YELLOWSTONE COUNTY BOARD OF PLANNING

City of Billings and
Yellowstone County, Montana

AGENDA

JANUARY 28, 2025 MEETING TIME: 6:00 p.m.
New City Hall - 3rd Floor Conference Room
316 N 26th St, Billings MT

NOTICE TO THE PUBLIC

***In the event a quorum of the Council is present, no City-related decisions will be made during this meeting or event.

Citizens are invited to:

- Review the Agenda Packet on the City's website at: https://ci.billings.mt.us/117/Agendas-Minutes
- View the meeting live online at Facebook

Public comment will be taken only during the Public Comment periods as indicated on the agenda and during the Public Hearings, if any are scheduled, under the Regular agenda. Comments may be sent to the Board via email before 12:00 pm on the meeting date. All emails received prior to this time will be entered into the record for the public hearing. Comments may be submitted by:

- Mail: City/County Planning Division PO Box 1178, Billings MT 59103
  - Email: plnonline@billingsmt.gov
- NOTICE: All meetings and official activities of the MPO are held in buildings and locations that comply with accessibility standards according to the Americans with Disabilities Act (ADA). A TTY number for the hearing impaired, 406-657-3079, is available upon request. Special arrangements for participation in the public hearings by individuals with hearing, speech, or vision impairment may be made upon request at least three days prior to the hearing. Please notify the Planning Division Office, at 406-247-8610.

1. **CALL TO ORDER - Planning Board President:** Welcome and Introduction of Board Members and Staff.

2. **APPROVAL OF AGENDA* -** including any additions or deletions to agenda. The agenda for a regular meeting will be closed at 5:00 p.m. three (3) working days prior to the date of the meeting.

3. Approval of meeting minutes of January 14, 2025

4. **PUBLIC COMMENT PERIOD** -- As required (3 minute maximum per person). *Any member of the public may be heard on any subject that is not on the agenda. The Planning Board will not take any action on these items at this time, but could choose to add an item to the next meeting's agenda for discussion.*
   4a) Comments on items not on agenda and requests to add items to future agendas
   4b) Comments on items on the non-public hearing agenda items

5. **DISCLOSURE OF CONFLICT OF INTEREST**:

6. **DISCLOSURE OF EX PARTE COMMUNICATION**: Ex Parte Communication Binder is available at the Sign-In and Agenda station.

7. **OLD BUSINESS** (Agenda items that were not discussed or not completed in a previous meeting or items requiring action).

   a. **PUBLIC HEARINGS/PUBLIC HEARING PARTICIPATION GUIDELINES**. The County Planning Board welcomes public input on matters brought before the Board. To ensure a fair and effective public comment process, we ask that you consider the following guidelines when presenting your comments: Address the Planning Board directly. You must state your name and address before commenting. This is an opportunity to explain how you will be affected by the decision and why that is an important consequence. By state law, the Planning Board must consider only certain criteria when reviewing subdivisions (76-3-608(a), MCA). Please see the attached guidelines for the criterion. Thank you for participating!

   b. **Public Hearing. Motion. Annafeld Subdivision, 6th Filing. Preliminary City Major. Submitted by Hunter Kelly**

c. **Public Hearing. Motion. High Sierra Subdivision, 22nd Filing. Preliminary City Major. Submitted by Dave Green**

d. **Public Hearing. Motion. Platinum Commercial Park Subdivision. Preliminary County Major. Submitted by Dave Green**

8. **NEW BUSINESS:** (Agenda items new to this meeting).

9. **OTHER BUSINESS:**

a. (Standing Item) Long Range Strategic Issues and an overview of future City and County issues and projects.

10. **ADJOURNMENT**

FUTURE AGENDA ITEMS

CITY/COUNTY PLANNING BOARD
New City Hall - 3rd Floor Conference Room
316 N 26th St, Billings MT

Public Hearing Participation Guidelines

NOTICE: All meetings and official activities of the MPO are held in buildings and locations that comply with accessibility standards according to the Americans with Disabilities Act (ADA). A TTY number for the hearing impaired, 406-657-3079, is available upon request. Special arrangements for participation in the public hearings by individuals with hearing, speech, or vision impairment may be made upon request at least three days prior to the hearing. Please notify the Planning Division Office, at 406-247-8610.

The County Planning Board welcomes public input on matters brought before the Board. To ensure a fair and effective public comment process, we ask that you consider the following guidelines when presenting your comments: **Address the Planning Board directly. You must state your name and address before commenting.** This is an opportunity to explain how you will be affected by the decision and why that is an important consequence. Be informed of the process and the requirements of the Board. If you are commenting about a subdivision, please limit your comments to the review criteria.

By state law, the Planning Board must consider only certain criteria when reviewing subdivisions (76-3-608(a), MCA). These criteria include:
-Effect on agriculture and agricultural water user facilities; Effect on local services; -Effect on the natural environment; Effect on wildlife and wildlife habitat; Effect on public health and safety

Provide specific information about why you are concerned about the pending application, how the decision will impact the review criteria listed above, and provide suggestions on how to minimize or eliminate the impact.

Respect the right of others to participate. Wait until the previous speaker has completed their comments before making your own comments. Do not talk over the person commenting or with other people in attendance.

The public hearing is not an opportunity to question or accuse the applicant or their agent. If you have questions of the Board, the applicant or the agent, ask questions directly to the Board during the public hearing portion of the meeting. The Board will respond or request the applicant or agent to respond after the public comment portion of the hearing is closed.

After the public comment portion of the hearing is closed, no further comments are allowed unless you are addressed directly by a Board member.

You should expect the Board to make a balanced recommendation in accordance with its statutory responsibilities. The Board's ability to make reasonable and thoughtful recommendations is dependent on a fair consideration of everyone's interests.

Thank you for participating.

Date:	01/28/2025
Title:	
Presented by:	
Department:	Planning & Community Services
Presentation:	

Information

RECOMMENDATION
MEETING MINUTES: January 14, 2025

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

ALTERNATIVES
City Council may:

- Approve; or,
- Not Approve

FISCAL EFFECTS

Attachments

Minutes of January 14, 2025

CITY/COUNTY PLANNING BOARD

"Serving Billings, Broadview, and Yellowstone County"

Tuesday, January 14, 2025 at 6:00pm

1 Board Attendance Roster: Please note: "A" stands for excused absence, "1" stands for present, "V" stands for Zoom participation. **BYLAWS, YELLOWSTONE COUNTY BOARD OF PLANNING, (Amended. May 25, 2004)**

Section 4. Absences and Removal A. Each member shall inform the Planning Director at least one day before the meeting of his/her inability to attend a Board or Committee meeting. Such an absence shall be considered an excused absence. If any Board member accrues three (3) or more consecutive unexcused absences from regular meetings, notice of which has been given at his/her usual place of work or residence, or by announcement at a meeting attended by him/her, the President may call such absences to the attention of the Board which may then recommend to the appointing authority that such member be asked to resign and that another person be appointed to serve out the unexpired term.

	Position	01/14/2025	01/28/2025	02/11/2025	02/25/2025	03/11/2025	03/26520025	04/082025	04/22/2025	05/13/2025	05/28/2025	06/10/2025	06/24/2027	07/08/2025	07/22/2025	08/12/2025	08/26/2025	09/09/2025	09/23/2025	10/14/2025	10/28/2025	11/12/2025	11/26520025	12/09/2025	12/23/2025
Jim Ronquillo	Billings Ward I	1																							
Roger Gravgaard **President**	Billings Ward II	1																							
Dennie Stephenson	Billings Ward III	1																							
John Staley **Vice President**	Billings Ward IV	V																							
David Nordel	Billings Ward V	A																							
Troy Boucher	YC District 1	A																							
Dennis Cook	YC District 2	A																							
Vacant	YC District 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vacant	YC District 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Woody Woods	YC District 5	1																							
Alexis Bonogofsky	YC District 6	1																							
Morgan Tuss	YC District 7	A																							

Vacant	Y County Cons. District	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scott Reiter	**Ex-Officio SD2**	A																							

Call the Meeting to Order: President Gravgaard called the meeting to order at 6:00 p.m. on Tuesday, January 14, 2025.

Introduction of Planning Board Members and Planning Department Staff
President Gravgaard called for introductions of the members of the Planning Board and staff.

Participating Planning staff members: Wyeth Friday, Planning & Community Services Director; Anna Vickers, Planning Division Manager; Dave Green, Planner; Hunter Kelly, Planner; Brenda Berns, Planning Clerk

Virtual Participation: Board member Staley; Monica Plecker, YCPW

1. Others in Attendance: Dennis Randall, McCall Homes; Ronni Tallerico, YCPW; John Halverson, Sanbell; Gary Owen, Sanbell; Taylor Kasperick, Performance Eng; Landy Leep, Oakland & Co.

2. Approval of Agenda: The board approved the agenda as presented by unanimous consent.

3. Approval of Minutes: November 26, 2024 & December 10, 2024

Motion

Motion made by Board member Staley, seconded by Board member Woods to approve the minutes of November 26, 2024 and December 10, 2024 as submitted. Motion carried with a unanimous vote.

4. Public Comment: As required (3 minutes maximum per person). Any member of the public might be heard on any subject that is not on the agenda. The Planning Board will not take any action on these items at this time but could choose to add an item to the next meeting agenda for discussion. There were no comments from the public.

5- 6. Disclosure of Outside (Ex-Parte) Communication or Conflicts of Interest: There was none.

7. Old Business

8. New Business

a. Annafeld Subdivision 6th - Preliminary Major Plat Review and Board Discussion.
The proposed subdivision creates 87 lots for development. The subject property is generally located south of Elysian Road and east of East Lane. The property is zoned PUD and is currently vacant. TAX ID: A37619

Hunter Kelly provided a brief overview of the development. An annexation petition is being processed concurrently to bring areas outside the city limits into the City. Both the development and annexation items will be presented together at the City Council meeting on February 24, 2025. The project is planned in three phases, with construction set to begin immediately and continue through November 1, 2030.

Staff recommends conditional approval, subject to the four (4) conditions of approval as presented in the staff report. A Public Hearing is scheduled for the upcoming Planning Board meeting on January 28, 2025. The City Council will review and make a decision on the preliminary plat at their meeting on February 24, 2025.

Questions:
Board member Ronquillo inquired about the availability of City services. Mr. Kelly affirmed there are services provided for water and sewer, consisting of a new 12" water main and an 8" sewer main within the Annafeld 6th filing development.

President Gravgaard commented that he appreciates the dedicated park land in excess of the requirement.

Applicant's Agent; Gary Owen, Sanbell.

Board member Stephenson inquired if this phase would differ from the other Annafeld filings. Mr. Owen responded that it would be consistent with the work completed in previous phases.

b. High Sierra Subdivision 22nd - Preliminary Major Plat Review and Board Discussion.
The subdivision creates 76 lots for residential development. The subject property is generally located north of Matador Avenue, west of Modera Avenue & Ortega Street, and east of High Sierra Subdivision 14th filing. The property is zoned Neighborhood 3 (N3). Tax ID: A37726

Dave Green provided a brief overview of the development. The current zoning, N3, permits larger single-family lots. The applicant is proposing a cash payment in lieu of parkland, as there is a 5-acre park located south of the property. The streets will extend throughout the subdivision and into the next filing. All utilities will be provided by the City, and a masterplan storm drainage system is in place to effectively manage the additional water flow generated by the development.

A correction was made to the Findings of Fact; some road names were mistakenly left in the document that does not align with this subdivision.

Staff recommends conditional approval of the proposed subdivision, subject to the five (5) conditions of approval as presented in the staff report. The Public Hearing and recommendation will be held at the next Planning board meeting on January 28, 2025. City Council will take action on February 24, 2025.

Questions:
Board member Woods asked if the 5-acre park would be sufficient for all filings. Mr. Green explained that they had requested larger parks, and as the development expands, additional large parks of at least 2 or 3 acres will be included.

Board member Woods asked for clarification regarding elevation and if there would be basements. Mr. Green stated they can have basements as long as the grading was sufficient for proper water run-off.

Board member Stephenson asked about sidewalks. Mr. Owen, applicant's agent stated there will be sidewalks installed with the construction of the homes.

c. Platinum Commercial Park Subd- Preliminary Major Plat Review and Board Discussion.
The subdivision creates 14 lots for commercial/industrial development. The subject property is generally located on the northeast corner of the intersection of South 72nd Street and Danford Road. The property is outside of County Zoning jurisdiction.

Dave Green gave an overview of the development. Mr. Green stated the subject property has been used for farming purposes, there will be no effect on the water users downstream from this property. The subdivision will be served by individual wells or alternative water source and wastewater disposal systems as submitted and approved by MDEQ. Access to the subdivision shall be from proposed approaches on Danford Road and South 72nd Street West. An RSID will be created to maintain the roads. The property is within the BUFSA boundary and will have a dry hydrant tank installed. The storm water drainage will be collected onsite using a combination of swales and the natural slope of the land. This proposed commercial/industrial subdivision will not have an impact on schools and is not required to provide parkland.

The applicant is requesting two variances as a part of the proposed subdivision.

A Variance is requested from the requirement to provide connections to adjacent properties in relation to the subject area's eastern boundary. The proposed use of this subdivision will be commercial and industrial, so by limiting/omitting connection to 68th Street West, heavy truck and equipment traffic associated with these uses will not unduly be mixed with residential traffic along 68th Street West.

A second Variance is requested from the 600' minimum spacing of connections to adjacent properties in relation to the property to the north of the proposed subdivision. A connection to the adjacent property to the north is proposed with the subdivision (Palladium Way) which will enable connection to the adjacent parcel for residents and owners to utilize to go from one subdivision to the other if desired. As the proposed subdivision is intended to be utilized for commercial and industrial uses, limiting the

number of connections to the adjacent property to the north will actually serve to potentially limit having heavy truck and equipment traffic intermingling with residential traffic.

Staff recommends to the Planning Board that they forward a recommendation of conditional approval to the Board of County Commissioners for the preliminary plat of Platinum Commercial Park Subdivision, approve the variance requests and adopt the Findings of Fact as presented in the staff report.

The Public hearing and recommendation on January 28, 2025. The Board of County Commissioners are scheduled to review and act on February 24, 2025.

Questions:
Board member Woods asked for clarification on the drain fields.

Mr. Kasperick, applicant's agent stated the drain field is at the highest point of the 63 acres. The ground water was found to be generally higher than DEQ would like for individual drain fields, therefore the higher point on the property was utilized to put the drain system in and each lot will essentially pump through a low-pressure sewer system up to that point.

Board member Woods inquired whether there will be an HOA or a Maintenance RSID. Mr. Green confirmed that an RSID will be established to cover maintenance.

Board member Gravgaard asked what street Palladium Way connects to. Mr. Kasperick explained that it is currently not connected to any other streets, but connections will be made with future development. Discussions have taken place with the property owner to the north regarding a connection every 600 feet.

Board member Staley asked if 68th St is part of the proposed development. Mr. Kasperick clarified that it is not and added that the streets within the development will be wider and paved with asphalt.

Board member Stephenson inquired about the types of businesses expected to occupy the units. Mr. Kasperick explained the area is unzoned and the potential uses are fairly broad, but typical occupants could include contractors using office or storage spaces, among others.

Board member Bonogofsky noted that groundwater is a concern and inquired about the long-term plan for the wells and the possibility of them running dry.

Wyeth Friday mentioned that the board will receive further information on the matter from the Bureau of Mines in February 2025. He expressed frustration, noting that there is significant attention being paid to the groundwater study and its findings. The wells are declining, and there are concerns about groundwater and nitrate issues. Finding a solution may be challenging, as they currently rely on purchasing water.

9. Other Business

Board member Woods requested Planning staff to give a briefing on the Annafeld and High Sierra subdivisions regarding intersections at the next Planning Board meeting scheduled for January 28, 2025.

Board member Woods mentioned legislation regarding planning and subdivisions following the last legislative session, specifically regarding splitting boards and land use. Woods expressed his opposition to splitting the boards, stating that proper planning is essential, and all boards should be advised jointly.

Wyeth responded that the only update he is aware of is a bill recently introduced, but with no hearing scheduled yet. The bill seeks to amend the Montana Land Use Act to make adjustments, including language that would allow the city/county planning board to be maintained. He hasn't seen any further details yet.

Anna added that the bill is part of the Montana Land Use Planning Act (MLUPA) and is largely for housekeeping purposes. The intent is to allow Belgrade to continue its planning board. However, the bill still has a long way to go and is being tracked daily. She also mentioned that there are other bills regarding incentivize low-income developments and another bill proposing to move RVs and mobile homes out of the subdivision review process. She noted that not every jurisdiction has access to this, and the bill has not yet been scheduled for the Housing Committee. She encouraged reaching out for requirements, as the process is still being navigated. Anna stated that she hasn't seen anything about extending the May deadline yet. She is tracking around 200 bills, but many haven't been drafted yet.

a. Upcoming Items in 2025

Mr. Friday mentioned that there are a few items currently in progress. The department is finalizing a review of 2024 to provide an overview of what has been happening. This will be presented to the board at the end of the month. Additionally, a contract will be brought to the city council to assist with the implementation of the MLUPA, starting in February 2025. Starting in March, meetings will take place on the 5th floor, with the specific conference room locations to be announced.

ADJOURNMENT: 6:58PM

10. Future Agenda Items

DRAFT—TO BE APPROVED BY A MOTION AT THE NEXT SCHEDULED MEETING

-Brenda J Berns, Planning Clerk

Planning Board

Date:	01/28/2025
Title:	Annafeld Subdivision, 6th Filing - Planning Board Public Hearing
Presented by:	Hunter Kelly, Planner 1
Department:	Planning & Community Services
Presentation:	Yes

Information

RECOMMENDATION

Staff recommends the Planning Board recommend to the City Council that the preliminary plat of Annafeld Subdivision, 6th Filing, be conditionally approved and the Findings of Fact adopted as presented in the staff report.

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

On December 2, 2024, Sanbel, on behalf of McCall Development, Inc., applied for Preliminary Major Plat approval for Annafeld Subdivision, 6th Filing. The proposed subdivision creates 87 lots for development over three (3) phases. The subject property is generally located south of Elysian Road and east of East Lane. The property is zoned PUD - Planned Unit Development. The land is currently vacant. There is a concurrent Annexation Petition (AN-24-05) for the portions of this subdivision still outside city limits that is being executed at the same time as this preliminary plat.

VARIANCES

No variances are requested.

PROPOSED CONDITIONS OF APPROVAL

1. Prior to Final Plat approval, the applicant shall provide names for the streets to the Land Management Coordinator for approval and list these approved street names on the final plat, Subdivision Improvements Agreement (SIA), and other supporting documents.
2. To minimize the effects on local service prior to final plat approval, the applicant will coordinate with the USPS to determine what type of delivery system is preferred and to locate and provide the correct amount of space for safely delivering the mail to the residents.
3. Minor changes may be made in the SIA and final documents, as requested by the Planning, Legal or Public Works Departments to clarify the documents and bring them into the standard acceptable format.
4. The final plat shall comply with all requirements of the City of Billings Subdivision Regulations, as well as the rules, regulations, policies, and resolutions of the City of Billings, and the laws and Administrative Rules of the State of Montana.

PROCEDURAL HISTORY

Pre-Application Meeting: September 26, 2024
Preliminary Plat application submitted to Planning Division: December 2, 2024
Departmental Review Meeting: December 19, 2024
Preliminary Plat Resubmittal: December 26, 2024
Planning Board Plat Review: January 14, 2025
Planning Board Public Hearing: January 28, 2025
Preliminary Plat to City Council: February 24, 2025
60 Working-Day Preliminary Plat Review period ends: February 28, 2025

PLAT INFORMATION

General Location: South of Elysian Road and east of East Lane
Legal Description: Lot 4A, Block 27 & Lot 5A-1, Block 24 of Annafeld Subdivision, 4th Filing and Lot 10, Block 26 and Lot 15, Block 22 of Annafeld Subdivision, 5th Filing
Owner/Subdivider: McCall Development, Inc.
Engineer/Surveyor: Sanbel
Existing Zoning: PUD - Planned Unit Development
Existing Land Use: Vacant
Proposed Zoning: PUD - Planned Unit Development
Proposed Land Use: Residential
Gross & Net Area: 13.54 Acres / 8.49 Acres
Lot Size:
    Minimum: 2,836 Square Feet

Maximum: 12,531 Square Feet

Phases: Subdivision will be completed in three (3) phases.

Parkland Requirements: 0.93 Acres Required, 0.49 Acres of private parkland provided with this plat. The parkland dedication has been met through the dedication of private park area within Annafeld Subdivision, Sixth Filing and with additional public and private park dedication with Annafeld Subdivision, First, Second, Third, Fourth and Fifth Filings. A park plan will be provided when the plat is presented to explain the park provisions.

Traffic Impact Study - Summary

- Development is 49 single-family lots and 22 townhomes in Phase 1 and an additional 15 single-family lots in Phase 2 generating a total of 762 estimated average weekday trips in the full buildout.
- Studied intersections were:
  - Mullowney Ln & Midland Rd/S Frontage Rd
  - South Frontage Rd & East Ln
  - Elysian Rd & S Frontage Rd
  - Elysian Rd & East Ln
  - Elysian Rd & Walter Creek Blvd
  - Mullowney Ln & Elysian Rd
- Conclusions and Recommendations:
  - Study intersections are anticipated to operate similarly to existing conditions at the time of full buildout.
  - A northbound right-turn lane is warranted at the Elysian Rd/S Frontage Rd intersection, and a westbound left-turn lane is projected to be warranted at East Ln & S Frontage Rd by 2028. The warranted turn lanes would have little to no impact on capacity operations. These improvements are on streets under Montana Department of Transportation jurisdiction. The City has sent the information to MDT for consideration and comment.
- Intersection contributions (to be spent at their respective intersection at a future date) are as follows:
  - Mullowney Ln & Midland Rd/S Frontage Rd = $7,875
  - Mullowney Ln & Elysian Rd = $9,360
  - Elysian Rd & East Ln = $4,500
  - Elysian Rd & S Frontage Rd = $3,555
  - S Frontage Rd & East Ln = $1,575

STAKEHOLDERS

There are no stakeholder responses at this time. Stakeholder input will be received at a public hearing scheduled for this subdivision on January 28, 2025.

Planning Board Plat Review - January 14, 2025

Planner Hunter Kelly presented his findings regarding the Subdivision and opened his time for questions or comment. Boardmember Jim Ronquillo asked if the City presently had utilities at the location. Hunter responded by stating the current available connections and the proposed connections to water & sewer mains as part of this subdivision are all available for extension. The applicant's agent, Gary Owen of Sanbel, was invited to speak. Boardmember Dennie Stephenson asked Gary if this filing of Annafeld Subdivision would contain any significant differences to the other filings. Gary responded by saying this filing will be identical to the previous filings. The Board had no more questions and closed the discussion.

ALTERNATIVES

In accordance with state law, the City Council has 60 working days to act upon this major preliminary plat. The 60-working-day review period for the proposed plat ends February 28, 2025. State and City subdivision regulations also require that preliminary plat be reviewed using specific criteria, as stated within this report. The City may not unreasonably restrict an owner's ability to develop land if the subdivider provides evidence that any identified adverse effects can be mitigated. Within the 60-working-day review period, the City Council is required to:

1. Approve;
2. Conditionally Approve; or
3. Deny the Preliminary Plat

FISCAL EFFECTS

This preliminary plat will have no fiscal impact on the Planning Division.

SUMMARY

One of the purposes of the City's subdivision review process is to identify potential negative effects of property being subdivided. Negative effects that are identified become the subdivider's responsibility to mitigate. Various City departments, private service/utility providers and the affected school districts, have reviewed this application and provided

input on effects and mitigation. The Findings of Fact, which are presented as an attachment, discuss potential negative impacts of the subdivision and conditions of approval are recommended as measures to further mitigate any impacts. In this case, there were found to be minimal impacts from this proposed subdivision.

Attachments

Preliminary Plat
Draft Subdivision Improvement Agreement
Findings of Fact
Traffic Impact Study

PRELIMINARY PLAT OF

ANNAFELD SUBDIVISION, SIXTH FILING

BEING LOT 4A, BLOCK 27 AND LOT 5A–1, BLOCK 24 OF AMENDED PLAT OF LOT 4, BLOCK 27 LOT 5A, BLOCK 24, AND LOT 6A BLOCK 20 ANNAFELD SUBDIVISION FOURTH FILING AND LOT 10, BLOCK 26 AND LOT 15, BLOCK 22 OF ANNAFELD SUBDIVISION, FIFTH FILING SITUATED IN THE NW1/4 OF SECTION 19, T. 1S., R. 26E., P.M.M., IN THE CITY OF BILLINGS, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : McCALL DEVELOPMENT, INC.

OCTOBER, 2024

PREPARED BY : sanbell

BILLINGS, MONTANA

PLAT DATA

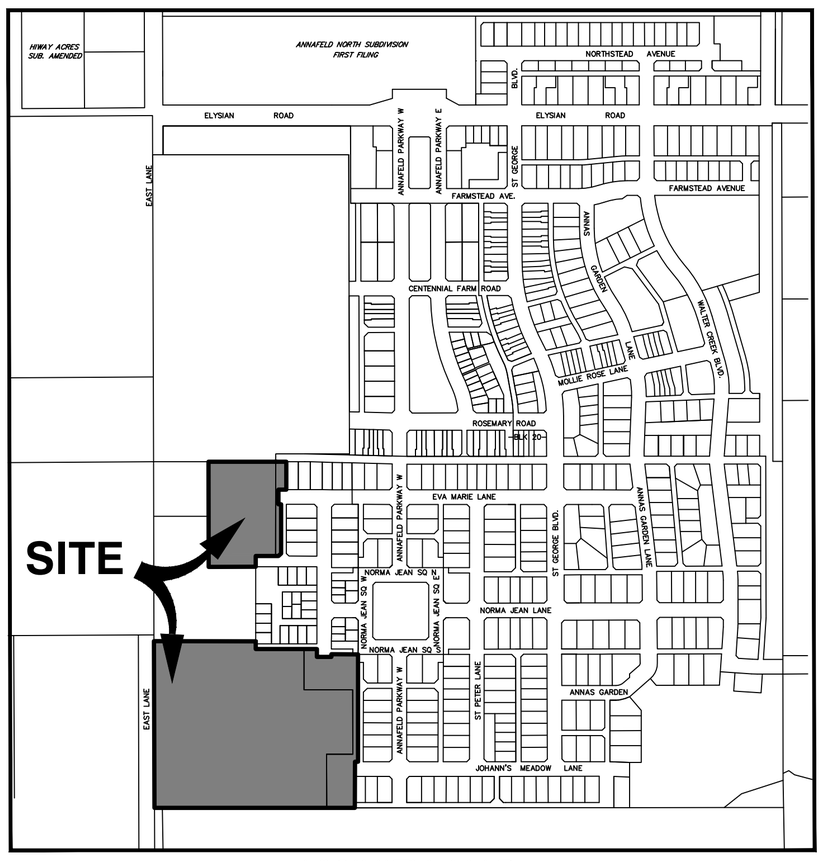
GROSS AREA	= 13.536 ACRES
NET AREA	= 8.486 ACRES
NUMBER OF LOTS	= 87
MINIMUM LOT SIZE	= 2836 S.F.
MAXIMUM LOT SIZE	= 12,531 S.F.
LINEAL FEET OF STREETS	= ±3135 L.F.
PARKLAND REQUIREMENT	= 0.933 ACRES
PARKLAND DEDICATION	= 0.499 ACRES AND PREVIOUS FILINGS
EXISTING ZONING	= PUD
SURROUNDING ZONING:	
NORTH	= PUD
SOUTH	= PUD AND AGRICULTURAL
EAST	= PUD
WEST	= I1 AND N4
EXISTING LAND USE	= VACANT
PROPOSED LAND USE	= RESIDENTIAL

BASIS OF BEARINGS: PLAT OF ANNAFELD SUBDIVISION, SECOND FILING

NOTE: ALL CURVES ARE TANGENT AND ALL PROPERTY LINES INTERSECTING CURVES ARE RADIAL UNLESS OTHERWISE NOTED.

OWNERSHIPS

1. MCCALL DEVELOPMENT INC, 1536 MULLOWNEY LN STE 100, BILLINGS, MT 59101–6397
2. CARDER, BRANDIE M & JASON T, 1886 ANNAFELD PARKWAY W, BILLINGS, MT 59101–7286
3. JEAN L NILSON REVOCABLE TRUST, 1815 GREYSTONE DR, BILLINGS, MT 59102–6556
4. WALTER, NORMA J, 1807 EAST LANE, BILLINGS, MT 59102–6349
5. GOODMAN, KELLY, 2201 EAST LN, BILLINGS, MT 59101–6351
6. WINCHELL, SCOTT & DANA, PO BOX 22967, BILLINGS, MT 59104–2967
7. FRONTIER SERVICES INC., PO BOX 418, HARDIN, MT 59034–0418
8. GARY J ARMSTRONG LIVING TRUST, 1701 EAST LANE, BILLINGS, MT 59101–6364
9. MCCALL HOMES LLC, 1536 MULLOWNEY LN STE 100, BILLINGS, MT 59101–6397
10. MILLER, MATTHEW & MADISON, 6224 NORMA JEAN SQUARE S, BILLINGS, MT 59101
11. COUILLARD, ANDREW & MARY, 6226 NORMA JEAN SQUARE S, BILLINGS, MT 59101



VICINITY MAP
NOT TO SCALE

TABLE OF CONTENTS

Return to:
Sanderson Stewart
1300 North Transtech Way
Billings, MT 59102

SUBDIVISION IMPROVEMENTS AGREEMENT & WAIVER OF RIGHT TO PROTEST FUTURE SPECIAL IMPROVEMENT DISTRICTS ANNAFELD SUBDIVISION, SIXTH FILING

THIS AGREEMENT is made and entered into this _____ day of _____, 20___, by and between **MCCALL DEVELOPMENT, INC.**, whose address for the purpose of this agreement is 1536 Mullowney Lane, Suite 100; Billings, Montana 59101, hereinafter referred to as "Subdivider," and the **CITY OF BILLINGS**, Billings, Montana, hereinafter referred to as "City."

WITNESSETH:

WHEREAS, the plat of Annafeld Subdivision, Sixth Filing located in Yellowstone County, Montana was submitted to the Yellowstone County Board of Planning; and

WHEREAS, at a regular meeting conducted on the _____ day of _____ 20__, the Board of Planning recommended conditional approval of a preliminary plat of Annafeld Subdivision, Sixth Filing; and

WHEREAS, at a regular meeting conducted on the ___ day of _____ 20__, the City Council conditionally approved a preliminary plat of Annafeld Subdivision, Sixth Filing; and

WHEREAS, a Subdivision Improvements Agreement is required by the City prior to the approval of the final plat.

WHEREAS, the provisions of this agreement shall be effective and applicable to Annafeld Subdivision, Sixth Filing upon the filing of the final plat thereof in the office of the Clerk and Recorder of Yellowstone County, Montana. The subdivision shall comply with all requirements of the City of Billings

Subdivision Regulations, the rules, regulations, policies, and resolutions of the City of Billings, and the laws and administrative rules of the State of Montana.

THEREFORE, THE PARTIES TO THIS AGREEMENT, for and in consideration of the mutual promises herein contained and for other good and valuable consideration, do hereby agree as follows:

I. VARIANCES

None requested

II. PROPERTY CONDITIONS AND INFORMATION FOR LOT PURCHASERS

A. Lot owners will be required to construct that segment of the required sidewalk that fronts their property at the time of lot development. If sidewalk is not constructed within five years, the City has the right to construct the sidewalk and assess the property owners.

B. There is attached hereto a Waiver waiving the right to protest the creation of the special improvement district or districts which by this reference is expressly incorporated herein and made as much a part hereof as though fully and completely set forth herein at this point. The Waiver will be filed with the plat, shall run with the land, and shall constitute the guarantee by the Subdivider and property owner, or owners of the developments described herein. Said Waiver is effective upon filing and is not conditioned on the completion of the conditions set forth in this agreement. The Subdivider and owner specifically agree that they are waiving valuable rights and do so voluntarily.

C. Lot owners should be aware that this subdivision is built with a "traditional neighborhood" design. The single-family dwellings will have the garage set in the rear of the lots. The access will be provided to the garages by means of a paved Carriage Lane.

D. Lot owners should be aware that this subdivision is zoned "Planned Development" (PD). Special zoning regulations regarding lot development will be enforced in accordance with the Amended Planned Development Agreement recorded at the Yellowstone County Clerk and Recorders Office under Document No. 3826023.

E. Lot owners should be aware that this subdivision is adjacent to wildlife habitat. Consequently, owners are advised that wildlife indigenous to the area is found on the property and may impact the developed property and interface with domestic animals, residents, and visitors. Owners may also experience problems with damage to landscaped shrubs, flowers, and gardens. Any impacts associated with wildlife and any damage arising there from is the responsibility of the lot owners.

F. No water rights have been transferred to the individual lot owners but may be held by the Subdivider and/or the homeowners association. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners without the permission of the controlling ditch company.

G. Lot owners should be aware they may be required to participate in a park maintenance district administered by the homeowners' association for Annafeld Subdivision, Sixth Filing.

H. Individual lot owners should be aware that Best Management Practices for stormwater control shall be required for any construction on lots. Best Management Practices are defined within Chapter 28-201, BMCC and detailed in the City of Billings *Stormwater Management Manual.*

I. Lot owners should be aware that Hogan's Slough adjacent to the subdivision is a major stormwater outfall for Billings west end. There is a possibility that the slough could overtop during a major storm event. Based upon the existing topography near Hogan's Slough and the Elysian Road Bridge, it is anticipated that the channel would overtop northeast of Elysian Road and flow east prior to overtopping Elysian Road. There is the possibility however that Elysian Road could be overtopped during a major storm event. If that occurs, flows not carried within the Hogan's Slough channel would be carried within the subdivision streets. The elevation of residential dwellings and commercial structures must be established in recognition of the City's policy that storm runoff flows are allowed to a depth of 18-inches in the gutter flowline of adjacent streets during the major storm. Higher house finished floor elevations may be required on a lot-by-lot basis.

J. The Subdivider and subsequent contractors/builders acknowledge that there is a Stormwater Pollution Prevention Plan (SWPPP) filed with the City and the State Department of Environmental Quality (DEQ). This SWPPP shall be adhered to during all phases of construction and shall be updated as required by DEQ under the General Permit for Stormwater Discharges Associated with Construction Activity, Chapter 28, BMCC and the City of Billings *Stormwater Management Manual.*

III. TRANSPORTATION

A. Streets

1. All internal access roads and site improvements within the subdivision will be in accordance with the City of Billings Site Development Ordinance, City Zoning Ordinance, the *Stormwater Management Manual*, and other applicable City codes, rules, and regulations.

2. All internal streets within the subdivision shall be built to grade with a satisfactory subbase, base course, curb and gutter, and asphalt surface. All public roads will be built to provide a 34-foot back-to-back curb street width. The design cross-sections of said streets shall be submitted to, and approved by, the City of Billings Public Works Department. The street improvements will be completed by private contract or SID.

3. East Lane is designated as a collector on the Billings/ Yellowstone County functional classification map. Curb and gutter and any necessary pavement widening will be constructed on the east side of East Lane frontage adjacent to the Sixth Filing. Storm drain in East Lane shall be installed, as necessary, and as approved by the City of Billings Public Works Department. A southbound left-turn bay is not required. A parking lane will be provided on the east side of East Lane adjacent to the Sixth Filing. East Lane shall be constructed wide enough to accommodate a future bike lane, but the bike lane should not be installed with this development. East Lane Improvements will be completed by private contract or SID.

4. At the time of this Filing, Phase IV of Harmony Meadows Subdivision, Second Filing has not been constructed. Therefore, a physical connection between Annafeld Subdivision and Harmony Meadows Subdivision cannot be made. Furthermore, even if the Story Road connection were constructed, the traffic generated from Annafeld Subdivision, Sixth Filing would be unlikely to utilize Story Road based on proximity to East Lane and Elysian Road and the land uses that are currently in Harmony Meadows Subdivision. Therefore, a detailed traffic impact analysis of the Story Road connection to Harmony Meadows Subdivision is not required for this Filing of Annafeld Subdivision.

   The Subdivider agrees to contribute up to 50 percent of the cost for design, permitting, and construction of the Hogan's Slough crossing on Story Road by a cash contribution or by SID. If the cash contribution is not sufficient to cover 50 percent of the crossing costs at the time of construction, the City retains the right to create a SID to recover additional design and construction costs.

   The timing of the contribution or SID for the Hogan's Slough crossing on Story Road shall be made at the earlier of the following:

   I. At the time, an Annafeld Subdivision Traffic Impact Study recommends the Story Road connection be completed.
   II. At the commencement of construction of Phase IV improvements for Harmony Meadows Subdivision, 2nd Filing.
   III. Prior to final plat approval of the final filing of Annafeld Subdivision.

5. A traffic accessibility study has been completed for Annafeld Subdivision 6th Filing. All required intersection improvement contributions identified therein shall be completed by the Subdivider at the Subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic accessibility study:

S. Frontage Rd/Midland Rd/Mullowney Lane	1.75%
Mullowney Lane & Elysian Road	2.08%
Elysian Road & East Lane	1.00%
Elysian Road & South Frontage Road	0.79%
South Frontage Road & East Lane	0.35%

The cash contributions shall be based on the percent of traffic contributions to the intersections based on the total cost of an intersection as determined by Engineering for the year in which the contribution is made.

The cash contribution shall be made prior to final plat approval.

B. Carriage Lanes

All Carriage Lanes within the subdivision shall be built to grade with a satisfactory subbase, base course, and asphalt surface or concrete surface. All Carriage Lane approaches constructed with asphalt shall be replaced with concrete by the Subdivider at the time when home construction is complete. In the event asphalt approaches within the subdivision are not replaced with concrete within three years of the date of recording of the final plat, the City may construct the concrete approaches and assess the Subdivider for the costs associated with the approach construction. Carriage Lane pavement widths shall be 12-feet. The design cross-sections of said Carriage Lanes shall be submitted to, and approved by, the City of Billings Public Works Department. No trees are allowed to be planted in the Carriage Lane. In addition, no shrubs taller than two feet are allowed to be planted in Carriage Lanes.

C. Sidewalks

Subdivider shall install handicap access ramps at the time of lot development, where necessary. Construction of sidewalks along frontage of the lots shall be installed by the lot owner at the time of lot development. Sidewalks along the street frontage shall be minimum 5-foot-wide and separated with a boulevard width not less than five feet. Developer shall construct the 5-foot-wide

boulevard sidewalk adjacent to private park (north/east side of Lot 27, Block 35) at the time of private park development.

D. Street Lighting

Street lighting is required for this subdivision. It is anticipated that street lighting will be installed for Sixth Filing by private contract or SID. A Street Light Maintenance District will be created for operation and maintenance of the lighting at a future date and is included in the waiver of right to protest.

E. Traffic Control Devices

The Subdivider shall furnish and install all necessary traffic control devices within and adjacent to the Subdivision in accordance with the plans and specification submitted to and approved by the City Engineer. Traffic control devices shall include all necessary signing, striping, and channelization devices to properly complete the implementation of the proposed street construction.

F. Access

Access to the subdivision will be provided by East Lane, Eva Marie Lane, St Peter Lane, and Johanns Meadow Lane. Carriage Lane access is also provided to all residential lots within the subdivision.

G. Billings Area Bikeway and Trail Master Plan

The width for a 5.5-foot-wide bike lane will be provided on the east side of East Lane adjacent to this subdivision. However, the bike lane improvements will not be installed a part of this subdivision. No additional trail improvements will be required as part of this subdivision.

H. Public Transit

There are no MET Transit routes that service this subdivision at this time. The nearest established route is at the intersection of Elysian Road and Mullowney Lane. No improvements with regard to MET Transit vehicles are anticipated at this time.

IV. EMERGENCY SERVICE

A. Fire Hydrants

Emergency service will be provided by the City. Placement of fire hydrants will be as required by the City of Billings Fire Department.

B. Construction of Buildings

Construction of buildings made of combustible materials shall have adequate fire apparatus access roads and water supply (fire hydrants) in place to allow for fire suppression requirements. Prior to issuance of a building permit for construction using combustible materials (i.e. lumber, plywood, wood trusses, etc.), fire apparatus access roads and water supply requirements shall be provided in accordance with the International Fire Code as adopted by the City of Billings.

At a minimum, the following is required:

- An unobstructed gravel road or gravel road base must be within 150-feet of the furthest portion of a building under construction as measured along the approved route.
- The access roads are required to support fire apparatus vehicle loading (40 tons) during all weather conditions and shall be a minimum of 20-foot-wide.
- An operational fire hydrant shall be located within 600-feet of the furthest portion of a residence under construction, or within 400-feet of the furthest portion of a commercial building under construction as measured along the access roads to the site.
- The above requirements do not alter or effect the current minimum subdivision requirements for fire apparatus access and water supply.

C. Building Location

All buildings shall be located on each lot so that the furthest portion of each building is within 150-feet from an approved fire department access road over an approved route excluding all carriage lanes.

V. STORM DRAINAGE

A. A stormwater management plan shall be submitted to the Engineering Division prior to final plat approval. The storm drainage system for Annafeld Subdivision, Sixth Filing will consist of a curb and gutter surface collection and curb inlets that drain into storm drainage piping, as well as surface conveyance. The storm drain piping will discharge into existing storm drain piping and to an existing mechanical stormwater filtration manhole, then into Hogan's Slough. All drainage improvements shall comply with the provisions of the City of Billings *Stormwater Management Manual* and Chapter 28, BMCC.

B. The mechanical stormwater filtration manholes are existing, and associated improvements are privately owned and maintained by the HOA. Annafeld Subdivision, Sixth Filing will be included in the HOA that is responsible to maintain these facilities. O&M requirements and HOA maintenance and fiscal responsibilities have been outlined within the Annafeld Subdivision, First Filing I O&M Manual.

C. Hogan's Slough adjacent to the subdivision is a major stormwater outfall for Billings west end. There is a possibility that the slough could overtop during a major storm event. Based upon the existing topography near Hogan's Slough and the Elysian Road Bridge, it is anticipated that the channel would overtop northeast of Elysian Road and flow east prior to overtopping Elysian Road. There is the possibility however that Elysian Road could be overtopped during a major storm event. If that occurs, flows not carried within the Hogan's Slough channel would be carried within the subdivision streets. The elevation of residential dwellings and commercial structures must be established in recognition of the City's policy that storm runoff flows are allowed to a depth of 18-inches in the gutter flowline of adjacent streets during the major storm.

D. Individual lot owners should be aware that Best Management Practices for stormwater control shall be required for any construction on lots. Best Management Practices are defined within Chapter 28, BMCC and detailed in the City of Billings *Stormwater Management Manual.*

E. The Subdivider and subsequent contractors/builders acknowledge that there is a Stormwater Pollution Prevention Plan (SWPPP) filed with the City and the State Department of Environmental Quality (DEQ). This SWPPP shall be adhered to during all phases of construction and shall be updated as required by DEQ under the General Permit for Stormwater discharges Associated with Construction Activity, Chapter 28, BMCC and the City of Billings *Stormwater Management Manual.*

VI. UTILITIES

The Subdivision Improvements Agreement does not constitute an approval for extension of or connection to water mains and sanitary sewers. The property owner shall make application for extension/ connection of water mains and sanitary sewers to the Public Works Department - Engineering Division. The extension of/connection to water mains and sanitary sewers is subject to the approval of the applications and the conditions of approval. Applications shall be submitted for processing prior to the start of any construction and prior to review and approval of any project plans and specifications.

The Subdivider/owner acknowledges that the subdivision shall be subject to the applicable system development fees in effect at the time new water and/or sanitary sewer service connections are made.

The design/installation of sanitary sewers and appurtenances, and water mains and appurtenances (fire hydrants, etc.) shall be in accordance with design standards, specifications, rules, regulations of, and as approved by the City of Billings Public Works Department, Fire Department, and the Montana Department of Environmental Quality.

A. Water

The Annafeld Subdivision water system consists of a series of looped water mains located in each of the local streets. The subdivision water system will consist of new 12-inch water main in Street 1 (temporary name), East Lane and in a portion of St. Peter Lane (north of Street 1 (temporary name)). 8-inch water mains will be installed in the remaining streets in Annafeld Subdivision, Sixth Filing.

B. Sanitary Sewer

Sanitary sewer service to Annafeld Sub., 6th Filing Phase 1 and Phase 3 will be provided by connecting to the existing 8-inch gravity sanitary sewer mains located in Eva Marie Lane, St Peter Lane, and Johanns Meadow Lane. The sanitary sewer improvement shall be completed by private contract.

Sanitary sewer service to Annafeld Sub., 6th Filing Phase 2 will be provided by connecting to existing sanitary sewer manhole located at the intersection of East Lane and Tun Tavern Road and extending 18-inch sanitary sewer main to the south boundary of Annafeld Sub., 6th Filing in East Lane. The construction of sanitary sewer improvements in East Lane will be completed by private contract or by a separate City of Billings work order, at the City's discretion.

If the East Lane sanitary sewer improvements are installed by private contract, the Subdivider can submit for reimbursement to the City of Billings for the cost of oversizing to 18-inch sanitary sewer main (from 8-inch main) adjacent to 6th Filing Phase 2 and for the total cost of sanitary sewer construction from the connection point at Tun Tavern Road to the northern boundary of the Annafeld 6th Filing Phase 2 in accordance with the City of Billings rules and regulations for reimbursement. Also, if adjacent Lot 5D, Block 1 of Amended Plat of Lot 5, Block 1 Bottrell Subdivision annexes and connects into the City of Billings, the Developer reserves the right for reimbursement for half the cost of the 8-inch sanitary sewer main adjacent to the lot in accordance with the City of Billings rules and regulations for reimbursement.

If the East Lane sanitary sewer improvements are installed by a City of Billings work order, the Subdivider shall reimburse the City of Billings at the time of construction for the equivalent cost of 8-inch sanitary sewer construction adjacent to Annafeld 6th Filing Phase 2.

All sanitary sewer construction improvements shall be installed in conformance with the design standards, specifications, and rules and regulations of the City of Billings and Montana Department of Environmental Quality, and will be approved by the Public Works Department, Distribution, and Collection Division.

C. Power, Telephone, Gas, and Cable Television

Private utility facilities currently exist to serve the subdivision. The private utility facilities will be installed within the Carriage Lane right-of-way and by easements included on the plat, as requested by the utility companies, to provide routes to the Carriage Lanes.

VII. PARKS/OPEN SPACE

The subdivision lies within a planned unit development that provides for land permanently set aside for park and recreational uses sufficient to meet the needs of the persons who will ultimately reside in the development, per 76-3-621(6)(a) of the Montana Code Annotated. The park and open space within the Annafeld Planned Unit Development Master Plan meets or exceeds the 0.933 acres (11% of net lot area, 6th Filing) of dedication required under section 76-3-621(1), MCA. The Subdivider and City agree that the parkland dedication has been met through the dedication of private park area within Annafeld Subdivision, Sixth Filing and with additional public and private park dedication with Annafeld Subdivision, First, Second, Third, Fourth and Fifth Filings.

In addition, the lots within Annafeld Subdivision, Sixth Filing may provide additional funding to complete the park improvements for the previously created public parkland SID. The park improvements shall be in accordance with the City Council approved Annafeld Parks Master Plan. The Subdivider shall prepare all SID documents necessary for creation, and coordinate with the City of Billings Parks and Recreation Department for review and approval. If all park improvements as defined in the Annafeld Parks Master Plan have been completed prior to the creation of this park SID, then this park SID will no longer be required.

The current park maintenance district (PMD 4041) for Annafeld Subdivision, First Filing shall be expanded to include lots with Annafeld Subdivision, Sixth Filing for the perpetual maintenance of the public parkland. The Subdivider shall prepare all park maintenance district

documents necessary for its expansion and coordinate with the City of Billings Parks and Recreation Department for review and approval.

VIII. HOMEOWNER'S ASSOCIATIONS

A homeowner's association (HOA) will be established for this subdivision. The HOA will have the following responsibilities:

A. Contact Information

HOA shall provide contact information of the senior board official to the City Engineering Department upon the establishment of the HOA and/or changing of board members.

B. Stormwater Drainage Facilities

The HOA shall be responsible for the maintenance of the mechanical filtration stormwater manholes. The HOA shall share the cost of maintenance of the community stormwater facilities.

IX. POSTAL DELIVERY

The Subdivider shall provide centralized delivery boxes with sufficient pullout to accommodate a mail carrier vehicle. The location of the boxes shall be reviewed and approved by the United States Postal Service.

X. SOILS/GEOTECHNICAL STUDY

A soils/geotechnical study has been performed for the subdivision by Rimrock Engineering Inc. The report dated (to be determined), is available for review at the City of Billings Planning Department. Lot owners and contractors/builders are encouraged to review the report and its recommendations.

XI. PHASING OF IMPROVEMENTS

The Subdivider does not desire to commence development of all lots within the subdivision but does desire to file the approved final plat of Annafeld Subdivision, Sixth Filing, and to sell and convey lots in said subdivision in phases. Improvements for the subdivision are to be developed in three (3) phases. The phases are defined as follows:

Phase I

Phase I improvements shall be constructed utilizing a private contract or an SID. Phase I improvements shall include necessary street and utility improvements adjacent to phase I lots. The lots to be served by Phase I are more particularly described as follows:

Annafeld Subdivision, 6th Filing

Block 22, Lots 15 through 24
Block 27, Lots 4 through 11
Block 33, Lots 25 through 34
Block 34, Lots 1 through 13
Block 35, Lots 19 through 27

Phase II – Opened by November 1, 2030

Phase II improvements shall be constructed utilizing a private contract or an SID. Phase II improvements shall include necessary street and utility improvements adjacent to Phase II lots. The lots to be served by Phase II are more particularly described as follows:

Annafeld Subdivision, 6th Filing

Block 33, Lots 35 through 38
Block 35, Lots 1 through 18

Phase III – Opened by November 1, 2030

Phase III improvements shall be constructed utilizing a private contract or an SID. Phase III improvements shall include necessary street and utility improvements adjacent to phase III lots. The lots to be served by Phase III are more particularly described as follows:

Annafeld Subdivision, 6th Filing

Block 26, Lots 10 through 12
Block 33, Lots 39 through 42
Block 36, Lots 1 through 8

Pursuant to the foregoing agreement, the Subdivider shall execute and record a Declaration of Restriction on Transfers and Conveyances for said Phase II and

Phase III (Attached hereto) to be recorded concurrently with the recording of this agreement. Said declaration notifies all third parties that said lots may not be legally sold, conveyed, or transferred until a release executed by the City of Billings and substantially in the form of Exhibit A attached hereto has been recorded in the office of the Clerk and Recorder of Yellowstone County, Montana. No lots shall be released until a certificate substantially in the form of Exhibit B attached hereto has been executed by the Department of Public Works stating that the above conditions have been met, which certificate must accompany any request for a release. By the acceptance and recording of the agreement, the City does hereby authorize the Public Works and Parks and Recreation Departments, Mayor, and City Clerk of the City to review any request for release and to execute such certificates and releases as may be necessary to evidence a release from the restriction against sale, conveyance, and transfer of lots in the subdivision.

XII. FINANCIAL GUARANTEES

Except as otherwise provided, Subdivider shall install, and construct said required improvements by SID or by private contract secured by letters of credit or a letter of commitment to lend funds from a commercial lender or by SID. All engineering and legal work in connection with such improvements shall be paid by the contracting parties pursuant to said private contract, and the improvements shall be installed as approved by the City Engineer and Utility Department Manager.

XIII. LEGAL PROVISIONS APPLYING TO SUBDIVIDER

A. Subdivider agrees to guarantee all public improvements for a period of two years from the date of final acceptance by the City of Billings.

