUM OR PER SUPPLIER REQUIREMENTS. SANITARY SEWER LINES WILL BE PLACED BELOW FROST DEPTH.
3. THE CONTRACTOR SHALL NOTIFY THE PUBLIC UTILITY COMPANIES AND DETERMINE THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO PROCEEDING WITH THE EXCAVATION. ALL WORK PERFORMED IN THE AREA OF THE PUBLIC UTILITIES SHALL BE PERFORMED ACCORDING TO THE REQUIREMENTS OF THESE AGENCIES.
4. COMPACTION OF ALL TRENCHES MUST BE ATTAINED IN ACCORDANCE WITH THE SOILS REPORTS AND COMPACTION TEST RESULTS SUBMITTED TO THE ARCHITECT AND ENGINEER OF RECORD PRIOR TO ACCEPTANCE.
5. THE EXISTING SANITARY SEWER LINE IS TO BE EXPOSED DURING DEMO AND EVALUATED FOR CONDITION AND REPORTED TO THE ENGINEER AND ARCHITECT.
6. THE EXISTING WATER SERVICES WILL BE ABANDONED AT THE CORP PER CITY OF GLENWOOD SPRINGS STANDARDS AND INSPECTED BY THE ENGINEER AND THE CITY OF GLENWOOD SPRINGS.
7. THE CONTRACTOR SHALL NOT OPERATE ANY EXISTING OR NEW WATERLINE VALVES EXCEPT IN THE CASE OF AN EMERGENCY. CONTRACTOR SHALL NOTIFY THE WATER DEPARTMENT A MINIMUM OF 48 HOURS IN ADVANCE OF ANY VALVE OPERATION REQUIRED TO COMPLETE THE WORK.
8. SEPARATION BETWEEN THE SANITARY SEWER MAIN AND WATER MAINS SHALL BE MAINTAINED AT 10-FOOT EXCEPT AT SPECIFIED CROSSINGS.
9. EXISTING TELEPHONE, GAS AND CABLE LINES TO THE BUILDING WILL BE RELOCATED FROM THE EXISTING OR RELOCATED PEDESTALS TO THE NEW BUILDING AND SHALL BE PROTECTED DURING CONSTRUCTION. NEW GAS SERVICE SHALL BE CONNECTED AS REQUIRED PER BLACK HILL ENERGY.
10. THE EXISTING MAIN LINE POWER FROM THE ALLEY FEED LOCATION WILL BE REMOVED AND NEW MAINLINE FEED TO THE NEW PLAN SET LOCATION. GLENWOOD SPRINGS ELECTRIC COMPANY SHALL SPECIFY SIZING.
11. GAS AND ELECTRIC METERS AND RISERS WILL BE REQUIRED TO MEET SEPARATION REQUIREMENTS BETWEEN THE TWO ITEMS, ALONG WITH ALL SEPARATION REQUIREMENTS AND SPACING REQUIREMENTS PER BLACK HILLS ENERGY, AND STATE AND LOCAL CODES.
12. ELECTRICAL LINES WITHIN CONDUITS NEED TO UTILIZE ELECTRIC GRADE SCH-80 PVC PIPING.
13. PIPE MATERIALS SPECIFIED ARE RECOMMENDATIONS, CONTRACTOR CAN USE EQUIVALENT MATERIALS IF CLEARED BY ENGINEER OR CITY INSPECTOR.
14. LANDSCAPE IRRIGATION SYSTEM TO BE DESIGNED AND INSTALLED BY OTHERS.
15. ALL WATERLINE AND SEWER LINE TESTING WILL BE PER THE CITY OF GLENWOOD SPRINGS MUNICIPAL CODE OR PUBLIC WORKS MANUAL SPECIFICATIONS.

1010 Park Ave. West
Suite 200
Denver, Colorado 80205
303 640 3173
Amanda Fitzjarrald
amanda@openstudioarchitecture.com

910 Grand Avenue
Glenwood Springs, CO 81601

Realty Management Group
3033 E. 1st Ave, Suite 305
Denver, CO 80206
303-394-5531
Will Coffield - wcoffield@realtygp.com

1517 Blake Avenue, Suite 101
Glenwood Springs, CO 81601
970-945-8676
Roger Neal - rneal@hceng.com

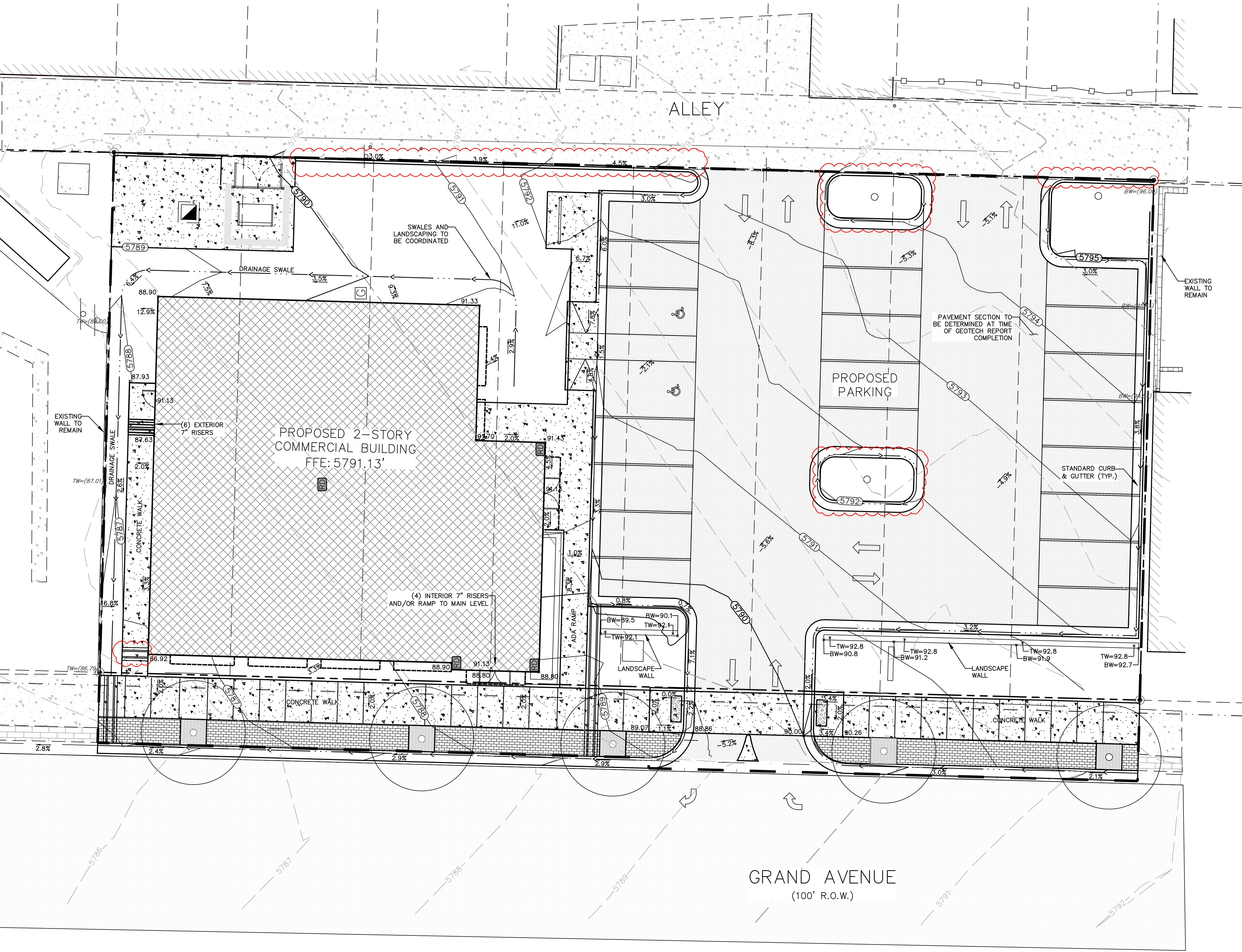
**ANB Bank
Glenwood
Springs**

**NOT FOR
CONSTRUCTION**

[illegible]

SITE PLAN

2 OF 11



ANB - GLENWOOD SPRINGS



	EXISTING	PROPOSED
CONTOUR	6158	6158
SPOT ELEVATION	x(58.07)	x58.66
SLOPE OR GRADE	0.8%	2.0%
LIMITS OF DISTURBANCE	.	
SEDIMENT CONTROL FENCE	SOF	
DRAINAGE FLOW DIRECTION	⇒	
SEDIMENT CONTROL LOG	(SCL)	
VEHICLE TRACKING CONTROL	(VTC)	
CONCRETE WASHOUT AREA	(CWA)	

1. ALL CONSTRUCTION TO BE PER CURRENT CITY OF GLENWOOD SPRINGS SPECIFICATIONS.
2. ALL UTILITIES, BOTH UNDERGROUND OR OVERHEAD, SHALL BE MAINTAINED IN CONTINUOUS SERVICE THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD, EXCEPT AS NOTED IN THE SPECIAL CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE AND LIABLE FOR ANY DAMAGES TO, OR INTERRUPTION OF, SERVICES CAUSED BY THE CONSTRUCTION.
3. THE CONTRACTOR SHALL CONTAIN HIS CONSTRUCTION OPERATIONS TO THE AREA WITHIN LOT. THE CONTRACTOR SHALL NOT OPERATE OUTSIDE THIS AREA WITHOUT THE PRIOR CONSENT FROM THE PROPERTY OWNER AFFECTED BY CONSTRUCTION.
4. ANY DAMAGE TO PRIVATE PROPERTY BY THE CONTRACTOR OUTSIDE THESE LIMITS WITHOUT THE PERMISSION OF THE PRIVATE PROPERTY OWNER WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
5. MAINTAIN POSITIVE DRAINAGE AWAY FROM STRUCTURES IN ALL DIRECTIONS.
6. EXISTING TOPOGRAPHY ESTABLISHED BY A FIELD SURVEY CONDUCTED BY HCE, FEBRUARY 2019.
7. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO AVOID POTENTIAL POLLUTION FROM CONSTRUCTION EQUIPMENT AND THE STORAGE OF ON-SITE MATERIALS. WRITTEN PRACTICES FOR THE MITIGATION OF THE ABOVE IS REQUIRED.
8. SOLS THAT ARE TRACKED OFF THE SITE ARE TO BE CLEANED UP ON A REGULAR BASIS.
9. EXISTING SANITARY SEWER SERVICE HAS NOT BEEN FIELD LOCATED OR VERIFIED. EXISTING SANITARY SIZE ASSUMED TO BE 4-INCH DIAMETER. CONTRACTOR TO FIELD VERIFY DURING DEMOLITION PRIOR TO CONSTRUCTION AND REPORT TO ENGINEER.
10. WATER SERVICES TO BE ABANDONED AT MAIN PER CITY OF GLENWOOD SPRINGS STANDARDS. NEW SERVICE WILL BE A 4" HOT TAPPED AND VALVE BOX WITHIN PARALLEL PARKING STALL.
11. CDOT UTILITY PERMIT WILL BE REQUIRED FOR ALL WORK IN THE ROW INCLUDING WATER SERVICE WORK.

1. ALL ORGANIC MATTER SHALL BE REMOVED FROM FILL AREAS.
2. ALL FILL AREAS, TRENCHING AND FOUNDATION BACKFILL AREAS SHALL BE COMPACTED IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
3. CERTIFIED WEED FREE EROSION LOGS OR SILT FENCE SHALL BE PLACED AT THE TOE AND DRAINAGE OUTLET POINTS OF ALL SLOPES 3:1 OR STEEPER TO PREVENT SILTATION ON STREETS. EROSION LOGS WILL BE PLACED IN COMPLETED SWALES TO CONTROL SWALE EROSION. CURBED CHASES WILL UTILIZE CLOTHED SAND LOGS TO PREVENT SOILS FROM ENTERING THE CHASE.
4. CONTRACTOR SHALL COMPLY WITH ALL LOCAL, COUNTY AND STATE REGULATIONS PERTAINING TO GRADING, DUST AND EROSION.
5. ALL DISTURBED AREAS SHALL BE RE-SEEDED, MULCHED OR SODED AS PER THE APPROVED LANDSCAPING PLAN DESIGN WITHIN 6 MONTHS OF DISTURBANCE OR DURING THE SPRING SEASON, WHICH EVER IS MOST Viable.
6. CONTRACTOR SHALL MAINTAIN DRAINAGE AWAY FROM THE SITE DIG. INUNDATION OF THE FOUNDATION DIG MUST BE RUMPLED OUT AND PROPER DRYING TIME FOR UNDERLYING SOILS MUST BE APPROVED BY THE GEOTECHNICAL ENGINEERING ONSITE PRIOR TO WORK RECOMMENCING.
7. CONTRACTOR SHALL ABIDE BY THE RULES OF THE CITY OF GLENWOOD SPRINGS PERTAINING TO ACTIVITIES AROUND EXISTING TREES ON THE SITE, SEE LANDSCAPE PLANS.
8. ANY SLOPES OVER 3:1 WILL HAVE A BIODEGRADABLE EROSION CONTROL BLANKET INSTALLED FOR SLOPE STABILITY. GRASSES WILL GROW THROUGH THE PERMANENT BLANKET TO COMPLETE ITS STABILIZING PROPERTIES.
9. ALL SITE GRADING AND DRAINAGE SHALL COMPLY WITH THE CITY OF GLENWOOD SPRINGS MUNICIPAL CODE OR CITY ENGINEERING STANDARDS AS A MINIMUM SPECIFICATION.
10. ALL ROAD BASE UNDER ASPHALT OR CONCRETE WILL BE COMPACTED TO 98% STANDARD PROCTOR OR PER THE CITY OF GLENWOOD SPRINGS MUNICIPAL CODE OR CITY ENGINEERING STANDARDS, WHICH EVER IS GREATER.
11. ALL LANDSCAPE AREAS WILL BE COMPACTED TO A MINIMUM OF 85% STANDARD PROCTOR OR PER THE CITY OF GLENWOOD SPRINGS MUNICIPAL CODE OR CITY ENGINEERING STANDARDS, WHICH EVER IS GREATER.
12. A DRAINAGE REPORT HAS BEEN SUPPLIED TO THE CITY FOR REVIEW. DUE TO THE INCREASE IN GREEN AREA ON THE SITE FROM 12% TO ABOVE 20%, WHICH REDUCES THE AMOUNT OF IMPERVIOUS AREA ON THE EXISTING SITE. THE SITE PLANNING IS KEEPING TO THE EXISTING DRAINAGE PATTERNS AND FLOW RATES AS HAS HISTORICALLY BEEN ON THE SITE. WITH THE EXCEPTION OF 9TH AND 8TH DRAINS BEING DIRECTED TO THE GRAND AVENUE INSTEAD OF THE ALLEY. THIS WILL ALLOW DRAINAGE TO REACH THE INTERSECTION OF 9TH AND GRAND SLIGHTLY SOONER THAN THE EXISTING PATH. THE GEOTECHNICAL ENGINEER IS RECOMMENDING AGAINST THE USE OF DRYWELLS SO NO DETENTION IS BEING PROPOSED. WATER QUALITY SHOULD BE IMPROVED DUE TO THE REDUCTION OF IMPERVIOUS AND ADDITION OF LANDSCAPE AND GRASSES. STORM FLOWS WILL DISCHARGE TO GRAND AVENUE VIA SCUPPERS WITHIN THE SIDEWALK AND THE CURB AND GUTTER. FLOW RATES TO THE CURB AND GUTTER WILL BE CARRIED TO GRAND AVE AND INTO STORM STORM SEWER SYSTEM AT 8TH AND GRAND AVENUE.

consultants:
High Country Engineering
1517 Blake Avenue, Suite 101
Glenwood Springs, CO 81601
970-945-8676
Roger Neal - meal@hceng.com

**NOT FOR
CONSTRUCTION**

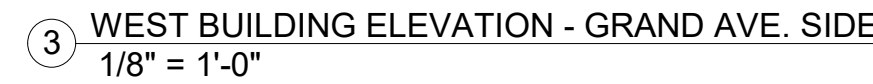
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scale:

3 OF 11

SITE / ARCHITECTURAL PLAN REVIEW

ANB - GLENWOOD SPRINGS



4 NORTH BUILDING ELEVATION - PARKING LOT
1/8" = 1'-0"



**ANB Bank
Glenwood
Springs**

**NOT FOR
CONSTRUCTION**

original issue description:	
SITE/ ARCHITECTURAL PLAN REVIEW	
OSA project no.:	2019-004
original issue date:	11/05/2019
copyright:	2019 open studio architecture
sheet title:	

scale: $1/8" = 1'-0"$

4 OF 11

THESE ELEVATIONS ARE CONCEPTUAL IN NATURE. INDIVIDUAL BUILDING ELEVATIONS MAY VARY BUT WILL BE EVALUATED FOR COMPLIANCE WITH DESIGN STANDARDS CONTAINED WITHIN TITLE 070 OF THE GLENWOOD SPRINGS MUNICIPAL CODE AT THE TIME OF SUBMITTING A BUILDING PERMIT APPLICATION.

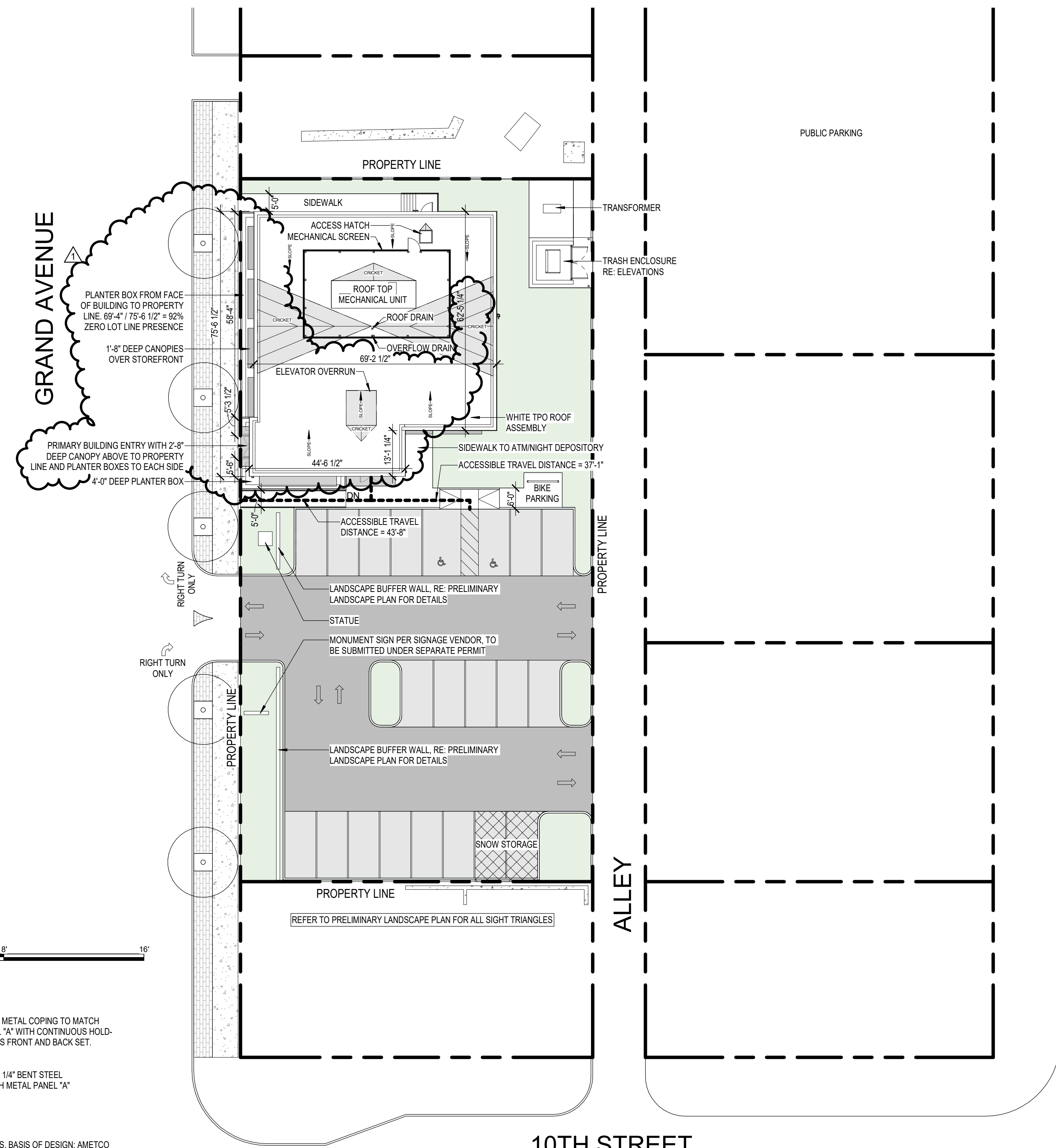
ANB - GLENWOOD SPRINGS

owner:

Realty Management Group

3033 E. 1st Ave, Suite 305
Denver, CO 80206
303-394-5531
Will Coffield - wcoffield@realtygp.com

5 OF 11





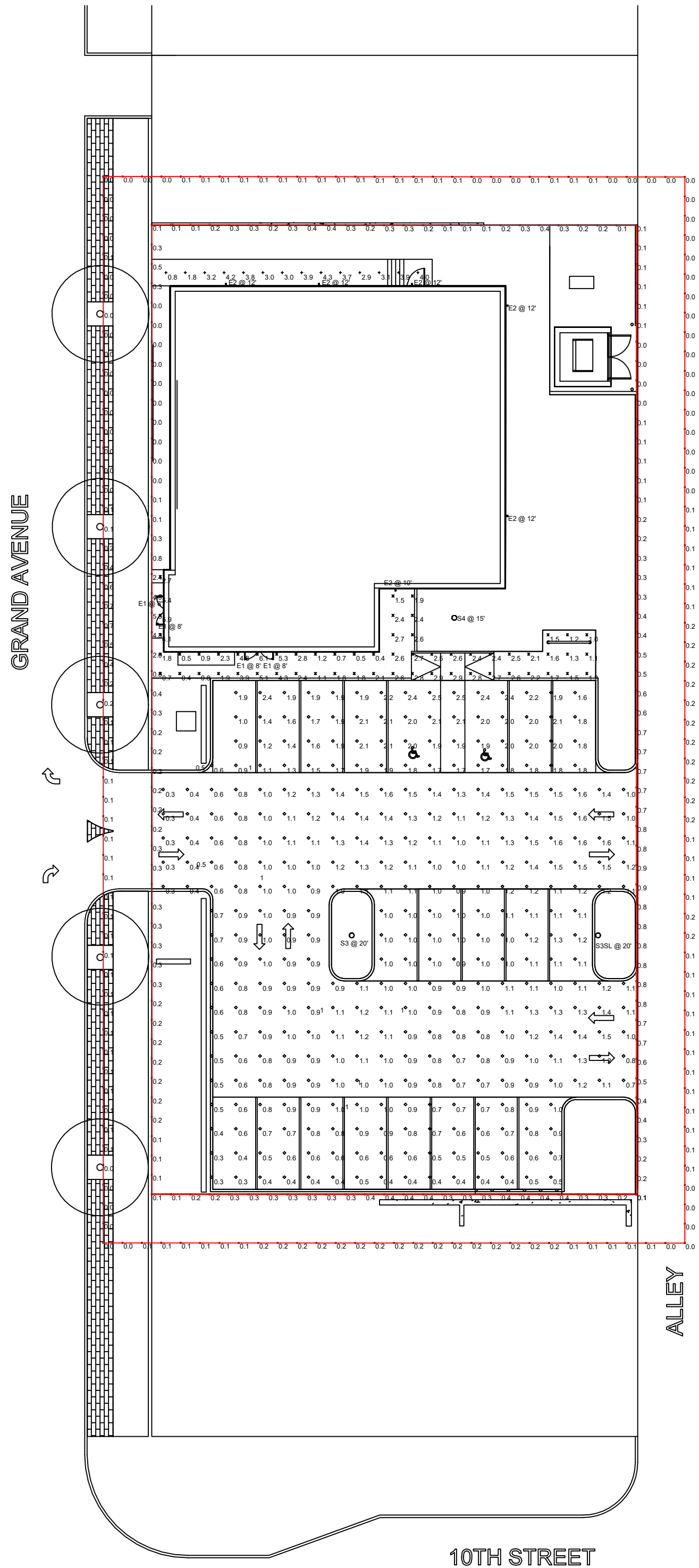
ANB - GLENWOOD SPRINGS



Packet Page 406

ANB - GLENWOOD SPRINGS

Luminaire Locations										Statistics							
		Location				Arm				Description							
No.	Label	X	Y	Z	MH	Orientation	Tilt	X	Y	Z		Symbol	Avg	Max	Mn	MaxMn	AvgMn
													10 beyond property line (Point B)				
1	E1	16866.65	36291.33	8.00	8.00	0.00	0.00	16866.65	36291.33	0.00			0.1	0.76	0.0	N/A	N/A
6	E1	16866.65	36293.86	8.00	8.00	0.00	0.00	16866.65	36293.86	0.00			1.16	2.56	0.3	8.31	3.71
6	E1	16866.65	36293.86	8.00	8.00	0.00	0.00	16866.65	36293.86	0.00			0.4	0.56	0.0	N/A	N/A
1	E1	16866.65	36293.86	8.00	8.00	0.00	0.00	16866.65	36293.86	0.00			2.36	4.06	0.8	9.41	4.11
6	E1	16874.83	36278.63	8.00	8.00	0.00	0.00	16874.83	36278.63	0.00			2.36	6.14	0.4	15.31	5.81
													Sidewalk (South)				
1	E2	16901.11	36350.81	12.00	12.00	0.00	0.00	16901.11	36350.81	0.00			0.1	0.76	0.0	N/A	N/A
2	E2	16928.98	36351.01	12.00	12.00	0.00	0.00	16928.98	36351.01	0.00			0.1	0.76	0.0	N/A	N/A
3	E2	16958.67	36350.12	12.00	12.00	90.00	0.00	16958.67	36350.12	0.00			0.1	0.76	0.0	N/A	N/A
5	E2	16889.95	36355.84	12.00	12.00	0.00	0.00	16889.95	36355.84	0.00			0.1	0.76	0.0	N/A	N/A
2	E2	16957.2	36362.84	10.00	10.00	180.00	0.00	16957.2	36362.84	0.00			0.1	0.76	0.0	N/A	N/A
7	E2	16870.70	36355.84	12.00	12.00	0.00	0.00	16870.70	36355.84	0.00			0.1	0.76	0.0	N/A	N/A
1	S3SL	16941.51	36221.54	20.00	20.00	270.00	0.00	16941.51	36221.54	0.00			0.1	0.76	0.0	N/A	N/A
3	S3	16894.68	36221.54	20.00	20.00	270.00	0.00	16894.68	36221.54	0.00			0.1	0.76	0.0	N/A	N/A
1	S4	16917.85	36298.07	10.00	10.00	180.00	0.00	16917.85	36298.07	0.00			0.1	0.76	0.0	N/A	N/A

