



AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
MAY 2, 2019
101 W. 8TH STREET
6:15 PM

The agenda is subject to change, including the addition of items 24 hours in advance or the deletion of items at any time.

The order and times of agenda items listed are approximate and intended as a guideline for the City Council.

TIME	ITEM	PRE-MEETING	ACTION
3:00pm	1. Computer Training		Information/Discussion
3:30pm	2. Review of Regular Session Agenda		Information/Discussion
3:45pm	3. Future Agendas		Information/Discussion
WORK SESSIONS			
4:00pm	A. Procedural Council Training		Information/Discussion
4:15pm	B. Council Liaisons for Board and Commissions		Information/Discussion
5:00pm	C. Strategic Planning		Information/Discussion
6:00pm	Meeting Set-up		
REGULAR SESSION			
6:15pm	1. Roll Call		Quorum
	2. Pledge of Allegiance		
	3. Agenda Changes & Conflicts		Information
	4. Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes)		Information Only
6:30pm	5. Proclamation Rick Voorhees		Presentation
	6. Council Comments		Information/Discussion
6:35pm	7. Consent Agenda		Discussion and/or Action
	<i>All matters under consent are considered to be routine and will be enacted by one motion and vote. The titles will not be read aloud. There will be no separate discussion on these items unless a Councilmember or Audience Member so requests.</i>		
	A. Receipt of Minutes from Regular Meeting April 4, 2019		
	B. 7 Party Memorandum of Understanding Regarding Garfield County Senior Programs for 2019		
ACTIONS AND/OR PRESENTATIONS			
6:40pm	8. 27th Street Bridge Update		Information/Discussion
6:45pm	9. Request for Funding from Tourism Board		Discussion and/or Action
6:50pm	10. Resolution 2019-23; Supporting the Take a Minute Traffic Community Traffic Calming Campaign		Discussion and/or Action
6:55pm	11. Planning Item #01-19 - Consideration of a Major Site/Architectural Plan Review for a Multi-Tenant Office/Retail Building, Lot 14 Glenwood Meadows No. 2, Wulfsohn Road		Discussion and/or Action

7:20pm	12. Planning Item #03-18 - Request for Storage Improvements at the Glenwood Springs Municipal Airport, 1172 County Road 116	Discussion and/or Action
7:50pm	13. Two Rivers Project	Discussion and/or Action
8:15pm	14. Report from City Administration	Information/Discussion
	A. City Manager	
	B. City Attorney	
	C. Correspondence Incoming/Outgoing	
8:30pm	15. Executive Session to Conduct a Conference with the City Manager and City Attorney for the Purpose of Discussing the City's Purchase, Acquisition, Lease, Transfer or Sale of Real Property; Determining Positions Relative to Matters That May be Subject to Negotiations, Developing Strategy for Negotiations, and Instructing Negotiators; and to Conduct a Conference with the City Attorney to Receive Legal Advice in Accordance with C.R.S. 24-6-402(4)(e), related to Shoshone and Garfield Industrial Development	Information/Discussion
	16. Adjournment	



AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
MAY 16, 2019
101 W. 8TH STREET
6:15 PM

*The agenda is subject to change, including the addition of items 24 hours in advance or the deletion of items at any time.
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TIME	ITEM	PRE-MEETING	ACTION
3:30pm	1. Review of Regular Session Agenda		Information/Discussion
	2. Future Agendas		Information/Discussion
		WORK SESSIONS	Information/Discussion
4:00pm	A. Elected Officials training with CIRSA Sam Light (90 min)		
	B. Bidding Process and Local Preference		Discussion and/or Action
6:00pm	Meeting Set-up		
		REGULAR SESSION	
6:15pm	1. Roll Call		
	2. Pledge of Allegiance		
	3. Agenda Changes & Conflicts		
	4. Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes)		
	5. Council Comments		
	6. Consent Agenda		
	<i>All matters under consent are considered to be routine and will be enacted by one motion and vote. The titles will not be read aloud. There will be no separate discussion on these items unless a Councilmember or Audience Member so requests.</i>		
		ACTIONS AND/OR PRESENTATIONS	
	7. VMC Program Summary , Results and Funding Asking		Discussion and/or Action
	8. URA Appointment		
	9. Resolution moving the June 20th meeting to June 27th		
	10. Bid for Landscaping and Furniture on 7th Street		Discussion and/or Action
	11. Riparian Setback Considerations		Discussion and/or Action
	12. Vacation Rental Update		Discussion and/or Action
	13. Update on Construction Schedule for 7th Street		Information/Discussion
	14. Report from City Administration		
	A. City Manager		
	B. City Attorney		
	C. Correspondence Incoming/Outgoing		

15. Executive Session to Conduct a Conference with the City Manager and City Attorney Information/Discussion for the Purpose of Discussing the City's Purchase, Acquisition, Lease, Transfer or Sale of Real Property; Determining Positions Relative to Matters That May be Subject to Negotiations, Developing Strategy for Negotiations, and Instructing Negotiators; and to Conduct a Conference with the City Attorney to Receive Legal Advice in Accordance with C.R.S. 24-6-402(4)(e), related to
16. Adjournment



AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
JUNE 6, 2019
101 W. 8TH STREET
6:15 PM

*The agenda is subject to change, including the addition of items 24 hours in advance or the deletion of items at any time.
The order and times of agenda items listed are approximate and intended as a guideline for the City Council.*

TIME	ITEM	PRE-MEETING	ACTION
3:30pm	1. Review of Regular Session Agenda		Information/Discussion
	2. Future Agendas		Information/Discussion
		WORK SESSIONS	Information/Discussion
4:00pm	A. Elected Official training with Anna Itenberg		
	B. Rural Fire Board		
	C. Performance Contracts		
6:00pm	Meeting Set-up		
		REGULAR SESSION	
6:15pm	1. Roll Call		
	2. Pledge of Allegiance		
	3. Agenda Changes & Conflicts		
	4. Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes)		
	5. Council Comments		
	6. Consent Agenda		
	<i>All matters under consent are considered to be routine and will be enacted by one motion and vote. The titles will not be read aloud. There will be no separate discussion on these items unless a Councilmember or Audience Member so requests.</i>		
		ACTIONS AND/OR PRESENTATIONS	
	7. Asset Management		
	8. Report from City Administration		
	A. City Manager		
	B. City Attorney		
	C. Correspondence Incoming/Outgoing		
	9. Executive Session to Conduct a Conference with the City Manager and City Attorney for the Purpose of Discussing the City's Purchase, Acquisition, Lease, Transfer or Sale of Real Property; Determining Positions Relative to Matters That May be Subject to Negotiations, Developing Strategy for Negotiations, and Instructing Negotiators, Developing Strategy for Negotiations, and Instructing Negotiators; and to Conduct a Conference with the City Attorney to Receive Legal Advice in Accordance with C.R.S. 24-6-402(4)(a), (b) and (e), related to		Information/Discussion

10. Adjournment

DRAFT



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Procedural Council Training

Action Requested: NA

Department: Attorney

Presented By: Glenwood Springs Legal, Legal

Background Info: The City Attorney will take City Council through important parts of the City Charter and answer questions. Handouts will be provided at the meeting.

Issues:

Staff Recommendation:



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Council Liaisons for Board and Commissions

Action Requested:

Department: City Administration

Presented By: Debra Figueroa, City Manager

Background Info: City Council requested a work session to discuss how to handle the appointments of Board and Commissions. Attached is the Board and Commission list for discussion purposes.

Issues: NA

Staff Recommendation: NA

CITY BOARDS AND COMMISSIONS:

Airport Board

- Meet at 7:20 AM on the 3rd Thursday of each month in the 2nd Floor Engineering Conference Room at City Hall
- Website: <http://www.gwsco.gov/198/Airport>
- Council Rep:
- Alternate:

Arts and Culture Board

Council Rep:

Building and Contractors Licensing Board

- Council Rep:
- Alternate:

Building Board of Appeals

- Meet as needed at 8:15 AM on the Last Wednesday of each Month in the 2nd Floor Engineering Conference Room at City Hall
- Website: <http://www.gwsco.gov/199/Building-Board-of-Appeals>
- Council Rep:
- Alternate:

Downtown Development Authority

- Meet at 11:30 AM the 3rd Tuesday of each month in the Council Chambers at City Hall
- City Website: <http://www.gwsco.gov/198/Airport>
- DDA Website: <http://www.glenwoodspringsdda.com/home.html>
- Council Rep:
- Alternate:

Financial Advisory Board

- Meet at 7:30 AM on the 4th Wednesday of each month, or as needed in the Council Chambers at City Hall
- Website: <http://www.gwsco.gov/201/Financial-Advisory>
- Council Rep:
- Alternate:

Historic Preservation Commission

- Meet at 5:15 PM on the 1st Monday of each month in the Council Chambers at City Hall
- Website: <http://www.gwsco.gov/203/Historic-Preservation>
- Council Rep:
- Alternate:

Rev

Parks and Recreation Commission

- Meet the 2nd Thursday of each month at 5:30 PM at the Community Center
- Website: <http://www.gwsco.gov/204/Parks-Recreation>
- Council Rep:
- Alternate:

Planning and Zoning Commission

- Meet on Tuesday 3 weeks prior to the 2nd City Council meeting of the following month (Council meets on the 1st and 3rd Thursday of each month) at 6:00 PM in the City Council Chambers at City Hall
- Website: <http://www.gwsco.gov/205/Planning-Zoning>
- Council Rep:

River Commission

- Meet the 1st Wednesday of each month at 5:00 PM at the Community Development Conference Room 201 at City Hall
- Website: <http://www.gwsco.gov/206/River>
- Council Rep:
- Alternate:

Transportation Commission

- Meet the 1st Tuesday of each month at 7:30 AM in the 2nd Floor Engineering Conference Room at City Hall
- Website: <http://www.gwsco.gov/207/Transportation>
- Council Rep:
- Alternate:

Tourism Promotion Board

- Meet at 2:00 PM on the 2nd Thursday of each month in the Council Chambers at City Hall
- Website: <http://www.gwsco.gov/208/Tourism-Promotion>
- Council Rep:
- Alternate:

Victim's and Witness Assistance and Law Enforcement Board (VALE Board)

- Meet at 7:30 AM on the 2nd Monday of each month in the Council Chambers at City Hall
- Website: <http://www.gwsco.gov/209/VALE>
- Council Rep:
- Alternate:

Volunteer Firefighter Pension Board

- Meetings are held as needed at Fire Station 2, 806 Cooper Avenue
- Website: <http://www.gwsco.gov/202/Volunteer-Firefighter-Pension>
- By code the Mayor is required to be the council liaison to this board

Rev

- Council Rep:
- Alternate: None – I don't believe that the code allows for an alternate

Housing Commission

- Council Rep:
- Alternate:

The powers and duties of the City Boards and Commissions are provided in 020.020.030 which can be accessed with the following link:

[https://www.municode.com/library/co/glenwood_springs/codes/municipal_code?nodeId=TIT020CICOBACO_ART020.020BOCO_020.020.030PODUBOCO]

OTHER BOARDS:

Associated Governments of Northwest Colorado

- Website: <http://agnc.org/about/>
- Council Rep:
- Alternate:

CDOT Intermountain Transportation Planning Region (IMTPR)

- Meetings are usually approximately every 3 to 4 months and are typically held on Friday mornings from 10AM to 12PM in the Eagle County Administration Building in Eagle.
- Council Rep:
- Alternate:

Club 20

- Calendar of Events: http://www.club20.org/images/pdfs/Calendar_of_Events_2017_-_Approved.pdf
- Website: <http://www.club20.org/>
- Council Rep:
- Alternate:

Colorado Municipal League

- Website: <https://www.cml.org/>
- Council Rep:
- Alternate:

Downtown Partners

- Apparently this organization is not active
- Council Rep:

Garfield Clean Energy:

- Meetings are held once every two months on the 2nd Friday of the month
- Website: <http://www.garfieldcleanenergy.org/about-governance.html>
- Council Rep:
- Alternate:

Rev

Glenwood Springs Chamber Resort Association Board of Directors

- Meetings are each month
- Website: <https://www.glenwoodchamber.com/>
- Council Rep:
- Alternate: None – I don't believe that the Chamber wants an Alternate Council Member appointed

Glenwood Springs Rural Fire District Board

- Council Rep:
- Alternate:

Northwest Colorado Council of Governments Rural Resort Region

- Meeting Schedule: <http://nwccog.org/wp-content/uploads/2015/03/2017-COUNCIL-MTG-SCHEDULE.pdf>
- Website: <http://nwccog.org/>
- Council Rep:
- Alternate:

Roaring Fork Transportation Authority (RFTA) Board of Directors

- Meeting Schedule: <https://www.rfta.com/board-meetings/>
- Website: <https://www.rfta.com/>
- Council Rep:
- Alternate:

Ruedi Water & Power Authority

- Website: <http://www.rwapa.org/>
- Council Rep:
- Alternate:



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Strategic Planning

Action Requested: Staff is requesting a general discussion on the type of strategic planning process City Council would to undertake over the next few months.

Department: City Administration

Presented By: Debra Figueroa, City Manager

Background Info: Staff has included an example of a streamlined planning process and a more complicated process from the City of Chula Vista, CA. We have also attached a PowerPoint presentation that helps explain strategic planning from Councilman Rick Voorhees.

There are many different ways to have a strategic planning process. No matter the direction Council wants to undertake, staff is suggesting the City use an outside facilitator.

Issues:

Staff Recommendation:

Working Vocabulary

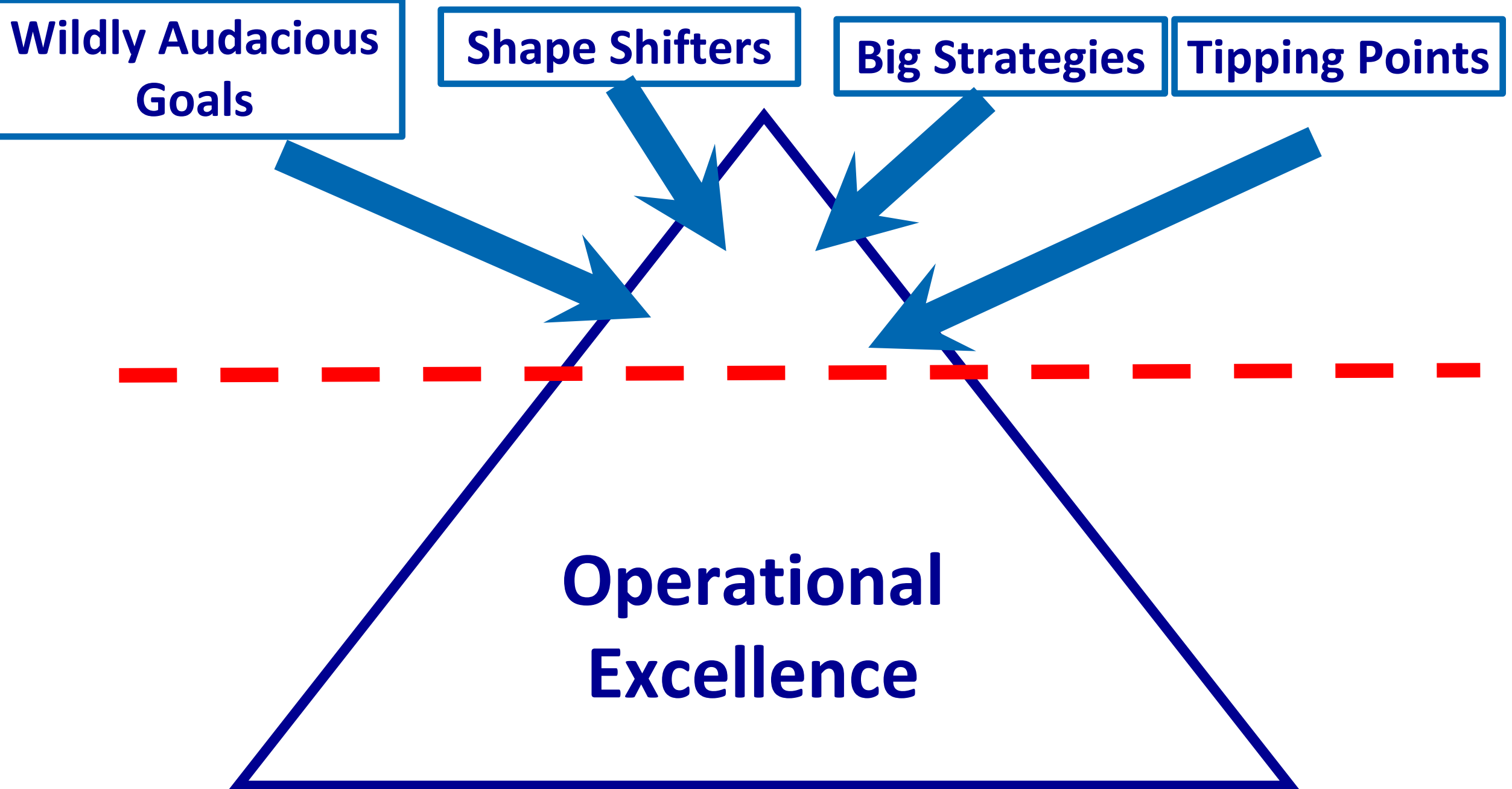
- A *Planning Goal* establishes an overarching direction for the organization over life of its strategic plan. Goals are supported by rationale and do not change over the planning period.
- A *Strategy* commits the organization to courses of action to support the planning goals.
- *Metrics* provide visible measures of goal attainment for each strategy. A success factor includes these elements: specific activities, responsible parties, target dates, and any budget amount associated with that strategy

Relationship Among Planning Components



Strategy Pyramid





Structure for a Strategic Plan

Mission Statement

Vision Statement

Strategic Goal #1

Strategic Goal #2

Strategic Goal #3

Key Strategies

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Key Strategies

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Key Strategies

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Examples of A High Level Summary

Mission: The City of Glenwood Springs provides responsive, efficient, and responsible services to meet the needs of its citizens.

Vision: The City of Glenwood Springs aspires to be recognized nationally and internationally for its service to community members through efficient use of taxpayer resources and ensuring quality of life for all citizens

Strategic Goal #1. Infrastructure

Key Strategies

- *Find resources to fix city streets
- *27th Street Bridge
- *South Midland
- *7th Street
- *LOVA Trail

Strategic Goal #2. Quality of Life

Key Strategies

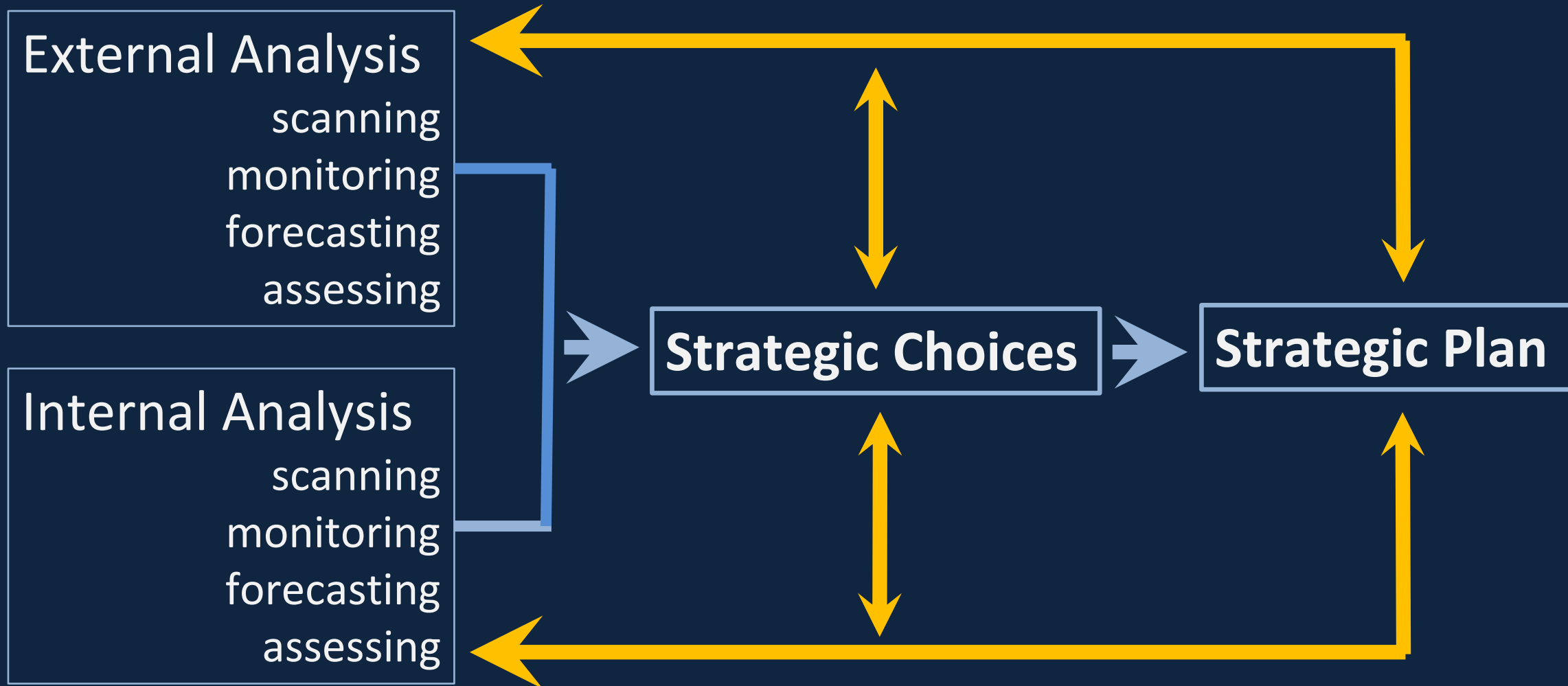
- *Arts and Culture
- *Summer of Music
- *Cultural Activities
- *Recreational Amenities
- *Affordable Housing

Strategic Goal #3. Sustainable Economic Development

Key Strategies

- *Attract high paying jobs
- *Revisit city policies

Role of External and Internal Analytics in Strategic Planning



Courage Is Redlining Strategies for Budgeting

- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
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But where to set??



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Separating the shape shifters from the operationally excellent

Responsibility for Results

Strategy	Description & Success Factor(s)	Individual Assigned Responsibility	Completion Date	Cost (if applicable)

Council's Steps Forward

1. May 2019

- Agree on three high hanging goals
- Direct senior staff to identify three strategies already in place and two future strategies to support goals

2. June 2019

- Convene public, boards and commissions, and staff for brainstorming session(s) to identify strategies

3. July 2019

- Council convenes to review current and future strategies collected. Council prioritizes those strategies over three or five year time period

4. August 2019

- Convene public, boards and commissions, and staff to review results of prioritization and associated timeframe
- Ratify plan
- Begin to link to 2020 budget

**2019 -2014 Strategic Plan
City of Glenwood Springs**

Vision (just an example)

The City of Glenwood Springs in a unique mountain town that deeply values its rivers, clean air and water, outdoor recreation, diverse economy, and incredible quality of life.

Mission (Example)

To provide high quality services to our residents and preserve our unique small town character.

The Mayor and City Council provides strategic policy guidance through five Strategic Priorities and then works with staff and the community to select projects during the budgeting process that help City Council attain their Strategic Priorities.

Strategic Priorities for 2019-2014

1. Preserving a High Quality Environment
2. Improving Infrastructure for the Future
3. Increased Public Safety through Strong and Responsive Police and Fire Departments
4. Economic Diversity and Strength
5. Fiscal Responsibility and Transparency

While staff will work on projects and programs outside of Council's Strategic Priorities to maintain day to day government operations, the Strategic Priorities of City Council will be a driving focus of City Staff. For the 2019 Budget, the following projects are already underway to move forward City Council direction.

1. Preserving a High Quality Environment/Increasing Sustainability

- A. Improve fiscal management of the landfill while providing sustainable services requested by the community.
- B. Convert the city's utility to 100% renewable energy.
- C. Partnering with Forest Service to Provide a Hanging Lake Shuttle Service
- D. Ensure that Proposed Mine Expansion does not negatively impact our air, water, quality of life.

2. Improving Infrastructure for the Future

- A. Complete the 27th Street Bridge Replacement Project
- B. Complete Design and Prepare Bid Package for the South Midland Reconstruction Project
- C. Continue Design and funding strategy for South Bridge
- D. Reconstruction of the Cedar Crest Neighborhood

3. Increased Public Safety through Strong and Responsive Police and Fire Departments

- A. Continue emphasis on police officer recruitment and retention
- B. Determine the location and strategy to build of a new fire station in West Glenwood to replace an obsolete facility.
- C. Work with Community Partners to reduce wildland fire risk and the negative impacts of transients in the surrounding hillsides and the local economy.

4. Economic Diversity and Strength

- A. Continue to implement the Urban Redevelop Plan for the West Glenwood Mall
- B. Promote Opportunity Zones and Work with the DDA and other community partners to attract high quality businesses.
- C. Strengthen downtown businesses through the completion of the 7th and 6th Street beautification projects.
- D. Partner with communities to provide workforce housing.

5. Fiscal Responsibility and Transparency

- A. Continue to Implement the Enterprise Resource Plan (ERP).
- B. Leverage limiting funding by obtaining outside funding.
- C. Continue to pursue the GFOA distinguished budget and CAFER awards.
- D. Attain 25% Unrestricted Reserves in the General Fund, A&I Fund, and Capitol Funds.

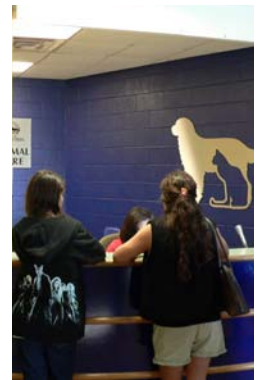
For the upcoming 2020 Budget, the Mayor and Council will have an opportunity to select new projects in the budget to help accomplish policy goals. In order to help City Council understand staff and community priorities before determining the 2020 Budget the following process will be undertaken.

June 2019:

- I. A three hour offsite retreat with Senior Staff to discuss their top three projects. Department Heads will have presentations that include project costs and potential funding solutions.
- II. A three hour offsite meeting with Board Chairs and Commissions to discuss the top two priorities for each Board and or Commission. Staff will capture these requests for City Council.
- III. Two community listening meetings that allow a forum for residents to express general concerns with City Council on any topic.

July 2019:

- I. A four hour retreat to select 5 high and 5 medium priority projects for the 2020 Budget based upon staff, Commission and community input.
- II. Staff will use this direction to prepare the 2020 Budget which will be presented starting in September.



Strategic Plan



The City is launching a Strategic Plan as an important tool to guide operations. The Strategic Plan provides a comprehensive framework that ensures priorities set by the City Council are clear to all employees and that the City government is accountable to meeting community needs by setting annual objectives to meet identified goals. This system is will be an annual cycle that encourages focused, meaningful service delivery to benefit all of Chula Vista. Simply put, the Strategic Plan is a road map that identifies where we want to go and includes concrete steps of how the City will get there.

City departments have been working together for approximately six months to develop the first draft of the plan. Together we have identified 13 strategies and 28 initiatives to support the following five core goals critical to achieving our shared vision of ensuring a vibrant and sustainable quality of life for Chula Vista residents and businesses:

- Operational Excellence
- Economic Vitality
- Healthy Community
- Strong and Secure Neighborhoods
- Connected Community

This is an important foundational step for our organization. Like many other public agencies, we have had to do more with less while still providing quality services. In order to keep up with quality service delivery, we must be strategic in direction and efficient in approach. The Strategic Plan, coupled with our commitment to continuous improvement, establishes a clear vision and priorities to efficiently leverage resources and be innovative in how we advance the City's goals. We embark on this inaugural implementation year with the end result in mind and plan to report in Fall, 2014 on the progress we make toward a more vibrant city.

Sincerely,

A handwritten signature in black ink that reads "James D. Sandoval". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

James D. Sandoval
City Manager

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City Strategic Plan Introduction

The City of Chula Vista is implementing a new Strategic Plan system. This system is an annual cycle that encourages focused, meaningful service delivery to benefit all of Chula Vista. It is a comprehensive framework that ensures: priorities set by the City Council are clear to all employees, goals are laid out that respond to priorities, objectives are achieved that meet the goals, and that the City government is accountable to meeting community needs. The Strategic Plan is a significant step in furthering the City's efforts in Continuous Improvement.

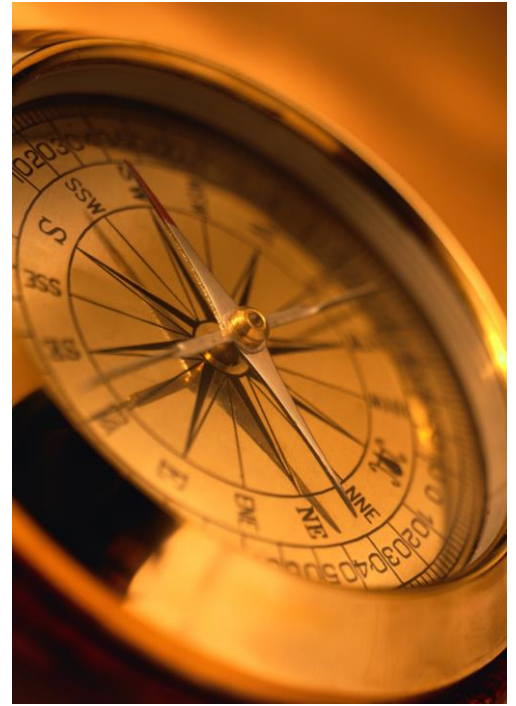
How did we get here?

A Steering Committee was formed to create the Plan. The Committee was comprised of one person per department that represented ideas and thoughts from their respective departments and various commissions. The Steering Committee met regularly between November and March to refine a draft Plan that includes long-term strategies and annual initiatives. On an annual basis we anticipate the committee will meet quarterly to go over performance measurements and check in on initiatives. The feedback loop is continuous, not a start and stop process. The "Plan, Do, Check, Act" philosophy is a foundation of continuous improvement.

The Strategic Plan is an operational tool for the City Manager and departments to use. The goals encompass visions the City Council and public have already expressed. Feedback on any potential changes would be solicited when we annually report out on past performance.

"People often complain about lack of time when the lack of direction is the real problem."

- Zig Ziglar



General Concept

Strategic Plan-Begins with a long-range Strategic Plan that identifies where we want to get to. This ensures we are all working in same direction toward clearly defined goals

Annual Plan-Development of a short-term annual plan that identifies Initiatives for the next year in support of achieving the strategic goals. Resources are aligned with annual Initiatives through service levels identified in the budget process. This step is where we align and link the city's Initiatives and resources in pursuit of goals.

Performance Measurement-Based on the annual plan, performance measurements are created to track achievement toward service levels/Initiatives identified through the annual plan. When implemented at the departmental and individual performance goal levels, everyone understands how they are contributing to City goals.

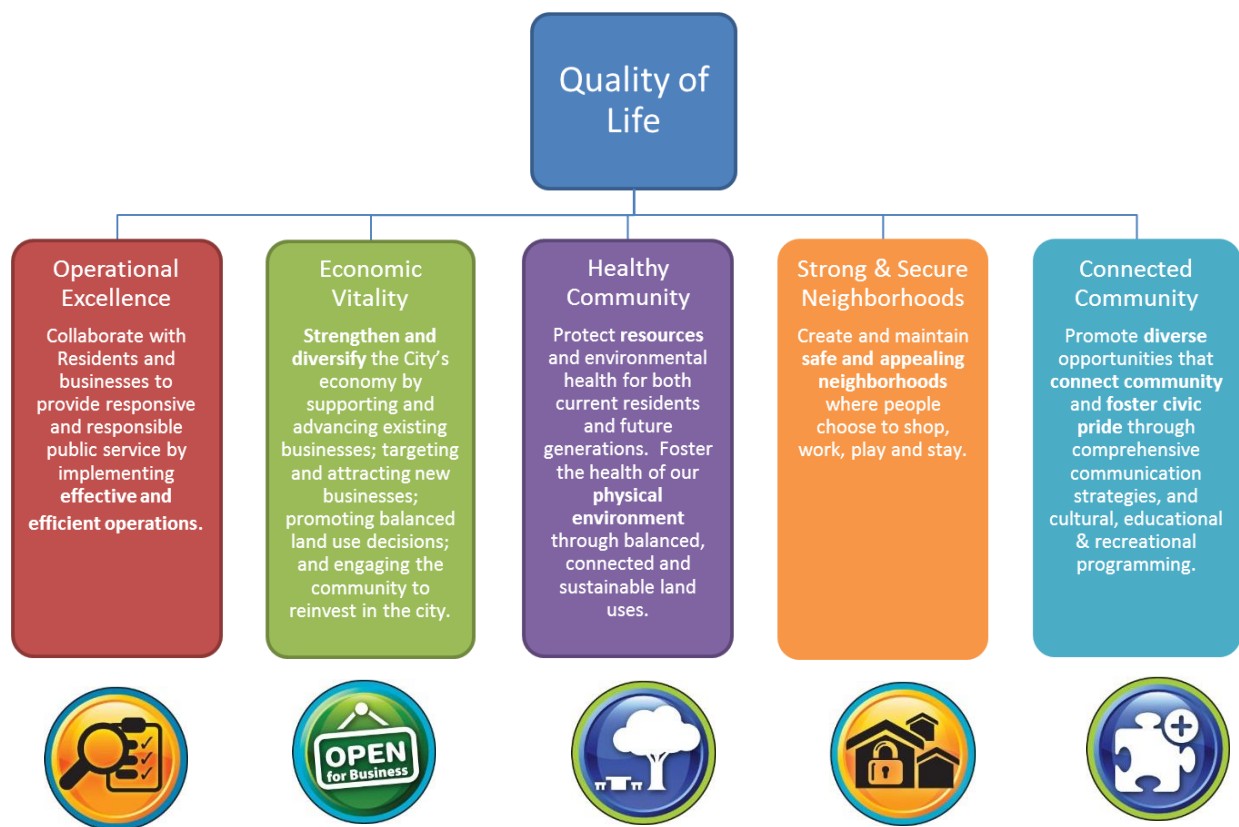
Tracking- Verify progress towards goals. Constant monitoring allows us to evaluate progress and make any necessary corrections.

Report Out-Reporting out on our progress against identified goals is an essential component of accountability. Evaluation of past performance also helps identify necessary changes in initiatives/resource allocation/measurements.



The Committee consolidated visions that the City Council and public have already expressed into five goals.

Goals: A goal is a broad statement of what we hope to achieve and is qualitative in nature. A goal identifies the gaps in service between the current situation and the ideal situation.



We have identified 13 strategies and 28 initiatives to support the five core goals critical to achieving our shared vision of ensuring a vibrant and sustainable quality of life for Chula Vista residents and businesses.

Strategies: Strategies are statements of major approach or method of attaining goals and resolving specific issues. Strategies begin to answer the question "How will we go about accomplishing our goals?" Strategies describe a general approach or method; they don't describe specific activities or projects.

Initiatives: Initiatives are the programs, projects, plans or activities, prioritized annually, which must be accomplished in order to achieve a stated goal. Individuals or groups are the sponsors of initiatives and responsible for their advancement.

These strategies and initiatives provide alignment to mirror beliefs and values established in the goals. The Strategic Plan describes these strategies and initiatives by goal area. The Strategic Plan, coupled with our commitment to continuous improvement, establishes a clear vision and priorities to efficiently leverage resources and be innovative in how we advance the City's goals.

Operational *Excellence*

Continuous Improvement • Fiscal Health • Quality Customer Service



Collaborate with residents and businesses to provide responsive and responsible public service by implementing effective and efficient operations.



Citywide Strategy 1.1. Uphold a commitment to Fiscal Health

Description: Establishing a financially resilient City is a long-term goal that can be reached by first stabilizing the City's financial condition, then working towards financial sustainability, and finally establishing an organization that is financially resilient. Financial resiliency better positions the City to withstand future economic downturns with minimal impacts to service levels.

Status: The City is undertaking steps to ensure that the fiscal health of the City going forward is protected and that the financial position of the City remains solid, by utilizing responsible and transparent fiscal policies.

Initiative/s:

Initiative 1.1.1. Implement Fiscal Recovery and Progress Plan

The Fiscal Recovery and Progress Plan identifies the major challenges the City faces in moving from financial stability to financial sustainability and eventually financial resiliency. Improving the long-term financial standing of the City will require a multi-faceted approach and will occur over several years.





City Strategy 1.1 Uphold a commitment to Fiscal Health

City Initiative 1.1.1. Implement Fiscal Recovery and Progress Plan

Description: The Fiscal Recovery and Progress Plan identifies the major challenges the City faces in moving from financial stability to financial sustainability and eventually financial resiliency. Improving the long-term financial standing of the City will require a multi-faceted approach and will occur over several years. Staff has identified a number of issues and challenges - the next step is to identify and implement policies to address these issues. The objectives listed below are the key short-term objectives in implementing the Fiscal Recovery and Progress Plan.

Key Departmental Partnerships: Administration, Finance, Human Resources/Information Technology Services, Public Works, Development Services

Resources: The Finance department will take lead in updating the Fiscal Recovery and Progress Plan. In addition, there is a standing multi-department committee that meets to track the implementation of the plan. The cost of the implementation of the plan will vary by objective – the plan includes small initiatives as well multi-million dollar initiatives related to infrastructure needs.

Status: The Five Year Financial Forecast is currently being updated by the Finance Department. The Fiscal Recovery and Progress Plan will be updated following the completion of the forecast. Some progress has been made in addressing some of the issues in the plan since its development in January 2012.

Timing: The implementation of the Fiscal Recovery and Progress Plan is an on-going activity; key milestones for project implementation are shown below. Update of the Fiscal Recovery and Progress Plan will begin in early 2013.

	Lead Dept	Citywide Objectives	STATUS	RESOURCE REQUIRED
1	FIN	Develop, review and update Fiscal Responsibility Policy	Draft Fiscal Responsibility Policy has been drafted and is currently being reviewed. Staff will take this Policy forward for Council approval before the end of the fiscal year.	No additional resources needed.
2	FIN	Develop and implement new budget development guidelines following performance based budgeting principals	The fiscal year 2014 proposed budget will incorporate some principles of performance based budgeting. Staff will research and develop a plan to more fully integrate performance based budgeting principals into the fiscal year 2015 budget development process.	Training funds will be needed for performance based budgeting training.
3	FIN	Update Fiscal Recovery and Progress Plan	A standing committee continues to meet on the implementation of	Additional resources are

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
		including Five Year Financial Forecast	the Fiscal Recovery and Progress Plan. During fiscal year 2014 staff will transition this plan into a yet to be developed Long Term Financial Plan. The Five Year Forecast will be updated in May 2013 as part of the Fiscal Year 2014 budget.	required to address issues identified in the Fiscal Recovery and Progress Plan. Budget requests will be brought to Council as part of the budget development process or mid-year if necessary.
4	FIN	Develop and implement policies to help protect/generate revenues	Staff is currently working on Phase III of the Master Fee Update.	No additional resources needed at this time.



Operational *Excellence*



Continuous Improvement • Fiscal Health • Quality Customer Service

Citywide Strategy 1.2. Excel in service delivery by continuously improving

Description: City's by their very definition are service delivery organizations. Many of these services are critical to the well-being of the citizens, but all city services enhance residents' "quality of life". The City of Chula Vista is committed to maximizing its service delivery through continually looking to eliminate waste in the processes of service delivery and maximizing the value of those services to our customers.

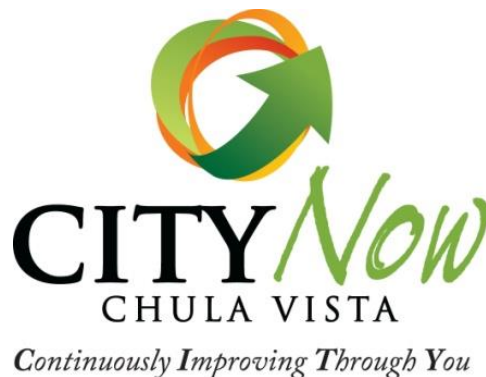
Status: Two Senior Managers implement the City's Continuous Improvement Program as collateral duties. In FY2013, the City began branding its continuous improvement program as "CITYNOW". CITYNOW's branding logo elicits a bias for action for employees and features a cyclical arrow demonstrating the continuous improvement cycle. The program is progressing forward with advanced training being completed by six managers throughout the organization. There are several continuous improvement initiatives currently underway throughout the City.

Initiative/s:

Initiative 1.2.1. Implement Continuous Improvement efforts throughout the organization
Continuous Improvement is a means to offer maximum customer value while minimizing waste. This means creating more value for customers with fewer resources.

Initiative 1.2.2. Leverage new and emerging technology to provide efficient, effective and secure Information Technology solutions
Technology continues to evolve at a rapid pace. The City should strive to be at the forefront of technology by embracing these changes and taking full advantage of leading edge innovations that can provide more efficient and effective ways of doing business.

Initiative 1.2.3. Retain and attract quality employees
Recruiting, developing, and retaining quality employees is the cornerstone of the Human Resources Department. It is important that the City continuously strive to develop employee relations and provide an appealing workplace for current and prospective employees.





City Strategy 1.2. Excel in service delivery through continuously improving

City Initiative 1.2.1. Implement Continuous Improvement efforts throughout the organization

Description: Continuous Improvement is a means to offer maximum customer value while minimizing waste. This means creating more value for customers with fewer resources. An organization which undertakes continuous improvement efforts understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide the highest level of service to the customer through processes that have zero waste. The CI Team presented a formal CI Plan in FY13, titled "CITY Now".

Key Departmental Partnerships: **Lead:** Admin, IT, **Partners/Support:** all City departments

Resources: Two managers within the Administration and Police departments lead the City efforts on a part-time status while working in their respective positions. Personnel costs for their positions are budgeted in their department budgets. A large part of the implementation of the performance measurement system is the launch of Sharepoint, a Microsoft program that will allow more automation of the data collection. The ITS Department is currently working on the creation and roll out of the software. Key staff from each department will be tasked with collaborating with ITS and the CI team to develop their performance metrics site on Sharepoint.

Status: A performance measurement system to track strategic objectives and other important metrics is being implemented for FY14. Software preparation occurred in FY13, with two pilot departments. Citywide launch is slated for the beginning of FY14.

Timing: While Continuous Improvement is a year-round activity, key milestones for project implementation are shown below. Routine implementation of the performance measurement system will occur in FY15.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	ADMIN	Train workforce on CI principles	6 staff persons attending additional training in FY13	Training paid for out of FY13 budget
2	ITS	Launch Citywide Performance Measurement System	ITS currently working with two pilot departments in preparation to launch citywide next FY	Training and servers paid for out of FY13 budget
3	ADMIN	Track and report out CI events throughout the City	Beginning to work with departments to document CI results, will report out quarterly	Within existing resources
4	ADMIN	Conduct at least one operational review of a department	The Police Department review has been completed. Identification of the next operational review is underway.	A funding source will need to be identified to pay for consulting services to

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
				perform adequate operational reviews. Potentially \$25,000 – \$50,000 depending on department.
5	ADMIN	Create monitoring system on new Strategic Plan	Key performance metrics will need to be identified for each initiative.	Within existing resources



City Strategy 1.2. Excel in service delivery by continuously improving

City Initiative 1.2.2. Leverage new and emerging technology to provide efficient, effective and secure Information Technology solutions

Description: Technology continues to evolve at a rapid pace. The City should strive to be at the forefront of technology by embracing these changes and taking full advantage of leading edge innovations that can provide more efficient and effective ways of doing business. The ITS Department should be directly involved in key city projects to ensure staff is utilizing the most efficient technology available.

Key Departmental Partnerships: Information Technology Services (ITS), Development Services, Fire

Resources: Information Technology Services staff will take the lead and work directly with each Department to ensure the city is providing efficient, secure IT solutions. Several objectives may require very limited resources, while others (e.g. enhance IT infrastructure) may involve substantial resources to fully implement.

Status: A number of projects are currently underway to eventually provide more efficient IT solutions. The GIS section is currently reviewing the feasibility of moving the city's mapping applications and data to the Amazon cloud. In addition, IT staff is working on a citywide computer replacement plan that will be implemented later this year.

Timing: Key milestones for project implementation are shown below.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	ITS	Research and identify IT services to possibly migrate to the cloud (GIS, email, etc)	Currently testing access to GIS data on the Amazon cloud	Within existing resources
2	ITS	Expand use of technologies available to reduce maintenance, support and energy costs for IT hardware and software	Currently working with Fire Dept to determine best virtualization options for fire staff.	Resources needs have not yet been determined.
4	ITS	Develop and implement the city's information systems security plan	Reviewing security policies from other government agencies	Within existing resources
5	DSD	Upgrade Permits-Plus to Accela Automation	The conversion to Accela Automation is expected over the next 18 months.	Funded with the DSF
6	ITS	Develop and implement citywide computer/software replacement plan	Currently reviewing vendor proposals	Within existing resources



City Strategy 1.2. Excel in service delivery by continuously improving

City Initiative 1.2.3. Retain and attract quality employees

Description: Recruiting, developing, and retaining quality employees is the cornerstone of the Human Resources Department. It is important that the City continuously strive to develop employee relations and provide an appealing workplace for current and prospective employees.

Key Departmental Partnerships: Human Resources, all City departments

Resources: Human Resources department to take lead; however, the overall continued development of employee relations, Citywide, requires the active participation of all departments. Full implementation of the Quality Workforce Program cannot begin until a budget has been established. Specific tasks to support objectives 2-4 are actively in progress and are scheduled to complete the initial phases by the middle of FY14. Efforts will be ongoing and continue in each subsequent fiscal year.

Status: Human Resources is in the process of reviewing current processes and procedures, with implementation of new processes and procedures pending.

Timing: Retaining and attracting quality employees is an on-going effort; key milestones for specific program/project implementation are shown below.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	HR	Create & implement new Citywide compensation policy	Quality Workforce Program presented to Council on 4/30/13	Financial resources will be required to implement program
2	HR	Create culture of employee engagement	Ongoing	No additional resources required at this time
3	HR	Conduct reviews & updates of recruitment strategies	Ongoing	In order to maintain service-level at green, additional analyst-level staff is needed
4	HR	Create succession planning program	Currently conducting research on succession planning programs	No additional resources required at this time
6	HR	Evaluate employee turnover	Annual report to be released July 2013	No additional resources required at this time



Citywide Strategy 1.3. Ensure interaction with the City is a positive experience

Description: The City of Chula Vista provides services to a diverse customer base. They rely on the City to perform those services in a cost effective and quality manner. The City of Chula Vista strives to make the interaction of service delivery a positive experience in which our customers can have confidence that they are valued.

Status: The City is undertaking several programs to ensure that citizens not only have access to information on how their government is run, but also the service that they receive is of the highest quality fostering an enhance quality of life throughout the City.

Initiative/s:

Initiative 1.3.1. Foster public trust through an open and ethical government

A cohesive society is one where citizens have a high degree of confidence in their governmental institutions and public administration. Information on the who, why and how of decision making is essential to maintain confidence in public institutions and hold the City accountable to its residents.

Initiative 1.3.2. Provide quality customer service

Providing quality customer service is essential to ensure citizens enjoy a positive experience when interacting with the city. The City of Chula Vista is committed to providing services to all customers that meet or exceed their expectations.





City Strategy 1.3. Ensure interaction with the City is a positive experience

City Initiative 1.3.1. Foster public trust through an open and ethical government

Description: A cohesive society is one where citizens have a high degree of confidence in their governmental institutions and public administration. Information on the who, why and how of decision making is essential to maintain confidence in public institutions and hold the City accountable to its residents.

Key Departmental Partnerships: City Clerk/City Attorney/IT/Admin/Finance

Resources: To begin the process of updating the Citywide Records Management program, a consultant would be needed to develop policies and procedures, update the records retention schedule, and provide training. The other component of Objective 1 is upgrading the City's Electronic Records Management System (ERMS). The City currently holds the rights to upgrade the current ERMS software, Laserfiche. Existing staff have the expertise and ability to carry out Objectives 2; associated personnel costs exist in the budget for their respective departments. Objective 3 begins with a needs assessment. It is unknown at this time whether additional technology and/or other resources will be needed.

Status: Updating the Citywide Records Management program cannot begin until a budget has been established to begin work with a consultant. Specific tasks to support Objectives 2 and 3 are actively in progress and are scheduled to complete the initial phases by the middle of FY14.

Timing: Funding is required to begin the retention schedule update component of Objective 1. All other objectives listed below are either currently in progress or will begin in FY14. Completion of the initial phases is anticipated in FY14.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	City Clerk	Update Citywide Records Management Program	A) Records retention schedule update/training: Funding for consultant needed to begin; B) Update ERMS: Will begin Q1FY14	\$16,500 needed for consultant for A; no additional funding needed for B
2	City Clerk/City Attorney	Ensure open and ethical conduct	In progress	No additional funding needed
3	IT	Provide citizens direct access to frequently requested public records, financial, and other critical documents	In progress	Resource needs will be determined in initial assessment phase



City Strategy 1.3. Ensure interaction with the City is a positive experience

City Initiative 1.3.2. Provide quality customer service

Description: Providing quality customer service is essential to ensure citizens enjoy a positive experience when interacting with the city. The City of Chula Vista is committed to providing services to all customers that meet or exceed their expectations. Providing effective and efficient customer service to both internal and external customers should be considered an integral component of the City's operations; doing so will result in overall added value and satisfaction of employees and the public.

Key Departmental Partnerships: Information Technology Services, Human Resources

Resources: The Human Resources (HR) and Information Technology (ITS) Departments will work together to ensure the city is providing quality customer service. Overall cost and resources to implement this initiative will vary depending on objective. Certain objectives will require limited resources while others (update city website) will require hiring of outside consultant to complete.

Status: The City Hall complex's WiFi has been upgraded to use more reliable and standardized equipment. The Cox Communications franchise agreement has been approved and their enhancements to the city's internet connectivity infrastructure will be implemented by mid-February. In addition, ITS is in the process of improving telecommunications links to outlying facilities, and is reviewing options for a fiber optic connection from City Hall to the Corpyard. The Human Resources Department is currently in the process of implementing various components of City's customer service program.

Timing: Key milestones for project implementation are shown below.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	ITS	Enhance mobile guest services by providing reliable, secure wireless access to all city facilities	Hardware purchased and deployed for all facilities except Police. Awaiting additional hardware	Need to purchase additional software for city wi-fi used by staff
2	ITS	Enhance the city's technology infrastructure to provide high-speed, high-capacity telecommunications	Recently upgraded primary internet connection to 20 mbs in late Feb.	No additional resources needed at this time. Within current budget
3	HR	Create & implement comprehensive customer service program	In progress/on-going. Customer service component incorporated into recruitment process and new-hire orientation	No additional resources needed at this time.
4	HR	Conduct customer satisfaction survey of internal and external customers	HR survey emailed Citywide in May 2013. Results will be reviewed and evaluated.	No additional resources needed at this time.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
5	ITS	Update city intranet site (CVInsider)	Currently reviewing staff needs and how other agencies are implementing SharePoint.	Additional SharePoint training may be required
6	ITS	Update and deploy IT help desk application	Currently reviewing existing help desk app to determine if enhancements will meet staff needs	Additional SharePoint training may be required
7	ITS	Update city website	Currently working on RFP to hire consultant to update website.	\$100,000 in consultant fees needed

Economic *Vitality*

Strong, Vibrant City • Properous Environment



Strengthen and diversify the City's economy by: supporting and advancing existing businesses, targeting and attracting new businesses, promoting balanced land use decisions, and engaging the community to reinvest in the City.



Citywide Strategy 2.1. Provide policies, planning, infrastructure, and services that are fundamental to an economically strong, vibrant city

Description: A strong, vibrant city relies on a foundation of forward looking decisions and quality infrastructure that support education, high quality jobs, and well-balanced livable communities. The City has made great progress in several long-term major development projects. These significant projects are vital to revitalizing the City.

Status: The City has three critical planning areas to ensure a strong city: investment in established neighborhoods, implementing new master planned communities to accommodate growth, and moving forward catalyst projects that will strengthen the city.

Initiative/s:

Initiative 2.1.1. Implement the Bayfront Master Plan

The Bayfront Master Plan is a comprehensive effort to guide and implement the development of housing, hotels, a conference center, retail, cultural space, recreational amenities, as well as the preservation of important natural resources over the next two decades.

Initiative 2.1.2. Foster opportunities for investment in Western Chula Vista

Ensure policies, plans and procedures are providing clear direction and certainty of process for our customers to achieve their desired outcome of investing in Western Chula Vista.

Initiative 2.1.3. Promote and support development of quality master-planned communities

Quality neighborhoods that provide a full complement of land uses and services in an integrated, convenient and balanced fashion enhance the City's overall image, stimulate further investment in the City and its neighborhoods, and lay a foundation for future sustainability.

Initiative 2.1.4. Plan and implement the University Park and Research Center

The University Park and Research Center is an effort to guide and implement the planning of a 375-acre area with development possibly occurring over the next two decades.





City Strategy 2.1. Provide policies, planning, infrastructure, and services that are fundamental to an economically strong, vibrant city

City Initiative 2.1.1. Implement the Bayfront Master Plan

Description: The Bayfront Master Plan is a comprehensive effort by the City of Chula Vista working in conjunction with the Port of San Diego to guide and implement the development of a 556-acre planning area, including 497 acres of land area and 59 acres of water area. The project is expected to be implemented over the next 24 years. The Bay Front Master Plan envisions the construction of housing, hotels, a conference center, retail, cultural space, recreational amenities, as well as the preservation of important natural resources.

Key Departmental Partnerships: Development Services Department; Public Works; and the City Attorney's office.

Resources: Staff will be working closely with applicants, the Port of San Diego, the California Coastal Commission, and other City staff to implement this project.

Status: Bayfront Master Plan and the Local Coastal Program Amendment approved in 2012. Staff is working to implement revisions to the Land Use Plan and Bay Front Specific Plan, required by the Coastal Commission. Staff is working with Pacifica Company on entitlements for the development of their site.

Timing: Required revisions to the Plan and Bay Front Specific Plan will be completed by the end of January 2013. Staff will work to entitle Pacifica over the course of the next year.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	DSD	Support Land Preparation and Remediation for South Campus in a timely manner	Ongoing	Staff time is included within adopted budget
2	DSD	Support Completion of New Infrastructure	Ongoing	City has committed all revenue from the Bayfront to support infrastructure construction
3	DSD	Demolition and remediation of Power Plant site	Site has been demolished above ground – remediation has not yet commenced	Funded by Port District / former plant owners
4	DSD	Complete Planning Documents	Minor revisions need Coastal Commission approval	Within adopted budget
5	DSD	Complete Entitlement of Pacifica Project	Pacifica has begun their forward planning but not submitted an application yet	Entitlement processes are funded with

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
				developer deposits
6	DSD	Update Bayfront DIFs	Cost estimates are being prepared to quantify the magnitude of Bayfront infrastructure	Resources will be required if an outside consultant is to be retained



City Strategy 2.1. Provide policies, planning, infrastructure, and services that are fundamental to an economically strong, vibrant city

City Initiative 2.1.2. Foster opportunities for investment in Western Chula Vista

Description: Ensure policies, plans and procedures are providing clear direction and certainty of process for our customers to achieve their desired outcome of investing in Western Chula Vista.

Key Departmental Partnerships: (Lead) Development Services; (Support) Economic Development, Finance, Planning, Engineering, Public Works, Fire, Police, Code, Building

Resources: This initiative is estimated to require the equivalent of two full time employees to complete all the identified citywide objectives.

Status: The Development Services Department has undertaken a process improvement program on all discretionary actions over the last two years and is about to commence review of the ministerial actions. However, a comprehensive review of all policies, procedures and codes has not been started. DSD is beginning the process of preparing road maps for each of the entitlement processes concurrent with the migration to Accella Automation. In addition, DSD allocates approximately .25 FTE's on the researching and coordination of grant opportunities for the City and at least three development incentive programs have been approved by the City Council (enterprise zone, Development Impact fee financing program, inclusionary housing relief program). Staff is also working on creation and implementation of mixed use zones in WCV, developing and obtaining approval for Specific Planning areas.

Timing: All efforts are underway with tasks 2, 3 and 4 being continuous and tasks 1 estimated to be complete in July, 2014.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	DSD	Prepare roadmap on all City Development processes	The process will begin as we complete the migration to Accella Automation	Within adopted budget
2	DSD	Review and revise, as necessary, City regulations, policies and practices to support investment in Western Chula Vista	This objective will begin in earnest once workload permits.	Within adopted budget
3	DSD	Obtain grants for missing and aging infrastructure improvements	Ongoing	Within adopted budget
4	DSD/EDD	Identify and implement development incentives in western Chula Vista	Ongoing	Within adopted budget



City Strategy 2.1. Provide policies, planning, infrastructure, and services that are fundamental to an economically strong, vibrant city

City Initiative 2.1.3. Promote and support development of quality master-planned communities

Description: Ensuring the development of well planned communities in which our residents, businesses and visitors are provided ample opportunities to live, work, shop and play is a fundamental City responsibility. Quality neighborhoods that provide a full complement of land uses and services in an integrated, convenient and balanced fashion enhance the City's overall image, stimulate further investment in the City and its neighborhoods, and lay a foundation for future sustainability.

This initiative is focused on developing and implementing land use policies, strategies and decisions that ensure balanced and complete communities, with the overarching goal of creating living, vibrant neighborhoods that provide for residents' daily needs, offer mobility options, and encourage physical and social activity. It will also update and maintain a related system of regulations and processes designed to encourage and support such development in a timely and cost-effective manner.

Following is a list of master planned communities currently under review for entitlements and implementation:

- Millenia (formerly the EUC); implementation. (2980 units, 3.4M sq. ft. non-res)
- Otay Ranch (Otay Land Co.); new SPAs, TMs & EIRs for Villages 8W and 9. (6050 units, 1.8M sq. ft. non-res.)
- Otay Ranch (JPB Development); new SPAs, TMs & EIRs for Villages 3, 8E and 10. (6600 units, minor non-res)
- Otay Ranch (Baldwin & Sons); SPA amendment for Village 2. (1500 new units, 19.6 AC MU, 70.3 AC IND)
- Otay Ranch Village 2 (misc. owners); implementation (400 units, 26 AC IND)
- Otay Ranch Freeway Commercial (Baldwin & Sons); SPA amendment. (550 units, hotels)

Key Departmental Partnerships: Development Services, Engineering, Attorney, Economic Development

Resources: Principal and Senior Planners, and a consultant planner serve as Project Managers and lead the City efforts for planning and entitlement processing for the above noted major projects. They are supported by a range of other City staff from multiple departments that serve as members of multi-disciplinary teams for each project. Personnel costs for their positions are budgeted in their department budgets, and reimbursed by project applicants through deposit accounts.

Status: All of the noted projects are underway and in varying stages of implementation, with most actions complete during 2013 and 2014. Millenia will began grading in 2013, with the first residential units anticipated to begin construction in 2014. The project has a 20 to 30 year buildout. Initial approvals for the Otay Land Co's Village 8W and 9 projects were approved by Council in February 2013, and their subsequent SPA/TM/EIR documents are anticipated for public hearing actions in Fall 2013. The JPB entitlements for Villages 3, 8E and 10 are in process with completion anticipated in later 2014, as are the entitlements for Baldwin and Sons Village 2 SPA amendments. The Freeway Commercial SPA Plan amendment could be completed by Spring 2014.

Timing: While processing and development of quality master planned communities is an ongoing activity, key milestones for project implementation are shown below.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	DSD	Implement programs and practices that promote sustainable development	Ongoing	Can perform most duties within existing resources, but will require some use of consultants. Also relies on some grant funding
2	DSD	Create and maintain regulations, procedures and processes that encourage and support quality development	Ongoing	Within existing resources
3	DSD	Complete timely processing of entitlements for Villages 3, 8W, 8E, 9 and 10 consistent with adopted Land Offer Agreements	Underway. Anticipate entitlement completion for Villages 8W and 9 by Fall 2013. Completion of Villages 3, 8E and 10 entitlements by Fall 2014.	Within existing resources and consulting services
4	DSD	Complete review and processing of Millenia Phase I entitlement changes, grading and infrastructure plans	Underway. Phase I entitlement changes completed March 2013. Grading and infrastructure plan completion anticipated by Fall 2013.	Within existing resources
5	DSD	Complete entitlement processing for Village 2 SPA amendments	Underway with completion anticipated by Fall 2014.	Within existing resources and consulting services
6	DSD	Complete entitlement processing for the Freeway Commercial SPA amendments	Underway with completion anticipated in Spring 2014.	Within existing resources



City Strategy 2.1. Provide policies, planning, infrastructure, and services that are fundamental to an economically strong, vibrant city

City Initiative 2.1.4. Plan and implement the University Park and Research Center

Description: The University Park and Research Center (UPRC) is an effort by the City of Chula Vista to guide and implement the planning and development of a 375-acre planning area. Planning for the project is expected to be completed in the next several years with development possibly occurring over the next 20 to 30 years. The current project description includes the development of a University campus (including academics, research facilities, student and faculty housing and athletic space) and 85-acre Regional Technology Park.

Key Departmental Partnerships: DSD/City Attorney's Office

Resources: Development Services Department Staff – Attorney's Office.

Status: Authorization to move forward with an Exclusive Negotiating Agreement with HomeFed to act as the Master Developer, appropriate \$972,000 for environmental, sustainable energy and initial planning entitlements and to enter into a two-party agreement with Helix for the preparation of an Environmental Impact Report (EIR) approved by the City Council on December 11, 2012. The City has entered into a separate agreement with Ayers Saint Gross to provide limited grading review to ensure compatibility with a pedestrian friendly campus design. On February 26, 2013 the City Council approved the General Plan and General Development Plan amendments for the Otay Land Company which gave the City ownership of an additional 50 acres of University land and 160 acres of mitigation properties that can be used to meet the University's conveyance requirements.

Timing: Work on grading design, the Sectional Planning Area (SPA) Plan and EIR to begin in December 2012/January 2013.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	DSD	Negotiate Master Developer Agreement	Ongoing	Within existing resources
2	DSD	Complete Design Evaluations and Implementation Documents (SPA, EIR, etc.).	Ongoing	Within existing resources, grant funded
3	DSD	Identify University Partners and Focus	Ongoing	Within existing resources



Citywide Strategy 2.2. Promote an environment for residents and businesses to prosper

Description: The City wants to strengthen and diversify the City's economy by supporting existing local businesses as well as identifying and recruiting new industries and businesses. We want to encourage opportunities for businesses and residents through quality job creation.

Status: The City undertakes efforts to attract new businesses and retain current businesses. The City has seen an increase in businesses utilizing the Enterprise Zone credit which translates to more jobs. The City is also finishing a study that would better direct business cluster types to recruit.

Initiative/s:

Initiative 2.2.1. Implement strategies that build prosperity and quality employment opportunities for existing businesses

A strong local economy creates quality work options and a broad variety of goods and services for our residents, and generates revenues for vital public infrastructure and services needed for a high quality of life in Chula Vista.

Initiative 2.2.2. Identify and recruit complementary businesses that provide quality employment and expand the goods and services available to residents

Economically sustainability comes with a jobs housing balance that provides a broad portfolio of the goods and services a community wants and needs while generating the revenues needed to sustain them.





City Strategy 2.2. Promote an environment for residents and businesses to prosper

City Initiative 2.2.1. Implement strategies that build prosperity and quality employment opportunities for existing businesses

Description: Economic Development focuses on facilitating retail, commercial and industrial prosperity for today's businesses. A strong local economy creates quality work options and a broad variety of goods and services for our residents, and generates revenues for vital public infrastructure and services needed for a high quality of life in Chula Vista.

Key Departmental Partnerships: Admin, IT, Finance

Resources: Economic Development consists of two professional, one administrative full-time staff members and a budget for interns, supplies and services. EDD works closely with Finance, ITS, Marketing Communications (Admin) and the City Attorney's Office to collect and communicate the type of data and assistance that supports retention and growth of existing businesses through technical support and locally generated incentive programs such as the Enterprise Zone and the Small business and jobs investment policy.

Status: In FY 2013 Economic Development expanded the Enterprise Zone to almost 1,000 additional businesses. The Department will have two additional opportunities to work with the Business community to identify the best business and job development options to submit a smaller modification of the zone in 2012, and the final expansion in FY14. The Department worked with Admin and local retail leaders to develop and launch Shop Chula Vista Now, and worked with IT, Finance and Admin to establish the Business Finder on the City's Website, begin a social media program to promote local goods and services and provide accurate and timely sales tax, demographic and property information to expanding local businesses and entrepreneurs. Economic Development is working with Admin, Finance, ITS and other departments to promote these programs and others through direct contact and electronic marketing of the benefits of the programs. The Department has used volunteers and Private/Public partnerships with South County Economic Development Council, the Chamber, Third Avenue Business Association, Eastlake Business Association, the Major retail center operators and Southwestern College to contact over 1,000 businesses in person and virtually every business in the City through email, regular mail and social media. Staff will continue to build on its portfolio of services by submitting a small local business and jobs investment policy later this year and build on Private Partnership support for Shop Chula Vista Now, Social Media, Business to Business Transaction and technology workshops for existing local businesses and entrepreneurs.

Timing: Shop Chula Vista Now and Social Media campaigns, Business to Business Transactions and Workshops and development and submittal of a Chula Vista small business and jobs incentive program are shown below. The first of up to three rounds of Enterprise Zone expansions was submitted in May 2013. The final two expansions will be filed in series upon approval of the previous application, which the state suggests is within 30 days of receipt of a complete application. Routine implementation of the performance measurement system for each program will occur in FY15.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	EDD	Expand Private sector sponsorship and business participation in the Shop Chula Vista NOW & social media campaigns	Staff has proposed program to major retail property managers, and will continue to work with them and business participants	Within existing budgeted resources
2	EDD	Market availability of Enterprise Zone benefits	Staff is posting Tax Credit signs, multiple contacts to each new business in Zone, using professional network to promote and expanding employee outreach	Within existing budgeted resources
3	EDD	Conduct Zone Expansion taskforce and submit final expansions	Workshops complete in April 2013, Council approval in May and first expansion submitted, & 2 more possible expansions this year	Within existing budgeted resources
4	EDD	Facilitate Business to Business transactions & conduct workshops	Staff has conducted 4 workshops & facilitated 3 private/public partnerships, 2 more planned 2013	Within existing budgeted resources
5	EDD	Submit Sm Biz and Job Program to Council and implement upon approval	Draft comments by major business groups, Manager and City Attorney, re-draft to Attorney May/June 2013	Within existing budgeted resources



City Strategy 2.2. Promote an environment for residents and businesses to prosper

City Initiative 2.2.2. Identify and recruit complementary businesses that provide quality employment and expand the goods and services available to residents

Description: Economically sustainability comes with a jobs housing balance that provides a broad portfolio of the goods and services a community wants and needs while generating the revenues needed to sustain them. A city that successfully fosters the environment needed to generate the volume and quality of jobs within that portfolio creates a sustainable community.

Key Departmental Partnerships: **LEAD:** Economic Development Department (EDD); **Partners:** Development Services Department (DSD), Finance, Admin, Information & Technology Services (ITS),

Resources: Economic Development consists of two professional, one administrative full-time staff members and a budget for interns, supplies and services. EDD works closely with Finance, ITS, Marketing Communications and the City Attorney's Office to collect and communicate the type of data that facilitates business attraction.

Status: in FY 2013 Economic Development hired a consultant to conduct an analysis of the industry clusters that represent the best prospects for establishing the largest number of quality jobs. The study began in Q2 and will be presented to City Council in early Q4. In Q4 the City will use the results to implement the attraction program. Economic Development employed City financial and demographic data to establish routine communication with a network of Chula Vista property owners, real estate professionals, and commercial and industrial business prospects. Economic Development successfully completed a two year effort to expand the Enterprise Zone tax incentives to include over 800 acres of strategic commercial and industrial employment lands. The Department also did a preliminary update of the website to communicate Enterprise Zone and incentives to business prospects. EDD also drafted the Local Business and Jobs Investment Policy and submitted it to the City Manager and Attorney for review and comment.

Timing: Over the past two years, with assistance from department partners, state and regional governments staff has leveraged and invested budget resources to develop the tools that business development professionals need to access & develop the Chula Vista market. Staff has also invested resources over the past two years in establishing and expanding the City's network of business development professionals. The Business Cluster Analysis will be presented to City Council before the end of this fiscal year and will lay out a road map for implementing the recommendations in the 2013/14 fiscal year. The Business & Jobs Investment Policy will complement the recommendations of the Analysis and be presented to Council within 60 days of the Business Cluster Analysis.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	EDD	Complete the EZ expansion	First expansion completed in 2012, second expansion submitted to the State 5/13	Within existing budgeted resources
2	EDD	Establish Professional RE	At least quarterly email, phone	Within existing

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
		Network	and Face to Face communication since 2011, & increased Network by 50%	budgeted resources
3	EDD	Update Web / Communications	Initial update fall 2012, routine content updates now possible	Within existing budgeted resources
4	EDD	Complete Business Cluster Analysis	Final Report to be completed 6/13	Within existing budgeted resources
5	EDD	Implement recommendations identified in Business Cluster study	First & Second Quarter 2013/14 fiscal year –following analysis recommendations	Funding need to be determined after the Analysis recommendations
6	EDD	Implement Local Business and Jobs Investment Policy	Including comments from City Attorney, Manager & community Presenting to Council in concert with Job Cluster Policy.	Within existing budgeted resources

Healthy Community

Supportive, Built Environment • Environmental Protection • Healthy, Active Environment



Protect resources and environmental health for both current residents and future generations. Foster the health of our physical environment through balanced, connected and sustainable land uses.



Healthy Community



Supportive, Built Environment • Environmental Protection • Healthy, Active Environment

Citywide Strategy 3.1. Support an environment that fosters health & wellness

Description: The City will encourage residents to choose healthy lifestyles by promoting and facilitating healthy options in our community and make it easier for residents to lead healthy lives. The City will promote policies and programs that enhance the well-being of residents. We are also committed to connecting residents in need with critical services that increase their potential for wellness and self-sufficiency.

Status: The City has been promoting healthy living opportunities for some time already. Current efforts are in place to formalize the City's policy and work plan around the wellbeing of our residents.

Initiative/s:

3.1.1. Implement policies and programs that support a healthy community

Develop the policies and supporting programs to implement a Healthy Community campaign that focuses on increasing opportunities for recreation and activity for individuals of all ages, multi-modal opportunities, neighborhood access, connectivity, safety, environmental justice, and neighborhood completeness.



Photo Credit: Susan Yee



City Strategy 3.1. Support an environment that fosters health & wellness

City Initiative 3.1.1. Implement policies and programs that support a healthy community

Description: Develop the policies and supporting programs to implement a Healthy Community campaign that focuses on increasing opportunities for recreation and activity for individuals of all ages, multi-modal opportunities, neighborhood access, connectivity, safety, environmental justice, and neighborhood completeness. The first phase will include a General Plan amendment that will encompass the vision and policies of a Healthy Community (“Healthy Chula Vista”). The General Plan amendment will set the vision for modifying as necessary the implementation documents e.g. the Pedestrian Master Plan, Bicycle Master Plan, Park Master Plan, Library Master Plan, etc. In addition to the updating of several Master Plans, other implementing documents such as the Subdivision Manual and the Street Design Manual will also be modified. The final product will be a Healthy Chula Vista Program Manual to provide the tools to create a healthy community at all levels (policy, programs, etc.).

Key Departmental Partnerships: The Advanced Planning Division of the Development Services Department, Recreation, Library, Police, Fire, and Human Resources Departments.

Resources: Healthy Chula Vista Campaign including Complete Streets and development of a yearly calendar by the Recreation Department viewing healthy awareness themes and cross departments collaborations.

Status: The project team has met several times to discuss objectives, goals and a schedule for implementation. The proposed work plan includes development of a policy statement, general plan amendment, and development of a stakeholder working group.

Timing: Key milestones for project development and implementation are shown below.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	DSD	Develop the Healthy Chula Vista Campaign including Complete Streets	SANDAG grant delayed. However, City staff moving forward with developing program.	Being recommended for \$100k in SANDAG funds. \$16,500 to be used for consultant.
2	HR	Develop City-wide employee wellness program	Human Resources currently offers regular employee development articles and various wellness workshops. Development of additional wellness program components currently on hold.	Further development requires concentrated effort, possibly afforded by the addition of staff. Will utilize City's insurance

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
				broker, Barney & Barney, for program ideas and possible funding sources.
3	REC	Create “Healthy Initiatives” program; use interdepartmental collaboration to develop monthly health awareness themes to be promulgated throughout city as a unifying program	The Recreation Department is beginning to meet with other city departments to develop a list of partnerships, events and collaborations.	Being recommended for \$100k in SANDAG funds. \$16,500 to be used for consultant.
4	REC/LIB	Collaborate with CVESD to increase children participating in intersession free lunch and snack program to combat hunger	Cooperative press release issued in March 2013 advertising both rec and library locations for free lunch and snack during spring intersession.	Additional hourly staff may need to be budgeted to accommodate larger numbers.
5	LIB	Partner with First Five to interface with young families of children ages 0 to 5 to promote early literacy and healthy living	First Five early literacy programs implemented in library schedule. Programs now expanded to “Kindergarten Boot Camp” and include prominent educators on site to answer questions	First Five program can be tapped for additional materials on a no-cost basis.
6	REC	Grow Critical Hours program to offer activities, homework help, and programs as healthy diversions during after school hours	After school homework help sessions increased from 4 weekly to 9 weekly.	Additional hourly staff may need to be budgeted to accommodate homework help.



Citywide Strategy 3.2. Develop and implement strategies and programs that restore and protect natural resources and promote sustainability

Description: Promote responsible development and land use decisions that benefit current and future residents. The City is committed to protecting and promoting the sustainability of natural resources through innovative programs and policies. We will continue to show leadership in the area of climate change.

Status: The City has been a leader in sustainability for years. The City's Climate Action Plan has been successful at reducing per capita greenhouse gas emissions, and needs to be updated to address new regulatory guidance and to broaden implementation measures.

Initiative/s:

Initiative 3.2.1. Design and implement innovative environmental & conservation programs
The ultimate goals of the City's environmental programs are clean air, clean water, and clean land to ensure a balanced, healthy environment for our citizens and natural communities.

Initiative 3.2.2. Update and implement the Climate Action Plan - Mitigation & Adaptation
The City's Climate Action Plan outlines various programs and policies to reduce greenhouse gas emissions and to make the community more resilient to local climate change impacts.





City Strategy 3.2. Develop & implement strategies and programs that protect natural resources and promote sustainability.

City Initiative 3.2.1. Design and implement innovative environmental & conservation programs

Description: The ultimate goals of the City's environmental programs are clean air, clean water, and clean land to ensure a balanced, healthy environment for our citizens and natural communities.

Key Departmental Partnerships: The Chula Vista Clean Team – Storm Water, Conservation, & Environmental Services.

Resources: The Public Works Department leads the City in efficient, effective, and sustainable operational practices and programs. The implementation of the programs occur through varying sources and levels of funding including the General Fund, separate funds - such as the Environmental Services Fund, Energy Conservation Fund, grants, and partnerships.

Status: The environmental and conservation programs as implemented by the Clean Team are directed by permit activities, state law, Council-adopted policies, and pragmatic programming toward the end goals of clean air, clean water, and clean land. As a result, these programs are at varying levels and stages of implementation.

Timing: While these activities are year-round and ongoing, key milestones for implementation are shown below:

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	PW-Environmental Services	Maintain 50% reduction in waste stream per AB 939	Waste reduction and recycling programs are ongoing. Annual reporting to CalRecycle is due August 1, 2013	Within existing budgets for the Environmental Services Fund
2	PW-Storm Water	Review and update Development Storm Water Manual	The NPDES Permit was re-issued on May 8, 2013. The City has 2 years to update the Manual. Staff is considering whether to hire a consultant or do the work in-house	Consultant services may be required with additional funding unknown at this time
3	PW-Storm Water	Review and update Jurisdictional Urban Run-off Plan (JURMP)	The NPDES Permit was re-issued on May 8, 2013. The City has 2 years to update the JURMP. Staff is considering whether to hire a consultant or do the work in-hours	Consultant services may be required with additional funding unknown at this time

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
4	PW-Conservation	Expand community energy & water retrofit services	A selection of a "Property Assessed Clean Energy" (PACE) program administrator is currently occurring	Within existing budgets through CY2014
5	PW-Conservation	Lower municipal utility costs thru resource management activities	Monthly energy management coordination meetings have begun to identify utility cost-saving opportunities over the next few years	Within existing budgets through CY2014
6	PW-Conservation, Environmental Services, Stormwater	Implement Modifications for 2013-14 Chula Vista Clean Team Program	With the input from a stakeholder group, the City's CLEAN Business program is currently being revamped and more closely coordinated with the "Shop CV Now" campaign	Within existing budgets
7	PW-Environmental Services	Develop an Organics Management Plan	City's contracted hauler and landfill are working with City staff to develop and implement a draft plan with consideration of pending legislation	Within existing budgets for the Environmental Services Fund



City Strategy 3.2. Develop and implement strategies and programs that restore and protect natural resources and promote sustainability

City Initiative 3.2.2. Update and implement the Climate Action Plan - Mitigation & Adaptation

Description: The City's Climate Action Plan (CAP) outlines various programs and policies to reduce greenhouse gas emissions ("mitigation") and to make the community more resilient to local climate change impacts ("adaptation"). In addition to numerous quality of life benefits such as cleaner air, less congested streets, and local economic development, the CAP fulfills regulatory requirements under Assembly Bill 32 and the California Environmental Quality Act (CEQA).

Key Departmental Partnerships: Public Works (Operations & Engineering) & Development Services

Resources: The Public Works Department coordinates the multi-department effort as part of his position. Personnel costs for his position as well as other key personnel in Public Works and Development Services are mainly supported through the SDG&E Local Government Partnership and other grant funds. Related CAP programs and policies are funded by these external sources and by leveraging existing departmental budgets.

Status: Although the City's Climate Action Plan has been successful at reducing per capita greenhouse gas emissions, the CAP needs to be updated to address new regulatory guidance and to broaden implementation measures in order to facilitate overall community-wide emissions reductions and resilience. The update process will be informed by a new greenhouse gas emissions inventory and community stakeholder engagement beginning in FY13 and FY14, respectively.

Timing: Key milestones for project implementation are shown below:

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	PW-Cons	Fully implement existing 18 climate measures	Most measures are being implemented; however, open space-related measures remain on-hold due to funding	Funding needed to update OVRP Concept Plan & redesign biological monitoring
2	PW-Cons	Set a new GHG emissions reduction target for City	Data to develop a 2012 GHG Emissions Inventory is being collected and will inform a new reduction target selection.	Within existing budget
3	PW-Cons	Update CAP to reach new target using stakeholder group	Stakeholder engagement will commence in CY14.	Within existing budget
4	PW-Cons	Initiate new CAP measures	Implementation of new CAP measures will commence in CY15.	To be determined



Healthy Community



Supportive, Built Environment • Environmental Protection • Healthy, Active Environment

Citywide Strategy 3.3. Provide parks, open spaces, outdoor experiences, libraries and recreational opportunities that residents can enjoy

Description: The City is supporting residents in choosing healthy lifestyles. Essential to a healthy community is the community infrastructure the City implements through libraries, parks, trails, and other recreational areas where residents can be active.

Status: The Public Works department is working with departments to develop a list of facility critical needs as well as replacement studies for City assets.

Initiative/s:

Initiative 3.3.1. Plan, construct, maintain and operate community and neighborhood facilities
Excellent recreational and library facilities, plentiful and well-maintained open spaces, and high-quality opportunities for enjoyment, relaxation, inspiration, community connection, and self-improvement are essential to a healthy city with high-paying jobs and a thriving economy, and create well-functioning communities with a bright civic future.

Initiative 3.3.2. Preserve and restore City Infrastructure through the Asset Management Program (AMP)
Asset Management is a methodology that balances: expected Levels of Service, inventory conditions, life cycle costs, consequences of failure, available resources, in order to sustain safe and appealing learning and recreational experiences.





City Strategy 3.3. Provide parks, open spaces, outdoor experiences, libraries, and recreational opportunities that residents can enjoy

City Initiative 3.3.1. Plan, construct, maintain and operate community and neighborhood facilities

Description: Excellent recreational and library facilities, plentiful and well-maintained open spaces, and high-quality opportunities for enjoyment, relaxation, inspiration, community connection, and self-improvement are essential to a healthy city with high-paying jobs and a thriving economy, and create well-functioning communities with a bright civic future.

Key Departmental Partnerships: Recreation Department (Lead), Library and Public Works (Operations & Engineering) as key City Department partners.

Resources: Public Works is working with departments to develop a critical and safety needs list for facilities. This list will help both the Recreation and Library Departments address programmatic needs. Recreation Department needs to create a core service, resource allocation and pricing strategy. In this process a community needs assessment for programs and services included.

Status The status of the Parks and Recreation Master Plan is pending while status of landmark park plan is finalized. In January, Public Works implemented a volunteer park ranger program in order to assist the hourly park rangers who monitor all 52 city parks. Public Works is working with departments to develop a list of facility critical needs for departments.

Timing: Key milestones for project development and implementation are shown below.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	PW/REC/ LIB	Develop a plan to analyze, prioritize and improve substandard and outdated facilities and operations.	Will be accomplished by Strong and Secure Community, 4.1.1, Initiative 3: Full development of the Facilities Management	Funding for Asset Management Systems implementation
2	REC/PW	Complete community parks and recreation needs assessment, strategic and master plans in order to determine residents' priorities for services and programs	Will be partially accomplished by Healthy Community 3.3.2, Objective 1: Fully develop the Parks Management System, and Objective 2: Fully develop the Open Space Management System	Funding for Asset Management Systems implementation
3	PW	Implement a Volunteer Ranger Program	The program has been implemented and volunteers are currently being solicited	Resources requested in FY 14 budget to manage volunteers



City Strategy 3.3. Provide parks, open spaces, outdoor experiences, libraries and recreational opportunities

City Initiative 3.3.2. Preserve and restore parks and open space systems through the Asset Management Program (AMP)

Description: Preservation and restoration of City infrastructure is vitally important to ensuring a strong and secure “built environment”. Asset Management is a methodology that balances: expected Levels of Service, inventory conditions, life cycle costs, consequences of failure, available resources, in order to sustain safe and appealing learning and recreational experiences.

Key Departmental Partnerships: Public Works (Lead), Admin, ITS, Finance, Library, and Recreation

Resources: Public Works Department leads the City efforts to fully implement an Asset Management Program providing transparent financial planning information to ensure annual budgeting considers reliable life cycle costs

Status: The Asset Management Program is comprised of nine separate and distinct Asset Management Systems (AMS's). As there are varying levels of funding available for the City assets, the systems are at various levels of implementation. The PMS and OSMS are lagging in development as they are general fund dependent.

Timing: While Asset Management is a year-round activity, key milestones for program implementation are shown below. Full implementation of the AMP is anticipated for the FY15. A request for proposal was issued in April submittals are due in early May 2013. Based on the response a contract will be awarded to complete the remaining condition assessments in FY 14.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	PW	Issue Request for Proposal for Asset Management Systems Condition Assessment for PW Parks and PW Open Space Sections	Request for Proposals has been issued and six responses received and are being reviewed.	Staff from Public Works, DSD, and ITS are assisting with reviewing the proposals
2	PW	Award Contract	Contract(s) to be awarded by July to complete the condition assessments in FY 14 contingent on available funds	Funding for Asset Management Systems implementation
3	PW	Conduct Condition Assessments Contingent on available Funds	Pending award of contract for Asset Management Systems condition assessments	Funding for Asset Management Systems implementation
4	PW	Pursue Funding for	Pending award of contract for	Resources

		Maintenance Schedules to sustain existing Infrastructure and Compile Missing Infrastructure.	Asset Management Systems condition assessments	requested in FY 14 budget
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Strong & Secure Neighborhoods

Public Safety - Prevention • Public Safety - Response •
Well-Planned and Maintained Communities



Create and maintain safe and appealing neighborhoods where people choose to shop, work, play and stay.



Strong & Secure Neighborhoods



Public Safety - Prevention • Public Safety - Response • Well-Planned Communities

Citywide Strategy 4.1. Ensure a sustainable and well maintained infrastructure to provide safe and appealing communities to live, work, and play

Description: One of the key functions of city government is to provide citizens and businesses a safe environment to live, work, play and conduct business on a daily basis. As such, the provision and maintenance of public infrastructure is vital to the quality of life for the residents. Ensuring that the homes we live in, the businesses we frequent and the roads we drive on are safe, is key to attracting home buyers, businesses and visitors to our community.

Status: The City is preparing to start a series of infrastructure studies to examine the conditions of a variety of critical infrastructure programs such as the Roadway Management System, Wastewater Management System, Building Management System, and the Drainage Management System. Funding has been identified to move forward with the studies in FY 2014.

Initiative/s:

Initiative 4.1.1. Preserve and restore City Infrastructure through the Asset Management Program (AMP) Preservation and restoration of City infrastructure is vitally important to ensuring a strong and secure “built environment”. Asset Management is a methodology that balances: expected Levels of Service, inventory conditions, life cycle costs, consequence of failure, available resources, in order to sustain safe and appealing neighborhoods.

Initiative 4.1.2. Provide comprehensive plan review and inspection services to ensure safety and code compliance.

Comprehensive plan review and inspection services are essential to ensure the timely processing and construction of projects and the health and safety of the community.





City Strategy 4.1 Ensure a sustainable and well maintained infrastructure to provide safe and appealing communities to live, work, and play

City Initiative 4.1.1. Preserve and restore City Infrastructure (such as roadway, wastewater, and drainage systems) through the Asset Management Program (AMP)

Description: Preservation and restoration of City infrastructure is vitally important to ensuring a strong and secure “built environment”. Asset Management is a methodology that balances: expected Levels of Service, inventory conditions, life cycle costs, consequence of failure, available resources, in order to sustain safe and appealing neighborhoods.

Key Departmental Partnerships: All

Resources: Public Works Department leads the City efforts to fully implement an Asset Management Program providing transparent financial planning information to ensure annual budgeting considers long- term life cycle costs and sustained performance of the assets.

Status: The Asset Management Program is comprised of nine separate and distinct Asset Management Systems (AMS’s). As there are varying levels of funding available for the City assets, the systems are at various levels of implementation. A request for proposal was issued in April with responses received. A contract will be awarded for the following condition assessments contingent on available funds.

Roadway Management System (RMS) - The Pavement Condition Index was recently completed and presented to the City Council in February 2013. A condition assessment will be conducted for other elements in the right of away such as sidewalks, curbs, gutters street signs and lights. For example, the City is in need of an inventory and condition assessment of all the signs. The reflectivity of approximately 19,000 signs needs to be measured to help prioritize the replacement of signs to comply with federally mandated reflectivity levels. With this information, recommendations for a Preservation and Rehabilitation Plan should be developed, including cost estimates and schedules.

Wastewater Management System (WMS) – This will include the condition assessment of sewer pipes and Lift Stations was completed last year and presented to Council at the Annual Infrastructure Workshop. Planned in the FY 2013-14 Capital Improvement Budget is the condition assessment of all manhole structures within the Wastewater Asset Management System.

Building Management System (BMS) - The City owns and operates approximately 1 million square feet of real property. A condition assessment will be conducted for each building. This would include all structural and mechanical elements including identification of ADA deficiencies. The data is to be used to develop a recommended Preservation and Rehabilitation Plan.

Drainage Management System (DMS) - The City has over 500 miles of drain pipes. In 2005 a study was completed evaluating a majority of the known Corrugated (CMP) pipes resulting in projects to repair those in danger of immediate failure. The remaining evaluated CMPs were rated to provide an initial prioritized listing of projects that is the basis of the annual CMP repair project. The Concrete Reinforced Pipe (CRP), remaining CMPs, and other miscellaneous pipes need assessment and prioritization.

While some of the recommended non-emergency repairs have been completed, the entire inventory needs to be reevaluated during the new condition assessment since the recommended 5-year review cycle has past.

Parks (PMS) –The City has 56 City-maintained parks. Completion of this inventory will be needed followed by a condition assessment of the entire inventory. This System is captured under another Initiative in Healthy Community.

Urban Forestry (UFMS) – This will include all street trees within the public right-of-way or within adjacent tree easements and within our 56 City parks. The City has approximately 27,500 trees in these areas (not including Open Space). The City is in need of an inventory by location and condition assessment of the trees. Recommendations should be developed for a maintenance plan to help prioritize trimming for healthy trees and removal and replacement for dead or dying trees.

Open Space –The overall condition in open space and CFD areas is good. This System is captured under another Initiative in Healthy Community.

Fleet (FMS) - The City owns and operates over 540 vehicles from police vehicles to fire trucks to dump trucks and sewer vacuators. The Central Garage performs the preventive maintenance on these vehicles. Vehicle replacement used to be funded by the Vehicle Replacement Fund established in 1985. Due to the City's financial crisis the continued funding of the Replacement Fund was eliminated. As a result many vehicles are past the recommended replacement cycles and in need of repair or replacement. An assessment of the fleet needs to be performed along with the re-establishment of a Replacement Fund.

Timing: While Asset Management is a year-round activity, key milestones for program implementation include condition assessments for each Asset Management Program. A request for proposal was issued in April, and submittals were received in May. A contract will be award to complete the remaining condition assessments in FY 14. Full implementation of the AMP is anticipated for the FY15.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	PW	Issue Request for Proposal for Asset Management Systems Condition Assessment	Request for Proposals has been issued and six responses received and are being reviewed	Staff from Public Works, DSD, and ITS are reviewing the proposals
2	PW	Award Contract	Contract(s) to be awarded by July to complete the condition assessments in FY 14 contingent on available funds	Funding for Asset Management Systems implementation
3	PW	Conduct Condition Assessments Contingent on available Funds	Pending award of contract for Asset Management Systems condition assessments	Funding for Asset Management Systems implementation
4	PW	Pursue Funding for Maintenance Schedules to sustain existing Infrastructure and Compile Missing Infrastructure.	Pending award of contract for Asset Management Systems condition assessments	Resources requested in FY 14 budget



City Strategy 4.1. Ensure a sustainable and well maintained infrastructure to provide safe and appealing communities to live, work, and play

City Initiative 4.1.2. Provide comprehensive plan review and inspection services to ensure safety and code compliance

Description: Comprehensive plan review and inspection services are essential to ensure the timely processing and construction of projects and the health and safety of the community. These services ensure compliance with City requirements, policies, procedures and codes while guiding the builders, developers, business and the general public through City processes with timely, effective and clear direction and communication. This initiative will benefit greatly with information technology improvements both in the efficient routing and scheduling of projects and in the reporting out of status to our stakeholders on the web and mobile apps.

Key Departmental Partnerships: Development Services Department (Lead), Fire, Public Works, and IT.

Resources: This is a broad initiative and includes the bulk of the Development Services Department and the public works and water quality inspectors. Personnel costs are budgeted in the department budgets. The performance measurement system for the review of plans and building inspection is currently housed in Permits Plus. With the City's purchase of the next upgrade (Accela Automation) there will be an opportunity to include Public Works inspection metrics on the same platform. In addition, the launch of SharePoint, will allow more automation of data collection. There is an initial need for greater IT resource allocation during the information technology rollouts, however it is anticipated that once the customized applications have been built that the maintenance of these platforms will be less intensive.

Status: DSD is moving forward with the purchase and customization of Accela Automation. After the vendor is awarded the contract there will be a year's worth of effort to convert the City's existing system and train the staff in using the new system. The ability to write mobile apps is built into Accela Automation however this will be a second phase of the rollout. Finally, a third phase for the City would be to embrace electronic plan checking.

Timing: The SharePoint rollout is expected in FY14 and the Accela Automation conversion should be complete in 2014.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	DSD	Implement mandatory Inspection Programs (Mobile homes, housing, building permits, water quality, public works)	Ongoing	Included in budget
2	DSD/Fire	Enforce Municipal code / Uphold safety and code compliance in plan review	Ongoing	Plan Check Supervisor; proposed in FY

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
				14 DSF budget, add a new Deputy Fire Marshal Position
3	DSD/ FIRE	Complete plan reviews within Department established timeframes.	Ongoing	Included in budget
4	FIRE	Implement the Business Inspection Program	Ongoing	Included in budget
5	DSD	Implement non-mandatory inspections (hotel/motel inspection, proactive sign enforcement, abandoned properties)	Ongoing	Included in budget



Citywide Strategy 4.2. Enhance prevention efforts and prepare communities for natural disasters and other emergencies

Description: City's provide public safety programs which include various prevention and emergency preparedness efforts. Prevention efforts are designed to help mitigate issues before they become a problem through thorough analysis of problems, enforcement of various codes and laws, and educational efforts to help residents improve their safety. Preparedness efforts are designed to ensure that the City and its residents are ready to respond to, survive and recover from a multitude of emergencies.

Status: The City continues to enhance public safety programs which help insure the safety of our residents. Through various grant programs, the City has been able to purchase equipment and provide valuable training to be able to respond to emergencies such as earthquakes, fires and other natural and man-made disasters. Although crime is at an all-time low in the City, the Police Department has begun efforts to enhance its analytical efforts to examine current and emerging crime and disorder trends throughout the City so it can respond in a proactive manner.

Initiative/s:

Initiative 4.2.1. Maintain a responsive Emergency Management Program

The City will continue to maintain and improve the Chula Vista Emergency Management Program, which is inclusive of maintaining an Emergency Operations Plan (EOP).

Initiative 4.2.2. Continue and enhance analysis led policing

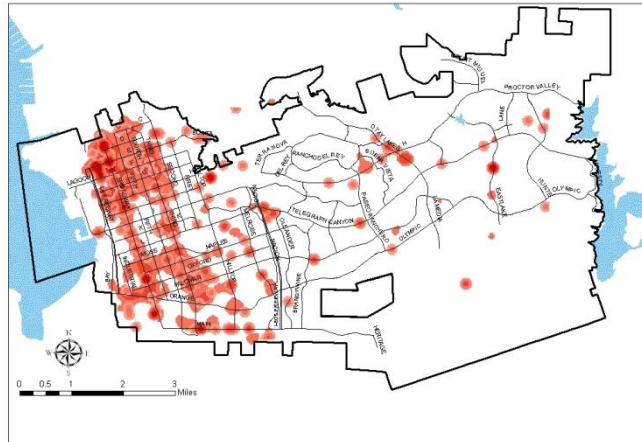
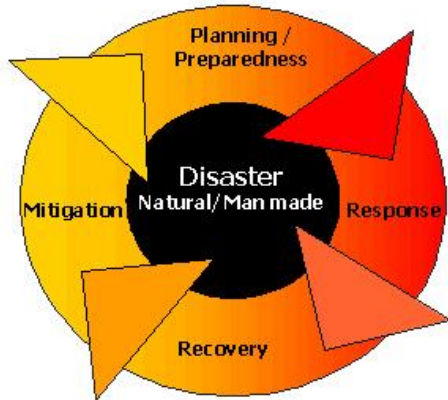
Through the use of timely information generated from public and private sources, Police Department managers will make informed decisions about deployment of scarce resources and the implementation of effective responses to public safety problems.

Initiative 4.2.3. Increase the public's perception of safety

Researchers have determined that the fear of crime affects where residents choose to live, shop, and socialize. Although reported crime has been decreasing since the 1990s, studies indicate peoples' perception of crime has increased. The City will implement programs that will assess residents' feelings of fear in order to positively impact their perceptions of safety in the City.

Initiative 4.2.4. Promote safety and readiness through community education and engagement
Through a comprehensive education program, the City can better prepare the community to prevent and be ready for threats to life and safety.

Comprehensive Emergency Management



Prepared by CVPD Special Investigations Unit
March 8, 2013

Source: Chula Vista Information Technology Services



City Strategy 4.2 Enhance prevention efforts and prepare communities for natural disasters and other emergencies

City Initiative 4.2.1. Maintain a responsive Emergency Management Program

Description: Maintain and improve the Chula Vista Emergency Management Program, which is inclusive of maintaining an Emergency Operations Plan (EOP). Maintain a trained and ready Emergency Operation Center (EOC) and respective staff. Train and equip a Community Emergency Response Team (CERT).

Key Departmental Partnerships: Fire (lead), All City Departments.

Resources: Emergency Operations Director (Fire) along with various EOC Staff.

Status: In December 2012, City Council adopted the Emergency Operations Plan (EOP). Additionally, a Power Outage Tabletop Exercise was conducted during the recent Golden Guardian event. The EOC Team Roster continues to be updated. EOC team members will continue to participate in section specific training, and other exercises.

Timing: Complete three training exercises by December 2013. Evaluate the EOC Team Roster and positions, as necessary.

Lead Dept.		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Fire	Review and or update annually, the Emergency Operations Plan	Ongoing	Hire Emergency Services Coordinator via funding provided through the Emergency Management Preparedness Grant (EMPG)
2	Fire	Identify, develop, train and exercise EOC staff	Ongoing	Hire Emergency Services Coordinator via funding provided through the Emergency Management Preparedness Grant (EMPG)
3	Fire	Identify, train, develop and exercise CERT members	Ongoing	Hire Emergency Services Coordinator via funding provided through the Emergency

Lead Dept.		Citywide Objectives	STATUS	RESOURCE REQUIRED
				Management Preparedness Grant (EMPG)
4	PW	Develop mutual aide agreement with County of SD for Public Works	Not yet begun	Need to hire Emergency Services Coordinator



City Strategy 4.2. Enhance prevention efforts and prepare communities for natural disasters and other emergencies

City Initiative 4.2.2. Continue and enhance analysis led policing

Description: Data- and evidence-driven police responses represent the benchmark of 21st century law enforcement. Through the use of timely information generated from public and private sources, Police Department managers will make informed decisions about deployment of scarce resources and the implementation of effective responses to public safety problems.

Resources: The Police department will utilize information from varied resources to guide coordinated responses from various units.

Status: The launch of Sharepoint will occur in the Police Department in Q4 of FY 2013 and is critical to timely dissemination of data. Calls for service reduction will continue to be a focus of department resources and will include on-going efforts such as the Hotel/Motel CFS Project, Apartment Complex CFS Project and the False Alarm Reduction Project. The Domestic Violence response unit is budgeted in FY 2013 and is dependent on specific hiring goals.

Timing: Plans for the Domestic Violence response unit were outlined in the successful federal grant proposal. Projects currently underway will be monitored on a continuous basis and have been previously budgeted or will become part of FY 2014 budget recommendations.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Police	Develop strategies and implement solutions to reduce calls for service for the Police Departments top calls for service with the objective of increasing proactive time for officers in Patrol.	A false alarm ordinance was passed in FY13 seeking to reduce the number of false alarms by up to 80%. The department is also launching a variety of other projects to reduce calls for service to the department and increase officers' proactive time on patrol.	Within existing resources
2	Police	Develop and deploy the Domestic Violence response unit to reduce the number of repeat domestic violence calls for service.	Currently hiring Officers in order to staff the response unit.	Within existing resources.
3	Police	Restructure the information analysis and sharing processes to enhance timely and qualitative information to managers in order to more accurately address crime and disorder issues.	Staff has begun examining how analytical information is shared throughout the department and the required analytical support that is needed as well. The goal is to finish this study by mid-year (Jan. 2014)	Within existing resources



City Strategy 4.2. Enhance prevention efforts and prepare communities for natural disasters and other emergencies

City Initiative 4.2.3. Increase the public's perception of safety

Description: Researchers have determined that the fear of crime affects where residents choose to live, shop, and socialize. Those fears are often felt by people regardless of age, race or economic background. Although reported crime has been decreasing since the 1990s, studies indicate peoples' perception of crime has increased. The City will implement programs that will assess residents' feelings of fear in order to positively impact their perceptions of safety in the City.

Key Departmental Partnerships: Police Department

Resources: The Police Department leads this Citywide initiative working with Public Safety Analysts who will be responsible for crafting and conducting resident surveys. Data gathered during these surveys and other data collected in an on-going effort will be analyzed for dissemination. Responses to the analysis will require the use of internal resources (Community Relations, Geographic Policing Unit, Community Patrol, etc) to address issues important to city residents.

Status: Similar surveys have been conducted in previous years using outside resources. Existing resources will be engaged during the latter part of FY 2013 to devise a resident survey. The state prison realignment effort called for in Assembly Bill 109 has been in place for over one year. An extensive amount of data is currently being analyzed both internally and externally to measure effects on our community.

Timing: Resident surveys will be conducted in Q4 of FY 2013 with communication strategies being developed in a parallel process.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Police	Conduct resident survey to assess citizens feelings of safety and gauge top public safety concerns, and develop appropriate response	Will begin June 2013.	Within existing resources
2	Police	Initiate new Crime Analysis Program measures	Underway, estimated completion June 2014	Within existing resources



City Strategy 4.2. Enhance prevention efforts and prepare communities for natural disasters and other emergencies

City Initiative 4.2.4. Promote safety and readiness through community education and engagement

Description: An important aspect of the City's public safety program is to work with residents and businesses on safety and disaster readiness. Through a comprehensive education program, the City can better prepare the community to prevent and be ready for threats to life and safety.

Key Departmental Partnerships: Fire, Recreation

Resources: Fire leads the city's community risk reduction efforts to maintain the "Ready, Set, GO" and Pool Safety Programs, and will create a Smoke Alarm Senior Citizen Program to ensure life safety.

Status: Partner with the Chula Vista Rotary to install Smoke Alarms in high-risk residential occupancies. Maintain the delivery of education for the 'Ready, Set, Go!' and 'Pool Safety' Programs.

Timing: The Fire Department and Rotary will identify and install smoke alarm in April 2013.

Lead Dept.		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Fire	Maintain and enhance the 'Ready, Set, GO' Program	Ongoing	Continue to utilize available grant funds and donations as available. Need to identify future funding in order to maintain program long term
2	Fire	Maintain and enhance the Pool Safety Program	Ongoing	Continue to utilize available grant funds and donations as available. Need to identify future funding in order to maintain program long term
3	Fire	Create a Smoke Alarm Senior Citizen Program	Ongoing	Continue to utilize available grant funds and donations as available. Need

Lead Dept.		Citywide Objectives	STATUS	RESOURCE REQUIRED
				to identify future funding in order to maintain program long term
4	Fire	Begin researching local public safety data to develop a Community Risk Reduction Program	Not yet started	Need to hire a Public Education Specialist and fund program



Strong & Secure Neighborhoods



Public Safety - Prevention • Public Safety - Response • Well-Planned Communities

Citywide Strategy 4.3. Ensure adequate emergency response and post emergency recovery services to our community

Description: The citizens of Chula Vista expect that the City's public safety providers will respond to emergency calls for service quickly, with adequately staffed, equipped and trained personnel to carry out the duties for which they are assigned. Additionally, the City wants to provide adequate follow-up services to help recover from emergencies.

Status: The Fire Department has recently begun implementation of the Advanced Life Support Program to provide paramedic services to the City of Chula Vista. This program will be p

Initiative/s:

Initiative 4.3.1. Provide and support an efficient and effective Advanced Life Support Program

The City is implementing an Advanced Life Support Program in the Fire Department to enhance the emergency medical care needs of the community.

Initiative 4.3.2. Restore and enhance public safety service capacity

Responding to residents' calls for service in a timely manner and providing quality public safety services are the primary functions of both the Police and Fire Departments. Response time thresholds for both Fire and Police have not met Growth Management Oversight Commission standards. Additionally, staffing issues for both departments have degraded each department's capacity to provide quality public safety services.





City Strategy 4.3. Ensure adequate emergency response and post emergency recovery services to our community

City Initiative 4.3.1. Provide and support an efficient and effective Advanced Life Support Program

Description: Implement the First Phase of the Advanced Life Support (ALS) First Responder Program.

Key Departmental Partnerships: Fire, City Attorney, Finance.

Resources: The Fire Department with support from the City Attorney and Finance departments negotiated an operational deployment and fiscal agreement with American Medical Response (AMR). This agreement provides the roadmap for the initial phase of that ALS program.

Status: First phase of ALS program implementation is underway with nine paramedics due to be deployed in July 2013. The first phase will staff five fire stations with paramedics, and succeeding phases will add more stations as resources allow. It is estimated that the total implementation will take 4 years.

Timing: Phase 1 of ALS implementation to begin on July 12, 2013.

Lead Dept.		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Fire	Acquire ALS equipment	Ongoing	Funded through American Medical Response (AMR) agreement and in FY12/13 and FY 13/14 budget
2	Fire	Implement first phase ALS program	Begins on July 12, 2013	Funded through American Medical Response (AMR) agreement and in FY 13/14 budget



4.3 City Strategy: Ensure adequate emergency response and post emergency recovery services to our community

4.3.2. City Initiative: Restore and enhance public safety service capacity

Description: Responding to residents' calls for service in a timely manner and providing quality public safety services are the primary functions of both the Police and Fire Departments. Response time thresholds for both Fire and Police have not met Growth Management Oversight Commission standards. Additionally, staffing issues for both departments have degraded each department's capacity to provide quality public safety services.

Key Departmental Partnerships: Police, Fire Departments and HR

Resources: Police and Fire lead their respective departments in the implementation of this initiative's objectives. Personnel costs for Police Department implementation of the initiative are budgeted in FY 2013 for consultant's findings in its first report. Hiring staff in both departments requires working closely with Human Resources staff to ensure success.

Status: The Fire Department has begun public outreach of the Fire Facility Master Plan. The FD is also working with Public Works to include the National Fire Protection Association (NFPA) 1901 Standards in the city-wide vehicle replacement policy. The City engaged a consultant to thoroughly examine police staffing in order to access: patrol workloads, scheduling, supervisor-to-subordinate ratios, utilization of volunteers, and policies. The consultant's study was planned to be delivered in two phases, one for patrol functions and two for the remainder of the Department. The first phase report was delivered in April 2012 and City Council adopted a police budget based partly on its findings/recommendations. The second phase of the report is expected to be presented during Q3 of FY 2013.

Timing: City Council approved the Fire Facility Master Plan and the Police Department's recommendations based on consultant's first phase report for FY 2013. Second phase recommendations will be evaluated in Q3 to guide budget discussions related to staffing and equipment needs. Hiring efforts are currently underway and will be continuously monitored.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Police	Increase proactive patrol time by implementing operational recommendations based on Phase 1 of Matrix Consulting Group (MCG) study	Ongoing; many of Phase 1 recommendations have been implemented; new "proactive time" study to be completed by MCG in Q1 FY14.	New contract with MCG to perform updated study
2	Police/FIRE	Restore or create vital public safety equipment replacement funds	The Police and Fire Departments are working with the Finance Department to identify funds in FY 2013 to purchase replacement vehicles.	Utilize expected savings from FY 2013 budget

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
3	Police	Complete and evaluate Phase 2 of MCG study in order to assess the Police Department's ability to provide critical	Final draft of MCG Phase 2 report was delivered to PD in Q4 of 2013.	Additional appropriations beyond the base FY 2014 budget would be required to implement recommendations from the MCG Phase 2 report
4	Police	Complete implementation of NetRMS police records management system in order to improve records management throughout the Department.	Ongoing; final version of software in testing by San Diego Sheriff's Office to be delivered in Q1 2014.	Within existing resources
5	Police	Achieve current authorized staffing levels in order to increase proactive time for officers in Patrol.	Ongoing; staff have been reassigned from other PD units to bolster recruiting and hiring capacity.	Within existing resources
6	FIRE	Adopt Fire Master Plan	Preparing presentation for community outreach	Within existing resources

Connected Community

Community Engagement • Enrichment Programming



Promote diverse opportunities that connect community and foster civic pride through comprehensive communication strategies, and cultural, educational, and recreational programming.



Citywide Strategy 5.1. Encourage residents to engage in civic activities

Description: A key component to a connected community is to have citizens engaged with their government and each other. The City will create a communication strategic plan to better inform the public and staff. Additionally, the City wants to create opportunities for residents to be engaged within their community through such mechanisms as volunteer opportunities or serving on a Board or Commission.

Status: The City is undertaking several efforts to encourage citizen awareness and involvement in City business.

Initiative/s:

Initiative 5.1.1. Implement Marketing and Communications Program

The City of Chula Vista is committed to implementing a robust marketing and communications program to help the City of Chula Vista enhance revenues, improve business development, and attract people to live and work here.

Initiative 5.1.2. Foster an environment of community engagement

The City of Chula Vista is committed to engaging communities and keeping stakeholders informed and involved in projects and initiatives.





City Strategy 5.1. Encourage residents to engage in civic activities

City Initiative 5.1.1. Implement Marketing and Communications Program

Description: The City of Chula Vista is committed to implementing a robust marketing and communications program to help the City of Chula Vista enhance revenues, improve business development, and attract people to live and work here. The City identifies major communications initiatives; develops marketing and advertising campaigns; supports programs and project managers; and provides professional graphic design and media and public information services.

Key Departmental Partnerships: Admin; IT

Resources: A five-member team coordinates marketing, communications, and the website for the City. The Web site and its public communications tools are coordinated with IT staff.

Status: A Marketing and Communications Operations Plan has been developed. Elements of the plan are being implemented. A progress reporting system for tracking communications initiatives is being developed. A communications process tool to coordinate with city staff on city initiatives is being developed.

Timing: Finalize Marketing and Communications Operations Plan in FY 13. Implement progress and process tools by June 30, 2013.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Admin-Comm	Enhance City of Chula Vista Image and Brand	Working with consultant to develop initial concept. Activation Plan development proposed for FY 14	Resources requested in FY 14 budget
2	Admin-Comm	Promote and inform progress and milestones on significant City projects	Ongoing	Included in budget
3	Admin-Comm	Support City of Chula Vista Programs and Services through communication strategies	Ongoing	Included in budget



City Strategy 5.1. Encourage residents to engage in civic activities

City Initiative 5.1.2. Foster an environment of community engagement

Description: The City of Chula Vista is committed to engaging communities and keeping stakeholders informed and involved in projects and initiatives. The City will coordinate efforts to implement proactive communications activities to provide information about city services; promote opportunities for involvement in decision-making processes; and incorporate new methods and technologies to provide the broadest possible access to send/receive input and information.