B. The owners of the properties involved in this proposed subdivision by signature subscribed herein below agree, consent, and shall be bound by the provisions of this agreement.

C. The covenants, agreements, and all statements in this Agreement run with the land and apply to and shall be binding on the heirs, personal representatives, successors, assigns and transferees of the respective parties.

D. In the event it becomes necessary for either party to this agreement to retain an attorney to enforce any of the terms or conditions of

this agreement or to give any notice required herein, then the prevailing party or the party giving notice shall be entitled to reasonable attorney fees and costs.

E. Any amendments or modifications of this agreement or any provisions herein shall be made in writing and executed in the same manner as this original document and shall after execution become a part of this agreement.

F. Subdivider shall comply with all applicable federal, state, and local statutes, ordinances, and administrative regulations during the performance and discharge of its obligations. Subdivider acknowledges and agrees that nothing contained herein shall relieve or exempt it from such compliance.

IN WITNESS WHEREOF, the parties hereto have set their hands and official seals on the date Sixth above written.

"SUBDIVIDER" **MCCALL DEVELOPMENT, INC.**

By:_____

Its:_____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this ____ day of _____, 20____, before me, a Notary Public in and for the State of Montana, personally appeared _____, known to me to be the _____ of **MCCALL DEVELOPMENT, INC.** who executed the foregoing instrument and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

This agreement is hereby approved and accepted by the City of Billings, this ____ day of _____, 20___.

"CITY" **CITY OF BILLINGS, MONTANA**

By: _____
Mayor

Attest: _____
City Clerk

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____ and _____, known to me to be the Mayor and City Clerk, respectively, of the City of Billings, Montana, whose names are subscribed to the foregoing instrument in such capacity and acknowledged to me that they executed the same on behalf of the City of Billings, Montana.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

WAIVER OF RIGHT TO PROTEST
FUTURE SPECIAL IMPROVEMENT DISTRICTS

FOR VALUABLE CONSIDERATION, the undersigned, being the Subdivider and all of the owners of the hereinafter described real property, do hereby waive the right to protest the formation of one or more special improvement district(s) for a period of no more than twenty years from the recording of this waiver, for street light maintenance and energy, and for the construction of streets, street widening, sidewalks, survey monuments, street name signs, curb and gutter, street lights, driveways, traffic signals, and traffic control devices, parks and park maintenance, trails, sanitary sewer lines, water lines, storm drains (either within or outside the area), and other improvements which the City of Billings may require.

This Waiver and Agreement is independent from all other agreements and is supported by sufficient independent consideration to which the undersigned are parties and shall run with the land and shall be binding upon the undersigned, their successors and assigns, and the same shall be recorded in the office of the County Clerk and Recorder of Yellowstone County, Montana.

This Waiver is in addition to any other recorded waiver related to the property described herein and is not intended to replace, supersede, or invalidate any such waiver.

The real property hereinabove mentioned that is the subject of this waiver is more particularly described as follows:

ANNAFELD SUBDIVISION, SIXTH FILING

SUBDIVIDER/OWNER **MCCALL DEVELOPMENT, INC.**

By:_____

Its:_____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____ day of _____, 20__, before me, a Notary Public in and for the State of _____, personally appeared _____ _____, known to me to be the person who executed the foregoing instrument as the _ _____ of **MCCALL DEVELOPMENT, INC.** and acknowledged to me that he/she executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Notarial Seal the day and year hereinabove written.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

FINDINGS OF FACT

The Planning staff has prepared the Findings of Fact for the preliminary plat of Annafeld Subdivision, 6th Filing. These findings are based on the preliminary plat application and supplemental documents and address the review criteria required by the Montana Subdivision and Platting Act (76-3-608, MCA) and the Billings Subdivision Regulations (Section 23-303(H), BMCC).

A. What are the effects on agriculture, local services, the natural environment, wildlife, wildlife habitat, and public health, safety and welfare? [MCA 76-3-608 (3) (a) and BMCC 23-302.H.2.]

1. Effect on agriculture and agricultural water user facilities

The subject property is vacant. Perimeter ditches and drains shall remain in place and not be altered by the subdivider or subsequent owners. The subdivision should not affect agricultural water users' facilities.

2. Effect on local services

a. **Utilities** – Water service will be provided by the City of Billings. New individual services will be provided to all the lots, and new fire hydrants will be installed as required by the City Fire Department. The water service for this subdivision will consist of new 12 -inch water main in Street 1 (temporary name), East Lane and in a portion of St. Peter Lane (north of Street 1 (temporary name)). 8-inch water mains will be installed in the remaining streets in Annafeld Subdivision, Sixth Filing. Any needed extension of those water lines will be installed by the subdivider to meet the requirements of the City of Billings Engineering Department regulations. The subdivider will install all new water lines in the local streets and individual services for each lot in accordance with design standards, specifications, rules, and regulations of the City of Billings Engineering/Public Works Department and MDEQ. This is outlined in the SIA under the heading VI Utilities, A, Water.

   Sanitary sewer service will be provided by connecting to the existing City of Billings' sewer mains. Sanitary sewer service to Annafeld Subdivision, 6th Filing Phase 1 and Phase 3 will be provided by connecting to the existing 8-inch gravity sanitary sewer mains located in Eva Marie Lane, St Peter Lane, and Johanns Meadow Lane. Sanitary sewer service to Annafeld Subdivision, 6th Filing Phase 2 will be provided by connecting to existing sanitary sewer manhole located at the intersection of East Lane and Tun Tavern Road and extending 18-inch sanitary sewer main to the south boundary of Annafeld Subdivision, 6th Filing in East Lane. All new services shall be installed in accordance with design standards, specifications, rules and regulations of the City of Billings Public Works Department and MDEQ. This is outlined in the SIA under the heading VI Utilities, B, Sanitary Sewer.

   Private Utilities will be provided from existing facilities to the subdivision. The private utility facilities will be installed within the Carriage Lane right-of-way and by easements

included on the plat, as requested by the utility companies, to provide routes to the Carriage Lanes.

Stormwater – Stormwater drainage for the public streets is proposed to be provided by curb and gutters that discharge into storm water pipes. These and all other drainage improvements shall satisfy the criteria set forth by the *City of Billings Stormwater Management Manual* and will be subject to review and approval by the City Engineering Department.

b. **Solid Waste** – The City of Billings will provide solid waste collection and disposal. The City's landfill has adequate capacity for this waste.

c. **Streets** – The subdivision will be accessed East Lane, Eva Marie Lane, St Peter Lane, and Johanns Meadow Lane. All of these streets are developed rights of way. All internal streets and carriage streets will be built according to the standards of the City of Billings Public Works Department. Street improvements are included in the Waiver of Right to Protest Future Special Improvement Districts.

The sidewalks will be installed by the respective lot owners on a lot-by-lot basis, as lots develop. Sidewalks along the street frontage shall be minimum 5-foot-wide and separated with a boulevard width not less than five feet. The developer will also install all ADA required ramps at the intersections within the proposed subdivision. The developer shall construct the 5-foot-wide boulevard sidewalk adjacent to private park (north/east side of Lot 27, Block 35) at the time of private park development. This information is all in the SIA under the heading Transportation.

The proposed roads of this subdivision shall be named with the approval of the Land Management Coordinator, and the approved names shall appear on the Plat, SIA, and supporting documents. **(Condition #1)**

Findings of the Traffic Impact Study:

- Development is 49 single-family lots and 22 townhomes in phase 1 and an additional 15 single-family lots in phase 2 generating a total of 762 average weekday trips in the full buildout.
- Studied intersections were: Mullowney Ln & Midland Rd/S Frontage Rd, South Frontage Rd & East Ln, Elysian Rd & S Frontage Rd, Elysian Rd & East Ln, Elysian Rd & Walter Creek Blvd, and Mullowney Ln & Elysian Rd
- Conclusions and Recommendations:
    - Study intersections are anticipated to operate similarly to existing conditions at the time of full buildout.
    - A northbound right-turn lane is warranted at the Elysian Rd/S Frontage Rd intersection, and a westbound left-turn lane is projected to be warranted at East Ln & S Frontage Rd by 2028. The warranted turn lanes would have little to no impact on capacity operations. These improvements are on

streets under Montana Department of Transportation jurisdiction. The City has sent the information to MDT for consideration and comment.

- Intersection contributions (to be spent at their respective intersection at a future date) are as follows:
  - Mullowney Ln & Midland Rd/S Frontage Rd = $7,875
  - Mullowney Ln & Elysian Rd = $9,360
  - Elysian Rd & East Ln = $4,500
  - Elysian Rd & S Frontage Rd = $3,555
  - S Frontage Rd & East Ln = $1,575

d. **Emergency Services** – The Billings Police and Fire Departments will respond to emergencies within the proposed subdivision. The nearest fire station, Fire Station #5, is located at 605 S 24th Street West, which is 2.87 road miles, or 6 minutes away. The subdivision is located within the ambulance service area of American Medical Response (AMR).

e. **Schools** – Elysian School (School District #23) provides service to students within this subdivision for elementary and middle school. School District #2 provides service to students within this subdivision for high school (West High School). Elysian School did not respond. School District #2 responded stating West High School is over capacity at this time, with 2176 students attending out of a maximum capacity of 1731 students.

f. **Parks and Recreation** – This subdivision is part of a master planned development. The parkland dedication has been met through the dedication of private park area within Annafeld Subdivision, Sixth Filing and with additional public and private park dedication with Annafeld Subdivision, First, Second, Third, Fourth and Fifth Filings.

g. **Mail Delivery -** The developer shall coordinate with the United States Postal Service to determine the preferred type and location of mail delivery system for this subdivision. **(Condition #2)**

h. **Phasing of Development** – The applicant is proposing to phase this subdivision. There are three (3) phases being proposed. Associated infrastructure for each phase shall be installed in accordance with emergency service standards and City of Billings Public Works standards. Infrastructure installation, phase opening dates, and lots included in each phase are within the SIA.

Phase	**Lots**	**Timeline**
Phase 1	Block 22, Lots 15 through 24 Block 27, Lots 4 through 11 Block 33, Lots 25 through 34 Block 34, Lots 1 through 13 Block 35, Lots 19 through 27	Immediately
Phase 2	Block 33, Lots 35 through 38 Block 35, Lots 1 through 18	November 1, 2030

Phase 3	Block 26, Lots 10 through 12 Block 33, Lots 39 through 42 Block 36, Lots 1 through 8	November 1, 2030

3. Effect on the natural environment

The subject property is currently vacant with the proposed use of residential development. The property is not located within a floodplain. During development, storm water pollution prevention best management practices are required to be used and monitored to prevent erosion on exposed ground. Overall, the effect on the natural environment should be minimal.

4. Effect on wildlife and wildlife habitat

There are no known endangered or threatened species on the property. There is a paragraph in the SIA that warns future lot owners of the presence of deer in the area, which may cause damage to their landscaping. This subdivision should have a minimal effect on wildlife and wildlife habitat.

5. Effect on public health, safety and welfare

There will be no significant impacts to public health, safety and welfare because of this subdivision.

B. Was an Environmental Assessment required? [(MCA 76-3-616 and BMCC 23-302.H.1.]

The proposed subdivision is exempt from the requirement for an Environmental Assessment pursuant to Section 76-3-616, MCA.

C. Does the subdivision conform to the City of Billings 2016 Growth Policy, the 2014 Transportation Plan, and the Billings Area Bikeway and Trail Master Plan? [BMCC 23-302.H.4.]

1. City of Billings 2016 Growth Policy

The proposed subdivision is consistent with the following goals of the Growth Policy:

> **Strong Neighborhoods (livable, safe, sociable and resilient neighborhoods):** Neighborhoods that are safe and attractive and provide essential services are much desired.
>
> **Home Base (healthy, safe and diverse housing options):** Planning and construction of interconnected sidewalks and trails are important to the economy and livability of Billings.
>
> **Essential Investments (relating public and private expenditures to public values)**: Planning and construction of safe and affordable interconnected sidewalks and trails are important to the economy and livability of Billings.

Developed parks that provide recreation, special amenities (community gardens, dog parks, viewing areas), and active living opportunities are desirable for an attractive and healthy community.

3. 2023 Billings Urban Area Long Range Transportation Plan

The proposed subdivision adheres to the goals and objectives of the 2023 Transportation Plan and preserves the street network and street hierarchy specified in the plan.

4. Billings Area Bikeway and Trail Master Plan (BABTMP)

The proposed subdivision is within the jurisdiction of the Billings Area Bikeways and Trail Master Plan. A 5.5-foot-wide bike lane has been identified on the east side of East Lane adjacent to this subdivision. However, the bike lane improvements will not be installed as part of this subdivision. No additional improvements of this nature are anticipated.

D. Does the subdivision conform to the Montana Subdivision and Platting Act and to local subdivision regulations? [MCA 76-3-608 (3) (b) and BMCC 23-302.H.3.a.]

The proposed subdivision satisfies the requirements of the Montana Subdivision and Platting Act, and the design standards specified in the local subdivision regulations. The subdivider and the local government have complied with the subdivision review and approval procedures set forth in the local and state subdivision regulations.

E. Does the proposed subdivision conform to all requirements of the zoning in effect? [BMCC 23-302.H.3.e.]

The subject property is located within Annafeld Planned Development zoning. The lot frontages conform to the requirements of this zone. Other building setbacks and structure specific requirements will be reviewed for compliance at the time of building permit review.

There is a concurrent Annexation Petition (AN-24-05) for the portions of this subdivision still outside city limits.

F. Does the proposed plat provide easements for the location and installation of any utilities? [MCA 76-3-608 (3) (c) and BMCC 23-302.H.3.b.]

The subdivider will provide utility easements as requested by private utility companies on the face of the plat.

G. Does the proposed plat provide legal and physical access to each parcel within the subdivision and notation of that access on the plat? [MCA 76-3-608 (3) (d) and BMCC 23-302.H.3.c.]

Legal and physical access is provided to the proposed will be from East Lane, Eva Marie Lane, St Peter Lane, and Johanns Meadow Lane. New internal accesses will provide circulation to individual lots.

CONCLUSIONS OF FINDINGS OF FACT

- The preliminary plat of Annafeld Subdivision, 6th Filing does not create any adverse impacts that warrant denial of the subdivision.

- The proposed subdivision conforms to several of the goals and policies of the 2016 Growth Policy and does not conflict with the Transportation or Bikeway/Trail Plans.

- The proposed subdivision complies with state and local subdivision regulations, local zoning, and sanitary requirements and provides legal and physical access to each lot.

- Any potential negative or adverse impacts will be mitigated with the proposed conditions of approval.

RECOMMENDATION

The Planning Board recommends to City Council that the preliminary plat of Annafeld Subdivision, 6th Filing be conditionally approved and the Findings of Fact adopted as presented in the staff report.

Approved by the Billings City Council, February 24, 2025

_____

William A. Cole, Mayor

October 17, 2024

Dakota Martonen, PE, PTOE
City of Billings Public Works Department
2224 Montana Avenue
Billings, MT 59101

Reference: Traffic Impact Study Update
Annafeld Subdivision, Sixth Filing, Billings, MT
Project No. 16001.161

Dear Dakota:

The purpose of this letter is to provide a traffic impact study (TIS) update for the Sixth Filing of Annafeld Subdivision, located south of Eva Marie Lane and east of East Lane in Billings, Montana. This development's original masterplan TIS (Josephine Landing Subdivision TIS, February 2016) analyzed the First Filing in detail and the Full Build scenario. Evaluations of subsequent phases were evaluated in several traffic impact studies and updates: a February 2019 TIS for the Second and Third Filings, a December 2020 TIS update for denser commercial land use in Blocks 10 and 12, a September 2021 TIS letter for the Fourth Filing, and a February 2023 TIS letter for the Fifth Filing. The current TIS update provides a detailed analysis of the traffic impacts of the proposed Sixth Filing.

Site Location and Layout

The Sixth Filing of the Annafeld Subdivision development plan proposes the construction of 49 single-family lots and 22 townhomes in the first phase and an additional 15 single-family lots in the second phase. Phase 1 of the subdivision is anticipated to be occupied in 2028, and the remaining units to be occupied by 2030. Figure 1 (Attachment A) illustrates the location of the proposed site. Figure 2 (Attachment A) shows the proposed layout. The Sixth Filing is generally located southwest of the Fifth Filing. The site is anticipated to be accessed via East Lane, Trade Center Avenue, and internal subdivision connections to Eva Marie Lane, St Stephen Boulevard, St Peter Boulevard, and Johanns Meadow Lane. Figure 3 (Attachment A) shows existing street classifications and other characteristics.

Existing Conditions

Existing Conditions (2024) traffic counts were collected at the study intersections on Tuesday, August 13, 2024. Intersection peak hours were found to be from 7:15 – 8:15 AM and 4:15 – 5:15 PM. Raw count data was adjusted for seasonal variation using City

of Billings seasonal adjustment factors. Figure 4 (Attachment A) illustrates the resulting Existing Conditions (2024) AM and PM peak hour turning movement volumes. Traffic volume count worksheets are also included in Attachment B.

Table 1. Existing Conditions (2024) Capacity Calculations Summary

Intersection	Approach	Existing (2024)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Signalized*					
Mullowney Lane & Midland Road/South Frontage Road	EB	35.1	D	4	25.6	C	7
	WB	33.8	C	3	21.5	C	3
	NB	12.2	B	7	19.2	B	7
	SB	5.9	A	3	10.8	B	6
	Intersection	16.1	B	--	17.4	B	--
Intersection Control		*One-Way Stop-Control (NB)*					
South Frontage Road & East Lane	EB	0.0	A	0	0.0	A	0
	WB	0.5	A	0	0.9	A	1
	NB	11.0	B	1	11.6	B	1
	Intersection	0.8	A	--	1.2	A	--
Intersection Control		*One-Way Stop-Control (WB)*					
Elysian Road & South Frontage Road	WB	13.4	B	1	17.5	C	2
	NB	0.0	A	0	0.0	A	0
	SB	0.0	A	0	0.2	A	0
	Intersection	2.3	A	--	2.4	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & East Lane	EB	0.2	A	0	0.1	A	0
	WB	0.8	A	0	0.4	A	0
	NB	10.2	B	1	10.3	B	1
	SB	10.1	B	1	10.8	B	0
	Intersection	2.3	A	--	2.3	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & Walter Creek Boulevard	EB	0.2	A	0	0.1	A	0
	WB	2.1	A	1	4.0	A	1
	NB	9.6	A	1	10.3	B	1
	SB	11.1	B	1	12.0	B	1
	Intersection	3.7	A	--	3.5	A	--
Intersection Control		*Signalized*					
Mullowney Lane & Elysian Road	EB	5.7	A	2	6.2	A	2
	WB	11.2	B	2	11.3	B	2
	NB	10.9	B	1	9.7	A	2
	SB	11.0	B	1	9.9	A	3
	Intersection	8.2	A	--	8.7	A	--

Capacity calculations were performed for the study area using Synchro, Version 11, which is based on the Highway Capacity Manual, 7th Edition (Transportation Research Board, 2022). Level of service (LOS) is defined as a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. LOS is a qualitative measure of the performance of an intersection with values ranging from LOS A, indicating good operation and low vehicle delays, to LOS F, which indicates congestion and longer vehicle delays. LOS C is generally considered the minimum acceptable threshold in Montana communities, though exceptions are made in some cases. Existing Conditions (2024) capacity results are shown in Table 1 on the previous page.

Existing Conditions (2024) capacity results show that the eastbound approach at the Mullowney Lane/Midland Road/South Frontage Road intersection operates at LOS D in the AM peak hour with an average approach delay that is barely over the LOS C cutoff value. This intersection has existing 95th percentile queues of up to seven vehicles. The remaining intersections and approaches operate at LOS C or better with minimal queueing. The attached Figure 4 also shows LOS results at each intersection approach, and Existing Conditions (2024) capacity calculation worksheets are included in Attachment C.

Trip Generation

This study utilized Trip Generation, 11th Edition, published by the Institute of Transportation Engineers (ITE), which is the most widely accepted source in the United States for determining trip generation projections. These projections are used to analyze the impacts of a new development on the surrounding area. For the purposes of this study, Land Use Code 210 – Single-Family Detached Housing and Land Use Code 215 – Single-Family Attached Housing were utilized to project trip generation for the proposed single-family homes and townhomes, respectively. Table 2 on the following page presents the results of the trip generation analysis for this study.

The Phase 1 scenario is projected to generate a total of 620 gross average weekday trips, with 45 gross trips (12 entering/33 exiting) generated during the AM peak hour and 59 gross trips (37 entering/22 exiting) generated during the PM peak hour. At full buildout, the Sixth Filing of Annafeld Subdivision is projected to generate a total of 762 gross average weekday trips, with 56 gross trips (14 entering/42 exiting) generated during the AM peak hour and 73 gross trips (46 entering/27 exiting) generated during the PM peak hour.

Table 2. Annafeld Sixth Filing Trip Generation Summary

Land Use	Independent Variable		Average Weekday			AM Peak Hour			PM Peak Hour		
	Intensity	Units	total	enter	exit	total	enter	exit	total	enter	exit
Phases 1											
Single-Family Detached Housing[1]	49	Dwelling Units	462	231	231	34	9	25	46	29	17
Single-Family Attached Housing[2]	22	Dwelling Units	158	79	79	11	3	8	13	8	5
Total Phase 1 Buildout New External Trips			**620**	**310**	**310**	**45**	**12**	**33**	**59**	**37**	**22**
Phases 1 & 2											
Single-Family Detached Housing[1]	64	Dwelling Units	604	302	302	45	11	34	60	38	22
Single-Family Attached Housing[2]	22	Dwelling Units	158	79	79	11	3	8	13	8	5
Total Phases 1 & 2 Buildout New External Trips			**762**	**381**	**381**	**56**	**14**	**42**	**73**	**46**	**27**

(1) Single-Family Detached Housing - Land Use 210* — Units = Dwelling Units
Average Weekday: Average Rate = 9.43 (50% entering/50% exiting)
Peak Hour of the Adjacent Street, One Hour between 7 and 9 AM: Average Rate = 0.70 (25% entering/75% exiting)
Peak Hour of the Adjacent Street, One Hour between 4 and 6 PM: Average Rate = 0.94 (63% entering/37% exiting)

(2) Single-Family Attached Housing - Land Use 215* — Units = Dwelling Units
Average Weekday: Average Rate = 7.20 (50% entering/50% exiting)
Peak Hour of the Adjacent Street, One Hour between 7 and 9 AM: Average Rate = 0.48 (25% entering/75% exiting)
Peak Hour of the Adjacent Street, One Hour between 4 and 6 PM: Average Rate = 0.57 (59% entering/41% exiting)

**Trip Generation, 11th Edition* , Institute of Transportation Engineers, 2021
***Trip Generation Handbook, 3rd Edition* , Institute of Transportation Engineers, 2017

Trip generation projections provide an estimate of the total number of trips that a proposed development would generate. However, to estimate the net number of new trips made by personal vehicles external to the site, adjustments must often be made to account for internal capture trips, pass-by trips, and trips made by alternate modes.

Internal capture (IC) trips are trips that do not have origins or destinations external to a project site. Since IC trips occur internally, they do not have an impact on external traffic operations. IC trips most often occur in mixed-use developments where residential, commercial, and office-related land uses exhibit a high rate of internal trip exchange. Although the Sixth Filing will be in close proximity to the commercial sites located in Blocks 10 and 12 of the Third Filing (including a coffee shop and deli/bakery), any IC trips to that area have already been accounted for in the analysis of prior filings. It is likely that IC trips will occur from the Sixth Filing but they will balance out with trips that have already been calculated.

Pass-by trips are trips that are made as intermediate stops on the way from the point of origin to a primary trip destination. Pass-by trips are attracted by traffic “passing by” on an adjacent street that offers direct access to that site. Pass-by trips are primarily attracted by commercial-type land uses such as restaurants, convenience markets, and gas stations. Since no commercial land uses exist in the Sixth Filing, these trips were not calculated for the Sixth Filing analysis.

A percentage of trips generated by the Sixth Filing could be made by alternate modes (walking, biking, or transit), as there is a multi-use path along Elysian Road , sidewalks throughout Annafeld Subdivision and the development's proximity to Elysian Elementary School. However, since there are no transit routes currently operating on Elysian Road west of Mullowney Lane and the subdivision is generally separated from Greater Billings, alternate mode trips were conservatively considered to be negligible for this analysis. Some alternate mode trips are possible within the subdivision between filings; however, the adjustments made for IC trips are assumed to account for this.

Trip Distribution, Traffic Assignment, and Future Projections

The trip distribution for this study was based upon that used for previous evaluations of Annafeld Subdivision as well as Existing Conditions (2024) volumes. Figures 5 and 6 (Attachment A) show the distribution percentages and resulting traffic assignments for the AM and PM peak hours for future scenarios.

Phase 1 (2028) and Full Buildout (2030) scenarios were evaluated based on the anticipated Sixth Filing buildout dates. In addition to the site-generated traffic assignments, an annual background traffic increase was calculated to account for additional area development and general population growth in the Billings area. A growth rate of 3.0% was calculated based on historic MDT traffic data and historical analysis of this study area. Trip projections for the remaining buildout of the Fourth Filing of Annafeld Subdivision and Annafeld North Subdivision and the Full Build of the Fifth Filing of Annafeld Subdivision were included in the Phase 1 (2028) and Full Buildout (2030) traffic projections. Trips from these developments were added together with the Sixth Filing of Annafeld Subdivision site trips and existing volumes with anticipated background growth applied to obtain Phase 1 (2028) and Full Buildout (2030) traffic projections, which are shown in Figures 7 and 8 (Attachment A).

Phase 1 (2028) and Full Buildout (2030) Capacity

Phase 1 (2028) and Full Buildout (2030) capacity calculations were performed using the peak hour traffic projections shown in Figures 7 and 8. Peak hour factors (PHFs) for the design years were assumed to be 0.92 for all intersections, per HCM guidelines and common industry practice for future scenarios. The assumed values were utilized to not overestimate future congestion in the study area. The results for each future scenario are shown in Tables 3 and 4 on the pages 7 and 8.

Phase 1 (2028) and Full Buildout (2030) capacity results show that operations are projected to operate similarly to the existing conditions. The eastbound approach at the Mullowney Lane/Midland Road/South Frontage Road intersection is projected to continue to operate near the LOS C/D delay threshold during the AM peak hour. Slight improvements to the delay value are likely due to the future PHF assumption of 0.92. All other intersections and approaches are projected to operate at LOS C or better. Phase 1 (2028) and Full Buildout (2030) capacity worksheets are included in Attachment C.

Auxiliary Turn Lanes

Auxiliary turn lane warrants were evaluated based on the methodology outlined in the MDT Traffic Engineering Manual (November 2007) for Existing Conditions (2024), Phase 1 (2028), and Full Buildout (2030) analysis scenarios. Warrants were not evaluated for turn lanes already present.

- **Elysian Road/South Frontage Road:** A northbound right-turn lane is warranted based on the Existing Conditions (2024) scenario.

- **East Lane/South Frontage Road:** A westbound left-turn lane is projected to be warranted based on the Phase 1 (2028) scenario.

- **Remaining intersections:** No other new turn lanes were found to be warranted at any other study area intersections.

Auxiliary turn lane warrant worksheets for the Existing Conditions (2024), Phase 1 (2028), and Full Buildout (2030) scenarios can be found in Attachment D.

Contribution Calculations

Proposed financial contributions were based on the traffic assignment volumes for the Sixth Filing of Annafeld Subdivision. This analysis showed that this development's portion of critical volumes for the affected intersections are as follows:

- Mullowney Lane/Midland Road/South Frontage Road: 1.75 percent
- South Frontage Road/East Lane: 0.35 percent
- Elysian Road/South Frontage Road: 0.79 percent
- Elysian Road/East Lane: 1.00 percent
- Mullowney Lane/Elysian Road: 2.08 percent

The percentages should be converted into dollar figures based on the current City of Billings intersection cost participation value, which is $450,000.00 as of July 1, 2024. Financial contribution calculation worksheets are included in Attachment E.

Table 3. Phase 1 (2028) Capacity Calculations Summary

Intersection	Approach	Phase 1 (2028)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Signalized*					
Mullowney Lane & Midland Road/South Frontage Road	EB	34.5	C	5	25.3	C	8
	WB	32.7	C	3	20.3	C	3
	NB	13.9	B	9	23.9	C	9
	SB	6.7	A	4	13.6	B	8
	Intersection	16.6	B	--	19.4	B	--
Intersection Control		*One-Way Stop-Control (NB)*					
South Frontage Road & East Lane	EB	0.0	A	0	0.0	A	0
	WB	0.6	A	1	1.1	A	1
	NB	10.2	B	1	12.2	B	1
	Intersection	1.1	A	--	1.5	A	--
Intersection Control		*One-Way Stop-Control (WB)*					
Elysian Road & South Frontage Road	WB	14.0	B	1	19.6	C	2
	NB	0.0	A	0	0.0	A	0
	SB	0.6	A	0	0.7	A	1
	Intersection	2.9	A	--	3.2	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & East Lane	EB	0.1	A	0	0.0	A	0
	WB	0.7	A	0	0.3	A	0
	NB	10.7	B	1	10.9	B	1
	SB	10.6	B	1	11.6	B	1
	Intersection	2.5	A	--	2.5	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & Walter Creek Boulevard	EB	0.1	A	0	0.1	A	0
	WB	1.7	A	1	2.8	A	1
	NB	10.4	B	1	11.8	B	1
	SB	12.6	B	1	15.5	C	1
	Intersection	3.0	A	--	2.8	A	--
Intersection Control		*Signalized*					
Mullowney Lane & Elysian Road	EB	5.8	A	4	6.5	A	4
	WB	12.8	B	2	12.4	B	2
	NB	12.6	B	2	10.8	B	3
	SB	12.8	B	2	11.0	B	4
	Intersection	8.6	A	--	9.2	A	--

Table 4. Full Buildout (2030) Capacity Calculations Summary

Intersection	Approach	Full Buildout (2030)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Signalized*					
Mullowney Lane & Midland Road/South Frontage Road	EB	34.1	C	5	25.2	C	8
	WB	32.0	C	4	19.5	B	4
	NB	15.0	B	10	27.0	C	10
	SB	7.3	A	5	15.4	B	9
	Intersection	17.1	B	--	20.8	C	--
Intersection Control		*One-Way Stop-Control (NB)*					
South Frontage Road & East Lane	EB	0.0	A	0	0.0	A	0
	WB	0.5	A	1	1.1	A	1
	NB	10.4	B	1	12.7	B	1
	Intersection	1.1	A	--	1.6	A	--
Intersection Control		*One-Way Stop-Control (WB)*					
Elysian Road & South Frontage Road	WB	14.7	A	1	21.5	C	2
	NB	0.0	A	0	0.0	A	0
	SB	0.5	A	0	0.7	A	1
	Intersection	3.0	A	--	3.5	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & East Lane	EB	0.1	A	0	0.0	A	0
	WB	0.7	A	0	0.3	A	0
	NB	10.8	B	1	11.1	B	1
	SB	10.7	B	1	11.9	B	1
	Intersection	2.6	A	--	2.6	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & Walter Creek Boulevard	EB	0.1	A	0	0.1	A	0
	WB	1.7	A	1	2.8	A	1
	NB	10.6	B	1	12.2	B	1
	SB	13.1	B	1	16.1	C	1
	Intersection	3.1	A	--	2.9	A	--
Intersection Control		*Signalized*					
Mullowney Lane & Elysian Road	EB	5.9	A	4	6.6	A	4
	WB	13.1	B	2	12.9	B	2
	NB	13.1	B	2	11.0	B	3
	SB	13.2	B	2	11.3	B	4
	Intersection	8.7	A	--	9.4	A	--

Conclusions & Recommendations

The preceding analysis has shown that the residential units planned for both phases of the Sixth Filing of Annafeld Subdivision will generate approximately 762 gross trips daily. With the projected 6th Filing external trips added to the surrounding roadway network along with background growth and other filings of Annafeld and Annafeld North Subdivisions, the study intersections are anticipated to operate similarly to Existing Conditions (2024).

The evaluation of auxiliary turn lane warrants showed that a northbound right-turn lane is warranted at the Elysian Road/South Frontage Road intersection, and a westbound left-turn lane is projected to be warranted at the East Lane/South Frontage Road intersection by 2028. However, the warranted turn lanes would likely have little to no impact on capacity operations at the respective intersections; any improvements at these intersections should be left up to the discretion of MDT.

If the above improvements are implemented as recommended, traffic on the area street network should continue to operate in a safe and efficient manner. If you have any questions about this assessment, or if additional analysis is required, please feel free to contact me at 406-922-4306 or jstaszcuk@sanbell.com.

Sincerely,

Joey Staszcuk, PE, PTOE, RSP1
Associate Principal | Community Transportation Studio Manager

ROFT/ars/SG/jhs

P:16001.161_Annafeld_6th_Traffic_Letter_10.17.2024

ANNAFELD SIXTH FILING – TIS UPDATE

Project No. 16001.161

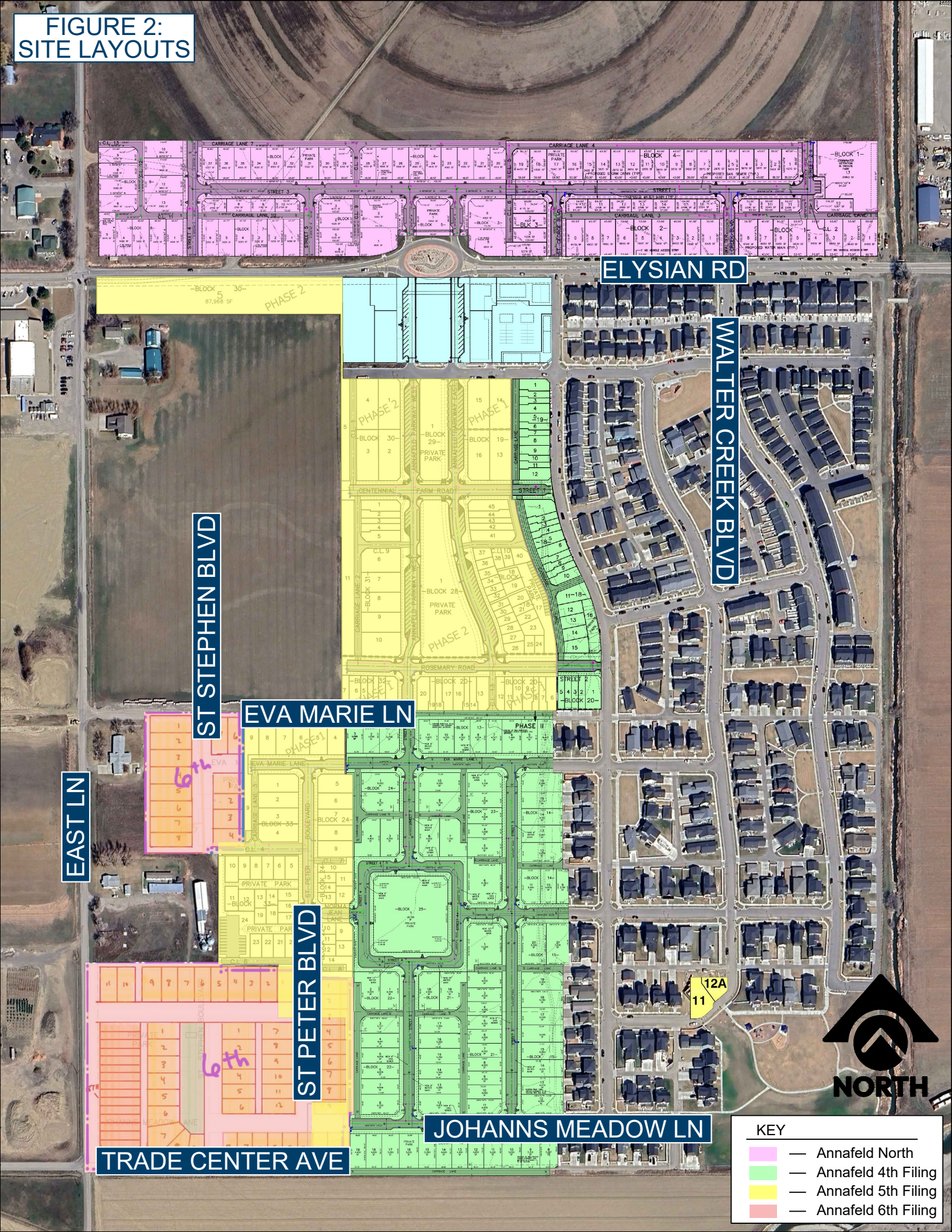
ATTACHMENT A
FIGURES

Intelligent Infrastructure.
Enduring Communities.

sanbell

FIGURE 1:
STUDY AREA

FIGURE 2: SITE LAYOUTS



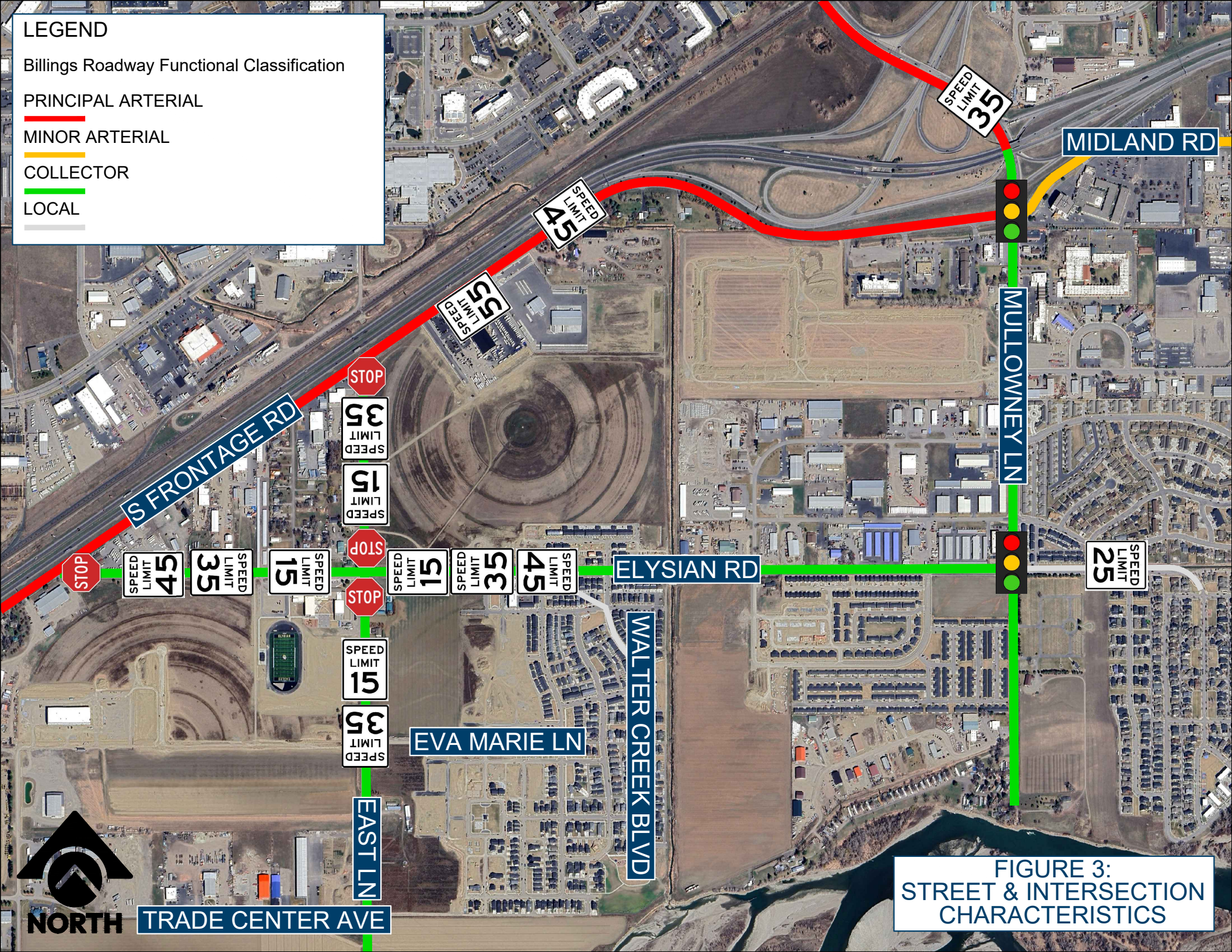


FIGURE 3:
STREET & INTERSECTION CHARACTERISTICS

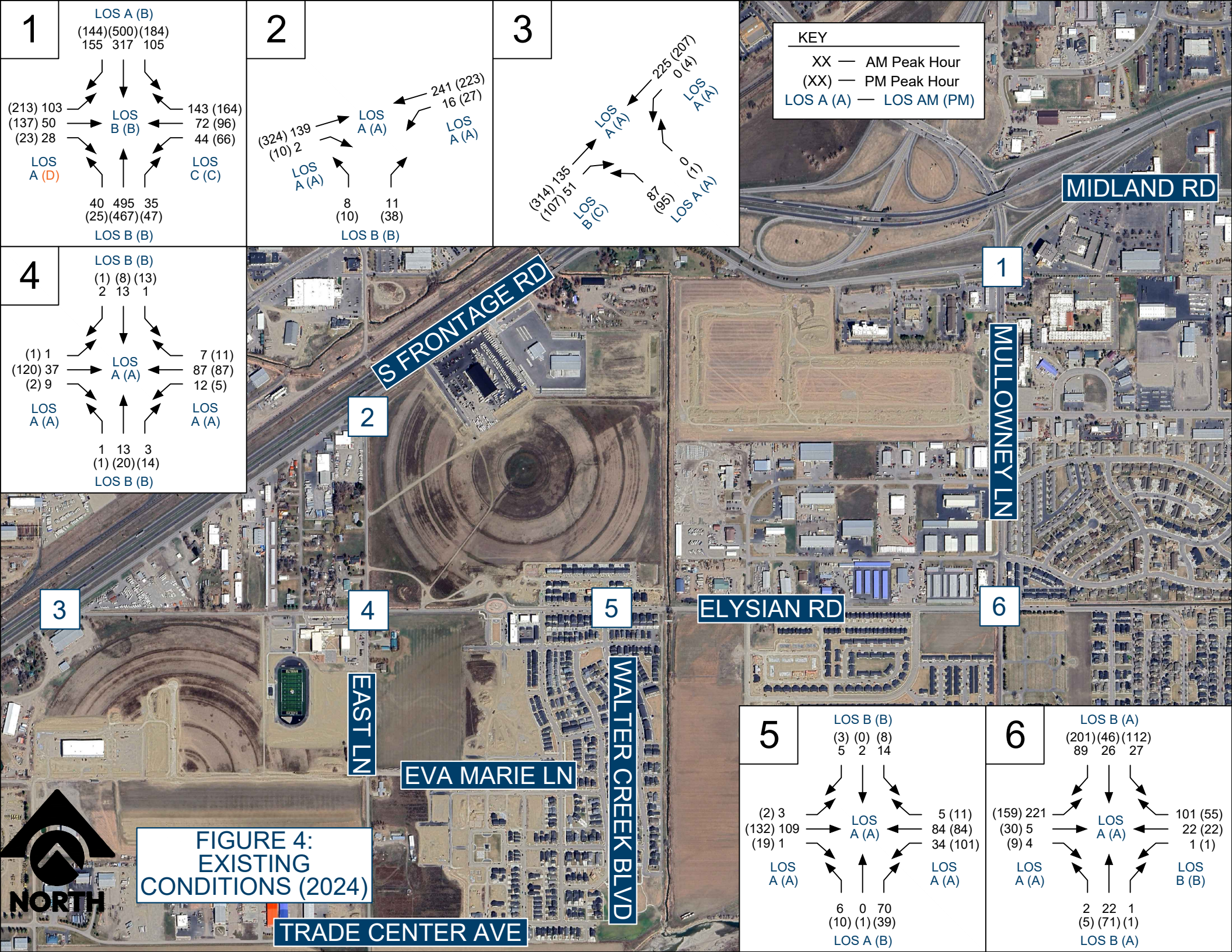


FIGURE 4: EXISTING CONDITIONS (2024)

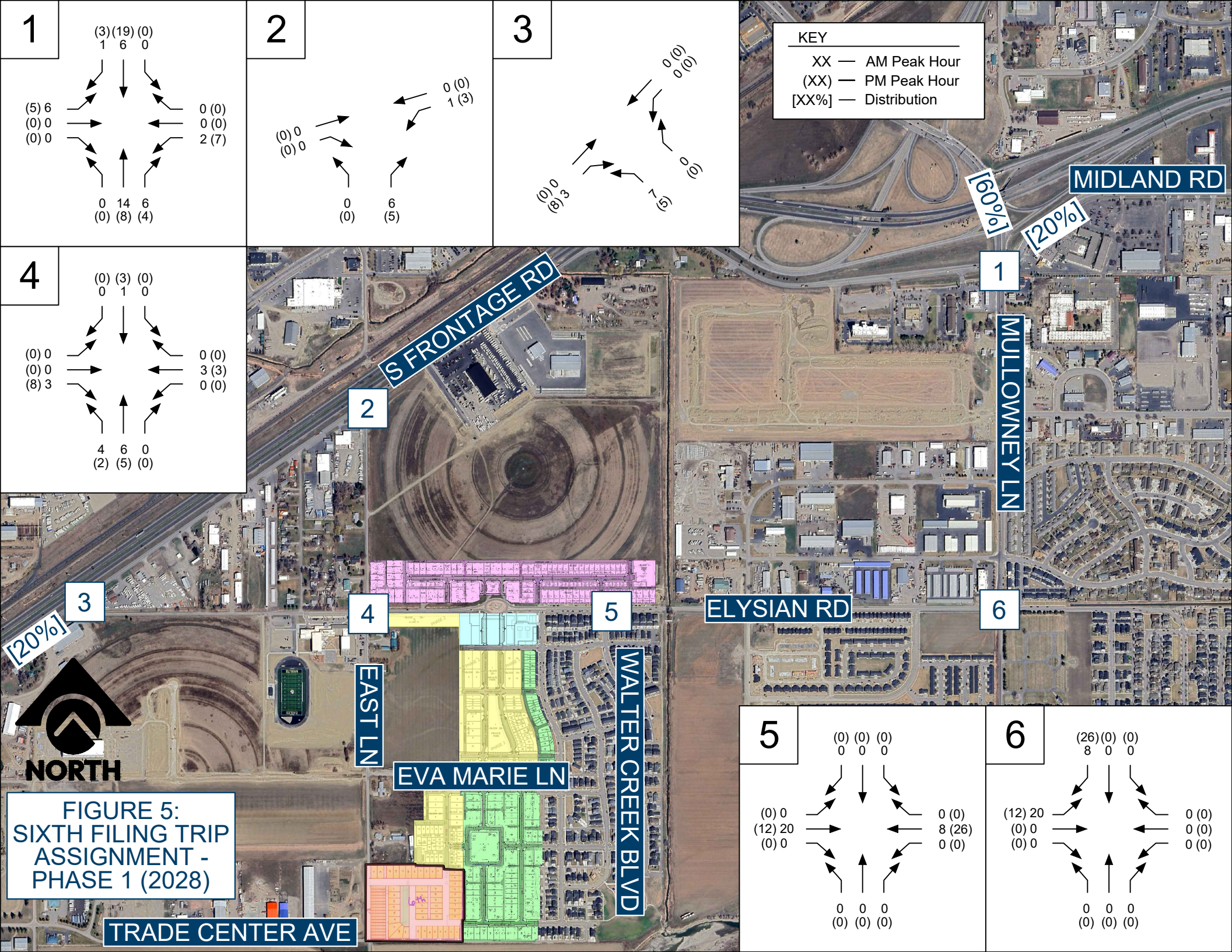


FIGURE 5:
SIXTH FILING TRIP ASSIGNMENT - PHASE 1 (2028)

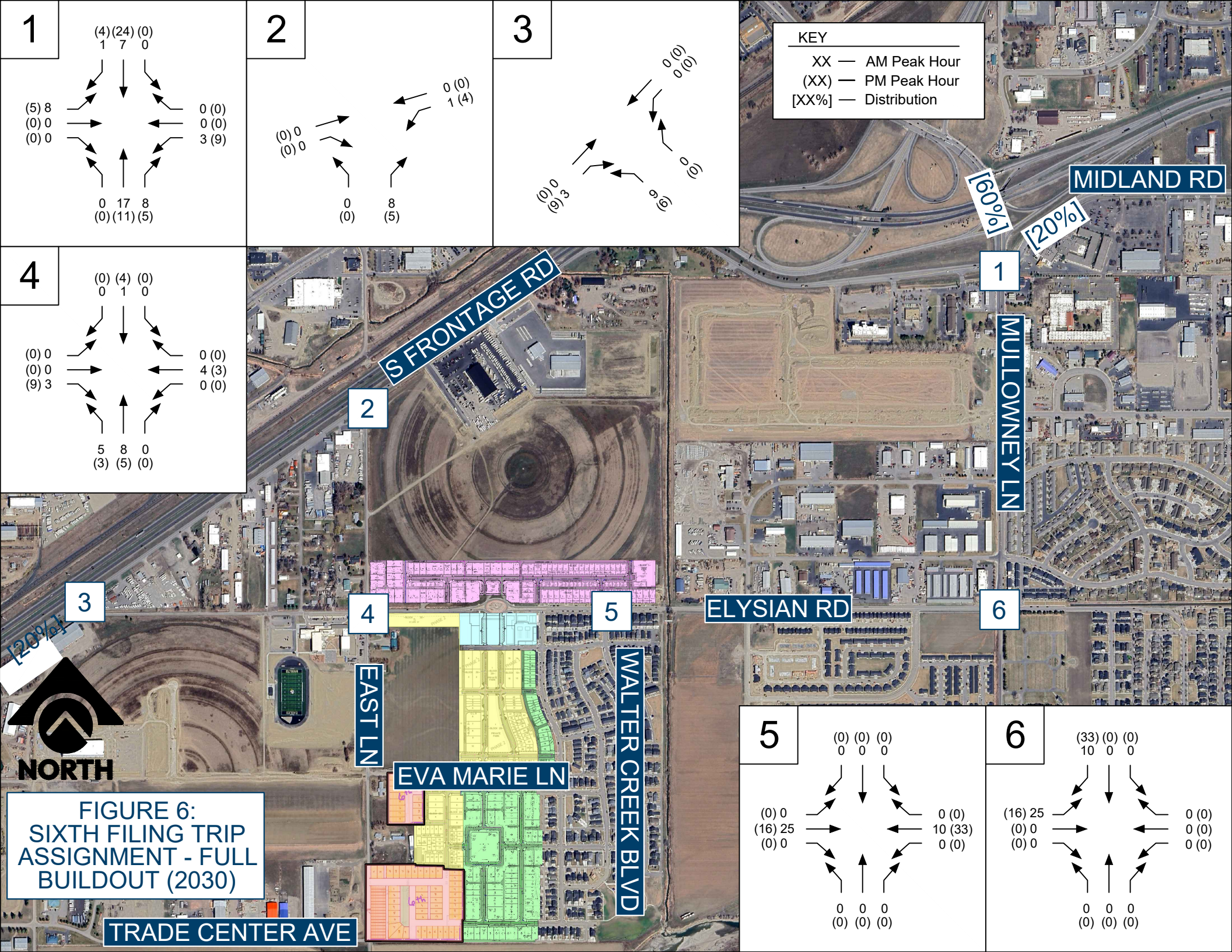


FIGURE 6:
SIXTH FILING TRIP ASSIGNMENT - FULL BUILDOUT (2030)