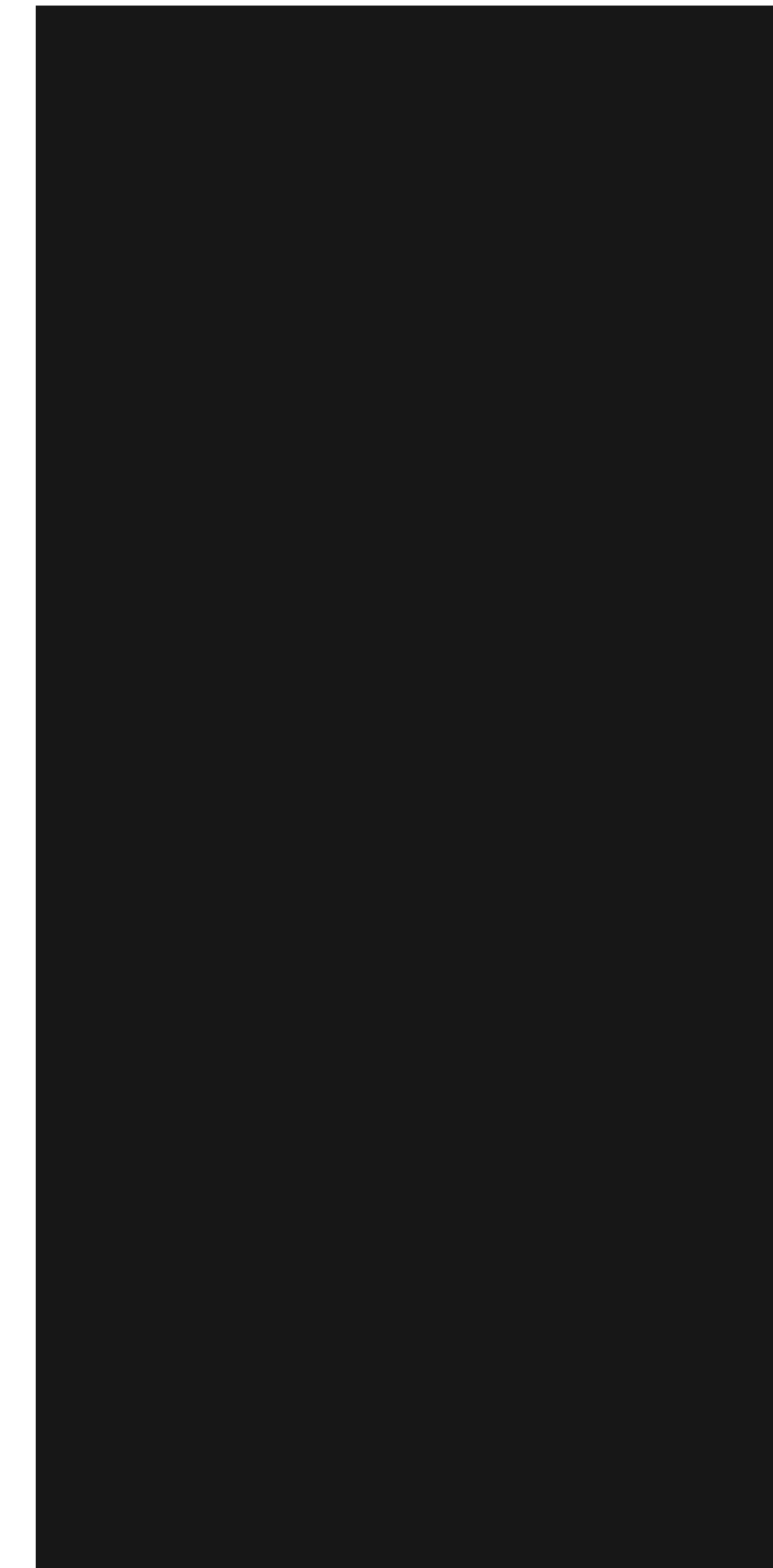
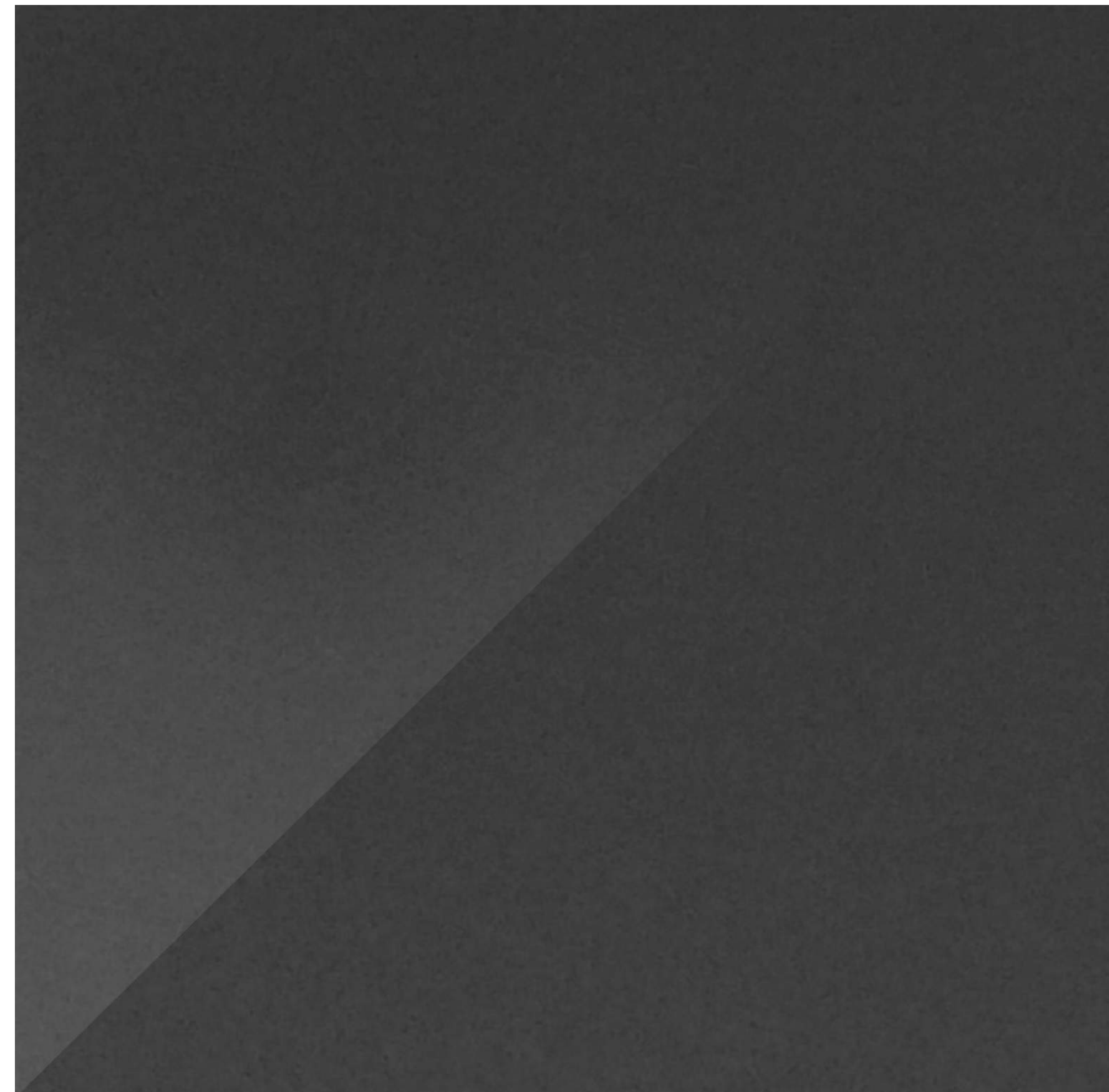
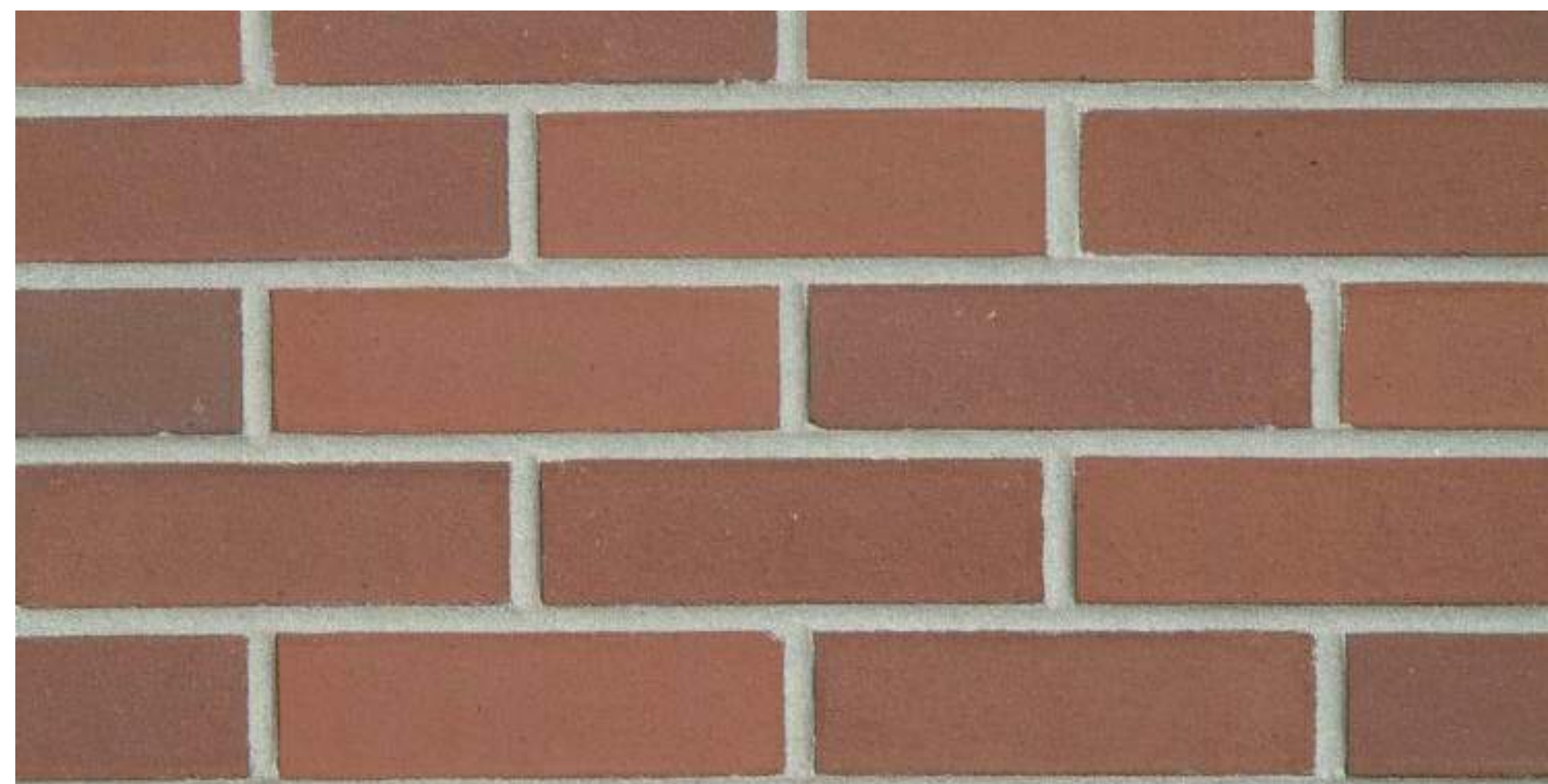


***ANB Bank
Glenwood
Springs***

original issue description:	
SITE/ ARCHITECTURAL PLAN REVIEW	
OSA project no.:	2019-004
original issue date:	04/09/2019
copyright:	2019 open studio architecture
sheet title:	
LIGHTING PLAN	
scale:	1" = 20'-0"

SITE / ARCHITECTURAL PLAN REVIEW

ANB - GLENWOOD SPRINGS



architect:
open studio | architecture
1010 Park Ave. West
Suite 200
Denver, Colorado 80205
303 640 3173
Amanda Fitzjarrald
amanda@openstudioarchitecture.com

project:
ANB Bank Glenwood Springs

910 Grand Avenue
Glenwood Springs, CO 81601

owner:

Realty Management Group

3033 E. 1st Ave, Suite 305
Denver, CO 80206
303-394-5531
Will Coffield - wcoffield@realtygp.com

**ANB Bank
Glenwood
Springs**

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original issue description:

SITE/ ARCHITECTURAL PLAN REVIEW

OSA project no.:	2019-004
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original issue date:	11/05/2019
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sheet title:

MATERIALS BOARD

scale:

8 OF 11

1010 Park Ave. West
Suite 200
Denver, Colorado 80205
303 640 3173
Amanda Fitzjarrald
amanda@openstudioarchitecture.com

910 Grand Avenue
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Glenwood
Springs***

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original issue description:

OSA project no.: 2019-004

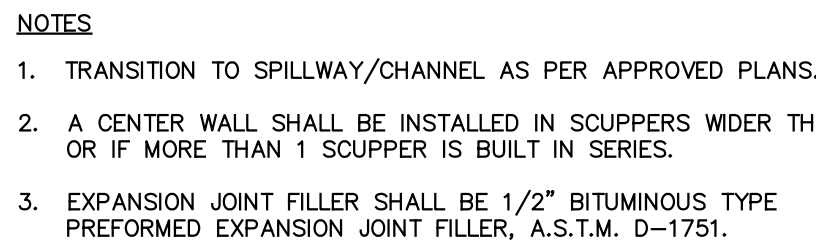
original issue date: 11/05/2019

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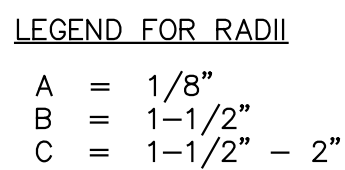
sheet title:

scale:

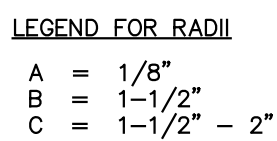
9 OF 11



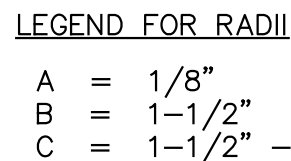
N.T.S.



N.T.S.

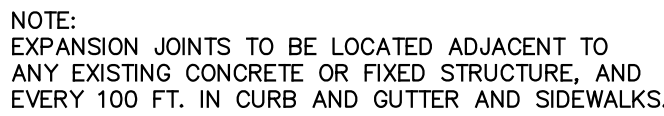


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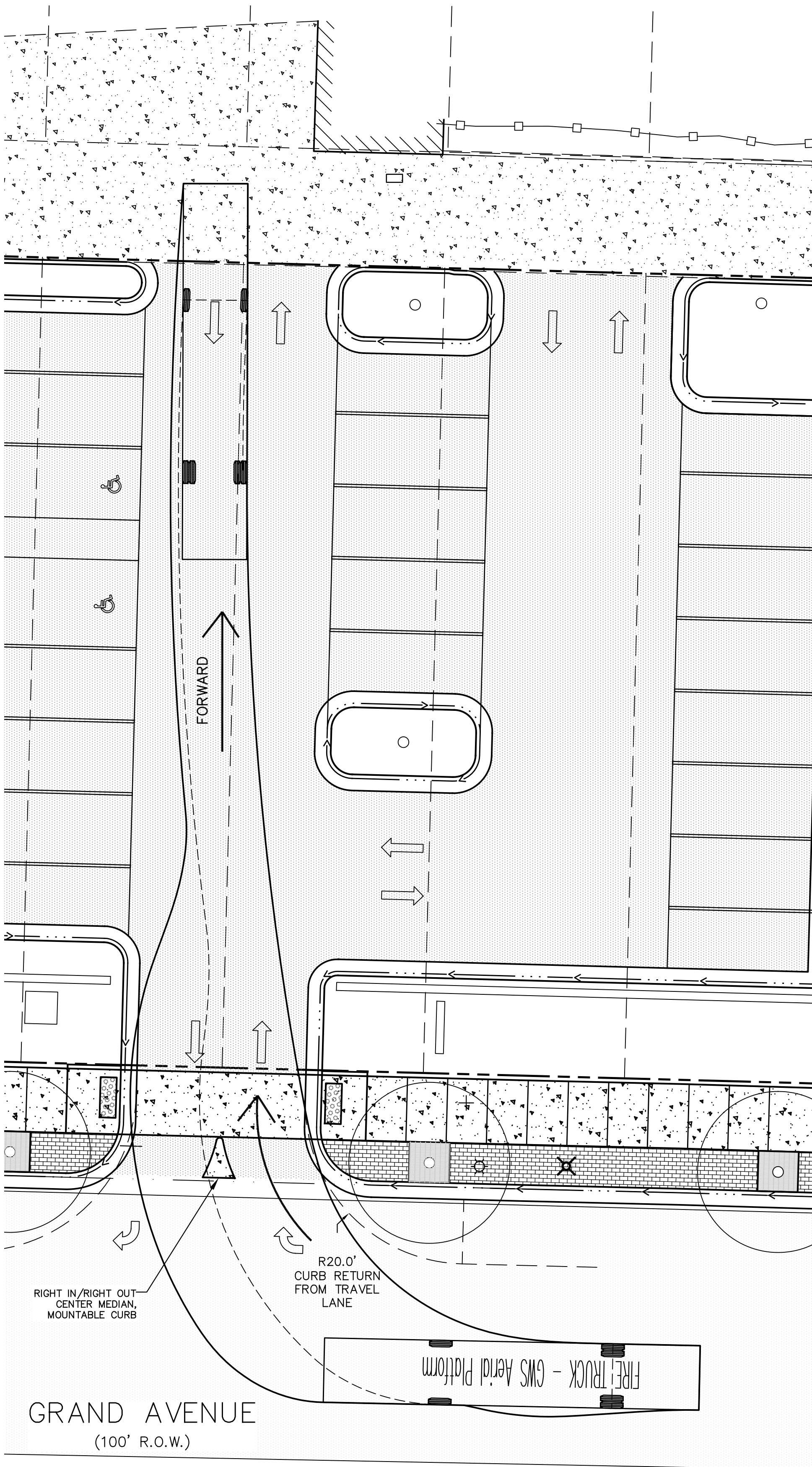
SEE PLANS FOR HEIGHT OF CURB. THE 6" DIMENSION IS A MINIMUM, SEVERAL AREAS THE CURB HEIGHT IS INCREASED TO ACCOMMODATE APPROPRIATE ADA SLOPES.

N.T.S.

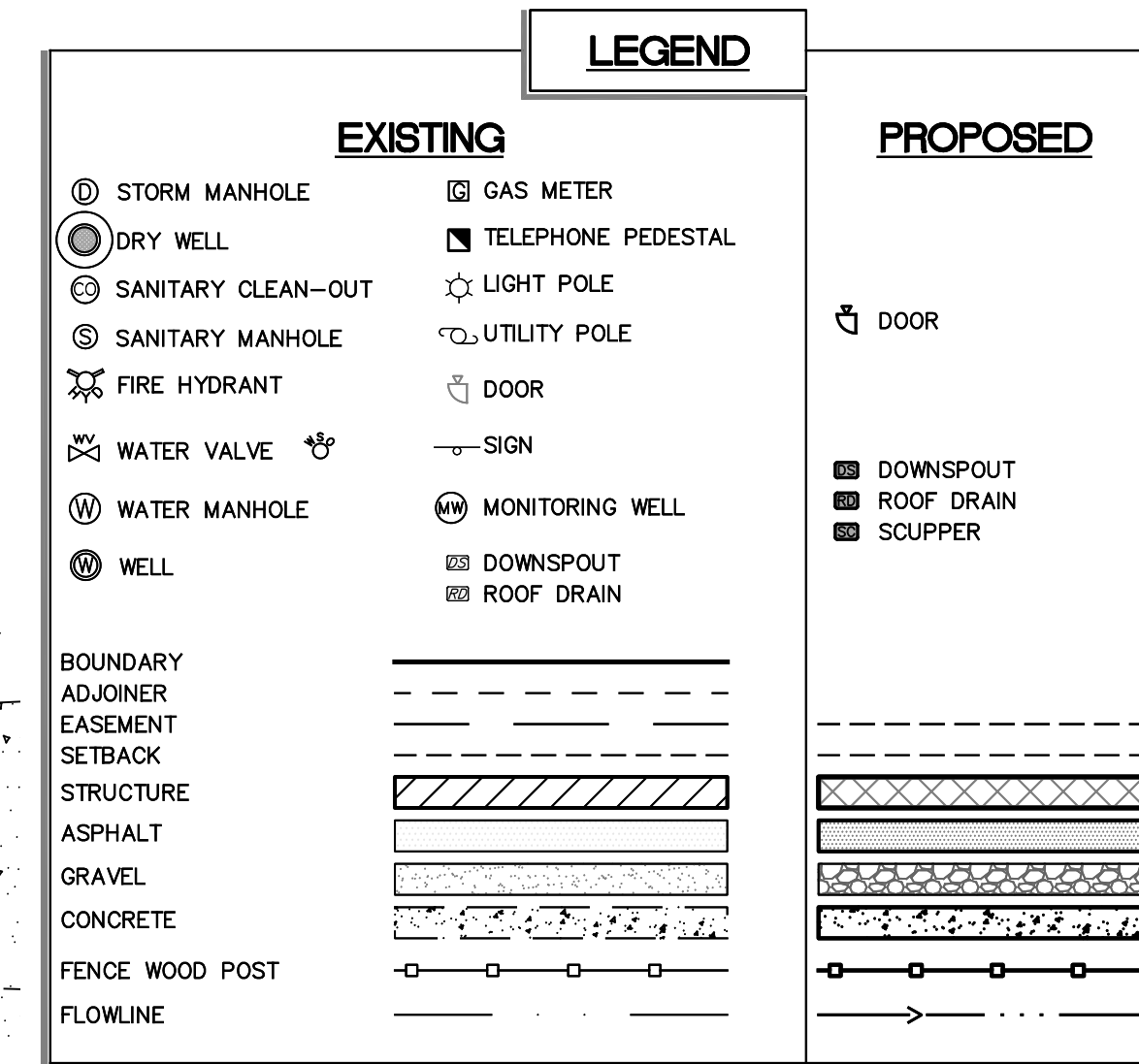


N.T.S.

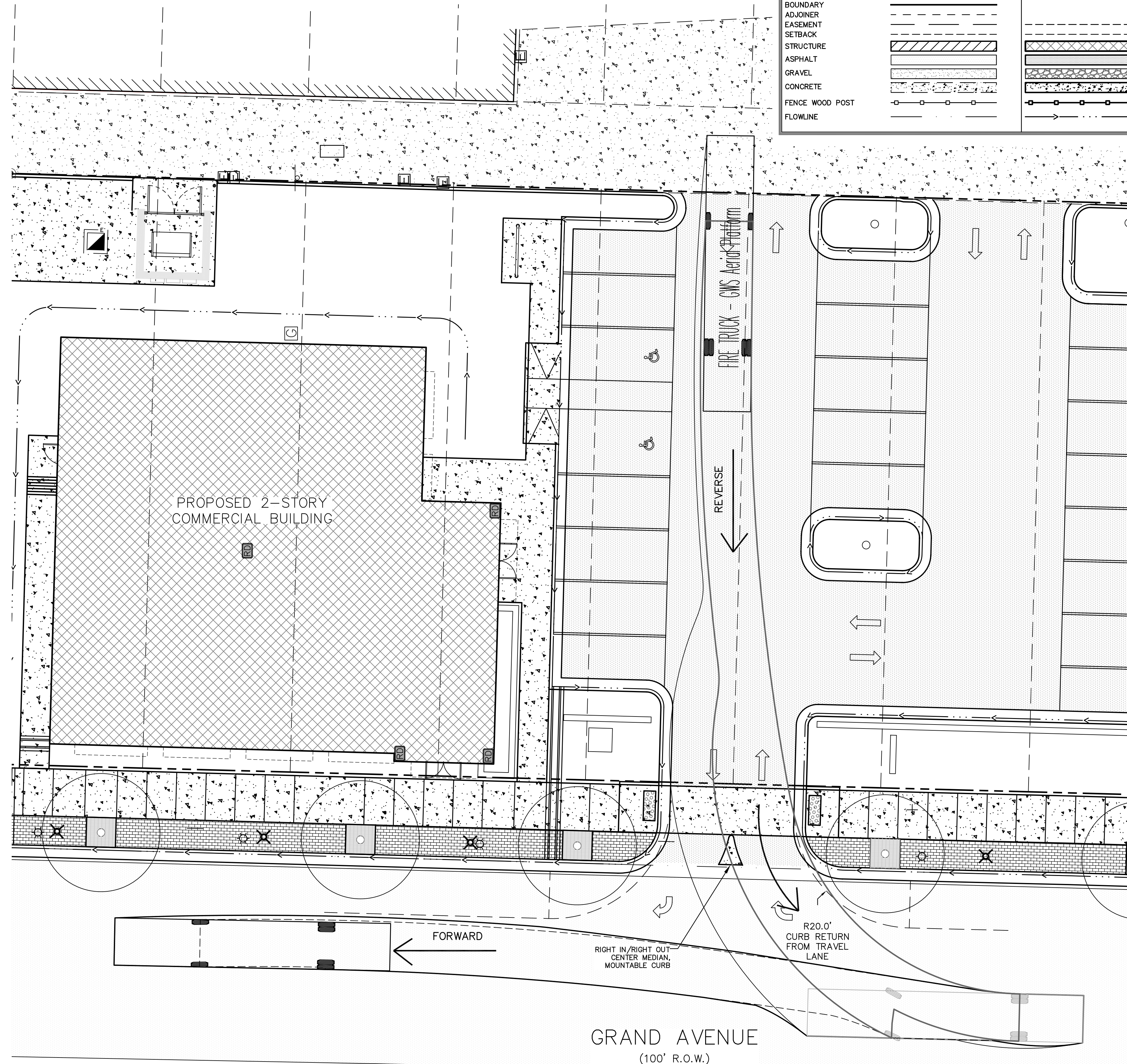




ANB - GLENWOOD SPRINGS



1. AERIAL PLATFORM FIRE TRUCK SPECIFICATIONS
PROVIDED BY GLENWOOD SPRINGS FIRE DEPARTMENT



consultants:
High Country Engineering
1517 Blake Avenue, Suite 101
Glenwood Springs, CO 81601
970-945-8676
Roger Neal - rneal@hceng.com

**NOT FOR
CONSTRUCTION**

[illegible]

scale:	AM
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10 OF 11

SITE / ARCHITECTURAL PLAN REVIEW

ANB - GLENWOOD SPRINGS



VIEW OF BUILDING ACROSS GRAND AVE.



VIEW OF BUILDING TRAVELING SOUTH ON GRAND AVE



VIEW OF BUILDING TRAVELING NORTH ON GRAND AVE

architect:
open studio | architecture
1010 Park Ave. West
Suite 200
Denver, Colorado 80205
303 640 3173
Amanda Fitzjarrald
amanda@openstudioarchitecture.com

project:
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Glenwood Springs, CO 81601

owner:

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Denver, CO 80206
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Will Coffield - wcoffield@realtygp.com

**ANB Bank
Glenwood
Springs**

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original issue description:

SITE/ ARCHITECTURAL PLAN REVIEW

OSA project no.:	2019-004
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original issue date:	11/05/2019
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sheet title:

COLOR RENDERINGS

scale:	PM
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11 OF 11



BALCOMB & GREEN

WATER LAW | REAL ESTATE | LITIGATION | BUSINESS ESTD 1953

Chad J. Lee, Esq.*
Telephone (970) 945-6546
clee@balcombgreen.com

November 5, 2019

VIA E-MAIL TO: jenn.ooton@cogs.us

Jenn Oton
Assistant City Manager
Director of Economic and Community Development
101 West 8th Street
Glenwood Springs, CO 81601

Re: ***ANB Bank – Site/Architectural Plan Application***

Dear Jenn:

Enclosed is an application for a Site/Architectural Plan Review for the construction of a 9,706 square foot bank/office building. This application represents the continued evolution of ANB's design for a new structure on the real estate it purchased at 9th and Grand in October, 2018. As you know, earlier this year ANB applied for a Site/Architectural Plan Review for this same site and, despite receiving City Staff support, was ultimately denied by the Planning and Zoning Commission ("Planning Commission"). ANB appealed this denial. In the spirit of attempting to incorporate the Planning Commission's comments, ANB presented a revised design during the appeal. Although the Planning Commission's decision was upheld, City Council provided valuable feedback on the design aesthetics of the building and its desire to better incorporate the unique architectural and design elements present in historical downtown Glenwood Springs. City Council also found that ANB's revised design, as presented to City Council, was not substantially similar to the design submitted in the original application as defined by 070.060.030(i)(5). After the hearing, the ANB design team again met with City Staff to further revise the design in a manner that was responsive to the feedback ANB received from both the Planning Commission and the City Council.

In October, ANB presented the revised design to several Planning Commissioners in a work session. ANB appreciates City Staff's and the Planning Commissioners' time and feedback in that work session, and ANB has further revised ANB's design based on this feedback, specifically the entryway, elevation, sidewalk, awnings, and landscaping. As promised, ANB has studied the requests of the Planning Commissioners and attempted to incorporate as much of their feedback as possible in this submission.

ANB's impression from the work session was that the most important consideration was ensuring the primary entrance along Grand Avenue is flush with the sidewalk. After extensive engineering analysis and modification, ANB was able to lower the west elevation building entry, which now provides a flush entry along the primary Grand Avenue entrance. This greatly enhances the pedestrian environment and creates an even more attractive street scene.

At the work session ANB also committed to studying the impact of slightly recessing the entrance from Grand Avenue to enhance the prominence of the primary entry. Given multiple design and safety concerns, ANB opted to recess the entire building further from the lot line to allow room for a deeper awning above the primary entrance, which will protect pedestrians from the weather and enhance the

ASPEN | BASALT | GLENWOOD SPRINGS | LAMAR

Post Office Box 790 | Glenwood Springs, Colorado 81602 | 800.836.5928 | 970.945.6546 | BalcombGreen.com
Packet Page 412

prominence of the entryway from Grand Avenue. By shifting the building, ANB has also created a landscape planting strip along both the south and west elevations, which was desired by the Planning Commissioners. This landscaping softens the building base, and adds color, texture and life to the elevations, enhancing the pedestrian experience for both of the primary elevations.

Additionally, ANB conducted extensive engineering and design analysis of a symmetrical door orientation on the west and south sides of the building. However, given the conditions resulting from the revised lower elevation of the building to accommodate the flush primary entryway, together with the new recessing of the building from the lot line to enhance the primary entry, a symmetrical door on the south elevation was not practical given the interior stairway and the need to have an accessible entryway on the south elevation.

Lastly, ANB has committed to include additional plantings on the drainage swale on the east side of the building.

This substantially different design complies with the letter and intent of the design standards in the Glenwood Springs Municipal Code, and even further promotes a design to human scale, meaning this building is uniquely designed in size and shape to be optimized for pedestrian use, and to be compatible with Glenwood's unique historical downtown character. ANB looks forward to continue working with City Staff during the application process.

Sincerely,

BALCOMB & GREEN, P.C.

By: _____


Chad J. Lee

CJL / bc
Encls.



LAND USE APPLICATION

City of Glenwood Springs
Economic and Community Development Dept.
101 West 8th Street
Glenwood Springs, CO 81601
970-384-6411

Ordinance Amendments		Development Permits	
Rezoning	☐	Site/Architectural Plan Review	☐
Rezoning to Planned Unit Development (PUD)	☐	Administrative	☒
Annexation	☐	Minor	☐
Condominiumization	☐	Major	☐
Annexation	☐	Master Plan	☐
Street Vacation	☐	Construction Plans	☐
	☐	Location & Extent	☐
Subdivisions		Right of Way Encroachment License	☐
Minor Subdivision	☐	Floodplain Development Permit	☐
Preliminary Plat	☐		☐
Final Plat	☐	Flexibility and Relief Procedures	☐
Vacation of Right-of-Way	☐	Variance	☐
	☐	Administrative Adjustment	☐
	☐	Appeal	☐

Applicant/Property Owner Information:			
Applicant		Owner	
Realty Management Group on Behalf of ANB Bank		ANB Bank	
Relationship to Owner		Owner	
Representative			
Applicant Address		Owner Address	
3033 E First Ave Suite 305	Denver CO 80206	3033 E First Ave Suite 300	Denver CO 80206
Phone 303-394-5531	Email Address wcofield@realtygp.com	Phone 303-394-5531	Email Address wcofield@realtygp.com

Property Information:	
Address	Parcel Number
910-918 Grand Avenue, Glenwood Springs, CO 81601	2185-094-21-002
Subdivision	Lot and Block Number
Original Twinst, Glenwood	Block 24 Lot 7-14
Zone District M2 - Mixed Use Central Core	Existing Land Use Commercial Retail - Restaurant

General Project Description:
The project proposes the demolition of the existing buildings and construction of a new two story 9,706sf building. A new 21 stall surface parking lot is proposed on the southern portion of the site.

Signatures:		
The owner or applicant must be present at the hearing. All public hearings must be properly noticed according to G.S.M.C. Section 070.010.030. Signatures of all owners of the property must appear before the application is accepted. Partnerships or corporations may have the authorized general partner or corporate officer sign the application. (Attach additional incorporation documents if necessary.) I declare under the penalty of perjury that the above information is true and correct to the best of my knowledge.		10/30/19
	Applicant	Date
		10/30/19
	Owner	Date
	Owner	Date



State Documentary Fee
Date: October 24, 2018
\$140.00

Warranty Deed
(Pursuant to 38-30-113 C.R.S.)