Key Departmental Partnerships: Admin/ITS/City Clerk/City Attorney

Resources: Communications and IT staff collaborate to ensure communications activities and the City website promote opportunities for community engagement and volunteering. City Clerk and City Attorney staff are responsible for recording and documenting the decision-making and legislative processes.

Status: A number of efforts are under development to enhance community engagement. Admin and IT will make recommendations for providing and receiving information via web, social media, and other tools. The City Clerk and City Attorney are considering how to enhance transparency in the decision-making and legislative processes. How technology and the website can extend opportunities for engagement are being considered.

Timing: A number of efforts are underway or under development to enhance community engagement. A number of new activities start or expand in the new Fiscal Year.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	Admin/City Clerk/City Attorney	Promote opportunities for the public to be involved in decision-making and legislative processes	Ongoing. Developing RFP to secure consultant services to upgrade and enhance website	Resources for website to be allocated from PEG funding
2	Admin/HR/City Clerk	Expand opportunities to volunteer and participate in civic activities	Expanded effort to be pursued in FY 14	Included in budget
3	Admin/City Clerk	Engage communities by informing and involving residents	Ongoing. Engagement opportunities to be enhanced with new website	Included in budget
4	DSD	Improve equal access for all members to participate in City Services and programs, as implemented through an ADA transition plan	An inventory has begun to determine what facilities programs and services need effort to provide access to all citizens.	Included in budget



Connected Community



Community Engagement • Enrichment Programming

Citywide Strategy 5.2. Provide opportunities that enrich the community's quality of life

Description: The City can contribute to a connected community by having ample opportunities to have citizens to interact with each other. The level of civic pride is also increased when the City can enrich lives with quality programming. Toward that end the City will promote culture, art, and community connections. As much as possible the City will cultivate and promote partnerships that expand and improve services.

Status: The City has undertaken several long term plans to address the service /program needs of the community in areas such as Parks, Recreation, Housing, and Library. Many of these efforts are to the point where the City will now be programming based on identified priorities.

Initiative/s:

Initiative 5.2.1. Provide services/programs responsive to residents' priorities
Services and programs will be offered to residents based on their priorities.





City Strategy 5.2. Provide opportunities that enrich the community's quality of life

City Initiative 5.2.1. Provide services/programs responsive to residents' priorities

Description: Services and programs will be offered to residents based on their priorities. Residents' priorities will be identified using formal customer input instruments, day-to-day interaction with residents' staff observation and analysis, usage data and service level measurement, research and knowledge of best 21st century practices, incorporation of relevant trends and cutting edge innovations, balanced with budget realities, prudent deployment of resources and maximization of partnerships and collaborations.

Key Departmental Partnerships: Recreation, Library, Public Works, Development Services and Human Resources Departments.

Resources: Staff of Library and Recreation Departments will plan and implement. Library strategic plan funding source identified.

Status: Analysis and evaluation of proposed Recreation and Library Departments merger underway, with expected initial report March 2013. Organizational structure and personnel deployment undergoing analysis – resulting projected service enhancement expected July 2013. Strategic planned process scheduled for Spring 2013, with completed report to council expected summer 2013. Library and Development Services Departments gathering public input on potential new site for Heritage Museum.

Timing: A number of efforts are underway or under development to enhance service programs. A number of the Library and Recreation Departments collaborations have taken place and will continue to expand in the new Fiscal Year. Additional objectives will time, resources and funding to complete.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
1	LIB/REC	Assess various options for Library/Recreation collaboration or merger	3/26/13 – City Manager provided status and recommendations to Council	Staff time has been allocated to provide analysis
2	LIB/REC/HR	Analyze organizational structure and personnel deployment with the goal of increasing service	Short-term analysis of current needs and capabilities performed with assistance of HR. More effective personnel deployment scheduled for FY13-14, using only existing personnel budget	HR has adequate staffing and funding to work with Lib and Rec over an extended period of time to perform necessary personnel analyses.

Lead Dept		Citywide Objectives	STATUS	RESOURCE REQUIRED
3	LIB	Complete community library needs assessment, strategic and master plans in order to determine residents' priorities for services and programs	Contract for strategic visioning component of draft Library Facilities Master plan in final negotiations – estimated time frame May-Nov 2013.	Planning funds have been made available to support this initiative
4	LIB/DSD/PW	Work with business community and city departments to upgrade Heritage Museum and other substandard facilities	Heritage Museum Board, Library, Recreation, and DSD analyzing various scenarios and options for upgrade of Heritage Museum. Other facility needs to be analyzed via full implementation of Facilities Management System implementation	Analysis of Heritage Museum condition and cost of necessary upgrades will need to be budgeted.
5	LIB/IT	Offer upgraded interactive, and social media information technology to support job search, school success, personal enrichment and small business	Library mobile apps added and advertised in March 2013. IT and Library collaborating on analyzing possible use of PEG funds for improved educational and communication potential	PEG funds expected to be available in FY 14-15 to support needed IT improvements
6	DSD	Implement programs identified as priorities in the City's Housing Element and Consolidated Plan	The 2013-2020 Housing Element was adopted by the City Council on April 23, 2013. Staff will begin work based upon the priorities and timelines identified within the Implementation Plan of the Element. The City is going into its fourth year of the adopted 2010/2015 Consolidated Plan. On an annual basis, the City selects public service, capital improvement, and housing activities for funding that best meet the needs of the community as identified within the Consolidated Plan. FY 2013/14 activities were approved on May 7, 2013.	Within adopted budget

Proclamation

of the City Council

RICK VOORHEES

in Recognition of being named 2019 Sidney Suslow Scholar by the Association for Institutional Research

WHEREAS, Dr. Rick Voorhees during his 40 + year career, has made a number of sustained contributions to higher education, in particular in the field of institutional research through his scholarly work. He has authored many studies in edited books, monographs, and several journals.

WHEREAS, Rick's scholarship has focused primarily on three main areas of inquiry: community colleges, institutional research, and strategic planning. In addition, Dr. Voorhees has contributed to the field of institutional research in other ways related to his scholarship. In addition to serving as president of the Association, a 4,000 plus member organization of planners and researchers from across the globe, he also has served as chairperson or member of the Association's Publications Committee, elections committee, forum evaluation committee, the executive committee and has been a regular presenter at the Association's annual meeting, as well as a presenter of research at higher education- related meetings and conferences around the world.

WHEREAS, Rick has authored a number of peer-reviewed articles, national policy briefs, and three volumes of New Directions of Institutional Research and was awarded the Best Paper award at the AIR Forum in 1984. He has served as dissertation chair and dissertation committee member at five universities while mentoring many new professionals in the areas of strategic planning, competency-based education, and student outcomes.

WHEREAS, The Suslow Award is the highest honor AIR bestows on an individual for their scholarly contributions to higher education.

NOW, THEREFORE, BE IT PROCLAIMED, that I, Jonathan Godes, Mayor of the City of Glenwood Springs, Colorado, on behalf of the entire Council and the residents we serve, recognize, and support Rick Voorhees being named 2019 Sidney Suslow Scholar by the Association for Institutional Research.

IN WITNESS

Given under my hand and the official seal of the
City of Glenwood Springs, in the State of Colorado,
this 2nd day of May 2019.

Jonathan Godes, Mayor
City of Glenwood Springs



MINUTES
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
APRIL 18, 2019
101 W. 8TH STREET
6:00 P.M.

5 Roll Call

Mayor Mike Gamba called the meeting to order at 6:00 p.m. Present at roll call: Shelley Kaup, Rick Voorhees, Todd Leahy, Mike Gamba, Steve Davis, and Jonathan Godes. Absent: Jim Ingraham.

Also present were Debra Figueroa, City Manager; Karl Hanlon, City Attorney; Steve Boyd, COO; Jenn Ooton, Assistant City Manager, Economic and Community Development Director; Catherine Mythen Fletcher, City Clerk; Roxanna Peskuski, Deputy City Clerk; Brian Smith, Parks and Recreation Director; Matt Langhorst, Public Works Director; Terri Partch, City Engineer; Terry Wilson, Police Chief; Jake Velasquez, Streets Superintendent; Gretchen Ricehill, Assistant Economic and Community Development Director.

6 Pledge of Allegiance

Mayor Gamba led in the Pledge of Allegiance

7 Agenda Changes

8 Conflict of Interest Disclosure

9 Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes)

Steve Smith-Thanked Council for their encouragement of bicycling in Glenwood Springs.

10 Consent Agenda

A. Receipt of Minutes from the March 21, 2019 and April 4, 2019 Regular Meetings

Councilor Voorhees moved, seconded by Councilor Kaup, to approve the consent agenda.

Motion passed unanimously by all present, Ingraham absent.

ACTIONS AND/OR PRESENTATIONS

11 Council Comments

Councilor Godes – Welcomed the new incoming council members and thanked the departing council for everything they had done the last eight years.

Councilor Davis – Thanked the departing council and expressed that he would miss them.

Councilor Voorhees – Expressed his appreciation for departing council.

Councilor Kaup – Thanked departing council and expressed her appreciation and respect for their willingness to serve the community.

Departing Council members Mike Gamba and Todd Leahy expressed their thanks and offered comments on their experience serving on City Council.

12 Swearing in of New Council Members

City Clerk Catherine Mythen Fletcher issued the oaths of office to the newly elected City Council members, Tony Hershey, Steve Davis, Charlie Willman, and Paula Stepp.

13 Break

14 Election of New Mayor and Mayor Pro-Tem

Councilor Hershey nominated Councilor Voorhees; Councilor Voorhees accepted the nomination.

Councilor Stepp nominated Councilor Kaup; Councilor Kaup accepted the nomination.

Councilor Willman nominated Councilor Godes; Councilor Godes accepted the nomination.

Councilors voted to bring the nominated candidates down to two -

Karl Hanlon read the results:

Godes: 3 votes

Kaup: 2 votes

Voorhees: 2 votes

Councilors voted between Councilor Kaup and Councilor Voorhees to choose who would run against Councilor Godes for Mayor position –

Karl Hanlon read the results:

Kaup: 4 votes

Voorhees: 2 votes

Councilors voted between Councilor Godes and Councilor Kaup for the position of Mayor, whomever received the least votes would be named Mayor Pro Tem –

Karl Hanlon read the results:

Godes: 4 votes

Kaup: 3 votes

Councilor Godes was named the new Mayor.

Councilor Kaup was named the new Mayor Pro-Tem.

15 Proclamation Glenwood Springs Architecture Month

A. Proclamation of Glenwood Springs Architecture Month

Mayor Godes read the Proclamation recognizing Glenwood Springs Architecture Month.

16 Receipt of the April 2, 2019 Municipal Election

A. Receipt of Results of the April 2, 2019 Municipal Election

Councilor Willman moved seconded by Councilor Voorhees to accept the results.

Motion passed unanimously.

17 Resolution 2019-22; A Resolution of the City Council of the City of Glenwood Springs, Colorado, Authorizing the Service Schedule K-1, West Side Bulk Power Supply Agreement with the Municipal Energy Agency of Nebraska (MEAN)

- A. Resolution 2019-22; A Resolution of the City Council of the City of Glenwood Springs, Colorado, Authorizing the Service Schedule K-1, West Side Bulk Power Supply Agreement with the Municipal Energy Agency of Nebraska (MEAN)

Matt Langhorst explained that the City of Glenwood Springs entered into a Service Schedule K-1 Bulk Power Supply contract with MEAN on June 6th 2012 for a 10 year duration. In 2018 MEAN contacted the City to discuss a potential new contract option that included a 100% Renewable Resource bulk power supply. The cost per MWH would drop from \$51 to \$46 which would save the City \$500,000 per year over the life of the contract.

Mayor Godes opened the item for public comment.

Heather McGregor-felt that MEAN's offer was a positive recognition of the great need in the community for utility renewable energy. She suggested that the contract allow customers to install larger renewable energy systems.

Mayor Godes closed public comment.

Mayor Pro-Tem Kaup moved, seconded by Councilor Voorhees to approve Resolution 2019-22; Authorizing the Service Schedule K-1, West Side Bulk Power Supply Agreement with the Municipal Energy Agency of Nebraska.

Motion passed unanimously.

18 Resolution 2019-21; A Resolution of the City Council of the City of Glenwood Springs, Colorado, Regarding Staff Appointment to Municipal Energy Agency of Nebraska ("MEAN") Board of Directors, the MEAN Management Committee and the Nebraska Municipal Power Pool ("NMPP") Members Council

- A. Resolution 2019-21; A Resolution of the City Council of the City of Glenwood Springs, Colorado, Regarding Staff Appointment to Municipal Energy Agency of Nebraska ("MEAN") Board of Directors, the MEAN Management Committee and the Nebraska Municipal Power Pool Committee ("NMPP") Members Council

Matt Langhorst continued the discussion about MEAN explaining the City purchased its electric power from the Municipal Energy Agency of Nebraska (MEAN), which has a Board of Directors made up of its power pool members, thus the City of Glenwood had a seat on the MEAN Board, Committee, and Council. The seats were required to be filled by a person that resides within the City's power supply boundary. It was recommending that Matthew Langhorst, Public Works Director be appointed to all three main seats and Debra Figueroa be appointed to the MEAN Board of Directors alternate seat.

Mayor Godes opened the item for public comment and no comments were noted. Mayor Godes closed public comment.

Councilor Stepp moved, seconded by Councilor Hershey to approve Resolution 2019-21; A Resolution of the City Council of the City of Glenwood Springs, Colorado, Regarding Staff Appointment to Municipal Energy Agency of Nebraska ("MEAN") Board of Directors, the MEAN Management Committee and the Nebraska Municipal Power Pool ("NMPP") Members Council.

Motion passed unanimously.

19 Council Meeting Format

Debra Figueroa spoke to Council about their desire to take a look at how Council meeting days were structured. This was Council's opportunity to give direction to change it, knowing that it can be changed in the future if needed.

Councilor Willman moved, seconded by Councilor Hershey, to change the regular meeting schedule to start at 3:30 in the afternoon with work sessions until 6:00 and to start the regular meeting at 6:15 and go for four hours to 10:15 for a three-month trial period.

Motion passed, Davis abstained.

20 City Council Board Liaison

Item to be continued at the next regular meeting

21 Report from City Administration

- A. City Manager
 - i. Hanging Lake Ribbon Cutting on May 1, 2019
 - ii. CML Meeting will be June 18-21, 2019
 - iii. South Canyon Ribbon Cutting on May 7, 2019
 - iv. 2019 Spring Clean-up update and information
- B. City Attorney
- C. Correspondence Incoming/Outgoing

22 Executive Session to Conduct a Conference with the City Manager and City Attorney for the Purpose of Discussing the City's Purchase, Acquisition, Lease, Transfer or Sale of Real Property; Determining Strategy for Negotiations and Instructing Negotiators; and to Conduct a Conference with the City Attorney to Receive Legal Advice in Accordance with C.R.S. 24-6-402(4)(a), (b) and (e), related to Garfield County Industrial Development

23 Adjournment

The meeting was adjourned at 9:20pm.



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: 7 Party Memorandum of Understanding Regarding Garfield County Senior Programs for 2019

Action Requested: Approve the MOU to provide Senior Services within Garfield County.

Department: City Administration

Presented By: Debra Figueroa, City Manager

Background Info: Since 2009, Garfield County has partnered with its municipalities, the Roaring Fork Transit Authority, and Colorado Mountain College to provide services to seniors. In 2016, Parachute withdrew and it was determined that in 2019 that CMC would no longer need to participate.

The remaining members still fund countywide meal and transportation services. Glenwood Springs contributed \$4,763.72 for meal service and \$116,861.48 for transportation services in 2018. This program is included in the 2019 Budget.

Issues: None at this time.

Staff Recommendation: Staff recommends approving the MOU for meal and transportation services for seniors within Glenwood Springs.

**7-PARTY MEMORANDUM OF UNDERSTANDING
REGARDING GARFIELD COUNTY SENIOR PROGRAMS
FOR 2019**

This Memorandum of Understanding is entered into between:

**The Garfield County Board of County Commissioners, (“BOCC”)
The City of Rifle, Colorado,
The City of Glenwood Springs, Colorado,
The Town of Carbondale, Colorado,
The Town of New Castle, Colorado,
The Town of Silt, Colorado,
Roaring Fork Transportation Authority, (“RFTA”)**

(collectively, the “7-Parties”) in order to set forth the terms and conditions of their cooperative provision, administration and funding of a county-wide meal and transportation services for the Garfield County Senior Programs for calendar year 2019 (the “MOU”). This MOU is effective as of January 1, 2019, regardless of the dates on which it is signed.

BACKGROUND

- A. Each of the 7-Parties is authorized to make the most efficient and effective use of their governmental powers, responsibilities and monies by cooperating and contracting with other governments. Colo. Const. art. XIV §§ 18(2)(a) and (2)(b); Colorado Revised Statutes § 29-1-201.
- B. In 2009, 9-Parties entered into an Intergovernmental Agreement to set forth the terms and conditions of their cooperative provision, administration and funding of meal and transportation services to senior citizens of Garfield County (“the 9-Party MOU”). This 9-Party MOU is recorded in records of the Garfield County Clerk and Recorder at Reception No. 776142.
- C. In accordance with the 9-Party MOU, in 2009 and each consecutive year thereafter, the now 7 parties have also entered into a Memorandum of Understanding that sets forth each party’s annual commitment to share the administrative and operational costs of the Senior Programs meal and transportation services and determines the methodology by which those costs will be allocated among them (the “MOU”).
- D. In 2016, The Town of Parachute withdrew from membership and opted not to participate in the services provided by Garfield County Senior Programs in 2017. In 2017, it was determined that Colorado Mountain College no longer needs to be part of the MOU beginning 2019.

- E. Each of the remaining 7-Parties desires to continue to provide meal and transportation services to eligible Garfield County senior citizens in 2019 in accordance with the original 9-Party MOU.

NOW, THEREFORE, for and in consideration of mutual covenants and agreements set forth below, the 7-Parties agree as follows:

AGREEMENT

1. Incorporation of Recitals. The foregoing Recitals are incorporated as if set forth in full.
2. Purpose of this Agreement. The purpose of this MOU is to define the terms and conditions by which the 7-Parties will collectively provide, administer and fund county-wide meal and transportation services for the Garfield County Senior Programs for calendar year 2019.
3. Term of Agreement. This Agreement shall have an Effective Date of January 1, 2019 regardless of the dates signed and shall terminate on December 31, 2019.
4. Senior Services to be Provided. The BOCC, through its Department of Human Services Senior Programs, will organize and administer the congregate meal and transportation services described in this MOU for eligible senior citizens of Garfield County on behalf of Rifle, Glenwood Springs, Carbondale, New Castle, Silt (collectively, the "Municipalities"). In exchange, the Municipalities will reimburse the BOCC for their proportionate shares of the cost of such services as calculated in accordance with the Cost Methodologies defined in this Agreement.
5. Congregate Meal Services. The BOCC and Municipalities agree that Senior Program meals will be provided at seven (7) locations throughout Garfield County on the days and times set forth in **Attachment A** and further agree that the costs to provide such services will be allocated among them as follows:
 - a. Cost Methodology – Nutrition: The BOCC agrees to pay forty percent (40%) of total budgeted cost to provide Congregate Meal Services in 2019.
 - b. The Municipalities each agree to pay a proportionate share of the remaining balance, less all anticipated grant and program funding income, based upon the percentage of total meals served between July 2017 and June 2018 to the residents of each Municipality. The BOCC agrees to be responsible for all meals served to residents of unaffiliated Garfield County and Battlement Mesa as well as any shortfall in grant and program funding income.
 - c. Application of Cost Methodology to the 2019 Budget: As illustrated in **Attachment B**, which is incorporated here for all purposes, the total budgeted cost to provide Congregate Meal Services in 2018 is **\$397,991.00**. The BOCC's 40% share of that amount equals **\$159,196.40**. Anticipated grant and program funding

income for 2018 is **\$218,816.00**. The remaining balance of \$19,978.60 is distributed among the Municipalities based upon the portion of total meals provided to residents of each Municipality between July 2017 and June 2018, which results in the following amounts due:

Municipality	Number of Meals	Percent of Total	Amount Due
Carbondale	1,241	7.64%	\$1,526.41
Glenwood Springs	3,873	23.84%	\$4,763.72
New Castle	734	4.52%	\$902.81
Silt	2,477	15.25%	\$3,046.67
Rifle	87,918	48.75%	\$9,739.00
TOTAL	16,243	100%	\$19,978.60

6. Transportation Services. The BOCC, RFTA and Municipalities agree that Senior Program transportation services will be provided to Garfield County residents sixty-five (65) years old and older who have difficulty utilizing public transportation (“Seniors”) and citizens under the age of sixty-five (65) with a functional disability affecting the ability to use public transportation on the schedule set forth in **Attachment C**. These services will be provided by RFTA’s Traveler bus system and will be wheel chair accessible, curb to curb, driver assisted transportation and will also include the delivery of meals to the meal site locations. Riders must make reservations 48 hours in advance. The cost to provide these transportation services will be shared by the BOCC, RFTA, and the Municipalities in accordance with the following Cost Methodology:

- a. Cost Methodology - Transportation: The BOCC agrees to be responsible for fifty-percent (50%) of the total budgeted cost to provide Senior Transportation Services in 2019. The remaining fifty-percent is paid for by grant and program funding income and allocated payments from the Municipalities based upon the number of rides provided to residents of each Municipality. RFTA agrees to be responsible for the cost of the transportation services provided to the three Municipalities that are current RFTA members: the Town of Carbondale, the City of Glenwood Springs, and the Town of New Castle. The remaining non-RFTA member Municipalities, the City of Rifle, the Town of Silt agree to pay their proportionate share of transportation costs based upon the number of rides provided to the residents of each. The BOCC agrees to be responsible for all rides provided to residents of unaffiliated Garfield County as well as any shortfall in anticipated grant and program funding income.
- b. Application of Cost Methodology to 2019 Budget. As illustrated in **Attachment D**, the total budgeted cost to provide Senior Transportation Services in 2019 is **\$693,231.00**. This cost represents the costs to the BOCC and to RFTA to provide such services in the amounts of **\$346,615.50** and **\$658,250.00** respectively, less the amount of **\$30,000** received by RFTA from other sources who utilize the Traveler bus system pursuant to a contractual agreement that is unrelated to this

MOU. The BOCC's 50% share of this amount equals **\$346,615.50**. Anticipated grant and program funding income for 2019 is **\$80,677.00**. The remaining balance of **\$265,938.50** is distributed among the Municipalities based upon the portion of total rides provided to residents of each Municipality between July 2017 and June 2018, which results in the following amounts due:

Municipality	Number of Rides	Percent of Total	Amount Due
Carbondale*	248	2.85%	\$7,572.94
Glenwood Springs*	3,827	43.94%	\$116,861.48
New Castle*	375	4.31%	\$11,451.02
Silt	394	4.52%	\$12,031.21
Rifle	3,865	44.38%	\$118,021.85
TOTAL	8,709	100%	\$265,938.50

- c. Payment. The BOCC and RFTA have entered into a separate intergovernmental agreement pursuant to which the BOCC agrees to pay RFTA the total amount of **\$522,364.56** in twelve (12) equal monthly payments for Senior Transportation Services (the "Traveler IGA"). This amount represents RFTA's estimated cost to provide such services in 2019 less amounts received by RFTA from other sources and less the cost to provide such services to the RFTA Member Municipalities identified with an asterisk above. The non-RFTA member Municipalities agree to pay the respective amounts set forth above upon receipt of an invoice from the BOCC.

7. Appropriation. This MOU is expressly contingent upon appropriation and budgeting for the costs required herein. If any Municipality, including RFTA on behalf of its member jurisdiction Municipalities, fails to appropriate or have available sufficient funds to pay for the costs of the obligations set forth in this Agreement, services to residents of the failing Municipality shall end.

8. Whole Agreement. This MOU sets forth the whole agreement of the Parties. No representation, either verbal or written, shall be considered binding to the extent it is not set forth herein.

9. Amendment and Assignment. This MOU may be amended, altered, or modified solely through a written agreement executed with equal formality. This MOU may not be assigned by any Party without the written agreement of the all.

10. Facsimiles and Counterparts. This MOU and all documents required for performance may be signed in counterparts. Facsimile signatures may be substituted for originals on such documents.

11. Authority. Each person signing this MOU represents and warrants that said person is fully authorized to enter into and execute this document and bind the Party represented.

12. Governing Law. The laws of the State of Colorado shall govern the validity, performance and enforcement of this MOU. Venue for any action instituted pursuant to this MOU shall lie in Garfield County.

13. Notice. Notices to be provided under this Agreement shall be given in writing either by hand delivery or by certified return receipt requested United States mail, to the following:

Carbondale	Jay Harrington, Town Manager Town of Carbondale 511 Colorado Avenue Carbondale, CO 81623 (970) 963-2733 ext. 1207 jharrington@carbondaleco.net
Garfield County	Mary Baydarian, Director Garfield County Department of Human Services 195 West 14 th Street Rifle, CO 81650 (970) 625-8282 mbaydarian@garfield-county.com
Glenwood Springs	Debra Figueroa, City Manager City of Glenwood Springs 101 W. 8 th Street Glenwood Springs, CO 81601 (970) 384-6500
New Castle	Dave Reynolds, Town Administrator New Castle Town Hall 450 West Main Street, P O Box 90 New Castle, CO 81647 (970) 984-2311 Dreynolds@newcastlecolorado.org
RFTA	Dan Blankenship, Chief Executive Officer Roaring Fork Transportation Authority 2307 Wolfshon Road Glenwood Springs, CO 81601 (970) 384-4981 dblankenship@rfta.com

Rifle

Scott Hahn, City Manager
City of Rifle
202 Railroad Ave
P. O. Box 1980
Rifle, CO 81650
(970) 625-6266
shahn@rifleco.org

Silt

Jeff Layman, Town Administrator
Town of Silt
231 N. 7th Street, PO BOX 70
Silt, CO 81652
970-876-2353, ext. 813
jlayman@townofsilt.org

IN WITNESS WHEREOF, the parties have caused this Memorandum of Understanding to be executed effective January 1, 2019.

ATTEST:

TOWN OF CARBONDALE, COLORADO

Town Clerk

By: _____
Dan Richardson, Mayor

Date: _____

ATTEST:

**BOARD OF COUNTY COMMISSIONERS
GARFIELD COUNTY, COLORADO and
BOARD OF SOCIAL SERVICES**

Clerk to the Board

By: _____
John Martin, Chairman

Date: _____

ATTEST:

**CITY OF GLENWOOD SPRINGS,
COLORADO**

City Clerk

By: _____
Michael Gamba, Mayor

Date: _____

ATTEST:

TOWN OF NEW CASTLE, COLORADO

Town Clerk

By: _____
Art Riddile, Mayor

Date: _____

ATTEST:

Secretary to the Board of Directors

**ROARING FORK TRANSPORTATION
AUTHORITY**

By: _____
_____, Chair

Date: _____

ATTEST:

City Clerk

CITY OF RIFLE, COLORADO

By: _____
Barbara Clifton, Mayor

Date: _____

ATTEST:

Town Clerk

TOWN OF SILT, COLORADO

By: _____
Rick Aluise, Mayor

Date: _____

ATTACHMENT A

2019 CONGREGATE MEAL SCHEDULE

2019 Senior Programs Congregate Meal Schedule

MEAL SITE CONTACT	KITCHEN	MEAL DAY	Meal Site Name/Location
Jerilyn Nieslanik, Manager Crystal Meadows Senior Housing 1250 Hendrick Drive Carbondale, CO 81623 970- 963-9326 cga@gwestoffice.net	Valley View Hospital	Wednesday	Roaring Fork & Spoon Crystal Meadows Senior Housing 1250 Hendrick Drive in the Romminger Room
JULIE S. HANSON <i>Purchasing & Contracts Director</i> Colorado Mountain College (CMC) 802 Grand Avenue Glenwood Springs, CO 81601 970.947.8402 / jshanson@coloradomtn.edu	Valley View Hospital	Tuesday/Friday	Chat n' Chew 1402 Blake Avenue Glenwood Springs, CO 81601 in Lucy Huntley Senior Center
Monique Hermosillo, Site Coordinator Sunnyside Retirement Center 601 21 st Street #106 Glenwood Springs, CO 81601 970-945-9234 sunnyside1@questoffice.net	Valley View Hospital	Monday/Thursday	Sunnyside 601 21 st Street Glenwood Springs, CO 81601 in the Kitchen
Leslie Means, Property Manager New Castle Senior Housing 201 Castle Valley Blvd New Castle, CO 81647 (970) 984-0779 newcastle@crhdc.org	City of Rifle	Monday	The Gathering 201 Castle Valley Blvd New Castle, CO 81647 In the Community Room
Ken Bachus, Board President Valley Senior Center PO BOX 932 Parachute, CO 81635-0932 (970) 285-6492 rcampbell623@gmail.com	City of Rifle	Wednesday	Valley Senior Center 540 N. Parachute Parachute, CO 81635
Colorado River Fire Rescue 1850 Railroad Avenue Rifle, CO 81650 Attention: Chief Rob Jones	City of Rifle	Wednesday	Meet n' Eat, Silt Fire Station 611 Main Street Silt, CO 81652

Scott Hahn, City Manager City of Rifle 202 Railroad Avenue Rifle, CO 81650 (970) 665-6409 SHahn@riflco.org	City of Rifle	Tuesday, Thursday & Friday	Senior Delight Rifle Senior Center 50 Ute Avenue Rifle, CO 81650
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ATTACHMENT B

**2018 CONGREGATE MEAL BUDGET
AND COST METHODOLOGY**

Nutrition Budget	
Wages	Annual
Employee Benefits	
Professional - Other	
Prof Oth - County Attorney Contr	
Rental of Land & Buildings	
Communications	
Printing and Binding	
DHS - Destruction of Records	
Travel	
Motor Pool Charges	
Professional Affiliations	
Training	
Office Supplies	
Operating Supplies	
Computer Supplies	
Freight, postage, Delivery	
Other Supplies	
Copy Machine Usage	
Food - non travel related	

Staff: 75% Manager
71% Program Coordinator
75% Program Coordinator

\$ 142,497.00
\$ 75,244.00
\$ 148,200.00
\$ 500.00
\$ 500.00
\$ 600.00
\$ 300.00
\$ 300.00
\$ 300.00
\$ 12,000.00
\$ 100.00
\$ 500.00
\$ 800.00
\$ 9,000.00
\$ 250.00
\$ 2,000.00
\$ 1,200.00
\$ 1,600.00
\$ 2,100.00

Total 12 Month Budget

\$397,991.00

Less AAA funding

\$ 167,816.00

Less NSIP Incentives

\$ 15,000.00

Less Program Income

\$ 36,000.00

Grant & Program Income Total

\$ 218,816.00

40% County Share of Total Expenses

\$ 159,196.40

Garfield County Share

\$ 159,196.40

Projected Income/County Share

\$ 378,012.40

Income less expenses

\$19,978.60

Municipal Budget Share for Distribution

\$19,978.60

NUTRITION BREAKDOWN SUMMARY FOR MUNICIPALITIES					2018		2017	
2019		Municipal Nutrition Contribution	Percent of Total	# of Meals Served	# Meals	Contributions	# Meals	Contributions
Jurisdiction								
Carbonale		\$1,526.41	7.64%	1,241	1,267	\$ 497.67	1,239	\$ -
Glenwood Springs		\$4,763.72	23.84%	3,873	4,041	\$ 1,587.28	4,400	\$ -
New Castle		\$902.81	4.52%	734	743	\$ 291.85	787	\$ -
Silt		\$3,046.67	15.25%	2,477	2,080	\$ 817.01	1,990	\$ -
Parachute		\$0.00	0.00%	-	-	\$ -	-	\$ -
Rifle		\$9,739.00	48.75%	7,918	8,301	\$ 3,260.59	9,383	\$ -
Municipal Total		\$19,978.60	100.00%	16,243	16,432	\$ 6,454.40	17,799	\$ -
Garfield County				3,253	2,966		2,435	
Parachute				-	-		108	
Grand Total				19,496	19,398		20,342	
Based on July 2017 - June 2018 Usage					Based on July 2016 - June 2017		Based on July 2015 - June 2016	

ATTACHMENT C

**2019 SENIOR TRANSPORTATION
SERVICES SCHEDULE**

Traveler Transportation Schedule - 2019

COMMUNITY	DAY OF WEEK OR MONTH	SERVICE DESCRIPTION	NORMAL HOURS OF OPERATION	NUMBER OF VEHICLES
Glenwood Springs	Monday- Friday	Customer transportation and/or local shopping	8 a.m. – 5 p.m.	2-4
	Tuesday	Meal transportation	11 a.m. – 2 p.m.	1
	2nd Thursday of the month	Customer transportation to/from Grand Junction, picking up customers Carbondale through Battlement Mesa	8 a.m. – 5 p.m.	1
	Thursday	Carbondale to Battlement Mesa with stops in Glenwood, New Castle, Silt, New Castle & Rifle	8 a.m. – 5 p.m.	1
	Friday	Meal transportation	11 a.m. – 2 p.m.	1
Carbondale	Monday – Friday	Customer transportation and/or local shopping	8 a.m. – 5 p.m.	1
	Wednesday	Meal transportation and local shopping	11 a.m. – 4 p.m.	1
	2nd Thursday of the month	Customer transportation to/from Grand Junction, picking up customers Carbondale through Battlement Mesa	8 a.m. – 5 p.m.	1
	Thursday	Carbondale to Battlement Mesa with stops in Glenwood, Silt, New Castle and Rifle	8 a.m. – 5 p.m.	1
	Thursday	Battlement Mesa to Carbondale with stops in Glenwood, Silt, New Castle and Rifle	8 a.m. – 5 p.m.	1
Rifle	Monday	Customer transportation	8 a.m. – 5 p.m.	2
	Tuesday	Customer transportation/Meal transportation	8 a.m. – 5 p.m.	2-3
	Wednesday	Customer transportation/ Shopping	8 a.m. – 5 p.m.	3-4
	Thursday	Customer transportation/Meal transportation	8 a.m. – 5 p.m.	2-3
	2nd Thursday of the month	Customer transportation to/from Grand Junction, picking up customers Carbondale through Battlement Mesa	8 a.m. – 5 p.m.	1
	Thursday	Carbondale to Battlement Mesa with stops in Glenwood, Silt and New Castle	8 a.m. – 5 p.m.	2-3

	Thursday	Battlement Mesa to Carbondale with stops in Glenwood, Silt, New Castle and Rifle	8 a.m. – 5 p.m.	1
	Friday	Customer transportation/Meal transportation	8 a.m. – 5 p.m.	2-3
Battlement Mesa	Monday – Friday	On call basis for customers	8 a.m. – 5 p.m.	1
	Tuesday	Shopping day in Rifle	8 a.m. – 5 p.m.	1
	Wednesday	Meal transportation/Local transportation	11 a.m. – 2 p.m.	1
	2nd Thursday of the month	Customer transportation to/from Grand Junction, picking up customers Carbondale through Battlement Mesa	8 a.m. – 5 p.m.	1
	Thursday	Battlement Mesa to Carbondale with stops in Rifle, Silt, New Castle, and Glenwood Springs	8 a.m. – 5 p.m.	1
	Thursday	Carbondale to Battlement Mesa	8 a.m. – 5 p.m.	1
Silt	Monday – Friday	On call basis for customers	8 a.m. – 5 p.m.	1
	Wednesday	Meal transportation/shopping	11 a.m. – 4 p.m.	1
	2nd Thursday of the month	Customer transportation to/from Grand Junction, picking up customers Carbondale through Battlement Mesa	8 a.m. – 5 p.m.	1
	Thursday	Battlement Mesa to Carbondale with stops in Rifle, Silt, New Castle, Glenwood Springs and Carbondale	8 a.m. – 5 p.m.	1
	Thursday	Carbondale to Battlement Mesa with stops in Rifle	8 a.m. – 5 p.m.	1
New Castle	Monday – Friday	On call basis for customers	8 a.m. – 5 p.m.	1
	Monday	Meal transportation/shopping	11 a.m. – 4:00 p.m.	1
	2nd Thursday of the month	Customer transportation to/from Grand Junction, picking up customers Carbondale through Battlement Mesa	8 a.m. – 5 p.m.	1
	Thursday	Battlement Mesa to Carbondale with stops in Glenwood Springs and Carbondale	8 a.m. – 5 p.m.	1
	Thursday	Carbondale to Battlement Mesa with stops in Silt, Rifle	8 a.m. – 5 p.m.	1

ATTACHMENT D

**2019 TRANSPORTATION BUDGET
AND COST METHODOLOGY**

Transportation Budget	Annual	Staff: 25% Manager 10% Prog Coordinator
Wages	\$ 24,819.00	
Employee Benefits	\$ 7,912.00	
Prof Oth - County Attorney Contr	\$ 500.00	
Language Translation	\$ 200.00	
Communication	\$ 650.00	
Printing and Binding	\$ 200.00	
Office Supplies	\$ 200.00	
Computer Supplies	\$ 200.00	
Freight, Postage, Delivery	\$ 300.00	
Total County Expenses	\$ 34,981.00	
RFTA	\$ 688,250.00	Projected based on RFTA Actual Expenditures
MINUS GWS Paratransit	\$ 30,000.00	
Total RFTA Expenses	\$ 658,250.00	
Total Expenses	\$ 693,231.00	
Less Program Income	\$ 28,000.00	
Less CSBG	\$ 52,677.00	
Total G/P Income	\$ 80,677.00	
Less 50% County Share	\$ 346,615.50	
Total County Share	\$ 346,615.50	
Total Revenue	\$ 427,292.50	
Total Expenses	\$ 693,231.00	
Income less expenses	\$ 265,938.50	
Municipal Budget Share for Distribution	\$ 265,938.50	

TRANSPORTATION BREAKDOWN Based on July 2017 - June 2018 Usage						
2019		Municipal		2018		2017
Jurisdiction	# of Rides Provided	Percent of Total	Transportation Contribution	# Rides	Contributions	# Rides
Contributions						
Carbondale*	248	2.85%	\$7,572.94	186	\$5,384.18	264
Glenwood Springs*	3,827	43.94%	\$116,861.48	4,321	\$125,080.81	5,041
New Castle*	375	4.31%	\$11,451.02	631	\$18,265.68	667
Silt	394	4.52%	\$12,031.21	366	\$10,594.67	322
Parachute	-	0.00%	-	-	\$0.00	-
Rifle	3,865	44.38%	\$118,021.85	3,765	\$108,986.17	4,333
MUNICIPAL TOTAL				9,269	\$268,311.50	10,627
* RFTA Members						
Rural Garfield County	3,150			3,272		3,674
Mt. Valley	2,608			2,939		1,173
Parachute	-			-		147
Total	14,467			15,480		15,621



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: 27th Street Bridge Update

Action Requested: None

Department: Engineering

Presented By: Terri Partch, City Engineer

Background Info: Public Information Only

Issues: None

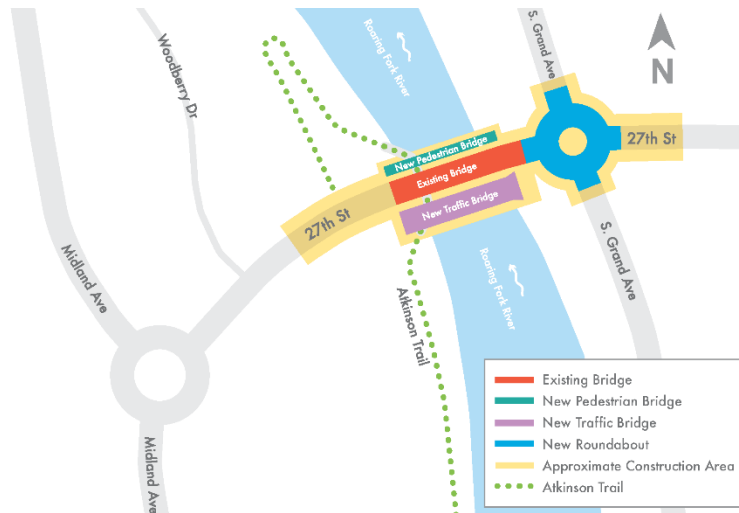
Staff Recommendation: None

27th Street Bridge Project Summary:

The current 27th Street Bridge (aka Sunlight Bridge) transports more than 14,000 vehicles per day and is at the end of its lifespan. Rated one of the worst bridges in Colorado, this bridge serves as a critical connection over the Roaring Fork River.

Throughout 2019 crews will build a separate pedestrian bridge, build and replace the current bridge, remove piers from the river and construct a new roundabout at 27th Street and South Grand Avenue.

Construction crews will build the new replacement traffic bridge just south of the existing bridge and the new pedestrian bridge just to the north of the existing bridge. In the late summer, after the installation of the pedestrian bridge, the current traffic bridge will be deconstructed, and the new bridge will be horizontally slid into place. This technique, called a bridge slide, will minimize impacts to traffic, pedestrians, utilities, and river users while replacing the existing vehicle bridge.



Construction Updates:

Soil nail walls are complete. In this picture, wall O is visible on the west side under the bridge. Wall P is on the east side. These are both critical elements to the overall project. They shore the area so the abutment can be formed.

We're halfway through micropile construction. To date, crews have installed about 40 micropiles. Reminder, these form the foundations for the new bridges. This will be ongoing into mid-May.



The ped bridge is expected to be delivered to the site in early May. This will be built on S. Grand by the John Deere dealership and transported in for installation. Crews will be working on preparations for the ped bridge installation which is anticipated to begin in June.

Schedule:

Activity	Timeline
Soil Nail Walls for Abutment	Completed
Micropile Construction	Late-March through May
Pedestrian Bridge Set	June 2019
84-Hour Traffic Bridge Closure and Slide of New Bridge	Late Summer 2019
In-Water Dates per Specifications	August 15-October 15, 2019
Roundabout Construction	Late Summer - Early Fall 2019
Pier Removal from Roaring Fork River	Late Summer - Early Fall 2019
Landscaping and Aesthetic Applications	Fall 2019
Project Completion	December 2019

Traffic and River Impacts:

- Ongoing traffic holds and lane closures during off-peak hours
 - Weekends and Weekdays between 8:30 AM-3:30 PM (2:30 PM on Wednesdays)
 - Beginning June 5-August 19: Weekends and Weekdays between 8:30 AM-4:30 PM
 - Whenever possible, work with traffic impacts will be pushed to off-peak hours. Some peak hour lane closures will be required.
- Night Work and Closures
 - Most river impacts will occur at night
 - Some trail and river closures for critical overhead work
 - Ped Bridge Installation - night closure of the 27th Street Bridge and South Grand Avenue intersection

Public Meetings:

- River Users Meeting
 - Monday, May 20, 6 PM
 - Glenwood Springs Public Library
- Community Informational Meeting
 - Wednesday, May 29, 5-7 PM
 - Glenwood Springs Community Center

Project Information:

- Project Webpage: cogs.us/27thStreetBridge -- AND/OR -- cogs.us/SunlightBridge
- Email: 27thStreetBridge@gmail.com
- Phone (call or text): 970-618-5379

To receive the latest ConeZone email updates on construction and traffic impacts, contact the project team or subscribe to the “Glenwood Springs News” list via the project’s webpage.



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Request for Funding from Tourism Board

Action Requested: Request for funding

Department: City Administration

Presented By: Tourism Board

Background Info: Presentation will be made by Lisa Langer, Tourism Promotion Project Manager

Issues:

Staff Recommendation:



TRAIL INFORMATION

The hike to Hanging Lake is a short, steep scenic trail that climbs 1.2 miles (1.93 km) through Dead-horse Creek Canyon with over 1,000 feet (305 m) of elevation gain to Hanging Lake. It is important that hikers are prepared for elevation, strenuous climbs and uneven trail conditions. Appropriate footwear and clothing is recommended. Trekking poles are very helpful for the hike down. Weather conditions can change rapidly in the canyon without warning. It takes the average person 3-4 hours to hike to the lake and experience the area.

BE PREPARED

- There is no restroom at the lake. Use facilities at the trailhead before hiking.
- Observe all rules and regulations.
- Wear sturdy footwear, not flip flops.
- Bring plenty of water.
- Be advised that there is no cell service available.
- Near the top, the trail becomes steep and rocky and more difficult to maneuver.
- Please stay on trail and do not cut switchbacks.
- Standing on the log, swimming and fishing in the lake are prohibited.
- Dogs and/or other pets are NOT allowed on the Hanging Lake trail or at the Hanging Lake Welcome Center. Please look for dog boarding options at visitglenwood.com/hanginglake.
- In accordance with FAA safety and Forest Service guidelines, drones should not be flown in the Hanging Lake area.

The Hanging Lake shuttle service is contracted by the City of Glenwood Springs in partnership with the US Forest Service.



ONGOING PROTECTION OF HANGING LAKE IS PROVIDED IN PARTNERSHIP WITH



The Hanging Lake Shuttle Service
is provided by H2O Ventures.

visitglenwood.com/hanginglake

HIKING HANGING LAKE



NEW PERMIT AND SHUTTLE SYSTEM

HANGING LAKE

A PERMIT IS REQUIRED TO HIKE HANGING LAKE.

Hanging Lake is a Colorado treasure and a rare example of a travertine geological formation located in the heart of Glenwood Canyon in the White River National Forest. The Hanging Lake permit and shuttle system is in place to protect the fragile ecosystem and provide visitors with high-quality experiences through education and interpretation at the Hanging Lake Welcome Center and along the trail.

Permits are required year-round and can be reserved at visitglenwood.com/hanginglake.

Peak Season (May 1 – October 31): Visit Hanging Lake by shuttle, hiking or biking. During peak season, personal vehicles are not allowed to park at the trailhead.

Off-Peak Season (November 1 – April 30): Visit Hanging Lake by personal vehicle, hiking or biking. During this time, parking a personal vehicle is allowed at the trailhead. A permit is still required for all visitors.

If you see a Ranger, say hello! Rangers will be patrolling the trail and parking area to provide visitor services, information and to check for permits.



GETTING TO HANGING LAKE

The shuttle will operate daily in the peak season between 6:45 a.m. and 8:00 p.m. Times may vary during the season based on weather and capacity. Park personal vehicles and board the shuttle at the Hanging Lake Welcome Center, located at 110 Wulfsohn Road, Glenwood Springs.

Personal vehicles are not allowed to park at the trailhead during peak season, May 1 – October 31.

COSTS

The price for the reservation is \$12 and is available online at visitglenwood.com/hanginglake. Reservation fees pay for the reservation service, shuttle operations, visitor information, conservation and interpretation services during your visit.

During November 1–April 30 reservations cost \$10 per person and will be available for purchase online.

For more information about groups of 20 or more please call the Hanging Lake information line at 970-384-6309.

WHAT IS INCLUDED AT THE HANGING LAKE WELCOME CENTER?

At the Welcome Center you'll find a convenient location with free parking, restrooms, retail merchandise, assistance with trip planning, helpful staff, information about Glenwood Springs and information about Hanging Lake and the White River National Forest.



PROTECTING HANGING LAKE

Hanging Lake was formed by a geological fault which caused the lake bed to drop away from the valley floor above. Over the years, water flowing over Bridal Veil Falls has deposited dissolved carbonates to build up the fragile lake edge. Because of its uniqueness, the area was designated a National Natural Landmark by the Secretary of the Interior in 2011. Over the years the popularity of the area has increased leading to vegetation, trail damage and overcrowding. A management plan was put in place in 2018 to protect this natural wonder into the future.

A percentage of the fees collected for reservations will be reinvested into the long-term stewardship and sustainability of Hanging Lake. The implementation of the permit system, environmental education and interpretation program will help visitors play an active role in protecting the ecological health of Hanging Lake, improve the visitor experience and support the local tourism economy.





Glenwood Springs Tourism Promotion Board

Vision: *Be the preferred regional tourism destination.*

Mission: *To promote regional activities, attractions and events to increase tourism spending in Glenwood Springs.*

At the Tourism Promotion Board meeting on April 11, 2019, Nancy Heard made a motion to direct Lisa Langer to go to the May 2, 2019 city council meeting to request that council moves \$60 from A+I back into the 2019 Tourism Promotion budget for enhanced marketing of hiking and biking trails, including Hanging Lake. Jeremy Gilley seconded the motion and it passed unanimously.

Outline of Marketing Plan to promote Hiking & Biking Trails, including Hanging Lake in Glenwood Springs, Colorado:

- **Printing of informational Hanging Lake Brochure (attached) ~ \$10,000**

**The vendor, H2O Ventures agreed to share the cost of printing!*

- **Google Ads (PPC advertising) ~ \$25,000**

- Bidding on more expensive search terms for which we currently only have limited budget available. Examples: Colorado Hiking, Best Hikes in Colorado, Colorado Mountain Biking, Best Cycling in Colorado, Colorado Nature Trails...
- Bidding on Hanging Lake keywords to guarantee the full benefit of the management contract for the town of Glenwood Springs. The town's official visitor website should always be the Nr. 1 search result for Hanging Lake to guarantee that as many visitors as possible stay in Glenwood Springs and not in other towns when interested in hiking Hanging Lake.
- Retargeting of Hanging Lake and other trail related website visitors with additional trail information, activities, restaurants and lodging in Glenwood Springs.
- Display and Video ads promoting Glenwood Springs trails.

All Google Ads campaigns use smart targeting options and don't compete with local businesses. VisitGlenwood.com targets locations and search terms to reach new markets and promote the shoulder seasons. Retargeting of

Visit Glenwood Springs, a department of the Glenwood Springs Chamber Resort Association, is a Destination Marketing Organization which promotes visitation to the community on behalf of the City of Glenwood Springs.

engaged visitors, targeting of Colorado, hiking, biking, -interest as well as geo-targeting is applied whenever appropriate!

- **Social Media Campaigns ~ \$8,000**
Target outdoorsy and lookalike users, direct users with hiking and biking interest to VisitGlenwood.com to spark interest and make Glenwood Springs their next vacation destination.
- **Colorado.com Display Ads ~ \$8,000**
Colorado.com native banner ads to promote trails in Glenwood Springs. Native banner ads appear and look like editorial content. Visitors are directed to informational blog posts about trails and things to do in Glenwood Springs.
- **Email Blasts through 3rd parties ~ \$2,500**
Purchase of informational E-Blasts to promote hiking and biking in Glenwood Springs to an outdoorsy audience with interest in Colorado.
- **PR Campaign Leave No Trace and Care for Colorado Principles in Glenwood Springs ~ \$6,500**
1-3 PR posts placed on Colorado.com: Using the popularity of Hanging Lake to educate visitors about *Leave No Trace Principles* on our trails, as well as promotion of other trails in the Glenwood Springs area.

Total: \$60,000

Money will be spent with *Care for Colorado Principles* in mind! Campaigns spending can be shifted, reduced or spread out over a longer time-frame if we see great ad performance and conversion rates. **Campaigns aim to educate visitors about Glenwood Springs' trails while also promoting less popular trails to help reduce the impact on popular nature trails.** Hanging Lake and all other trail information will promote *Leave No Trace Rules* and benefit the entire community of Glenwood Springs. People interested in Glenwood Springs' recreational trails will be directed to a variety of appropriate pages on VisitGlenwood.com. Through retargeting campaigns, day trippers and weekend visitors will see promotions matching their interest that encourage longer stays during shoulder seasons.



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Resolution 2019-23; Supporting the Take a Minute Traffic Community Traffic Calming Campaign

Action Requested: Approve a resolution supporting Imagine Glenwood's Take A Minute traffic calming campaign and authorize in-kind support from City staff.

Department: Engineering

Presented By: Tanya Allen, Transportation Manager
Terri Partch, City Engineer

Background Info: Background:

In mid-2018 Imagine Glenwood convened a group of interested parties to begin discussing ways to promote slower, safer driving in the City of Glenwood Springs. This group included representation from Valley View Hospital, Alpine Bank, the DDA, CDOT, the City of Glenwood Springs, and other interested parties.

This group's efforts ultimately resulted in a proposal for a community-driven safe driving campaign for which they are seeking both funding (via the discretionary grant process) and in-kind support from the City.

Campaign Theme and Activities

The campaign is called "Take A Minute." The idea is to encourage people to drive the posted speed limit on Grand Avenue and elsewhere. The "minute" is the time supposedly "saved" by driving 10mph faster through the core of Glenwood.

The group plans to undertake the following activities:

- 1) Distribute before and after surveys asking people to think about how they drive on Grand Avenue/in town. The survey will be hosted on Survey Monkey. The link will be distributed by partner organizations through their internal communications, social media, and other means.
- 2) Print and distribute election-style yard signs and window clings with the campaign logo and encourage people to display them during the campaign. The group will purchase these signs and distribute them to supporters.
- 3) Purchase radio and print advertising based on educational talking points developed in consultation with CDOT and City staff.

More detailed information is included as an attachment to this report.

Requested Support

Imagine Glenwood has submitted a grant application to the Financial Advisory Board for discretionary grant funding. In addition, they are asking the City for the following in-kind support:

- 1) A resolution supporting the themes/objectives of the campaign. This resolution is included for your

consideration.

2) Permission to place campaign signage in City right of way along Grand Avenue. Acceptable locations will be identified in consultation with relevant City departments. Signs will not be placed in City right of way without prior City approval.

3) Commitment to sharing campaign materials (e.g. op-eds or PSAs) on the City's website and social media.

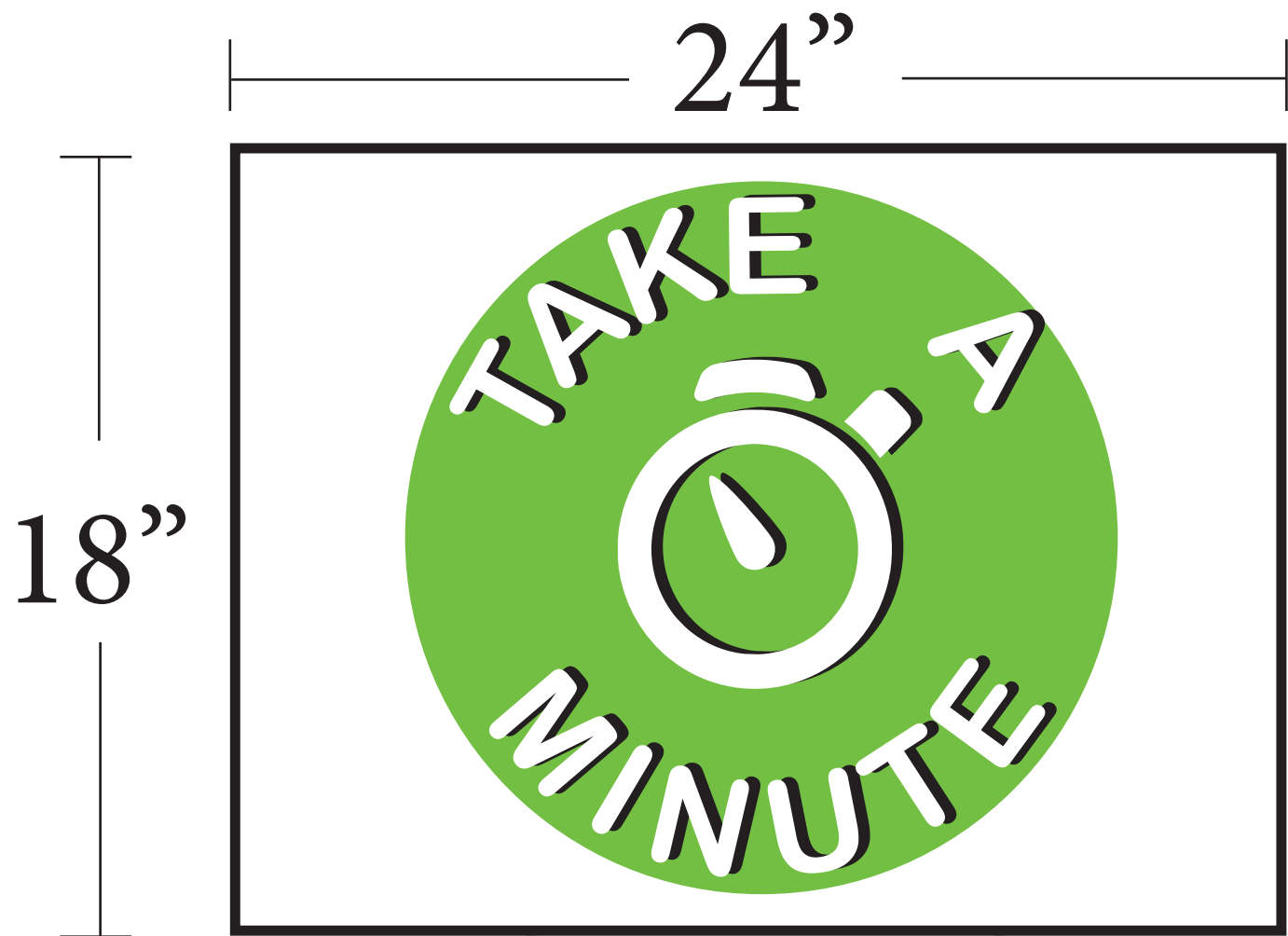
4) Additional Police enforcement and education regarding the speed limit on Grand Avenue for a defined period during the Campaign, to be determined in consultation with the Police Department.

Issues:

The Transportation Commission has discussed Imagine Glenwood's request for support and considered whether it would qualify for traffic calming funds. They voiced their support for the goals and intent of the program but believe it should be expanded beyond Grand Avenue. They did not support using Traffic Calming funds to support the campaign but encouraged the group to apply for discretionary grants from the City and County.

Staff Recommendation:

Staff recommends that Council issue the attached resolution in support of the campaign and direct staff to work with Imagine Glenwood to provide the requested in-kind support.



Front



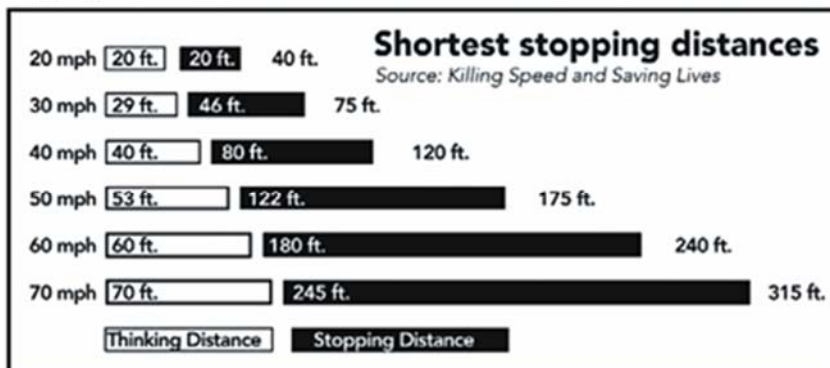
Back

Educational Talking Points

- The distance between 23rd street and the exit 116 on-ramp is approximately 1.5 miles. Assuming a free flow of traffic, the trip would take:
 - o 3:36 @ 25mph
 - o 2:34 @ 35 mph
- Driving 5-10 mph slower can literally save a life. Pedestrian fatality rates increase exponentially for speeds above 20mph.
 - o In a crash at 20 mph, the likelihood of a pedestrian sustaining a serious or fatal injury is 18 percent;
 - o In a crash at 30 mph, the likelihood of a pedestrian sustaining a serious or fatal injury is 50 percent;
 - o In a crash at 40 mph, the likelihood of a pedestrian sustaining a serious or fatal injury is 77 percent

(Tefft, 2011; see also Rosen & Sander, 2009, and Leaf & Preusser, 1999, quoted in https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812502_pedestrian-and-bicyclist-data-analysis-tsf-research-note.pdf).

- Driving a little slower reduces your stopping distance and improves your ability to react to unpredictable drivers, bicyclists, and pedestrians in the busy commercial areas along Grand Avenue. On average, a driver takes 1.5 seconds to react before making a decision to stop. The chart below illustrates the effect of speed on stopping distance.



Taken from https://safety.fhwa.dot.gov/ped_bike/ped_transit/ped_transguide/ch4.cfm

- Grand Avenue is both a Main Street and a highway. On average 28,000 cars per day travel the section between the Grand Avenue Bridge and 23rd Street. (per CDOT OTIS)
- These cars and trucks travel past more than 100 access points (driveways, intersections, etc.) where drivers may need to enter/exit the roadway between 23rd Street and the Grand Avenue Bridge. (per SH-82 Access Control Plan)

- Slower driving speeds encourage more people to walk and bike in downtown areas. This means less automobile congestion, a smoother trip for those just passing through, and more foot traffic for our downtown businesses. (multiple studies, for example <http://www.nyc.gov/html/dot/downloads/pdf/dot-economic-benefits-of-sustainable-streets.pdf>)

**The Take a Minute Campaign is focused on the impact of traffic on the town of Glenwood Springs.
Your input will be of great help.**

Please take a minute to respond to these short questions.

I am fully aware of my speed while driving through Glenwood Springs

- ☐ Seldom
- ☐ Sometimes
- ☐ Often
- ☐ Always

I drive the speed I do through Glenwood Springs

- ☐ To get through town as quickly as possible
- ☐ I drive as fast as the cars around me
- ☐ I never really thought about it, I just drive
- ☐ Other _____

I value driving through Glenwood at 25 mph

- ☐ Not really
- ☐ Sort of
- ☐ Totally
- ☐ Other _____

I drive 25 mph through Glenwood Springs

- ☐ Seldom
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Not sure

I feel my actions can influence the speed of other drivers

- ☐ Not really
- ☐ Sort of
- ☐ Totally
- ☐ Other _____



2019 GRANT APPLICATION

Dear Applicant,

This document contains the 2019 Grant Application.

Each year, the City of Glenwood Springs allocates a portion of sales tax revenues from its A&I and Tourism Funds for human services, special events, tourism promotion and other public purposes as City Council deems appropriate.

Please be aware that this year the City is requiring all applications to be submitted in **full, on-time and in one pdf file only**. We have made exceptions in the past but Council has directed the finance staff to not present applications to the reviewing body that do not meet the 2019 requirements.

An applicant may submit only one application each grant cycle. The grant process is competitive. Receipt of funds in a prior year is not a guarantee of funding or the same amount of funds, in the current year.

Please review the entire application and all instructions prior to beginning work on it. Contact the City's COO Steve Boyd at steve.boyd@cogs.us or (970) 384-6422 at any point while completing your application. We will do our best to answer your questions.

Review your application completely before submitting it, and make sure you have followed all instructions.

The City of Glenwood Springs complies with all applicable state and federal laws, and does not discriminate in any manner.

Sincerely,

CITY OF GLENWOOD SPRINGS



INSTRUCTIONS

2019 Grant Application

PROGRAM DATES

Applications Available:	March 8, 2019
Applications Due:	April 19, 2019
Target Award Date:	June 7, 2019

Note: *City Council reserves the right to take whatever time is necessary to make its final determination.*

INSTRUCTIONS

1. Applications will be considered based on the following eligibility and organizational guidelines:
 - a. Must be complete, on-time and in a single pdf. Applications may be printed, completed and scanned along with supporting documentation into one pdf file. Applicants are encouraged to supply your answers directly in this Word document. You may then print this completed document as a pdf file and edit it to include your other documents or print this Word document when it is completed and scan it along with supporting documentation into a single pdf file. You may visit the City's finance office for assistance in either printing or scanning your document.
 - b. Must be a not-for-profit, government or tax-supported public entity.
 - c. May not be a political organization.
 - d. The estimated number of citizens of Glenwood Springs impacted by the application must be disclosed separately from the estimated number of people impacted overall.
 - e. General operating expenses are more likely to be funded than capital expenditures which will be subject to a higher level of scrutiny by the reviewing body.
 - f. Awards to religious organizations are generally not funded. Exceptions may be made on an individual basis depending on the purpose of the request.
 - g. We generally consider only applications of less than 10% of the organization's annual budget.
2. Applications **MUST BE RECEIVED** by the City of Glenwood Springs prior to 5:00 p.m. on April 19, 2019. The official time of submittal will be the time stamp on the incoming email from the City's email server. All applicants must submit a complete copy in one .pdf document to steve.boyd@cogs.us. There will be no exceptions to this.
3. Applications will be evaluated first on compliance with eligibility requirements and then on responses to the selection criteria. The City of Glenwood Springs reserves the right to fund applications in whole, in part, or not at all, and to reject any or all applications.
4. Applications and all materials submitted to the City may be subject to disclosure pursuant to the Colorado Open Records Act.
5. No cover letter or table of contents should be submitted.
6. The final pdf file submitted to the City must include:
 - Completed and signed Summary Form – electronic signatures are acceptable
 - Use of Funds Summary (250 words)
 - Responses to Selection Criteria Questions (3 pages)
 - Attachments or supporting documentation in proper order
7. The City Council of the City of Glenwood Springs is the sole decision maker for grants awarded through the Financial Advisory Board. The Financial Advisory Board reviews applications and makes its recommendations to the City Council.

8. The Finance Director is responsible for all activities regarding the distribution of funds through the 2019 Grant Cycle and may solicit information from any source as needed in conducting his work.
9. The City or its designee has the right to issue or not to issue supplemental statements regarding these Instructions or any aspect of the grant program on an as-needed basis, and to perform any due diligence that may be required in the discharge of its obligations. Applicants may be required to provide additional information or to participate in pre-award interviews, as needed.

SUMMARY FORM

APPLICANT INFORMATION

NAME:	
MAILING ADDRESS:	
APPLICANT CONTACT NAME:	TITLE:
ARE YOU THE PRIMARY CONTACT FOR THIS GRANT: ☐ YES ☐ NO	
EMAIL:	
TELEPHONE:	
FEIN:	
INDICATE WHETHER THIS APPLICATION IS FOR DISCRETIONARY OR TOURISM FUNDS:	

GRANT REQUEST AND FINANCIAL INFORMATION

GRANT AMOUNT REQUESTED FOR 2019:
TOTAL OF ALL CURRENT RESERVES:
TOTAL APPROVED BUDGET FOR FISCAL 2019 (CURRENT BUDGET YEAR):
TOTAL ACTUAL OPERATING EXPENSES FOR FISCAL 2018 (PRIOR BUDGET YEAR):
TOTAL INCOME FROM ALL SOURCES FOR FISCAL 2018 (PRIOR BUDGET YEAR):
PERCENTAGE OF FISCAL 2018 TOTAL INCOME FROM CITY OF GS GRANT FUNDS, IF ANY:
BRIEF PROJECT DESCRIPTION (PLEASE ANSWER THE THREE QUESTIONS BELOW IN A <u>TOTAL</u> WORD COUNT OF 250 WORDS (250 TOTAL, NOT 750) OR LESS: • What does your organization do? • How will grant funds be used? • How will you measure success?

APPLICATION CHECKLIST

SUBMIT THIS APPLICATION WITH THE FOLLOWING REQUIRED DOCUMENTS IN THE FOLLOWING ORDER:

- ☐ Summary Form (two pages)
- ☐ Use of Funds Summary (max 250 words)
- ☐ Response to Selection Criteria Questions in narrative form, maximum three pages

Additional information to include:

- ☐ Copy of IRS determination letter as to 501(c)(3) or other not-for-profit status
- ☐ Colorado Secretary of State Certificate as nonprofit corporation in good standing
- ☐ List of current board of directors and officers
- ☐ List of all major contributors (\$2,000 and above) and amounts contributed, highest to lowest
- ☐ Year-end financial statements for fiscal year most recently ended
- ☐ IRS Form 990 (most current available)
- ☐ Approved budget for current fiscal year

By signing below, the applicant hereby certifies and warrants that any and all statements and representations, including all sources and uses of funds made in this Grant Application, are true and correct, and may be relied upon by the City of Glenwood Springs.

Authorized Signature: _____
(From applicant organization)

Date: _____
(mm/dd/yyyy)

Printed Name and Title:

SELECTION CRITERIA

All applicants must respond to the following questions in no more than three (3) pages. The three-page limit applies only to your answers to these questions, not to the Summary Form, Use of Funds Summary, or any supporting documentation.

1. Which needs within the City of Glenwood Springs does your organization serve, or will your special event or public program serve?
2. Describe your paid professional staff and your level of volunteer involvement.
3. Quantify the service level you provide to the citizens of the City of Glenwood Springs. How many City clients were served in your last full fiscal year in the program(s) for which you are requesting funds? What are the projections for the current year and next year? If funding a special event, how many participants do you expect, and will the event draw visitors to Glenwood Springs?
4. Highlight the desired 2019 goals and outcomes to be achieved with City of Glenwood Springs' funds. How will you define and measure your success as related to this funding request?
5. Describe your income stream(s), including fundraising efforts. If you are the local chapter of a national entity, explain how much funding it provides.
6. Have you used City of Glenwood Springs funds to receive additional funds from other sources? If so, what is the amount of leveraged funds received?
7. Has your organization had a deficit budget within the last three years? If so, how did you fund the deficit? What plans have you made to eliminate future deficits? Does your organization have a fund balance/reserve that is equal to or greater than six months of operating expenses? If so, how do you plan to use this reserve?

RESOLUTION 2019 - 23

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF GLENWOOD SPRINGS, COLORADO, SUPPORTING IMAGINE GLENWOOD'S "TAKE A MINUTE" CAMPAIGN.

WHEREAS, Imagine Glenwood has launched the "Take a Minute" campaign to encourage people to drive the speed limit on Grand Avenue and other streets in the core of Glenwood Springs; and

WHEREAS, when traffic is flowing freely, the time it takes to drive from 23rd street to the Exit 116 on-ramp is approximately one minute longer when someone is driving the posted speed limit of 25 mph instead of 35 mph; and

WHEREAS, the name of the campaign is derived from this additional minute it takes to drive the speed limit through town, a minute that could save a life; and

WHEREAS, data indicates that pedestrian fatality rates increase exponentially for speeds about 20 mph; and

WHEREAS, driving a little slower reduces a drivers' stopping distance and improves the driver's ability to react to unpredictable drivers, bicyclists, and pedestrians in the busy commercial areas along Grand Avenue; and

WHEREAS, Grand Avenue is both a main street and a highway, with more than 28,000 cars traveling past 100 access points such as driveways and intersections daily; and

WHEREAS, in addition to promoting safety, slower driving speeds encourage more people to walk and bike in downtown areas, leading to reduced automobile congestion, a smoother trip for through traffic, and more patrons visiting businesses on Grand Avenue and throughout town.

NOW, THEREFORE, BE IT HEREBY RESOLVED BY THE CITY COUNCIL OF GLENWOOD SPRINGS THAT:

Section 1. The above recitals are hereby incorporated as findings by the City Council of the City of Glenwood Springs.

Section 2. The City Council of the City of Glenwood Springs supports the goals and objectives of the Take a Minute campaign.

INTRODUCED, READ, AND PASSED THIS 2ND DAY OF MAY 2019.

CITY OF GLENWOOD SPRINGS, COLORADO

Jonathan Godes, Mayor

ATTEST:

Catherine Mythen Fletcher, City Clerk



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

- Agenda Item:** Planning Item #01-19 - Consideration of a Major Site/Architectural Plan Review for a Multi-Tenant Office/Retail Building, Lot 14 Glenwood Meadows No. 2, Wulfsohn Road
- Action Requested:** **Action 1 - Major Site/Architectural Plan Review** allowing the construction of a 45,000 square foot multi-tenant office/retail building.
- Department:** Economic and Community Development
- Presented By:** Trent Hyatt, Senior Planner
- Background Info:** The Planning and Zoning Commission (Commission) reviews major site/architectural plan review applications and provides a recommendation to City Council. On February 26, 2019, the Commission held a public hearing to consider the proposal. The applicant was originally scheduled for the March 21, 2019 City Council meeting. However, the applicant requested a continuance to the May 2, 2019 meeting to further consider revisions requested by staff.
- Attached for your review are copies of the Commission staff report, Commission draft minutes, reviewing agency comments, and the application submittal materials. Please refer to the Commission staff report for analysis of applicable issues and compliance with the *Glenwood Springs Municipal Code* (Code) and/or *Glenwood Meadows Zoning and Development Plan* (Plan) not addressed herein.
- Issues:** The staff report provided to the Commission outlines numerous areas where the proposal is not in compliance with the Code and/or Plan. Prior to the Commission meeting, the applicant expressed their intent and ability to address these issues and comply with applicable regulations. However, numerous Commissioners expressed concern with the number and significance of the noncompliance issues identified by staff and whether the applicant could make the necessary revisions without making substantial changes to site layout and building design. Some the Commission's general angst can also be attributed to the newly adopted review procedures which require much less information related to site, architectural, and civil drawings and reports than was previously required from any given applicant. Staff explained that future revisions not in compliance with the Code which require a variance or cause a significant change to the application may require additional review.
- Section 070.060.050(a)d.4 of the Code provides for certain minor changes to development permit approvals without additional review as outlined in *italics* below. The Director must determine whether the minor changes:
- i. Could be approved under the allowable administrative adjustments pursuant to 070.060.070(b), had they been requested with the original application;*
 - ii. Comply with the standards of this Code;*
 - iii. Are necessary to meet conditions of approval; and/or*
 - iv. Would not significantly alter the function, form, intensity, character, demand on public facilities, or impact on adjacent properties as approved with the administrative site/architectural plan.*

Table 060.3 (referenced in Section 070.060.070(b)) is depicted below.

Table 060.3: Allowable Administrative Adjustments	
Code Standard	Allowable Administrative Adjustment (maximum percentage)
Site Standards	
Lot area, minimum	15
Lot coverage, maximum	15
Block length, maximum	15
Lot Dimensional Standards	
Front setback, minimum	15
Side setback, minimum	15
Rear setback, minimum	15
Encroachment into setback pursuant to Table 020.20, Authorized Exceptions to Setback Standards, maximum	15
Building Standards	
Building height, maximum (excludes wireless communication facilities)	15
Accessory building height, maximum (excludes wireless communication facilities)	15
Separation between buildings, minimum	15
Projection into height requirement pursuant to Table 020.21, Authorized Exceptions to Maximum Height Standards, maximum	15
Development Standards	
Number of required parking spaces, maximum or minimum	15
Lighting height, maximum	15
Sign height, maximum	15
Fence or wall height, maximum	15 (one foot maximum)
Minimum landscaping requirements	15

Since the February 26 Commission meeting, the applicant has addressed many of the necessary revisions/outstanding issues formerly identified by staff. A response and revised plans are attached which discuss and/or revise issues such as retaining/refuse wall heights, site landscaping percentages, Glenwood Meadows design requirements, and building entrances accordingly. The revised plans appear to be in substantial compliance with the application materials reviewed by the Commission.

Staff Recommendation:

Planning and Zoning Commission Recommendation

After discussing issues associated with necessary revisions outlined above, the Commission voted 5-1 to recommend **approval** of Action Item 1 to City Council.

Action Alternatives and Staff Recommendation

Section 070.060.030(g)(1)d of the Code outlines the review and decision procedures for applications being considered by City Council stating, *"The 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 - Major Site/Architectural Plan Review allowing the construction of a 45,000 square foot multi-tenant office/retail building.

Staff recommends **approval** of the major site/architectural plan review application with the following findings and conditions:

Recommended Findings:

1. The site/architectural plan is consistent with the general purpose and intent of this Code;
2. Upon addressing staff comments outlined herein and attached to the staff report, the site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;
3. The site/architectural plan is consistent with the Glenwood Meadows Zoning and Development Plan and other precedent land use approvals; and
4. The site/architectural plan is substantially consistent with the Comprehensive Plan and other adopted City policies and plans.

Recommended Conditions:

1. The applicant shall file the approved site/architectural plan with the Community Development

within 60 days of City Council approval.

2. The applicant shall comply with/address all staff comments prior to the issuance of a development permit and/or approval of a Construction Plans application.

3. The applicant must apply for and receive approval of a Construction Plans prior to the submittal of a building permit application.

4. Major site/architectural plan approval shall expire if the authorized use or construction is not substantially underway as determined by the Director within three years following approval of the application by City Council.



Planning and Zoning Commission Report

Date: February 26, 2019
To: Planning and Zoning Commission
From: Trent L. Hyatt, Senior Planner
Subject: #01-19– Boldt/Glenwood Properties, LLC Office/Retail Building

REQUEST	Major Site/Architectural Plan Review for the construction of a 45,000 square foot multi-tenant office/retail building
APPLICANT	Boldt/Glenwood Properties, LLC
OWNER	Centura Ventures, LLC
LOCATION	Lot 14, Glenwood Meadows No. 2, Wulfsohn Road (PIN: 2185-053-38-014)
ZONE	Mixed-Use (M1) Corridor
SURROUNDING LAND USES	North: Midland Avenue, Union Pacific Railroad South: vacant, multi-family residential East: Glenwood Meadows mixed retail West: RFTA facility
LOT SIZE	Approximately 9.90 acres

ACTION ITEM

The Planning and Zoning Commission (Commission) is the recommending body to City Council for major site/architectural plan review applications. Following any approval (with or without conditions) of a major site/architectural review, an applicant must submit and receive approval of a construction plans application from City staff prior to submitting a building permit application.

Action 1 - Major Site/Architectural Plan Review – to allow for the construction of a 45,000 square foot multi-tenant office/retail building.

Staff recommendation: *Staff recommends **approval (with conditions)** of the Major Site/Architectural Plan Review with the findings and conditions on page 7.*

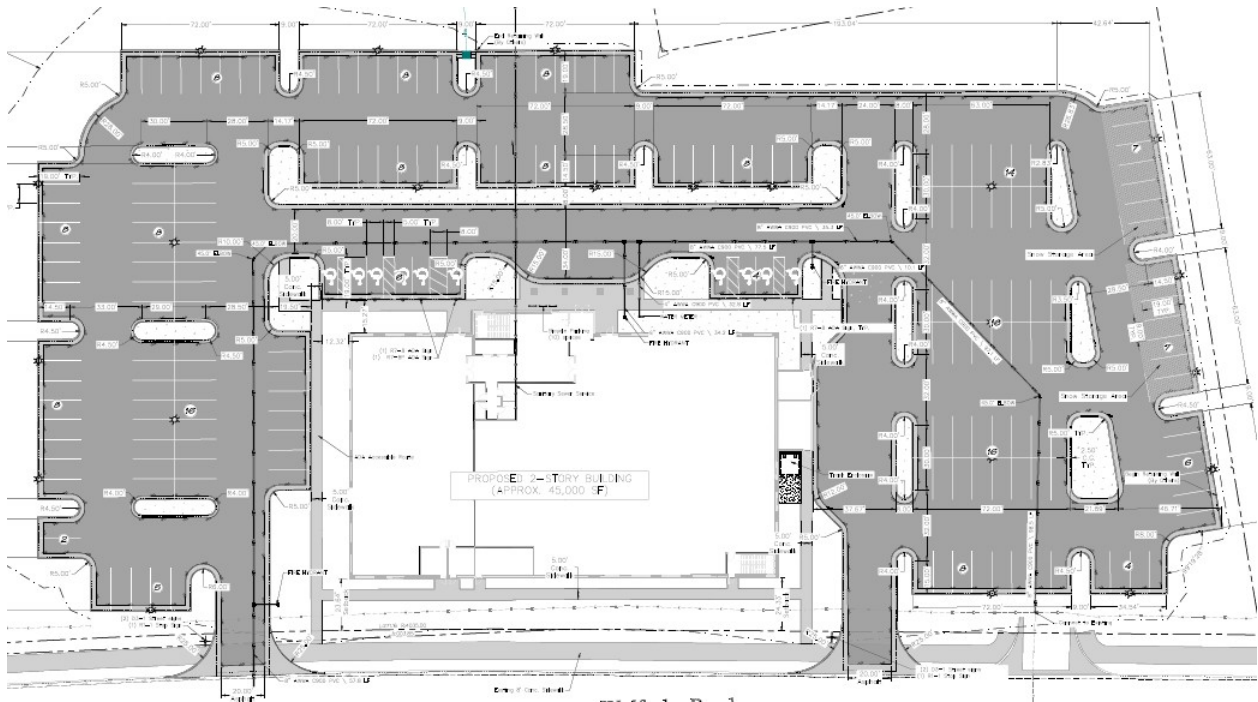
BACKGROUND/ANALYSIS

Proposal

In 2002, City Council approved the annexation, rezoning, and corresponding development plan for the mixed use development known as Glenwood Meadows. The subject property is a portion of Parcel A which is classified as Mixed-Use Campus in the Glenwood Meadows Zoning and Development Plan (Plan). Section VI (beginning on Page 26) of the Plan outlines the general intent of the Mixed-Use Campus as “...a variety of office, research, and development activities in addition to complimentary uses such as restaurants, convenience shopping, childcare and

housing... to function as an integral part of the overall Glenwood Meadows development, providing a range of employment opportunities for nearby residents.”

The applicant proposes an approximately 45,000 square foot office/retail building on approximately 3.43 acres (the area of disturbance) of the 9.9 acre property. Other improvements include parking, open space, and related landscaping and retaining walls. The attached plan set includes a site plan (a portion of which is shown below), floor plans, and elevations as well as preliminary landscaping plans, grading and utilities plans, for your review.



Major Site/Architectural Plan Review

Section 070.040 of the *Glenwood Spring Municipal Code* (Code) outlines the development standards for all land use applications. Additional development standards specific to Glenwood Meadows are outlined in Sections V and VI of the aforementioned Plan. However, many of the applicable standards found in either document are similar in nature. Applicable Code sections/issues are outlined in more detail below.

Mixed-Use Corridor Zone District Standards

The subject property is zoned Mixed-Use (M1) Corridor, formerly C-1 Limited Commercial as referred to in the Plan. Section 070.020.090/Table 020.11 outlines the dimensional standards as shown to the right.

Common Open Space

Commercial uses require a minimum of 10 percent of any development site be set aside as common open space as per Section 070.040.040(c)/Table 040.3.

**Table 020.11: M1 District
Dimensional Standards**

Lot Standards, Minimum

A	Lot area (sq ft)	None
	Landscaped area (%)	15

Setbacks, Minimum

B	Front, min (ft)	5
	Front, max (from arterials) (ft)	60
	Front, max (from other streets) (ft)	25
C	Side, min (ft)	5
D	Rear, with alley, min (ft)	10
	Rear, without alley, min (ft)	7.5

Building Standards, Maximum

E	Building height (ft)	40
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While additional details are needed to determine the exact type and location of these facilities, the applicant proposes 15 percent of the limits of disturbance (that which is required for mixed use project) as common open space for the enjoyment of visitors. This may change as staff comments are addressed by the applicant but will not be less than the required 10 percent.

Landscaping, Screening, and Retaining Walls

Section 070.040.050(f) of the Code outlines that refuse enclosure and retaining wall heights shall not exceed six feet in height. The preliminary grading plan and various elevations depict retaining walls of up to 24 feet and refuse screening walls of up to 8 feet in height. The applicant has begun redesigning the retaining wall to include terraces in compliance with the Code and with Glenwood Meadow design requirements.

Building Design

The Glenwood Meadows development has its own design standards and is exempt from the standard commercial design standards outlined in the Code. However, the vast majority of the standards therein are similar. Nonresidential and Mixed-Use Site and Building Design Standards outlined in Section 070.040.090 of the Code provide guidance for the building scale in relation to building orientation, architectural elements, etc. for new and infill construction in the City. The primary entrance of a building shall be located along the street providing primary access to the site, which is Wulfsohn Road. However, it appears the main entrance is located along the north elevation.



Each wall plane shall incorporate at least two horizontal and vertical articulating design features every 30 feet. Walls facing public rights-of-way shall have 60 percent coverage with windows, entrances, awnings, etc. The design of the proposed building provides more than three features for many façades such as variations in materials, projections and recessions, window and door glazing, change in roofline, awnings. Staff has requested more information regarding the exact footprint of the building to confirm compliance with the depth or projection of said features.



Necessary Revisions

Comments are attached which identify necessary revisions to the plan set required prior to the issuance of a major site/architectural plan development permit and/or a Construction Plans application. Staff recommends said comments are made conditions of approval of the Major Site/Architectural Plan Review application. That being said, the applicant has been committed to full compliance with both the Code and Plan and intends to make any revision requested by staff to ensure that no variance is necessary.

Glenwood Meadows Required Improvements

Certain on and off site improvements are required by the original annexation and development agreement, and amendments thereto, between the original developer of the property and the City. Completion of the Midland Trail and Midland Road improvements are examples of these improvements. If the application receives approval, staff will need evaluate said agreement to determine the remaining payment or improvements the current developer is responsible for, if applicable.

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;

Exclusive of the compliance issues/concerns addressed above, the proposal is consistent with the general purpose of the Code. Additionally, the applicant has expressed the wiliness and ability to address all code issues outlined by staff.

b. The site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;

Exclusive of the compliance issues/concerns addressed above, the proposal is consistent with the dimensional, design, development, and all other standards of the Code. Additionally, the applicant has expressed the wiliness and ability to address all code issues outlined by staff.

c. The site/architectural plan is consistent with any previously approved plat, PUD, or any other precedent land use approval; and

Exclusive of the compliance issues/concerns addressed above, the proposal is consistent with the Glenwood Meadows Zoning and Development Plan. Additionally, the applicant has expressed the wiliness and ability to address all code issues outlined by staff.

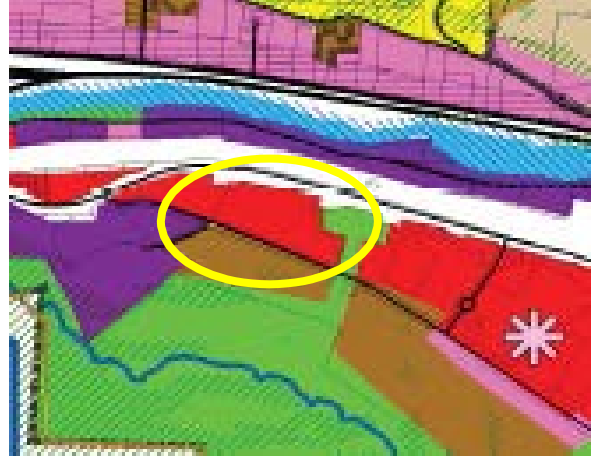
d. The site/architectural plan is consistent with the Comprehensive Plan and other adopted City policies and plans.

The proposal is consistent with Comp Plan as detailed above.

Comprehensive Plan

As shown in the map below, *Map 2.1 Future Land Use – South Portion of the City of the Glenwood Springs* of the Comprehensive Plan (Comp Plan) identifies the property as Commercial in red. 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. Retail that would compete directly with Downtown retail is discouraged.” The current proposal is in compliance with the map designation and description.

Numerous community goals and related objectives and strategies outlined in the Executive Summary and subsequent chapters of the Comp Plan encourage economic development, preserving our small town character, convenient transportation, infill development, housing opportunities, social diversity, and preserving natural resources all of which are supported by this proposal. These goals are outlined in the following table.



<u>Comprehensive Plan Goal</u>	<u>Objective and Strategy</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)
-Maintain Glenwood Springs the regional tourism, retail, commercial, and governmental center of Garfield County as	-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)
-Preserve small town small town character while maintaining the livability of Glenwood Springs and increasing the vibrancy and commercial success of the downtown	-Develop according to the vision (Chapter 4, Page 34) -Direct development into a compact form: infill and redevelopment (Chapter 3, Page 34) -Enhance pedestrian-friendliness while facilitating traffic (Chapter 3, Page 36) -Direct growth inward (Chapter 9, Page 102)

-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) -Direct growth inward (Chapter 9, Page 102)
-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)
-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)
-Preserve natural resources	-Promote water conservation (Chapter 7, Page 84) -Direct growth inward (Chapter 9, Page 102)

Reviewing Agency Comments

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

Engineering – Comments received outline needed details related to existing hydro-compactive soils, drainage, traffic increase/improvements, utility locations and connections, pedestrian connections, etc.

Water and Wastewater – Comments received outline general details related to utility connections, irrigation, fire sprinklers, sprinklers, ownership of utilities, etc.

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 - Major Site/Architectural Plan Review – to allow for the construction of a 45,000 square foot multi-tenant office/retail building.

Staff Recommendation/Motion

Staff recommends the Planning and Zoning Commission recommend to City Council **approval with conditions** of the Major Site/Architectural Plan Review with the following **findings** and **conditions**:

Recommended Findings:

1. The site/architectural plan is consistent with the general purpose and intent of this Code;
2. Upon addressing staff comments outlined herein and attached to the staff report, the site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;
3. The site/architectural plan is consistent with the Glenwood Meadows Zoning and Development Plan and other precedent land use approvals; and
4. 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 staff comments prior to the issuance of a development permit and/or approval of a Construction Plans application.

Planning Item 01-19
Boldt Multi-Tenant Office/Retail Building
List of Necessary Revisions

- Please provide pedestrian access to from the parking area to the primary entrance of the building. See sheet A101 of the revised plan set
- Please revise the retaining wall heights to an average height of six feet and not to exceed 10 feet at any point. See Boulder letter dated 3/8/19, Pg. 1, #3 in Green
- Please revise or provide detail depicting 60 percent coverage by windows, awnings, or other architectural elements along th south elevation0. See sheet A301 & A302 of the revised plan set
- Please provide details for common open space features/elements.
- Please revise the height of refuse screening walls to a maximum of six feet. Confirmed. See Boulder letter 3/8/19, Pg. 2 #4 in Green
- Please provide details as to the exact footprint of the proposed building.
- Parking shall be a minimum of 25 feet from the property line or a berm shall be provided. Please clarify. Berm to be provided
- 20 percent of the interior of the parking area shall be landscaped. Please clarify.
- Please clarify the differences in site landscaping coverage found on various sheets.
- Please call out building dimensions on the site plan. See sheet A201/202
- Please clarify the number of required and provided parking spaces on various sheets. See sheet A101
- Please call out parking aisle widths and parking stalls from the end of each stall. See sheet A101
- Please call ouf the maximum height of the building on each elevation.

See sheet A101 of the revised plan set

See sheet A101 of the revised plan set

Max. building height per code is 60 feet. All elevations are measured at heights of 5,793 feet at the base of the building and 5,831 feet at the top of the mechanical units. Total height of the building on each elevation is 38 feet.

Building Entrance

To address the requirements of the Glenwood Meadows development code, Boldt will be providing a building entrance off of Wulfsohn Road. This entrance will provide access off Wulfsohn, and will connect to the northern entrance of the building, providing access to the lobby and building suites.

Planning Item 01-19
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- Please clarify the differences in site landscaping coverage found on various sheets.
- Please call out building dimensions on the site plan.
- Please clarify the number of required and provided parking spaces on various sheets.
- Please call out parking aisle widths and parking stalls from the end of each stall.
- Please call ouf the maximum height of the building on each elevation.

13-foot ramp needed. Ms. Reynolds responded saying the ramp needs to meet the ADA standards, snow removal and access for maintenance.

Chairman Dehm asked for clarification regarding the Electric Department comments and if other buildings in the alley are in their rear setbacks.

Public Comment

6:39 called for public comment. None. Commissioner Dehm closed the public portion of the hearing.

Commission Discussion/Action

MOTION: Action Item 1: Commissioner Grosscup moved to approve a variance to allow a 2.7-foot rear yard setback with findings on page 4-5 of the staff report. Second by Commissioner Cipperly.

Discussion:

Commissioner Dehm again points out there is 20 feet to the door and not only 13 feet.

Commissioner Cipperly states the extra room allows for access around the building and snow storage which she believes is further reasoning to support the variance.

Commissioner Dehm tables the motion and reopens questions to the applicant.

Questions to Applicant

Commissioner Dehm asked Ms. Reynolds why she pushed the ADU so far back when he believes she does not have to. The applicant responded that she would like the ADU to be connected to the backyard, allow for maintenance access and snow removal. Commissioner Dehm and Ms. Reynolds discussed the setback and agreed to reduce if possible after engineering and soils have been completed.

Commissioner Dehm opens the motion.

Commissioner Grosscup amends the motion to add condition 3 that once engineering, and soils reports are available, the applicant will bring it back to staff to determine the setback is the least needed but not less than 2 feet 7 inches. Commissioner Cipperly amended her second.

Motion carried unanimously.

Commissioners Shaver and Schachter returned to the meeting at 6:55 p.m.

5. 01-19 – Consideration of a Major Site/Architectural Plan Review for a Multi-Tenant Office/Retail Building.

Applicant:	Boldt/Glenwood Springs Properties, LLC
Owner:	Centura Ventures LLC
Location:	Lot 14, Glenwood Meadows No. 2 Subdivision, Wulfsohn Road
Zone:	M1 Mixed-Use Corridor

Trent Hyatt, Senior Planner, summarized the project in accordance with the staff report.

- The site is 9.90 acres.
- Propose building on 3.3-acre area of disturbance
- 45,000 square foot office and retail building

- Retaining wall up to 24 feet will be redesigned with terracing
- Issues with amount of and type of open space
- Issues with retaining wall height and refuse container screening
- Improvements may need to be made with previous approval
- Articulating design features exceed the design requirement
- Issues with primary entrances not fronting Wulfsohn Road
- Outlines compliance with Comprehensive Plan

Mr. Hyatt reviewed the approval criteria.

- Plan meets all approval criteria except for the parts outlined previously
- Applicant has voiced the willingness to address all the mentioned issues
- Consistent with the Comprehensive Plan

Engineering had comments regarding soils, drainage, traffic, utilities and pedestrian connection

Water and Waste Water had comments regarding connections, irrigation, fire sprinklers and utilities ownership.

Commission Schachter clarified a typo on the presentation, to say north instead of south portion of the city.

Commissioner Shaver asked about the Midland Trail. Mr. Hyatt explained the applicant pay for certain improvements for the city, Midland Trail being one of them. He further explains the applicant may be required to pay a certain fee to another improvement directly related to their impact.

Commissioner Grosscup is concerned about the very important issues that still need to be addressed. Trent Hyatt explained the issues are captured under the condition of address all staff comments.

Discussion between commission and staff about the differences between the old code and new code in the level of detail required in the applications.

Commissioner Schachter talked with Mr. Hyatt about how many of the listed issues have been resolved and also about how much the project can change after P&Z approval.

Commissioner Shaver and Mr. Hyatt talk about the old HPOZ zoning requirements, the new limits of disturbance and how the slope on the site was calculated.

Applicant Presentation

Applicant, Ben Cantor, Milwaukee, WI, stated they have no intent to request variances, only to comply with the new code.

Questions to Applicant

Commissioner Wissing and the applicant discussed what uses will be going into the building. The applicant stated the uses will be limited to commercial. No one has signed up for any spaces, they are currently marketing.

Commissioner Grosscup and applicant talk about

- Necessary revisions
- Timeline of project
- The applicant stated they would be addressing the list of comments provided on the initial

submittal.

- Redesign of retaining wall
- 70.40.90 (b)(2)(b) should exempt the requirement of the primary entrance
- Issues with the building design

Ken Griffy, Mechwan, Wisconsin, explained the materials are called out on the drawing of the building. Materials include, brick, stucco, metal panels, cast stone, warm- tone pallet

Commission and Mr. Griffy discuss

- What secondary entry would look like
- Elevation changes if entry is moved
- Blank section of the south elevation
- Motivation of commercial use vs residential use

7:31 called for public comment. No one from the public commented. Commissioner Dehm closed the public portion of the meeting.

Commission Discussion/Action

MOTION: Action Item 1: Commissioner Schacter moved to approve a Major Site/Architectural Plan Review for a 45,000 square foot Multi-Tenant Office/Retail Building with findings and conditions on page 7. Commissioner Shaver seconded the motion.

Discussion:

Commission has extensive discussion about the following:

- New code designed to delegate more to staff.
- If and when the commission would be able to review again
- Comparison of old and new code
- Intent of new code
- This is the first and would be confident to trust staff
- How new code is designed to work
- Discussion of completeness of an application

Called for question: **5-1 (Cipperly) Motion carried.**

7:45 break; meeting reconvened at 7:54.

6. 06-19 – Consideration of a Side and Rear Setback Variance for a Convenience Store

Applicant: Roger Titmus, Stinker Stores, Inc.
Location: 2122 Grand Avenue
Zone: M1 Mixed-Use Corridor

Trent Hyatt presented the staff report:

- Proposal for 2800 square foot convenience store
- Relocation of fuel tanks will require a special use permit
- Front setback is not actually 111 feet the gas canopy is closer
- Rear setback of 1 foot
- Parking spaces are longer than code requirement
- Landscaping on site requires minimum 15%
- Street trees and landscaping strip are required
- CDOT and Engineering want to restrict the street access

GLENWOOD SPRINGS

ABBREVIATIONS

A/C	air conditioning	FA	fire alarm	MISC	miscellaneous	STL	steel
AB	anchor bolt	FAAP	fire alarm annunciator panel	MLD	molding, moulding	STOR	storage
ABV	above	FAS	fasten(er)	MM	millimeter(s)	STRUCT	structure(al)
AC	acoustical	FB	face brick	SUSP	membrane	SUSP	suspended
AC BD	acoustic board	FBO	furnished by other	MO	masonry opening	SV	spray vinyl
AC TL	acoustic tile	FBD	fiberboard	MOD	modular	SYM	symmetry(ical)
AC	asphaltic concrete	FD	floor drain	MOV	movable	SYN	synthetic
ACC	access	FE	fire extinguisher	MRB	marble	SVS	system
ACC PNL	access panel	FE	fixed equipment	MRD	metal roof deck	T&G	tongue & groove
ADH	adhesive	FEC	fire extinguisher cabinet	MT	mount(ing)	T	tread(s)
ADJ	adjacent	FF	factory finish	MTD	mounted	TB	towel bar
ADI	adjustable	FFE	finished floor elevation	MTL FUR	metal furring	TO	tolerance
AF	above finished floor	FFL	finished floor line	MTL	metal	TC	terra cotta
AGG	aggregate	FGL	fiberglass	MTL THR	metal threshold	TD	tinted
AL or ALUM	aluminum	FHC	fire hose cabinet	MULL	mullion	TELE	telephone
ALT	alternate	FHMS	flat head machine screw	MWK	millwork	TEMP	tempered
ALPA	area line pressure alarm	FHS	fire hose station	N	nitrogen	THK	thick(ness)
ANC	anchor, anchorage	FHWS	flat head wood screw	N	north	TK BD	tack board
ANOD	anodized	FIN	finish	NAT	natural	TL	tile
APPROX	approximately	FLG	flashing	N	nurse call	TO PL	top of plate
ARCH	architect(ural)	FLR CO	floor cleanout	NIC	not in contract	TO	top of
ASPH	asphalt	FLR	floor(ing)	NMT	nonmetallic	TOL	tolerance
AUTO	automatic	FLT	float	NO	nitrous oxide	TOS	top of steel
BD	board	FLUOR	fluorescent	NOM	nominal	TOW	top of wall
BE	below	FUR	flexible	NOM	noise reduction	TP	transparent
BET	between	FN	fence	NRC	noise reduction coefficient	TPD	toilet paper dispenser
BIT	bituminous	FND	foundation	NTS	not to scale	TPTN	toilet partition transom
BLDG	building	FDC	face of concrete	O	oxygen	TR	transom
BLK	block	FOF	face of finish	OA	overall	TRM	thermal
BLKG	blocking	FOM	face of masonry	OB	obscure	TS	tube steel
BM	beam	FOS	face of stud	OBS	obscure	TSL	top of slab
BO	bottom of	FP	fireproof(ing)	OC	on center	TTD	treated
BOT	bottom	FPL	floor plate	OD	outside diameter	TV	television
BRG PL	bearing plate	FR	fire-resistant	OH	opposite hand	TYP	typical
BRG	bearing	FRC	fire-resistant coating	OH	overhead	TZ	terrazzo
BRK	brick	FRT	fire-retardant	OI	owner installed	UC	undercut
BRZ	bronze	FS	floor sink	OI	open-web joist	UNF	unfinished
BSMT	basement	FTG	footing	OP	opaque	UNO	unless noted otherwise
BT	bolt	FUR	furred(ing)	OP	owner provided	UR	urinal
BU BD	bulletin board	FUT	future	OPG	opening	V	vacuum
BUR	built-up roof	GA	gage, gauge	OPP	opposite	VAR	varies, variable
BVL	bevel	GALV	galvanized	OR	operating room	VB	vinyl base
CAB	cabinet	GB	galvanized	ORD	overflow roof drain	VCT	vinyl composition tile
CB	code blue	GC	general contract(or)	OS	opposite surface	VERT	vertical
CCTV	closed circuit television	GDC	grade	PLAM or PL	plastic laminate	VIF	verify in field
CEM PLAS	cement plaster (portland)	GR	glass fiber reinforced	PAR	parallel	VIN TL	vinyl tile
CEM	cement	GRC	concrete	PB	panic bar	VIN	vinyl
CER	ceramic	GRI	gasket	PBD	particle board	VJ	vertical joint
CG	corner guard	GKT	galvanized iron	PCT CONC	precast concrete	VNR	veneer
CI	cast iron	GL	glass, glazing	PERF	perforate(d)	VRM	vermiculite
CIR	circumference	GLB	glass block	PERI	perimeter	VWC	vinyl wall covering
CJ	control joint	GLS	glass	PFN	prefinished	W	width, wide
CK	caulking, caulk(ing)	GP	galvanized pipe	PH	panic hardware	W	width, wide
CL	center line	GRN	granite	PK	parking	W/O	without
CLG	ceiling	GT	grout	PL	plate	WB	wood base
CLG HGT	ceiling height	GVL	gravel	PLAS	plaster	WC	water closet
CLK BD	chalkboard	GW	gypsum wallboard	PLY	plywood	WD	wood
CLD	clear	GYP BD	gypsum board	PLY WD	plywood	WD	window
CLS	closure	GYP PLAS	gypsum plaster	PNL	panel(ed)(ing)	WDW	window
CMU	concrete masonry unit(s)	GYP LA	gypsum lath	PNT	paint	WH	wall hung
COL	column	GYP TL	gypsum tile	PRE-FAB	prefabricate(d)	WP	waterproof(ing)
CONB	combination	HB	hose bibb	PRF	preformed	WPT	working point
CONP	compressed(ion)(ible)	HBD	hardboard	PSC	prestressed concrete	WR	water resistant
COMPO	composition, composite	HC	hollow core	PSF	pounds per square foot	WR	wire(d)
COMP	compartment	HD	heavy duty	PSI	pounds per square inch	WSCT	wainscot
CONC	concrete	HDR	header	PT	point	WTW	wall to wall
CONST	construction	HDW	hardware	PTC	post-tensioned concrete	WWM	woven wire mesh
CONT	continue, continuous	HGX	hexagonal	PTD	paper towel dispenser	ZVB	zone valve box
CONTR	contract(or)	HGT or H	height	PTR	partition		
CORR	corrugated	HM	hollow metal	PVC	poly vinyl chloride		
CI	contractor installed	HORIZ	horizontal	PVMT	pavement		
CP	contractor provided	HTG	heating	QT	quarry tile		
CPR	copper	HVAC	heating/ventilation/				
CPT	carpet(ed)(ing)	HWD	hardwood				
CS	countersink(sunk)	ID	inside diameter				
CT	ceramic tile	INCL	included(d)(ing)				
CTR	counter flashing	INS CONC	insulating concrete				
CTR FLG	cubic foot (feet)	INSUL	insulate(d)(ion)				
CU FT	cubic yard(s)	INT	interior				
CV	cover	INV	invert				
D	depth	IPS	iron pipe size				
D	drain	J	joist				
DBL	double	JAN CLO	janitor closet				
DEMO	demolish, demolition	JF	joint filler				
DEP	depression	JT	joint				
DF	drinking fountain	KIT	kitchen				
DIAG	diagonal	KO	knock-out				
DIAM	diameter	L	length				
DIM	dimension(s)	LAB	laboratory				
DIV	division	LAD	ladder				
DL	dead load	LAM	laminated				
DN	down	LAV	lavatory				
DP PF	dampproofing	LBL	label				
DPR	dampener	LH	left hand				
DR	door	LL	live load				
DS	downspout	LPT	low point				
DSPR	dispenser	LT	light				
DTL	detail	LTL	lintel				
DWG	drawing	LVR	louver				
DWR	drawer	LW	lightweight				
E	east	LWC	lightweight concrete				
EA	elevation	M	meter(s)				
EL or ELEV	electrical panel board	MAP	map				
ELEC PNL BD	electric(al)	MAS	masonry				
ELEV	elevator	MATL	material				
EMERG	emergency	MAX	maximum				
ENCL	enclosure	MB	member				
EP	epoxy	MD	medium				
EQ	equal	MECH	mechanical				
EST	estimate	MFD	metal floor decking				
ET	elapsed timer	MFR	manufacture(r)				
EW	each way	MH	manhole				
EW	electric water cooler	MHO	magnetic hold open				
EX	exposed	MIN	minimum				
EXH	exhaust	MIR	mirror				
EXIST or E	existing						
EXP JT or EJ	expansion joint						
EXT	exterior						

PROJECT SYMBOL LEGEND

VIEW REFERENCES

DRAWING TITLES

VIEW NAME

DETAIL NUMBER

SCALE

SHEET WHERE DRAWN

SHEET WHERE REFERENCED

WALL/DETAIL SECTIONS

SECTION NUMBER

VIEW DIRECTION

SHEET WHERE DRAWN

BUILDING SECTION

SECTION NUMBER

VIEW DIRECTION

SHEET WHERE DRAWN

PLAN/DETAIL CALLOUTS

CALLOUT NUMBER

SHEET WHERE DRAWN

EXTERIOR / INTERIOR ELEVATIONS

ELEVATION NUMBER

SHEET WHERE DRAWN

DATUM SYMBOLS

STRUCTURAL GRIDLINE

NAME OF LEVEL

FLOOR TWO

HEIGHT ABOVE PROJECT DATUM

SPOT ELEVATION INDICATOR

TRUE NORTH

PROJECT SYMBOLS AND ANNOTATION

ROOM NAME

ROOM NUMBER

DOOR OR OPENING NUMBER, SEE DOOR SCHEDULE.

WINDOW TYPE INDICATOR, SEE WINDOW TYPES.

FIXED EQUIPMENT INDICATOR, SEE EQUIPMENT SCHEDULE

ACCESSORY INDICATOR, SEE ACCESSORY SCHEDULE

CEILING TYPE, SEE CEILING SCHEDULE

FINISH TYPE, WHERE APPLICABLE

CEILING HEIGHT

SIGNAGE INDICATOR, SEE SIGNAGE SCHEDULE

ALIGN FINISH FACE OF NEW WALL W/ FINISH FACE OF ADJACENT EXISTING WALL

NOTE: SEE INDIVIDUAL SHEETS FOR ADDITIONAL SYMBOLS.

MATERIAL GRAPHIC LEGEND

SECTION

EARTH (CUT)

AGGREGATE BASE COURSE (CUT)

SAND

CONCRETE (CUT)

PRECAST CONCRETE

CONCRETE MASONRY UNIT

BRICK MASONRY

MORTAR CUT

STONE (CUT)

MARBLE

STEEL, STAINLESS STEEL (LARGE SCALE)

ALUMINUM (LARGE SCALE)

CERAMIC TILE (LARGE SCALE)

WOOD FRAMING - CONTINUOUS (LARGE SCALE)

WOOD FRAMING - DISCONTINUOUS (LARGE SCALE)

PLYWOOD (SMALL SCALE)

PLYWOOD (LARGE SCALE)

FINISH WOOD (LARGE SCALE)

EIPS (CUT)

RIGID INSULATION (LARGE SCALE)

BATT INSULATION (LARGE SCALE)

FIREPROOFING

STUCCO CUT

GYPSON BOARD (LARGE SCALE CUT)

TERRAZZO (LARGE SCALE)

GLASS (LARGE SCALE)

METAL SIDING (VERTICAL)

METAL SIDING (HORIZONTAL)

PLASTER, CONCRETE, STUCCO

MASONRY

GLASS BLOCK, CERAMIC TILE

GLASS ELEVATION

SITE/ ARCHITECTURAL PLAN REVIEW

PROJECT DIRECTORY

OWNER

BOLDT

1110 N. OLD WORLD THIRD ST., STE 610

MILWAUKEE, WI 53203

PHONE: 414-276-4631

STRUCTURAL ENGINEER

MARTIN/MARTIN INC.

12499 WEST COLFAX AVENUE

LAKEWOOD, CO 80215

PHONE: 303-431-6100

ARCHITECT

BOULDER ASSOCIATES, INC.