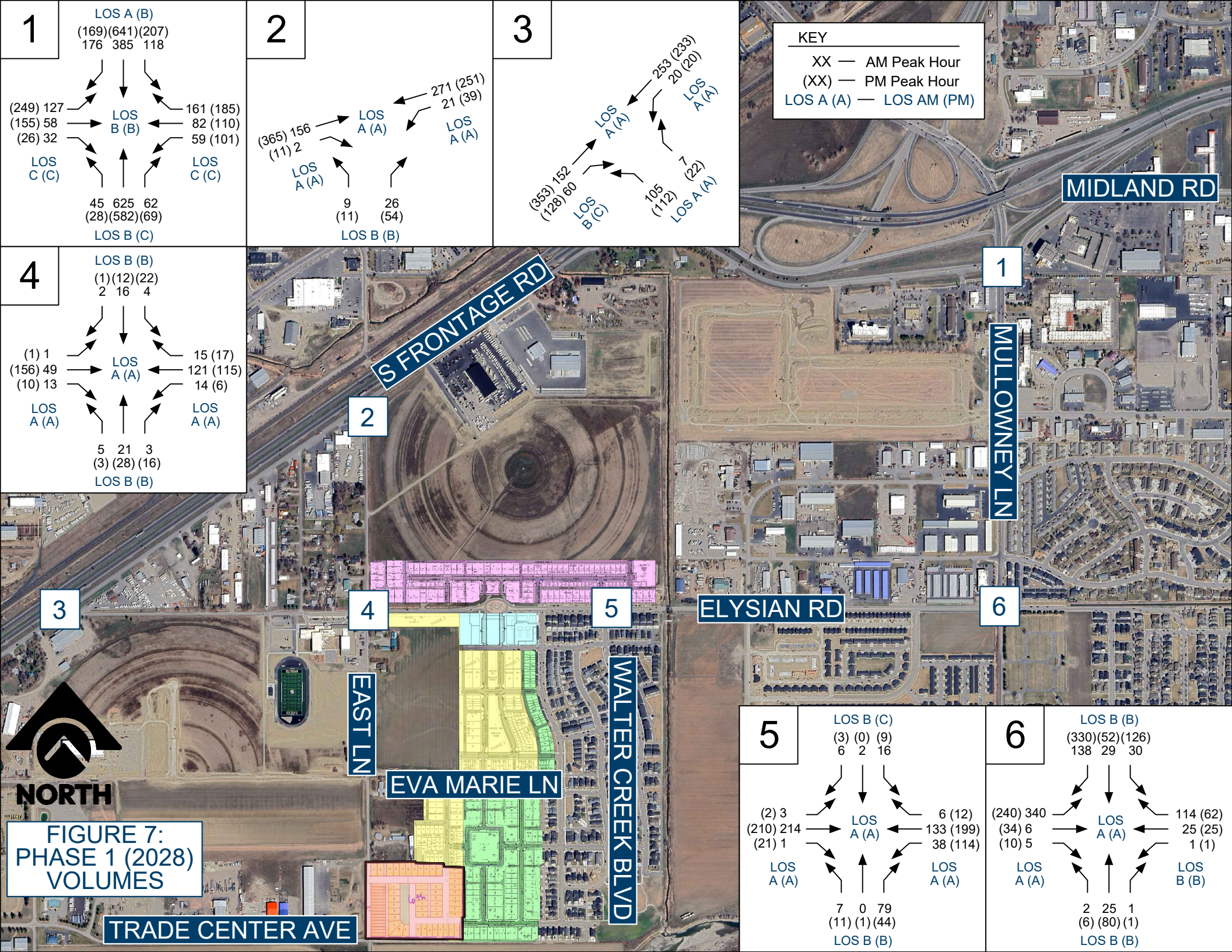


FIGURE 7:
PHASE 1 (2028)
VOLUMES

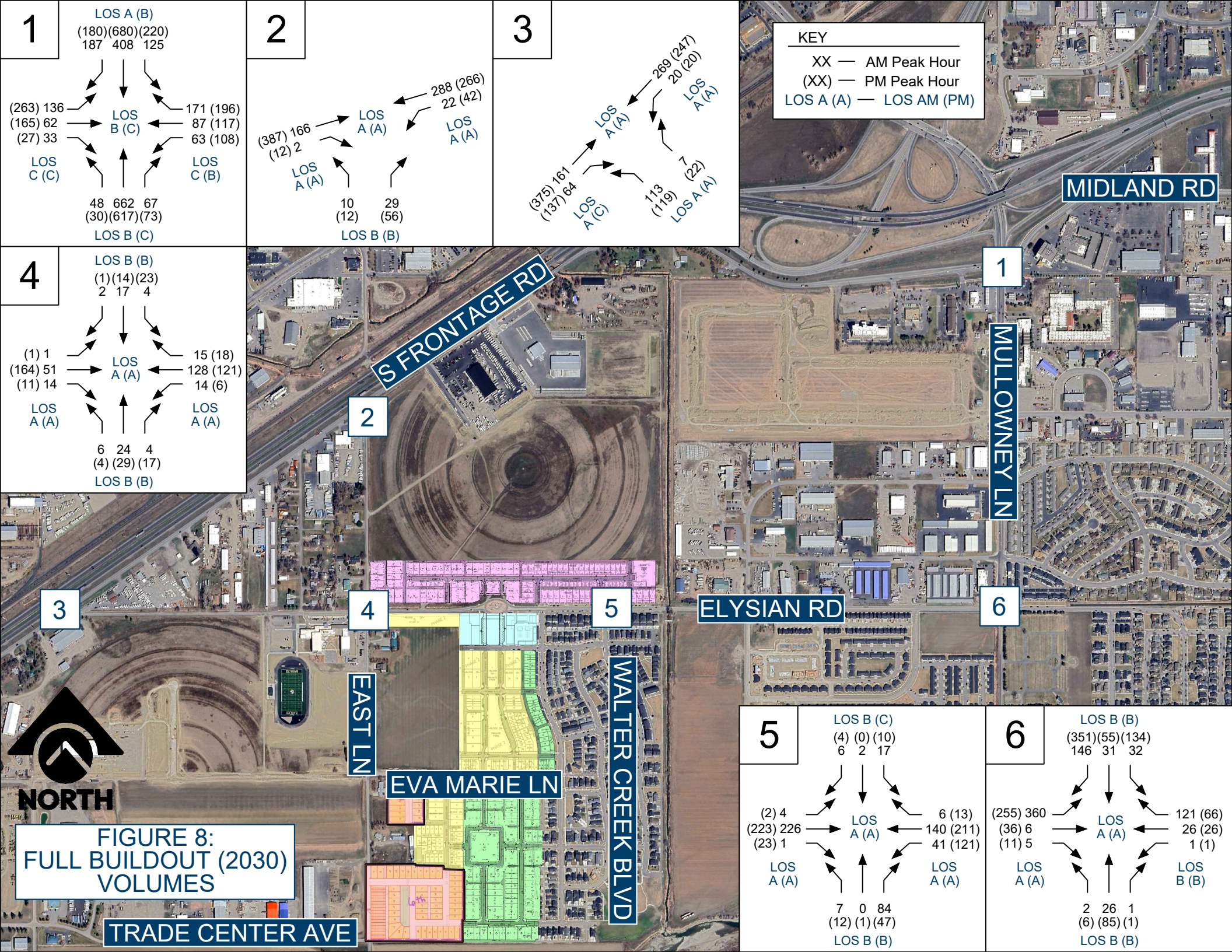


FIGURE 8:
FULL BUILDOUT (2030)
VOLUMES

ANNAFELD SIXTH FILING – TIS UPDATE

Project No. 16001.161

ATTACHMENT B
TRAFFIC VOLUME COUNT WORKSHEETS

Intelligent Infrastructure.
Enduring Communities.

sanbell

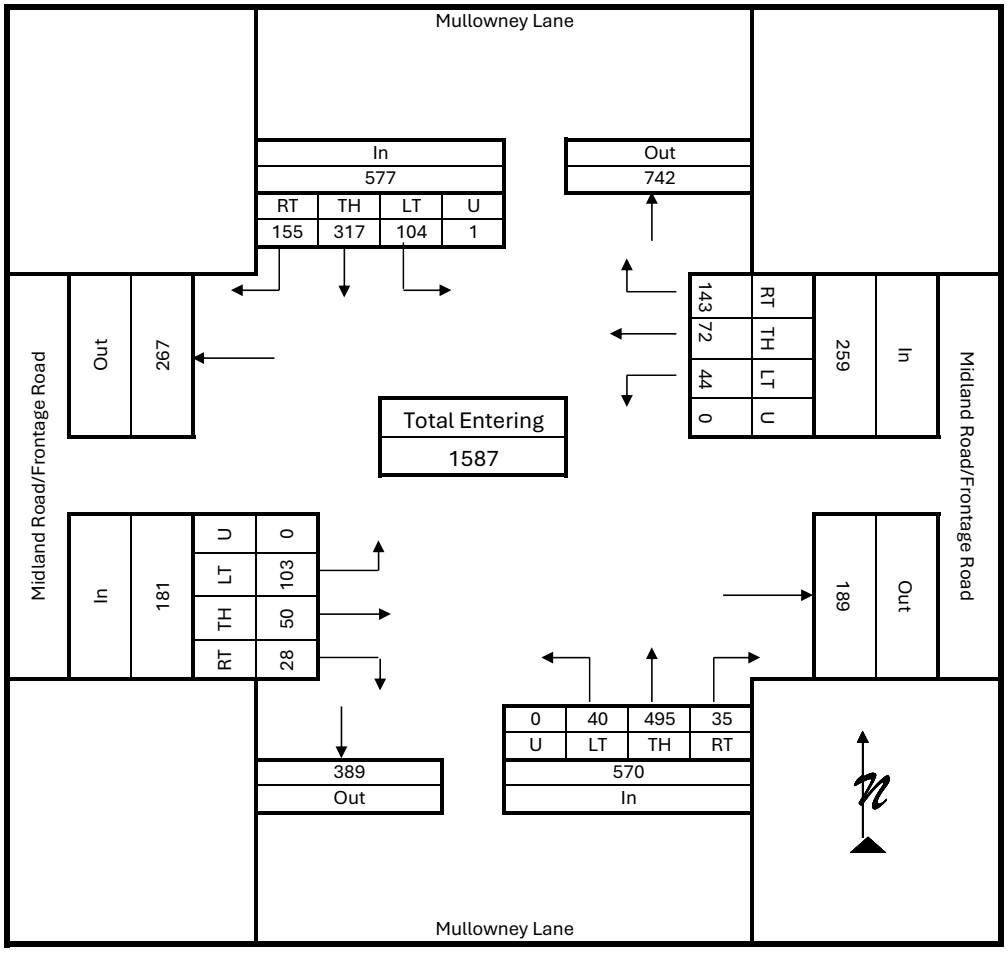
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Mullowney Lane/Midland Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Mullowney Lane	East/West Street:	Midland Road/Frontage Road

Vehicle Volumes and Adjustments

	Mullowney Lane Southbound					Mullowney Lane Northbound					Midland Road/Frontage Road Eastbound					Midland Road/Frontage Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
7:15 AM	37	62	18	1	118	8	126	4	0	138	5	11	22	0	38	27	8	5	0	40	334
7:30 AM	38	67	23	0	128	13	126	8	0	147	8	17	27	0	52	42	19	16	0	77	404
7:45 AM	50	96	36	0	182	8	139	6	0	153	11	16	33	0	60	34	24	12	0	70	465
8:00 AM	30	92	27	0	149	6	104	22	0	132	4	6	21	0	31	40	21	11	0	72	384
Grand Total	155	317	104	1	577	35	495	40	0	570	28	50	103	0	181	143	72	44	0	259	1587
Medium Truck %	1.9	0.9	5.8	0.0	2.1	0.0	3.2	17.5	0.0	4.0	28.6	6.0	3.9	0.0	8.3	7.7	8.3	2.3	0.0	6.9	
Heavy Truck %	1.9	1.6	1.0	0.0	1.6	0.0	0.4	2.5	0.0	0.5	0.0	2.0	3.9	0.0	2.8	0.7	5.6	0.0	0.0	1.9	
Total Truck %	3.9	2.5	6.7	0.0	3.6	0.0	3.6	20.0	0.0	4.6	28.6	8.0	7.8	0.0	11.0	8.4	13.9	2.3	0.0	8.9	
Total %	9.8	20.0	6.6	0.1	36.4	2.2	31.2	2.5	0.0	35.9	1.8	3.2	6.5	0.0	11.4	9.0	4.5	2.8	0.0	16.3	100.0
PHF	0.79	0.79	0.79			0.93	0.93	0.93			0.75	0.75	0.75			0.93	0.93	0.93			0.85



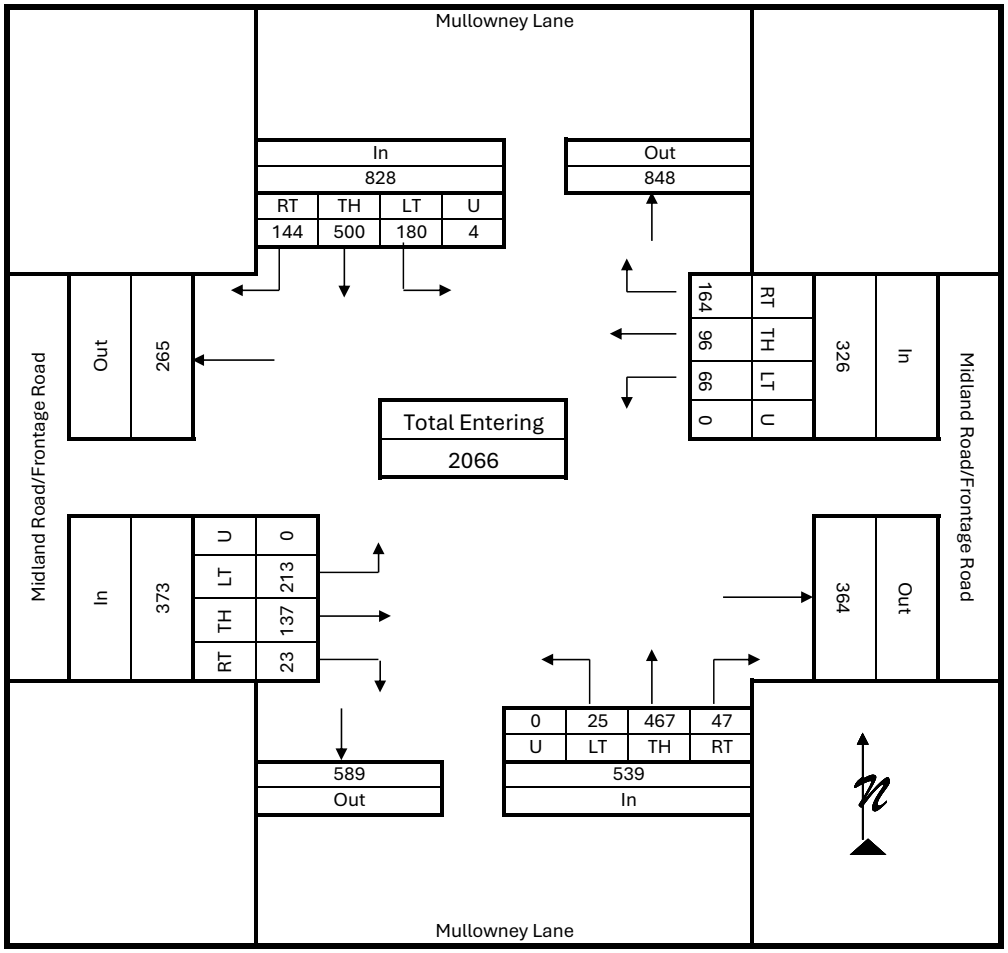
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Mullowney Lane/Midland Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	PM Peak Hour (4:15 - 5:15 PM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Mullowney Lane	East/West Street:	Midland Road/Frontage Road

Vehicle Volumes and Adjustments

	Mullowney Lane Southbound					Mullowney Lane Northbound					Midland Road/Frontage Road Eastbound					Midland Road/Frontage Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
4:15 PM	41	108	48	2	199	16	104	4	0	124	5	35	50	0	90	37	18	18	0	73	486
4:30 PM	36	149	52	0	237	11	133	4	0	148	5	39	60	0	104	52	26	15	0	93	582
4:45 PM	38	118	40	1	197	11	114	11	0	136	7	23	46	0	76	39	18	19	0	76	485
5:00 PM	29	125	40	1	195	9	116	6	0	131	6	40	57	0	103	36	34	14	0	84	513
Grand Total	144	500	180	4	828	47	467	25	0	539	23	137	213	0	373	164	96	66	0	326	2066
Medium Truck %	7.6	1.0	5.0	0.0	3.0	0.0	0.6	12.0	0.0	1.1	21.7	3.6	0.9	0.0	3.2	2.4	3.1	4.5	0.0	3.1	
Heavy Truck %	1.4	1.0	0.0	0.0	0.8	0.0	0.2	0.0	0.0	0.2	0.0	5.1	2.8	0.0	3.5	1.2	0.0	0.0	0.0	0.6	
Total Truck %	9.0	2.0	5.0	0.0	3.9	0.0	0.9	12.0	0.0	1.3	21.7	8.8	3.8	0.0	6.7	3.7	3.1	4.5	0.0	3.7	
Total %	7.0	24.2	8.7	0.2	40.1	2.3	22.6	1.2	0.0	26.1	1.1	6.6	10.3	0.0	18.1	7.9	4.6	3.2	0.0	15.8	100.0
PHF	0.87	0.87	0.87			0.91	0.91	0.91			0.90	0.90	0.90			0.87	0.87	0.87			0.88



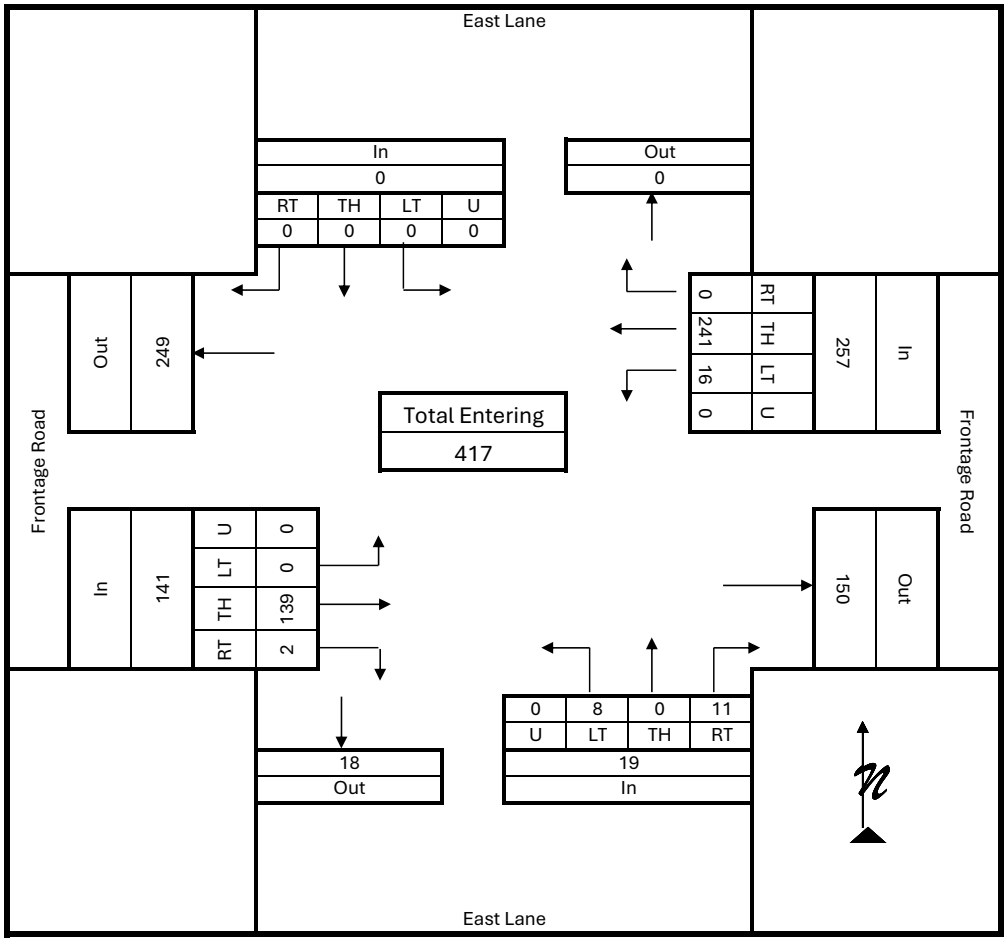
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	East Lane/Frontage Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	East Lane	East/West Street:	Frontage Road

Vehicle Volumes and Adjustments

	East Lane Southbound					East Lane Northbound					Frontage Road Eastbound					Frontage Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
7:15 AM	0	0	0	0	0	4	0	1	0	5	0	28	0	0	28	0	44	2	0	46	79
7:30 AM	0	0	0	0	0	3	0	1	0	4	1	39	0	0	40	0	57	4	0	61	105
7:45 AM	0	0	0	0	0	1	0	2	0	3	0	49	0	0	49	0	82	5	0	87	139
8:00 AM	0	0	0	0	0	3	0	4	0	7	1	23	0	0	24	0	58	5	0	63	94
Grand Total	0	0	0	0	0	11	0	8	0	19	2	139	0	0	141	0	241	16	0	257	417
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	10.5	50.0	9.4	0.0	0.0	9.9	0.0	5.8	0.0	0.0	5.4	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	0.0	2.9	6.3	0.0	3.1	
Total Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	10.5	50.0	10.1	0.0	0.0	10.6	0.0	8.7	6.3	0.0	8.6	
Total %	0.0	0.0	0.0	0.0	0.0	2.6	0.0	1.9	0.0	4.6	0.5	33.3	0.0	0.0	33.8	0.0	57.8	3.8	0.0	61.6	100.0
PHF	1.00	1.00	1.00			1.00	1.00	1.00			0.72	0.72	0.72			0.74	0.74	0.74			0.75



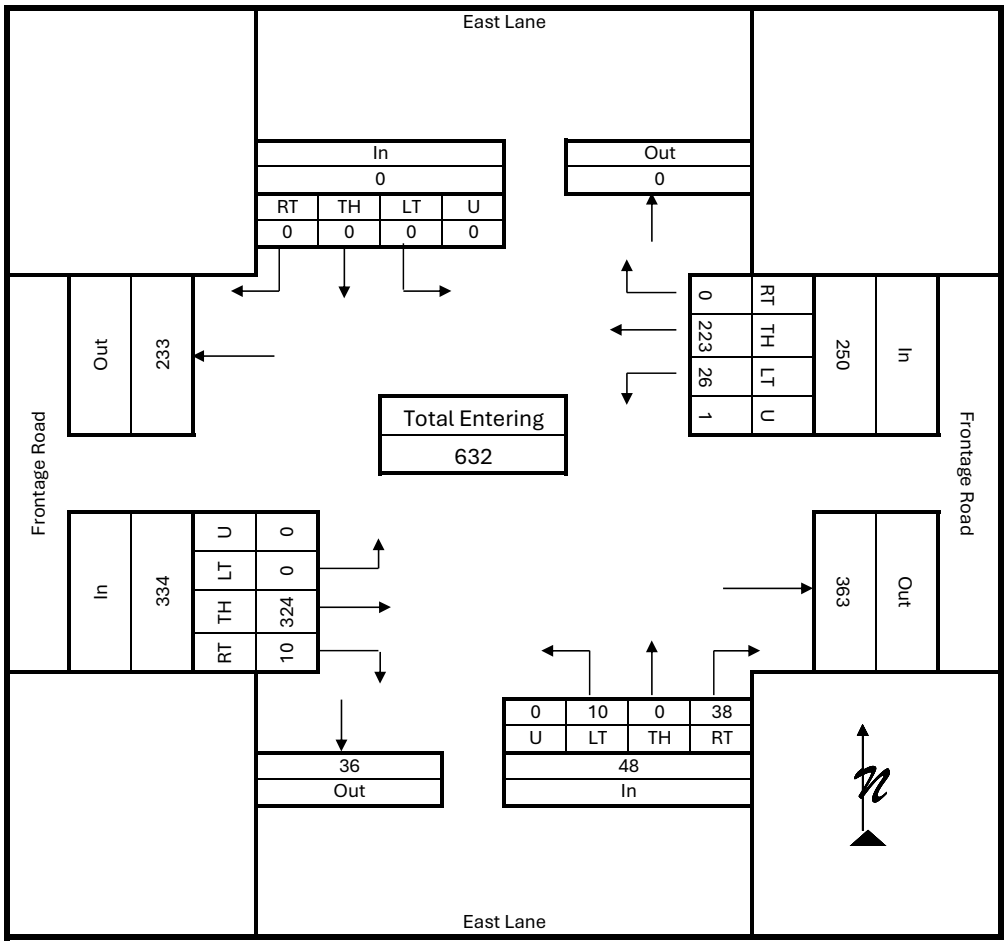
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	East Lane/Frontage Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	PM Peak Hour (4:15 - 5:15 PM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	East Lane	East/West Street:	Frontage Road

Vehicle Volumes and Adjustments

	East Lane Southbound					East Lane Northbound					Frontage Road Eastbound					Frontage Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
4:15 PM	0	0	0	0	0	9	0	4	0	13	1	84	0	0	85	0	51	5	0	56	154
4:30 PM	0	0	0	0	0	10	0	2	0	12	4	89	0	0	93	0	55	10	0	65	170
4:45 PM	0	0	0	0	0	9	0	2	0	11	3	63	0	0	66	0	48	7	0	55	132
5:00 PM	0	0	0	0	0	10	0	2	0	12	2	88	0	0	90	0	69	4	1	74	176
Grand Total	0	0	0	0	0	38	0	10	0	48	10	324	0	0	334	0	223	26	1	250	632
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	3.6	0.0	4.0	3.8	0.0	4.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	2.1	0.0	2.8	0.0	0.0	2.7	0.0	2.2	0.0	0.0	2.0	
Total Truck %	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	2.1	0.0	6.5	0.0	0.0	6.3	0.0	6.3	3.8	0.0	6.0	
Total %	0.0	0.0	0.0	0.0	0.0	6.0	0.0	1.6	0.0	7.6	1.6	51.3	0.0	0.0	52.8	0.0	35.3	4.1	0.2	39.6	100.0
PHF	1.00	1.00	1.00			1.00	1.00	1.00			0.93	0.93	0.93			0.84	0.84	0.84			0.90



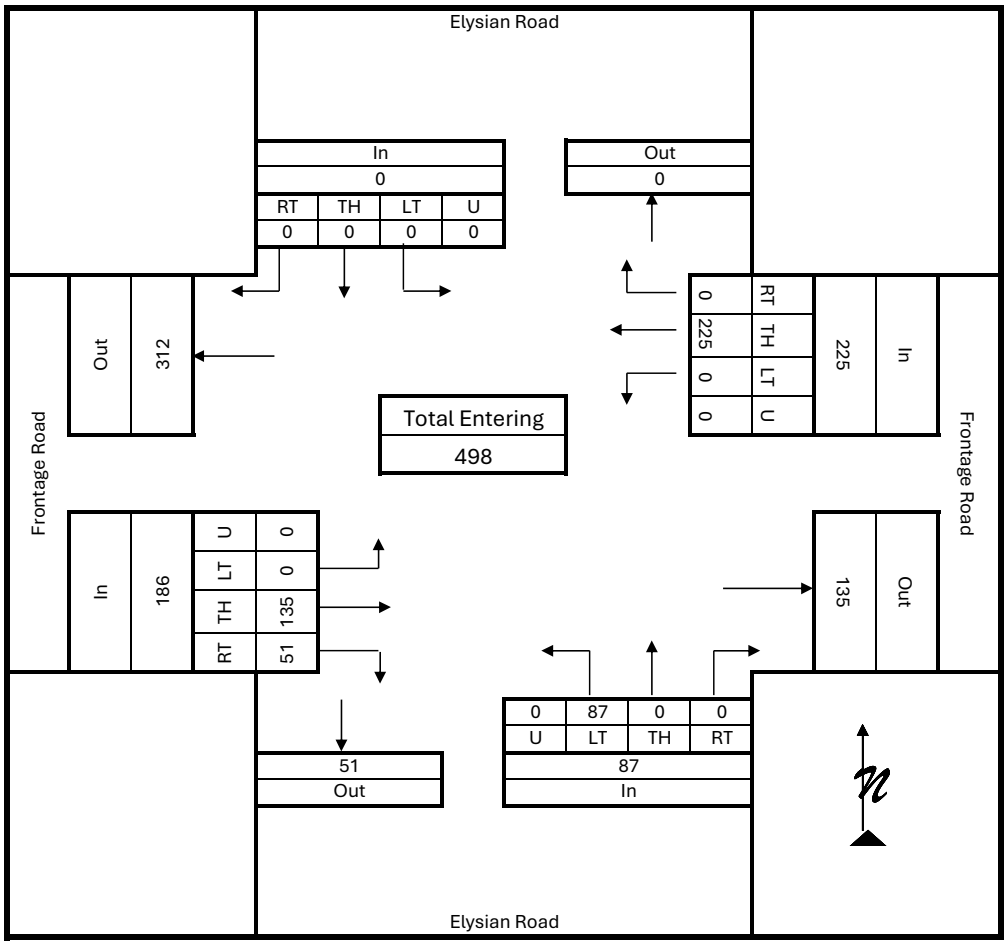
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Elysian Road/Frontage Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Elysian Road	East/West Street:	Frontage Road

Vehicle Volumes and Adjustments

	Elysian Road Southbound					Elysian Road Northbound					Frontage Road Eastbound					Frontage Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
7:15 AM	0	0	0	0	0	0	0	24	0	24	12	27	0	0	39	0	37	0	0	37	100
7:30 AM	0	0	0	0	0	0	0	24	0	24	10	44	0	0	54	0	56	0	0	56	134
7:45 AM	0	0	0	0	0	0	0	27	0	27	12	43	0	0	55	0	76	0	0	76	158
8:00 AM	0	0	0	0	0	0	0	12	0	12	17	21	0	0	38	0	56	0	0	56	106
Grand Total	0	0	0	0	0	0	0	87	0	87	51	135	0	0	186	0	225	0	0	225	498
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	3.4	11.8	11.1	0.0	0.0	11.3	0.0	7.1	0.0	0.0	7.1	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.5	0.0	2.2	0.0	0.0	2.2	
Total Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	3.4	11.8	11.9	0.0	0.0	11.8	0.0	9.3	0.0	0.0	9.3	
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	0.0	17.5	10.2	27.1	0.0	0.0	37.3	0.0	45.2	0.0	0.0	45.2	100.0
PHF	1.00	1.00	1.00			0.81	0.81	0.81			0.85	0.85	0.85			0.74	0.74	0.74			0.79



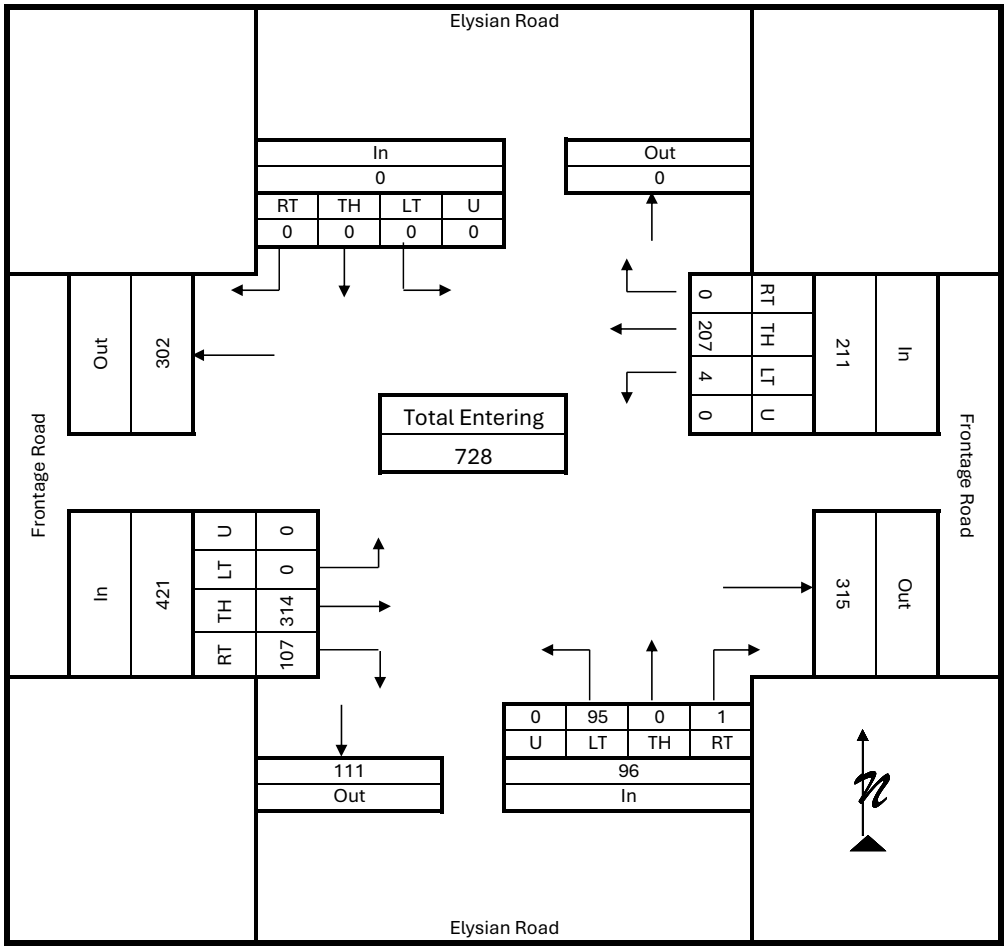
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Elysian Road/Frontage Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	PM Peak Hour (4:15 - 5:15 PM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Elysian Road	East/West Street:	Frontage Road

Vehicle Volumes and Adjustments

	Elysian Road Southbound					Elysian Road Northbound					Frontage Road Eastbound					Frontage Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
4:15 PM	0	0	0	0	0	0	0	15	0	15	21	80	0	0	101	0	43	2	0	45	161
4:30 PM	0	0	0	0	0	0	0	19	0	19	25	85	0	0	110	0	53	0	0	53	182
4:45 PM	0	0	0	0	0	0	0	29	0	29	32	63	0	0	95	0	44	0	0	44	168
5:00 PM	0	0	0	0	0	1	0	32	0	33	29	86	0	0	115	0	67	2	0	69	217
Grand Total	0	0	0	0	0	1	0	95	0	96	107	314	0	0	421	0	207	4	0	211	728
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	5.2	3.7	4.5	0.0	0.0	4.3	0.0	4.8	25.0	0.0	5.2	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.0	0.9	2.5	0.0	0.0	2.1	0.0	2.4	0.0	0.0	2.4	
Total Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	6.3	4.7	7.0	0.0	0.0	6.4	0.0	7.2	25.0	0.0	7.6	
Total %	0.0	0.0	0.0	0.0	0.0	0.1	0.0	13.0	0.0	13.2	14.7	43.1	0.0	0.0	57.8	0.0	28.4	0.5	0.0	29.0	100.0
PHF	1.00	1.00	1.00			0.73	0.73	0.73			0.92	0.92	0.92			0.76	0.76	0.76			0.84



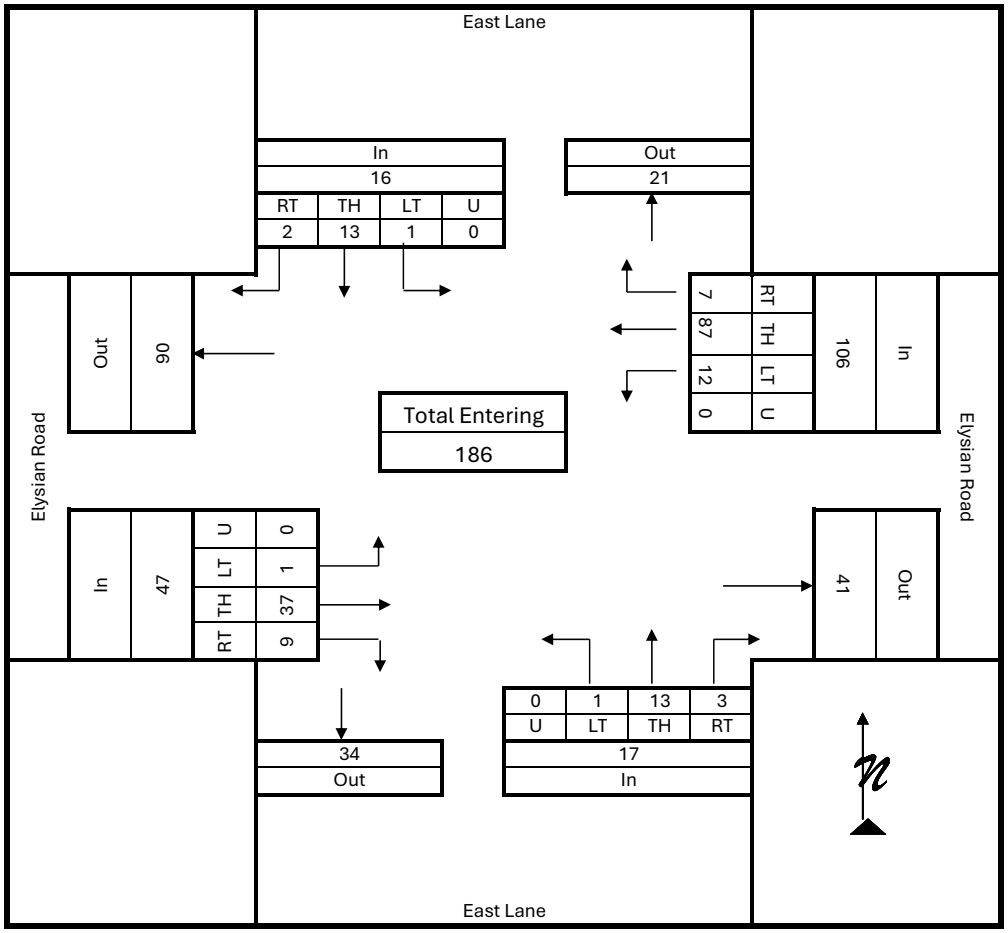
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Elysian Road/East Lane
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	East Lane	East/West Street:	Elysian Road

Vehicle Volumes and Adjustments

	East Lane Southbound					East Lane Northbound					Elysian Road Eastbound					Elysian Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
7:15 AM	0	1	0	0	1	1	3	0	0	4	0	10	0	0	10	1	27	4	0	32	47
7:30 AM	0	5	0	0	5	0	1	0	0	1	5	5	1	0	11	1	23	1	0	25	42
7:45 AM	1	3	0	0	4	2	1	1	0	4	0	11	0	0	11	4	25	2	0	31	50
8:00 AM	1	4	1	0	6	0	8	0	0	8	4	11	0	0	15	1	12	5	0	18	47
Grand Total	2	13	1	0	16	3	13	1	0	17	9	37	1	0	47	7	87	12	0	106	186
Medium Truck %	0.0	15.4	0.0	0.0	12.5	33.3	23.1	100.0	0.0	29.4	55.6	2.7	0.0	0.0	12.8	0.0	2.3	0.0	0.0	1.9	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	15.4	0.0	0.0	12.5	33.3	23.1	100.0	0.0	29.4	55.6	2.7	0.0	0.0	12.8	0.0	2.3	0.0	0.0	1.9	
Total %	1.1	7.0	0.5	0.0	8.6	1.6	7.0	0.5	0.0	9.1	4.8	19.9	0.5	0.0	25.3	3.8	46.8	6.5	0.0	57.0	100.0
PHF	1.00	1.00	1.00			1.00	1.00	1.00			1.00	1.00	1.00			0.85	0.85	0.85			0.93



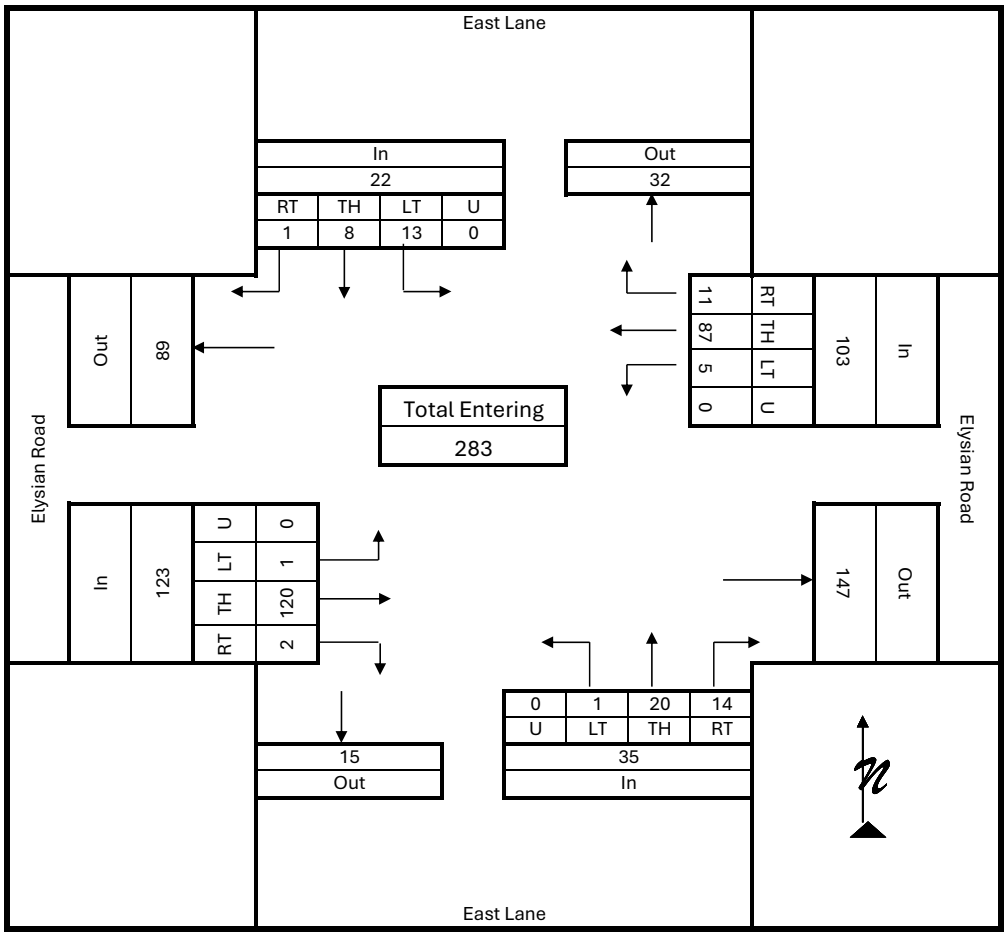
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Elysian Road/East Lane
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	PM Peak Hour (4:15 - 5:15 PM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	East Lane	East/West Street:	Elysian Road

Vehicle Volumes and Adjustments

	East Lane Southbound					East Lane Northbound					Elysian Road Eastbound					Elysian Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
4:15 PM	0	1	1	0	2	3	7	0	0	10	1	23	0	0	24	4	13	2	0	19	55
4:30 PM	1	3	6	0	10	6	5	1	0	12	1	32	0	0	33	2	21	1	0	24	79
4:45 PM	0	4	3	0	7	0	4	0	0	4	0	31	1	0	32	2	21	2	0	25	68
5:00 PM	0	0	3	0	3	5	4	0	0	9	0	34	0	0	34	3	32	0	0	35	81
Grand Total	1	8	13	0	22	14	20	1	0	35	2	120	1	0	123	11	87	5	0	103	283
Medium Truck %	0.0	12.5	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	2.4	0.0	2.3	0.0	0.0	1.9	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	2.9	0.0	0.8	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	12.5	0.0	0.0	4.5	0.0	5.0	0.0	0.0	2.9	0.0	3.3	0.0	0.0	3.3	0.0	2.3	0.0	0.0	1.9	
Total %	0.4	2.8	4.6	0.0	7.8	4.9	7.1	0.4	0.0	12.4	0.7	42.4	0.4	0.0	43.5	3.9	30.7	1.8	0.0	36.4	100.0
PHF	1.00	1.00	1.00			0.97	0.97	0.97			0.90	0.90	0.90			0.74	0.74	0.74			0.87



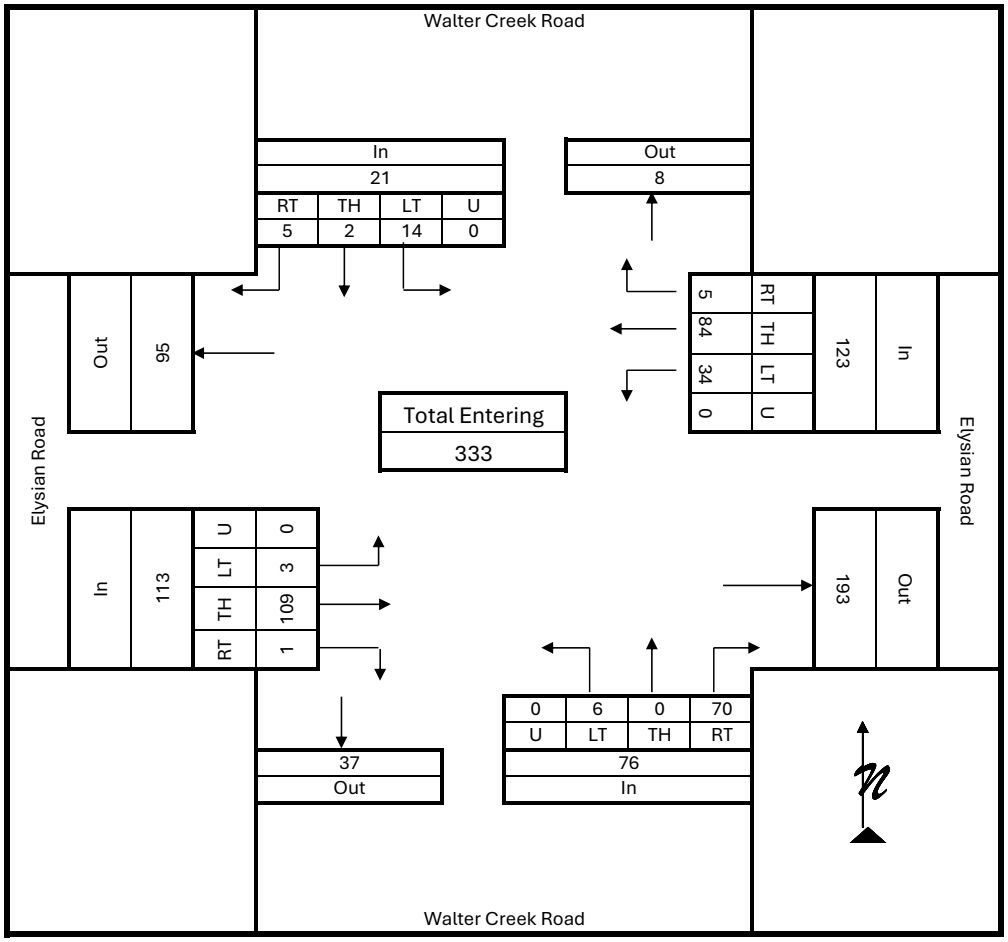
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Elysian Road/Walter Creek Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Walter Creek Road	East/West Street:	Elysian Road

Vehicle Volumes and Adjustments

	Walter Creek Road Southbound					Walter Creek Road Northbound					Elysian Road Eastbound					Elysian Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
7:15 AM	1	0	1	0	2	18	0	2	0	20	0	27	0	0	27	0	21	5	0	26	75
7:30 AM	1	1	6	0	8	17	0	0	0	17	0	21	0	0	21	3	20	8	0	31	77
7:45 AM	3	1	5	0	9	23	0	3	0	26	0	33	1	0	34	1	23	7	0	31	100
8:00 AM	0	0	2	0	2	12	0	1	0	13	1	28	2	0	31	1	20	14	0	35	81
Grand Total	5	2	14	0	21	70	0	6	0	76	1	109	3	0	113	5	84	34	0	123	333
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	33.3	0.0	2.7	0.0	2.4	2.9	0.0	2.4	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	33.3	0.0	2.7	0.0	2.4	2.9	0.0	2.4	
Total %	1.5	0.6	4.2	0.0	6.3	21.0	0.0	1.8	0.0	22.8	0.3	32.7	0.9	0.0	33.9	1.5	25.2	10.2	0.0	36.9	100.0
PHF	0.58	0.58	0.58			0.73	0.73	0.73			0.83	0.83	0.83			0.99	0.99	0.99			0.83



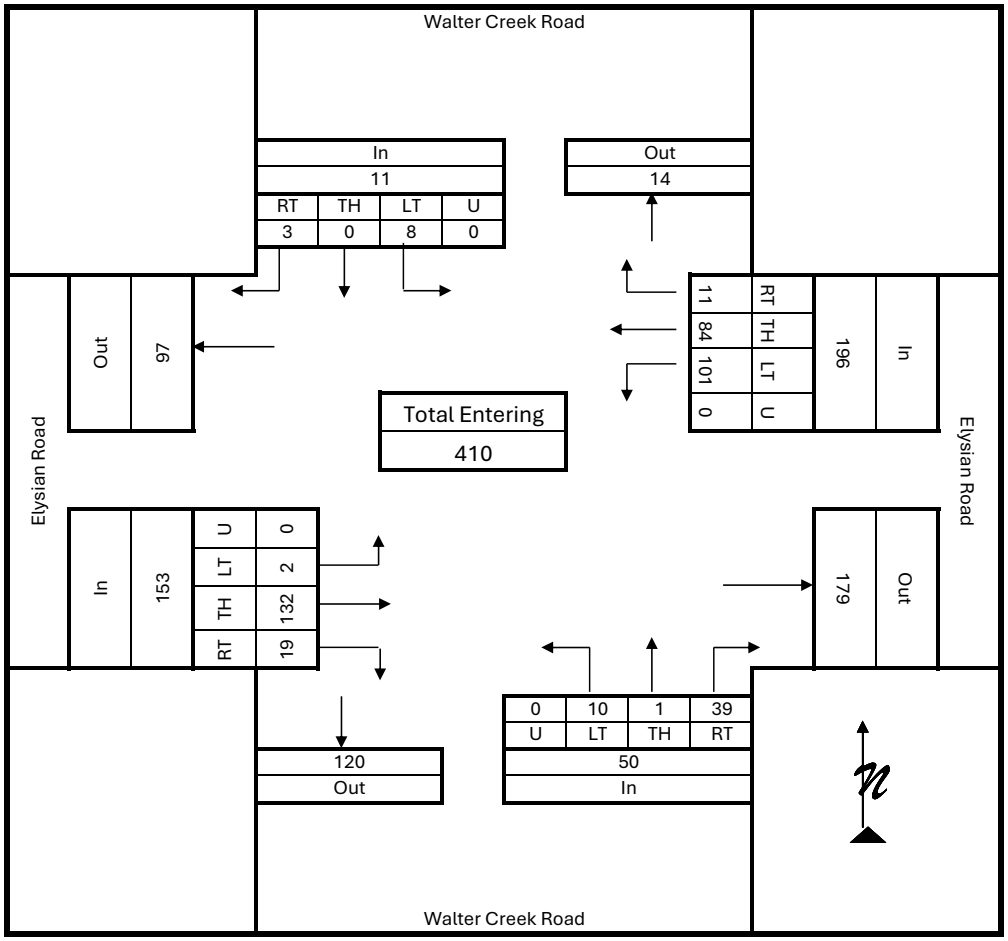
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Elysian Road/Walter Creek Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	PM Peak Hour (4:15 - 5:15 PM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Walter Creek Road	East/West Street:	Elysian Road