THIS DEED, made on **October 24th, 2018** by **910 GRAND AVENUE LLC, A COLORADO LIMITED LIABILITY COMPANY** Grantor(s), of the County of Garfield and State of Colorado for the consideration of **(\$1,400,000.00) ***One Million Four Hundred Thousand and 00/100***** dollars in hand paid, hereby sells and conveys to **ANB BANK, A COLORADO CORPORATION** Grantee(s), whose street address is **3033 EAST 1ST AVE, SUITE 300, DENVER, CO 80206**, County of Denver, and State of Colorado, the following real property in the County of Garfield, and State of Colorado, to wit:

**LOTS 7, 8, 9, 10, 11, 12, 13 AND 14, BLOCK 24,
CITY OF GLENWOOD SPRINGS**

**COUNTY OF GARFIELD
STATE OF COLORADO**

also known by street and number as: **910 GRAND AVE, GLENWOOD SPRINGS, CO 81601**

with all its appurtenances and warrants the title to the same, subject to **GENERAL TAXES AND ASSESSMENTS FOR THE YEAR 2018 AND SUBSEQUENT YEARS AND SUBJECT TO THOSE ITEMS AS SET FORTH ON EXHIBIT "A" ATTACHED HERETO AND INCORPORATED HEREIN.**

**910 GRAND AVENUE LLC, A COLORADO LIMITED
LIABILITY COMPANY**


**ERIC FAAS AS TRUSTEE OF THE ERIC FAAS
REVOCABLE TRUST AS MEMBER-MANAGER OF 910
GRAND AVENUE LLC, A COLORADO LIMITED
LIABILITY COMPANY**

State of Colorado)

)ss.

County of GARFIELD)

The foregoing instrument was acknowledged before me on this day of **October 24th, 2018** by **ERIC FAAS AS TRUSTEE OF THE ERIC FAAS REVOCABLE TRUST AS MEMBER-MANAGER OF 910 GRAND AVENUE LLC, A COLORADO LIMITED LIABILITY COMPANY**

Witness my hand and official seal

My Commission expires:

1-18-21


Notary Public

**REBECCA BLANCHARD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 19924017123
My Commission Expires January 18, 2021**

When recorded return to: **ANB BANK, A COLORADO CORPORATION
3033 EAST 1ST AVE, SUITE 300, DENVER, CO 80206**



EXHIBIT A

Property Address: 910 GRAND AVE, GLENWOOD SPRINGS, CO 81601

1. EXISTING LEASES AND TENANCIES.
2. RESERVATIONS AND EXCEPTIONS CONTAINED IN THE UNITED STATES PATENT TO THE DESCRIBED PROPERTY AS GRANTED TO WILLIAM GELDER DATED APRIL 25, 1883 AND RECORDED SEPTEMBER 3, 1883 AS DOCUMENT NO. 461 IN BOOK 1 AT PAGE 29 AND RERECORDED JANUARY 18, 1886 AS DOCUMENT NO. 2212 IN BOOK 1 AT PAGE 94, INCLUDING: PROVIDED THAT NO TITLE SHALL BE HEREBY ACQUIRED TO ANY MINE OF GOLD, SILVER, CINNABAR OR COPPER OR TO ANY VALID MINING CLAIM OR POSSESSION HELD UNDER EXISTING LAWS, AND PROVIDED FURTHER THAT THE GRANT HEREBY MADE IS HELD AND DECLARED TO BE SUBJECT TO ALL THE CONDITIONS, LIMITATIONS AND RESTRICTIONS CONTAINED IN SECTION 2386 OF THE REVISED STATUTES OF THE UNITED STATES SO FAR AS THE SAME ARE APPLICABLE THERETO.
3. ALL MEDICINAL OR MINERAL WATERS IN, UNDER OR ISSUING OUT OF, OR THAT HEREAFTER MAY BE UNDER OR ISSUING OUT OF THE LANDS HEREIN GRANTED, ARE HEREBY FOR EVER EXPRESSLY EXCEPTED AND RESERVED OUT OF THIS GRANT; AND GRANTEE FOR HIS HEIRS, EXECUTORS, ADMINISTRATORS AND ASSIGNS, HEREBY COVENANT, TO AND WITH SAID FIRST PARTY, THAT HE WILL NOT DIG OR BORE FOR, OR IN ANY MANNER INTERFERE WITH OR APPROPRIATE ANY OF SUCH WATERS THAT MAY BE IN, UNDER, OR THAT MAY HEREAFTER ISSUE OUT OF SAID LANDS AS RESERVED IN THE DEED RECORDED OCTOBER 14, 1885 IN BOOK 8 AT PAGE 351.
4. ALL MEDICINAL OR MINERAL WATERS IN, UNDER OR ISSUING OUT OF, OR THAT HEREAFTER MAY BE UNDER OR ISSUING OUT OF THE LANDS HEREIN GRANTED, ARE HEREBY FOR EVER EXPRESSLY EXCEPTED AND RESERVED OUT OF THIS GRANT; AND GRANTEE FOR HIS HEIRS, EXECUTORS, ADMINISTRATORS AND ASSIGNS, HEREBY COVENANT, TO AND WITH SAID FIRST PARTY, THAT HE WILL NOT DIG OR BORE FOR, OR IN ANY MANNER INTERFERE WITH OR APPROPRIATE ANY OF SUCH WATERS THAT MAY BE IN, UNDER, OR THAT MAY HEREAFTER ISSUE OUT OF SAID LANDS AS RESERVED IN THE DEED RECORDED OCTOBER 05, 1885 IN BOOK 8 AT PAGE 347.
5. ALL MEDICINAL OR MINERAL WATERS IN, UNDER OR ISSUING OUT OF, OR THAT HEREAFTER MAY BE UNDER OR ISSUING OUT OF THE LANDS HEREIN GRANTED, ARE HEREBY FOR EVER EXPRESSLY EXCEPTED AND RESERVED OUT OF THIS GRANT; AND GRANTEE FOR HIS HEIRS, EXECUTORS, ADMINISTRATORS AND ASSIGNS, HEREBY COVENANT, TO AND WITH SAID FIRST PARTY, THAT HE WILL NOT DIG OR BORE FOR, OR IN ANY MANNER INTERFERE WITH OR APPROPRIATE ANY OF SUCH WATERS THAT MAY BE IN, UNDER, OR THAT MAY HEREAFTER ISSUE OUT OF SAID LANDS AS RESERVED IN THE DEED RECORDED FEBRUARY 23, 1885 IN BOOK 8 AT PAGE 291.
6. ALL MEDICINAL OR MINERAL WATERS IN, UNDER OR ISSUING OUT OF, OR THAT HEREAFTER MAY BE UNDER OR ISSUING OUT OF THE LANDS HEREIN GRANTED, ARE HEREBY FOR EVER EXPRESSLY EXCEPTED AND RESERVED OUT OF THIS GRANT; AND GRANTEE FOR HIS HEIRS, EXECUTORS, ADMINISTRATORS AND ASSIGNS, HEREBY COVENANT, TO AND WITH SAID FIRST PARTY, THAT HE WILL NOT DIG OR BORE FOR, OR IN ANY MANNER INTERFERE WITH OR APPROPRIATE ANY OF SUCH WATERS THAT MAY BE IN, UNDER, OR THAT MAY HEREAFTER ISSUE OUT OF SAID LANDS AS RESERVED IN THE DEED RECORDED OCTOBER 09, 1885 IN BOOK 8 AT PAGE 350.
7. ANY FACTS, RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON IMPROVEMENT SURVEY PLAT CERTIFIED JUNE 05, 2018 PREPARED BY BILL W.A. BAKER, P.L.S. #23875, ON BEHALF OF HIGH COUNTRY ENGINEERING, INC., JOB NO. 2181638, SAVED AS OUR IMAGE 9314838: APPARENT ENCROACHMENT OF THE BUILDING INTO THE GRAND AVENUE RIGHT OF WAY TO THE WEST.

November 05, 2019

ANB – Glenwood Springs Project Description

The proposed project site is located at 910 Grand Ave. and is approximately 4,853 SF (0.101 acres) in building area footprint. The property is bound by an adjacent property on the North, existing alley on the East, Grand Ave. on the West, and an adjacent property on the South. The existing entrance to the parking lot from Grand Ave. will be revised to accommodate the new parking lot configuration and the new entrance will be North of the current access. Parking lot access will also be from the alley. The Two Story building will include a 4,853 SF bank on the ground floor and Shell Space with Bathrooms on the Second Floor in approximately 4,853 SF of space. The main entry point to the building will be from Grand Ave. with an additional entry point facing south into the parking lot.



COLORADO

Department of Transportation

Region 3

R3 Traffic Section, Access Unit
222 S 6th St, Rm 100
Grand Junction, CO 81501
PH (970) 683-6284 FAX (970) 683-6290

<<<<< e-mailed >>>>>

September 10, 2019

Permit No. 319092

ANB Bank
3033 E. 1st Avenue
Denver, Colorado 80209

Dear Permittee:

1. Please review the attached State Highway Access Permit (Form #101) and all enclosed attachments.
2. If you choose NOT to act on the permit, please return the permit unsigned.
3. If you ACCEPT the Permit and its Terms and Conditions (and are authorized to sign as legal owner of the property, or as an authorized representative), please sign and date the Access Permit form on the line marked "PERMITTEE" within 60 days of the transmittal date on the permit. Your signature confirms your agreement to all the listed Terms and Conditions.
4. If you fail to sign and return the attached Access Permit within 60 days of the permit transmittal date, the Colorado Department of Transportation (CDOT) will consider this permit withdrawn.
5. You must return the signed Access Permit hard copies with original signature(s), including all pages of terms and conditions and all attachments, with your payment to the Colorado Department of Transportation (CDOT) at the address noted below. The Department will return an executed copy of this permit. You may retain this cover letter for your records.
6. Provide a check or money order made payable to "CDOT" for the total amount due of \$100.00.
7. If you wish to APPEAL the Terms and Conditions of the permit, please refer to the attached Form 101, Pages 2 and 3 for an explanation of the appeal procedures.
8. As described in the additional attached Terms and Conditions, you must make a written request to obtain a Notice to Proceed. DO NOT begin any work within the State Highway Right-of-Way without a validated Access Permit and Notice to Proceed. Use of this permit without the Colorado Department of Transportation's validation shall be considered a violation of State Law.

If you have any questions please call Kandis Aggen, Access Coordinator, at (970) 683-6270 or Dan Roussin, Region 3 Permit Manager, at the number above.

Please return Access Permit and attachments to: Region 3 Access Unit
Attn: Kandis Aggen, Access Coordinator
222 S 6th St, Rm 100
Grand Junction, CO 81501

COLORADO DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ACCESS PERMIT			CDOT Permit No. 319092
			State Highway No / Mp / Side 082A / 0.560 / Left
Permit Fee \$100.00	Date of Transmittal 09/10/2019	Region / Section / Patrol / Name 3 / 02 / 2K12 Alan Hayes	Local Jurisdiction Glenwood Springs

The Permittee(s): ANB Bank 3033 E. 1st Avenue Denver, Colorado 80209 (303) 394-5011	The Applicant(s): High Country Engineering, Inc 1517 Blake Ave, Ste 101 Glenwood Springs, Colorado 81601 (970) 945-8676
is hereby granted permission to have an access to the state highway at the location noted below. The access shall be constructed, maintained and used in accordance with this permit, including the State Highway Access Code and any attachments, terms, conditions and exhibits. This permit may be revoked by the Issuing Authority if at any time the permitted access and its use violate any parts of this permit. The issuing authority, the Department and their duly appointed agents and employees shall be held harmless against any action for personal injury or property damage sustained by reason of the exercise of the permit.	
Location: Located on the north (east) side of Hwy 082A approximately 150 feet north of 10th St. and 2450 feet north of MP 1	
Access to Provide Service to: (Land Use Code) (Size) (Units) 911 - Walk-in Bank 90 DHV	
Additional Information: This is a right-in/right out access only. No left turns are allowed.	

MUNICIPALITY OR COUNTY APPROVAL Required only when the appropriate local authority retains issuing authority.			
Signature	Print Name	Date	Title
Upon the signing of this permit the permittee agrees to the terms and conditions and referenced attachments contained herein. All construction shall be completed in an expeditious and safe manner and shall be finished within 45 days from Initiation. The permitted access shall be completed in accordance with the terms and conditions of the permit prior to being used.			
The permittee shall notify Les Stanton 2K2 with the Colorado Department of Transportation, at (970) 384-3357 at least 48 hours prior to commencing construction within the State Highway right-of-way.			
The person signing as the permittee must be the owner or legal representative of the property served by the permitted access and have full authority to accept the permit and its terms and conditions.			
Permittee Signature: 	Print Name Kager Probst President & CEO ANB Bank	Date	
Co-Permittee Signature: (if applicable)	Print Name	Date	
This permit is not valid until signed by a duly authorized representative of the Department. COLORADO DEPARTMENT OF TRANSPORTATION			
Signature	Print Name	Title	Date (of issue)

Copy Distribution: Required: 1.Region 2.Applicant 3.Staff Access Section 4.Central Files Make copies as necessary for: Local Authority MTCE Patrol Inspector Traffic Engineer Previous editions are obsolete and may not be used Page 1 of 3 CDOT Form #101 5/07

**State Highway Access Permit
Form 101, Page 2**

The following paragraphs are excerpts of the State Highway Access Code. These are provided for your convenience but do not alleviate compliance with all sections of the Access Code. A copy of the State Highway Access Code is available from your local issuing authority (local government) or the Colorado Department of Transportation (Department). When this permit was issued, the issuing authority made its decision based in part on information submitted by the applicant, on the access category which is assigned to the highway, what alternative access to other public roads and streets is available, and safety and design standards. Changes in use or design not approved by the permit or the issuing authority may cause the revocation or suspension of the permit.

APPEALS

1. Should the permittee or applicant object to the denial of a permit application by the Department or object to any of the terms or conditions of a permit placed there by the Department, the applicant and permittee (appellant) have a right to appeal the decision to the [Transportation] Commission [of Colorado]. To appeal a decision, submit a request for administrative hearing to the Transportation Commission of Colorado within 60 days of transmittal of notice of denial or transmittal of the permit for signature. Submit the request to the Transportation Commission of Colorado, 4201 East Arkansas Avenue, Denver, Colorado 80222-3400. The request shall include reasons for the appeal and may include changes, revisions, or conditions that would be acceptable to the permittee or applicant.

2. Any appeal by the applicant or permittee of action by a local issuing authority shall be filed with the local authority and be consistent with the appeal procedures of the local authority.

3. In submitting the request for administrative hearing, the appellant has the option of including within the appeal a request for a review by the Department's internal administrative review committee pursuant to [Code] subsection 2.10. When such committee review is requested, processing of the appeal for formal administrative hearing, 2.9(5) and (6), shall be suspended until the appellant notifies the Commission to proceed with the administrative hearing, or the appellant submits a request to the Commission or the administrative law judge to withdraw the appeal. The two administrative processes, the internal administrative review committee, and the administrative hearing, may not run concurrently.

4. Regardless of any communications, meetings, administrative reviews or negotiations with the Department or the internal administrative review Committee regarding revisions or objections to the permit or a denial, if the permittee or applicant wishes to appeal the Department's decision to the Commission for a hearing, the appeal must be brought to the Commission within 60 days of transmittal of notice of denial or transmittal of the permit.

PERMIT EXPIRATION

1. A permit shall be considered expired if the access is not under construction within one year of the permit issue date or before the expiration of any authorized extension. When the permittee is unable to commence construction within one year after the permit issue date, the permittee may request a one year extension from the issuing authority. No more than two one-year extensions may be granted under any circumstances. If the access is not under construction within three years from date of issue the permit will be considered expired. Any request for an extension must be in writing and submitted to the issuing authority before the permit expires. The request should state the reasons why the extension is necessary, when construction is anticipated, and include a copy of page 1 (face of permit) of the access permit. Extension approvals shall be in writing. The local issuing authority shall obtain the concurrence of the Department prior to the approval of an extension, and shall notify the Department of all denied extensions within ten days. Any person wishing to reestablish an access permit that has expired may begin again with the application procedures. An approved Notice to Proceed, automatically renews the access permit for the period of the Notice to Proceed.

CONSTRUCTION

1. Construction may not begin until a Notice to Proceed is approved. (Code subsection 2.4)

2. The construction of the access and its appurtenances as required by the terms and conditions of the permit shall be completed at the expense of the permittee except as provided in subsection 2.14. All materials used in the construction of the access within the highway right-of-way or on permanent easements, become public property. Any materials removed from the highway right-of-way will be disposed of only as directed by the Department. All fencing, guard rail, traffic control devices and other equipment and materials removed in the course of access construction shall be given to the Department unless otherwise instructed by the permit or the Department inspector.

3. The permittee shall notify the individual or the office specified on the permit or Notice to Proceed at least two working days prior to any construction within state highway right-of-way. Construction of the access shall not proceed until both the access permit and the Notice to Proceed are issued. The access shall be completed in an expeditious and safe manner and shall be finished within 45 days from initiation of construction within the highway right-of-way. A construction time extension not to exceed 30 working days may be requested from the individual or office specified on the permit.

4. The issuing authority and the Department may inspect the access during construction and upon completion of the access to ensure that all terms and conditions of the permit are met. Inspectors are authorized to enforce the conditions of the permit during construction and to halt any activities within state right-of-way that do not comply with the provisions of the permit, that conflict with concurrent highway construction or maintenance work, that endanger highway property, natural or cultural resources protected by law, or the health and safety of workers or the public.

5. Prior to using the access, the permittee is required to complete the construction according to the terms and conditions of the permit. Failure by the permittee to abide by all permit terms and conditions shall be sufficient cause for the Department or issuing authority to initiate action to suspend or revoke the permit and close the access. If in the determination of the Department or issuing authority the failure to comply with or complete the construction requirements of the permit create a highway safety hazard, such shall be sufficient cause for the summary suspension of the permit. If the permittee wishes to use the access prior to completion, arrangements must be approved by the issuing authority and Department and included in the permit. The Department or issuing authority may order a halt to any unauthorized use of the access pursuant to statutory and regulatory powers. Reconstruction or improvement of the access may be required when the permittee has failed to meet required specifications of design or materials. If any construction element fails within two years due to improper construction or material specifications, the permittee shall be responsible for all repairs. Failure to make such repairs may result in suspension of the permit and closure of the access.

6. The permittee shall provide construction traffic control devices at all times during access construction, in conformance with the M.U.T.C.D. as required by section 42-4-104, C.R.S., as amended.

7. A utility permit shall be obtained for any utility work within highway right-of-way. Where necessary to remove, relocate, or repair a traffic control device or public or private utilities for the construction of a permitted access, the relocation, removal or repair shall be accomplished by the permittee without cost to the Department or issuing authority, and at the direction of the Department or utility company. Any damage to the state highway or other public right-of-way beyond that which is allowed in the permit shall be repaired immediately. The permittee is responsible for the repair of any utility damaged in the course of access construction, reconstruction or repair.

8. In the event it becomes necessary to remove any right-of-way fence, the posts on either side of the access shall be securely braced with an approved end post before the fence is cut to prevent any slacking of the remaining fence. All posts and wire removed are Department property and shall be turned over to a representative of the Department.

9. The permittee shall ensure that a copy of the permit is available for review at the construction site at all times. The permit may require the contractor to notify the individual or office specified on the permit at any specified phases in construction to allow the field inspector to inspect various aspects of construction such as concrete forms, subbase, base course compaction, and materials specifications. Minor changes and additions may be ordered by the Department or local authority field inspector to meet unanticipated site conditions.

10. Each access shall be constructed in a manner that shall not cause water to enter onto the roadway or shoulder, and shall not interfere with the existing drainage system on the right-of-way or any adopted municipal system and drainage plan.

11. By accepting the permit, permittee agrees to save, indemnify, and hold harmless to the extent allowed by law, the issuing authority, the Department, its officers, and employees from suits, actions, claims of any type or character brought because of injuries or damage sustained by any person resulting from the permittee's use of the access permit during the construction of the access.

CHANGES IN ACCESS USE AND PERMIT VIOLATIONS

1. It is the responsibility of the property owner and permittee to ensure that the use of the access to the property is not in violation of the Code, permit terms and conditions or the Act. The terms and conditions of any permit are binding upon all assigns, successors-in-interest, heirs and occupants. If any significant changes are made or will be made in the use of the property which will affect access operation, traffic volume and or vehicle type, the permittee or property owner shall contact the local issuing authority or the Department to determine if a new access permit and modifications to the access are required.

2. When an access is constructed or used in violation of the Code, section 43-2-147(5)(c), C.R.S., of the Act applies. The Department or issuing authority may summarily suspend an access permit and immediately order closure of the access when its continued use presents an immediate threat to public health, welfare or safety. Summary suspension shall comply with article 4 of title 24, C.R.S.

MAINTENANCE

1. The permittee, his or her heirs, successors-in-interest, assigns, and occupants of the property serviced by the access shall be responsible for meeting the terms and conditions of the permit, the repair and maintenance of the access beyond the edge of the roadway including any cattle guard and gate, and the removal or clearance of snow or ice upon the access even though deposited on the access in the course of Department snow removal operations. Within unincorporated areas the Department will keep access culverts clean as part of maintenance of the highway drainage system. However, the permittee is responsible for the repair and replacement of any access-related culverts within the right-of-way. Within incorporated areas, drainage responsibilities for municipalities are determined by statute and local ordinance. The Department will maintain the roadway including auxiliary lanes and shoulders, except in those cases where the access installation has failed due to improper access construction and/or failure to follow permit requirements and specifications in which case the permittee shall be responsible for such repair. Any significant repairs such as culvert replacement, resurfacing, or changes in design or specifications, requires authorization from the Department.

**STATE of COLORADO HIGHWAY ACCESS PERMIT
ADDITIONAL TERMS and CONDITIONS**

September 10, 2019

PERMIT No. 319092

Permittee(s): ANB Bank

Location: Garfield County on CO Highway 082A, near Mile Ref. Pt. 0.56 Left

1. This permitted access is only for the use and purpose stated in the Application and Permit. This Permit is issued in accordance with the State Highway Access Code (2 CCR 601-1), and is based in part upon the information submitted by the Permittee. Any subsequent relocation, reconstruction, or modifications to the access or changes in the traffic volume or traffic nature using the access shall be requested for by means of a new application. Any changes causing non-compliance with the Access Code may render this permit void, requiring a new permit.
2. This permit replaces any and all additional access permits that may be in existence for this access.
3. This permit is for walk-in bank.
4. The traffic volume shall be 80 DHV.
5. This access shall be a right in/right out access. All left turn are prohibited.
6. The Permittee shall design the access in a manner that will only allow right turn ingress and egress.
7. This access shall be designed and constructed to CDOT's design standards.
8. The horizontal axis of the access to the State Highway shall be constructed perpendicular to the centerline of the highway and extend from the edge of the roadway a minimum distance of 40 feet, or to the property line, whichever is greater. This design shall be in conformance with section 4 of the State Highway Access Code, 2CCR 601-1.
9. Side slopes shall be at a 4:1 slope on the roadway. The roadway shall slope away from the highway at a -2% grade for the first 20 feet of driveway. This design shall be in conformance with section 4 of the State Highway Access Code, 2CCR 601-1.
10. Immediately upon completion of earthwork, and prior to use, this access shall be hard surfaced in accordance with Section 4.7 of the Access.
11. The access shall be hard-surfaced a minimum distance of 50 feet from the traveled way, or to the CDOT Right-of-Way, whichever is greater. Where the hard surface is to abut the existing pavement, the existing pavement shall be saw cut and removed a minimum of one foot back from the existing edge for bituminous, or until an acceptable existing cross slope is achieved. Surfacing shall meet the Department's specifications with minimum surfacing to be equal to, or greater than, existing highway conditions.

12. Materials, Placing, and Compaction

Unless the Applicant has approval from the Access Manager who may state otherwise, the following are requirements for driveway construction:

Hot Mix Asphalt Option (HMA)

Base: 16 inches of class 6 gravel with maximum 6-inch lifts;

Surface: 4 inches of HMA in two, 2-inch lifts;

Compaction of the subgrade, embankments and backfill shall comply with sections 203 & 304 of the Colorado Highway Standard Specifications for Road and Bridge Construction.

**STATE of COLORADO HIGHWAY ACCESS PERMIT
ADDITIONAL TERMS and CONDITIONS**

September 10, 2019

PERMIT No. 319092

Permittee(s): ANB Bank

Location: Garfield County on CO Highway 082A, near Mile Ref. Pt. 0.56 Left

Concrete Pavement Option: Portland Cement (PCCP)

Base: 4 inches of class 6 gravel;

Surface: A minimum of 6" of doweled and tied PCCP.

Compaction of the subgrade, embankments and backfill shall comply with sections 203 & 304 of the Colorado Highway Standard Specifications for Road and Bridge Construction.

13. **A Notice to Proceed, CDOT Form 1265, must be issued by CDOT before beginning construction on the access or any activity within the highway Right-of-Way.**
14. **To receive the Notice to Proceed** the applicant shall submit a complete packet to CDOT with the following items:
 - (a) A cover letter requesting a Notice to Proceed.
 - (b) Certificate of Insurance Liability as per Section 2.3(11)(i) of the State Highway Access Code, naming CDOT as an additional insured for general liability.
 - (c) A certified Traffic Control Plan in accordance with Section 2.4(6) of the Access Code. The Traffic Control Plan shall provide accessibility features to accommodate all pedestrians including persons with disabilities for all pathways during construction.
 - (d) Two copies of Construction Plans Stamped (11"x 17" with a minimum scale of 1" = 50') by a Colorado Registered Professional Engineer in full compliance with the State Highway Access Code.
15. No drainage from this site shall enter onto the State Highway travel lanes. The Permittee is required to maintain all drainage in excess of historical flows and time of concentration on site. All existing drainage structures shall be extended, modified or upgraded, as applicable, to accommodate all new construction and safety standards, in accordance with the Department's standard specifications.
16. Open cuts, which are at least 4 inches in depth, within 30 feet of the edge of the State Highway traveled way, will not be left open at night, on weekends, or on holidays, or shall be protected with a suitable barrier per State and Federal Standards.
17. Nothing in this permit shall prohibit the Chief Engineer from exercising the right granted in CRS 43-3-102 Including but not limited to restricting left hand turns by construction of physical medial separations.
18. The Permittee is responsible for obtaining any necessary additional Federal, State and/or City/County permits or clearances required for construction of the access. Approval of this access permit does not constitute verification of this action by the Permittee. Permittee is also responsible for obtaining all necessary utility permits in addition to this access permit.
19. All workers within the State Highway right-of-way shall comply with their employer's safety and health policies/procedures, and all applicable U.S. Occupational Safety and Health Administration (OSHA) regulations - including, but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction. Personal protective equipment (e.g. head protection, footwear, high visibility

**STATE of COLORADO HIGHWAY ACCESS PERMIT
ADDITIONAL TERMS and CONDITIONS**

September 10, 2019

PERMIT No. 319092

Permittee(s): ANB Bank

Location: Garfield County on CO Highway 082A, near Mile Ref. Pt. 0.56 Left

apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in regulation.

20. The Permittee shall provide accessibility features to accommodate all pedestrians including persons with disabilities for all pathways during and after construction.
21. The Permittee is required to comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) that have been adopted by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board), and incorporated by the U.S. Attorney General as a federal standard. These guidelines are defining traversable slope requirements and prescribing the use of a defined pattern of truncated domes as detectable warnings at street crossings. The new Standards Plans and can be found on the Design and Construction Project Support web page at: <https://www.codot.gov/business/designsupport/standard-plans>.
22. When it is necessary to remove any highway right-of-way fence, the posts on either side of the access entrance shall be securely braced with approved end posts and in conformance with the Department's M-607-1 standard, before the fence is cut, to prevent slacking of the remaining fence. All materials removed shall be returned to the Department.
23. It shall be the responsibility of the Permittee to maintain adequate sight distance for this driveway. Trimming of vegetation or trees to maintain adequate sight distance is the sole responsibility of the Permittee.
24. The permittee, his or her heirs, successors-in-interest, assigns, and occupants of the property serviced by the access shall be responsible for meeting the terms and conditions of the permit, the repair and maintenance of the access beyond the edge of the roadway including any cattle guard and gate, and the removal or clearance of snow or ice upon the access even though deposited on the access in the course of Department snow removal operations. Within unincorporated areas the Department will keep access culverts clean as part of maintenance of the highway drainage system. However, the permittee is responsible for the repair and replacement of any access-related culverts within the right-of-way. Within incorporated areas, drainage responsibilities for municipalities are determined by statute and local ordinance. The Department will maintain the roadway including auxiliary lanes and shoulders, except in those cases where the access installation has failed due to improper access construction and/or failure to follow permit requirements and specifications in which case the permittee shall be responsible for such repair. Any significant repair such as culvert replacement, resurfacing, or changes in design or specifications, requires authorization from the Department.
25. Any damage to present highway facilities including traffic control devices shall be repaired immediately at no cost to the Department and prior to continuing other work.
26. During access construction, no construction-related, personal vehicles will be permitted to park in the state highway right-of-way.
27. Any mud or other material tracked, or otherwise deposited, on the roadway shall be removed daily or as ordered by the Department inspector. If mud is an obvious condition during site construction, it is recommended that the contractor build a Stabilized Construction Entrance or Scrubber Pad at the intended construction access to aid in the removal of mud and debris from vehicle tires. The details of the Stabilized Construction Entrance can be found in the M & S Standards Plan No. M-208-1.

**STATE of COLORADO HIGHWAY ACCESS PERMIT
ADDITIONAL TERMS and CONDITIONS**

September 10, 2019

PERMIT No. 319092

Permittee(s): ANB Bank

Location: Garfield County on CO Highway 082A, near Mile Ref. Pt. 0.56 Left

28. A fully-executed, complete copy of this permit and the Notice to Proceed must be on the job site with the contractor at all times during the construction. Failure to comply with this or any other construction requirement may result in the immediate suspension of work by order of the Department inspector or the issuing authority.
29. No work will be allowed at night, Saturdays, Sundays and legal holidays without prior authorization from the Department. The Department may also restrict work within the State Highway right-of-way during adverse weather conditions.
30. The access shall be completed in an expeditious and safe manner and shall be completed within 45 days from initiation of construction within State Highway right-of-way or in accordance with written concurrence of the Access Manager. All construction shall be completed in a single season.
31. All costs associated with any type of utility work will be at the sole responsibility and cost of the Permittee and at no cost to CDOT.
32. Areas of roadway and/or right-of-way disturbed during this installation shall be restored to their original conditions to insure proper strength and stability, drainage and erosion control. Restoration shall meet the Department's standard specifications for topsoil, fertilization, mulching, and re-seeding.
33. Upon the completion of the access (and prior to any use as allowed by this permit), the Applicant shall notify the Access Manager within 10 days to request a final inspection. This request shall include certification that all materials and construction have been completed in accordance with all applicable Department Standards and Specifications; and that the access is constructed in conformance with the State Highway Access Code, 2 CCR 601-1, including this permit. The Engineer of Record as indicated on the construction plans, may be requested by the Department for this inspection. The access serviced by this permit may not be opened to traffic until written approval has been given from the CDOT Access Manager.