1426 PEARL STREET, STE 300

BOULDER, CO 80302

PHONE: 303-499-7795

MECHANICAL ENGINEER

WSP

5613 DTC PARKWAY, STE 500

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PHONE: 303-694-4755

GENERAL CONTRACTOR

HASELDEN CONSTRUCTION

6950 SOUTH POTOMAC ST.

CENTENNIAL, CO 80112

PHONE: 303-751-1478

ELECTRICAL ENGINEER

WSP

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CIVIL ENGINEER

RIVER CITY CONSULTANTS

744 HORIZON CT., STE 110

GRAND JUNCTION, CO 81506

PHONE: 971-241-4722

LANDSCAPE ARCHITECT

NORRIS DESIGN

409 EAST MAIN ST., STE 207

FRISCO, CO 80443

PHONE: 970-368-7068

SITE REVIEW SHEET INDEX

G-001	COVER SHEET
C001	LEGEND
C002	OVERALL SITE PLAN
C003	PRELIMINARY SITE PLAN
C004	PRELIMINARY GRADING PLAN
L100	LANDSCAPE NOTES
L200	LANDSCAPE PLAN
L300	LANDSCAPE DETAILS
A-101	ARCHITECTURAL SITE PLAN
A-201	FIRST FLOOR PLAN
A-202	SECOND FLOOR PLAN
A-203	ROOF PLAN
A-301	EXTERIOR ELEVATIONS
A-302	EXTERIOR ELEVATIONS
E1.1	SITE LIGHTING PHOTOMETRICS
E2.1	LIGHT FIXTURE CUTSHEET
E2.2	LIGHT FIXTURE CUTSHEET

GENERAL PROJECT DATA

PROJECT TYPE

OFFICE BUILDING

TWO STORIES ABOVE GRADE

APPLICABLE CODES

2015 INTERNATIONAL BUILDING CODE

2015 INTERNATIONAL PLUMBING CODE

2015 INTERNATIONAL MECHANICAL CODE

2015 INTERNATIONAL FUEL GAS CODE

2015 INTERNATIONAL FIRE CODE

2014 NATIONAL ELECTRICAL CODE (NFPA 70)

2009 INTERNATIONAL ENERGY CODE

2010 ASHRAE STANDARD 90.1

2009 ICC/ ANSI A117.1 ACCESSIBILITY CODE

2010 ADA (AMERICANS WITH DISABILITIES ACT)

DEFERRED SUBMITTALS

FIRE SUPPRESSION SYSTEM

FIRE ALARM SYSTEM

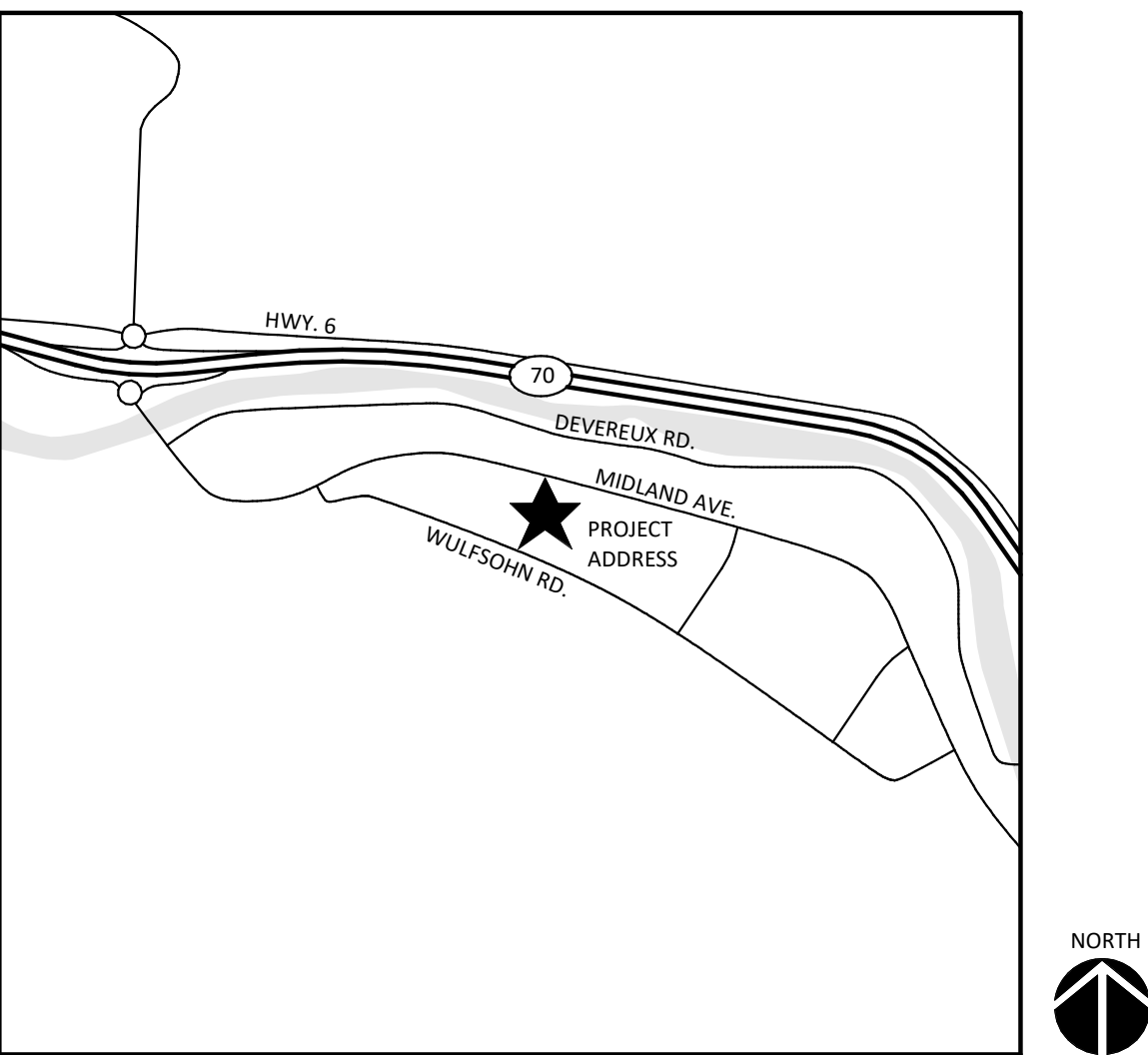
BUILDING DEPARTMENT

CITY OF GLENWOOD SPRINGS

FIRE DEPARTMENT

CITY OF GLENWOOD SPRINGS FIRE DEPARTMENT

VICINITY MAP



PROJECT NUMBER

184101.00

DRAWN BY

K. Fronczak

DATE

01/02/19

REVISIONS

REV	DESCRIPTION	DATE
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PROPERTY DESCRIPTION

Lot 14, Glenwood Meadows No. 2

A Parcel of Land Situate in the SW 1/4 of Section 5, Township 6 South, Range 89 West of the 6th P.M.

City of Glenwood Springs, County of Garfield, State of Colorado

BOULDER ASSOCIATES

ARCHITECTS

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Boulder, Colorado 80302

303.499.7795 F 303.499.7767

www.boulderassociates.com

OWNER

BOLDT

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Milwaukee, WI 53203

414.276.4631

ben.ganther@boldt.com

PROJECT

GLENWOOD SPRINGS

LOT 14

GLENWOOD MEADOWS NO. 2

TBD WULFSOHN RD.

GLENWOOD SPRINGS, CO 81601

SITE/ ARCHITECTURAL PLAN REVIEW

SHEET TITLE

COVER SHEET

SHEET NUMBER

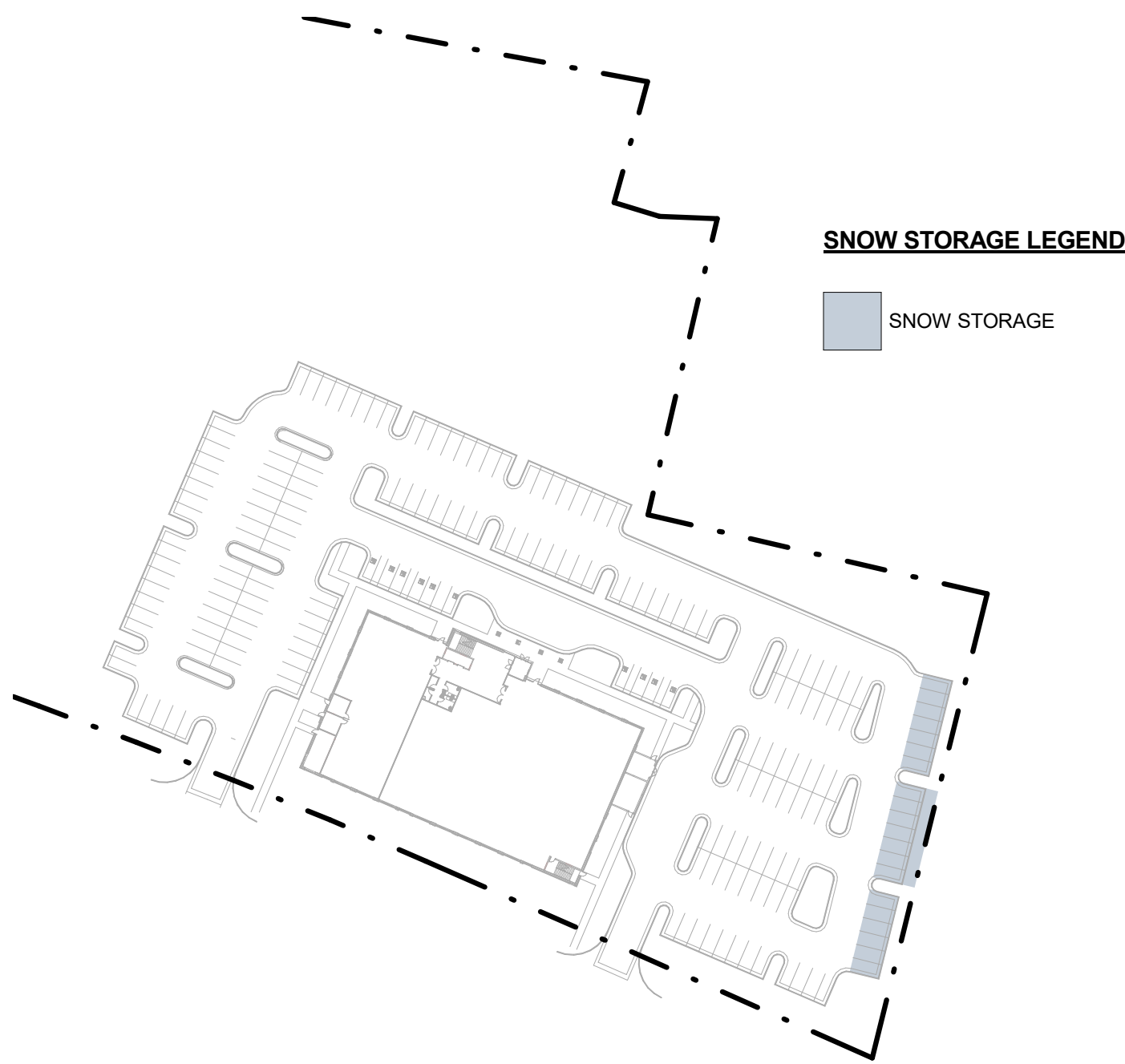
G-001

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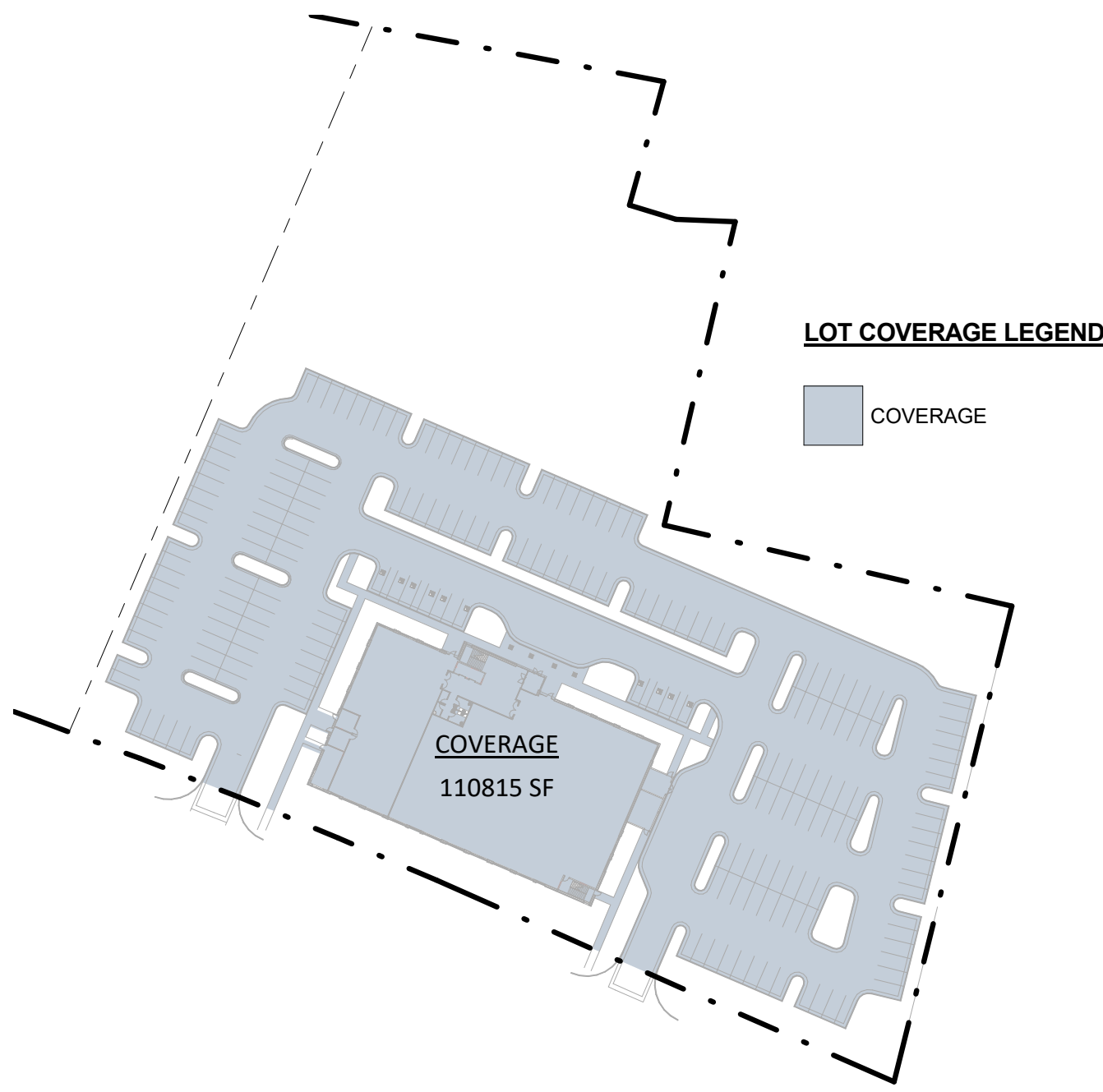


PROJECT DESCRIPTION						
LOT SIZE INFORMATION	ACRES	SQUARE FEET	LOT COVERAGE	EXISTING (SQFT & %)	PROPOSED (SQFT)	(%)
	9.9	431,224		N/A	110,815	25.7%
LIMITS OF DISTURBANCE	EXISTING (SQFT & %)	PROPOSED (SQFT & %)	AVERAGE SLOPE WITHIN LIMITS OF DISTURBANCE	PERCENTAGE (%)		
	N/A	149,235				
OFF-STREET PARKING SPACES	REQUIRED # VEHICLE...	PROPOSED # VEHICLE...	BICYCLE PARKING	REQUIRED # SPACES	PROPOSED # SPACES	
	174	189 (STANDARD) 10 (HANDICAP) 199 (TOTAL)		10	10	
OPEN SPACE	REQUIRED (SQFT & %)	PROPOSED (SQFT & %)	NON-RESIDENTIAL USES	TYPE OF USE	GROSS FLOOR AREA (SQFT ...)	
	22,385	23,000		MULTI-USE	43,333	
BUILDING HEIGHT	MAX	PROPOSED	TOTAL LANDSCAPED AREA	EXISTING (SQFT & %)	PROPOSED (SQFT)	(%)
	40' - 0"	35' - 0"		N/A	38,420	25.7%
SNOW STORAGE	REQUIRED (SQFT)	PROPOSED (SQFT)	TOTAL IMPERVIOUS AREA	EXISTING (SQFT & %)	PROPOSED (SQFT)	(%)
	NO MINIMUM	4,084 (20 PARKING SPACES)		N/A	110,815	74.3%

PLEASE SEE THE REVISED CALCULATIONS REFLECTING THE DEVELOPED AREA (LIMITS OF DISTURBANCE)



SNOW STORAGE DIAGRAM



LOT COVERAGE DIAGRAM

PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS
REV DESCRIPTION DATE

BOULDER ASSOCIATES

ARCHITECTS

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PROJECT
GLENWOOD SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

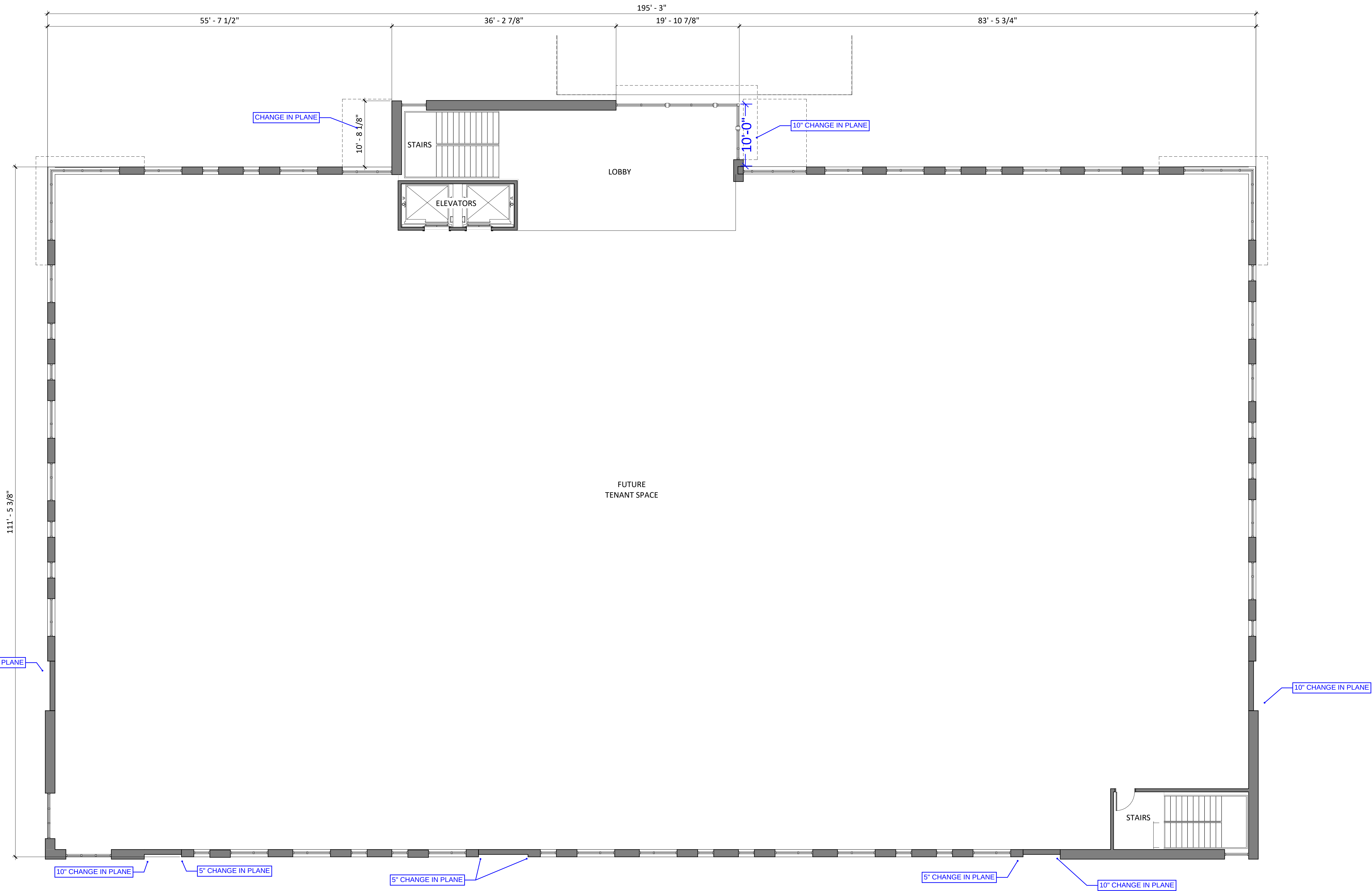
SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
ARCHITECTURAL SITE PLAN

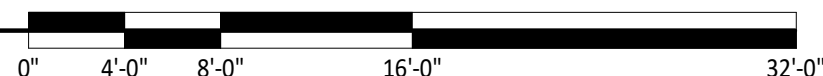
SHEET NUMBER

A-101

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1 SECOND FLOOR PLAN
A3.10 | A-202 1/8" = 1'-0"



PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS		
REV	DESCRIPTION	DATE

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Lot 14, Glenwood Meadows No. 2
A Parcel of Land Situate in the SW 1/4
of Section 5, Township 6 South,
Range 89 West of the 6th P.M.
City of Glenwood Springs,
County of Garfield, State of Colorado

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OWNER

BOLDT
1110 N. Old World Third St., Suite 610
Milwaukee, WI 53203
414.276.4631
ben.ganther@boldt.com

PROJECT
GLENWOOD
SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

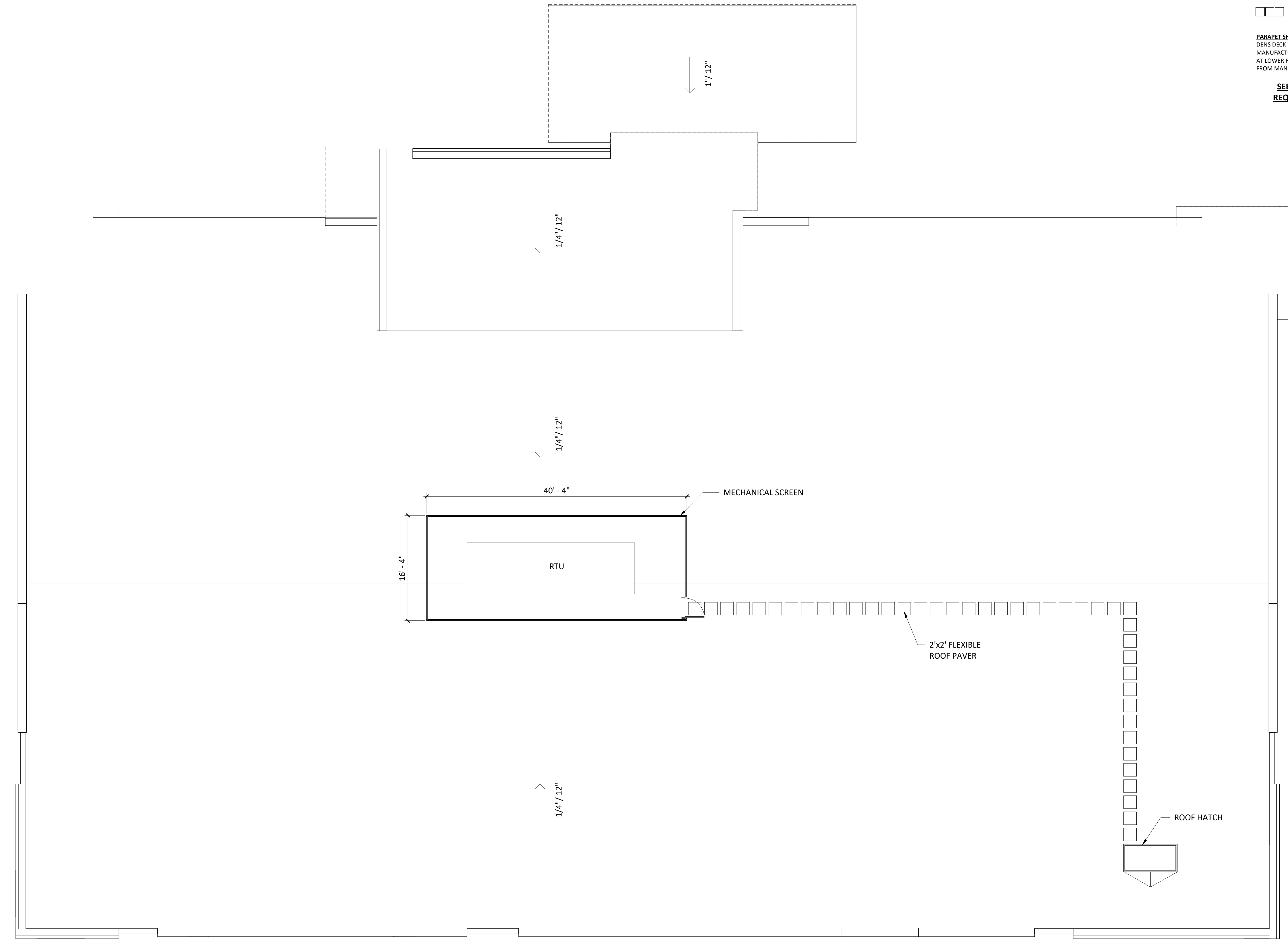
SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
SECOND FLOOR PLAN

SHEET NUMBER

A-202

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ROOF PLAN LEGEND

- MEMBRANE ROOF SYSTEM**
FULLY ADHERED, 60 MIL UNREINFORCED WHITE EPDM OVER 5/8" COVER BOARD OVER MINIMUM R-30 RIGID INSULATION OVER METAL DECK, SEE STRUCTURAL, SEE ALSO BACK OF PARAPET SHEATHING BOARD
- TAPERED INSULATION, SLOPE @ 1/4" PER FOOT, SEE ARROWS FOR SLOPE DIRECTION. TAPER UP FROM MINIMUM R-30 INSULATION.
- EPDM ROOF PAVER

PARAPET SHEATHING BOARD
DENS DECK PRIME W/ METAL STRAP BACKING AS REQUIRED BY MANUFACTURER FOR PULL-OUT RESISTANCE. BACK OF PARAPETS AT LOWER ROOFS TO RECEIVE MANUFACTURER'S PAINT, COLOR TBD FROM MANUFACTURER'S STANDARD RANGE.

SEE SPEC FOR WIND SPEED WARRANTY REQUIREMENTS FOR ALL ROOFING TYPES
V ult = 120 mph
V asd = 93 mph

PROJECT NUMBER

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REV	DESCRIPTION	DATE
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City of Glenwood Springs,
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PROJECT

GLENWOOD SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

SITE/ ARCHITECTURAL PLAN REVIEW

SHEET TITLE

ROOF PLAN

SHEET NUMBER

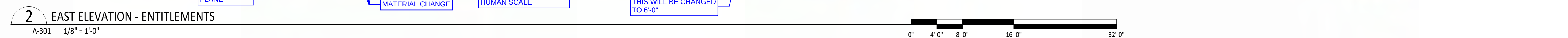
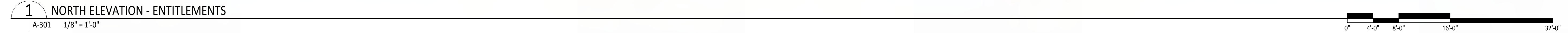
A-203

1 ROOF PLAN

A-203 1/8" = 1'-0"

0" 4'-0" 8'-0" 16'-0" 32'-0"





NOTE: PER SECTION V.D.2.d THE FEATURE LENGTH INCLUDES EITHER OF THE FOLLOWING: WINDOWS, ENTRANCES, ARCADES, AWNINGS, OR OTHER FEATURES.

SOUTH ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*

	SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	6,394	NA
STUCCO (NET*)	2,934	45.9%
MASONRY (NET*)	1,926	30.1%
METAL PANEL (NET*)	161	2.5%
GLAZING	1,373	21.5%

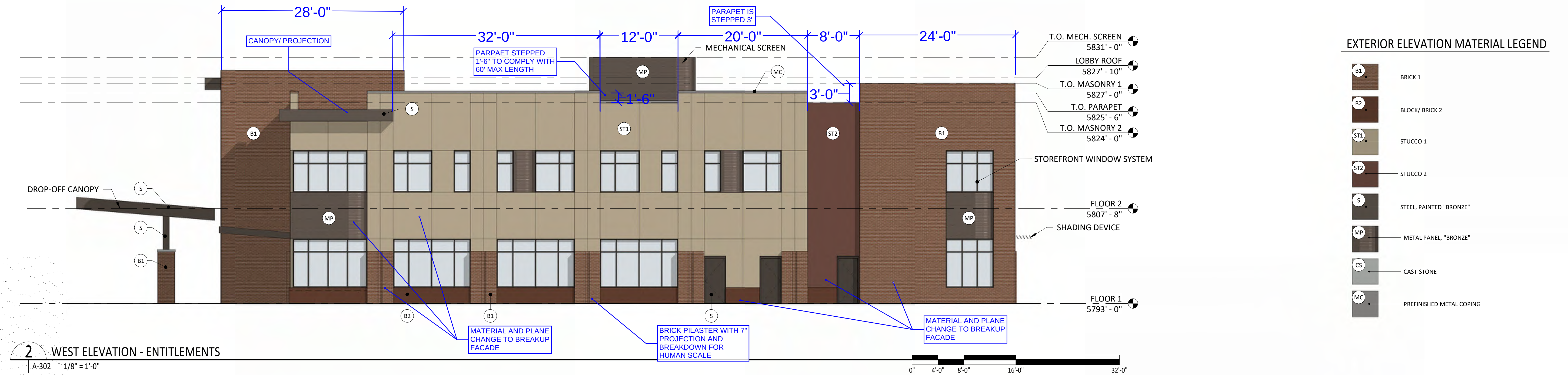
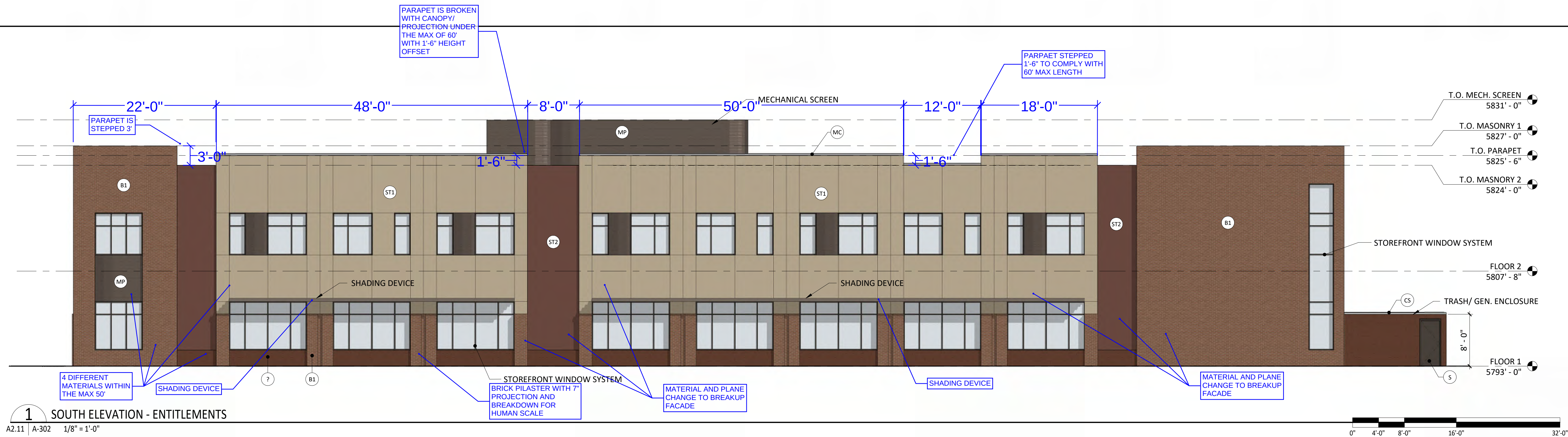
NET* EXCLUDES ROOF FORMS, AWNINGS, AND SIMILAR FEATURES.

WEST ELEVATION	
SURFACE AREA	PERCENTAGE OF NET

	SURFACE AREA	PERCENTAGE OF NET *
GROSS OF WALL	3,975	NA
STUCCO (NET*)	1,596	40.2%
MASONRY (NET*)	1,440	36.2%
METAL PANEL (NET*)	181	2.9%
GLAZING	758	19.1%

A-301

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EXTERIOR ELEVATION MATERIAL LEGEND

B1	BRICK 1
B2	BLOCK/ BRICK 2
ST1	STUCCO 1
ST2	STUCCO 2
S	STEEL, PAINTED "BRONZE"
MP	METAL PANEL, "BRONZE"
CS	CAST-STONE
MC	PREFINISHED METAL COPING

ELEVATION LENGTH				
	FEATURE LENGTH (FEET)	OVERALL LENGTH (FEET)	PERCENTAGE OF LENGTH (FEET)	60% MIN. OF FAÇADE
NORTH	164.58	195.25	84%	OK
EAST	90.13	122.00	74%	OK
SOUTH	139.19	196.00	71%	OK
WEST	79.82	122.00	65%	OK

NOTE: PER SECTION V.D.2.d THE FEATURE LENGTH INCLUDES EITHER OF THE FOLLOWING: WINDOWS, ENTRANCES, ARCADES, AWNINGS, OR OTHER FEATURES.

NORTH ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	6,328	NA
STUCCO (NET*)	2,062	32.6%
MASONRY (NET*)	1,618	25.6%
METAL PANEL (NET*)	587	9.3%
GLAZING	2,061	32.6%

SOUTH ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	6,394	NA
STUCCO (NET*)	2,934	45.9%
MASONRY (NET*)	1,926	30.1%
METAL PANEL (NET*)	161	2.5%
GLAZING	1,373	21.5%

NOTE: 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.

NET* EXCLUDES ROOF FORMS, AWNINGS, AND SIMILAR FEATURES.

EAST ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	3,622	NA
STUCCO (NET*)	1,658	45.8%
MASONRY (NET*)	1,114	17.6%
METAL PANEL (NET*)	128	3.5%
GLAZING	722	19.9%

WEST ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	3,975	NA
STUCCO (NET*)	1,596	40.2%
MASONRY (NET*)	1,440	36.2%
METAL PANEL (NET*)	181	2.9%
GLAZING	758	19.1%

PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS	DESCRIPTION	DATE
REV		

PROPERTY DESCRIPTION
Lot 14, Glenwood Meadows No. 2
A Parcel of Land Situate in the SW 1/4
of Section 5, Township 6 South,
Range 89 West of the 6th P.M.
City of Glenwood Springs,
County of Garfield, State of Colorado

**BOULDER
ASSOCIATES**

ARCHITECTS

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PROJECT
**GLENWOOD
SPRINGS**

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
**EXTERIOR
ELEVATIONS**

SHEET NUMBER

A-302

March 8, 2019

BOULDER
ASSOCIATES

ARCHITECTS

Glenwood Springs Planning Commission Preliminary Response Memo

RE: Glenwood Springs (File No. 01-19) Plan Review – Engineering Comments Memo

Civil:

3. 24' walls will require step backs. Check with Community Development. All walls over 4' require an engineer's stamp.

- a. *The current retaining walls located on the North/ Northeast of the site are in the process of being eliminated by revising some of the parking layout.*

Please note, the Glenwood Meadows Development Plan (Plan) allows higher walls than the City's standard Development Code. Section V.H.6.b outlines that walls in commercial areas may be up to 10 feet in height, having a 3 foot step back/terraces with a 2:1 slope maximum between each section. Retaining walls shall be faced with stone or earth colored materials and have a 12 inch minimum recession or projection every 50 feet.

- *Acknowledged and noted. The intent is to eliminate the retaining walls along all the North portion of the site with slight revisions to parking. If retaining walls are still required, we will comply with Section V.H.6.b as indicated above from your comments.*

General Notes, Sanitary Notes and Waterline Notes:

1. A101. Snow Storage. Placing the snow storage on the east end of the lot and allowing it to melt and sheet flow across the asphalt to the drain/outfall will cause icing.
 - *The snow storage locations will be revised to the furthest north 24 parking spaces closer to the outfall to eliminate potential for icing.*

Additional Comments:

1. The height of the retaining wall at the north-easternmost portion appears to be approximately 24 feet which significantly exceeds the maximum 6 foot permitted by the Municipal Code.
 - *The current retaining walls located on the North/ Northeast of the site are in the process of being eliminated. Only a small retaining wall of less than 6'-0" in height may remain satisfying the requirement for step backs.*
2. The M1 zone district requires that landscaping make up a minimum of 15 percent of the site and it appears you provide only 8.9 percent.
 - *The landscaped area requirement was calculated from the limit of disturbance area of 149,200 sqft located on sheet L100 providing us with 26% landscaped area. We used this calculation to isolate a square footage based on this specific project area within the overall site with the intent that future development on the site will account for the remaining required landscape for each development.*

Acknowledged. It appears the project description table on the cover sheet and elsewhere in the plan set may need revising. Please see the pic reference below.

Boulder Associates, Inc.

1426 Pearl Street | Suite 300 | Boulder, Colorado 80302 | 303.499.7795 | www.boulderassociates.com

BOULDER ■ SACRAMENTO ■ ORANGE COUNTY ■ SAN FRANCISCO ■ DALLAS

EXISTING (SQFT & %)	PROPOSED (SQFT)	(%)
N/A	38,420	8.9%
EXISTING (SQFT & %)	PROPOSED (SQFT)	(%)
N/A	110,815	25.7%

- Please see the revised table on Sheet A-101 providing the calculations using the proposed developed area (Limits of Disturbance).
- 3. It seems the plans lack internal pedestrian access from parking areas to the building entrance(s).
 - Pedestrian access will be added into the parking design to allow for safe access for pedestrians walking from the parking lot to the building entrance.
- 4. The height of the refuse enclosure (8 feet) exceeds the maximum of 6 feet outlined in the Municipal Code.
 - The refuse enclosure will be lowered to 6'-0" to comply with Section 070.040.050.f.1.3.
- 5. It is difficult to determine if the elevations meet all of the building design guidelines as the site plan does not represent every projection and recession in each of the building walls. Can you provide a site plan which represents the exact building footprint? Also, please call out the architectural features you propose on each side of the building (i.e. projections/recessions a minimum of 24 inches in depth, glazed windows and doors for 30 percent of the elevation (this is required as one of the three features for elevations facing the right-of-way), change in texture and/or masonry pattern, change in building roofline height a minimum of two feet; and/or awnings/canopies/marquees extending at least four feet beyond the building face.)
 - Per section 070.040.090.b.2.b "Properties subject to the Glenwood Meadows Annexation and Development Agreement." we are required to comply with Glenwood Meadows Zoning and Development Plan.

Acknowledged
 - Per Glenwood Meadows Development Standards V.D.2.C. all the facades comply with buildings less than 60,000 sqft. Providing two or more of the following for each 30 horizontal feet of the building façade or wall. We utilize the options below to break-up the façade:
 - Option 1 – Changes in color, texture, or materials.
 - Option 2 - Projections, recesses, and reveals, expressing structural bays, entrances, or other aspects of the architecture with a minimum change of plane of 4-6 inches.

Please call out the elements provided for each wall on each elevation accordingly. -Does the site plan accurately depict the buildings projections, recesses, etc. accordingly? Please clarify

 - Please refer to Sheet A-201 First Floor Plan (Exhibit) identifying the changes in plane etc. for compliance with this section. The site plan depicts the elements but do to scale may be difficult to delineate, please refer to A-201 in the attached exhibit for clarification.
 - Per Glenwood Meadows Development Standards V.D.2.D. the building façades or walls comply with the requirement of subdividing the proportions along 60% of the horizontal length.

Please provide a call out column in the materials table (example below) on the elevations sheets which depicts compliance with this requirement.

 - Please refer to the added table on Sheet A-301 Exterior Elevations and A-302 Exterior Elevations (Exhibit) indicating the proportions along 60% of the horizontal length.

- *Per Glenwood Meadows Development Standards V.D.2.E. Parapet walls on each façade comply with the requirements for stepping the parapet for each 60 lineal feet of parapet.*

Please call out compliance with this requirement on the elevation sheets.

- *Please refer to Sheet A-301 Exterior Elevations and A-302 Exterior Elevations (Exhibit) identifying the stepping of the parapets in compliance with this section. We have either stepped or provided a roof projection to the roof/ parapets to be less than the max 60' in length.*

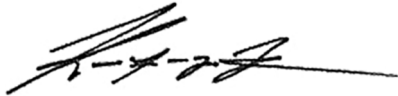
6. It does not appear (per sheet A-302) you provide a building entrance on the south elevation which faces the principal street providing access to the site. That being said, the preliminary site plan (but not architectural site plan) appears to show sidewalk connections to this side of the building. Please clarify.

- *Per section 070.040.090.b.2.b "Properties subject to the Glenwood Meadows Annexation and Development Agreement." we are required to comply with Glenwood Meadows Zoning and Development Plan. Referenced section 070.040.090 Nonresidential and Mixed-Use Site and Building Design does not apply per the section stated above.*

Section VI.D.3 requires building are oriented towards the adjacent street. Additionally, Section II of the Plan states that the Municipal Code shall apply where the Plan does not address a specific subject.

Sincerely,

BOULDER ASSOCIATES, INC.



Keith Fronczak, AIA

Associate

Glenwood Meadows Lot 14

Drainage:

Both soils reports identify a significant risk of hydrocompactive soils. Identify the locations and sizing of the proposed detention/ water quality ponds. If a pond is proposed next to the City's concrete trail, lining and fencing may be required.

Basin OS2 is routed around the development. Show how that occurs.

Add a smaller scale drainage basin map. Show developed drainage design points and connection to the existing system to the Colorado River. Show Midland road grading and basin delineation lines.

All water quality facilities will require a maintenance agreement with the City.

The geotechnical report states that an interceptor drain system should be built to intercept subsurface drainage.

Utilities

All water and sewer crossings must meet the CDPHE requirements

Coordinate with City Fire for hydrant locations and capacity

Traffic

Please justify no project driven increase in traffic on West Meadows. It seems unlikely that project based traffic will not use the most convenient access to Midland to the east. The report shows a 37% split of traffic bypassing West Meadows to use a less convenient outlet. Some people may by pass West Meadows due to congestion, but not at a 37% split. Analyze the effect of the additional traffic on other intersections to the east.

The City would prefer to have a roundabout at Wulfsohn Road intersection, if it were economically and physically feasible. The City will evaluate the different intersection configurations, and ask the project developer to contribute to a future intersection improvement.

Trip generation is based on retail. No restaurant uses are proposed?

Civil

A CDPHE stormwater Permit will be required.

New utility location regulations were in acted in Colorado. Determine whether the existing utility design requirements apply to this project.

24' walls will require step backs. Check with Community Development. All walls over 4' require an engineer's stamp.

General Notes, Sanitary Notes and Waterline Notes: The contractor will provide 72 hours notice before proceeding with general construction, or with and sanitary or sewer line construction.

Sheet C002. Please add Basis of Bearing Lot Line labels

The waterline appears to be on the south side of the road. Show the waterline connection, road cut and trenching details.

Sheet C002. Show ADA access (ramps). We recommend that you review the site accommodations with Rocky Mountain ADA.

Sheet C003. Parking spaces on the west side of the building are effectively narrowed to 3' with a car bumper overhang.

Do you want to provide any pedestrian connection to the trail north of the building?

Grades in the parking lot exceed City standard of 8% maximum.

L200. Landscaping layout does not reflect civil grading and retaining walls.

A101. Snow Storage. Placing the snow storage on the east end of the lot and allowing it to melt and sheet flow across the asphalt to the drain/outfall will cause icing

Water/Wastewater (W/WW) Department Comments

Planning Item: 01-19 Boldt Mulita-Tenant Office Building
Applicant: Boldt/Glenwood Properties, LLC
Owner: Centura Ventures, LLC
Location: Wulfsohn Road, Glenwood Meadows No. 2, Lot 14
Zone: Mixed Use Corridor (M1) District
Parcel: 2185-053-38-014

The following are water/wastewater (W/WW) Department comments based on a review of the application package and the Department Review meeting held on 2/4/2019.

Project Understanding

- We understand that the applicant is proposing construction of an approximately 45,000 square foot multi-tenant office building on Lot 14 of the Glenwood Meadows No. 2 Subdivision located along Wulfsohn Road.

W/WW Department Comments

General.

- The W/WW department requests the applicant submit a revised utility plan to the City for review and approval that includes design changes based on the comments provided in this document.
- All publically-owned or maintained water and sewer infrastructure must meet the requirements of the City's engineering standards. In addition, private water mains that feed a City-maintained fire hydrant must also meet the requirements of the City's engineering standards. The current version can be found at the following link: <http://cogs.us/EngineeringStandards>.
- Per Colorado 811 and City requirements, tracer wire and utility warning tape shall be installed with all underground water and sewer infrastructure.
- In this particular geologic area, the City strongly recommends restrained joint piping systems for all underground water and sewer piping, including bell-restraints.
- The City's minimum cover on water and sewer pipe is 5.5', not 4.5' as noted on sheet C001.

Potable Water Service and Fire Hydrants.

- There is an existing 8" potable water stub-out for this property that is tapped on the water main located in Wulfsohn Rd. The applicant proposes connecting to the existing stub-out, looping a new 8" service main through the development, and re-connecting to the main in Wulfsohn Rd. at a new tap.
- The water mains and services installed within the development will be private. The public/private demarcation point will be the 8" isolation valves located at the mainline taps in Wulfsohn Rd. The demarcation points for water and sewer services shall be shown on the plans and referenced in the development agreement. Legal agreements shall be in place defining operations, maintenance, and financial responsibilities for the private system.
- The City will accept ownership and O&M responsibilities for the new fire hydrant(s) installed as part of this project. However, the hydrants (and private water mains serving them) must meet City specifications.
- The public/private demarcation point for fire hydrants is the hydrant lead valve. The owner shall provide the City with utility easements for the hydrants in accordance with Section 3.4 of the City's engineering standards.
- We understand fire sprinkler system(s) will be installed in the buildings within the development. All water mains used to supply water for fire protection must be designed and tested in accordance with NFPA 24. The contractor shall be responsible for providing the City with a copy a completed "Contractor's Material and Testing Certificate for Underground Piping" prior to issuance of a Certificate of Occupancy.
- Please provide a detail showing the proposed new tap in Wulfsohn Rd. The City prefers installation of a cut-in tee vs. a live ("hot") tap whenever possible.
- There are several water/sewer crossings shown on the plans. Water/sewer main alignments and crossings must meet the separation requirements defined in the City's rules and regulations and the CDPHE Design Criteria for water and sewer systems. When vertical and/or horizontal separation requirements are not met, encasement in a pipe sleeve is the preferred encasement approach (vs. concrete encasement).
- Please consult with the Fire Department to verify that the proposed location and quantity of new fire hydrants is acceptable.

Irrigation Service.

- Per the City Code, all outdoor irrigation for this proposed development must utilize raw (untreated) water. The City's raw water main is located in Wulfsohn Rd.
- Our records indicate that there is an existing 2" stub-out installed for this parcel, however the raw water service has not been field-verified by W/WW staff. Please

contact the W/WW department for more information regarding the raw water irrigation requirements, stub-out location, metering, and cross-connection requirements.

Sanitary Sewer Service.

- The utility plan provided in the application package shows a tie-in to the City's existing 8" sanitary sewer line. Please provide a detail of the proposed 6" tap.
- The slope of the proposed sanitary service line is shown as 21.7%. The City requests that a private manhole be installed on the customer-side of the tap to dissipate energy of the flow from this highly-sloped service line. Please provide a detail of the manhole for City review and approval.

Cross-connection Control Requirements.

- **This project requires that a cross connection/backflow prevention hazard survey be completed (by the City) before a certificate of occupancy will be issued.** A City-approved cross-connection/ backflow device must be installed on water service lines if a hazard exists. At the customer's request, W/WW Department staff will perform an initial Cross Connection Hazard Survey and provided preliminary recommendations during the planning phases of the project. Upon completion of the project, a follow-up inspection of the property is required (per State law) to ensure that acceptable backflow devices have been properly installed and tested. We recommend that you contact the W/WW department to discuss specific requirements as soon as possible to avoid unforeseen installation issues during the construction phase.

Please note that backflow prevention devices cannot be installed below grade per International Plumbing Code (IPC). In addition, certain backflow prevention devices require drainage requirements. We encourage the customer to consider these requirements and address them during the design phase of the project.

Water Meters.

- All water services must be metered. **A water meter inspection must be performed by City staff before a certificate of occupancy will be issued.** We recommend that you contact the W/WW department to discuss specific requirements as soon as possible to avoid an unforeseen installation issues.

Water meters must be installed per manufacturer's requirements. They may be subjected to performance testing before being accepted by the City.

Please note that water meters must be installed in a location that can be accessed by the City for inspection and future maintenance. Please refer to the attached schematic for meter installation instructions, including additional requirements for isolation valves, pressure reducing valves, and cross-connection devices (**see attached water meter installation schematic**). Note that if the water system pressure exceeds 80 psi, a pressure reducing valve must be installed downstream of the water meter.

W/WW Department Contact Information:

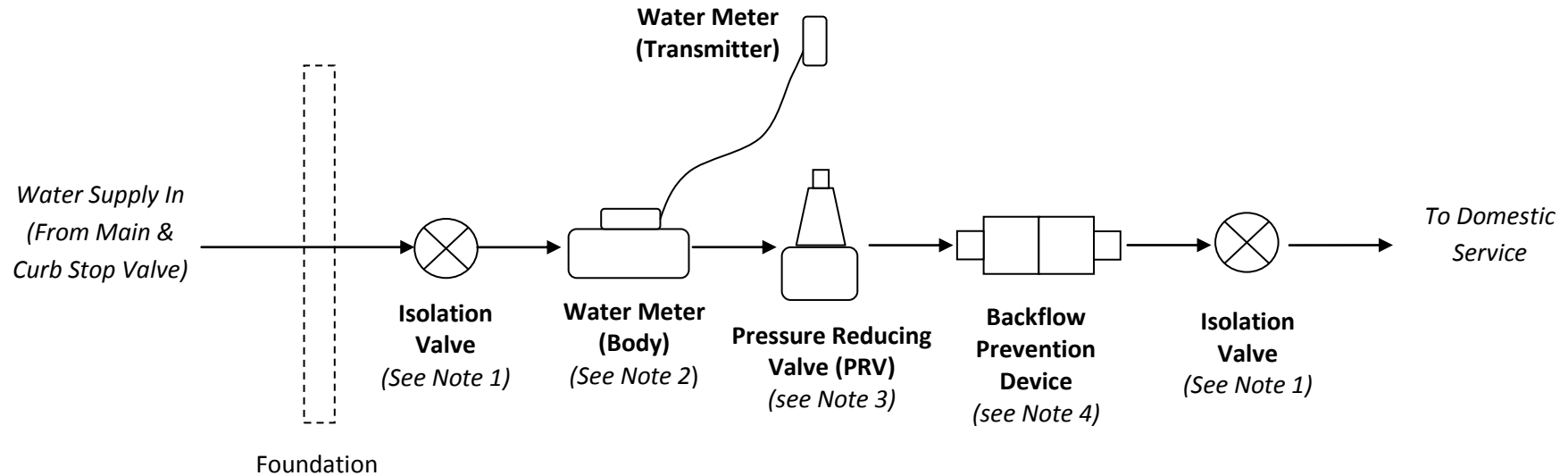
- o Horacio Diaz – 379-1974 (Sewer Services & Taps)
- o Mike Hoffman – 989-3902 (Water Services & Taps, Cross Connections, Water Meter Inspections)
- o Brad Zachman – 384-6388 (General Information)
- o Utility Billing – 384-6400 (Account setup; Water Meter Purchase)
- o Community Development Department – 384-6411 (Improvements Fees)

Attachments:

- o Water Meter Installation Schematic
- o NFPA 24 - Contractor's Material and Testing Certificate for Underground Piping

Water Meter Installation Schematic

Glenwood Springs Water Department



Notes:

1. It is strongly recommended that isolation valves be installed at the locations shown. These valves allow for the water supply to be shut off during repairs or for replacement of the water meter equipment.
2. To assure accurate measurements, water meters must be installed per manufacturer's specific instructions. Contact the City's Water Department for a copy of these instructions or if you have any questions regarding the installation requirements.
3. A pressure reducing valve (PRV) regulates incoming pressure from the main. A PRV is recommended for all installations, but is required for all services that are fed off of water mains with static water pressure of 80 psi or greater. Contact the water department (**384-6344 or 989-3902**) for more information regarding the static water main pressure that serves your property.
4. A backflow prevention device protects the City's water supply from contamination or pollution due to backflow conditions. Please contact the City's cross connection technicians (**384-6345**) to discuss specific backflow prevention requirements and installation procedures.
5. Requests for water meters can be initiated by contacting the City's Utility Billing Office (**384-6400**). Once payment is made, water meters can be picked up from the Water Department at 401 7th St. (**384-6344 or 989-3902**).
6. Contact the Water Department to schedule a final inspection of the meter (**384-6344 or 989-3902**) and the backflow device (**384-6345**).

Updated June 2016

Contractor's Material and Test Certificate for Underground Piping	
PROCEDURE Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.	
Property name	Date
Property address	
Plans	Accepted by approving authorities (names)
	Address
	Installation conforms to accepted plans ☐ Yes ☐ No
	Equipment used is approved ☐ Yes ☐ No If no, state deviations
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? ☐ Yes ☐ No If no, explain
	Have copies of appropriate instructions and care and maintenance charts been left on premises? ☐ Yes ☐ No If no, explain
Location	Supplies buildings
Underground pipes and joints	Pipe types and class _____ Type joint _____
	Pipe conforms to _____ standard ☐ Yes ☐ No Fittings conform to _____ standard ☐ Yes ☐ No If no, explain
	Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard ☐ Yes ☐ No If no, explain
Test description	Flushing: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at one of the flow rates as specified in 10.10.2.1.3. Hydrostatic: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.5 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ± 5 psi (0.35 bar) for 2 hours. Hydrostatic Testing Allowance: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (for metric equation, see 10.10.2.2.6): $L = \frac{SD\sqrt{P}}{148,000}$ L = testing allowance (makeup water), in gallons per hour S = length of pipe tested, in feet D = nominal diameter of the pipe, in inches P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)
Flushing tests	New underground piping flushed according to _____ standard by (company) ☐ Yes ☐ No If no, explain
	How flushing flow was obtained ☐ Public water ☐ Tank or reservoir ☐ Fire pump Through what type opening ☐ Hydrant butt ☐ Open pipe
	Lead-ins flushed according to _____ standard by (company) ☐ Yes ☐ No If no, explain
	How flushing flow was obtained ☐ Public water ☐ Tank or reservoir ☐ Fire pump Through what type opening ☐ Y connection to flange and spigot ☐ Open pipe

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NFPA 24 (p. 1 of 2)

FIGURE 10.10.1 Sample of Contractor's Material and Test Certificate for Underground Piping.

Hydrostatic test	All new underground piping hydrostatically tested at _____ psi for _____ hours		Joints covered ☐ Yes ☐ No	
Leakage test	Total amount of leakage measured _____ gallons _____ hours			
	Allowable leakage _____ gallons _____ hours			
Forward flow test of backflow preventer	Forward flow test performed in accordance with 10.10.2.5.2: ☐ Yes ☐ No			
Hydrants	Number installed	Type and make	All operate satisfactorily ☐ Yes ☐ No	
Control valves	Water control valves left wide open If no, state reason		☐ Yes ☐ No	
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm		☐ Yes ☐ No	
Remarks	Date left in service			
Signatures	Name of installing contractor			
	Tests witnessed by			
	For property owner (signed)	Title	Date	
	For installing contractor (signed)	Title	Date	
Additional explanation and notes				
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FIGURE 10.10.1 Continued

GLENWOOD SPRINGS

ABBREVIATIONS

A/C	air conditioning	FA	fire alarm	MISC	miscellaneous	STL	steel
AB	anchor bolt	FAAP	fire alarm annunciator panel	MID	molding, moulding	STOR	storage
ABV	above	FAS	fasten(er)	MM	millimeter(s)	STRUCT	structure(al)
AC	acoustical	FB	face brick	SUSP	membrane	SUSP	suspended
AC BD	acoustic board	FBO	furnished by other	MO	masonry opening	SV	spray vinyl
AC TL	acoustic tile	FBD	fiberboard	MOD	modular	SYM	symmetry(ical)
AC	asphaltic concrete	FD	floor drain	MOV	movable	SYN	synthetic
ACC	access	FE	fire extinguisher	MRB	marble	SVS	system
ACC PNL	access panel	FE	fixed equipment	MRD	metal roof deck	T&G	tongue & groove
ADH	adhesive	FEC	fire extinguisher cabinet	MT	mount(ing)	T	tread(s)
ADJ	adjacent	FF	factory finish	MTD	mounted	TB	towel bar
ADI	adjustable	FFE	finished floor elevation	MTL FUR	metal furring	TO	tolerance
AF	above finished floor	FFL	finished floor line	MTL	metal	TC	terra cotta
AGG	aggregate	FGL	fiberglass	MTL THR	metal threshold	TD	tinted
AL or ALUM	aluminum	FHC	fire hose cabinet	MULL	mullion	TELE	telephone
ALT	alternate	FHMS	flat head machine screw	MWK	millwork	TEMP	tempered
ALPA	area line pressure alarm	FHS	fire hose station	N	nitrogen	THK	thick(ness)
ANC	anchor, anchorage	FHWS	flat head wood screw	N	north	TK BD	tack board
ANOD	anodized	FIN	finish	NAT	natural	TL	tile
APPROX	approximately	FLG	flashing	N	nurse call	TO PL	top of plate
ARCH	architect(ural)	FLR CO	floor cleanout	NIC	not in contract	TO	top of
ASPH	asphalt	FLR	floor(ing)	NMT	nonmetallic	TOL	tolerance
AUTO	automatic	FLT	float	NO	nitrous oxide	TOS	top of steel
BD	board	FLUOR	fluorescent	NOM	nominal	TOW	top of wall
BE	below	FUR	flexible	NOM	noise reduction	TP	transparent
BET	between	FN	fence	NRC	noise reduction coefficient	TPD	toilet paper dispenser
BIT	bituminous	FND	foundation	NTS	not to scale	TPTN	toilet partition transom
BLDG	building	FDC	face of concrete	O	oxygen	TR	transom
BLK	block	FOF	face of finish	OA	overall	TRM	thermal
BLKG	blocking	FOM	face of masonry	OB	obscure	TS	tube steel
BM	beam	FOS	face of stud	OBS	obscure	TSL	top of slab
BO	bottom of	FP	fireproof(ing)	OC	on center	TTD	treated
BOT	bottom	FPL	floor plate	OD	outside diameter	TV	television
BRG PL	bearing plate	FR	fire-resistant	OH	opposite hand	TYP	typical
BRG	bearing	FRC	fire-resistant coating	OH	overhead	TZ	terrazzo
BRK	brick	FRT	fire-retardant	OI	owner installed	UC	undercut
BRZ	bronze	FS	floor sink	OI	owner installed	UNF	unfinished
BSMT	basement	FTG	footing	OP	opaque	UNO	unless noted otherwise
BT	bolt	FUR	furred(ing)	OP	owner provided	UR	urinal
BU BD	bulletin board	FUT	future	OPG	opening	V	vacuum
BUR	built-up roof	GA	gage, gauge	OPP	opposite	VAR	varies, variable
BVL	bevel	GALV	galvanized	OR	operating room	VB	vinyl base
CAB	cabinet	GB	galvanized	ORD	overflow roof drain	VCT	vinyl composition tile
CB	code blue	GC	general contract(or)	OS	opposite surface	VERT	vertical
CCTV	closed circuit television	GDC	grade	PLAM or PL	plastic laminate	VIF	verify in field
CEM PLAS	cement plaster (portland)	GR	glass fiber reinforced	PAR	parallel	VIN TL	vinyl tile
CEM	cement	GRC	concrete	PB	panic bar	VIN	vinyl
CER	ceramic	GRI	gasket	PBD	particle board	VJ	vertical joint
CG	corner guard	GKT	galvanized iron	PCF	precast concrete	VNR	veneer
CI	cast iron	GL	glass, glazing	PERF	perforate(d)	VRM	vermiculite
CIR	circle	GLB	glass block	PERF	perimeter	VWC	vinyl wall covering
CIRC	circumference	GLS	glass	PERI	perimeter	W	width, wide
CJ	control joint	GP	galvanized pipe	PFN	prefinished	W	width, wide
CK	caulking, caulk(ing)	GRN	granite	PH	panic hardware	W/O	without
CL	center line	GT	grout	PK	parking	WB	wood base
CLG	ceiling	GVL	gravel	PL	plate	WC	water closet
CLG HGT	ceiling height	GWB	gypsum wallboard	PLAS	plaster	WD	wood
CLK BD	chalkboard	GYP BD	gypsum board	PLY	plywood	WDO	window
CLD	clear	GYP PLAS	gypsum plaster	PLY WD	plywood	WH	wall hung
CLS	closure	GYP LA	gypsum lath	PNL	panel(ed)(ing)	WP	waterproof(ing)
CMU	concrete masonry unit(s)	GYP TL	gypsum tile	PNT	paint	WPT	working point
COL	column	H	hose bibb	PRE-FAB	prefabricate(d)	WR	water resistant
COMB	combination	HBD	hardboard	PRF	preformed	WR	wire(d)
COMP	compressed(ion)(ible)	HC	hollow core	PSF	pounds per square foot	WSCT	wainscot
COMPO	composition, composite	HD	heavy duty	PT	point	WTW	wall to wall
COMPT	compartment	HDR	header	PTC	post-tensioned concrete	WWM	woven wire mesh
CONC	concrete	HDW	hardware	PTD	paper towel dispenser	ZVB	zone valve box
CONST	construction	HGX	hexagonal	PTR	partition		
CONT	continue, continuous	HMT or H	height	PTR	paper towel receptor		
CONTR	contract(or)	HM	hollow metal	PVC	poly vinyl chloride		
CORR	corrugated	HORIZ	horizontal	PVMT	pavement		
CI	contractor installed	HTG	heating	QT	quarry tile		
CP	contractor provided	HVAC	heating/ventilation/				
CPR	copper	HWD	hardwood				
CPT	carpet(ed)(ing)	ID	inside diameter				
CS	countersink(sunk)	INCL	included(d)(ing)				
CT	ceramic tile	INS CONC	insulating concrete				
CTR	counter	INSUL	insulate(d)(ion)				
CTR FLG	counter flashing	INT	interior				
CU FT	cubic foot	INV	invert				
CU YD	cubic yard(s)	IPS	iron pipe size				
CV	cover	J	joist				
D	depth	JAN CLO	janitor closet				
D	drain	JF	joint filler				
DBL	double	JT	joint				
DEMO	demolish, demolition	KIT	kitchen				
DEP	depressed(d)	KO	knock-out				
DF	drinking fountain	L	length				
DIAG	diagonal	LAB	laboratory				
DIAM	diameter	LAD	ladder				
DIM	dimension(s)	LAM	laminated				
DIV	division	LAV	lavatory				
DL	dead load	LBL	label				
DN	down	LH	left hand				
DP PF	dampproofing	LL	live load				
DPR	dampener	LPT	low point				
DR	door	LT	light				
DS	downspout	LTL	lintel				
DSPR	dispenser	LVR	louver				
DTL	detail	LW	lightweight				
DWG	drawing	LWC	lightweight concrete				
DWR	drawer	M	meter(s)				
E	east	MAP	med gas alarm panel				
EA	elevation	MAS	masonry				
EL or ELEV	electrical panel board	MATL	material				
ELEC PNL BD	electrical panel board	MAX	maximum				
ELECT	electric(al)	MB	machine bolt				
ELEV	elevator	MD	medium				
EMERG	emergency	MECH	mechanical				
ENCL	enclosure	MFD	medicine cabinet				
EPN	epoxy	MFR	metal floor decking				
EQ	equal	MH	manhole				
EST	estimate	MHO	magnetic hold open				
ET	elapased timer	MIN	minimum				
EW	each way	MIR	mirror				
EW	electric water cooler						
EX	exposed						
EXH	exhaust						
EXIST or E	existing						
EXP JT or EJ	expansion joint						
EXT	exterior						

PROJECT SYMBOL LEGEND

VIEW REFERENCES

DRAWING TITLES

VIEW NAME

1

A2.1 A6.1

1/8" = 1'-0"

DETAIL NUMBER

SCALE

SHEET WHERE DRAWN

SHEET WHERE REFERENCED

WALL/DETAIL SECTIONS

SECTION NUMBER

VIEW DIRECTION

SHEET WHERE DRAWN

BUILDING SECTION

SECTION NUMBER

VIEW DIRECTION

SHEET WHERE DRAWN

PLAN/DETAIL CALLOUTS

CALLOUT NUMBER

SHEET WHERE DRAWN

EXTERIOR / INTERIOR ELEVATIONS

ELEVATION NUMBER

SHEET WHERE DRAWN

DATUM SYMBOLS

STRUCTURAL GRIDLINE

NAME OF LEVEL

FLOOR TWO

14'-0"

HEIGHT ABOVE PROJECT DATUM

SPOT ELEVATION INDICATOR

9'-0"

TRUE NORTH

PROJECT SYMBOLS AND ANNOTATION

ROOM NAME

ROOM NUMBER

DOOR OR OPENING NUMBER, SEE DOOR SCHEDULE.

WINDOW TYPE INDICATOR, SEE WINDOW TYPES.

FIXED EQUIPMENT INDICATOR, SEE EQUIPMENT SCHEDULE

ACCESSORY INDICATOR, SEE ACCESSORY SCHEDULE

CEILING TYPE, SEE CEILING SCHEDULE

FINISH TYPE, WHERE APPLICABLE

CEILING HEIGHT

SIGNAGE INDICATOR, SEE SIGNAGE SCHEDULE

ALIGN FINISH FACE OF NEW WALL W/ FINISH FACE OF ADJACENT EXISTING WALL

NOTE: SEE INDIVIDUAL SHEETS FOR ADDITIONAL SYMBOLS.

MATERIAL GRAPHIC LEGEND

SECTION

EARTH (CUT)

AGGREGATE BASE COURSE (CUT)

SAND

CONCRETE (CUT)

PRECAST CONCRETE

CONCRETE MASONRY UNIT

BRICK MASONRY

MORTAR CUT

STONE (CUT)

MARBLE

STEEL, STAINLESS STEEL (LARGE SCALE)

ALUMINUM (LARGE SCALE)

CERAMIC TILE (LARGE SCALE)

WOOD FRAMING - CONTINUOUS (LARGE SCALE)

WOOD FRAMING - DISCONTINUOUS (LARGE SCALE)

PLYWOOD (SMALL SCALE)

PLYWOOD (LARGE SCALE)

FINISH WOOD (LARGE SCALE)

EIPS (CUT)

RIGID INSULATION (LARGE SCALE)

BATT INSULATION (LARGE SCALE)

FIREPROOFING

STUCCO CUT

GYPNUM BOARD (LARGE SCALE CUT)

TERRAZZO (LARGE SCALE)

GLASS (LARGE SCALE)

ELEVATION

METAL SIDING (VERTICAL)

METAL SIDING (HORIZONTAL)

PLASTER, CONCRETE, STUCCO

MASONRY

GLASS BLOCK, CERAMIC TILE

GLASS ELEVATION

SITE/ ARCHITECTURAL PLAN REVIEW

PROJECT DIRECTORY

OWNER

BOLDT

1110 N. OLD WORLD THIRD ST., STE 610

MILWAUKEE, WI 53203

PHONE: 414-276-4631

STRUCTURAL ENGINEER

MARTIN/MARTIN INC.

12499 WEST COLFAX AVENUE

LAKEWOOD, CO 80215

PHONE: 303-431-6100

ARCHITECT

BOULDER ASSOCIATES, INC.

1426 PEARL STREET, STE 300

BOULDER, CO 80302

PHONE: 303-499-7795

MECHANICAL ENGINEER

WSP

5613 DTC PARKWAY, STE 500

GREENWOOD VILLAGE, CO 80111

PHONE: 303-694-4755

GENERAL CONTRACTOR

HASELDEN CONSTRUCTION

6950 SOUTH POTOMAC ST.

CENTENNIAL, CO 80112

PHONE: 303-751-1478

ELECTRICAL ENGINEER

WSP

5613 DTC PARKWAY, STE 500

GREENWOOD VILLAGE, CO 80111

PHONE: 303-694-4755

CIVIL ENGINEER

RIVER CITY CONSULTANTS

744 HORIZON CT., STE 110

GRAND JUNCTION, CO 81506

PHONE: 971-241-4722

LANDSCAPE ARCHITECT

NORRIS DESIGN

409 EAST MAIN ST., STE 207

FRISCO, CO 80443

PHONE: 970-368-7068

SITE REVIEW SHEET INDEX

G-001	COVER SHEET
C001	LEGEND
C002	OVERALL SITE PLAN
C003	PRELIMINARY SITE PLAN
C004	PRELIMINARY GRADING PLAN
L100	LANDSCAPE NOTES
L200	LANDSCAPE PLAN
L300	LANDSCAPE DETAILS
A-101	ARCHITECTURAL SITE PLAN
A-201	FIRST FLOOR PLAN
A-202	SECOND FLOOR PLAN
A-203	ROOF PLAN
A-301	EXTERIOR ELEVATIONS
A-302	EXTERIOR ELEVATIONS
E1.1	SITE LIGHTING PHOTOMETRICS
E2.1	LIGHT FIXTURE CUTSHEET
E2.2	LIGHT FIXTURE CUTSHEET

GENERAL PROJECT DATA

PROJECT TYPE

OFFICE BUILDING

TWO STORIES ABOVE GRADE

APPLICABLE CODES

2015 INTERNATIONAL BUILDING CODE

2015 INTERNATIONAL PLUMBING CODE

2015 INTERNATIONAL MECHANICAL CODE

2015 INTERNATIONAL FUEL GAS CODE

2015 INTERNATIONAL FIRE CODE

2014 NATIONAL ELECTRICAL CODE (NFPA 70)

2009 INTERNATIONAL ENERGY CODE

2010 ASHRAE STANDARD 90.1

2009 ICC/ ANSI A117.1 ACCESSIBILITY CODE

2010 ADA (AMERICANS WITH DISABILITIES ACT)

DEFERRED SUBMITTALS

FIRE SUPPRESSION SYSTEM

FIRE ALARM SYSTEM

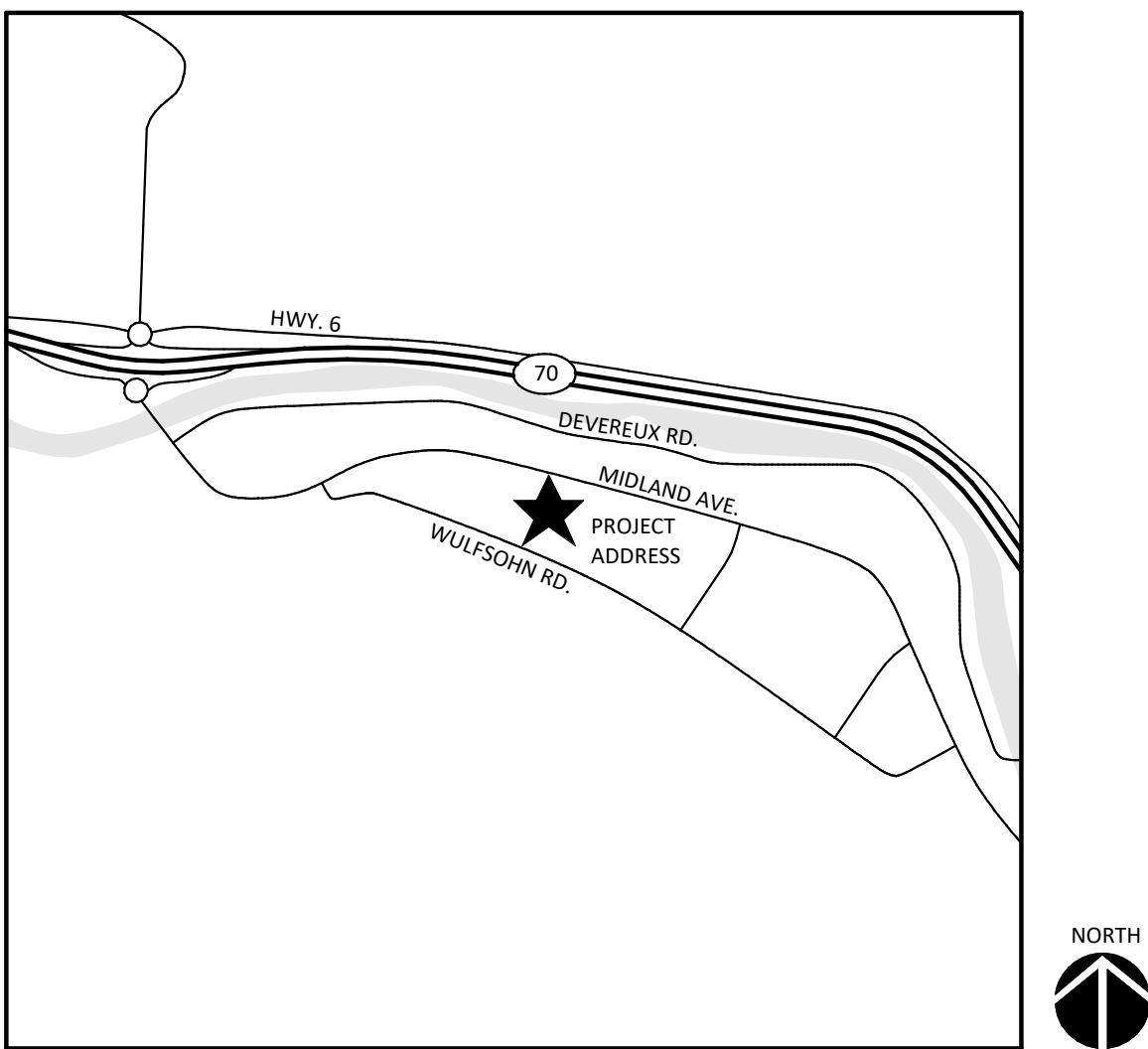
BUILDING DEPARTMENT

CITY OF GLENWOOD SPRINGS

FIRE DEPARTMENT

CITY OF GLENWOOD SPRINGS FIRE DEPARTMENT

VICINITY MAP



PROJECT NUMBER

184101.00

DRAWN BY

K. Fronczak

DATE

01/02/19

REVISIONS

REV	DESCRIPTION	DATE
-----	-------------	------

PROPERTY DESCRIPTION

Lot 14, Glenwood Meadows No. 2

A Parcel of Land Situate in the SW 1/4 of Section 5, Township 6 South, Range 89 West of the 6th P.M.

City of Glenwood Springs, County of Garfield, State of Colorado

BOULDER ASSOCIATES

ARCHITECTS

Boulder Associates, Inc.

Architecture + Interior Design

1426 Pearl Street, Suite 300

Boulder, Colorado 80302

303.499.7795 F 303.499.7767

www.boulderassociates.com

OWNER

BOLDT

1110 N. Old World Third St., Suite 610

Milwaukee, WI 53203

414.276.4631

ben.ganther@boldt.com

PROJECT

GLENWOOD SPRINGS

LOT 14

GLENWOOD MEADOWS NO. 2

TBD WULFSOHN RD.

GLENWOOD SPRINGS, CO 81601

SITE/ ARCHITECTURAL PLAN REVIEW

COVER SHEET

SHEET NUMBER

G-001

LEGEND

	Toe of Slope		Existing Manhole
	Top of Slope		Existing Manhole
	Edge of Water		Existing Manhole
	100-YR Flood Limits		Existing Manhole
	500-YR Flood Limits		Existing Manhole
	Floodway Limits		Proposed Manhole
	Edge of Wetlands		Proposed Manhole
	Tree Mass Area		Proposed Manhole
	Edge of Asphalt		Proposed Manhole
	Edge of Concrete		Proposed Services
	Edge of Gravel		Proposed Services
	Flowline		Proposed Services
	Railroad		Cleanouts
	Building		Cleanouts
	Building Overhang		Cleanouts
	Wire Fence		Inlets
	Chain Fence		Inlets
	Gate		Inlets
	Wood Fence		Fire Hydrant/Blowoff/Meter
	Quadrail		Fire Hydrant/Blowoff/Meter
	Existing Major Contour		Fire Hydrant/Blowoff/Meter
	Existing Minor Contour		Well/Yard Hydrant/Box
	Existing Cable TV		Well/Yard Hydrant/Box
	Existing Comm Duct		Well/Yard Hydrant/Box
	Existing Electric		Valve/Cap/Thrust Block
	Existing Fiber Optic		Valve/Cap/Thrust Block
	Existing Gas		Valve/Cap/Thrust Block
	Existing Irrigation		Box/Pump/Valve
	Existing Overhead Electric		Box/Pump/Valve
	Existing Overhead Telephone		Box/Pump/Valve
	Existing Storm Drain		Roof Drain/Vent Pipe/Pedestal
	Existing Sanitary Sewer		Roof Drain/Vent Pipe/Pedestal
	Existing Sewer Force Main		Roof Drain/Vent Pipe/Pedestal
	Existing Telephone		Utility Boxes
	Existing Unknown Utility		Utility Boxes
	Existing Water		Utility Boxes
	Out Extents		Utility Pedestals
	Fill Extents		Utility Pedestals
	Proposed Demolition or Removal		Utility Pedestals
	Drainage Flowline		Meters
	Proposed Parcel Boundary		Meters
	Proposed Easement		Meters
	Proposed Lot Line		Utility Marker/Transformer/Valve
	Proposed Right of Way		Utility Marker/Transformer/Valve
	Proposed Setback		Utility Marker/Transformer/Valve
	Proposed Tract		Monitor Well/Borehole/Posthole
	Proposed Striping		Monitor Well/Borehole/Posthole
	Milling Limits		Monitor Well/Borehole/Posthole
	Sawcut Line		Decid Tree/Conif Tree/Shrub
	Proposed Major Contour		Decid Tree/Conif Tree/Shrub
	Proposed Minor Contour		Decid Tree/Conif Tree/Shrub
	Common Utilities		Utility Pole/Guy Wire/Guy Pole
	Irrigation Line		Utility Pole/Guy Wire/Guy Pole
	Irrigation Service Line		Utility Pole/Guy Wire/Guy Pole
	Storm Drain Line (with Flow Direction)		Intersection Sign/Sign/Delineator
	Sanitary Sewer Line (with Flow Direction)		Intersection Sign/Sign/Delineator
	Sanitary Sewer Force Main Line		Intersection Sign/Sign/Delineator
	Sanitary Sewer Service Line		Ballard/Light/Mailbox
	Water Line		Ballard/Light/Mailbox
	Water Service Line		Ballard/Light/Mailbox

LIST OF ABBREVIATIONS

ABC Aggregate Base Course	ELEV Elevation	LC Level Crown
AC Acre	ENC End Normal Crown	LF Linear Feet
ADJ Adjacent	EOA Edge of Asphalt	LP Low Point
AL Alignment	EOP End of Pavement	LS Lump Sum
BFS Begin Full Superelevation	ER End of Radius	LVC Length of Vertical Curve
BLDG Building	ESMT Easement	MAX Maximum
BLM Bureau of Land Management	EVCE End of Vertical Curve Elevation	MC&C Mountable Curb & Cutter
BM Benchmark	EVCS End of Vertical Curve Station	MCQS Mountable Curb, Gutter, & Sidewalk
BNC Begin Normal Crown	EX Existing	MCSM Mesa County Survey Marker
BOC Back of Curb	FDC Fire Department Connection	MDS Maximum Design Speed
BOW Back of Walk	FES Flared End Section	MH Manhole
BVCE Beginning Vertical Curve Elevation	FFE Finished Floor Elevation	MIN Minimum
BVCS Beginning Vertical Curve Station	FG Finished Grade	MPE Multi-Purpose Easement
CBC Concrete Box Culvert	FL Flow Line	MTR Meter
CDOT Colorado Department of Transportation	GB Grade Break	MUTCD Manual on Uniform Traffic Control Devices
CGS Curb, Gutter & Sidewalk	GV Gate Valve	N Northing Coordinate
CL Center Line OR Class	HDPE High Density Polyethylene	NO Number
CMP Corrugated Metal Pipe	HOA Home Owners Association	NTS Not to Scale
CY Cubic Yard	HP High Point	PC Point of Curvature
E Easting Coordinate	INC Incorporated	PCC Point of Compound Curvature
EA Each	INV Invert	PI Point of Intersection
EFS End Full Superelevation	IRR Irrigation	PL Property Line
EGTC Electric, Gas, Telephone, Cable	K Design Coefficient	PLS Professional Licensed Surveyor
EL Elevation	L Length	PR Proposed
ELEC Electric		PRC Point of Reverse Curvature

GENERAL CONSTRUCTION NOTES

- All boundary linework, project control, underground utility locations, and topographic survey data shown hereon was provided by Bookcliff Survey Services, Inc. Locations of underground utilities as shown hereon are based on visible evidence from above ground structures, markings by the respective utility companies and/or their locator services, and drawings provided by the utility companies. No excavations were made during this survey to determine exact locations and depths of underground utilities and structures. Actual locations may vary from those as shown hereon and additional underground utilities may exist. Existence and locations of all underground utilities and structures should be verified prior to any construction on this property.
- Contractor shall give 48 hour notice to all authorized inspectors, superintendents, or person in charge of public and private utilities affected by his operations prior to commencement of work. Contractor shall assure himself that all construction permits have been obtained prior to commencement of work. All permits obtainable by the Contractor are required to be obtained at the Contractor's expense.
- The Contractor shall limit construction activities to those areas within the project limits of disturbance and/or toes of slopes as shown on the plans and cross sections. Any disturbance beyond these limits shall be restored to the original condition by the contractor at the contractor's expense. Construction activities in addition to normal construction procedure shall include the parking of vehicles or equipment, disposal of debris or any other action which could alter the existing conditions. The contractor shall not stockpile or store equipment within 30 feet of the edge of traveled way during the project, unless protected by temporary barrier or existing guardrail.
- All satisfactory excess excavation from either utility or street construction shall be spread uniformly across the lots as directed by the Owner or his designated representative. All unsatisfactory or waste material including vegetation, roots, concrete, rocks, or other debris, shall be hauled from the project by the Contractor at the Contractor's expense.
- All road construction and related work, all materials, performance, and quality of work, shall conform to the requirements of the City of Glenwood Springs Standard Specifications.
- All utility installations are to be performed in accordance with the technical specifications of the City of Glenwood Springs. All water and sewer lines must be tested and approved prior to street construction. All waterlines are to be constructed in accordance with the technical specifications of the local water district.
- All sign fabrication and installation shall conform to the Manual on Uniform Traffic Control Devices (MUTCD) and City of Glenwood standards.

PAVING CONSTRUCTION NOTES

- All road widths, and radii are to flowline unless noted otherwise. Any "spot" design elevations are to flowline unless otherwise noted.
- The top of existing ground or the top of areas cut to final grade are to be scarified, brought to the optimal water content, and recompacted to 95% of AASHTO T99 before placing fill or before base is placed.
- Contractor is to protect existing utilities and appurtenances. Manholes, drainage inlets, utility lines, etc., damaged, covered or filled with dirt or debris by the Contractor shall be cleaned and repaired or replaced at no expense to the Owner.
- Where proposed pavement is to match existing pavement, sawcut the existing pavement 1 foot back from the existing edge of and remove pavement. From the sawcut line, mill existing pavement half existing pavement depth (or a minimum of 2 inches), a width of 2 feet. Existing surface is to be tack-coated before new pavement is placed. See T-Lock detail below.
- Include backing of curb and gutter and/or sidewalk with native fill material per the typical roadway section in the unit price bid for embankment.
- For site specific geotechnical requirements and recommendations, see the referenced geotechnical report which shall supercede all other geotechnical references:

Subsurface Exploration Program Geotechnical and Pavement Section Recommendations
Glenwood Meadows Lot 14, Glenwood Springs, Colorado
Ground Engineering Consultants, Inc.
41 Inverness Drive East
Englewood, CO 80112-5412
Job #07-6051
January 15, 2008

TESTING NOTES

- Contractor shall familiarize themselves with the geotechnical testing requirements of the City of Glenwood Springs. It shall be the responsibility of the Contractor to contact the Testing Firm 24 hours in advance of the need for testing, and to verify that the appropriate number of tests have been taken. The results of the required types of tests and number of passing tests shall be furnished to the Engineer for verification before final acceptance by the Owner will be granted. All failing tests shall be brought to the immediate attention of the Engineer and re-tests shall be performed until passing results are obtained. All utility lines, including service lines, failing within the Public right-of-way or the Public easements shall be tested. Payment of testing is the Contractor's responsibility and shall not be paid for separately but shall be incidental to the work.
- Only materials on which a proctor and accurate nuclear density test can be performed are approved for utility trench backfill, unless otherwise approved by the Engineer.
- Backfilling of trenches without testing during the backfill operation is strongly discouraged and will result in removal and replacement of backfill back to the last documented passing test.

SANITARY SEWER CONSTRUCTION NOTES

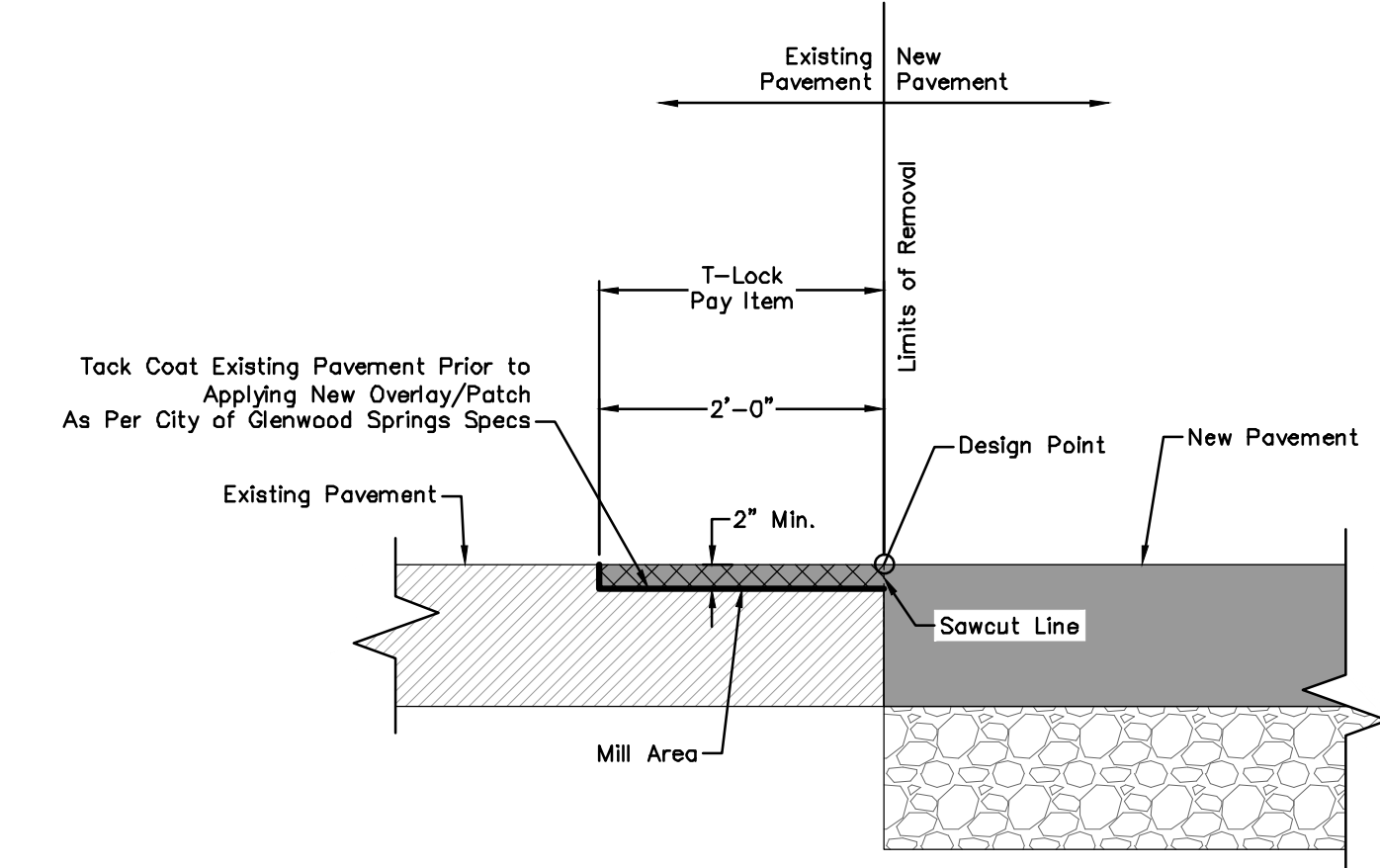
- All sewer line construction shall conform to the City of Glenwood Springs Standards and Specifications.
- Contractor shall have one signed copy of plans and a copy of the City of Glenwood Springs Standard Specifications at the job site at all times.
- All sewer mains shall be PVC SDR-35 (ASTM 3034) unless otherwise noted.
- All sewer mains shall be laid to grade utilizing a pipe laser.
- All service line connections to new mains shall be accomplished with full body wyes or tees. Tapping saddles will not be allowed.
- Service line connections to existing non-PVC mains shall be accomplished using "Inserta Tees" manufactured by Fowler Manufacturing Company of Hillsboro, Oregon. For existing PVC mains, tapping saddles shall be used.
- 4 inch services shall not be connected directly into manholes. All 6 inch services shall be connected to the main at a manhole.
- The contractor shall notify the City Inspector 48 hours prior to commencement of construction.
- The contractor is responsible for all required sewer line testing to be completed in the presence of the engineer or his representative. Pressure testing will be performed after installation of dry utilities, after all compaction of street subgrade and prior to street paving. Final lamping will also be accomplished after paving is completed. These tests shall be the minimum basis of acceptance of the sewer line extension.
- The contractor shall obtain City of Glenwood Springs street cut permit for all work within existing city right-of-way prior to construction.
- A clay cut-off wall shall be placed 10 feet upstream from all new manholes unless otherwise noted. The cut-off wall shall extend from 6 inches below to 6 inches above granular backfill material and shall be 2 feet wide. If native material is not suitable, the contractor shall import material approved by the engineer.
- Sewer service stub outs shall be capped and plugged. Stub out shall be marked with a 4x4 inch post painted green buried with 3 feet above grade. As-built surveying for vertical grade of stub out required prior to backfill.
- Red line as-builts shall be submitted to the City Development Engineer at least 72 hours prior to paving for review.
- The City of Glenwood Springs may require tracer wires for pipes and additional sanitary sewer clean-outs. Contractor is to follow the City's Standard Contract Documents.
- Contact City Staff at least 48 hours prior to construction.

WATERLINE CONSTRUCTION NOTES

- All water line construction shall be in accordance with the City of Glenwood Springs Standards and Specifications.
- Contractor shall notify the City 48 hours PRIOR to the beginning of construction.
- All trenches shall be compacted according to the recommendations in the Geotechnical Report. Contractor shall be required to perform all compaction tests through a certified soils lab.
- Minimum cover required over top of new waterlines is 4'-6" (54 inches).
- All water mains to be DR-18 PVC conforming to AWWA C-900.
- All water mains are to be bedded per City of Glenwood Springs Standards.
- All service connections to be 3/4 inch Type "K" copper, unless specified otherwise.
- Ductile iron fittings to conform to AWWA C-110.
- Fire Hydrants shall conform to AWWA C-502.
- All materials, labor and equipment required for testing and disinfection of waterlines shall be furnished by Contractor. Disinfection of waterlines shall conform to City Standards.
- All pipe bends/angle points, both horizontal and vertical, as called for on the plans are to be thrust blocked per the City Details and Technical Specifications.
- Only material on which a proctor test can be performed and accurate nuclear density tests can be run are approved for waterline trench backfill unless otherwise approved by the Engineer.
- All water meter pits shall be located on opposite lot side of dry utility transformers and pedestals. There shall be no dry utility transformers/pedestals located within five feet of any fire hydrant. These are utility/customer/consumer safety issues.
- No privacy fences are to be allowed to enclose meter pits or fire hydrants located within streets & road ROWs and multi-purpose easements.

STORM DRAIN CONSTRUCTION NOTES

- All Reinforced Concrete storm drain pipe shall conform to ASTM Standard Specifications, C-76, Class III unless otherwise noted.
- All polyvinyl chloride (PVC) pipe and fittings shall conform to ASTM Standard Specifications, D3034 and F679, SDR-35 unless otherwise noted.
- All High Density Polyethylene (HDPE) pipe and fittings to conform to the following:
 - 12 inch to 36 inch shall meet ASSHTO M294, and
 - 42 inch to 48 inch shall meet ASSHTO MP6.
- All 30 inch and larger HDPE pipe shall be covered to top of pipe with Class 6 base course.



01 T-Lock Detail
SCALE: N.T.S.

PROJECT NUMBER

1458-003

DRAWN BY

BMS

DATE

12/27/2018

REVISIONS

REV

DESCRIPTION

DATE

BOULDER ASSOCIATES

ARCHITECTS

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RIVER CITY CONSULTANTS
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Grand Junction, CO 81506
Phone: 970.241.4172
Fax: 970.241.5841
www.rcwva.com

PROJECT

Glenwood Springs

ADDRESS

WULFSOHN ROAD
GLENWOOD MEADOWS LOT 14
GLENWOOD SPRINGS, CO 81601

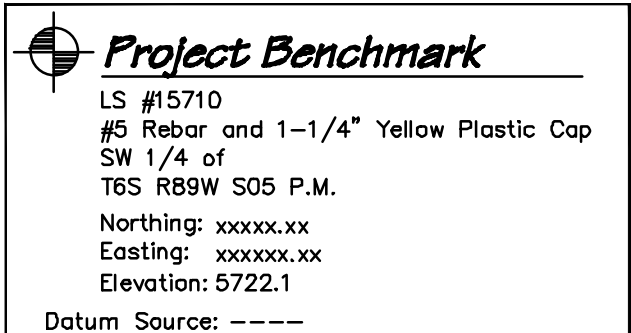
SITE/ARCHITECTURAL PLAN REVIEW

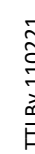
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Legend

SHEET NUMBER

C001





SHEET NUMBER

C002

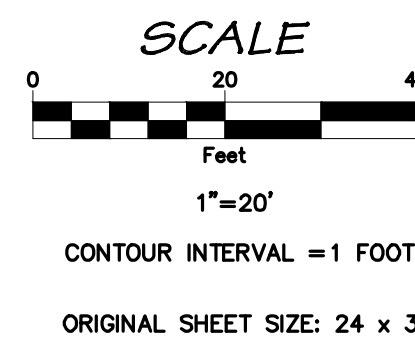
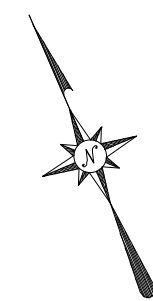
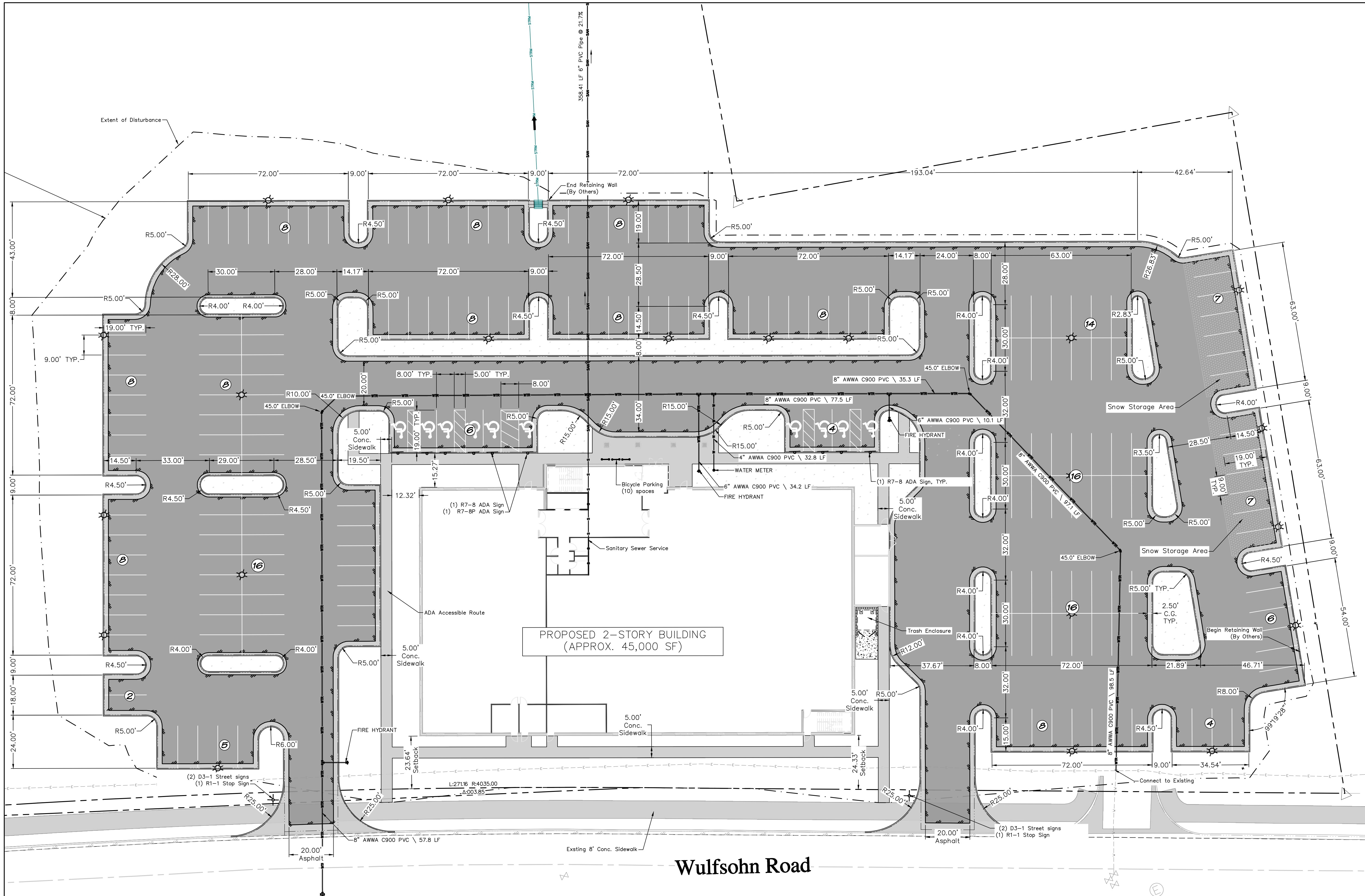
PRELIMINARY

<i>SITE BREAKDOWN</i>		
Undisturbed	6.484 ac	64.9 %
Impervious-Parking	1.870 ac	18.7 %
Impervious-Building	1.030 ac	10.3 %
Pervious-Landscaping	0.600 ac	6.0 %
Total	9.984 ac	100.0 %

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TTLW:110221



Project Benchmark

LS #15710
#5 Rebar and 1-1/4" Yellow Plastic Cap
SW 1/4 of
T6S R89W S05 P.M.
Northing: xxxxxx.xx
Easting: xxxxxx.xx
Elevation: 5722.1
Datum Source: ----

PARKING BREAKDOWN			
Standard Spaces Required	150	Standard Spaces Provided	173
ADA Spaces Required	6	ADA Spaces Provided	10
Total Required	156	Total Provided	183



Signs

NTS



NOTES:

- Utilities shall comply with the City of Glenwood Springs Standards and respective utility provider standards.

PROJECT NUMBER
1458-003

DRAWN BY
BMS

DATE
12/26/2018

REVISIONS

REV	DESCRIPTION	DATE
-----	-------------	------

BOULDER ASSOCIATES

ARCHITECTS

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www.boulderassociates.com



PROJECT
Glenwood Springs

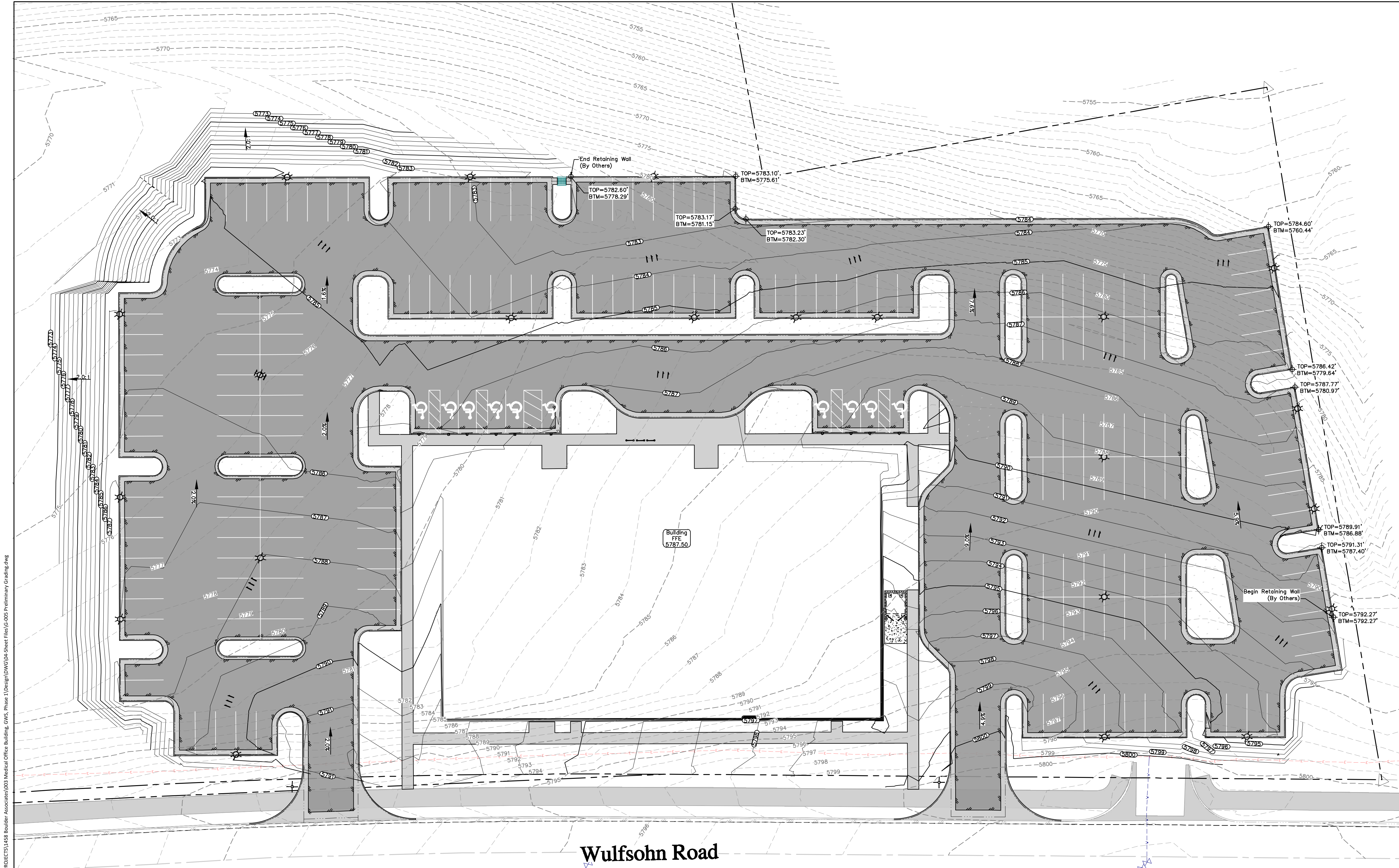
ADDRESS
WULFSOHN ROAD
GLENWOOD MEADOWS LOT 14
GLENWOOD SPRINGS, CO 81601

SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
Preliminary Site Plan

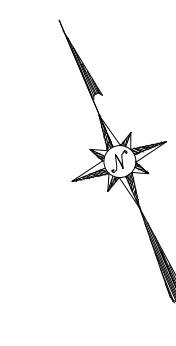
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C003



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811
UNCC
Know what's below.
Call before you dig.
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



SCALE
0 20 40
Feet
1"=20'
CONTOUR INTERVAL = 1 FOOT
ORIGINAL SHEET SIZE: 24 x 36

Project Benchmark
LS #15710
#5 Rebar and 1-1/4" Yellow Plastic Cap
SW 1/4 of
T6S R89W S05 P.M.
Northing: xxxxxx.xx
Easting: xxxxxx.xx
Elevation: 5722.1
Datum Source: ----

PROJECT NUMBER
1458-003

DRAWN BY
BMS

DATE
12/27/2018

REVISIONS
REV. DESCRIPTION DATE

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PROJECT
Glenwood Springs

ADDRESS
WULFSOHN ROAD
GLENWOOD MEADOWS LOT 14
GLENWOOD SPRINGS, CO 81601

SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
Preliminary Grading Plan

SHEET NUMBER
C004

PRELIMINARY

GENERAL NOTES

1. THESE PLANS SHALL NOT BE UTILIZED FOR CONSTRUCTION OR PERMITTING UNLESS STATED FOR SUCH USE IN THE TITLE BLOCK.
2. SIGHT TRIANGLES AND SIGHT LINES SHALL REMAIN UNOBSTRUCTED BY EQUIPMENT, CONSTRUCTION MATERIALS, PLANT MATERIAL OR ANY OTHER VISUAL OBSTACLE DURING THE CONTRACT PERIOD AND AT MATURITY OF PLANTS PER LOCAL JURISDICTIONAL REQUIREMENTS. NO PLANT MATERIAL OTHER THAN GROUND COVER IS ALLOWED TO BE PLANTED ADJACENT TO FIRE HYDRANTS AS STIPULATED BY JURISDICTIONAL REQUIREMENTS.
3. SIGHT TRIANGLES SHALL REMAIN UNOBSTRUCTED BY PLANT MATERIAL, OR ANY OTHER VISUAL OBSTACLE, OVER 30" IN HEIGHT.
4. LOCAL, STATE AND FEDERAL JURISDICTIONAL REQUIREMENTS, RESTRICTIONS OR PROCEDURES SHALL SUPERSEDE THESE PLANS, NOTES AND SPECIFICATIONS WHEN MORE STRINGENT. NOTIFY THE OWNER'S REPRESENTATIVE IF CONFLICTS OCCUR.
5. THIS SHEET SET IS PREPARED WITH INFORMATION SUFFICIENT FOR CITY OF GLENWOOD SPRINGS SITE PLAN APPROVAL AND MAY NOT BE SUFFICIENT FOR CONSTRUCTION BIDDING OR AS CONSTRUCTION DOCUMENTS. IT IS RECOMMENDED THAT THE CONTRACTOR CONTACT THE OWNER'S REPRESENTATIVE FOR ADDITIONAL INFORMATION.

LANDSCAPE NOTES

1. ALL LANDSCAPED AREAS ARE TO RECEIVE ORGANIC SOIL PREPARATION AT 3.5 cu.yrds/1,000sf.
2. ALL UTILITY EASEMENTS SHALL REMAIN UNOBSTRUCTED AND FULLY ACCESSIBLE ALONG THEIR ENTIRE LENGTH FOR THE MAINTENANCE EQUIPMENT ENTRY.
3. THE OWNER/DEVELOPER, HIS SUCCESSORS AND ASSIGNS, SHALL BE RESPONSIBLE FOR INSTALLATION, MAINTENANCE AND REPLACEMENT OF ALL LANDSCAPING MATERIALS SHOWN OR INDICATED ON THE APPROVED SITE PLAN OR LANDSCAPE PLAN ON FILE IN THE PLANNING DEPARTMENT. ALL LANDSCAPING WILL BE INSTALLED AS DELINEATED ON THE PLAN, PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY.
4. ALL LANDSCAPED AREAS AND PLANT MATERIAL, EXCEPT FOR NON-IRRIGATED NATIVE, RESTORATIVE AND DRYLAND GRASS AREAS SHALL BE WATERED BY AN AUTOMATIC UNDERGROUND IRRIGATION SYSTEM.
5. LANDSCAPE MATERIAL PLACEMENT SHALL NOT BE PLACED OR KEPT NEAR FIRE HYDRANTS, FIRE DEPARTMENT INLET CONNECTIONS OR FIRE PROTECTION CONTROL VALVES IN A MANNER THAT WOULD PREVENT SUCH EQUIPMENT OR FIRE HYDRANTS FROM BEING IMMEDIATELY DISCERNABLE. THE FIRE DEPARTMENT SHALL NOT BE DETERRED OR HINDERED FROM GAINING IMMEDIATE ACCESS TO FIRE PROTECTION EQUIPMENT OR HYDRANTS.
6. A 5-FOOT CLEAR SPACE SHALL BE MAINTAINED AROUND THE CIRCUMFERENCE OF FIRE HYDRANTS.
7. LANDSCAPING MATERIAL SHOWN WITHIN THE SITE PLAN CANNOT ENCROACH INTO ROADWAYS THAT ARE DEDICATED (OR DESIGNATED) AS FIRE LANE EASEMENTS (OR CORRIDORS).
8. SHRUB BEDS SHALL BE MULCHED WITH 3" DEPTH OF SHREDDED WOOD MULCH. FOR AREAS SPECIFIED AS COBBLE, USE 3"-4" LOCAL RIVER ROCK. WEED BARRIER IS REQUIRED UNDER COBBLE AND RIVER ROCK MULCH. AREAS OF PERENNIALS AND ANNUALS TO BE MULCHED WITH 3" DEPTH OF GORILLA HAIR SHREDDED MULCH WITH NO WEED BARRIER NECESSARY.
9. SIGHT TRIANGLES SHALL REMAIN UNOBSTRUCTED BY PLANT MATERIAL, OR ANY OTHER VISUAL OBSTACLE, OVER 30" IN HEIGHT.

PLANTING SCHEDULE

QTY.	SYM.	COMMON NAME	BOTANICAL NAME	SIZE & COND.
DECIDUOUS TREES (76)				
		RED MAPLE	ACER RUBRUM	3" CAL, B&B
		COMMON HACKBERRY	CELTIS OCCIDENTALIS	3" CAL, B&B
		THORNLESS HONEYLOCUST	GLEDISTSIA TRIACANTHOS INERMIS	3" CAL, B&B
		AMUR MAPLE	ACER GINNALA	2" CAL, B&B
		SHADBLOW SERVICEBERRY	ARNELANCHIER CANADENSIS	2" CAL, B&B
		WASHINGTON HAWTHORNE	CRATEGUS PHAENOPHYRUM	2" CAL, B&B
		NEWPORT PLUM	PRUNUS CERASIFERA 'NEWPORT'	2" CAL, B&B
		CALLERY PEAR	PYRUS CALLERYANA	2" CAL, B&B
EVERGREEN TREES (9)				
		AUSTRIAN PINE	PINUS NIGRA	6' HT. MIN., B&B
		COLORADO BLUE SPRUCE	PICEA PUNGENS	6' HT. MIN., B&B
EVERGREEN SHRUBS (26)				
		ARMSTRONG JUNIPER	JUNIPER CHINENSIS 'ARMSTRONG'	#5 CONT.
		SEA GREEN JUNIPER	JUNIPEROUS HORIZONTALIS 'WILTONII'	#5 CONT.
		BLUE STAR JUNIPER	JUNPEROUS SQUAMATA "BLUE STAR"	#5 CONT.
		MUGO PINE	PINUS MUGO	#5 CONT.
DECIDUOUS SHRUBS (680)				
		PEKING COTONEASTER	COTONEASTER LUCIDUS	#5 CONT.
		BLUE MIST SPIREA	CARYOPTERIS CLANDENOSIS	#5 CONT.
		MOUNTAIN NINEBARK	PHYSOCARPUS MONOGYNUS	#5 CONT.
		BARBERRY	BERBERIS THUNBERGII ATROPURPEA	#5 CONT.
		BUTTERFLY BUSH	BUDDLEIA	#5 CONT.
		DOGWOOD	CORNUS SERICEA	#5 CONT.
		HONEYSUCKLE	LONICERA SPP.	#5 CONT.
		FORSYTHIA, SPRING GLORY	FORSTHIA INTERMEDIA 'SPRING GLORY'	#5 CONT.