Vehicle Volumes and Adjustments

	Walter Creek Road Southbound					Walter Creek Road Northbound					Elysian Road Eastbound					Elysian Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
4:15 PM	0	0	3	0	3	11	1	3	0	15	3	26	0	0	29	2	18	23	0	43	90
4:30 PM	0	0	1	0	1	6	0	1	0	7	3	42	0	0	45	5	26	22	0	53	106
4:45 PM	2	0	1	0	3	11	0	3	0	14	6	31	2	0	39	2	18	28	0	48	104
5:00 PM	1	0	3	0	4	11	0	3	0	14	7	33	0	0	40	2	22	28	0	52	110
Grand Total	3	0	8	0	11	39	1	10	0	50	19	132	2	0	153	11	84	101	0	196	410
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	2.0	0.0	1.5	0.0	0.0	1.3	0.0	1.2	1.0	0.0	1.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	2.0	0.0	2.3	0.0	0.0	2.0	0.0	1.2	1.0	0.0	1.0	
Total %	0.7	0.0	2.0	0.0	2.7	9.5	0.2	2.4	0.0	12.2	4.6	32.2	0.5	0.0	37.3	2.7	20.5	24.6	0.0	47.8	100.0
PHF	0.69	0.69	0.69			0.89	0.89	0.89			0.96	0.96	0.96			0.94	0.94	0.94			0.93



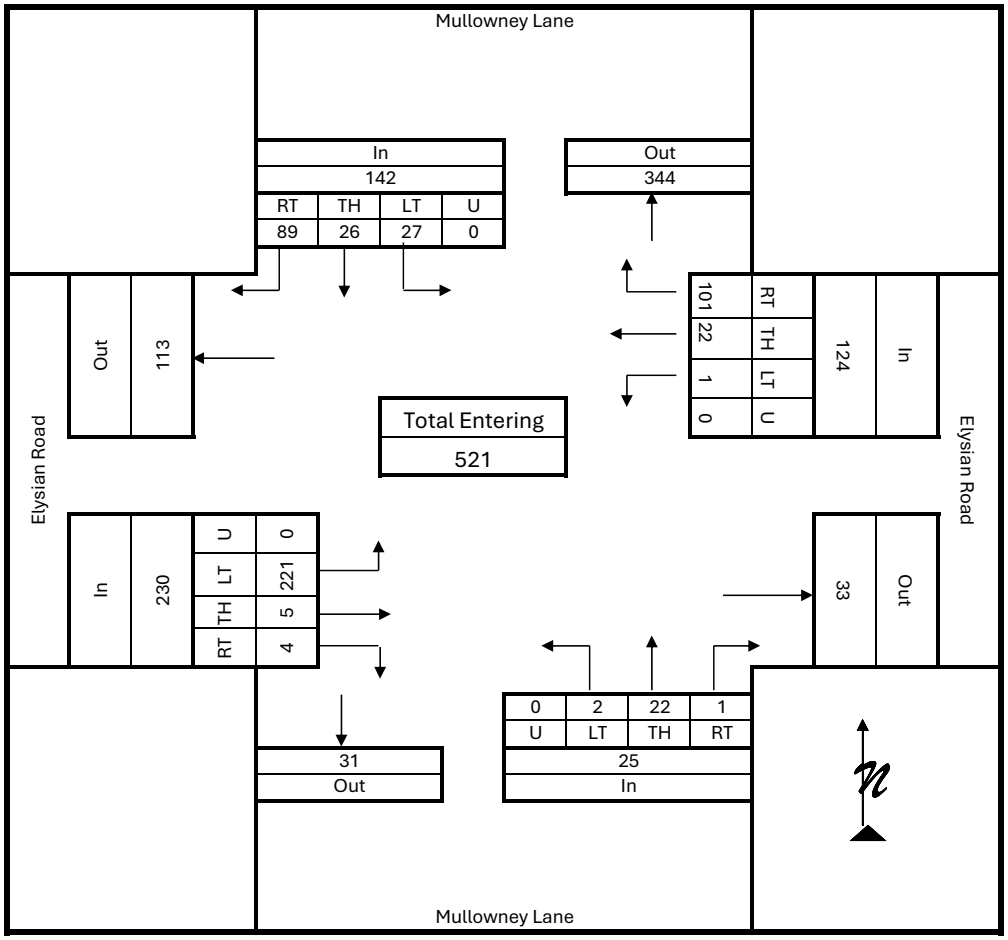
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Mullowney Lane/Elysian Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Mullowney Lane	East/West Street:	Elysian Road

Vehicle Volumes and Adjustments

	Mullowney Lane Southbound					Mullowney Lane Northbound					Elysian Road Eastbound					Elysian Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
7:15 AM	20	3	4	0	27	0	6	0	0	6	1	0	52	0	53	24	6	0	0	30	116
7:30 AM	16	7	9	0	32	0	8	0	0	8	0	0	64	0	64	32	4	1	0	37	141
7:45 AM	26	6	5	0	37	0	3	2	0	5	2	2	61	0	65	32	7	0	0	39	146
8:00 AM	27	10	9	0	46	1	5	0	0	6	1	3	44	0	48	13	5	0	0	18	118
Grand Total	89	26	27	0	142	1	22	2	0	25	4	5	221	0	230	101	22	1	0	124	521
Medium Truck %	1.1	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.5	0.0	0.9	0.0	0.0	0.0	0.0	0.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	1.1	0.0	0.0	0.0	0.7	0.0	4.5	0.0	0.0	4.0	25.0	0.0	0.5	0.0	0.9	0.0	0.0	0.0	0.0	0.0	
Total %	17.1	5.0	5.2	0.0	27.3	0.2	4.2	0.4	0.0	4.8	0.8	1.0	42.4	0.0	44.1	19.4	4.2	0.2	0.0	23.8	100.0
PHF	0.96	0.96	0.96			1.00	1.00	1.00			0.88	0.88	0.88			0.79	0.79	0.79			0.89



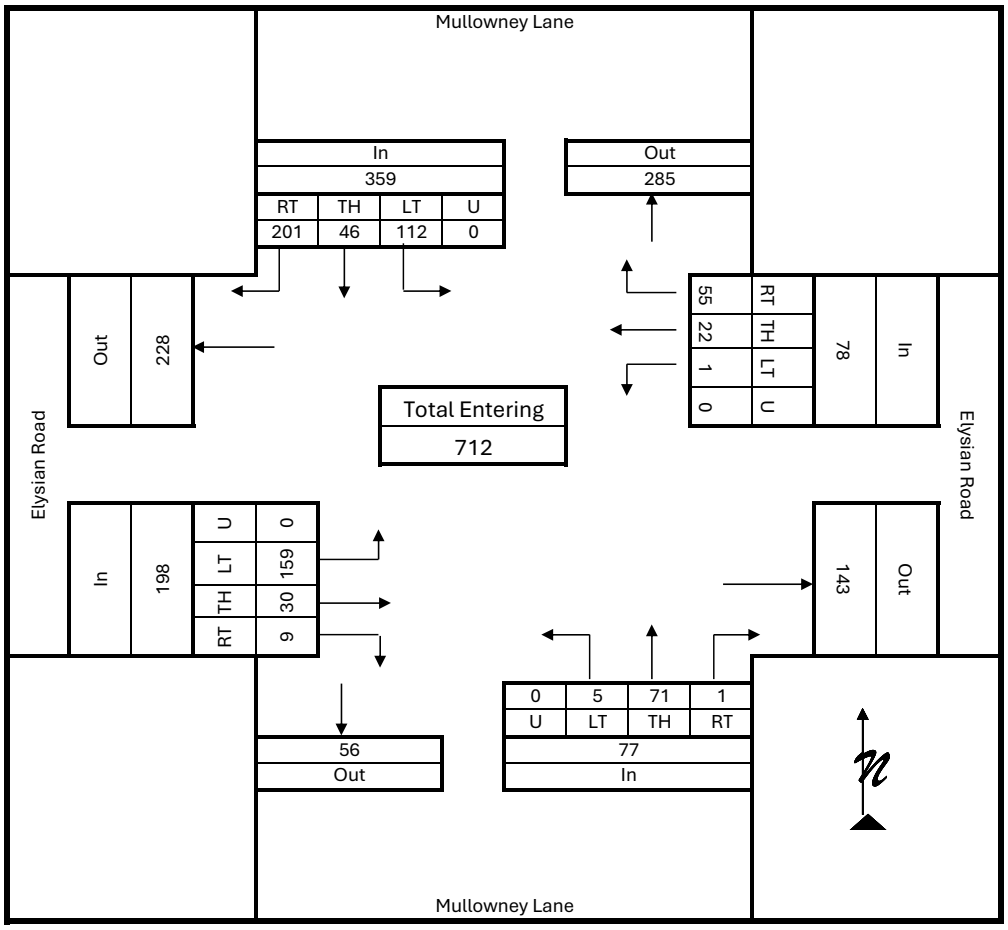
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Kole Ketterling	Intersection:	Mullowney Lane/Elysian Road
Agency/Company:	Sanbell		
Date Performed:	Tuesday, August 13, 2024	Jurisdiction:	City of Billings/MDT
Count Time Period:	PM Peak Hour (4:15 - 5:15 PM)		
Project Number:	16001.161	Project Description:	Annafeld Subdivision 6th Filing
North/South Street:	Mullowney Lane	East/West Street:	Elysian Road

Vehicle Volumes and Adjustments

	Mullowney Lane Southbound					Mullowney Lane Northbound					Elysian Road Eastbound					Elysian Road Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99		
4:15 PM	41	8	28	0	77	1	13	2	0	16	1	10	36	0	47	7	3	0	0	10	150
4:30 PM	58	15	27	0	100	0	12	1	0	13	4	5	43	0	52	17	7	0	0	24	189
4:45 PM	52	12	31	0	95	0	20	1	0	21	1	8	37	0	46	16	4	1	0	21	183
5:00 PM	50	11	26	0	87	0	26	1	0	27	3	7	43	0	53	15	8	0	0	23	190
Grand Total	201	46	112	0	359	1	71	5	0	77	9	30	159	0	198	55	22	1	0	78	712
Medium Truck %	1.0	4.3	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	
Heavy Truck %	0.0	4.3	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	1.0	8.7	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	
Total %	28.2	6.5	15.7	0.0	50.4	0.1	10.0	0.7	0.0	10.8	1.3	4.2	22.3	0.0	27.8	7.7	3.1	0.1	0.0	11.0	100.0
PHF	1.00	1.00	1.00			0.71	0.71	0.71			0.93	0.93	0.93			0.85	0.85	0.85			0.94



ANNAFELD SIXTH FILING – TIS UPDATE

Project No. 16001.161

APPENDIX C
CAPACITY CALCULATIONS
WORKSHEETS

Intelligent Infrastructure.
Enduring Communities.

sanbell

Intersection	Approach	Existing (2024)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Signalized*					
Mullowney Lane & Midland Road/South Frontage Road	EB	35.1	D	4	25.6	C	7
	WB	33.8	C	3	21.5	C	3
	NB	12.2	B	7	19.2	B	7
	SB	5.9	A	3	10.8	B	6
	Intersection	16.1	B	--	17.4	B	--
Intersection Control		*One-Way Stop-Control (NB)*					
South Frontage Road & East Lane	EB	0.0	A	0	0.0	A	0
	WB	0.5	A	0	0.9	A	1
	NB	11.0	B	1	11.6	B	1
	Intersection	0.8	A	--	1.2	A	--
Intersection Control		*One-Way Stop-Control (WB)*					
Elysian Road & South Frontage Road	WB	13.4	B	1	17.5	C	2
	NB	0.0	A	0	0.0	A	0
	SB	0.0	A	0	0.2	A	0
	Intersection	2.3	A	--	2.4	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & East Lane	EB	0.2	A	0	0.1	A	0
	WB	0.8	A	0	0.4	A	0
	NB	10.2	B	1	10.3	B	1
	SB	10.1	B	1	10.8	B	0
	Intersection	2.3	A	--	2.3	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & Walter Creek Boulevard	EB	0.2	A	0	0.1	A	0
	WB	2.1	A	1	4.0	A	1
	NB	9.6	A	1	10.3	B	1
	SB	11.1	B	1	12.0	B	1
	Intersection	3.7	A	--	3.5	A	--
Intersection Control		*Signalized*					
Mullowney Lane & Elysian Road	EB	5.7	A	2	6.2	A	2
	WB	11.2	B	2	11.3	B	2
	NB	10.9	B	1	9.7	A	2
	SB	11.0	B	1	9.9	A	3
	Intersection	8.2	A	--	8.7	A	--

Lane Group	EBL	EBT	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	248	10	139	28	30	29	100
v/c Ratio	0.32	0.01	0.33	0.08	0.10	0.08	0.26
Control Delay (s/veh)	5.1	2.9	8.7	16.4	17.0	16.7	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.1	2.9	8.7	16.4	17.0	16.7	7.1
Queue Length 50th (ft)	21	1	5	5	6	5	0
Queue Length 95th (ft)	46	4	42	23	25	24	30
Internal Link Dist (ft)		2570	797	465		2233	
Turn Bay Length (ft)	150				80		150
Base Capacity (vph)	1045	1476	1486	1447	1350	1566	1329
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.01	0.09	0.02	0.02	0.02	0.08

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	221	5	4	1	22	101	2	22	1	27	26	89
Future Volume (veh/h)	221	5	4	1	22	101	2	22	1	27	26	89
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	0.99		0.99	0.99		0.99	0.99		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	1736	1750	1409	1750	1750	1750	1750	1682	1750	1750	1750	1736
Adj Flow Rate, veh/h	248	6	4	1	25	113	2	25	1	30	29	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	1	0	25	0	0	0	0	5	0	0	0	1
Cap, veh/h	871	508	339	139	40	179	157	153	6	421	180	
Arrive On Green	0.17	0.52	0.52	0.15	0.15	0.15	0.10	0.10	0.10	0.10	0.10	0.00
Sat Flow, veh/h	1654	978	652	6	277	1229	94	1493	59	1388	1750	1471
Grp Volume(v), veh/h	248	0	10	139	0	0	28	0	0	30	29	0
Grp Sat Flow(s),veh/h/ln	1654	0	1630	1512	0	0	1646	0	0	1388	1750	1471
Q Serve(g_s), s	2.8	0.0	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Cycle Q Clear(g_c), s	2.8	0.0	0.1	2.3	0.0	0.0	0.4	0.0	0.0	0.4	0.4	0.0
Prop In Lane	1.00		0.40	0.01		0.81	0.07		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	871	0	847	358	0	0	316	0	0	421	180	
V/C Ratio(X)	0.28	0.00	0.01	0.39	0.00	0.00	0.09	0.00	0.00	0.07	0.16	
Avail Cap(c_a), veh/h	1828	0	2466	2425	0	0	2361	0	0	2152	2362	
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	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.7	0.0	3.0	10.5	0.0	0.0	10.7	0.0	0.0	10.8	10.7	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.1	0.4	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(50%),veh/ln	0.4	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	5.8	0.0	3.0	11.2	0.0	0.0	10.9	0.0	0.0	10.8	11.2	0.0
LnGrp LOS	A		A	B			B			B	B	
Approach Vol, veh/h		258			139			28			59	
Approach Delay, s/veh		5.7			11.2			10.9			11.0	
Approach LOS		A			B			B			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		7.3		18.9		7.3	9.8	9.1				
Change Period (Y+Rc), s		* 4.6		5.3		* 4.6	5.3	5.3				
Max Green Setting (Gmax), s		* 35		39.7		* 35	19.7	39.7				
Max Q Clear Time (g_c+I1), s		2.4		2.1		2.4	4.8	4.3				
Green Ext Time (p_c), s		0.1		0.0		0.2	0.6	0.9				

Intersection Summary	
HCM 7th Control Delay, s/veh	8.2
HCM 7th LOS	A

Notes

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	87	0	135	51	0	225
Future Vol, veh/h	87	0	135	51	0	225
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	3	0	12	12	0	9
Mvmt Flow	110	0	171	65	0	285

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	488	203	0	0	235	0
Stage 1	203	-	-	-	-	-
Stage 2	285	-	-	-	-	-
Critical Hdwy	6.43	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	537	843	-	-	1344	-
Stage 1	829	-	-	-	-	-
Stage 2	761	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	537	843	-	-	1344	-
Mov Cap-2 Maneuver	537	-	-	-	-	-
Stage 1	829	-	-	-	-	-
Stage 2	761	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s/v	13.42	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	537	1344	-
HCM Lane V/C Ratio	-	-	0.205	-	-
HCM Control Delay (s/veh)	-	-	13.4	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.8	0	-

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	1	37	9	12	87	7	1	13	3	1	13	2
Future Vol, veh/h	1	37	9	12	87	7	1	13	3	1	13	2
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	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	3	56	0	2	0	100	23	33	0	15	0
Mvmt Flow	1	40	10	13	94	8	1	14	3	1	14	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	101	0	0	49	0	0	173	174	45	172	175	97
Stage 1	-	-	-	-	-	-	47	47	-	123	123	-
Stage 2	-	-	-	-	-	-	126	127	-	49	52	-
Critical Hdwy	4.1	-	-	4.1	-	-	8.1	6.73	6.53	7.1	6.65	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	7.1	5.73	-	6.1	5.65	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.1	5.73	-	6.1	5.65	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	4.4	4.207	3.597	3.5	4.135	3.3
Pot Cap-1 Maneuver	1504	-	-	1570	-	-	615	683	944	796	696	964
Stage 1	-	-	-	-	-	-	768	816	-	886	770	-
Stage 2	-	-	-	-	-	-	688	752	-	969	827	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1504	-	-	1570	-	-	596	677	944	769	689	964
Mov Cap-2 Maneuver	-	-	-	-	-	-	596	677	-	769	689	-
Stage 1	-	-	-	-	-	-	767	816	-	878	763	-
Stage 2	-	-	-	-	-	-	668	746	-	949	826	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.16	0.83	10.23	10.13
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	706	37	-	-	201	-	-	720
HCM Lane V/C Ratio	0.026	0.001	-	-	0.008	-	-	0.024
HCM Control Delay (s/veh)	10.2	7.4	0	-	7.3	0	-	10.1
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	8	11	139	2	16	241
Future Vol, veh/h	8	11	139	2	16	241
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	25	0	10	50	6	9
Mvmt Flow	11	15	185	3	21	321

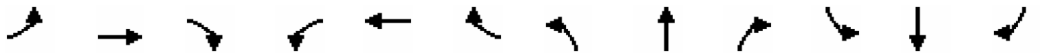
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	551	187	0	0	188	0
Stage 1	187	-	-	-	-	-
Stage 2	364	-	-	-	-	-
Critical Hdwy	6.65	6.2	-	-	4.16	-
Critical Hdwy Stg 1	5.65	-	-	-	-	-
Critical Hdwy Stg 2	5.65	-	-	-	-	-
Follow-up Hdwy	3.725	3.3	-	-	2.254	-
Pot Cap-1 Maneuver	458	861	-	-	1362	-
Stage 1	793	-	-	-	-	-
Stage 2	655	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	450	861	-	-	1362	-
Mov Cap-2 Maneuver	450	-	-	-	-	-
Stage 1	793	-	-	-	-	-
Stage 2	643	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s/v	11.04	0	0.48
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	SWL	SWT
Capacity (veh/h)	-	-	621	112	-
HCM Lane V/C Ratio	-	-	0.041	0.016	-
HCM Control Delay (s/veh)	-	-	11	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	121	92	52	85	168	47	623	124	555
v/c Ratio	0.60	0.33	0.25	0.31	0.44	0.13	0.35	0.23	0.25
Control Delay (s/veh)	44.9	22.7	31.7	32.8	8.2	13.4	12.5	5.8	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	44.9	22.7	31.7	32.8	8.2	13.4	12.5	5.8	4.4
Queue Length 50th (ft)	65	30	26	43	0	11	89	16	32
Queue Length 95th (ft)	96	57	47	68	38	37	160	48	73
Internal Link Dist (ft)		1262		599			350		377
Turn Bay Length (ft)	300		200		175	100		200	
Base Capacity (vph)	378	495	395	509	569	364	1789	563	2201
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.19	0.13	0.17	0.30	0.13	0.35	0.22	0.25

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	50	28	44	72	143	40	495	35	105	317	155
Future Volume (veh/h)	103	50	28	44	72	143	40	495	35	105	317	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.99	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	1641	1641	1354	1723	1559	1641	1477	1695	1750	1654	1709	1695
Adj Flow Rate, veh/h	121	59	33	52	85	168	47	582	41	124	373	182
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	8	8	29	2	14	8	20	4	0	7	3	4
Cap, veh/h	243	196	110	272	310	275	481	1676	118	588	1463	703
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.55	0.55	0.55	0.11	0.69	0.69
Sat Flow, veh/h	1068	985	551	1297	1559	1380	731	3052	215	1576	2125	1021
Grp Volume(v), veh/h	121	0	92	52	85	168	47	307	316	124	284	271
Grp Sat Flow(s),veh/h/ln	1068	0	1537	1297	1559	1380	731	1611	1656	1576	1624	1522
Q Serve(g_s), s	9.7	0.0	4.6	3.2	4.2	10.0	2.8	9.5	9.6	2.5	5.9	6.1
Cycle Q Clear(g_c), s	13.9	0.0	4.6	7.8	4.2	10.0	2.8	9.5	9.6	2.5	5.9	6.1
Prop In Lane	1.00		0.36	1.00		1.00	1.00		0.13	1.00		0.67
Lane Grp Cap(c), veh/h	243	0	306	272	310	275	481	885	909	588	1118	1048
V/C Ratio(X)	0.50	0.00	0.30	0.19	0.27	0.61	0.10	0.35	0.35	0.21	0.25	0.26
Avail Cap(c_a), veh/h	385	0	511	445	518	458	481	885	909	631	1118	1048
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.4	0.0	30.7	34.0	30.5	32.9	9.8	11.3	11.3	6.0	5.3	5.3
Incr Delay (d2), s/veh	1.6	0.0	0.5	0.3	0.5	2.2	0.4	1.1	1.1	0.2	0.5	0.6
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(50%),veh/ln	2.6	0.0	1.7	1.0	1.6	3.4	0.5	3.4	3.5	0.7	1.8	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	38.0	0.0	31.2	34.4	31.0	35.1	10.2	12.4	12.4	6.1	5.8	5.9
LnGrp LOS	D		C	C	C	D	B	B	B	A	A	A
Approach Vol, veh/h		213			305			670			679	
Approach Delay, s/veh		35.1			33.8			12.2			5.9	
Approach LOS		D			C			B			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.5	54.4		23.0		67.0		23.0				
Change Period (Y+Rc), s	3.0	5.0		5.1		5.0		5.1				
Max Green Setting (Gmax), s	12.0	35.0		29.9		50.0		29.9				
Max Q Clear Time (g_c+I1), s	4.5	11.6		15.9		8.1		12.0				
Green Ext Time (p_c), s	0.2	4.2		0.8		3.7		1.1				

Intersection Summary												
HCM 7th Control Delay, s/veh			16.1									
HCM 7th LOS			B									

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	109	1	34	84	5	6	0	70	14	2	5
Future Vol, veh/h	3	109	1	34	84	5	6	0	70	14	2	5
Conflicting Peds, #/hr	4	0	6	6	0	4	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	330	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	33	2	0	3	2	0	0	0	0	0	0	0
Mvmt Flow	4	131	1	41	101	6	7	0	84	17	2	6

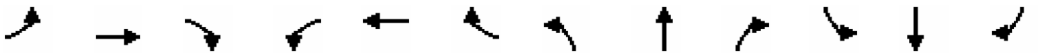
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	111	0	0	139	0	0	329	338	138	329	336	108
Stage 1	-	-	-	-	-	-	145	145	-	190	190	-
Stage 2	-	-	-	-	-	-	184	193	-	139	146	-
Critical Hdwy	4.43	-	-	4.13	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.497	-	-	2.227	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1306	-	-	1439	-	-	628	586	916	628	588	951
Stage 1	-	-	-	-	-	-	862	781	-	816	747	-
Stage 2	-	-	-	-	-	-	822	744	-	869	780	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1301	-	-	1431	-	-	598	562	911	550	564	947
Mov Cap-2 Maneuver	-	-	-	-	-	-	598	562	-	550	564	-
Stage 1	-	-	-	-	-	-	855	774	-	790	723	-
Stage 2	-	-	-	-	-	-	791	720	-	787	774	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.21	2.1	9.6	11.13
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	874	1301	-	-	1431	-	-	613
HCM Lane V/C Ratio	0.105	0.003	-	-	0.029	-	-	0.041
HCM Control Delay (s/veh)	9.6	7.8	-	-	7.6	-	-	11.1
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.1

Lane Group	EBL	EBT	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	169	42	83	82	119	49	214
v/c Ratio	0.26	0.06	0.23	0.17	0.35	0.11	0.38
Control Delay (s/veh)	6.9	4.6	10.5	14.4	17.5	14.2	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.9	4.6	10.5	14.4	17.5	14.2	5.2
Queue Length 50th (ft)	17	3	5	15	23	9	0
Queue Length 95th (ft)	47	14	36	47	68	32	40
Internal Link Dist (ft)		2570	797	465		2235	
Turn Bay Length (ft)	150				80		150
Base Capacity (vph)	1071	1635	1463	1496	1063	1397	1309
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.03	0.06	0.05	0.11	0.04	0.16

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	159	30	9	1	22	55	5	71	1	112	46	201
Future Volume (veh/h)	159	30	9	1	22	55	5	71	1	112	46	201
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	0.99		0.99	0.99		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	1750	1750	1600	1750	1750	1750	1750	1750	1750	1750	1627	1736
Adj Flow Rate, veh/h	169	32	10	1	23	59	5	76	1	119	49	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	11	0	0	0	0	0	0	0	9	1
Cap, veh/h	798	577	180	140	51	130	155	282	4	514	278	
Arrive On Green	0.13	0.45	0.45	0.12	0.12	0.12	0.17	0.17	0.17	0.17	0.17	0.00
Sat Flow, veh/h	1667	1271	397	13	434	1099	57	1652	21	1334	1627	1471
Grp Volume(v), veh/h	169	0	42	83	0	0	82	0	0	119	49	0
Grp Sat Flow(s),veh/h/ln	1667	0	1668	1545	0	0	1730	0	0	1334	1627	1471
Q Serve(g_s), s	2.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.8	0.7	0.0
Cycle Q Clear(g_c), s	2.0	0.0	0.4	1.3	0.0	0.0	1.1	0.0	0.0	1.9	0.7	0.0
Prop In Lane	1.00		0.24	0.01		0.71	0.06		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	798	0	757	320	0	0	440	0	0	514	278	
V/C Ratio(X)	0.21	0.00	0.06	0.26	0.00	0.00	0.19	0.00	0.00	0.23	0.18	
Avail Cap(c_a), veh/h	1819	0	2512	2463	0	0	2452	0	0	2077	2185	
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	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	6.6	0.0	4.0	10.8	0.0	0.0	9.5	0.0	0.0	9.8	9.3	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.2	0.3	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(50%),veh/ln	0.4	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.4	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.7	0.0	4.1	11.3	0.0	0.0	9.7	0.0	0.0	10.0	9.6	0.0
LnGrp LOS	A		A	B			A			B	A	
Approach Vol, veh/h		211			83			82			168	
Approach Delay, s/veh		6.2			11.3			9.7			9.9	
Approach LOS		A			B			A			A	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		9.1		17.3		9.1	8.8	8.4				
Change Period (Y+Rc), s		* 4.6		5.3		* 4.6	5.3	5.3				
Max Green Setting (Gmax), s		* 35		39.7		* 35	19.7	39.7				
Max Q Clear Time (g_c+I1), s		3.1		2.4		3.9	4.0	3.3				
Green Ext Time (p_c), s		0.4		0.2		0.6	0.4	0.5				

Intersection Summary	
HCM 7th Control Delay, s/veh	8.7
HCM 7th LOS	A

Notes

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	95	1	314	107	4	207
Future Vol, veh/h	95	1	314	107	4	207
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	6	0	7	5	25	7
Mvmt Flow	113	1	374	127	5	246

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	693	438	0	0	501	0
Stage 1	438	-	-	-	-	-
Stage 2	256	-	-	-	-	-
Critical Hdwy	6.46	6.2	-	-	4.35	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.3	-	-	2.425	-
Pot Cap-1 Maneuver	403	623	-	-	955	-
Stage 1	642	-	-	-	-	-
Stage 2	778	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	401	623	-	-	955	-
Mov Cap-2 Maneuver	401	-	-	-	-	-
Stage 1	642	-	-	-	-	-
Stage 2	773	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s/v	17.46	0	0.17
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	402	34	-
HCM Lane V/C Ratio	-	-	0.284	0.005	-
HCM Control Delay (s/veh)	-	-	17.5	8.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0	-

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	1	120	2	5	87	11	1	20	14	13	8	1
Future Vol, veh/h	1	120	2	5	87	11	1	20	14	13	8	1
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	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	0	3	0	0	2	0	0	5	0	0	13	0
Mvmt Flow	1	138	2	6	100	13	1	23	16	15	9	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	113	0	0	140	0	0	257	266	139	270	260	106
Stage 1	-	-	-	-	-	-	141	141	-	118	118	-
Stage 2	-	-	-	-	-	-	116	124	-	152	143	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.55	6.2	7.1	6.63	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.55	-	6.1	5.63	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.55	-	6.1	5.63	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4.045	3.3	3.5	4.117	3.3
Pot Cap-1 Maneuver	1489	-	-	1455	-	-	700	635	914	687	626	953
Stage 1	-	-	-	-	-	-	866	774	-	892	777	-
Stage 2	-	-	-	-	-	-	893	787	-	856	758	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1489	-	-	1455	-	-	685	632	914	647	623	953
Mov Cap-2 Maneuver	-	-	-	-	-	-	685	632	-	647	623	-
Stage 1	-	-	-	-	-	-	866	773	-	888	774	-
Stage 2	-	-	-	-	-	-	878	784	-	815	758	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.06	0.36	10.27	10.79
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	723	15	-	-	85	-	-	647
HCM Lane V/C Ratio	0.056	0.001	-	-	0.004	-	-	0.039
HCM Control Delay (s/veh)	10.3	7.4	0	-	7.5	0	-	10.8
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	1.2

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	10	38	324	10	27	223
Future Vol, veh/h	10	38	324	10	27	223
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	3	7	0	4	3
Mvmt Flow	11	42	360	11	30	248

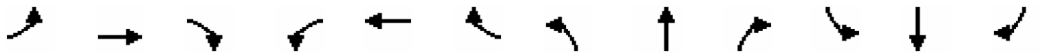
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	673	366	0	0	371	0
Stage 1	366	-	-	-	-	-
Stage 2	308	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.236	-
Pot Cap-1 Maneuver	423	677	-	-	1176	-
Stage 1	706	-	-	-	-	-
Stage 2	750	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	411	677	-	-	1176	-
Mov Cap-2 Maneuver	411	-	-	-	-	-
Stage 1	706	-	-	-	-	-
Stage 2	728	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s/v	11.62	0	0.88
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	SWL	SWT
Capacity (veh/h)	-	-	597	194	-
HCM Lane V/C Ratio	-	-	0.089	0.026	-
HCM Control Delay (s/veh)	-	-	11.6	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	242	182	75	109	186	28	584	209	732
v/c Ratio	0.76	0.42	0.27	0.23	0.35	0.12	0.44	0.42	0.40
Control Delay (s/veh)	39.4	22.0	21.4	20.2	4.9	19.6	18.8	10.6	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	39.4	22.0	21.4	20.2	4.9	19.6	18.8	10.6	9.2
Queue Length 50th (ft)	102	63	27	39	0	8	96	39	77
Queue Length 95th (ft)	155	99	51	65	35	29	165	87	138
Internal Link Dist (ft)		1262		599			348		377
Turn Bay Length (ft)	300		200		175	100		200	
Base Capacity (vph)	430	582	378	632	648	236	1320	510	1846
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.31	0.20	0.17	0.29	0.12	0.44	0.41	0.40

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	213	137	23	66	96	164	25	467	47	184	500	144
Future Volume (veh/h)	213	137	23	66	96	164	25	467	47	184	500	144
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
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	1695	1627	1450	1682	1709	1695	1586	1736	1750	1682	1723	1627
Adj Flow Rate, veh/h	242	156	26	75	109	186	28	531	53	209	568	164
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, %	4	9	22	5	3	4	12	1	0	5	2	9
Cap, veh/h	373	417	70	351	525	441	354	1169	116	514	1392	401
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.39	0.39	0.39	0.13	0.56	0.56
Sat Flow, veh/h	1066	1360	227	1173	1709	1435	666	3022	301	1602	2493	717
Grp Volume(v), veh/h	242	0	182	75	109	186	28	289	295	209	372	360
Grp Sat Flow(s),veh/h/ln	1066	0	1586	1173	1709	1435	666	1650	1674	1602	1637	1574
Q Serve(g_s), s	16.3	0.0	6.7	4.0	3.5	7.7	2.0	9.8	9.8	5.1	9.7	9.8
Cycle Q Clear(g_c), s	19.8	0.0	6.7	10.7	3.5	7.7	2.0	9.8	9.8	5.1	9.7	9.8
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.18	1.00		0.46
Lane Grp Cap(c), veh/h	373	0	487	351	525	441	354	638	647	514	914	879
V/C Ratio(X)	0.65	0.00	0.37	0.21	0.21	0.42	0.08	0.45	0.46	0.41	0.41	0.41
Avail Cap(c_a), veh/h	442	0	590	427	636	534	354	638	647	559	914	879
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.6	0.0	20.3	24.6	19.2	20.7	14.7	17.1	17.1	10.2	9.5	9.5
Incr Delay (d2), s/veh	2.5	0.0	0.5	0.3	0.2	0.6	0.4	2.3	2.3	0.5	1.3	1.4
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(50%),veh/ln	4.1	0.0	2.4	1.1	1.3	2.5	0.3	3.8	3.9	1.6	3.3	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	29.1	0.0	20.8	24.9	19.4	21.3	15.2	19.4	19.4	10.7	10.8	10.9
LnGrp LOS	C		C	C	B	C	B	B	B	B	B	B
Approach Vol, veh/h		424			370			612			941	
Approach Delay, s/veh		25.6			21.5			19.2			10.8	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.9	34.0		28.1		46.9		28.1				
Change Period (Y+Rc), s	3.0	5.0		5.1		5.0		5.1				
Max Green Setting (Gmax), s	12.0	22.0		27.9		37.0		27.9				
Max Q Clear Time (g_c+I1), s	7.1	11.8		21.8		11.8		12.7				
Green Ext Time (p_c), s	0.2	2.6		1.1		4.8		1.3				

Intersection Summary												
HCM 7th Control Delay, s/veh			17.4									
HCM 7th LOS			B									

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	132	19	101	84	11	10	1	39	8	0	3
Future Vol, veh/h	2	132	19	101	84	11	10	1	39	8	0	3
Conflicting Peds, #/hr	0	0	4	4	0	0	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	330	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	2	0	1	1	0	10	0	0	0	0	0
Mvmt Flow	2	142	20	109	90	12	11	1	42	9	0	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	102	0	0	166	0	0	468	480	158	462	484	96
Stage 1	-	-	-	-	-	-	160	160	-	313	313	-
Stage 2	-	-	-	-	-	-	308	319	-	149	171	-
Critical Hdwy	4.1	-	-	4.11	-	-	7.2	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.209	-	-	3.59	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1503	-	-	1418	-	-	492	488	892	513	486	966
Stage 1	-	-	-	-	-	-	823	769	-	702	660	-
Stage 2	-	-	-	-	-	-	686	656	-	859	761	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1503	-	-	1412	-	-	450	448	887	449	446	966
Mov Cap-2 Maneuver	-	-	-	-	-	-	450	448	-	449	446	-
Stage 1	-	-	-	-	-	-	819	765	-	648	609	-
Stage 2	-	-	-	-	-	-	631	606	-	814	757	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.1	4	10.31	12.01
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	731	1503	-	-	1412	-	-	526
HCM Lane V/C Ratio	0.074	0.001	-	-	0.077	-	-	0.023
HCM Control Delay (s/veh)	10.3	7.4	-	-	7.8	-	-	12
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-	0.1

Intersection	Approach	Phase 1 (2028)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Signalized*					
Mullowney Lane & Midland Road/South Frontage Road	EB	34.5	C	5	25.3	C	8
	WB	32.7	C	3	20.3	C	3
	NB	13.9	B	9	23.9	C	9
	SB	6.7	A	4	13.6	B	8
	Intersection	16.6	B	--	19.4	B	--
Intersection Control		*One-Way Stop-Control (NB)*					
South Frontage Road & East Lane	EB	0.0	A	0	0.0	A	0
	WB	0.6	A	1	1.1	A	1
	NB	10.2	B	1	12.2	B	1
	Intersection	1.1	A	--	1.5	A	--
Intersection Control		*One-Way Stop-Control (WB)*					
Elysian Road & South Frontage Road	WB	14.0	B	1	19.6	C	2
	NB	0.0	A	0	0.0	A	0
	SB	0.6	A	0	0.7	A	1
	Intersection	2.9	A	--	3.2	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & East Lane	EB	0.1	A	0	0.0	A	0
	WB	0.7	A	0	0.3	A	0
	NB	10.7	B	1	10.9	B	1
	SB	10.6	B	1	11.6	B	1
	Intersection	2.5	A	--	2.5	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & Walter Creek Boulevard	EB	0.1	A	0	0.1	A	0
	WB	1.7	A	1	2.8	A	1
	NB	10.4	B	1	11.8	B	1
	SB	12.6	B	1	15.5	C	1
	Intersection	3.0	A	--	2.8	A	--
Intersection Control		*Signalized*					
Mullowney Lane & Elysian Road	EB	5.8	A	4	6.5	A	4
	WB	12.8	B	2	12.4	B	2
	NB	12.6	B	2	10.8	B	3
	SB	12.8	B	2	11.0	B	4
	Intersection	8.6	A	--	9.2	A	--

Queues
3: Elysian Rd & Mullowney Ln

10/15/2024

Lane Group	EBL	EBT	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	370	12	152	30	33	32	150
v/c Ratio	0.46	0.01	0.39	0.10	0.13	0.10	0.38
Control Delay (s/veh)	6.0	2.7	10.0	18.5	19.4	18.8	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.0	2.7	10.0	18.5	19.4	18.8	7.9
Queue Length 50th (ft)	34	1	6	6	7	7	0
Queue Length 95th (ft)	76	4	48	26	29	28	39
Internal Link Dist (ft)		2570	797	465		2233	
Turn Bay Length (ft)	150				80		150
Base Capacity (vph)	1020	1493	1416	1358	1176	1454	1249
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.01	0.11	0.02	0.03	0.02	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	340	6	5	1	25	114	2	25	1	30	29	138
Future Volume (veh/h)	340	6	5	1	25	114	2	25	1	30	29	138
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	0.99		0.99	0.99		0.99	0.99		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	1736	1750	1477	1750	1750	1750	1750	1695	1750	1750	1750	1736
Adj Flow Rate, veh/h	370	7	5	1	27	124	2	27	1	33	32	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	0	20	0	0	0	0	4	0	0	0	1
Cap, veh/h	917	542	387	119	43	195	134	158	6	384	181	
Arrive On Green	0.24	0.57	0.57	0.16	0.16	0.16	0.10	0.10	0.10	0.10	0.10	0.00
Sat Flow, veh/h	1654	948	677	5	274	1231	77	1532	55	1386	1750	1471
Grp Volume(v), veh/h	370	0	12	152	0	0	30	0	0	33	32	0
Grp Sat Flow(s),veh/h/ln	1654	0	1625	1509	0	0	1664	0	0	1386	1750	1471
Q Serve(g_s), s	4.7	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.0
Cycle Q Clear(g_c), s	4.7	0.0	0.1	2.9	0.0	0.0	0.5	0.0	0.0	0.6	0.5	0.0
Prop In Lane	1.00		0.42	0.01		0.82	0.07		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	917	0	930	358	0	0	298	0	0	384	181	
V/C Ratio(X)	0.40	0.00	0.01	0.42	0.00	0.00	0.10	0.00	0.00	0.09	0.18	
Avail Cap(c_a), veh/h	1588	0	2115	2081	0	0	2047	0	0	1848	2030	
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	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.6	0.0	2.8	12.0	0.0	0.0	12.5	0.0	0.0	12.5	12.5	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.8	0.0	0.0	0.1	0.0	0.0	0.1	0.5	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(50%),veh/ln	0.7	0.0	0.0	0.8	0.0	0.0	0.2	0.0	0.0	0.2	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	5.9	0.0	2.8	12.8	0.0	0.0	12.6	0.0	0.0	12.6	13.0	0.0
LnGrp LOS	A		A	B			B			B	B	
Approach Vol, veh/h		382			152			30			65	
Approach Delay, s/veh		5.8			12.8			12.6			12.8	
Approach LOS		A			B			B			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		7.8		22.8		7.8	12.6	10.1				
Change Period (Y+Rc), s		* 4.6		5.3		* 4.6	5.3	5.3				
Max Green Setting (Gmax), s		* 35		39.7		* 35	19.7	39.7				
Max Q Clear Time (g_c+I1), s		2.5		2.1		2.6	6.7	4.9				
Green Ext Time (p_c), s		0.1		0.0		0.2	0.9	0.9				

Intersection Summary	
HCM 7th Control Delay, s/veh	8.6
HCM 7th LOS	A

Notes

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	105	7	152	60	20	253
Future Vol, veh/h	105	7	152	60	20	253
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	0	10	10	0	7
Mvmt Flow	114	8	165	65	22	275

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	516	198	0	0	230	0
Stage 1	198	-	-	-	-	-
Stage 2	318	-	-	-	-	-
Critical Hdwy	6.43	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	517	848	-	-	1349	-
Stage 1	833	-	-	-	-	-
Stage 2	735	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	507	848	-	-	1349	-
Mov Cap-2 Maneuver	507	-	-	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	721	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s/v	14.02	0	0.56
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	520	132	-
HCM Lane V/C Ratio	-	-	0.234	0.016	-
HCM Control Delay (s/veh)	-	-	14	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0	-

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	1	49	13	14	121	15	5	21	3	4	16	2
Future Vol, veh/h	1	49	13	14	121	15	5	21	3	4	16	2
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	3	40	0	2	0	25	12	33	0	10	0
Mvmt Flow	1	53	14	15	132	16	5	23	3	4	17	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	148	0	0	67	0	0	233	241	60	237	240	140
Stage 1	-	-	-	-	-	-	63	63	-	170	170	-
Stage 2	-	-	-	-	-	-	171	178	-	67	70	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.35	6.62	6.53	7.1	6.6	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	5.62	-	6.1	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	5.62	-	6.1	5.6	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.725	4.108	3.597	3.5	4.09	3.3
Pot Cap-1 Maneuver	1446	-	-	1547	-	-	676	644	924	722	648	914
Stage 1	-	-	-	-	-	-	894	824	-	837	743	-
Stage 2	-	-	-	-	-	-	780	733	-	949	822	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1446	-	-	1547	-	-	648	636	924	686	640	914
Mov Cap-2 Maneuver	-	-	-	-	-	-	648	636	-	686	640	-
Stage 1	-	-	-	-	-	-	893	823	-	828	735	-
Stage 2	-	-	-	-	-	-	752	725	-	918	821	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.12	0.69	10.73	10.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	660	27	-	-	164	-	-	667
HCM Lane V/C Ratio	0.048	0.001	-	-	0.01	-	-	0.036
HCM Control Delay (s/veh)	10.7	7.5	0	-	7.4	0	-	10.6
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	1.1

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	9	26	156	2	21	271
Future Vol, veh/h	9	26	156	2	21	271
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	20	0	8	50	5	7
Mvmt Flow	10	28	170	2	23	295

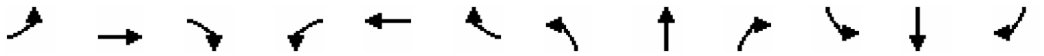
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	511	171	0	0	172	0
Stage 1	171	-	-	-	-	-
Stage 2	340	-	-	-	-	-
Critical Hdwy	6.6	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	492	878	-	-	1387	-
Stage 1	818	-	-	-	-	-
Stage 2	682	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	483	878	-	-	1387	-
Mov Cap-2 Maneuver	483	-	-	-	-	-
Stage 1	818	-	-	-	-	-
Stage 2	669	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s/v	10.24	0	0.55
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	SWL	SWT
Capacity (veh/h)	-	-	725	129	-
HCM Lane V/C Ratio	-	-	0.052	0.016	-
HCM Control Delay (s/veh)	-	-	10.2	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	138	98	64	89	175	49	746	128	609
v/c Ratio	0.64	0.33	0.29	0.31	0.43	0.14	0.42	0.27	0.28
Control Delay (s/veh)	46.0	22.6	32.1	31.9	7.8	13.9	13.7	6.4	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	46.0	22.6	32.1	31.9	7.8	13.9	13.7	6.4	5.0
Queue Length 50th (ft)	74	32	32	44	0	12	115	18	41
Queue Length 95th (ft)	116	65	59	75	46	42	213	52	94
Internal Link Dist (ft)		1262		599			350		377
Turn Bay Length (ft)	300		200		175	100		200	
Base Capacity (vph)	383	506	393	518	582	353	1770	504	2179
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.19	0.16	0.17	0.30	0.14	0.42	0.25	0.28

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	127	58	32	59	82	161	45	625	62	118	385	176
Future Volume (veh/h)	127	58	32	59	82	161	45	625	62	118	385	176
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.99	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	1668	1668	1409	1723	1586	1668	1545	1709	1750	1668	1709	1709
Adj Flow Rate, veh/h	138	63	35	64	89	175	49	679	67	128	418	191
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	25	2	12	6	15	3	0	6	3	3
Cap, veh/h	259	214	119	287	338	299	469	1596	157	524	1465	662
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.53	0.53	0.53	0.11	0.67	0.67
Sat Flow, veh/h	1075	1005	558	1290	1586	1404	727	2984	294	1589	2171	981
Grp Volume(v), veh/h	138	0	98	64	89	175	49	369	377	128	311	298
Grp Sat Flow(s),veh/h/ln	1075	0	1563	1290	1586	1404	727	1624	1655	1589	1624	1529
Q Serve(g_s), s	11.0	0.0	4.7	3.9	4.2	10.1	3.0	12.3	12.3	2.7	6.9	7.1
Cycle Q Clear(g_c), s	15.3	0.0	4.7	8.7	4.2	10.1	3.0	12.3	12.3	2.7	6.9	7.1
Prop In Lane	1.00		0.36	1.00		1.00	1.00		0.18	1.00		0.64
Lane Grp Cap(c), veh/h	259	0	333	287	338	299	469	868	885	524	1096	1032
V/C Ratio(X)	0.53	0.00	0.29	0.22	0.26	0.59	0.10	0.43	0.43	0.24	0.28	0.29
Avail Cap(c_a), veh/h	387	0	519	441	527	466	469	868	885	567	1096	1032
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.9	0.0	29.7	33.4	29.5	31.8	10.4	12.6	12.6	6.9	5.9	5.9
Incr Delay (d2), s/veh	1.7	0.0	0.5	0.4	0.4	1.8	0.4	1.5	1.5	0.2	0.7	0.7
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(50%),veh/ln	2.9	0.0	1.8	1.2	1.6	3.5	0.5	4.4	4.5	0.8	2.1	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	37.6	0.0	30.2	33.8	29.9	33.7	10.9	14.1	14.1	7.2	6.5	6.6
LnGrp LOS	D		C	C	C	C	B	B	B	A	A	A
Approach Vol, veh/h		236			328			795			737	
Approach Delay, s/veh		34.5			32.7			13.9			6.7	
Approach LOS		C			C			B			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.6	53.1		24.3		65.7		24.3				
Change Period (Y+Rc), s	3.0	5.0		5.1		5.0		5.1				
Max Green Setting (Gmax), s	12.0	35.0		29.9		50.0		29.9				
Max Q Clear Time (g_c+I1), s	4.7	14.3		17.3		9.1		12.1				
Green Ext Time (p_c), s	0.2	4.9		0.8		4.2		1.2				

Intersection Summary			
HCM 7th Control Delay, s/veh		16.6	
HCM 7th LOS		B	

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	214	1	38	133	6	7	0	79	16	2	6
Future Vol, veh/h	3	214	1	38	133	6	7	0	79	16	2	6
Conflicting Peds, #/hr	4	0	6	6	0	4	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	330	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	33	2	0	3	2	0	0	0	0	0	0	0
Mvmt Flow	3	233	1	41	145	7	8	0	86	17	2	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	155	0	0	240	0	0	474	483	239	474	481	152
Stage 1	-	-	-	-	-	-	246	246	-	234	234	-
Stage 2	-	-	-	-	-	-	228	238	-	239	246	-
Critical Hdwy	4.43	-	-	4.13	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.497	-	-	2.227	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1256	-	-	1321	-	-	504	486	805	504	488	900
Stage 1	-	-	-	-	-	-	763	707	-	773	715	-
Stage 2	-	-	-	-	-	-	779	712	-	769	706	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1252	-	-	1314	-	-	479	465	800	433	467	896
Mov Cap-2 Maneuver	-	-	-	-	-	-	479	465	-	433	467	-
Stage 1	-	-	-	-	-	-	756	701	-	746	689	-
Stage 2	-	-	-	-	-	-	747	687	-	684	700	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.11	1.68	10.41	12.58
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	759	1252	-	-	1314	-	-	501
HCM Lane V/C Ratio	0.123	0.003	-	-	0.031	-	-	0.052
HCM Control Delay (s/veh)	10.4	7.9	-	-	7.8	-	-	12.6
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.2

Queues
3: Elysian Rd & Mullowney Ln

10/15/2024

Lane Group	EBL	EBT	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	261	48	95	95	137	57	359
v/c Ratio	0.38	0.06	0.31	0.22	0.45	0.14	0.56
Control Delay (s/veh)	8.4	5.1	13.1	16.8	21.8	16.2	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	8.4	5.1	13.1	16.8	21.8	16.2	6.2
Queue Length 50th (ft)	32	4	7	20	31	12	0
Queue Length 95th (ft)	86	18	45	58	87	40	54
Internal Link Dist (ft)		2570	797	465		2235	
Turn Bay Length (ft)	150				80		150
Base Capacity (vph)	920	1644	1352	1339	943	1265	1229
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.03	0.07	0.07	0.15	0.05	0.29

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	240	34	10	1	25	62	6	80	1	126	52	330
Future Volume (veh/h)	240	34	10	1	25	62	6	80	1	126	52	330
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	0.99		0.99	0.99		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	1750	1750	1614	1750	1750	1750	1750	1750	1750	1750	1641	1736
Adj Flow Rate, veh/h	261	37	11	1	27	67	7	87	1	137	57	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	10	0	0	0	0	0	0	0	8	1
Cap, veh/h	848	628	187	127	55	133	145	280	3	490	280	
Arrive On Green	0.18	0.49	0.49	0.12	0.12	0.12	0.17	0.17	0.17	0.17	0.17	0.00
Sat Flow, veh/h	1667	1288	383	10	446	1091	68	1641	18	1321	1641	1471
Grp Volume(v), veh/h	261	0	48	95	0	0	95	0	0	137	57	0
Grp Sat Flow(s),veh/h/ln	1667	0	1671	1547	0	0	1727	0	0	1321	1641	1471
Q Serve(g_s), s	3.4	0.0	0.4	0.3	0.0	0.0	0.0	0.0	0.0	1.0	0.9	0.0
Cycle Q Clear(g_c), s	3.4	0.0	0.4	1.7	0.0	0.0	1.4	0.0	0.0	2.4	0.9	0.0
Prop In Lane	1.00		0.23	0.01		0.71	0.07		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	848	0	814	315	0	0	428	0	0	490	280	
V/C Ratio(X)	0.31	0.00	0.06	0.30	0.00	0.00	0.22	0.00	0.00	0.28	0.20	
Avail Cap(c_a), veh/h	1680	0	2293	2247	0	0	2229	0	0	1881	2008	
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	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	6.7	0.0	3.9	11.9	0.0	0.0	10.5	0.0	0.0	10.9	10.3	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.0	0.3	0.4	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(50%),veh/ln	0.6	0.0	0.1	0.4	0.0	0.0	0.4	0.0	0.0	0.6	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.9	0.0	3.9	12.4	0.0	0.0	10.8	0.0	0.0	11.2	10.7	0.0
LnGrp LOS	A		A	B			B			B	B	
Approach Vol, veh/h		309			95			95			194	
Approach Delay, s/veh		6.5			12.4			10.8			11.0	
Approach LOS		A			B			B			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		9.5		19.4		9.5	10.6	8.8				
Change Period (Y+Rc), s		* 4.6		5.3		* 4.6	5.3	5.3				
Max Green Setting (Gmax), s		* 35		39.7		* 35	19.7	39.7				
Max Q Clear Time (g_c+I1), s		3.4		2.4		4.4	5.4	3.7				
Green Ext Time (p_c), s		0.5		0.2		0.7	0.6	0.5				