COLORADO
Department of
Transportation

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like roads and sidewalks prevent stormwater from naturally soaking into the ground

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt and other pollutants and flow into CDOT's storm drain system or directly into a stream, river, lake, wetland or reservoir. Anything that enters CDOT's storm drain system is discharged untreated into the waterways we use for fishing, swimming, and providing drinking water.



Dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, pH, wrecked or discarded equipment, rock, sand, any industrial, municipal, or agricultural waste.

Tips for Reporting an Illicit Discharge

Call the illicit discharge hotline at (303) 512-4426

From a safe distance try to estimate the amount of the discharge.

Identify characteristics of the discharge (color, odor, algae, etc.).

Obtain information on the vehicle dumping the waste (if applicable).

Do not approach!

Call *CSP for illicit dumping.

If possible, take a photo, record a license plate.

REMEMBER:

Never get too close to the illicit discharge, it may be dangerous!!!

For more information on CDOT Utility Permits:

<https://www.codot.gov/business/permits/utilityspecialuse>

For more information on CDOT Access Permits:

<https://www.codot.gov/business/permits/accesspermits>

For more information on CDOT Water Quality Program:

Water Quality Program Manager

4201 E. Arkansas Ave.

Shumate Building

Denver, Colorado 80222

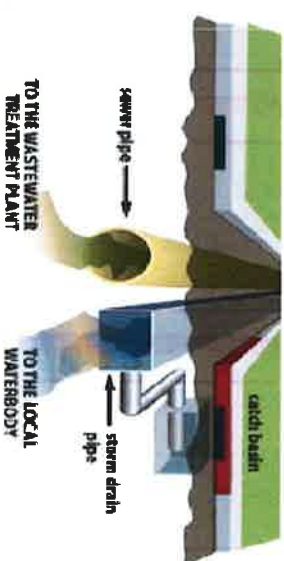
303-757-9343



COLORADO
Department of
Transportation

Water Quality Program Industrial Facilities Program

CDOT has a Municipal Separate Storm Sewer System permit, otherwise known as (MS4) from the Colorado Department of Public Health and Environment. The permit states that only stormwater can be discharged from CDOT's storm drain system



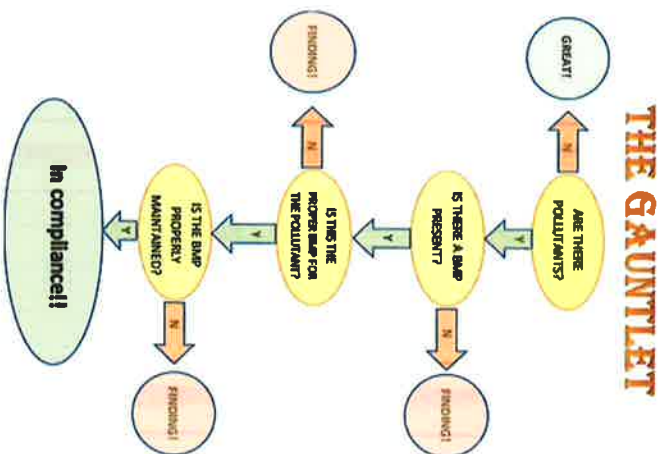
As part of the permit, CDOT has several different programs to prevent pollutants from entering into the storm drain system:

- Construction Site Program
- New Development Redevelopment Program
- Illicit Discharge Program
- Industrial Facilities Program
- Public Education and Outreach Program
- Pollution Prevention and Good Housekeeping Program
- Wet Weather Monitoring Program



Control Measures for Industrial Facilities

Industrial facilities can use control measures (CM) otherwise known as Best Management Practices (BMP) during the construction of a facility and when operating the facility. Control measures are schedules of activities, maintenance procedures, and other management practices to prevent and reduce pollution entering into CDOT's storm drain system. Control Measures also include treatment, operating procedures, and practices to control site run off which can include structural and non-structural controls.



CDOT defines a utility, or utility facility as any privately, publicly, or cooperatively owned line, facility, or system producing, transmitting or distributing the following:

- ✓ Communications
- ✓ Cable television
- ✓ Power
- ✓ Electricity
- ✓ Light
- ✓ Heat Gas
- ✓ Oil
- ✓ Crude Products
- ✓ Water
- ✓ Stream
- ✓ Waste
- ✓ Stormwater not connected with highway drainage
- ✓ Similar Commodity



Industrial Facilities Program Elements:

1. Educate and outreach to owners or operators that have potential to contribute substantial pollutant to water.
2. Report and include information on discharge and water quality concerns. Provide written notification within 15 days of discovery to CDPHE.
3. Submit an annual report to CDPHE containing the number of informational brochures distributed; name and title of each individual trained.

Education

There are instances when a utility company or other entity doing work in the state highway right-of-way will require some type of environmental permit or clearance for that work. CDOT has put together an Environmental Clearances Information Summary for those applying for a CDOT Utility and Special Use Permit or Access Permit to obtain all required clearances. This fact sheet is given to each permittee and is available at:

<http://www.coloradodot.info/programs/environmental/resources/guidance-standards/Environmental%20Clearances%20info%20Summary.pdf>

COLORADO DEPARTMENT OF TRANSPORTATION

Environmental Clearances Information Summary

PURPOSE - This summary is intended to inform entities external to CDOT that may be entering the state highway right-of-way to perform work related to their own facilities (such as Utility, Special Use or Access Permittees), about some of the more commonly encountered environmental permits/clearances that may apply to their activities. This listing is not all-inclusive - additional environmental or cultural resource permits/clearances may be required in certain instances. Appropriate local, state and federal agencies should be contacted for additional information if there is any uncertainty about what permits/clearances are required for a specific activity. **IMPORTANT – Please Review The Following Information Carefully – Failure to Comply With Regulatory Requirements May Result In Suspension or Revocation of Your CDOT Permit, Or Enforcement Actions By Other Agencies**

CLEARANCE CONTACTS - As indicated in the permit/clearance descriptions listed below, the following individuals or agencies may be contacted for additional information:

- Colorado Department of Public Health and Environment (CDPHE): General Information – (303) 692-2035
Water Quality Control Division (WQCD): (303) 692-3500
Environmental Permitting Website <https://www.colorado.gov/pacific/cdphe/all-permits>
- CDOT Water Quality Program Manager: (303) 757-9343 <https://www.codot.gov/programs/environmental/water-quality>
- CDOT Asbestos Project Manager: Phil Kangas, (303) 512-5519
- Colorado Office of Archaeology and Historic Preservation: (303) 866-3395
- U.S. Army Corps of Engineers, District Regulatory Offices:
Omaha District (NE CO), Denver Office (303) 979-4120
<http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado.aspx>
Sacramento Dist. (Western CO), Grand Junction Office (970) 243-1199
<http://www.spk.usace.army.mil/Missions/Regulatory.aspx>
Albuquerque District (SE CO), Pueblo Office (719)-543-9459
<http://www.spa.usace.army.mil/Missions/RegulatoryProgramandPermits.aspx>
- CDOT Utilities, Special Use and Access Permitting: (303) 757-9654 <https://www.codot.gov/business/permits>

Wildlife Resources - Disturbance of wildlife shall be avoided to the maximum extent practicable. Entry into areas of known or suspected threatened or endangered species habitat will require special authorization from the CDOT permitting office. If any threatened or endangered species are encountered during the progress of the permitted work, work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Information about threatened or endangered species may be obtained from the CDOT website, <http://www.codot.gov/programs/environmental/wildlife/guidelines>, or the Colorado Parks and Wildlife (CPW) website, <http://www.cpw.state.co.us/learn/Pages/SOC-ThreatenedEndangeredList.aspx>. Additional guidance may be provided by the appropriate Region Planning and Environmental Manager (RPEM).

Cultural Resources - The applicant must request a file search of the permit area through the Colorado Office of Archaeology and Historic Preservation (OAHP), Denver, to ascertain if historic or archaeological resources have previously been identified (<http://www.historycolorado.org/oaHP/file-search>). Inventory of the permit area by a qualified cultural resources specialist may be necessary, per the recommendation of CDOT. If archaeological sites/artifacts or historic resources are known to exist prior to the initiation of the permitted work or are encountered as the project progresses, all work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Additional guidance may be provided by the Regional Permitting Office and RPEM. **Contact Information:** Contact the OAHP for file searches at (303) 866-3395.

Paleontological Resources - The applicant must request a fossil locality file search through the University of Colorado Museum, Boulder (<https://cumuseum.colorado.edu/research/paleontology/vertebrates/policies>), and the Denver Museum of Nature and Science (<http://www.dmns.org/science/collections/earth-science-collections/>) to ascertain if paleontological resources have been previously identified in or near the permit area. Inventory of the permit area by a qualified paleontologist may be necessary, per the recommendation of CDOT. If fossils are encountered during the permitted work, all work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Additional guidance may be provided by the Regional Permitting Office in the Permit Special Provisions. **Contact Information:** See the museum websites listed above for Paleontological Collections Manager contact information. Contact the CDOT Paleontologist for further information at nicole.peavey@state.co.us or (303) 757-9632. The CDOT Paleontologist will not conduct a comprehensive file search independently of the museums.

Hazardous Materials, Solid Waste - The Solid Wastes Disposal Sites and Facilities Act C.R.S. 30-20-100, et al, and Regulations Pertaining to Solid Waste Disposal Sites and Facilities (6 CCR 1007-2), prohibit solid waste disposal without an approved Certificate of Designation (a landfill permit). The Colorado Hazardous Waste Act C.R.S. 25-15-301 et al, and the Colorado Hazardous Waste Regulations (6 CCR 1007-3) prohibit the transfer, storage or disposal (TSD) of hazardous waste except at permitted TSD sites. There are no permitted landfills or TSD sites within the State Highway Right of Way. Therefore, all solid or hazardous wastes that might be generated by the activities of entities entering the State Highway Right of Way must be removed from the ROW and disposed of at a permitted facility or designated collection point (e.g., for solid waste, a utility or construction company's own dumpster). If pre-existing solid waste or hazardous materials contamination (including oil or petroleum contaminated soil, asbestos, chemicals, mine tailings, etc.) is encountered during the performance of work, the permittee shall halt work in the affected area and immediately contact the CDOT Regional Permitting Office for direction as to how to proceed. **Contact Information:** Theresa Santangelo-Dreiling, CDOT Hazardous Materials Project Manager, (303) 512-5524, or Andy Flurkey, (303) 512-5520.

Asbestos Containing Materials, Asbestos Contaminated Soil - All work on asbestos containing materials (ACM) must comply with the applicable requirements of the CDPHE Air Pollution Control Division's (APCD) Regulation 8. Disposal of ACM, and work done in asbestos-contaminated soil, must comply with the CDPHE Hazardous Materials and Waste Management Division's (HMWMD) Solid

Waste Regulations. The application for any CDOT permit must specifically identify any ACM involved in the work for which authorization is being requested. Additional guidance or requirements may be specified in the permit special provisions. **Contact Info:** CDPHE APCD and HMWMD Regulations can be accessed via the CDPHE Environmental Permitting Website listed above. Additional information **concerning clearance on CDOT projects** is available from the CDOT Asbestos Project Manager (303) 512-5519, or Theresa Santangelo-Dreiling, Hazardous Materials Management Supervisor (303) 512-5524.

Transportation of Hazardous Materials - No person may offer or accept a hazardous material for transportation in commerce unless that person is registered in conformance with the United States Department of Transportation regulations at 49 CFR, Part 171. The hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by applicable requirements, or an exemption, approval or registration has been issued. Vehicles requiring a placard, must obtain authorization and a State HAZMAT Permit from the Colorado Public Utilities Commission. **Contact Information:** For authorization and more info call the Federal Motor Safety Carrier Administration, US DOT for inter- and intra-state HAZMAT Registration (303) 969-6748. Colorado Public Utilities Commission: (303) 894-2868.

Discharge of Dredged or Fill Material – 404 Permits Administered By the U.S. Army Corps of Engineers, and Section 401 Water Quality Certifications Issued by the CDPHE WQCD - Corps of Engineers 404 permits are required for the discharge of dredged or fill materials into waters of the United States, including wetlands. There are various types of 404 permits, including nationwide permits, which are issued for activities with relatively minor impacts. For example, there is a nationwide permit for utility line activities (nwp #12). Depending upon the specific circumstances, it is possible that either a "general" or "individual" 404 permit would be required. If an individual 404 permit is required, section 401 water quality certification from the CDPHE WQCD is also required. Contact the appropriate Corps District Regulatory Office for information about what type of 404 permit may be required (contact information above). Contact the CDPHE Water Quality Control Division at (303) 692-3500.

Working on or in any stream or its bank - In order to protect and preserve the state's fish and wildlife resources from actions that may obstruct, diminish, destroy, change, modify, or vary a natural existing stream or its banks or tributaries, it may be necessary to obtain a Senate Bill 40 certification from the Colorado Department of Natural Resources. A stream is defined as 1) represented by a solid blue line on USGS 7.5' quadrangle maps; and/or 2) intermittent streams providing live water beneficial to fish and wildlife; and/or 3) segments of streams supporting 25% or more cover within 100 yards upstream or downstream of the project; and/or 4) segments of streams having wetlands present within 200 yards upstream or downstream of the project measured by valley length. The CPW application, as per guidelines agreed upon by CDOT and CPW, can be accessed at <http://www.coloradodot.info/programs/environmental/wildlife/guidelines>.

Stormwater Construction Permit (SCP) and Stormwater Discharge From Industrial Facilities - Discharges of stormwater runoff from construction sites disturbing one acre or more - or certain types of industrial facilities, such as concrete batch plants - requires a CDPS Stormwater Permit. **Contact Information:** Contact the CDPHE Water Quality Control Division at (303) 692-3500. Website: <https://www.colorado.gov/pacific/cdphe/wq-construction-general-permits> and <https://colorado.gov/pacific/cdphe/wq-commerce-and-industry-permits>.

Construction Dewatering (Discharge or Infiltration) and Remediation Activities - Discharges of water encountered during excavation or work in wet areas may require a Construction Dewatering or Remediation Activities Discharge Permit. **Contact Information:** For Construction Dewatering and Remediation Activities Discharge Permits, contact the CDPHE WQCD at (303) 692-3500. For Applications and Instructions (CDPHE website): <https://www.colorado.gov/pacific/cdphe/wq-construction-general-permits>.

Municipal Separate Storm Sewer System (MS4) Discharge Permit - Discharges from the storm sewer systems of larger municipalities, and from the CDOT highway drainage system that lies within those municipalities, are subject to MS4 Permits issued by the CDPHE WQCD. For facilities that lie within the boundaries of a municipality that is subject to an MS4 permit, the owner of such facility should contact the municipality regarding stormwater related clearances that may have been established under that municipality's MS4 permit. All discharges to the CDOT highway drainage system or within the Right of Way (ROW) must comply with the applicable provisions of the Colorado Water Quality Control Act, the Water Quality Control Commission (WQCC) Regulations (<https://www.colorado.gov/pacific/cdphe/wqcc-regulations-and-policies-and-water-quality-statutes>) and the CDOT MS4 Permit # COS-000005 (<https://www.codot.gov/programs/environmental/water-quality/documents>). Discharges are subject to inspection by CDOT and CDPHE. Contact the CDPHE Water Quality Control Division at (303) 692-3500 for a listing of municipalities required to obtain MS4 Permits, or go to <https://www.colorado.gov/pacific/cdphe/wq-municipal-ms4-permits>.

General Prohibition – Discharges - All discharges are subject to the provisions of the Colorado Water Quality Control Act and the Colorado Discharge Permit Regulations. Prohibited discharges include, but are not limited to, substances such as wash water, paint, automotive fluids, solvents, oils or soaps and sediment. **Contact Information:** Contact the CDPHE Water Quality Control Division at (303) 692-3500.

General Authorization - Allowable Non-Stormwater Discharges - Unless otherwise identified by CDOT or the WQCD as significant sources of pollutants to the waters of the State, the following discharges to stormwater systems are allowed without a Colorado Discharge Permit System permit: landscape irrigation, diverted stream flows, uncontaminated ground water infiltration to separate storm sewers, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, uncontaminated springs, footing drains, water line flushing, flows from riparian habitats and wetlands, and flow from firefighting activities. Allowable non-stormwater discharges can be found at <https://www.codot.gov/programs/environmental/water-quality/glossary.html>. **Contact Information:** The CDPHE Water Quality Control Division (telephone #'s listed above).

Erosion and Sediment Control Practices - For activities requiring a Stormwater Construction Permit, erosion control requirements will be specified in that permit. In those situations where a stormwater permit is not required, all reasonable measures should be taken in order to minimize erosion and sedimentation according to CDOT Standard Specifications 107.25 and 208. All disturbances require a stabilization plan, native seeding or landscape design plan according to applicable CDOT Standard Specifications 212-217 and 623. In any case, the CDOT Erosion Control and Stormwater Quality Guide (most recent version) should be used to design erosion controls and to restore disturbed vegetation. **Contact Information:** The CDOT Erosion Control and Stormwater Quality Guide may be obtained from the Bid Plans Office at (303) 757-9313 or from: <https://www.codot.gov/programs/environmental/landscape-architecture/erosion-storm-quality>.

Disposal of Drilling Fluids - Drilling fluids used in operations such as Horizontal Directional Drilling may be classified as "discharges" or "solid wastes," and in general, should be pumped or vacuumed from the construction area, removed from the State Highway Right of Way, and disposed of at permitted facilities that specifically accept such wastes. Disposal of drilling fluids into storm drains, storm sewers, roadside ditches or any other type of man-made or natural waterway is prohibited by Water Quality Control and/or Solid Waste regulations. Small quantities of drilling fluid solids (less than 1 cubic yard of solids) may be left on-site after either being separated from fluids or after infiltration of the water, provided: 1) the drilling fluid consists of only water and bentonite clay, or, if required for proper drilling properties, small quantities of polymer additives that are approved for use in drinking water well drilling; 2) the solids are fully contained in a pit, and are not likely to pose a nuisance to future work in the area, 3) the solids are covered and the area restored as required by CDOT permit requirements (Utility, Special Use, or Access Permits, etc.). **Contact Information:** Contact CDPHE (telephone #'s listed above).

Noxious Weeds and Invasive Species Management Plan – Noxious Weeds and Invasive Species guidance can be found by contacting the Colorado Department of Agriculture (<https://www.colorado.gov/pacific/agconservation/noxiousweeds>) and the Colorado Division of Parks and Wildlife (<http://cpw.state.co.us/aboutus/Pages/RS-NoxiousWeeds.aspx>). In either case, management plans involving the control of noxious weeds associated with the permitted activity and cleaning of equipment will be required.

Concrete Washout - Waste generated from concrete activities shall NOT be allowed to flow into the drainage ways, inlets, receiving waters, or in the CDOT ROW. Concrete waste shall be placed in a temporary concrete washout facility and must be located a minimum of 50 feet from state waters, drainageways, and inlets. Concrete washout shall only be performed as specified by the CDOT Environmental Program and shall be in accordance to CDOT specifications and guidelines. **Contact Information:** Contact CDPHE or find additional information on the CDOT website: <https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs> and refer to the specifications and their revisions for sections 101, 107 and 208.

Spill Reporting - Spills shall be contained and cleaned up as soon as possible. Spills shall NOT be washed down into the storm drain or buried. All spills shall be reported to the CDOT Illicit Discharge Hotline at (303) 512-4446 (4H2O), as well as the Regional Permitting Office and Regional Maintenance Supervisor. Spills on highways, into waterways, any spill in the highway right-of-way exceeding 25 gallons, or that may otherwise present an immediate danger to the public shall be reported by calling 911, and shall also be reported to the CDPHE at 1-877-518-5608. More information can be found at <https://www.colorado.gov/pacific/cdphe/emergency-reporting-line>.

About This Form - Questions or comments about this Information Summary may be directed to Alex Karami, Program Administrator, CDOT Access Management Unit, at (303) 757-9841, alex.karami@state.co.us.



Kumar & Associates, Inc.
Geotechnical and Materials Engineers
and Environmental Scientists

5020 County Road 154
Glenwood Springs, CO 81601
phone: (970) 945-7988
fax: (970) 945-8454
email: kaglenwood@kumarus.com
www.kumarus.com

An Employee Owned Company

Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs, and Summit County, Colorado

February 21, 2019

Realty Management Group, LLC
Attn: Will Coffield, P.E.
3033 East First Avenue, Suite 210
Denver, Colorado 80206
wcoffield@realtygp.com



Project No. 19-7-147

Subject: Preliminary Summary Soils Report, Proposed ANB Bank Building, 910 Grand Avenue,
Glenwood Springs, Colorado

Gentlemen:

As requested, we are providing a preliminary soils report for the proposed bank building based on previous subsoil studies performed on adjacent properties. This report can be used for planning and preliminary design of the proposed building. The planned building area is occupied by an existing building. Once the building is removed, we will drill borings within the proposed building footprint for a design level geotechnical report. The services were performed in accordance with Purchase Order Number 5 and our proposal for professional engineering services to Realty Management Group, LLC, dated February 12, 2019.

The proposed bank building will be a two-story frame structure with a slab-on-grade floor, located on the north end of the property on the east side of Grand Avenue, adjacent to the U.S. Forest Service District Office. A municipal parking garage (Ground Engineering Consultants, 2011) is located to the east, the former High Country Engineering building (H-P Geotech, 1994) is located to the southeast and the existing Colorado National Bank building (H-P Geotech, 2015) is across Grand Avenue to the northwest. The boring drill logs for those structures were reviewed for this report. H-P Geotech (now Kumar & Associates, Inc.) also performed construction observation and testing on the parking garage and bank projects.

Nearby Subsurface Conditions and Building Foundations: Borings drilled at the parking garage encountered 25 to 29 feet of sandy silt and clay (alluvial fan deposits) overlying dense gravel alluvium. The sandy silt and clay soils tend to settle when wetted. The parking garage is supported on heavy duty screw piles based in the dense gravel.

A boring drilled at the former High Country Engineering building, located across the alley to the southeast of the proposed bank building, encountered 27 feet of sandy silt and clay overlying dense gravel. That building was reportedly partially underpinned with steel push piles down to the dense gravel.

Borings drilled at the Colorado National Bank building, located across Grand Avenue and northeast of the subject site had 15 to 18 feet of the sandy silt and clay overlying the dense gravel. The bank building has a basement level and is supported on pad footings based on the gravel soils, 8 to 9 feet below the basement.

Expected Subsurface Conditions: We expect that the subsoils under the proposed building, below a shallow depth of fill, will consist of about 25 feet of sandy silt and clay overlying the dense gravel alluvium. Groundwater is expected to be more than 30 feet deep. The silt and clay soils are typically hydro-compressive and tend to settle when wetted. The settlement can average about 2 percent of the depth of soil, which could result in buildings on shallow spread footing foundations to settle 3 to 5 inches depending on the depth and extent of wetting.

Recommended Foundations: A deep foundation based in the underlying dense gravel below the site is recommended for support of the proposed bank. Possible foundations include drilled piers, screw piles, micro-piles and, possibly, heavy duty helical piles. Rocky zones within the relatively fine-grained alluvial fan deposit could make installation of helical piers difficult. Piers or piles with capacities of 30 to 50 kips should be feasible at this site.

The recommendations submitted in this letter are based on the previous exploratory borings drilled in the vicinity of the site. This preliminary study is based on the assumption that soils beneath the proposed building site are similar to the nearby sites. Site specific borings should be drilled to further evaluate the soil conditions. It is possible the data obtained by site specific subsurface exploration could change the recommendations contained in this letter.

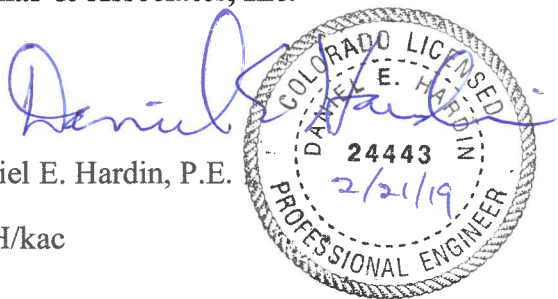
If you have any questions or need further assistance, please call our office.

Sincerely,

Kumar & Associates, Inc.

Daniel E. Hardin, P.E.

DEH/kac





April 8, 2019

City of Glenwood Springs
Economic & Community Development Department
101 West 8th Street
Glenwood Springs, CO 81601

RE: Preliminary Traffic Impact Letter
HCE Project No. 2191008

Dear City of Glenwood Springs:

This letter is to formally acknowledge the preliminary traffic impact for the proposed ANB Bank located in Glenwood Springs, Colorado.

Based on the ITE Trip Generation, 9th Edition, the average trip rate per 1,000 GSF for the most restrictive peak hour (P.M.) is 12.13 trips for a walk-in bank. The proposed building is 9,428 GSF, resulting in 114.4 trips for the P.M. peak hour.

Feel free to contact me at 970-945-8676 with any questions or concerns.

Sincerely,

High Country Engineering, Inc.

Roger Neal, PE
Principal

INSTITUTE OF TRANSPORTATION ENGINEERS

COMMON TRIP GENERATION RATES (PM Peak Hour)

(Trip Generation Manual, 9th Edition)

Code	Description	Unit of Measure	Trips Per Unit
PORT AND TERMINAL			
30	Truck Terminal	Acres	6.55
90	Park and Ride Lot with Bus Service	Parking Spaces	0.62
INDUSTRIAL			
110	General Light Industrial	1,000 SF	0.97
120	General Heavy Industrial	Acres	2.16
130	Industrial Park	1,000 SF	0.85
140	Manufacturing	1,000 SF	0.73
150	Warehousing	1,000 SF	0.32
151	Mini-Warehouse	1,000 SF	0.26
152	High-Cube Warehouse	1,000 SF	0.12
170	Utilities	1,000 SF	0.76
RESIDENTIAL			
210	Single-Family Detached Housing	Dwelling Units	1.00
220	Apartment	Dwelling Units	0.62
221	Low-Rise Apartment	Dwelling Units	0.58
230	Residential Condominium / Townhouse	Dwelling Units	0.52
240	Mobile Home Park	Dwelling Units	0.59
251	Senior Adult Housing - Detached	Dwelling Units	0.27
252	Senior Adult Housing - Attached	Dwelling Units	0.25
253	Congregate Care Facility	Dwelling Units	0.17
254	Assisted Living	Beds	0.22
255	Continuing Care Retirement Community	Dwelling Units	0.16
LODGING			
310	Hotel	Rooms	0.60
320	Motel	Rooms	0.47
330	Resort Hotel	Rooms	0.42
RECREATIONAL			
411	City Park	Acres	0.19
412	County Park	Acres	0.09
413	State Park	Acres	0.07
415	Beach Park	Acres	1.30
416	Campground / Recreation Vehicle Park	Camp Sites	0.27
417	Regional Park	Acres	0.20
420	Marina	Berths	0.19
430	Golf Course	Acres	0.30
431	Miniature Golf Course	Holes	0.33

Code	Description	Unit of Measure	Trips Per Unit
432	Golf Driving Range	Tees / Driving Positions	1.25
433	Batting Cages	Cages	2.22
435	Multi-Purpose Recreational Facility	Acres	5.77
437	Bowling Alley	1,000 SF	1.71
441	Live Theater	Seats	0.02
443	Movie Theater without Matinee	1,000 SF	6.16
444	Movie Theater with Matinee	1,000 SF	3.80
445	Multiplex Movie Theater	1,000 SF	4.91
452	Horse Race Track	Acres	4.30
454	Dog Race Track	Attendance Capacity	0.15
460	Arena	Acres	3.33
473	Casino / Video Lottery Establishment	1,000 SF	13.43
480	Amusement Park	Acres	3.95
488	Soccer Complex	Fields	17.70
490	Tennis Courts	Courts	3.88
491	Racquet / Tennis Club	Courts	3.35
492	Health / Fitness Club	1,000 SF	3.53
493	Athletic Club	1,000 SF	5.96
495	Recreational Community Center	1,000 SF	1.45
INSTITUTIONAL			
520	Elementary School	1,000 SF	1.21
522	Middle School / Junior High School	1,000 SF	1.19
530	High School	1,000 SF	0.97
536	Private School (K-12)	Students	0.17
540	Junior / Community College	1,000 SF	2.54
560	Church	1,000 SF	0.55
565	Daycare Center	1,000 SF	12.46
566	Cemetery	Acres	0.84
571	Prison	1,000 SF	2.91
580	Museum	1,000 SF	0.18
590	Library	1,000 SF	7.30
591	Lodge / Fraternal Organization	Members	0.03
MEDICAL			
610	Hospital	1,000 SF	0.93
620	Nursing Home	1,000 SF	0.74
630	Clinic	1,000 SF	5.18
640	Animal Hospital / Veterinary Clinic	1,000 SF	4.72

Code	Description	Unit of Measure	Trips Per Unit
OFFICE			
710	General Office Building	1,000 SF	1.49
714	Corporate Headquarters Building	1,000 SF	1.41
715	Single Tenant Office Building	1,000 SF	1.74
720	Medical-Dental Office Building	1,000 SF	3.57
730	Government Office Building	1,000 SF	1.21
732	United States Post Office	1,000 SF	1.22
733	Government Office Complex	1,000 SF	2.85
750	Office Park	1,000 SF	1.48
760	Research and Development Center	1,000 SF	1.07
770	Business Park	1,000 SF	1.29
RETAIL			
812	Building Materials and Lumber Store	1,000 SF	4.49
813	Free-Standing Discount Superstore	1,000 SF	4.35
814	Variety Store	1,000 SF	6.82
815	Free Standing Discount Store	1,000 SF	4.98
816	Hardware / Paint Store	1,000 SF	4.84
817	Nursery (Garden Center)	1,000 SF	6.94
818	Nursery (Wholesale)	1,000 SF	5.17
820	Shopping Center	1,000 SF	3.71
823	Factory Outlet Center	1,000 SF	2.29
826	Specialty Retail Center	1,000 SF	2.71
841	New Car Sales	1,000 SF	2.62
842	Recreational Vehicle Sales	1,000 SF	2.54
843	Automobile Parts Sales	1,000 SF	5.98
848	Tire Store	1,000 SF	4.15
850	Supermarket	1,000 SF	9.48
851	Convenience Market (Open 24 Hours)	1,000 SF	52.41
852	Convenience Market (Open 15-16 Hours)	1,000 SF	34.57
853	Convenience Market with Gasoline Pumps	1,000 SF	50.92
854	Discount Supermarket	1,000 SF	8.34
857	Discount Club	1,000 SF	4.18
860	Wholesale Market	1,000 SF	0.88
861	Sporting Goods Superstore	1,000 SF	1.84
862	Home Improvement Superstore	1,000 SF	2.33
863	Electronics Superstore	1,000 SF	4.50
864	Toy / Children's Superstore	1,000 SF	4.99
866	Pet Supply Superstore	1,000 SF	3.38
867	Office Supply Superstore	1,000 SF	3.40
875	Department Store	1,000 SF	1.87

Code	Description	Unit of Measure	Trips Per Unit
876	Apparel Store	1,000 SF	3.83
879	Arts and Craft Store	1,000 SF	6.21
880	Pharmacy / Drugstore without Drive-Through Window	1,000 SF	8.4
881	Pharmacy / Drugstore with Drive-Through Window	1,000 SF	9.91
890	Furniture Store	1,000 SF	0.45
896	DVD/Video Rental Store	1,000 SF	13.60
SERVICES			
911	Walk-In Bank	1,000 SF	12.13
912	Drive-In Bank	1,000 SF	24.30
918	Hair Salon	1,000 SF	1.93
925	Drinking Place	1,000 SF	11.34
931	Quality Restaurant	1,000 SF	7.49
932	High-Turnover (Sit-Down) Restaurant	1,000 SF	11.15
933	Fast Food Restaurant without Drive-Through Window	1,000 SF	26.15
934	Fast Food Restaurant with Drive-Through Window	1,000 SF	33.84
935	Fast Food Restaurant with Drive-Through Window and No Indoor Seating	1,000 SF	153.85
936	Coffee / Donut Shop without Drive-Through Window	1,000 SF	40.75
937	Coffee / Donut Shop with Drive-Through Window	1,000 SF	42.8
938	Coffee / Donut Shop with Drive-Through Window and No Indoor Seating	1,000 SF	75
940	Bread / Donut / Bagel Shop with Drive-Through Window	1,000 SF	18.99
941	Quick Lubrication Vehicle Shop	Service Bays	5.19
942	Automobile Care Center	1,000 SF	3.11
943	Automobile Parts and Service Center	1,000 SF	4.46
944	Gasoline / Service Station	Fueling Positions	13.87
945	Gasoline / Service Station with Convenience Market	Fueling Positions	13.51
946	Gasoline / Service Station with Convenience Market and Car Wash	Fueling Positions	13.94
947	Self Service Car Wash	Stalls	5.54
948	Automated Car Wash	1,000 SF	14.12
950	Truck Stop	1,000 SF	13.63

Note: All land uses in the 800 and 900 series are entitled to a "passby" trip reduction of 60% if less than 50,000 ft² or a reduction of 40% if equal to or greater than 50,000 ft².