LANDSCAPE CALCULATIONS

SITE CALCULATIONS		
	AREA	PERCENTAGE
LIMITS OF DISTURBANCE	149,200 SF	
IMPERVIOUS/LOT COVERAGE	110,815	74%
TOTAL LANDSCAPE AREA	38,420 SF	26%
OPEN SPACE LANDSCAPE	26,390 SF	
PARKING LANDSCAPE	7,530 SF	
STREETSCAPE	4,500 SF	

LANDSCAPE REQUIREMENTS		
TOTAL LANDSCAPE AREA	30,890 SF	
	REQUIRED	PROVIDED
1 TREE / 400 SF	78	30
1 SHRUB / 25 SF	1,236	341
1 PERENNIAL / 5 SF	6,178	1,200

STREET TREES		
STREETSCAPE (LF)	508 LF (4,500 SF)	
	REQUIRED	PROVIDED
1 TREE / 35 LF	15	14

PARKING LOT LANDSCAPE	
PARKING LANDSCAPE ISLANDS	7,530 SF

		REQUIRED		PROVIDED	
		TREES	SHRUBS	TREES	SHRUBS
SINGLE LOADED (1TREE/5 SHRUBS)	12 ISLANDS	12	60		
DOUBLE LOADED (2TREE/5 SHRUBS)	9 ISLANDS	18	45		
TOTAL		30	105	41	365

SUMMARY						
	TREES REQUIRED	TREES PROVIDED	SHRUBS REQUIRED	SHRUBS PROVIDED	PERENNIALS REQUIRED	PERENNIALS PROVIDED
LANDSCAPE	78	30	1236	341	6,178	1,200
STREETSCAPE	15	14	0	0	0	0
PARKING LOT	30	41	105	365	0	0
TOTAL	127	85	1,642	706	6,178	1,200

SHEET INDEX

- L100 LANDSCAPE NOTES
L200 LANDSCAPE PLAN
L300 LANDSCAPE DETAILS

PROJECT NUMBER
184101.00

DRAWN BY
NORRIS DESIGN
K. KRAMER / B. RICE

DATE
01/01/2019

REVISIONS	DESCRIPTION	DATE



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P 303.892.1166
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PROJECT
GLENWOOD SPRINGS

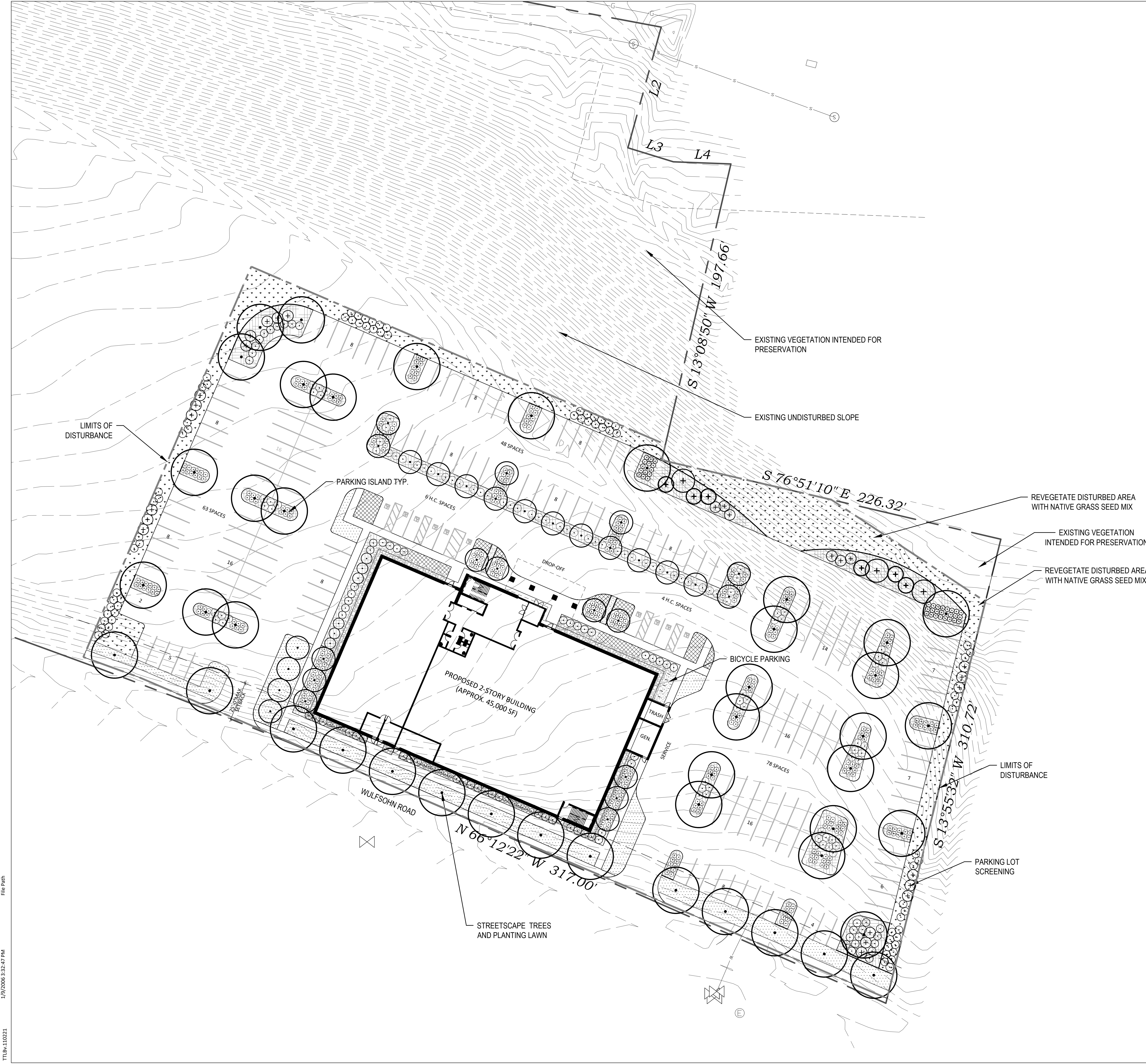
WULFSOHN ROAD,
GLENWOOD MEADOWS LOT 14
GLENWOOD SPRINGS, CO 81601

SITE/
ARCHITECTURAL
PLAN REVIEW

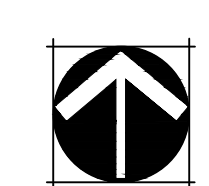
SHEET TITLE
LANDSCAPE
NOTES

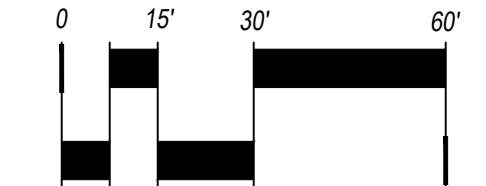
SHEET NUMBER
L100

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION



- LEGEND**
- DECIDUOUS TREES (REFER DETAIL 1/L300)
 - EVERGREEN TREES (REFER DETAIL 1/L300)
 - SHRUBS (REFER DETAIL 2/L300)
 - EDGER
 - LIMIT OF DISTURBANCE
 - PERENNIAL BED (REFER DETAIL 3/L300)
 - SOD
 - COBBLE DRIP EDGE
 - NATIVE SEED
 - CRUSHER FINE PATH
 - LANDSCAPE BED
 - BICYCLE RACKS (5 RACKS / CAPACITY OF 10 BIKES)


NORTH


SCALE: 1" = 30'

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION

PROJECT NUMBER
184101.00

DRAWN BY
NORRIS DESIGN
K. KRAMER / B. RICE

DATE
01/01/2019

REVISIONS	DESCRIPTION	DATE
REV		

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PROJECT
GLENWOOD SPRINGS

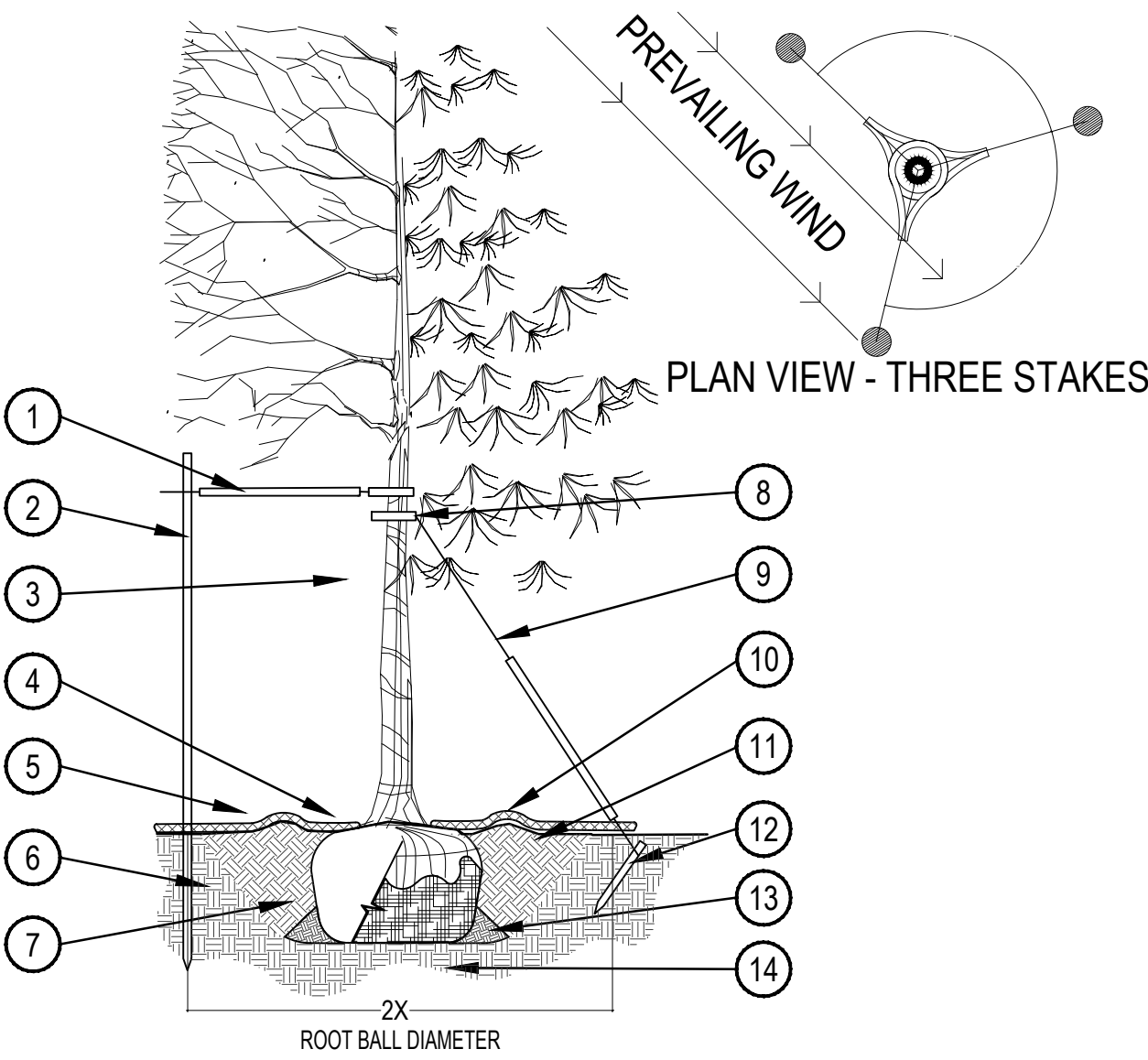
WULFSOHN ROAD,
GLENWOOD MEADOWS LOT 14
GLENWOOD SPRINGS, CO 81601

**SITE/
ARCHITECTURAL
PLAN REVIEW**

SHEET TITLE
**LANDSCAPE
PLAN**

SHEET NUMBER
L200

FILE PATH
1/9/2006 3:32:47 PM
TITLE: L10221

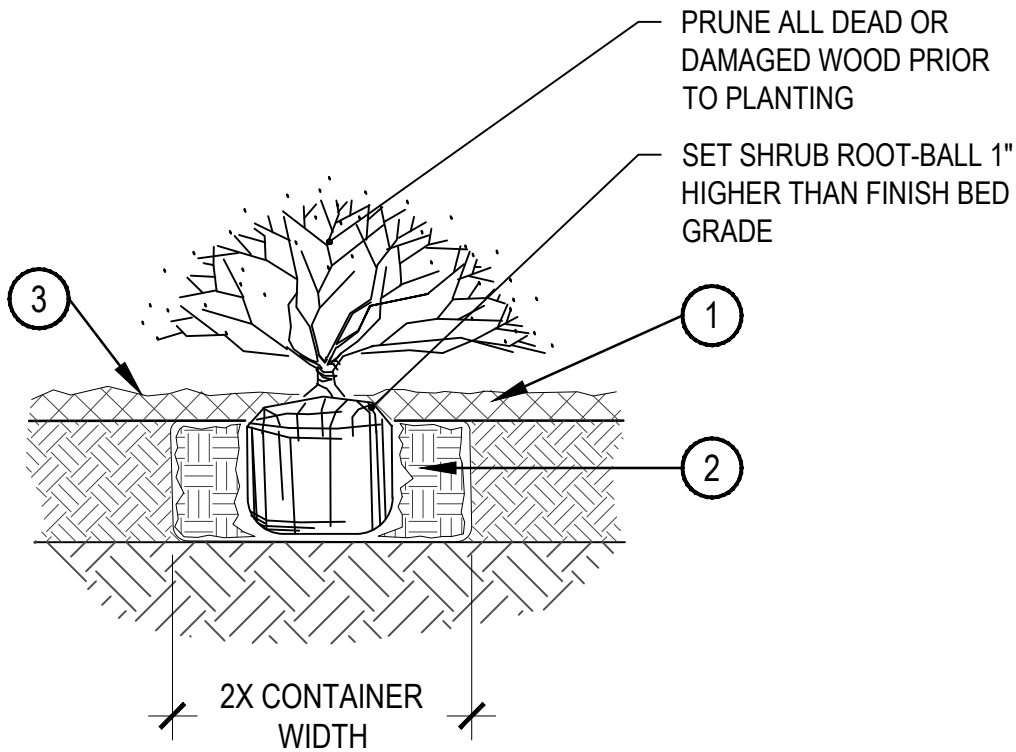


1 TREE PLANTING DETAIL

- PRUNING NOTES:**
- ALL PRUNING SHALL COMPLY WITH ANSI A300 STANDARDS.
 - DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS AND BROKEN BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
- STAKING NOTES:**
- STAKE TREES PER FOLLOWING SCHEDULE, THEN REMOVE AT END OF FIRST GROWING SEASON.
 - 1- $\frac{1}{2}$ " CALIPER SIZE - MIN. 1 STAKE ON SIDE OF PREVAILING WIND (GENERALLY N.W. SIDE)
 - 1- $\frac{1}{2}$ " - 3" CALIPER SIZE - MIN. 2 STAKES - ONE ON N.W. SIDE, ONE ON S.W. SIDE (OR PREVAILING WIND SIDE AND 180° FROM THAT SIDE)
 - 3" CALIPER SIZE AND LARGER - 3 STAKES PER DIAGRAM
 - WIRE OR CABLE SHALL BE MIN. 12 GAUGE, TIGHTEN WIRE OR CABLE ONLY ENOUGH TO KEEP FROM SLIPPING. ALLOW FOR SOME TRUNK MOVEMENT. NYLON STRAPS SHALL BE LONG ENOUGH TO ACCOMMODATE 1- $\frac{1}{2}$ " OF GROWTH AND BUFFER ALL BRANCHES FROM WIRE.

- PLACE MIN. $\frac{1}{2}$ " PVC PIPE AROUND EACH WIRE. EXPOSED WIRE SHALL BE MAX. 2" EACH SIDE
- 6 FT. UNTREATED WOOD POST (MIN. 1.5" DIAMETER). ALL SHALL BE DRIVEN OUTSIDE ROOTBALL AND IN UNDISTURBED SOIL.
- TREE WRAP TO BE INSTALLED ONLY FROM OCTOBER 1 THROUGH APRIL 30. (DECIDUOUS ONLY)
- PLANT TREE SO THAT FIRST ORDER MAJOR ROOT IS 1"-2" ABOVE FINAL GRADE.
- 3" DEEP MULCH RING PLACED A MINIMUM OF 4 FT. IN DIAMETER. DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK (FINISHED GRADE REFERENCES TOP OF MULCH).
- 1:1 SLOPE ON SIDES OF PLANTING HOLE.
- REMOVE ALL TWINE, ROPE, BURLAP AND WIRE FROM ENTIRE ROOT BALL AND TRUNK
- GROMMETED NYLON STRAPS
- GALVANIZED WIRE, MIN. 12 GAUGE CABLE - TWIST WIRE ONLY TO KEEP FROM SLIPPING.
- 4-6" HIGH WATER SAUCER IN NON-TURF AREAS.
- BACKFILL WITH BLEND OF EXISTING SOIL AND A MAXIMUM 20% (BY VOLUME) ORGANIC MATERIAL. WATER THOROUGHLY WHEN BACKFILLING
- 2 FT. STEEL T-POST. ALL SHALL BE DRIVEN BELOW GRADE AND OUTSIDE ROOTBALL IN UNDISTURBED SOIL.
- PLACE SOIL AROUND ROOT BALL FIRMLY, DO NOT COMPACT OR TAMP. SETTLE SOIL WITH WATER TO FILL ALL AIR POCKETS.
- PLACE ROOT BALL ON UNDISTURBED SOIL TO PREVENT SETTLEMENT.

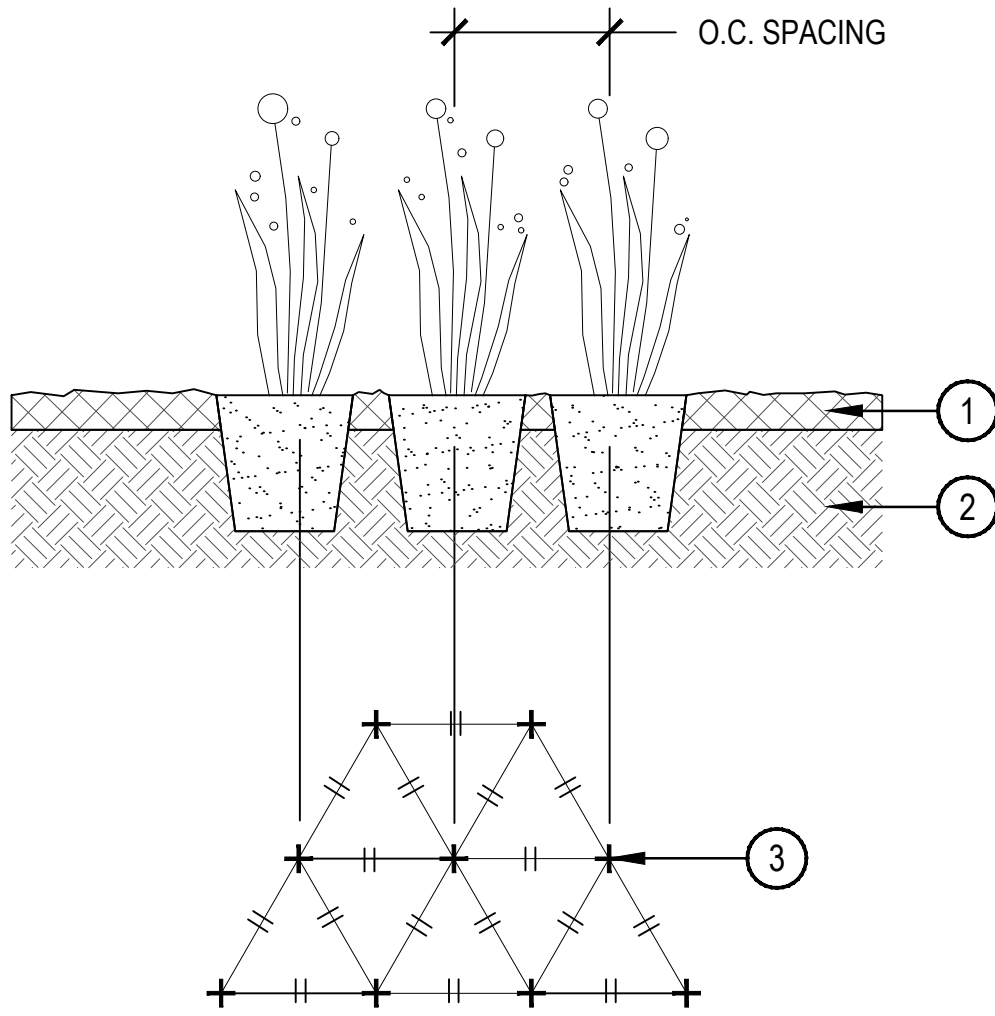
SCALE: 3/16" = 1'-0"



2 SHRUB PLANTING

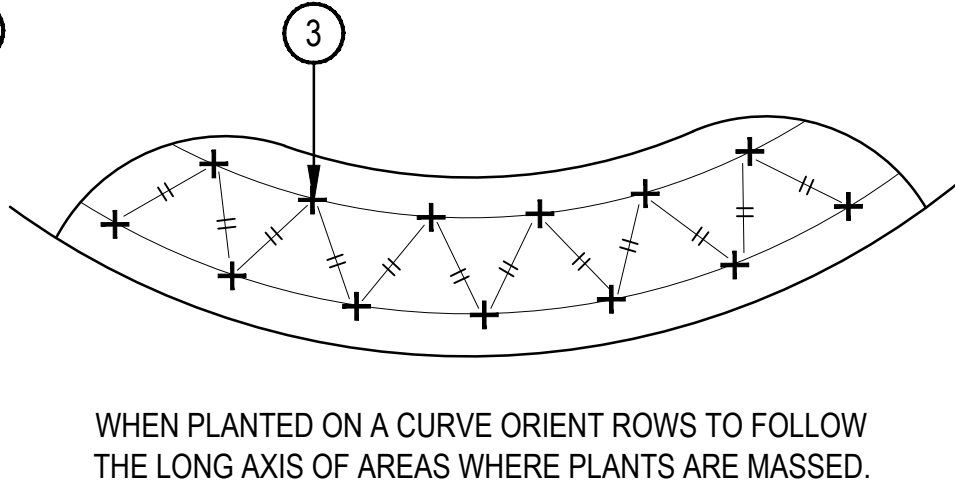
- SPECIFIED MULCH
- AMENDED SOIL IN PLANTING BED PER SPECIFICATIONS. TILL SOIL TO A DEPTH OF EIGHT INCHES.
- FINISH GRADE (TOP OF MULCH)

- NOTE:**
- BROKEN OR CRUMBLING ROOT-BALLS WILL BE REJECTED
 - CARE SHOULD BE TAKEN NOT TO DAMAGE THE SHRUB OR ROOT-BALL WHEN REMOVING IT FROM ITS CONTAINER
 - ALL JUNIPERS SHOULD BE PLANTED SO THE TOP OF THE ROOT-BALL OCCURS ABOVE THE FINISH GRADE OF THE MULCH LAYER
 - DIG PLANT PIT TWICE AS WIDE AND HIGH AS THE CONTAINER



3 PERENNIAL PLANT LAYOUT

- SPECIFIED MULCH
- AMENDED PLANTING BED TILLED TO A DEPTH OF 6"
- CENTER OF PLANT



WHEN PLANTED ON A CURVE ORIENT ROWS TO FOLLOW THE LONG AXIS OF AREAS WHERE PLANTS ARE MASSES.

SCALE: 1" = 1'-0"

PROJECT NUMBER
184101.00

DRAWN BY
NORRIS DESIGN
K. KRAMER / B. RICE

DATE
01/01/2019

REVISIONS

REV	DESCRIPTION	DATE
-----	-------------	------

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PROJECT
GLENWOOD SPRINGS

WULFSOHN ROAD,
GLENWOOD MEADOWS LOT 14
GLENWOOD SPRINGS, CO 81601

SITE/
ARCHITECTURAL
PLAN REVIEW

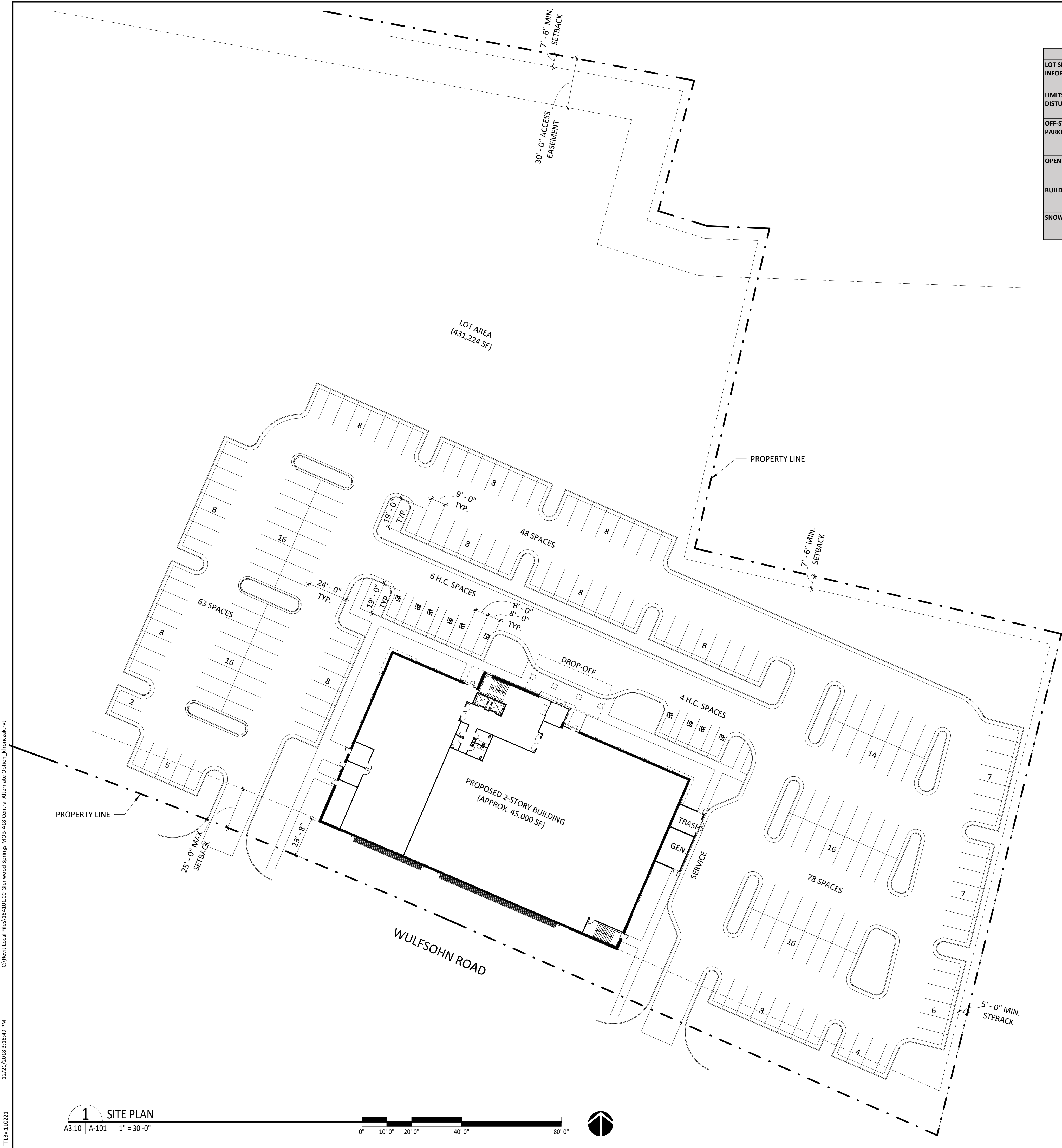
SHEET TITLE
LANDSCAPE DETAILS

SHEET NUMBER

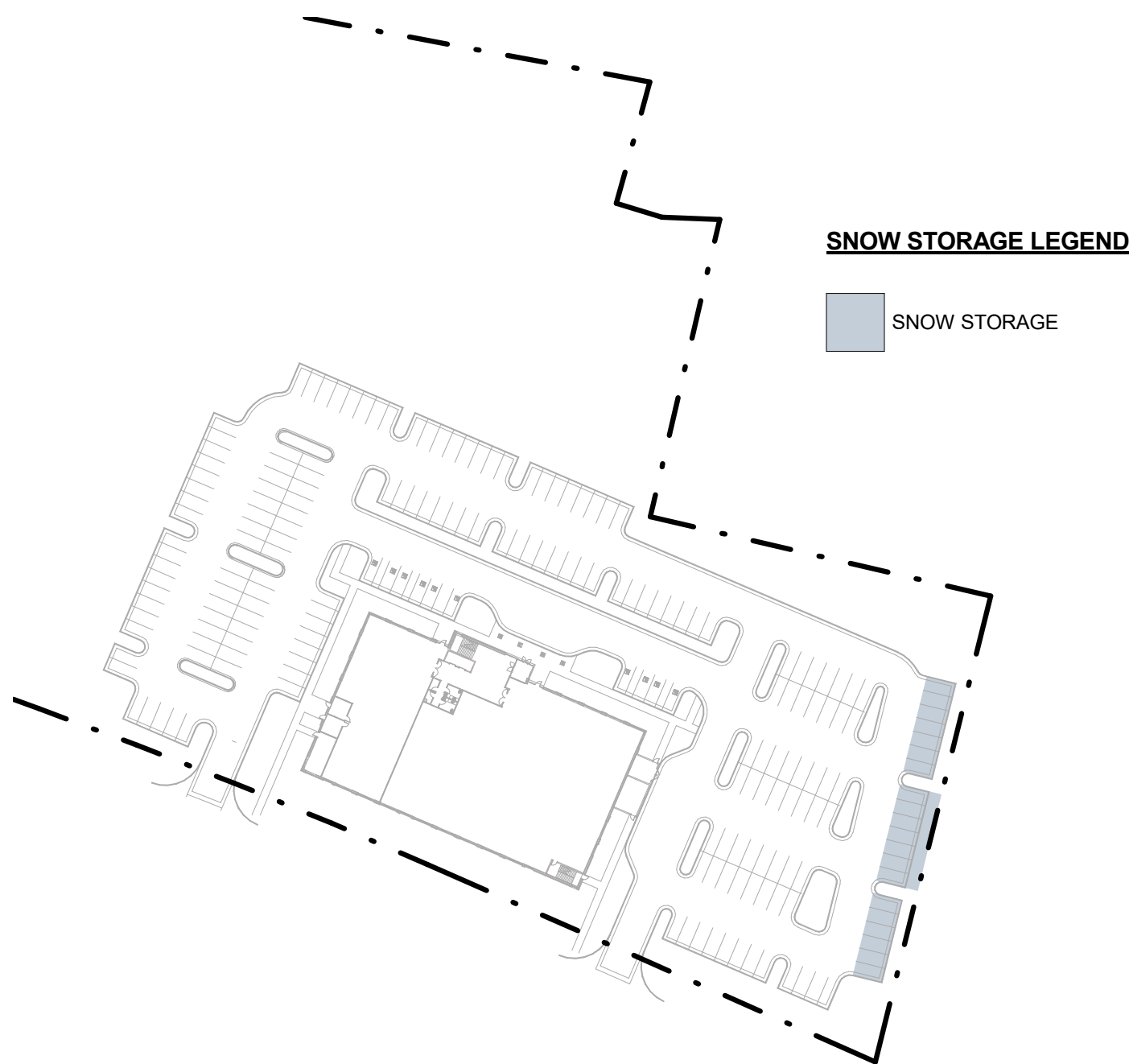
L300

PRELIMINARY DRAWING
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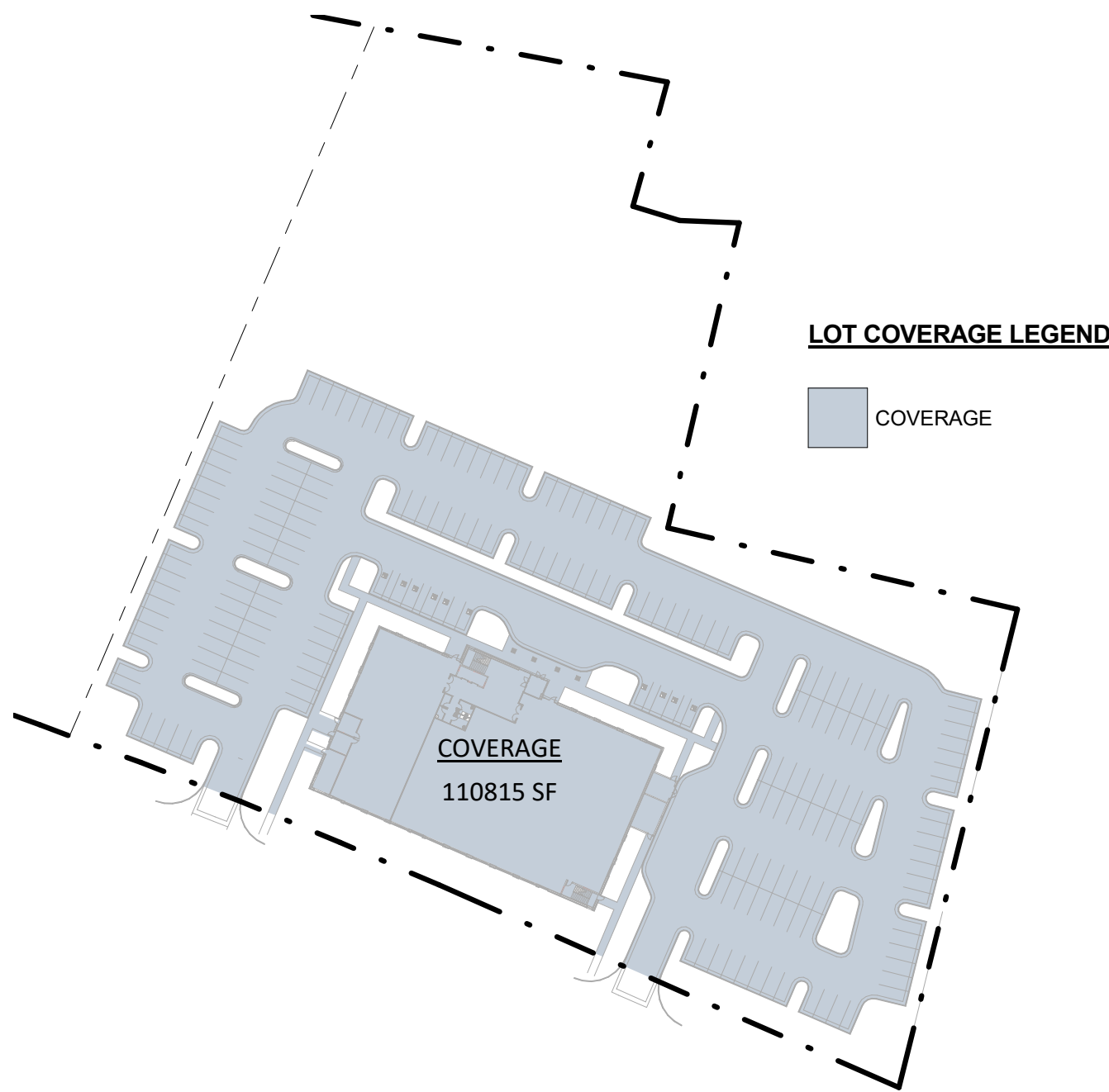
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12/21/2018 3:18:49 PM
TLBx-110221



PROJECT DESCRIPTION					
LOT SIZE INFORMATION	ACRES	SQUARE FEET	LOT COVERAGE	EXISTING (SQFT & %)	PROPOSED (SQFT) (%)
	9.9	431,224		N/A	110,815 25.7%
LIMITS OF DISTURBANCE	EXISTING (SQFT & %)	PROPOSED (SQFT & %)	AVERAGE SLOPE WITHIN LIMITS OF DISTURBANCE	PERCENTAGE (%)	
	N/A	149,235			
OFF-STREET PARKING SPACES	REQUIRED # VEHICLE...	PROPOSED # VEHICLE...	BICYCLE PARKING	REQUIRED # SPACES	PROPOSED # SPACES
	174	189 (STANDARD) 10 (HANDICAP) 199 (TOTAL)		10	10
OPEN SPACE	REQUIRED (SQFT & %)	PROPOSED (SQFT & %)	NON-RESIDENTIAL USES	TYPE OF USE	GROSS FLOOR AREA (SQFT ...)
	22,385	23,000		MULTI-USE	43,333
BUILDING HEIGHT	MAX	PROPOSED	TOTAL LANDSCAPED AREA	EXISTING (SQFT & %)	PROPOSED (SQFT) (%)
	40'-0"	35'-0"		N/A	38,420 8.9%
SNOW STORAGE	REQUIRED (SQFT)	PROPOSED (SQFT)	TOTAL IMPERVIOUS AREA	EXISTING (SQFT & %)	PROPOSED (SQFT) (%)
	NO MINIMUM	4,084 (20 PARKING SPACES)		N/A	110,815 25.7%



SNOW STORAGE DIAGRAM



LOT COVERAGE DIAGRAM

PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS
REV DESCRIPTION DATE

BOULDER ASSOCIATES

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PROJECT
GLENWOOD SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

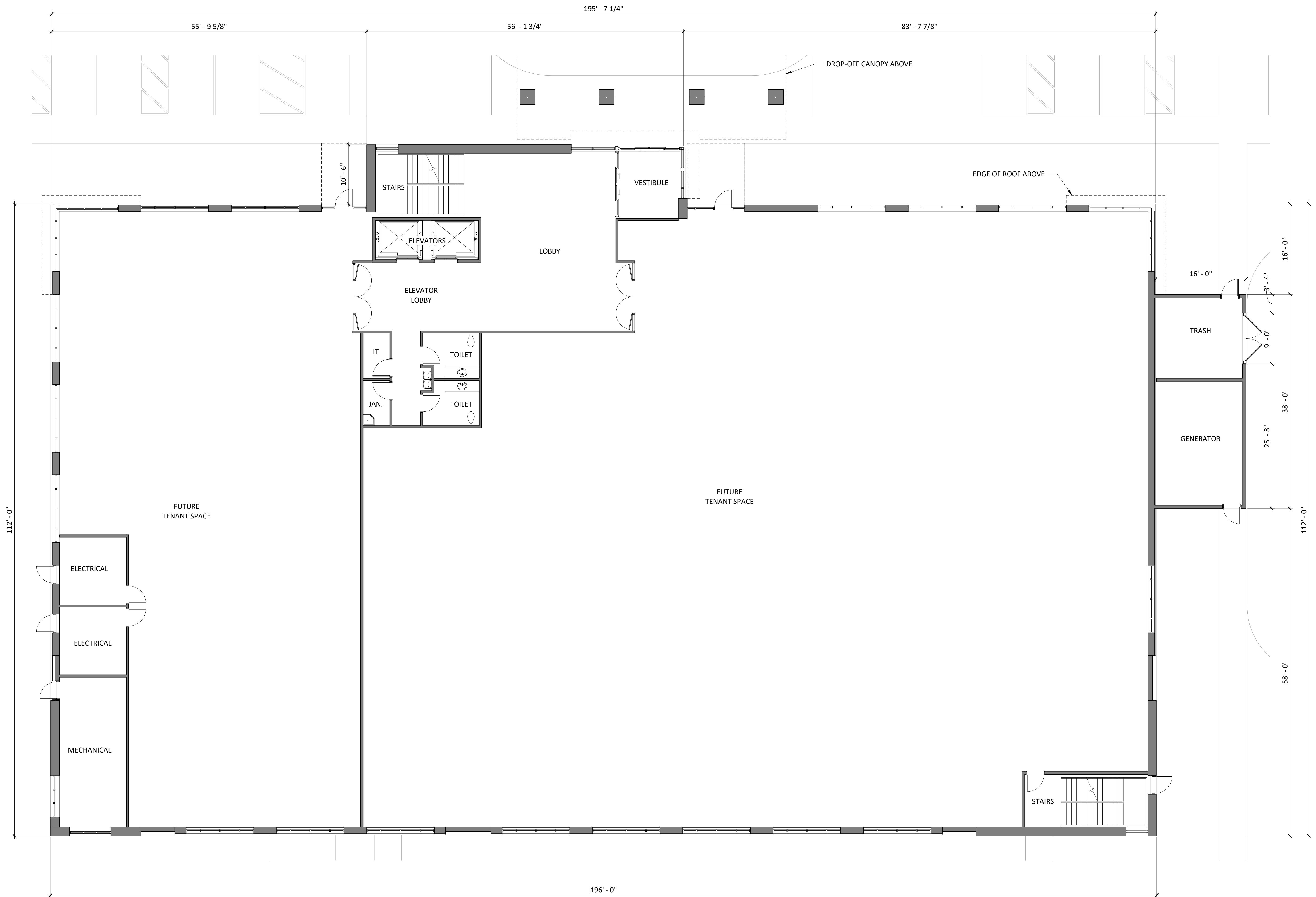
SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
ARCHITECTURAL SITE PLAN

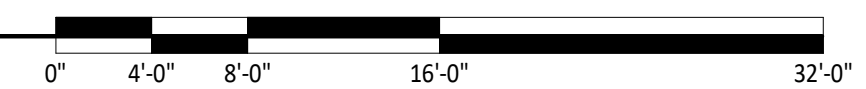
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A-101

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1 FIRST FLOOR PLAN
A3.10 | A-201 1/8" = 1'-0"



PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS	DESCRIPTION	DATE
REV		

PROPERTY DESCRIPTION
Lot 14, Glenwood Meadows No. 2
A Parcel of Land Situate in the SW 1/4
of Section 5, Township 6 South,
Range 89 West of the 6th P.M.
City of Glenwood Springs,
County of Garfield, State of Colorado

**BOULDER
ASSOCIATES**

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ben.ganther@boldt.com

PROJECT
**GLENWOOD
SPRINGS**

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

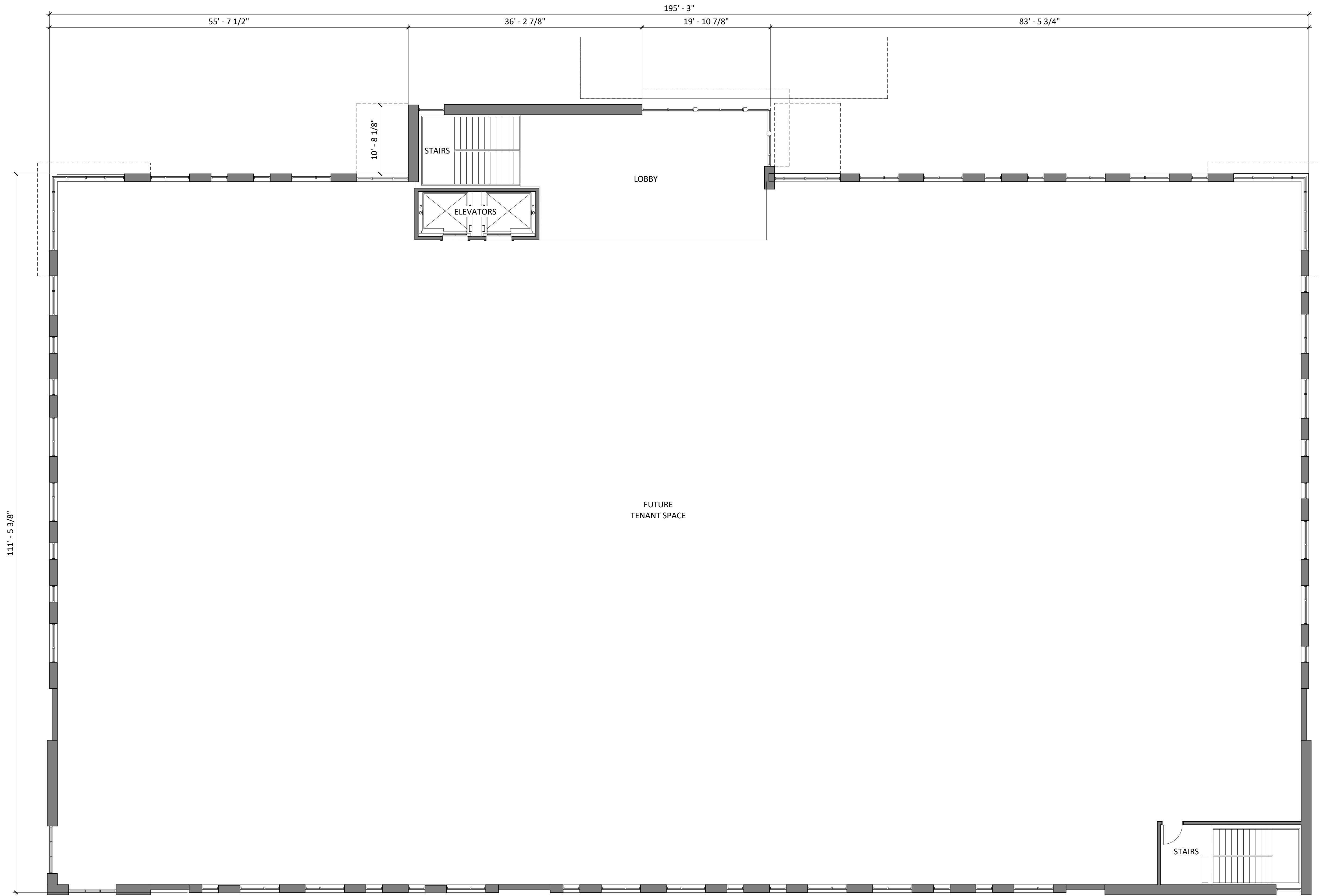
SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
FIRST FLOOR PLAN

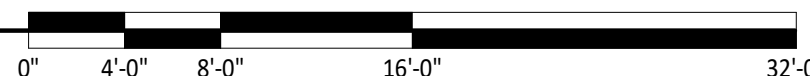
SHEET NUMBER

A-201

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1 SECOND FLOOR PLAN
A3.10 | A-202 1/8" = 1'-0"



PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS	DESCRIPTION	DATE
REV		

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PROJECT
GLENWOOD
SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

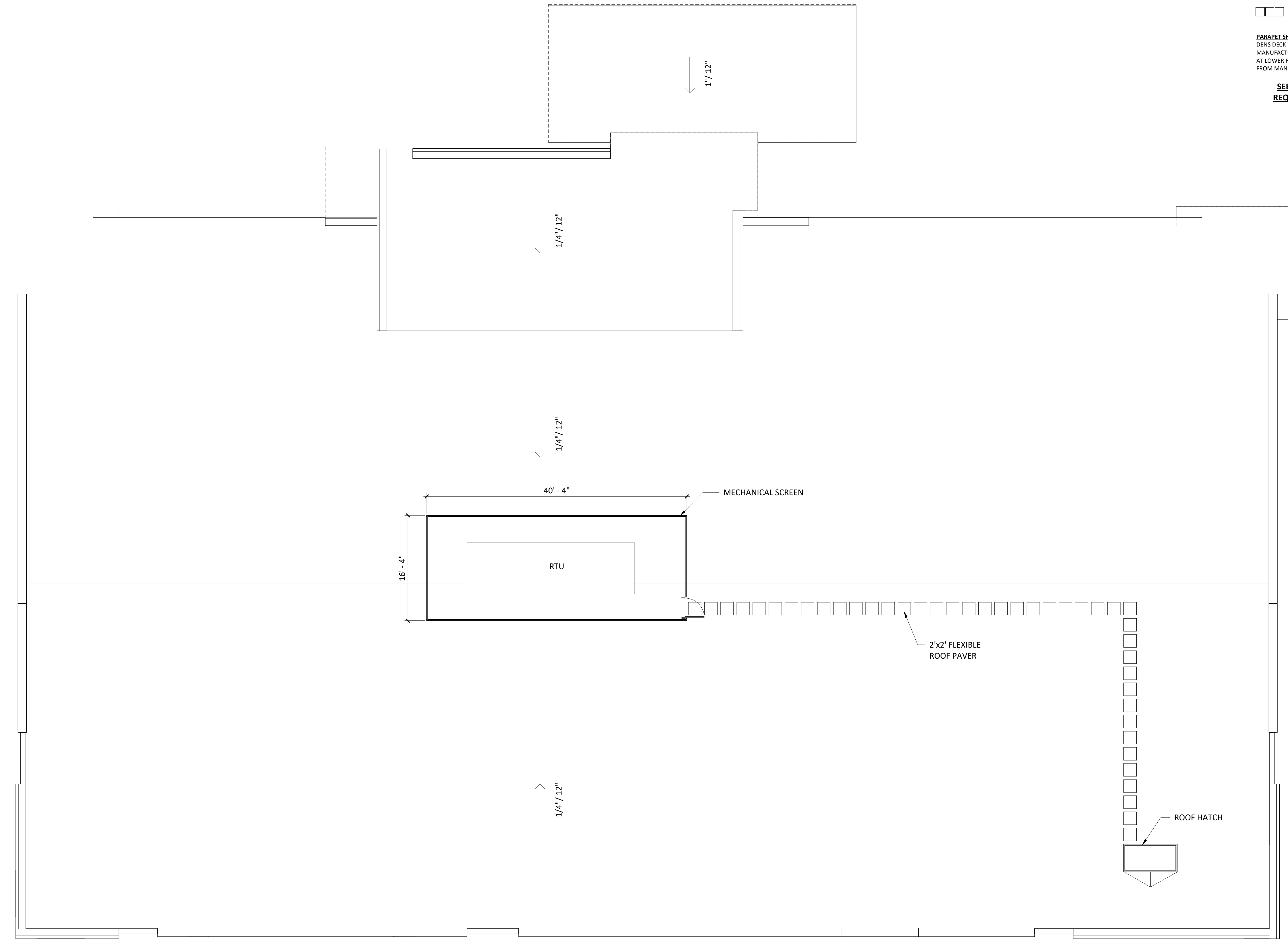
SITE/
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
SECOND FLOOR PLAN

SHEET NUMBER

A-202

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ROOF PLAN LEGEND

- MEMBRANE ROOF SYSTEM**
FULLY ADHERED, 60 MIL UNREINFORCED WHITE EPDM OVER 5/8" COVER BOARD OVER MINIMUM R-30 RIGID INSULATION OVER METAL DECK, SEE STRUCTURAL, SEE ALSO BACK OF PARAPET SHEATHING BOARD
- TAPERED INSULATION, SLOPE @ 1/4" PER FOOT, SEE ARROWS FOR SLOPE DIRECTION. TAPER UP FROM MINIMUM R-30 INSULATION.
- EPDM ROOF PAVER

PARAPET SHEATHING BOARD
DENS DECK PRIME W/ METAL STRAP BACKING AS REQUIRED BY MANUFACTURER FOR PULL-OUT RESISTANCE. BACK OF PARAPETS AT LOWER ROOFS TO RECEIVE MANUFACTURER'S PAINT, COLOR TBD FROM MANUFACTURER'S STANDARD RANGE.

SEE SPEC FOR WIND SPEED WARRANTY REQUIREMENTS FOR ALL ROOFING TYPES
V ult = 120 mph
V asd = 93 mph

PROJECT NUMBER

184101.00

DRAWN BY

K. Fronczak

DATE

01/02/19

REVISIONS

REV	DESCRIPTION	DATE
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PROPERTY DESCRIPTION

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A Parcel of Land Situate in the SW 1/4 of Section 5, Township 6 South, Range 89 West of the 6th P.M.
City of Glenwood Springs,
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PROJECT

GLENWOOD SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

SITE/ ARCHITECTURAL PLAN REVIEW

SHEET TITLE

ROOF PLAN

SHEET NUMBER

A-203

1 ROOF PLAN

A-203 1/8" = 1'-0"

0" 4'-0" 8'-0" 16'-0" 32'-0"





EXTERIOR ELEVATION MATERIAL LEGEND

A vertical list of eight material samples, each consisting of a small square swatch and a corresponding label and description to its right. The samples are:

- B1**: BRICK 1 (Dark brown brick)
- B2**: BLOCK/ BRICK 2 (Dark brown brick with a different pattern)
- ST1**: STUCCO 1 (Light brown stucco)
- ST2**: STUCCO 2 (Dark brown stucco)
- S**: STEEL, PAINTED "BRONZE" (Dark brown painted steel)
- MP**: METAL PANEL, "BRONZE" (Dark brown metal panel)
- CS**: CAST-STONE (Light grey cast stone)
- MC**: PREFINISHED METAL COPING (Dark grey metal coping)

A-301

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12/21/2018 3:18:17 PM
TTLbx-110221



EXTERIOR ELEVATION MATERIAL LEGEND

- B1 BRICK 1
- B2 BLOCK/ BRICK 2
- ST1 STUCCO 1
- ST2 STUCCO 2
- S STEEL, PAINTED "BRONZE"
- MP METAL PANEL, "BRONZE"
- CS CAST-STONE
- MC PREFINISHED METAL COPING

NORTH ELEVATION			EAST ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*		SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	6,328	NA	GROSS OF WALL	3,622	NA
STUCCO (NET*)	2,062	32.6%	STUCCO (NET*)	1,658	45.8%
MASONRY (NET*)	1,618	25.6%	MASONRY (NET*)	1,114	17.6%
METAL PANEL (NET*)	587	9.3%	METAL PANEL (NET*)	128	3.5%
GLAZING	2,061	32.6%	GLAZING	722	19.9%

SOUTH ELEVATION			WEST ELEVATION		
	SURFACE AREA	PERCENTAGE OF NET*		SURFACE AREA	PERCENTAGE OF NET*
GROSS OF WALL	6,394	NA	GROSS OF WALL	3,975	NA
STUCCO (NET*)	2,934	45.9%	STUCCO (NET*)	1,596	40.2%
MASONRY (NET*)	1,926	30.1%	MASONRY (NET*)	1,440	36.2%
METAL PANEL (NET*)	161	2.5%	METAL PANEL (NET*)	181	2.9%
GLAZING	1,373	21.5%	GLAZING	758	19.1%

NOTE: 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.

NET* EXCLUDES ROOF FORMS, AWNINGS, AND SIMILAR FEATURES.

PROJECT NUMBER
184101.00

DRAWN BY
K. Fronczak

DATE
01/02/19

REVISIONS
REV DESCRIPTION DATE

PROPERTY DESCRIPTION
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A Parcel of Land Situate in the SW 1/4
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PROJECT
GLENWOOD SPRINGS

LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

SITE/ ARCHITECTURAL PLAN REVIEW

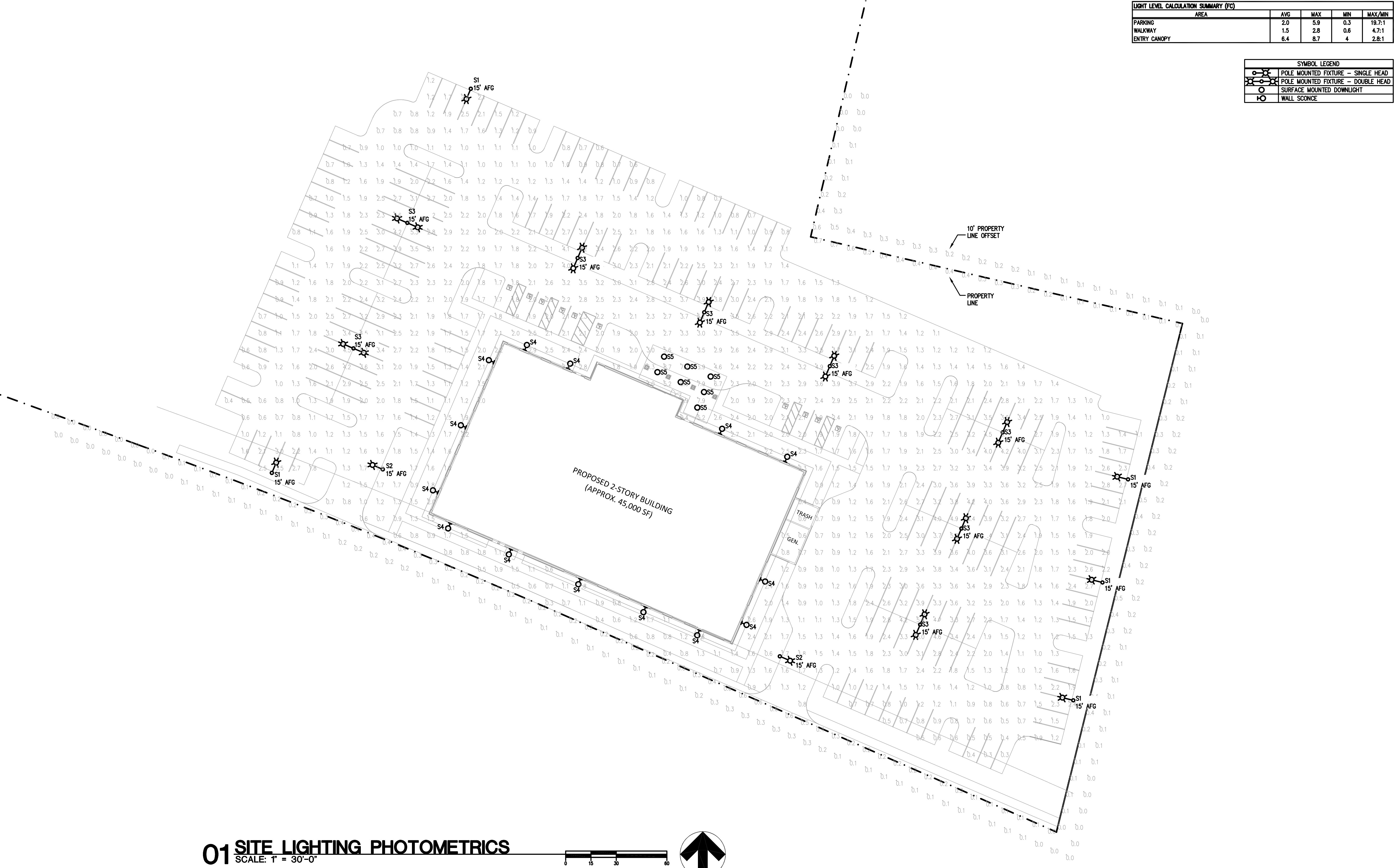
SHEET TITLE
EXTERIOR ELEVATIONS

SHEET NUMBER
A-302

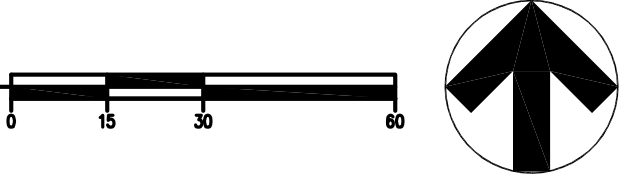
ELECTRICAL LUMINAIRE FIXTURE SCHEDULE																	
	PHYSICAL DESCRIPTION					ELECTRICAL SPECIFICATIONS								MANUFACTURER INFORMATION			
TYPE	DESCRIPTION	HOUSING	REFLECTOR	SHIELDING	FINISH	MOUNTING	COLOR TEMP.	LAMP	LUMENS	HOURS	VA	UNITS	BALLAST/DRIVER/XFRM	VOLTAGE	MANUFACTURER	CATALOG NUMBER	REMARKS
S1	SINGLE HEAD SITE FIXTURE, SINGLE PIECE HOUSING, HOUSE SIDE SHIELD, IP65, UL LISTED FOR WET LOCATIONS. INTEGRAL 5-PIN TWIST LOCK RECEPTACLE FOR WIRELESS DIMMING CONTROLLER.	DIE-CAST ALUMINUM	TYPE II	NONE	TGIC THERMOSET POWDER COAT FINISH IN DARK BRONZE	POLE MOUNTED - 12'-6" SQUARE ALUMINIUM POLE ON 2'-6" CONCRETE BASE	4,000K	LED	4,700	100,000 @ L85	38 VA	EACH	LED 0-10V DIMMING DRIVER - DIM TO 10%	277 V	LITHONIA	DSX0LED-P1-40K-T2M-277-SPA-PER5-HS-DDBXD	
S2	SINGLE HEAD SITE FIXTURE, SINGLE PIECE HOUSING, IP65, UL LISTED FOR WET LOCATIONS. INTEGRAL 5-PIN TWIST LOCK RECEPTACLE FOR WIRELESS DIMMING CONTROLLER.	DIE-CAST ALUMINUM	TYPE V	NONE	TGIC THERMOSET POWDER COAT FINISH IN DARK BRONZE	POLE MOUNTED - 12'-6" SQUARE ALUMINIUM POLE ON 2'-6" CONCRETE BASE	4,000K	LED	4,700	100,000 @ L85	38 VA	EACH	LED 0-10V DIMMING DRIVER - DIM TO 10%	277 V	LITHONIA	DSX0LED-P1-40K-T5M-277-SPA-PER5-DDBXD	
S3	DOUBLE HEAD SITE FIXTURE, SINGLE PIECE HOUSING, HOUSE SIDE SHIELD, IP65, UL LISTED FOR WET LOCATIONS. INTEGRAL 5-PIN TWIST LOCK RECEPTACLE FOR WIRELESS DIMMING CONTROLLER.	DIE-CAST ALUMINUM	TYPE IV	NONE	TGIC THERMOSET POWDER COAT FINISH IN DARK BRONZE	POLE MOUNTED - 22'-6" SQUARE ALUMINIUM POLE ON 2'-6" CONCRETE BASE	4,000K	LED	15,400	100,000 @ L85	276 VA	EACH	LED 0-10V DIMMING DRIVER - DIM TO 10%	277 V	LITHONIA	DSX1LED-P5-40K-T4M-2777-SPA-PER 5-DDBXD	
S4	LED WALL SCONCE, SINGLE PIECE FULL CUTOFF HOUSING, IP65, UL LISTED FOR WET LOCATIONS.	DIE-CAST ALUMINUM	TYPE II	NONE	TGIC THERMOSET POWDER COAT FINISH IN DARK BRONZE	WALL MOUNT - 9'-8" AFG	4,000K	LED	1,300	100,000 @ L88	14 VA	EACH	LED 0-10V DIMMING DRIVER - DIM TO 10%	277 V	LITHONIA	PSXW1LED-10C-350-40K-T2M-MVOLT-DDBXD	
S5	LED OPEN DOWNLIGHT, 6" APERTURE.	DIE-CAST STEEL	WIDE	NONE	SEMI-SPECULAR CLEAR	RECESSED IN CEILING - VERIFY CEILING TYPE	4,000K	LED	1,000	60,000 @ L70	12 VA	EACH	LED 0-10V DIMMING DRIVER - DIM TO 10%	277 V	LITHONIA	EVO-40/10-6AR-WD-LSS-MVOLT-EZ10	

LIGHT LEVEL CALCULATION SUMMARY (FC)				
AREA	AVG	MAX	MIN	MAX/MIN
PARKING	2.0	5.9	0.3	19.7:1
WALKWAY	1.5	2.8	0.6	4.7:1
ENTRY CANOPY	6.4	8.7	4	2.8:1

SYMBOL LEGEND	
	POLE MOUNTED FIXTURE - SINGLE HEAD
	POLE MOUNTED FIXTURE - DOUBLE HEAD
	SURFACE MOUNTED DOWNLIGHT
	WALL SCONCE



01 SITE LIGHTING PHOTOMETRICS
SCALE: 1" = 30'-0"



PROJECT NUMBER
184101.00

DRAWN BY
CL

DATE
01/02/2019

REVISIONS
REV DESCRIPTION DATE



Boulder Associates, Inc.
Architecture + Interior Design
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PROJECT
GLENWOOD SPRINGS

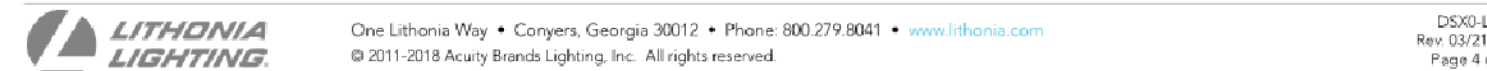
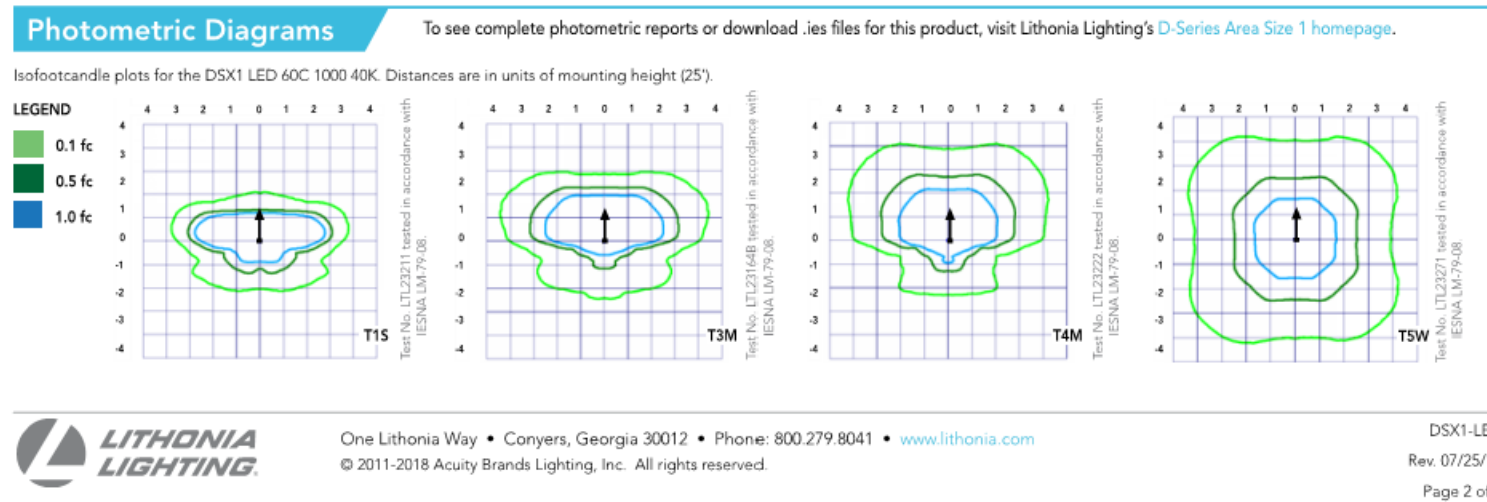
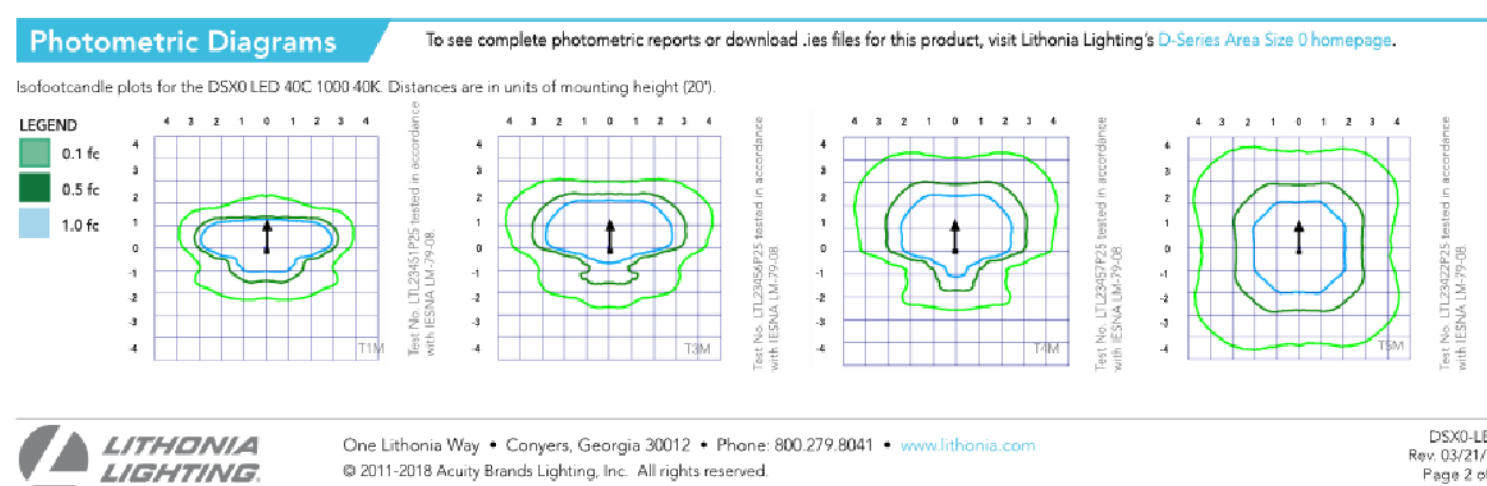
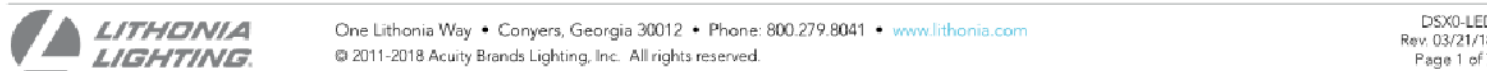
LOT 14
GLENWOOD MEADOWS NO. 2
TBD WULFSOHN RD.
GLENWOOD SPRINGS, CO 81601

SITE /
ARCHITECTURAL
PLAN REVIEW

SHEET TITLE
SITE LIGHTING
PHOTOMETRICS

SHEET NUMBER

E1.1



Preliminary Drainage Report

Glenwood Meadows Lot 14

December 31, 2018
(Revised -----)

Prepared for:
Boulder Associates
1426 Pearl Street #300
Boulder, CO 80302

Prepared by:
Marc J. Kenney, P.E.
State of Colorado Reg. No. 41215



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Job No. 1458-003

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Engineering Certification

"I hereby affirm that this drainage report for the Glenwood Meadows Lot 14 was prepared by me (or under my direct supervision) for the owners 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."

(Stamped for the Final Drainage Report – but not at Preliminary)

Marc J. Kenney, P.E.
State of Colorado Reg. No. 41215

I. Introduction

A. Background

The purpose of this Preliminary Drainage Report is to address developed drainage conditions for the proposed Glenwood Meadows Lot 14 Project. This report addresses the following items with respect to the site: existing drainage, potential drainage issues resulting from development, solutions to the potential drainage issues, detention and stormwater quality requirements, and floodplain boundaries.

This preliminary report outlines all the content and requirements of the final drainage report and includes some preliminary calculations and estimates.

River City Consultants, Inc. prepared this Preliminary Drainage Report for **Boulder Associates**.

B. Project Location

Glenwood Meadows Lot 14 (of Filing No. 2) is listed as parcel number 2185-053-38-014 on the Garfield County website. The project location is bordered on the north by Midland Avenue, on the west by Glenwood Springs Park & Ride, on the east by the Glenwood Meadows retail development, and on the south by Wulfsohn Road. In more legal terms, the site is within the southwest $\frac{1}{4}$ of Section 5, Township 6 South, Range 89 West of the 6th Principal Meridian.

Access to the site will be from Wulfsohn Road. The surrounding land use is a mixture of commercial and undeveloped land. Refer to Figure 1 for the General Location Map.

The proposed project location is outside any FEMA mapped floodplains (see the FEMA Firm Map in Appendix F).

C. Project Description

The project site is comprised of a single parcel of 9.9 acres. Only the eastern portion of Lot 14 will be developed as part of this project, the western portion will remain undeveloped. The proposed land use is a commercial building and associated parking. The proposed building will be 2 stories and approximately 45,000 square feet. The parking area will consist of approximately 200 spaces, curb and gutter, and landscape areas. Approximately 20% of the lot is unbuildable due to topography and will remain undisturbed. There are no existing irrigation facilities on-site.

D. Previous Investigations

Previous investigations include the Master Drainage Report for Glenwood Meadows, by High Country Engineering, Inc., revised March 4, 2004 and a Final Drainage Report for Glenwood Meadows Lot 14 prepared by V3 Companies Ltd. dated January 30, 2009. The V3 Report was prepared, but the associated project was not constructed.

II. Drainage System Description

A. Existing Drainage Conditions

The Site is currently undeveloped and ground cover consists of native and non-native grasses and shrubs. There are no structures located on the parcel. Existing topography of the site consists of a bench sloped at 1-5% and areas of steeper slopes (3H:1V). The site generally slopes from south to north. The bench slopes from the southeast to the northwest.

Historically, runoff flows across the site via sheet and shallow concentrated flow. Eventually the flows concentrate in natural depressions and channels and are directed to a pond on Tract D. The Tract D pond discharges to an existing 36-inch culvert under the concrete trail south of Midland Avenue. Flows from the 36-inch culvert are conveyed under Midland Avenue via an existing 48-inch culvert. Flows continue within a well-defined drainage channel then through a second 48-inch culvert under the Union Pacific Railroad tracks. The flows are directed through a third 48-inch culvert under Devereux Road before being discharged to the Colorado River. Please refer to the Existing Conditions Drainage Map, Figure 2.

The existing site was divided into a single on-site basin and several off-site basins for modeling purposes. The off-site basins make up the tributary areas that flow to and/or around the site or are tributary to downstream conveyances that were analyzed (e.g., the railroad culvert).

According to the NRCS web site, the soils present at the site consist of Begy sandy loam, 6-12% slopes (7.5%) and Chilton channery loam, 12-25% slopes (22%). Both are classified as Hydrologic Soil Group A "high infiltration rate and low runoff potential". Soil information is included in Appendix A.

The allowable release rates are based on the historic peak flow values for the site and were calculated by using Autodesk's Storm and Sanitary Analysis. Modeling results will be discussed in "Section III. G. Results" of this report.

B. Master Drainage Plan

A Master Drainage Report was prepared for the Glenwood Meadows Subdivision by High Country Engineering, Inc. and dated revised March 4, 2004. This report was reviewed as part of this project's drainage design and development of this drainage report.

The Master Drainage Plan shows stormwater from Lot 14 of the Glenwood Meadows Subdivision (Basin PR-A of the Master Plan) being directed to "Pond 4" in Tract D. Pond 4 is the smaller of the two ponds within Tract D and is in the northwest corner of Tract D. Basin PR-A consisted of 15.23 acres and the Master Plan assumed a SCS Curve Number of 92 for the entire basin.

The Master Plan states "Each parcel inside the property will be required to evaluate their site-specific design to ensure they meet or exceed the requirements of this study and the City of Glenwood Springs Development Code." ... "In addition to this study, each parcel will be required to implement best management practices and erosion control measures to reduce stormwater sediment and pollutant transport to downstream sources. Water quality measures are the responsibility of individual lot owners and may include detaining the 2-year storm (the water quality capture volume) and or providing baffled oil skimmers or vortech systems to reduce potential pollutants."

The stormwater requirements of Lot 14 as per the Master Plan are to

1. Evaluate the assumptions made in the Master Plan and compare them to the proposed development (i.e., SCS Curve Number).
2. Determine what, if any, modifications are required to Pond 4 and its outlet structure to accommodate the developed Lot 14 flows.
3. Design and construct stormwater quality measures for Lot 14.

C. Onsite and Offsite Tributary Area

Eight basins will be modeled under existing conditions. Seven of those basins are offsite basins and flow to, through, and around the site or are tributary to downstream conveyances. The proposed site grading will minimize any flow through the project by off-site stormwater. Wulfsohn Road cuts-off and concentrates flows south (upstream) of the site. No culverts under Wulfsohn Road were identified on the existing site survey.

Basin OS1 and OS3 both flow to the debris flow pond. The debris flow pond discharges via an 8-inch pipe to the CDOT Pond in the bottom of OS4.

Basin OS2 flows to the site and will be routed around the site to the extent possible via grading. Basin EX1 is the historic basin for Lot 14. Basin OS5 is

from the centerline of Midland Avenue south to the site. All of these basins discharge to an existing culvert under Midland Avenue (listed as 48-inch CMP in the V3 report).

Basin OS6 is the additional tributary area to the existing culvert under the Union Pacific Railroad (also listed as 48-inch CMP in the V3 report). Lastly, Basin OS7 is tributary to the existing culvert under Devereux Road (48-inch CMP as per the V3 report).

D. Proposed Drainage System Description

Under proposed conditions, runoff will sheet flow until intercepted and concentrated by v-pans and curb and gutter. The concentrated flow will be directed to an on-site water quality pond and then routed to Pond 4 in Tract D (as per the Master Drainage Plan for the Glenwood Meadows Subdivision). The on-site water quality pond will be located along the northern property line just south of Midland Avenue. The water quality pond's outlet structure will be a modified Agri-Drain In-Line Water Level Control Structure (refer to the Manufacturer's information in Appendix H). The pond will convey flows through an outlet control structure to Pond 4 (located in adjacent Tract D), which discharges to the existing 48-inch culvert under Midland Avenue. Pond 4 was designed and sized in the Master Drainage Plan by High Country Engineering for a catchment area that included Lot 14. The Pond 4 outlet control structure will be analyzed to ensure peak developed discharge rates are limited to historic peak rates.

A Geotechnical Investigation is scheduled for this site, but has not yet been received by River City Consultants, Inc..

A model of the developed site will be prepared in Autodesk's Storm and Sanitary Analysis. The developed model will use the existing model as a base. The offsite basins and conveyances will not change and the only basin that will change is Basin EX1, which will likely be divided into more detailed developed sub-basins for inlet and pipe sizing purposes. The developed model will include the water quality pond and existing Pond 4. The developed model will simulate the pond outlet works to ensure developed peak flows are reduced to historic values. This will be depicted in a Developed Drainage Basin Map, Figure 3 (to be included in the Final Report).

E. Project Impacts on Adjacent Facilities and Areas

The development of the eastern half of Lot 14 will have minimal impact on the surrounding facilities and area. The historic pathway of stormwater will be altered slightly. However, potential negative impacts will be mitigated by

stormwater ponds that will provide water quality and will reduce peak flows to historic rates by detaining stormwater. Downstream facilities will be checked to ensure they are sufficiently sized to convey the peak 25-year 24-hour storm flows.

E. Drainage Facility Maintenance

The on-site water quality pond will require periodic inspection and maintenance. The inspection and maintenance of drainage facilities outside the right-of-way will be performed by the Property Owner. RCC advises annual inspections of on-site drainage facilities and inspections following any major storms (greater than 1-inch of rainfall). Reports documenting inspection activities shall be kept as proof of inspection.

III. DRAINAGE ANALYSIS AND DESIGN CRITERIA

A. Regulations

The policy, design criteria, design constraints, methods of analysis, recommendations, and conclusions presented in this report are in conformance with standard engineering practice, the City of Glenwood Springs Engineering Design Standards, Chapter 4: Stormwater, Drainage, Water Quality, and Erosion Control, and the Urban Drainage and Flood Control District's Drainage Criteria Manual Volumes 1, 2, and 3 regarding stormwater quality.

B. Development Criteria/Constraints

This project has been designed using the criteria in the City of Glenwood Springs design standards and development code. No drainage constraints were noted for this project.

C. Hydrologic Criteria

The hydrologic design criteria presented in this report are in conformance with standard engineering practice. The rainfall values were generated by the NOAA Precipitation Frequency Data Server (NOAA Atlas 14) for the project location (see Appendix G).

D. Hydraulic Criteria

The hydraulic design criteria presented in this report are in conformance with standard engineering practice.

E. Variance from Criteria

No variances are requested.

F. Calculation Methodology

The calculation methodology used within this report is consistent with the City of Glenwood Springs Development code and standard engineering practice.

G. Modeling Results

This section will be completed at final, but will include the following information:

Existing basin peak flows for the 25-year and 100-year 24-hour storm events. The historic peak flows at critical design points (i.e., existing culvert crossings that will not be replaced).

Developed basin peak flows and the peak flows at critical design points.

Detention pond information, including depth to groundwater and the following table

	WSEL	Volume (cubic ft)	Discharge (cfs)
Top of Detention Pond			---
Detention Pond 100 Year 24 Hour			
Detention Pond 10 Year & WQCV			---
Weir Invert (Top of Stop Logs)		---	---
Detention Pond 10 Year 24 Hour			
Detention Pond WQCV			
Bottom of Detention Pond		0	0.00

Detention pond outlet works (water quality orifices, minor storm orifice, and major storm weir).

Water quality capture volume calculation results, water quality features and permanent stormwater BMPs.

Inlet capacity and pipe sizing calculation results.

A discussion of downstream conveyance capacity (existing culverts under the railroad and streets). Confirmation that downstream structures can convey the proposed post-development flows.

Recommended minimum finished floor elevation vs pond 100-year storm peak WSEL.

IV. CONCLUSIONS

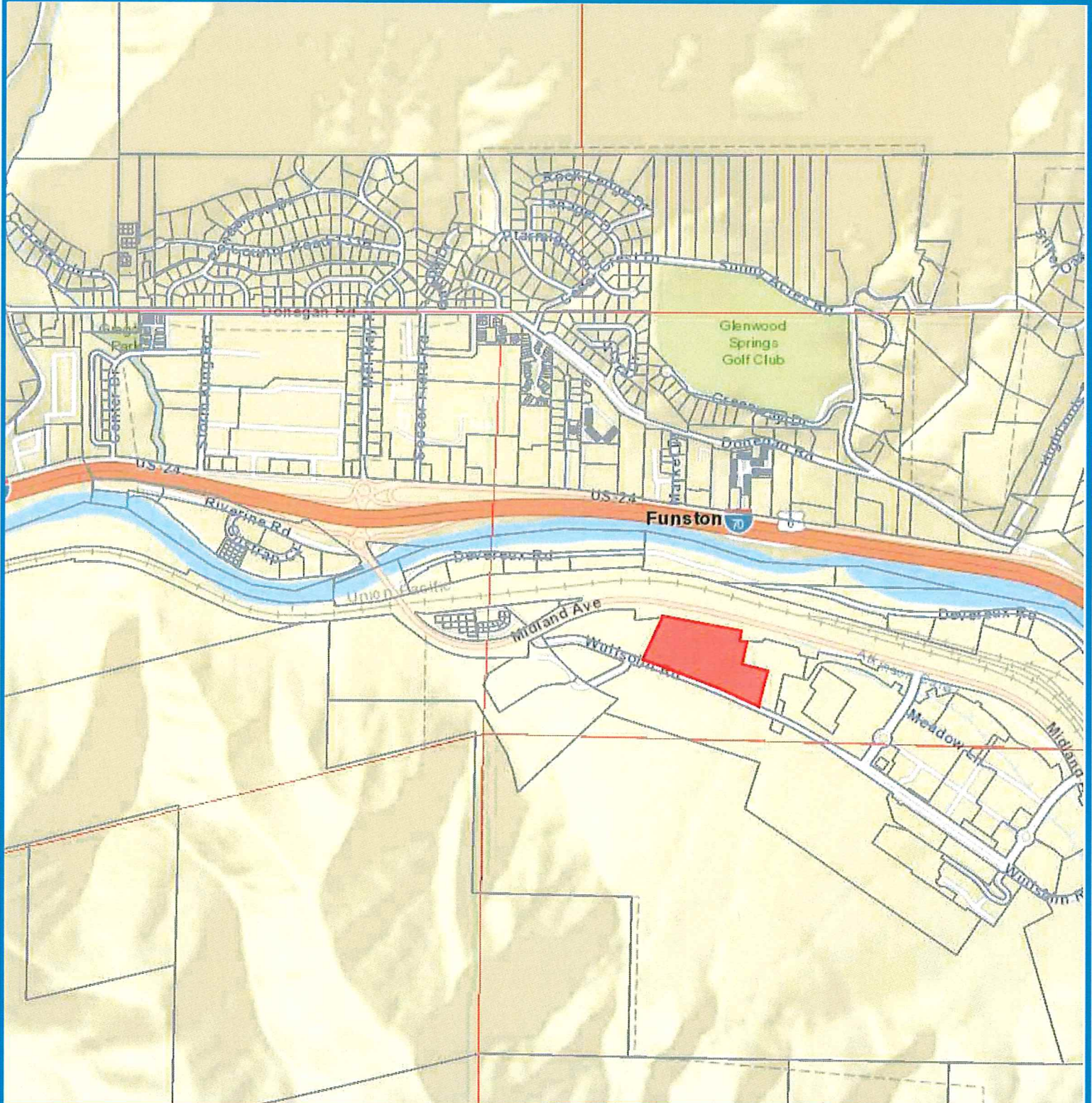
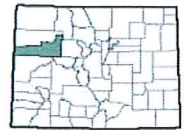
The proposed storm water conveyance system will be designed to handle the 25-year 24-hour storm runoff from this site. The storm sewer system will

convey the 25-year 24-hour peak flows. The proposed outlet works of the detention pond will limit the peak discharge rates to historic rates and will provide improved stormwater quality due to the extended detention basin.

VI. REFERENCES

1. Engineering Design Standards, Chapter 4: Stormwater, Drainage, Water Quality, and Erosion Control; City of Glenwood Springs, July 2018.
2. Garfield County Colorado GIS Website,
<https://gis.garfield-county.com/LandExplorer/index.html> .
3. Natural Resources Conservation Service National Cooperative Soils Survey Website,
<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> .
4. Drainage Criteria Manual, Urban Drainage and Flood Control District, Volumes 1, 2, & 3; Denver, Colorado 2001.

FIGURES



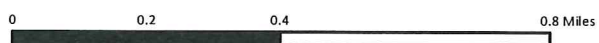
Garfield County Land Explorer

GENERAL LOCATION MAP

Printed by Web User

1 inch = 1,505 feet

1 inch = 0.28 miles



Garfield County

Garfield County Colorado
www.garfield-county.com

Colorado

Disclaimer

This is a compilation of records as they appear in the Garfield County Offices affecting the area shown. This drawing is to be used only for reference purposes and the County is not responsible for any inaccuracies herein contained.

FIGURE 1

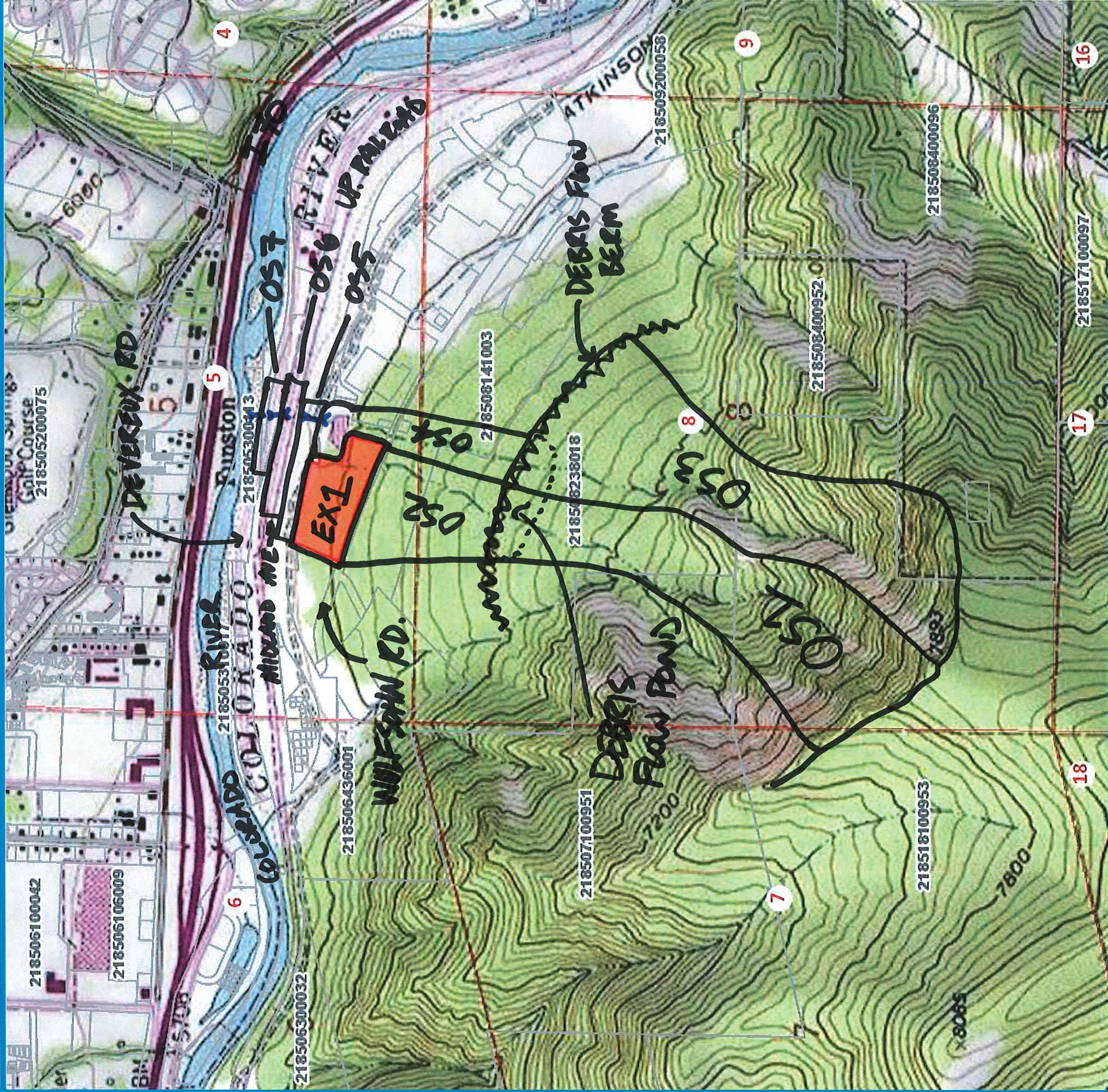




Garfield County

Garfield County Land Explorer

Garfield County, Colorado



Garfield County Land Explorer

GLENWOOD MCB HISTORIC DRAINAGE BASINS

Printed by Web User

1 inch = 1,505 feet
1 inch = 0.28 miles

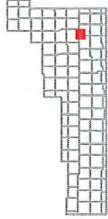
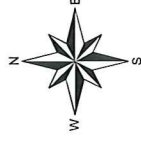


Figure 2

Garfield County
www.garfield-county.com

Colorado

Disclaimer

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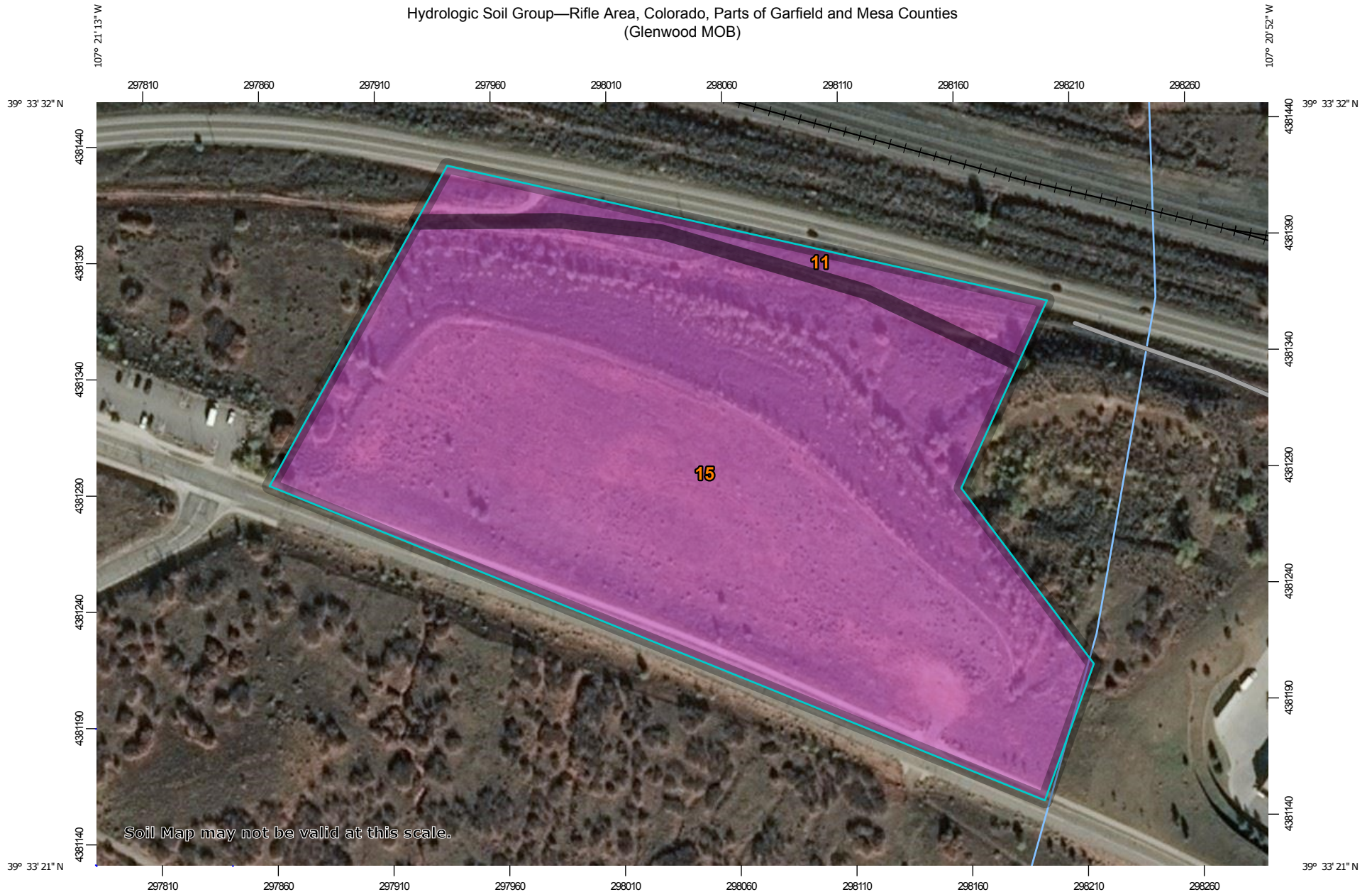
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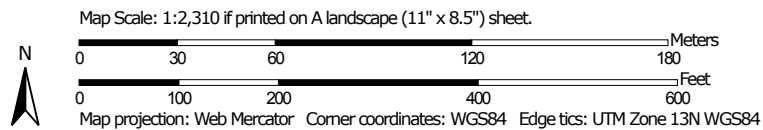
APPENDIX A

NRCS Web Soil Survey

Hydrologic Soil Group—Rifle Area, Colorado, Parts of Garfield and Mesa Counties (Glenwood MOB)



Soil Map may not be valid at this scale.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey
Packet Page 221

12/17/2018
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties
 Survey Area Data: Version 11, Sep 10, 2018

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

Date(s) aerial images were photographed: Sep 24, 2015—Nov 2, 2015

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
11	Begay sandy loam, 6 to 12 percent slopes	A	1.0	7.5%
15	Chilton channery loam, 12 to 25 percent slopes	A	12.6	92.5%
Totals for Area of Interest			13.6	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

Rational Coefficient and Water Quality Capture Volume Calculations

Glenwood MOB
Rational Coefficient Calculations

 **RIVERCITY**
 CONSULTANTS
 744 Horizon Ct
 Grand Junction, CO 81506

COMPOSITE RUNOFF COEFFICIENTS (whole site)

USING December 31, 2007 SWMM MANUAL (issued April 2008) (SECTION 700)

(Note the SWMM Manual uses the Urban Drainage and Flood Control formulas and methods, but the constants in the formulas have been adjusted to more closely match western slope rainfall and runoff)

$$C_{CD} = K_{CD} + (0.858 * i^3 - 0.786 * i^2 + 0.774 * i + 0.04)$$

$$C_A = K_A + (1.31 * i^3 - 1.44 * i^2 + 1.135 * i - 0.12)$$

$$C_B = (C_A + C_{CD}) / 2$$

Where:

C_{CD} = Runoff coefficient for C and D soils
 C_A = Runoff coefficients for A soils
 C_B = Runoff coefficients for B soils
 i = % impervious (asphalt, concrete, etc.) as a decimal
 K_{CD} = Coefficient adjustment for C and D soils
 K_A = Coefficient adjustment for A soils)

ADJUSTMENT FACTORS FOR RUNOFF EQUATIONS
 (FROM TABLE 707)

	2 YEAR	5 YEAR	10 YEAR	100 YEAR
K_{CD}	0	-0.10*i+0.11	-0.18*i+0.21	-0.39*i+0.46
K_A	0	-0.08*i+0.09	-0.14*i+0.17	-0.25*i+0.32

Historical Conditions	Developed Conditions
Impervious Area Area Description 0.00 Impervious (asphalt, concrete, etc.) 6.45 Total area 0.00 Impervious (i) as decimal	Impervious Area Area Description 5.48 Impervious (asphalt, concrete, etc.) 6.45 Total area 0.85 Impervious (i) as decimal
2 Year Runoff Coefficients C_{CD} = 0.04 C_A = 0.00 C_B = 0.02	2 Year Runoff Coefficients C_{CD} = 0.66 C_A = 0.61 C_B = 0.63
5 Year Runoff Coefficients C_{CD} = 0.15 C_A = 0.00 C_B = 0.08	5 Year Runoff Coefficients C_{CD} = 0.68 C_A = 0.63 C_B = 0.66
100 Year Runoff Coefficients C_{CD} = 0.50 C_A = 0.20 C_B = 0.35	100 Year Runoff Coefficients C_{CD} = 0.79 C_A = 0.72 C_B = 0.75

Soil Type for project = TYPE **A**

HISTORICAL			
$C_{2 \text{ YEAR}}$	$C_{5 \text{ YEAR}}$	$C_{10 \text{ YEAR}}$	$C_{100 \text{ YEAR}}$
0.00	0.00	0.05	0.20
DEVELOPED			
$C_{2 \text{ YEAR}}$	$C_{5 \text{ YEAR}}$	$C_{10 \text{ YEAR}}$	$C_{100 \text{ YEAR}}$
0.61	0.63	0.66	0.72

Glenwood MOB

Estimated Detention Volume and Release Rate



744 Horizon Ct
Grand Junction, CO 81506

Minimum Detention Volume

SWMM Table 1401:

Ultimate % Impervious	X_{100}	X_{10}
< 50%	0.42	0.26
≥ 50%	0.48	0.38

$X_{100} = 0.48$ Developed Basin Imperviousness (%) $P = 85$
 $X_{10} = 0.38$ Tributary Area (Acres) $A = 6.45$

$$K_{100} = (1.78P - 0.002P^2 - 3.56)(X_{100}/900) = 0.07$$

$$K_{10} = (0.95P - 1.90)(X_{10}/1000) = 0.03$$

Assumed Depth = 5 ft

For 100-Year:

$V_{100} = K_{100} * A =$	0.46 acre-feet	19,973.03 ft ³	3994.605 ft ²
---------------------------	----------------	---------------------------	--------------------------

For 10-Year:

$V_{10} = K_{10} * A =$	0.19 acre-feet	8,418.46 ft ³
-------------------------	----------------	--------------------------

Estimated Allowable Release Rate:

SWMM Table 1402

FREQUENCY	SOIL GROUP			
	A	B	C	D
10-Year	0.05	0.09	0.12	0.12
100-Year	0.25	0.43	0.50	0.50

cfs/Acre
 per Table 1402 SWMM Release Rate
 10-Year 0.05 **0.32 cfs**
 100-Year 0.25 **1.61 cfs**

Glenwood MOB

WATER QUALITY CAPTURE VOLUME (WQCV)



744 Horizon Drive
Grand Junction, CO 81506

WQCV CALCULATIONS

Calculate WQCV:

$$WQCV = k[a(0.91*i^3 - 1.19*i^2 + 0.78i)]$$

$$k = d_6/0.43 \quad \text{where } d_6 = 0.28$$

$$= 0.28/0.43$$

$$= 0.65$$

$$a = \text{BMP Drain Time Coefficient (Assumed it is based on 40 hrs)}$$

$$= 1.00$$

$$i = \text{Watershed Imperviousness as a decimal}$$

Description	Area (acres)	Imperviousness (decimal)	A*I
Basin D1	6.45	0.85	5.48
Total	6.45		

$$= [\text{sum}(\text{area} * \text{imperviousness})] / \text{total area}$$

$$= 0.85$$

$$WQCV = 0.65[1.0(0.91*0.80^3 - 1.19*0.80^2 + 0.78*0.80)]$$

$$= 0.2358 \quad \text{in}$$

$$0.49$$

Calculate 120% WQCV:

$$120 \% WQCV = 1.2 * WQCV$$

$$= 0.2829 \quad \text{in}$$

Calculate Required Storage Volume, SV:

$$SV = (120\% WQCV/12) * \text{Tributary Area}$$

$$= 0.1521 \quad \text{acre-ft}$$

$$\rightarrow \text{Multiply by } 43,560 \text{ ft}^2/\text{acre} \quad 6,624 \text{ ft}^3$$

APPENDIX C

Existing Model Input & Output

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Information will be included at Final

APPENDIX D

Developed Model Input & Output

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Information will be included at Final

APPENDIX E

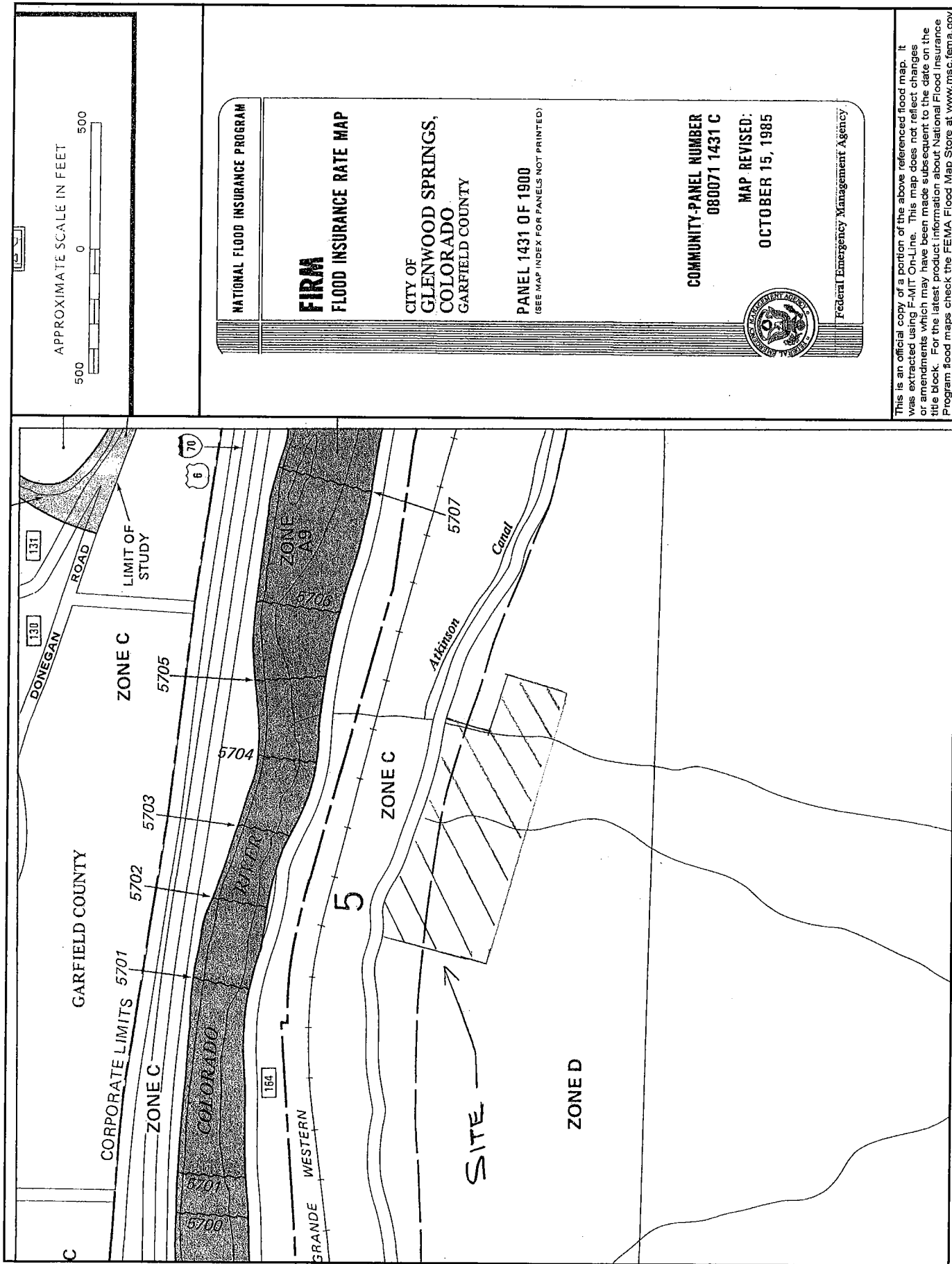
Miscellaneous Calculations

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Information will be included at Final

APPENDIX F

FEMA Firm Map



APPENDIX G

NOAA Point Precipitation Frequency Data



NOAA Atlas 14, Volume 8, Version 2
Location name: Glenwood Springs, Colorado,
USA*

Latitude: 39.5455°, Longitude: -107.326°

Elevation: 5788.02 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerals](#)

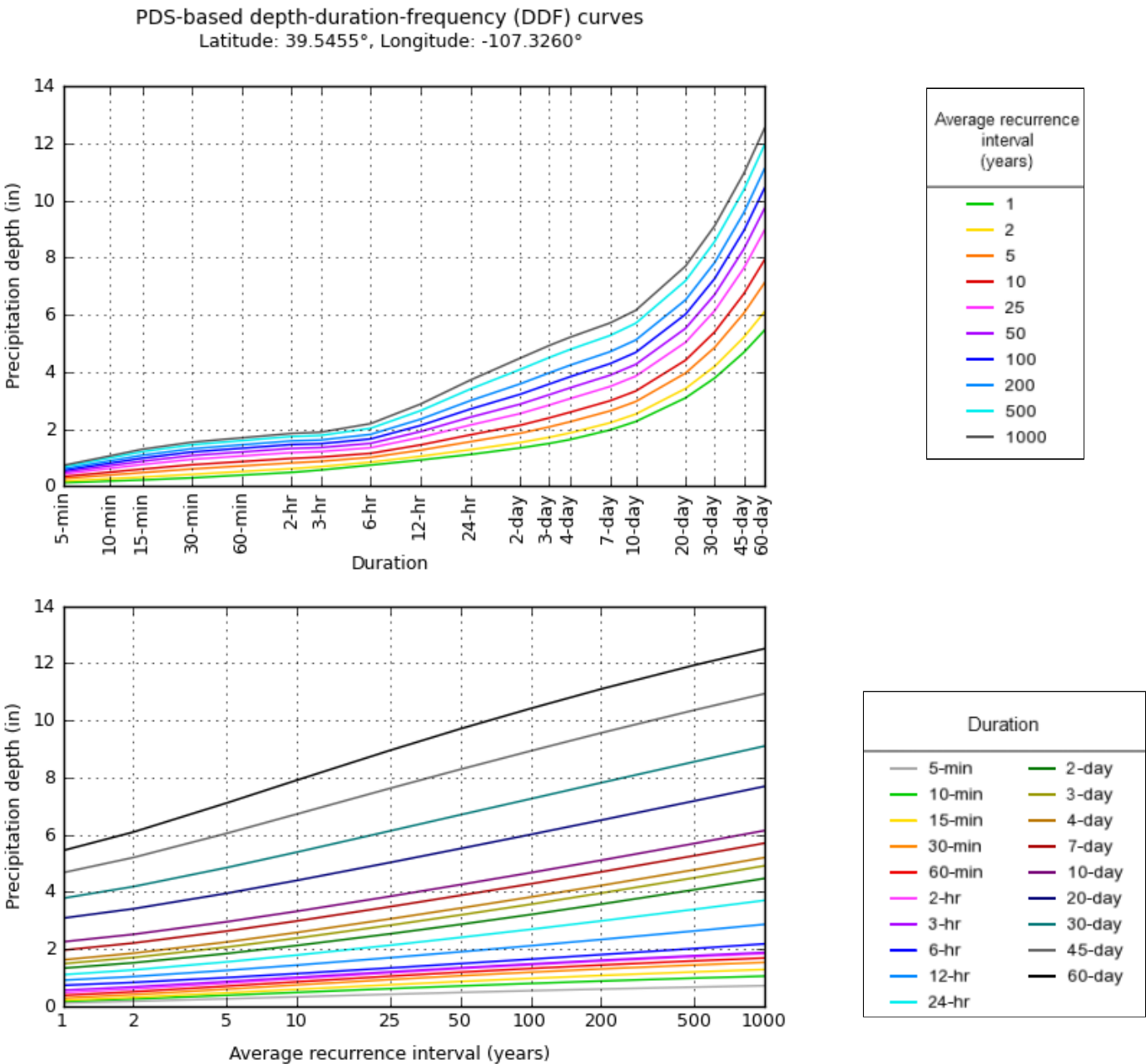
PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.120 (0.095-0.155)	0.176 (0.139-0.228)	0.264 (0.208-0.343)	0.333 (0.261-0.435)	0.422 (0.314-0.565)	0.487 (0.355-0.664)	0.547 (0.385-0.768)	0.605 (0.407-0.876)	0.674 (0.435-1.01)	0.722 (0.457-1.11)
10-min	0.176 (0.139-0.227)	0.258 (0.204-0.334)	0.387 (0.304-0.502)	0.488 (0.382-0.637)	0.619 (0.460-0.828)	0.713 (0.519-0.972)	0.801 (0.563-1.13)	0.885 (0.595-1.28)	0.987 (0.637-1.48)	1.06 (0.669-1.63)
15-min	0.214 (0.169-0.277)	0.315 (0.249-0.407)	0.472 (0.371-0.612)	0.595 (0.465-0.777)	0.754 (0.561-1.01)	0.869 (0.633-1.19)	0.977 (0.687-1.37)	1.08 (0.726-1.56)	1.20 (0.777-1.80)	1.29 (0.816-1.98)
30-min	0.289 (0.229-0.374)	0.411 (0.325-0.532)	0.600 (0.473-0.780)	0.748 (0.585-0.976)	0.936 (0.695-1.25)	1.07 (0.779-1.46)	1.19 (0.839-1.67)	1.31 (0.880-1.89)	1.45 (0.933-2.16)	1.54 (0.973-2.37)
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	0.480 (0.385-0.613)	0.610 (0.488-0.778)	0.811 (0.646-1.04)	0.969 (0.767-1.25)	1.17 (0.885-1.55)	1.32 (0.973-1.77)	1.45 (1.03-2.01)	1.58 (1.08-2.26)	1.74 (1.13-2.56)	1.84 (1.18-2.79)
3-hr	0.563 (0.454-0.712)	0.681 (0.549-0.862)	0.867 (0.696-1.10)	1.01 (0.809-1.29)	1.21 (0.921-1.58)	1.35 (1.01-1.80)	1.48 (1.07-2.04)	1.61 (1.11-2.29)	1.77 (1.17-2.60)	1.89 (1.21-2.83)
6-hr	0.735 (0.601-0.916)	0.837 (0.683-1.04)	1.00 (0.816-1.26)	1.15 (0.925-1.44)	1.34 (1.04-1.75)	1.50 (1.14-1.98)	1.65 (1.21-2.25)	1.81 (1.26-2.54)	2.02 (1.35-2.94)	2.19 (1.42-3.23)
12-hr	0.913 (0.755-1.12)	1.04 (0.861-1.28)	1.26 (1.03-1.55)	1.44 (1.18-1.78)	1.70 (1.34-2.19)	1.91 (1.47-2.49)	2.12 (1.57-2.85)	2.34 (1.65-3.24)	2.64 (1.78-3.77)	2.87 (1.88-4.18)
24-hr	1.11 (0.927-1.34)	1.27 (1.07-1.54)	1.55 (1.29-1.88)	1.79 (1.49-2.19)	2.14 (1.71-2.71)	2.41 (1.88-3.11)	2.69 (2.02-3.57)	2.99 (2.13-4.09)	3.39 (2.32-4.79)	3.71 (2.46-5.31)
2-day	1.33 (1.13-1.59)	1.52 (1.29-1.81)	1.85 (1.56-2.20)	2.13 (1.78-2.55)	2.54 (2.06-3.17)	2.87 (2.26-3.64)	3.21 (2.44-4.20)	3.58 (2.59-4.82)	4.08 (2.82-5.67)	4.47 (3.00-6.31)
3-day	1.49 (1.28-1.76)	1.71 (1.46-2.01)	2.07 (1.76-2.45)	2.38 (2.02-2.84)	2.84 (2.31-3.51)	3.20 (2.54-4.02)	3.57 (2.72-4.62)	3.96 (2.88-5.28)	4.50 (3.13-6.19)	4.92 (3.32-6.87)
4-day	1.63 (1.40-1.90)	1.86 (1.60-2.18)	2.25 (1.92-2.64)	2.58 (2.19-3.05)	3.06 (2.51-3.75)	3.44 (2.74-4.29)	3.82 (2.93-4.90)	4.23 (3.09-5.59)	4.78 (3.34-6.52)	5.21 (3.53-7.23)
7-day	1.96 (1.71-2.27)	2.21 (1.92-2.56)	2.63 (2.27-3.05)	2.99 (2.56-3.48)	3.49 (2.88-4.22)	3.88 (3.13-4.77)	4.28 (3.32-5.42)	4.70 (3.47-6.13)	5.27 (3.72-7.09)	5.71 (3.91-7.82)
10-day	2.26 (1.98-2.59)	2.52 (2.20-2.89)	2.96 (2.57-3.40)	3.33 (2.88-3.85)	3.85 (3.20-4.61)	4.26 (3.45-5.19)	4.68 (3.64-5.86)	5.11 (3.79-6.61)	5.70 (4.04-7.60)	6.15 (4.23-8.35)
20-day	3.09 (2.74-3.48)	3.41 (3.02-3.85)	3.95 (3.49-4.47)	4.40 (3.86-5.01)	5.03 (4.24-5.92)	5.52 (4.53-6.60)	6.01 (4.74-7.39)	6.51 (4.89-8.27)	7.18 (5.16-9.41)	7.70 (5.36-10.3)
30-day	3.78 (3.38-4.22)	4.19 (3.74-4.68)	4.85 (4.31-5.44)	5.39 (4.76-6.08)	6.14 (5.20-7.13)	6.70 (5.54-7.92)	7.26 (5.76-8.82)	7.82 (5.91-9.81)	8.56 (6.18-11.1)	9.11 (6.38-12.0)
45-day	4.68 (4.21-5.17)	5.21 (4.68-5.76)	6.05 (5.42-6.72)	6.73 (5.99-7.50)	7.63 (6.50-8.74)	8.29 (6.89-9.68)	8.94 (7.13-10.7)	9.57 (7.26-11.8)	10.4 (7.52-13.3)	10.9 (7.71-14.3)
60-day	5.45 (4.94-5.98)	6.10 (5.52-6.70)	7.11 (6.41-7.84)	7.91 (7.08-8.77)	8.95 (7.66-10.2)	9.71 (8.10-11.2)	10.4 (8.35-12.4)	11.1 (8.46-13.6)	11.9 (8.69-15.1)	12.5 (8.87-16.3)

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.