Intersection Summary	
HCM 7th Control Delay, s/veh	9.2
HCM 7th LOS	A

Notes

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	112	22	353	128	20	233
Future Vol, veh/h	112	22	353	128	20	233
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	0	5	3	5	5
Mvmt Flow	122	24	384	139	22	253

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	750	453	0	0	523	0
Stage 1	453	-	-	-	-	-
Stage 2	297	-	-	-	-	-
Critical Hdwy	6.45	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	375	611	-	-	1029	-
Stage 1	634	-	-	-	-	-
Stage 2	747	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	365	611	-	-	1029	-
Mov Cap-2 Maneuver	365	-	-	-	-	-
Stage 1	634	-	-	-	-	-
Stage 2	729	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s/v	19.56	0	0.68
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	391	142	-
HCM Lane V/C Ratio	-	-	0.372	0.021	-
HCM Control Delay (s/veh)	-	-	19.6	8.6	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.7	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	1	156	10	6	115	17	3	28	16	22	12	1
Future Vol, veh/h	1	156	10	6	115	17	3	28	16	22	12	1
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	3	0	0	2	0	0	3	0	0	10	0
Mvmt Flow	1	170	11	7	125	18	3	30	17	24	13	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	143	0	0	180	0	0	322	334	175	334	330	134
Stage 1	-	-	-	-	-	-	177	177	-	147	147	-
Stage 2	-	-	-	-	-	-	145	157	-	187	183	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.53	6.2	7.1	6.6	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.6	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4.027	3.3	3.5	4.09	3.3
Pot Cap-1 Maneuver	1451	-	-	1407	-	-	635	585	874	623	576	920
Stage 1	-	-	-	-	-	-	829	751	-	860	760	-
Stage 2	-	-	-	-	-	-	863	766	-	819	734	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1451	-	-	1407	-	-	616	581	874	576	573	920
Mov Cap-2 Maneuver	-	-	-	-	-	-	616	581	-	576	573	-
Stage 1	-	-	-	-	-	-	829	750	-	856	756	-
Stage 2	-	-	-	-	-	-	843	762	-	770	733	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.04	0.33	10.92	11.63
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	659	11	-	-	76	-	-	581
HCM Lane V/C Ratio	0.078	0.001	-	-	0.005	-	-	0.065
HCM Control Delay (s/veh)	10.9	7.5	0	-	7.6	0	-	11.6
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	11	54	365	11	39	251
Future Vol, veh/h	11	54	365	11	39	251
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	3	5	0	3	3
Mvmt Flow	12	59	397	12	42	273

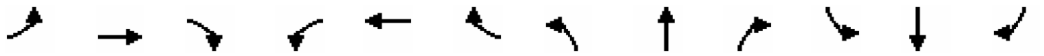
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	760	403	0	0	409	0
Stage 1	403	-	-	-	-	-
Stage 2	358	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	377	645	-	-	1145	-
Stage 1	679	-	-	-	-	-
Stage 2	712	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	360	645	-	-	1145	-
Mov Cap-2 Maneuver	360	-	-	-	-	-
Stage 1	679	-	-	-	-	-
Stage 2	681	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s/v	12.22	0	1.11
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	SWL	SWT
Capacity (veh/h)	-	-	569	242	-
HCM Lane V/C Ratio	-	-	0.124	0.037	-
HCM Control Delay (s/veh)	-	-	12.2	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	271	196	110	120	201	30	708	225	881
v/c Ratio	0.80	0.42	0.37	0.24	0.36	0.15	0.57	0.52	0.49
Control Delay (s/veh)	41.3	21.2	23.1	19.6	4.6	21.5	21.6	13.0	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.3	21.2	23.1	19.6	4.6	21.5	21.6	13.0	11.0
Queue Length 50th (ft)	113	66	40	41	0	9	130	45	111
Queue Length 95th (ft)	184	109	75	73	39	32	213	96	185
Internal Link Dist (ft)		1262		599			348		377
Turn Bay Length (ft)	300		200		175	100		200	
Base Capacity (vph)	429	592	372	632	663	196	1249	450	1803
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.33	0.30	0.19	0.30	0.15	0.57	0.50	0.49

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	249	155	26	101	110	185	28	582	69	207	641	169
Future Volume (veh/h)	249	155	26	101	110	185	28	582	69	207	641	169
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
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	1709	1654	1477	1695	1709	1709	1614	1736	1750	1695	1723	1654
Adj Flow Rate, veh/h	271	168	28	110	120	201	30	633	75	225	697	184
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	7	20	4	3	3	10	1	0	4	2	7
Cap, veh/h	397	465	78	382	575	487	303	1057	125	442	1347	356
Arrive On Green	0.34	0.34	0.34	0.34	0.34	0.34	0.36	0.36	0.36	0.13	0.53	0.53
Sat Flow, veh/h	1050	1382	230	1167	1709	1447	590	2962	350	1615	2548	672
Grp Volume(v), veh/h	271	0	196	110	120	201	30	352	356	225	448	433
Grp Sat Flow(s),veh/h/ln	1050	0	1613	1167	1709	1447	590	1650	1663	1615	1637	1583
Q Serve(g_s), s	18.6	0.0	6.9	5.9	3.8	8.0	2.6	13.1	13.1	5.9	13.3	13.3
Cycle Q Clear(g_c), s	22.4	0.0	6.9	12.8	3.8	8.0	3.0	13.1	13.1	5.9	13.3	13.3
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.21	1.00		0.42
Lane Grp Cap(c), veh/h	397	0	543	382	575	487	303	588	593	442	865	837
V/C Ratio(X)	0.68	0.00	0.36	0.29	0.21	0.41	0.10	0.60	0.60	0.51	0.52	0.52
Avail Cap(c_a), veh/h	434	0	600	423	636	538	303	588	593	487	865	837
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.7	0.0	18.8	23.6	17.8	19.2	16.6	19.7	19.7	12.4	11.5	11.5
Incr Delay (d2), s/veh	3.9	0.0	0.4	0.4	0.2	0.6	0.7	4.4	4.4	0.9	2.2	2.3
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(50%),veh/ln	4.7	0.0	2.5	1.6	1.4	2.6	0.4	5.3	5.4	1.9	4.7	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	29.7	0.0	19.2	24.0	17.9	19.7	17.3	24.2	24.2	13.3	13.7	13.7
LnGrp LOS	C		B	C	B	B	B	C	C	B	B	B
Approach Vol, veh/h		467			431			738			1106	
Approach Delay, s/veh		25.3			20.3			23.9			13.6	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.9	31.8		30.3		44.7		30.3				
Change Period (Y+Rc), s	3.0	5.0		5.1		5.0		5.1				
Max Green Setting (Gmax), s	12.0	22.0		27.9		37.0		27.9				
Max Q Clear Time (g_c+I1), s	7.9	15.1		24.4		15.3		14.8				
Green Ext Time (p_c), s	0.2	2.5		0.8		5.8		1.4				

Intersection Summary												
HCM 7th Control Delay, s/veh			19.4									
HCM 7th LOS			B									

Notes
User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	210	21	114	199	12	11	1	44	9	0	3
Future Vol, veh/h	2	210	21	114	199	12	11	1	44	9	0	3
Conflicting Peds, #/hr	0	0	4	4	0	0	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	330	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	2	0	1	1	0	9	0	0	0	0	0
Mvmt Flow	2	228	23	124	216	13	12	1	48	10	0	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	229	0	0	255	0	0	712	725	246	706	730	223
Stage 1	-	-	-	-	-	-	248	248	-	471	471	-
Stage 2	-	-	-	-	-	-	464	477	-	235	259	-
Critical Hdwy	4.1	-	-	4.11	-	-	7.19	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.209	-	-	3.581	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1351	-	-	1316	-	-	338	354	798	353	352	822
Stage 1	-	-	-	-	-	-	741	705	-	577	563	-
Stage 2	-	-	-	-	-	-	565	559	-	772	697	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1351	-	-	1311	-	-	304	319	793	299	317	822
Mov Cap-2 Maneuver	-	-	-	-	-	-	304	319	-	299	317	-
Stage 1	-	-	-	-	-	-	737	701	-	523	510	-
Stage 2	-	-	-	-	-	-	510	506	-	722	693	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.07	2.82	11.8	15.52
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	591	1351	-	-	1311	-	-	355
HCM Lane V/C Ratio	0.103	0.002	-	-	0.095	-	-	0.037
HCM Control Delay (s/veh)	11.8	7.7	-	-	8	-	-	15.5
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.3	-	-	0.1

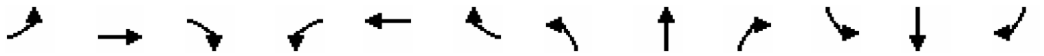
Intersection	Approach	Full Build (2030)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Signalized*					
Mullowney Lane & Midland Road/South Frontage Road	EB	34.1	C	5	25.2	C	8
	WB	32.0	C	4	19.5	B	4
	NB	15.0	B	10	27.0	C	10
	SB	7.3	A	5	15.4	B	9
	Intersection	17.1	B	--	20.8	C	--
Intersection Control		*One-Way Stop-Control (NB)*					
South Frontage Road & East Lane	EB	0.0	A	0	0.0	A	0
	WB	0.5	A	1	1.1	A	1
	NB	10.4	B	1	12.7	B	1
	Intersection	1.1	A	--	1.6	A	--
Intersection Control		*One-Way Stop-Control (WB)*					
Elysian Road & South Frontage Road	WB	14.7	A	1	21.5	C	2
	NB	0.0	A	0	0.0	A	0
	SB	0.5	A	0	0.7	A	1
	Intersection	3.0	A	--	3.5	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & East Lane	EB	0.1	A	0	0.0	A	0
	WB	0.7	A	0	0.3	A	0
	NB	10.8	B	1	11.1	B	1
	SB	10.7	B	1	11.9	B	1
	Intersection	2.6	A	--	2.6	A	--
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Elysian Road & Walter Creek Boulevard	EB	0.1	A	0	0.1	A	0
	WB	1.7	A	1	2.8	A	1
	NB	10.6	B	1	12.2	B	1
	SB	13.1	B	1	16.1	C	1
	Intersection	3.1	A	--	2.9	A	--
Intersection Control		*Signalized*					
Mullowney Lane & Elysian Road	EB	5.9	A	4	6.6	A	4
	WB	13.1	B	2	12.9	B	2
	NB	13.1	B	2	11.0	B	3
	SB	13.2	B	2	11.3	B	4
	Intersection	8.7	A	--	9.4	A	--

Queues
3: Elysian Rd & Mullowney Ln

10/15/2024

Lane Group	EBL	EBT	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	391	12	161	31	35	34	159
v/c Ratio	0.48	0.01	0.41	0.10	0.14	0.11	0.40
Control Delay (s/veh)	6.2	2.7	10.0	18.8	19.8	19.1	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.2	2.7	10.0	18.8	19.8	19.1	7.9
Queue Length 50th (ft)	37	1	6	7	8	7	0
Queue Length 95th (ft)	82	4	49	27	30	29	40
Internal Link Dist (ft)		2570	797	465		2233	
Turn Bay Length (ft)	150				80		150
Base Capacity (vph)	1010	1493	1404	1341	1139	1436	1237
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.01	0.11	0.02	0.03	0.02	0.13

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	360	6	5	1	26	121	2	26	1	32	31	146
Future Volume (veh/h)	360	6	5	1	26	121	2	26	1	32	31	146
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	0.99		0.99	0.99		0.99	0.99		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	1736	1750	1477	1750	1750	1750	1750	1695	1750	1750	1750	1736
Adj Flow Rate, veh/h	391	7	5	1	28	132	2	28	1	35	34	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	0	20	0	0	0	0	4	0	0	0	1
Cap, veh/h	917	552	394	115	45	206	129	162	6	377	184	
Arrive On Green	0.25	0.58	0.58	0.17	0.17	0.17	0.11	0.11	0.11	0.11	0.11	0.00
Sat Flow, veh/h	1654	948	677	4	268	1237	71	1541	54	1385	1750	1471
Grp Volume(v), veh/h	391	0	12	161	0	0	31	0	0	35	34	0
Grp Sat Flow(s),veh/h/ln	1654	0	1625	1509	0	0	1666	0	0	1385	1750	1471
Q Serve(g_s), s	5.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.0
Cycle Q Clear(g_c), s	5.1	0.0	0.1	3.1	0.0	0.0	0.5	0.0	0.0	0.6	0.6	0.0
Prop In Lane	1.00		0.42	0.01		0.82	0.06		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	917	0	946	366	0	0	296	0	0	377	184	
V/C Ratio(X)	0.43	0.00	0.01	0.44	0.00	0.00	0.10	0.00	0.00	0.09	0.18	
Avail Cap(c_a), veh/h	1536	0	2038	2005	0	0	1974	0	0	1781	1957	
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	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.6	0.0	2.8	12.3	0.0	0.0	12.9	0.0	0.0	13.0	12.9	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.8	0.0	0.0	0.2	0.0	0.0	0.1	0.5	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(50%),veh/ln	0.8	0.0	0.0	0.8	0.0	0.0	0.2	0.0	0.0	0.2	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.0	0.0	2.8	13.1	0.0	0.0	13.1	0.0	0.0	13.1	13.4	0.0
LnGrp LOS	A		A	B			B			B	B	
Approach Vol, veh/h		403			161			31			69	
Approach Delay, s/veh		5.9			13.1			13.1			13.2	
Approach LOS		A			B			B			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		7.9		23.7		7.9	13.2	10.6				
Change Period (Y+Rc), s		* 4.6		5.3		* 4.6	5.3	5.3				
Max Green Setting (Gmax), s		* 35		39.7		* 35	19.7	39.7				
Max Q Clear Time (g_c+I1), s		2.5		2.1		2.6	7.1	5.1				
Green Ext Time (p_c), s		0.1		0.0		0.2	1.0	1.0				

Intersection Summary	
HCM 7th Control Delay, s/veh	8.7
HCM 7th LOS	A

Notes

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	113	7	161	64	20	269
Future Vol, veh/h	113	7	161	64	20	269
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	0	10	10	0	7
Mvmt Flow	123	8	175	70	22	292

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	546	210	0	0	245	0
Stage 1	210	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Critical Hdwy	6.43	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	497	836	-	-	1333	-
Stage 1	823	-	-	-	-	-
Stage 2	722	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	488	836	-	-	1333	-
Mov Cap-2 Maneuver	488	-	-	-	-	-
Stage 1	823	-	-	-	-	-
Stage 2	708	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s/v	14.73	0	0.54
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	500	125	-
HCM Lane V/C Ratio	-	-	0.261	0.016	-
HCM Control Delay (s/veh)	-	-	14.7	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1	0	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	51	14	14	128	15	6	24	4	4	17	2
Future Vol, veh/h	1	51	14	14	128	15	6	24	4	4	17	2
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	3	35	0	2	0	20	10	25	0	8	0
Mvmt Flow	1	55	15	15	139	16	7	26	4	4	18	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	155	0	0	71	0	0	244	251	63	248	251	147
Stage 1	-	-	-	-	-	-	65	65	-	178	178	-
Stage 2	-	-	-	-	-	-	179	186	-	71	73	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.3	6.6	6.45	7.1	6.58	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.6	-	6.1	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.6	-	6.1	5.58	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.68	4.09	3.525	3.5	4.072	3.3
Pot Cap-1 Maneuver	1437	-	-	1543	-	-	674	638	941	709	642	905
Stage 1	-	-	-	-	-	-	902	825	-	829	741	-
Stage 2	-	-	-	-	-	-	783	731	-	944	823	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1437	-	-	1543	-	-	645	631	941	669	635	905
Mov Cap-2 Maneuver	-	-	-	-	-	-	645	631	-	669	635	-
Stage 1	-	-	-	-	-	-	901	824	-	820	733	-
Stage 2	-	-	-	-	-	-	753	723	-	909	822	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.11	0.66	10.79	10.69
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	659	26	-	-	157	-	-	658
HCM Lane V/C Ratio	0.056	0.001	-	-	0.01	-	-	0.038
HCM Control Delay (s/veh)	10.8	7.5	0	-	7.4	0	-	10.7
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	1.1

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	10	29	166	2	22	288
Future Vol, veh/h	10	29	166	2	22	288
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	20	0	7	50	5	6
Mvmt Flow	11	32	180	2	24	313

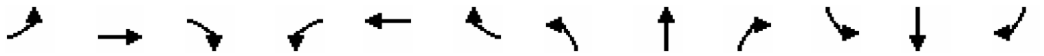
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	542	182	0	0	183	0
Stage 1	182	-	-	-	-	-
Stage 2	361	-	-	-	-	-
Critical Hdwy	6.6	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	471	866	-	-	1375	-
Stage 1	808	-	-	-	-	-
Stage 2	667	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	462	866	-	-	1375	-
Mov Cap-2 Maneuver	462	-	-	-	-	-
Stage 1	808	-	-	-	-	-
Stage 2	653	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s/v	10.41	0	0.54
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	SWL	SWT
Capacity (veh/h)	-	-	707	128	-
HCM Lane V/C Ratio	-	-	0.06	0.017	-
HCM Control Delay (s/veh)	-	-	10.4	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	103	68	95	186	52	793	136	646
v/c Ratio	0.66	0.33	0.30	0.31	0.44	0.15	0.45	0.29	0.30
Control Delay (s/veh)	46.6	22.8	31.9	31.6	7.5	14.4	14.4	6.9	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	46.6	22.8	31.9	31.6	7.5	14.4	14.4	6.9	5.3
Queue Length 50th (ft)	79	35	34	47	0	13	128	20	47
Queue Length 95th (ft)	125	69	62	78	47	44	230	55	102
Internal Link Dist (ft)		1262		599			350		377
Turn Bay Length (ft)	300		200		175	100		200	
Base Capacity (vph)	384	513	391	528	594	343	1749	484	2162
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.20	0.17	0.18	0.31	0.15	0.45	0.28	0.30

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	136	62	33	63	87	171	48	662	67	125	408	187
Future Volume (veh/h)	136	62	33	63	87	171	48	662	67	125	408	187
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.99	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	1682	1682	1436	1723	1614	1682	1573	1709	1750	1682	1709	1709
Adj Flow Rate, veh/h	148	67	36	68	95	186	52	720	73	136	443	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	5	5	23	2	10	5	13	3	0	5	3	3
Cap, veh/h	267	230	123	298	361	317	454	1558	158	500	1440	654
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.52	0.52	0.52	0.11	0.66	0.66
Sat Flow, veh/h	1068	1027	552	1285	1614	1416	715	2976	302	1602	2168	984
Grp Volume(v), veh/h	148	0	103	68	95	186	52	393	400	136	331	315
Grp Sat Flow(s),veh/h/ln	1068	0	1578	1285	1614	1416	715	1624	1653	1602	1624	1528
Q Serve(g_s), s	11.9	0.0	4.9	4.2	4.4	10.6	3.4	13.7	13.7	2.9	7.7	7.9
Cycle Q Clear(g_c), s	16.3	0.0	4.9	9.1	4.4	10.6	3.4	13.7	13.7	2.9	7.7	7.9
Prop In Lane	1.00		0.35	1.00		1.00	1.00		0.18	1.00		0.64
Lane Grp Cap(c), veh/h	267	0	353	298	361	317	454	850	865	500	1078	1015
V/C Ratio(X)	0.55	0.00	0.29	0.23	0.26	0.59	0.11	0.46	0.46	0.27	0.31	0.31
Avail Cap(c_a), veh/h	383	0	524	437	536	470	454	850	865	541	1078	1015
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.6	0.0	29.0	32.8	28.8	31.2	11.0	13.5	13.5	7.6	6.4	6.4
Incr Delay (d2), s/veh	1.8	0.0	0.5	0.4	0.4	1.7	0.5	1.8	1.8	0.3	0.7	0.8
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(50%),veh/ln	3.1	0.0	1.8	1.3	1.7	3.6	0.6	5.0	5.1	0.9	2.4	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	37.4	0.0	29.5	33.2	29.2	33.0	11.5	15.3	15.3	7.9	7.1	7.2
LnGrp LOS	D		C	C	C	C	B	B	B	A	A	A
Approach Vol, veh/h		251			349			845			782	
Approach Delay, s/veh		34.1			32.0			15.0			7.3	
Approach LOS		C			C			B			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.7	52.1		25.2		64.8		25.2				
Change Period (Y+Rc), s	3.0	5.0		5.1		5.0		5.1				
Max Green Setting (Gmax), s	12.0	35.0		29.9		50.0		29.9				
Max Q Clear Time (g_c+I1), s	4.9	15.7		18.3		9.9		12.6				
Green Ext Time (p_c), s	0.2	5.2		0.9		4.5		1.2				

Intersection Summary												
HCM 7th Control Delay, s/veh			17.1									
HCM 7th LOS			B									

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	226	1	41	140	6	7	0	84	17	2	6
Future Vol, veh/h	4	226	1	41	140	6	7	0	84	17	2	6
Conflicting Peds, #/hr	4	0	6	6	0	4	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	330	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	25	2	0	3	2	0	0	0	0	0	0	0
Mvmt Flow	4	246	1	45	152	7	8	0	91	18	2	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	163	0	0	253	0	0	503	513	252	503	510	159
Stage 1	-	-	-	-	-	-	261	261	-	249	249	-
Stage 2	-	-	-	-	-	-	242	252	-	254	261	-
Critical Hdwy	4.35	-	-	4.13	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.425	-	-	2.227	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1288	-	-	1307	-	-	482	468	791	482	469	891
Stage 1	-	-	-	-	-	-	748	696	-	760	705	-
Stage 2	-	-	-	-	-	-	766	702	-	754	696	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1283	-	-	1299	-	-	456	446	787	409	448	888
Mov Cap-2 Maneuver	-	-	-	-	-	-	456	446	-	409	448	-
Stage 1	-	-	-	-	-	-	742	690	-	731	678	-
Stage 2	-	-	-	-	-	-	732	676	-	665	689	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.14	1.73	10.57	13.07
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	745	1283	-	-	1299	-	-	473
HCM Lane V/C Ratio	0.133	0.003	-	-	0.034	-	-	0.057
HCM Control Delay (s/veh)	10.6	7.8	-	-	7.9	-	-	13.1
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0.1	-	-	0.2

Queues
3: Elysian Rd & Mullowney Ln

10/15/2024

Lane Group	EBL	EBT	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	277	51	101	100	146	60	382
v/c Ratio	0.41	0.06	0.33	0.22	0.46	0.14	0.57
Control Delay (s/veh)	8.9	5.3	13.3	17.0	22.2	16.3	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	8.9	5.3	13.3	17.0	22.2	16.3	6.2
Queue Length 50th (ft)	35	4	7	22	34	13	0
Queue Length 95th (ft)	96	20	48	62	92	41	55
Internal Link Dist (ft)		2570	797	465		2235	
Turn Bay Length (ft)	150				80		150
Base Capacity (vph)	904	1645	1319	1307	914	1245	1212
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.03	0.08	0.08	0.16	0.05	0.32

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	255	36	11	1	26	66	6	85	1	134	55	351
Future Volume (veh/h)	255	36	11	1	26	66	6	85	1	134	55	351
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	0.99		0.99	0.99		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	1750	1750	1627	1750	1750	1750	1750	1750	1750	1750	1654	1736
Adj Flow Rate, veh/h	277	39	12	1	28	72	7	92	1	146	60	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	9	0	0	0	0	0	0	0	7	1
Cap, veh/h	851	628	193	122	54	136	139	293	3	491	294	
Arrive On Green	0.19	0.49	0.49	0.12	0.12	0.12	0.18	0.18	0.18	0.18	0.18	0.00
Sat Flow, veh/h	1667	1276	393	9	435	1102	61	1650	17	1315	1654	1471
Grp Volume(v), veh/h	277	0	51	101	0	0	100	0	0	146	60	0
Grp Sat Flow(s),veh/h/ln	1667	0	1669	1545	0	0	1729	0	0	1315	1654	1471
Q Serve(g_s), s	3.7	0.0	0.5	0.3	0.0	0.0	0.0	0.0	0.0	1.1	0.9	0.0
Cycle Q Clear(g_c), s	3.7	0.0	0.5	1.8	0.0	0.0	1.5	0.0	0.0	2.6	0.9	0.0
Prop In Lane	1.00		0.24	0.01		0.71	0.07		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	851	0	821	313	0	0	436	0	0	491	294	
V/C Ratio(X)	0.33	0.00	0.06	0.32	0.00	0.00	0.23	0.00	0.00	0.30	0.20	
Avail Cap(c_a), veh/h	1629	0	2212	2167	0	0	2154	0	0	1812	1955	
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	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	6.9	0.0	4.0	12.3	0.0	0.0	10.7	0.0	0.0	11.2	10.5	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.6	0.0	0.0	0.3	0.0	0.0	0.3	0.3	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(50%),veh/ln	0.7	0.0	0.1	0.5	0.0	0.0	0.5	0.0	0.0	0.7	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	7.1	0.0	4.0	12.9	0.0	0.0	11.0	0.0	0.0	11.5	10.9	0.0
LnGrp LOS	A		A	B			B			B	B	
Approach Vol, veh/h		328			101			100			206	
Approach Delay, s/veh		6.6			12.9			11.0			11.3	
Approach LOS		A			B			B			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		9.9		20.0		9.9	11.0	9.0				
Change Period (Y+Rc), s		* 4.6		5.3		* 4.6	5.3	5.3				
Max Green Setting (Gmax), s		* 35		39.7		* 35	19.7	39.7				
Max Q Clear Time (g_c+I1), s		3.5		2.5		4.6	5.7	3.8				
Green Ext Time (p_c), s		0.5		0.2		0.8	0.7	0.6				

Intersection Summary	
HCM 7th Control Delay, s/veh	9.4
HCM 7th LOS	A

Notes

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	119	22	375	137	20	247
Future Vol, veh/h	119	22	375	137	20	247
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	4	0	4	3	5	4
Mvmt Flow	129	24	408	149	22	268

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	794	482	0	0	557	0
Stage 1	482	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Critical Hdwy	6.44	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	354	588	-	-	999	-
Stage 1	617	-	-	-	-	-
Stage 2	738	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	345	588	-	-	999	-
Mov Cap-2 Maneuver	345	-	-	-	-	-
Stage 1	617	-	-	-	-	-
Stage 2	719	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s/v	21.51	0	0.65
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	369	135	-
HCM Lane V/C Ratio	-	-	0.415	0.022	-
HCM Control Delay (s/veh)	-	-	21.5	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2	0.1	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	164	11	6	121	18	4	29	17	23	14	1
Future Vol, veh/h	1	164	11	6	121	18	4	29	17	23	14	1
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	3	0	0	2	0	0	3	0	0	9	0
Mvmt Flow	1	178	12	7	132	20	4	32	18	25	15	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	151	0	0	190	0	0	339	351	184	351	347	141
Stage 1	-	-	-	-	-	-	186	186	-	154	154	-
Stage 2	-	-	-	-	-	-	152	164	-	196	192	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.53	6.2	7.1	6.59	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.59	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.59	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4.027	3.3	3.5	4.081	3.3
Pot Cap-1 Maneuver	1442	-	-	1396	-	-	619	572	863	608	566	912
Stage 1	-	-	-	-	-	-	820	744	-	853	757	-
Stage 2	-	-	-	-	-	-	855	760	-	810	728	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1442	-	-	1396	-	-	598	569	863	559	562	912
Mov Cap-2 Maneuver	-	-	-	-	-	-	598	569	-	559	562	-
Stage 1	-	-	-	-	-	-	819	743	-	848	753	-
Stage 2	-	-	-	-	-	-	832	757	-	759	728	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.04	0.31	11.08	11.86
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	646	10	-	-	73	-	-	566
HCM Lane V/C Ratio	0.084	0.001	-	-	0.005	-	-	0.073
HCM Control Delay (s/veh)	11.1	7.5	0	-	7.6	0	-	11.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1.6

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	12	56	387	12	42	266
Future Vol, veh/h	12	56	387	12	42	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	3	4	0	3	3
Mvmt Flow	13	61	421	13	46	289

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	808	427	0	0	434	0
Stage 1	427	-	-	-	-	-
Stage 2	380	-	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	353	625	-	-	1121	-
Stage 1	662	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	336	625	-	-	1121	-
Mov Cap-2 Maneuver	336	-	-	-	-	-
Stage 1	662	-	-	-	-	-
Stage 2	662	-	-	-	-	-

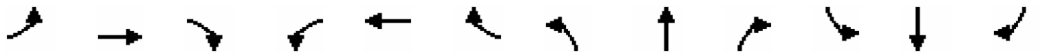
Approach	NB	NE	SW
HCM Control Delay, s/v	12.67	0	1.14
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	SWL	SWT
Capacity (veh/h)	-	-	543	245	-
HCM Lane V/C Ratio	-	-	0.136	0.041	-
HCM Control Delay (s/veh)	-	-	12.7	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	286	208	117	127	213	33	750	239	935
v/c Ratio	0.82	0.42	0.39	0.25	0.36	0.18	0.62	0.58	0.53
Control Delay (s/veh)	42.5	21.1	23.0	19.2	4.5	22.5	23.1	14.8	11.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	42.5	21.1	23.0	19.2	4.5	22.5	23.1	14.8	11.8
Queue Length 50th (ft)	119	70	42	43	0	10	146	51	126
Queue Length 95th (ft)	#200	116	79	76	40	35	228	101	201
Internal Link Dist (ft)		1262		599			348		377
Turn Bay Length (ft)	300		200		175	100		200	
Base Capacity (vph)	427	598	367	632	670	185	1218	427	1775
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.35	0.32	0.20	0.32	0.18	0.62	0.56	0.53

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	263	165	27	108	117	196	30	617	73	220	680	180
Future Volume (veh/h)	263	165	27	108	117	196	30	617	73	220	680	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
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	1709	1668	1504	1709	1709	1709	1641	1736	1750	1709	1723	1668
Adj Flow Rate, veh/h	286	179	29	117	127	213	33	671	79	239	739	196
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	6	18	3	3	3	8	1	0	3	2	6
Cap, veh/h	407	495	80	397	604	512	274	1006	118	415	1302	345
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.13	0.51	0.51
Sat Flow, veh/h	1032	1400	227	1164	1709	1447	570	2964	349	1628	2545	675
Grp Volume(v), veh/h	286	0	208	117	127	213	33	373	377	239	475	460
Grp Sat Flow(s),veh/h/ln	1032	0	1627	1164	1709	1447	570	1650	1663	1628	1637	1583
Q Serve(g_s), s	20.1	0.0	7.1	6.2	3.9	8.4	3.2	14.5	14.5	6.5	15.0	15.0
Cycle Q Clear(g_c), s	24.0	0.0	7.1	13.3	3.9	8.4	5.2	14.5	14.5	6.5	15.0	15.0
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.21	1.00		0.43
Lane Grp Cap(c), veh/h	407	0	575	397	604	512	274	560	565	415	838	810
V/C Ratio(X)	0.70	0.00	0.36	0.29	0.21	0.42	0.12	0.67	0.67	0.58	0.57	0.57
Avail Cap(c_a), veh/h	426	0	605	419	636	538	274	560	565	459	838	810
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	18.0	22.9	16.9	18.4	18.8	21.1	21.2	13.8	12.6	12.6
Incr Delay (d2), s/veh	4.9	0.0	0.4	0.4	0.2	0.5	0.9	6.2	6.2	1.5	2.8	2.9
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(50%),veh/ln	5.1	0.0	2.5	1.6	1.4	2.7	0.5	6.1	6.2	2.2	5.4	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	30.2	0.0	18.4	23.3	17.1	18.9	19.7	27.3	27.3	15.3	15.4	15.5
LnGrp LOS	C		B	C	B	B	B	C	C	B	B	B
Approach Vol, veh/h		494			457			783			1174	
Approach Delay, s/veh		25.2			19.5			27.0			15.4	
Approach LOS		C			B			C			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.9	30.5		31.6		43.4		31.6				
Change Period (Y+Rc), s	3.0	5.0		5.1		5.0		5.1				
Max Green Setting (Gmax), s	12.0	22.0		27.9		37.0		27.9				
Max Q Clear Time (g_c+I1), s	8.5	16.5		26.0		17.0		15.3				
Green Ext Time (p_c), s	0.2	2.3		0.5		6.0		1.5				

Intersection Summary												
HCM 7th Control Delay, s/veh			20.8									
HCM 7th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

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	2	223	23	121	211	13	12	1	47	10	0	4
Future Vol, veh/h	2	223	23	121	211	13	12	1	47	10	0	4
Conflicting Peds, #/hr	0	0	4	4	0	0	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	330	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	2	0	1	1	0	9	0	0	0	0	0
Mvmt Flow	2	242	25	132	229	14	13	1	51	11	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	243	0	0	271	0	0	756	770	261	749	775	236
Stage 1	-	-	-	-	-	-	263	263	-	499	499	-
Stage 2	-	-	-	-	-	-	492	507	-	249	276	-
Critical Hdwy	4.1	-	-	4.11	-	-	7.19	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.209	-	-	3.581	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1335	-	-	1298	-	-	316	334	783	331	331	808
Stage 1	-	-	-	-	-	-	727	694	-	557	547	-
Stage 2	-	-	-	-	-	-	545	543	-	759	686	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1335	-	-	1293	-	-	281	298	778	276	296	808
Mov Cap-2 Maneuver	-	-	-	-	-	-	281	298	-	276	296	-
Stage 1	-	-	-	-	-	-	723	691	-	500	491	-
Stage 2	-	-	-	-	-	-	487	488	-	706	682	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.06	2.84	12.22	16.1
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	564	1335	-	-	1293	-	-	340
HCM Lane V/C Ratio	0.116	0.002	-	-	0.102	-	-	0.045
HCM Control Delay (s/veh)	12.2	7.7	-	-	8.1	-	-	16.1
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0.3	-	-	0.1

ANNAFELD SIXTH FILING – TIS UPDATE

Project No. 16001.161

APPENDIX D
AUXILIARY TURN LANE WARRANTS WORKSHEETS

Intelligent Infrastructure.
Enduring Communities.

sanbell

TURN LANE WARRANTS		East Lane & South Frontage Road		Elysian Road & South Frontage Road		East Lane & Elysian Road	
		AM	PM	AM	PM	AM	PM
2024	EB Right-Turn Lane	NO	NO			NO	NO
	EB Left-Turn Lane					NO	NO
	WB Right-Turn Lane					NO	NO
	WB Left-Turn Lane	NO	NO			NO	NO
	NB Right-Turn Lane			NO	YES		
	SB Left-Turn Lane			NO	NO		
2028	EB Right-Turn Lane	NO	NO			NO	NO
	EB Left-Turn Lane					NO	NO
	WB Right-Turn Lane					NO	NO
	WB Left-Turn Lane	NO	YES			NO	NO
	NB Right-Turn Lane			NO	YES		
	SB Left-Turn Lane			NO	NO		
2030	EB Right-Turn Lane	NO	NO			NO	NO
	EB Left-Turn Lane					NO	NO
	WB Right-Turn Lane					NO	NO
	WB Left-Turn Lane	NO	YES			NO	NO
	NB Right-Turn Lane			NO	YES		
	SB Left-Turn Lane			NO	NO		

Existing Traffic Volumes (2024) - Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Total DHV (veh/hr)	Right-Turn Volume During DHV (veh/hr, one direction)	Required Right-Turn Volume for Warranted Lane	Warranted Right-Turn Lane? (Y/N)	Speed Limit at Approach	Adjustment
East & S Frontage EB	AM weekday	141	2	101	N	55	0
	PM weekday	334	10	75	N	55	0
Elysian & S Frontage NB	AM weekday	186	51	95	N	55	0
	PM weekday	421	107	64	Y	55	0
East & Elysian EB	AM weekday	47	9	114	N	35	0
	PM weekday	123	2	104	N	35	0
East & Elysian WB	AM weekday	106	7	106	N	35	0
	PM weekday	103	11	106	N	35	0

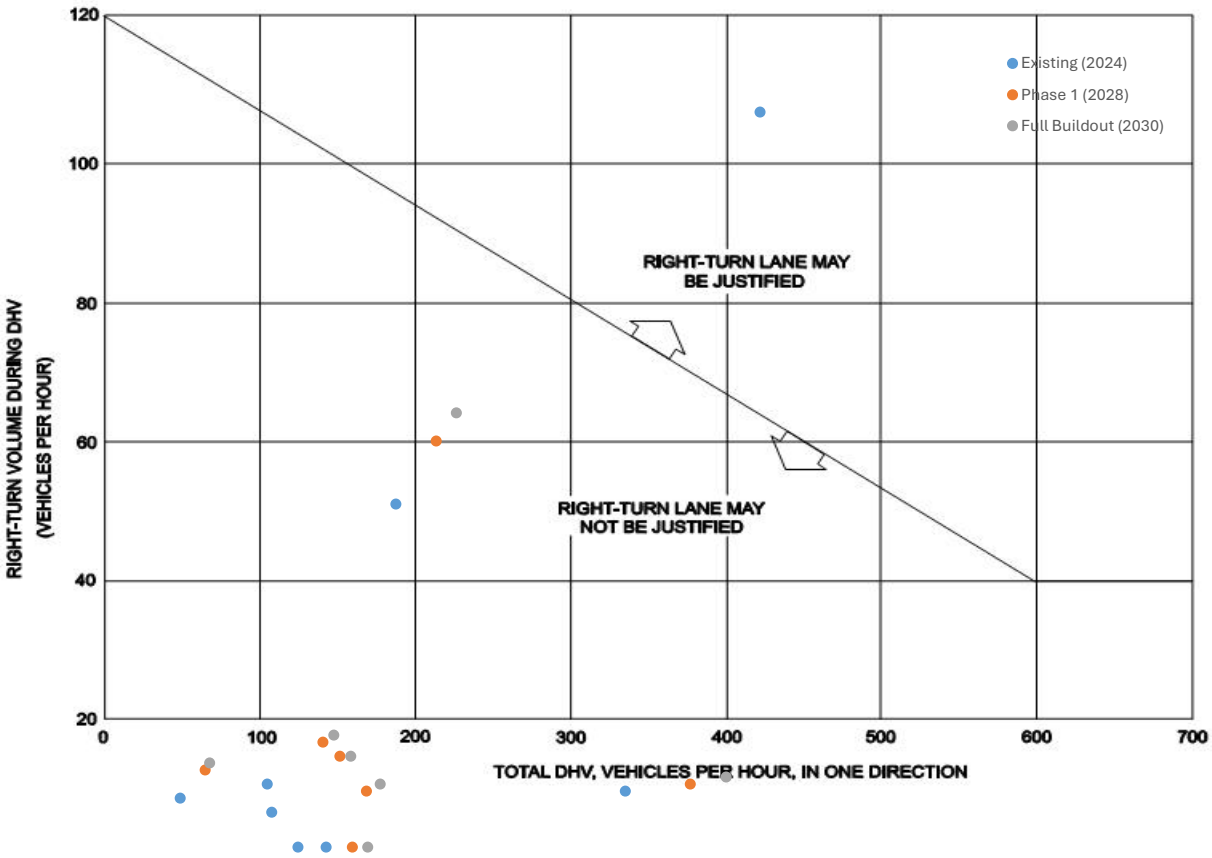
Phase 1 (2028) Traffic Volumes - Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Total DHV (veh/hr)	Right-Turn Volume During DHV (veh/hr, one direction)	Required Right-Turn Volume for Warranted Lane	Warranted Right-Turn Lane? (Y/N)	Speed Limit at Approach	Adjustment
East & S Frontage EB	AM weekday	158	2	99	N	55	0
	PM weekday	376	11	70	N	55	0
Elysian & S Frontage NB	AM weekday	212	60	92	N	55	0
	PM weekday	481	128	56	Y	55	0
East & Elysian EB	AM weekday	63	13	112	N	35	0
	PM weekday	167	10	98	N	35	0
East & Elysian WB	AM weekday	150	15	100	N	35	0
	PM weekday	139	17	101	N	35	0

Full Buildout (2030) Traffic Volumes - Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Total DHV (veh/hr)	Right-Turn Volume During DHV (veh/hr, one direction)	Required Right-Turn Volume for Warranted Lane	Warranted Right-Turn Lane? (Y/N)	Speed Limit at Approach	Adjustment
East & S Frontage EB	AM weekday	168	2	98	N	55	0
	PM weekday	399	12	67	N	55	0
Elysian & S Frontage NB	AM weekday	225	64	90	N	55	0
	PM weekday	512	137	52	Y	55	0
East & Elysian EB	AM weekday	66	14	111	N	35	0
	PM weekday	176	11	97	N	35	0
East & Elysian WB	AM weekday	157	15	99	N	35	0
	PM weekday	146	18	101	N	35	0

Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (Figure 28.4A)



Existing Traffic Volumes (2022) - Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Va = Total advancing traffic volume	Val = Total left-turn volume in advancing traffic	Percent left-turns in Va	Vo = Total opposing traffic volume	Warranted Left-Turn Lane? (Y/N)	Speed Limit at Approach
East & S Frontage WB	AM weekday	257	16	6.2%	141	N	55
	PM weekday	250	27	10.8%	334	N	55
Elysian & S Frontage SB	AM weekday	225	0	0.0%	186	N	55
	PM weekday	211	4	1.9%	421	N	55
East & Elysian EB	AM weekday	47	1	2.1%	106	N	35
	PM weekday	123	1	0.8%	103	N	35
East & Elysian WB	AM weekday	106	12	11.3%	47	N	35
	PM weekday	103	5	4.9%	123	N	35

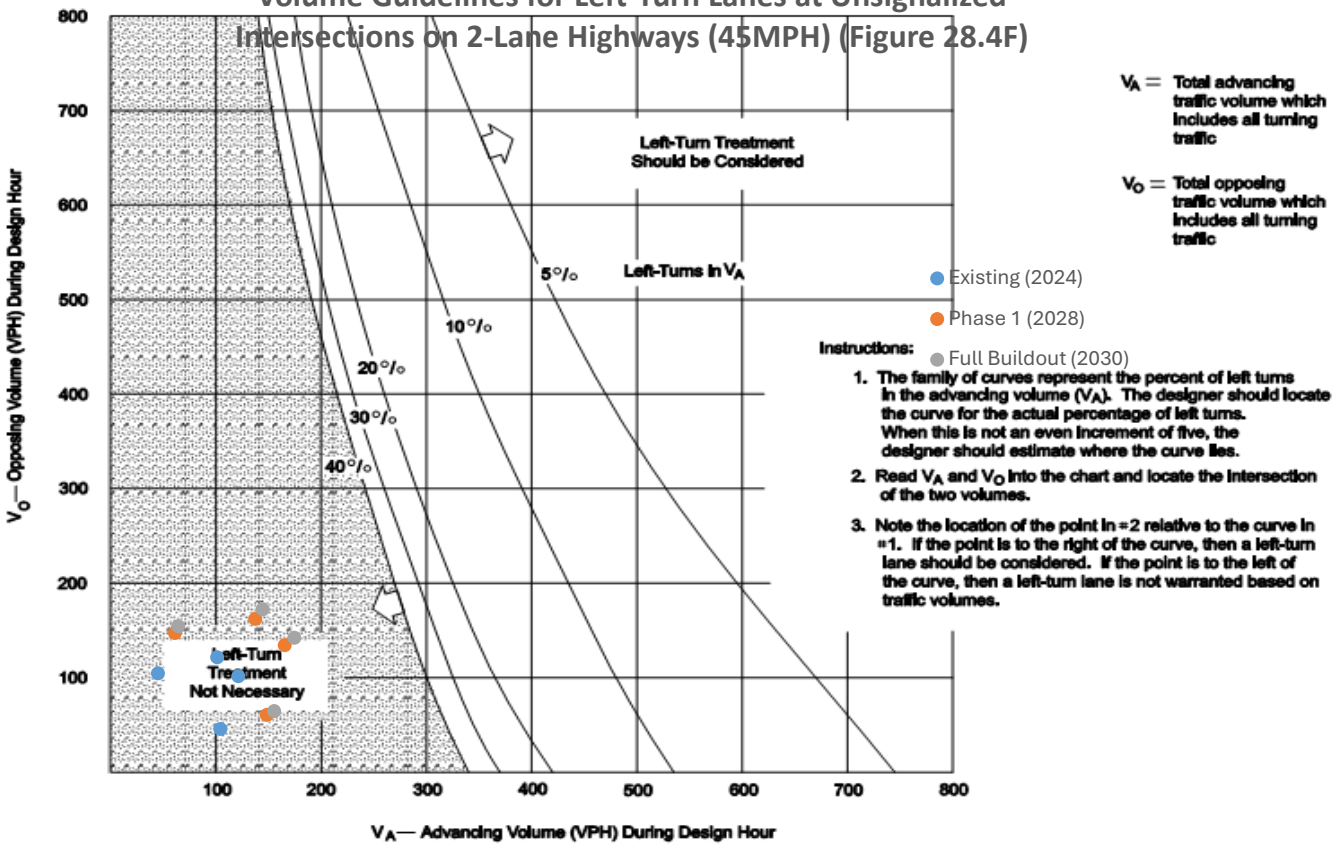
Phase 1 (2028) Traffic Volumes - Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Va = Total advancing traffic volume	Val = Total left-turn volume in advancing traffic	Percent left-turns in Va	Vo = Total opposing traffic volume	Warranted Left-Turn Lane? (Y/N)	Speed Limit at Approach
East & S Frontage WB	AM weekday	292	21	7.2%	258	N	55
	PM weekday	290	39	13.4%	376	Y	55
Elysian & S Frontage SB	AM weekday	273	20	7.3%	211	N	55
	PM weekday	253	20	7.9%	478	N	55
East & Elysian EB	AM weekday	63	1	1.6%	149	N	35
	PM weekday	167	1	0.6%	136	N	35
East & Elysian WB	AM weekday	150	14	9.3%	62	N	35
	PM weekday	139	6	4.3%	164	N	35

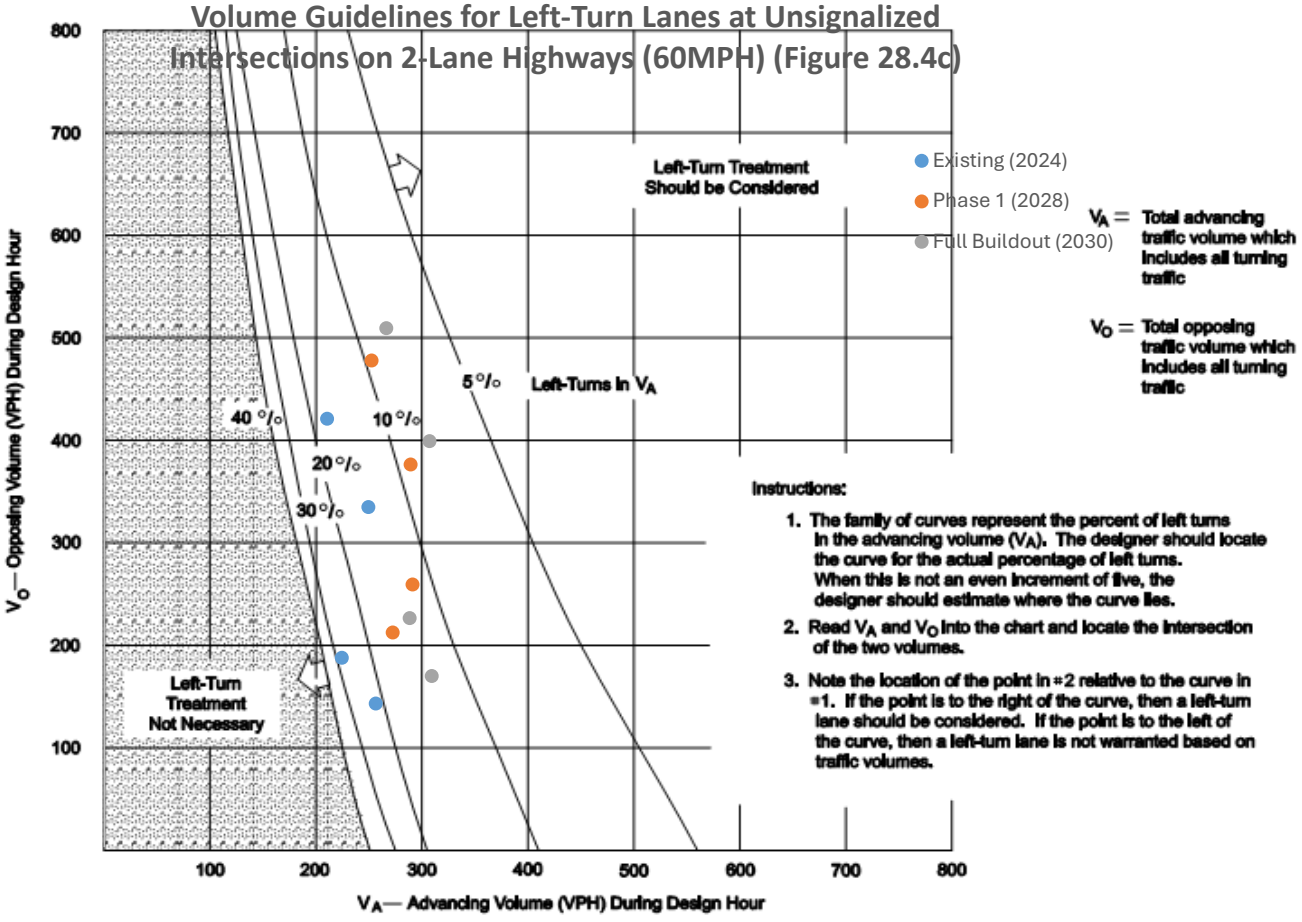
Full Buildout (2030) Traffic Volumes - Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Va = Total advancing traffic volume	Vla = Total left-turn volume in advancing traffic	Percent left-turns in Va	Vo = Total opposing traffic volume	Warranted Left-Turn Lane? (Y/N)	Speed Limit at Approach
East & S Frontage WB	AM weekday	310	22	7.1%	168	N	55
	PM weekday	308	42	13.6%	399	Y	55
Elysian & S Frontage SB	AM weekday	289	20	6.9%	225	N	55
	PM weekday	267	20	7.5%	510	N	55
East & Elysian EB	AM weekday	66	1	1.5%	156	N	35
	PM weekday	176	1	0.6%	144	N	35
East & Elysian WB	AM weekday	157	14	8.9%	66	N	35
	PM weekday	146	6	4.1%	174	N	35

Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (45MPH) (Figure 28.4F)



Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (60MPH) (Figure 28.4c)



ANNAFELD SIXTH FILING – TIS UPDATE

Project No. 16001.161

APPENDIX E
FINANCIAL CONTRIBUTION CALCULATION WORKSHEETS

Intelligent Infrastructure.
Enduring Communities.

sanbell

Intersection: Mullowney Lane & S Frontage Rd/Midland Rd - 6th Filing Full Build (2030)

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	17	9	11	6	2
	L	0	0	0	0	1
SB	T	7	4	24	12	2
	L	0	0	0	0	1
EB	T	0	0	0	0	1
	L	8	8	5	5	1
WB	T	0	0	0	0	1
	L	3	3	9	9	1
Critical Lane Sum Increase:			17		21	
Critical Lane Sum:			1200		1200	
Peak Hour %:			1.38%		1.75%	
Highest %:			1.75%			

<--- 1200 for 4-leg intersection,
1140 for 3-leg intersection

Intersection: East Lane & S Frontage Road - 6th Filing Full Build (2030)

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	1
	L	0	0	0	0	1
SB	T	0	0	0	0	1
	L	0	0	0	0	1
EB	T	0	0	0	0	1
	L	0	0	0	0	1
WB	T	0	0	0	0	1
	L	1	1	4	4	1
Critical Lane Sum Increase:			1	4		
Critical Lane Sum:			1140	1140		
Peak Hour %:			0.09%	0.35%		
Highest %:			0.35%			

<--- 1200 for 4-leg intersection,
1140 for 3-leg intersection

Intersection: Elysian Road & S Frontage Road - 6th Filing Full Build (2030)

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	1
	L	9	9	6	6	1
SB	T	0	0	0	0	1
	L	0	0	0	0	1
EB	T	0	0	0	0	1
	L	0	0	0	0	1
WB	T	0	0	0	0	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			9	6		
Critical Lane Sum:			1140	1140		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			0.79%	0.53%		
Highest %:			0.79%			

Intersection: Elysian Road & East Lane - 6th Filing Full Build (2030)

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	8	8	5	5	1
	L	5	5	3	3	1
SB	T	1	1	4	4	1
	L	0	0	0	0	1
EB	T	0	0	0	0	1
	L	0	0	0	0	1
WB	T	4	4	3	3	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			**12**	**10**		
Critical Lane Sum:			**1200**	**1200**		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			**1.00%**	**0.83%**		
Highest %:			**1.00%**			

Intersection: Mullowney Lane & Elysian Road - 6th Filing Full Build (2030)

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	1
	L	0	0	0	0	1
SB	T	0	0	0	0	1
	L	0	0	0	0	1
EB	T	0	0	0	0	1
	L	25	25	16	16	1
WB	T	0	0	0	0	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			25		16	
Critical Lane Sum:			1200		1200	<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			2.08%		1.33%	
Highest %:			2.08%			

Intelligent Infrastructure.
Enduring Communities.

www.sanbell.com

Planning Board

Date:	01/28/2025
Title:	High Sierra Subdivision, 22nd Filing - City Major Subdivision - Public Hearing
Presented by:	David Green
Department:	Planning & Community Services
Presentation:	Yes

Information

RECOMMENDATION

Staff recommends to the Planning Board that they forward a recommendation of conditional approval to the City Council for the preliminary plat of High Sierra Subdivision, 22nd Filing and adopt the Findings of Fact as presented in the staff report.