* Approximated by 10% of Weekday average rate.

***DRAINAGE STUDY
FOR
ANB Bank
GLENWOOD SPRINGS, COLORADO***

PREPARED FOR:
Open Studio Architecture
1010 Park Avenue, Suite 200
Denver, CO 80205

PREPARED BY:
High Country Engineering, Inc.
1517 Blake Avenue, Suite 101
Glenwood Springs, CO 81601
(970) 945-8676

April 8, 2019

HCE JOB NUMBER: 2191008.00

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II. DRAINAGE BASINS	5
III. DRAINAGE DESIGN CRITERIA	6
IV. DRAINAGE FACILITY DESIGN	8
V. CONCLUSION	8
VI. REFERENCES	10

EXHIBITS:

1. SCS Soils Map (8.5"x11")
2. FEMA Map (8.5"x11")
3. Existing Drainage Conditions (24"x36")
4. Proposed Drainage Conditions (24"x36")
5. Point Precipitation Frequency Estimates Table

APPENDICES

- A. Hydrologic Computations
- B. Hydraulic Computations
- C. Kumar & Associates, Inc. Preliminary Soils Summary Report – Job No. 19-7-147.

Engineers Certification

"I hereby affirm that this report and the accompanying plans for the (type or phase design) of (Name of Development) was prepared by me (or under my direct supervision) for the ANB Project thereof in accordance with the provisions of the City of Glenwood Springs Stormwater, Drainage, Water Quality and Erosion Control Chapter and approved variances and exceptions listed thereto. I understand that it is the policy of the City of Glenwood Springs that the City of Glenwood Springs does not and will not assume liability for drainage facilities designed by others."



Roger D. Neal, P.E.
Registration Number 29975

I. GENERAL LOCATION AND DESCRIPTION

A. Location

ANB Bank is located at 910-918 Grand Street in Glenwood Springs which lies within Section 9 Township 6 South, Range 89 West of the 6th P.M., Garfield County, State of Colorado. The proposed remodel and onsite parking lot revisions is located in down town Glenwood Springs, Colorado, which is approximately 1,500 feet south of the Interstate 70 and US Highway 82 intersection. US Highway 82 (Grand Avenue) runs along the western property line. A commercial building is located to the south of the project. A parking lot is located to the north of the property and a concrete alley is located adjacent to the eastern property line. The vicinity map can be seen below.



Vicinity Map

B. Description of Property

The existing property currently consists of two buildings on a zero lot line between the buildings. The building contains a small restaurant, jewelry store, nail salon, and escape room to name a few. These buildings, sidewalks, asphalt etc., will be removed from the site and a new, smaller building will be constructed. The existing parking lot will be regraded and upgraded and landscape planters will be installed along the perimeters, thus increasing the pervious surface within the site and reducing the overall impervious area. The new parking lot will be constructed with a curb and gutter system. The proposed building will be a two-story above grade building with a flat roof that captures the runoff in the northwestern portion of the building.

The proposed property is approximately 0.459 acres. The terrain within the site slopes to the northwest at approximately 5-6 percent. The property will be encompassed by a bank and an asphaltic pavement parking lot. A concrete sidewalk with a landscape buffer runs north-south along the western property line and the parking areas have landscape islands.

Within the area of study, there is one soil type as designated by the United States Department of Agriculture Soil Conservation Service (SCS) in cooperation with Colorado Agricultural Experiment Station. See Exhibit #1 for the SCS map. The SCS soil type is Soil #8, Atencio-Azeltine Complex, 1-3 percent slopes. The soil is mixed alluvium derived from sandstone and shale and is deep and well drained with low to very low runoff and has a moderately high to high capacity to transmit water. The soil has a low to very low capacity to store water. Atencio soils are defined as soil B and Azeltine is defined as soil A.

A site specific soils report has not been completed for the site. However, subsoil surveys have been completed by Kumar and Associates for properties adjacent to the site. The soils borings discovered sandy silt and clay overtop dense gravels. The soils tend to settle when wet. It is recommended that the building be constructed on piles or piers that are supported by the dense gravel.

II. DRAINAGE BASINS

A. Major Basin Description

The proposed site is located on FEMA's Flood Insurance Rate Map (FIRM) Number 0800711432C which has an effective date of October 15, 1985. The entire property is located in Zone C. Zone C is described as areas determined to be areas of minimal flooding and outside 100-year and 500-year floodplains.

B. Sub-Basin Description

The existing drainage basin for the site has been defined as the property boundary. The runoff from the basin sheet flows from the southeast to the northwest and offsite to the curb and gutter system along the east side of US Highway 82 (Grand Avenue) or to the existing alley to the east of the property via roof drains. Per the City of Glenwood Springs Standards, the

existing condition is the current state of the property. The property currently contains two buildings and a parking area. The site is currently 100% impervious, which helped determine the runoff coefficients. See Table 1 for existing hydrologic calculations.

There are no offsite basins that drain to the property. The property is encompassed by curb and gutter systems and an inverted crown within the alley.

Table 1: Existing Basin Calculations

BASIN	AREA, AC.	C, 25- YR	I, 25YR	Q _{25-YR} , CFS	C, 100- YR	I, 100- YR	Q _{100-YR} , CFS
EX-1	0.459	0.88	5.05	2.04	0.89	6.55	2.68

The proposed drainage plan will collect all of the impervious area runoff on the site and direct it to Grand Avenue. This was discussed with the City as whether to direct storm-water to alley or Grand Avenue and the preference was Grand Avenue. We considered a drywell to offer some water quality but the soils are likely not suitable for percolation from a drywell. The storm flows will be directed to Grand Avenue via two scuppers under the sidewalks. The scuppers will be from the bank building and from the parking lot.

The proposed site's redesign has added pervious surfaces by adding landscaping to the southwestern portion of the parking lot as well as two curb areas and around the building. The site's addition of landscaping will reduce the overall runoff from the site from its existing condition. See Table 2 for proposed hydrologic calculations.

Table 2: Proposed Basin Calculations

BASIN	AREA, AC.	C, 25- YR	I, 25YR	Q _{25-YR} , CFS	C, 100- YR	I, 100- YR	Q _{100-YR} , CFS
PR-1	0.459	0.86	5.05	2.00	0.87	6.55	2.62

III. DRAINAGE DESIGN CRITERIA

A. Criteria

This drainage study was prepared in conformance with the City of Glenwood Springs standards and specifications to be in compliance with the MS4 permit (Municipal Separate Storm Sewer System) Stormwater Management Plan. The drainage system has been designed for proper drainage away from the buildings and has analyzed runoff from areas adjacent and upstream as necessary. Since the site reduces the current storm-water flows the site will not detain for the 25-year storm event or provide water quality.

Many of the nine Stormwater Better Site Design Practices were utilized for this project. The site will reduce the overall imperviousness by adding landscaping around the proposed parking lot, so some of the stormwater will be treated through the proposed grasses within the site.

The site was analyzed to attain the Excess Urban Runoff Volume (EURV) per the Urban

Drainage and Flood Control District since the site ultimately drains to either the Colorado River or the Roaring Fork River. The EURV is the difference between the pre- and post-development runoff volumes for storms that produce runoff from pervious land surfaces. In this case there is a reduction from the existing to the proposed and therefore the basin releases the EURV storm-water more slowly and into drainage ways that directly connect to the Colorado River which results in storms smaller than the 2-year event being reduced to flowrates less than the threshold value for erosion control in most drainage ways.

The site will disturb more than 5,000 square feet of land and therefore will be required to comply with the Major Drainage Report requirements.

B. Hydrologic Criteria

The hydrologic methods for this study are outlined in Chapter 4 of the City of Glenwood Springs Engineering Standards adopted August 18, 2018 and the computer program “Hydroflow Express Extension for Autodesk AutoCAD Civil 3D.” Peak flows in this area will be rainfall intensity derived due to drainage basins less than 90 acres.

The rainfall intensities were obtained using NOAA (National Oceanic and Atmospheric Administration) Atlas 14 – Volume 8, Version 2 IDF curves table provided in Chapter 4 of the City of Glenwood Springs Engineering Standards, the precipitation intensity corresponding to the 2-year, 1-hour is 0.51 inches/hour, the 25-year, 1-hour storm event is 1.05 inches/hour; and the 100-year, 1-hour storm event produces 1.32 inches/hour of precipitation intensity. The Precipitation-Frequency table used in calculations can be found in Exhibit #5. These precipitation intensities were used for calculating runoff from each basin using the Rational Method. Existing and proposed hydrographs are located in the appendices of this report. Detention volume was not determined due to a reduction in storm-water flows from historic to proposed condition according to City Code.

The WQCV will be determined in accordance with the Urban Drainage and Flood Control District (UDFCD) Chapter 3 recommendations. The equation for the WQCV is:

$$WQCV = a(0.91I^3 - 1.19I^2 + 0.78I)$$

a= Coefficient corresponding to WQCV drain Time (table 3-2) *0.9 for 24 hours

I= Imperviousness (%/100) *96% for the site

$$WQCV = 0.41 \text{ watershed inches}$$

The WQCV detention volume is: $V = (WQCV/12)A$

V=WQCV volume (acre-feet)

A= Tributary Area (acres)

WQCV= Water Quality Capture Volume (watershed inches)

$$WQCV = (0.41/12) * 0.459 = 0.016 \text{ acre-ft} = 697 \text{ cubic feet}$$

Since there is a reduction from existing to proposed developed condition the WQCV is not required.

The Excess Urban Runoff Volume (EURV) was not determined due to a reduction of stormwater flows from the existing condition to the proposed developed condition.

The EURV detention volume is: $V = (EURV/12)A$

V=EURV volume (acre-feet)

A= Tributary Area (acres)

EURV= Water Quality Capture Volume (watershed inches)

C. Hydraulic Criteria

Detention volume was not determined due to a reduction in storm-water flows from historic to proposed condition according to City Code. The discharge from the site will be through two scuppers located through the sidewalk to the Grand Avenue curb and gutter. A small amount of water flows from the landscaping on the east side of the building to the alley as overland flow.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

The proposed site has been broken down into one onsite basin. The runoff from the flat roofed building will be collected in a downspout located in the northwestern portion of the building. The downspout will transfer the runoff to a sidewalk scupper via a roof drain from the building. The runoff from the proposed parking lot will sheet flow as well as flow along the curb and gutter system to a second proposed scupper to grand Avenue curb and gutter.

The scuppers were sized to pass the 100 year flows from the building and from the parking area. Scupper calculations can be found in the appendices of this report.

V. CONCLUSION

A. Compliance with Standards

This drainage report has been prepared in accordance with the city of Glenwood Springs Regulations. The proposed development shall utilize best management practices, BMPs, both for construction and long-term control to minimize or eliminate pollutant discharge. The temporary construction BMPs may include erosion logs and rock socks over existing downstream inlets. The downstream portions of the site shall have erosion control logs installed. All onsite spoil and stock piles shall have erosion control logs encompass the entire perimeter to prevent fugitive dirt migration. Spill kits shall be located onsite in the event of a liquid spill during construction. Vehicle tracking pads shall be located at all entrances to the site that will be utilized by construction equipment to prevent sediment transport from the site.

B. Drainage Concept

The proposed site design will be effective in reducing the runoff from the site by incorporating landscaping into the parking lot design to reduce the runoff from the site below the existing, pre-developed runoff.

VI. REFERENCES

NOAA (National Oceanic and Atmospheric Administration) Atlas 14 – Volume 8, Version 2
Point Precipitation Frequency Estimates

United States Department of Agriculture, Soil Conservation Service: Soil Survey of Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties, May 1992.

United States Department of Agriculture, Soil Conservation Service: Urban Hydrology for Small Watersheds, June 1986.

Soil Conservation Service (SCS) publication "Procedures for Determining Peak Flows in Colorado" (1980).

City of Glenwood Springs, Chapter 4 "Stormwater, Drainage, Water Quality and Erosion Control," July 2018.

Urban Drainage and Flood Control District Volume 2, September 2017.

Urban Drainage and Flood Control District Volume 3, November 2015.

EXHIBITS

SOIL INFORMATION

Rifle Area, Colorado, Parts of Garfield and Mesa Counties

8—Atencio-Azeltine complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: jnzd

Elevation: 5,000 to 7,000 feet

Farmland classification: Farmland of statewide importance

Map Unit Composition

Atencio and similar soils: 45 percent

Azeltine and similar soils: 45 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atencio

Setting

Landform: Alluvial fans, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Mixed alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 11 inches: sandy loam

H2 - 11 to 23 inches: gravelly sandy clay loam

H3 - 23 to 28 inches: gravelly sandy loam

H4 - 28 to 60 inches: extremely cobbly sand

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 10 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: B

Ecological site: Rolling Loam (R048AY298CO)

Hydric soil rating: No

Description of Azeltine

Setting

Landform: Terraces, alluvial fans

Landform position (three-dimensional): Tread

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Parent material: Mixed alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 18 inches: gravelly sandy loam

H2 - 18 to 60 inches: extremely gravelly sand

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 10 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: Rolling Loam (R048AY298CO)

Hydric soil rating: No

Minor Components

Gravel pits

Percent of map unit: 10 percent

Landform: Alluvial fans, terraces

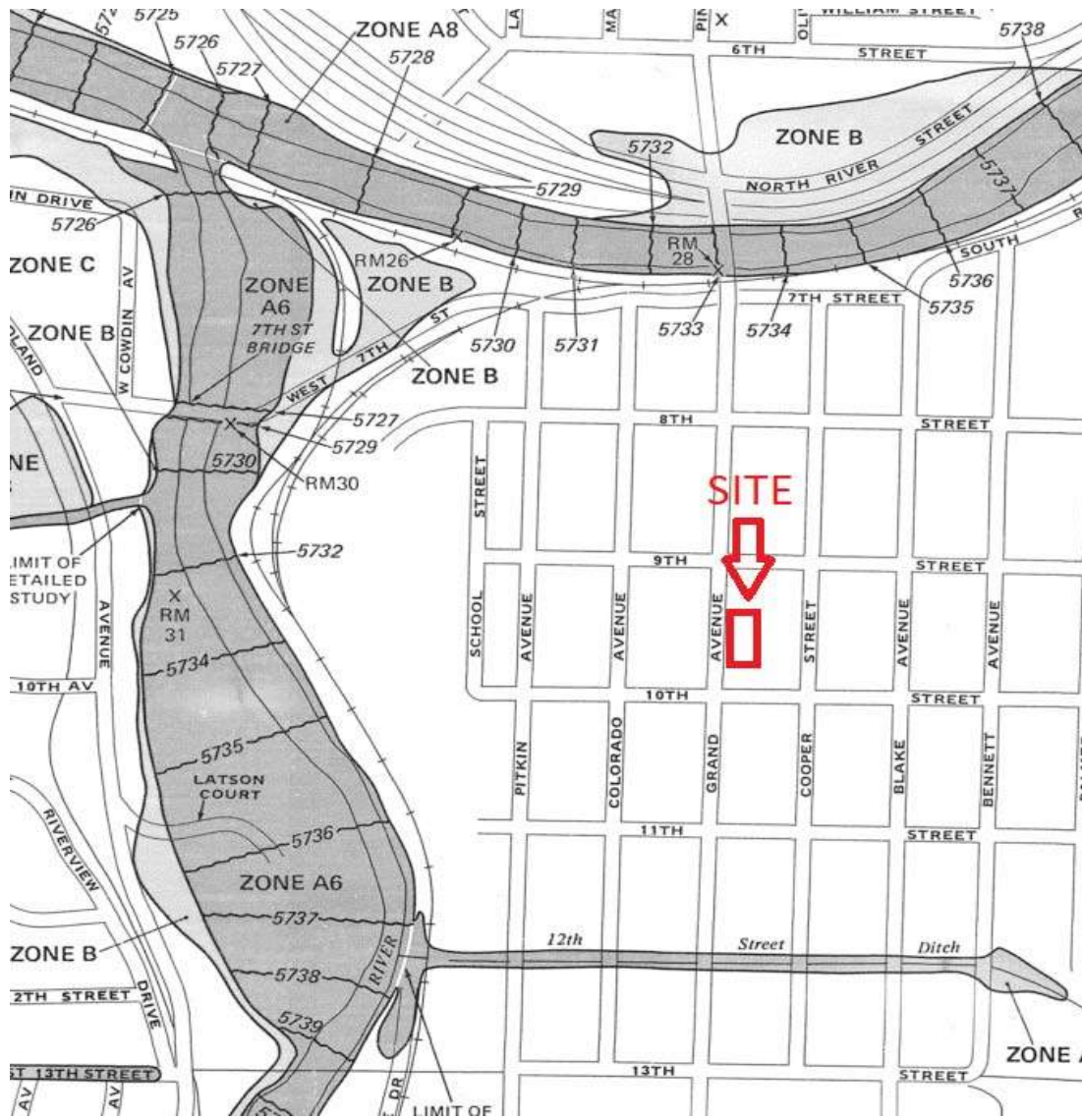
Landform position (three-dimensional): Tread

Hydric soil rating: No



Search			
Map Unit Legend			
Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Atencio-Azeltine complex, 1 to 3 percent slopes	4.8	100.0%
Totals for Area of Interest		4.8	100.0%

FEMA MAPPING



KEY TO MAP

500-Year Flood Boundary	→	→
100-Year Flood Boundary	→	→
Zone Designations		ZONE B ZONE A1 ZONE A5 ZONE B
100-Year Flood Boundary	→	→
500-Year Flood Boundary	→	→
Base Flood Elevation Line With Elevation In Feet**		513
Base Flood Elevation in Feet Where Uniform Within Zone**		(EL 987)
Elevation Reference Mark		RM7X
Zone D Boundary	→	→
River Mile		•M1.5

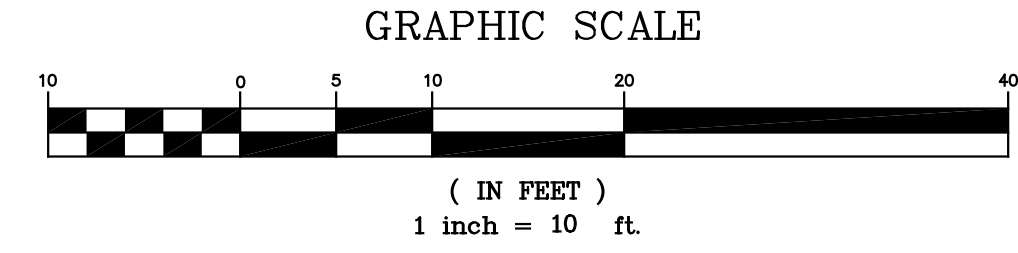
**Referenced to the National Geodetic Vertical Datum of 1929

COMMUNITY-PANEL NUMBER
080071 1432 C

MAP REVISED:
OCTOBER 15, 1985

EXISTING DRAINAGE BASIN MAP

EXTENDED VIEW
NOT TO SCALE:



LEGEND

- EXISTING PROPERTY BOUNDARY
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING DRAINAGE BASIN BOUNDARY
- PROPOSED DRAINAGE BASIN BOUNDARY

EX-1 ### ACRES	PR-1 ### ACRES
C ₀ =0.##	C ₀ =0.##
C ₁₀₀ =## CFS	C ₁₀₀ =## CFS
C ₂₅ =## CFS	C ₂₅ =## CFS

DRAINAGE FLOW PATTERN
 DESIGN POINT

DESIGN POINTS

△ DESIGN POINT 1: RECEIVES SHEET FLOW FROM BASIN EX-1

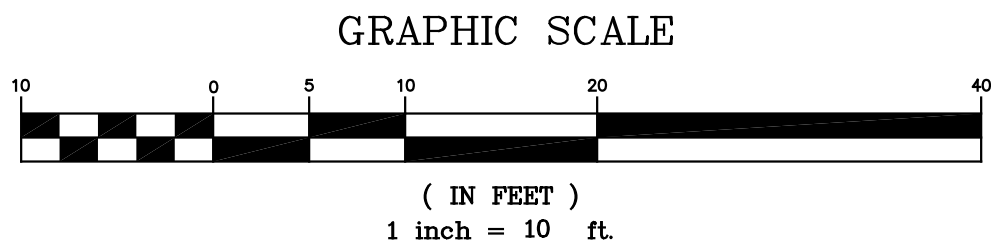
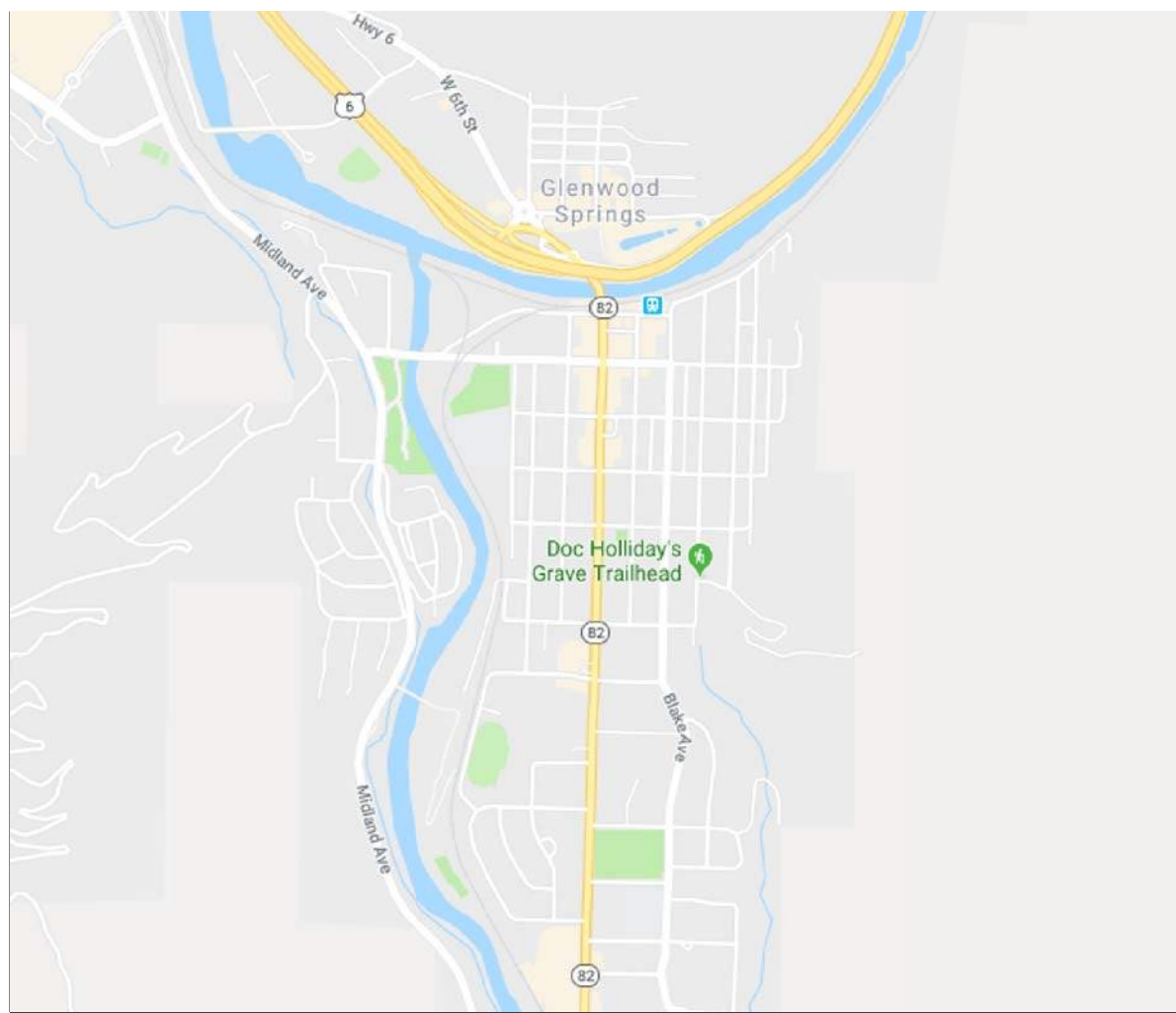
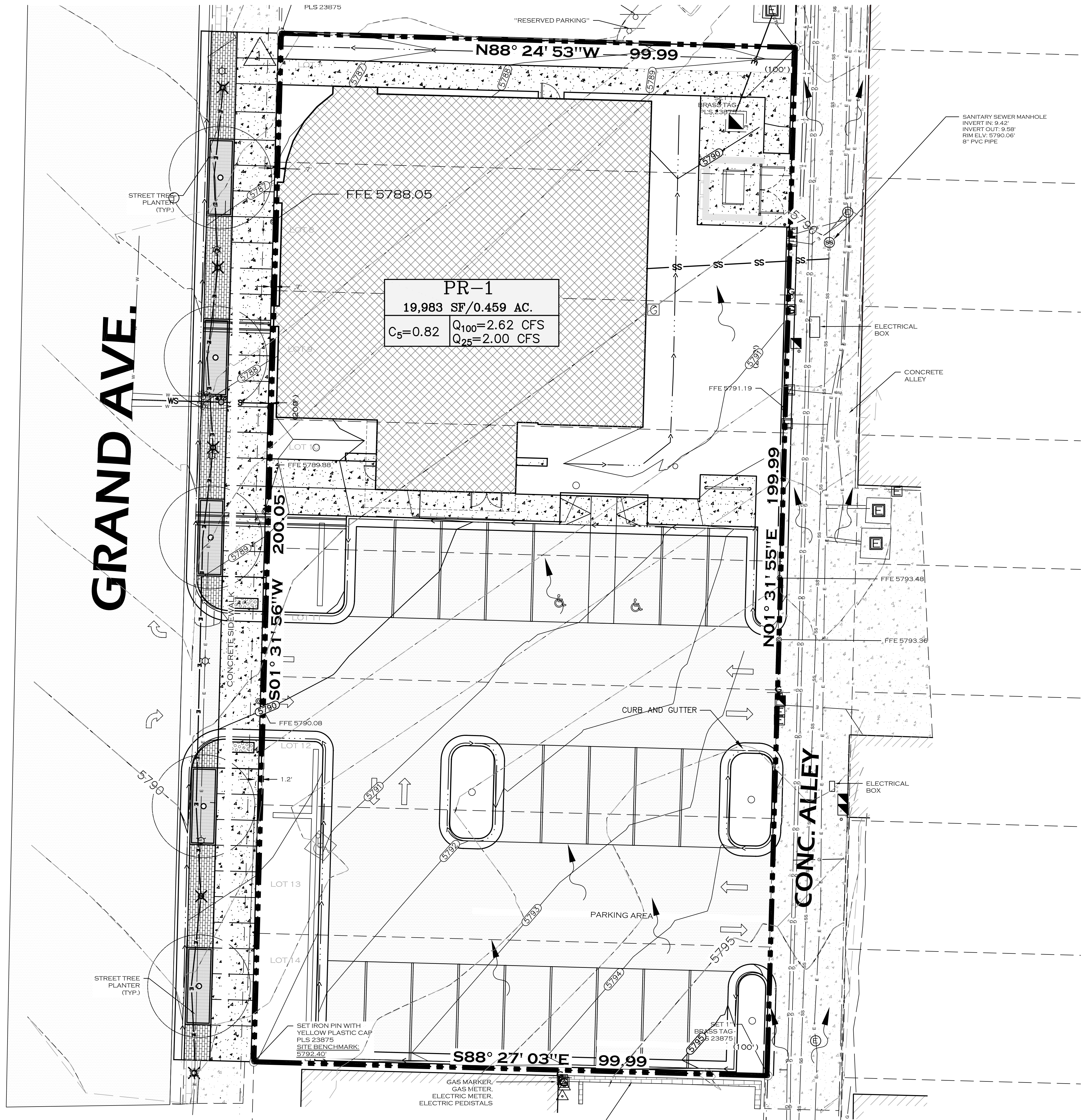
NOTES:

- 1.) A SITE SPECIFIC GEOTECHNICAL REPORT WAS NOT COMPLETED FOR THE LOTS IN GLENWOOD SPRINGS, COLORADO. SUBSOL INVESTIGATIONS WERE PERFORMED BY KUMAR & ASSOCIATES, INC. ON THE ADJACENT PROPERTIES. ACCORDING TO THE USDA WEB SOIL SURVEY, THE SITE CONTAINS TYPE B SOILS.
- 2.) THE ENTIRE SITE IS LOCATED WITHIN ZONE C ON THE FIRM MAP. OCTOBER 15, 1985.
- 3.) EXISTING SURVEY INFORMATION PROVIDED BY HIGH COUNTRY ENGINEERING FOR THE ANB BANK.
- 4.) THE EXISTING SITE GENERALLY SHEET FLOWS TO THE NORTHWEST CORNER OF THE BASIN. THE DESIGN POINT IS BEING UTILIZED TO DEFINE THE OVERALL RELEASE FROM THE HISTORIC SITE.
- 5.) PARCEL NUMBER 218509421002

DRAINAGE BASIN EXISTING CONDITIONS CHARTS

BASIN	AREA, AC.	C, 25- YR	I, 25YR	Q _{25-YR} , CFS	C, 100- YR	I, 100- YR	Q _{100-YR} , CFS
EX-1	0.459	0.88	5.05	2.04	0.89	6.55	2.68

PROPOSED DRAINAGE BASIN MAP



LEGEND

---	EXISTING PROPERTY BOUNDARY
---	EXISTING MAJOR CONTOUR
---	EXISTING MINOR CONTOUR
(---)	PROPOSED MAJOR CONTOUR
(---)	PROPOSED MINOR CONTOUR
---	EXISTING DRAINAGE BASIN BOUNDARY
---	PROPOSED DRAINAGE BASIN BOUNDARY

EX-1 ### ACRES C ₅ =### Q ₁₀₀ =### CFS Q ₂₅ =### CFS	PR-1 ### ACRES C ₅ =0.## Q ₁₀₀ =### CFS Q ₂₅ =### CFS
---	--

--- DRAINAGE FLOW PATTERN Δ DESIGN POINT

- DESIGN POINTS**
Δ DESIGN POINT 1: RECEIVES SHEET FLOW FROM BASIN EX-1.
- NOTES:**
- 1.) A SITE SPECIFIC GEOTECHNICAL REPORT WAS NOT COMPLETED FOR THE LOTS IN GLENWOOD SPRINGS, COLORADO. SUBSOIL INVESTIGATIONS WERE PERFORMED BY KUMAR & ASSOCIATES, INC. ON THE ADJACENT PROPERTIES. ACCORDING TO THE USDA WEB SOIL SURVEY, THE SITE CONTAINS TYPE B SOILS.
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 - 5.) PARCEL NUMBER 218509421002

DRAINAGE BASIN EXISTING CONDITIONS CHARTS

BASIN	AREA, AC.	C, 25-YR	I, 25YR	Q _{25-YR} , CFS	C, 100-YR	I, 100-YR	Q _{100-YR} , CFS
PR-1	0.459	0.86	5.05	2.00	0.87	6.55	2.62

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OPEN STUDIO ARCHITECTURE
CITY OF GLENWOOD SPRINGS, CO
ANB BANK GLENWOOD
EXISTING DRAINAGE BASIN

DRAWN BY:	CHECKED BY:	DATE:	NO.	DATE:	BY:

PROJECT NO. **2191008.00**

4

NOAA ATLAS PF-TABLE

The 2-, 25-, and 100-year storms are needed for drainage designs. The IDF curves provided in the figures below are based upon data in the Precipitation-Frequency Atlas of the United States, Midwestern States, NOAA Atlas 14, Volume 8 (NOAA 2013).