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PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Dec 26 15:59:19 2018

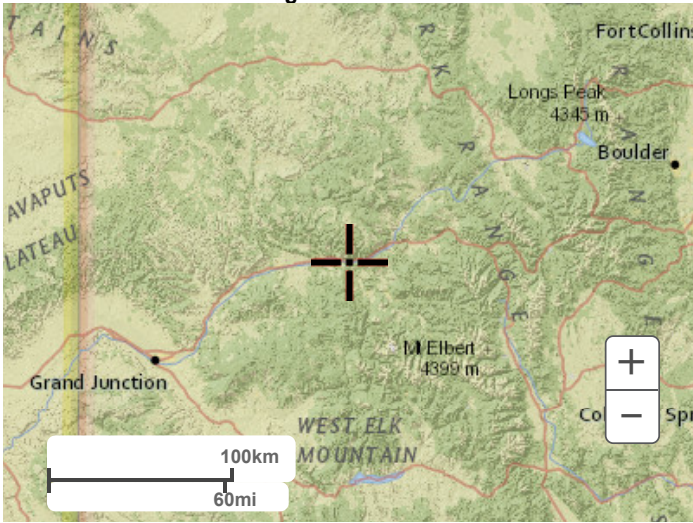
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Maps & aerials

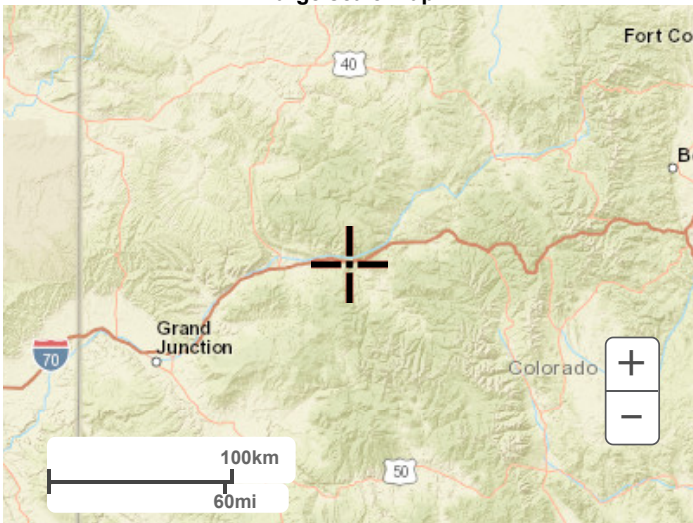
Small scale terrain



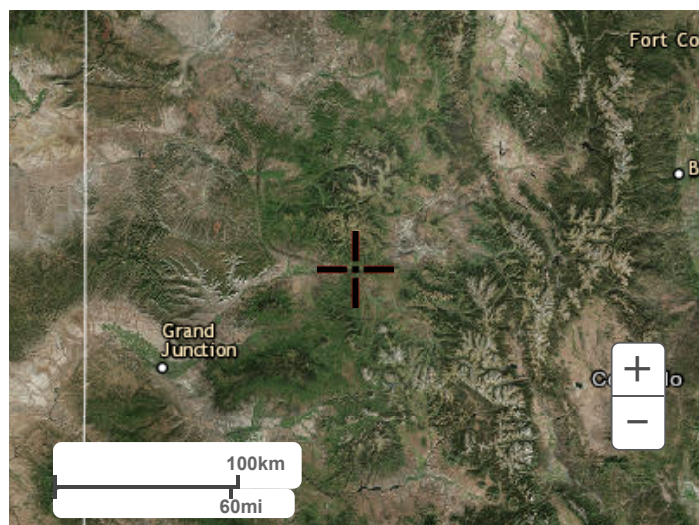
Large scale terrain



Large scale map



Large scale aerial



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[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

APPENDIX H

Agri-Drain Manufacturer's Specification Sheet

Inline Water Level Control Structure™

- Available in manual or automatic.
- Constructed of rugged ½" PVC with lockable plastic lid.
- Stainless steel screws and custom anodized aluminum corner extrusions used for strength and durability.*
- Flexible couplers allow PVC, plastic pipe, or other materials to be easily attached. *(Please specify type of pipe when ordering.)*
- Stoplogs made of PVC in 5" and 7" heights for adjustability. (Maintenance recommended: Remove stoplogs and grease seal with included Lubriplate Grease. Ensure there is no debris in the tracks or along the bottom of the structure. Replace stoplogs after greasing.)
- **Important!** To minimize seepage, align stoplogs firmly against one side of the stoplog track.
- Stoplogs must remain in track during structure installation.
- Structures are not pressure rated.
- Structures are intended for gravity flow: Low pressure and some seepage may occur.
- 5-year warranty on all standard structures.
- Customized or special orders will carry a 1-year warranty on workmanship and material and are nonreturnable.

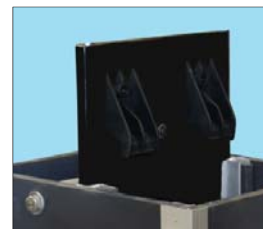
**For water that is caustic, acid, corrosive, salt, or pH below 5 pH or above 9 pH, please notify us of your requirements to ensure structures are built with compatible hardware. For these applications, Agri Drain recommends stainless steel.*



Comes with a handle to install and remove stoplogs.



Stoplog seal ensures a tight fit to prevent leakage.



Inline Water Level Control Structure™

Pipe Size	Available Heights	Width	Depth
4"	2' - 12'	8"	10"
6"	2' - 12'	8"	10"
8"	2' - 12'	11 5/8"	12"
10"	2' - 12'	14"	16"
12"	2' - 12'	16"	20"
15"	2' - 12'	20"	24"
18"	2' - 12'	24"	28"
24"	3' - 10'	31"	39"

Lubriplate Grease

- Recommended for lubricating the seal on the stoplogs in our Water Level Control Structures. (One 10-oz. tube is included with each structure purchased.)
- Available in a 10-oz. tube.



Rugged injection molded stoplogs used in structures with 4", 6", 8", 10", and 12" pipe sizes.



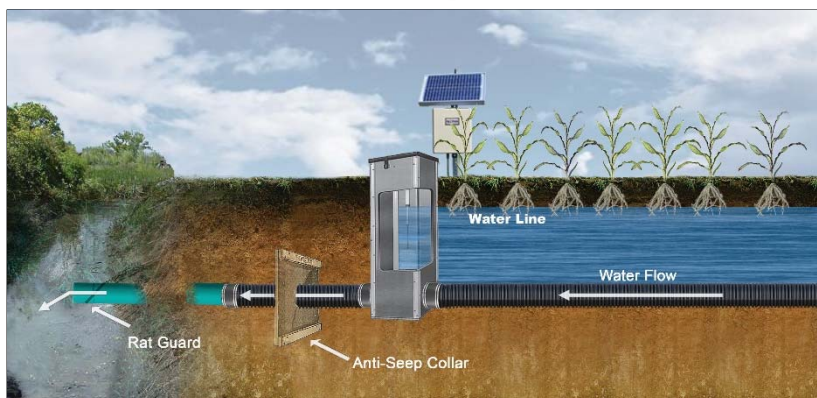
Stoplog Retainer

Hold extra stoplogs up & out of the way!

- Stainless steel retainer hooks to lowest stoplog that you want to hold up within your Inline Water Level Control Structure™.
- 10' of 3/16" nylon rope (included) attaches to the retainer and secures to the inner brace bar near the top of the structure.



PVC stoplogs with stainless steel lifting hooks used in structures with 15", 18", and 24" pipe sizes.



Water Level Control Structures

The **Water Level Control Structures** manufactured by *Agri Drain Corp.* are constructed of rugged $\frac{1}{2}$ "-thick PVC sheets, connected at the corners by means of specially extruded anodized aluminum profiles sealed with waterproof caulking and secured with stainless steel screws.* The bottom of the structure is sealed with either a $\frac{1}{2}$ "- or 1"-thick PVC sheet (dependent upon structure size) and also utilizes waterproof caulking for sealant and stainless steel screws to hold it in place. *For water that is caustic, acid, corrosive, salt, or pH below 5 pH or above 9 pH, please notify us of your requirements to ensure structures are built with compatible hardware. For these applications, Agri Drain recommends stainless steel.

The stoplogs* are constructed of PVC and utilize a seal that mates against the downstream surface of the extruded aluminum track and the top of the stoplog that it rests upon. The stoplogs are equipped with hooks to facilitate their removal by means of a special handle/hook assembly. ***Important!** To minimize seepage, align stoplogs firmly against one side of the stoplog track. Stoplogs must remain in track during structure installation.

In order to obtain inch-by-inch water level adjustment capabilities, the stoplogs are built in two heights: 5" and 7" tall. This allows for various combinations and nearly infinite adjustability. An additional, 7"-tall stoplog is specified with a sticker stating "Bottom Board", and this stoplog must be placed in the bottom of the structure. Examples: 7"+7"=14", 5"+5"+5"=15", 5"+5"+7"=17", 5"+7"+7"=19", 5"+5"+5"+5"=20", etc.

The means of connecting to the downstream and upstream pipe is a flexible rubber sewer coupler. It will accommodate corrugated plastic tubing, PVC pipe, corrugated metal pipe or virtually any other conduit material.

The units are available in two different types. The first type (Inlet) is designed to be installed on the upstream end of the conduit so the water must enter the structure before it enters the pipe. The Inlet must be anchored down when installed or it may have the tendency to float. The second type (Inline) is designed to be installed in the pipe line, so the water enters the pipe, then flows into the box, over the stoplogs, then out the downstream side of the structure. The Inline structure is equipped with a lockable plastic lid and is available in manual or automatic. Both structures come with a handle to remove, install, or adjust the stoplogs.

The structures are manufactured in various sizes based on diameter of the conduit and engineered to provide a minimum of 30% greater capacity than the conduit it is connected to. They are available in heights to suit the specific installation.

INLINE WATER LEVEL CONTROL STRUCTURE™ SHIPPING WEIGHTS								
Pipe Size	HEIGHT							
	2'	3'	4'	5'	6'	8'	10'	12'
4"	50U	64U	81U	102U	121T	216T	244T	278T
6"	52U	66U	83U	103U	164T	222T	272T	320T
8"	64U	84U	105U	176T	198T	264T	320T	392T
10"	79U	107U	168T	210T	238T	300T	375T	458T
12"	99U	157T	190T	242T	294T	366T	480T	542T
15"	154T	222T	270T	322T	382T	502T	614T	722T
18"	191T	236T	340T	402T	450T	592T	710T	834T
24"	N/A	348T	454T	524T	600T	766T	946T	N/A

INLET WATER LEVEL CONTROL STRUCTURE™ SHIPPING WEIGHTS					
Pipe Size	HEIGHT				
	2'	3'	4'	5'	6'
4"	26U	38U	51U	64U	76U
6"	35U	41U	52U	67U	78U
8"	37U	51U	67U	86U	132T
10"	49U	62U	85U	130T	150T
12"	55U	76U	125T	164T	152T
15"	82U	126T	158T	196T	216T
18"	110T	150T	186T	224T	250T
24"	178T	192T	248T	310T	336T

UPS=U
TRUCK LINE=T

Larger CMP structures also available. Call for details on custom sizes and pricing.

INLINE WATER LEVEL CONTROL STRUCTURE™ INSTALLATION INSTRUCTIONS

- Important!** —To minimize seepage, align stoplogs firmly against one side of the stoplog track.
—Stoplogs must remain in track during structure installation.
—Structures are intended for gravity flow: Low pressure and some seepage may occur.

1.) EXCAVATION AND GRADING

Structure base, inlet pipe, & outlet pipe must be set on compacted soil or fill sand to provide a solid, stable base. This will reduce settling and reduce stress or misalignment of pipe connections.

2.) PIPE CONNECTION

Remove stainless steel clamps from inside structure. Place pipe inside flex couplers and tighten SS clamps.

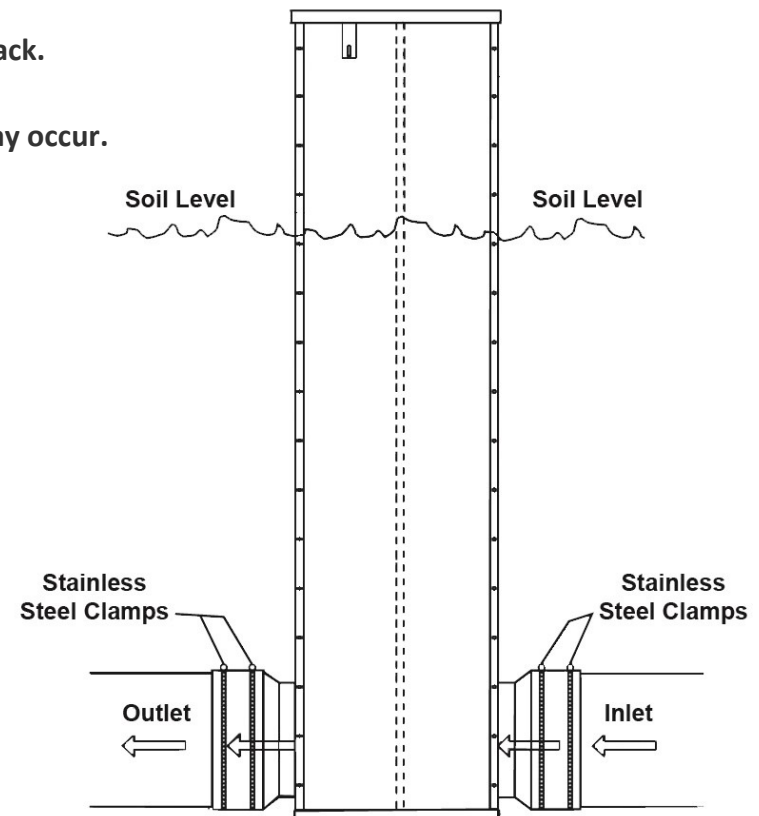
3.) BACKFILL AND COMPACTION

Level structure vertically before placing backfill. Backfill around control structure by hand in 6" lifts. Hand tamp only - **do not** mechanically compact. **Do not** use a backhoe or blade to place backfill directly against the water control structure.

- Seal on stoplog faces downstream/outlet side of structure.

Excessive compaction may cause structural damage or failure.

- ◆ Either the inlet or inline structure may be used for primary or secondary outlet, with larger pipe or emergency spillway as primary.
- ◆ Inline structure removes subsurface water.
- ◆ On the inline installation, the inlet end of the pipe should be held off the bottom of the impoundment to allow for siltation, and be protected with an inlet guard. The outlet end of the structure should be protected with a rodent guard.
- ◆ In a controlled drainage or subsurface irrigation application, the structure nearest the outlet should be installed with a minimum of 20' of non-perforated pipe on the downstream end. Anti-Seep Collars are recommended.



Agri Drain
CORPORATION

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Adair, Iowa 50002**

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www.agridrain.com

info@agridrain.com

— Since 1976 —



The Boldt Company
1110 N. Old World Third Street
Suite 610
Milwaukee, WI 53203

414-276-4666 phone
www.boldt.com

December 26, 2018

Gretchen Ricehill
Glenwood Springs Community Development Department
101 West 8th Street
Glenwood Springs, CO 81601

Dear Ms. Ricehill,

Please find enclosed Boldt's application for a Major Site Development Plan and Architectural Review. As part of this application, we have included a brief narrative describing the project below.

Project Narrative

Boldt intends to develop an approximately 45,000 gross square foot project and associated parking for a strictly commercial, multi-tenant use. The users of the building are contemplated to be commercial, retail, dental or medical in nature, and Boldt is in the preliminary stages of identifying community partners that are interested in becoming a part of our development.

We are looking forward to meeting with the City of Glenwood Springs and taking the next steps for developing this project.

Best Regards,

A handwritten signature in blue ink, appearing to read "Jake Garro".

Jake Garro
414-276-4635

TRAFFIC IMPACT STUDY

Wulfsohn Road Commercial Building
Glenwood Springs, Colorado

Prepared for:

Glenwood Springs Properties, LLC
1110 N. Old World Third Street, Suite 610
Milwaukee, WI 53203

Prepared by:

Felsburg Holt & Ullevig
6300 South Syracuse Way, Suite 600
Centennial, CO 80111
303.721.1440

I

Project Manager: Charles M. Buck, PE, PTOE
Principal: Lyle E. DeVries, PE, PTOE



FHU Reference No. 118467-01

December 21, 2018

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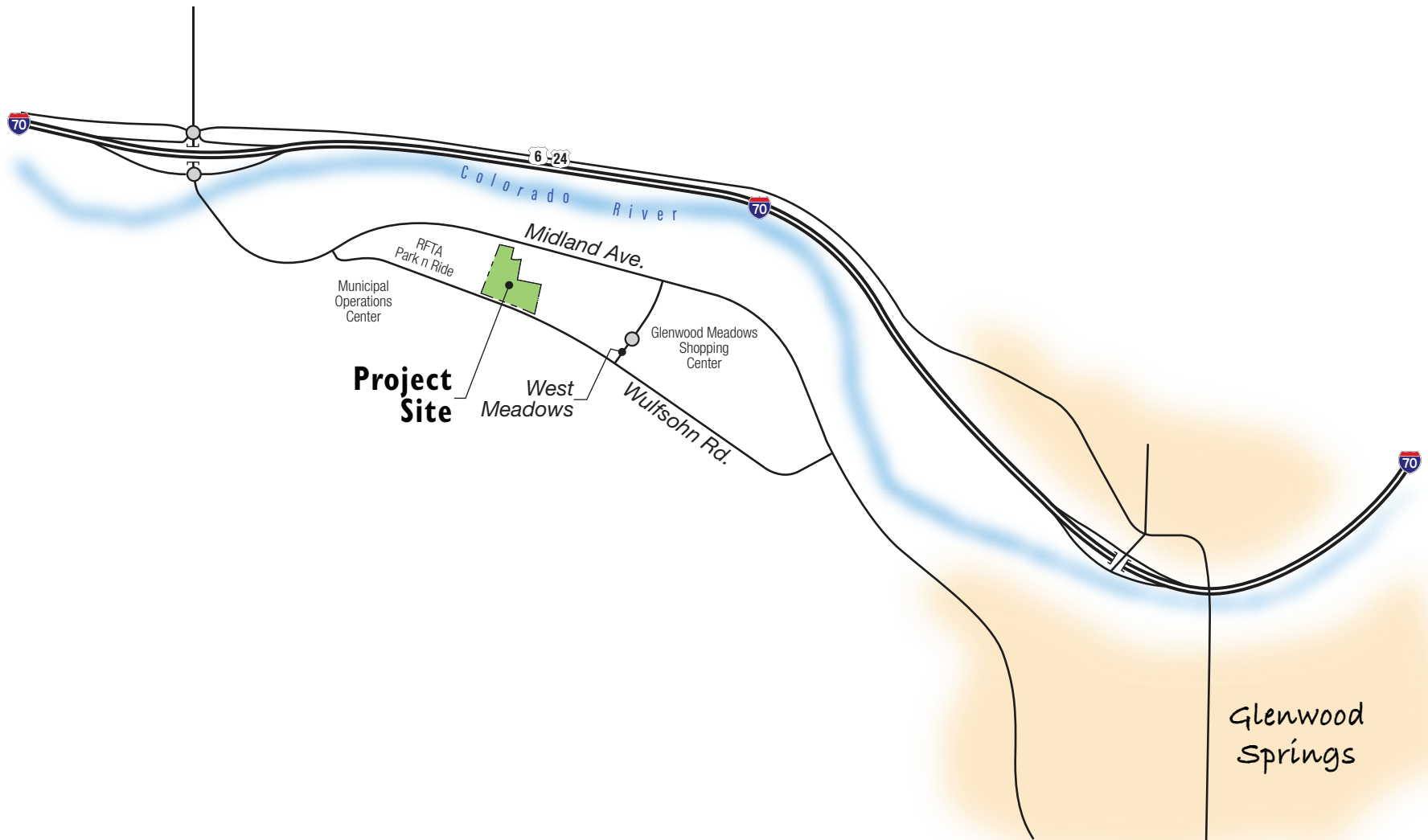
I. INTRODUCTION

Glenwood Springs Properties LLC is proposing a new commercial building to be located between Midland Avenue and Wulfsohn Road in Glenwood Springs, Colorado. The currently vacant site is generally southeast of the I-70/Midland Avenue (Exit 114) interchange. **Figure 1** depicts the study area and primary roadway system.

The proposed development would consist of approximately 45,000 square feet of commercial space. While specific uses are yet to be determined, this analysis has assumed 15,000 square feet of retail, 15,000 square feet of general office, and 15,000 square feet of medical office uses. Vehicular access to the site would be via two driveways on Wulfsohn Road. **Figure 2** depicts the current site plan concept.

The purpose of this report is to assess the traffic impacts specific to the proposed commercial development and to identify any potential roadway or traffic control requirements. Two future planning horizons are evaluated:

- **Short Range Future.** This scenario estimates traffic conditions based on a near-term project build-out.
- **Long Range Future.** This scenario evaluates a projected 20-year planning horizon, consistent with the City of Glenwood Spring's Long Range Comprehensive Plan.





II. EXISTING CONDITIONS

II.A. Land Use

As mentioned previously, the site is currently vacant and is identified for commercial uses per the City's Comprehensive Plan. The existing Glenwood Meadows Shopping Center is located to the east of the site. To the west, existing development includes the City of Glenwood Spring's Municipal Operations Center and Roaring Fork Transit Authority (RFTA) Park-N-Ride facility. The Midland Center, a commercial development, is located farther west, in the northwest quadrant of the Midland Avenue/Wulfsohn Road intersection. Lands along the south side of Wulfsohn Road directly opposite the site are now vacant, but are identified for multi-family residential uses in the future, per the Comprehensive Plan.

II.B. Existing Roadway Network

Midland Avenue

Midland Avenue is an arterial roadway extending east from I-70, then trending south along the Roaring Fork River through Glenwood Springs. Within the study area, the cross section is two-lane, with auxiliary turn lanes provided as needed at key intersections. The speed limit is 45 miles per hour (MPH). The intersection with West Meadows Drive is a full movement "T" intersection and is signal controlled. The intersection with Wulfsohn Road is currently STOP sign controlled on the Wulfsohn Road approach. A paved, non-motorized, multi-use trail runs parallel to Midland Avenue along the south side.

Wulfsohn Road

Wulfsohn Road is a two-lane collector that extends east from the intersection at Midland Avenue near the RFTA Park-N-Ride, along the south side of the Glenwood Meadows center, and tying back into Midland Avenue about 3,600 feet east of the site. Near the site, the cross section is two-lane, with a posted speed limit of 25 MPH. Existing intersections along Wulfsohn Road are unsignalized, with STOP sign control on the minor approaches. A continuous concrete sidewalk is provided along the north side of Wulfsohn Road for the entire length of the roadway.

West Meadows Drive

West Meadows Drive bisects the Glenwood Meadows center, providing retail traffic access to Midland Avenue and Wulfsohn Road. The cross section is two-lane, divided, with a raised center median. The speed limit is not posted; speeds are controlled by a roundabout within the shopping center.

II.C. Traffic Volumes

Per discussions with City staff, turning movement traffic counts were recently conducted at the Midland Avenue/Wulfsohn Road, Midland Avenue/West Meadows Drive, and Wulfsohn Road/West Meadows Drive intersections. These traffic counts were collected in 15-minute intervals from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM to encompass the morning and afternoon peak periods of commuter activity; the peak hours were then extracted from these data. Existing turning movements at the RFTA Park-N-Ride and Municipal Center access intersection on Wulfsohn Road were estimated based on the adjacent intersection counts data. Twenty-four-hour roadway counts were also conducted on all three roadways, with adjacent segments estimated based on the ratio of peak hour to daily ratios exhibited in the counts. **Appendix A** includes the traffic count data collected for this report.

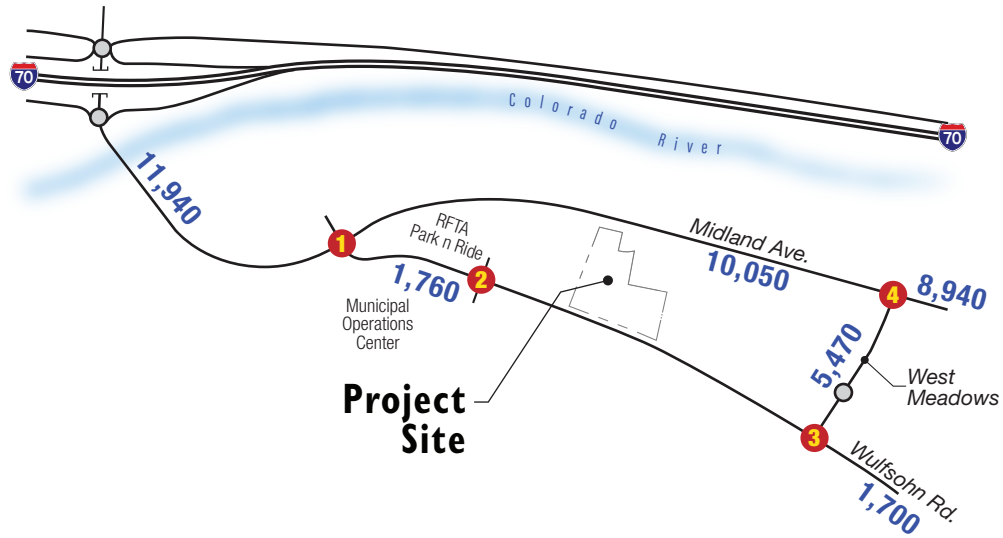
Figure 3 graphically depicts the existing traffic conditions. As shown, two-way daily volumes along Midland Avenue west of the site are approximately 11,940 vehicles per day (VPD), and about 10,050 VPD adjacent to the site. The daily traffic volumes along Wulfsohn Road range between about 1,700 and 1,760 VPD. West Meadows Drive currently experiences about 5,470 VPD.

II.D. Traffic Operations

Existing traffic operations were analyzed at the study area intersections based on procedures documented in the *Highway Capacity Manual*, 6th Edition (Transportation Research Board, 2017). Level of Service (LOS) is a qualitative measure of traffic operations and is based on roadway capacity and motorist delay. LOS ranges from A to F, with LOS A representing the best possible operating conditions, and LOS F representing over-capacity or congested conditions. LOS D is considered to be acceptable for peak hour traffic operations per City standards. For signalized traffic control, LOS represents an average of the delays for all movements at the intersection. At unsignalized intersections, LOS is reported for each movement that yields the right-of-way.

Figure 3 summarizes the existing LOS results (**Appendix B** includes worksheets for the existing conditions analysis). As indicated, exiting traffic operations are generally acceptable, with the exception of STOP-sign controlled movements at Midland Avenue/Wulfsohn Road. During peak times, motorists experience excessive delays, particularly making left-turns. This intersection was evaluated relative to signal warrants, per the *Manual on Uniform Traffic Control Devices*, FHWA, 2009 (MUTCD). It was determined that current conditions at this intersection approach, but do not meet, threshold criteria for signal installation. Signal warrants are discussed in greater detail in subsequent sections of this report.

Key Map



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

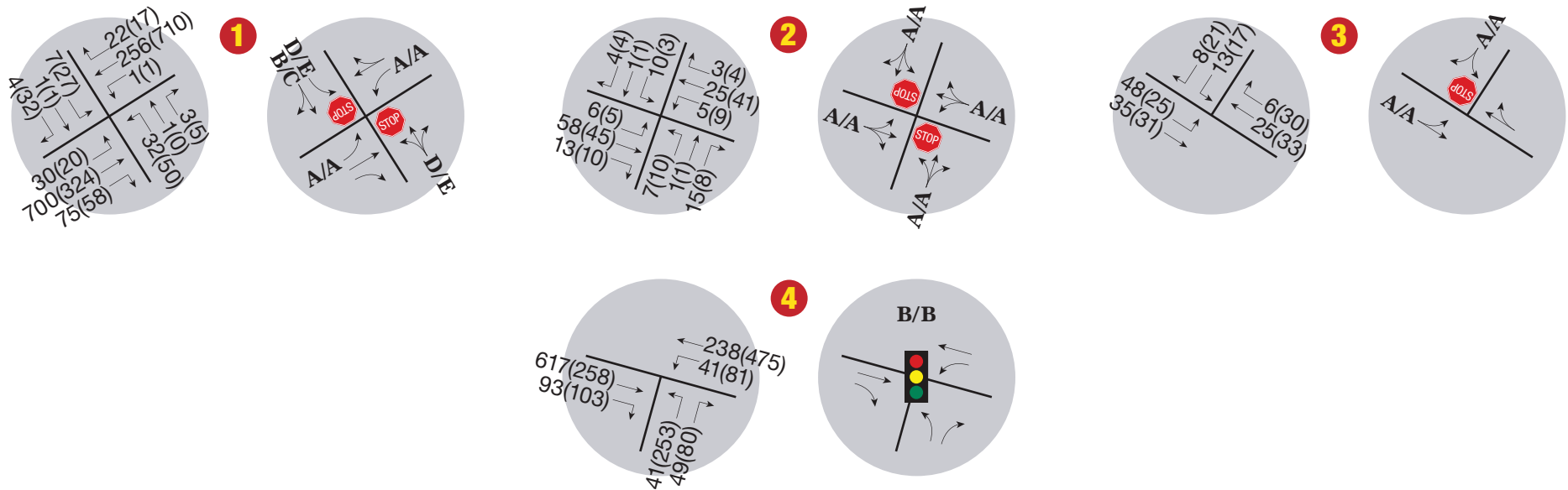
XXXX = Daily Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service



= Stop Sign

= Traffic Signal



III. FUTURE CONDITIONS

III.A. Background Traffic Volumes

Background traffic is the component of traffic volumes on the adjacent street network that would be present regardless of the proposed commercial building. Because the commercial building is expected to be developed in the near future, the existing traffic volumes, previously presented, were used for the short-range background traffic volumes.

To estimate background increases in traffic volumes for the long-range future, growth rates were extracted from the *SH 82 Corridor Optimization Plan*, December 2010, which projects an average annual growth rate of 2.0 percent. This growth rate was used to project the 20-year planning horizon.

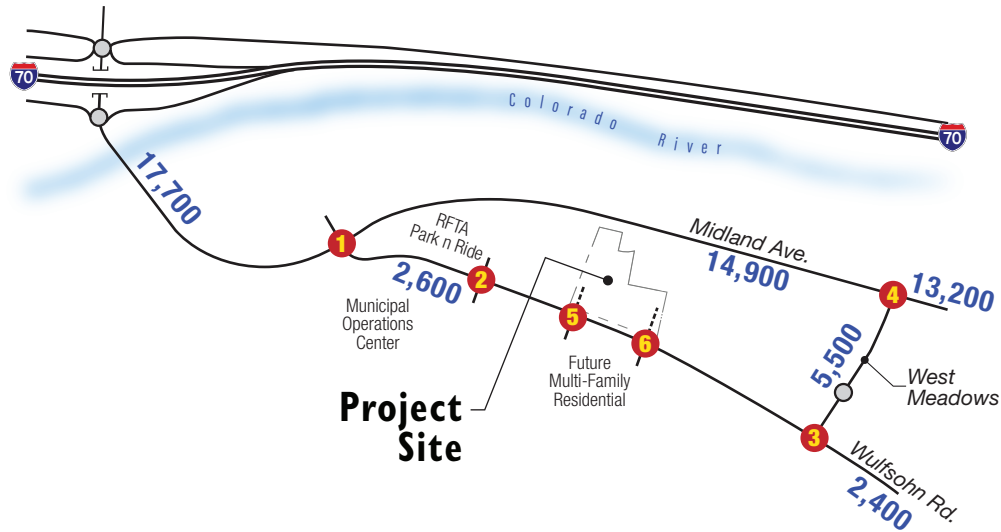
Currently vacant lands along the south side of Wulfsohn Road opposite the site are identified for multi-family residential uses in the future, per the City's Comprehensive Plan. Therefore, for the purposes of this analysis, it was assumed that about 20 acres could be developed at a density of 15 dwelling units per acre, for a total of approximately 335 dwelling units. Trips were generated using *Trip Generation*, 10th Edition, Institute of Transportation Engineers, 2017 (ITE), Land Use Code 221, Multi-Family Housing, Mid-Rise). These trips were assigned to two access points, which are assumed to align opposite the proposed commercial site driveways. Traffic volumes along Wulfsohn Road were then balanced for continuity.

Figure 4 depicts the resultant long-range background projections. As shown, daily volumes along Midland Avenue would range from approximately 13,200 to 17,700 VPD within the study area. The daily traffic volumes along Wulfsohn Road would range between about 2,400 and 2,600 VPD. As West Meadows Drive serves a built-out shopping center, the existing volumes are not anticipated to grow significantly; the 20-year projection on this roadway is 5,500 VPD.

LOS calculations based on the long-range future background conditions indicate that traffic operations would remain acceptable, at LOS C or better during peak times. Of note: the projected traffic volumes along Midland Avenue would exceed the typical daily capacity for a two-lane arterial roadway (generally about 12,000 to 16,000 VPD).

Traffic operations at the intersection of Midland Avenue/Wulfsohn Road would experience unacceptable delays and congestion under the existing STOP sign control; therefore, this intersection was assumed to be signalized to maintain acceptable traffic operations. **Appendix C** provides LOS worksheets.

Key Map



LEGEND

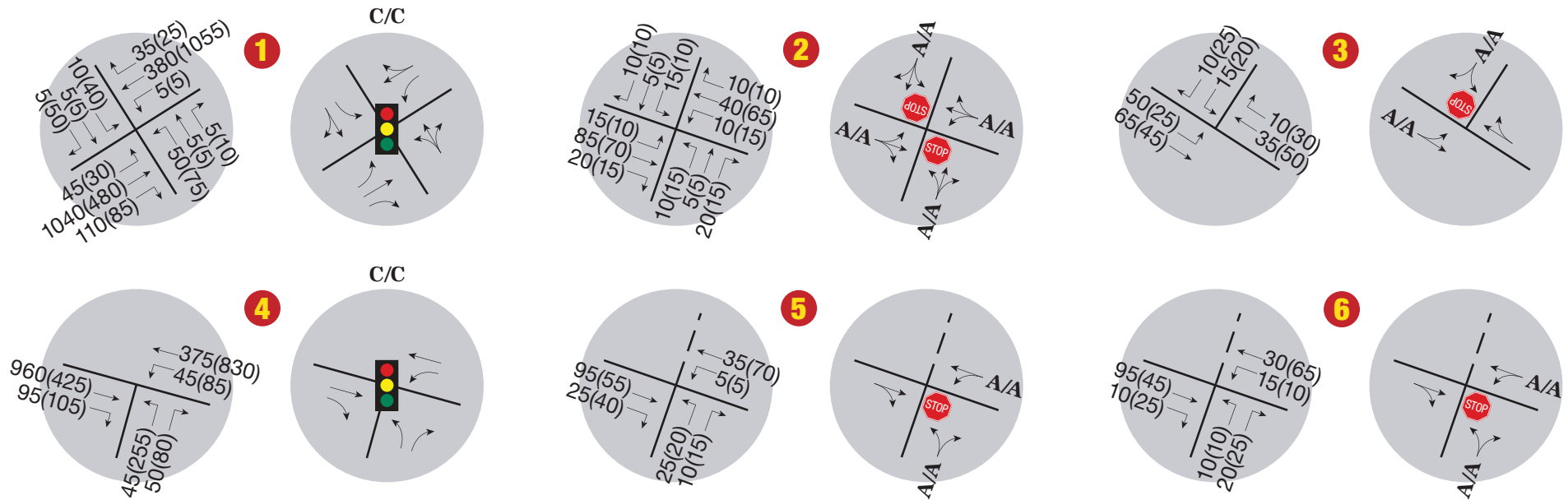
XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service

= Stop Sign

= Traffic Signal



III.B. Site Trip Generation

As previously mentioned, the commercial concept for this site consists of an approximate 45,000 square feet of commercial space. While specific uses are yet to be determined, this analysis has assumed 15,000 square feet of retail, 15,000 square feet of general office, and 15,000 square feet of medical office uses. A trip generation analysis was conducted using standard rates documented in *Trip Generation*, 10th Edition, Institute of Transportation Engineers, 2017 (ITE). **Table I** summarizes the trip generation potential of the site.

Table I. Trip Generation Analysis

Land Use	Quantity	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
			In	Out	Total	In	Out	Total
Retail (1)	15,000 sf	570	10	5	15	25	35	60
General Office (2)	15,000 sf	150	15	5	20	5	15	20
Medical Office (3)	15,000 sf	520	35	5	40	15	35	50
Total	45,000 sf	1,240	60	15	75	45	85	130
1. ITE Code 820 Shopping Center. Equations and average rates applied. 2. ITE Code 710 General Office Building. Average rates applied. 3. ITE Code 720 Medical Office Building Average rates applied.								

As **Table I** indicates, the commercial site would generate about 1,240 trips daily, with peak hour trip generation estimates ranging from approximately 75 vehicle trips per hour (VPH) to 130 VPH.

Typically, retail uses attract a percentage of trips from background traffic passing by the site on the way to other destinations. Some site-internal trips could also be expected, based on the mix of uses. However, to be conservative, no pass-by or internal reductions have been applied in this analysis.

The proximity of the RFTA transit facility could also be expected to reduce the vehicle trip generation of the site. This transit facility is within easy walking distance of the site and would likely be attractive to employees and customers. The nearby regional trail would also provide bicycle access for the site. To ensure a conservative estimate of vehicular impacts, however, no mode-split reductions have been applied.

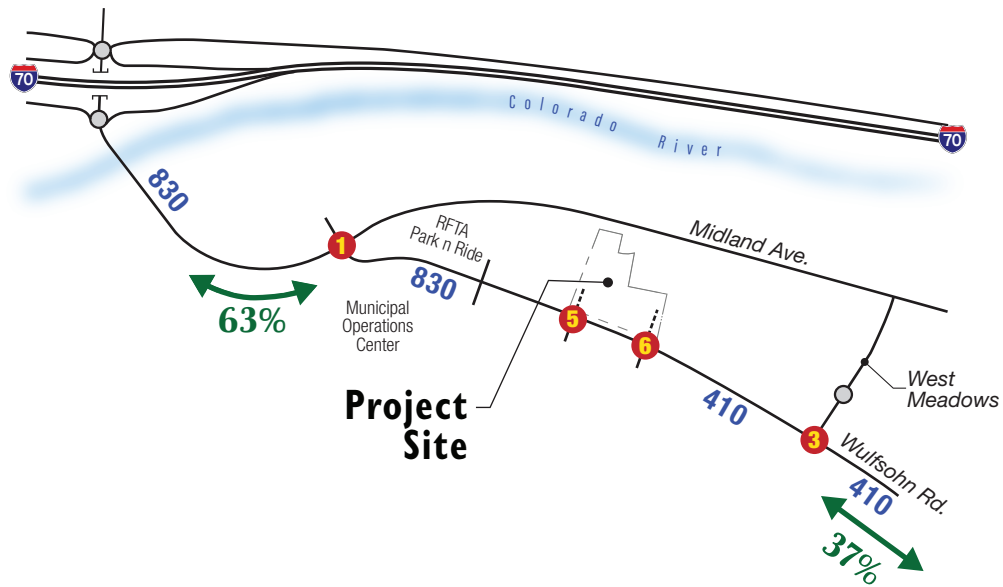
III.C. Trip Distribution and Site Generated Traffic Assignment

The site generated traffic volumes identified in **Table I** were distributed and assigned to the adjacent street network based on the following trip distribution percentages:

- 63 percent to/from the west via Wulfsohn Road and Midland Avenue
- 37 percent to/from the east via Wulfsohn Road

This trip distribution is based on the existing travel patterns extracted from the traffic counts. **Figure 5** depicts the resultant site generated traffic assignment. As shown, the site is projected to contribute approximately 830 VPD to Wulfsohn Road to the west of the site and to Midland Avenue farther west. The site generated daily traffic volumes along Wulfsohn Road to the east would be about 410 VPD. Note that the site is not expected to contribute significantly to traffic volumes along West Meadows Drive.

Key Map

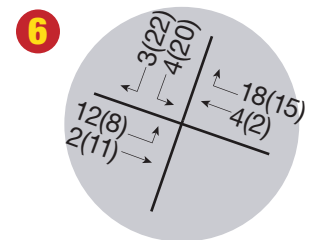
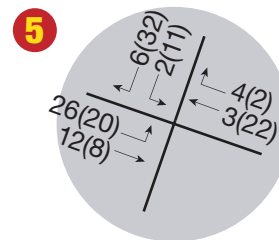
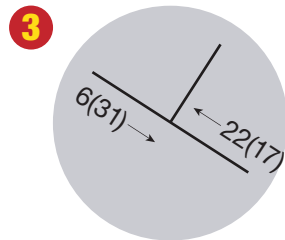
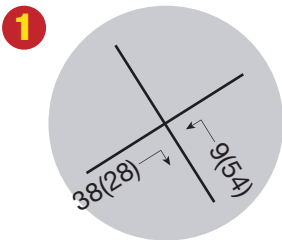


LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

XX% = Site Trip Distribution



III.D. Short Range Future Total Traffic Conditions

The site generated traffic volumes (**Figure 5**) were added to the existing traffic volumes (**Figure 3**) to produce the short range future total traffic volumes illustrated on **Figure 6**. As depicted, daily volumes along Midland Avenue are projected to range from approximately 8,940 to 12,700 VPD within the study area. The daily traffic volumes along Wulfsohn Road would range between about 2,110 and 2,590 VPD.

Figure 6 also shows the peak hour traffic volumes, intersection geometrics, and traffic control used as the basis for LOS analyses (**Appendix D** includes LOS worksheets). As indicated, traffic operations at the study area intersections would remain generally acceptable, at LOS C or better, during peak times under short range future total traffic conditions. Relative to this, the intersection at Midland Avenue/Wulfsohn Road would require signalization to maintain acceptable traffic operations. An evaluation of the peak hour volumes indicates the potential to warrant a traffic signal with the addition of site generated traffic. Note that the site generated component of traffic volumes through this intersection would be less than seven percent. Signal warrants are discussed in greater detail in a subsequent section of this report.

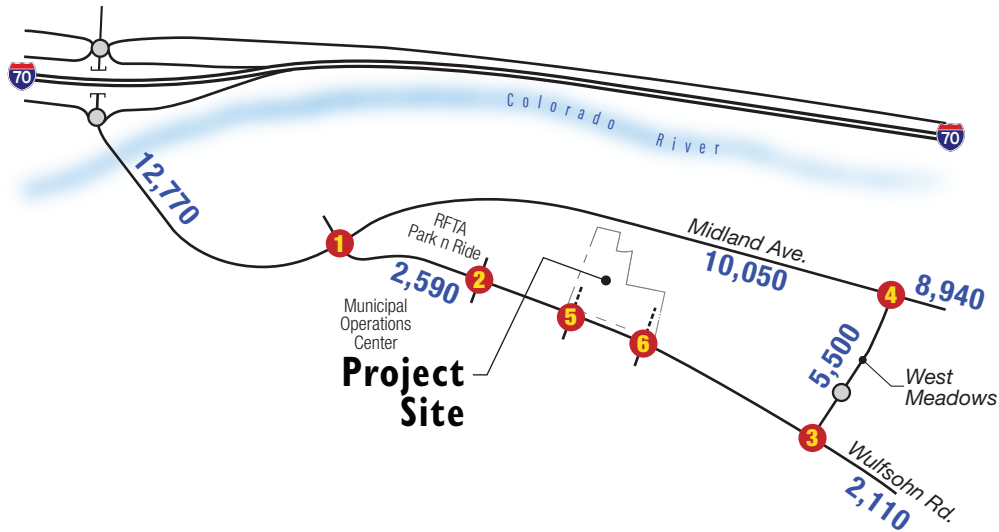
III.E. Long Range Future Total Traffic Conditions

The site generated traffic volumes were added to the 2040 background traffic volumes (**Figure 4**) to produce the long-range future total traffic volumes shown on **Figure 7**. At the 20-year horizon, Midland Avenue would experience approximately 13,200 to 18,530 VPD within the study area. The total daily traffic volumes along Wulfsohn Road would range between about 2,810 and 3,430 VPD. Traffic volumes along West Meadows Drive would remain at about 5,500 VPD.

Figure 7 depicts LOS analysis results for the long-range future total traffic projections (**Appendix E** includes LOS worksheets). As indicated, traffic operations near the commercial site would remain acceptable, at LOS C or better during peak times. The site accesses would function acceptably, at LOS A or B, under STOP-sign control.

Traffic signals at the two intersections along Midland Avenue would be at LOS C during peak times. At Midland Avenue/Wulfsohn Road, the site generated component of traffic volumes through this intersection would be only three to four percent in the long-range future.

Key Map



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

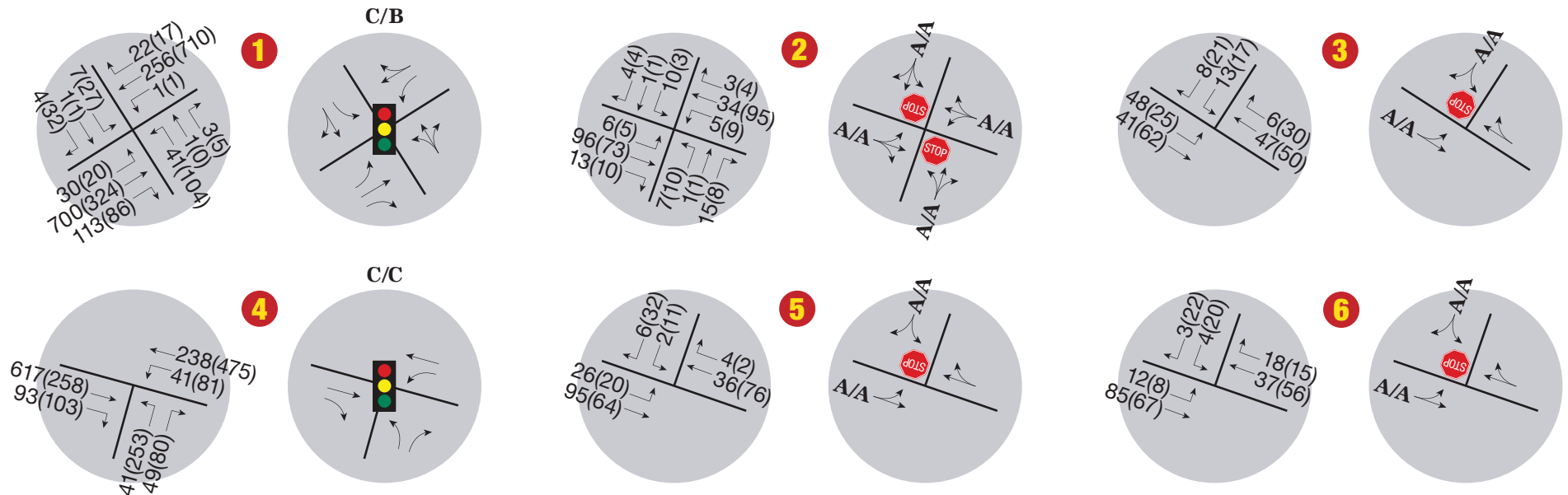
X/X = AM/PM Peak Hour Intersection Level of Service



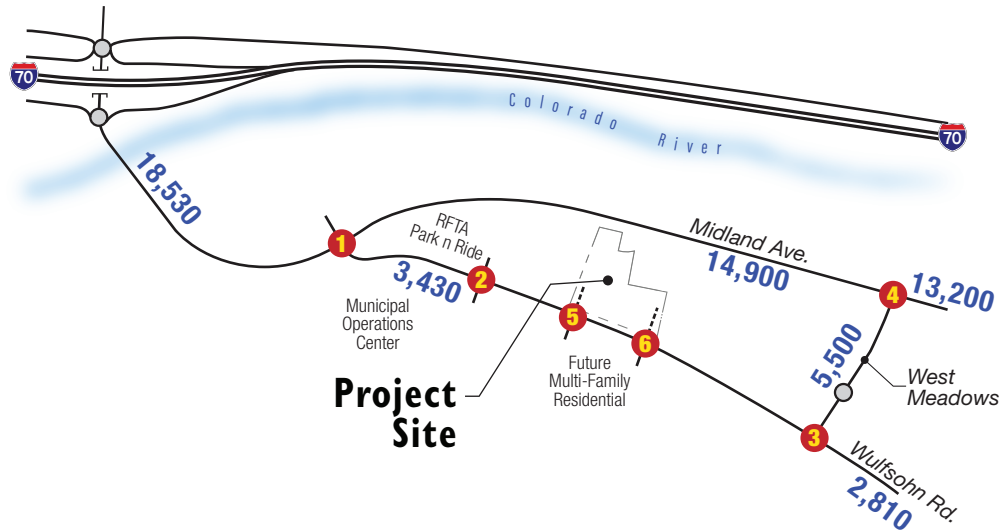
= Stop Sign



= Traffic Signal



Key Map



LEGEND

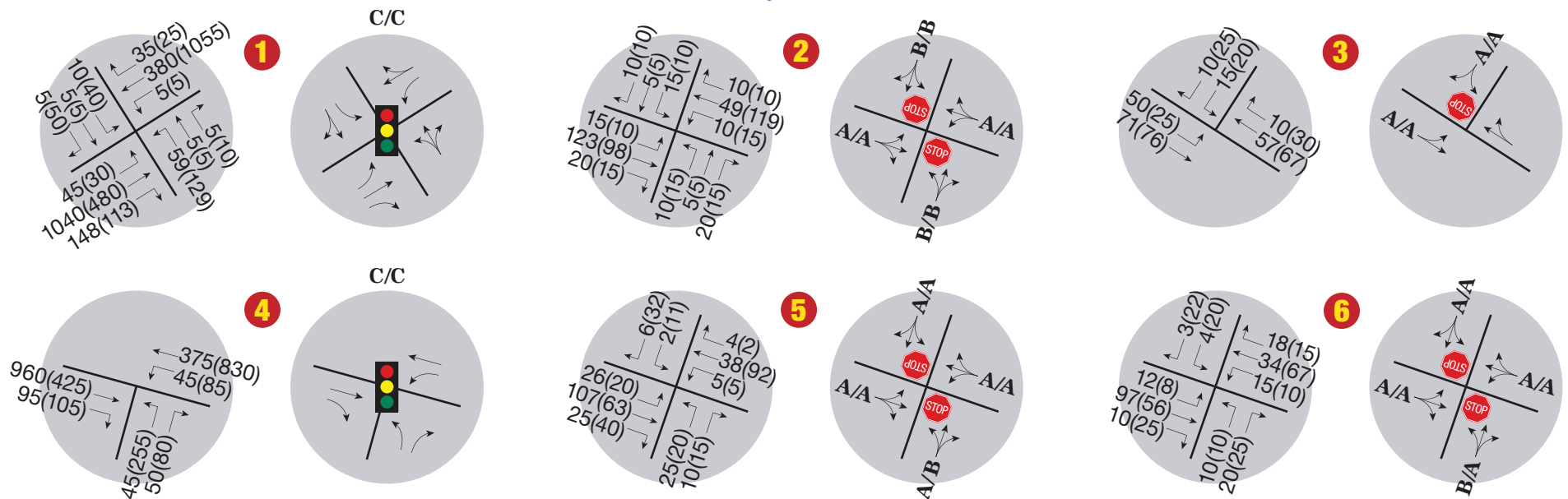
XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service

 = Stop Sign

 = Traffic Signal



IV. IMPROVEMENT EVALUATION

IV.A. Signal Warrants

As previously mentioned, existing unsignalized operations at the intersection of Midland Avenue/Wulfsohn Road create delays for STOP sign controlled movements. During peak times, motorists waiting to enter Midland Avenue experience LOS E, indicating near-capacity conditions. This is due to the heavy through-traffic on Midland Avenue. This intersection was evaluated relative to MUTCD Signal Warrants 1 (Eight Hour Volume), 2 (Four Hour Volume), and 3 (Peak Hour). As previously noted, current conditions at this intersection approach, but do not meet, threshold criteria for signal installation under Warrants 2 and 3. Two of the four hours are nearly met under Warrant 2, and the PM peak hour volumes are just below the threshold for Warrant 3. **Appendix F** contains data plots of the signal warrant analysis.

The short-range future total traffic volumes would be sufficient to indicate a signal per Warrant 3 (PM peak hour), as would the long-range future background and total conditions. If signalized, this intersection would provide acceptable traffic operations through the projected long-range future.

As indicated previously, the projected traffic volumes along Midland Avenue would exceed the typical daily capacity of 12,000 to 16,000 VPD for a two-lane arterial roadway. Signal timing changes should be expected at the existing traffic signal at Midland Avenue/West Meadows Drive. One measure of traffic operations along a signalized corridor is progression: the ability for mainline traffic to proceed along the corridor without having to stop for a red signal indication. Time-space diagrams indicate good potential for progressive movement along Midland Avenue, with calculated green band efficiencies of 61 to 63 percent (time-space diagrams are included in **Appendix F**).

IV.B. Queue Analysis

Auxiliary lane storage requirements at the signalized intersections were evaluated based on the long-range future total traffic conditions using the 95th percentile maximum probable queue lengths extracted from the LOS worksheets (assuming 25 feet per vehicle in storage). **Table 2** summarizes the results.

Table 2. Queue Analysis

Intersection	Movement	Queue Length (ft) AM (PM)	Existing Storage (ft)
Midland Avenue/ Wulfsohn Road	NB Left-Through-Right	75 (200)	N/A
	SB Left	25 (50)	75
	SB Through-Right	25 (75)	75
	EB Left	25 (25)	100
	EB Through	850(175)	N/A
	EB Right	50 (50)	60
	WB Left	25 (25)	100
	WB Through	175 (725)	N/A
	WB Right	25 (25)	30 (Taper)
Midland Avenue/ West Meadows Drive	NB Left	50 (225)	80
	NB Right	50 (75)	80
	EB Through	625 (275)	N/A
	EB Right	50 (75)	120
	WB Left	50 (50)	200
	WB Through	125 (625)	N/A

As indicated, the existing storage lengths provided for the above movements are generally adequate to accommodate the projected queues. Northbound left-turn queues exiting the Glenwood Meadows shopping center would exceed the available storage during the PM peak hour, which would impact outbound right-turns and could cause some congestion inside the shopping center. Note that the proposed commercial site is not projected to contribute to this movement. Also of note are the through-movement queues on Midland Avenue, which are due to the high projected volumes, which are above the typical capacity of this two-lane arterial.

The current laneage on Wulfsohn Road adjacent to the site would be sufficient for the future total traffic volumes. The need for auxiliary lanes (right-turn or left-turn lanes) is not envisioned for either the commercial site or the future multi-family residential accesses.

IV.C. Pedestrians and Bicycles

As mentioned previously, transit use by site employees and customers is likely to reduce the vehicular impacts of this development. Pedestrian access between the site and the RFTA facility is already provided via the existing concrete sidewalk along Wulfsohn Road. The nearby regional multi-use trail just north of the site will enhance the potential for commuter bicycle access by employees. Site planning should incorporate bike racks and potentially lockers, to accommodate bicyclists and encourage alternate modes.

IV.D. Travel Demand Management (TDM)

Other enhancements to promote multi-modal trip choices would include making informational materials available to site employees and visitors. Such information could include bus schedules, bike route maps, and car-pool information. These materials could be located in a kiosk or central display within the public area of the building. Employers could offer flexible schedules to smooth out the peak hour traffic load, and could establish car pool programs and/or offer bus passes.

V. CONCLUSIONS AND RECOMMENDATIONS

Glenwood Springs Properties LLC is planning to develop a new commercial building along Wulfsohn Road in Glenwood Springs, Colorado. The currently vacant site is located generally southeast of the I-70/Midland Avenue (Exit 114) interchange. The proposed development would consist of an approximate 45,000 square-foot of commercial building. This analysis has considered 15,000 square feet of retail, 15,000 square feet of general office, and 15,000 square feet of medical office uses. Vehicular access to the site would be via two driveways on Wulfsohn Road.

The commercial site would generate about 1,240 trips daily, with approximately 75 to 130 vehicle trips per hour. In general, the existing study area roadway system would remain sufficient to accommodate this development through the projected long-range future. Relative to this, the following summarize the findings and recommendations of this report:

- The two site accesses along Wulfsohn Road will function acceptably with STOP-sign control exiting the site. These accesses should align with, or be sufficiently separated from, any potential future accesses serving south side multi-family residential development. This analysis has assumed four-way intersections in the long-range future; traffic operations would remain at LOS B or better for all movements.
- The current laneage on Wulfsohn Road adjacent to the site would be sufficient for the future total traffic volumes. Auxiliary lanes are not envisioned for either the commercial site or the future multi-family residential accesses.
- The intersection at Midland Avenue/Wulfsohn Road (currently STOP sign controlled) is approaching threshold values for warranting a signal. Existing traffic operations include long delays (LOS E) for side-street movements. It is estimated that the proposed commercial site could generate sufficient traffic to meet signal warrant criteria. Therefore, traffic conditions should be periodically monitored, and a traffic signal be installed when warrants are met. The site generated component of traffic volumes through this intersection would be only three to four percent in the long-range future.
- Projected long-range future traffic volumes along Midland Avenue could exceed the capacity of a two-lane arterial. To adequately serve through-volumes on Midland Avenue, signal timing and cycle length modifications may be necessary over time. The potential to provide good signal progression along this corridor is anticipated through the 20-year design horizon.
- The proximity of transit, along with existing pedestrian and bicycle facilities, will help to reduce the traffic impacts of this proposed development. Additional Travel Demand Management (TDM) measures could help encourage multi-modal choices.

APPENDIX A TRAFFIC COUNTS

Site Code: 4
Station ID: 4
MIDLAND AVE W/O MEADOWS DR

Start Time	05-Dec-18 Wed	EB	WB							Total
12:00 AM		8	6							14
01:00		6	3							9
02:00		9	7							16
03:00		10	4							14
04:00		27	11							38
05:00		160	28							188
06:00		241	58							299
07:00		589	197							786
08:00		498	254							752
09:00		304	166							470
10:00		320	244							564
11:00		323	290							613
12:00 PM		382	299							681
01:00		360	349							709
02:00		320	412							732
03:00		346	475							821
04:00		326	553							879
05:00		335	715							1050
06:00		218	356							574
07:00		145	205							350
08:00		78	145							223
09:00		50	87							137
10:00		36	55							91
11:00		11	15							26
Total		5102	4934							10036
Percent		50.8%	49.2%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	07:00
Vol.	-	589	290	-	-	-	-	-	-	786
PM Peak	-	12:00	17:00	-	-	-	-	-	-	17:00
Vol.	-	382	715	-	-	-	-	-	-	1050
Grand Total		5102	4934							10036
Percent		50.8%	49.2%							
ADT		ADT 10,036	AADT 10,036							

All Traffic Data Sevlces
www.alltrafficdata.net

Site Code: 5
Station ID: 5
WULFSOHN RD N/O MEADOWS DR

Start Time	05-Dec-18										Total
	Wed	NB	SB								
12:00 AM		6	2								8
01:00		2	0								2
02:00		5	2								7
03:00		5	7								12
04:00		7	12								19
05:00		15	44								59
06:00		8	53								61
07:00		32	63								95
08:00		26	61								87
09:00		31	74								105
10:00		38	58								96
11:00		37	68								105
12:00 PM		64	86								150
01:00		57	75								132
02:00		58	75								133
03:00		78	78								156
04:00		55	62								117
05:00		51	61								112
06:00		69	50								119
07:00		43	34								77
08:00		24	17								41
09:00		19	12								31
10:00		20	8								28
11:00		5	3								8
Total		755	1005								1760
Percent		42.9%	57.1%								
AM Peak	-	10:00	09:00	-	-	-	-	-	-	-	09:00
Vol.	-	38	74	-	-	-	-	-	-	-	105
PM Peak	-	15:00	12:00	-	-	-	-	-	-	-	15:00
Vol.	-	78	86	-	-	-	-	-	-	-	156
Grand Total		755	1005								1760
Percent		42.9%	57.1%								
ADT		ADT 1,760	AADT 1,760								

All Traffic Data Sevlces
www.alltrafficdata.net

Site Code: 6
Station ID: 6
W MEADOWS DR S/O MIDLAND AVE

Start Time	05-Dec-18									Total
	Wed	NB	SB							
12:00 AM		1	0							1
01:00		1	0							1
02:00		0	0							0
03:00		0	3							3
04:00		2	7							9
05:00		7	31							38
06:00		26	51							77
07:00		58	93							151
08:00		110	134							244
09:00		132	157							289
10:00		194	218							412
11:00		216	204							420
12:00 PM		246	227							473
01:00		286	236							522
02:00		295	208							503
03:00		270	220							490
04:00		311	210							521
05:00		317	173							490
06:00		175	132							307
07:00		142	78							220
08:00		113	51							164
09:00		66	17							83
10:00		37	7							44
11:00		7	0							7
Total		3012	2457							5469
Percent		55.1%	44.9%							
AM Peak	-	11:00	10:00	-	-	-	-	-	-	11:00
Vol.	-	216	218	-	-	-	-	-	-	420
PM Peak	-	17:00	13:00	-	-	-	-	-	-	13:00
Vol.	-	317	236	-	-	-	-	-	-	522
Grand Total		3012	2457							5469
Percent		55.1%	44.9%							
ADT		ADT 5,469	AADT 5,469							



(303) 216-2439
www.alltrafficdata.net

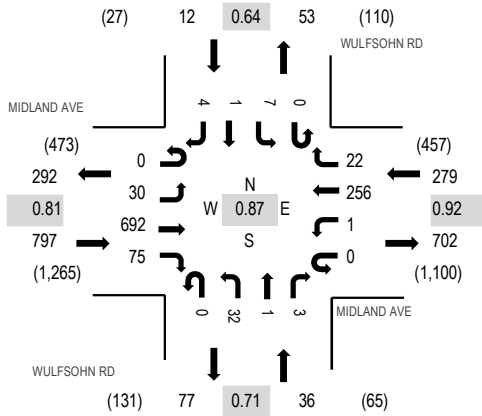
Location: 1 WULFSOHN RD & MIDLAND AVE AM

Date: Wednesday, December 5, 2018

Peak Hour: 07:30 AM - 08:30 AM

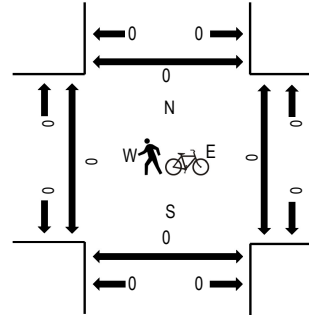
Peak 15-Minutes: 07:45 AM - 08:00 AM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	MIDLAND AVE Eastbound				MIDLAND AVE Westbound				WULFSOHN RD Northbound				WULFSOHN RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	9	74	17	0	1	33	0	0	5	0	0	0	1	0	0	140	934	0	0	0	0
7:15 AM	0	10	112	10	0	0	29	3	0	10	0	0	0	1	0	0	175	1,062	0	0	0	0
7:30 AM	0	8	185	18	0	0	67	4	0	6	1	1	0	3	0	2	295	1,124	0	0	0	0
7:45 AM	0	9	216	21	0	1	54	7	0	12	0	2	0	1	0	1	324	1,001	0	0	0	0
8:00 AM	0	7	158	16	0	0	72	4	0	8	0	0	0	1	1	1	268	880	0	0	0	0
8:15 AM	0	6	133	20	0	0	63	7	0	6	0	0	0	2	0	0	237		0	0	0	0
8:30 AM	0	5	98	7	0	2	45	3	0	5	0	1	0	4	0	2	172		0	0	0	0
8:45 AM	0	9	101	16	0	1	43	18	0	6	0	2	0	4	0	3	203		2	0	2	0
Count Total	0	63	1,077	125	0	5	406	46	0	58	1	6	0	17	1	9	1,814		2	0	2	0
Peak Hour	0	30	692	75	0	1	256	22	0	32	1	3	0	7	1	4	1,124		0	0	0	0



(303) 216-2439
www.alltrafficdata.net

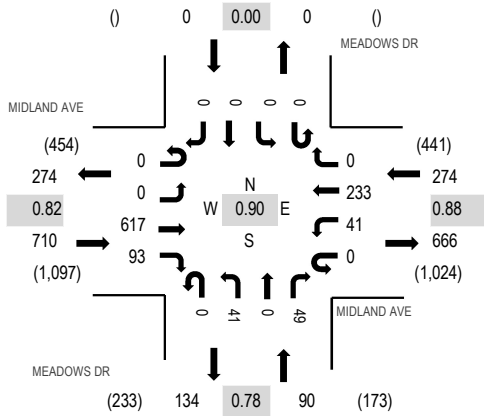
Location: 2 MEADOWS DR & MIDLAND AVE AM

Date: Wednesday, December 5, 2018

Peak Hour: 07:30 AM - 08:30 AM

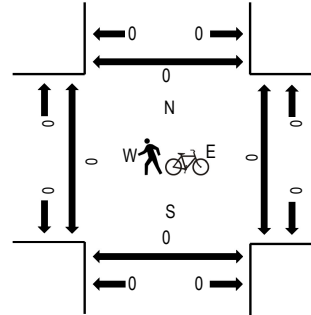
Peak 15-Minutes: 07:45 AM - 08:00 AM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	MIDLAND AVE Eastbound				MIDLAND AVE Westbound				MEADOWS DR Northbound				MEADOWS DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	0	62	16	0	2	29	0	0	6	0	4	0	0	0	0	119	836	0	0	0	0
7:15 AM	0	0	88	11	0	4	32	0	0	5	0	6	0	0	0	0	146	979	0	0	0	0
7:30 AM	0	0	169	21	0	6	57	0	0	9	0	9	0	0	0	0	271	1,074	0	0	0	0
7:45 AM	0	0	192	24	0	13	50	0	0	10	0	11	0	0	0	0	300	986	0	0	0	0
8:00 AM	0	0	144	25	0	10	68	0	0	7	0	8	0	0	0	0	262	875	0	0	0	0
8:15 AM	0	0	112	23	0	12	58	0	0	15	0	21	0	0	0	0	241		0	0	0	0
8:30 AM	0	0	83	21	0	15	32	0	0	16	0	16	0	0	0	0	183		0	0	0	0
8:45 AM	0	0	86	20	0	10	43	0	0	17	0	13	0	0	0	0	189		0	0	0	0
Count Total	0	0	936	161	0	72	369	0	0	85	0	88	0	0	0	0	1,711		0	0	0	0
Peak Hour	0	0	617	93	0	41	233	0	0	41	0	49	0	0	0	0	1,074		0	0	0	0



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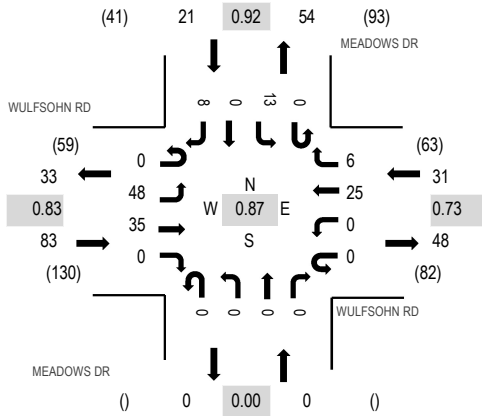
Location: 3 MEADOWS DR & WULFSOHN RD AM

Date: Wednesday, December 5, 2018

Peak Hour: 07:30 AM - 08:30 AM

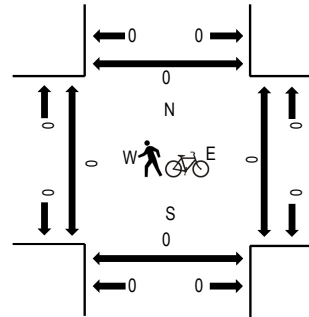
Peak 15-Minutes: 07:45 AM - 08:00 AM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	WULFSOHN RD Eastbound				WULFSOHN RD Westbound				MEADOWS DR Northbound				MEADOWS DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	5	10	0	0	0	6	4	0	0	0	0	0	2	0	2	29	116	0	0	0	0
7:15 AM	0	6	1	0	1	0	3	2	0	0	0	0	0	3	0	2	18	120	0	0	0	0
7:30 AM	0	10	8	0	0	0	2	3	0	0	0	0	0	5	0	2	30	135	0	0	0	0
7:45 AM	0	11	14	0	0	0	11	0	0	0	0	0	0	2	0	1	39	126	0	0	0	0
8:00 AM	0	14	7	0	0	0	5	2	0	0	0	0	0	3	0	2	33	118	0	0	0	0
8:15 AM	0	13	6	0	0	0	7	1	0	0	0	0	0	3	0	3	33		0	0	0	0
8:30 AM	0	4	6	0	0	0	2	3	0	0	0	0	0	5	0	1	21		0	0	0	0
8:45 AM	0	10	5	0	0	0	6	5	0	0	0	0	0	1	0	4	31		0	0	0	0
Count Total	0	73	57	0	1	0	42	20	0	0	0	0	0	24	0	17	234		0	0	0	0
Peak Hour	0	48	35	0	0	0	25	6	0	0	0	0	0	13	0	8	135		0	0	0	0



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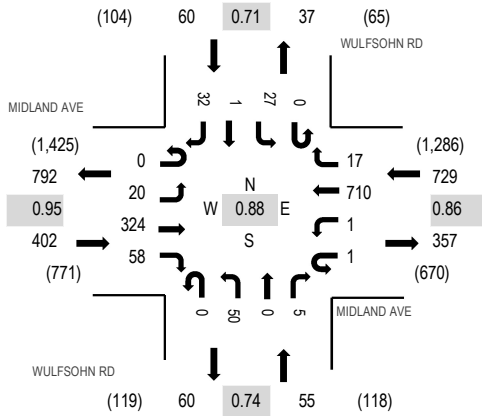
Location: 1 WULFSOHN RD & MIDLAND AVE PM

Date: Wednesday, December 5, 2018

Peak Hour: 04:45 PM - 05:45 PM

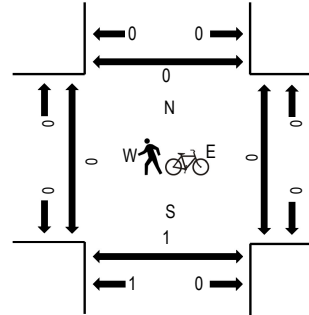
Peak 15-Minutes: 05:00 PM - 05:15 PM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	MIDLAND AVE Eastbound				MIDLAND AVE Westbound				WULFSOHN RD Northbound				WULFSOHN RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	6	69	20	0	0	113	6	0	13	0	2	0	4	1	12	246	1,059	0	0	0	0
4:15 PM	0	4	66	16	0	0	136	3	0	13	0	1	0	3	0	7	249	1,168	0	0	0	0
4:30 PM	0	4	94	6	0	1	150	3	0	15	0	0	0	1	2	5	281	1,218	0	0	0	0
4:45 PM	0	8	81	13	0	1	141	7	0	14	0	1	0	8	0	9	283	1,246	0	0	0	0
5:00 PM	0	9	87	14	0	0	208	5	0	10	0	1	0	9	0	12	355	1,220	0	0	0	0
5:15 PM	0	2	88	11	0	0	172	4	0	9	0	0	0	5	0	8	299		0	0	0	0
5:30 PM	0	1	68	20	1	0	189	1	0	17	0	3	0	5	1	3	309		0	0	0	0
5:45 PM	0	1	71	12	0	0	144	1	0	19	0	0	0	2	1	6	257		0	0	0	0
Count Total	0	35	624	112	1	2	1,253	30	0	110	0	8	0	37	5	62	2,279		0	0	0	0
Peak Hour	0	20	324	58	1	1	710	17	0	50	0	5	0	27	1	32	1,246		0	0	0	0



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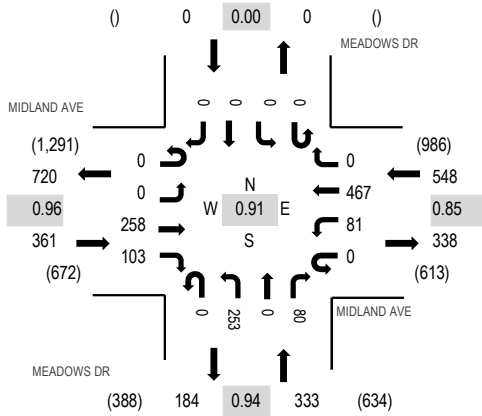
Location: 2 MEADOWS DR & MIDLAND AVE PM

Date: Wednesday, December 5, 2018

Peak Hour: 04:45 PM - 05:45 PM

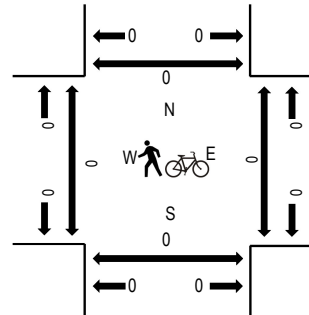
Peak 15-Minutes: 05:00 PM - 05:15 PM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	MIDLAND AVE Eastbound				MIDLAND AVE Westbound				MEADOWS DR Northbound				MEADOWS DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	56	25	0	31	63	0	0	58	0	17	0	0	0	0	250	1,083	0	0	0	0
4:15 PM	0	0	55	16	0	24	87	0	0	51	0	23	0	0	0	0	256	1,173	0	0	0	0
4:30 PM	0	0	47	41	0	24	95	0	0	66	0	23	0	0	0	0	296	1,241	0	0	0	0
4:45 PM	0	0	59	31	0	20	95	0	0	54	0	22	0	0	0	0	281	1,242	0	0	0	0
5:00 PM	0	0	70	25	0	18	143	0	0	70	0	14	0	0	0	0	340	1,209	0	0	0	0
5:15 PM	0	0	74	22	0	21	117	0	0	66	0	24	0	0	0	0	324		0	0	0	0
5:30 PM	0	0	55	25	0	22	112	0	0	63	0	20	0	0	0	0	297		0	0	0	0
5:45 PM	0	0	45	26	0	17	97	0	0	54	0	9	0	0	0	0	248		0	0	0	0
Count Total	0	0	461	211	0	177	809	0	0	482	0	152	0	0	0	0	2,292		0	0	0	0
Peak Hour	0	0	258	103	0	81	467	0	0	253	0	80	0	0	0	0	1,242		0	0	0	0



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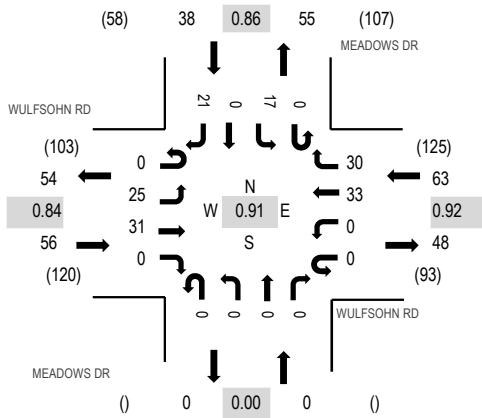
Location: 3 MEADOWS DR & WULFSOHN RD PM

Date: Wednesday, December 5, 2018

Peak Hour: 04:00 PM - 05:00 PM

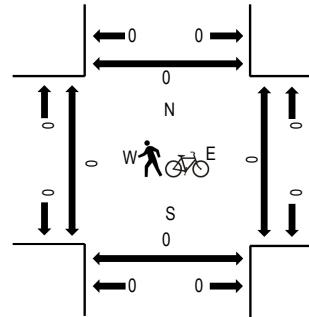
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	WULFSOHN RD Eastbound				WULFSOHN RD Westbound				MEADOWS DR Northbound				MEADOWS DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	7	13	0	0	0	6	6	0	0	0	0	0	4	0	7	43	157	0	0	0	0
4:15 PM	0	10	7	0	0	0	9	9	0	0	0	0	0	4	0	3	42	154	0	0	0	0
4:30 PM	0	5	5	0	0	0	10	7	0	0	0	0	0	5	0	4	36	145	0	0	0	0
4:45 PM	0	3	6	0	0	0	8	8	0	0	0	0	0	4	0	7	36	146	0	0	0	0
5:00 PM	0	5	14	0	0	0	5	10	0	0	0	0	0	2	0	4	40	146	0	0	0	0
5:15 PM	0	6	6	0	0	0	8	9	0	0	0	0	0	3	0	1	33		0	0	0	0
5:30 PM	0	10	6	0	0	0	13	3	0	0	0	0	0	1	0	4	37		0	0	0	0
5:45 PM	0	6	11	0	1	0	10	3	0	0	0	0	0	1	0	4	36		0	0	0	0
Count Total	0	52	68	0	1	0	69	55	0	0	0	0	0	24	0	34	303		0	0	0	0
Peak Hour	0	25	31	0	0	0	33	30	0	0	0	0	0	17	0	21	157		0	0	0	0

APPENDIX B EXISTING CONDITIONS LEVEL OF SERVICE WORKSHEETS

HCM 6th Signalized Intersection Summary
8: W Meadows Dr & Midland Ave

Existing Conditions AM Peak Hour

12/11/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	617	93	41	238	41	49
Future Volume (veh/h)	617	93	41	238	41	49
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	701	106	47	270	47	56
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	820	695	261	1035	544	484
Arrive On Green	0.44	0.44	0.04	0.55	0.31	0.31
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	701	106	47	270	47	56
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	21.5	2.6	0.8	4.8	1.2	1.6
Cycle Q Clear(g_c), s	21.5	2.6	0.8	4.8	1.2	1.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	820	695	261	1035	544	484
V/C Ratio(X)	0.85	0.15	0.18	0.26	0.09	0.12
Avail Cap(c_a), veh/h	1216	1031	335	1509	544	484
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.1	10.8	12.4	7.4	15.8	16.0
Incr Delay (d2), s/veh	4.1	0.1	0.3	0.1	0.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	12.8	1.3	0.5	2.5	0.9	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.2	10.9	12.7	7.6	16.1	16.4
LnGrp LOS	C	B	B	A	B	B
Approach Vol, veh/h	807			317	103	
Approach Delay, s/veh	18.9			8.3	16.3	
Approach LOS	B			A	B	
Timer - Assigned Phs	2		3	4	8	
Phs Duration (G+Y+Rc), s	24.0		7.3	32.5	39.8	
Change Period (Y+Rc), s	4.5		4.5	4.5	4.5	
Max Green Setting (Gmax), s	19.5		5.5	41.5	51.5	
Max Q Clear Time (g_c+I1), s	3.6		2.8	23.5	6.8	
Green Ext Time (p_c), s	0.2		0.0	4.5	1.5	
Intersection Summary						
HCM 6th Ctrl Delay			16.0			
HCM 6th LOS			B			

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	30	700	75	1	256	22	32	1	3	7	1	4
Future Vol, veh/h	30	700	75	1	256	22	32	1	3	7	1	4
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	80	-	50	100	-	-	-	-	-	70	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	795	85	1	291	25	36	1	3	8	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	316	0	0	880	0	0	1172	1181	795	1214	1254	304
Stage 1	-	-	-	-	-	-	863	863	-	306	306	-
Stage 2	-	-	-	-	-	-	309	318	-	908	948	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1244	-	-	768	-	-	169	190	388	158	172	736
Stage 1	-	-	-	-	-	-	349	372	-	704	662	-
Stage 2	-	-	-	-	-	-	701	654	-	330	339	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1244	-	-	768	-	-	163	185	388	152	167	736
Mov Cap-2 Maneuver	-	-	-	-	-	-	163	185	-	152	167	-
Stage 1	-	-	-	-	-	-	340	362	-	685	661	-
Stage 2	-	-	-	-	-	-	695	653	-	317	330	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0	32.3	23
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	172	1244	-	-	768	-	-	152	438
HCM Lane V/C Ratio	0.238	0.027	-	-	0.001	-	-	0.052	0.013
HCM Control Delay (s)	32.3	8	-	-	9.7	-	-	30	13.3
HCM Lane LOS	D	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0.9	0.1	-	-	0	-	-	0.2	0

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	58	13	5	25	3	7	1	15	10	1	4
Future Vol, veh/h	6	58	13	5	25	3	7	1	15	10	1	4
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	66	15	6	28	3	8	1	17	11	1	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	31	0	0	81	0	0	133	131	74	139	137	30
Stage 1	-	-	-	-	-	-	88	88	-	42	42	-
Stage 2	-	-	-	-	-	-	45	43	-	97	95	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1582	-	-	1517	-	-	839	760	988	831	754	1044
Stage 1	-	-	-	-	-	-	920	822	-	972	860	-
Stage 2	-	-	-	-	-	-	969	859	-	910	816	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1582	-	-	1517	-	-	829	753	988	810	747	1044
Mov Cap-2 Maneuver	-	-	-	-	-	-	829	753	-	810	747	-
Stage 1	-	-	-	-	-	-	915	818	-	967	857	-
Stage 2	-	-	-	-	-	-	960	856	-	889	812	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			1.1			9			9.3		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	922	1582	-	-	1517	-	-	856				
HCM Lane V/C Ratio	0.028	0.004	-	-	0.004	-	-	0.02				
HCM Control Delay (s)	9	7.3	0	-	7.4	0	-	9.3				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	48	35	25	6	13	8
Future Vol, veh/h	48	35	25	6	13	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	55	40	28	7	15	9
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	35	0	-	0	182	32
Stage 1	-	-	-	-	32	-
Stage 2	-	-	-	-	150	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1576	-	-	-	807	1042
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	878	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1576	-	-	-	778	1042
Mov Cap-2 Maneuver	-	-	-	-	778	-
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	878	-
Approach	EB	WB		SB		
HCM Control Delay, s	4.3	0		9.3		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1576	-	-	-	861	
HCM Lane V/C Ratio	0.035	-	-	-	0.028	
HCM Control Delay (s)	7.4	0	-	-	9.3	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	

HCM 6th Signalized Intersection Summary
8: W Meadows Dr & Midland Ave

Existing Conditions PM Peak Hour
12/11/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	258	103	81	475	253	80
Future Volume (veh/h)	258	103	81	475	253	80
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	293	117	92	540	288	91
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	426	361	367	743	735	654
Arrive On Green	0.23	0.23	0.07	0.40	0.41	0.41
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	293	117	92	540	288	91
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	6.8	2.9	1.7	11.6	5.4	1.7
Cycle Q Clear(g_c), s	6.8	2.9	1.7	11.6	5.4	1.7
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	426	361	367	743	735	654
V/C Ratio(X)	0.69	0.32	0.25	0.73	0.39	0.14
Avail Cap(c_a), veh/h	1642	1392	442	2038	735	654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	15.2	11.6	12.1	9.7	8.7
Incr Delay (d2), s/veh	2.0	0.5	0.4	1.4	1.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.5	1.6	0.9	6.5	3.7	0.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.7	15.7	12.0	13.5	11.3	9.1
LnGrp LOS	B	B	B	B	B	A
Approach Vol, veh/h	410			632	379	
Approach Delay, s/veh	17.9			13.2	10.8	
Approach LOS	B			B	B	
Timer - Assigned Phs	2		3	4	8	
Phs Duration (G+Y+Rc), s	24.0		8.0	15.3	23.3	
Change Period (Y+Rc), s	4.5		4.5	4.5	4.5	
Max Green Setting (Gmax), s	19.5		5.5	41.5	51.5	
Max Q Clear Time (g_c+I1), s	7.4		3.7	8.8	13.6	
Green Ext Time (p_c), s	1.0		0.0	2.0	3.4	
Intersection Summary						
HCM 6th Ctrl Delay			13.9			
HCM 6th LOS			B			

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	324	58	1	710	17	50	1	5	27	1	32
Future Vol, veh/h	20	324	58	1	710	17	50	1	5	27	1	32
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	80	-	50	100	-	-	-	-	-	70	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	23	368	66	1	807	19	57	1	6	31	1	36

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	826	0	0	434	0	0	1251	1242	368	1270	1299	817
Stage 1	-	-	-	-	-	-	414	414	-	819	819	-
Stage 2	-	-	-	-	-	-	837	828	-	451	480	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	805	-	-	1126	-	-	149	175	677	145	161	376
Stage 1	-	-	-	-	-	-	616	593	-	369	389	-
Stage 2	-	-	-	-	-	-	361	386	-	588	554	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	805	-	-	1126	-	-	131	170	677	140	156	376
Mov Cap-2 Maneuver	-	-	-	-	-	-	131	170	-	140	156	-
Stage 1	-	-	-	-	-	-	598	576	-	358	389	-
Stage 2	-	-	-	-	-	-	325	386	-	565	538	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0	49.5	25.9
HCM LOS			E	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	142	805	-	-	1126	-	-	140	361
HCM Lane V/C Ratio	0.448	0.028	-	-	0.001	-	-	0.219	0.104
HCM Control Delay (s)	49.5	9.6	-	-	8.2	-	-	37.8	16.1
HCM Lane LOS	E	A	-	-	A	-	-	E	C
HCM 95th %tile Q(veh)	2	0.1	-	-	0	-	-	0.8	0.3

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	45	10	9	41	4	10	1	8	3	1	4
Future Vol, veh/h	5	45	10	9	41	4	10	1	8	3	1	4
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	51	11	10	47	5	11	1	9	3	1	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	52	0	0	62	0	0	142	141	57	144	144	50
Stage 1	-	-	-	-	-	-	69	69	-	70	70	-
Stage 2	-	-	-	-	-	-	73	72	-	74	74	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1554	-	-	1541	-	-	828	750	1009	825	747	1018
Stage 1	-	-	-	-	-	-	941	837	-	940	837	-
Stage 2	-	-	-	-	-	-	937	835	-	935	833	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1554	-	-	1541	-	-	816	742	1009	810	739	1018
Mov Cap-2 Maneuver	-	-	-	-	-	-	816	742	-	810	739	-
Stage 1	-	-	-	-	-	-	937	834	-	936	831	-
Stage 2	-	-	-	-	-	-	925	829	-	922	830	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			1.2			9.2			9.1		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	882	1554	-	-	1541	-	-	890				
HCM Lane V/C Ratio	0.024	0.004	-	-	0.007	-	-	0.01				
HCM Control Delay (s)	9.2	7.3	0	-	7.4	0	-	9.1				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0				

Intersection

Int Delay, s/veh 3.3

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations 

Traffic Vol, veh/h 24 31 33 30 17 21

Future Vol, veh/h 24 31 33 30 17 21

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Free Free Free Free Stop Stop

RT Channelized - None - None - None

Storage Length - - - - 0 -

Veh in Median Storage, # - 0 0 - 0 -

Grade, % - 0 0 - 0 -

Peak Hour Factor 88 88 88 88 88 88

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 27 35 38 34 19 24

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 72 0 - 0 144 55

Stage 1 - - - - 55 -

Stage 2 - - - - 89 -

Critical Hdwy 4.12 - - - 6.42 6.22

Critical Hdwy Stg 1 - - - - 5.42 -

Critical Hdwy Stg 2 - - - - 5.42 -

Follow-up Hdwy 2.218 - - - 3.518 3.318

Pot Cap-1 Maneuver 1528 - - - 849 1012

Stage 1 - - - - 968 -

Stage 2 - - - - 934 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1528 - - - 834 1012

Mov Cap-2 Maneuver - - - - 834 -

Stage 1 - - - - 951 -

Stage 2 - - - - 934 -

Approach EB WB SB

HCM Control Delay, s 3.2 0 9.1

HCM LOS A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1528 - - - 924

HCM Lane V/C Ratio 0.018 - - - 0.047

HCM Control Delay (s) 7.4 0 - - 9.1

HCM Lane LOS A A - - A

HCM 95th %tile Q(veh) 0.1 - - - 0.1

APPENDIX C BACKGROUND TRAFFIC LEVEL OF SERVICE WORKSHEETS

HCM 6th Signalized Intersection Summary

2: Wulfsohn Rd/Midland Center & Midland Ave

Long Range Background AM Peak Hour

12/19/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	1040	110	5	380	35	50	5	5	10	5	5
Future Volume (veh/h)	45	1040	110	5	380	35	50	5	5	10	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	51	1182	125	6	432	40	57	6	6	11	6	6
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	592	1195	1013	98	1153	977	312	33	26	383	176	176
Arrive On Green	0.03	0.64	0.64	0.01	0.62	0.62	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1164	161	126	1402	858	858
Grp Volume(v), veh/h	51	1182	125	6	432	40	69	0	0	11	0	12
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1451	0	0	1402	0	1716
Q Serve(g_s), s	0.9	55.8	2.8	0.1	10.4	0.9	3.0	0.0	0.0	0.0	0.0	0.5
Cycle Q Clear(g_c), s	0.9	55.8	2.8	0.1	10.4	0.9	3.5	0.0	0.0	0.4	0.0	0.5
Prop In Lane	1.00		1.00	1.00		1.00	0.83		0.09	1.00		0.50
Lane Grp Cap(c), veh/h	592	1195	1013	98	1153	977	371	0	0	383	0	353
V/C Ratio(X)	0.09	0.99	0.12	0.06	0.37	0.04	0.19	0.00	0.00	0.03	0.00	0.03
Avail Cap(c_a), veh/h	611	1195	1013	157	1195	1013	371	0	0	383	0	353
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.96	0.96	0.96	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.5	15.9	6.4	22.8	8.6	6.8	29.8	0.0	0.0	28.6	0.0	28.6
Incr Delay (d2), s/veh	0.1	23.3	0.1	0.3	0.2	0.0	1.1	0.0	0.0	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.5	33.5	1.4	0.1	6.2	0.5	2.4	0.0	0.0	0.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.6	39.3	6.4	23.0	8.8	6.8	30.9	0.0	0.0	28.7	0.0	28.8
LnGrp LOS	A	D	A	C	A	A	C	A	A	C	A	C
Approach Vol, veh/h	1358				478				69			
Approach Delay, s/veh	35.0				8.8				30.9			
Approach LOS	D				A				C			
Timer - Assigned Phs	2		3	4		6		7	8			
Phs Duration (G+Y+Rc), s	23.0		5.0	62.0		23.0		7.0	60.0			
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5	4.5			
Max Green Setting (Gmax), s	15.5		3.5	57.5		15.5		3.5	57.5			
Max Q Clear Time (g_c+I1), s	5.5		2.1	57.8		2.5		2.9	12.4			
Green Ext Time (p_c), s	0.2		0.0	0.0		0.0		0.0	2.7			
Intersection Summary												
HCM 6th Ctrl Delay	28.3											
HCM 6th LOS	C											

HCM 6th Signalized Intersection Summary

8: W Meadows Dr & Midland Ave

Long Range Background AM Peak Hour

12/19/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Traffic Volume (veh/h)	960	95	45	375	45	50
Future Volume (veh/h)	960	95	45	375	45	50
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1091	108	51	426	51	57
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1110	941	163	1279	385	343
Arrive On Green	0.59	0.59	0.04	0.68	0.22	0.22
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	1091	108	51	426	51	57
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	51.2	2.7	0.9	8.4	2.1	2.6
Cycle Q Clear(g_c), s	51.2	2.7	0.9	8.4	2.1	2.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1110	941	163	1279	385	343
V/C Ratio(X)	0.98	0.11	0.31	0.33	0.13	0.17
Avail Cap(c_a), veh/h	1112	942	191	1309	385	343
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.25	0.25	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	8.0	22.3	5.8	28.5	28.7
Incr Delay (d2), s/veh	9.8	0.0	1.1	0.2	0.7	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	24.0	1.4	1.2	4.4	1.7	1.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	27.7	8.0	23.4	6.0	29.2	29.7
LnGrp LOS	C	A	C	A	C	C
Approach Vol, veh/h	1199			477	108	
Approach Delay, s/veh	25.9			7.8	29.5	
Approach LOS	C			A	C	
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		24.0	8.1	57.9		66.0
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		18.0	5.0	53.5		63.0
Max Q Clear Time (g_c+I1), s		4.6	2.9	53.2		10.4
Green Ext Time (p_c), s		0.2	0.0	0.2		2.6
Intersection Summary						
HCM 6th Ctrl Delay			21.3			
HCM 6th LOS			C			

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	85	20	10	40	10	10	5	20	15	5	10
Future Vol, veh/h	15	85	20	10	40	10	10	5	20	15	5	10
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	97	23	11	45	11	11	6	23	17	6	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	56	0	0	120	0	0	224	221	109	230	227	51
Stage 1	-	-	-	-	-	-	143	143	-	73	73	-
Stage 2	-	-	-	-	-	-	81	78	-	157	154	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1549	-	-	1468	-	-	732	678	945	725	672	1017
Stage 1	-	-	-	-	-	-	860	779	-	937	834	-
Stage 2	-	-	-	-	-	-	927	830	-	845	770	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1549	-	-	1468	-	-	708	664	945	692	659	1017
Mov Cap-2 Maneuver	-	-	-	-	-	-	708	664	-	692	659	-
Stage 1	-	-	-	-	-	-	850	770	-	926	827	-
Stage 2	-	-	-	-	-	-	903	823	-	809	761	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			1.2			9.6			9.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	817	1549	-	-	1468	-	-	767				
HCM Lane V/C Ratio	0.049	0.011	-	-	0.008	-	-	0.044				
HCM Control Delay (s)	9.6	7.4	0	-	7.5	0	-	9.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	3.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	50	65	35	10	15	10
Future Vol, veh/h	50	65	35	10	15	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	74	40	11	17	11
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	51	0	-	0	234	46
Stage 1	-	-	-	-	46	-
Stage 2	-	-	-	-	188	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1555	-	-	-	754	1023
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	844	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1555	-	-	-	725	1023
Mov Cap-2 Maneuver	-	-	-	-	725	-
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	844	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.2	0		9.5		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1555	-	-	-	821	
HCM Lane V/C Ratio	0.037	-	-	-	0.035	
HCM Control Delay (s)	7.4	0	-	-	9.5	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	

Intersection						
Int Delay, s/veh	2.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	95	10	15	30	10	20
Future Vol, veh/h	95	10	15	30	10	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	11	17	34	11	23

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	119
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1469
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1469
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	886	-	-	1469	-
HCM Lane V/C Ratio	0.038	-	-	0.012	-
HCM Control Delay (s)	9.2	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	1.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	95	25	5	35	25	10
Future Vol, veh/h	95	25	5	35	25	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	28	6	40	28	11

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	136	0	174	122
Stage 1	-	-	-	-	122	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1448	-	816	929
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	970	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1448	-	813	929
Mov Cap-2 Maneuver	-	-	-	-	813	-
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	970	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	9.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	843	-	-	1448	-
HCM Lane V/C Ratio	0.047	-	-	0.004	-
HCM Control Delay (s)	9.5	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

HCM 6th Signalized Intersection Summary

2: Wulfsohn Rd/Midland Center & Midland Ave

Long Range Background PM Peak Hour

12/19/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	480	85	5	1055	25	75	5	10	40	5	50
Future Volume (veh/h)	30	480	85	5	1055	25	75	5	10	40	5	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	34	545	97	6	1199	28	85	6	11	45	6	57
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	138	1258	1066	513	1226	1039	233	19	22	338	26	251
Arrive On Green	0.02	0.67	0.67	0.01	0.66	0.66	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	928	108	125	1396	153	1455
Grp Volume(v), veh/h	34	545	97	6	1199	28	102	0	0	45	0	63
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1161	0	0	1396	0	1608
Q Serve(g_s), s	0.6	12.1	1.9	0.1	55.4	0.6	5.6	0.0	0.0	0.0	0.0	3.0
Cycle Q Clear(g_c), s	0.6	12.1	1.9	0.1	55.4	0.6	8.6	0.0	0.0	2.2	0.0	3.0
Prop In Lane	1.00		1.00	1.00		1.00	0.83		0.11	1.00		0.90
Lane Grp Cap(c), veh/h	138	1258	1066	513	1226	1039	273	0	0	338	0	277
V/C Ratio(X)	0.25	0.43	0.09	0.01	0.98	0.03	0.37	0.00	0.00	0.13	0.00	0.23
Avail Cap(c_a), veh/h	168	1258	1066	573	1237	1048	273	0	0	338	0	277
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	0.55	0.55	0.55	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.1	6.8	5.1	5.8	14.9	5.4	35.4	0.0	0.0	31.7	0.0	32.1
Incr Delay (d2), s/veh	0.9	0.2	0.0	0.0	14.1	0.0	3.9	0.0	0.0	0.8	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	6.5	0.9	0.1	27.4	0.3	4.2	0.0	0.0	1.6	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.0	7.1	5.2	5.8	29.0	5.4	39.2	0.0	0.0	32.6	0.0	34.0
LnGrp LOS	C	A	A	A	C	A	D	A	A	C	A	C
Approach Vol, veh/h		676			1233			102			108	
Approach Delay, s/veh		7.6			28.3			39.2			33.4	
Approach LOS		A			C			D			C	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		20.0	5.0	65.0		20.0	6.5	63.5				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		13.5	3.5	59.5		13.5	3.5	59.5				
Max Q Clear Time (g_c+I1), s		10.6	2.1	14.1		5.0	2.6	57.4				
Green Ext Time (p_c), s		0.1	0.0	3.8		0.2	0.0	1.6				
Intersection Summary												
HCM 6th Ctrl Delay			22.5									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th Signalized Intersection Summary

8: W Meadows Dr & Midland Ave

Long Range Background PM Peak Hour

12/19/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↙	↑	↙	↗
Traffic Volume (veh/h)	425	105	85	830	255	80
Future Volume (veh/h)	425	105	85	830	255	80
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	483	119	97	943	290	91
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	836	709	378	1024	628	558
Arrive On Green	0.45	0.45	0.05	0.55	0.35	0.35
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	483	119	97	943	290	91
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	17.3	4.0	2.5	41.4	11.3	3.6
Cycle Q Clear(g_c), s	17.3	4.0	2.5	41.4	11.3	3.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	836	709	378	1024	628	558
V/C Ratio(X)	0.58	0.17	0.26	0.92	0.46	0.16
Avail Cap(c_a), veh/h	1010	856	395	1216	628	558
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.6	14.9	13.3	18.6	22.5	20.0
Incr Delay (d2), s/veh	0.6	0.1	0.4	10.3	2.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.9	2.4	1.6	24.6	8.8	2.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	19.1	15.0	13.7	28.8	25.0	20.7
LnGrp LOS	B	B	B	C	C	C
Approach Vol, veh/h	602			1040	381	
Approach Delay, s/veh	18.3			27.4	24.0	
Approach LOS	B			C	C	
Timer - Assigned Phs	2		3	4	8	
Phs Duration (G+Y+Rc), s	36.2		9.1	44.7	53.8	
Change Period (Y+Rc), s	4.5		4.5	4.5	4.5	
Max Green Setting (Gmax), s	22.5		5.4	48.6	58.5	
Max Q Clear Time (g_c+I1), s	13.3		4.5	19.3	43.4	
Green Ext Time (p_c), s	0.9		0.0	3.3	5.9	
Intersection Summary						
HCM 6th Ctrl Delay			24.1			
HCM 6th LOS			C			
Notes						

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	70	15	15	65	10	15	5	15	10	5	10
Future Vol, veh/h	10	70	15	15	65	10	15	5	15	10	5	10
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	80	17	17	74	11	17	6	17	11	6	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	85	0	0	97	0	0	233	230	89	236	233	80
Stage 1	-	-	-	-	-	-	111	111	-	114	114	-
Stage 2	-	-	-	-	-	-	122	119	-	122	119	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1512	-	-	1496	-	-	722	670	969	718	667	980
Stage 1	-	-	-	-	-	-	894	804	-	891	801	-
Stage 2	-	-	-	-	-	-	882	797	-	882	797	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1512	-	-	1496	-	-	698	657	969	690	654	980
Mov Cap-2 Maneuver	-	-	-	-	-	-	698	657	-	690	654	-
Stage 1	-	-	-	-	-	-	887	798	-	884	791	-
Stage 2	-	-	-	-	-	-	855	787	-	853	791	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			1.2			9.8			9.8		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	785	1512	-	-	1496	-	-	773				
HCM Lane V/C Ratio	0.051	0.008	-	-	0.011	-	-	0.037				
HCM Control Delay (s)	9.8	7.4	0	-	7.4	0	-	9.8				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	45	50	30	20	25
Future Vol, veh/h	25	45	50	30	20	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	51	57	34	23	28

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	91	0	0 181 74
Stage 1	-	-	- 74 -
Stage 2	-	-	- 107 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1504	-	- 808 988
Stage 1	-	-	- 949 -
Stage 2	-	-	- 917 -
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1504	-	- 793 988
Mov Cap-2 Maneuver	-	-	- 793 -
Stage 1	-	-	- 931 -
Stage 2	-	-	- 917 -

Approach	EB	WB	SB
HCM Control Delay, s	2.7	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1504	-	-	-	891
HCM Lane V/C Ratio	0.019	-	-	-	0.057
HCM Control Delay (s)	7.4	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection

Int Delay, s/veh 2.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	45	25	10	25	10	25
Future Vol, veh/h	45	25	10	25	10	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	51	28	11	28	11	28

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	79
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1519
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1519
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	960	-	-	1519	-
HCM Lane V/C Ratio	0.041	-	-	0.007	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	55	40	5	70	20	15
Future Vol, veh/h	55	40	5	70	20	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	63	45	6	80	23	17

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	108	0	178	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	92	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1483	-	812	973
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	932	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1483	-	809	973
Mov Cap-2 Maneuver	-	-	-	-	809	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	932	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	872	-	-	1483	-
HCM Lane V/C Ratio	0.046	-	-	0.004	-
HCM Control Delay (s)	9.3	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

APPENDIX D SHORT RANGE FUTURE TOTAL TRAFFIC LEVEL OF SERVICE WORKSHEETS

HCM 6th Signalized Intersection Summary

2: Wulfohn Rd/Midland Center & Midland Ave

Short Range Total Traffic AM Peak Hour

12/20/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	700	113	1	256	22	41	1	3	7	1	4
Future Volume (veh/h)	30	700	113	1	256	22	41	1	3	7	1	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	34	795	128	1	291	25	47	1	3	8	1	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	499	898	761	148	898	761	619	15	34	673	110	552
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1064	1870	1585	606	1870	1585	1307	37	84	1412	271	1355
Grp Volume(v), veh/h	34	795	128	1	291	25	51	0	0	8	0	6
Grp Sat Flow(s),veh/h/ln	1064	1870	1585	606	1870	1585	1428	0	0	1412	0	1626
Q Serve(g_s), s	1.6	30.8	3.7	0.1	7.7	0.7	1.5	0.0	0.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	9.3	30.8	3.7	30.9	7.7	0.7	1.7	0.0	0.0	0.2	0.0	0.2
Prop In Lane	1.00		1.00	1.00		1.00	0.92		0.06	1.00		0.83
Lane Grp Cap(c), veh/h	499	898	761	148	898	761	668	0	0	673	0	663
V/C Ratio(X)	0.07	0.89	0.17	0.01	0.32	0.03	0.08	0.00	0.00	0.01	0.00	0.01
Avail Cap(c_a), veh/h	673	1204	1020	247	1204	1020	668	0	0	673	0	663
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.98	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.7	18.8	11.8	32.8	12.8	11.0	14.5	0.0	0.0	14.1	0.0	14.1
Incr Delay (d2), s/veh	0.1	6.4	0.1	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.7	18.5	2.0	0.0	5.1	0.4	1.1	0.0	0.0	0.2	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.7	25.3	11.9	32.8	13.0	11.0	14.8	0.0	0.0	14.1	0.0	14.1
LnGrp LOS	B	C	B	C	B	B	B	A	A	B	A	B
Approach Vol, veh/h	957			317			51			14		
Approach Delay, s/veh	23.1			12.9			14.8			14.1		
Approach LOS	C			B			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	37.1			42.9			37.1			42.9		
Change Period (Y+Rc), s	4.5			4.5			4.5			4.5		
Max Green Setting (Gmax), s	19.5			51.5			19.5			51.5		
Max Q Clear Time (g_c+I1), s	3.7			32.8			2.2			32.9		
Green Ext Time (p_c), s	0.2			5.6			0.0			1.5		
Intersection Summary												
HCM 6th Ctrl Delay	20.3											
HCM 6th LOS	C											

HCM 6th Signalized Intersection Summary
8: W Meadows Dr & Midland Ave

Short Range Total Traffic AM Peak Hour
12/20/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	617	93	41	238	41	49
Future Volume (veh/h)	617	93	41	238	41	49
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	701	106	47	270	47	56
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	784	665	210	965	662	589
Arrive On Green	0.42	0.42	0.04	0.52	0.37	0.37
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	701	106	47	270	47	56
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	27.9	3.3	1.1	6.5	1.4	1.8
Cycle Q Clear(g_c), s	27.9	3.3	1.1	6.5	1.4	1.8
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	784	665	210	965	662	589
V/C Ratio(X)	0.89	0.16	0.22	0.28	0.07	0.10
Avail Cap(c_a), veh/h	970	822	261	1204	662	589
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.56	0.56	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.6	14.5	16.9	10.9	16.2	16.4
Incr Delay (d2), s/veh	5.5	0.1	0.5	0.2	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	15.9	1.9	0.7	4.2	1.1	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	27.1	14.5	17.4	11.1	16.4	16.7
LnGrp LOS	C	B	B	B	B	B
Approach Vol, veh/h	807			317	103	
Approach Delay, s/veh	25.4			12.0	16.6	
Approach LOS	C			B	B	
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		34.2	7.7	38.0		45.8
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		19.5	5.5	41.5		51.5
Max Q Clear Time (g_c+I1), s		3.8	3.1	29.9		8.5
Green Ext Time (p_c), s		0.2	0.0	3.7		1.5
Intersection Summary						
HCM 6th Ctrl Delay			21.2			
HCM 6th LOS			C			