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

On December 2, 2024, Sanbell, formerly Sanderson Stewart, applied for preliminary minor plat approval for High Sierra Subdivision, 22nd Filing. The proposed subdivision creates 76 lots for residential development. The subject property is generally located north of Matador Avenue, west of Modera Avenue and Ortega Street and east of High Sierra Subdivision, 14th Filing. The property is zoned N3 - Suburban Neighborhood.

VARIANCES REQUESTED

No variances from the City Subdivision Regulations have been requested.

PROPOSED CONDITIONS OF APPROVAL

Pursuant to Section 76-3-608(4), MCA, the following conditions are recommended to reasonably minimize potential adverse impacts identified within the Findings of Fact.

1. To protect public health and safety, prior to final plat approval, the applicant will submit all drawings and specifications for water systems, sewer systems, and stormwater systems to the City of Billings Public Works for review and approval prior to installation.
2. To protect public health and safety, prior to final plat approval, the applicant will coordinate with City of Billings Public Works and update the finished floor elevations under Section II Property Conditions and Information for Lot Purchasers of the Subdivision Improvements Agreement (SIA).
3. To minimize the effects on local service prior to final plat approval, the applicant will coordinate with the USPS to determine what type of delivery system is preferred and to locate and provide the correct amount of space for safely delivering the mail to the residents.
4. Minor changes may be made in the SIA and final documents, as requested by the Planning, Legal or Public Works Departments to clarify the documents and bring them into the standard acceptable format.
5. The final plat shall comply with all requirements of the City of Billings Subdivision regulations, rules, policies, and resolutions of the City of Billings, and the laws and Administrative Rules of the State of Montana.

PROCEDURAL HISTORY

- Pre-application meeting September 19, 2024
- Preliminary plat application submitted to Planning Division on December 2, 2024
- Departmental review meeting December 19, 2024
- Subdivision resubmittal December 26, 2024
- Planning Board plat review January 14, 2025
- Planning Board public hearing January 28, 2025
- Preliminary plat to City Council February 24, 2025
- 60 working-day preliminary plat review period ends February 28, 2025

PLAT INFORMATION

General location:	North of Matador Avenue, west of Modera Avenue and Ortega Street and east of High Sierra Subdivision, 14th Filing
Legal Description:	Being Lot 8A, Block 30 of High Sierra Subdivision, 17th Filing Amended
Owner/Subdivider:	High Sierra II, Inc.

Engineer and Surveyor:	Sanbell Engineering
Existing Zoning:	N3
Existing land use:	Open grassland / Agricultural
Proposed land use:	Residential
Gross and Net area:	22.758 acres / 22.758
Proposed number of lots:	76
Lot size:	Max: 91,558 square feet / 2.1 acres Min: 6,778 square feet
Parkland requirements:	Parkland dedication requirement is 1.7323 acres. The applicant is proposing to provide a cash in lieu contribution for parkland.

STAKEHOLDERS

There are no stakeholder comments at this time. A public hearing is scheduled for the Planning Board meeting on January 28, 2025. Comments will be taken at that time. The Planning Division has received no public comments or questions regarding the proposed subdivision at this time.

ALTERNATIVES

In accordance with state law, the City Council has 60 working days to act upon this major preliminary plat. The 60 working day review period for the proposed plat ends on February 28, 2025. State and City subdivision regulations also require that preliminary plats be reviewed using specific criteria, as stated within this report. The City may not unreasonably restrict an owner's ability to develop land if the subdivider provides evidence that any identified adverse effects can be mitigated. Within the 60 working day review period, the City Council is required to:

1. Approve;
2. Conditionally Approve; or
3. Deny the Preliminary Plat

FISCAL EFFECTS

This plat will have no fiscal impacts on the City/County Planning Division.

SUMMARY

One of the purposes of the City's subdivision review process is to identify potential negative effects of property being subdivided. Negative effects that are identified become the subdivider's responsibility to mitigate. Various City departments, private service/utility providers and the affected school district/s, have reviewed this application and provided input on effects and mitigation. The Findings of Fact, which are presented as an attachment, discuss potential negative impacts of the subdivision and conditions of approval are recommended as measures to further mitigate any impacts. In this case, there were found to be minimal impacts from this proposed subdivision.

Attachments

Findings of Fact
Proposed Plat
Draft SIA
Traffic Study

FINDINGS OF FACT

The Planning staff has prepared the Findings of Fact for the preliminary plat of High Sierra Subdivision, 22nd Filing. These findings are based on the preliminary plat application and supplemental documents and address the review criteria required by the Montana Subdivision and Platting Act (76-3-608, MCA) and the Billings Subdivision Regulations (Section 23-303(H), BMCC).

A. What are the effects on agriculture, local services, the natural environment, wildlife, wildlife habitat, and public health, safety and welfare? [MCA 76-3-608 (3) (a) and BMCC 23-302.H.2.]

1. Effect on agriculture and agricultural water user facilities

The subject property was used for agricultural purposes. There are no permanent irrigation ditches, filed laterals, or irrigation easements that exist on the subject property. The subdivision should not affect agricultural water users' facilities.

2. Effect on local services

a. **Utilities** – Water service will be provided by the City of Billings. There are 12-inch water mains in High Sierra Boulevard, one at the current end of Vesca Way and one at the current end of Madrid Drive. The applicant will extend the 12-inch water main in High Sierra Boulevard, Madrid Drive and Vesca Way north of Madrid Drive. 8-inch water line will be installed in all other local interior street of the proposed subdivision. Mains and services will be approved by the Engineering Division and shall be installed in conformance with the design standards, specifications, rules and regulations of the City of Billings and Montana Department of Environmental Quality. **(Condition #1)**

   Sanitary sewer service will be provided by the City of Billings. The Subdivider will connect to an existing 12-inch sewer main located in Madrid Drive and an existing 8-inch sewer main located in Vesca Way. Those sewer lines will be extended in the current streets. An 8-inch sewer main will be extended in all other proposed streets in the subdivision. Sewer services shall be reviewed and approved and built in accordance with design standards, specifications, rules and regulations of the City of Billings Public Works Department and MDEQ. **(Condition #1)**

   Private utility companies will provide services to the subdivision. Any easement required by a private utility company will be coordinated with the subdivider and the utility company.

   Stormwater – Stormwater drainage for the public streets is proposed to be provided by curb and gutters that discharge into storm water pipes. This will drain to underground storm drains, and with discharge to a stormwater detention facility that is located within an off-site area on Lot 17, Block 6, High Sierra Subdivision, 11th Filing generally north of the future projection of Gleneagles Boulevard designated for storm water detention. This subdivision shall satisfy the criteria set

forth by the *City of Billings Stormwater Management Manual* and will be subject to review and approval by the City Engineering Department. A Stormwater Report will be submitted for review and approval by City Engineering at the time of individual lot development. **(Condition #1)**

Storm water management with this subdivision also included the requirement of the finished floor elevation (FFE) being a minimum of 18 inches above the back or curb in front on the house. Under the heading Property Conditions and Information for Lot Purchasers, G 1 there are certain lots that require specific FFE to prevent storm damage under normal storm events. Those numbers will be determined and included in the SIA before final plat. **(Condition #2)**

The drainage system improvements will be in accordance with the recommendations of the stormwater analysis and report prepared and submitted with the improvement plans and specifications. Maintenance of the stormwater detention area and associated drainage facilities shall be by the High Sierra Subdivision HOA.

b. **Solid waste** – The City of Billings will provide solid waste collection and disposal. The City's landfill has adequate capacity for this waste.

c. **Streets** – The lots within the subdivision will be served by streets that are an extension of existing streets in the area. High Sierra Boulevard, Vesca Way, Baja Drive and Madrid Drive. These streets will be built to grade with a satisfactory subbase, base course, curb and gutter, and asphalt surface. The design section of said streets shall be submitted to, and approved by, the City Engineer prior to construction.

A traffic accessibility study has been completed for High Sierra Subdivision 22nd Filing. All required intersection improvement contributions identified therein shall be completed by the Subdivider at the Subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic accessibility study:

Wicks Lane/Gleneagles Blvd 1.64%
Wicks Lane/Fantan Street 1.83%
Wicks Lane/St. Andrews Dr 1.45%
Annandale Road/Gleneagles Blvd 0.17%
Annandale Road/St. Andrews Dr 0.18%
Skyway Drive/Alkali Creek Road 1.08%

The cash contributions shall be based on the percent of traffic contributions to the intersections based on the total cost of an intersection as determined. The contributions will be made at the time of final plat.

This information and table are in the SIA under the heading Transportation D Traffic Control Devices.

High Sierra Boulevard, Vesca Way and Madrid Drive provide access to the subdivision. High Sierra Boulevard is located in a 74-foot-wide right-of-way and has a street width of 49-foot back of curb to back of curb. High Sierra Boulevard is classified as a collector road. Vesca Way and Madrid Drive are located within a 56-foot right-of-way and have a width of 34-feet back of curb to back of curb.

The sidewalks will be installed by individual lot owners when the lots are developed. All sidewalks will be 5-feet-wide with a 5-foot-wide boulevard behind the curb to the edge of the sidewalk. All intersection ADA compliant ramps will be installed by the subdivider.

d. **Emergency services** – The Billings Police and Fire Departments will respond to emergencies within the proposed subdivision. The fire station serving this area is located at 1601 Saint Andrews Drive (Station #6). The subdivision is located within the ambulance service area of American Medical Response (AMR).

e. **Schools** –This subdivision could be developed with residential uses. School District #2 provides educational services to elementary through high school students. Schools serving these students are Eagle Cliffs elementary, Castle Rock Middle School, and Skyview High School. Response from School District #2 was not received before this staff report was written. Past correspondence with School District #2 shows all these school as near maximum capacity or over.

f. **Parks and Recreation** – Residential subdivisions are required by City of Billings Subdivision Regulations to provide parkland for the residents of the subdivision. This subdivision is required to provide 1.7323 acres of parkland dedication, they are proposing to provide a cash in lieu contribution. There is a 5-acre City Park within this subdivision directly south and east of the proposed subdivision. The nearest connection to the park is from Vesca Way and Modera Avenue. There is an existing 5-acre park to the south east of the proposed subdivision. It is within easy walking distance to the proposed subdivision.

g. **Mail Delivery -** The United States Postal Service will provide postal service to the subdivision. Location of mail delivery boxes will need to be coordinate with the developer and the postal service. **(Condition #3)**

h. **Phasing of Development** - The applicant is not proposing to develop this subdivision in phases.

3. Effect on the natural environment

The subject property was formerly farmland. The area of this proposed subdivision does not have any flood history or water ways nearby that may flood. However, in the SIA under the heading Property Conditions and Information for Lot Purchasers, G the

developer recommends building the finished floor elevation a minimum of 18 inches above the top of road curb. During development, storm water pollution prevention best management practices are required to be used and monitored to prevent erosion on exposed ground. Overall, the effect on the natural environment should be minimal.

4. Effect on wildlife and wildlife habitat

There are no known endangered or threatened species on the property. There is a paragraph in the SIA that warns future lot owners of the presence of wildlife in the area, which may cause damage to their landscaping. This subdivision should have a minimal effect on wildlife and wildlife habitat.

5. Effect on the public health, safety and welfare

There will be minimal impacts to public health, safety and welfare because of this subdivision.

B. Was an Environmental Assessment required? [(MCA 76-3-616 and BMCC 23-302.H.1.]

The proposed subdivision is exempt from the requirement for an Environmental Assessment pursuant to Section 76-3-616, MCA.

C. Does the subdivision conform to the City of Billings 2016 Growth Policy, the 2014 Transportation Plan, and the Billings Area Bikeway and Trail Master Plan? [BMCC 23-302.H.4.]

1. City of Billings 2016 Growth Policy

The proposed subdivision is consistent with the following goals of the Growth Policy:

> **Strong Neighborhoods (livable, safe, sociable and resilient neighborhoods):** Neighborhoods that are safe and attractive and provide essential services are much desired (p.8).
>
> **Home Base (healthy, safe and diverse housing options)** Planning and construction of interconnected sidewalks and trails are important to the economy and livability of Billings.

2. 2023 Billings Urban Area Long Range Transportation Plan

The proposed subdivision adheres to the goals and objectives of the 2023 Transportation Plan and preserves the street network and street hierarchy specified in the plan. High Sierra Boulevard is identified as a collector road, it will be built to the standards of a collector through this subdivision.

3. Billings Area Bikeway and Trail Master Plan (BABTMP)

There is a future trail identified on High Sierra Boulevard. With the construction of the street, and its width, the trail would be on street and identified with paint markings.

D. Does the subdivision conform to the Montana Subdivision and Platting Act and to local subdivision regulations? [MCA 76-3-608 (3) (b) and BMCC 23-302.H.3.a.]

The proposed subdivision satisfies the requirements of the Montana Subdivision and Platting Act and to the design standards specified in the local subdivision regulations. The subdivider and the local government have complied with the subdivision review and approval procedures set forth in the local and state subdivision regulations.

E. Does the proposed subdivision conform to all requirements of the zoning in effect? [BMCC 23-302.H.3.e.]

The subject property is located within N3 – Suburban Neighborhood Residential. The lot frontages conform to the requirements of these zonings. Other building setbacks and structure specific requirements will be reviewed for compliance at the time of building permit review.

F. Does the proposed plat provide easements for the location and installation of any utilities? [MCA 76-3-608 (3) (c) and BMCC 23-302.H.3.b.]

The subdivider will provided utility easements as requested by private utility companies. Those easement will be shown on the face of the plat.

G. Does the proposed plat provide legal and physical access to each parcel within the subdivision and notation of that access on the plat? [MCA 76-3-608 (3) (d) and BMCC 23-302.H.3.c.]

Legal and physical access is provided to the proposed lots from existing roads and new roads within the proposed subdivision.

CONCLUSIONS OF FINDINGS OF FACT

- The preliminary plat of High Sierra Subdivision, 22nd Filing, does not create any adverse impacts that warrant denial of the subdivision.

- The proposed subdivision conforms to several of the goals and policies of the 2016 Growth Policy and does not conflict with the Transportation or Bikeway/Trail Plans.

- The proposed subdivision complies with state and local subdivision regulations, local zoning, and sanitary requirements and provides legal and physical access to each lot.

- Any potential negative or adverse impacts will be mitigated with the proposed conditions of approval.

RECOMMENDATION

Staff recommends the Planning Board forwards a recommendation to the City Council that the preliminary plat of High Sierra Subdivision, 22nd Filing, be conditionally approved and adopt the Findings of Fact as presented in the staff report.

PRELIMINARY PLAT OF

HIGH SIERRA SUBDIVISION 22ND FILING

BEING LOT 8A, BLOCK 30 OF HIGH SIERRA SUBDIVISION, 17TH FILING AMENDED
SITUATED IN THE SE1/4 OF SECTION 8, THE SW1/4 OF SECTION 9 AND NE1/4 AND NW1/4 OF
SECTION 17, T.1N., R. 26 E., P.M.M.,
CITY OF BILLINGS
YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : HIGH SIERRA II, INC.

PREPARED BY : sanbell

OCTOBER, 2024

BILLINGS, MONTANA

VICINITY MAP

NOT TO SCALE

PLAT DATA

GROSS AREA	= 22.76 ACRES
NET AREA	= 18.1 ACRES
NUMBER OF LOTS	= 76
MINIMUM LOT SIZE	= 6786 S.F.
MAXIMUM LOT SIZE	= 91558 S.F.
LINEAL FEET OF STREETS	= ±3480 L.F.
PARKLAND REQUIREMENT	= 1.732 ACRES
PARKLAND DEDICATION	= CASH IN LIEU
EXISTING ZONING	= N3
SURROUNDING ZONING:	
NORTH	= N3
SOUTH	= N3
EAST	= N3
WEST	= N3
EXISTING LAND USE	= N3
PROPOSED LAND USE	= N3

ADJACENT OWNERS

1. HIGH SIERRA II INC
175 N 27TH ST STE 940
BILLINGS, MT 59101
2. INFINITY HOME LLC
PO BOX 20174
BILLINGS, MT 59104
3. WH HIGH SIERRA 50 LLC
24911 AVENUE STANFORD
VALENCIA, CA 91355
4. CRUZ, DAVID & EMILY ANN
1113 VERA CRUZ CIR
BILLINGS, MT 59105
5. MULLINS, STEVEN J & GENEVIEVE L
60 KIHALANI ST, UNIT 1001
KIHEI, HI 96753
6. SALVO, RONALD A
1121 VERA CRUZ CIR
BILLINGS, MT 59105
7. WATTERUD, KENDALL S
1125 VERA CRUZ CIR
BILLINGS, MT 59105
8. OMMUNDSON, DENNIS
1129 VERA CRUZ CIR
BILLINGS, MT 59105
9. NELSON, ANN K
1134 VERA CRUZ CIR
BILLINGS, MT 59105
10. ELSTON, WESLEY & CAITLIN
1130 VERA CRUZ CIR
BILLINGS, MT 59105
11. KETCHUM, KARENA L
2117 HIGH SIERRA BLVD
BILLINGS, MT 59105
12. JACOBSON, LORI L
622 W HARVARD PL
ONTARIO, CA 91762
13. WAHL, NATHAN & KARA
1207 BENJAMIN BLVD
BILLINGS, MT 59105
14. JENSEN, ARIN ELAINE
1215 BENJAMIN BLVD
BILLINGS, MT 59105
15. OAKLAND, GARY
175 N 27TH STREET, SUITE 900
BILLINGS, MT 59101

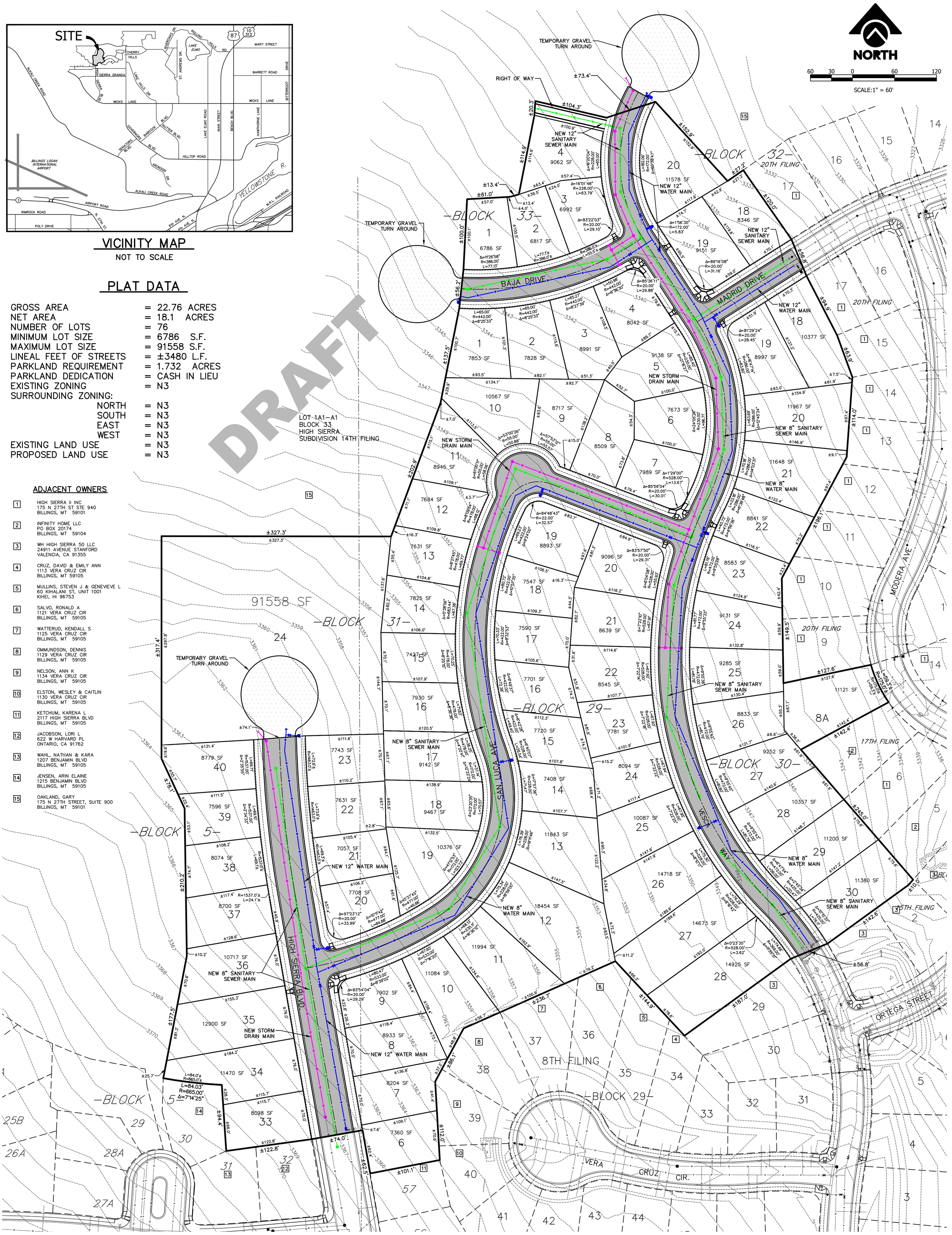


TABLE OF CONTENTS

Return to:
Sanderson Stewart
1300 North Transtech Way
Billings, MT 59102

SUBDIVISION IMPROVEMENTS AGREEMENT & WAIVER OF RIGHT TO PROTEST FUTURE SPECIAL IMPROVEMENT DISTRICTS HIGH SIERRA SUBDIVISION, TWENTY SECOND FILING

THIS AGREEMENT is made and entered into this _____ day of _____, 20___, by and between **HIGH SIERRA II, INC.**, whose address for the purpose of this agreement is 175 North 27th Street, Suite 900, Billings, MT 59101, hereinafter referred to as "Subdivider," and the **CITY OF BILLINGS**, Billings, Montana, hereinafter referred to as "City."

WITNESSETH:

WHEREAS, at a regular meeting conducted on _____ day of _____, 20__, the Board of Planning recommended conditional approval of a preliminary plat of High Sierra Subdivision, 22nd Filing; and

WHEREAS, at a regular meeting conducted on _____ day of _____, 20__, the City Council conditionally approved a preliminary plat of High Sierra Subdivision, 22nd Filing; and

WHEREAS, a Subdivision Improvements Agreement is required by the City prior to the approval of the final plat.

WHEREAS, the provisions of this agreement shall be effective and applicable to High Sierra Subdivision, 22nd Filing upon the filing of the final plat thereof in the office of the Clerk and Recorder of Yellowstone County, Montana. The Subdivision shall comply with all requirements of the City of Billings Subdivision Regulations, the rules, regulations, policies, and resolutions of the City of Billings, and the laws and administrative rules of the State of Montana.

THEREFORE, THE PARTIES TO THIS AGREEMENT, for and in consideration of the mutual promises herein contained and for other good and valuable consideration, do hereby agree as follows:

I. VARIANCES

A. Subdivider has requested, and the City hereby grants, the following variances by the City Council from the strict interpretation of the City's Subdivision Regulations (Section 23.1401, BMCC):

1. No Variances are requested.

II. PROPERTY CONDITIONS AND INFORMATION FOR LOT PURCHASERS

A. Lot owners will be required to construct that segment of the required sidewalk that fronts their property at the time of lot development. If sidewalk is not constructed within 5 years, the City has the right to construct the sidewalk and assess the property owners.

B. Lot owners should be aware that this subdivision is being built in close proximity to prime deer and antelope habitat and it is likely that homeowners will experience problems with damage to landscaped shrubs, flowers, and gardens. The Montana Fish, Wildlife, and Parks Department does not provide damage assistance unless there is damage to commercial crops and/or a threat to public health and safety. In addition, this subdivision is being built in close proximity to prime prairie dog habitat and lot owners will be responsible for any costs and damages incurred due to the presence of prairie dogs.

C. No water rights have been transferred to the lot owners. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners.

D. There is attached hereto a Waiver waiving the right to protest the creation of the special improvement district or districts which by this reference is expressly incorporated herein and made as much a part hereof as though fully and completely set forth herein at this point. The Waiver will be filed with the plat, shall run with the land, and shall constitute the guarantee by the Subdivider, and property owner or owners of the developments

described herein. Said Waiver is effective upon filing and is not conditioned on the completion of the conditions set forth in this Agreement. The Subdivider and owner specifically agree that they are waiving valuable rights and do so voluntarily.

E. Lot owners are advised they will be subject to inclusion in a Parks Maintenance District (PMD) for the operation and maintenance of the parkland dedicated with various filings of High Sierra Subdivision.

F. The Subdivider and subsequent contractors/builders acknowledge that there is a Stormwater Pollution and Prevention Plan (SWPPP) filed with the City and the Montana Department of Environmental Quality (MDEQ). This SWPPP shall be adhered to during all phases of construction and shall be updated as required by MDEQ under the General Permit for Stormwater Discharges Associated with Construction Activity, Chapter 28, BMCC and the Billings Stormwater Management Manual.

G. Individual lot owners should be aware that Best Management Practices for stormwater control shall be required for new construction on lots. Best Management Practices are defined within Chapter 28, BMCC and detailed in the Billings Stormwater Management Manual.

1. The lowest finish floor elevation (which includes the garage) shall be a minimum of 18-inches higher than the top of curb, measured from the highest location along the lot frontage. Home builder and lot owner may find it necessary to raise the finish floor elevation of house or garage above this minimum during on-site building design and/or during on-lot grading.

   Minimum finished floor elevation for Lots 7-10, Block 31 shall be as follows:

Lot 7, Block 31	33XX.XX (TBD prior to final plat)
Lot 8, Block 31	33XX.XX (TBD prior to final plat)
Lot 9, Block 31	33XX.XX (TBD prior to final plat)
Lot 10, Block 31	33XX.XX (TBD prior to final plat)

2. The stormwater runoff from individual lots shall be directed toward the public right-of-way wherever possible. However, due to the existing terrain of the subdivision this is not possible for every lot. Where runoff from lots cannot

be directed to public right-of-way because existing terrain is falling away from the public right of way, the stormwater runoff shall be directed to flow to the same location as it has historically. Home builder and lot owners shall consider the effect of potential off-lot run-on waters from lots uphill of the subject lot, and grade around the home to provide positive drainage away from the home. Home builder and lot owners must take necessary measures to protect the house from surface stormwater flows. Lots shall allow, through on-site building design and on-lot grading, for stormwater to pass through each lot without negatively impacting adjacent lots. The lowest openings on each home (window wells) are to be located outside the designated drainage paths. If this is not possible, the builder and lot owners must take necessary measures to protect these openings from inundating from surface water flows. In any case, the homebuilder shall allow enough space between window wells and property lines to provide sufficient swales and proper storm water drainage away from window wells.

3. Each owner of a completed lot shall be a member of the High Sierra Subdivision Homeowners Association (HOA). Membership shall be appurtenant to and may not be separated from ownership of a lot. The Homeowners Association will be set up to maintain the permanent stormwater detention facilities. The HOA Board of Directors shall have the power, in its discretion, to exclude costs of major repairs or approved capital improvements to the HOA Storm Water System from the regular monthly assessments and, instead, impose special assessments for these expenses, and for emergencies, as they are incurred.

III. TRANSPORTATION

A. Streets

1. Subdivider will enter into a private contract for the construction of all required improvements for those streets within the subdivision, as follows:

   Madrid Drive, Vesca Way, San Lucas Avenue, and Baja Drive will be constructed within a 56-foot right-of-way using curb and gutter and full-width pavement (34-feet back of

curb to back of curb). Curb and Gutter will be installed per the City of Billings Standards in place at time of construction.

High Sierra Boulevard shall be dedicated a collector street and shall be located within a 74-foot wide right of way and have a street width of 49-foot back of curb to back of curb to accommodate two 11-foot-wide drive lanes, two 8-foot-wide parking lanes, and two 5-foot-wide bicycle lanes. High Sierra Boulevard shall be built to grade with a satisfactory subbase, base course, curb and gutter and asphalt surface. This street shall be built per the City of Billings Standards in place at time of construction.

B. Sidewalks

1. Sidewalk on the internal streets shall be installed at the time of individual lot development. The sidewalk shall consist of a 5-foot-wide boulevard type sidewalk with a minimum 5-foot-wide boulevard.

2. Subdivider will install accessible ramps at the intersections, which shall be completed with the subdivision improvements.

C. Street Lighting

Construction or installation of streetlights within the public rights-of-way shall not be required at this time, but streetlights are included in the Waiver referenced herein for construction of the same in the future. A maintenance district for streetlights may be formed for future maintenance of any streetlights installed in the future.

D. Traffic Control Devices

The Subdivider shall furnish and install all necessary traffic control devices within and adjacent to the Subdivision in accordance with the plans and specification submitted to and approved by the City Engineer. Traffic control devices shall include all necessary signing, striping, and channelization devices to properly complete the implementation of the proposed street construction.

A traffic accessibility study has been completed for High Sierra Subdivision 22nd Filing. All required intersection improvement contributions identified therein shall be completed by the Subdivider at the Subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic accessibility study:

Wicks Lane/Gleneagles Blvd	1.64%
Wicks Lane/Fantan Street	1.83%
Wicks Lane/St. Andrews Dr	1.45%
Annandale Road/Gleneagles Blvd	0.17%
Annandale Road/St. Andrews Dr	0.18%
Skyway Drive/Alkali Creek Road	1.08%

The cash contributions shall be based on the percent of traffic contributions to the intersections based on the total cost of an intersection as determined by Engineering for the year in which the contribution is made.

The cash contribution shall be made prior to final plat approval.

E. Access

High Sierra Boulevard, Vesca Way and Madrid Drive provide access to the subdivision. High Sierra Boulevard is located in a 74-foot-wide right-of-way and has a street width of 49-foot back of curb to back of curb. Vesca Way and Madrid Drive are located within a 56-foot right-of-way and have a width of 34-feet back of curb to back of curb.

F. Billings Area Bikeway and Trail Master Plan

5-foot-wide bike lanes will be provided on High Sierra Boulevard consistent with previous filing. No addition trail improvements are required as part of this subdivision.

G. Public Transit

The subdivision does not require improvements to ensure public transit service.

IV. EMERGENCY SERVICE

The City will provide emergency service. Fire hydrants shall be provided at each street intersection and at intermediate locations where distances exceed 500-feet. Appropriate turnarounds will be located on any dead-end street in excess of 150-feet.

Construction of buildings made of combustible materials shall have adequate fire apparatus access roads and fire hydrant(s) in place to allow for fire suppression requirements. Prior to issuance of a building permit for construction using combustible materials (i.e., lumber, plywood, wood trusses, etc.), fire apparatus access roads, and water supply requirements shall be provided in accordance with the International Fire Code as adopted by the City of Billings.
At a minimum, the following is required:

- An unobstructed gravel road or gravel road base must be within 150-feet of the furthest portion of a building under construction as measured along an approved route.
- The access roads are required to support fire apparatus vehicle loading (40 tons) during all weather conditions and shall be a minimum of 20-feet-wide.
- An operational fire hydrant shall be located within 600-feet of the furthest portion of a residence under construction or within 400-feet of the furthest portion of a commercial building under construction as measured along the access roads to the site.
- The above requirements do not alter or effect the current minimum subdivision requirements for fire apparatus access and water supply.

V. STORM DRAINAGE

Storm drainage for the public streets shall be provided by a combination of surface drainage and curbs and gutters, drained to underground storm drains, and with discharge to a stormwater detention facility that is located within an off-site area on Lot 17A, Block 1, High Sierra Subdivision, 12th Filing generally north of the future projection of Gleneagles Boulevard designated for storm water detention. This detention facility will be sized to accept runoff generated from the High Sierra Subdivision, 22nd Filing. Stormwater management facilities for the subdivision must be able to pass flows generated outside the subdivision area without inundating existing and proposed home sites. All drainage improvements shall comply with the provisions of the *Stormwater Management Manual* and Section 23-706, BMCC, a

stormwater management plan shall be submitted to and approved by the Engineering Division prior to filing of the final plat.

The drainage system improvements will be in accordance with the recommendations of the stormwater analysis and report prepared and submitted with the improvement plans and specifications. Maintenance of the stormwater detention area and associated drainage facilities shall be by the High Sierra Subdivision HOA.

VI. UTILITIES

The Subdivision Improvements Agreement does not constitute an approval for extension of or connection to water mains and sanitary sewers. The property owner shall make application for extension/ connection of water mains and sanitary sewers to the Public Works Department – Engineering Division. The extension/connection of/to water mains and sanitary sewers is subject to the approval of the applications and the conditions of approval. Applications shall be submitted for processing prior to the start of any construction and prior to review and approval of any project plans and specifications.

The Developer/Owner acknowledges that the Subdivision shall be subject to the applicable System Development Fees in effect at the time new water and/or sanitary sewer service connections are made.

The design/installation of sanitary sewers and appurtenances, and water mains and appurtenances (fire hydrants, etc.) shall be in accordance with design standards, specifications, rules, regulations of and as approved by the City of Billings Public Works Department, Fire Department, and the Montana Department of Environmental Quality.

A. Water

The subdivision will be served by making connections to public water mains, one at the end of High Sierra Boulevard, one at the end of Vesca Way and one at the end of Madrid Drive. 12-inch water main will be installed in High Sierra Boulevard, Madrid Drive and Vesca Way north of Madrid Drive. 8-inch water main will be installed in the remaining local interior streets of the subdivision which is subject to approval from the City of Billings. The water main within the subdivision will make looped connections whenever possible. Fire hydrants will be provided at all appropriate locations and are also subject to approval by the City of Billings.

B. Sanitary Sewer

The subdivision will be served by making a connection to an existing 12-inch diameter sewer main located in Madrid Drive and an existing 8-inch diameter sewer main located in Vesca Way. 12-inch sanitary sewer main will be extended in Madrid Drive, Vesca Way north of Madrid Drive and the 20-foot right of way at north end of Vesca Way. 8-inch sanitary sewer main will be extended on the remaining streets in the subdivision.

C. Power, Telephone, Gas, and Cable Television

All telephone, gas, electrical power, and cable television lines shall be the responsibility of the Subdivider. Any line located within public right-of-way shall be subject to approval of the City Engineer.

VII. PARKS/OPEN SPACE

Section 76-3-621 of the Montana Subdivision and Platting Act covers the park dedication requirement. Additionally, Section 23-1002. B.1 of the City of Billings municipal code covers parkland dedication of major subdivisions. High Sierra Subdivision, 22nd Filing requires a parkland dedication 1.7323 acres. The Subdivider will make a cash-in-lieu contribution for the 1.732 acres in lieu of parkland dedication.

VIII. IRRIGATION

No permanent irrigation ditches, field laterals, or irrigation easements exist on the subdivision.

IX. SOILS/GEOTECHNICAL STUDY

A geotechnical report was performed within the area of this subdivision and submitted with the preliminary plat and is available for review at the City of Billings Planning Department. The Geotechnical Investigation Report for High Sierra Subdivision 22nd Filing Billings, Montana was completed by Rimrock Engineering Inc. and dated December 11, 2024.

It is recommended that owners, purchasers, realtors, builders, and developers fully familiarize themselves with the information contained in this report prior to design or construction.

X. FINANCIAL GUARANTEES

Except as otherwise provided, Subdivider shall install, and construct said required improvements with cash or by utilizing the mechanics of a special improvement district or private contracts secured by letters of credit or a letter of commitment to lend funds from a commercial lender. All engineering and legal work in connection with such improvements shall be paid by the contracting parties pursuant to said special improvement district or private contract, and the improvements shall be installed as approved by the City Engineer and Utility Department Manager.

XI. LEGAL PROVISIONS APPLYING TO SUBDIVIDER

A. Subdivider agrees to guarantee all public improvements for a period of two years from the date of final acceptance by the City of Billings.

B. The owners of the properties involved in this proposed Subdivision by signature subscribed herein below agree, consent, and shall be bound by the provisions of this Agreement.

C. The covenants, agreements, and all statements in this Agreement run with the land and apply to and shall be binding on the heirs, personal representatives, successors, assigns and transferees of the respective parties.

D. In the event it becomes necessary for either party to this Agreement to retain an attorney to enforce any of the terms or conditions of this Agreement or to give any notice required herein, then the prevailing party or the party giving notice shall be entitled to reasonable attorney fees and costs.

E. Any amendments or modifications of this Agreement or any provisions herein shall be made in writing and executed in the same manner as this original document and shall after execution become a part of this Agreement.

F. Subdivider shall comply with all applicable federal, state, and local statutes, ordinances, and administrative regulations during the performance and discharge of its obligations. Subdivider acknowledges and agrees that nothing contained herein shall relieve or exempt it from such compliance.

IN WITNESS WHEREOF, the parties hereto have set their hands and official seals on the date first above written.

"SUBDIVIDER" **HIGH SIERRA II, INC.**

By:_____

Its:_____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____, known to me to be the person who executed the foregoing instrument as the _____ of **HIGH SIERRA II, INC.**, and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

This agreement is hereby approved and accepted by the City of Billings, this ____ day of _____, 20___.

"CITY" **CITY OF BILLINGS, MONTANA**

By: _____
Mayor

Attest: _____
City Clerk

STATE OF MONTANA)
: ss
County of Yellowstone)

On this ____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____ _____ and _____, known to me to be the Mayor and City Clerk, respectively, of the City of Billings, Montana, whose names are subscribed to the foregoing instrument in such capacity and acknowledged to me that they executed the same on behalf of the City of Billings, Montana.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

WAIVER OF RIGHT TO PROTEST
FUTURE SPECIAL IMPROVEMENT DISTRICTS

FOR VALUABLE CONSIDERATION, the undersigned, being the Subdivider and all of the owners of the hereinafter described real property, do hereby waive the right to protest the formation of one or more special improvement district(s) for a period of no more than twenty years from the recording of this waiver, for street light maintenance and energy, and for the construction of streets, street widening, sidewalks, survey monuments, street name signs, curb and gutter, street lights, driveways, traffic signals, and traffic control devices, parks and park maintenance, trails, sanitary sewer lines, water lines, storm drains (either within or outside the area), and other improvements which the City of Billings may require.

This Waiver and Agreement is independent from all other agreements and is supported by sufficient independent consideration to which the undersigned are parties and shall run with the land and shall be binding upon the undersigned, their successors, and assigns, and the same shall be recorded in the office of the County Clerk and Recorder of Yellowstone County, Montana.

This Waiver is in addition to any other recorded waiver related to the property described herein and is not intended to replace, supersede, or invalidate any such waiver.

The real property hereinabove mentioned is more particularly described as follows:

High Sierra Subdivision, 22nd Filing

Signed and dated this _____ day of _____, 20___.

"SUBDIVIDER" **HIGH SIERRA II, INC.**

_____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this ____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____, known to me to be the _____ of **HIGH SIERRA II, INC.,** the person who executed the forgoing instrument and acknowledged to me that he/she executed the same.

IN WITNESS WHEROF, I have hereunto set my hand and affixed my Notarial Seal the day and year hereinabove written.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

December 24, 2024

Dakota Martonen
City of Billings Public Works Department
2224 Montana Avenue
Billings, MT 59101

Reference: High Sierra Subdivision, 22nd Filing
Project No. 82061.157

Dear Dakota:

The purpose of this letter is to provide a traffic impact study (TIS) update for High Sierra Subdivision in support of the upcoming plat submittal for the 22nd Filing. Traffic impacts were originally analyzed for this part of the subdivision masterplan via the *High Sierra Subdivision (5th-12th Filings) Traffic Impact Study* (June 2008). Through this update, we will provide a comparison of the current filing layout, lot count, and projected traffic generation characteristics to the original study, provide updated volumes and capacity calculations for a nearby intersection, and update the recommended intersection contribution percentages for use in the subdivision improvements agreement (SIA).

This project proposes creation of a major subdivision plat for the 22nd Filing (74 single-family residential lots) of High Sierra Subdivision. Figure 1 (attached) illustrates the proposed layout of the 22nd Filing. The filing is located west of Modera Avenue, north of Matador Avenue, and north and east of Largo Circle. Access is proposed via High Sierra Boulevard, Vesca Way, and Madrid Drive. It should be noted that although the original TIS projected only a total of 12 filings for the entire development, previous filings have been much smaller than originally projected. As a result, much of the subdivision is still yet to be developed and there will likely be additional future filings beyond the filing in this TIS update.

At the request of the City of Billings, traffic data was collected at the intersection of Alkali Creek Road and Inner Belt Loop/Skyway Drive on Wednesday, July 31, 2024, using Miovision Scout video-based systems. The weekday AM and PM peak hour periods were found to occur from 7:15 to 8:15 AM and 5:00 to 6:00 PM, respectively. Detailed traffic count data worksheets are included in the attachments.

The results of the capacity calculations at the Alkali Creek Road/Inner Belt Loop/Skyway Drive intersection showed that all approaches currently operate at LOS B or better in both the AM and PM peak hours with minimal 95th percentile queueing. A detailed capacity summary table and capacity calculation worksheets can be found in the attachments.

The trip generation calculations in the original TIS for High Sierra Subdivision modeled Land Use Code 210 - Single-Family Detached Housing (1,366 total dwelling units). Reductions for alternate modes of travel were not made and internal capture and pass-

by trips were not calculated since the subdivision was only planned to have residential land use components.

Table 1 below presents the trip generation calculations for the 22nd Filing calculated through this study update. The Single-Family Detached Housing (Land Use Code 210) category was used to calculate trip generation with dwelling units as the independent variable. No reductions were made for internal capture (IC) or pass-by trips. Given the close proximity of Billings Skyview High School to the subdivision, it is likely that a percentage of trips could be attributed to bicycle or pedestrian traffic. The nearest MET Transit bus routes are also adjacent to the school, so transit access is convenient. However, since it would be difficult to estimate an accurate percentage of alternate mode trips, and for the purposes of being consistent with previous TIS updates for this subdivision, alternate mode trips were considered to be negligible for this study.

Table 1: Trip Generation, Mode, and Classification

Land Use	Independent Variable		Average Weekday			AM Peak Hour			PM Peak Hour		
	Intensity	Units	total	enter	exit	total	enter	exit	total	enter	exit
Single-Family Detached Housing[1]	74	Dwelling Units	698	349	349	52	13	39	70	44	26
Total New Trips			**698**	**349**	**349**	**52**	**13**	**39**	**70**	**44**	**26**

(1) Single-Family Attached Housing - Land Use 210* Units = Dwelling Units

Average Weekday: Average Rate = 9.43 (50% entering/50% exiting)

Peak Hour of the Adjacent Street, One Hour between 7 and 9 AM: Average Rate = 0.70 (25% entering/75% exiting)

Peak Hour of the Adjacent Street, One Hour between 4 and 6 PM: Average Rate = 0.94 (63% entering/37% exiting)

**Trip Generation, 11th Edition*, Institute of Transportation Engineers, 2021

***Trip Generation Handbook, 3rd Edition*, Institute of Transportation Engineers, 2017

The previously platted 5th through 12th, 14th through 16th (there will be no 13th Filing), and 17th through 21st Filings contain 676 single-family dwelling unit lots.

The 5th through 16th Filings are currently constructed. The 17th-19th and 21st Filings are expected to be occupied in 1.5 years while the 20th Filing is expected to be occupied in 3 years. With the addition of the 22nd Filing (expected to be built out in approximately 6 years), the total number of single-family dwelling unit lots in High Sierra Subdivision will be 750, which equates to approximately 55 percent of what is proposed in the masterplan and what was analyzed via the original TIS. The approved filings have generally followed the original layout, so it is expected that the final number of dwelling units will be approximately in line with what was originally proposed. Therefore, based on discussions with the City, additional analysis is not required to determine if anticipated impacts would differ from those identified in that original study.

The original High Sierra TIS recommended improvements at 3 off-site intersections for the purposes of mitigating transportation impacts and provided total proportionate cost share contribution percentage figures based on full buildout of the overall masterplan. The original calculation worksheets that show the total contribution percentages for each intersection are attached. Subsequent TIS updates have then calculated updated, by-filing contribution percentages for those same intersections

on a fractional basis relative to the original percentages that were determined for the overall masterplan. The 74 lots proposed in the 22nd Filing represent a 5.42 percent share of the original proposed lot total. Applying this percentage to the original total contribution percentages, the proportional lot share percentage for the 22nd Filing is as follows:

- Wicks Lane/Gleneagles Boulevard – 1.64 percent
- Wick Lane/Fantan Street – 1.83 percent
- Wicks Lane/St. Andrews Drive – 1.45 percent

In addition to the 3 off-site intersections included in the original High Sierra TIS, 3 additional City intersections with collector and arterial classifications have become operational within the limits of the High Sierra development and are impacted by future development filings. A distribution for trips at these intersections was calculated based on the *Inner Belt Loop Corridor Study* completed in November of 2020 and inspection of new traffic patterns. Through this analysis it was assumed that 30 percent of trips will utilize Inner Belt Loop. Figure 2 in the attachments presents the trip distribution scheme and traffic assignment for the 3 additional intersections for the High Sierra 22nd Filing. For the purposes of mitigating transportation impacts, proportionate cost share contribution percentages were determined for the 22nd Filing based on the new distribution and calculated site trips and are as follows:

- Skyway Drive/Alkali Creek Road – 1.08 percent
- Annandale Road/Gleneagles Boulevard – 0.17 percent
- Annandale Road/St. Andrews Drive – 0.18 percent

Please feel free to call me at 406-922-4306 or jstaszcuk@sanbell.com if you have any questions or would like to discuss this further.