PF tabular										
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.44 (1.14–1.86)	2.11 (1.67–2.74)	3.17 (2.50–4.12)	4.00 (3.13–5.22)	5.06 (3.77–6.78)	5.84 (4.26–7.97)	6.56 (4.62–9.22)	7.26 (4.88–10.5)	8.09 (5.22–12.1)	8.66 (5.48–13.3)
10-min	1.06 (0.834–1.36)	1.55 (1.22–2.00)	2.32 (1.82–3.01)	2.93 (2.29–3.82)	3.71 (2.76–4.97)	4.28 (3.11–5.83)	4.81 (3.38–6.75)	5.31 (3.57–7.69)	5.92 (3.82–8.87)	6.34 (4.01–9.76)
15-min	0.856 (0.676–1.11)	1.26 (0.996–1.63)	1.89 (1.48–2.45)	2.38 (1.86–3.11)	3.02 (2.24–4.04)	3.48 (2.53–4.74)	3.91 (2.75–5.49)	4.32 (2.90–6.26)	4.82 (3.11–7.21)	5.16 (3.26–7.93)
30-min	0.578 (0.458–0.748)	0.822 (0.650–1.06)	1.20 (0.946–1.56)	1.50 (1.17–1.95)	1.87 (1.39–2.50)	2.14 (1.56–2.91)	2.39 (1.68–3.34)	2.62 (1.76–3.79)	2.89 (1.87–4.32)	3.08 (1.95–4.73)
60-min	0.385 (0.304–0.498)	0.510 (0.403–0.661)	0.706 (0.556–0.917)	0.858 (0.672–1.12)	1.05 (0.785–1.41)	1.19 (0.871–1.63)	1.32 (0.931–1.86)	1.45 (0.973–2.09)	1.59 (1.03–2.38)	1.69 (1.07–2.60)
2-hr	0.240 (0.192–0.306)	0.305 (0.244–0.389)	0.406 (0.323–0.519)	0.484 (0.384–0.624)	0.586 (0.442–0.772)	0.659 (0.486–0.885)	0.727 (0.518–1.00)	0.791 (0.538–1.13)	0.868 (0.567–1.28)	0.921 (0.589–1.40)
3-hr	0.187 (0.151–0.237)	0.227 (0.183–0.287)	0.289 (0.232–0.367)	0.338 (0.269–0.431)	0.402 (0.307–0.527)	0.449 (0.335–0.599)	0.494 (0.355–0.678)	0.537 (0.369–0.761)	0.590 (0.389–0.865)	0.628 (0.404–0.943)
6-hr	0.123 (0.100–0.153)	0.140 (0.114–0.174)	0.168 (0.136–0.210)	0.191 (0.154–0.240)	0.224 (0.174–0.292)	0.250 (0.190–0.331)	0.276 (0.201–0.375)	0.302 (0.211–0.425)	0.338 (0.226–0.490)	0.365 (0.237–0.540)
12-hr	0.076 (0.063–0.093)	0.086 (0.071–0.106)	0.104 (0.086–0.129)	0.120 (0.098–0.148)	0.141 (0.111–0.182)	0.158 (0.122–0.207)	0.176 (0.130–0.236)	0.194 (0.137–0.269)	0.219 (0.148–0.313)	0.238 (0.156–0.347)
24-hr	0.046 (0.039–0.056)	0.053 (0.044–0.064)	0.065 (0.054–0.078)	0.075 (0.062–0.091)	0.089 (0.071–0.113)	0.100 (0.078–0.129)	0.112 (0.084–0.149)	0.125 (0.089–0.170)	0.141 (0.097–0.199)	0.154 (0.103–0.221)
2-day	0.028 (0.024–0.033)	0.032 (0.027–0.038)	0.038 (0.032–0.046)	0.044 (0.037–0.053)	0.053 (0.043–0.066)	0.060 (0.047–0.076)	0.067 (0.051–0.087)	0.074 (0.054–0.100)	0.085 (0.059–0.118)	0.093 (0.063–0.131)
3-day	0.021 (0.018–0.024)	0.024 (0.020–0.028)	0.029 (0.024–0.034)	0.033 (0.028–0.039)	0.039 (0.032–0.049)	0.044 (0.035–0.056)	0.050 (0.038–0.064)	0.055 (0.040–0.073)	0.062 (0.044–0.086)	0.068 (0.046–0.095)
4-day	0.017 (0.015–0.020)	0.019 (0.017–0.023)	0.023 (0.020–0.028)	0.027 (0.023–0.032)	0.032 (0.026–0.039)	0.036 (0.029–0.045)	0.040 (0.031–0.051)	0.044 (0.032–0.058)	0.050 (0.035–0.068)	0.054 (0.037–0.075)
7-day	0.012 (0.010–0.014)	0.013 (0.011–0.015)	0.016 (0.014–0.018)	0.018 (0.015–0.021)	0.021 (0.017–0.025)	0.023 (0.019–0.028)	0.025 (0.020–0.032)	0.028 (0.021–0.037)	0.031 (0.022–0.042)	0.034 (0.023–0.047)
10-day	0.009 (0.008–0.011)	0.010 (0.009–0.012)	0.012 (0.011–0.014)	0.014 (0.012–0.016)	0.016 (0.013–0.019)	0.018 (0.014–0.022)	0.019 (0.015–0.024)	0.021 (0.016–0.028)	0.024 (0.017–0.032)	0.026 (0.018–0.035)
20-day	0.006 (0.006–0.007)	0.007 (0.006–0.008)	0.008 (0.007–0.009)	0.009 (0.008–0.010)	0.010 (0.009–0.012)	0.011 (0.009–0.014)	0.013 (0.010–0.015)	0.014 (0.010–0.017)	0.015 (0.011–0.020)	0.016 (0.011–0.021)
30-day	0.005 (0.005–0.006)	0.006 (0.005–0.006)	0.007 (0.006–0.008)	0.007 (0.007–0.008)	0.009 (0.007–0.010)	0.009 (0.008–0.011)	0.010 (0.008–0.012)	0.011 (0.008–0.014)	0.012 (0.009–0.015)	0.013 (0.009–0.017)
45-day	0.004 (0.004–0.005)	0.005 (0.004–0.005)	0.006 (0.005–0.006)	0.006 (0.006–0.007)	0.007 (0.006–0.008)	0.008 (0.006–0.009)	0.008 (0.007–0.010)	0.009 (0.007–0.011)	0.010 (0.007–0.012)	0.010 (0.007–0.013)
60-day	0.004 (0.003–0.004)	0.004 (0.004–0.005)	0.005 (0.004–0.005)	0.005 (0.005–0.006)	0.006 (0.005–0.007)	0.007 (0.006–0.008)	0.007 (0.006–0.009)	0.008 (0.006–0.009)	0.008 (0.006–0.011)	0.009 (0.006–0.011)
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.										

Figure 4-1. Tabular Representation of Point Precipitation Frequency Estimates (NOAA Atlas 14, Volume 8, Version 2; Glenwood Springs, Colorado; Latitude 39.5455°, Longitude - 107.326°, Elevation 5788.02 feet)

APPENDIX A: HYDROLOGIC CALCULATIONS

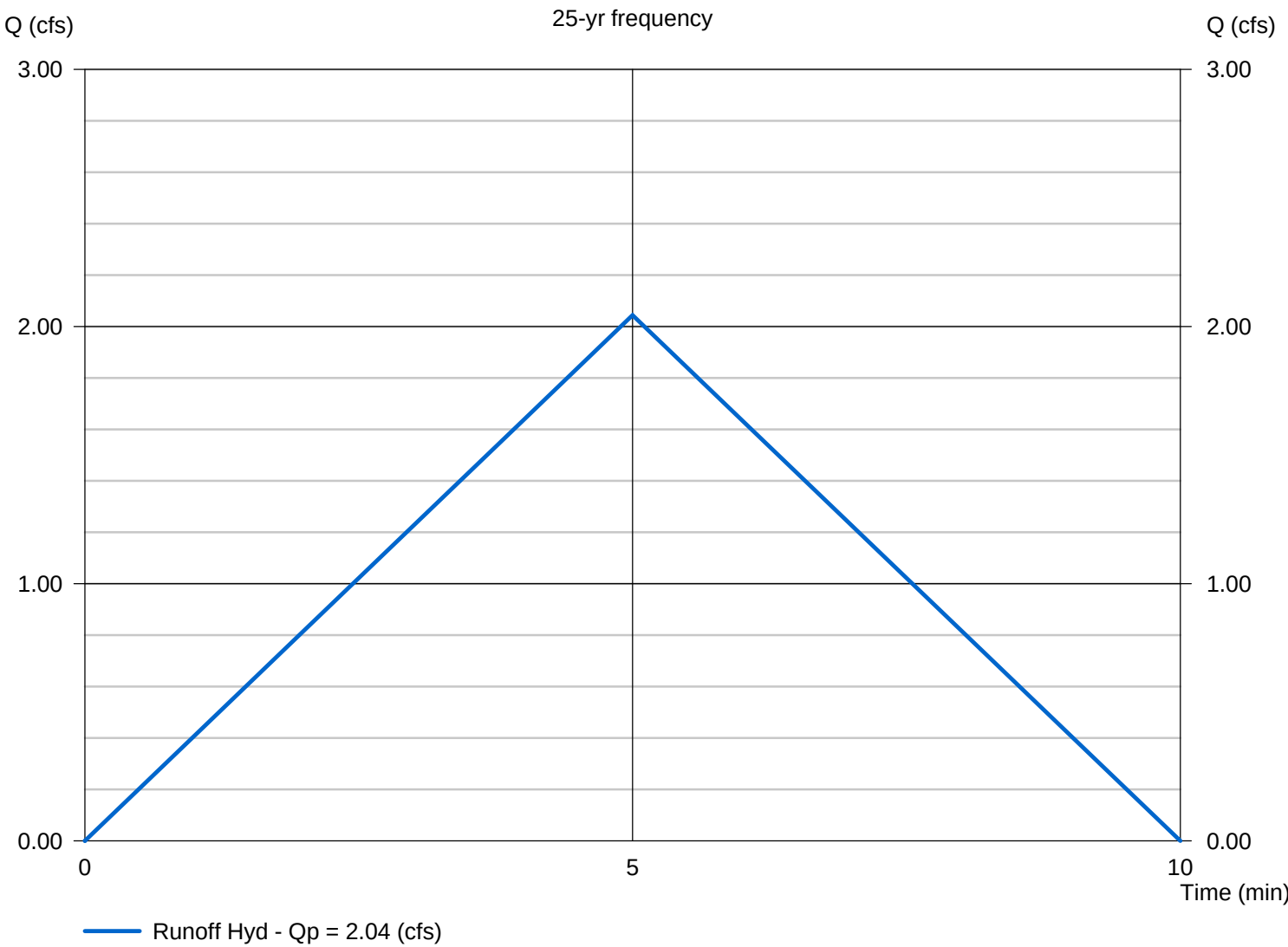
Hydrology Report

EXISTING 25-YR HYDROGRAPH

Hydrograph type	=	Mod Rational	Peak discharge (cfs)	=	2.044
Storm frequency (yrs)	=	25	Time interval (min)	=	1
Drainage area (ac)	=	0.460	Runoff coeff. (C)	=	0.88
Rainfall Inten (in/hr)	=	5.050	Tc by User (min)	=	5
IDF Curve	=	GWS_CH4.IDF	Storm dur factor	=	1.00

Hydrograph Volume = 613 (cuft); 0.014 (acft)

Runoff Hydrograph



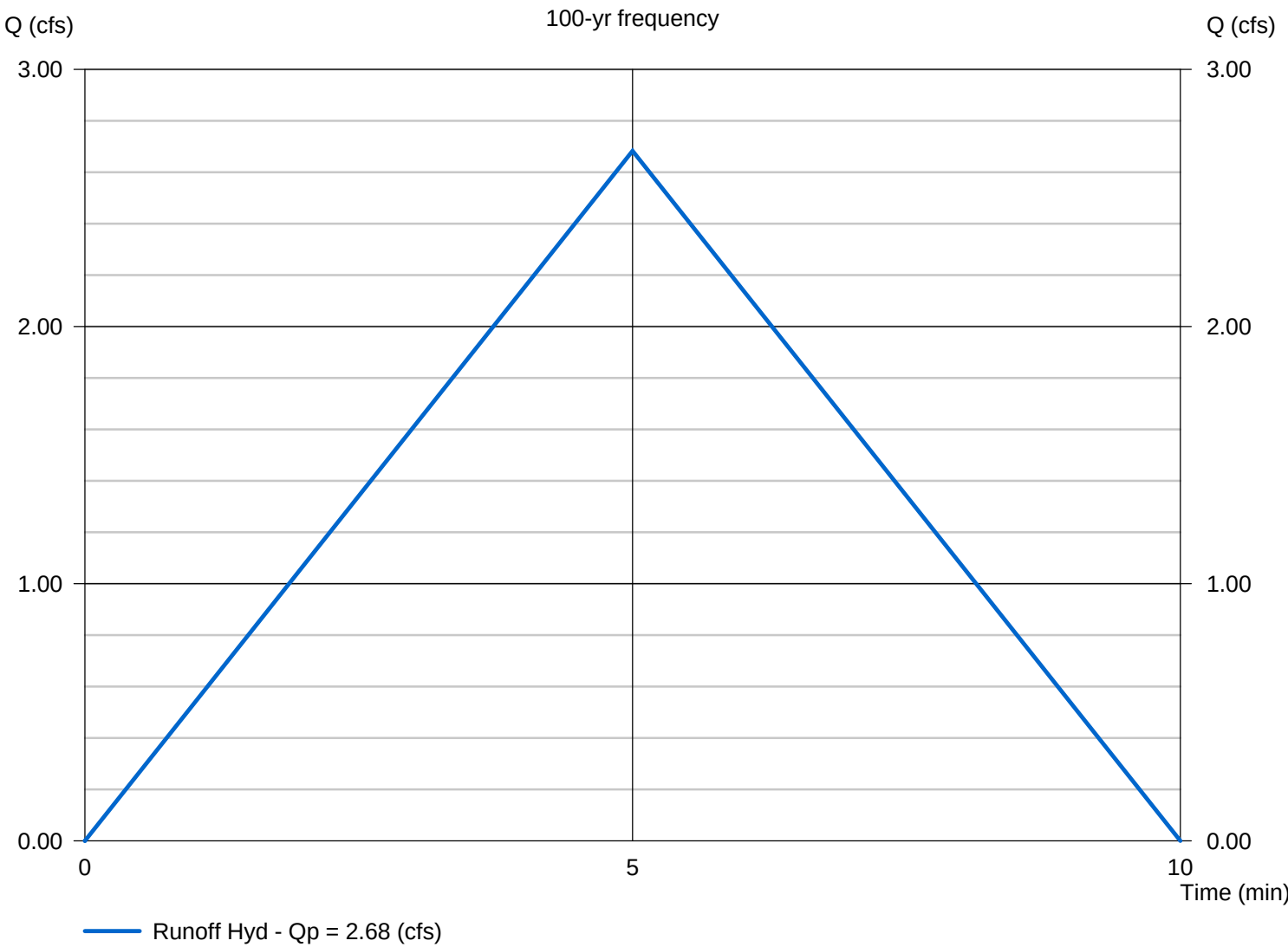
Hydrology Report

EXISTING 100-YR HYDROGRAPH

Hydrograph type	=	Mod Rational	Peak discharge (cfs)	=	2.683
Storm frequency (yrs)	=	100	Time interval (min)	=	1
Drainage area (ac)	=	0.460	Runoff coeff. (C)	=	0.89
Rainfall Inten (in/hr)	=	6.553	Tc by User (min)	=	5
IDF Curve	=	GWS_CH4.IDF	Storm dur factor	=	1.00

Hydrograph Volume = 805 (cuft); 0.018 (acft)

Runoff Hydrograph

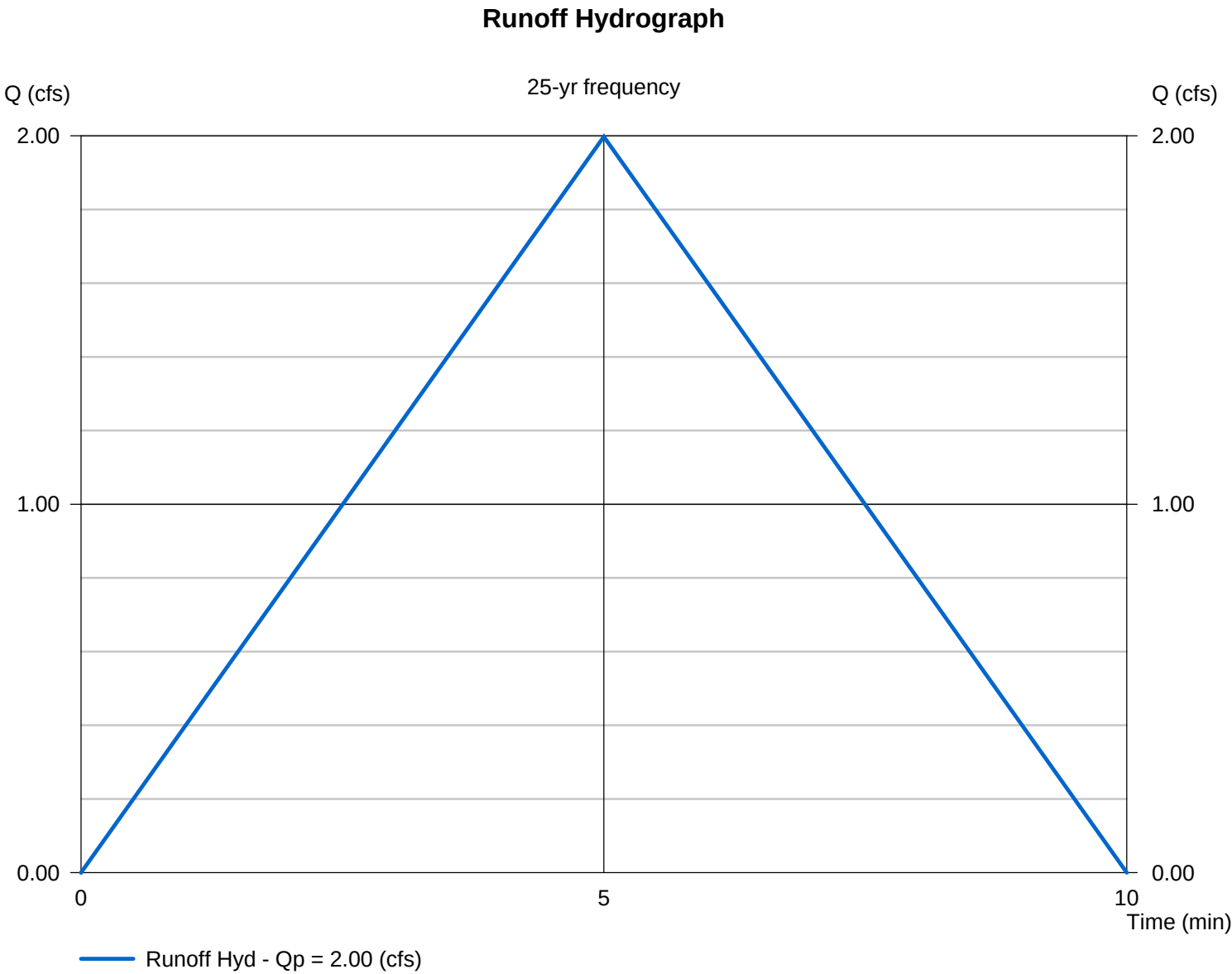


Hydrology Report

PROPOSED 25-YR HYDROGRAPH

Hydrograph type	=	Mod Rational	Peak discharge (cfs)	=	1.998
Storm frequency (yrs)	=	25	Time interval (min)	=	1
Drainage area (ac)	=	0.460	Runoff coeff. (C)	=	0.86
Rainfall Inten (in/hr)	=	5.050	Tc by User (min)	=	5
IDF Curve	=	GWS_CH4.IDF	Storm dur factor	=	1.00

Hydrograph Volume = 599 (cuft); 0.014 (acft)

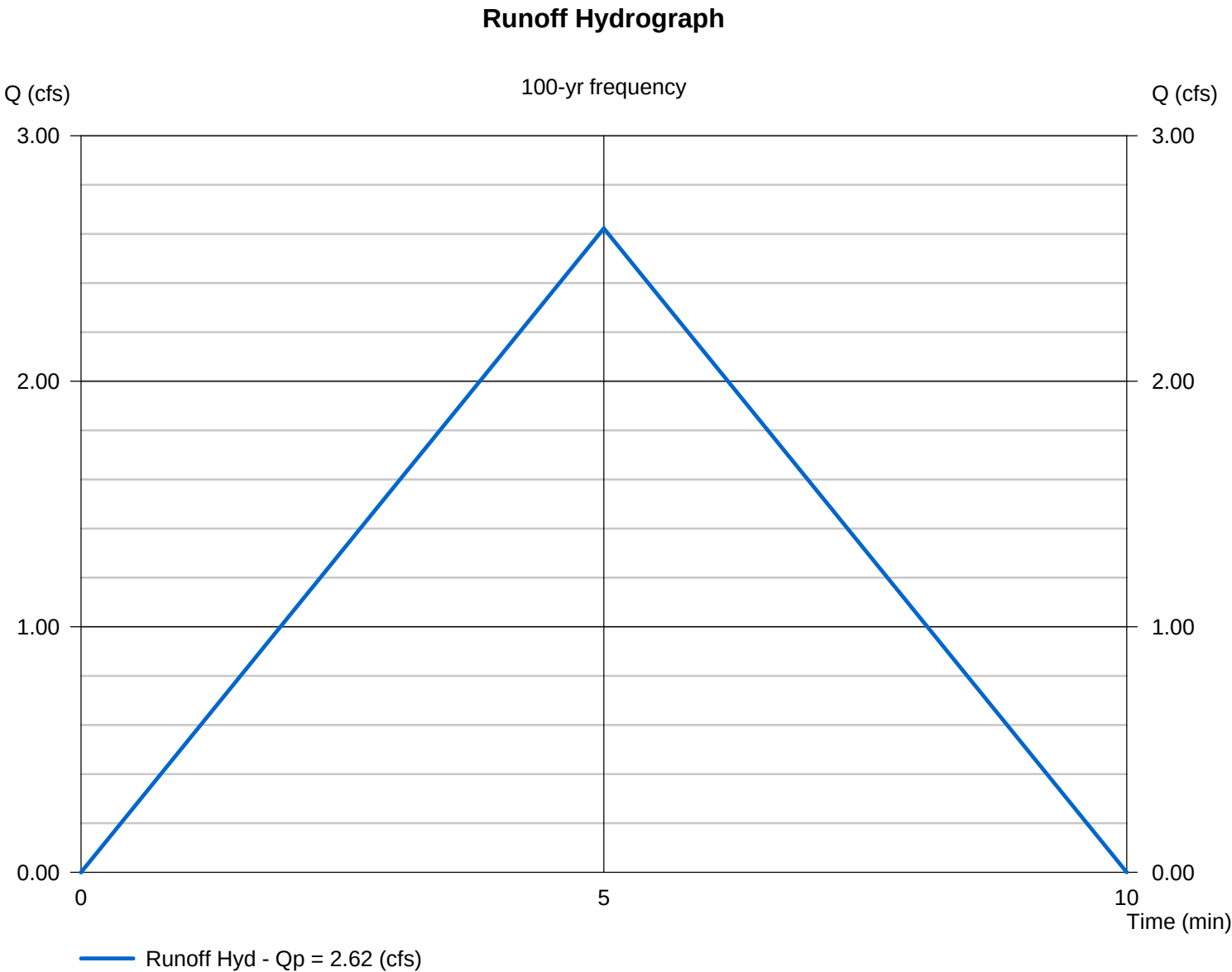


Hydrology Report

PROPOSED 100-YR HYDROGRAPH

Hydrograph type	=	Mod Rational	Peak discharge (cfs)	=	2.623
Storm frequency (yrs)	=	100	Time interval (min)	=	1
Drainage area (ac)	=	0.460	Runoff coeff. (C)	=	0.87
Rainfall Inten (in/hr)	=	6.553	Tc by User (min)	=	5
IDF Curve	=	GWS_CH4.IDF	Storm dur factor	=	1.00

Hydrograph Volume = 787 (cuft); 0.018 (acft)