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	96	13	5	34	3	7	1	15	10	1	4
Future Vol, veh/h	6	96	13	5	34	3	7	1	15	10	1	4
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	109	15	6	39	3	8	1	17	11	1	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	42	0	0	124	0	0	187	185	117	193	191	41
Stage 1	-	-	-	-	-	-	131	131	-	53	53	-
Stage 2	-	-	-	-	-	-	56	54	-	140	138	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1567	-	-	1463	-	-	774	709	935	767	704	1030
Stage 1	-	-	-	-	-	-	873	788	-	960	851	-
Stage 2	-	-	-	-	-	-	956	850	-	863	782	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1567	-	-	1463	-	-	765	703	935	747	698	1030
Mov Cap-2 Maneuver	-	-	-	-	-	-	765	703	-	747	698	-
Stage 1	-	-	-	-	-	-	869	784	-	955	848	-
Stage 2	-	-	-	-	-	-	947	847	-	842	778	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.9			9.3			9.6		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	864	1567	-	-	1463	-	-	802				
HCM Lane V/C Ratio	0.03	0.004	-	-	0.004	-	-	0.021				
HCM Control Delay (s)	9.3	7.3	0	-	7.5	0	-	9.6				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	48	41	47	6	13	8
Future Vol, veh/h	48	41	47	6	13	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	55	47	53	7	15	9
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	60	0	-	0	214	57
Stage 1	-	-	-	-	57	-
Stage 2	-	-	-	-	157	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1544	-	-	-	774	1009
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	871	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1544	-	-	-	745	1009
Mov Cap-2 Maneuver	-	-	-	-	745	-
Stage 1	-	-	-	-	930	-
Stage 2	-	-	-	-	871	-
Approach	EB	WB		SB		
HCM Control Delay, s	4	0		9.5		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1544	-	-	-	827	
HCM Lane V/C Ratio	0.035	-	-	-	0.029	
HCM Control Delay (s)	7.4	0	-	-	9.5	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	

Intersection						
Int Delay, s/veh	1.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	26	95	36	4	2	6
Future Vol, veh/h	26	95	36	4	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	108	41	5	2	7

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	46	0	0 212 44
Stage 1	-	-	- 44 -
Stage 2	-	-	- 168 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1562	-	- 776 1026
Stage 1	-	-	- 978 -
Stage 2	-	-	- 862 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1562	-	- 760 1026
Mov Cap-2 Maneuver	-	-	- 760 -
Stage 1	-	-	- 958 -
Stage 2	-	-	- 862 -

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1562	-	-	-	943
HCM Lane V/C Ratio	0.019	-	-	-	0.01
HCM Control Delay (s)	7.3	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	85	37	18	4	3
Future Vol, veh/h	12	85	37	18	4	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	97	42	20	5	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	62	0	0	177	52
Stage 1	-	-	-	52	-
Stage 2	-	-	-	125	-
Critical Hdwy	4.12	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	3.518	3.318
Pot Cap-1 Maneuver	1541	-	-	813	1016
Stage 1	-	-	-	970	-
Stage 2	-	-	-	901	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1541	-	-	805	1016
Mov Cap-2 Maneuver	-	-	-	805	-
Stage 1	-	-	-	960	-
Stage 2	-	-	-	901	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1541	-	-	-	884
HCM Lane V/C Ratio	0.009	-	-	-	0.009
HCM Control Delay (s)	7.4	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

HCM 6th Signalized Intersection Summary
2: Wulfsohn Rd/Midland Center & Midland Ave

Short Range Total Traffic PM Peak Hour

12/20/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	324	86	1	710	17	104	1	5	27	1	32
Future Volume (veh/h)	20	324	86	1	710	17	104	1	5	27	1	32
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	23	368	98	1	807	19	118	1	6	31	1	36
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	149	902	765	420	902	765	598	7	26	688	17	627
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	663	1870	1585	927	1870	1585	1260	17	64	1409	43	1549
Grp Volume(v), veh/h	23	368	98	1	807	19	125	0	0	31	0	37
Grp Sat Flow(s),veh/h/ln	663	1870	1585	927	1870	1585	1341	0	0	1409	0	1592
Q Serve(g_s), s	2.6	10.1	2.7	0.1	31.4	0.5	4.7	0.0	0.0	0.0	0.0	1.1
Cycle Q Clear(g_c), s	34.0	10.1	2.7	10.2	31.4	0.5	5.8	0.0	0.0	0.8	0.0	1.1
Prop In Lane	1.00		1.00	1.00		1.00	0.94		0.05	1.00		0.97
Lane Grp Cap(c), veh/h	149	902	765	420	902	765	631	0	0	688	0	645
V/C Ratio(X)	0.15	0.41	0.13	0.00	0.89	0.02	0.20	0.00	0.00	0.05	0.00	0.06
Avail Cap(c_a), veh/h	256	1204	1020	569	1204	1020	631	0	0	688	0	645
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.76	0.76	0.76	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	34.3	13.3	11.4	16.6	18.8	10.8	16.2	0.0	0.0	14.4	0.0	14.5
Incr Delay (d2), s/veh	0.5	0.3	0.1	0.0	5.6	0.0	0.7	0.0	0.0	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	6.7	1.5	0.0	17.8	0.3	2.9	0.0	0.0	0.6	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.8	13.6	11.5	16.6	24.4	10.9	16.9	0.0	0.0	14.5	0.0	14.7
LnGrp LOS	C	B	B	B	C	B	B	A	A	B	A	B
Approach Vol, veh/h		489			827			125			68	
Approach Delay, s/veh		14.2			24.1			16.9			14.6	
Approach LOS		B			C			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		36.9		43.1		36.9		43.1				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		19.5		51.5		19.5		51.5				
Max Q Clear Time (g_c+I1), s		7.8		36.0		3.1		33.4				
Green Ext Time (p_c), s		0.5		2.2		0.2		5.2				
Intersection Summary												
HCM 6th Ctrl Delay				19.9								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
8: W Meadows Dr & Midland Ave

Short Range Total Traffic PM Peak Hour
12/20/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	258	103	81	475	253	80
Future Volume (veh/h)	258	103	81	475	253	80
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	293	117	92	540	288	91
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	420	356	266	628	983	874
Arrive On Green	0.22	0.22	0.05	0.34	0.55	0.55
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	293	117	92	540	288	91
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	11.5	4.9	3.0	21.6	6.9	2.2
Cycle Q Clear(g_c), s	11.5	4.9	3.0	21.6	6.9	2.2
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	420	356	266	628	983	874
V/C Ratio(X)	0.70	0.33	0.35	0.86	0.29	0.10
Avail Cap(c_a), veh/h	970	822	291	1204	983	874
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.5	26.0	21.7	24.8	9.6	8.5
Incr Delay (d2), s/veh	2.0	0.5	0.8	3.6	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.5	3.2	2.2	14.1	4.9	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	30.5	26.5	22.4	28.4	10.3	8.8
LnGrp LOS	C	C	C	C	B	A
Approach Vol, veh/h	410			632	379	
Approach Delay, s/veh	29.3			27.5	10.0	
Approach LOS	C			C	A	
Timer - Assigned Phs	2		3	4	8	
Phs Duration (G+Y+Rc), s	48.6		8.9	22.5	31.4	
Change Period (Y+Rc), s	4.5		4.5	4.5	4.5	
Max Green Setting (Gmax), s	19.5		5.5	41.5	51.5	
Max Q Clear Time (g_c+I1), s	8.9		5.0	13.5	23.6	
Green Ext Time (p_c), s	0.9		0.0	1.9	3.3	
Intersection Summary						
HCM 6th Ctrl Delay			23.4			
HCM 6th LOS			C			

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	73	10	9	95	4	10	1	8	3	1	4
Future Vol, veh/h	5	73	10	9	95	4	10	1	8	3	1	4
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	83	11	10	108	5	11	1	9	3	1	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	113	0	0	94	0	0	235	234	89	237	237	111
Stage 1	-	-	-	-	-	-	101	101	-	131	131	-
Stage 2	-	-	-	-	-	-	134	133	-	106	106	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1476	-	-	1500	-	-	720	666	969	717	664	942
Stage 1	-	-	-	-	-	-	905	811	-	873	788	-
Stage 2	-	-	-	-	-	-	869	786	-	900	807	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1476	-	-	1500	-	-	710	659	969	703	657	942
Mov Cap-2 Maneuver	-	-	-	-	-	-	710	659	-	703	657	-
Stage 1	-	-	-	-	-	-	901	808	-	870	782	-
Stage 2	-	-	-	-	-	-	858	780	-	887	804	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.6			9.6			9.6		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	796	1476	-	-	1500	-	-	797				
HCM Lane V/C Ratio	0.027	0.004	-	-	0.007	-	-	0.011				
HCM Control Delay (s)	9.6	7.4	0	-	7.4	0	-	9.6				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0				

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	62	50	30	17	21
Future Vol, veh/h	25	62	50	30	17	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	70	57	34	19	24
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	91	0	-	0	200	74
Stage 1	-	-	-	-	74	-
Stage 2	-	-	-	-	126	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1504	-	-	-	789	988
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	900	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1504	-	-	-	774	988
Mov Cap-2 Maneuver	-	-	-	-	774	-
Stage 1	-	-	-	-	931	-
Stage 2	-	-	-	-	900	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.1	0		9.3		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1504	-	-	-	879	
HCM Lane V/C Ratio	0.019	-	-	-	0.049	
HCM Control Delay (s)	7.4	0	-	-	9.3	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	64	76	2	11	32
Future Vol, veh/h	20	64	76	2	11	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	73	86	2	13	36
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	88	0	-	0	206	87
Stage 1	-	-	-	-	87	-
Stage 2	-	-	-	-	119	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1508	-	-	-	782	971
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	906	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1508	-	-	-	769	971
Mov Cap-2 Maneuver	-	-	-	-	769	-
Stage 1	-	-	-	-	921	-
Stage 2	-	-	-	-	906	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.8	0		9.2		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1508	-	-	-	910	
HCM Lane V/C Ratio	0.015	-	-	-	0.054	
HCM Control Delay (s)	7.4	0	-	-	9.2	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0.2	

Intersection						
Int Delay, s/veh	2.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	67	56	15	20	22
Future Vol, veh/h	8	67	56	15	20	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	76	64	17	23	25

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	81	0	0 167 73
Stage 1	-	-	- 73 -
Stage 2	-	-	- 94 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1517	-	- 823 989
Stage 1	-	-	- 950 -
Stage 2	-	-	- 930 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1517	-	- 818 989
Mov Cap-2 Maneuver	-	-	- 818 -
Stage 1	-	-	- 944 -
Stage 2	-	-	- 930 -

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1517	-	-	-	899
HCM Lane V/C Ratio	0.006	-	-	-	0.053
HCM Control Delay (s)	7.4	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

APPENDIX E LONG RANGE FUTURE TOTAL TRAFFIC LEVEL OF SERVICE WORKSHEETS

HCM 6th Signalized Intersection Summary

2: Wulfsohn Rd/Midland Center & Midland Ave

Long Range Total Traffic AM Peak Hour

12/19/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	1040	148	5	380	35	59	5	5	10	5	5
Future Volume (veh/h)	45	1040	148	5	380	35	59	5	5	10	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	51	1182	168	6	432	40	67	6	6	11	6	6
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	592	1195	1013	97	1153	977	319	29	22	386	176	176
Arrive On Green	0.03	0.64	0.64	0.01	0.62	0.62	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1190	140	109	1402	858	858
Grp Volume(v), veh/h	51	1182	168	6	432	40	79	0	0	11	0	12
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1439	0	0	1402	0	1716
Q Serve(g_s), s	0.9	55.8	3.9	0.1	10.4	0.9	3.7	0.0	0.0	0.0	0.0	0.5
Cycle Q Clear(g_c), s	0.9	55.8	3.9	0.1	10.4	0.9	4.2	0.0	0.0	0.4	0.0	0.5
Prop In Lane	1.00		1.00	1.00		1.00	0.85		0.08	1.00		0.50
Lane Grp Cap(c), veh/h	592	1195	1013	97	1153	977	370	0	0	386	0	353
V/C Ratio(X)	0.09	0.99	0.17	0.06	0.37	0.04	0.21	0.00	0.00	0.03	0.00	0.03
Avail Cap(c_a), veh/h	611	1195	1013	157	1195	1013	370	0	0	386	0	353
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.96	0.96	0.96	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.5	15.9	6.6	22.8	8.6	6.8	30.1	0.0	0.0	28.6	0.0	28.6
Incr Delay (d2), s/veh	0.1	23.3	0.1	0.3	0.2	0.0	1.3	0.0	0.0	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.5	33.5	1.9	0.1	6.2	0.5	2.8	0.0	0.0	0.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.6	39.3	6.6	23.0	8.8	6.8	31.4	0.0	0.0	28.7	0.0	28.8
LnGrp LOS	A	D	A	C	A	A	C	A	A	C	A	C
Approach Vol, veh/h		1401			478			79			23	
Approach Delay, s/veh		34.2			8.8			31.4			28.7	
Approach LOS		C			A			C			C	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		23.0	5.0	62.0		23.0	7.0	60.0				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		15.5	3.5	57.5		15.5	3.5	57.5				
Max Q Clear Time (g_c+I1), s		6.2	2.1	57.8		2.5	2.9	12.4				
Green Ext Time (p_c), s		0.2	0.0	0.0		0.0	0.0	2.7				
Intersection Summary												
HCM 6th Ctrl Delay			27.9									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th Signalized Intersection Summary 8: W Meadows Dr & Midland Ave

Long Range Total Traffic AM Peak Hour
12/19/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Traffic Volume (veh/h)	960	95	45	375	45	50
Future Volume (veh/h)	960	95	45	375	45	50
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1091	108	51	426	51	57
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1110	941	163	1279	385	343
Arrive On Green	0.59	0.59	0.04	0.68	0.22	0.22
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	1091	108	51	426	51	57
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	51.2	2.7	0.9	8.4	2.1	2.6
Cycle Q Clear(g_c), s	51.2	2.7	0.9	8.4	2.1	2.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1110	941	163	1279	385	343
V/C Ratio(X)	0.98	0.11	0.31	0.33	0.13	0.17
Avail Cap(c_a), veh/h	1112	942	191	1309	385	343
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.27	0.27	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	8.0	22.3	5.8	28.5	28.7
Incr Delay (d2), s/veh	10.3	0.0	1.1	0.2	0.7	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	24.4	1.4	1.2	4.4	1.7	1.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	28.2	8.0	23.4	6.0	29.2	29.7
LnGrp LOS	C	A	C	A	C	C
Approach Vol, veh/h	1199			477	108	
Approach Delay, s/veh	26.4			7.8	29.5	
Approach LOS	C			A	C	
Timer - Assigned Phs	2		3	4	8	
Phs Duration (G+Y+Rc), s	24.0		8.1	57.9	66.0	
Change Period (Y+Rc), s	4.5		4.5	4.5	4.5	
Max Green Setting (Gmax), s	18.0		5.0	53.5	63.0	
Max Q Clear Time (g_c+I1), s	4.6		2.9	53.2	10.4	
Green Ext Time (p_c), s	0.2		0.0	0.2	2.6	
Intersection Summary						
HCM 6th Ctrl Delay			21.6			
HCM 6th LOS			C			

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	123	20	10	49	10	10	5	20	15	5	10
Future Vol, veh/h	15	123	20	10	49	10	10	5	20	15	5	10
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	140	23	11	56	11	11	6	23	17	6	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	67	0	0	163	0	0	278	275	152	284	281	62
Stage 1	-	-	-	-	-	-	186	186	-	84	84	-
Stage 2	-	-	-	-	-	-	92	89	-	200	197	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1535	-	-	1416	-	-	674	632	894	668	627	1003
Stage 1	-	-	-	-	-	-	816	746	-	924	825	-
Stage 2	-	-	-	-	-	-	915	821	-	802	738	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1535	-	-	1416	-	-	652	619	894	637	614	1003
Mov Cap-2 Maneuver	-	-	-	-	-	-	652	619	-	637	614	-
Stage 1	-	-	-	-	-	-	806	737	-	913	818	-
Stage 2	-	-	-	-	-	-	891	814	-	766	729	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			1.1			10			10.2		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	764	1535	-	-	1416	-	-	720				
HCM Lane V/C Ratio	0.052	0.011	-	-	0.008	-	-	0.047				
HCM Control Delay (s)	10	7.4	0	-	7.6	0	-	10.2				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	50	71	57	10	15	10
Future Vol, veh/h	50	71	57	10	15	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	81	65	11	17	11
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	76	0	-	0	266	71
Stage 1	-	-	-	-	71	-
Stage 2	-	-	-	-	195	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1523	-	-	-	723	991
Stage 1	-	-	-	-	952	-
Stage 2	-	-	-	-	838	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1523	-	-	-	695	991
Mov Cap-2 Maneuver	-	-	-	-	695	-
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	838	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.1	0		9.7		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1523	-	-	-	789	
HCM Lane V/C Ratio	0.037	-	-	-	0.036	
HCM Control Delay (s)	7.5	0	-	-	9.7	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	97	10	15	34	18	10	1	20	4	1	3
Future Vol, veh/h	12	97	10	15	34	18	10	1	20	4	1	3
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	110	11	17	39	20	11	1	23	5	1	3
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	59	0	0	121	0	0	229	237	116	239	232	49
Stage 1	-	-	-	-	-	-	144	144	-	83	83	-
Stage 2	-	-	-	-	-	-	85	93	-	156	149	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1545	-	-	1467	-	-	726	664	936	715	668	1020
Stage 1	-	-	-	-	-	-	859	778	-	925	826	-
Stage 2	-	-	-	-	-	-	923	818	-	846	774	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1545	-	-	1467	-	-	711	649	936	685	653	1020
Mov Cap-2 Maneuver	-	-	-	-	-	-	711	649	-	685	653	-
Stage 1	-	-	-	-	-	-	850	770	-	916	816	-
Stage 2	-	-	-	-	-	-	908	808	-	816	766	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			1.7			9.5			9.7		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	838	1545	-	-	1467	-	-	776				
HCM Lane V/C Ratio	0.042	0.009	-	-	0.012	-	-	0.012				
HCM Control Delay (s)	9.5	7.4	0	-	7.5	0	-	9.7				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0				

Intersection												
Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	26	107	25	5	38	4	25	1	10	2	1	6
Future Vol, veh/h	26	107	25	5	38	4	25	1	10	2	1	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	30	122	28	6	43	5	28	1	11	2	1	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	150	0	0	258	256	136	260	268	46
Stage 1	-	-	-	-	-	-	196	196	-	58	58	-
Stage 2	-	-	-	-	-	-	62	60	-	202	210	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1431	-	-	695	648	913	693	638	1023
Stage 1	-	-	-	-	-	-	806	739	-	954	847	-
Stage 2	-	-	-	-	-	-	949	845	-	800	728	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1559	-	-	1431	-	-	676	632	913	670	622	1023
Mov Cap-2 Maneuver	-	-	-	-	-	-	676	632	-	670	622	-
Stage 1	-	-	-	-	-	-	789	723	-	934	844	-
Stage 2	-	-	-	-	-	-	938	842	-	772	713	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0.8	10.2	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	727	1559	-	-	1431	-	-	861
HCM Lane V/C Ratio	0.056	0.019	-	-	0.004	-	-	0.012
HCM Control Delay (s)	10.2	7.4	0	-	7.5	0	-	9.2
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0

HCM 6th Signalized Intersection Summary
2: Wulfsohn Rd/Midland Center & Midland Ave

Long Range Total Traffic PM Peak Hour

12/19/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	480	113	5	1055	25	129	5	10	40	5	50
Future Volume (veh/h)	30	480	113	5	1055	25	129	5	10	40	5	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	34	545	128	6	1199	28	147	6	11	45	6	57
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	130	1247	1056	495	1215	1030	253	12	14	370	27	259
Arrive On Green	0.02	0.67	0.67	0.01	0.65	0.65	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	995	65	76	1396	153	1455
Grp Volume(v), veh/h	34	545	128	6	1199	28	164	0	0	45	0	63
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1137	0	0	1396	0	1608
Q Serve(g_s), s	0.6	12.3	2.6	0.1	56.3	0.6	10.1	0.0	0.0	0.0	0.0	3.0
Cycle Q Clear(g_c), s	0.6	12.3	2.6	0.1	56.3	0.6	13.2	0.0	0.0	2.0	0.0	3.0
Prop In Lane	1.00		1.00	1.00		1.00	0.90		0.07	1.00		0.90
Lane Grp Cap(c), veh/h	130	1247	1056	495	1215	1030	278	0	0	370	0	287
V/C Ratio(X)	0.26	0.44	0.12	0.01	0.99	0.03	0.59	0.00	0.00	0.12	0.00	0.22
Avail Cap(c_a), veh/h	180	1247	1056	574	1216	1030	278	0	0	370	0	287
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	0.55	0.55	0.55	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.6	7.1	5.4	6.0	15.4	5.6	37.0	0.0	0.0	31.2	0.0	31.6
Incr Delay (d2), s/veh	1.0	0.2	0.1	0.0	16.1	0.0	8.8	0.0	0.0	0.7	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	6.8	1.2	0.1	28.7	0.3	7.5	0.0	0.0	1.6	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.6	7.3	5.5	6.0	31.5	5.6	45.9	0.0	0.0	31.9	0.0	33.4
LnGrp LOS	C	A	A	A	C	A	D	A	A	C	A	C
Approach Vol, veh/h		707			1233			164			108	
Approach Delay, s/veh		7.8			30.8			45.9			32.8	
Approach LOS		A			C			D			C	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		20.5	5.0	64.5		20.5	6.5	63.0				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		13.5	4.5	58.5		13.5	4.5	58.5				
Max Q Clear Time (g_c+I1), s		15.2	2.1	14.3		5.0	2.6	58.3				
Green Ext Time (p_c), s		0.0	0.0	4.0		0.2	0.0	0.1				
Intersection Summary												
HCM 6th Ctrl Delay			24.6									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th Signalized Intersection Summary 8: W Meadows Dr & Midland Ave

Long Range Total Traffic PM Peak Hour
12/19/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	425	105	85	830	255	80
Future Volume (veh/h)	425	105	85	830	255	80
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	483	119	97	943	290	91
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	836	709	378	1024	628	558
Arrive On Green	0.45	0.45	0.05	0.55	0.35	0.35
Sat Flow, veh/h	1870	1585	1781	1870	1781	1585
Grp Volume(v), veh/h	483	119	97	943	290	91
Grp Sat Flow(s),veh/h/ln	1870	1585	1781	1870	1781	1585
Q Serve(g_s), s	17.3	4.0	2.5	41.4	11.3	3.6
Cycle Q Clear(g_c), s	17.3	4.0	2.5	41.4	11.3	3.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	836	709	378	1024	628	558
V/C Ratio(X)	0.58	0.17	0.26	0.92	0.46	0.16
Avail Cap(c_a), veh/h	1010	856	395	1216	628	558
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.6	14.9	13.3	18.6	22.5	20.0
Incr Delay (d2), s/veh	0.6	0.1	0.4	10.3	2.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.9	2.4	1.6	24.6	8.8	2.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	19.1	15.0	13.7	28.8	25.0	20.7
LnGrp LOS	B	B	B	C	C	C
Approach Vol, veh/h	602			1040	381	
Approach Delay, s/veh	18.3			27.4	24.0	
Approach LOS	B			C	C	
Timer - Assigned Phs	2		3	4	8	
Phs Duration (G+Y+Rc), s	36.2		9.1	44.7	53.8	
Change Period (Y+Rc), s	4.5		4.5	4.5	4.5	
Max Green Setting (Gmax), s	22.5		5.4	48.6	58.5	
Max Q Clear Time (g_c+I1), s	13.3		4.5	19.3	43.4	
Green Ext Time (p_c), s	0.9		0.0	3.3	5.9	
Intersection Summary						
HCM 6th Ctrl Delay			24.1			
HCM 6th LOS			C			

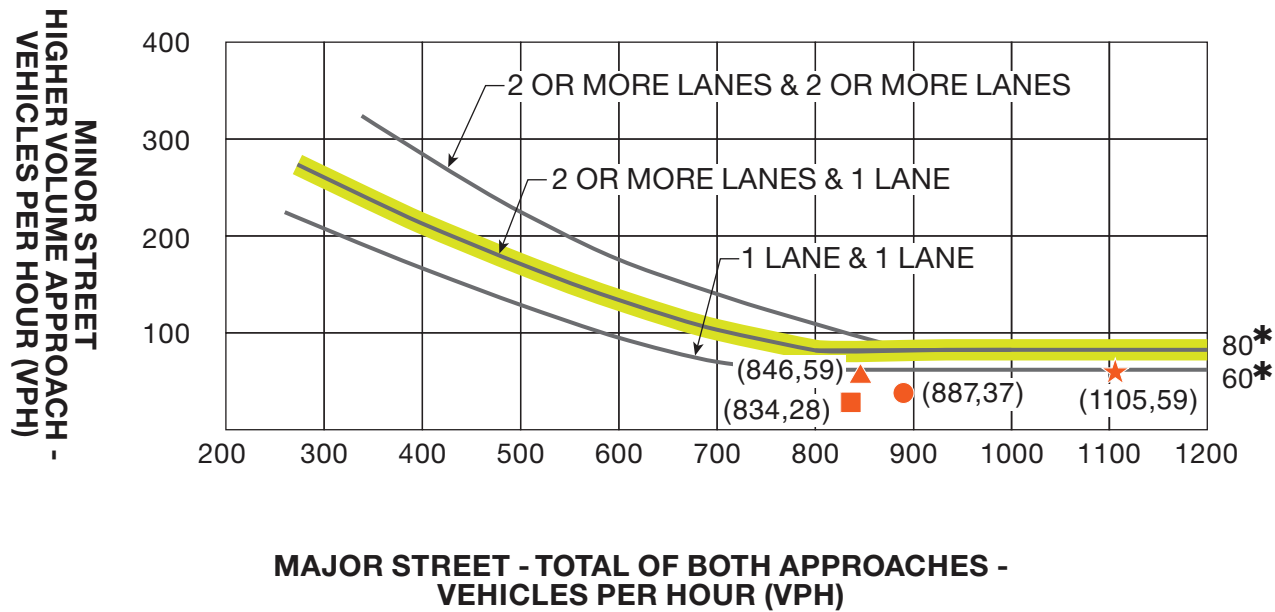
Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	98	15	15	119	10	15	5	15	10	5	10
Future Vol, veh/h	10	98	15	15	119	10	15	5	15	10	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	111	17	17	135	11	17	6	17	11	6	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	146	0	0	128	0	0	325	322	120	328	325	141
Stage 1	-	-	-	-	-	-	142	142	-	175	175	-
Stage 2	-	-	-	-	-	-	183	180	-	153	150	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1436	-	-	1458	-	-	628	595	931	625	593	907
Stage 1	-	-	-	-	-	-	861	779	-	827	754	-
Stage 2	-	-	-	-	-	-	819	750	-	849	773	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1436	-	-	1458	-	-	606	583	931	599	581	907
Mov Cap-2 Maneuver	-	-	-	-	-	-	606	583	-	599	581	-
Stage 1	-	-	-	-	-	-	854	773	-	820	744	-
Stage 2	-	-	-	-	-	-	792	740	-	821	767	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			0.8			10.4			10.5		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	708	1436	-	-	1458	-	-	688				
HCM Lane V/C Ratio	0.056	0.008	-	-	0.012	-	-	0.041				
HCM Control Delay (s)	10.4	7.5	0	-	7.5	0	-	10.5				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	2.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	76	67	30	20	25
Future Vol, veh/h	25	76	67	30	20	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	86	76	34	23	28
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	110	0	-	0	235	93
Stage 1	-	-	-	-	93	-
Stage 2	-	-	-	-	142	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1480	-	-	-	753	964
Stage 1	-	-	-	-	931	-
Stage 2	-	-	-	-	885	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1480	-	-	-	738	964
Mov Cap-2 Maneuver	-	-	-	-	738	-
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	885	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.9	0		9.5		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1480	-	-	-	849	
HCM Lane V/C Ratio	0.019	-	-	-	0.06	
HCM Control Delay (s)	7.5	0	-	-	9.5	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	56	25	10	67	15	10	1	25	20	1	22
Future Vol, veh/h	8	56	25	10	67	15	10	1	25	20	1	22
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	64	28	11	76	17	11	1	28	23	1	25
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	93	0	0	92	0	0	216	211	78	218	217	85
Stage 1	-	-	-	-	-	-	96	96	-	107	107	-
Stage 2	-	-	-	-	-	-	120	115	-	111	110	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1501	-	-	1503	-	-	740	686	983	738	681	974
Stage 1	-	-	-	-	-	-	911	815	-	898	807	-
Stage 2	-	-	-	-	-	-	884	800	-	894	804	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1501	-	-	1503	-	-	713	676	983	708	671	974
Mov Cap-2 Maneuver	-	-	-	-	-	-	713	676	-	708	671	-
Stage 1	-	-	-	-	-	-	906	810	-	893	801	-
Stage 2	-	-	-	-	-	-	853	794	-	862	799	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.8			9.3			9.7		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	879	1501	-	-	1503	-	-	822				
HCM Lane V/C Ratio	0.047	0.006	-	-	0.008	-	-	0.059				
HCM Control Delay (s)	9.3	7.4	0	-	7.4	0	-	9.7				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2				

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	20	63	40	5	92	2	20	1	15	11	1	32
Future Vol, veh/h	20	63	40	5	92	2	20	1	15	11	1	32
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	23	72	45	6	105	2	23	1	17	13	1	36
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	107	0	0	117	0	0	278	260	95	268	281	106
Stage 1	-	-	-	-	-	-	141	141	-	118	118	-
Stage 2	-	-	-	-	-	-	137	119	-	150	163	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1484	-	-	1471	-	-	674	645	962	685	627	948
Stage 1	-	-	-	-	-	-	862	780	-	887	798	-
Stage 2	-	-	-	-	-	-	866	797	-	853	763	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1484	-	-	1471	-	-	637	631	962	661	614	948
Mov Cap-2 Maneuver	-	-	-	-	-	-	637	631	-	661	614	-
Stage 1	-	-	-	-	-	-	847	767	-	872	795	-
Stage 2	-	-	-	-	-	-	828	794	-	822	750	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.2			0.4			10.1			9.5		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	741	1484	-	-	1471	-	-	846				
HCM Lane V/C Ratio	0.055	0.015	-	-	0.004	-	-	0.059				
HCM Control Delay (s)	10.1	7.5	0	-	7.5	0	-	9.5				
HCM Lane LOS	B	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2				

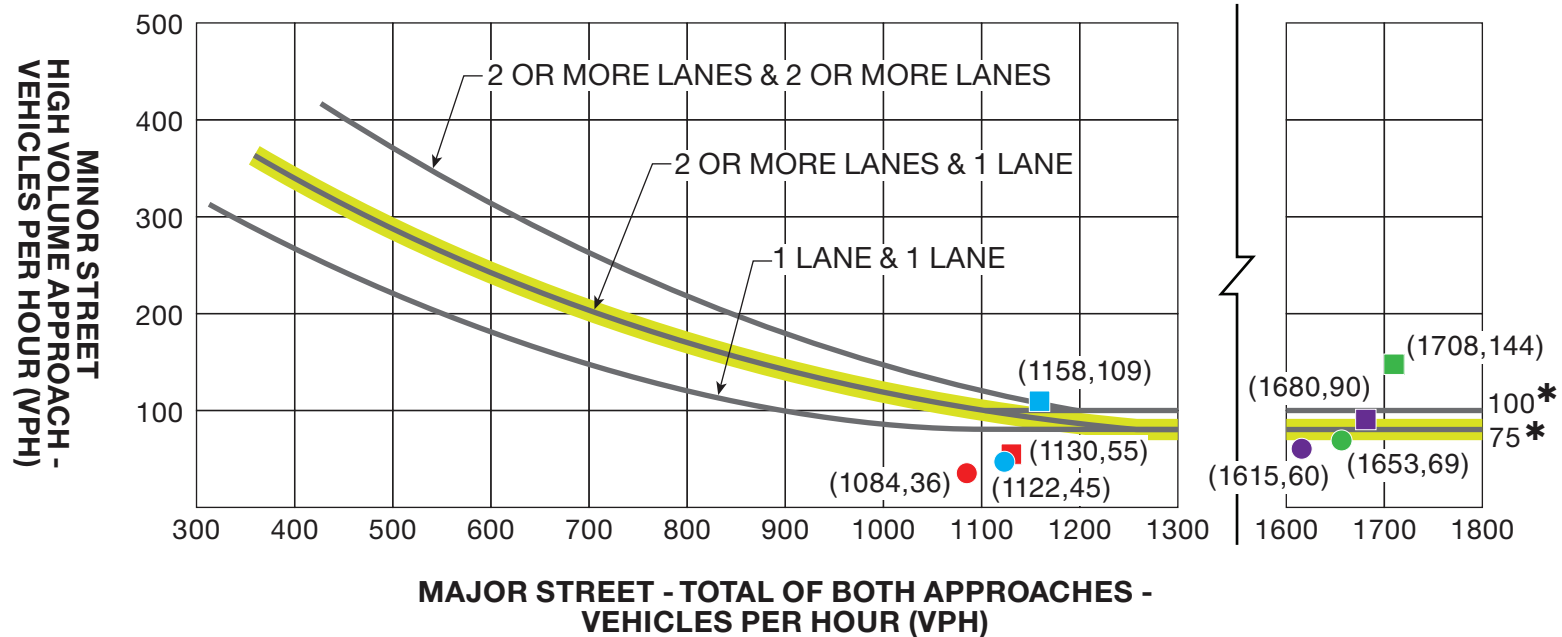
APPENDIX F SIGNAL WARRANT ANALYSIS



* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

LEGEND

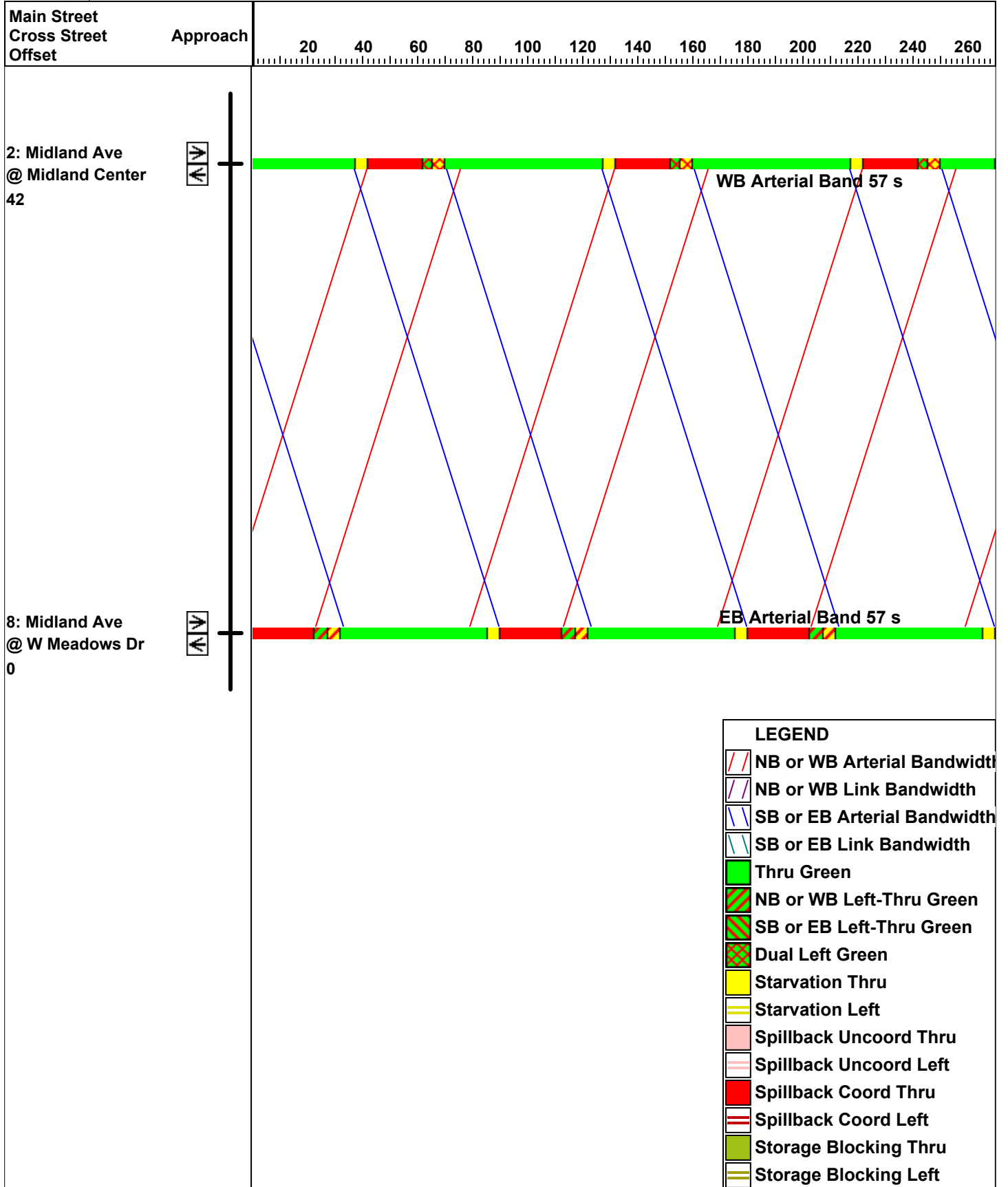
- = 7:00am - 8:00am
- = 8:00am - 9:00am
- ▲ = 4:00pm - 5:00pm
- ★ = 5:00pm - 6:00pm



* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

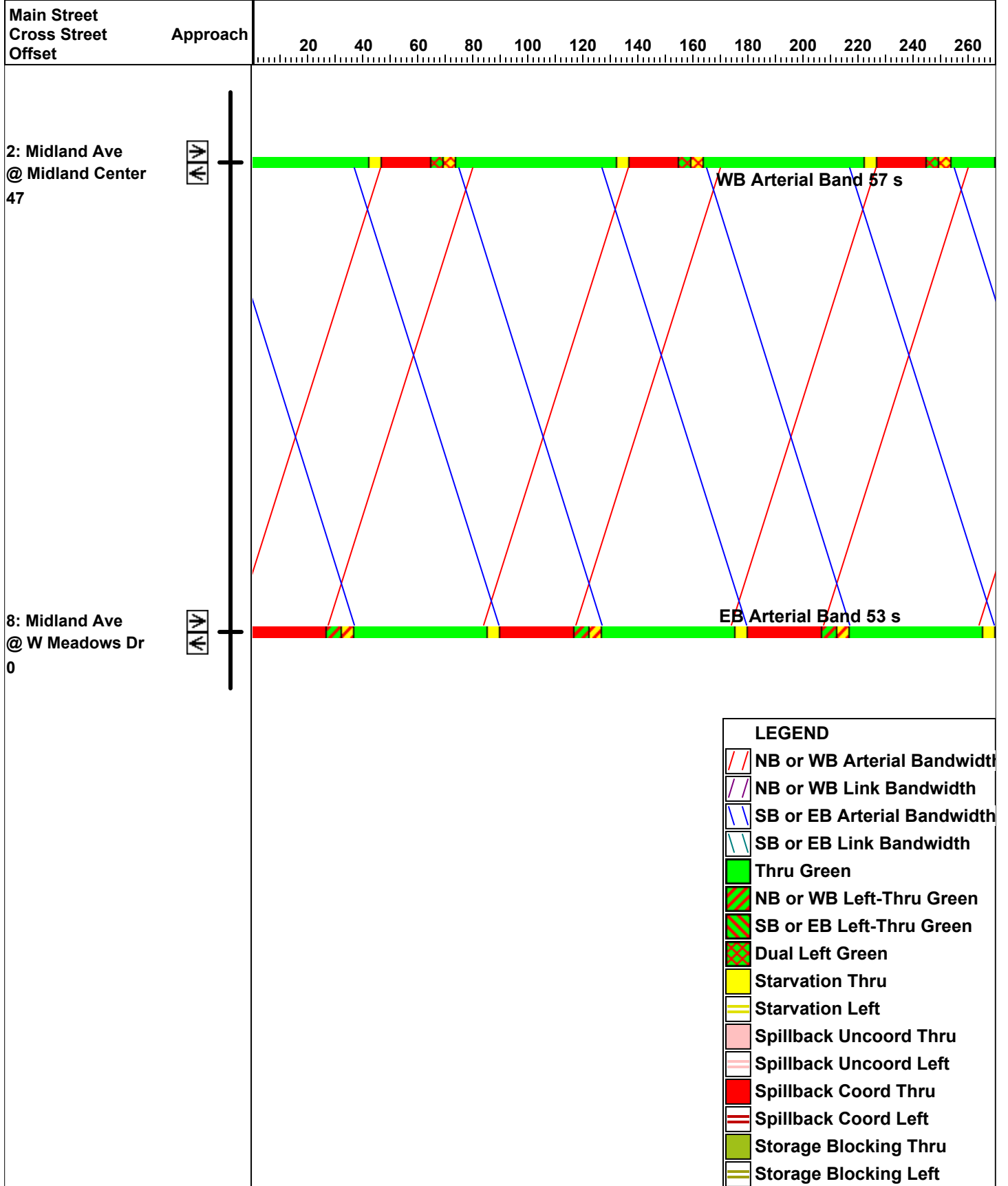
LEGEND

- = AM Peak Hour Existing
- = PM Peak Hour Existing
- = AM Peak Hour Short Range Total
- = PM Peak Hour Short Range Total
- = AM Peak Hour Long Range Background
- = PM Peak Hour Long Range Background
- = AM Peak Hour Long Range Total
- = PM Peak Hour Long Range Total



Baseline

I:\118467-01 Glenwood Commercial Site\Synchro\LR\TOTAM.syn



Baseline

I:\118467-01 Glenwood Commercial Site\Synchro\LR\TOTPM.syn



Name

Title
email@blackhillscorp.com

Street Address
City, State Zip Code
P: 999.999.9999
F: 999.999.9999

December 7, 2018

Ben Ganther
Boldt
1110 N. Old World Third St.
Ste. 610
Milwaukee, WI 53203

Re: Proposed Development, Wulfsohn Road, Glenwood Springs, CO Parcel #2185-053-38-014

Dear Mr. Ben Ganther:

The above mentioned development is within the certificated service area of Black Hills Energy

Black Hills Energy has existing natural gas facilities located on or near the above mentioned project. At this time it appears that these existing facilities have adequate capacity to provide natural gas service to your project, subject to the tariffs, rules and regulations on file. Any upgrading of our facilities necessary to deliver adequate service to and within the development will be undertaken by Black Hills Energy upon completion of appropriate contractual agreements and subject to necessary governmental approvals.

Please contact us with any questions regarding this project, and with a timeline of when you would like to proceed with your project.

Sincerely,

Todd Ellsworth
Supervisor
Black Hills Energy



12/07/2018

Attn: Ben Ganther
Boldt Development
1110 N. Old World Third St.
Suite 610
Milwaukee, WI 53203
414.276.4637 | Direct Dial
414.405.6685 | Cell/Text

RE: Glenwood Meadows Lot 14

To whom it may concern:

Your request for facilities to the Glenwood Meadows Lot 14 is within CenturyLink's serving area and will be provided in accordance with all the rates and tariffs set forth by the Colorado Public Utilities Commission.

Connections to CenturyLink facilities are contingent upon the customer meeting all the requirements of the Utilities tariffs that are in effect for each requested utility service at the time the application for service is made by the customer and formally accepted by CenturyLink. Connection requirements may include provisions for necessary line extensions and/or other system improvements, and payment of all applicable system development charges, recovery agreement charges and other fees or charges applicable to the requested service.

Although CenturyLink diligently seeks to expand its facilities as necessary to meet anticipated growth, CenturyLink services are provided to eligible customers at the time of connection to the facilities on a "first come, first served" basis after acceptance of the customer's application as described above. In certain instances, our facilities and capacities may be limited. Accordingly, no specific allocations or amounts of CenturyLink facilities or supplies are reserved for service to the subject property, and no commitments are made as to the availability of CenturyLink service at future times.

Sincerely,

Jason Sharpe
Senior Field Engineer
970-328-8290



City of Glenwood Springs
101 West 8th Street
Glenwood Springs, CO 81601

December 19, 2018

Centura Ventures
Attn: Real Estate Department
9100 E. Mineral Circle
Englewood, CO 80112

RE: Can and Will Serve Letter for City of Glenwood Parcel # 218505338014

To Whom it May Concern:

The purpose of this letter is to provide confirmation that the City of Glenwood Springs can-and-will serve parcel #218505338014 (also identified as Lot 14 in Glenwood Meadows Subdivision Filing #2) with domestic water, sanitary sewer, community broadband network (CBN), and electrical services.

The new utility services are governed by, and shall conform to, the Glenwood Springs Municipal Code, the City of Glenwood Springs Engineering Design Standards, and the Rules and Regulations of the Water, Wastewater, CBN, and Electric Departments and their respective Line Extension Policies. Please note that this property is required by the City's Municipal Code to utilize the City's raw (untreated) water system for all outdoor irrigation.

The request for this letter was made by Mr. Ben Ganther, Glenwood Springs Properties, LLC / The Boldt Company, acting as an authorized representative on behalf of the parcel owner.

Sincerely,

Brad Zachman
Water & Wastewater Superintendent
970-384-6388

CC:

Glenwood Springs Properties, LLC
1110 N. Old World Third St.
Suite 610
Milwaukee, WI 53203
Attn: Jacob Garro

City of Glenwood Springs:
Debra Figueroa, City Manager
Matt Langhorst, Public Works Director
Eric Arnette, Information Services Director
Doug Hazzard, Electric Superintendent

**Subsurface Exploration Program
Geotechnical and Pavement Section
Recommendations
Glenwood Meadows Lot 14
Glenwood Springs, Colorado**



Prepared for:

**Total Merchant Services
c/o: The JHM Group of Companies
76 Progress Drive
Stamford, CT 06902**

Attention: Mr. John McClutchy, Jr.

Job Number: 07-6051

January 15, 2008

GROUND

ENGINEERING CONSULTANTS, INC

41 Inverness Drive East, Englewood, CO 80112-5412 Phone (303) 289-1989 Fax (303) 289-1686 www.groundeng.com
Office Locations: Englewood • Commerce City • Loveland • Granby • Gypsum

23-08

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PURPOSE AND SCOPE OF STUDY

This report presents the results of a subsurface exploration program performed by Ground Engineering Consultants, Inc., (GROUND) to develop geotechnical recommendations for design and construction of Lot 14 of the Glenwood Meadows retail development north of Wulfsohn Road and south of Midland Avenue in western Glenwood Springs, Colorado. The study was conducted in general accordance with GROUND's Proposal No. 0711-1906, dated November 29, 2007.

Field and office investigations provided information regarding surface and subsurface conditions, including existing improvements, the lateral and vertical distribution of earth materials, and depths to bedrock and groundwater. Material samples retrieved during subsurface exploration were tested in our laboratory to assess the engineering characteristics of site earth materials and assist development of our geotechnical recommendations. Results of the field, office and laboratory studies are presented below.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to the construction of the proposed facilities are included.

PROPOSED CONSTRUCTION

Present plans call for construction of approximately 70,000 total square feet office building on the western portion of the site. The two-story office building is anticipated to have 1 or 2 levels of below-grade parking. There will be 7 three-story multi-family residential buildings comprising approximately 135,000 total square feet, each with a single below-grade parking level. Additionally, there will be 5 two-story commercial buildings totalling approximately 23,500 total square feet in the northern portion of the site. No below-grade levels planned at this time for the commercial buildings.

The buildings will enclose several small parking areas served by two access driveways off of Wulfsohn Road. We anticipate that landscaping is planned for areas around the individual buildings and at several locations within the parking area. Development also will include installation of underground utilities to service the proposed buildings.

Information concerning the finished floor and finished grade elevations was not available at the time this report was prepared. Given the relatively flat existing grades, it appears that only minor cuts and fills, likely of less than 5 feet in depth, will be required to construct the building pads. Excavations on the order of 15 to 20 feet are anticipated to construct the below-grade levels. Deeper excavations and replacement of the material as fill will be required if the shallow foundation and slab-on-grade floor systems are selected.

If the proposed construction differs significantly from that described above, GROUND should be notified to re-evaluate the recommendations contained herein.

SITE CONDITIONS

Surface Conditions Lot 14 was a previously rough graded parcel west of the existing Glenwood Meadows retail center. Site grading was completed at the site to obtain its current grade in 2005. The site exhibits a gentle slope to the north at approximately 2 to 3 percent and the northern margin of the site is marked by an approximately 30-foot, 2:1 (horizontal : vertical) fill slope descending northward. The ground surface supported grasses and weeds. The surficial soils consisted largely of silty sands with gravel, and numerous scattered cobbles and boulders.

The property is bounded to the south by Wulfsohn Road and to the north by Midland Avenue. The remainder of the Glenwood Meadows development is to the east, and the Roaring Fork Transit Park-n-Ride facility and the City of Glenwood Springs' maintenance facility are to the west. Uphill to the south, several ridges ascend to the cliffs overlooking the area. Below the toes of the cliffs but above the development, a series of debris flow material retention basins and berm have been constructed.

Geologic Setting The site comprised a portion of the lower slopes of a relatively recent alluvial fan complex descending from gullies in the steep, elevated terrain to the south. The alluvial fan deposits consist of debris flow deposits with subordinate fluvial (stream laid) deposits of materials derived from the Maroon Formation supporting the cliffs. Clasts of basalt derived from a lava flow overlying the Maroon Formation locally also have been identified in the alluvial fan deposits.

The alluvial fan deposits and recently placed fills are underlain by sands, gravels and cobbles interpreted to be Pleistocene river terrace deposits associated with the

Colorado River. These deposits contain a significant proportion of clasts of crystalline rock types such as granite and gneiss.

Bedrock deposits of the Middle Pennsylvanian to Lower Permian Eagle Valley Evaporite, Eagle Valley Formation and Maroon Formation underlie the surficial deposits at the site and adjacent areas. The Maroon Formation consists largely of interbedded sandstones, siltstones and claystones as exposed in the cliffs above the project. Materials of the Eagle Valley Formation are exposed on the lowest slopes south of the site, above the alluvial fan deposits. This unit is broadly similar to the Maroon Formation with a greater percentage of limestone and gypsum. The Eagle Valley Evaporite, underlying the Eagle Valley Formation consists primarily of beds of gypsum, anhydrite and halite, with interbedded sandstones, siltstones, limestones and shales.

Geologic Hazards The project site lies within an area including much of the City of Glenwood Springs and its vicinity subject to geologic hazards including landslides, debris flows and subsidence related to hydro-consolidation. Maps depicting the general distribution of these hazards are public record such as the Colorado Geological Survey (CGS) *Open-File Report 78-10*. Geologic and geotechnical hazards at the site were assessed by CTL/Thompson, Inc., in the report, *Geologic and Preliminary Geotechnical Investigation, Glenwood Meadows, Glenwood Springs, Colorado*, Job No. GS-2871, prepared for Glenwood Meadows, LLC, dated February 1, 2000. A draft review of that study and others was provided by the CGS titled, *Geologic Hazards Review for the Glenwood Meadows Development Application*, prepared for the City of Glenwood Springs Planning Office, dated October 23, 2001. The Glenwood Meadows Annexation and Development Agreement (ADA) between the City and the Developer reflected these conditions. GROUND recommends that these documents be reviewed for additional information regarding development at the site.

The recognized potential for concentrated surface run-off and debris flows to damage improvements on the subject site as well as the retail and nearby City facilities has been addressed by the debris flow retention basins and berm constructed above the subject site. Design of the debris flow retention basins and berm was provided by others.

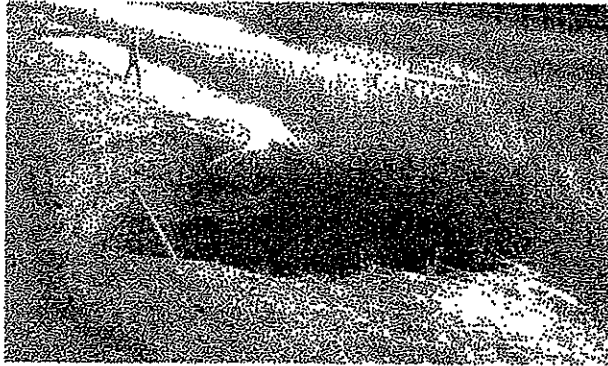
GROUND considers the potential for hydro-consolidation or "collapse" of the local soils comprising the alluvial fan complex upon wetting under a load to be the geologic hazard of principal concern at the site. Hydro-consolidation consists of a significant volume loss due to rearrangement of the constituent grains of the soil to a more compact

assemblage upon wetting under a load. Geotechnical recommendations to address hydro-consolidation are provided in this report.

(The potential for rock-fall hazard also was addressed by the February 1, 2000, CLT/Thompson report. Based on that report and as incorporated into the ADA, the subject site is not significantly exposed to potential rockfalls.)

In GROUND's opinion, with appropriate geotechnical and civil design, properly implemented during construction and effectively maintained after construction, Glenwood Meadows Lot 14 site is feasible for the proposed office building, commercial buildings and multi-family residences with regard to hydro-consolidation, flooding and debris flows.

The site also is vulnerable to the development of sinkholes from dissolution of water-soluble minerals in the bedrock underlying the site at depth. In August, 2003, for example, a sinkhole developed along the northern margin of Midland Avenue, east of the subject site, approximately downslope the Target



store. The sinkhole, which was backfilled promptly by the City of Glenwood Springs, was approximately 13 feet by 16 feet at the surface, about 11 feet in depth and about 130 cubic yards in volume. Additional information about the sinkhole can be found in an evaluation prepared for the City by Hepworth – Pawlak Geotechnical, *Subsurface Study for Evaluation of Sinkhole for Remedial Repair, Midland Avenue, North of the Community Center, Glenwood Springs, Colorado*, Job No. 103 522, dated September 8, 2003.

The geologic conditions giving rise to sinkholes, and the associated risks, are common in the Glenwood Springs area and generally greater along the Roaring Fork River to the south. Compilations of published map data suggest an average sinkhole density in the region on the order of 0.8 sinkholes per square mile. Therefore, the risk of sinkhole development at any given location such as the subject site appears relatively low. Most typically, sinkholes develop where stream terrace deposits or similar materials overlie the evaporitic bedrock. Subsurface exploration for this project included several test

holes advanced to depths of approximately 75 feet. None of the test holes encountered conditions suggesting the presence of voids beneath the site to the depths explored.

Nevertheless, the risk of sinkhole development, although apparently low, cannot be eliminated entirely. The potential for sinkholes must be accepted for development at the site, as well as for residence there. Effective surface drainage appears to reduce the risk of sinkhole development, but cannot eliminate it.

Annexation and Development Agreement We understand that the ADA for the overall Glenwood Meadows site is applicable to Lot 14. In that Agreement were established a number of geotechnical criteria for the development, based in part on recommendations from CGS regarding geologic hazards, including foundation types, measures for grading, surface drainage, and pavements, and underdrains for below-grade construction. We believe that the requirements therein have been met or exceeded by the recommendations herein.

The City also has expressed concerns that proposed improvements, particularly wet utility lines, could contribute to subsidence after project construction is completed. We understand that based on CGS comments, the City is requiring ground-penetrating radar (GPR) surveys to be performed along all utility alignments under public streets to further explore for the possible presence of sinkholes in the shallow subsurface. Therefore, GROUND recommends that the GPR surveys will be performed in general accordance with the City's requirements.

SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted in December, 2007 and January 2008. A total of 21 test holes were drilled with a truck/track-mounted, continuous flight, power auger rig to evaluate subsurface conditions, including depths to groundwater and bedrock, as well as to retrieve samples for laboratory testing and analysis. Of these, 14 test holes were drilled in the approximate building footprints, generally to depths of about 25 to 40 feet; several test holes, however were advanced to depths of approximately 75 feet. An additional 7 shallower test holes were advanced in the areas proposed for parking and driveways. A GROUND engineer directed subsurface exploration, logged the test holes in the field and prepared the samples for transport to our laboratory.

Relatively undisturbed samples of the subsurface materials were taken with a 2-inch I.D. "California" -type liner sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches. This procedure is similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values (blows per distance driven, typically 12 inches), when properly evaluated, indicate the relative density or consistency of soils and bedrock. A composite, disturbed (bulk) sample of the shallow soils in the pavement areas was collected from the auger returns. Depths at which the driven samples were taken, 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 exploratory test holes are presented on Figures 2 through 6. Explanatory notes and a legend are provided on Figure 7.

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 obtained from the subject site included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses and liquid and plastic limits. Swell-consolidation, water-soluble sulfate content, pH and resistivity tests were performed on selected samples, as well. A resilient modulus test was performed on the composite sample of materials from the areas to be paved.

Laboratory tests were performed in general accordance with applicable ASTM and AASHTO protocols. Data from the laboratory testing program are summarized in Table 1. Results of the swell-consolidation testing are plotted on Figures 9 through 17.

SUBSURFACE CONDITIONS

The earth materials encountered in the test holes, in general, of sandy fill soils extending to depths of a few feet to approximately 35 feet. (Delineating the complete lateral and vertical extents of existing fills on the project site was beyond our present scope of services for this project.) The fills were underlain by interbedded native silty to clayey sands and sandy silts with gravel, boulders and cobbles, and local lenses of clays. These soils are interpreted to be alluvial fan deposits. The native and fill soils contained significant fractions of cobbles and boulders. Based on other drilling by GROUND within the overall Glenwood Meadows site, it is anticipated that dense beds of

cobbles and boulders underlay the alluvial fan materials below about 80 to 95 feet, interpreted to be Quaternary alluvial (fluvial) materials deposited by Colorado River prior to burial beneath the alluvial fan deposits.

Bedrock was not encountered to the depths explored. Neither was groundwater encountered in the test holes at the time of subsurface exploration. However, groundwater levels can fluctuate, in response to annual and longer-term cycles of precipitation, irrigation, surface drainage and land use, the development and drainage of transient, perched water conditions, and other factors.

Fill consisted of silty to clayey sands to sandy silts. Gravel, boulders and cobbles were encountered. They were moist, low plastic, medium dense to dense and red in color.

Native Sands were clean to silty or clayey to gravelly. Cobbles and boulders were encountered, as well as lenses of sandy clays, sandy silts and relatively clean sands and gravels. They were fine to medium grained, dry to slightly moist, non-plastic to low plastic, loose to medium dense, and red in color.

Swell-Consolidation Testing Consolidations ranging from about 0.3 to 6.1 percent were measured in samples of the alluvial fan soils upon wetting under a 1,000 psf surcharge load. (See Table 1.)

SEISMIC CLASSIFICATION

No known active faults are in the immediate project vicinity. The closest documented potentially active (seismogenic) fault to the site is an unnamed series of relatively short, northwest-trending faults approximately 2½ to 3 miles to the southwest of the site (Kirkham, R.M., and W. P. Rogers, *Earthquake Potential in Colorado, A Preliminary Evaluation*, Colorado Geological Survey, Bulletin 43, dated 1981; *Preliminary Quaternary Fault and Fold Database, and Map Server*, Colorado Geological Survey, <http://geosurvey.state.co.us/Default.aspx?tabid=453>). These faults are shown as late Quaternary in age (demonstrable timing of last offset across the fault), but not Holocene (movement during the last 11,000 years ±). The risk of these faults giving rise to damaging, earthquake-induced ground motions at the site is considered to be low given their short length and the moderate, previously recorded, seismic magnitudes in the area.

Compared with other regions of Colorado, recorded earthquake frequency in the project area is relatively low; Kirkham and Rogers (1981) depict 2 historical earthquake epicenters of moderate magnitude in the Glenwood Springs area. The project area falls within Seismic Performance Category A based on AASHTO guidelines, and is considered to have a low probability for large, damaging earthquakes.

GROUND considers the site to fall within the parameters of a Seismic Site Class D site, in accordance with 2006 IBC. It should be noted that this classification is an estimate, based on the conditions encountered during drilling, our laboratory test data, and GROUND's experience in similar soils. If a quantitative assessment of the classification is needed, GROUND can perform down-hole shear wave velocity testing. A proposal for this work can be provided upon request.

GEOTECHNICAL CONSIDERATIONS FOR DESIGN

Geotechnical Risk Our data indicate that the native soils underlying the site are vulnerable to hydro-consolidation or "collapse." Hydro-consolidation consists of a significant volume loss due to rearrangement of the constituent grains of the soil to a more compact structure upon wetting under a surcharge load. The data obtained for this study suggested moderate potentials for post-construction settlement of structures constructed on the soils encountered at this site. Soils subject to "collapse" are generally stable with regard to their moisture-volume relationships so long as their moisture contents are kept unchanged. Post-construction wetting of "collapsible" soils gives rise to settlement and resultant damages. Pavements, utilities, and sidewalks, etc., all can be affected, in addition to the buildings. The actual extent and distribution of post-construction settlement realized at a given location (and the nature and degree of resultant damages) will depend on a variety of factors. These factors include the spatial distribution of the hydro-consolidation potentials in the underlying soils, the type and design of the structure supported on them, structural loads, and the depth and lateral extent to which the soils become wetted after construction, etc. Because of the number and variability of these factors, the necessarily limited data set by which the geotechnical factors can be estimated, the variety of means by which estimates of post-construction settlement can be made, and the inherent assumptions involved, estimates of future settlement will tend to range widely in magnitude.

Various quantitative and semi-quantitative methods are used by geotechnical engineers in Colorado to estimate post-construction settlements of structures, pavements, etc.,

constructed on "collapsible" soils as a step toward development of recommendations for foundations, remedial earthworks, etc. Those typically used are based on practical engineering experience and judgment using combinations of measured values of soil moisture content, density and plasticity, one-dimensional swell/consolidation, and/or soil suction. The recommendations and criteria provided in this report were based on the data presented herein, and 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 recommendations 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 the Owner or prospective future owners, upon receipt of this report, however, to discuss these risks and the geotechnical alternatives with us.

Anticipated 'Depth of Wetting' At any point in the design life of a structure, the vertical and lateral extents of future wetting of the underlying "collapsible" soils will exert a significant influence on the extent and distribution of future settlement. Professional experience and opinions differ with regard to depths to which significant, post-construction, soil moisture changes take place. Differing assumptions for this future "depth of wetting" at a site will give rise to differing estimates of potential, post-construction heave. Movement estimates based on much deeper than typically estimated depths of wetting will be larger than those based on more typically observed depths.

Engineering consulting and design practice necessarily involves weighing the risks inherent in a given design approach against the construction and maintenance costs associated with reducing those risks. The Owner (and subsequent prospective future owners) must, therefore, understand the risks and remedial approaches presented in this report and the risk-cost trade-offs addressed by the Civil Engineer and Structural Engineer 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 (or was) designed. If the Owner or a prospective future owner does not understand these risks, it is critical

that he request additional information or clarification so that his expectations reasonably can be met.

As noted above, the "depth of wetting" forecast for a given site strongly affects the anticipated performance of structures placed there. At this site, GROUND estimated a depth of wetting of 18 feet, a depth that is equal to or greater than the "depth of wetting" found at about 62 percent of the sites studied by Walsh and others (2006)¹ in the Denver metropolitan area and appears reasonable for this site based on our experience in on the Colorado Western Slope. A "depth of wetting" of 18 feet is appropriately conservative in our opinion for this project. Clearly, however, there is a potential for this "depth of wetting" to be exceeded. And, if a greater depth of wetting were considered – other parameters being equal – then a greater estimate of post-construction movement would result. "Depths of wetting" of 30, 40 or 70 feet or more have been considered (e.g., Chao and others, 2006)² and have been encountered locally in the field. These cases, however, generally are in unusual geologic conditions such as the "Designated Dipping Bedrock Area" as recognized by Jefferson County, Colorado, or identified forensically in unusual circumstances such as a pipe leak that has remained un-repaired for an extended period. In more typical geologic settings, such deep "depths of wetting" are considered only rarely in engineering consulting practice in this area, however. If the Owner prefers a more conservative (or less conservative) "depth of wetting" to be used to develop geotechnical recommendations, GROUND should be contacted to revise geotechnical criteria herein.

Likely Post-Construction Movements Utilizing the above assumptions, data obtained for this study, and our experience on other projects in the vicinity, our estimates indicate potential likely post-construction movements on the order of 6 to 8 inches where building elements are supported directly on native earth materials that become wetted following construction to the depth described. Movements of this magnitude can cause severe cosmetic and/or structural distress to the proposed buildings. (These same general potentials for post-construction movement and damage also apply to project pavements, hardscaping, piping, and all other improvements in contact with the site soils where subject to post-construction wetting.)

¹ Walsh, K.D., C.A. Colby, W.N. Houston and S.A. Houston, 2006, *Evaluation of Changes to Soil Suction Resulting from Residential Development, Unsaturated Soils 2006*, American Society of Civil Engineers, Special Publication No. 147, pp. 203 – 212.

² Chao, K-C, D.D. Overton, and J.D. Nelson, 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.

General Foundation Types At the subject site, several types of foundation systems, in conjunction with differing extents of remedial earthworks, etc., can be employed to support the proposed buildings on the soils and bedrock encountered in the test holes. Each combination entails a different degree of risk of post-construction building movements. These range from utilizing shallow spread footings and slab-on-grade concrete floors bearing directly on the native soils (entailing the greatest risk) to supporting the structures, including floors, on deep, driven pile foundations bearing in the underlying alluvial cobbles and boulders at depths of on the order of 80 feet or more (entailing the least risk).

Lower movement tolerances are typically associated with residential buildings and if placed on spread footings and slab-on-grade the allowable movement tolerance would likely be exceeded. Therefore, GROUND recommends that the proposed residential buildings be supported on driven pile foundation systems and providing it with structural floors similarly supported as the most positive way to minimize post-construction settlements. We also recommend use of a driven pile foundation system and a structural floor for the office building where a below grade levels planned. We anticipate that construction of the deep fill section recommended for use of shallow foundations and floor system on deep fill section may not be feasible, economically.

We assume, however, that 80+ -foot pile foundations and a structural floor may not be practical economically for the other commercial buildings at the subject project. Therefore, in the absence of direction otherwise from Total Merchant Services or the Owner, we have assumed that the Owner prefers to use conventional, shallow foundations and a slab-on-grade concrete floor for the commercial buildings on this project. The geotechnical criteria provided in the *Foundation Systems and Floor Systems* section of this report were developed accordingly to reduce damage resulting from movement of the foundation soils. If this approach is selected, the Owner must understand that foundation and/or floor slab movements will result, with associated damages. Shallow foundations and slab-on-grade floors together with excavation of the underlying soils and replacement with backfill with less potential for settlement have been used in the Denver metropolitan area with varying degrees of success. If the alternative criteria are implemented effectively in design and construction, and site drainage is maintained effectively, likely settlements in the soils supporting the footings and slab will be on the order of 1½ inches, with similar differential movements over a span of about 50 feet. GROUND is available to meet, however, to discuss the risks

and remedial approaches presented in this report, as well as other possible design approaches, upon request.

Irrespective of the foundation system and floor system selected by the Owner, some risk of post-construction building and floor movements will remain, even after effective implementation of the recommendations in this report. The Owner and prospective future owners should understand these risks, as well as the site maintenance measures that are necessary to manage them. Other elements of the proposed improvements on this site (hardscaping, pavements, etc.) will be underlain by expansive earth materials, and likely will be damaged. Owner tolerances for movement and distress to these appurtenant improvements typically is greater than for buildings. Nevertheless, periodic maintenance will be required. To achieve performance similar to that of the building floors, similar foundation measures will be required. We recommend that the Owner and prospective future owners familiarize themselves with the measures presented in Noe and others (1997)³ and implement them at this site. This booklet is available from the Colorado Geological Survey in Denver, Colorado, and can be purchased from their website. (www.geosurvey.state.co.us). Although written for residential construction on expansive soils, the site drainage concepts and recommendations outlined therein are generally applicable to building sites on collapsible soils, as well.

GROUND recommends consideration of a supplemental drilling program for structures not supported on deep foundations in order to provide additional information regarding the potential for severe settlements. We suggest advancing test holes on approximately 30-foot centers with an air percussion rig or other, rapid-drilling equipment, to a depth on the order of 50 to 60 feet beneath each building supported on shallow foundations. Such a drilling program would provide direct evidence of voids beneath those support locations, if present, and allow those voids to be collapsed or filled prior to building construction.

On-Going Maintenance Some risk of post-construction building and floor slab movements will remain, however, even after effective implementation of the recommendations in this report. The Owner and prospective tenants / residents should understand these risks, as well as the site maintenance measures that should be performed to manage them. Geotechnical parameters for design and construction of shallow, spread footing foundations for the proposed buildings, as well as

³ Noe, D.C., C.L. Jochim and W.P. Rogers, 1997, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners*, Colorado Geological Survey, Special Publication 43.

recommendations for remedial earthworks, drainage, etc., are provided in subsequent sections of this report. These measures also will be beneficial with regard to potential heave of clayey soils encountered locally in the test holes. GROUND can provide geotechnical recommendations and parameters for other types of foundation systems upon request.

FOUNDATION SYSTEMS

Shallow Foundation Systems for Commercial Buildings As discussed in the *Geotechnical Considerations for Design* section of this report, it is GROUND's opinion that the proposed commercial buildings, if determined to be feasible, can be supported on conventional, shallow foundation systems bearing on a section of properly moisture-conditioned and compacted fill provided that the Owner is aware of the risks inherent in construction on collapsible soils, and that the buildings are designed accordingly.

The criteria presented below may be observed for spread footing foundation systems. The construction details should be considered when preparing project documents.

- 1) Footings should bear on 10 or more feet of properly compacted fill.
- 2) The thickness of the fill section should be taken from the lowest foundation element or the bottom of the slab + gravel layer system, respectively. (If the gravel layer is not installed, the fill section should be correspondingly thickened.)

The existing soils and fill soils should be removed to a sufficient depth beneath footing (and slab) bearing elevations to accommodate placement of a new fill section uniformly beneath the building, in addition to scarification and re-compaction of the underlying 8 to 12 inches of material.

Excavation and replacement to the full, recommended depth should extend at least 12 feet beyond the building perimeter.

Based on the data obtained from our test holes, varying depths of existing fill were encountered, however a uniform fill thickness of at least 10 feet should be placed below the footing bearing elevations. Therefore, the existing fill should not be considered as part of the fill recommended fill section below the footings.

Recommendations for placement and compaction of fill soils are provided in the *Project Earthworks* section of this report. As discussed in that section, site soils free of debris are suitable, in general, for use as compacted fill.

The Contractor should provide surveyed elevations of the bottoms of the excavations beneath the building verifying that the remedial excavation was advanced to a sufficient depth.

- 3) Footing excavation bottoms may expose debris, loose or wet materials, organic 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.
- 4) Footings bearing on 10 or more feet of properly compacted fill may be designed for an allowable soil bearing pressure (Q) of 2,500 psf under drained conditions. This value may be increased by $\frac{1}{3}$ for transient loads such as wind or seismic loading.

Based on this allowable bearing capacity, we anticipate direct compression of the foundation soils on the order of 1 inch. For other estimated settlements, allowable bearing pressure values can be obtained from Figure 8.

The allowable bearing capacity provided above is based on the assumption of well-drained conditions. If foundation soils become wet, the effective bearing capacity could be reduced and larger post-construction settlements than those estimated herein may result. In addition, the risk of hydro-consolidation of the underlying native soils underlying the fill prism will be increased.

- 5) In order to reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle differentially.

The Contractor should take care to construct fill section beneath the building of uniform depth and composition to reduce differential post-construction building, slab and flatwork movements. A differential fill beneath the building will tend to increase differential settlements.

- 6) Spread footings should have a minimum footing lateral dimension of 16 or more inches for linear strip footings and a minimum lateral dimension of 24 or more

inches for isolated pad footings. Actual footing dimensions, however, should be determined by the Structural Engineer, based on the design loads.

- 7) Footings should be provided with adequate soil cover above their bearing elevation for frost protection. Footings should be placed at a bearing elevation 3.5 or more feet below the lowest adjacent exterior finish grades in un-heated areas. In heated interior areas, footings should bear at least 1.5 feet below lowest adjacent finish grades.
- 8) Continuous foundation walls should be reinforced top and bottom to span an unsupported length of at least 10 feet.
- 9) The lateral resistance of spread footings will be developed as sliding resistance of the footing bottoms on the foundation materials. Sliding friction at the bottom of footings may be taken as 0.35 times the vertical dead load.
- 10) Compacted fill placed against the sides of the footings should be compacted to at least **96 percent** relative compaction in accordance with the recommendations in the *Project Earthworks* section of this report.
- 11) Care should be taken when excavating the foundation to avoid disturbing the supporting materials. Hand excavation or careful backhoe soil removal may be required in excavating the last few inches.
- 12) Foundation soils may be disturbed or deform excessively under the wheel loads of heavy construction vehicles as the excavations approach footing levels. Construction equipment should be as light as possible to limit development of this condition. The use of track-mounted vehicles is recommended since they exert lower contact pressures. The movement of vehicles over proposed foundation areas should be restricted.
- 13) All footing areas should be compacted with a vibratory plate compactor prior to placement of concrete.

The Geotechnical Engineer should be retained to observe and test all footing excavations prior to placement of reinforcing steel or concrete.

Deep Foundation Systems for the Residential and Office Buildings As discussed in the *Geotechnical Considerations for Design* section of this report, it is GROUND's opinion that the proposed residential building should be supported on deep foundation systems bearing in the river terrace gravels, cobbles and boulders underlying the site at depths of 75 or more feet below existing grades. Although driven pile foundation systems will not eliminate the risk of post-construction building movement, if the recommendations below are followed, the likelihood of acceptable building performance will be well within the local industry standards for construction of a driven pile foundation system on soils and bedrock of this nature.

The design criteria below should be followed for design and construction of driven, steel, H-pile foundations for the residential buildings. We assume that HP 12 x 74 or 14 x 89 piles will be used for driven pile foundations. The construction details should be considered when preparing project documents.

- 1) The pile should consist of a heavy steel H-section. The pile tip should be reinforced with a commercial, heavy duty, pile tip.
- 2) The maximum pile load should not exceed a maximum service stress of 12,000 psi based on the pile cross-sectional area.
- 3) We anticipate that piles will be driven to depths of about 80 to 95 feet below existing grades at the time of preparation of this report. Locally, lower tip depths may be necessary.
- 4) Based on the dominantly granular nature of the site alluvial fan soils, we anticipate that post-installation down-drag on the piles will be negligible due to the densification of the soils surrounding each pile from the driving efforts. We anticipate that subsequent soil adjustments will be realized rapidly. Nevertheless, GROUND recommends re-striking of the piles to evaluate their capacity at least 24 hours after (initial) driving has been completed.
- 5) Closely spaced groups of piles required to support concentrated loads will require an appropriate reduction of the estimated bearing capacity based on the effective envelope area of the pile group. This reduction can be avoided by spacing piles apart a distance of at least 3 diameters, center to center. Pile groups with spacings less than 3 diameters center to center should be studied

on an individual basis to determine the appropriate reduction for both lateral and axial capacities.

- 6) Piles may be designed to resist lateral loads taking a modulus of horizontal subgrade reaction of 140 pci to be characteristic of the native alluvial fan and fill soils below a depth of 6 feet, based on adjacent finished grade. A modulus of horizontal subgrade reaction of 225 pci may be assumed in the alluvial river terrace deposits. Resistance to lateral loads should be neglected in fill and/or native soils shallower than 6 feet.

We understand that the building pads will be wide enough so that any loads from relaxation of the shallow soils or downslope creep will not affect the piles. Should the buildings be constructed in a "walk-out" configuration, however, these loads should be evaluated and accounted for in the wall and foundation designs.

- 7) Lateral resistance to horizontal forces also may 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. Batters should not exceed 1:4 (horizontal : vertical).
- 8) Uplift capacity of piles should be limited to 25 percent of the indicated vertical load capacities
- 9) We recommend that the pile driving hammer should develop a minimum of 42,000 foot-pounds of energy per blow for HP 12 x 74 piles, and a minimum of 52,000 foot pounds of energy per blow for the HP 14 x 89's.

After the actual pile type and proposed hammer have been selected, the Geotechnical Engineer should perform a Wave 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 are driven.

A Geotechnical Engineer should be retained to evaluate necessary minimum embedment depths based on the structural loadings for the piles. The Geotechnical Engineer should observe all pile driving operations. We recommend that at the start of pile installation for each building, the Geotechnical Engineer perform pile dynamic

testing. This testing should be performed in order to a) assess whether piles are being over-stressed relative to the maximum service stress of 12,000 psi recommended above, and b) develop virtual refusal criteria for bedrock penetration based on the design capacity of the piles. Dynamic pile testing should be performed by means of a Pile Driving Analyzer (PDA) to determine the virtual refusal criteria. Lateral loading tests also should be performed at the start of pile installation.

The test holes drilled for this evaluation were advanced to the depths indicated on the test hole logs by means of a conventional, truck-mounted, drilling rig using 4-inch diameter, solid-stem, flight auger equipment. Nevertheless, because of the cobbles and boulders in the site soils, the Contractor should anticipate some difficulties in advancing the piles, and be prepared to work in these conditions. We anticipate the need for local pre-drilling of pile locations and/or splitting of boulders to advance the piles to the anticipated depths.

Additional pile footage should be included in project planning to allow for additional piles locally where offsets were required due to potential obstructions to pile driving in the landfill materials or damage to piles.

Where a pile cannot be advanced to at least the approximate, anticipated tip depths, it should be evaluated with regard to its capacity by the Geotechnical Engineer and the Structural Engineer.

PARTIAL BASEMENTS / BELOW GRADE LEVELS

Partial basements or any otherwise below grade levels (loading docks, garden-levels, etc.) can result in differential settlement between the portion of the building that is founded near the final surface grade (no basement level) and that which is founded below grade, specifically if the portion of the building directly adjacent to the below grade level is founded on backfill material. The backfill material may exhibit settlement due to compression of the foundation that exceeds the magnitudes provided in Figure 8.

Therefore, the Structural Engineer and the Contractor must carefully schedule the construction of the building such that the footing bearing soils are not disturbed or vulnerable to movement associated with settlement of the below grade wall backfill. This most often occurs when the below grade walls are backfilled to lower compaction standards because of structural concerns regarding wall deformation (i.e. the walls are not braced with the first floor beams, girders, decking, etc.).

In addition, foundation elements supporting the portion of the building not located above a below grade level are sometimes designed for less bearing capacity than those located under the below grade level. As shown in Figure 8, different loads may result in differential settlement.

In no case should the subgrade for future foundations or existing foundation elements be undermined.

FLOOR SYSTEMS

Slab-on-Grade Floors for the Commercial Buildings As discussed in the *Geotechnical Considerations for Design* section of this report, there is a potential for post-construction movements of slab-on-grade floor systems even where placed on a relatively deep fill section. Therefore, if the Owner understands and accepts the risk of post-construction slab movements, the remedial earthworks and other parameters provided below will tend to reduce slab movements, make them more uniform and reduce potential distress that can result from settlement of foundation materials.

Post-construction slab movements are directly related to changes in moisture contents to the underlying soils after construction is completed. If slab-on-grade construction is used in accordance with the following criteria, potential for slab movement will not be eliminated, but may tend to make movements more uniform and will reduce damages where movements do occur.

- 1) Floor slabs should bear on 12 or more feet of properly moisture-conditioned and compacted fill soils.

The existing soils should be removed to a sufficient depth beneath slab bearing elevation to accommodate construction of the above fill section, in addition to scarification and re-compaction of the underlying 8 to 12 inches of material. The thickness of the fill section should be taken from the bottom of the slab + gravel layer system. (Taking the slab+gravel system to be approximately 1 foot in thickness and assuming the footings will bear at 3 feet below existing grades, a 12-foot fill section beneath the floor system and 10-foot fill section beneath the footings should yield a nearly uniform excavation bottom elevation. If the gravel layer is not installed, the fill section should be correspondingly thickened.)

Excavation and replacement to the full recommended depth should extend laterally at least 12 feet beyond each building perimeter.

Recommendations for placement and compaction of fill soils are provided in the *Project Earthworks* section of this report. As discussed in that section, site soils free of debris are suitable, in general, for use as compacted fill.

The Contractor should provide surveyed elevations of the bottoms of the excavations beneath the building verifying that the remedial excavation was advanced to a sufficient depth.

The Contractor should take care to construct a fill section of uniform depth and composition to reduce differential post-construction building, slab and flatwork movements. A differential fill beneath the building will tend to increase differential settlements.

Based on the data obtained from our test holes, varying depths of existing fill were encountered, however a uniform fill thickness of at least 12 feet should be placed below the floor slabs. Therefore, the existing fill should not be considered as part of the recommended fill section below the floor slabs.

- 2) An allowable vertical soil modulus (K_v) of 45 pci may be used for design of concrete slabs bearing on a properly prepared subgrade.
- 3) A Geotechnical Engineer should be retained to observe the prepared surface on which the floor slab will be cast prior to placement of reinforcement. Exposed loose, soft or otherwise unsuitable materials should be excavated and replaced with properly compacted fill, placed in accordance with the recommendations in the *Project Earthworks* section of this report.
- 4) The floor slab should be separated from all bearing walls and columns with slip joints that allow unrestrained vertical movement.

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) Interior partitions resting on the floor slab 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 door frames. A slip joint that will allow 2 or more inches of vertical movement is recommended. If slip joints are placed at the tops of walls, in the event that the floor slabs move, it is likely that the wall will show signs of distress, especially where the floors meet the exterior wall.
- 6) A concrete slab-on-grade should be constructed and cured in accordance with applicable industry standards and provided with properly designed and constructed control joints. ACI, AASHTO and other industry groups provide guidelines for proper design and construction of concrete slabs-on-grade, and associated jointing. The design and construction of such joints should account for cracking resulting from concrete shrinkage, curling, tension and applied loads, as well as other factors related to the proposed slab use. Joint layout based on slab design may require more frequent, additional or deeper joints than typical industry minimums, and should reflect the configuration and proposed use of the slab. Particular attention in slab joint design should be given to areas where slabs exhibit interior corners or curves, e.g., at column block-outs or reentrant corners, and slabs with 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.
- 7) Floor slabs should be adequately reinforced. Recommendations based on structural considerations for slab thickness, jointing, and steel reinforcement in floor slabs should be developed by the Structural Engineer.
- 8) All plumbing lines should be carefully tested before operation. Where plumbing lines enter through the floor, a positive bond break should be provided. Flexible connections allowing 2 or more inches of vertical movement or more should be provided for slab-bearing mechanical equipment and the connection should be adjustable and observed periodically.
- 9) 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.

- 10) A vapor barrier beneath a building floor slab can be beneficial with regard to reducing exterior moisture moving into the building, 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.

Therefore, in light of the several, potentially conflicting effects of the use vapor-barriers, the Owner and the Architect and/or Flooring 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 buildings or building areas and not for others.

Structural Floors for the Residential and Office Buildings The residential and office buildings should be provided with structural floors should be supported on grade beams and H-piles in the same manner as the building structure. Requirements for the number and position of additional H-piles to support the floors will depend upon the span, design load, and structural design, and should be developed by the Structural Engineer. Geotechnical recommendations for design and installation of the driven H-piles are provided in the *Building Foundations* section of this report.

Structural floors should be constructed to span above a well-ventilated crawl space. The crawl space should be adequate to allow access and maintenance to utility piping. Piping connections through the floor should allow for differential movement between the piping and the floor system. If a wooden structural floor system is used, particular care should be taken to design and maintain the under-floor ventilation systems in order to reduce potential deterioration of the wooden structural members. A minimum 10-mil unreinforced polyethylene vapor-retarder (a plastic sheet material) should be considered for installation below all structurally supported below-grade floors and should be properly attached/sealed to foundation walls. The plastic sheeting should not be attached to horizontal surfaces such that condensate might drain to wood or corrodible metal surfaces.

New buildings generally lack ventilation due primarily to systematic efforts to construct airtight, 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 close proximity of finished building pad grades. Persistently warm, humid conditions in the presence of cellulose, which is the base material found in many typical construction products, creates an ideal environment for the growth of fungi, molds, and mildew. Published data suggest links between molds and negative health affects. Therefore, GROUND recommends that crawl spaces beneath structural floors be provided with adequate, positive active ventilation systems or other active mechanisms such as specially designed HVAC systems (as well as properly constructed and maintained underdrains) 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 construction means and methods, and any observation or testing performed by a representative of a Geotechnical Engineer during construction does not relieve the Contractor of that responsibility.

Mold Growth Areas/Conditions for Growth for Structural Floors:

1. Water damaged building materials or high moisture/humidity areas where cellulose-containing materials are used:
 - Wallboard/sheetrock
 - MDF/OSB/Plywood
 - Fibrous Ceiling Tiles
 - Paper-backed Insulation
 - Jute-backed carpet
 - Hardwood Flooring
2. Condensation inside buildings from pipes, baths, heaters, and dryer vents
3. Relative humidity greater than 55%
4. Temperatures of 36 to 104 °F.
5. "Wet" areas that do not dry out after 24 hours.

Mold does not require a light source in order to grow and can grow inside walls, behind tubs/showers, under carpet and flooring undetected.

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 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 4 inches or more.

Crawl spaces typically are vulnerable to moisture accumulation. Proper installation and maintenance of the underdrains as recommended in the *Underdrain System* section of this report will assist drainage of free water and assist the ventilation system reduce crawl space moisture.

FOUNDATION WALLS

Foundation walls that are laterally supported and can be expected to undergo only a limited amount of deflection, i.e., an "at-rest" condition, should be designed to resist lateral earth pressures computed taking an equivalent fluid unit weight of 55 pcf to be

characteristic of the backfill soils for a horizontal backfill surface if imported, select, granular, backfill is placed the walls and compacted properly. The at-rest lateral earth pressures should be computed taking an at-rest equivalent fluid pressure of 67 pcf to be characteristic of the backfill soils where on-site materials are used as backfill, again for a horizontal backfill surface.

Select, granular materials imported for use as wall backfill should meet the criteria for CDOT Class 1 Structure Backfill as tabulated below. All imported soils should be tested and approved by the Geotechnical Engineer prior to transport to the site.

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

GROUND suggests use of select, granular, backfill behind the walls to achieve lower lateral earth pressures. To realize the lower equivalent fluid unit weight, structural fill should be placed behind the wall to a minimum distance equal or greater than half of the wall height. Where select, granular, backfill is used, the upper 1-foot of the wall backfill should be a relatively low permeability soil or otherwise protected to reduce surface water infiltration into the backfill.

The 'at rest' loads recommended above are for well-drained conditions. The additional loading of hydrostatic loads if sufficient drainage is not provided, and loads from traffic, stockpiled materials, etc., should be included in foundation wall design.

Backfill soils should be properly moisture-conditioned and compacted in accordance with the recommendations in the *Project Earthworks* section of this report. The Contractor should take care not to over-compact the backfills, which could result in excessive lateral pressures on the walls.

A Geotechnical Engineer should be retained to observe the exposed excavation prior to placement of backfill, observe earthwork operations, and test the soils.

Some settlement of wall backfills will occur even where the material was placed correctly. This settlement likely will be differential, increasing with depth of fill. Where shallowly founded structures and pavements must be placed on backfilled zones, the associated risks should be understood by the Owner. Structural design, pipe connections, etc., should take into account backfill settlement, including differential movements from settlements and/or heave of the foundation wall backfill soils. A Geotechnical Engineer should be retained to provide recommendations for founding improvements in such areas.

Passive pressure against the sides of wall footings bearing against firm native soils or properly compacted backfill can be computed taking an at-rest equivalent fluid pressure of 275 pcf to be characteristic of the site soils, up to a maximum of 2,750 psf. The upper 1-foot of embedment should not be relied upon for passive resistance, however.

WATER-SOLUBLE SULFATES

The concentrations of water-soluble sulfates measured in samples obtained from the test holes were less than 0.01 percent by weight. (See Table 1). Such concentrations of water-soluble sulfates represent a negligible degree of 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).

Based on these data GROUND, makes no recommendation for use of a special, sulfate-resistant cement in project concrete. However, based on other studies in the area, and the presence of gypsum in the local bedrock, we recommend that after overlot grading has been completed, samples of site soils be tested for water soluble sulfates to assess the potential for locally elevated sulfate concentrations.

SOIL CORROSIVITY

Measurements of soil acidity (pH) and electrical resistivity were made to provide a general assessment of the potential for corrosion of ferrous metals installed in contact with earth materials. Test results are summarized in Table 1.

Values of pH below 7 (neutral) indicate acidic conditions; values greater than 7 indicate basic conditions, on a logarithmic scale. Testing indicated pH values from about 8.6 to

9.2, which indicate that the materials tested are basic. These characteristics will not contribute greatly to corrosion.

Electrical resistivity is related both to a material's moisture content and to the concentrations of dissolved salts and other conductive constituents in the soil pore water. Measurements of electrical resistivity indicated values from about 13,000 to more than 30,000 ohm-centimeters in selected samples of the local soils.

Resistivities greater than 6,000 ohm-centimeters are classified as representing an 'excellent' corrosive environment for ferrous metals in contact with site soils, on a scale of 'bad,' 'fair,' 'good' and 'excellent' as presented in the "Handbook of Steel Drainage and Highway Construction Products" published by the American Iron and Steel Institute. Therefore, the site alluvial fan soils appeared to represent an excellent (low risk) environment with regard to metallic corrosion.

Corrosive conditions can be mitigated by use of materials not vulnerable to corrosion, heavier gauge materials with longer design lives, or cathodic protection systems. If additional information or recommendations are needed regarding soil corrosivity, GROUND recommends contacting a Corrosion Engineer. 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, can alter the corrosion potentials significantly.

RADON

Radon is a naturally occurring, colorless, odorless, radioactive gas that can cause lung cancer, according to the U.S. Environmental Protection Agency (EPA). The occurrence of radon is difficult to predict, and structures with all types of foundations can be affected by radon build up. Where radon is allowed to concentrate in an enclosed structure represents a potential hazard. It is not a hazard that can be mitigated by geotechnical measures, however.

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 most typically are found in basements, crawl spaces 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, but cannot be excluded. Additional information regarding radon and radon-resistant building design can be obtained from the EPA (e.g., www.epa.gov/radon) as well as from many local building and/or health departments.

GROUND recommends that radon testing be performed in the building after construction is completed. However, we understand that incorporating sufficient ventilation and other measures into a structure to address radon accumulation during construction is significantly less costly than installing them after construction has been completed. We recommend that the Architect consider radon mitigative measures for the proposed structure and incorporate appropriate systems into the design.

SURFACE DRAINAGE

The following drainage precautions should be observed during construction and maintained at all times after the facilities have been completed. Establishment and maintenance of surface drainage is critical to the proper performance of the proposed structures and pavements. If the drainage measures below are not implemented and maintained effectively, the movement estimates provided in this report could be exceeded.

- 1) Excessive wetting or drying of the foundation excavations and underslab areas should be avoided during construction.
- 2) Care should be taken during and after construction to identify local, concentrated water sources such as leaking hose bibs or pipes, downspouts from which water is not positively controlled, construction water tanks, etc., and repair the damage or make positive provision to capture the water or convey it off-site. On-going, localized wetting of the site soils will result in piping of the silty materials and potentially severe localized settlements.
- 3) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils. The ground surface surrounding the exterior of each building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 12 inches in the first 10 feet in landscaped areas and 3 inches in the first 10 feet in areas where hardscaping covers the ground adjacent to the building. (It may be necessary to incorporate ramps or other measures into project design to implement this

recommendation while complying with access requirements.) In no case should water be allowed to pond near or adjacent to foundation elements.

Drainage measures also should be included in project design to direct water away from sidewalks and other hardscaping as well as utility trench alignments that are likely to be adversely affected by moisture-volume changes in the underlying soils or flow of infiltrating water. Routine maintenance of site drainage, including sealing of cracks and joints, should be undertaken throughout the design life of the project.

- 4) In sloping terrain, it is common to have slopes descending toward buildings. Such slopes can be created during grading even on comparatively flat sites. In such cases, even where the recommendation above regarding slopes adjacent to the building is followed, water will flow to and beneath the building with resultant additional post-construction movements. Where the final site configuration includes graded or retained slopes descending toward the building, and the toe-of-slope (-wall) is less than 3 times the total slope (wall) height from the building, then an interceptor drain should be installed between the building and the slope. Ideally, the interceptor drain should be installed either about 10 feet from the building or along the axis of a swale between the building and the toe-of-slope (-wall). An interceptor drain system should be generally like the underdrain system described in the *Interceptor Drain System* section of this report. The actual layout, outlets, etc., of an interceptor should be designed by the Civil Engineer. GROUND can provide more specific geotechnical recommendations for an interceptor drain system upon request.

In addition, where irrigation is applied on or above graded slopes, drainage structures commonly are needed near the toe-of-slope to prevent on-going or recurrent wet conditions there.

- 5) The ground surface near foundation elements should be able to convey water away readily. Ground coverings that direct water downward rather than away from the building should not be used to cover the ground surface near the foundations or other improvements sensitive to post-construction soil movements. Cobbles or other materials that tend to act as baffles and restrict surface flow should not be used.

Correspondingly, near other project improvements, such as hardscaping, where the ground surface does not convey water away readily, additional post-construction movements and distress should be anticipated. Shallow underdrain systems or flatwork edge drains can be beneficial in reducing movements and distress.

- 6) The buildings should be provided with roof drains/gutters and downspouts. Roof drainage feature design should accommodate the potential for ice accumulation.

Roof downspouts and drains should discharge well beyond the perimeters of the structure foundations, or be provided with positive conveyance off-site for collected waters. Providing piped discharge to the project storm sewer system is the most effective means of reducing infiltration into the site soils. Where collected waters are allowed to flow across the ground surface (whether paved or landscaped), the potential for post-construction movements are increased, particularly where joints, cracks, adverse local surface gradients, etc., are not well maintained.

Roof drains should not be routed inside the buildings. Roof downspouts and other surface water collectors should not discharge into the building underdrain or interceptor drain systems.

- 7) Landscaping that requires watering should be located 10 or more feet from building perimeters. Irrigation sprinkler heads should be deployed so that applied water is not introduced into foundation 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 the amount 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 and floors should take higher priority than minimizing landscape plant losses.

We understand that municipal ordinances commonly require plantings in close proximity to buildings. Where plantings are desired within 10 feet of a building, GROUND recommends that the plants 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. Where water-tight planters cannot be used, project design measures and post-construction maintenance routines should be developed to prevent infiltration.

- 8) We do not recommend the use of plastic membranes 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 or 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, which allow ready evaporation from the underlying soils may be used.
- 9) GROUND recommends that snow storage should be restricted to paved areas where effective surface drainage is maintained. Snowmelt has the potential to introduce additional water into the soils supporting the slope, with consequent potentials for increased post-construction settlements.

If it is necessary to use unpaved areas of the project for snow storage, only designated slopes should be used that have been provided with shallow, underdrain systems. General recommendations for underdrains are provided in the *Subsurface Moisture Infiltration and Drainage* and *Interceptor Drain Systems* sections of this report. The drains should be installed at depths of about 2 to 3 feet below finished grades aligned generally parallel to slope. Individual drain lines should be installed no more than 30 feet apart throughout the areas designated for snow storage. The pipes for the drain system should be graded at a sufficient slope to move water effectively to one or more non-perforated discharge lines to carry water off-site or into the storm sewer system.

GROUND recommends that a regular program of site monitoring and maintenance by a qualified maintenance Contractor or similar agent for the Owner be established for the proposed facility, and implemented throughout the design life of the project. The site should be observed for indications of ineffective drainage, settlement, ponding, erosion, damaged irrigation lines, etc., so that repairs can be effected. Necessary repairs/restoration should be implemented as soon as possible. Where localized

infiltration is allowed to continue, the risk of local subsidence or the development of sinkholes will be significantly increased.

In addition to design, construction and maintenance of effective, permanent surface drainage measures, effective surface drainage must be established and regularly maintained throughout construction. In GROUND's experience, it is common in areas of partially completed paving or hardscaping, bare soil surrounding buildings and behind curbs and gutters, and open utility trenches, etc., that water from irrigation or rain and snow melt events is allowed to pond. Because of the numerous trades that can be working on a site at various stages of construction, maintenance of effective surface drainage can require weekly or more frequent restoration. As has been discussed elsewhere in this report, wetting of the subgrade can result in loss of support and increased settlements. By the time that final grading has been accomplished, and permanent surface and subsurface drainage measures completed, significant volumes of water can already have entered the subgrade, with consequent increased risks of movements, etc. GROUND recommends that the Contractor be directed to maintain the site regularly during the entire construction process so that water is directed into appropriate drainage structures during construction.

We understand that local, state and/or federal regulations regarding erosion control may require use of silt fencing, straw bundles or other erosion-control devices that can significantly impede surface drainage during construction, preventing effective implementation of the recommendations above. GROUND recommends that the various measures that could be implemented to comply with applicable regulations be assessed carefully with regard to minimizing interference with effective surface drainage. Use of local, lined sumps that can be pumped regularly, for example, may be necessary to prevent uncontrolled ponding and infiltration prior to completion of fine grading.

INTERCEPTOR DRAIN SYSTEM

Because of the debris flow retention ponds upslope from the proposed buildings that commonly will act as water detention basins, development of the site should include construction of a project-wide interceptor drain system.

The interceptor drains should consist of perforated PVC collection pipe at least 6 inches in diameter, non-perforated PVC discharge pipe at least 6 inches in diameter, free-draining gravel, and filter fabric. The free-draining gravel should contain less than 5

percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. Each collection pipe should be surrounded on the sides and top only with 6 or more inches of free-draining gravel. Above the pipe, the gravel should form a vertical curtain extending to within at least 3 feet of the ground surface. The gravel surrounding the collection pipe should be wrapped with filter fabric to reduce the migration of fines into the drain system. 'Clean out' access points should be provided at intervals along the system to facilitate maintenance. A typical, cross-section detail of an underdrain as described above is provided on Figure 20.

The interceptor drains should be laid out generally as depicted on Figure 1. The actual layout, outlets, and locations of the interceptor drain should be designed by the Civil Engineer. The system should be designed so that the flow lines of the pipes are at least 7 feet below finished grades. The pipe(s) for the interceptor drain system should be graded at a sufficient slope to enable efficient discharge of collected waters to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. Design slopes should consider potential post-construction soil movements, as discussed herein, which could affect the pipes, as well.

The interceptor drain systems should be tested by the Contractor after installation and after placement and compaction of the overlying backfill to verify that the systems function properly.

SUBSURFACE MOISTURE INFILTRATION AND DRAINAGE

Common practice for residential construction as proposed for this project includes the installation of building perimeter underdrains. If properly constructed, a perimeter underdrain system can result in a reduction of moisture infiltration of the subsurface soils. However, an underdrain not properly functioning can collect or introduce water, induce settlement of the subsurface soils, and may result in structure/floor slab distress. If deep foundation systems to support the proposed building frames and floor systems are used as recommended herein, the need for perimeter drain systems is reduced. They can be beneficial as a component of project drainage design, however.

For each building supported on shallow foundations, GROUND recommends installation of perimeter underdrain systems around each building. The perimeter drains should be located approximately 10 feet out-board of the building perimeters, corresponding to the lateral limit of the recommended zone of excavation and re-placement beneath each

building. In accordance with the ADA, GROUND also recommends installation of a perimeter underdrain system around any structure with a below-grade (basement) level.

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 cause adverse wetting of the foundation soils. Therefore, wetting of the soils likely will result from infiltrating surface waters (precipitation, irrigation, etc.), and flow along constructed pathways such as bedding in utility pipe trenches. Project design should incorporate measures to prevent water from wetting the project soils. Surface drainage gradients, pavements, flatwork, piping, drainage structures, etc., should be maintained during and after construction to prevent infiltration.

It is the responsibility of the design team and Ownership as well as the construction and maintenance Contractor(s) within their respective disciplines and in accordance with their familiarity with the site conditions to evaluate the possible sources of water that could affect the project area and provide design and/or construction measures that address the conditions so that moisture is directed away from the foundations and supporting materials prior to being allowed to infiltrate the subsurface, both during and after construction. Wetting or drying of the foundation excavations and under-slab areas should be avoided during and after construction as well as throughout the life of the facility. Permitting increases/variations in moisture to the supporting soils may result in a decrease in bearing capacity and an increase in total and/or differential movements.

Where underdrains are incorporated into project design, the system should consist of perforated PVC collection pipe at least 4 inches in diameter, non-perforated PVC discharge pipe at least 4 inches in diameter, free-draining gravel, and filter fabric. The free-draining gravel should contain less than 5 percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. 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 should be wrapped with filter fabric to reduce the migration of fines into the drain system. 'Clean out' access points should be provided at intervals along the system to facilitate maintenance. A typical cross-section detail of an underdrain of this type is provided on Figure 19.

The actual layout, outlets, and locations of underdrains should be designed by the Civil Engineer. The pipe(s) for underdrain systems should be graded at a sufficient slope to

enable efficient discharge of collected waters to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. Design slopes should consider potential post-construction soil movements, as discussed herein, which could affect the pipes, as well. Where collection segments of the underdrain system (with gravel and perforated pipe) transition to discharge segments with solid pipe, clay or concrete cut-off walls should be installed to reduce migration of water along the discharge line trenches outside of the pipes.

All subsurface drain systems should be tested by the Contractor after installation, and after placement and compaction of the overlying backfill, to verify that the systems function properly.

PROJECT EARTHWORKS

General Considerations Based on the site topography and the extent of previous overlot grading, we anticipate only nominal cuts and fills on the order of 5 feet or less in nominal depth to complete the earthworks for the building pads and parking areas, etc.. Site grading should be reviewed and improved as necessary to provide positive surface drainage away from the buildings, and all pavements, utility alignments, and flatwork. Surface diversion features should be provided around paved areas to prevent surface runoff from flowing across the paved surfaces.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. We anticipate that the majority of on-site soils may exhibit significant pumping, rutting, and deflection at moisture contents above optimum. In addition to local plastic soils, laboratory testing indicated that the site soils generally are classified as slightly plastic silts and silty to clayey sands. In our experience, achieving and maintaining compaction in such soils can be very difficult, particularly if water contents are not monitored closely. We understand that earthwork construction on nearby areas such as Glenwood Meadows Retail Development to the east of the project experienced difficulties of this type. Locally, during subgrade preparation for pavements achieving a stable subgrade was difficult, as well. The Contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Prior to earthwork construction, 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 capped at the margins of the property.

Permanent site slopes supported by on-site soils up to 10 feet in height should be constructed no steeper than 3:1 (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. Where adequate compaction is not achieved and maintained in the soils supporting a slope, the soils will tend to relax and displace downward and outward. This can result in loss of bearing and lateral support for improvements in proximity to the slope.

Because of the potential loss of foundation bearing or lateral support due to slope relaxation or "slope creep," where building foundations or other improvements are placed within 30 feet of the principal slope face descending northward from Lot 14, a Geotechnical Engineer should be retained to evaluate the conditions on an individual case basis.

On-Site Soils The existing soils including both fill and native materials, free of landfill materials, organic materials, large cobbles and other deleterious materials are, in general, suitable for placement as compacted fill. Cobbles and rock fragments larger than 6 inches in maximum dimension will require special handling and/or placement to be incorporated into project fills. In general, such materials should be placed as deeply as possible in the proposed fills. The geotechnical engineer should be consulted regarding appropriate recommendations for usage of such materials on a case-by-case basis when such materials have been identified during earthworks. Standard recommendations that likely will be generally applicable can be found in Section 203 of the CDOT Standard Specifications for Road and Bridge Construction (2005).

Imported Fill Materials If it is necessary to import material to the site as fill, the imported soils should contain no boulders, cobbles or rock fragments coarser than 6 inches in maximum dimension, be free of claystone, organic material, and other deleterious materials. Imported material should have less than 60 percent passing the No. 200 Sieve and should have a plasticity index of less than 10.

Bulk/Shrinkage Based on comparison of measured, in-place soil densities with compaction test (Proctor) data for the project, and contractors' experience reported for

nearby projects, the existing native site soils likely will shrink during grading by approximately 10 to 16 percent. Given that more shallow soils likely will be re-worked than those at depth, GROUND suggests that a shrinkage factor of about 12 to 17 percent be used for preliminary earthwork volume calculations. We understand, however, that higher shrinkage factors have been reported in the project area, on the order of 15 to 20 percent. All such values necessarily are highly dependent upon the average depth of earthworking and the average degree of compaction achieved.

Bulking or shrinkage of existing fill soils should be limited, likely within a few percentage points of 0.

Fill Platform Preparation Prior to filling, the top 8 to 12 inches of in-place materials on which fill soils will be placed should be scarified, moisture conditioned and properly compacted in accordance with the recommendations 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. The surfaces to receive fill must be effectively stable prior to placement of fill.

Fill Placement Fill materials should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted. Soils that classify as GP, GW, GM, GC, SP, SW, SM, or SC in accordance with the USCS classification system (granular materials) should be compacted to **96 or more percent** of the maximum modified Proctor dry density at moisture contents within 2 percentage points of optimum moisture content as determined by ASTM D1557, the "modified Proctor." Soils that classify as ML, MH, CL or CH should be compacted to **at least 96 percent** of the maximum standard Proctor density at moisture contents from optimum to 3 percent above the optimum moisture content as determined by ASTM D698, the "standard Proctor."

It should be noted, however, that due to the low- to non-expansive nature of the great majority of site soils, the recommendations for moisture-conditioning the soils to within the specified ranges are intended primarily to facilitate achievement of adequate compaction. Achievement of sufficient compaction to reduce subsequent settlements is more important than the actual soil moisture increase. Therefore, although addition of significant volumes of water to the native soils and possibly some existing fill materials

will be necessary for compaction, achievement of the recommended compaction levels (and stable paving platforms) should be the Contractor's principal goal in this regard. Adjustments of acceptable ranges of moisture contents may be made in the field by the Geotechnical Engineer.

See the recommendations below, however, regarding deep fill sections, as well as those below.

No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Compaction areas should be kept separate, and no lift should be covered by another until the recommended relative compaction and moisture content are obtained.

To achieve adequate compaction near the outer faces of fill slopes, it may be beneficial to over-build the slopes and trim them back.

Because of the presence of coarse cobbles and boulders, much of the excavated site soils will require sorting or separation of the large clasts to enable the remaining material to be placed as compacted fill. (Crushing of the coarse materials to fall within the recommended size limit is acceptable, as well.) The Contractor should mobilize appropriate equipment of sufficient capability to excavate, move, process and compact the on-site soils. Because of the high percentage of coarse materials commonly present in the soils (even after removal/breakdown of boulders and coarse cobbles), the Contractor should anticipate greater than usual wear on his equipment, as well as the need to handle, stockpile and remove large boulders.

Deep Fills All fill materials placed 10 feet or more below the finished ground elevation including those portions of the recommended fill section beneath building foundations more than 10 feet below the post-tensioned slab should be compacted to the following higher relative compaction levels. (Except as modified below, the recommendations herein regarding fill placement, etc., are applicable to these deep fill sections, as well.)

- Soils that classify as GP, GW, GM, GC, SP, SW, SM or SC should be compacted to **97 or more percent** of the maximum dry density at moisture contents within 2 percent of optimum moisture content as determined by ASTM D1557.

- Soils that classify as CL, CH, ML and MH should be compacted to **at least 100 percent** of the maximum density at moisture contents within 2 percent of the optimum as determined by ASTM D698.

Settlements Settlements will occur in filled ground, typically on the order of 1 to 2 percent of the fill depth. For a 6-foot fill, this corresponds to settlements on the order of 1 inch, without imposition of foundation loads. If fill placement is performed properly and is tightly controlled, in GROUND's experience the majority of that settlement will take place during earthwork construction. The remaining potential settlements likely will take several months or longer, to be realized.

Use of Squeegee Relatively uniformly graded fine gravel or coarse sand, i.e., "squeegee," or similar materials commonly are proposed for backfilling foundation excavations, portions of utility trenches and other areas where employing compaction equipment is difficult. In general, GROUND does not recommend this procedure for the following reasons:

Although commonly considered "self compacting," uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are permeable and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

GROUND recommends that wherever possible, excavations be backfilled with approved, on-site soils placed as properly compacted fill. Where this is not feasible, use of "Controlled Low Strength Material" (CLSM), i.e., a lean, sand-cement slurry ("flowable fill") or a similar material for backfilling should be considered.

Where "squeegee" or similar materials are proposed for use by the Contractor, the design team should be notified by means of a Request for Information (RFI), so that the proposed use can be considered on a case-by-case basis.

Quality Assurance A Geotechnical Engineer should be retained to observe project excavations prior to placement of fill. The Geotechnical Engineer also should observe earthwork operations and test the soils.

It should be noted that in the later stages of large projects such as construction of the proposed mixed use buildings, multiple sub-contractors commonly are installing or adjusting/replacing components of the project simultaneously. These can range from electrical boxes to sidewalk access ramps to lighting fixtures. In order to facilitate proper observation and testing of the associated earthworks, GROUND recommends that the Contractor verify that his sub-contractors mobilize the necessary equipment and personnel to moisture-condition and compact disturbed or excavated soils quickly and effectively. The Contractor also should coordinate with his sub-contractors to ensure that these local earthwork operations are observed with sufficient frequency by the retained Geotechnical Engineer and the soils tested.