Sincerely,

Joey Staszcuk, PE, PTOE, RSP1
Senior Engineer | Community Transportation Studio Manager

SJW/ars/SG

Enc.
22nd Filing Layout
Trip Distribution & Traffic Assignment Figure
Traffic Count Data Worksheets
Capacity Summary Table
Capacity Calculation Worksheets
Contribution Worksheets

P:82061_157_High_Sierra_Sub_22nd_Prelim_Plat

EXHIBIT A

CONCEPTUAL LAYOUT

FOR

PROPOSED HIGH SIERRA SUBDIVISION, 22ND FILING

PREPARED FOR : HIGH SIERRA II, INC

PREPARED BY : sanbell

SEPTEMBER, 2024

BILLINGS, MONTANA

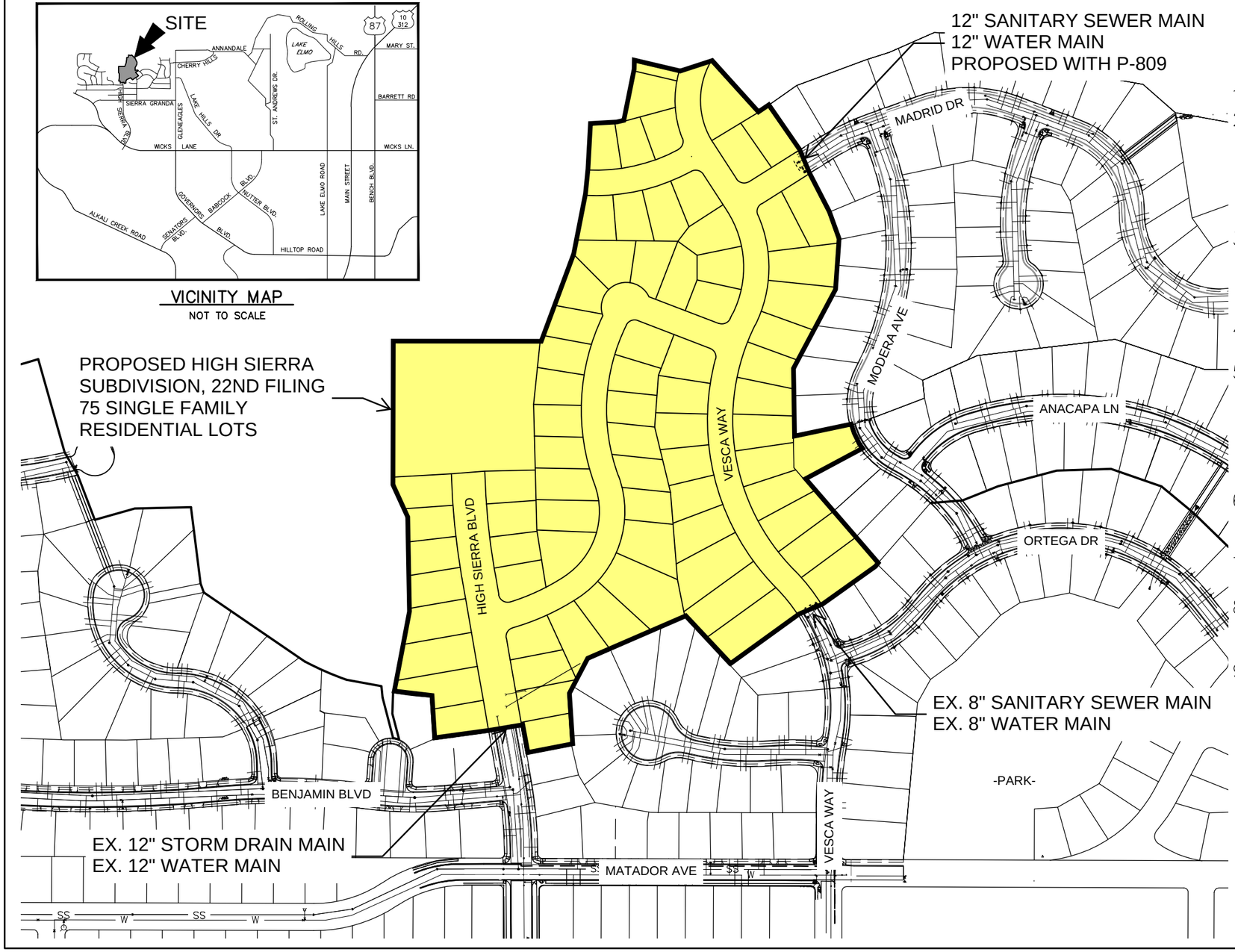
NORTH

125 0 125 250

SCALE:1" = 250'

VICINITY MAP

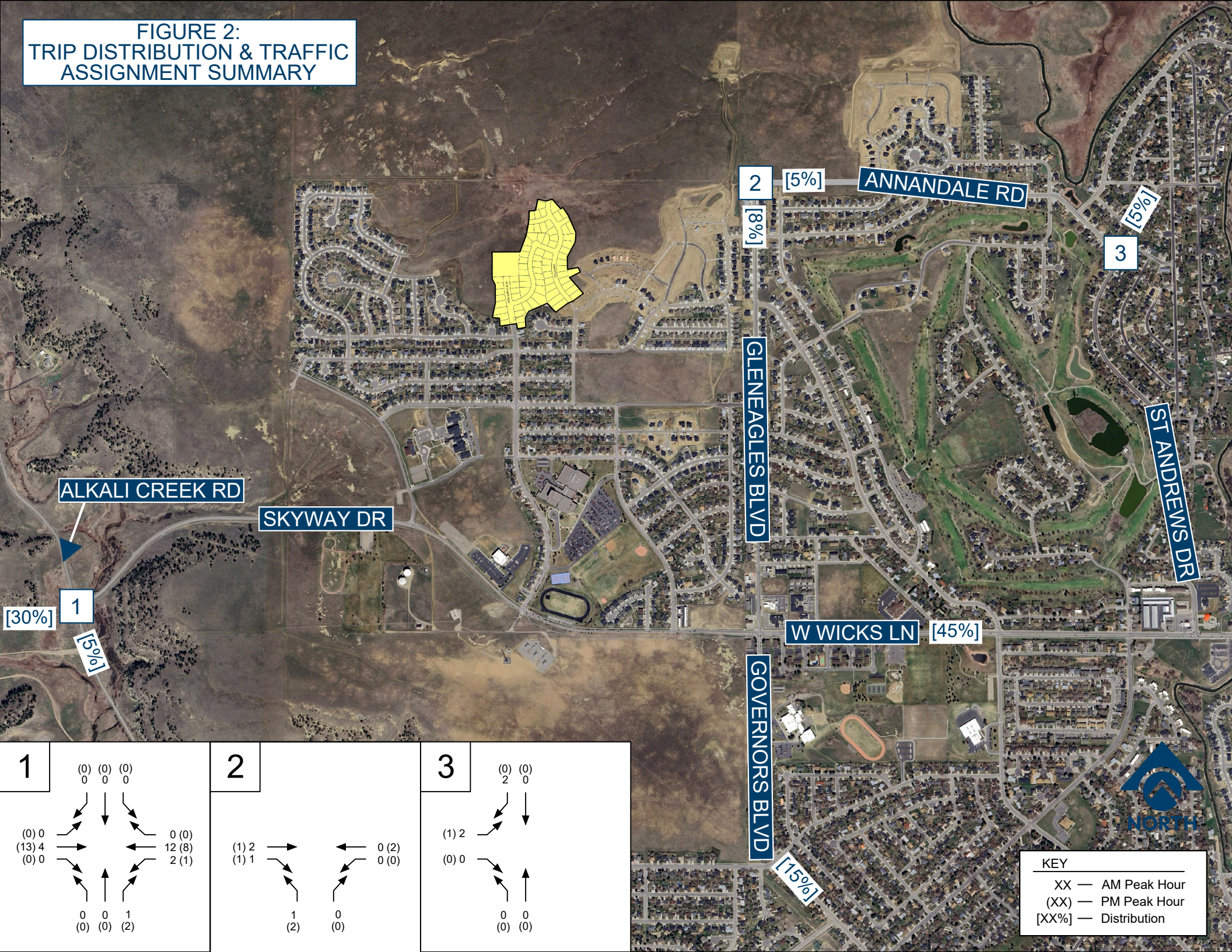
NOT TO SCALE



NOTES:

1. EXISTING AND PROPOSED ZONING IS N3
2. ALL INTERNAL STREETS (EXCLUDING HIGH SIERRA BLVD) SHALL BE BUILT TO CITY OF BILLINGS STANDARDS 34' BACK TO BACK IN A 56' WIDE R.O.W. HIGH SIERRA BLVD SHALL BE 49' BACK TO BACK IN A 74' WIDE R.O.W.
3. ALL STREETS WILL CONTAIN 8" WATER MAIN EXCEPT FOR A 12" WATER MAIN IN HIGH SIERRA BLVD, MADRID DRIVE AND VESCA WAY (NORTH OF MADRID DRIVE).
4. SANITARY SEWER WILL BE PROVIDED VIA GRAVITY SANITARY SEWER SYSTEM.
5. STORM DRAIN HAS BEEN MASTER PLANNED AND THIS FILING WILL INCLUDE OF STORMWATER PIPING, INLETS, TEMPORARY DRAINAGE SWALES AND EXPANSION OF PERMANENT STORMWATER DETENTION FACILITY IN ACCORDANCE WITH THE MASTER PLAN.
6. EXISTING GRADE WITHIN SUBDIVISION IS APPROXIMATELY 2–5% TO THE NORTH AND EAST.
7. PARKLAND DEDICATION WILL BE MET WITH A CASH IN LIEU CONTRIBUTION.
8. A TRAFFIC IMPACT UPDATE LETTER WILL BE PROVIDED WITH PRELIMINARY PLAT SUBMITTAL.
9. IT IS ANTICIPATED THAT PRIVATE UTILITIES AND EASEMENTS WILL BE TYPICALLY LOCATED ALONG FRONT LOT LINES IN 8' WIDE EASEMENTS. THIS WILL BE CONFIRMED WITH THE PRIVATE UTILITY COMPANIES.

FIGURE 2: TRIP DISTRIBUTION & TRAFFIC ASSIGNMENT SUMMARY



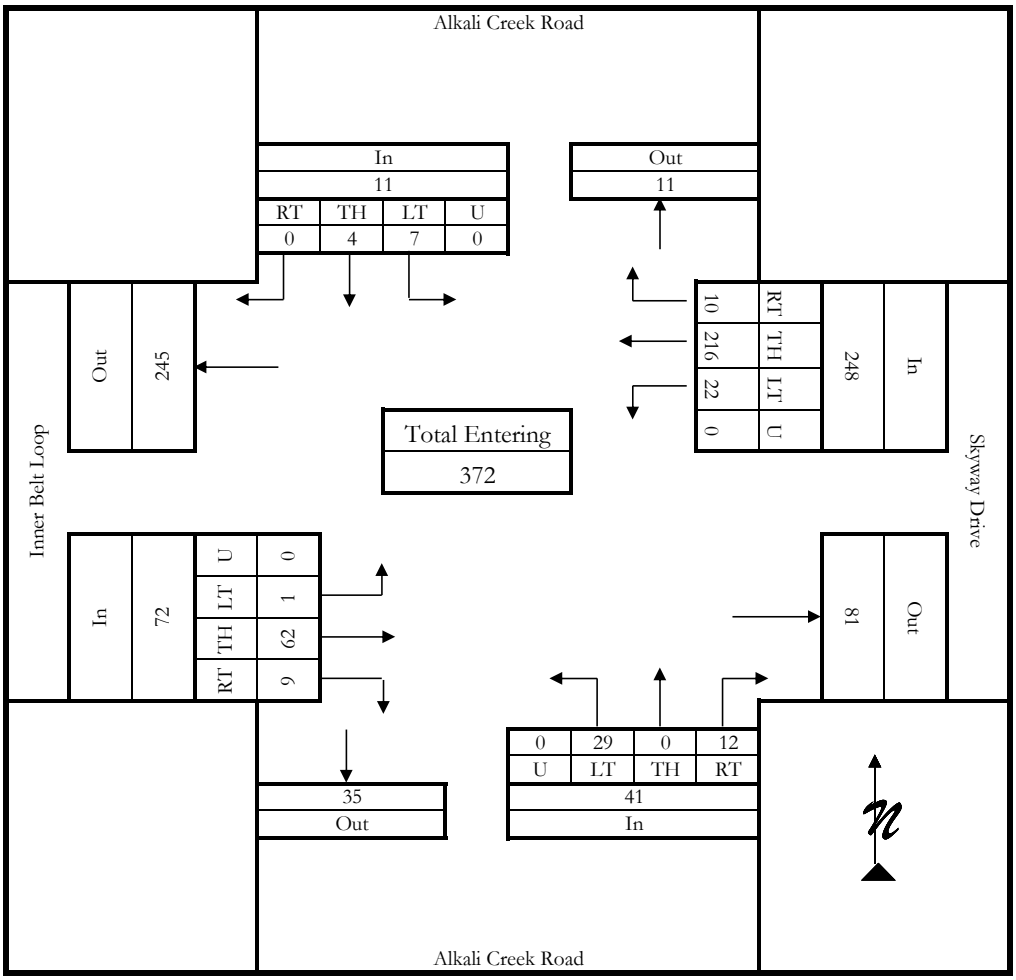
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Gannon Chamberlain	Intersection:	Alkali Creek Road/Skyway Drive/IBL
Agency/Company:	Sanderson Stewart		
Date Performed:	Wednesday, July 31, 2024	Jurisdiction:	Billings, MT / MDT
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	24180	Project Description:	High Sierra 22nd Filing Update
North/South Street:	Alkali Creek Road	East/West Street:	Skyway Drive/Inner Belt Loop

Vehicle Volumes and Adjustments

	Alkali Creek Road Southbound					Alkali Creek Road Northbound					Inner Belt Loop Eastbound					Skyway Drive Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.97	0.97	0.97	0.97		0.97	0.97	0.97	0.97		0.97	0.97	0.97	0.97		0.97	0.97	0.97	0.97		
7:15 AM	0	0	0	0	0	2	0	7	0	9	4	16	0	0	20	2	54	5	0	61	90
7:30 AM	0	2	3	0	5	1	0	8	0	9	3	16	1	0	20	5	77	9	0	91	125
7:45 AM	0	1	3	0	4	8	0	7	0	15	2	17	0	0	19	2	40	4	0	46	84
8:00 AM	0	1	1	0	2	1	0	7	0	8	0	13	0	0	13	1	45	4	0	50	73
Grand Total	0	4	7	0	11	12	0	29	0	41	9	62	1	0	72	10	216	22	0	248	372
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	2.4	0.0	4.8	0.0	0.0	4.2	0.0	1.9	0.0	0.0	1.6	
Heavy Truck %	0.0	25.0	0.0	0.0	9.1	0.0	0.0	3.4	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	25.0	0.0	0.0	9.1	0.0	0.0	6.9	0.0	4.9	0.0	4.8	0.0	0.0	4.2	0.0	1.9	0.0	0.0	1.6	
Total %	0.0	1.1	1.9	0.0	3.0	3.2	0.0	7.8	0.0	11.0	2.4	16.7	0.3	0.0	19.4	2.7	58.1	5.9	0.0	66.7	100.0
PHF	0.55	0.55	0.55			1.00	1.00	1.00			0.89	0.89	0.89			0.68	0.68	0.68			0.74



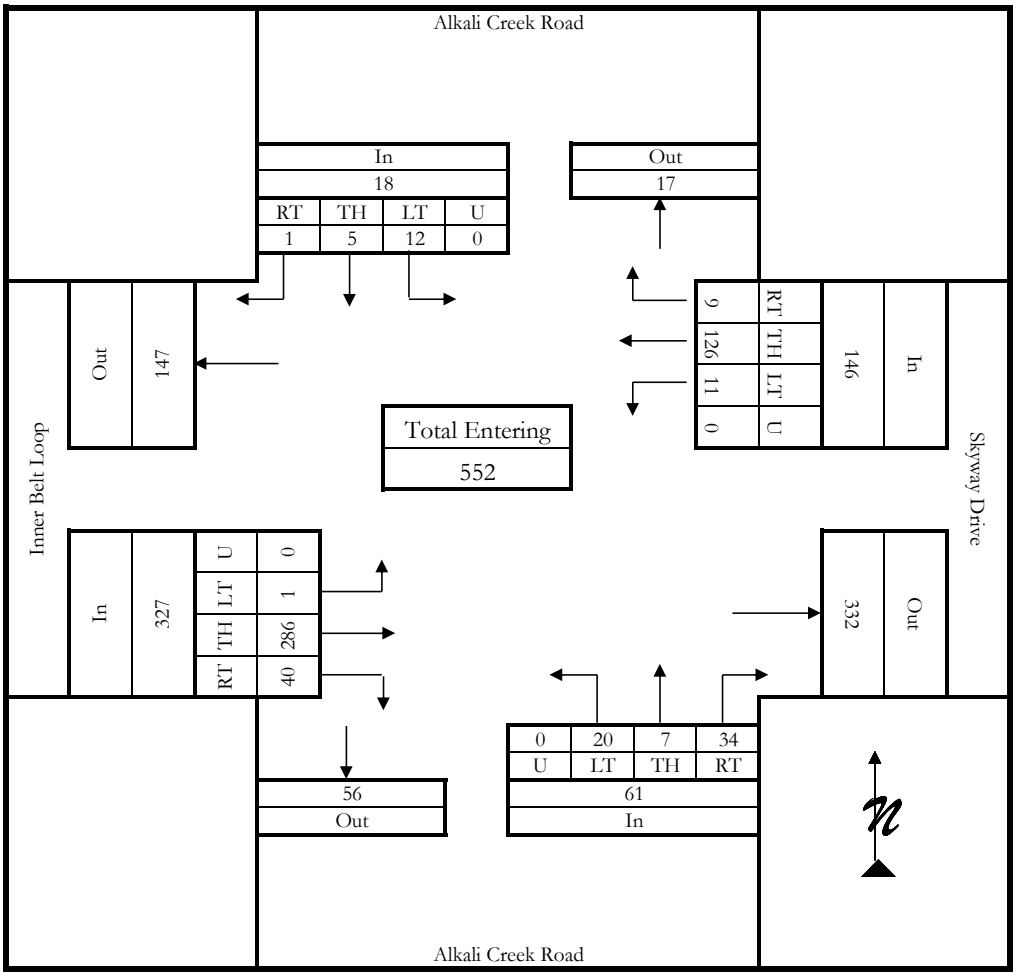
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Gannon Chamberlain	Intersection:	Alkali Creek Road/Skyway Drive/IBL
Agency/Company:	Sanderson Stewart		
Date Performed:	Wednesday, July 31, 2024	Jurisdiction:	Billings, MT / MDT
Count Time Period:	PM Peak Hour (5:00 - 6:00 PM)		
Project Number:	24180	Project Description:	High Sierra 22nd Filing Update
North/South Street:	Alkali Creek Road	East/West Street:	Skyway Drive/Inner Belt Loop

Vehicle Volumes and Adjustments

	Alkali Creek Road Southbound					Alkali Creek Road Northbound					Inner Belt Loop Eastbound					Skyway Drive Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	0.97	0.97	0.97	0.97		0.97	0.97	0.97	0.97		0.97	0.97	0.97	0.97		0.97	0.97	0.97	0.97		
5:00 PM	0	1	3	0	4	8	1	3	0	12	9	61	0	0	70	3	39	3	0	45	131
5:15 PM	0	3	2	0	5	10	2	8	0	20	12	81	0	0	93	2	27	3	0	32	150
5:30 PM	0	0	6	0	6	4	3	2	0	9	11	67	1	0	79	3	29	2	0	34	128
5:45 PM	1	1	1	0	3	12	1	7	0	20	8	77	0	0	85	1	31	3	0	35	143
Grand Total	1	5	12	0	18	34	7	20	0	61	40	286	1	0	327	9	126	11	0	146	552
Medium Truck %	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	1.6	2.5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	1.6	2.5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	
Total %	0.2	0.9	2.2	0.0	3.3	6.2	1.3	3.6	0.0	11.1	7.2	51.8	0.2	0.0	59.2	1.6	22.8	2.0	0.0	26.4	100.0
PHF	0.90	0.90	0.90			0.76	0.76	0.76			0.88	0.88	0.88			1.00	1.00	1.00			0.92



Intersection	Approach	Existing (2024)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		*Two-Way Stop-Control (NB/SB)*					
Alkali Creek Road & Inner Belt Loop/Skyway Drive	NB	10.6	B	1	11.6	B	1
	SB	11.2	B	1	12.8	B	1
	EB	0.1	A	0	0.0	A	0
	WB	0.7	A	1	0.6	A	1
	Intersection	2.0	A	--	1.9	A	--

Intersection Level Of Service Report
Intersection 1: Alkali Creek Road & Inner Belt Loop/Skyway Drive

Control Type:	Two-way stop	Delay (sec / veh):	11.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.007

Intersection Setup

Name	Alkali Creek Road			Alkali Creek Road			Inner Belt Loop			Skyway Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			No			No			No		

Volumes

Name	Alkali Creek Road			Alkali Creek Road			Inner Belt Loop			Skyway Drive		
Base Volume Input [veh/h]	29	0	12	7	4	0	1	62	9	22	216	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	29	0	12	7	4	0	1	62	9	22	216	10
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	0	3	2	1	0	0	16	2	6	54	3
Total Analysis Volume [veh/h]	29	0	12	7	4	0	1	62	9	22	216	10
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	11.30	11.62	8.95	11.15	11.40	9.51	7.68	0.00	0.00	7.38	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.19	0.19	0.19	0.06	0.06	0.06	0.00	0.00	0.00	0.04	0.04	0.04
95th-Percentile Queue Length [ft/ln]	4.78	4.78	4.78	1.43	1.43	1.43	0.04	0.04	0.04	0.94	0.94	0.94
d_A, Approach Delay [s/veh]	10.61			11.24			0.11			0.65		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	1.96											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 1: Alkali Creek Road & Inner Belt Loop/Skyway Drive

Control Type:	Two-way stop	Delay (sec / veh):	13.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.026

Intersection Setup

Name	Alkali Creek Road			Alkali Creek Road			Inner Belt Loop			Skyway Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			No			No			No		

Volumes

Name	Alkali Creek Road			Alkali Creek Road			Inner Belt Loop			Skyway Drive		
Base Volume Input [veh/h]	20	7	34	12	5	1	1	286	40	11	126	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	7	34	12	5	1	1	286	40	11	126	9
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	2	9	3	1	0	0	72	10	3	32	2
Total Analysis Volume [veh/h]	20	7	34	12	5	1	1	286	40	11	126	9
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.01	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	12.90	13.02	10.57	13.10	12.80	9.21	7.49	0.00	0.00	7.93	0.00	0.00
Movement LOS	B	B	B	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.33	0.33	0.33	0.12	0.12	0.12	0.00	0.00	0.00	0.02	0.02	0.02
95th-Percentile Queue Length [ft/ln]	8.37	8.37	8.37	2.92	2.92	2.92	0.04	0.04	0.04	0.47	0.47	0.47
d_A, Approach Delay [s/veh]	11.62			12.80			0.02			0.60		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	1.87											
Intersection LOS	B											

Intersection: Fantan St & Wicks Ln

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	0
	L	0	0	2	0	0
SB	T	0	0	0	0	0
	L	109	109	63	63	1
EB	T	275	275	158	158	1
	L	0	0	0	0	1
WB	T	93	93	270	270	1
	L	0	0	0	0	0
Critical Lane Sum Increase:			384	333		
Critical Lane Sum:			1140	1140		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			33.68%	29.21%		
Highest %:			33.68%			

Intersection: Gleneagle Blvd & Wicks Ln

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	54	54	149	149	1
	L	60	60	185	185	1
SB	T	130	130	75	75	1
	L	95	95	54	54	1
EB	T	173	173	100	100	1
	L	0	0	0	0	1
WB	T	69	35	192	96	2
	L	0	0	0	0	1
Critical Lane Sum Increase:			363	360		
Critical Lane Sum:			1200	1200		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			30.25%	30.00%		
Highest %:			30.25%			

Intersection: St. Andrews Dr & Wicks Ln

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	0
	L	0	0	0	0	0
SB	T	0	0	0	0	0
	L	37	37	21	21	1
EB	T	268	268	154	154	1
	L	0	0	0	0	0
WB	T	89	89	263	263	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			305	284		
Critical Lane Sum:			1140	1140		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			26.75%	24.91%		
Highest %:			26.75%			

Intersection: Skyway Drive & Alkali Creek Road - 22nd Filing

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0		0	1
	L	0	0	0	0	1
SB	T	0	0		0	1
	L	0	0	0	0	1
EB	T	4	4	13	13	1
	L	0	0	0	0	1
WB	T	12	12	8	8	1
	L	2	2	1	0	1
Critical Lane Sum Increase:			12	13		
Critical Lane Sum:			1200	1200		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			1.00%	1.08%		
Highest %:			1.08%			

Intersection: Gleneagles & Annandale - 22nd Filing

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	1
	L	1	0	2	0	1
SB	T	0	0	0	0	0
	L	0	0	0	0	0
EB	T	2	2	1	1	1
	L	0	0	0	0	0
WB	T	0	0	2	2	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			2	2		
Critical Lane Sum:			1200	1200		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			0.17%	0.17%		
Highest %:			0.17%			

Intersection: St. Andrews & Annandale - 22nd Filing

Approach		AM Peak		PM Peak		
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	Number of Lanes
NB	T	0	0	0	0	0
	L	0	0	0	0	1
SB	T	0	0	0	0	1
	L	0	0	0	0	1
EB	T	0	0	0	0	1
	L	2	2	1	1	1
WB	T	0	0	0	0	0
	L	0	0	0	0	0
Critical Lane Sum Increase:			2	1		
Critical Lane Sum:			1140	1140		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			0.18%	0.09%		
Highest %:			0.18%			

Planning Board

Date:	01/28/2025
Title:	Platinum Commercial Park Subdivision - County Major Subdivision - Pubic Hearing
Presented by:	David Green
Department:	Planning & Community Services
Presentation:	Yes

Information

RECOMMENDATION

Staff recommends the Planning Board forward a recommendation of conditional approval to the Board of County Commissioners for the major preliminary plat of Platinum Commercial Park Subdivision, approve the variance requests, and adopt the Findings of Fact as presented in the staff report.

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

On December 2, 2024, Performance Engineering, applied for preliminary major plat approval of Platinum Commercial Park Subdivision. The subdivision will create 14 lots for commercial/industrial development. The subject property is generally located northeast of the intersection of South 72nd Street West and Danford Road. This parcel of land is outside county zoning. Historically, the land has been used for farming/agriculture.

VARIANCES REQUESTED

The applicant has requested variances from Section 4.6.B.2 the Yellowstone County Subdivision Regulations, which outlines connection to undeveloped/underdeveloped land surrounding the proposed subdivisions. The maximum distance between those connections is 600 feet Section 4.6.B.1. Staff is recommending approval of the variance requests. Further explanation and analysis can be found in 'Attachment A.'

PROPOSED CONDITIONS OF APPROVAL

Pursuant to Section 76-3-608(4), MCA, the following conditions are recommended to reasonably minimize potential adverse impacts identified within the Findings of Fact.

1. To protect public health and safety, prior to final plat approval, the applicant will receive approval from the MDEQ for the proposed water systems, septic systems and the proposed storm water management. The applicant will also create an RSID to maintain the community wastewater system.
2. To provide a maintenance mechanism for the new public roads within the subdivision and to protect public health and safety, prior to final plat approval, the applicant will petition to create an RSID for the future maintenance of the roads.
3. To protect public health and safety with proper fire suppression, prior to final plat approval, the applicant will submit construction drawings of the dry hydrant system to Billings Fire Department for review and approval. Once installed, the applicant will request Billings Fire Department test the system to ensure it works correctly and get a sign off from Billings Fire Department. The applicant will also create an RSID for the dry hydrant system.
4. To minimize the effects on local service, prior to final plat approval, the applicant will coordinate with the USPS for locating and providing the correct amount of space for safely delivering the mail to the lots.
5. Prior to final plat approval, the Traffic Impact Study and any identified improvements shall be completed and approved by the Public Works Department.
6. Minor changes may be made in the SIA and final documents, as requested by the Planning, Legal or Public Works Departments to clarify the documents and bring them into the standard acceptable format.
7. The final plat shall comply with all requirements of the Yellowstone County Subdivision Regulations, rules, policies, and resolutions of Yellowstone County, and the laws and Administrative Rules of the State of Montana.

PROCEDURAL HISTORY

- Pre-application meeting October 10, 2024
- Preliminary plat application submitted to Planning Division on December 2, 2024
- Planning Board plat review meeting January 14, 2025
- Planning Board public hearing meeting January 28, 2025
- Preliminary plat to Board of County Commissioners, February 18, 2025
- 60 working-day preliminary plat review period ends February 28, 2025

PLAT INFORMATION

General location:	Northeast corner of 72nd Street South and Danford Road
Legal Description:	SE 1/4 SW 1/4 SECTION 30, TOWNSHIP 1 SOUTH, RANGE 25 EAST

Owner/Subdivider:	KE Construction
Engineer and Surveyor:	Performance Engineering
Existing Zoning:	No zoning
Existing land use:	Active Farmland
Proposed land use:	Commercial
Gross and Net area:	67.311 acres / 54.082 acres
Proposed number of lots:	14
Lot size:	Max: 5.68 acres Min.: 2.63 acres
Parkland requirements:	Parkland dedication is not required as this is a commercial subdivision.

STAKEHOLDERS

There are no stakeholder comments at this time. A public hearing is scheduled for the Planning Board meeting of January 28, 2025. Comments will be taken at that time. The Planning Division has received no public comments or questions regarding the proposed subdivision at this time.

ALTERNATIVES

In accordance with state law, the Board of County Commissioners has 60 working days to act upon this major preliminary plat. The 60 working day review period for the proposed plat ends on February 28, 2025. State and County subdivision regulations also require that preliminary plats be reviewed using specific criteria, as stated within this report. The County may not unreasonably restrict an owner's ability to develop land if the subdivider provides evidence that any identified adverse effects can be mitigated. Within the 60 working day review period, the Board of County Commissioners is required to:

1. Approve;
2. Conditionally Approve; or
3. Deny the Preliminary Plat

FISCAL EFFECTS

The development of this subdivision will have no fiscal impact on the Planning Division.

SUMMARY

The purpose of the County's subdivision review process is to identify potential negative effects of property being subdivided. When negative effects are identified it is the subdivider's responsibility to mitigate those effects. Various County departments, private service/utility providers and the affected school district(s), have reviewed this application and provided input on effects and mitigation. The Findings of Fact, which are presented as an attachment, discuss potential negative impacts of the subdivision and conditions of approval are recommended as measures to further mitigate any impacts. In this case, there were found to be some impacts from this proposed subdivision.

Attachments

Findings of Fact
Platinum Commercial Park PrePlat
SIA
Variance Requests
Attachment A - Staff variance review
Traffic Study

FINDINGS OF FACT

The City-County Planning Division Staff has prepared the Findings of Fact for Platinum Commercial Park Subdivision. These findings are based on the preliminary plat application and supplemental documents addressing the review criteria required by the Montana Subdivision and Platting Act (76-3-608, MCA) and the Yellowstone County Subdivision Regulations (YCSR).

A. What are the effects on agriculture, local services, the natural environment, wildlife and wildlife habitat and public health and safety (76-3-608 (3) (a) MCA) (Section 3.2 (H) (2) YCSR)

1. Effect on agriculture and agricultural water users' facilities

The subject property has been used for farming purposes. No water rights or shares will be transferred to individual lot owners. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners without permission of said adjacent properties. There will be no effect on the water users down stream from this property.

2. Effect on local services

a. **Water** – The proposed subdivision is not located within any public water district. The subdivision will be served by individual wells or alternative water source as approved by the Montana Department of Environmental Quality, or its designee. Water systems will be installed meeting the requirements outlined in Section 4.9 of the Yellowstone County Subdivision Regulations and the MDEQ. **(Condition #1)** The operation and maintenance of approved water system will be the responsibility of individual lot owners.

b. **Septic -** The proposed subdivision is not located within any public sewer district. The subdivision will be served by wastewater disposal systems as submitted to and approved by Montana Department of Environmental Quality. These systems shall be located and installed as shown on the site layout approved by Montana Department of Environmental Quality, or its designee.

The Subdivision is proposed to be served by a community wastewater treatment system located on Utility Lot 7, Block 2, which will be dedicated to the public in accordance with Yellowstone County Subdivision Regulations Section 4.8, E. An RSID will be formed to provide maintenance, repair, and replacement of said community wastewater treatment system. Septic systems will be installed meeting the requirements outlined in Section 4.9 of the Yellowstone County Subdivision Regulations and the MDEQ. **(Condition #1)** The operation and maintenance of the septic system will be the responsibility of the County through an RSID.

All private utilities, power, telephone, gas and cable television will be installed in the public right of way or easements identified on the plat.

c. **Streets and roads** – Access to the Subdivision shall be from proposed approaches on Danford Road and South 72nd Street West as approved by the Yellowstone County Public Works Department. Resource Way, within the subdivision, will be built in 74-foot-wide right of way and be built with a 34-foot paved surface. Palladium Way will be built in 60-foot-wide right of way and be built with a 24-foot paved surface. An RSID will be created to maintain the roads within the subdivision. **(Condition #2)**

This subdivision has frontage on Danford Road and South 72nd Street West. To meet the requirements of more than one way in and out there will be one access from South 72nd Street West and one from Danford Road.

A TIS has been submitted for this proposed subdivision. After initial review County Public works stated that there are some negligible corrections and minor information that needs to be addressed by the applicant. No existing road improvements are required for this subdivision. In the future should there be more development then this subdivision can be assessed proportional cost through the Waiver.

Any required improvements to intersections or possible widening at access points to accommodate traffic movement into and out of the subdivision will be completed by the applicant. Any item identified in the TIS that needs to be done will be coordinated with the applicant and County Public Works. **(Condition #5)**

d. **Fire and Police services** – The property is within the BUFSA boundary. This subdivision will be provided fire service from the Billings Fire Department. The subdivision will have a dry hydrant tank installed alongside the road Resource Way on the edge of the Utility Lot, as shown on the plat. The applicant will submit drawings for the tank to the Billings Fire Department for review and approval. When the tank is installed the applicant will have the system tested and signed off by the Billings Fire Department. **(Condition #3)**

The Yellowstone County Sheriff's Department will provide law enforcement services to this subdivision.

e. **Solid Waste disposal** – The Billings Landfill has capacity for solid waste disposal. Solid waste will be collected and disposed of by a private garbage collection company. Each lot owner will be responsible for arranging for collection.

f. **Storm water drainage** – The storm water drainage will be collected onsite using a combination of swales and the natural slope of the land. Proposed storm water drainage shall be submitted to the MDEQ for review and approval prior to final plat. All proposed stormwater systems shall meet the requirements of Section 4.7 of Yellowstone County Subdivision Regulation's and the requirements of MDEQ. **(Condition #1)**

g. **School facilities** – The proposed subdivision is located within Laurel School District. Because this is a commercial / industrial subdivision there will be no impact on schools.

h. **Parks and recreation** – This proposed subdivision is not required to provide parkland as it is a commercial / industrial subdivision.

i. **Postal Service –** The applicant will be required to coordinate with the USPS to ensure they are providing a safe location for the postal worker to deliver the mail and the business owners to retrieve it. **(Condition #4)**

j. **Historic features** – No known historic or cultural assets exist on the site.

k. **Phasing of Development** - The applicant is not proposing to develop this subdivision in phases.

3. Effects on the natural environment

The development will use noxious weed control measures to prevent the spread of noxious weeds to adjacent developed or agricultural land. As required by County Subdivision Regulations Section 4.15 all county subdivisions are required to apply for and obtain a weed management plan with the County Weed Department. Any subdivision that has an existing Weed Management Plan are required to get an updated Weed Management Plan. The weed management plan has been completed and will be submitted with final plat.

There are no apparent or known natural hazards on the property.

4. Effects on wildlife and wildlife habitat

Impacts on Significant, Important, and Critical Habitat:
According to the U.S. Fish and Wildlife Service's IPaC (Information for Planning and Consultation), there are no critical habitats within the Area of Interest (AOI). Critical habitat for listed species is not known to be present on the AOI; however, changing the land use could potentially impact some food supply for multiple species of birds.

There are no known endangered or threatened species on the property. A paragraph in the 'Conditions that Run with the Land' section of the SIA warns future lot owners of the likely presence of wildlife in the area and their potential to damage residential landscaping.

5. Effects on public health and safety

Plans and designs for the water and septic system will be reviewed and approved by MDEQ prior building construction on each lot to ensure public health and safety.

Fire and emergency services are provided for this proposed subdivision from Billings Fire Department and the Yellowstone County Sheriff's department.

B. Was an environmental assessment required? If yes, what, if any, significant adverse impacts were identified? (76-3-603 MCA) (Chapter 9, YCSR)

A summary of impacts was required for this subdivision pursuant Section 9.2 of the County Subdivision Regulations.

C. Does the subdivision conform to the Yellowstone County 2008 Growth Policy, the 2018 Urban Area Transportation Plan and the Billings Area Bikeway and Trail Master Plan Update? [BMCC 23-302.H.4.]

1. **Yellowstone County - 2008 Growth Policy**

The subdivision is consistent with the following goals of the Growth Policy:

- Goal: Predictable land use decisions that are consistent with neighborhood character and land use patterns. (p. 6)

The subdivision is consistent with the type of residential development in the surrounding area. Large lots with homes on those lots.

- Goal: Controlled weed populations. (p. 9)

The developer shall complete a weed management plan and shall provide a re-vegetation plan for any ground disturbed by development.

2. 2023 Billings Urban Area Long Range Transportation Plan

The subject property maintains the road study area of the Transportation Plan. As proposed, the internal streets are neighborhood streets associated with this subdivision.

3. Billings Area Bikeway and Trail Master Plan (BABTMP)

This subdivision is inside the BABTMP boundaries for trails. There are future trails shown on South 72nd Street and Danford Road. At a future time when these two roads are widened those trails will be installed. This subdivision will not be required to install any trails at this time.

D. Does the subdivision conform to the Montana Subdivision and Platting Act (MSPA) and to local subdivision regulations? [MCA 76-3-608 (3) (b) and Section 3.2 (3) (a) YCSR]

The proposed subdivision meets the requirements of the MSPA and the YCSR. The subdivider and the local government have complied with the subdivision review and approval procedures that are set forth by local and state subdivision regulations.

E. Does the subdivision conform to sanitary requirements? [Section 4.8 (C) and 4.9 (C), YCSR]

The subdivision must receive approval from the MDEQ prior to any building construction on each lot. The new parcels will be connected to the subdivision community septic system. This system will be approved by MDEQ before final plat.

F. Does the proposed subdivision meet any applicable Zoning Requirements? [Section 3.2 (H) (3) (e), YCSR]

The proposed subdivision is outside the County Zoning Jurisdiction.

G. Does the subdivision provide for necessary planned utilities? [MCA 76-3-608 (3) (c) and Section 3.2 (H) (3) (b), YCSR]

The applicant will coordinate with private utility companies to provide the required easements.

H. Does the proposed subdivision provide for Legal and Physical Access to all lots? [MCA 76-3-608 (3) (d) and Section 3.2 (H) (3) (c) (d), YCSR]

Legal and physical access will be provided from South 72nd Street and Danford Road. Access to each lot will be from the internal roads of the subdivision.

CONCLUSIONS OF FINDINGS OF FACT

- This subdivision does not create adverse impacts that warrant denial of the subdivision.
- Impacts to agriculture, agriculture water user facilities, local services, public health and safety, the natural environment, and wildlife should be minimal, and can be mitigated by reasonable conditions of final plat approval.
- The subdivision conforms to some of the goals of the Growth Policy.
- The applicant has complied with the MSPA and YCSR processes and the subdivision conforms to the law requirements.

RECOMMENDATION

Staff recommends to the Planning Board that they forward a recommendation of conditional approval to the Board of County Commissioners for the preliminary plat of Platinum Commercial Park Subdivision, approve the variance requests and adopt the Findings of Fact as presented in the staff report.

SITE DATA	
NUMBER OF LOTS	14
MAXIMUM LOT AREA	± 247,486 SF
MINIMUM LOT AREA	± 107,368 SF
PARKLAND AREA REQUIRED	N/A
PARKLAND AREA PROVIDED	N/A
LINEAL FEET OF STREET ℄	± 3,524 LF
NET LOT ACREAGE	± 57.158 AC
GROSS ACREAGE	± 67.311 AC
EXISTING ZONING	UNZONED
EXISTING LAND USE	AGRICULTURAL
PROPOSED LAND USE	COMMERCIAL
SANITARY SEWER	COMMUNITY SEPTIC
WATER	INDIVIDUAL WATER
FIRE SERVICE AREA	BUFSA

PRELIMINARY PLAT OF

PLATINUM COMMERCIAL PARK SUBDIVISION

BEING LOCATED ON LOT 4, SE 1/4 SW 1/4 SECTION 30, TOWNSHIP 1 SOUTH, RANGE 25 EAST, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : KE CONSTRUCTION

PREPARED BY : PERFORMANCE ENGINEERING, LLC

0 100 200
IN FEET

PARKLAND LAZY KU SUBD
LOT 12 LAZY KU SUBD
LOT 1 LAZY KU SUBD
PARCEL 1 (COS 2301)
PARCEL 1A (COS 1646)
PARCEL 1 (COS 3206)
LOT 1 (COS 1133)
LOT 2 (COS 1133)
LOT 3 (COS 1133)
LOT 4 (COS 1133)
LOT 5 (COS 1133)
LOT 6 (COS 1133)
TRACT 2 (COS 3861)
UNPLATTED LT 3, SESW, S30, T 01S, R25E
UNPLATTED LOTS 1&2, NENW S31, T 01S, R25E

SOUTH 72ND STREET W
68TH STREET W
PALLADIUM WAY (60' R-O-W)
RESOURCE WAY (74' R-O-W)
DANFORD ROAD

~BLOCK 1~
~BLOCK 2~
~BLOCK 3~

Lot: 1 247080 SQ FT 5.672 ACRES
Lot: 2 210176 SQ FT 4.825 ACRES
Lot: 3 211087 SQ FT 4.846 ACRES
Lot: 4 119531 SQ FT 2.744 ACRES
Lot: 1 119530 SQ FT 2.744 ACRES
Lot: 2 174386 SQ FT 4.003 ACRES
Lot: 3 132271 SQ FT 3.037 ACRES
Utility Lot: 7 157353 SQ FT 3.612 ACRES
Lot: 6 107368 SQ FT 2.465 ACRES
Lot: 1 238220 SQ FT 5.469 ACRES
Lot: 2 205412 SQ FT 4.716 ACRES
Lot: 3 205468 SQ FT 4.717 ACRES
Lot: 4 247486 SQ FT 5.681 ACRES
Lot: 5 114419 SQ FT 2.627 ACRES

PROPOSED 30,000 GALLON DRY FIRE HYDRANT
PROPOSED COMMUNITY DRAINFIELD WITH 100% REPLACEMENT
INDIVIDUAL WELL WITH 100' ISOLATION ZONE, TYP.
1' WIDE NO ACCESS STRIP, TYP.
20' WIDE SANITARY SEWER EASEMENT
10' WIDE SANITARY SEWER EASEMENT
10' WIDE UTILITY EASEMENT
SIGN EASEMENT
STORMWATER RETENTION EASEMENT
STORMWATER RETENTION EASEMENT
EXISTING 60' WIDE COUNTY ROAD EASEMENT TO BE DEDICATED AS RIGHT-OF-WAY
EXISTING 30' COUNTY ROAD EASEMENT
60' R-O-W DEDICATION
EXISTING 30' COUNTY ROAD EASEMENT
EXISTING 30' COUNTY ROAD R-O-W (COS 1133)
EXISTING 60' ROAD (COS 1133)

SHEET 1 OF 1

SUBDIVISION IMPROVEMENTS AGREEMENT
Platinum Commercial Park Subdivision
Table of Contents
(Yellowstone County)

SUBDIVISION IMPROVEMENTS AGREEMENT

Platinum Commercial Park Subdivision

This agreement is made and entered this _____ day of _____, 20___, by and between *Cougar Investments, LLC, a Montana limited liability company*, whose address for the purpose of this agreement **PO Box 81153, Billings, MT 59108**, hereinafter referred to as "Subdivider," and YELLOWSTONE COUNTY, Montana, hereinafter referred to as "County."

WITNESSETH:

WHEREAS, the plat of *Platinum Commercial Park Subdivision*, located in Yellowstone County, Montana, was submitted to the Yellowstone County Board of Planning; and

WHEREAS, at a regular meeting conducted on _____ day of _____, 20__, the Board of Planning recommended conditional approval of a preliminary plat of *Platinum Commercial Park Subdivision*; and

WHEREAS, at a regular meeting conducted on _____ day of _____, 20___, the Yellowstone County Board of County Commissioners conditionally approved a preliminary plat of *Platinum Commercial Park Subdivision*; and

WHEREAS, a Subdivision Improvements Agreement is required by the County prior to the approval of the final plat.

WHEREAS, the provisions of this agreement shall be effective and applicable to *Platinum Commercial Park Subdivision* upon the filing of the final plat thereof in the office of the Clerk and Recorder of Yellowstone County, Montana. The Subdivision shall comply with all requirements of the Yellowstone County Subdivision Regulations, the rules, regulations, policies, and resolutions of Yellowstone County, and the laws and administrative rules of the State of Montana.

THEREFORE, THE PARTIES TO THIS AGREEMENT, for and in consideration of the mutual promises herein contained and for other good and valuable consideration, do hereby agree as follows:

I. VARIANCES

Subdivider has requested, and the County hereby grants, the following variances by the Board of County Commissioners from the strict interpretation of the County's Subdivision Regulations (Chapter 11, Yellowstone County Subdivision Regulations):

1. Variance from the Yellowstone County Subdivision Regulations, Section 4.6 Streets and Roads, B, 1 is requested to allow for a single connection to the adjacent undeveloped property north of Platinum Commercial Park Subdivision, rather than multiple connections spaced no more than 600 feet apart.

    a. This variance is sought as Platinum Commercial Park Subdivision is proposed as a commercial and industrial use development with large lots, whose traffic

characteristics may vary significantly from future development plans to the north which would intermingle residential and commercial/industrial traffic and vehicles compromising the potential safety of motorists and residents. In addition, the proposed single connection to the adjacent property to the north provides inter-connectedness between Platinum Commercial Park Subdivision and the adjacent property to limit the need to enter Danford Road or South 72nd Street West to access the future undeveloped parcel as is intended by this Subdivision Regulation. Based on the desired lot sizes and configuration of Platinum Commercial Park Subdivision, meeting the connection per 600' would also necessitate unduly splitting lots further (minimum lot width along the northern line is ~350' with a maximum lot width of 518') to comply with this requirement when large lots are desired and proposed.

2. Variance from the Yellowstone County Subdivision Regulations, Section 4.6 Streets and Roads, B, 2 is requested to allow for no connection to be made to the existing 68th Street West.

    a. This variance is sought as the existing land use of properties on the east side of 68th Street West include single family residences whose "land use in incompatible with the proposed subdivision" being a commercial/industrial development. This is a condition of waiving this requirement per the referenced section of the Subdivision Regulations.

    b. Additionally, the portion of 68th Street West that would be able to tied into is a roadway tract created with Certificate of Survey No. 1133 (Document Number 845884). This roadway tract does not appear to have been formally accepted as right-of-way by Yellowstone County.

II. CONDITIONS THAT RUN WITH THE LAND

A. Lot owners should be aware that this subdivision is being built in close proximity to prime deer and antelope habitat and it is likely that homeowners will experience problems with damage to landscaped shrubs, flowers, and gardens. The Montana Fish, Wildlife, and Parks Department does not provide damage assistance unless there is damage to commercial crops and/or a threat to public health and safety.

B. Lot owners should be aware that soil characteristics within the area of this subdivision, as described in the 1972 Yellowstone County Soil Survey, indicate that there could be potential limitations for proposed construction on the lots, which may require a geotechnical survey prior to construction.

C. There is attached hereto a Waiver waiving the right to protest the creation of the special improvement district or districts which by this reference is expressly incorporated herein and made as much a part hereof as though fully and completely set forth herein at this point. The Waiver will be filed with the plat, shall run with the land, and shall constitute the guarantee by the Subdivider and property owner or owners of the developments described herein. Said Waiver is effective upon filing and is not

conditioned by the completion of the conditions set forth in the Agreement. The Subdivider and owner specifically agree that they are waiving valuable rights and do so voluntarily.

D. Culverts and associated drainage swales shall not be filled in or altered by the Subdivider or subsequent lot owners.

E. When required by road improvements, all fences and irrigation ditches in the public right-of-way adjacent to this subdivision shall be removed or relocated outside of the public right-of-way and any relocation outside of the public right-of-way shall be subject to securing and recording easements.

F. Future maintenance of all public (or common) improvements shall be done through one (1) or more RSID(s) created as part of the SIA for this subdivision.

G. Individual lot owners should be aware that Best Management Practices for stormwater control shall be required for new construction on lots. Best Management Practices are detailed within the MDEQ Montana Post-Construction Storm Water BMP Design Guidance Manual and the MDEQ Storm Water Management During Construction Field Guide for Best Management Practices.

H. No water rights have been transferred to the lot owners. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners without permission of said adjacent properties.

III. TRANSPORTATION

A. Access

Access to the Subdivision shall be from proposed approaches on Danford Road and South 72nd Street West as approved by the Yellowstone County Public Works Department. Danford Road and South 72nd Street West are both Yellowstone County roadways within 60-foot wide and 120-foot wide road easements, respectively, that will be perpetuated with this Subdivision. An RSID will be formed for ongoing maintenance, repair, and replacement of internal roadways of the subdivision, including Resource Way (74’ right-of-way and 34’ wide asphalt road) and Palladium Way (60’ right-of-way and 24’ asphalt road). Public right-of-way for each roadway will be dedicated with the platting of the subdivision.

B. Traffic Control

Traffic control for the proposed roadway approaches to the Subdivision will be implemented as recommended within the Traffic Impact Study (TIS) for the Subdivision. Said TIS shall be prepared and paid for by the Subdivider.

IV. EMERGENCY SERVICE

The Subdivision is located within the Billings Urban Fire Service Area, and as such the City of Billings Fire Department currently provides fire protection services for the subdivision.

At a minimum, the following is required:

- An unobstructed gravel road or gravel road base must be within 150 feet of the furthest portion of a building under construction as measured along the approved route.

- Being a major subdivision and planned commercial use, a 30,000-gallon dry hydrant fire tank is required for the subdivision and will be constructed as part of the Subdivision public improvements. An RSID will be formed for ongoing maintenance, repair, and replacement of said dry hydrant fire tank.

V. STORM DRAINAGE

All drainage improvements shall comply with the provisions of the Section 4.7, Yellowstone County Subdivision Regulations, and a stormwater management plan shall be submitted to and approved by the Montana Department of Environmental Quality (MDEQ), or its designee.

VI. UTILITIES

A. Water

In accordance with Section 4.9 of the Yellowstone County Subdivision Regulations, all proposed water systems must obtain Approval by Montana Department of Environmental Quality, or its designee.

Municipal public water service is not available in the subdivision at this time. The subdivision will be served by individual wells or alternative water source as approved by the Montana Department of Environmental Quality, or its designee.

Individual lot water supply is the responsibility of the lot owner at the time of development.

B. Septic System

In accordance with Section 4.8 of the Yellowstone County Subdivision Regulations, all sanitary sewer systems must obtain approval by the Montana Department of Environmental Quality, or its designee.

Municipal public sanitary sewer service is not available in the subdivision at this time. The subdivision will be served by wastewater disposal systems as submitted to and approved by Montana Department of Environmental Quality. These systems shall be

located and installed as shown on the site layout approved by Montana Department of Environmental Quality, or its designee.

The Subdivision is proposed to be served by a community wastewater treatment system located on Utility Lot 7, Block 3, which will be dedicated to the public in accordance with Yellowstone County Subdivision Regulations Section 4.8, E. An RSID will be formed to provide maintenance, repair, and replacement of said community wastewater treatment system.

C. Power, Telephone, Gas, and Cable Television

Power, natural gas, telephone, and cable services will be extended into the subdivision through utility easements along each lot's frontage along Resource Way and Palladium Way at the time of construction of subdivision roadways.

VII. PARKS/OPEN SPACE

Section 76-3-621 (3) (a-e) of the Montana Code Annotated (MCA) provides for when park land dedication may not be required. As the Subdivision is proposed as a Commercial/Industrial use subdivision (all non-residential), the Yellowstone County Subdivision Regulations Section 10.8 and said MCA does not require parkland dedication. While the Utility Lot 7, Block 3 is not considered parkland per the Yellowstone County Subdivision regulations, this ~3.612 acre piece of land will provide for open space within the Subdivision.

VIII. IRRIGATION

Subdivider agrees there will be no irrigation water, outside that reviewed and appropriated by DNRC in approval of the Subdivision, available to this Subdivision. No irrigation water shares shall be transferred to individual lot owners.

IX. WEED MANAGEMENT

All noxious weeds on the latest Yellowstone County Noxious Weed List shall be controlled on all properties in the subdivision.

- A Weed Management Plan must be filed and updated as needed for approval by the Yellowstone County Weed Department. Said weed management plan shall contain the noxious weeds being addressed and the plan for the control of those weeds. All associated cost for noxious weed control is the responsibility of the owner of record.
- A revegetation plan shall be submitted as part of the management plan. A seeding recommendation can be obtained from the Yellowstone County Weed Department pursuant to Section 7-22-2152, MCA. The Yellowstone County Weed Department reserves the right to revise these recommendations based on the required site inspection.

X. SOILS/GEOTECHNICAL STUDY

A geotechnical study is not required by the Yellowstone County Subdivision Regulations as part of this plat. Lot owners should be aware that soil characteristics within the area of this subdivision, as described in the 1972 Yellowstone County Soil Survey, indicate that there could be potential limitation for proposed construction on the lots, which may require a geotechnical survey prior to construction.

XI. PHASING OF IMPROVEMENTS

There are no intended phasing improvements.

XII. FINANCIAL GUARANTEES

Except as otherwise provided, Subdivider shall install and construct said required improvements by private contracts secured by bonds, irrevocable letters of credit, sequential development, or any other method that may be acceptable to the Planning Board and Board of County Commissioners. All engineering and legal work in connection with such improvements shall be paid by the contracting parties pursuant to said private contract, and the improvements shall be designed by and constructed under the supervision of a professional engineer competent in civil engineering, licensed in the state of Montana. Upon completion of the improvements, the consulting Engineer shall file with the Public Works Department, a statement certifying that the improvements have been completed in accordance with approved, seal stamped, record drawings, along with all required post-construction certification per Section 4.6.C. of the Yellowstone County Subdivision Regulations..

XIII. LEGAL PROVISIONS

A. Subdivider agrees to guarantee all public improvements for a period of one year from the date of final acceptance by Yellowstone County.

B. The owners of the properties involved in this proposed Subdivision by signature subscribed herein below agree, consent, and shall be bound by the provisions of this Agreement.

C. The covenants, agreements, and all statements in this Agreement apply to and shall be binding on the heirs, personal representatives, successors and assigns of the respective parties.

D. In the event it becomes necessary for either party to this Agreement to retain an attorney to enforce any of the terms or conditions of this Agreement or to give any notice required herein, then the prevailing party or the party giving notice shall be entitled to reasonable attorney fees and costs.