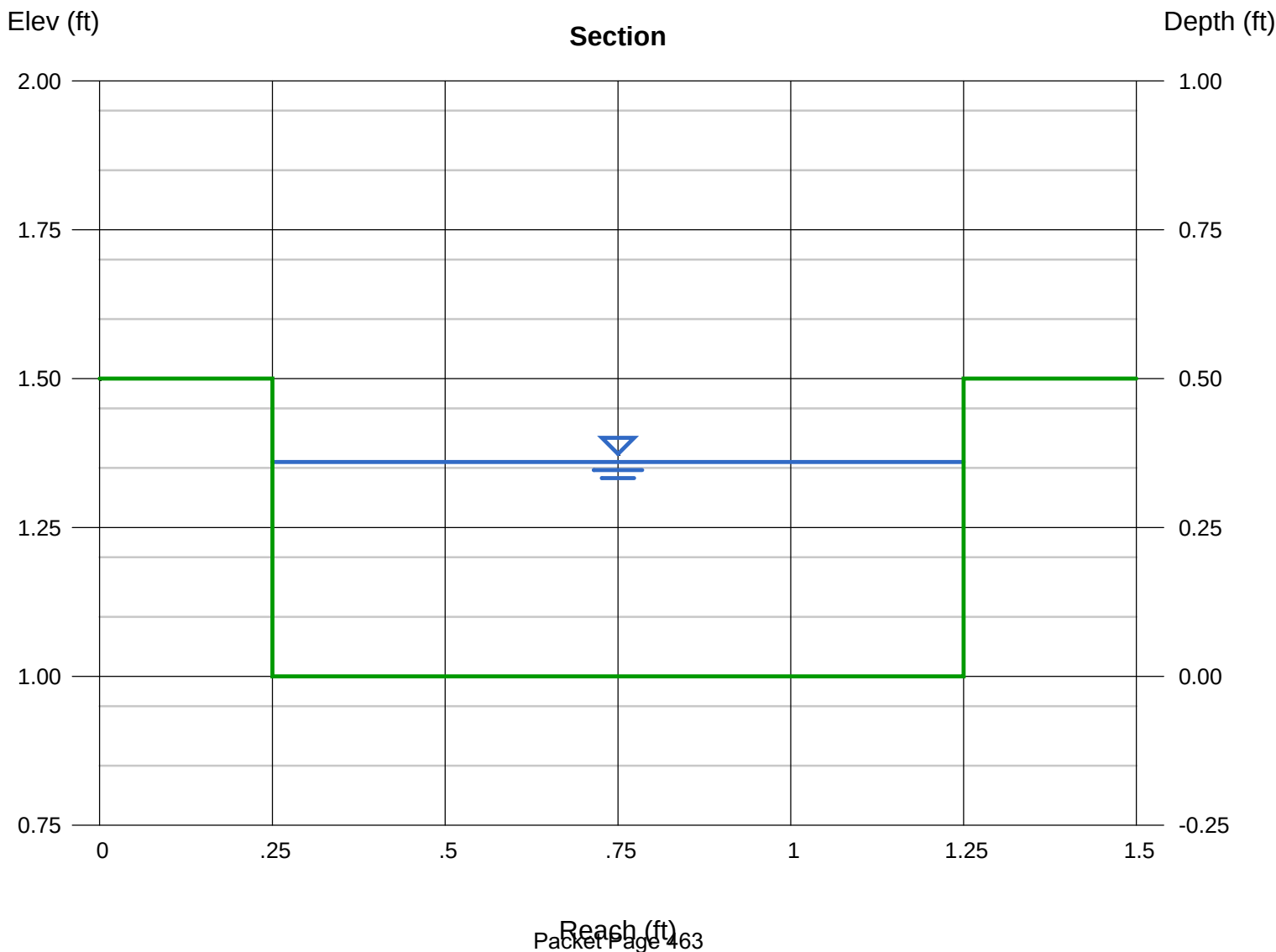


APPENDIX B: HYDRAULIC CALCULATIONS

Channel Report

SCUPPER CHANNEL @ 25YR PEAK FLOWRATE

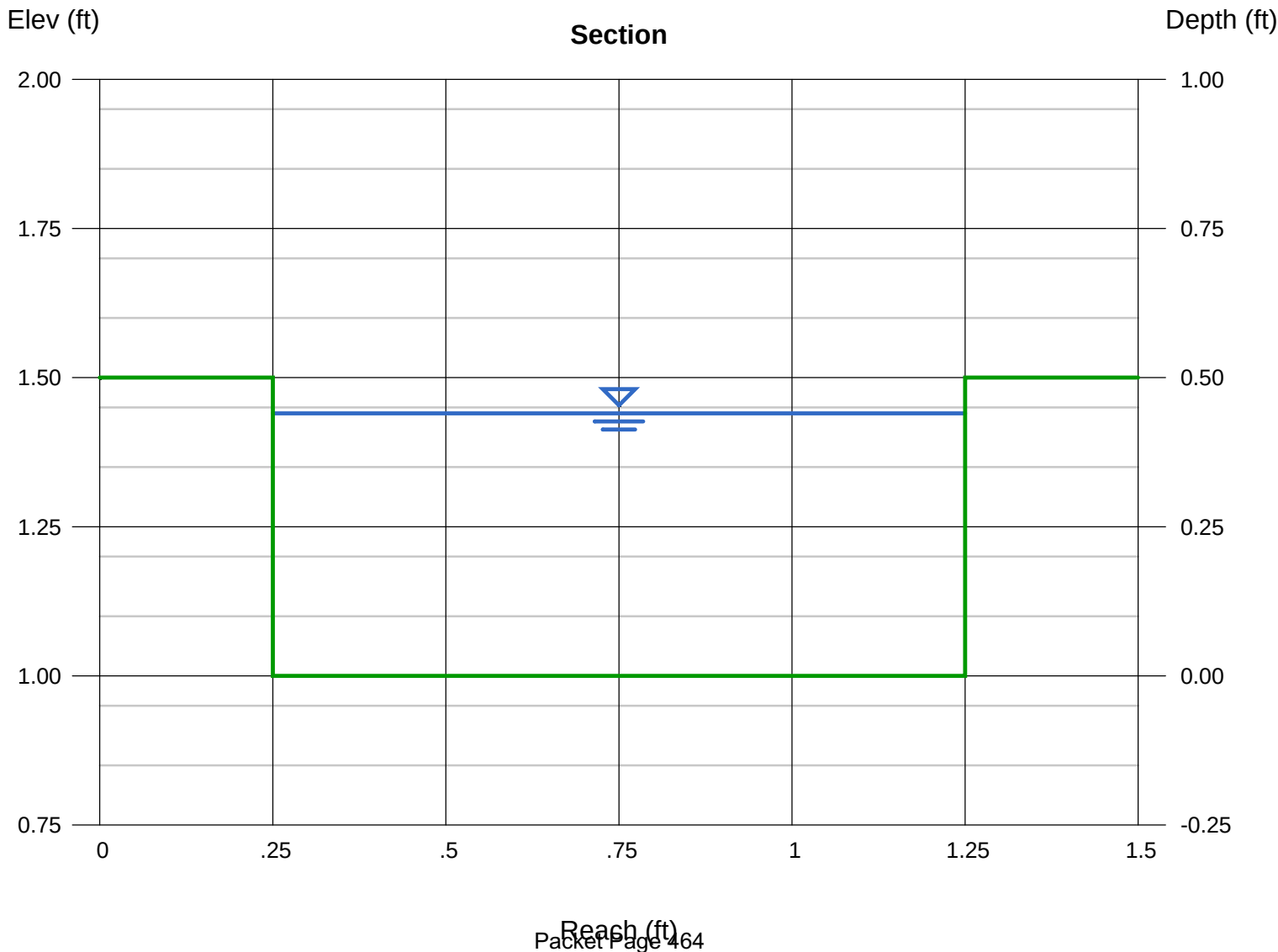
Rectangular		Highlighted	
Bottom Width (ft)	= 1.00	Depth (ft)	= 0.36
Total Depth (ft)	= 0.50	Q (cfs)	= 1.998
		Area (sqft)	= 0.36
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 5.55
Slope (%)	= 2.00	Wetted Perim (ft)	= 1.72
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.50
		Top Width (ft)	= 1.00
		EGL (ft)	= 0.84
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 2.00		



Channel Report

SCUPPER CHANNEL @ 100YR PEAK FLOWRATE

Rectangular		Highlighted	
Bottom Width (ft)	= 1.00	Depth (ft)	= 0.44
Total Depth (ft)	= 0.50	Q (cfs)	= 2.620
Invert Elev (ft)	= 1.00	Area (sqft)	= 0.44
Slope (%)	= 2.00	Velocity (ft/s)	= 5.95
N-Value	= 0.013	Wetted Perim (ft)	= 1.88
Calculations		Crit Depth, Yc (ft)	= 0.50
Compute by:	Known Q	Top Width (ft)	= 1.00
Known Q (cfs)	= 2.62	EGL (ft)	= 0.99



APPENDIX C: SOILS REPORT



Kumar & Associates, Inc.
Geotechnical and Materials Engineers
and Environmental Scientists

5020 County Road 154
Glenwood Springs, CO 81601
phone: (970) 945-7988
fax: (970) 945-8454
email: kaglenwood@kumarus.com
www.kumarus.com

An Employee Owned Company

Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs, and Summit County, Colorado

February 21, 2019

Realty Management Group, LLC
Attn: Will Coffield, P.E.
3033 East First Avenue, Suite 210
Denver, Colorado 80206
wcoffield@realtygp.com



Project No. 19-7-147

Subject: Preliminary Summary Soils Report, Proposed ANB Bank Building, 910 Grand Avenue,
Glenwood Springs, Colorado

Gentlemen:

As requested, we are providing a preliminary soils report for the proposed bank building based on previous subsoil studies performed on adjacent properties. This report can be used for planning and preliminary design of the proposed building. The planned building area is occupied by an existing building. Once the building is removed, we will drill borings within the proposed building footprint for a design level geotechnical report. The services were performed in accordance with Purchase Order Number 5 and our proposal for professional engineering services to Realty Management Group, LLC, dated February 12, 2019.

The proposed bank building will be a two-story frame structure with a slab-on-grade floor, located on the north end of the property on the east side of Grand Avenue, adjacent to the U.S. Forest Service District Office. A municipal parking garage (Ground Engineering Consultants, 2011) is located to the east, the former High Country Engineering building (H-P Geotech, 1994) is located to the southeast and the existing Colorado National Bank building (H-P Geotech, 2015) is across Grand Avenue to the northwest. The boring drill logs for those structures were reviewed for this report. H-P Geotech (now Kumar & Associates, Inc.) also performed construction observation and testing on the parking garage and bank projects.

Nearby Subsurface Conditions and Building Foundations: Borings drilled at the parking garage encountered 25 to 29 feet of sandy silt and clay (alluvial fan deposits) overlying dense gravel alluvium. The sandy silt and clay soils tend to settle when wetted. The parking garage is supported on heavy duty screw piles based in the dense gravel.

A boring drilled at the former High Country Engineering building, located across the alley to the southeast of the proposed bank building, encountered 27 feet of sandy silt and clay overlying dense gravel. That building was reportedly partially underpinned with steel push piles down to the dense gravel.

Borings drilled at the Colorado National Bank building, located across Grand Avenue and northeast of the subject site had 15 to 18 feet of the sandy silt and clay overlying the dense gravel. The bank building has a basement level and is supported on pad footings based on the gravel soils, 8 to 9 feet below the basement.

Expected Subsurface Conditions: We expect that the subsoils under the proposed building, below a shallow depth of fill, will consist of about 25 feet of sandy silt and clay overlying the dense gravel alluvium. Groundwater is expected to be more than 30 feet deep. The silt and clay soils are typically hydro-compressive and tend to settle when wetted. The settlement can average about 2 percent of the depth of soil, which could result in buildings on shallow spread footing foundations to settle 3 to 5 inches depending on the depth and extent of wetting.

Recommended Foundations: A deep foundation based in the underlying dense gravel below the site is recommended for support of the proposed bank. Possible foundations include drilled piers, screw piles, micro-piles and, possibly, heavy duty helical piles. Rocky zones within the relatively fine-grained alluvial fan deposit could make installation of helical piers difficult. Piers or piles with capacities of 30 to 50 kips should be feasible at this site.

The recommendations submitted in this letter are based on the previous exploratory borings drilled in the vicinity of the site. This preliminary study is based on the assumption that soils beneath the proposed building site are similar to the nearby sites. Site specific borings should be drilled to further evaluate the soil conditions. It is possible the data obtained by site specific subsurface exploration could change the recommendations contained in this letter.

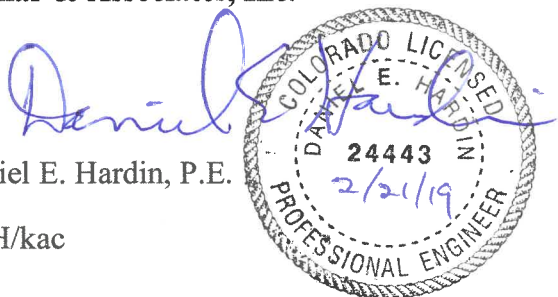
If you have any questions or need further assistance, please call our office.

Sincerely,

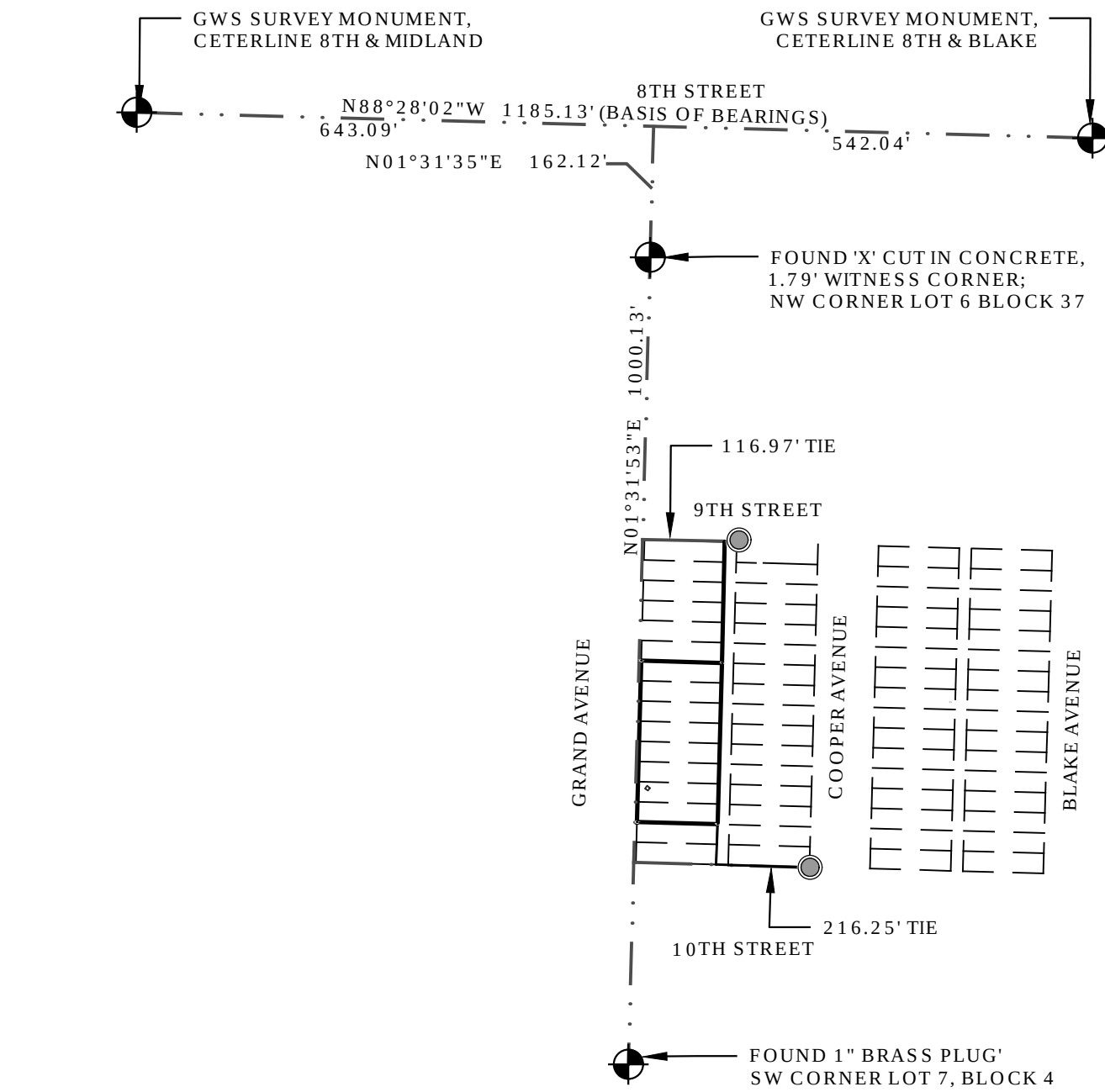
Kumar & Associates, Inc.

Daniel E. Hardin, P.E.

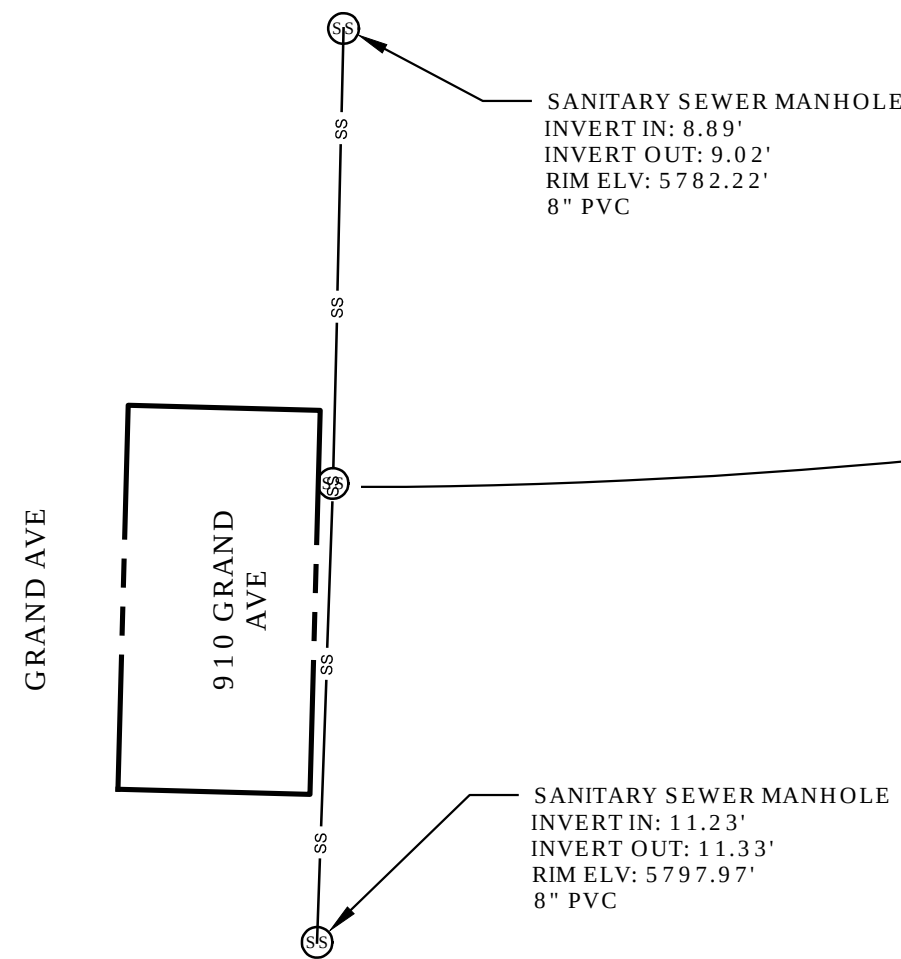
DEH/kac



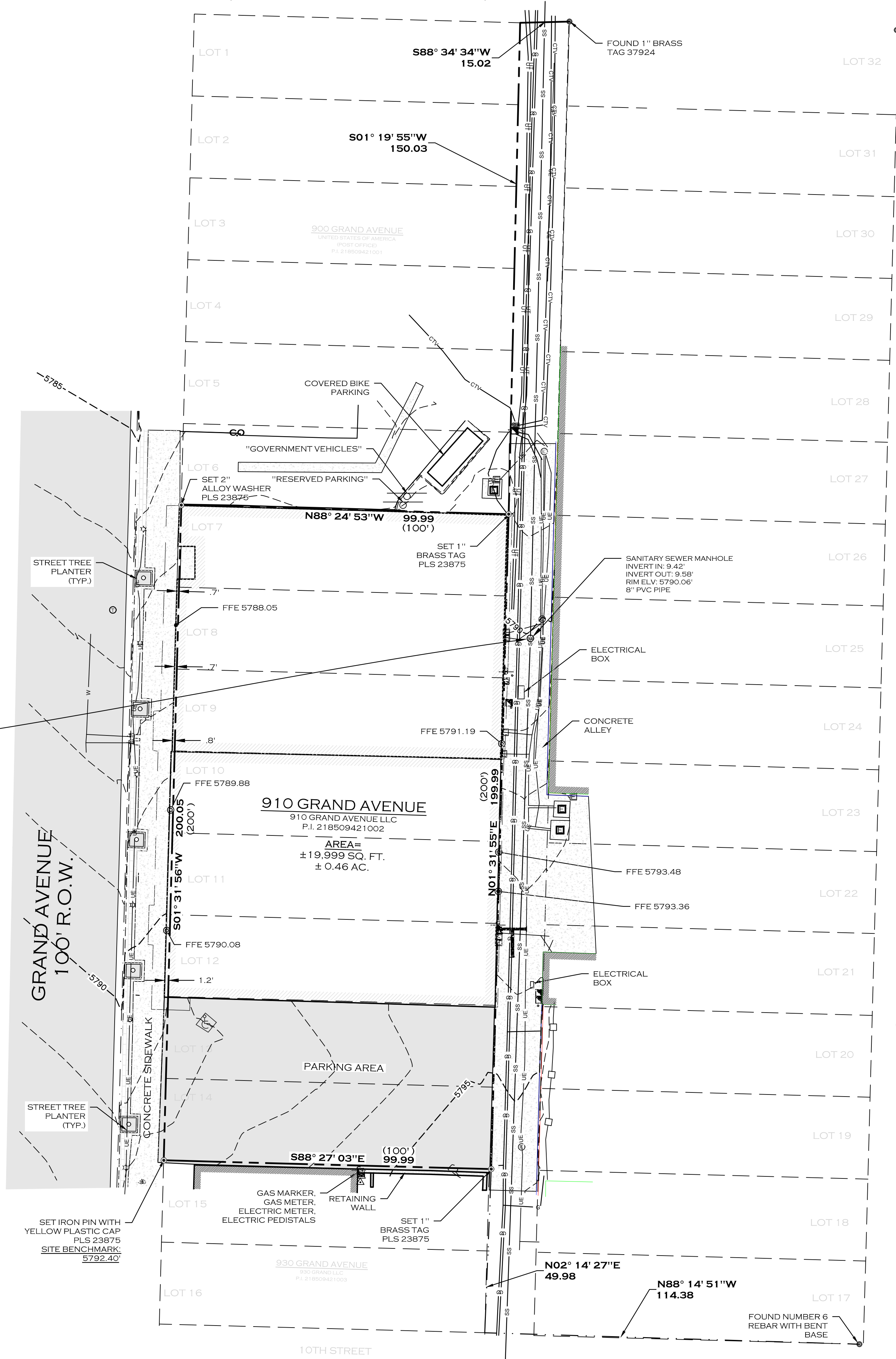
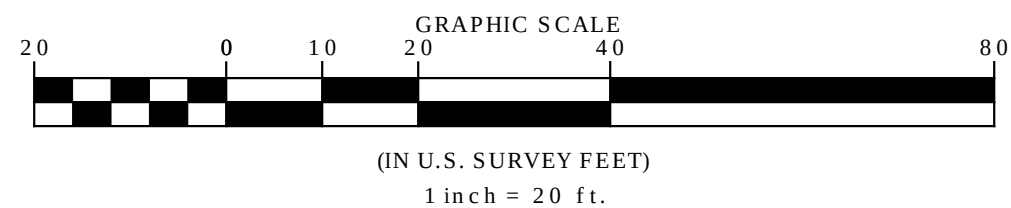
IMPROVEMENT SURVEY PLAT
LOT 7 THROUGH LOT 14, BLOCK 24, GLENWOOD ORIGINAL TOWNSITE
SECTION 9, TOWNSHIP 6, RANGE 89 OF THE 6TH P.M.
CITY OF GLENWOOD, COUNTY OF GARFIELD, STATE OF COLORADO



BASIS OF BEARINGS
SCALE: 1" = 200'



SEWER MANHOLE DETAIL
SCALE: 1" = 100'



SURVEYOR'S NOTES

- DATE OF FIELD SURVEY: MAY 16 & 17, 2018 AND FEBRUARY 21 & 27, 2019. THERE WERE SIGNIFICANT SNOW PILES ON SITE DURING THE FEBRUARY FIELD WORK.
- THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY THIS SURVEYOR OF THE PROPERTY SHOWN AND DESCRIBED HEREON TO DETERMINE:
 - OWNERSHIP OF THE TRACT OF LAND
 - COMPATIBILITY OF THIS DESCRIPTION WITH THOSE OF ADJOINERS
 - RIGHTS-OF WAY, EASEMENTS AND ENCUMBRANCES OF RECORD AFFECTING THIS PARCEL.
- FOR ALL INFORMATION REGARDING EASEMENT, RIGHTS-OF-WAY AND/OR TITLE OF RECORD, HIGH COUNTRY ENGINEERING, INC. RELIED UPON TITLE COMMITMENT NO. ABS63012738 ISSUED BY LAND TITLE GUARANTEE COMPANY, EFFECTIVE DATE: 5-2-2018.
- ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR LAND BOUNDARY MONUMENT OR ACCESSORY COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO SECTION 18-4-508 OF THE COLORADO REVISED STATUTES.
- ALL DIMENSIONS AND COURSES ARE AS MEASURED IN THE FIELD UNLESS DENOTED IN PARENTHESIS, WHICH DENOTE THE BOUNDARIES OF RECORD ON THE ORIGINAL PLAT OF GLENWOOD ORIGINAL TOWNSITE IN THE PUBLIC RECORDS OF GARFIELD COUNTY, STATE OF COLORADO.
- UNDERGROUND UTILITIES HAVE BEEN MARKED OUT BY OTHERS, ONLY PAINT MARKS AND UTILITY FLAGS HAVE BEEN LOCATED BY HIGH COUNTRY ENGINEERING, INC. THE ACTUAL LOCATION OF UNDERGROUND UTILITIES MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
- UTILITY LOCATES SEEM PARTIALLY INCOMPLETE EVEN THOUGH POSITIVE RESPONSES WERE RECEIVED. THIS MAY HAVE BEEN DUE TO ADVERSE WEATHER AND EXISTING SNOW PILES ON THE SITE. ANOTHER LOCATE MAY BE PRUDENT ONCE THE WEATHER IMPROVES.
- ELEVATIONS SHOWN HEREON ARE BASED ON GPS OBSERVATIONS UTILIZING THE CONTINUOUS OPERATING REFERENCE STATIONS (CORS) THROUGH THE MESA COUNTY RTVRN NETWORK BROAD CASTING NORTH AMERICAN VERTICAL DATUM (NAV088).
- THE WORD "CERTIFY" AS SHOWN AND USED HEREON MEANS AN EXPRESSION OF PROFESSIONAL OPINION REGARDING THE FACTS OF THE SURVEY, AS BASED UPON THE EVIDENCE PRESENTED HEREON, AND DOES NOT CONSTITUTE A WARRANTY OR GUARANTEE, EXPRESSED OR IMPLIED.
- NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED ON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT, MAY ANY ACTION BASED ON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF CERTIFICATION SHOWN HEREON.
- NOTICE: THIS PLAT AND THE INFORMATION SHOWN HEREON MAY NOT BE USED FOR ANY ADDITIONAL OR EXTENDED PURPOSE BEYOND THAT FOR WHICH IT WAS INTENDED AND MAY NOT BE USED BY ANY PARTIES OTHER THAN THOSE TO WHICH IT IS CERTIFIED. THIS DOCUMENT AND THE WORK IT REPRESENTS IS THE PROPERTY OF HIGH COUNTRY ENGINEERING, INC. NO PART OF THIS DOCUMENT MAY BE STORED, REPRODUCED, DISTRIBUTED OR USED TO PREPARE DERIVATIVE PRODUCTS WITHOUT PRIOR WRITTEN PERMISSION. AN ORIGINAL SEAL AND ORIGINAL SIGNATURE IS REQUIRED TO VALIDATE THIS DOCUMENT AND IS EXCLUSIVE TO HIGH COUNTRY ENGINEERING, INC. AND THE OWNER(S) OF RECORD AS OF THIS DATE, OF THE PROPERTY DELINEATED HEREON AND THE SUBJECT OF THE SURVEY.

SURVEYOR'S CERTIFICATION

I, BILL W.A. BAKER, A LICENSED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO (#23875) DO BY THESE PRESENTS CERTIFY THAT THE DRAWING SHOWN HEREON, WITH NOTES ATTACHED HERETO AND MADE A PART HEREOF, REPRESENTS A MONUMENTED LAND SURVEY MADE UNDER MY DIRECT SUPERVISION AND THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, AN ACCURATE DEPICTION OF SAID SURVEY IS RENDERED BY THIS PLAT. THIS SURVEY WAS CONDUCTED IN CONFORMANCE WITH CURRENT STANDARDS OF PRACTICE PROMULGATED BY THE PROFESSIONAL LAND SURVEYORS OF COLORADO, AND COMPLIES WITH TITLE 38-51-102, COLORADO REVISED STATUTES.

BILL W.A. BAKER, COLORADO PROFESSIONAL LAND SURVEYOR #23875
CERTIFIED FEDERAL SURVEYOR #1699

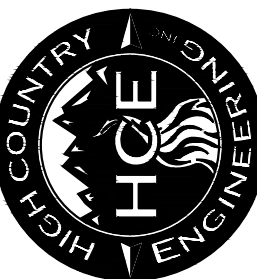
LEGEND

- SET L.S. NO. 23875
- FOUND PROPERTY CORNER - AS DESCRIBED
- TELEPHONE PEDESTAL
- TELEPHONE VAULT
- WATER SHUTOFF
- ELECTRIC MANHOLE
- ELECTRICAL TRANSFORMER
- ELECTRIC PEDESTAL
- LIGHT POLE
- ELECTRICAL METER
- GAS VALVE
- GAS METER
- GAS MARKER
- SANITARY CLEAN-OUT
- SANITARY MANHOLE
- STREET SIGN
- HANDICAP PARKING
- BOLLARD

- BUILDING OVERHANG
- ADJOINER LINE
- FLOWLINE
- TOP BACK OF CURB
- WATER LINE
- SEWER LINE
- TELEPHONE LINE
- FIBER OPTIC LINE
- GAS LINE
- UNDERGROUND ELECTRIC LINE
- OVERHEAD ELECTRIC LINE
- CATV LINE



HIGH COUNTRY ENGINEERING, INC.



ERIC FAAS
GLENWOOD SPRINGS, COLORADO
910 GRAND AVENUE
IMPROVEMENT SURVEY PLAT

PROJECT NO.
2181638

SHEET NUMBER
1 of 1



BALCOMB & GREEN

WATER LAW | REAL ESTATE | LITIGATION | BUSINESS ESTD 1953

Chad J. Lee, Esq.*
Telephone (970) 945-6546
clee@balcombgreen.com
*Licensed in CO, WY, and the
U.S. Patent and Trademark Office

December 11, 2019

VIA E-MAIL TO: trent.hyatt@cogs.us

Trent Hyatt
City of Glenwood Springs Community Development
101 West 8th Street
Glenwood Springs, CO 81601

Re: ***ANB Appeal***

Dear Trent:

Thank you for your and your staff's continued cooperation on the design of the new ANB Bank ("ANB") building on 9th and Grand. As mentioned in prior submittals, ANB seeks to utilize the Alternative Equivalent Compliance process pursuant to Section 070.040.090(c)(2) of the Glenwood Springs Municipal Code. The AEC process is intended to encourage creative and unique design, which meets the intent of the design regulations, but which might not strictly adhere to the Section's standards. It allows site-specific plans that are equal to or better than plans that would result from the strict application of the standard. In this case, the Applicant has two separate AEC requests, both of which better meet the intent of the design guidelines than strict compliance. Below is a discussion of these criteria with respect to each request.

1. GLAZING PERCENTAGE.

The Code requires at least 65% glazing on the ground floor along Grand Avenue. However, this results in a modern looking building inconsistent with the direction the Planning Commission and City Council requested of us. The design discussed at the work session resulted in 62% glazing. By increasing the glazing to above 65%, it would eliminate many of the historical elements we were requested to include, and which meet multiple provisions of the Code. We are therefore requesting that the Planning Commission find that this meets the AEC criteria, each of which are discussed below.