Additional Earthworks and Building Pad Caps Native soils and bedrock prepared for subsequent construction, as well as properly compacted fills, that are allowed to stand for extended periods prior to construction of buildings, pavements, etc., will degrade over time. Moisture will be lost and the soils can become eroded or loosened, or shrink back to a denser and more expansive condition. The extent of degradation will increase with time. Therefore, where these conditions arise, the Geotechnical Engineer should test the soils and provide recommendations regarding an appropriate depth of moisture-conditioning and re-compaction prior to construction. In the case of subgrade soils beneath a slab-on-grade floor, this re-compaction can be accomplished with significantly less effort prior to construction of the building shell.

Remedial earthworks by the Contractor, such as excavation and re-compaction of 1 to 3 feet of soil, may be necessary at that time to restore the prepared soils to an acceptable condition. Because the building pads are the most critical portions of the site, the following measures are recommended as an alternative to reduce the depth of re-working necessary on the pads prior to transfer of ownership and/or construction:

- 1) Additional fill should be placed on the pad to raise the grades and form a crowned cap to protect the compacted pad soils from desiccation and erosion. This cap could be removed shortly before transfer of the pad. We anticipate that only limited earthworks then would be needed to restore the pad to an acceptable state.

- 2) The cap should extend across the entire building footprint as well as the 10+ feet of re-worked ground beyond the lateral limits of the building.
- 3) At least 12 inches of material should be placed to form the cap above the compacted pad soils. In addition, the cap should be sloped to drain with a gradient of at least 2 percent.
- 4) Cap soils should be compacted to 90 or more percent of the maximum standard or modified Proctor dry density (for cohesive and granular soils, respectively) at moisture contents within 3 percent of optimum moisture content as determined by ASTM D698 / D1557.

EXCAVATION CONSIDERATIONS

Test holes for subsurface exploration were advanced to the depths indicated on the test hole logs by means of conventional, truck/track-mounted, flight auger equipment. We anticipate no unusual excavation difficulties, in general, for the proposed construction in these materials with conventional, heavy-duty excavating equipment in good working condition.

Coarse cobbles and boulders were observed on the site surface and encountered commonly in the test holes. Individual clasts up to 2½ feet in maximum dimension are common at the site. Larger boulders have been observed. The Contractor should anticipate encountering numerous cobbles and boulders in project excavations, commonly comprising at least 20 percent of the soil volume and be prepared to excavate, handle, sort and/or crush these materials. In addition, specialized breaking equipment, or limited, local blasting may be cost effective to facilitate project excavations, particularly in trenches, and to break local masses of nested cobbles and boulders. Many of the excavated clasts will be too coarse for inclusion in project fills without crushing.

As noted above, groundwater was not encountered during subsurface exploration, which reached depths as great as approximately 75 feet. Therefore, groundwater is not anticipated to be a major factor during construction of most aspects this project. However, if seepage or groundwater is encountered in project excavations, the Geotechnical Engineer should evaluate the conditions and provide additional recommendations, as appropriate

We recommend that temporary, un-shored excavation slopes up to 20 feet in height be cut no steeper than 2:1 (horizontal : vertical) in the native soils in the absence of seepage. Some surface sloughing may occur on the slope faces at this angle. Local conditions encountered during construction, such as groundwater seepage, loose, dry sand, or soft, wet materials, will require flatter slopes. Stockpiling of materials should not be permitted closer to the tops of temporary slopes than 5 feet or a distance equal to the depth of the excavation, whichever is greater.

Should site constraints prohibit the use of the recommended slope angles, then temporary shoring should be used. Shoring designed to allow the soils to deflect sufficiently to utilize the full active strength of the soils may be designed for lateral earth pressures computed on the basis of an equivalent fluid unit weight of 45 pounds per cubic foot (pcf) for a level adjacent ground condition. In addition to this lateral earth pressure, shoring design should include surcharge loads exerted by equipment, traffic, material stockpiles, etc. Actual shoring system(s) should be designed for the Contractor by a registered engineer.

Effective surface drainage should be provided around temporary excavation slopes to direct surface runoff away from the slope faces. A properly designed drainage swale should be provided at the top of the excavations. Temporary slopes will erode readily if water is allowed to flow over the slope faces. Erosion along the slopes will result in sloughing and could lead to a slope failure. In no case should water be allowed to pond at the site.

Excavations in which personnel will be working must comply with all 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 above solely as a service to Total Merchant Services, and is not assuming responsibility for construction site safety or the Contractor's activities.

UTILITY INSTALLATION

Recommendations regarding utility trench excavation are provided in the *Excavation Considerations* section of this report. On-site soils excavated from trenches are suitable, in general, for use as trench backfill. Backfill soils should be free of boulders, vegetation, debris and other deleterious materials. Cobbles coarser than 6 inches in maximum dimension should not be incorporated into trench backfills.

Trench backfill materials should be properly moisture-conditioned and compacted in accordance with the recommendations in the *Project Earthworks* section of this report. Some settlement of trench backfill materials should be anticipated, even where materials are placed and compacted correctly.

The Contractor should take adequate measures to achieve adequate compaction in the utility trench backfills, particularly in the lower portions of the excavations. Some settlement of trench backfill materials should be anticipated, even where materials are placed and compacted correctly. The Contractor should take particular care to achieve and maintain adequate compaction of the backfill soils around manholes, valve risers and other vertical pipeline elements where greater settlements commonly are observed. Use of "Controlled Low Strength Material" (CLSM), i.e., a lean, sand-cement slurry ("flowable fill") or a similar material should be considered in lieu of compacted soil backfill for areas with low tolerances for surface settlements. Placement of CLSM in the lower portions of the excavations and around risers, etc., likely will yield a superior backfill, although at an increased cost.

Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. The Contractor should not anticipate that significant volumes of excavated site soils will be suitable for use where free-draining materials are called for as pipe bedding. Materials proposed for use as pipe bedding should be tested for suitability prior to use. Imported materials should be tested and approved by the Geotechnical Engineer prior to transport to the site.

We assume that surface drainage will direct water away from trench alignments. Nevertheless, non-woven filter fabric (e.g., Mirafi® 140N or the equivalent) should be placed around granular bedding materials to reduce migration of fines into the bedding.

Sandy pipe bedding materials can function as efficient conduits for re-distribution of natural and applied waters in the subsurface. Clay or concrete cut-off walls or, as necessary, drains should be installed in utility trenches to reduce the rates and volumes of water transmitted to the building foundation soils. Cut-off walls should be spaced no more than 200 feet apart on generally east – west -oriented alignments (parallel to elevation contours) and no more than 100 feet apart on north – south (uphill – downhill) -oriented alignments. These measures also will reduce the risk of loss of fine-grained backfill soils into the bedding material with resultant surface settlement.

Utility lines should be sealed and the seals checked prior to backfilling. Checks for leakage and appropriate maintenance should be performed regularly. Utilities other than drains should enter the building interior as immediately as possible, and no more than 5 feet from the building perimeter. Longer utility runs increase the risk of settlements related to trench backfills, can facilitate distribution of water beneath the building, and increase repair difficulties.

Ground-Penetrating Radar The City of Glenwood Springs required ground-penetrating radar (GPR) surveys along the public wet utility alignments below the public streets at the Glenwood Meadows retail development to assess the potential presence of voids in the subsurface. GROUND provided those surveys during construction of that project. Based on conversations with the City, we anticipate that similar surveys may be required along public streets serving the Glenwood Meadows Lot 14. In order to maximize effectiveness of the GPR, we suggest that to the extent possible, required surveys be performed after cuts along the alignments are made, but prior to significant filling (i.e., when alignments are at the lowest elevations).

EXTERIOR FLATWORK

Proper design, drainage, construction and maintenance of the areas between individual buildings and hardscape 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. Multiple subcontractors, with light or hand equipment, often perform subsequent landscaping and hardscape installation. This results in necessary over-excavation and soil processing and compaction not being performed. Consequently, subgrade soil conditions commonly deviate significantly from recommended ranges. Therefore, GROUND recommends that the Contractor take particular care with regard to proper subgrade preparation in the immediate building exteriors.

As recommended in the Project Earthworks and Surface Drainage sections of this report, positive surface drainage away from all pavements and flatwork should be

included in project design. Proper drainage also should be maintained after completion of the project, and re-established as necessary.

Exterior flatwork and other hardscaping placed on the clayey soils encountered on-site likely will experience post-construction movements due to the expansive nature of those soils and the relatively light loads that they impose. Both vertical and lateral soil movements can be anticipated as clay mineral particles swell and shrink as the soils are wetted and dried. Distress to rigid hardscaping likely will result.

The most positive means to reduce distress to these elements is to support them on foundations in the same manner as the building. Other mitigative measures could include casting flatwork over a 12-inch or thicker void form and pinning the flatwork to the building grade beams, or development of an accelerated maintenance and replacement schedule, anticipating post-construction movements and distress.

Where deep foundations are not utilized to support exterior improvements, the following measures will help to reduce damages to these improvements.

- 1) Shortly before installation, the subgrade soils beneath project sidewalks, paved entryways and patios, masonry planters and short, decorative walls, and other flatwork should be excavated and/or scarified to a depth of 36 or more inches. The excavated soil should be replaced as properly moisture-conditioned and compacted fill as outlined in the *Project Earthworks* section of this report, in order to reduce the magnitude of potential movements. Greater depths of moisture-density conditioning of the subgrade soils beyond the above minimum, as indicated for the pavements, will improve hardscape performance.
- 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. As in the case of pavements, passing a proof roll is an additional requirement to placing and compacting the subgrade fill soils within the recommended ranges of moisture content and relative compaction presented in the *Project Earthworks* section of this report.

- 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 2 inches of 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.

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 (“frost heave”) in sustained cold weather up to 2 inches or more. This heaving can develop relatively rapidly. Much of this movement typically is recovered when the soils thaw, but due to loss of soil density, some degree of displacement commonly 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 3 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 recommendations 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. The relative risks from these soil conditions should be taken into consideration where frost heave is a concern. GROUND will be available to discuss these concerns upon request.

Where soils supporting foundations or on which foundation will be placed are exposed to these conditions 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.

The site soils include low plasticity silts as well as some clays and fine sands that due to their capillarity appear vulnerable to frost heave where an underlying source of water is present. Groundwater was not encountered to the depths explored, however. Therefore, if surface drainage is effective, the likelihood of movement of pavements, flatwork and other hardscaping is relatively low. However, if other source(s) of water develop and are not drained effectively, frost heave may develop.

Effects of Slope Creep In addition, the potential effects of gradual, incremental downward and outward movements of the embankment soils ("slope creep") on all improvements near the top-of-slope should be considered in project maintenance plans. Pavements, curbs-and-gutters, fences, screen walls, pilasters, light poles, etc., all will tend to be affected by these on-going soil movements, even where slopes are supported by firm native soils or properly compacted fill soils. Effective surface drainage, erosion control and timely maintenance of both the slope and the improvements above the slope will reduce the damages resulting from slope creep, but cannot eliminate them.

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. Pavement sections for private parking and driveways, as well as public streets comprising a part of the project, were developed in general accordance with the design guidelines and procedures of the American Association of State Highway and Transportation Officials (AASHTO), the Colorado Department of Transportation (CDOT) as well as local road construction practices. For public streets, the recommended pavement sections also reflected general accordance with the design guidelines and procedures of the City of Glenwood Springs.

Subgrade Materials Based on the results of our field and laboratory studies, the shallow subgrade materials in the proposed pavement areas consisted predominantly of fill material that was silty to clayey sands, with gravel commonly. These materials were classified typically as A-2-4 and A-4 soils in accordance with the AASHTO classification system, with Group Index values of 0. Resilient Modulus (M_R) testing (AASHTO T-307) was performed on a representative composite sample of the subgrade materials encountered at the site. The material was compacted to 95 percent of maximum dry density at moisture contents of optimum, two percent above optimum, and four percent

above optimum moisture content based on AASHTO T-99 (the "standard Proctor") for cohesive soils, or AASHTO T-180 (the "modified Proctor") for granular soils. For the sandy site soils, a resilient modulus of 7,806 psi obtained at the optimum moisture content was taken as characteristic of the subgrade materials and used for development of the pavement sections. It is important to note that significant decreases in soil support as quantified by the resilient modulus have been observed as the moisture content increases above the optimum.

Anticipated Traffic Specific traffic loadings were not available at the time of this report preparation. Therefore, an 18-kip equivalent daily load application (EDLA) value of 3 was assumed for development of the pavement structure for automobile parking stall areas. An EDLA of 10 was assumed for project driveways and 30 for any public streets within the project. The EDLA values of 3, 10 and 30 were converted to 18-kip equivalent single axle (ESAL) values of 21,900, 73,000 and 219,000, respectively, for 20-year design lives. An EDLA of 30 also was assumed for trash collection zones and other areas subject to heavy truck traffic. If design traffic loadings differ significantly from these assumed values, GROUND should be notified to re-evaluate the pavement recommendations below.

Pavement Sections The soil resilient modulus and the assumed ESAL values were used to determine the required structural number for the project pavements. The required structural number was then used to develop recommended pavement sections. Pavement sections were based on the DARWin™ computer program that solves the 1993 AASHTO pavement section equation. Pavement parameters and calculations are summarized in Appendix A. Structural coefficients of 0.40 and 0.12 were used for high quality asphalt and aggregate base course, respectively. A Reliability Level of 75 percent was utilized for design of the private pavement sections; a Reliability Level of 90 percent was used for public streets.

The minimum pavement sections recommended by GROUND for the project are tabulated below. As indicated, trash collection areas as well as other pavement areas subjected to high turning stresses or heavy truck traffic should be provided with rigid (portland cement concrete) pavements.

Recommended Minimum Pavement Sections

Location	Full Depth Asphalt (inches Asphalt)	Composite Section (inches Asphalt / inches
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Glenwood Meadows Lot 14
Glenwood Springs, Colorado

		<i>Aggregate Base)</i>
Driveways	5	4 / 6
Automobile-Only Parking	4	-
High Turning Stresses & Heavy Vehicle Traffic	6 inches of portland cement concrete	
Public Streets	6½	4 / 8

For superior performance, concrete sections should be underlain by 6 inches of properly compacted aggregate base.

Private 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 areas of repeated turning stresses we recommend that the concrete pavement joints be fully tied and doweled. We suggest that civil design consider joint layout in accordance with CDOT's M standards, found at the CDOT website: <http://www.dot.state.co.us/DesignSupport/>.

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 design requirements of the City of Glenwood Springs.

Concrete pavements 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 design requirements of the City of Glenwood Springs. Concrete should have a minimum modulus of rupture of third point loading of 650 psi. Normally, concrete with a 28-day compressive strength of 4,000 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.

If composite flexible sections are placed, the aggregate base material should meet the criteria of CDOT Class 6 aggregate base course. Base course should be placed in uniform lifts not exceeding 8 inches in loose thickness and compacted to at least 95

percent of the maximum dry density a uniform moisture contents within 3 percent of the optimum as determined by ASTM D1557 / AASHTO T-180, the "modified Proctor."

Subgrade Preparation The pavement subgrade soils should be excavated and replaced with properly moisture-conditioned and compacted fill. To reduce the potential for consolidation and settlements somewhat, as well as any local potentials for heave, excavation and replacement should be undertaken to a depth of 36 inches beneath the pavement sections. Subgrade preparation should extend the full width of the pavement from back-of-curb to back-of-curb. As recommended in the *Exterior Flatwork* section of this report, sidewalks and other hardscaping should be underlain by at least 36 inches of properly moisture conditioned and compacted fill. If a significant time lag ensues between overlot grading and paving, e.g., several months or more, some re-working of the shallow soils may be necessary shortly prior to paving. In such cases, scarification, moisture conditioning and re-compaction to a depth of 8 to 12 inches likely will be appropriate. Performing GPR surveys along public street alignments as discussed in the *Site Conditions* section of this report should be coordinated with street subgrade preparation to accomplish both efficiently.

Some post-construction movements of the pavements should be anticipated. Grades should be restored in areas of local settlement to re-establish surface drainage. A greater depth of excavation and replacement will result in improved pavement performance over its design life. Recommendations in this regard can be provided upon request.

Soils that classify as A-1 through A-5 (granular soils) should be compacted to 95 or more percent of the maximum modified Proctor dry density within 2 percent of the optimum moisture content as determined by ASTM D1557 / AASHTO T-180. Soils that classify as A-6 and A-7 (cohesive materials) should be compacted to 95 or more percent of the maximum standard Proctor density at moisture contents from 1 percent below the optimum to 3 percent above optimum moisture content as determined by ASTM D-698 / AASHTO T-99.

The Contractor should be prepared either to dry the subgrade materials or moisten them, as needed, prior to compaction. Some site soils likely will "pump" or deflect during compaction if moisture levels are not carefully controlled, particularly the silts and silty sands. The Contractor should be prepared to process and compact such soils to

establish a stable platform for paving, including use of chemical stabilization, if necessary.

Where adequate drainage cannot be achieved or maintained, a greater depth of excavation and replacement is recommended, in addition to the edge drains recommended below.

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 stabilized. Areas allowed to pond prior to paving will require significant re-working prior to proof-rolling. Passing proof-rolling is an additional requirement for pavement subgrade soils; it may be possible for soils to be compacted within the limits indicated in the *Project Earthworks* section of this report and fail proof-rolling, particularly in the upper range of recommended moisture contents.

Planter Drains We understand that the parking areas may have "islands" planted with, flowers, shrubs and trees. Infiltration of irrigation water in planters adjacent to pavements and in islands within paved areas should be carefully controlled or differential heave and/or rutting of the nearby pavements will result. Drip irrigation systems are recommended for such planters to reduce over-spray and water infiltration beyond the planters. GROUND recommends enclosing the soil in the planters with plastic liners and providing them with positive drainage or providing the planters with underdrains.

The planter drains should consist of perforated PVC drain pipe at least 3 inches in diameter, free-draining gravel, and filter fabric. We recommend use of rigid drain piping rather than flexible piping to better insure that proper drainage gradients are maintained. The free-draining gravel should contain less than 5 percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. Each drain pipe should be surrounded with 4 or more inches of free-draining gravel. The gravel surrounding the drain pipe should be wrapped with filter fabric to reduce the migration of fines into the drain system. The underdrains should be located at sufficient depth to accommodate the anticipated plantings. The pipes for the planter drain systems should be graded at a minimum slope of 1 percent to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge.

The island / planter drain systems should be tested by the Contractor after installation and after placement and compaction of the overlying backfill to verify that the systems function properly.

We understand, however, that provision of such an extensive drainage system may not be not feasible for this project. Therefore, GROUND suggests where these measures cannot be implemented, the plantings should be selected to minimize the necessary irrigation and a program of maintenance be implemented to repair the resultant distress.

Where islands and other planters near pavements are not provided with underdrains, we suggest that they and the plantings in them be underlain with a layer of relatively densely compacted fill at least 2 feet in thickness beneath the root balls to reduce water infiltration. The more densely compacted fill soils should extend at least 2 feet laterally beyond the limits of the islands. General recommendations for fill placement and compaction are provided in the *Project Earthworks* section of this report. Granular fill soils (classified as GP, GW, GM, GC, SP, SW, SM or SC) for this purpose should be compacted to 97 or more percent of the maximum 'modified Proctor' dry density at moisture contents within 2 percent of optimum moisture content as determined by ASTM D1557. Soils that classify as ML, MH, CL or CH (cohesive soils) should be compacted to 100 percent of the maximum standard Proctor density at moisture contents from optimum to 3 percent above the optimum moisture content as determined by ASTM D698.

Additional Observations The collection and diversion of surface drainage away from paved areas is extremely important to satisfactory performance of the pavement. The subsurface and surface drainage systems should be carefully designed to ensure removal of the water from paved areas and subgrade soils. 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 curb, gutter, and sidewalk. Unless the interceptor drain and edge drains (where included) are installed properly and maintained, and site drainage in general is well maintained, there is an increased risk of poor pavement performance at this site due to the expansive subgrade materials and the local introduction of off-site irrigation water.

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 recommended 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. Where the subgrade soils are expansive, wetting also typically results in increased pavement heave. In relatively flat areas where design drainage gradients necessarily are small, subgrade settlement or heave 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. This 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. In areas where the maintenance traffic is turning, concrete pavement is recommended.

As noted above, the standard care of practice in pavement design describes the recommended flexible pavement section as a "20-year" design pavement; however, most pavements will not remain in satisfactory condition 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, GROUND recommends that an effective program of regular maintenance 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.

A crack sealing and 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.

CLOSURE

Geotechnical Review The poor performance of many pavements, foundations and subsurface structures has been directly attributed to inadequate geotechnical review and earthwork quality control. Therefore, project plans and specifications should be reviewed by the Geotechnical Engineer to evaluate whether they comply with the intent of the recommendations in this report. This review should be reported in writing.

Project earthwork construction operations should be observed by the Geotechnical Engineer. All excavations should be observed by the Geotechnical Engineer prior to placement of fill or backfill soils, installation of shoring, or foundation construction. Placement of fill/backfill soils should be observed by the Geotechnical Engineer, and the soils tested.

The geotechnical recommendations presented in this report are highly contingent upon observation and testing of project earthworks by representatives of GROUND. If another geotechnical consultant is selected to provide construction observation and quality control, then that consultant must assume all responsibility for the geotechnical aspects of the project by concurring in writing with the recommendations in this report, or by providing alternative recommendations.

Limitations This report has been prepared for Total Merchant Services, as it pertains to design and construction of the subject mixed use project as described herein. It may not contain sufficient information for other parties or other purposes. In addition, GROUND has assumed that project construction will commence by Autumn, 2008. Changes in project plans or schedule should be brought to the attention of the

Geotechnical Engineer, in order that the geotechnical recommendations may be re-evaluated and, as necessary, modified.

The geotechnical conclusions and recommendations in this report relied upon subsurface exploration at a limited number of exploration points, as shown on Figure 1. Subsurface conditions were interpolated between and extrapolated beyond these locations. Findings were dependent on the limited amount of direct evidence obtained at the time of this geotechnical evaluation. Our recommendations were developed for site conditions as described above. Actual conditions exposed during construction may be anticipated to differ, somewhat, from those encountered during site exploration. If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, the Geotechnical Engineer should be advised at once, so that re-evaluation of the recommendations may be made in a timely manner. In addition, a Contractor who relies upon this report for development of his scope of work or cost estimates may consider 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. In such cases, the Contractor should obtain the additional geotechnical information that he considers necessary to develop his workscope and cost estimates with sufficient precision.

Collapsible earth materials are present on the project site. These materials can shrink significantly if their moisture content is increased. The collapse potential of site soils can vary significantly, both laterally and vertically. Changes in moisture can occur irregularly, as well, resulting in conditions that cannot always be predicted.

The recommendations presented in this report are based on the current state-of-the-art for improvements placed on collapsible earth materials. The Owner should be aware that there are risks in construction on these types of soils. Performance of the proposed structures and pavements will depend on implementation of the recommendations in this report and on proper maintenance after construction is completed. Because water is the principal cause of volume change in expansive soils and rock, it is necessary that the changes in moisture content be kept to a minimum. Any indications of distress to project installations should be brought to the attention of the Geotechnical Engineer.

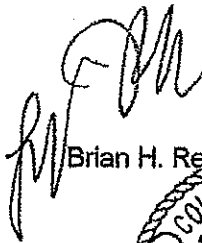
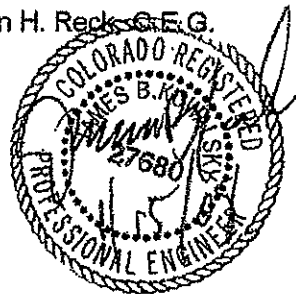
This report was prepared in accordance with generally accepted soil and foundation engineering practice in the Garfield County, Colorado, area, at the date of preparation.

Glenwood Meadows Lot 14
Glenwood Springs, Colorado

GROUND makes no other warranties, either express or implied, as to the professional data, opinions or recommendations contained herein.

Sincerely,

Ground Engineering Consultants, Inc.


Brian H. Reck, G.E.G.


Reviewed by James B. Kowalsky, P.E.

December 27, 2018

Subject: Preliminary Geotechnical Information and Discussion, **Glenwood Meadows Office Building**, Glenwood Springs, Colorado

Job No. 18-3069

Mr. Ben Ganther
Boldt Development
1110 North Old World Third Street
Milwaukee, Wisconsin 53203

Dear Mr. Ganther:

At this time, GROUND Engineering Consultants, Inc. (GROUND) is completing a geotechnical evaluation to provide geotechnical parameters for design of the proposed office building to be located east of the intersection of Midland Avenue and Wulfsohn Road in Glenwood Springs, Colorado. The results will be fully summarized in a report to be released once our evaluation has been completed. However, we understand that a preliminary summary of the information obtained and preliminary, geotechnical parameters are being requested. This information is provided below.

It should be noted, however, that not all of the planned laboratory testing has been completed at this time. Therefore, the information provided below is preliminary and may be revised, once our laboratory testing along with other aspects of our evaluation have been completed.

SUBSURFACE CONDITIONS

Our subsurface exploration was performed in November and December 2018. A total of 10 test holes were drilling using a truck-mounted drilling rig advancing 4 inch diameter, continuous flight augers and ODEX (air percussion) drilling equipment. Six (6) test holes drilled within the approximate, proposed foundation footprint and 4 test holes were drilled within the areas proposed pavements. The test holes advanced to depths up to 124 feet below existing grade

Before penetrating the underlying soils, the test holes encountered a relatively thin layer of topsoil approximately 3 to 5 inches in thickness. Underlying the topsoil, fill soils were recognized to depths of about 19 to 32 feet. Beneath the fill soils, similar native sands and gravels were encountered and extended to the depths explored. Groundwater and bedrock were not encountered in the test holes at the time of drilling.

We interpret the fill soils to be soils to materials placed during the construction of the existing Glenwood Meadows development to the east of the site during the mid-2000s. We interpret the native sands and gravels to be alluvial fan materials generated from the hillside to the southwest of the site.

GEOTECHNICAL RISK

The primary sources of geotechnical risk at this site are the presence of undocumented fill soils and the presence of alluvial fan materials. Both materials present a significant risk of post-construction movement upon wetting. As indicated by our lab testing (note that not all of our laboratory testing had been completed at the time of this lettered), consolidations up to about 12 percent were measured under surcharge loads approximating overburden loads. Consolidations of this magnitude are severe and can cause damaging post-construction movements. Such movements have been experienced structures in the project area.

Another source of geotechnical risk at this site includes the presence of the Eagle Valley Evaporite beneath the site. This formation includes evaporite deposits (salt, gypsum, etc.), limestones, and other materials vulnerable to subsurface dissolution. Therefore, the likelihood of sinkhole development and or other hazards related to subsurface dissolution appears to be relatively high in the project area as a whole, compared to other regions of Colorado. Such features have been observed in the project area, as well. This risk at the subject site, however, does not appear to be greater than most other locations in Glenwood Springs.

Additionally, development of the project site address the presence of the relatedly tall, steep slope to the south of the project site and the associated risks of debris flows, landslides, other mass wasting events. However, debris flow catch basins have been constructed upslope of the site to protect prior development to the east and west of the site which likely will protect the proposed project as well

The soils in the project area generally have elevated levels of water soluble sulfates and project concrete likely will need protections from water soluble sulfates in addition to the relatively harsh climate. Similarly, corrosivity protection for ductile iron pipes likely also will be necessary at the subject site

FOUNDATION AND FLOOR SYSTEMS

Improvements that bear directly on the existing materials could experience post-construction movements on the order of 8 to 12 inches. Given the nature of the underlying soils and bedrock, greater movements than those estimated could occur. However, other development in the greater project area, subject to similar geotechnical risk have performed in relatively satisfactory manner where appropriate mitigation efforts have been used. Project pavements and flatwork also will be subject to significant post-construction movements, were they bear directly on the existing site soils.

For the lowest risk of post-construction movements, a deep foundation system and structural floor system should be utilized. A driven pile foundation system appears to be geotechnically feasible, but given the subsurface profile and nature of the debris flow materials, installing deep foundations likely will be deep and difficult to install.

Shallow foundation systems and slab-on-grade floors, also appear to be geotechnically feasible, provide they bear on improved soils. Soil could be improved through the removal and replacement of the existing soils to a depth of about 15 to 20 feet below existing grades. Such a fill section could reduce estimates of post-construction movements to about 1 inch. Specialty soil improvement techniques, such as rammed aggregate piers and compaction grouting, also appear to be geotechnical feasible. Post-construction movements for shallow foundations and slab-on-grade could reduce estimates of post-construction movements to about 1 inch. An allowable bearing pressure of about 1,500 psf to 2,000 psf likely will be appropriate.

Regardless of the foundation system or soil improvement technique, the effective surface and subsurface drainage, including proper drainage of storm water, snowmelt, irrigation water, etc., will be critical to the performance of the proposed construction. Serious problems have occurred during and after construction of nearby development, where effective surface and subsurface drainage was not maintained.

Once our final evaluation has been completed, a report providing a more through discussion of the subsurface conditions, geotechnical hazards, sources of geotechnical risk, and associated remedial methods as well as geotechnical parameters for design, and construction considerations will be provided. Until that report is issued, please let us know if there are any questions or comments regarding the preliminary information provided above.

Sincerely,

GROUND Engineering Consultants, Inc.

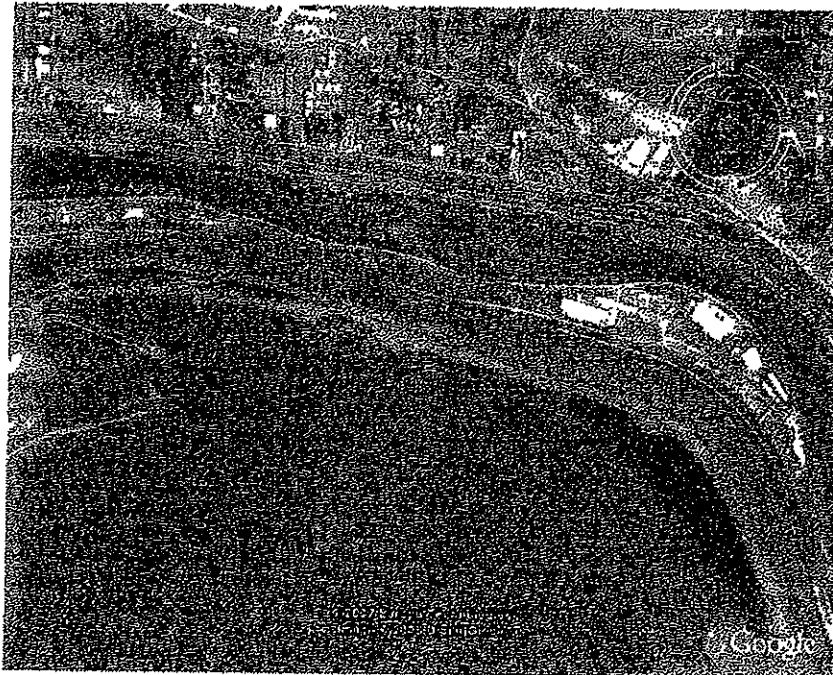
A handwritten signature in black ink, appearing to read 'Ben Fellbaum', with a long horizontal stroke extending to the right.

Ben Fellbaum, P.G.

A handwritten signature in blue ink, appearing to read 'Brian H. Reck', with a long horizontal stroke extending to the right.

Reviewed by Brian H. Reck, P.G., C.E.G., P.E.

**Subsurface Exploration Program
Geotechnical and Pavement Section
Recommendations
Glenwood Meadows Lot 14
Glenwood Springs, Colorado**



Prepared for:

**Total Merchant Services
c/o: The JHM Group of Companies
76 Progress Drive
Stamford, CT 06902**

Attention: Mr. John McClutchy, Jr.

Job Number: 07-6051

January 15, 2008

GROUND

ENGINEERING CONSULTANTS, INC

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PURPOSE AND SCOPE OF STUDY

This report presents the results of a subsurface exploration program performed by Ground Engineering Consultants, Inc., (GROUND) to develop geotechnical recommendations for design and construction of Lot 14 of the Glenwood Meadows retail development north of Wulfsohn Road and south of Midland Avenue in western Glenwood Springs, Colorado. The study was conducted in general accordance with GROUND's Proposal No. 0711-1906, dated November 29, 2007.

Field and office investigations provided information regarding surface and subsurface conditions, including existing improvements, the lateral and vertical distribution of earth materials, and depths to bedrock and groundwater. Material samples retrieved during subsurface exploration were tested in our laboratory to assess the engineering characteristics of site earth materials and assist development of our geotechnical recommendations. Results of the field, office and laboratory studies are presented below.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to the construction of the proposed facilities are included.

PROPOSED CONSTRUCTION

Present plans call for construction of approximately 70,000 total square feet office building on the western portion of the site. The two-story office building is anticipated to have 1 or 2 levels of below-grade parking. There will be 7 three-story multi-family residential buildings comprising approximately 135,000 total square feet, each with a single below-grade parking level. Additionally, there will be 5 two-story commercial buildings totalling approximately 23,500 total square feet in the northern portion of the site. No below-grade levels planned at this time for the commercial buildings.

The buildings will enclose several small parking areas served by two access driveways off of Wulfsohn Road. We anticipate that landscaping is planned for areas around the individual buildings and at several locations within the parking area. Development also will include installation of underground utilities to service the proposed buildings.

Information concerning the finished floor and finished grade elevations was not available at the time this report was prepared. Given the relatively flat existing grades, it appears that only minor cuts and fills, likely of less than 5 feet in depth, will be required to construct the building pads. Excavations on the order of 15 to 20 feet are anticipated to construct the below-grade levels. Deeper excavations and replacement of the material as fill will be required if the shallow foundation and slab-on-grade floor systems are selected.

If the proposed construction differs significantly from that described above, GROUND should be notified to re-evaluate the recommendations contained herein.

SITE CONDITIONS

Surface Conditions Lot 14 was a previously rough graded parcel west of the existing Glenwood Meadows retail center. Site grading was completed at the site to obtain its current grade in 2005. The site exhibits a gentle slope to the north at approximately 2 to 3 percent and the northern margin of the site is marked by an approximately 30-foot, 2:1 (horizontal : vertical) fill slope descending northward. The ground surface supported grasses and weeds. The surficial soils consisted largely of silty sands with gravel, and numerous scattered cobbles and boulders.

The property is bounded to the south by Wulfsohn Road and to the north by Midland Avenue. The remainder of the Glenwood Meadows development is to the east, and the Roaring Fork Transit Park-n-Ride facility and the City of Glenwood Springs' maintenance facility are to the west. Uphill to the south, several ridges ascend to the cliffs overlooking the area. Below the toes of the cliffs but above the development, a series of debris flow material retention basins and berm have been constructed.

Geologic Setting The site comprised a portion of the lower slopes of a relatively recent alluvial fan complex descending from gullies in the steep, elevated terrain to the south. The alluvial fan deposits consist of debris flow deposits with subordinate fluvial (stream laid) deposits of materials derived from the Maroon Formation supporting the cliffs. Clasts of basalt derived from a lava flow overlying the Maroon Formation locally also have been identified in the alluvial fan deposits.

The alluvial fan deposits and recently placed fills are underlain by sands, gravels and cobbles interpreted to be Pleistocene river terrace deposits associated with the

Colorado River. These deposits contain a significant proportion of clasts of crystalline rock types such as granite and gneiss.

Bedrock deposits of the Middle Pennsylvanian to Lower Permian Eagle Valley Evaporite, Eagle Valley Formation and Maroon Formation underlie the surficial deposits at the site and adjacent areas. The Maroon Formation consists largely of interbedded sandstones, siltstones and claystones as exposed in the cliffs above the project. Materials of the Eagle Valley Formation are exposed on the lowest slopes south of the site, above the alluvial fan deposits. This unit is broadly similar to the Maroon Formation with a greater percentage of limestone and gypsum. The Eagle Valley Evaporite, underlying the Eagle Valley Formation consists primarily of beds of gypsum, anhydrite and halite, with interbedded sandstones, siltstones, limestones and shales.

Geologic Hazards The project site lies within an area including much of the City of Glenwood Springs and its vicinity subject to geologic hazards including landslides, debris flows and subsidence related to hydro-consolidation. Maps depicting the general distribution of these hazards are public record such as the Colorado Geological Survey (CGS) *Open-File Report 78-10*. Geologic and geotechnical hazards at the site were assessed by CTL/Thompson, Inc., in the report, *Geologic and Preliminary Geotechnical Investigation, Glenwood Meadows, Glenwood Springs, Colorado*, Job No. GS-2871, prepared for Glenwood Meadows, LLC, dated February 1, 2000. A draft review of that study and others was provided by the CGS titled, *Geologic Hazards Review for the Glenwood Meadows Development Application*, prepared for the City of Glenwood Springs Planning Office, dated October 23, 2001. The Glenwood Meadows Annexation and Development Agreement (ADA) between the City and the Developer reflected these conditions. GROUND recommends that these documents be reviewed for additional information regarding development at the site.

The recognized potential for concentrated surface run-off and debris flows to damage improvements on the subject site as well as the retail and nearby City facilities has been addressed by the debris flow retention basins and berm constructed above the subject site. Design of the debris flow retention basins and berm was provided by others.

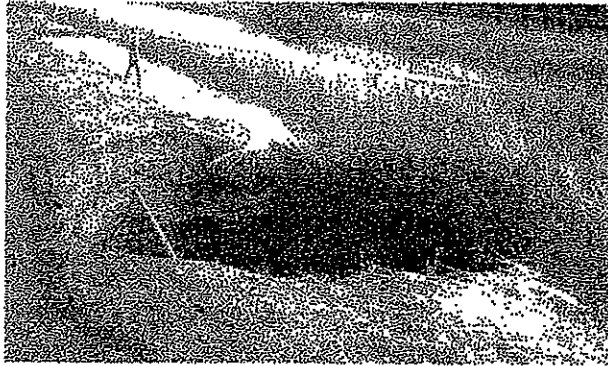
GROUND considers the potential for hydro-consolidation or "collapse" of the local soils comprising the alluvial fan complex upon wetting under a load to be the geologic hazard of principal concern at the site. Hydro-consolidation consists of a significant volume loss due to rearrangement of the constituent grains of the soil to a more compact

assemblage upon wetting under a load. Geotechnical recommendations to address hydro-consolidation are provided in this report.

(The potential for rock-fall hazard also was addressed by the February 1, 2000, CLT/Thompson report. Based on that report and as incorporated into the ADA, the subject site is not significantly exposed to potential rockfalls.)

In GROUND's opinion, with appropriate geotechnical and civil design, properly implemented during construction and effectively maintained after construction, Glenwood Meadows Lot 14 site is feasible for the proposed office building, commercial buildings and multi-family residences with regard to hydro-consolidation, flooding and debris flows.

The site also is vulnerable to the development of sinkholes from dissolution of water-soluble minerals in the bedrock underlying the site at depth. In August, 2003, for example, a sinkhole developed along the northern margin of Midland Avenue, east of the subject site, approximately downslope the Target



store. The sinkhole, which was backfilled promptly by the City of Glenwood Springs, was approximately 13 feet by 16 feet at the surface, about 11 feet in depth and about 130 cubic yards in volume. Additional information about the sinkhole can be found in an evaluation prepared for the City by Hepworth – Pawlak Geotechnical, *Subsurface Study for Evaluation of Sinkhole for Remedial Repair, Midland Avenue, North of the Community Center, Glenwood Springs, Colorado*, Job No. 103 522, dated September 8, 2003.

The geologic conditions giving rise to sinkholes, and the associated risks, are common in the Glenwood Springs area and generally greater along the Roaring Fork River to the south. Compilations of published map data suggest an average sinkhole density in the region on the order of 0.8 sinkholes per square mile. Therefore, the risk of sinkhole development at any given location such as the subject site appears relatively low. Most typically, sinkholes develop where stream terrace deposits or similar materials overlie the evaporitic bedrock. Subsurface exploration for this project included several test

holes advanced to depths of approximately 75 feet. None of the test holes encountered conditions suggesting the presence of voids beneath the site to the depths explored.

Nevertheless, the risk of sinkhole development, although apparently low, cannot be eliminated entirely. The potential for sinkholes must be accepted for development at the site, as well as for residence there. Effective surface drainage appears to reduce the risk of sinkhole development, but cannot eliminate it.

Annexation and Development Agreement We understand that the ADA for the overall Glenwood Meadows site is applicable to Lot 14. In that Agreement were established a number of geotechnical criteria for the development, based in part on recommendations from CGS regarding geologic hazards, including foundation types, measures for grading, surface drainage, and pavements, and underdrains for below-grade construction. We believe that the requirements therein have been met or exceeded by the recommendations herein.

The City also has expressed concerns that proposed improvements, particularly wet utility lines, could contribute to subsidence after project construction is completed. We understand that based on CGS comments, the City is requiring ground-penetrating radar (GPR) surveys to be performed along all utility alignments under public streets to further explore for the possible presence of sinkholes in the shallow subsurface. Therefore, GROUND recommends that the GPR surveys will be performed in general accordance with the City's requirements.

SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted in December, 2007 and January 2008. A total of 21 test holes were drilled with a truck/track-mounted, continuous flight, power auger rig to evaluate subsurface conditions, including depths to groundwater and bedrock, as well as to retrieve samples for laboratory testing and analysis. Of these, 14 test holes were drilled in the approximate building footprints, generally to depths of about 25 to 40 feet; several test holes, however were advanced to depths of approximately 75 feet. An additional 7 shallower test holes were advanced in the areas proposed for parking and driveways. A GROUND engineer directed subsurface exploration, logged the test holes in the field and prepared the samples for transport to our laboratory.

Relatively undisturbed samples of the subsurface materials were taken with a 2-inch I.D. "California" -type liner sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches. This procedure is similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values (blows per distance driven, typically 12 inches), when properly evaluated, indicate the relative density or consistency of soils and bedrock. A composite, disturbed (bulk) sample of the shallow soils in the pavement areas was collected from the auger returns. Depths at which the driven samples were taken, 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 exploratory test holes are presented on Figures 2 through 6. Explanatory notes and a legend are provided on Figure 7.

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 obtained from the subject site included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses and liquid and plastic limits. Swell-consolidation, water-soluble sulfate content, pH and resistivity tests were performed on selected samples, as well. A resilient modulus test was performed on the composite sample of materials from the areas to be paved.

Laboratory tests were performed in general accordance with applicable ASTM and AASHTO protocols. Data from the laboratory testing program are summarized in Table 1. Results of the swell-consolidation testing are plotted on Figures 9 through 17.

SUBSURFACE CONDITIONS

The earth materials encountered in the test holes, in general, of sandy fill soils extending to depths of a few feet to approximately 35 feet. (Delineating the complete lateral and vertical extents of existing fills on the project site was beyond our present scope of services for this project.) The fills were underlain by interbedded native silty to clayey sands and sandy silts with gravel, boulders and cobbles, and local lenses of clays. These soils are interpreted to be alluvial fan deposits. The native and fill soils contained significant fractions of cobbles and boulders. Based on other drilling by GROUND within the overall Glenwood Meadows site, it is anticipated that dense beds of

cobbles and boulders underlay the alluvial fan materials below about 80 to 95 feet, interpreted to be Quaternary alluvial (fluvial) materials deposited by Colorado River prior to burial beneath the alluvial fan deposits.

Bedrock was not encountered to the depths explored. Neither was groundwater encountered in the test holes at the time of subsurface exploration. However, groundwater levels can fluctuate, in response to annual and longer-term cycles of precipitation, irrigation, surface drainage and land use, the development and drainage of transient, perched water conditions, and other factors.

Fill consisted of silty to clayey sands to sandy silts. Gravel, boulders and cobbles were encountered. They were moist, low plastic, medium dense to dense and red in color.

Native Sands were clean to silty or clayey to gravelly. Cobbles and boulders were encountered, as well as lenses of sandy clays, sandy silts and relatively clean sands and gravels. They were fine to medium grained, dry to slightly moist, non-plastic to low plastic, loose to medium dense, and red in color.

Swell-Consolidation Testing Consolidations ranging from about 0.3 to 6.1 percent were measured in samples of the alluvial fan soils upon wetting under a 1,000 psf surcharge load. (See Table 1.)

SEISMIC CLASSIFICATION

No known active faults are in the immediate project vicinity. The closest documented potentially active (seismogenic) fault to the site is an unnamed series of relatively short, northwest-trending faults approximately 2½ to 3 miles to the southwest of the site (Kirkham, R.M., and W. P. Rogers, *Earthquake Potential in Colorado, A Preliminary Evaluation*, Colorado Geological Survey, Bulletin 43, dated 1981; *Preliminary Quaternary Fault and Fold Database, and Map Server*, Colorado Geological Survey, <http://geosurvey.state.co.us/Default.aspx?tabid=453>). These faults are shown as late Quaternary in age (demonstrable timing of last offset across the fault), but not Holocene (movement during the last 11,000 years ±). The risk of these faults giving rise to damaging, earthquake-induced ground motions at the site is considered to be low given their short length and the moderate, previously recorded, seismic magnitudes in the area.

Compared with other regions of Colorado, recorded earthquake frequency in the project area is relatively low; Kirkham and Rogers (1981) depict 2 historical earthquake epicenters of moderate magnitude in the Glenwood Springs area. The project area falls within Seismic Performance Category A based on AASHTO guidelines, and is considered to have a low probability for large, damaging earthquakes.

GROUND considers the site to fall within the parameters of a Seismic Site Class D site, in accordance with 2006 IBC. It should be noted that this classification is an estimate, based on the conditions encountered during drilling, our laboratory test data, and GROUND's experience in similar soils. If a quantitative assessment of the classification is needed, GROUND can perform down-hole shear wave velocity testing. A proposal for this work can be provided upon request.

GEOTECHNICAL CONSIDERATIONS FOR DESIGN

Geotechnical Risk Our data indicate that the native soils underlying the site are vulnerable to hydro-consolidation or "collapse." Hydro-consolidation consists of a significant volume loss due to rearrangement of the constituent grains of the soil to a more compact structure upon wetting under a surcharge load. The data obtained for this study suggested moderate potentials for post-construction settlement of structures constructed on the soils encountered at this site. Soils subject to "collapse" are generally stable with regard to their moisture-volume relationships so long as their moisture contents are kept unchanged. Post-construction wetting of "collapsible" soils gives rise to settlement and resultant damages. Pavements, utilities, and sidewalks, etc., all can be affected, in addition to the buildings. The actual extent and distribution of post-construction settlement realized at a given location (and the nature and degree of resultant damages) will depend on a variety of factors. These factors include the spatial distribution of the hydro-consolidation potentials in the underlying soils, the type and design of the structure supported on them, structural loads, and the depth and lateral extent to which the soils become wetted after construction, etc. Because of the number and variability of these factors, the necessarily limited data set by which the geotechnical factors can be estimated, the variety of means by which estimates of post-construction settlement can be made, and the inherent assumptions involved, estimates of future settlement will tend to range widely in magnitude.

Various quantitative and semi-quantitative methods are used by geotechnical engineers in Colorado to estimate post-construction settlements of structures, pavements, etc.,

constructed on "collapsible" soils as a step toward development of recommendations for foundations, remedial earthworks, etc. Those typically used are based on practical engineering experience and judgment using combinations of measured values of soil moisture content, density and plasticity, one-dimensional swell/consolidation, and/or soil suction. The recommendations and criteria provided in this report were based on the data presented herein, and 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 recommendations 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 the Owner or prospective future owners, upon receipt of this report, however, to discuss these risks and the geotechnical alternatives with us.

Anticipated 'Depth of Wetting' At any point in the design life of a structure, the vertical and lateral extents of future wetting of the underlying "collapsible" soils will exert a significant influence on the extent and distribution of future settlement. Professional experience and opinions differ with regard to depths to which significant, post-construction, soil moisture changes take place. Differing assumptions for this future "depth of wetting" at a site will give rise to differing estimates of potential, post-construction heave. Movement estimates based on much deeper than typically estimated depths of wetting will be larger than those based on more typically observed depths.

Engineering consulting and design practice necessarily involves weighing the risks inherent in a given design approach against the construction and maintenance costs associated with reducing those risks. The Owner (and subsequent prospective future owners) must, therefore, understand the risks and remedial approaches presented in this report and the risk-cost trade-offs addressed by the Civil Engineer and Structural Engineer 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 (or was) designed. If the Owner or a prospective future owner does not understand these risks, it is critical

that he request additional information or clarification so that his expectations reasonably can be met.

As noted above, the "depth of wetting" forecast for a given site strongly affects the anticipated performance of structures placed there. At this site, GROUND estimated a depth of wetting of 18 feet, a depth that is equal to or greater than the "depth of wetting" found at about 62 percent of the sites studied by Walsh and others (2006)¹ in the Denver metropolitan area and appears reasonable for this site based on our experience in on the Colorado Western Slope. A "depth of wetting" of 18 feet is appropriately conservative in our opinion for this project. Clearly, however, there is a potential for this "depth of wetting" to be exceeded. And, if a greater depth of wetting were considered – other parameters being equal – then a greater estimate of post-construction movement would result. "Depths of wetting" of 30, 40 or 70 feet or more have been considered (e.g., Chao and others, 2006)² and have been encountered locally in the field. These cases, however, generally are in unusual geologic conditions such as the "Designated Dipping Bedrock Area" as recognized by Jefferson County, Colorado, or identified forensically in unusual circumstances such as a pipe leak that has remained un-repaired for an extended period. In more typical geologic settings, such deep "depths of wetting" are considered only rarely in engineering consulting practice in this area, however. If the Owner prefers a more conservative (or less conservative) "depth of wetting" to be used to develop geotechnical recommendations, GROUND should be contacted to revise geotechnical criteria herein.

Likely Post-Construction Movements Utilizing the above assumptions, data obtained for this study, and our experience on other projects in the vicinity, our estimates indicate potential likely post-construction movements on the order of 6 to 8 inches where building elements are supported directly on native earth materials that become wetted following construction to the depth described. Movements of this magnitude can cause severe cosmetic and/or structural distress to the proposed buildings. (These same general potentials for post-construction movement and damage also apply to project pavements, hardscaping, piping, and all other improvements in contact with the site soils where subject to post-construction wetting.)

¹ Walsh, K.D., C.A. Colby, W.N. Houston and S.A. Houston, 2006, *Evaluation of Changes to Soil Suction Resulting from Residential Development, Unsaturated Soils 2006*, American Society of Civil Engineers, Special Publication No. 147, pp. 203 – 212.

² Chao, K-C, D.D. Overton, and J.D. Nelson, 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.

General Foundation Types At the subject site, several types of foundation systems, in conjunction with differing extents of remedial earthworks, etc., can be employed to support the proposed buildings on the soils and bedrock encountered in the test holes. Each combination entails a different degree of risk of post-construction building movements. These range from utilizing shallow spread footings and slab-on-grade concrete floors bearing directly on the native soils (entailing the greatest risk) to supporting the structures, including floors, on deep, driven pile foundations bearing in the underlying alluvial cobbles and boulders at depths of on the order of 80 feet or more (entailing the least risk).

Lower movement tolerances are typically associated with residential buildings and if placed on spread footings and slab-on-grade the allowable movement tolerance would likely be exceeded. Therefore, GROUND recommends that the proposed residential buildings be supported on driven pile foundation systems and providing it with structural floors similarly supported as the most positive way to minimize post-construction settlements. We also recommend use of a driven pile foundation system and a structural floor for the office building where a below grade levels planned. We anticipate that construction of the deep fill section recommended for use of shallow foundations and floor system on deep fill section may not be feasible, economically.

We assume, however, that 80+ -foot pile foundations and a structural floor may not be practical economically for the other commercial buildings at the subject project. Therefore, in the absence of direction otherwise from Total Merchant Services or the Owner, we have assumed that the Owner prefers to use conventional, shallow foundations and a slab-on-grade concrete floor for the commercial buildings on this project. The geotechnical criteria provided in the *Foundation Systems and Floor Systems* section of this report were developed accordingly to reduce damage resulting from movement of the foundation soils. If this approach is selected, the Owner must understand that foundation and/or floor slab movements will result, with associated damages. Shallow foundations and slab-on-grade floors together with excavation of the underlying soils and replacement with backfill with less potential for settlement have been used in the Denver metropolitan area with varying degrees of success. If the alternative criteria are implemented effectively in design and construction, and site drainage is maintained effectively, likely settlements in the soils supporting the footings and slab will be on the order of 1½ inches, with similar differential movements over a span of about 50 feet. GROUND is available to meet, however, to discuss the risks

and remedial approaches presented in this report, as well as other possible design approaches, upon request.

Irrespective of the foundation system and floor system selected by the Owner, some risk of post-construction building and floor movements will remain, even after effective implementation of the recommendations in this report. The Owner and prospective future owners should understand these risks, as well as the site maintenance measures that are necessary to manage them. Other elements of the proposed improvements on this site (hardscaping, pavements, etc.) will be underlain by expansive earth materials, and likely will be damaged. Owner tolerances for movement and distress to these appurtenant improvements typically is greater than for buildings. Nevertheless, periodic maintenance will be required. To achieve performance similar to that of the building floors, similar foundation measures will be required. We recommend that the Owner and prospective future owners familiarize themselves with the measures presented in Noe and others (1997)³ and implement them at this site. This booklet is available from the Colorado Geological Survey in Denver, Colorado, and can be purchased from their website. (www.geosurvey.state.co.us). Although written for residential construction on expansive soils, the site drainage concepts and recommendations outlined therein are generally applicable to building sites on collapsible soils, as well.

GROUND recommends consideration of a supplemental drilling program for structures not supported on deep foundations in order to provide additional information regarding the potential for severe settlements. We suggest advancing test holes on approximately 30-foot centers with an air percussion rig or other, rapid-drilling equipment, to a depth on the order of 50 to 60 feet beneath each building supported on shallow foundations. Such a drilling program would provide direct evidence of voids beneath those support locations, if present, and allow those voids to be collapsed or filled prior to building construction.

On-Going Maintenance Some risk of post-construction building and floor slab movements will remain, however, even after effective implementation of the recommendations in this report. The Owner and prospective tenants / residents should understand these risks, as well as the site maintenance measures that should be performed to manage them. Geotechnical parameters for design and construction of shallow, spread footing foundations for the proposed buildings, as well as

³ Noe, D.C., C.L. Jochim and W.P. Rogers, 1997, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners*, Colorado Geological Survey, Special Publication 43.

recommendations for remedial earthworks, drainage, etc., are provided in subsequent sections of this report. These measures also will be beneficial with regard to potential heave of clayey soils encountered locally in the test holes. GROUND can provide geotechnical recommendations and parameters for other types of foundation systems upon request.

FOUNDATION SYSTEMS

Shallow Foundation Systems for Commercial Buildings As discussed in the *Geotechnical Considerations for Design* section of this report, it is GROUND's opinion that the proposed commercial buildings, if determined to be feasible, can be supported on conventional, shallow foundation systems bearing on a section of properly moisture-conditioned and compacted fill provided that the Owner is aware of the risks inherent in construction on collapsible soils, and that the buildings are designed accordingly.

The criteria presented below may be observed for spread footing foundation systems. The construction details should be considered when preparing project documents.

- 1) Footings should bear on 10 or more feet of properly compacted fill.
- 2) The thickness of the fill section should be taken from the lowest foundation element or the bottom of the slab + gravel layer system, respectively. (If the gravel layer is not installed, the fill section should be correspondingly thickened.)

The existing soils and fill soils should be removed to a sufficient depth beneath footing (and slab) bearing elevations to accommodate placement of a new fill section uniformly beneath the building, in addition to scarification and re-compaction of the underlying 8 to 12 inches of material.

Excavation and replacement to the full, recommended depth should extend at least 12 feet beyond the building perimeter.

Based on the data obtained from our test holes, varying depths of existing fill were encountered, however a uniform fill thickness of at least 10 feet should be placed below the footing bearing elevations. Therefore, the existing fill should not be considered as part of the fill recommended fill section below the footings.

Recommendations for placement and compaction of fill soils are provided in the *Project Earthworks* section of this report. As discussed in that section, site soils free of debris are suitable, in general, for use as compacted fill.

The Contractor should provide surveyed elevations of the bottoms of the excavations beneath the building verifying that the remedial excavation was advanced to a sufficient depth.

- 3) Footing excavation bottoms may expose debris, loose or wet materials, organic 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.
- 4) Footings bearing on 10 or more feet of properly compacted fill may be designed for an allowable soil bearing pressure (Q) of 2,500 psf under drained conditions. This value may be increased by $\frac{1}{3}$ for transient loads such as wind or seismic loading.

Based on this allowable bearing capacity, we anticipate direct compression of the foundation soils on the order of 1 inch. For other estimated settlements, allowable bearing pressure values can be obtained from Figure 8.

The allowable bearing capacity provided above is based on the assumption of well-drained conditions. If foundation soils become wet, the effective bearing capacity could be reduced and larger post-construction settlements than those estimated herein may result. In addition, the risk of hydro-consolidation of the underlying native soils underlying the fill prism will be increased.

- 5) In order to reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle differentially.

The Contractor should take care to construct fill section beneath the building of uniform depth and composition to reduce differential post-construction building, slab and flatwork movements. A differential fill beneath the building will tend to increase differential settlements.

- 6) Spread footings should have a minimum footing lateral dimension of 16 or more inches for linear strip footings and a minimum lateral dimension of 24 or more

inches for isolated pad footings. Actual footing dimensions, however, should be determined by the Structural Engineer, based on the design loads.

- 7) Footings should be provided with adequate soil cover above their bearing elevation for frost protection. Footings should be placed at a bearing elevation 3.5 or more feet below the lowest adjacent exterior finish grades in un-heated areas. In heated interior areas, footings should bear at least 1.5 feet below lowest adjacent finish grades.
- 8) Continuous foundation walls should be reinforced top and bottom to span an unsupported length of at least 10 feet.
- 9) The lateral resistance of spread footings will be developed as sliding resistance of the footing bottoms on the foundation materials. Sliding friction at the bottom of footings may be taken as 0.35 times the vertical dead load.
- 10) Compacted fill placed against the sides of the footings should be compacted to at least **96 percent** relative compaction in accordance with the recommendations in the *Project Earthworks* section of this report.
- 11) Care should be taken when excavating the foundation to avoid disturbing the supporting materials. Hand excavation or careful backhoe soil removal may be required in excavating the last few inches.
- 12) Foundation soils may be disturbed or deform excessively under the wheel loads of heavy construction vehicles as the excavations approach footing levels. Construction equipment should be as light as possible to limit development of this condition. The use of track-mounted vehicles is recommended since they exert lower contact pressures. The movement of vehicles over proposed foundation areas should be restricted.
- 13) All footing areas should be compacted with a vibratory plate compactor prior to placement of concrete.

The Geotechnical Engineer should be retained to observe and test all footing excavations prior to placement of reinforcing steel or concrete.

Deep Foundation Systems for the Residential and Office Buildings As discussed in the *Geotechnical Considerations for Design* section of this report, it is GROUND's opinion that the proposed residential building should be supported on deep foundation systems bearing in the river terrace gravels, cobbles and boulders underlying the site at depths of 75 or more feet below existing grades. Although driven pile foundation systems will not eliminate the risk of post-construction building movement, if the recommendations below are followed, the likelihood of acceptable building performance will be well within the local industry standards for construction of a driven pile foundation system on soils and bedrock of this nature.

The design criteria below should be followed for design and construction of driven, steel, H-pile foundations for the residential buildings. We assume that HP 12 x 74 or 14 x 89 piles will be used for driven pile foundations. The construction details should be considered when preparing project documents.

- 1) The pile should consist of a heavy steel H-section. The pile tip should be reinforced with a commercial, heavy duty, pile tip.
- 2) The maximum pile load should not exceed a maximum service stress of 12,000 psi based on the pile cross-sectional area.
- 3) We anticipate that piles will be driven to depths of about 80 to 95 feet below existing grades at the time of preparation of this report. Locally, lower tip depths may be necessary.
- 4) Based on the dominantly granular nature of the site alluvial fan soils, we anticipate that post-installation down-drag on the piles will be negligible due to the densification of the soils surrounding each pile from the driving efforts. We anticipate that subsequent soil adjustments will be realized rapidly. Nevertheless, GROUND recommends re-striking of the piles to evaluate their capacity at least 24 hours after (initial) driving has been completed.
- 5) Closely spaced groups of piles required to support concentrated loads will require an appropriate reduction of the estimated bearing capacity based on the effective envelope area of the pile group. This reduction can be avoided by spacing piles apart a distance of at least 3 diameters, center to center. Pile groups with spacings less than 3 diameters center to center should be studied

on an individual basis to determine the appropriate reduction for both lateral and axial capacities.

- 6) Piles may be designed to resist lateral loads taking a modulus of horizontal subgrade reaction of 140 pci to be characteristic of the native alluvial fan and fill soils below a depth of 6 feet, based on adjacent finished grade. A modulus of horizontal subgrade reaction of 225 pci may be assumed in the alluvial river terrace deposits. Resistance to lateral loads should be neglected in fill and/or native soils shallower than 6 feet.

We understand that the building pads will be wide enough so that any loads from relaxation of the shallow soils or downslope creep will not affect the piles. Should the buildings be constructed in a "walk-out" configuration, however, these loads should be evaluated and accounted for in the wall and foundation designs.

- 7) Lateral resistance to horizontal forces also may 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. Batters should not exceed 1:4 (horizontal : vertical).
- 8) Uplift capacity of piles should be limited to 25 percent of the indicated vertical load capacities
- 9) We recommend that the pile driving hammer should develop a minimum of 42,000 foot-pounds of energy per blow for HP 12 x 74 piles, and a minimum of 52,000 foot pounds of energy per blow for the HP 14 x 89's.

After the actual pile type and proposed hammer have been selected, the Geotechnical Engineer should perform a Wave 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 are driven.

A Geotechnical Engineer should be retained to evaluate necessary minimum embedment depths based on the structural loadings for the piles. The Geotechnical Engineer should observe all pile driving operations. We recommend that at the start of pile installation for each building, the Geotechnical Engineer perform pile dynamic

testing. This testing should be performed in order to a) assess whether piles are being over-stressed relative to the maximum service stress of 12,000 psi recommended above, and b) develop virtual refusal criteria for bedrock penetration based on the design capacity of the piles. Dynamic pile testing should be performed by means of a Pile Driving Analyzer (PDA) to determine the virtual refusal criteria. Lateral loading tests also should be performed at the start of pile installation.

The test holes drilled for this evaluation were advanced to the depths indicated on the test hole logs by means of a conventional, truck-mounted, drilling rig using 4-inch diameter, solid-stem, flight auger equipment. Nevertheless, because of the cobbles and boulders in the site soils, the Contractor should anticipate some difficulties in advancing the piles, and be prepared to work in these conditions. We anticipate the need for local pre-drilling of pile locations and/or splitting of boulders to advance the piles to the anticipated depths.

Additional pile footage should be included in project planning to allow for additional piles locally where offsets were required due to potential obstructions to pile driving in the landfill materials or damage to piles.

Where a pile cannot be advanced to at least the approximate, anticipated tip depths, it should be evaluated with regard to its capacity by the Geotechnical Engineer and the Structural Engineer.

PARTIAL BASEMENTS / BELOW GRADE LEVELS

Partial basements or any otherwise below grade levels (loading docks, garden-levels, etc.) can result in differential settlement between the portion of the building that is founded near the final surface grade (no basement level) and that which is founded below grade, specifically if the portion of the building directly adjacent to the below grade level is founded on backfill material. The backfill material may exhibit settlement due to compression of the foundation that exceeds the magnitudes provided in Figure 8.

Therefore, the Structural Engineer and the Contractor must carefully schedule the construction of the building such that the footing bearing soils are not disturbed or vulnerable to movement associated with settlement of the below grade wall backfill. This most often occurs when the below grade walls are backfilled to lower compaction standards because of structural concerns regarding wall deformation (i.e. the walls are not braced with the first floor beams, girders, decking, etc.).

In addition, foundation elements supporting the portion of the building not located above a below grade level are sometimes designed for less bearing capacity than those located under the below grade level. As shown in Figure 8, different loads may result in differential settlement.

In no case should the subgrade for future foundations or existing foundation elements be undermined.

FLOOR SYSTEMS

Slab-on-Grade Floors for the Commercial Buildings As discussed in the *Geotechnical Considerations for Design* section of this report, there is a potential for post-construction movements of slab-on-grade floor systems even where placed on a relatively deep fill section. Therefore, if the Owner understands and accepts the risk of post-construction slab movements, the remedial earthworks and other parameters provided below will tend to reduce slab movements, make them more uniform and reduce potential distress that can result from settlement of foundation materials.

Post-construction slab movements are directly related to changes in moisture contents to the underlying soils after construction is completed. If slab-on-grade construction is used in accordance with the following criteria, potential for slab movement will not be eliminated, but may tend to make movements more uniform and will reduce damages where movements do occur.

- 1) Floor slabs should bear on 12 or more feet of properly moisture-conditioned and compacted fill soils.

The existing soils should be removed to a sufficient depth beneath slab bearing elevation to accommodate construction of the above fill section, in addition to scarification and re-compaction of the underlying 8 to 12 inches of material. The thickness of the fill section should be taken from the bottom of the slab + gravel layer system. (Taking the slab+gravel system to be approximately 1 foot in thickness and assuming the footings will bear at 3 feet below existing grades, a 12-foot fill section beneath the floor system and 10-foot fill section beneath the footings should yield a nearly uniform excavation bottom elevation. If the gravel layer is not installed, the fill section should be correspondingly thickened.)

Excavation and replacement to the full recommended depth should extend laterally at least 12 feet beyond each building perimeter.

Recommendations for placement and compaction of fill soils are provided in the *Project Earthworks* section of this report. As discussed in that section, site soils free of debris are suitable, in general, for use as compacted fill.

The Contractor should provide surveyed elevations of the bottoms of the excavations beneath the building verifying that the remedial excavation was advanced to a sufficient depth.

The Contractor should take care to construct a fill section of uniform depth and composition to reduce differential post-construction building, slab and flatwork movements. A differential fill beneath the building will tend to increase differential settlements.

Based on the data obtained from our test holes, varying depths of existing fill were encountered, however a uniform fill thickness of at least 12 feet should be placed below the floor slabs. Therefore, the existing fill should not be considered as part of the recommended fill section below the floor slabs.

- 2) An allowable vertical soil modulus (K_v) of 45 pci may be used for design of concrete slabs bearing on a properly prepared subgrade.
- 3) A Geotechnical Engineer should be retained to observe the prepared surface on which the floor slab will be cast prior to placement of reinforcement. Exposed loose, soft or otherwise unsuitable materials should be excavated and replaced with properly compacted fill, placed in accordance with the recommendations in the *Project Earthworks* section of this report.
- 4) The floor slab should be separated from all bearing walls and columns with slip joints that allow unrestrained vertical movement.

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) Interior partitions resting on the floor slab 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 door frames. A slip joint that will allow 2 or more inches of vertical movement is recommended. If slip joints are placed at the tops of walls, in the event that the floor slabs move, it is likely that the wall will show signs of distress, especially where the floors meet the exterior wall.
- 6) A concrete slab-on-grade should be constructed and cured in accordance with applicable industry standards and provided with properly designed and constructed control joints. ACI, AASHTO and other industry groups provide guidelines for proper design and construction of concrete slabs-on-grade, and associated jointing. The design and construction of such joints should account for cracking resulting from concrete shrinkage, curling, tension and applied loads, as well as other factors related to the proposed slab use. Joint layout based on slab design may require more frequent, additional or deeper joints than typical industry minimums, and should reflect the configuration and proposed use of the slab. Particular attention in slab joint design should be given to areas where slabs exhibit interior corners or curves, e.g., at column block-outs or reentrant corners, and slabs with 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.
- 7) Floor slabs should be adequately reinforced. Recommendations based on structural considerations for slab thickness, jointing, and steel reinforcement in floor slabs should be developed by the Structural Engineer.
- 8) All plumbing lines should be carefully tested before operation. Where plumbing lines enter through the floor, a positive bond break should be provided. Flexible connections allowing 2 or more inches of vertical movement or more should be provided for slab-bearing mechanical equipment and the connection should be adjustable and observed periodically.
- 9) 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.

- 10) A vapor barrier beneath a building floor slab can be beneficial with regard to reducing exterior moisture moving into the building, 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.

Therefore, in light of the several, potentially conflicting effects of the use vapor-barriers, the Owner and the Architect and/or Flooring 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 buildings or building areas and not for others.

Structural Floors for the Residential and Office Buildings The residential and office buildings should be provided with structural floors should be supported on grade beams and H-piles in the same manner as the building structure. Requirements for the number and position of additional H-piles to support the floors will depend upon the span, design load, and structural design, and should be developed by the Structural Engineer. Geotechnical recommendations for design and installation of the driven H-piles are provided in the *Building Foundations* section of this report.

Structural floors should be constructed to span above a well-ventilated crawl space. The crawl space should be adequate to allow access and maintenance to utility piping. Piping connections through the floor should allow for differential movement between the piping and the floor system. If a wooden structural floor system is used, particular care should be taken to design and maintain the under-floor ventilation systems in order to reduce potential deterioration of the wooden structural members. A minimum 10-mil unreinforced polyethylene vapor-retarder (a plastic sheet material) should be considered for installation below all structurally supported below-grade floors and should be properly attached/sealed to foundation walls. The plastic sheeting should not be attached to horizontal surfaces such that condensate might drain to wood or corrodible metal surfaces.

New buildings generally lack ventilation due primarily to systematic efforts to construct airtight, 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 close proximity of finished building pad grades. Persistently warm, humid conditions in the presence of cellulose, which is the base material found in many typical construction products, creates an ideal environment for the growth of fungi, molds, and mildew. Published data suggest links between molds and negative health affects. Therefore, GROUND recommends that crawl spaces beneath structural floors be provided with adequate, positive active ventilation systems or other active mechanisms such as specially designed HVAC systems (as well as properly constructed and maintained underdrains) 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 construction means and methods, and any observation or testing performed by a representative of a Geotechnical Engineer during construction does not relieve the Contractor of that responsibility.

Mold Growth Areas/Conditions for Growth for Structural Floors:

1. Water damaged building materials or high moisture/humidity areas where cellulose-containing materials are used:
 - Wallboard/sheetrock
 - MDF/OSB/Plywood
 - Fibrous Ceiling Tiles
 - Paper-backed Insulation
 - Jute-backed carpet
 - Hardwood Flooring
2. Condensation inside buildings from pipes, baths, heaters, and dryer vents
3. Relative humidity greater than 55%
4. Temperatures of 36 to 104 °F.
5. "Wet" areas that do not dry out after 24 hours.

Mold does not require a light source in order to grow and can grow inside walls, behind tubs/showers, under carpet and flooring undetected.

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 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 4 inches or more.

Crawl spaces typically are vulnerable to moisture accumulation. Proper installation and maintenance of the underdrains as recommended in the *Underdrain System* section of this report will assist drainage of free water and assist the ventilation system reduce crawl space moisture.

FOUNDATION WALLS

Foundation walls that are laterally supported and can be expected to undergo only a limited amount of deflection, i.e., an "at-rest" condition, should be designed to resist lateral earth pressures computed taking an equivalent fluid unit weight of 55 pcf to be

characteristic of the backfill soils for a horizontal backfill surface if imported, select, granular, backfill is placed the walls and compacted properly. The at-rest lateral earth pressures should be computed taking an at-rest equivalent fluid pressure of 67 pcf to be characteristic of the backfill soils where on-site materials are used as backfill, again for a horizontal backfill surface.

Select, granular materials imported for use as wall backfill should meet the criteria for CDOT Class 1 Structure Backfill as tabulated below. All imported soils should be tested and approved by the Geotechnical Engineer prior to transport to the site.

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

GROUND suggests use of select, granular, backfill behind the walls to achieve lower lateral earth pressures. To realize the lower equivalent fluid unit weight, structural fill should be placed behind the wall to a minimum distance equal or greater than half of the wall height. Where select, granular, backfill is used, the upper 1-foot of the wall backfill should be a relatively low permeability soil or otherwise protected to reduce surface water infiltration into the backfill.

The 'at rest' loads recommended above are for well-drained conditions. The additional loading of hydrostatic loads if sufficient drainage is not provided, and loads from traffic, stockpiled materials, etc., should be included in foundation wall design.

Backfill soils should be properly moisture-conditioned and compacted in accordance with the recommendations in the *Project Earthworks* section of this report. The Contractor should take care not to over-compact the backfills, which could result in excessive lateral pressures on the walls.

A Geotechnical Engineer should be retained to observe the exposed excavation prior to placement of backfill, observe earthwork operations, and test the soils.

Some settlement of wall backfills will occur even where the material was placed correctly. This settlement likely will be differential, increasing with depth of fill. Where shallowly founded structures and pavements must be placed on backfilled zones, the associated risks should be understood by the Owner. Structural design, pipe connections, etc., should take into account backfill settlement, including differential movements from settlements and/or heave of the foundation wall backfill soils. A Geotechnical Engineer should be retained to provide recommendations for founding improvements in such areas.

Passive pressure against the sides of wall footings bearing against firm native soils or properly compacted backfill can be computed taking an at-rest equivalent fluid pressure of 275 pcf to be characteristic of the site soils, up to a maximum of 2,750 psf. The upper 1-foot of embedment should not be relied upon for passive resistance, however.

WATER-SOLUBLE SULFATES

The concentrations of water-soluble sulfates measured in samples obtained from the test holes were less than 0.01 percent by weight. (See Table 1). Such concentrations of water-soluble sulfates represent a negligible degree of 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).

Based on these data GROUND, makes no recommendation for use of a special, sulfate-resistant cement in project concrete. However, based on other studies in the area, and the presence of gypsum in the local bedrock, we recommend that after overlot grading has been completed, samples of site soils be tested for water soluble sulfates to assess the potential for locally elevated sulfate concentrations.

SOIL CORROSIVITY

Measurements of soil acidity (pH) and electrical resistivity were made to provide a general assessment of the potential for corrosion of ferrous metals installed in contact with earth materials. Test results are summarized in Table 1.

Values of pH below 7 (neutral) indicate acidic conditions; values greater than 7 indicate basic conditions, on a logarithmic scale. Testing indicated pH values from about 8.6 to

9.2, which indicate that the materials tested are basic. These characteristics will not contribute greatly to corrosion.

Electrical resistivity is related both to a material's moisture content and to the concentrations of dissolved salts and other conductive constituents in the soil pore water. Measurements of electrical resistivity indicated values from about 13,000 to more than 30,000 ohm-centimeters in selected samples of the local soils.

Resistivities greater than 6,000 ohm-centimeters are classified as representing an 'excellent' corrosive environment for ferrous metals in contact with site soils, on a scale of 'bad,' 'fair,' 'good' and 'excellent' as presented in the "Handbook of Steel Drainage and Highway Construction Products" published by the American Iron and Steel Institute. Therefore, the site alluvial fan soils appeared to represent an excellent (low risk) environment with regard to metallic corrosion.

Corrosive conditions can be mitigated by use of materials not vulnerable to corrosion, heavier gauge materials with longer design lives, or cathodic protection systems. If additional information or recommendations are needed regarding soil corrosivity, GROUND recommends contacting a Corrosion Engineer. 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, can alter the corrosion potentials significantly.

RADON

Radon is a naturally occurring, colorless, odorless, radioactive gas that can cause lung cancer, according to the U.S. Environmental Protection Agency (EPA). The occurrence of radon is difficult to predict, and structures with all types of foundations can be affected by radon build up. Where radon is allowed to concentrate in an enclosed structure represents a potential hazard. It is not a hazard that can be mitigated by geotechnical measures, however.

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 most typically are found in basements, crawl spaces 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, but cannot be excluded. Additional information regarding radon and radon-resistant building design can be obtained from the EPA (e.g., www.epa.gov/radon) as well as from many local building and/or health departments.

GROUND recommends that radon testing be performed in the building after construction is completed. However, we understand that incorporating sufficient ventilation and other measures into a structure to address radon accumulation during construction is significantly less costly than installing them after construction has been completed. We recommend that the Architect consider radon mitigative measures for the proposed structure and incorporate appropriate systems into the design.

SURFACE DRAINAGE

The following drainage precautions should be observed during construction and maintained at all times after the facilities have been completed. Establishment and maintenance of surface drainage is critical to the proper performance of the proposed structures and pavements. If the drainage measures below are not implemented and maintained effectively, the movement estimates provided in this report could be exceeded.

- 1) Excessive wetting or drying of the foundation excavations and underslab areas should be avoided during construction.
- 2) Care should be taken during and after construction to identify local, concentrated water sources such as leaking hose bibs or pipes, downspouts from which water is not positively controlled, construction water tanks, etc., and repair the damage or make positive provision to capture the water or convey it off-site. On-going, localized wetting of the site soils will result in piping of the silty materials and potentially severe localized settlements.
- 3) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils. The ground surface surrounding the exterior of each building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 12 inches in the first 10 feet in landscaped areas and 3 inches in the first 10 feet in areas where hardscaping covers the ground adjacent to the building. (It may be necessary to incorporate ramps or other measures into project design to implement this

recommendation while complying with access requirements.) In no case should water be allowed to pond near or adjacent to foundation elements.

Drainage measures also should be included in project design to direct water away from sidewalks and other hardscaping as well as utility trench alignments that are likely to be adversely affected by moisture-volume changes in the underlying soils or flow of infiltrating water. Routine maintenance of site drainage, including sealing of cracks and joints, should be undertaken throughout the design life of the project.

- 4) In sloping terrain, it is common to have slopes descending toward buildings. Such slopes can be created during grading even on comparatively flat sites. In such cases, even where the recommendation above regarding slopes adjacent to the building is followed, water will flow to and beneath the building with resultant additional post-construction movements. Where the final site configuration includes graded or retained slopes descending toward the building, and the toe-of-slope (-wall) is less than 3 times the total slope (wall) height from the building, then an interceptor drain should be installed between the building and the slope. Ideally, the interceptor drain should be installed either about 10 feet from the building or along the axis of a swale between the building and the toe-of-slope (-wall). An interceptor drain system should be generally like the underdrain system described in the *Interceptor Drain System* section of this report. The actual layout, outlets, etc., of an interceptor should be designed by the Civil Engineer. GROUND can provide more specific geotechnical recommendations for an interceptor drain system upon request.

In addition, where irrigation is applied on or above graded slopes, drainage structures commonly are needed near the toe-of-slope to prevent on-going or recurrent wet conditions there.

- 5) The ground surface near foundation elements should be able to convey water away readily. Ground coverings that direct water downward rather than away from the building should not be used to cover the ground surface near the foundations or other improvements sensitive to post-construction soil movements. Cobbles or other materials that tend to act as baffles and restrict surface flow should not be used.

Correspondingly, near other project improvements, such as hardscaping, where the ground surface does not convey water away readily, additional post-construction movements and distress should be anticipated. Shallow underdrain systems or flatwork edge drains can be beneficial in reducing movements and distress.

- 6) The buildings should be provided with roof drains/gutters and downspouts. Roof drainage feature design should accommodate the potential for ice accumulation.

Roof downspouts and drains should discharge well beyond the perimeters of the structure foundations, or be provided with positive conveyance off-site for collected waters. Providing piped discharge to the project storm sewer system is the most effective means of reducing infiltration into the site soils. Where collected waters are allowed to flow across the ground surface (whether paved or landscaped), the potential for post-construction movements are increased, particularly where joints, cracks, adverse local surface gradients, etc., are not well maintained.

Roof drains should not be routed inside the buildings. Roof downspouts and other surface water collectors should not discharge into the building underdrain or interceptor drain systems.

- 7) Landscaping that requires watering should be located 10 or more feet from building perimeters. Irrigation sprinkler heads should be deployed so that applied water is not introduced into foundation 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 the amount 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 and floors should take higher priority than minimizing landscape plant losses.

We understand that municipal ordinances commonly require plantings in close proximity to buildings. Where plantings are desired within 10 feet of a building, GROUND recommends that the plants 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. Where water-tight planters cannot be used, project design measures and post-construction maintenance routines should be developed to prevent infiltration.

- 8) We do not recommend the use of plastic membranes 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 or 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, which allow ready evaporation from the underlying soils may be used.
- 9) GROUND recommends that snow storage should be restricted to paved areas where effective surface drainage is maintained. Snowmelt has the potential to introduce additional water into the soils supporting the slope, with consequent potentials for increased post-construction settlements.

If it is necessary to use unpaved areas of the project for snow storage, only designated slopes should be used that have been provided with shallow, underdrain systems. General recommendations for underdrains are provided in the *Subsurface Moisture Infiltration and Drainage* and *Interceptor Drain Systems* sections of this report. The drains should be installed at depths of about 2 to 3 feet below finished grades aligned generally parallel to slope. Individual drain lines should be installed no more than 30 feet apart throughout the areas designated for snow storage. The pipes for the drain system should be graded at a sufficient slope to move water effectively to one or more non-perforated discharge lines to carry water off-site or into the storm sewer system.

GROUND recommends that a regular program of site monitoring and maintenance by a qualified maintenance Contractor or similar agent for the Owner be established for the proposed facility, and implemented throughout the design life of the project. The site should be observed for indications of ineffective drainage, settlement, ponding, erosion, damaged irrigation lines, etc., so that repairs can be effected. Necessary repairs/restoration should be implemented as soon as possible. Where localized

infiltration is allowed to continue, the risk of local subsidence or the development of sinkholes will be significantly increased.

In addition to design, construction and maintenance of effective, permanent surface drainage measures, effective surface drainage must be established and regularly maintained throughout construction. In GROUND's experience, it is common in areas of partially completed paving or hardscaping, bare soil surrounding buildings and behind curbs and gutters, and open utility trenches, etc., that water from irrigation or rain and snow melt events is allowed to pond. Because of the numerous trades that can be working on a site at various stages of construction, maintenance of effective surface drainage can require weekly or more frequent restoration. As has been discussed elsewhere in this report, wetting of the subgrade can result in loss of support and increased settlements. By the time that final grading has been accomplished, and permanent surface and subsurface drainage measures completed, significant volumes of water can already have entered the subgrade, with consequent increased risks of movements, etc. GROUND recommends that the Contractor be directed to maintain the site regularly during the entire construction process so that water is directed into appropriate drainage structures during construction.

We understand that local, state and/or federal regulations regarding erosion control may require use of silt fencing, straw bundles or other erosion-control devices that can significantly impede surface drainage during construction, preventing effective implementation of the recommendations above. GROUND recommends that the various measures that could be implemented to comply with applicable regulations be assessed carefully with regard to minimizing interference with effective surface drainage. Use of local, lined sumps that can be pumped regularly, for example, may be necessary to prevent uncontrolled ponding and infiltration prior to completion of fine grading.

INTERCEPTOR DRAIN SYSTEM

Because of the debris flow retention ponds upslope from the proposed buildings that commonly will act as water detention basins, development of the site should include construction of a project-wide interceptor drain system.

The interceptor drains should consist of perforated PVC collection pipe at least 6 inches in diameter, non-perforated PVC discharge pipe at least 6 inches in diameter, free-draining gravel, and filter fabric. The free-draining gravel should contain less than 5

percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. Each collection pipe should be surrounded on the sides and top only with 6 or more inches of free-draining gravel. Above the pipe, the gravel should form a vertical curtain extending to within at least 3 feet of the ground surface. The gravel surrounding the collection pipe should be wrapped with filter fabric to reduce the migration of fines into the drain system. 'Clean out' access points should be provided at intervals along the system to facilitate maintenance. A typical, cross-section detail of an underdrain as described above is provided on Figure 20.

The interceptor drains should be laid out generally as depicted on Figure 1. The actual layout, outlets, and locations of the interceptor drain should be designed by the Civil Engineer. The system should be designed so that the flow lines of the pipes are at least 7 feet below finished grades. The pipe(s) for the interceptor drain system should be graded at a sufficient slope to enable efficient discharge of collected waters to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. Design slopes should consider potential post-construction soil movements, as discussed herein, which could affect the pipes, as well.

The interceptor drain systems should be tested by the Contractor after installation and after placement and compaction of the overlying backfill to verify that the systems function properly.

SUBSURFACE MOISTURE INFILTRATION AND DRAINAGE

Common practice for residential construction as proposed for this project includes the installation of building perimeter underdrains. If properly constructed, a perimeter underdrain system can result in a reduction of moisture infiltration of the subsurface soils. However, an underdrain not properly functioning can collect or introduce water, induce settlement of the subsurface soils, and may result in structure/floor slab distress. If deep foundation systems to support the proposed building frames and floor systems are used as recommended herein, the need for perimeter drain systems is reduced. They can be beneficial as a component of project drainage design, however.

For each building supported on shallow foundations, GROUND recommends installation of perimeter underdrain systems around each building. The perimeter drains should be located approximately 10 feet out-board of the building perimeters, corresponding to the lateral limit of the recommended zone of excavation and re-placement beneath each

building. In accordance with the ADA, GROUND also recommends installation of a perimeter underdrain system around any structure with a below-grade (basement) level.

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 cause adverse wetting of the foundation soils. Therefore, wetting of the soils likely will result from infiltrating surface waters (precipitation, irrigation, etc.), and flow along constructed pathways such as bedding in utility pipe trenches. Project design should incorporate measures to prevent water from wetting the project soils. Surface drainage gradients, pavements, flatwork, piping, drainage structures, etc., should be maintained during and after construction to prevent infiltration.

It is the responsibility of the design team and Ownership as well as the construction and maintenance Contractor(s) within their respective disciplines and in accordance with their familiarity with the site conditions to evaluate the possible sources of water that could affect the project area and provide design and/or construction measures that address the conditions so that moisture is directed away from the foundations and supporting materials prior to being allowed to infiltrate the subsurface, both during and after construction. Wetting or drying of the foundation excavations and under-slab areas should be avoided during and after construction as well as throughout the life of the facility. Permitting increases/variatioins in moisture to the supporting soils may result in a decrease in bearing capacity and an increase in total and/or differential movements.

Where underdrains are incorporated into project design, the system should consist of perforated PVC collection pipe at least 4 inches in diameter, non-perforated PVC discharge pipe at least 4 inches in diameter, free-draining gravel, and filter fabric. The free-draining gravel should contain less than 5 percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. 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 should be wrapped with filter fabric to reduce the migration of fines into the drain system. 'Clean out' access points should be provided at intervals along the system to facilitate maintenance. A typical cross-section detail of an underdrain of this type is provided on Figure 19.

The actual layout, outlets, and locations of underdrains should be designed by the Civil Engineer. The pipe(s) for underdrain systems should be graded at a sufficient slope to

enable efficient discharge of collected waters to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. Design slopes should consider potential post-construction soil movements, as discussed herein, which could affect the pipes, as well. Where collection segments of the underdrain system (with gravel and perforated pipe) transition to discharge segments with solid pipe, clay or concrete cut-off walls should be installed to reduce migration of water along the discharge line trenches outside of the pipes.

All subsurface drain systems should be tested by the Contractor after installation, and after placement and compaction of the overlying backfill, to verify that the systems function properly.

PROJECT EARTHWORKS

General Considerations Based on the site topography and the extent of previous overlot grading, we anticipate only nominal cuts and fills on the order of 5 feet or less in nominal depth to complete the earthworks for the building pads and parking areas, etc.. Site grading should be reviewed and improved as necessary to provide positive surface drainage away from the buildings, and all pavements, utility alignments, and flatwork. Surface diversion features should be provided around paved areas to prevent surface runoff from flowing across the paved surfaces.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. We anticipate that the majority of on-site soils may exhibit significant pumping, rutting, and deflection at moisture contents above optimum. In addition to local plastic soils, laboratory testing indicated that the site soils generally are classified as slightly plastic silts and silty to clayey sands. In our experience, achieving and maintaining compaction in such soils can be very difficult, particularly if water contents are not monitored closely. We understand that earthwork construction on nearby areas such as Glenwood Meadows Retail Development to the east of the project experienced difficulties of this type. Locally, during subgrade preparation for pavements achieving a stable subgrade was difficult, as well. The Contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Prior to earthwork construction, 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 capped at the margins of the property.

Permanent site slopes supported by on-site soils up to 10 feet in height should be constructed no steeper than 3:1 (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. Where adequate compaction is not achieved and maintained in the soils supporting a slope, the soils will tend to relax and displace downward and outward. This can result in loss of bearing and lateral support for improvements in proximity to the slope.

Because of the potential loss of foundation bearing or lateral support due to slope relaxation or "slope creep," where building foundations or other improvements are placed within 30 feet of the principal slope face descending northward from Lot 14, a Geotechnical Engineer should be retained to evaluate the conditions on an individual case basis.

On-Site Soils The existing soils including both fill and native materials, free of landfill materials, organic materials, large cobbles and other deleterious materials are, in general, suitable for placement as compacted fill. Cobbles and rock fragments larger than 6 inches in maximum dimension will require special handling and/or placement to be incorporated into project fills. In general, such materials should be placed as deeply as possible in the proposed fills. The geotechnical engineer should be consulted regarding appropriate recommendations for usage of such materials on a case-by-case basis when such materials have been identified during earthworks. Standard recommendations that likely will be generally applicable can be found in Section 203 of the CDOT Standard Specifications for Road and Bridge Construction (2005).

Imported Fill Materials If it is necessary to import material to the site as fill, the imported soils should contain no boulders, cobbles or rock fragments coarser than 6 inches in maximum dimension, be free of claystone, organic material, and other deleterious materials. Imported material should have less than 60 percent passing the No. 200 Sieve and should have a plasticity index of less than 10.

Bulk/Shrinkage Based on comparison of measured, in-place soil densities with compaction test (Proctor) data for the project, and contractors' experience reported for

nearby projects, the existing native site soils likely will shrink during grading by approximately 10 to 16 percent. Given that more shallow soils likely will be re-worked than those at depth, GROUND suggests that a shrinkage factor of about 12 to 17 percent be used for preliminary earthwork volume calculations. We understand, however, that higher shrinkage factors have been reported in the project area, on the order of 15 to 20 percent. All such values necessarily are highly dependent upon the average depth of earthworking and the average degree of compaction achieved.

Bulking or shrinkage of existing fill soils should be limited, likely within a few percentage points of 0.

Fill Platform Preparation Prior to filling, the top 8 to 12 inches of in-place materials on which fill soils will be placed should be scarified, moisture conditioned and properly compacted in accordance with the recommendations 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. The surfaces to receive fill must be effectively stable prior to placement of fill.

Fill Placement Fill materials should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted. Soils that classify as GP, GW, GM, GC, SP, SW, SM, or SC in accordance with the USCS classification system (granular materials) should be compacted to **96 or more percent** of the maximum modified Proctor dry density at moisture contents within 2 percentage points of optimum moisture content as determined by ASTM D1557, the "modified Proctor." Soils that classify as ML, MH, CL or CH should be compacted to **at least 96 percent** of the maximum standard Proctor density at moisture contents from optimum to 3 percent above the optimum moisture content as determined by ASTM D698, the "standard Proctor."

It should be noted, however, that due to the low- to non-expansive nature of the great majority of site soils, the recommendations for moisture-conditioning the soils to within the specified ranges are intended primarily to facilitate achievement of adequate compaction. Achievement of sufficient compaction to reduce subsequent settlements is more important than the actual soil moisture increase. Therefore, although addition of significant volumes of water to the native soils and possibly some existing fill materials

will be necessary for compaction, achievement of the recommended compaction levels (and stable paving platforms) should be the Contractor's principal goal in this regard. Adjustments of acceptable ranges of moisture contents may be made in the field by the Geotechnical Engineer.

See the recommendations below, however, regarding deep fill sections, as well as those below.

No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Compaction areas should be kept separate, and no lift should be covered by another until the recommended relative compaction and moisture content are obtained.

To achieve adequate compaction near the outer faces of fill slopes, it may be beneficial to over-build the slopes and trim them back.

Because of the presence of coarse cobbles and boulders, much of the excavated site soils will require sorting or separation of the large clasts to enable the remaining material to be placed as compacted fill. (Crushing of the coarse materials to fall within the recommended size limit is acceptable, as well.) The Contractor should mobilize appropriate equipment of sufficient capability to excavate, move, process and compact the on-site soils. Because of the high percentage of coarse materials commonly present in the soils (even after removal/breakdown of boulders and coarse cobbles), the Contractor should anticipate greater than usual wear on his equipment, as well as the need to handle, stockpile and remove large boulders.

Deep Fills All fill materials placed 10 feet or more below the finished ground elevation including those portions of the recommended fill section beneath building foundations more than 10 feet below the post-tensioned slab should be compacted to the following higher relative compaction levels. (Except as modified below, the recommendations herein regarding fill placement, etc., are applicable to these deep fill sections, as well.)

- Soils that classify as GP, GW, GM, GC, SP, SW, SM or SC should be compacted to **97 or more percent** of the maximum dry density at moisture contents within 2 percent of optimum moisture content as determined by ASTM D1557.

- Soils that classify as CL, CH, ML and MH should be compacted to **at least 100 percent** of the maximum density at moisture contents within 2 percent of the optimum as determined by ASTM D698.

Settlements Settlements will occur in filled ground, typically on the order of 1 to 2 percent of the fill depth. For a 6-foot fill, this corresponds to settlements on the order of 1 inch, without imposition of foundation loads. If fill placement is performed properly and is tightly controlled, in GROUND's experience the majority of that settlement will take place during earthwork construction. The remaining potential settlements likely will take several months or longer, to be realized.

Use of Squeegee Relatively uniformly graded fine gravel or coarse sand, i.e., "squeegee," or similar materials commonly are proposed for backfilling foundation excavations, portions of utility trenches and other areas where employing compaction equipment is difficult. In general, GROUND does not recommend this procedure for the following reasons:

Although commonly considered "self compacting," uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are permeable and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

GROUND recommends that wherever possible, excavations be backfilled with approved, on-site soils placed as properly compacted fill. Where this is not feasible, use of "Controlled Low Strength Material" (CLSM), i.e., a lean, sand-cement slurry ("flowable fill") or a similar material for backfilling should be considered.

Where "squeegee" or similar materials are proposed for use by the Contractor, the design team should be notified by means of a Request for Information (RFI), so that the proposed use can be considered on a case-by-case basis.

Quality Assurance A Geotechnical Engineer should be retained to observe project excavations prior to placement of fill. The Geotechnical Engineer also should observe earthwork operations and test the soils.

It should be noted that in the later stages of large projects such as construction of the proposed mixed use buildings, multiple sub-contractors commonly are installing or adjusting/replacing components of the project simultaneously. These can range from electrical boxes to sidewalk access ramps to lighting fixtures. In order to facilitate proper observation and testing of the associated earthworks, GROUND recommends that the Contractor verify that his sub-contractors mobilize the necessary equipment and personnel to moisture-condition and compact disturbed or excavated soils quickly and effectively. The Contractor also should coordinate with his sub-contractors to ensure that these local earthwork operations are observed with sufficient frequency by the retained Geotechnical Engineer and the soils tested.

Additional Earthworks and Building Pad Caps Native soils and bedrock prepared for subsequent construction, as well as properly compacted fills, that are allowed to stand for extended periods prior to construction of buildings, pavements, etc., will degrade over time. Moisture will be lost and the soils can become eroded or loosened, or shrink back to a denser and more expansive condition. The extent of degradation will increase with time. Therefore, where these conditions arise, the Geotechnical Engineer should test the soils and provide recommendations regarding an appropriate depth of moisture-conditioning and re-compaction prior to construction. In the case of subgrade soils beneath a slab-on-grade floor, this re-compaction can be accomplished with significantly less effort prior to construction of the building shell.

Remedial earthworks by the Contractor, such as excavation and re-compaction of 1 to 3 feet of soil, may be necessary at that time to restore the prepared soils to an acceptable condition. Because the building pads are the most critical portions of the site, the following measures are recommended as an alternative to reduce the depth of re-working necessary on the pads prior to transfer of ownership and/or construction:

- 1) Additional fill should be placed on the pad to raise the grades and form a crowned cap to protect the compacted pad soils from desiccation and erosion. This cap could be removed shortly before transfer of the pad. We anticipate that only limited earthworks then would be needed to restore the pad to an acceptable state.

- 2) The cap should extend across the entire building footprint as well as the 10+ feet of re-worked ground beyond the lateral limits of the building.
- 3) At least 12 inches of material should be placed to form the cap above the compacted pad soils. In addition, the cap should be sloped to drain with a gradient of at least 2 percent.
- 4) Cap soils should be compacted to 90 or more percent of the maximum standard or modified Proctor dry density (for cohesive and granular soils, respectively) at moisture contents within 3 percent of optimum moisture content as determined by ASTM D698 / D1557.

EXCAVATION CONSIDERATIONS

Test holes for subsurface exploration were advanced to the depths indicated on the test hole logs by means of conventional, truck/track-mounted, flight auger equipment. We anticipate no unusual excavation difficulties, in general, for the proposed construction in these materials with conventional, heavy-duty excavating equipment in good working condition.

Coarse cobbles and boulders were observed on the site surface and encountered commonly in the test holes. Individual clasts up to 2½ feet in maximum dimension are common at the site. Larger boulders have been observed. The Contractor should anticipate encountering numerous cobbles and boulders in project excavations, commonly comprising at least 20 percent of the soil volume and be prepared to excavate, handle, sort and/or crush these materials. In addition, specialized breaking equipment, or limited, local blasting may be cost effective to facilitate project excavations, particularly in trenches, and to break local masses of nested cobbles and boulders. Many of the excavated clasts will be too coarse for inclusion in project fills without crushing.

As noted above, groundwater was not encountered during subsurface exploration, which reached depths as great as approximately 75 feet. Therefore, groundwater is not anticipated to be a major factor during construction of most aspects this project. However, if seepage or groundwater is encountered in project excavations, the Geotechnical Engineer should evaluate the conditions and provide additional recommendations, as appropriate

We recommend that temporary, un-shored excavation slopes up to 20 feet in height be cut no steeper than 2:1 (horizontal : vertical) in the native soils in the absence of seepage. Some surface sloughing may occur on the slope faces at this angle. Local conditions encountered during construction, such as groundwater seepage, loose, dry sand, or soft, wet materials, will require flatter slopes. Stockpiling of materials should not be permitted closer to the tops of temporary slopes than 5 feet or a distance equal to the depth of the excavation, whichever is greater.

Should site constraints prohibit the use of the recommended slope angles, then temporary shoring should be used. Shoring designed to allow the soils to deflect sufficiently to utilize the full active strength of the soils may be designed for lateral earth pressures computed on the basis of an equivalent fluid unit weight of 45 pounds per cubic foot (pcf) for a level adjacent ground condition. In addition to this lateral earth pressure, shoring design should include surcharge loads exerted by equipment, traffic, material stockpiles, etc. Actual shoring system(s) should be designed for the Contractor by a registered engineer.

Effective surface drainage should be provided around temporary excavation slopes to direct surface runoff away from the slope faces. A properly designed drainage swale should be provided at the top of the excavations. Temporary slopes will erode readily if water is allowed to flow over the slope faces. Erosion along the slopes will result in sloughing and could lead to a slope failure. In no case should water be allowed to pond at the site.

Excavations in which personnel will be working must comply with all 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 above solely as a service to Total Merchant Services, and is not assuming responsibility for construction site safety or the Contractor's activities.

UTILITY INSTALLATION

Recommendations regarding utility trench excavation are provided in the *Excavation Considerations* section of this report. On-site soils excavated from trenches are suitable, in general, for use as trench backfill. Backfill soils should be free of boulders, vegetation, debris and other deleterious materials. Cobbles coarser than 6 inches in maximum dimension should not be incorporated into trench backfills.

Trench backfill materials should be properly moisture-conditioned and compacted in accordance with the recommendations in the *Project Earthworks* section of this report. Some settlement of trench backfill materials should be anticipated, even where materials are placed and compacted correctly.

The Contractor should take adequate measures to achieve adequate compaction in the utility trench backfills, particularly in the lower portions of the excavations. Some settlement of trench backfill materials should be anticipated, even where materials are placed and compacted correctly. The Contractor should take particular care to achieve and maintain adequate compaction of the backfill soils around manholes, valve risers and other vertical pipeline elements where greater settlements commonly are observed. Use of "Controlled Low Strength Material" (CLSM), i.e., a lean, sand-cement slurry ("flowable fill") or a similar material should be considered in lieu of compacted soil backfill for areas with low tolerances for surface settlements. Placement of CLSM in the lower portions of the excavations and around risers, etc., likely will yield a superior backfill, although at an increased cost.

Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. The Contractor should not anticipate that significant volumes of excavated site soils will be suitable for use where free-draining materials are called for as pipe bedding. Materials proposed for use as pipe bedding should be tested for suitability prior to use. Imported materials should be tested and approved by the Geotechnical Engineer prior to transport to the site.

We assume that surface drainage will direct water away from trench alignments. Nevertheless, non-woven filter fabric (e.g., Mirafi® 140N or the equivalent) should be placed around granular bedding materials to reduce migration of fines into the bedding.

Sandy pipe bedding materials can function as efficient conduits for re-distribution of natural and applied waters in the subsurface. Clay or concrete cut-off walls or, as necessary, drains should be installed in utility trenches to reduce the rates and volumes of water transmitted to the building foundation soils. Cut-off walls should be spaced no more than 200 feet apart on generally east – west -oriented alignments (parallel to elevation contours) and no more than 100 feet apart on north – south (uphill – downhill) -oriented alignments. These measures also will reduce the risk of loss of fine-grained backfill soils into the bedding material with resultant surface settlement.

Utility lines should be sealed and the seals checked prior to backfilling. Checks for leakage and appropriate maintenance should be performed regularly. Utilities other than drains should enter the building interior as immediately as possible, and no more than 5 feet from the building perimeter. Longer utility runs increase the risk of settlements related to trench backfills, can facilitate distribution of water beneath the building, and increase repair difficulties.

Ground-Penetrating Radar The City of Glenwood Springs required ground-penetrating radar (GPR) surveys along the public wet utility alignments below the public streets at the Glenwood Meadows retail development to assess the potential presence of voids in the subsurface. GROUND provided those surveys during construction of that project. Based on conversations with the City, we anticipate that similar surveys may be required along public streets serving the Glenwood Meadows Lot 14. In order to maximize effectiveness of the GPR, we suggest that to the extent possible, required surveys be performed after cuts along the alignments are made, but prior to significant filling (i.e., when alignments are at the lowest elevations).

EXTERIOR FLATWORK

Proper design, drainage, construction and maintenance of the areas between individual buildings and hardscape 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. Multiple subcontractors, with light or hand equipment, often perform subsequent landscaping and hardscape installation. This results in necessary over-excavation and soil processing and compaction not being performed. Consequently, subgrade soil conditions commonly deviate significantly from recommended ranges. Therefore, GROUND recommends that the Contractor take particular care with regard to proper subgrade preparation in the immediate building exteriors.

As recommended in the Project Earthworks and Surface Drainage sections of this report, positive surface drainage away from all pavements and flatwork should be

included in project design. Proper drainage also should be maintained after completion of the project, and re-established as necessary.

Exterior flatwork and other hardscaping placed on the clayey soils encountered on-site likely will experience post-construction movements due to the expansive nature of those soils and the relatively light loads that they impose. Both vertical and lateral soil movements can be anticipated as clay mineral particles swell and shrink as the soils are wetted and dried. Distress to rigid hardscaping likely will result.

The most positive means to reduce distress to these elements is to support them on foundations in the same manner as the building. Other mitigative measures could include casting flatwork over a 12-inch or thicker void form and pinning the flatwork to the building grade beams, or development of an accelerated maintenance and replacement schedule, anticipating post-construction movements and distress.

Where deep foundations are not utilized to support exterior improvements, the following measures will help to reduce damages to these improvements.

- 1) Shortly before installation, the subgrade soils beneath project sidewalks, paved entryways and patios, masonry planters and short, decorative walls, and other flatwork should be excavated and/or scarified to a depth of 36 or more inches. The excavated soil should be replaced as properly moisture-conditioned and compacted fill as outlined in the *Project Earthworks* section of this report, in order to reduce the magnitude of potential movements. Greater depths of moisture-density conditioning of the subgrade soils beyond the above minimum, as indicated for the pavements, will improve hardscape performance.
- 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. As in the case of pavements, passing a proof roll is an additional requirement to placing and compacting the subgrade fill soils within the recommended ranges of moisture content and relative compaction presented in the *Project Earthworks* section of this report.

- 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 2 inches of 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.

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 (“frost heave”) in sustained cold weather up to 2 inches or more. This heaving can develop relatively rapidly. Much of this movement typically is recovered when the soils thaw, but due to loss of soil density, some degree of displacement commonly 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 3 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 recommendations 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. The relative risks from these soil conditions should be taken into consideration where frost heave is a concern. GROUND will be available to discuss these concerns upon request.

Where soils supporting foundations or on which foundation will be placed are exposed to these conditions 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.

The site soils include low plasticity silts as well as some clays and fine sands that due to their capillarity appear vulnerable to frost heave where an underlying source of water is present. Groundwater was not encountered to the depths explored, however. Therefore, if surface drainage is effective, the likelihood of movement of pavements, flatwork and other hardscaping is relatively low. However, if other source(s) of water develop and are not drained effectively, frost heave may develop.

Effects of Slope Creep In addition, the potential effects of gradual, incremental downward and outward movements of the embankment soils ("slope creep") on all improvements near the top-of-slope should be considered in project maintenance plans. Pavements, curbs-and-gutters, fences, screen walls, pilasters, light poles, etc., all will tend to be affected by these on-going soil movements, even where slopes are supported by firm native soils or properly compacted fill soils. Effective surface drainage, erosion control and timely maintenance of both the slope and the improvements above the slope will reduce the damages resulting from slope creep, but cannot eliminate them.

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. Pavement sections for private parking and driveways, as well as public streets comprising a part of the project, were developed in general accordance with the design guidelines and procedures of the American Association of State Highway and Transportation Officials (AASHTO), the Colorado Department of Transportation (CDOT) as well as local road construction practices. For public streets, the recommended pavement sections also reflected general accordance with the design guidelines and procedures of the City of Glenwood Springs.

Subgrade Materials Based on the results of our field and laboratory studies, the shallow subgrade materials in the proposed pavement areas consisted predominantly of fill material that was silty to clayey sands, with gravel commonly. These materials were classified typically as A-2-4 and A-4 soils in accordance with the AASHTO classification system, with Group Index values of 0. Resilient Modulus (M_R) testing (AASHTO T-307) was performed on a representative composite sample of the subgrade materials encountered at the site. The material was compacted to 95 percent of maximum dry density at moisture contents of optimum, two percent above optimum, and four percent

above optimum moisture content based on AASHTO T-99 (the "standard Proctor") for cohesive soils, or AASHTO T-180 (the "modified Proctor") for granular soils. For the sandy site soils, a resilient modulus of 7,806 psi obtained at the optimum moisture content was taken as characteristic of the subgrade materials and used for development of the pavement sections. It is important to note that significant decreases in soil support as quantified by the resilient modulus have been observed as the moisture content increases above the optimum.

Anticipated Traffic Specific traffic loadings were not available at the time of this report preparation. Therefore, an 18-kip equivalent daily load application (EDLA) value of 3 was assumed for development of the pavement structure for automobile parking stall areas. An EDLA of 10 was assumed for project driveways and 30 for any public streets within the project. The EDLA values of 3, 10 and 30 were converted to 18-kip equivalent single axle (ESAL) values of 21,900, 73,000 and 219,000, respectively, for 20-year design lives. An EDLA of 30 also was assumed for trash collection zones and other areas subject to heavy truck traffic. If design traffic loadings differ significantly from these assumed values, GROUND should be notified to re-evaluate the pavement recommendations below.

Pavement Sections The soil resilient modulus and the assumed ESAL values were used to determine the required structural number for the project pavements. The required structural number was then used to develop recommended pavement sections. Pavement sections were based on the DARWin™ computer program that solves the 1993 AASHTO pavement section equation. Pavement parameters and calculations are summarized in Appendix A. Structural coefficients of 0.40 and 0.12 were used for high quality asphalt and aggregate base course, respectively. A Reliability Level of 75 percent was utilized for design of the private pavement sections; a Reliability Level of 90 percent was used for public streets.

The minimum pavement sections recommended by GROUND for the project are tabulated below. As indicated, trash collection areas as well as other pavement areas subjected to high turning stresses or heavy truck traffic should be provided with rigid (portland cement concrete) pavements.

Recommended Minimum Pavement Sections

<i>Location</i>	<i>Full Depth Asphalt (inches Asphalt)</i>	<i>Composite Section (inches Asphalt / inches</i>
-----------------	--	---

Glenwood Meadows Lot 14
Glenwood Springs, Colorado

		<i>Aggregate Base)</i>
Driveways	5	4 / 6
Automobile-Only Parking	4	-
High Turning Stresses & Heavy Vehicle Traffic	6 inches of portland cement concrete	
Public Streets	6½	4 / 8

For superior performance, concrete sections should be underlain by 6 inches of properly compacted aggregate base.

Private 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 areas of repeated turning stresses we recommend that the concrete pavement joints be fully tied and doweled. We suggest that civil design consider joint layout in accordance with CDOT's M standards, found at the CDOT website: <http://www.dot.state.co.us/DesignSupport/>.

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 design requirements of the City of Glenwood Springs.

Concrete pavements 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 design requirements of the City of Glenwood Springs. Concrete should have a minimum modulus of rupture of third point loading of 650 psi. Normally, concrete with a 28-day compressive strength of 4,000 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.

If composite flexible sections are placed, the aggregate base material should meet the criteria of CDOT Class 6 aggregate base course. Base course should be placed in uniform lifts not exceeding 8 inches in loose thickness and compacted to at least 95

percent of the maximum dry density a uniform moisture contents within 3 percent of the optimum as determined by ASTM D1557 / AASHTO T-180, the "modified Proctor."

Subgrade Preparation The pavement subgrade soils should be excavated and replaced with properly moisture-conditioned and compacted fill. To reduce the potential for consolidation and settlements somewhat, as well as any local potentials for heave, excavation and replacement should be undertaken to a depth of 36 inches beneath the pavement sections. Subgrade preparation should extend the full width of the pavement from back-of-curb to back-of-curb. As recommended in the *Exterior Flatwork* section of this report, sidewalks and other hardscaping should be underlain by at least 36 inches of properly moisture conditioned and compacted fill. If a significant time lag ensues between overlot grading and paving, e.g., several months or more, some re-working of the shallow soils may be necessary shortly prior to paving. In such cases, scarification, moisture conditioning and re-compaction to a depth of 8 to 12 inches likely will be appropriate. Performing GPR surveys along public street alignments as discussed in the *Site Conditions* section of this report should be coordinated with street subgrade preparation to accomplish both efficiently.

Some post-construction movements of the pavements should be anticipated. Grades should be restored in areas of local settlement to re-establish surface drainage. A greater depth of excavation and replacement will result in improved pavement performance over its design life. Recommendations in this regard can be provided upon request.

Soils that classify as A-1 through A-5 (granular soils) should be compacted to 95 or more percent of the maximum modified Proctor dry density within 2 percent of the optimum moisture content as determined by ASTM D1557 / AASHTO T-180. Soils that classify as A-6 and A-7 (cohesive materials) should be compacted to 95 or more percent of the maximum standard Proctor density at moisture contents from 1 percent below the optimum to 3 percent above optimum moisture content as determined by ASTM D-698 / AASHTO T-99.

The Contractor should be prepared either to dry the subgrade materials or moisten them, as needed, prior to compaction. Some site soils likely will "pump" or deflect during compaction if moisture levels are not carefully controlled, particularly the silts and silty sands. The Contractor should be prepared to process and compact such soils to

establish a stable platform for paving, including use of chemical stabilization, if necessary.

Where adequate drainage cannot be achieved or maintained, a greater depth of excavation and replacement is recommended, in addition to the edge drains recommended below.

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 stabilized. Areas allowed to pond prior to paving will require significant re-working prior to proof-rolling. Passing proof-rolling is an additional requirement for pavement subgrade soils; it may be possible for soils to be compacted within the limits indicated in the *Project Earthworks* section of this report and fail proof-rolling, particularly in the upper range of recommended moisture contents.

Planter Drains We understand that the parking areas may have "islands" planted with, flowers, shrubs and trees. Infiltration of irrigation water in planters adjacent to pavements and in islands within paved areas should be carefully controlled or differential heave and/or rutting of the nearby pavements will result. Drip irrigation systems are recommended for such planters to reduce over-spray and water infiltration beyond the planters. GROUND recommends enclosing the soil in the planters with plastic liners and providing them with positive drainage or providing the planters with underdrains.

The planter drains should consist of perforated PVC drain pipe at least 3 inches in diameter, free-draining gravel, and filter fabric. We recommend use of rigid drain piping rather than flexible piping to better insure that proper drainage gradients are maintained. The free-draining gravel should contain less than 5 percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. Each drain pipe should be surrounded with 4 or more inches of free-draining gravel. The gravel surrounding the drain pipe should be wrapped with filter fabric to reduce the migration of fines into the drain system. The underdrains should be located at sufficient depth to accommodate the anticipated plantings. The pipes for the planter drain systems should be graded at a minimum slope of 1 percent to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge.

The island / planter drain systems should be tested by the Contractor after installation and after placement and compaction of the overlying backfill to verify that the systems function properly.

We understand, however, that provision of such an extensive drainage system may not be not feasible for this project. Therefore, GROUND suggests where these measures cannot be implemented, the plantings should be selected to minimize the necessary irrigation and a program of maintenance be implemented to repair the resultant distress.

Where islands and other planters near pavements are not provided with underdrains, we suggest that they and the plantings in them be underlain with a layer of relatively densely compacted fill at least 2 feet in thickness beneath the root balls to reduce water infiltration. The more densely compacted fill soils should extend at least 2 feet laterally beyond the limits of the islands. General recommendations for fill placement and compaction are provided in the *Project Earthworks* section of this report. Granular fill soils (classified as GP, GW, GM, GC, SP, SW, SM or SC) for this purpose should be compacted to 97 or more percent of the maximum 'modified Proctor' dry density at moisture contents within 2 percent of optimum moisture content as determined by ASTM D1557. Soils that classify as ML, MH, CL or CH (cohesive soils) should be compacted to 100 percent of the maximum standard Proctor density at moisture contents from optimum to 3 percent above the optimum moisture content as determined by ASTM D698.

Additional Observations The collection and diversion of surface drainage away from paved areas is extremely important to satisfactory performance of the pavement. The subsurface and surface drainage systems should be carefully designed to ensure removal of the water from paved areas and subgrade soils. 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 curb, gutter, and sidewalk. Unless the interceptor drain and edge drains (where included) are installed properly and maintained, and site drainage in general is well maintained, there is an increased risk of poor pavement performance at this site due to the expansive subgrade materials and the local introduction of off-site irrigation water.

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 recommended 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. Where the subgrade soils are expansive, wetting also typically results in increased pavement heave. In relatively flat areas where design drainage gradients necessarily are small, subgrade settlement or heave 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. This 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. In areas where the maintenance traffic is turning, concrete pavement is recommended.

As noted above, the standard care of practice in pavement design describes the recommended flexible pavement section as a "20-year" design pavement; however, most pavements will not remain in satisfactory condition 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, GROUND recommends that an effective program of regular maintenance 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.

A crack sealing and 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.

CLOSURE

Geotechnical Review The poor performance of many pavements, foundations and subsurface structures has been directly attributed to inadequate geotechnical review and earthwork quality control. Therefore, project plans and specifications should be reviewed by the Geotechnical Engineer to evaluate whether they comply with the intent of the recommendations in this report. This review should be reported in writing.

Project earthwork construction operations should be observed by the Geotechnical Engineer. All excavations should be observed by the Geotechnical Engineer prior to placement of fill or backfill soils, installation of shoring, or foundation construction. Placement of fill/backfill soils should be observed by the Geotechnical Engineer, and the soils tested.

The geotechnical recommendations presented in this report are highly contingent upon observation and testing of project earthworks by representatives of GROUND. If another geotechnical consultant is selected to provide construction observation and quality control, then that consultant must assume all responsibility for the geotechnical aspects of the project by concurring in writing with the recommendations in this report, or by providing alternative recommendations.

Limitations This report has been prepared for Total Merchant Services, as it pertains to design and construction of the subject mixed use project as described herein. It may not contain sufficient information for other parties or other purposes. In addition, GROUND has assumed that project construction will commence by Autumn, 2008. Changes in project plans or schedule should be brought to the attention of the

Geotechnical Engineer, in order that the geotechnical recommendations may be re-evaluated and, as necessary, modified.

The geotechnical conclusions and recommendations in this report relied upon subsurface exploration at a limited number of exploration points, as shown on Figure 1. Subsurface conditions were interpolated between and extrapolated beyond these locations. Findings were dependent on the limited amount of direct evidence obtained at the time of this geotechnical evaluation. Our recommendations were developed for site conditions as described above. Actual conditions exposed during construction may be anticipated to differ, somewhat, from those encountered during site exploration. If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, the Geotechnical Engineer should be advised at once, so that re-evaluation of the recommendations may be made in a timely manner. In addition, a Contractor who relies upon this report for development of his scope of work or cost estimates may consider 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. In such cases, the Contractor should obtain the additional geotechnical information that he considers necessary to develop his workscope and cost estimates with sufficient precision.

Collapsible earth materials are present on the project site. These materials can shrink significantly if their moisture content is increased. The collapse potential of site soils can vary significantly, both laterally and vertically. Changes in moisture can occur irregularly, as well, resulting in conditions that cannot always be predicted.

The recommendations presented in this report are based on the current state-of-the-art for improvements placed on collapsible earth materials. The Owner should be aware that there are risks in construction on these types of soils. Performance of the proposed structures and pavements will depend on implementation of the recommendations in this report and on proper maintenance after construction is completed. Because water is the principal cause of volume change in expansive soils and rock, it is necessary that the changes in moisture content be kept to a minimum. Any indications of distress to project installations should be brought to the attention of the Geotechnical Engineer.

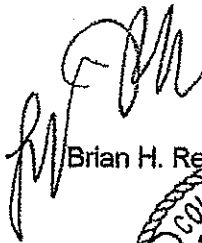
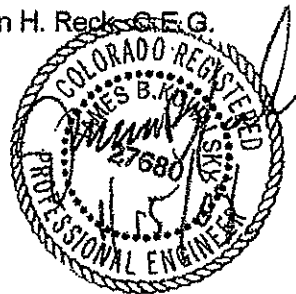
This report was prepared in accordance with generally accepted soil and foundation engineering practice in the Garfield County, Colorado, area, at the date of preparation.

Glenwood Meadows Lot 14
Glenwood Springs, Colorado

GROUND makes no other warranties, either express or implied, as to the professional data, opinions or recommendations contained herein.

Sincerely,

Ground Engineering Consultants, Inc.


Brian H. Reck, G.E.G.


Reviewed by James B. Kowalsky, P.E.



LAND USE APPLICATION

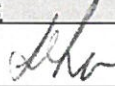
City of Glenwood Springs
Economic and Community Development Dept.
101 West 8th Street
Glenwood Springs, CO 81601
970-384-6411

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	
Boldt / Glenwood Springs Properties, LLC		Centura Ventures, LLC	
Relationship to Owner		Owner	
Purchaser			
Applicant Address		Owner Address	
1110 N Old World 3rd Street	Suite 610, Milwaukee, WI 53203	9100 E Mineral Circle	Englewood, Colorado 80112
Phone 414-276-4635	Email Address jake.garro@boldt.com	Phone	Email Address

Property Information:	
Address	Parcel Number
Wulfsohn Road	2185-053-38-014
Subdivision	Lot and Block Number
Glenwood Meadows No. 2	Lot: 14
Zone District M1	Existing Land Use Vacant

General Project Description:
See attached

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.	 Applicant	12/21/18 Date
	 Owner	12/21/18 Date
	Owner	Date
	Owner	Date



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Planning Item #03-18 - Request for Storage Improvements at the Glenwood Springs Municipal Airport, 1172 County Road 116

Action Requested: Planning Item #03-18 - Request for Storage Improvements at the Glenwood Springs Municipal Airport, 1172 County Road 116

Department: Economic and Community Development

Presented By: Trent Hyatt, Senior Planner

Background Info: On the January 4, 2018 City Council agenda, under Citizens Appearing, Njord Rota approached Council with a proposal to install a number of temporary storage containers to support existing business at the Glenwood Springs Municipal Airport property. At that time Mr. Rota was directed to work with staff on a solution. Mr. Rota had first approached the Airport Commission with the idea at their December 2017 meeting. Following said meeting, Mr. Rota began preliminary discussions with City staff on how to move forward with the proposal but never officially submitted an application until recently or signed a lease with the City. Since quite a bit of time has passed, Staff would like to update Council on the details and history of the proposal as well as seek direction on how to proceed.

Issues: The current request is to place five (5) - 8 foot by 40 foot by 8.5 foot tall storage containers (commonly referred to as CONEX containers) on the airport property in one of the two areas outlined on the attached site plan titled "Glenwood Springs Aviation Business Storage Solution". Additional details regarding the proposal and the design of a typical container are attached.

Mr. Rota and other existing and prospective airport users would prefer to construct additional hangar space to accommodate more storage and operation needs. However, the City has been reluctant to allow further development at the site due to uncertainty surrounding the South Bridge project as well as the ongoing Scenario Planning Project (scheduled for completion by the end of the year).

Lease

Currently, all private use of public airport property owned by the City is permitted via one year term leases renewed annually. Each owner which bases their plane, currently 69 total, at the airport pays the City \$575 each year to lease/rent the space.

In an effort to support existing businesses without requiring the construction of expensive permanent hangars, storage containers are proposed as an option to meet temporary needs. In order to allow for the additional storage, the City will need to agree to lease terms for the applicable space. A draft lease was provided to the applicant previously and is attached. Staff is interested in whether or not City Council desires to address the applicant's need for temporary storage by entering into a new lease agreement?

Process

Two land use processes could apply to the review of the proposal: 1) an administrative Site/Architectural Plan Review or 2) a Location and Extent Review. Details of each are addressed below.

Site/Architectural Plan Review

Generally, a Site/Architectural Plan Review process as outlined in Section 070.060.050 of

the *Glenwood Springs Municipal Code* (Code) would apply to private development. Each storage unit is approximately 320 square feet, for a total of 1,600 square feet, which is well below the 10,000 square foot threshold which allows for administrative staff level review. While this would allow for a fairly expedient review of the proposal, staff is concerned that a CONEX container is not in compliance with the Nonresidential and Mixed- Use Site and Building Design Standards of Section 070.040.0910(e) of the Code. Any part of the proposal not in compliance with the Code requires a variance from the Planning and Zoning Commission. However, screening of the containers with fencing and/or landscaping is also an option.

Location and Extent Review

Another way the proposal can advance is via a Location and Extent Review as outlined in Section 070.060.050(d) of the Code. This is a review process for projects proposed by public or quasi-public entities as provided for by Colorado Revised Statutes 30-28-110 and 22-32101 et seq. However, this process would require the City to be the formal applicant of the application. Location and Extent review applications are reviewed by the Planning and Zoning Commission for compliance with the *Glenwood Springs Comprehensive Plan* only and not strict compliance with all requirements of the Code. Staff is concerned about not requiring the applicant to adhere to various Code requirements as we have traditionally done with even our own projects such as the new storage building at the wastewater treatment plant.

Special Use Permit

"Airport/aviation-related business" is identified as a special use in the Table of Allowed Use, Section 070.030(e)/Table 030.1 of the Code. However, the proposal is not expected to increase or businesses to the airport but to support those which currently operates at the site. Therefore, staff does not believe a special use permit is required for the current proposal.

Staff Recommendation:

At this time, staff is requesting direction from City Council on how to proceed with the applicant's request. More specifically, does City Council desire for staff to move forward with the current request by formalizing a lease for additional storage at the Glenwood Springs Municipal Airport? If so, which process would Council like for the applicant and staff to follow: 1) site/architectural plan review or 2) a location and extent review with the City being the applicant?

Property Description:
A tract of land situate in Sections 22 and 27, Township 6 South, Range 89 West of the 6th Principal Meridian
being more particularly described as follows:
Beginning at a point whence the witness corner to the North 1/4 corner of said Section 27 bears S.21°52'50".W 134.17 feet; thence, N.63°47'58".E, 61.83 feet along the south line of Parcel 3, Second Amended Plat of Glenwood Limited Subdivision, City of Glenwood Springs, County of Garfield, State of Colorado, to the south and west boundary of said City of Glenwood Springs; thence along said south and west boundary of Park East Subdivision the following two (2) courses:
N.63°47'58".E, 368.17 feet;
S.26°55'02".E, 1624.90 feet;
thence S.
62°58'58".W, 152.19 feet along the north line of a tract of land described in that document recorded as Reception no. 249318 of the records of the Clerk and Recorder of Garfield County, Colorado; thence leaving the north line of said tract of land S.
30°19'00".E, along the west line of said tract of land 1,261.14 feet;
thence leaving the west line of said tract of land S.
30°19'00".E, along the west line of a tract of land described in that document recorded as Reception no. 185182 of the records of the Clerk and Recorder of Garfield County, Colorado 444.35 feet to a point the boundary of that property described in that document recorded as Reception no. 220844 of the records of the Clerk and Recorder of Garfield County, Colorado; thence leaving the west line of said tract of land along the boundary of said property the following two (2) courses:
S.01°40'00".W 211.72 feet to the easterly right of way line of a 300 foot airport Runway Strip;
S.26°14'20".E 98.03 feet along said easterly right of way to a point on the boundary of that property described in that document recorded as Reception no. 852205 of the records of the Clerk and Recorder of Garfield County, Colorado;
Thence along said property boundary the following two (2) courses:
S.26°14'20".E, 66.92 feet along said easterly right of way;
N.63°45'40".E, 138.95 feet to the center of the Roaring Fork River;
thence along the center of the Roaring Fork River the following 5 courses:
S.14°00'00".W, 144.21 feet;
S.07°56'00".W, 1,269.47 feet;
S.04°23'44".W, 515.52 feet;
S.09°46'19".W, 306.38 feet;
S.00°30'15".W, 226.32 feet to the south line of said Section 27;
thence N.88°21'55".W 278.44 feet along said south line to the E1/16 corner between Section 27 and 34; thence, N.
01°28'11".E, 1751.84 feet along the west line of the SE 1/4 of said Section 27 to a point being 50 feet easterly of the center of the Midland Railroad; thence 2246.84 feet along a non-tangent curve to the left having a radius of 3175.36 feet and a central angle of 40°32'30" with a chord bearing of N.
27°49'16".W and a chord distance of 2200.26 feet along a line 50 feet easterly of the center of the Midland Railroad; thence, N.
34°40'24".E, 53.52 feet along the easterly line of a tract of land described in Book 719 at Page 736 of said Garfield County records to the south line of a Replat of a portion of the Town site of Cardiff, County of Garfield, State of Colorado; thence along the boundary of said Replat of a portion of the Townsite of Cardiff the following courses seventeen (17):
S.86°48'33".E, 145.14 feet;
S.02°32'15".W, 1.61 feet;
S.87°51'18".E, 61.61 feet;
N.88°13'34".E, 48.65 feet;
S.88°44'32".E, 14.89 feet;
S.87°38'18".E, 59.90 feet;
N.00°08'42".E, 32.77 feet;
N.86°48'25".E, 62.16 feet;
N.27°42'36".W, 132.45 feet;
N.00°08'42".E, 12.57 feet;
N.89°51'18".W, 9.51 feet;
N.26°11'18".W, 22.70 feet;
63.28 feet along a tangent curve to the left having a radius of 27.34 feet and a central angle of 132°36'29" with a chord bearing of S.87°30'27".W and a chord distance of 50.07 feet;
N.87°16'18".W, 2.92 feet;
N.02°09'14".E, 115.93 feet;
N.10°02'27".W, 31.46 feet;
N.89°51'18".W, 16.64 feet;
thence leaving said boundary of a Replat of a portion of the Townsite of Cardiff on a course bearing N.26°44'02".W, 381.09 feet along the west line of a tract of land described in Book 347 at Page 98 of said Garfield County records; thence, N.26°54'02".W 1267.29 feet along the west line of said tract of land described in Book 347 at Page 98; to the point of beginning.
Containing 2,658,830 sq.ft., or 61.038 acres more or less

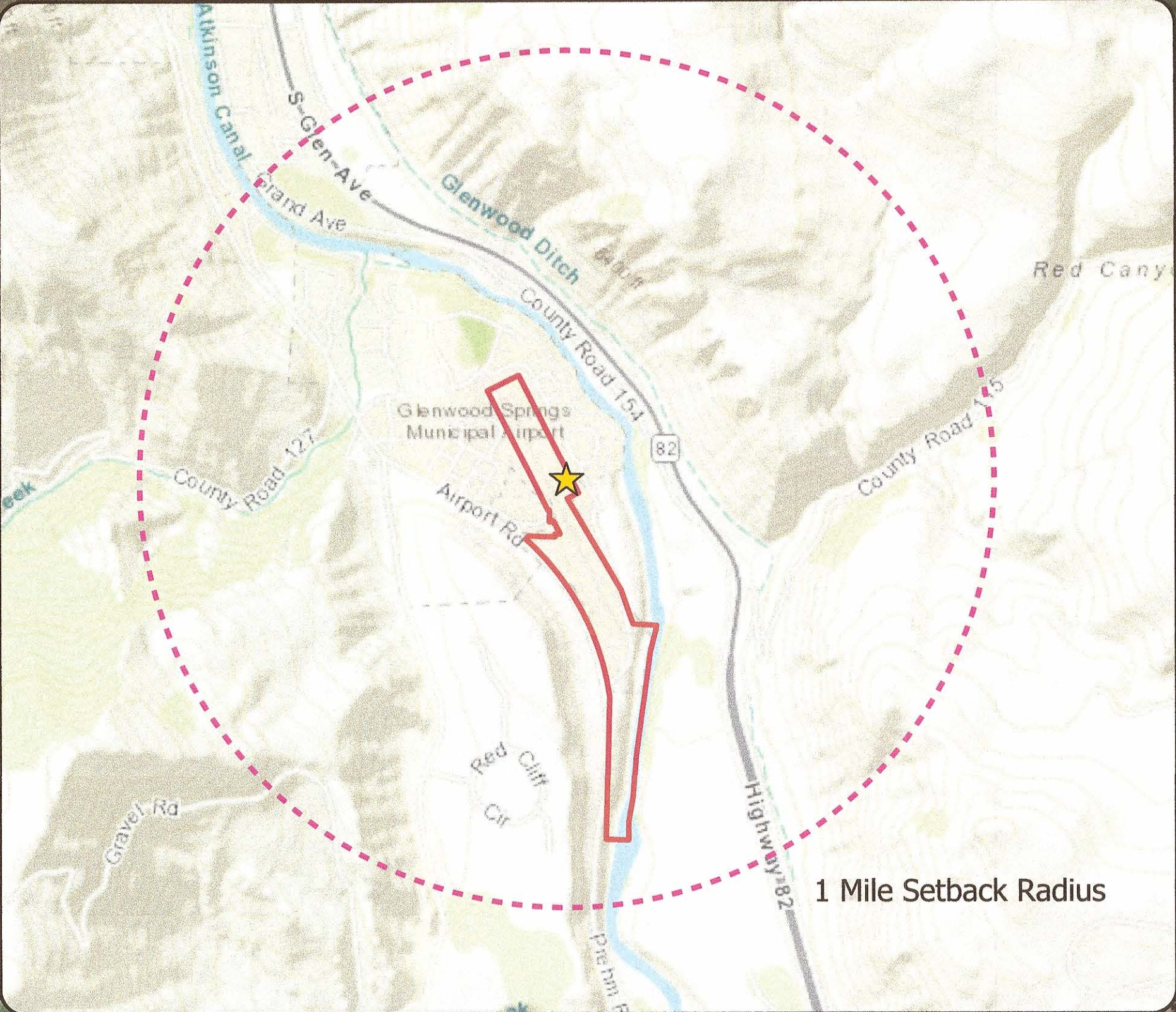
Notes:
1. Contour data is derived from a 2009, City of Glenwood Springs aerial flight. Contour accuracy is reported to be 1'. In this mapping contours should be utilized for reference only as no on-the-ground verification was performed.

SGM
118 W. Sixth St., Suite 200
Glenwood Springs, CO 81601
970.945.1004
www.sgm-inc.com

**Glenwood Springs Aviation Business
Storage Solution**
Glenwood Springs, CO

Date:	3/27/2019	Job No.	2018-450.001	Map by:	NCT
Coordinate System:	City of Glenwood Springs Local Coordinate System			Projection:	Transverse Mercator
Data Sources:	City of Glenwood Springs, ESRI, Garfield County			Page:	1 of 1
File:	I:\2018\2018-450-AirportProperty\001\H-Dwgs\GIS\MXDs\AirportExhibit\AirportExhibit.aprx				
The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.					

1 inch equals 200 ft.



GLENWOOD SPRINGS AVIATION BUSINESS STORAGE SOLUTION

The Glenwood Springs Airport is home to multiple small aviation businesses. These businesses rely on airplanes and helicopters being able to fly in order to remain viable businesses. It takes more than just fuel and ramp space to safely and effectively fly aircraft – it takes spare parts, consumables, tools, and extensive Ground Support Equipment (GSE) to support these aircraft. There is currently a sky diving business, an aviation maintenance business, flight instruction, and two helicopter companies in need additional storage space. Unfortunately, there is an acute lack of hangar and storage space available at the Glenwood Springs Airport to meet this need. Additionally, there has been interest from community general aviation pilots as well for such a space. Due to a building moratorium in South Glenwood Springs, potentially new hangar and storage areas have been delayed until further resolution is made.

The intent of this whitepaper is to propose allowing the lease of ground space for the purpose of installing temporary storage containers on the Glenwood Springs Airport to alleviate this condition. RAVCO proposes installing five (5) forty-foot metal shipping containers on the airport. These shipping containers are temporary, modular, and easily transportable – creating a rapid temporary solution to an urgent need. RAVCO is prepared to purchase, install, sublease, and manage these storage containers as well as remove them once adequate facilities are constructed at a future date.

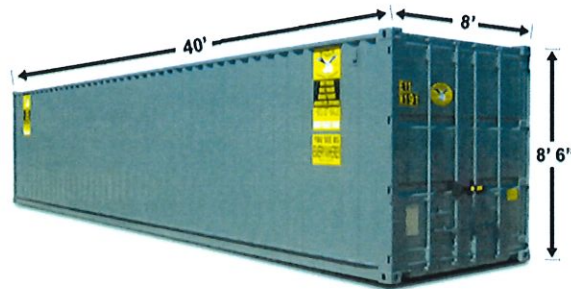


Figure 1 - 40-foot shipping container

RAVCO proposes locating the storage units on the East side of the airport (see map on next page). This area is currently occupied by other hangar and ad-hoc storage spaces. The units would be clustered together in a "5 across" configuration, creating a solid 40' by 40' footprint. At least two of the containers would be divided into 20-foot sections, resulting in creating space for at least 7 users. The lease agreements could stipulate that the containers would be used exclusively for the purpose of furthering aviation activities at the Glenwood Springs.

For further information, please contact Njord Rota, CEO at njord@ravco or (970) 366-6600 for further information.



Figure 2 Glenwood Springs Airport

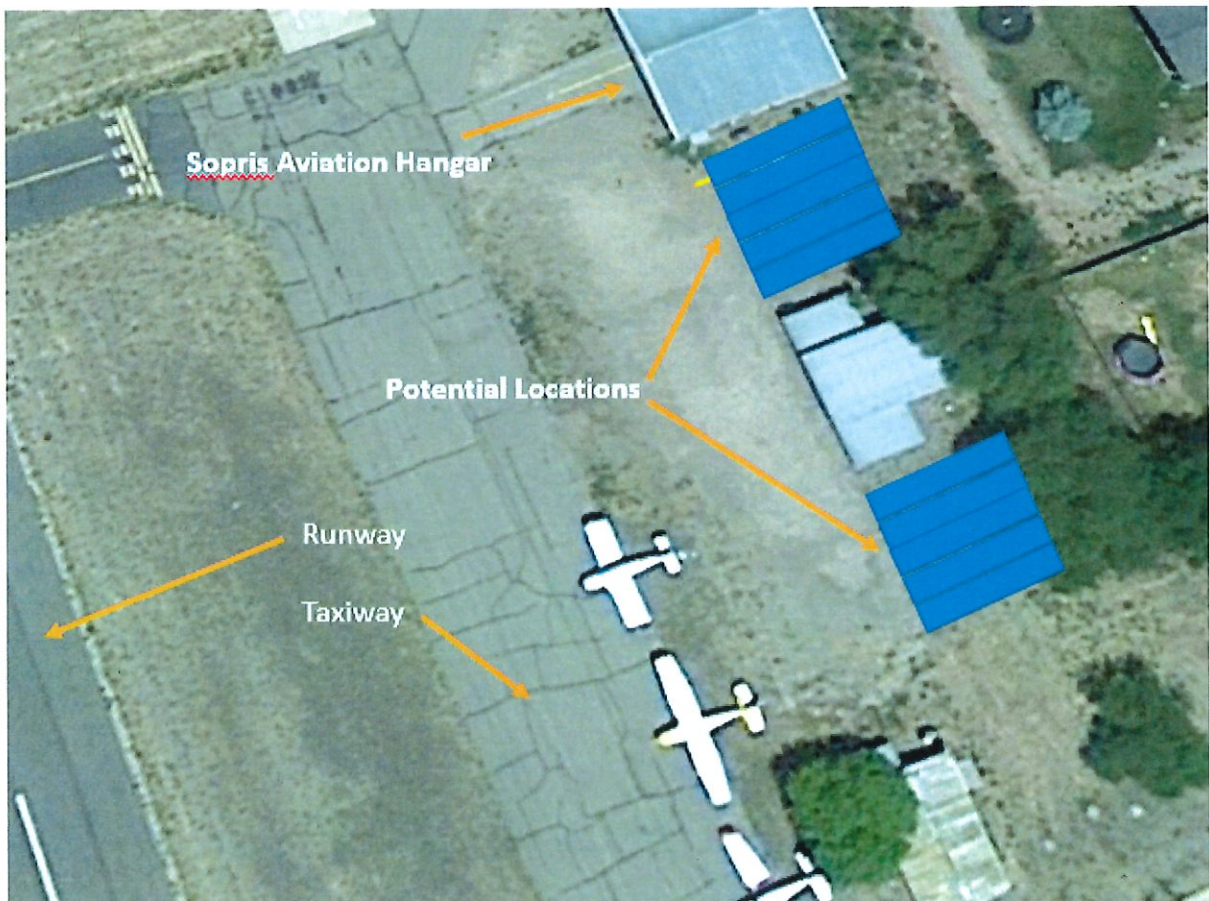


Figure 3 Potential Location Sites

AIRPORT LAND LEASE AGREEMENT

THIS AIRPORT LAND LEASE AGREEMENT (this "Lease") is entered into between the CITY OF GLENWOOD SPRINGS, a Colorado home-rule municipality (the "City"), and ROTA AVIATION CONSULTING d/b/a "RAVCO", a Colorado limited liability company (also referred to herein as the "Lessee"), to be effective March 15, 2018, regardless of the date on which the Parties actually affix their signatures.

WITNESSETH, the City, for and in consideration of the rents and covenants contained herein, does hereby lease to the Lessee the premises described herein and at the Glenwood Springs Municipal Airport.

1. Application Processing. The City and RAVCO regard the location of temporary shipping containers at the Glenwood Springs Municipal Airport to be for the mutual benefit of the Parties and other parties using the Airport. The City shall act as applicant in seeking the necessary land use approvals under the appropriate processes of the Glenwood Springs Municipal Code. RAVCO shall provide to the City any and all supporting documentation reasonably necessary to the completion and presentation of such application to applicable reviewing authorities. The City makes no representation that the application will be approved. If approved, the placement of any shipping containers at the Glenwood Springs Municipal Airport by RAVCO, shall be at RAVCO sole expense.

2. Leased Premises. The leased premises shall be used for the purpose of locating _____ 40-foot shipping containers at the Glenwood Springs Municipal Airport in the area generally depicted on **Exhibit A**. Such shipping containers shall have approximate overall dimensions of 40' in length, 8' in width, and 8'6" in height and shall be painted a uniform color blended to the general surroundings. RAVCO shall, as required by the City, screen the shipping containers from adjacent properties. RAVCO shall provide the Airport Manager keys to any shipping containers located on the leased premises.

3. Use. The leased premises shall be used for the storage of aviation-related tools, equipment, supplies, and other parts and personal property. The storage of non-aviation-related personal property is not permitted. Storage of fuel is limited to 10 gallons per shipping container, and storage of waste oil and oil-soaked items is not permitted. The leased premises shall not be used for human or animal occupancy.

4. Facilities. Any structure or shipping container installed or constructed on the leased premises shall be in compliance with any and all applicable laws and regulations, as they may be amended. RAVCO agrees to obtain written consent from the City prior to any changes, alterations, or renovations of such facilities.

The City shall exert its best efforts to maintain the areas commonly accessible to airport users, including snow removal and maintenance of paved common areas. RAVCO shall be responsible for maintaining its access to common areas, including but not limited to paving repair, snow removal, and removal or suppression of trash, weeds, and other rubbish or garbage adjacent to the leased premises. The City shall have the authority to enforce this section under the City's nuisance abatement sections of the City Code.

5. Rent. RAVCO shall pay to the City, beginning in the first year of this Lease, annual rent of \$110 for each shipping container located at the Glenwood Springs Municipal Airport under this Lease. The Parties agree that this amount is a reasonable approximation of the annual ground lease fee set by resolution of the Glenwood Springs City Council, from time-to-time. In the event the annual ground lease fee is changed, the City shall adjust the annual rent under this Lease in a manner reasonably calculated to approximate such change. Any such change to the annual ground lease fee and corresponding adjustment to the annual rent under this Lease shall be deemed an automatic amendment to this Lease and is not subject to renegotiation.

Rent for the leased premises for the remaining 2018 calendar year shall be pro-rated from the time the first shipping container is located on the leased premises and paid by RAVCO to the City no later than 30 days thereafter. Rent for the leased premises in each subsequent year shall be paid by RACVO to the City, unless another date is stipulated in a City-produced invoice, on or before January 31st of each year. Should RAVCO fail to pay such annual rent by January 31st in any year, or as otherwise stipulated by the Parties, this Lease shall immediately terminate without further action by the City, and the termination provisions under Section 9 of this Lease shall apply. Nothing in this Section shall be read to preclude the City from accepting late payment of rent by RAVCO in the City's sole discretion.

6. Term. This Lease shall be effective on the date indicated above and shall terminate at midnight on December 31, 2018. This Lease may be extended for additional one-year terms upon written notice from RAVCO to the City provided no later than November 1st of the year preceding the desired additional term, and subsequent agreement by the City to such extension. RAVCO may rely on the City's silence as an agreement to extend this Lease for an additional one-year term, but in no event shall an extension term longer than one year be granted. Upon receipt of RAVCO's notice to extend, the City may notify RAVCO in writing, no later than November 30th of that same year of any terms of this Lease it desires to renegotiate under the extended term.

7. Cessation of Airport Operations by City. Nothing in this Lease shall be construed to require the City to continue the operation of the Glenwood Springs Municipal Airport at its present location or at any location whatsoever. In the event the Glenwood Springs City Council, by ordinance, resolution, or other official action, determines that it should no longer operate a municipal airport at its present location or at all, this Lease shall terminate 90 days after the effective date of such ordinance, resolution, or other official action. Notwithstanding any provisions in this Lease to the contrary, RAVCO shall remove all structures, shipping containers, personal property, and other items on the lease premises before the end of such 90-day termination period. Any property remaining on or around the leased premises after 90 days shall be deemed abandoned, a nuisance, or forfeited to become the property of the City. Upon termination pursuant to this Section, the City agrees to refund to RAVCO a pro rata amount of rent equal to the percent of the term remaining less any amount expended to remove structures, shipping containers, and personal property not removed by RAVCO. The City shall not incur any liability to RAVCO for closure of the airport, including but not limited to, lost profits and compensatory damages. The City explicitly retains all legal and equitable rights to seek compensation from RAVCO for damages incurred due to RAVCO's actions or omissions in vacating the leased premises.

8. Breach. In the event of default or breach of this Lease or in the performance of any of its covenants, terms, and obligations by RAVCO, the City may, at its sole option, terminate this

Lease and immediately enter and retake possession of the leased premises. Upon the City's repossession of the leased premises, it shall, within seven days, provide written notice to RAVCO of such repossession and shall therein provide 30 days for removal of any structures, shipping containers, and other personal property therefrom. Termination of this Lease shall not restrict the City's right to otherwise pursue any and all remedies available to it for such default or breach.

9. Expiration; Termination. Upon expiration or termination of this Lease, RAVCO shall remove all structures, shipping containers, personal property, and other items on the lease premises to its original condition. Notwithstanding this right of removal, RAVCO shall not have the right to remove any airport facilities or fixtures, regardless of who installed said facilities or fixtures. Shipping containers and other personal property shall not be considered airport facilities or fixtures under this Lease. Any property remaining on or around the leased premises after 90 days from the expiration or termination of this Lease shall be deemed abandoned, a nuisance, or forfeited to become the property of the City.

10. Indemnification. RAVCO hereby agrees to indemnify, defend, and hold the City harmless against any and all claims and damages of any kind, including attorneys' fees, arising under this Lease or RAVCO's use of the leased premises and the Glenwood Springs Municipal Airport.

11. Insurance. RAVCO shall be solely responsible for insuring its property located on the leased premises. In addition, RAVCO shall, at all times under this Lease, maintain bodily injury and property damage insurance covering the leased premises and any structures, shipping containers, and/or personal property located thereon, as well as any persons using or present on such leased premises. Such coverages shall be in the amount of \$1,000,000.00 per occurrence. RAVCO shall furnish the City a certificate of insurance evidencing such coverages upon demand and shall include the City as an additional insured.

12. Governmental Immunity. Nothing contained in this Lease shall be interpreted as a waiver or limitation of governmental immunity, to which the City is otherwise entitled under C.R.S. § 24-10-101, *et seq.*, as amended.

13. Maintenance. Any improvements, including extensions and/or connection to taxiways, driving access or utilities to the leased premises, maintenance, including snow removal, and the security of the leased premises shall be the sole responsibility of RAVCO. Nothing in this Lease shall be construed to impose improvement, utility, maintenance, or security obligations on the City, either pertaining to the leased premises or the Glenwood Springs Municipal Airport as a whole. In addition, nothing shall constitute a call or claim upon any future budget or appropriation of the City. The City shall not be liable for any losses or damages suffered by RAVCO and arising under this Lease or RAVCO use of the leased premises.

RAVCO shall pay all charges for water, sewer, gas, electricity, telephone, and other services and utilities used by RAVCO on the leased premises during the term of this Lease. RAVCO shall pay all such utility charges by the due date. RAVCO shall not use any equipment or devices that utilize excessive electrical energy or which may, in the City's reasonable opinion, overload the wiring.

14. Quiet Enjoyment. Upon the commencement of the term of this Lease, RAVCO shall have the right to the exclusive possession and enjoyment of the leased premises during the term. The City and City's agents shall have the right to enter the leased premises, including structures or shipping containers, in the case of an emergency, at any time, and, in the case of an inspection of the premises for compliance with this Lease and applicable laws and regulations, upon 24 hours advance notice to RAVCO.

15. Other Costs. Nothing in this Lease shall be construed to relieve RAVCO from paying any other fees or costs approved and required by the Glenwood Springs City Council or other jurisdiction with authority over the Glenwood Springs Municipal Airport or RAVCO's operations.

16. Compliance with Laws and Regulations. RAVCO shall at all times comply with any and all applicable laws and regulations regarding the leased premises and its use, including the City Code of ordinances regarding business and tax licenses and permitting, as well as the general use of the Glenwood Springs Municipal Airport. Failure to comply with any such law or regulations shall be deemed a dangerous condition and shall be grounds for immediate termination of this Lease by the City.

17. Assignment; Subletting. RAVCO shall not assign this Lease without prior written consent of the City. RAVCO shall have the right to sublet any divisible portion of the leased premises to other users of the Glenwood Springs Municipal Airport upon notice to the City and such sublessee's acceptance of all terms of this Lease. Any such sublease of any portion of the leased premises shall be equal to a proportional share of the rent owed to the City under this Lease.

18. Notice. Any notice or other communication required under this Lease shall be delivered in writing either in person or by U.S. mail to the following addresses, unless a new address is provided by either Party:

To City: City Manager
City of Glenwood Springs
101 West 8th Street
Glenwood Springs, CO 81601

To RAVCO: RAVCO
P.O. Box 1052
Leadville, CO 80461

19. Savings. If any terms, covenants, conditions, or provisions of this Lease are for any reason held to be invalid or unenforceable, the remainder of this Lease shall not be affected, and each and every remaining term, covenant, condition, and provision shall remain valid and enforceable to the fullest extent permitted by law.

20. Binding Upon Successors. All terms of this Lease shall be binding upon and inure to the benefit of the Parties, as well as to their assignees and sublessees.



City Council
STAFF REPORT
City of Glenwood Springs
May 2, 2019

Agenda Item: Two Rivers Project

Action Requested: Approval of staff recommendations of potential bid alternates for the Two Rivers Shoreline Restoration Project.

Department: Parks & Recreation

Presented By: Brian Smith, Recreation Director

Background Info: The property at 740 Devereux Road was the site of several industrial operations and following the closure of the Basic Chemical plant, the site was in need of reclamation. The city acquired the property in the early 1970's. There were attempts by volunteer groups such as Rotary and Kiwanis groups to clean up the site, but the enormity of the site proved to be too massive. Federal grant money was available for riverside or wetland reclamation projects in partnership with the National Resource Conservation District (NRCS.) The city was awarded matching grant money for reclamation with a 25-year performance obligation.

The city was in need of land for waste water treatment, public works shops and operational facilities. There was also a push from the public for more park lands which was ultimately selected. Within the community's call for park development was a desire for various park amenities. However, the matching funds did not cover amenities such as ball fields, boat ramps and music pavilions so the city funded those amenities independent of the site reclamation.

The park was built on fill over a lot of industrial materials which over time have begun to become exposed along the river bank as the shoreline has eroded over the years. The City identified a pressing need to address the erosion and safety issues of the park's river bank as well as make improvements to the old boat ramp that services a large portion of the City's economy. In 2014 the City hired Recreation Engineering and Planning, INC. (REP) to conduct several public charrette's and develop a concept report. In August of 2016 REP was again contracted to develop plans based on the report's recommendations to include:

1. Shoreline improvements from the pedestrian bridge to the boat ramp
2. Boat ramp reconstruction and related improvements
3. Island reconstruction and restoration

Additional upland park improvements and structures were not included at the time of the contract but were added in over the next year as plans developed to 60% design. These included a large amphitheater concept that was scaled down by Council at the 60% design presentation, as well as an island bridge, repairs to the trails that were removed or destroyed during construction of the lift station, and additional landscaping and lighting.

Council approved continuing to final design and bidding in July 2017. The City Council listed shoreline restoration at Two Rivers Park as a high priority in their list of goals for 2018. REP had difficulty in engineering the plans to a full bid set but Council directed staff to move forward with REP for bidding the project in Fall of 2018.

After the bid came back with only one proposal and was rejected by Council, SGM was contracted with to complete the plans and staff presented final options and estimated costs to Council. Council

removed the Island restoration but kept the channel and trails, approved the boat ramp and supporting restroom but was asked to look at reworking the approach or alignment and to include a staging area, approved the lower trail and lighting but asked to look at cost saving options for the upper rock terracing, and removed the amphitheater as designed but asked to look at improving the existing band shell area or a larger capacity amphitheater to replace the band-shell area.

Staff are presenting these changes and providing a history and background of the need for the project to the new Council.

Issues:

The goal of the project is to improve areas of the shoreline at Two Rivers Park that have been impacted by erosion and remove man-made materials protruding from the shoreline to improve the experience for recreational and family users of the park.

There are many improvement needs in the park, however, this project should focus on the original goals of shoreline restoration and improving the boat ramp and supporting structures.

The main alternate Council wished to look at options for or decide to remove is improving the Band-shell area or an amphitheater option. The amphitheater would remove the existing band-shell.

A few years after the earth work was completed and the “greening” of the property was under way, the original music pavilion was constructed. Restrooms were in the original proposal, but were not constructed. The structure has been modified since original construction with additional stage area added.

After its original construction, an explosion at a local propane supply company occurred sometime around December 16, 1985 and claimed the lives of 12 employees. The community decided to commemorate the event by placing a plaque on the music pavilion. Also, the community dedicated the recently constructed ball field support building in the name of Teri Luetke, near the recently constructed restroom building.

The pavilion has been used for music events such as “Summer of Jazz”, “Music in the Park” and other gatherings ever since. A new roof was installed in 2005. A request to renovate the pavilion to include a proscenium extension over the stage to provide additional protection for performers has been discussed in recent years.

Staff Recommendation:

Approve staff recommendations for the Two Rivers Project including:

- Channel design and trails.
- Staging area and approach road for the boat ramp.
- Restroom design.
- Trail and retaining wall material.
- Irrigation, electrical, lighting, and support utility installation.
- Removal of the amphitheater and band-shell area from the project.

Two Rivers Shoreline



CITY OF

GLENWOOD
SPRINGS

PARKS AND RECREATION

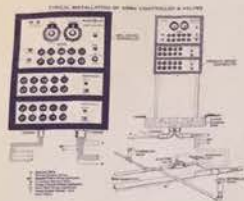








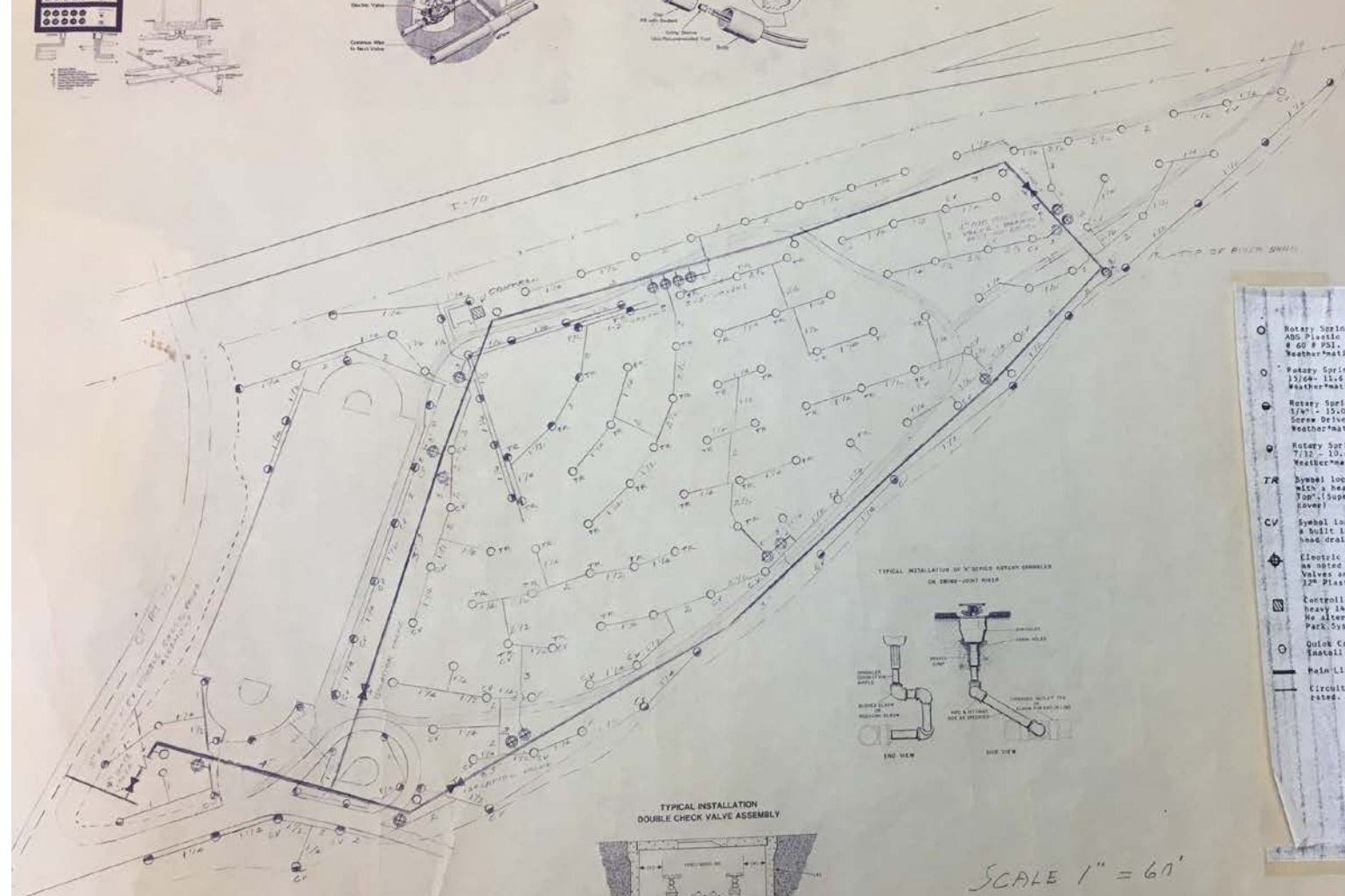




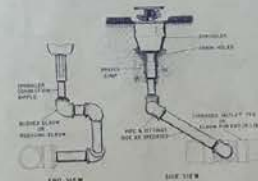
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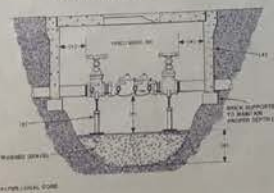
TYPICAL WIRE CONNECTION



TYPICAL INSTALLATION OF 3" SERIES SYSTEM ORDNANCE OR SWIRL-JOINT NOZZLE



TYPICAL INSTALLATION DOUBLE CHECK VALVE ASSEMBLY



LEGEND

- Rotary Sprinkler Head, Full Circle, All Bronze head, Heavy Duty ABS Plastic Housing, Dual Nozzles - 7/32 x 1/64" - 17.5 GPM, 120" Dia. # 60 # PSI. With Screw Driver Arm Spring Adjustment. Weathermatic PM70C, or approved equal.
- Rotary Sprinkler Head, Full Circle, as above with Single Nozzle 15/64" - 11.6 GPM, 98" Dia. # 60 # PSI. Weathermatic PM60 or Approved Equal.
- Rotary Sprinkler Head, Part Circle, as above with Single Nozzle, 1/4" - 15.0 GPM, 58" Radius # 70 PSI. With Diffuser Pin in Nozzle. Screw Driver Arm Spring Adjustment. Weathermatic PM70PC, or approved equal.
- Rotary Sprinkler Head, Part Circle, as above with Single Nozzle. 7/32 - 10.6 GPM - 68" Rad. # 60 PSI. With Diffuser Pin in Nozzle. Weathermatic PM 60PC, or approved equal.
- TR Symbol located by a head indicates that head is to be equipped with a heavy rubber cover and rubber ring on head, with a "Turf Top" Super-Turf Brand of artificial turf bonded to the rubber cover.
- CV Symbol located by a head indicates that head to be equipped with a built in check valve removable from the top, to prevent low head drainage of the lines.
- ⊕ Electric Valves, Brass, with five control. Size to be 3" except as noted on plan. Weathermatic # 80240 or approved equal. Valves and control to be of same manufacturer. Install valves in 72" Plastic valve boxes.
- ⊞ Controller, 20 stations, with solid state timing, mounted in heavy 16 gauge metal resistant housing. Weathermatic 59MA-20. Or alternate. This control is to match balance of controls in the Park System.
- Quick Coupler Valve, 1" Weathermatic V100, or approved equal. Install on 1" Galvanized steel double wing joints.
- Main Line - PVC Class 200, Solvent welded fittings. NSF rated.
- Circuit lines, PVC Class 160. Solvent welded fittings. NSF rated.

SCALE 1" = 60'

NAME & LEGEND
BE ADDED TO

TWO RIVERS PARK
GLENNWOOD SD



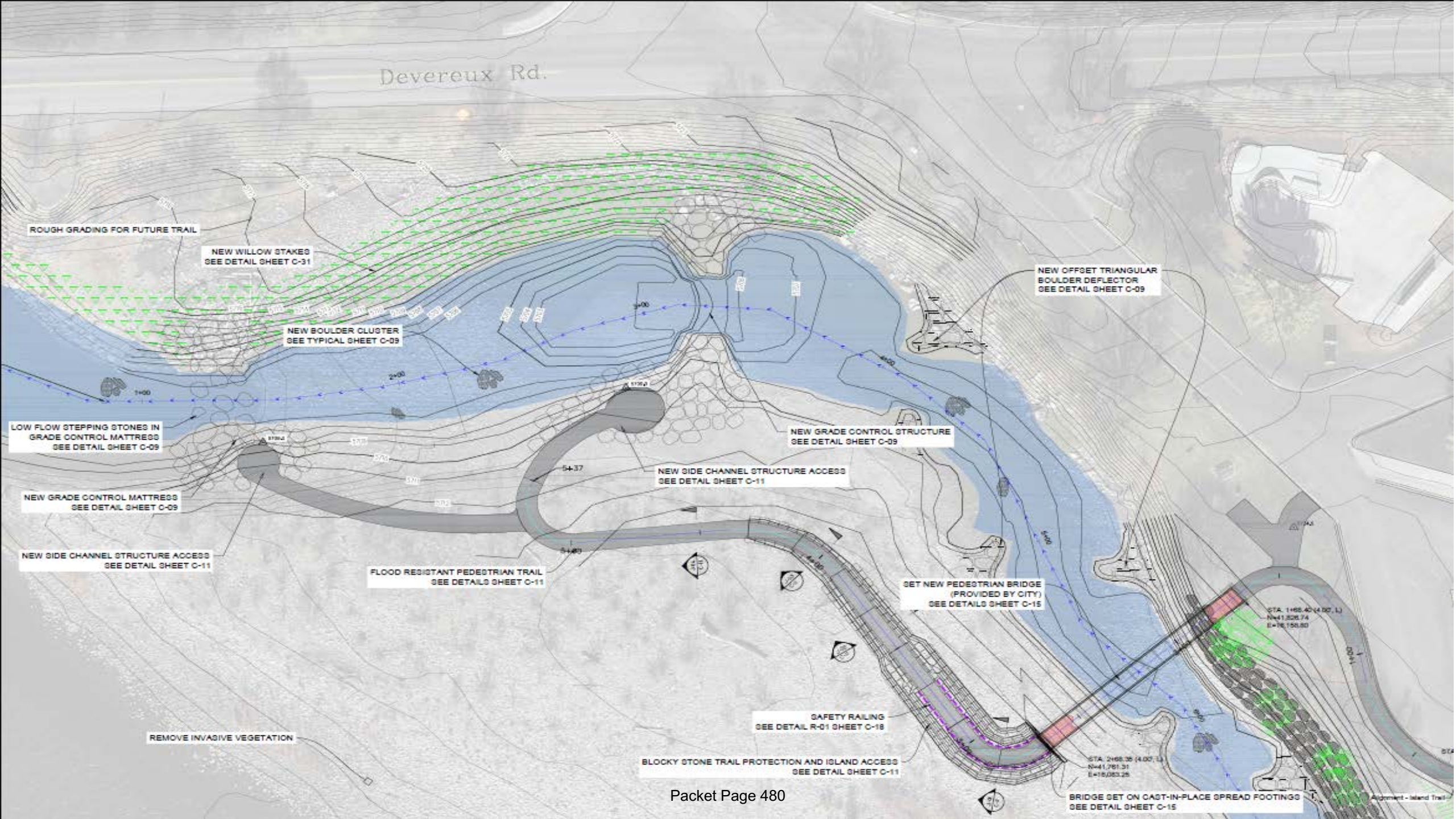
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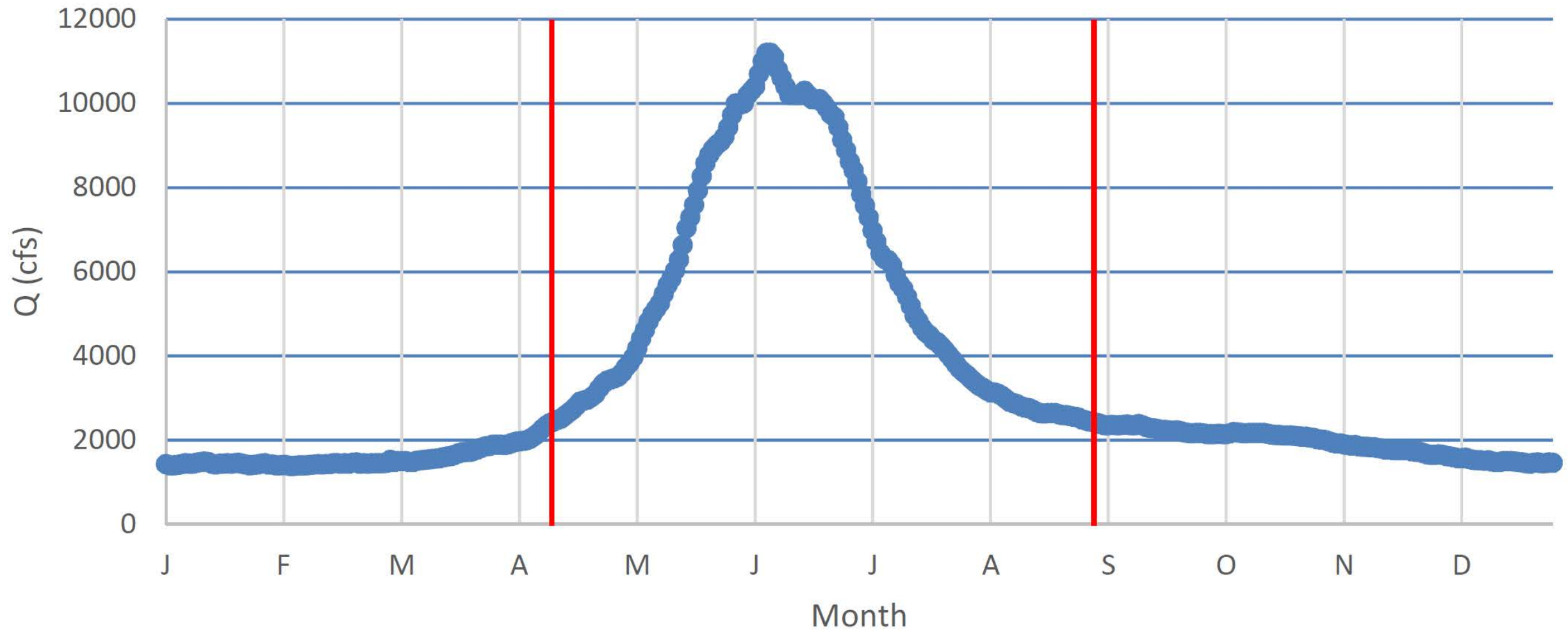
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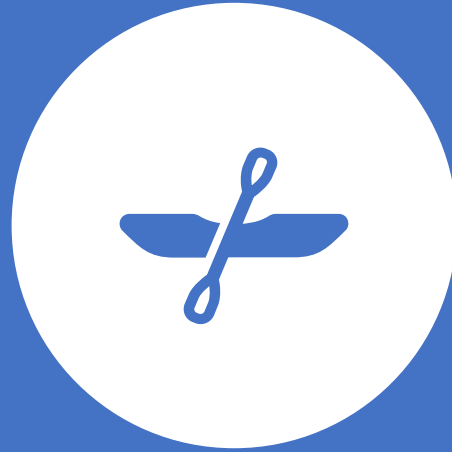


Island Channel

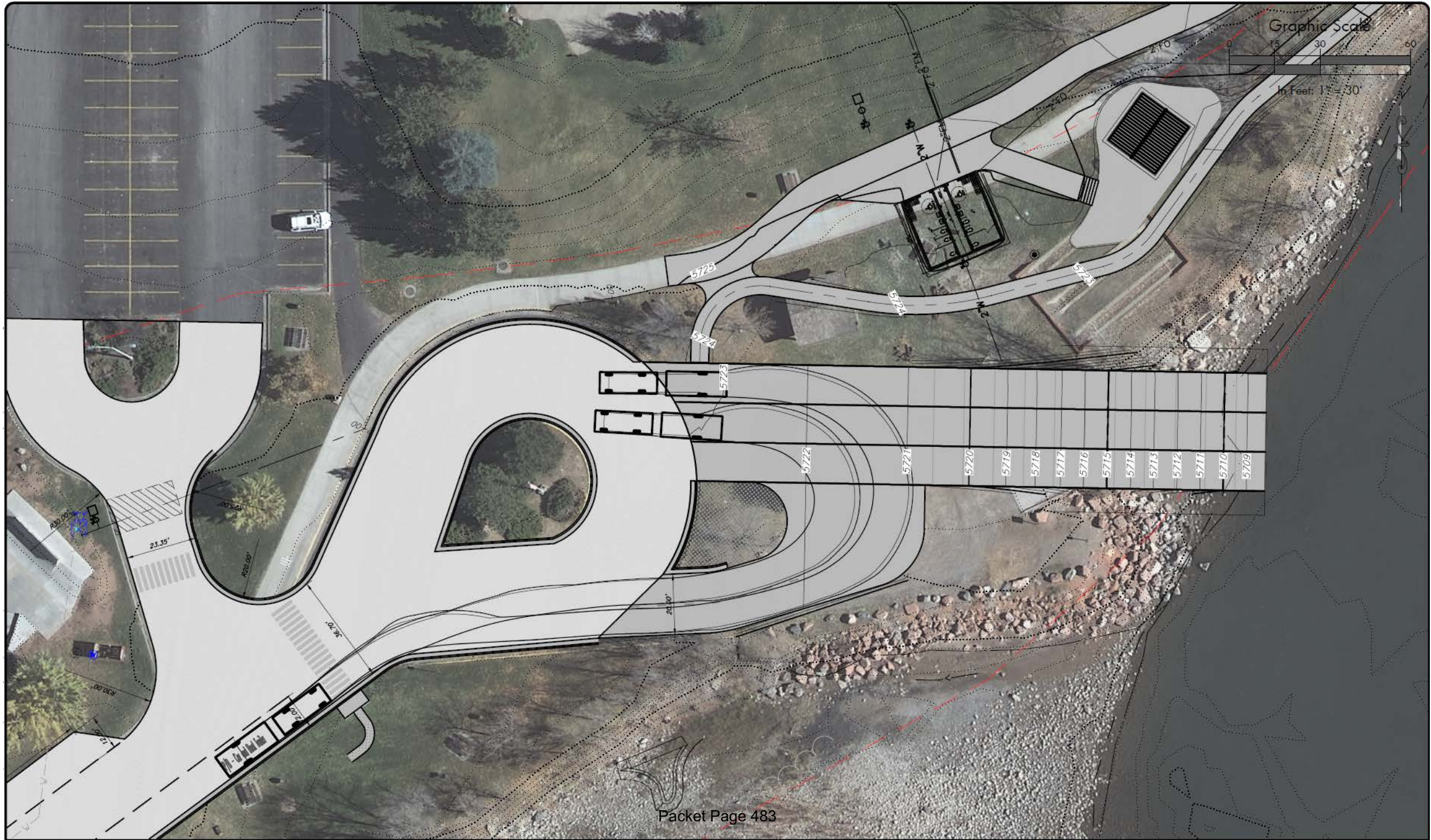


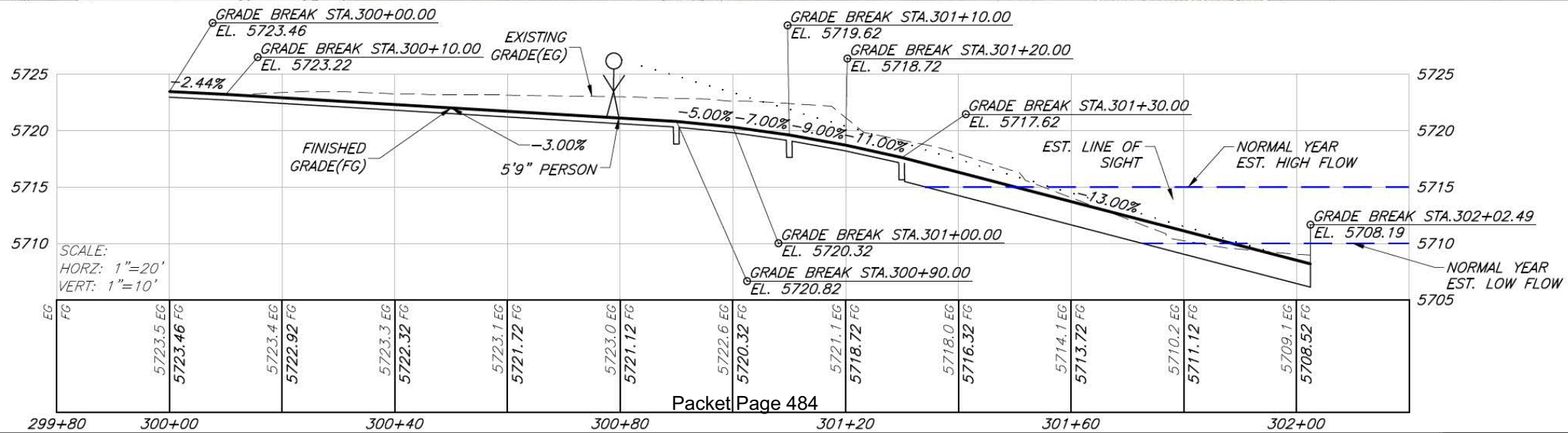
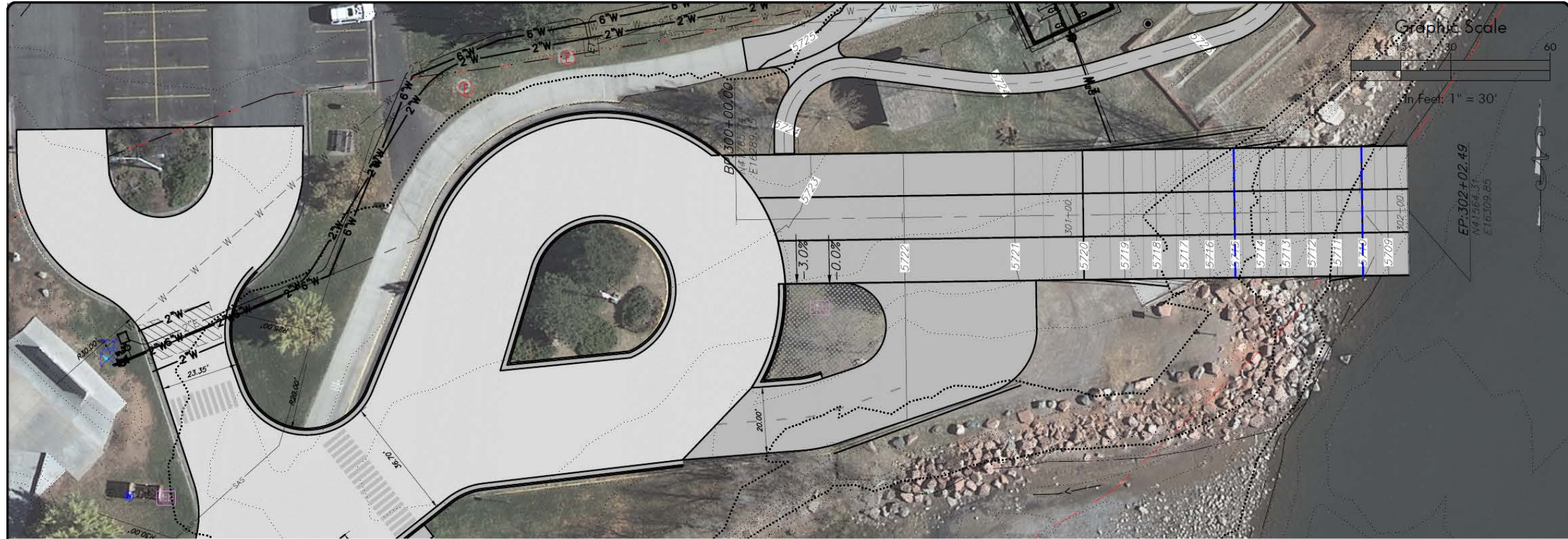
Mean Flow (1966-2019)

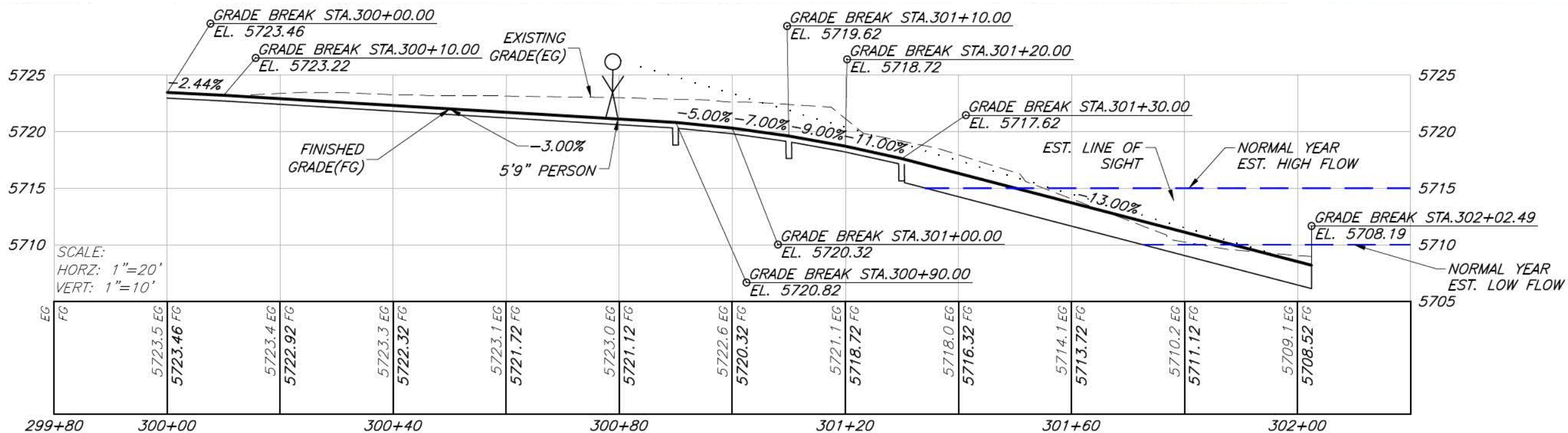




Boat Ramp



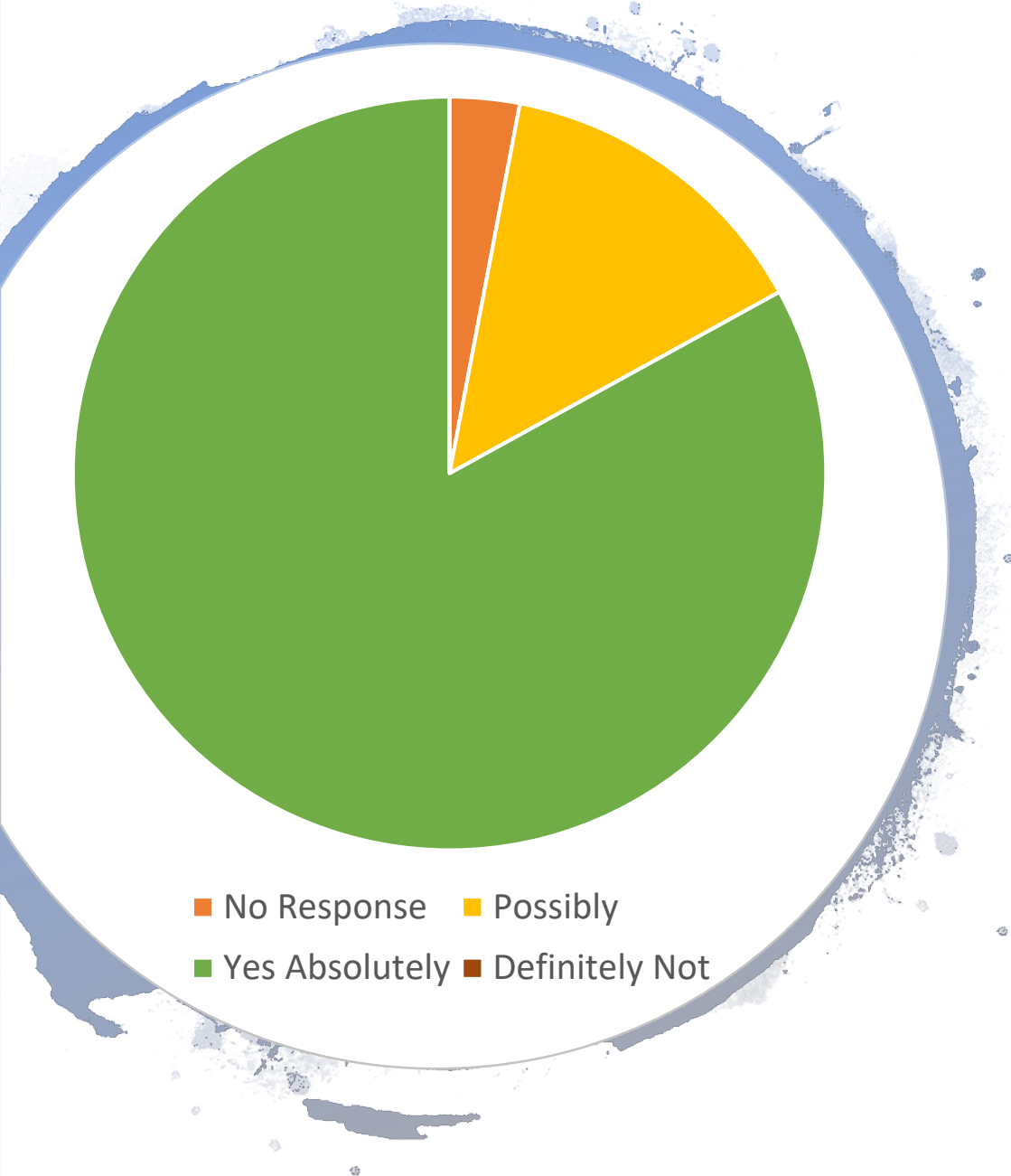






Restroom & Changing Station

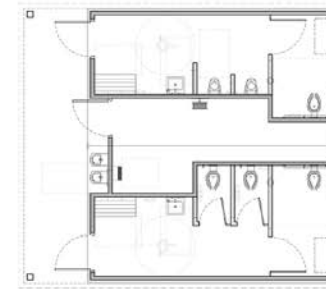
Restroom



- **83%** Surveyed Want Enhanced Restroom Facilities at Two Rivers Park
- This was the **strongest** response from all questions



PROJECT REF#: 10631-4/22/2019-0



FLOOR PLAN

SCALE: NOT TO SCALE



TWO RIVERS PARK

GLENWOOD SPRINGS, COLORADO

RESTROOM BUILDING

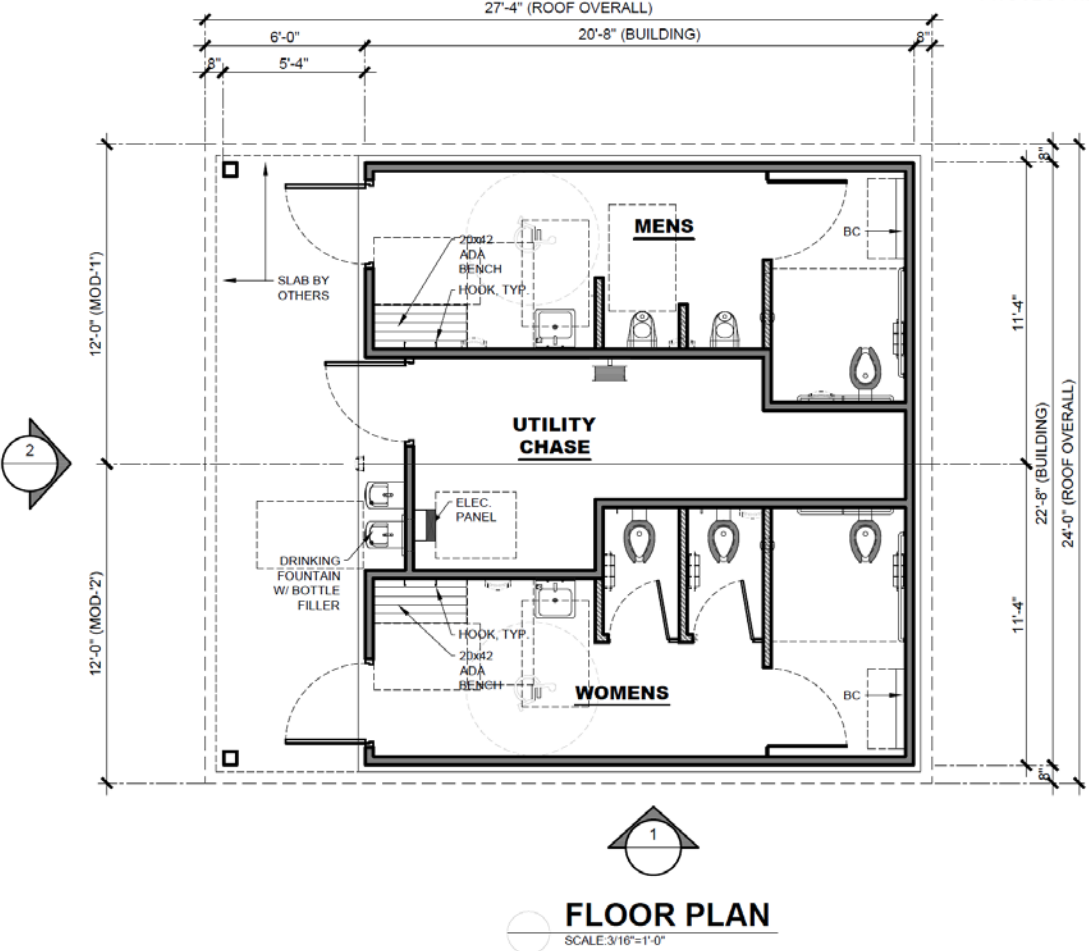
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www.PublicRestroomCompany.com

2587 BUSINESS PARKWAY
MINDEN NEVADA 89423
P: 888-888-2060 F: 888-888-1448



FLOOR PLAN

SCALE: 3/16"=1'-0"

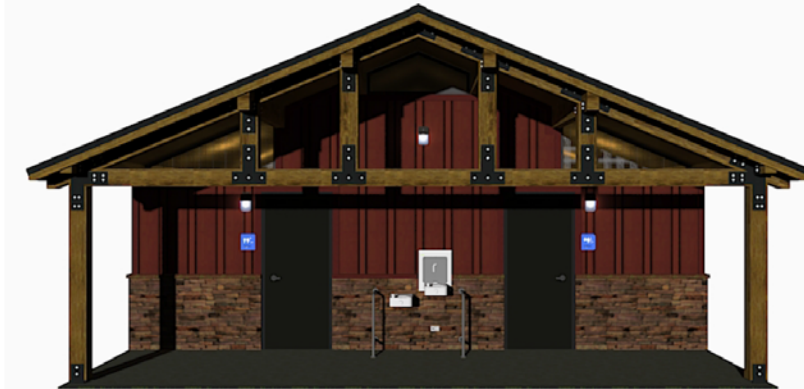
 PUBLIC RESTROOM COMPANY Building Better Places To Go.™	COPYRIGHT 2019, PUBLIC RESTROOM COMPANY THIS MATERIAL IS THE EXCLUSIVE PROPERTY OF PUBLIC RESTROOM COMPANY AND SHALL NOT BE REPRODUCED, USED, OR DISCLOSED TO OTHERS EXCEPT AS AUTHORIZED BY THE WRITTEN PERMISSION OF PUBLIC RESTROOM COMPANY.	BUILDING TYPE: RESTROOM BUILDING PROJECT: TWO RIVERS PARK GLENWOOD SPRINGS, CO	REVISION # -	REVISION DATE: -	SHEET# A-1
			PROJECT #: 10631	START DATE: 4/22/2019	MAX. PERSON / HOUR: 180 M
			DRAWN BY: EOR		

PH: 888-888-2060 | FAX: 888-888-1428

-NOT FOR CONSTRUCTION - PRELIMINARY DESIGN DRAWING ONLY - DO NOT SCALE, DIMENSIONS PRESIDE



1 SIDE VIEW
SCALE: 1/4" = 1'-0"



3 FRONT VIEW
SCALE: 1/4" = 1'-0"



2 ISOMETRIC VIEW
SCALE: 1/4" = 1'-0"

THESE PLAN VIEW AND ELEVATION DRAWINGS ARE A PRELIMINARY ARCHITECTURAL REPRESENTATION OF THE BUILDING. ALL DIMENSIONS, FEATURES AND COMPONENTS SHOWN ON THESE PRELIMINARY DRAWINGS MAY OR MAY NOT BE PART OF THE QUOTE. PLEASE REFER TO THE "SCOPE OF SUPPLY AND SERVICES" LETTER PROVIDED WITH YOUR QUOTE FOR ROMTEC'S PROPOSED SCOPE OF SUPPLY.

ROMTEC

18240 NORTH BANK ROAD - ROSEBURG, OR 97470
503.765.3441 FAX 503.765.3442

PRELIMINARY

PROJECT:		RECREATION ENGINEERING & PLANNING	
PROJECT #		TWO RIVERS PARK	
MODEL #		GLENWOOD SPRINGS, COLORADO	
DATE		2071 M	
DATE		04/11/19	
REVISIONS			
NO.	DATE	BY	REVISION
1		JS	

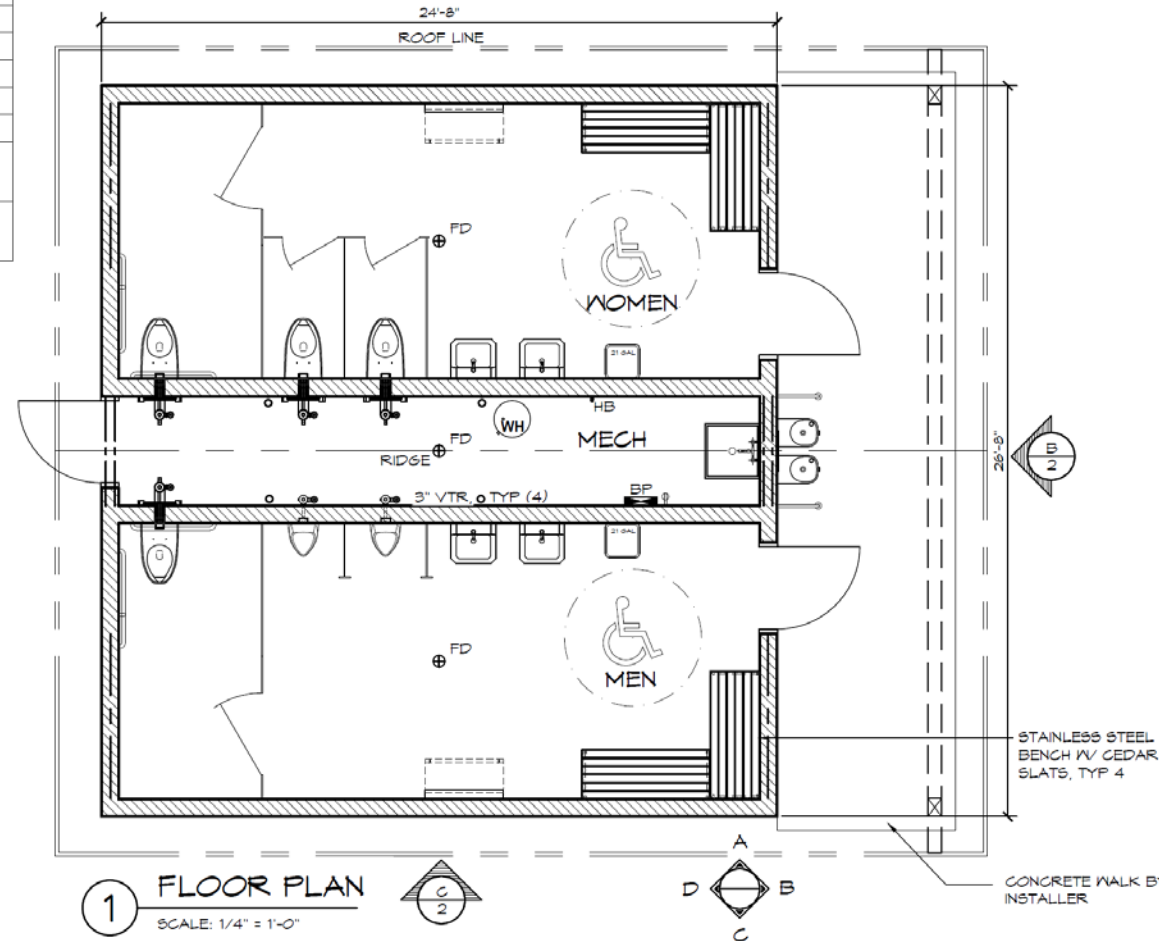
SHEET NO. RENDER

LEGEND		
SYMBOL	DESCRIPTION	AREA/ QUANTITY
----	GABLE VENT	4
----	RIDGE WINDOW	2
	EXTERIOR WALL LIGHTS	4
	INTERIOR 48" LIGHTS	6
⊙	FLOOR DRAIN	3
HD	WALL MOUNT HAND DRYER	
*HB-1	WALL FAUCET	1
⊕	ELECTRICAL OUTLET	1
	ROMTEC SHOWER BENCH STEEL FRAME W/ CEDAR > 20" WIDE X > 48" LONG	4
DIAPER DECK	DIAPER DECK	2

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WALL TYPE SCHEDULE

8" REINFORCED CONCRETE MASONRY BLOCK WALL WITH MORTAR JOINTS, GROUTED SOLID ALL CELLS RUNNING BOND PATTERN.



18240 NORTH BANK ROAD - ROSEBURG, OR 97270
(503) 685-3341 FAX (503) 685-0808

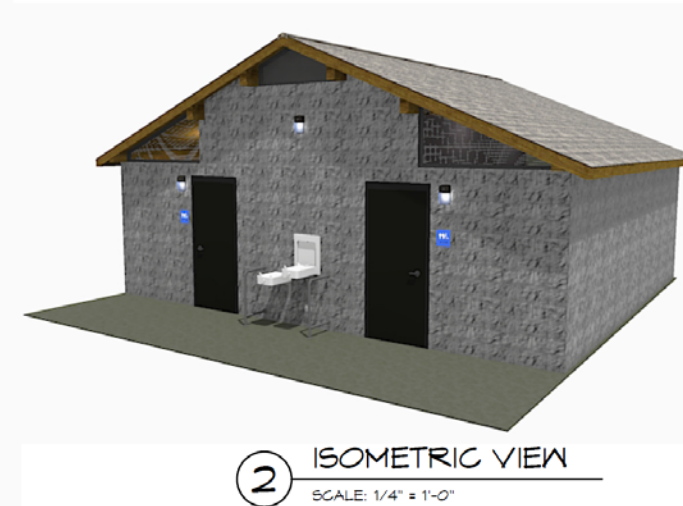
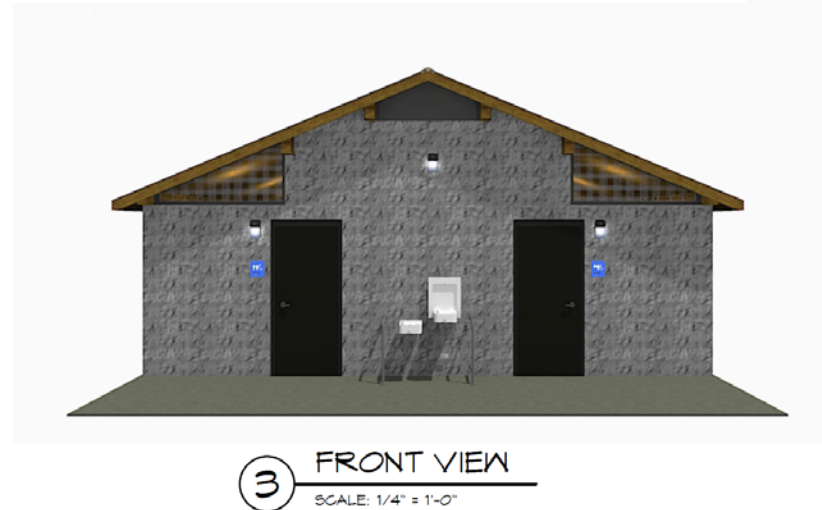
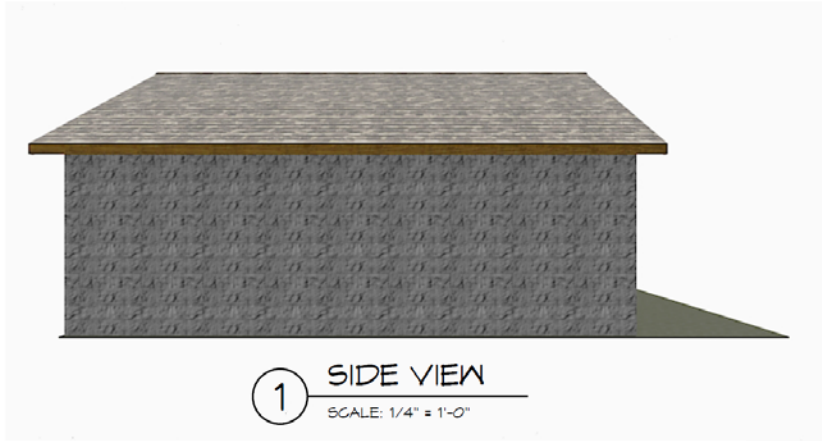
PRELIMINARY

PROJECT: 2071 SIERRA II MULTI-USER RESTROOM, MODIFIED
RECREATION ENGINEERING & PLANNING
TWO RIVERS PARK
GLENWOOD SPRINGS, COLORADO

PROJECT: 013
MOORE: 2071 M
DATE: 1/13/2018
REVISIONS:

REV	DATE	BY
1	1/25/2018	TH
2	2/1/2018	TH

SHEET NO. 1



THESE PLAN VIEW AND ELEVATION DRAWINGS ARE A PRELIMINARY ARCHITECTURAL REPRESENTATION OF THE BUILDING. ALL DIMENSIONS, FEATURES AND COMPONENTS SHOWN ON THESE PRELIMINARY DRAWINGS MAY OR MAY NOT BE PART OF THE QUOTE. PLEASE REFER TO THE "SCOPE OF SUPPLY AND SERVICES" LETTER PROVIDED WITH YOUR QUOTE FOR ROMTEC'S PROPOSED SCOPE OF SUPPLY.

18240 NORTH BANK ROAD - ROSEBURG, OR 97470
(503) 665-5444 FAX (503) 665-5003

PRELIMINARY

PROJECT: RECREATION ENGINEERING & PLANNING
PROJECT#: 013
MODEL: 2071 M
DATE: 04/11/19
REVISIONS

SHEET TITLE: GLENWOOD SPRINGS, COLORADO
RENDER

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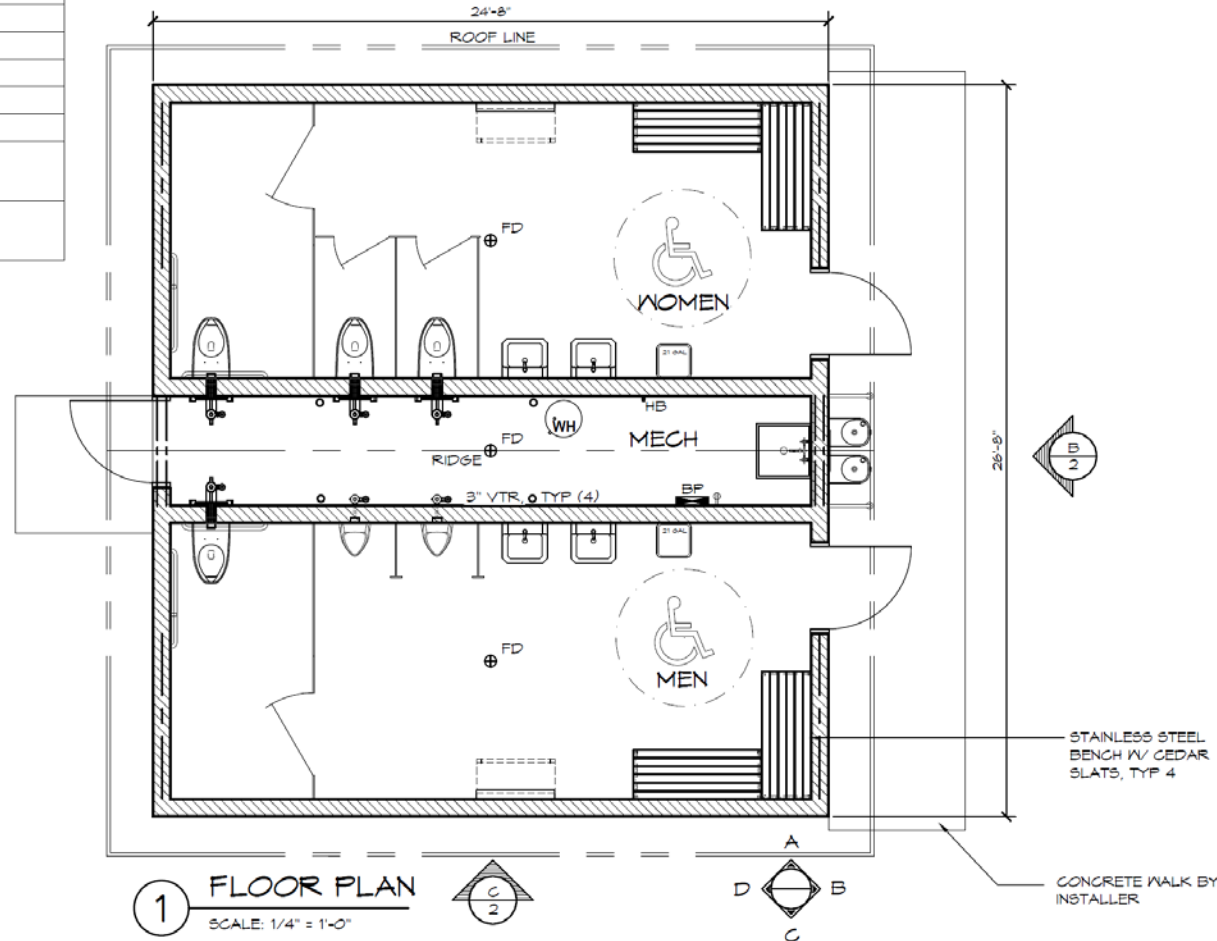
DRAWN BY: JS
SHEET NO.

LEGEND		
SYMBOL	DESCRIPTION	AREA/ QUANTITY
---	SABLE VENT	4
---	RIDGE WINDOW	2
	EXTERIOR WALL LIGHTS	4
	INTERIOR 48" LIGHTS	6
⊙	FLOOR DRAIN	3
HD	WALL MOUNT HAND DRYER	
*H3-1	WALL FAUCET	1
⊕	ELECTRICAL OUTLET	1
	ROMTEC SHOWER BENCH STEEL FRAME W/ CEDAR ≥ 20" WIDE X ≥ 48" LONG	4
	DIAPER DECK	2

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WALL TYPE SCHEDULE

8" REINFORCED CONCRETE MASONRY BLOCK WALL WITH MORTAR JOINTS, GROUTED SOLID ALL CELLS RUNNING BOND PATTERN.



18240 NORTH BANK ROAD - ROSEBURG, OR 97470
503.685.5341 FAX 503.685.2303

PRELIMINARY

PROJECT: 2071 SIERRA III MULTIHUSE RESTROOM, MODIFIED
RECREATION ENGINEERING & PLANNING
TWO RIVERS PARK
GLENWOOD SPRINGS, COLORADO

PROJECT: 013
MODEL: 2071 M
DATE: 1/15/2018
REVISIONS:

REV	DATE	BY	DESCRIPTION
1	1/15/2018	TH	TH

SHEET NO. 1



1 SIDE VIEW
SCALE: 1/4" = 1'-0"



3 FRONT VIEW
SCALE: 1/4" = 1'-0"



2 ISOMETRIC VIEW
SCALE: 1/4" = 1'-0"

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18240 NORTH BANK ROAD - ROSEBURG, OR 97470
(503) 666-5344 FAX (503) 666-5353

PRELIMINARY

PROJECT: RECREATION ENGINEERING & PLANNING
TWO RIVERS PARK
GLEWOOD SPRINGS, COLORADO

PROJECT NO: 013
MODEL: 2071 M
DATE: 04/11/19
REVISIONS

REV	DATE	BY
1		JS

SHEET NO. 15

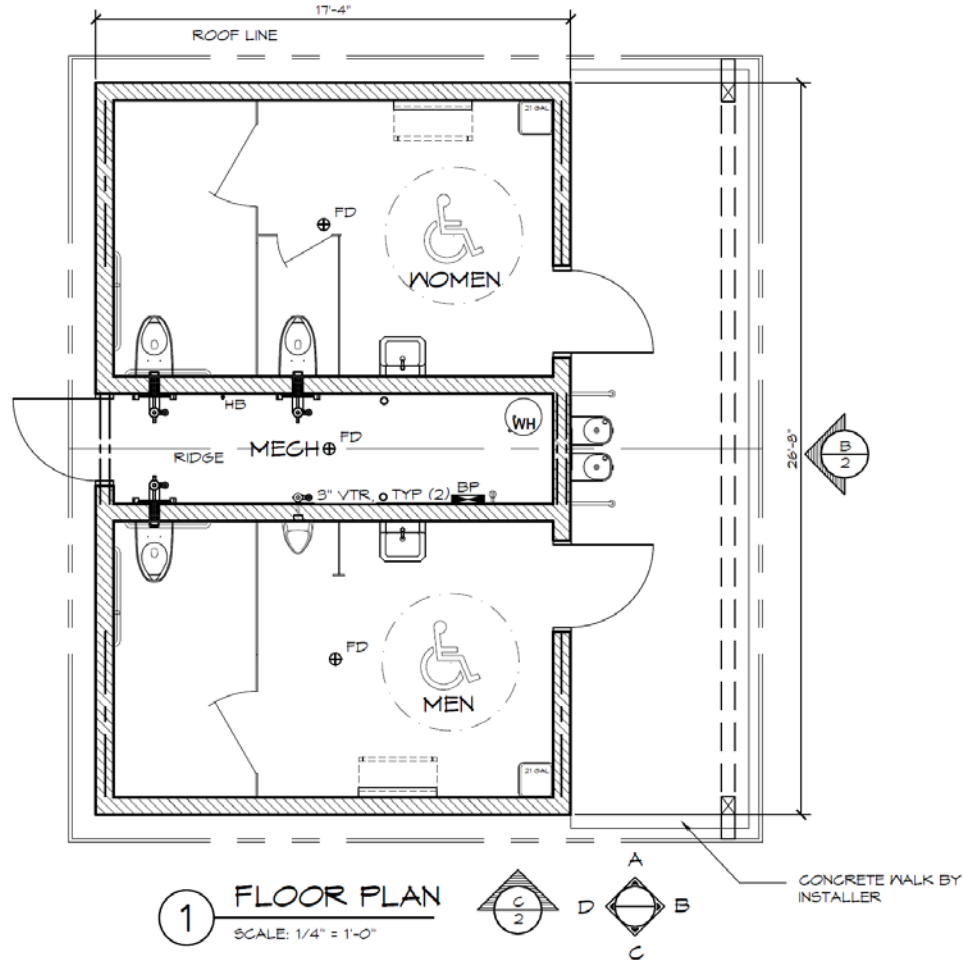
RENDER

LEGEND		
SYMBOL	DESCRIPTION	AREA/ QUANTITY
---	GABLE VENT	4
---	RIDGE WINDOW	2
	EXTERIOR WALL LIGHTS	4
	INTERIOR 48" LIGHTS	5
⊙	FLOOR DRAIN	3
HD	WALL MOUNT HAND DRYER	2
HB-1	WALL FAUCET	1
⊕	ELECTRICAL OUTLET	1
DIAPER DECK	DIAPER DECK	2

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WALL TYPE SCHEDULE

8" REINFORCED CONCRETE MASONRY BLOCK WALL WITH MORTAR JOINTS, GROUTED SOLID ALL CELLS RUNNING BOND PATTERN.



18240 NORTH BANK ROAD - ROSEBURG, OR 97170
(503) 686-3341 FAX (503) 686-2863

PRELIMINARY

PROJECT: 2071 SIERRA II MULTIFAMILY RESTROOM, MODIFIED
RECREATION ENGINEERING & PLANNING
TWO RIVERS PARK
GLENWOOD SPRINGS, COLORADO

PROJECT: 013
MODEL: 2071 M
DATE: 1/15/2013
REVISIONS

NO.	DATE	BY	CHK
1	1/15/2013	TH	
2	01/15/2013	TH	
3	01/15/2013	TH	
4	01/15/2013	TH	

TH

SHEET NO. 1





Trail & River Access





Terraced Stone Selection





Farmers Beams



Farmers Cubes





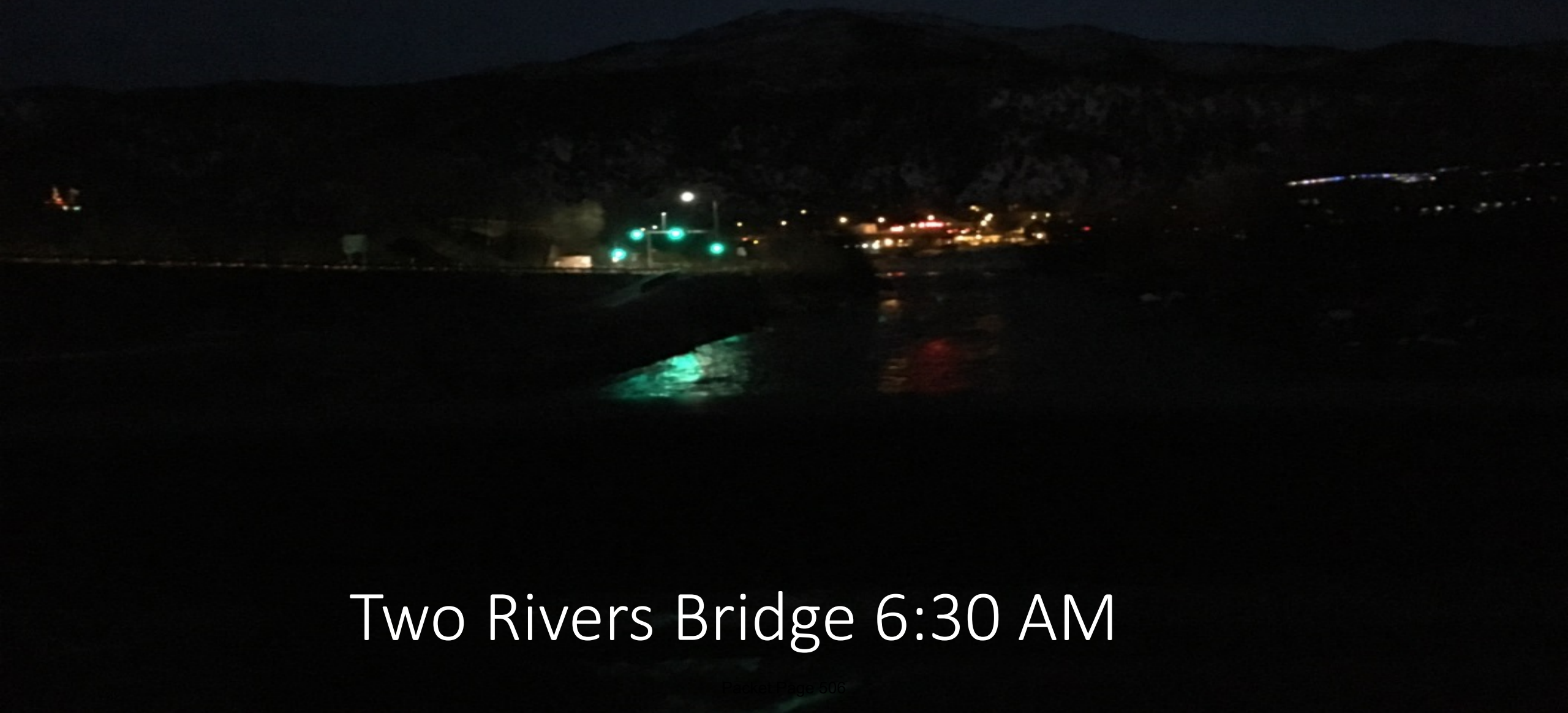


Lighting

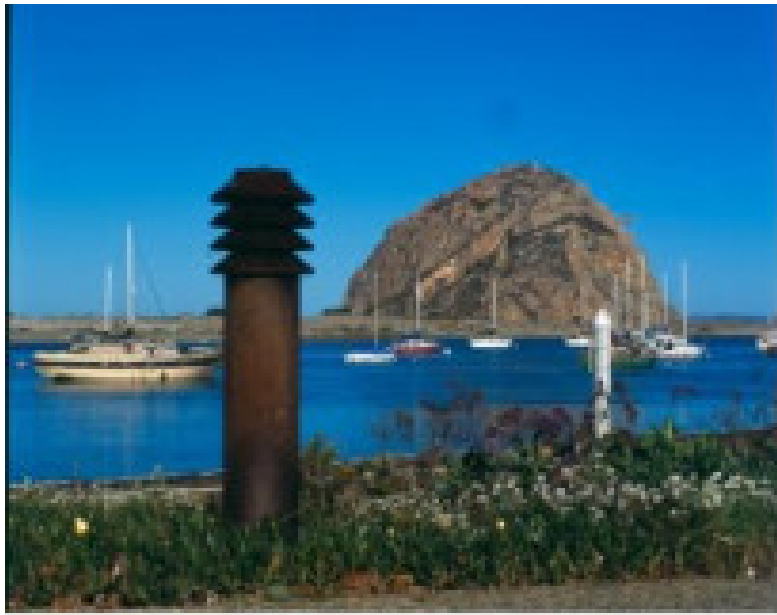
Lighting

Two Rivers Bridge 6:30 AM

Lighting



Two Rivers Bridge 6:30 AM





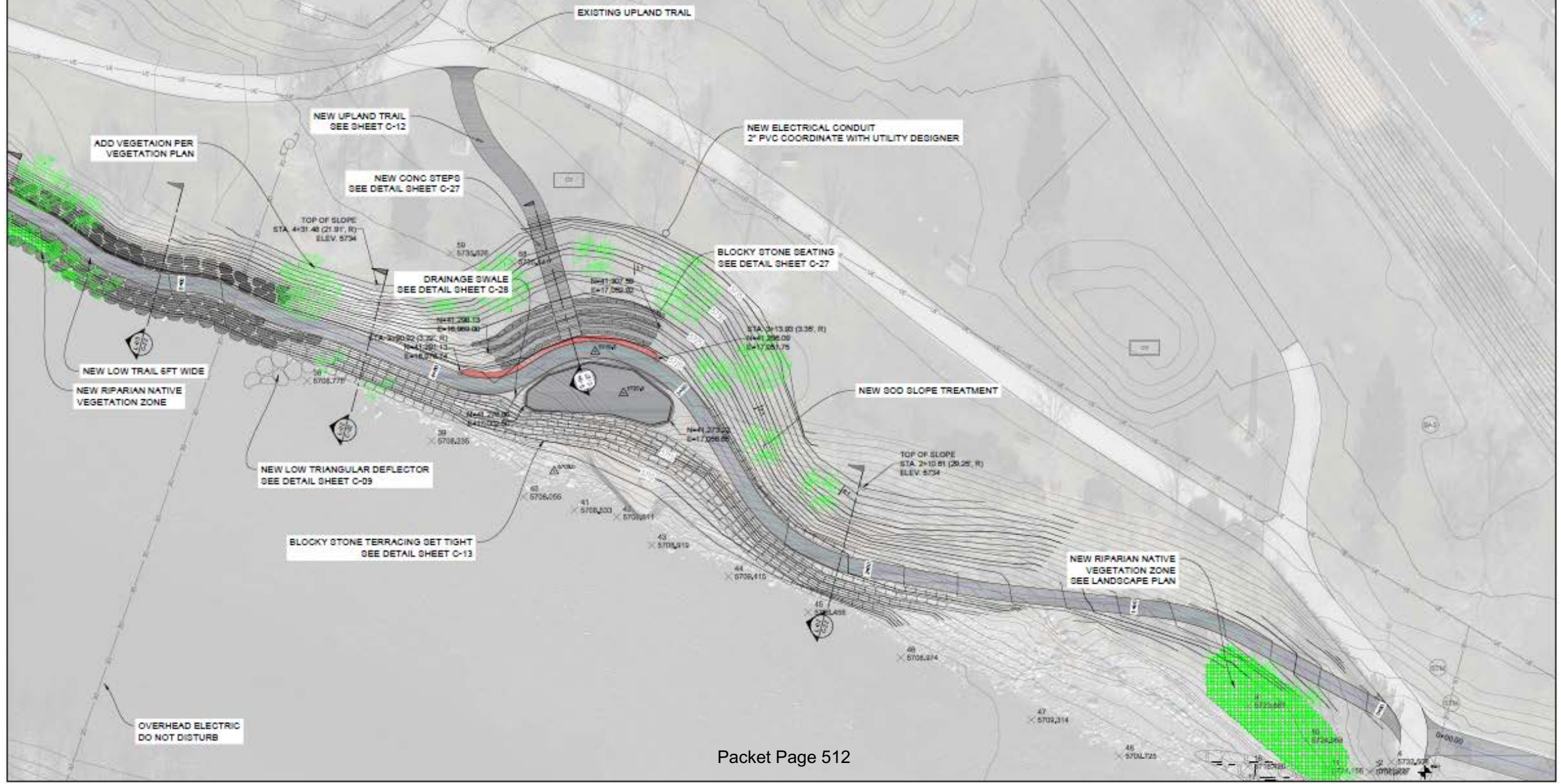






Amphitheater

Amphitheater & Band Shell



Amphitheater & Band Shell

NEW UPLAND TRAIL



SCALE: 1" = 20'

CONTOUR INTERVAL ONE FOOT

NEW AMPHITHEATER AREA

NEW LOW TRAIL AT OHWM

NEW RIPARIAN NATIVE
VEGETATION ZONE

NEW LOW TRIANGULAR DEFLECTORS
SEE DETAIL

NEW RAISED "BEACH" AREA

OVERHEAD ELECTRIC
(DO NOT DISTURB)

NEW RIPARIAN NATIVE VEGETATION ZONE



MEMORIAL PAVILION

IN MEMORY

TOM BOLIN
BRIAN CARROLL
CINDY COWLING
DICK ECKERT
BARBARA J. FELD
LARRY HUTSON
SHELBY JACKSON
JIM JOSLIN
TERI LUETKE
DAVID W. NEAL
ALLEN L. RHODES
REX RHODES

DECEMBER 16, 1985

Planning and Design Costs

- REP: Conceptual Report, Planning and Design..... **\$113,525**
- REP: Final Design..... **\$45,700**
- REP: Bidding and Construction Phase Services \$152,315
- SGM: Engineering and Design..... \$159,672
- LandStudio: Landscaping Plan..... \$31,500

- **Total Project Design Services.....\$503,097**



Recommendations for Cost Savings

- Removal of Island Bridge and Trails.....Savings: \$293,954
- Delete Decorative Large Boulders.....Savings: \$169,600
- Remove amphitheater.....Savings: \$1,001,364
- Trail and Retaining Wall material.....Savings: \$286,553
- **Total Savings.....\$1,751,471**



Consideration for Two Rivers Shoreline

1. Channel design and trails
2. Staging area and approach road for the boat ramp
3. Restroom design
4. Trail and retaining wall material
5. Irrigation, electrical, lighting, and support utility installation
6. Removal of the amphitheater and band-shell area from the project.
Other additions, modifications, deletions