AEC Criteria (GWS Code 070.040.090(c)(2):

a. Achieves the intent of the subject standard to the same or better degree than the subject standard;

62% glazing would allow the building to retain more of the historical elements requested by both City Council and Planning Commission thus better meeting the intent of the subject design standards. The submitted design incorporates brick pilasters that divide the building into bays that mimic historic Commercial Core Buildings as required by Sections 070.040.090(e)(2)(a)(1), 070.040.090(e)(7)(d), and 070.040.090(e)(7)(d)(3). The existing belt brick course between floors would need to be shortened to allow for taller storefront windows, the building floor levels and proportions would no longer align with the adjacent buildings in the commercial core as they would need to adjust with the taller windows. This would be in conflict with the adjacent historic building floor levels and proportions as required by Sections 070.040.090(e)(7)(a)(1) and 070.040.090(e)(7)(b)(1). The shortening of the brick belt course

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Packet Page 469

would also have an impact on the required building articulations required per section 070.040.090(e)(7)(d)(1). Additionally, providing more of a ribbon storefront design along this face to meet 65% glazing would be in conflict with the section of the Code requiring new buildings to include windows designed to align with historic window articulation described in Sections 070.040.090(e)(7)(g)(1), 070.040.090(e)(7)(g)(2), and 070.040.090(e)(7)(g)(4).

b. Advances the goals and policies of this Code to the same or better degree than the subject standard;

Again, the goals and policies of this Code, as clarified by City Council and Planning Commission, are to better express Glenwood's historical character in this design. Less glazing meets these goals and policies better than the subject standard.

c. Results in benefits to the community that are equivalent to or exceed benefits associated with the subject standard; and

The resulting benefits of less glazing exceed the benefits associated with the subject standard, which would result in a more modern looking building.

d. Imposes no greater impacts on adjacent properties than would occur through compliance with the specific requirements of this Code.

The requesting glazing percentage imposes no greater impacts on adjacent properties.

2. 75% OF FRONT FAÇADE ZERO SETBACK

The Code requires at least 75% of the front façade provide a zero foot front setback from the sidewalk. However, after the City Council hearing and the Planning Commission work session, we understood the most important change we needed to make to our building design was to increase the prominence of the building's entrance along Grand Avenue. In order to accomplish this, a large portion of the building was slightly set back from the sidewalk along most of Grand Avenue. And instead of paving the sidewalk all the way to the building (which would meet the letter of the Code), we are requesting a raised bed planter, which would better enhance the pedestrian environment along Grand Avenue. This raised bed would be similar in height and match the planter located around the entry and on the south building elevation. The raised planter beds would consist of the same brick and sandstone materials as utilized on the building, creating a continuous extension of the building to the pedestrian sidewalk edge. The landscaping softens the building base, and adds color, texture and life to the elevations, enhancing the pedestrian experience for both of the primary elevations.

AEC Criteria (GWS Code 070.040.090(c)(2):

a. Achieves the intent of the subject standard to the same or better degree than the subject standard;

The stepped back building and continuous planting strip allow for a prominent Grand Avenue primary entrance, enhance the texture of the building elevation, and further improve the pedestrian environment to a much greater degree than a paved surface to the building edge, thereby better achieving the intent of the subject standard. The step back and wall offset of the building also conforms to Section 070.040.090(e)(7)(d)(1) of the Code regarding building articulation.

b. Advances the goals and policies of this Code to the same or better degree than the subject standard;

Again, the goals and policies of this Code, as clarified by City Council and Planning Commission, are to increase the prominence of the entryway along Grand Avenue and to enhance the pedestrian environment. A planting strip better enhances the pedestrian environment than a paved surface.

- c. Results in benefits to the community that are equivalent to or exceed benefits associated with the subject standard; and*

The resulting benefits of a planting strip exceed the benefits associated with the subject standard, which would result in a more pavement, less prominence to the entryway, and would degrade the pedestrian environment along Grand Avenue.

- d. Imposes no greater impacts on adjacent properties than would occur through compliance with the specific requirements of this Code.*

The requested planter bed imposes no greater impacts on adjacent properties.

Thank you for your consideration of these two requests for Alternative Equivalent Compliance.

Sincerely,

BALCOMB & GREEN, P.C.

By: /s/ Chad J. Lee, Esq.
Chad J. Lee

CJL

**Engineering
Department**

**Jessica Bowser
Asst. City
Engineer**

Date: 11/15/2019

To: Trent L. Hyatt, Senior Planner

Re: ANB Bank Glenwood Springs Site/Architectural Plan Review #3

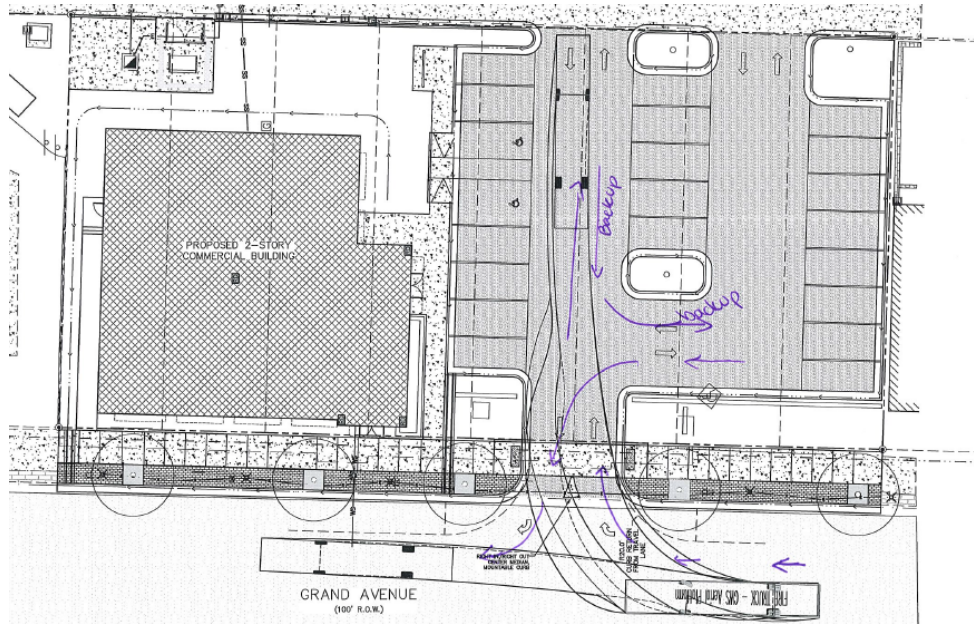
Please see the following engineering comments for the ANB Bank Glenwood Springs plans.

General Comments:

1. ~~CDOT Access Permit process will be required for the SH 82 access. Provide CDOT Access Permit to Engineering.~~
Provided Access Permit is in conflict within the document. Sheet 2 shows 90 DHV and sheet 5 shows 80 DHV. Please verify numbers and re-submit. Approved permit shall be provided to the City.
2. Provide Existing/Demolition Plan with next submittals.
Outstanding, to be submitted with Construction Documents.
3. Provide Utility plans with next submittal.
Outstanding, to be submitted with Construction Documents.
4. Replace references to the Public Works Manual to reference the City Engineering Standards.

Plan 2 – Site Plan

5. ~~Verify 20' minimum curb return radius per CDOT access code and City of Glenwood springs standards.~~
6. ~~Incorporate a center median “pork chop” in the access drive to define right in right out movement.~~
 - a. ~~Pork chop will be required to be mountable curb to allow fire truck access to the site.~~
7. Verify fire truck turning movement into site. Turning movement may encroach into the mountable pork chop area. Fire Turning radii are attached, use the aerial platform.
EMS Response access is not accurately depicted. Generally, a fire truck would not back into the parking. They would either head North or Southbound, with Southbound access being the most restrictive, and drive head in to the parking lot. They would then exit by using a hammerhead movement and exit head out.
See exhibit below:



8. ~~Verify through the CDOT permit process that the existing trees within the sight distance triangles are acceptable.~~
 - a. ~~Triangle for the left turn movement may be removed from the plan.~~
9. ~~What is the proposed section of permeable pavers, this may not be an ideal location for a permeable paver section? More detail to be provided with subsequent submittal.~~
 - a. Coordinate streetscape design with the DDA.
Outstanding, to be submitted with Construction Documents.
10. Electrical transformer will need an easement.
Outstanding, to be submitted with Construction Documents.
11. ~~Remove light pole located within the proposed access drive.~~
12. ~~Remove or relocate utility pedestals located within the north access to the alley.~~
13. ~~Handrail will be required for the ADA access ramp.~~

Plan 3 – Preliminary Grading Plan

14. ~~Identify roof drain location/s.~~
It is unclear where the roof drains outfall. Indicate any chases that will be necessary for their outfall with the Construction Document Submittal.
15. ~~Verify curb and gutter grading is consistent with existing Grand Ave grades.~~
16. ~~Provide a chase to convey stormwater from the grassed swale to the curb and gutter within Grand Ave.~~
Chase has been added but does not appear to be centered on the swale. This could cause overtopping to the sidewalk and an icing issue.
17. Curb and gutter along alley should be spill type to drain to the existing alley flowline/centerline.
The center island curb and gutter sill appears to be designed as a catch.

Prior to Grading/Building permit issuance:

1. Final Drainage Report must be submitted and accepted. In general, the concept of the proposed drainage is acceptable, but some items should be considered and revised:
 - a. Existing Drainage assumptions appear inaccurate. While the surface lot appears to surface drain to CDOT ROW, the roofs do not flow to the NW and surface drain. Please indicate how the roofs drain are connected to the storm system. If they tie in to the underground storm, this should be considered in the proposed drainage plan.
 - b. Updated the proposed drainage mapping to be consistent with the revised plans. There appear to be conflicts between this plan and the architectural/site plans.
 - c. A site-specific soils study should be completed for this site. The owner cannot use a study they did not complete/pay for from adjacent properties to make assumptions.
2. Approved and signed CDOT Access Permit must be submitted to the City.
3. Final Construction Document Plans should be submitted and approved. See attached Draft Checklist for guidance.
4. Provide Subsurface Utility Engineering (SUE) or stamped letter stating why this project is exempt from a SUE.

Prior to Certificate of Occupancy:

1. Stamped certification letter for the drainage improvements made to the property.
2. Maintenance plan and agreement for the drainage improvements.
3. A License to encroach for the sidewalk chases?
4. As-Built Survey with Improvement Survey Plat. AutoCAD with PDF's can be submitted initially. Once approved, a Final Mylar copy shall be provided.

Construction Document Review Checklist

General Engineering Items

This checklist is not all inclusive and additional items may be requested for design completeness and verification.

Applicant			City Staff	
Yes	N/A		Yes	N/A
		Geologic Hazard Report		
		Drainage Letter/Report		
		Traffic Impact Analysis/Report		
		Site Improvement Survey		
		Plat, if applicable		
		Plan Set: Include Cover Sheet, Existing/Demolition Plan, Site Plan, Grading Plan, Erosion Control Plan, Storm Sewer Plan, Utility Plan, Landscaping Plan, Irrigation Plan, Details		
		Letters must be submitted from the public or private utility companies that will service the proposed subdivision with gas, electricity, telephones, sanitary sewer, water, and fire protection facilities that state the aforementioned can service the proposed subdivision. Additionally, any agreements with utility or ditch companies must be submitted.		
		Maintenance easement and agreement with appropriate maintenance plan should be executed prior to Certificate of Occupancy.		
		All shared use (public access) facilities must meet PROWAG, ADA, or Federal Fair housing regulations, depending on applicability.		

Survey Plat

Applicant			City Staff	
Yes	N/A		Yes	N/A
		Drawings shall be submitted in both hard copy and electronic (PDF) formats		
		Sheet size shall be a minimum of 11" x 17" with a ½" border in 'landscape' orientation		
		Title Block		
		Colorado Professional Surveyor (P.L.S.) seals shall be provided on each set of drawings. All seals and stamps shall be in black, non-smearable ink and shall be legible. All letterings shall be solid black and a minimum of 11 pt. type. The contents of the survey plat shall include:		
		Surveyor's name and address		
		Survey performed or verified within the last 12 months 6 months?		
		Title on the top center of the front page with lettering not less than 1 inch; a purpose under the title that clearly describes the purpose of the plat; under the purpose, a legal description of the property		
		Vicinity map showing the property surveyed in reference to nearby highway(s) or major street intersections (shown at a legible scale)		
		Monuments placed (or a reference monument or witness to the corner) at all corners of the boundary of the property, unless already marked or referenced by an existing monument or witness to the corner		
		Boundary, field, and recorded bearing and distances around the property. All curves shall be circular arcs and shall be defined by the radius, central angle, tangent, arc, and chord distances		
		Name of subdivision or address, followed by the section, township and range along with City, County, and State.		
		Page Number (i.e. 1 of x, 2 of x, etc.)		
		Scale: The plan view must be drawn to a scale that displays the plan in a way that is clearly legible. Recommended scales include 1 inch equals 5, 10, or 20 feet. Include an indication of a standardized scale, both fractional and bar (i.e. 1" = 20')		
		North Arrow		
		Symbols and line types shall comply with industry drafting standards, and shall graphically distinguish between existing and proposed items		

		Legend for all symbols and linetypes used		
		Property Boundary Lines of the subject property shall be depicted with a bold 'phantom' linetype		
		Text should be no less than 0.1 inches in height		
		Street Labels, indicate public or private		
		Survey tied to City of Glenwood Springs monuments		
		Benchmark identified		
		Existing building(s) locations and dimensions with ties		
		Basis of bearing and point of beginning graphically		
		Label easements and encroachments; add reference numbers as applicable		
		Indication of access to public right—of-way on land, such as curb cuts and driveways, and to and from waters adjoining the surveyed tract		
		All Existing on site features: including, but not limited to, buildings, trees, utilities, etc.		
General Plan Items (to be included on all sheets)				
Applicant			City Staff	
Yes	N/A		Yes	N/A
		Drawings shall be submitted in both hard copy and electronic (PDF) formats		
		Name of subdivision or address, followed by the section, township and range along with City, County, and State.		
		City File Number		
		Page Number (i.e. 1 of x, 2 of x, etc.)		
		Sheet size shall be a minimum of 11" x 17" with a ½" border in 'landscape' orientation		
		Title Block		
		Indication of a standardized scale, both fractional and bar (i.e. 1" = 20')		
		North Arrow		
		Symbols and line types shall comply with industry drafting standards, and shall graphically distinguish between existing and proposed items		
		Legend for all symbols and linetypes used. May be represented on individual sheets, or with a master legend on a notes sheet.		
		Property Boundary Lines of the subject property shall be depicted with a bold 'phantom' linetype		
		Bearings and Distances indicated on all Property Lines		
		Indicate Benchmark and Basis of Bearing		
		Text should be no less than 0.1 inches in height		
		Street Labels, indicate public or private		
Cover Sheet				
The cover sheet is to reflect the summary of a proposed development.				
Applicant			City Staff	
Yes	N/A		Yes	N/A
		Date of Preparation		
		Legal description		
		Site Address, if available		
		Vicinity Map		
		Owner, Developer, and Applicant name		
		Basis of Bearings		
		Benchmarks		
		Proposed Land uses		
		Required and proposed parking quantities		
		FEMA Floodplain statement including community map number and date. Indicate whether the site is located within a designated floodplain.		

		Geologic Hazards Disclosure: "This property is subject to the findings summary and conclusions of a Geologic Hazards Report prepared by _____ dated _____, which identified the following specific geologic hazard/s on the property: _____". A copy of said report has been placed within file # _____ or within the subdivision file _____ of the City of Glenwood Springs Community Development/Engineering? . Contact the Community Development/Engineering? Office at 101 W. 8 th St. Glenwood Springs, Colorado, if you would like to view said report."		
		If within an airport overlay, the following note must be added: "The avigation easement dedicated herein for public avigation purposes, shall be considered a public easement subject to those terms and conditions specified on the instrument recorded at _____ of the Records of Garfield County, Colorado. All other easements or interests of record affecting any of the platted property depicted hereon shall not be affected and shall remain in full force and effect."		
		Site data tabulation listing acreage of land in the proposed subdivision, number, type, and typical size of lots, structures, and/or dwelling units; ground coverage of proposed structures and improvements, including parking areas, streets, sidewalks and open space; and the amount of open space that is being provided		
		<u>Public Facilities</u> – A note shall be placed on the site plan that makes reference to the public facility requirements for the installation and construction and/or contributions.		
		<u>PUD Projects</u> – Indicate the City ordinance number and approved land use types, maximum building heights and the intensity or density of the development.		
		<u>Residential Projects</u> – Indicate the potential housing types and the number of lots and/or units, maximum density range, minimum lot area and width, minimum front, side and rear setbacks, maximum building height, and maximum lot coverage.		
		<u>Non-Residential Projects</u> – Indicate the potential land use types and approximate site area and building use, floor area, minimum lot area and width, minimum front, side and rear setbacks, building height and percent of lot coverage. Indicate the total percent of site covered with both structures and impervious surfaces.		
Existing Conditions/Demolition Plan				
The existing conditions should reflect what is on the proposed site pre-development. Any removals can be represented on a separate sheet or indicated on the same plan, dependent on readability.				
Applicant			City Staff	
Yes	N/A		Yes	N/A
		Existing building locations, gross square footage, finished floor elevation (FFE), and existing use		
		Gross square footage/acreage of the property		
		Bearings and Distances indicated on all Property Lines		
		Indicate Benchmark and Basis of Bearing		
		Existing streams or other natural features		
		Existing historic sites and resources		
		Existing topography		
		Existing sidewalk/trail locations and materials		
		Existing access locations		
		Existing utilities		
		Existing easements		
		Indicate any removals or replacements. Indicated graphically and including quantities, if applicable		
Site Plan				
The site plan should be a graphical representation of the proposed site features, grading should be excluded from this sheet. This should include any item that would be seen standing on site. Removals indicated on the demolition plan should not be included on this plan.				
Applicant			City Staff	

Yes	N/A		Yes	N/A
		Include all above ground appurtenances of utilities (Fire Hydrants, Power poles, valves, manholes, etc). Do not indicate below grade utilities lines.		
		Identify parking: include stall sizes (may be typical), number of stalls, location, access widths, curb returns, ADA parking and access		
		Common elements, along with limited and general common elements (i.e., sidewalks, parking, open space, etc.)		
		Buildings		
		Existing and Proposed easements		
		Building footprints, and gross square footage indicated		
		Tie building corner to two property lines with appropriate dimensioning		
		Setbacks shown and identified		
		Indicate pavement type		
Roadway Plan and Profile (if applicable)				
A roadway plan and profile should be included for any public Roadway construction. Roadway design should follow the City of Glenwood Springs Engineering standards and promote positive drainage through the Right of Way. Removals indicated on the demolition plan should not be included on this plan.				
		The profile view is to be located directly below the plan view drawing along a matching survey line and stationing and is to be drawn at a horizontal scale that matches the plan view and a vertical scale of 1 inch equals 5 feet and shall contain the following information:		
		Original and proposed ground elevations		
		Stationing sequence, preferably left to right		
		Elevations labeled on both left and right sides of the drawing sheet		
		Match lines		
		Elevations based on centerline (if needed), flowline, or invert of pipe (Top of pipe is acceptable only for existing utilities)		
		Stations and elevations of existing and proposed grade breaks		
		Crossings of existing and proposed utilities		
		Elevations of inlets, tops of curbs, flowlines, inverts, and connection locations		
		Interference drawings that show all crossings for proposed and existing grades		
		Slopes or grades of stormwater sewers		
		Existing and proposed finished grades over utilities		
		Street profiles, including:		
		Stations and elevations of existing and proposed horizontal PC, PT, PCC, and PRC		
		Vertical curves with VIP, VPC, VPT, high point, or low point (not middle ordinate) stations and elevations		
		Centerline stations of all intersecting streets		
		Grades for all profiles		
		Curb flowlines		
		Curb return profiles to ensure positive drainage at ramp locations		
Grading Plan				
The grading plan should indicate site grading and general drainage locations. Removals indicated on the demolition plan should not be included on this plan.				
Applicant			City Staff	
Yes	N/A		Yes	N/A
		Existing and proposed topography		
		Type, location and extent of drainage facilities and permanent stormwater best management practices. Label these as private or public (on a separate sheet if necessary)		
		Storm Sewer should be shown		
		Retaining or foundation wall locations. Including top and bottom of wall elevations. Identify materials. Additional Retaining wall profiles and details may be required.		

		Drainage flow arrows		
		Indicate building finished floor elevation (FFE)		
		Indicate limits of disturbance		
		Cut and Fill Slopes may not exceed 2:1, unless supported by a site specific geotechnical report		
		Geologic Hazards Disclosure: "This property is subject to the findings summary and conclusions of a Geologic Hazards Report prepared by _____ dated _____, which identified the following specific geologic hazard/s on the property: _____. A copy of said report has been placed within file # _____ or within the subdivision file _____ of the City of Glenwood Springs Community Development/Engineering?. Contact the Community Development/Engineering? Office at 101 W. 8 th St. Glenwood Springs, Colorado, if you would like to view said report."		

Erosion Control Plan

The erosion control plan should indicate temporary and permanent erosion control measures. Removals indicated on the demolition plan should not be included on this plan.

		Appropriate stormwater management methods should be used. This includes, but is not limited to:		
		Vehicle Tracking Control		
		Concrete Washout		
		Silt Fence		
		Erosion control blanket in locations steeper than 3:1		
		Erosion control logs		
		If the development exceeds 1 Acre (even if it is in multiple phases) a Colorado Department of Health and Environment (CDPHE) Construction Stormwater Discharges Permit must be obtained prior to any work on site.		
		Details should be included for erosion control methods indicated		

Storm Sewer Plan

The erosion control plan should indicate temporary and permanent erosion control measures. Removals indicated on the demolition plan should not be included on this plan.

		Storm Sewer systems should be designed to in compliance with Urban Drainage design standards. The hydraulic grade line (HGL) should not exceed pipe capacity in the 10-year event. HGL can exceed pipe capacity in the 25-year event, but may not overtop above ground features.		
		Type, location and extent of drainage facilities and permanent stormwater best management practices. Label these as private or public (on a separate sheet if necessary)		
		Easement locations		
		Applicable details. These should include detention pond, outfall, bedding, cleanout, etc.		
		Pipe locations, material, size, and slope		
		All Rim and inverts of inlets, cleanouts, manholes, etc		
		Pond locations and sizing		
		Outfall locations, including emergency outfalls		

Utility Plan

The Utility Plan should indicate all utility mains and services proposed. Removals indicated on the demolition plan should not be included on this plan.

Applicant		City Staff		
Yes	N/A	Yes	N/A	
		The plan shall contain a note stating: "Utilities shall comply with the City of Glenwood Springs Standards and respective utility provider standards."		
		Utility agreements and/or reference to associated agreements with utility providers or ditch companies, including reception numbers		
		Indicate all existing/proposed utility features Including, but not limited to:		
		Manholes: Rim and invert elevations identified.		

		Cleanouts		
		Fire Hydrant Locations		
		Valve locations		
		Curb stop locations		
		Meters		
		Power Poles		
		Bends, tees, connections and type		
		Underground utilities should be identified with sizing and type. Indicate public or private facility.		
		Storm Sewer should be shown to identify any potential conflicts but can be labeled in the Grading Plan.		
		Easement Location should be identified		
		Utility Crossings should be identified		
		Grease Interceptor location, if applicable		
		Utility Mains that will become the property of the City of Glenwood Springs should have a plan and profile included on separate sheets		
		Profile		
		Original and proposed ground elevations		
		Stationing sequence, preferably left to right		
		Elevations labeled on both left and right sides of the drawing sheet		
		Match lines		
		Elevations based on centerline (if needed), flowline, or invert of pipe (Top of pipe is acceptable only for existing utilities)		
		Stations and elevations of existing and proposed grade breaks		
		Crossings of existing and proposed utilities		
		Elevations of manholes, valves, fire hydrants, inverts, and connection locations		
		Interference drawings that show all crossings for proposed and existing grades		
		Size, type, and slope of utility		
Paving and Geometrics Plan (if applicable)				
The paving and geometrics plan should indicate curblines, parking, sidewalks (or other publicly access facilities, i.e. trails, stairs, etc) and ADA facilities. Removals indicated on the demolition plan should not be included on this plan.				
		General geometrics for the paving layouts to indicate positive drainage for the site		
		Detailed geometrics for all ADA ramps and parking including slopes		
		Detailed geometrics for all stairs		
		Curb return dimensioning		
Construction Details				
Construction details should include any details necessary for the construction of this site. They should include the following, if applicable.				
		Retaining walls		
		Handrail		
		Ramps		
		Paving (cross section/materials)		
		Sidewalk (cross sections/materials)		
		Signage		
		Curb and gutter		
		Jointing		
		Service Tap Details		
		Inlets, Cleanouts, Manholes, Valves, Curb stops, Meters		
		Bedding		
		Restraints		

		Grease Interceptor		
Landscaping Plan				
The Landscaping Plan should indicate proposed landscaping within the site. Please be conscientious of any utilities, underground or overhead, easement locations when selecting plant layouts. Removals indicated on the demolition plan should not be included on this plan.				
Applicant			City Staff	
Yes	N/A		Yes	N/A
		Existing and proposed topography		
		Plant schedule and legend		
		All utilities (above and below ground)		
		Easement Locations		
		Sight triangles identified		
		Notes and Details		
Irrigation Plan				
The irrigation plan should be design to promote efficiency.				
Applicant			City Staff	
Yes	N/A		Yes	N/A
		Irrigation schedule		
		Underground utilities (identify any potential conflicts and revise prior to submittal)		
		Irrigation analysis		
		Notes and Details		
		Valve schedule		

November 22, 2019

Trent L. Hyatt
Senior Planner
City of Glenwood Springs
101 W. Eighth Street
Glenwood Springs, CO 81601
trent.hyatt@cogs.us

RE: Planning Item: 38-19 ANB Bank

Trent:

The Glenwood Downtown Development Authority appreciates the opportunity to offer land use referral comments on the ANB Bank development proposals, planning item: 38-19ANB Bank.

The DDA would like to acknowledge the work that ANB has undertaken to incorporate comments received from Planning and Zoning, the Council, the DDA, and others into their revised application. The current design is a much better fit for the downtown Glenwood core. The engagement with Grand Avenue represents a vast improvement from the earlier schemes.

We have two comments about the package. The first relates to the colored renderings shown in the packet. Those renderings have not incorporated the ADA ramp along the south side of the building façade. It would be helpful in communicating design intent for the renderings to include this site element as it is integral to the function and design of the project.

The second applies to the landscape plan. Though not specifically addressed in the code, we would offer the following suggestions to that plan. We would recommend that the applicant evaluate the placement of the Compact Oregon Grape Holly by the Kayak Sculpture; from our experience that species struggles with western exposure. We would also suggest that the applicant consider the design of the drainage swale. As depicted, the solution feels highly engineered. We recognize that the swale needs to meet the functional requirements as directed by the engineer, but there are a variety of ways to soften that element with plant material, alignment, etc. to provide a more aesthetic landscape treatment more in keeping with the overall design intent.

We look forward to continued interaction with ANB as their project moves forward. And again, we appreciate their willingness to work with the various entities to improve the building design.

On behalf of the DDA Board,

A handwritten signature in blue ink, appearing to read 'Laura Kirk', with a stylized, flowing script.

Laura Kirk
Glenwood DDA
970.963.6520
dda@dhmdesign.com

From: [Lisa DiNardo](#)
To: [Trent Hyatt](#)
Subject: Fwd: ANB Landscape Plan Comments
Date: Monday, November 25, 2019 10:12:44 AM
Attachments: [Soil Volume for Trees in the Urban Built Environment.png](#)

FYI

Sent from my iPhone

Begin forwarded message:

From: Lisa DiNardo <sweetbirchxoxo@yahoo.com>
Date: November 24, 2019 at 4:46:11 PM MST
To: Lisa DiNardo <lisa.dinardo@cogs.us>
Subject: ANB Landscape Plan Comments

Hi Trent,

Below are my comments for the ANB landscape plan

1. Substitute Bur Oak which grows too large to be used as a street tree with minimal rooting and canopy potential in the urban streetscape. Appropriate substitute is the Sienna Glenn Maple (Acer × freemanii Sienna Glen)
2. An irrigation plan was not submitted. The contractor should specify where the new building will tie into the city's irrigation line and the irrigation details.

Notes

- In the general landscape notes on page 6, it states plant quantities are for informational purposes only and that the contractor will verify quantities. City staff is requesting exact plant quantities in the plan.
- City Arborist to approve street tree species, quantity and locations.
- Tree grates are not recommended as they are expensive and harmful to the trees future growth. Alternative surface treatments options include, pavers, bricks cobble and planting an evergreen groundcover. See links below regarding alternative options for not using tree grates.
- Bark Mulch: 3/4 inch sifted – (not shredded red cedar)

Tree Rooting Potential in the Built Environment
<https://hort.ifas.ufl.edu/woody/root-space.shtml>

The case for not employing tree grates in the urban landscape

1. <https://hort.ifas.ufl.edu/woody/grate-alternatives.shtml>
2. <http://depts.washington.edu/dislc/UrbanTrees/Components.htm>



MEMO

TO: Trent Hyatt
Senior Planner

FROM: Gretchen Ricehill
Asst. Director, Community Development Dept.
Staff Liaison Historic Preservation Commission

DATE: December 4, 2019

RE: Historic Preservation Commission – Reviewing Agency Comments - ANB Bank

The Historic Preservation Commission met December 2, 2019 and discussed the ANB Bank building design. Five members were in attendance.

Generally, the majority of the Commission liked the brick columns which extended from the ground to the cornice; and the decorative brick treatments at the cornice and between the first and second floors. The Commission focused most of its discussion on three areas of the proposed design:

Black Metal Awnings/Marquees

In a 5-0 vote, the Commission recommended that the marquee be moved to the top of the transom rather than between the transom and display window as currently proposed, or moving it to the top of the transom and making it flush with the brick more like a traditional I-beam.

Building Setback from Grand Avenue

In a 3-2 vote, the Commission recommended that the building have a 0-foot setback from the Grand Avenue property line. All of the Commissioners felt that the black metal marquee should not be extended as a solution to meet the 0-foot setback design standard.

Second Floor Windows

Some Commissioners expressed concern about the size of the 2nd floor windows on the west and north elevations. Two of the five members believed that the windows should be paired like what is proposed on the south elevation. The remaining three members were supportive of the proposed design.

*City of Glenwood Springs Community Development Department
101 W 8th Street
Glenwood Springs, Colorado 81601
Tel: 970-384-6400
FAX: 970-945-8582*