E. Any amendments or modifications of this Agreement or any provisions herein shall be made in writing and executed in the same manner as this original document and shall after execution become a part of this Agreement.

F. Subdivider shall comply with all applicable federal, state, and local statutes, ordinances, and administrative regulations during the performance and discharge of its obligations. Subdivider acknowledges and agrees that nothing contained herein shall relieve or exempt it from such compliance.

G. Subdivider agrees to create any required (or expansion of existing) RSID(s) for future maintenance of all public (or common) constructed improvements prior to final plat approval.

IN WITNESS WHEREOF, the parties hereto have set their hands and official seals on the date first above written.

"SUBDIVIDER" *Cougar Investments, LLC, a Montana limited liability company*

By:_____

Its:_____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____, authorized signatory of *Cougar Investments, LLC, a Montana limited liability company*, known to me to be the person who executed the foregoing instrument and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

This agreement is hereby approved and accepted by Yellowstone County, this ____ day of _____, 20___.

"COUNTY"
COUNTY OF YELLOWSTONE
MONTANA

County of Yellowstone
Board of County Commissioners

By: _____
Chairman

_____
Commissioner

_____
Commissioner

Attest: _____
County Clerk and Recorder

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____, _____, _____, and _____, known to me to be the Board of County Commissioners and the County Clerk and Recorder, respectively, of Yellowstone County, Montana, whose names are subscribed to the foregoing instrument in such capacity and acknowledged to me that they executed the same on behalf of Yellowstone County, Montana.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

Waiver of Right to Protest

FOR VALUABLE CONSIDERATION, the undersigned, being the Subdivider and all of the owners of the hereinafter described real property, do hereby waive the right to protest the formation of one or more Rural Special Improvement Districts (RSID's), for a period of no more than twenty years from the recording of this waiver, which Yellowstone County may require.

This Waiver and Agreement is independent from all the other agreements and is supported by sufficient independent consideration to which the undersigned are parties, and shall run with the land and shall be binding upon the undersigned, their successors and assigns, and the same shall be recorded in the office of the County Clerk and Recorder of Yellowstone County, Montana.

The real property hereinabove mentioned is more particularly describe as follows:

Platinum Commercial Park Subdivision

Signed and dated this _____ day of _____, 20___

"SUBDIVIDER" *Cougar Investments, LLC, a Montana limited liability company*

By:_____

Its:_____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____ day of _____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared _____, authorized signatory of *Cougar Investments, LLC, a Montana limited liability company*, known to me to be the person who executed the foregoing instrument and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

Variance Request
Platinum Commercial Park Subdivision

Platinum Commercial Park Subdivision is a 14-lot major subdivision proposed on the northeast corner of 72nd Street West and Danford Road West. As part of the proposed subdivision, a variance from the requirement to provide connections to adjacent properties is requested in relation to the subject areas eastern boundary.

1. The granting of the variance will not be detrimental to the public health, safety, or general welfare or injurious to other adjoining properties.
The granting of this variance will not be detrimental to the public health, safety, or general welfare or injurious to adjoining properties. The developed area east of the subject property is a residential neighborhood along 68th Street West. The proposed use of Platinum Commercial Park Subdivision will be commercial and industrial, so by limiting/omitting connection to 68th Street West heavy truck and equipment traffic associated with these uses will not unduly be mixed with residential traffic along 68th Street West. Additionally, 68th Street West is not built out to County Road standards, meaning that at least a portion of 68th Street West would be heavily impacted by connecting to the subdivision and potentially be detrimental to the general welfare of those existing residents.

2. Because of the particular physical surroundings, shape, or topographical conditions of the specific property involved, an undue hardship to the owner would result if the strict letter of the regulation was enforced.
68th Street West currently serves as an improved driveway for the six residential lots served on the east side of the roadway. Further, the roadway lies within a dedicated road tract that has not been accepted by Yellowstone County as right-of-way. As such, the legality of allowing another subdivision to send traffic to this roadway is unsure, in addition to placing additional heavy traffic from the proposed subdivision onto the roadway that is currently used by six residential lots. By requiring a connection to the eastern boundary of the subdivision, an undue burden would not only be placed on the owner but on the current residents along 68th Street West.

3. The variance will not result in an increase in taxpayer burden.
The variance would not increase taxpayer burden.

4. The variance will not in any manner place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy.
The subject parcel is outside the zoning boundary of Yellowstone County (property is unzoned).

5. The subdivider must prove that the alternative design is equally effective, and the objectives of the improvements are satisfied.
As the proposed subdivision is intended to be commercial and industrial in use, it is not anticipated cross connection to the property to the east is desired or will be necessitated as the requirement is intended to provide.

Variance Request
Platinum Commercial Park Subdivision

Platinum Commercial Park Subdivision is a 14-lot major subdivision proposed on the northeast corner of 72nd Street West and Danford Road West. As part of the proposed subdivision, a variance from the 600' minimum spacing of connections to adjacent properties is requested in relation to the property to the north of the proposed subdivision.

1. The granting of the variance will not be detrimental to the public health, safety, or general welfare or injurious to other adjoining properties.
The granting of this variance will not be detrimental to the public health, safety, or general welfare or injurious to adjoining properties. A connection to the adjacent property to the north is proposed with the subdivision (Palladium Way) which will enable connection to the adjacent parcel for residents and owners to utilize to go from one subdivision to the other if desired. As the proposed subdivision is intended to be utilized for commercial and industrial uses (will be specified in the subdivision CCRs), limiting the number of connections to the adjacent property to the north will actually serve to potentially limit having heavy truck and equipment traffic intermingling with potentially residential traffic. While it is not guaranteed that the property to the north with be residential, the owner of the adjacent property has been met with and also desires a limited number of connection (s) for this reason.

2. Because of the particular physical surroundings, shape, or topographical conditions of the specific property involved, an undue hardship to the owner would result if the strict letter of the regulation was enforced.
As the proposed subdivision is intended to serve commercial and industrial uses, it is desired to have large lots to facilitate these uses. With an average lot width of 388' along the northern property line, requiring connections to be spaced a minimum of 600' feet apart would unduly require further splitting of the lots into smaller parcels (goes against the need and intent of the subdivision) or place roadway connections between each lot essentially. This would be an undue burden on the owner.

3. The variance will not result in an increase in taxpayer burden.
The variance would not increase taxpayer burden as connection between the subdivision and adjacent parcel to the north is still provided, allowing for traffic from one parcel to travel to the other without imparting more traffic on 72nd Street West or Danford Road West.

4. The variance will not in any manner place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy.
The subject parcel is outside the zoning boundary of Yellowstone County (property is unzoned).

5. The subdivider must prove that the alternative design is equally effective, and the objectives of the improvements are satisfied.
By providing a singular connection to the property to the north, residents and owners within each area can navigate to the other without needing to travel back onto 72nd Street West or Danford Road West, which is the primary intent of this requirement.

Attachment A

Staff Analysis and Recommendation

County Planning, County Public Works, and County Legal staff have reviewed the request for a variance from Yellowstone County Subdivision Regulations Section 4.6.B.2, of the Yellowstone County Subdivision Regulations, which outlines connection to undeveloped/underdeveloped land surrounding proposed subdivisions. Also, from Section 4.6.B.1, the maximum distance between those connections of 600 feet.

The variance request is for this subdivision to make one connection to the north and not to connect to South 68th Street West to the east of the subdivision. South 68th Street West is not a developed street.

1. The granting of the variance will not be detrimental to the public health, safety, or general welfare or injurious to other adjoining properties.

The granting of this variance would not be detrimental to the public health. The reason for the requirement to connect to other land is to prevent subdivision islands where main roads between subdivisions are the only option available to subsequent subdivisions. The connection to the north will provide a connection to the north if that land develops in the future. The connection to the east is an undeveloped road, South 68th Street West, and the development is residential. Several property owners in the residential development use the undeveloped South 68th Street West as a driveway to their homes. In an effort to not have conflict with residential and commercial / industrial traffic, this particular road connection is not being proposed. Staff believes the requested variances will not be detrimental to the area. Commercial/industrial uses have larger lot needs and the requirement to have a connection every 600 feet is more appropriate for residential lots with more typical lot sizes under 1 acre.

2. Because of the particular physical surroundings, shape, or topographical conditions of the specific property involved, an undue hardship to the owner would result if the strict letter of the regulation was enforced.

There are no surrounding physical conditions that would result in an undue hardship to the developer.

3. The variance will not result in an increase in taxpayer burden.

The variance will not increase taxpayer burden.

4. The variance will not in any manner place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy.

Approval of this variance will not place this subdivision in nonconformance of adopted zoning regulations or the growth policy. This subdivision is outside of the Yellowstone County Zoned area.

5. The subdivider must prove that the alternative design is equally effective, and the objectives of the improvements are satisfied.

Staff believes what is being proposed by the developer is a solution that works with the proposed uses within the new subdivision, commercial/industrial. Multiple connections with such large lots being proposed would require the subdivider to re-layout the subdivision and the lots would be smaller. Smaller lots may not be the market this developer is aiming for.

Therefore, staff is recommending approval of the proposed variances and recommends that the Planning Board recommend approval to the Board of County Commissioners.

Platinum Commercial Park

Traffic Impact Study

Prepared on behalf of:

Performance Engineering

December 2024

TRAFFIC & TRANSPORTATION CONSULTING

Traffic Impact Study

Prepared for submittal to:

for the project:

Platinum Commercial Park

on behalf of:

Performance Engineering, LLC

3412 Colton Boulevard, Suite 202
Billings, MT 59102
406.384.0080

by:

406 Traffic and Transportation Consulting
P.O. Box 249
Bozeman, MT 59771

406.922.7300

December 2024

TABLE OF CONTENTS

LIST OF EXHIBITS

APPENDICES

1 INTRODUCTION

This report documents the Traffic Impact Study conducted for the Platinum Commercial Park project to the northeast of the City of Laurel. It is situated at Lot 4, SE 1/4 SW 1/4 Section 30, Township 1 South, Range 25 East, Yellowstone County, Montana. The study documented here was conducted as required by Yellowstone County Subdivision Regulations Section 4.6.C.4.B, in concert with Performance Engineering, LLC.

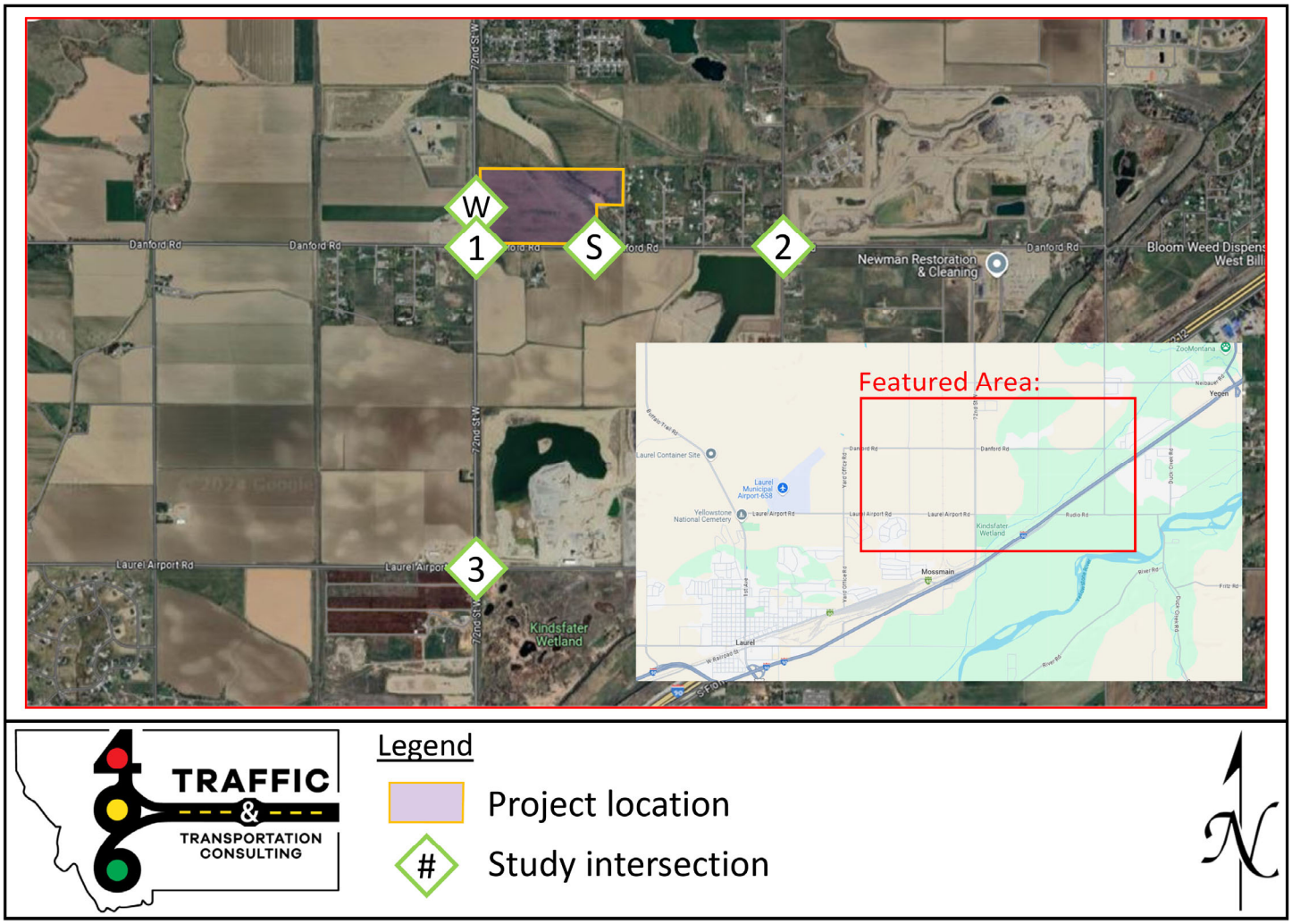
1.1 PROJECT SITE AND STUDY AREA

The site location is shown in **Exhibit 1** along with the intersections studied. The study intersections were identified in coordination with County staff. The three existing study intersections for this project are:

1. S 72nd St W at Danford Road
2. S 64th St W at Danford Road
3. S 72nd St W at Laurel Airport Road

The two access points for the project have also been studied with respect to intersection operations. From here forward in this report, study intersections are generally referred to only by their distinguishing street names (e.g., "72nd at Danford") for the sake of brevity.

Exhibit 1. Overall Site Location and Study Intersections



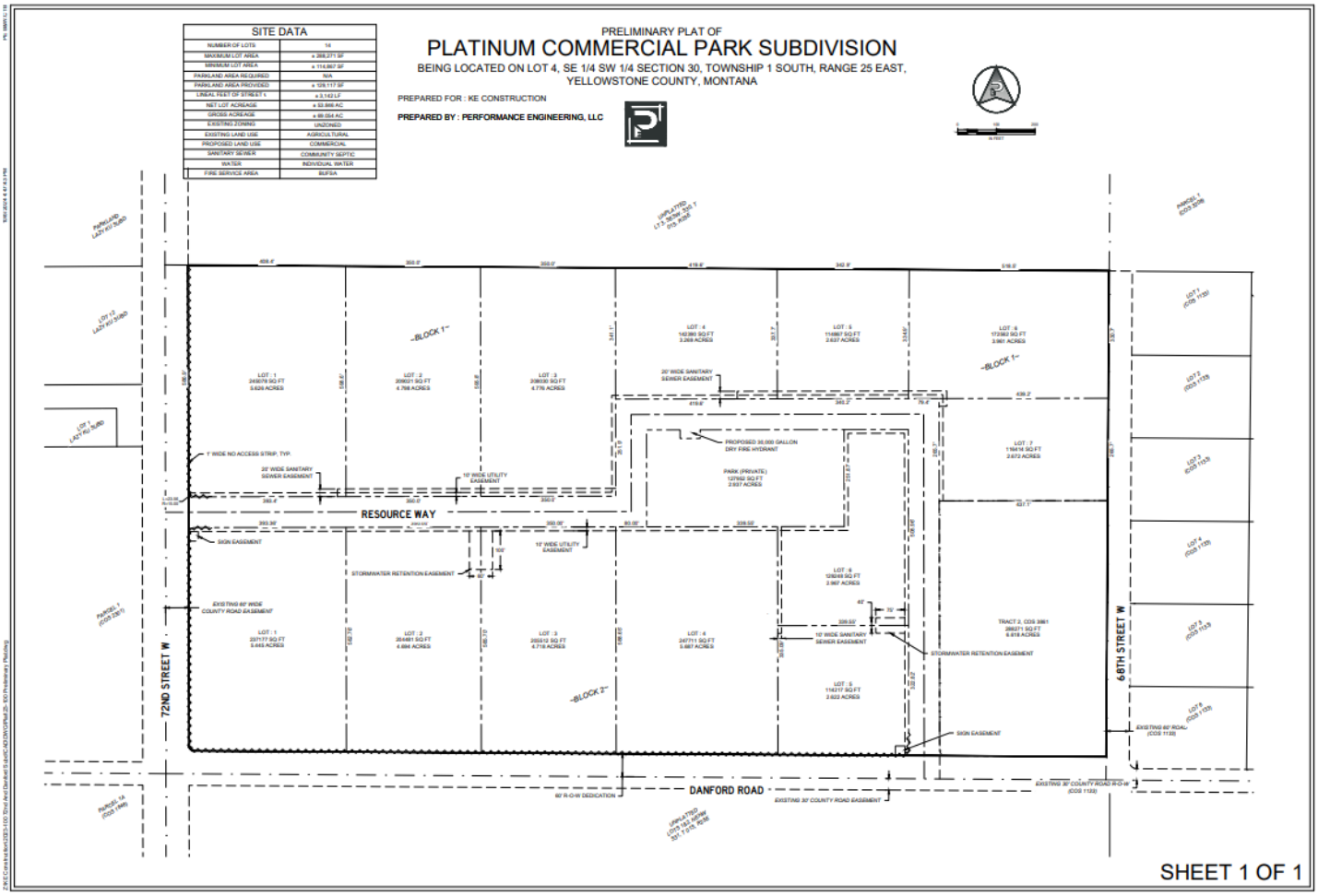
1.2 ZONING AND LAND-USE CONTEXT

The project site is outside of the existing city limits of Laurel and Billings, but the segments of S 72nd St W and Danford Road adjacent to the project site form the boundary of the City of Laurel's planning jurisdiction. The intersection of S 72nd St W and Laurel Airport Road is entirely within Laurel's planning jurisdiction. The proposed development is to be located on what is currently rural, non-qualified agricultural land. Being outside of any city limits, no zoning restrictions are in place for this area. All of the adjacent land uses are either agricultural or rural residential, such as the Lazy Ku subdivision on the west side of S 72nd St W. Most of the project trips will come from the railyard to the south, Laurel's airport to the southwest, Interstate 90 to the south, and the greater Billings area to the northeast.

1.3 PROJECT DESCRIPTION

The proposed project is a new industrial park development to the northeast of Laurel. A new through street named Resource Way will be built completely within the project site, and it will connect to two new site accesses onto Danford Road and S 72nd St W. This new road will bisect the site into two "blocks". The northern block will be divided into seven lots, while the southern block will be divided into six lots, creating a total of thirteen lots on the project site. Each lot will employ an estimated 25 industrial workers, adding to a total of 325 employees. **Exhibit 2** shows the site plan and proposed access point locations for the proposed development.

Exhibit 2. Platinum Commercial Park Site Plan



Source: Performance Engineering, 3/12/2024

1.4 Analysis Methods and References

Operational performance was analyzed at the study intersections using the industry-standard methods presented in the USDOT's Highway Capacity Manual (HCM), published in its modern form as Transportation Research Board Special Report 209. The Synchro software package, version 12, was employed as both a data repository and a capacity analysis tool, with reports for each intersection generated using Synchro's application of the assumptions of the HCM's 7th edition, which is the most recent at the time of this study. The HCM methodology for intersection capacity analysis produces delay estimates for each turning movement (or "lane group", when multiple turning movements operate from the same lane).

As indicated in **Exhibit 3**, these delay estimates are assigned Level of Service (LOS) grades that range from A (best) to F (worst). It's also important to note that for unsignalized intersections with only side-street stop sign control, LOS for the intersection is represented by the LOS for the worst lane group, which are most often on the stop-controlled side street approach. "T" intersections with side-street stop control also fall under this category.

Exhibit 3. LOS Definitions

LOS	Delay, seconds per vehicle
A	0 - 10.0
B	10.1 - 15.0
C	15.1 - 25.0
D	25.1 - 35.0
E	35.1 - 50.0
F	50.1 or more

Source: HCM 7th Edition

Operations impacts are determined by whether LOS relates to acceptability standards. According to the Yellowstone County subdivision regulations, the County employs a peak hour intersection LOS standard of C or better. If the future LOS at any intersection or approach is predicted to be lower than C, traffic mitigation measures such as turning lanes, roundabouts, all-way stops, or traffic signals may be required.

2 EXISTING AND BASE CONDITIONS

2.1 Streets and Intersections

S 72nd St W is a north-south rural major collector in MDT Financial District 5, giving it MDT functional class designation RMA_RMC_345, with one travel lane in each direction and a speed limit of 60 mph in the study area. For those not using Interstate 90 to the south, it serves as part of the primary "backroad" route between Laurel and Billings, connecting to Neibauer Road and King Ave W to the north of the study area. At its southern terminus after crossing over railroad tracks, it turns into Old US 10, which connects to Interstate 90 and Laurel's Main Street. It has no exclusive turn lanes at any of the study intersections and it has no multimodal facilities.

Danford Road is an east-west local road with one travel lane in each direction and a speed limit of 50 mph in the study area. It generally exists to connect local farms and residences to north-south routes such as S 72nd St W, S 64th St W, and S 56th St W, which crosses under Interstate 90 and intersects with S Frontage Road. Danford Road has no exclusive turn lanes at any of its intersections and it has no multimodal facilities.

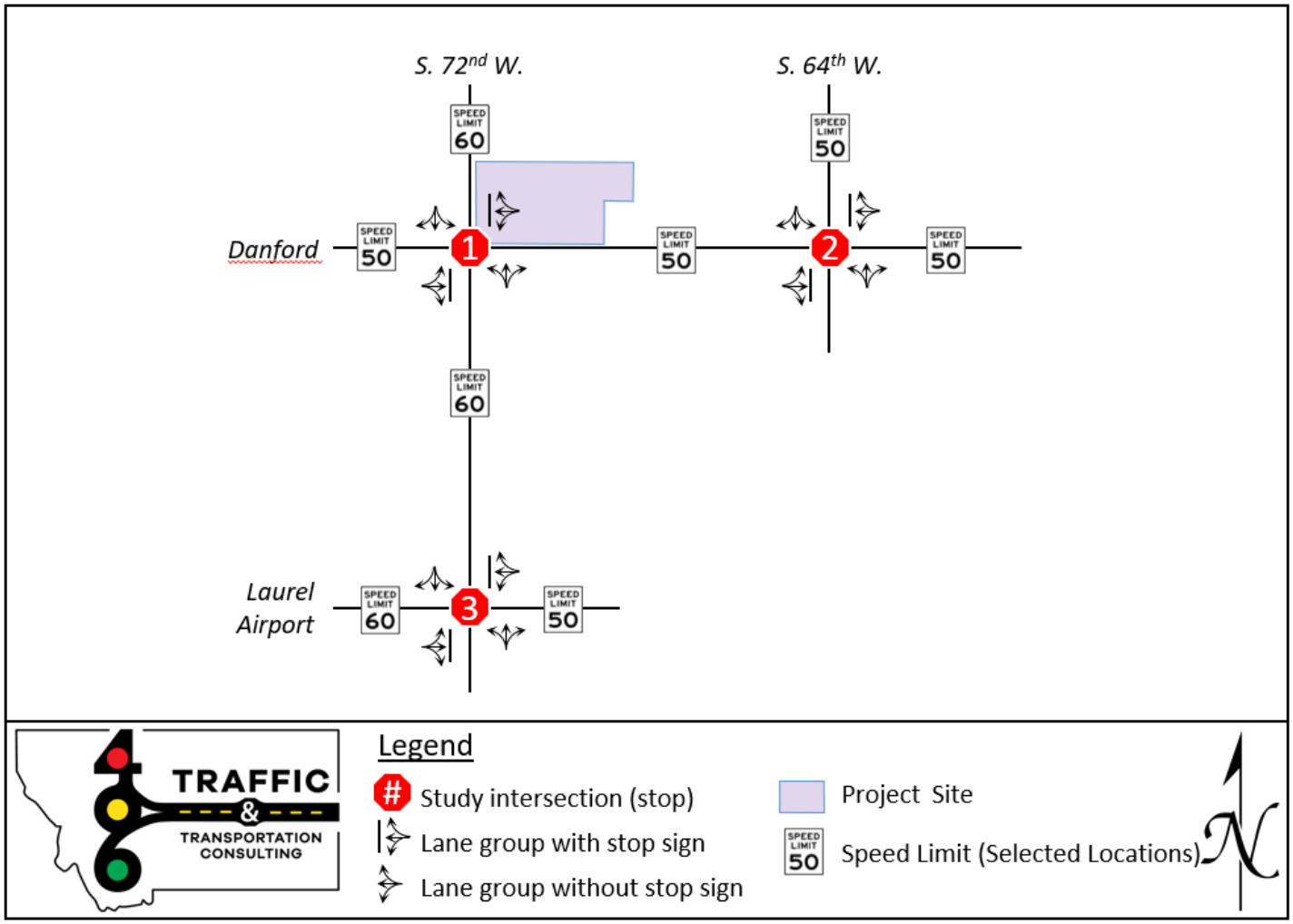
Laurel Airport Road is an east-west rural major collector with a speed limit of 60 mph to the west of S 72nd St W, and it is a local street with a speed limit of 50 mph to the east of S 72nd St W. Laurel Airport Road has one travel lane in each direction. It provides access to the eponymous Laurel Municipal Airport, as well as to a few rural neighborhoods and an MDT maintenance facility. Its western terminus is at Buffalo Trail Road near the Yellowstone National Cemetery, and it simply turns into S 64th St W at its eastern terminus. It has no exclusive turn lanes at any of its intersections and it has no multimodal facilities. There is a flashing red signal head at its intersection with S 72nd St W however.

S 64th St W is a north-south local road with one travel lane in each direction and a speed limit of 50 mph in the study area. It generally exists to connect local farms and neighborhoods to east-west routes such as Danford Road, King Ave W, and Neibauer Rd, which turns into Shiloh Road to the east. S 64th St W turns into Laurel Airport Road at its southern terminus. It is probably not part of the aforementioned preferred non-interstate

route between Billings and Laurel because of its lower speed limits and because of the Elder Grove school zone near its intersection with Hesper Road to the north of the study area. S 64th St W has no exclusive turn lanes at any of its intersections and it has no multimodal facilities in the study area.

No signal-controlled intersections currently exist within the study area. All three study intersections are currently two-way stop controlled. There is a flashing amber signal head at the 72nd intersection with Laurel Airport Road, but no other traffic control exists for north-south traffic in the study area. Note that T-intersections with a stop sign at only one leg of the intersection are also considered two-way stop-controlled. **Exhibit 4** shows traffic control and lane arrangements schematically at each existing intersection, as well as posted speed limits on selected road segments.

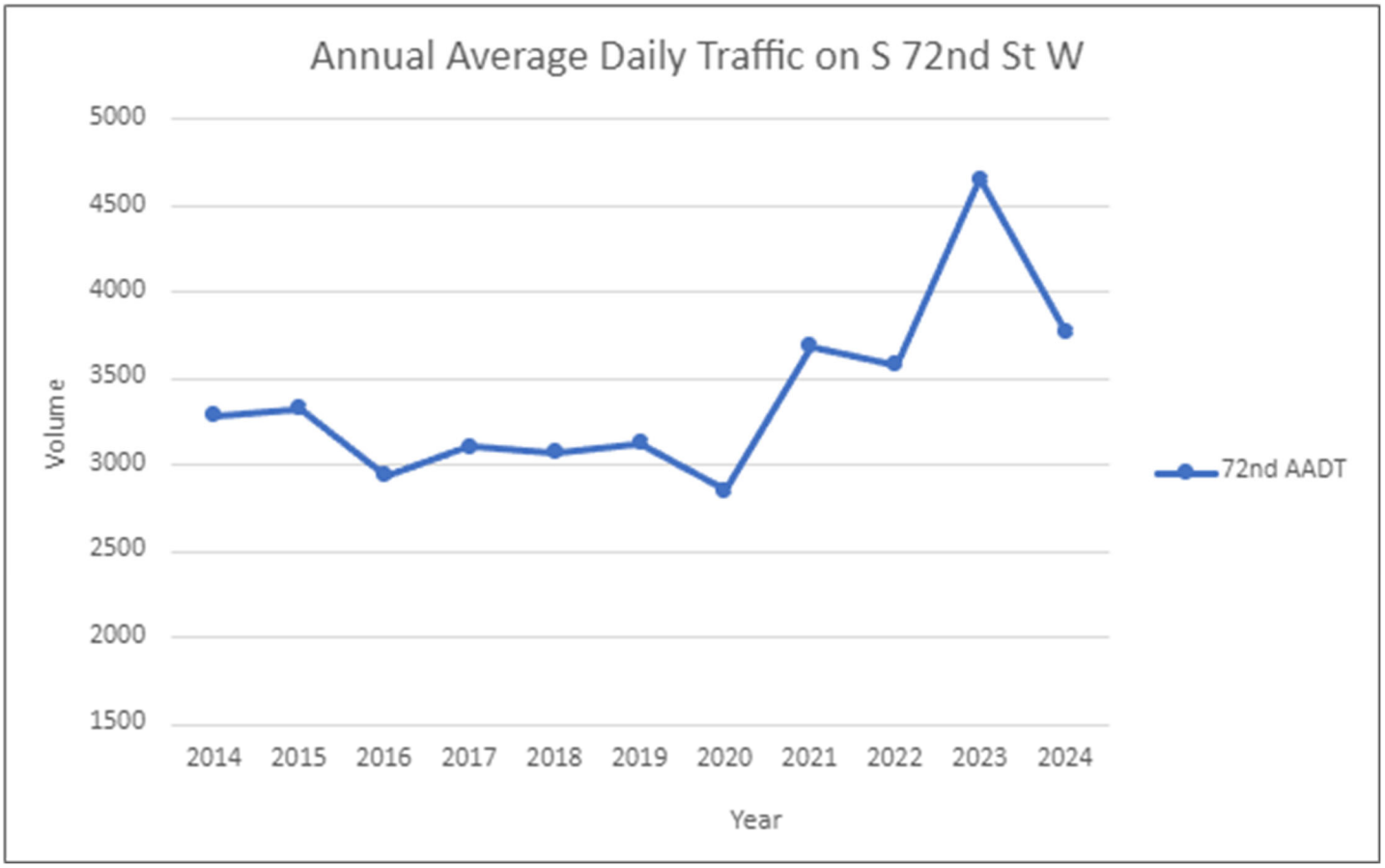
Exhibit 4. Road and Intersection Basics



2.2 Historical Traffic Volumes

Daily traffic information was gathered from the Montana Department of Transportation's (MDT's) public-facing data resource, the Transportation Data Management System. The MDT maintains a permanent traffic counting station on S 72nd St W between Laurel Airport Road and Danford Road from which the annualized average daily traffic (AADT) data was used in this study. These volumes were examined over ten years for a historical perspective. The historical AADT volumes are shown in **Exhibit 5**.

Exhibit 5. Historical AADT



Source: MDT Transportation Data Management System: retrieved 11/25/2024

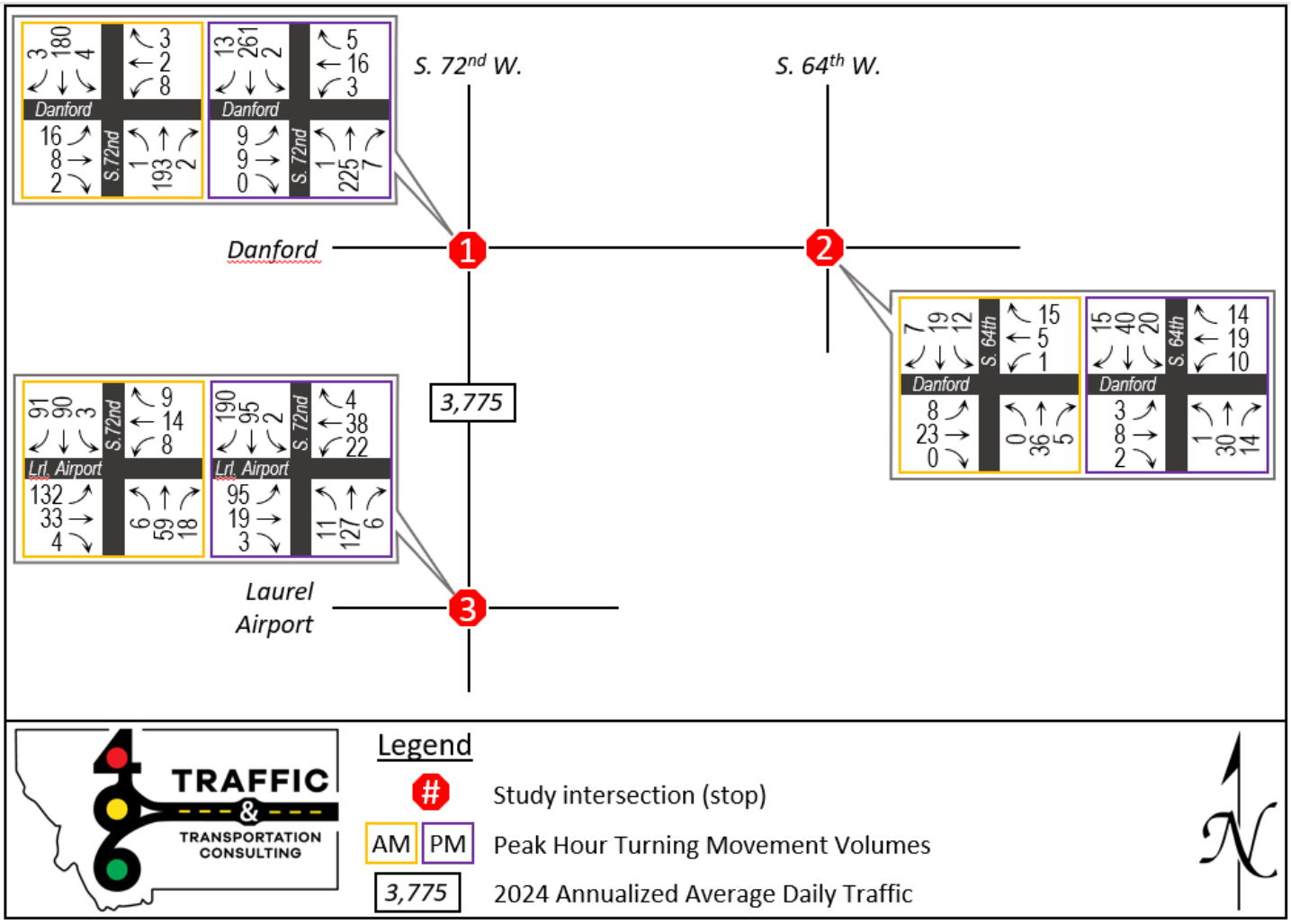
A few trends can be discerned from these data. The COVID-19 pandemic caused a slight decrease in traffic in 2020, but traffic levels quickly rebounded to exceed pre-pandemic levels in 2021. The sharp increase in traffic in 2023 was likely caused by the major MDT project on Interstate 90, which temporarily narrowed the freeway to one travel lane in each direction and closed the S 56th St W underpass. For the duration of construction, this made S 72nd St W a much more attractive route between Laurel and the northern parts of Billings than before. Traffic on S 72nd St W drastically dropped after construction was complete, the S 56th St W underpass was reopened, and all lanes of the interstate returned to normal operations. Aside from these events, a very slow average growth rate has been observed over the past decade. The 10-year average growth rate of 1.4% per year is used for this project's traffic.

2.3 Recent Traffic Counts

The three study intersections were counted for this project from 7-9 a.m. and from 4-6 p.m. on Wednesday, October 30, 2024 using Miovision cameras. Counts were summarized for analysis in 15-minute increments. Based on total entering volume (TEV), the AM peak hour was identified from these counts as starting at 7:15 am at the intersections of 64th and Danford and of 72nd and Laurel Airport Road. The AM peak hour started at 7:30 at the intersection of 72nd and Danford. The PM peak hour started at 4:30 pm at 64th and Danford, 4:45 at 72nd and Laurel Airport Road, and 5:00 pm at 72nd and Danford. The raw count data information is provided in **Appendix A**.

Counts at all three study intersections were adjusted for seasonal variation using the MDT's 2023 seasonal adjustment factor for an October Wednesday on a rural minor arterial/major collector in MDT financial district 5, which is 0.995. Existing annualized traffic volumes based on these counts are shown in **Exhibit 6**.

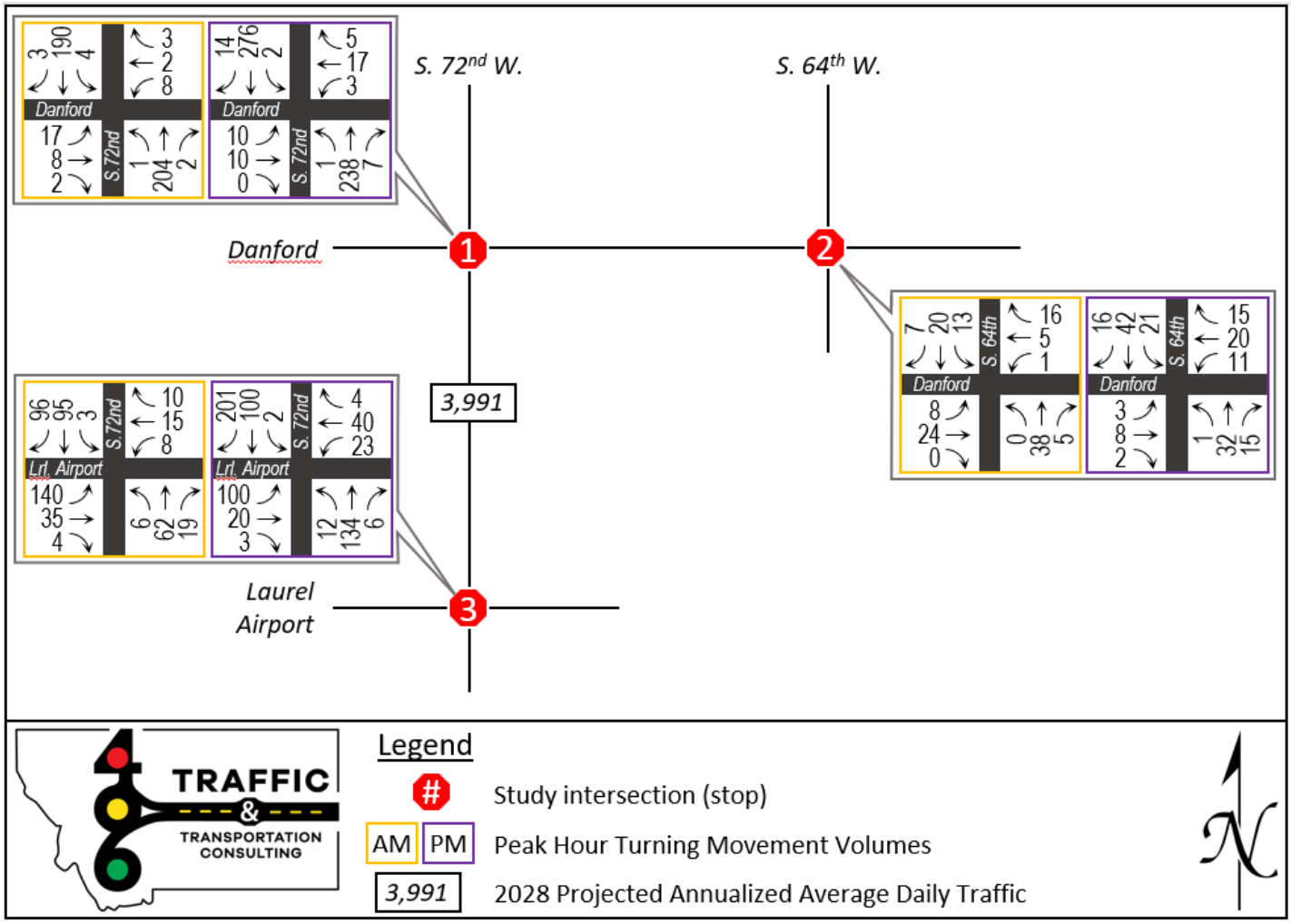
Exhibit 6. Existing Annualized Traffic Volumes



2.4 PROJECTED TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT

Using the aforementioned 1.4% background growth rate, existing traffic was projected four years into the future (2028). This future study year was chosen to reflect the time needed for permitting activities, site preparation, utility work, and the leasing and furnishing of individual industrial lots, along with an additional year to account for traffic associated with the project to stabilize. **Exhibit 7** shows 2028 Background traffic.

Exhibit 7. Projected 2028 Background Traffic Volumes



3 TRIP GENERATION AND DISTRIBUTION

3.1 TRIP GENERATION

Trip generation rates, or equations as applicable, are from the Institute of Transportation Engineers (ITE) Trip Generation package's 11th edition. ITE trip generation data, when aggregated across enough varied sites, produce both simple average rates and best-fit equations, either linear or logarithmic, to help the analyst derive proper estimates for their situation. Equations are generally preferred over rates, especially for larger sites where trip generation per unit of land use can diminish with increasing project size.

Three types of adjustments to trip generation were evaluated for this project. First, a discount is sometimes taken to reflect internal capture where multiple uses are present in a single project site. All of the project site's lots are expected to be used for industrial buildings, so no such discount is taken for this single-use project. Second, modal reductions are sometimes taken where facilities and services for walking, cycling, and transit are more robust than in a "general urban/suburban" environment in which most ITE uses are studied. No such facilities exist near the project site, so no modal reductions are applied. Finally, some land uses attract trips that were already using the adjacent or nearby road network by virtue of improved convenience over a similar site that would have been used before. These are called "pass-by" and "diverted-linked" trips. Pass-by trips are those on streets bordering the site, while diverted-linked trips are those that might go slightly out of their way to stop at the establishment on their way to their destination. These reductions do not apply to this project

because it is located far from any major roadways where travelers might see it on their way to another destination. In addition, few (if any) travelers would be inclined to stop at industrial land uses on their way to another destination.

The summary of projected trip generation for the project is provided in **Exhibit 8**. Note that in/out splits are only meaningful for peak hour traffic.

Exhibit 8. Trip Generation

ITE 130: Industrial Park, X = 325 employees	Daily	AM Peak Hour			PM Peak Hour		
	Equation/rate	**Equation**/rate	In	Out	**Equation**/rate	In	Out
	ln(T)=.68 ln(X)+3.34	ln(T)=.82 ln(X)+0.39	86%	14%	ln(T)=.74 ln(X)+0.93	20%	80%
Trips (T):	1441	168	144	23	183	37	146

Source: Equations from ITE Trip Generation, 11th Edition.

The AM peak hour inbound and outbound traffic appears not to add to the total of 168 trips due to rounding; 168 is a lower calculation result (167.79) rounded up, while 144 and 23 are both slightly higher calculated numbers (144.30 and 23.49, respectively) that are rounded down. Actual numbers, not rounded ones, were used in the next step, trip distribution and assignment.

3.2 Trip Distribution and Assignment

Trip distribution has been estimated for the roads surrounding the project site in percentages that add to 100%. Trip distribution and assignment estimates were developed by considering the site's location relative to regional roadways and other major trip generators. Farther from the site, traffic eventually disperses in smaller percentages to other routes. No project trips were assigned to Laurel Airport Road east of 72nd or to 64th south of Danford Road because there are no major trip generators in those directions. Those roads also do not have any connections to the existing road network outside of the study area. Trip distribution percentages are shown in **Exhibit 9**.

The project trips presented as peak hour intersection turning movement volumes are shown in **Exhibit 10**, and the estimated total intersection volumes with the project are shown in **Exhibit 11**. These total intersection volumes were calculated by adding the new project trips to the 2028 background trips.

Exhibit 9. Distribution of Project Trips

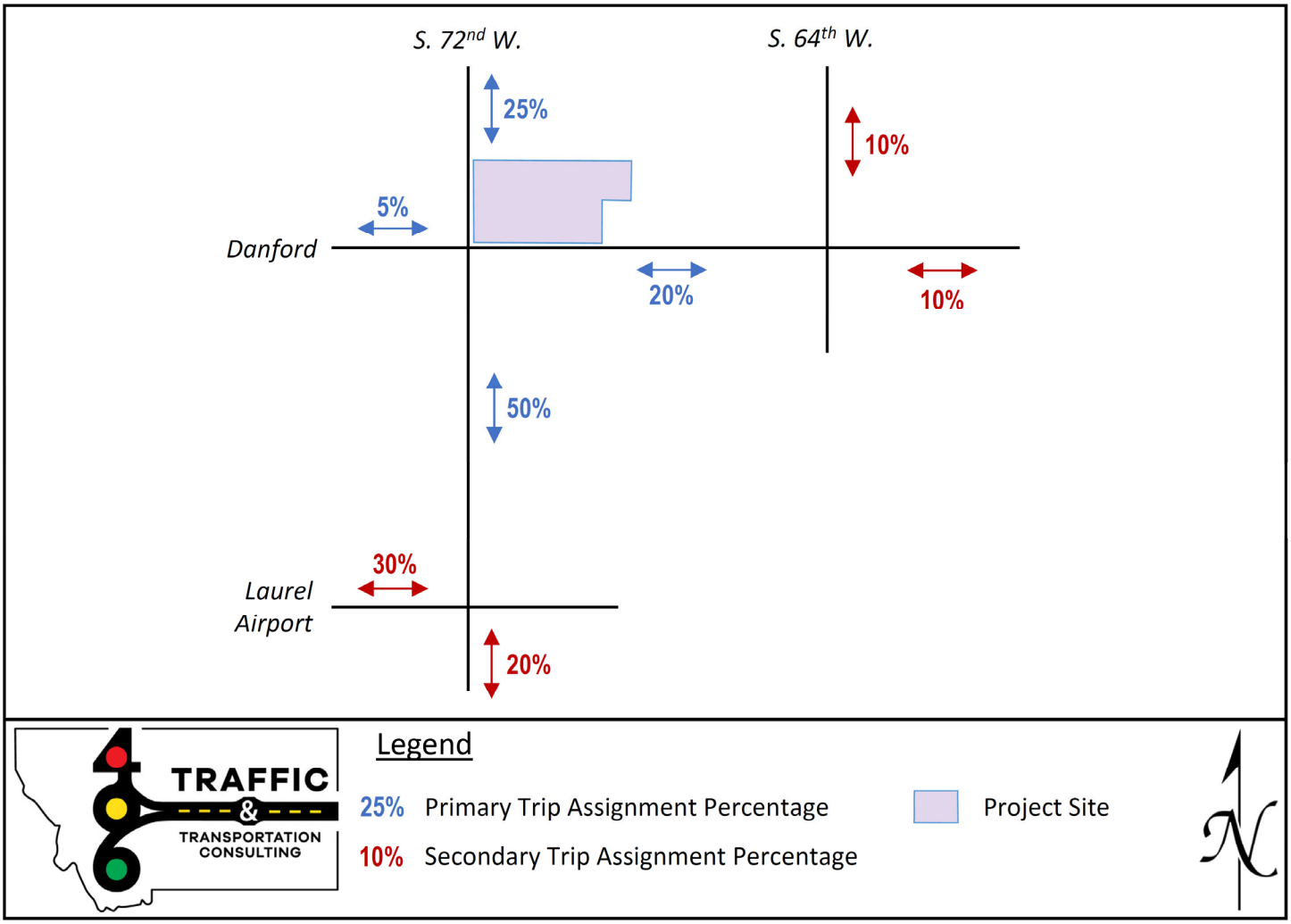


Exhibit 10. Project Trip Assignment

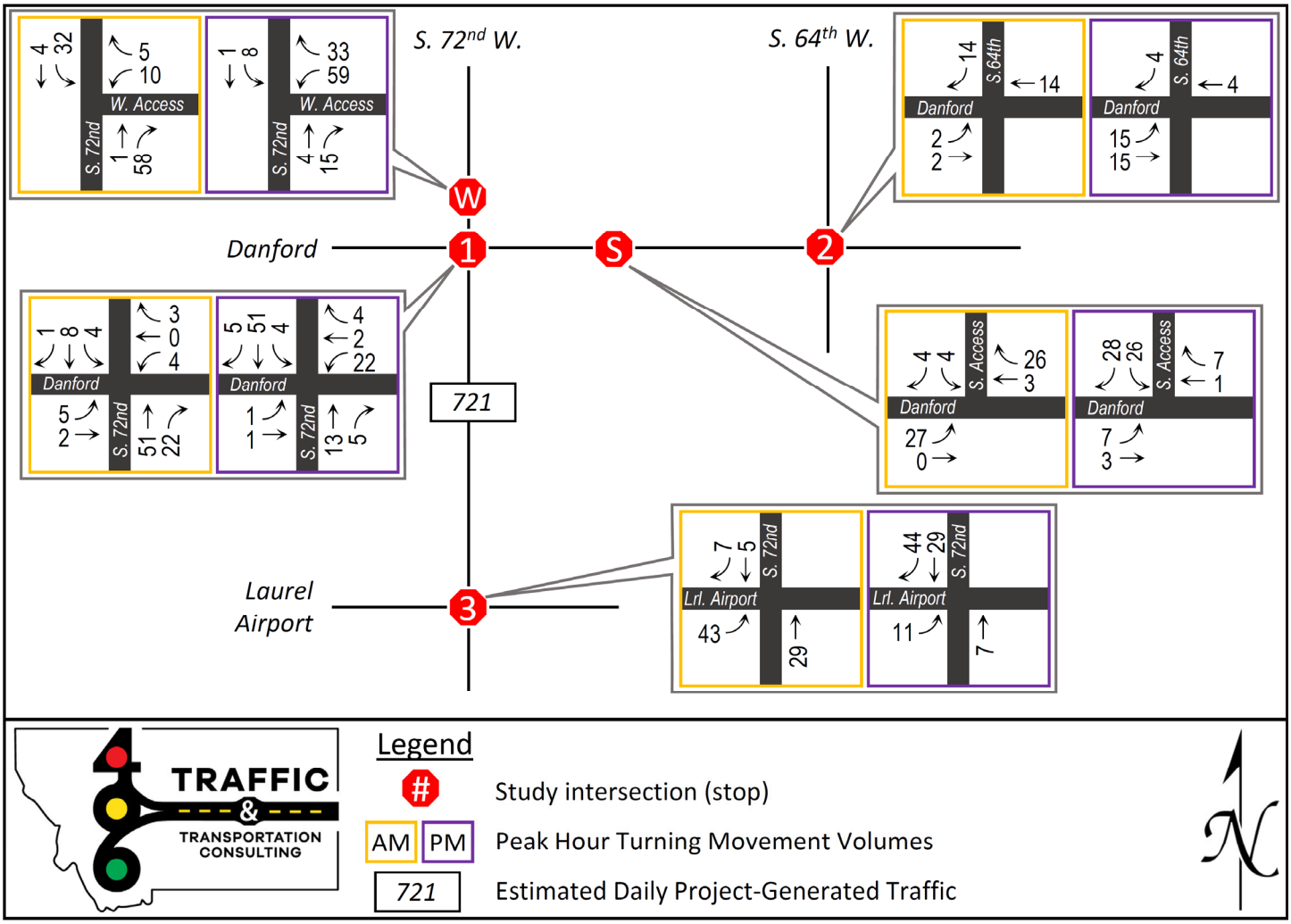
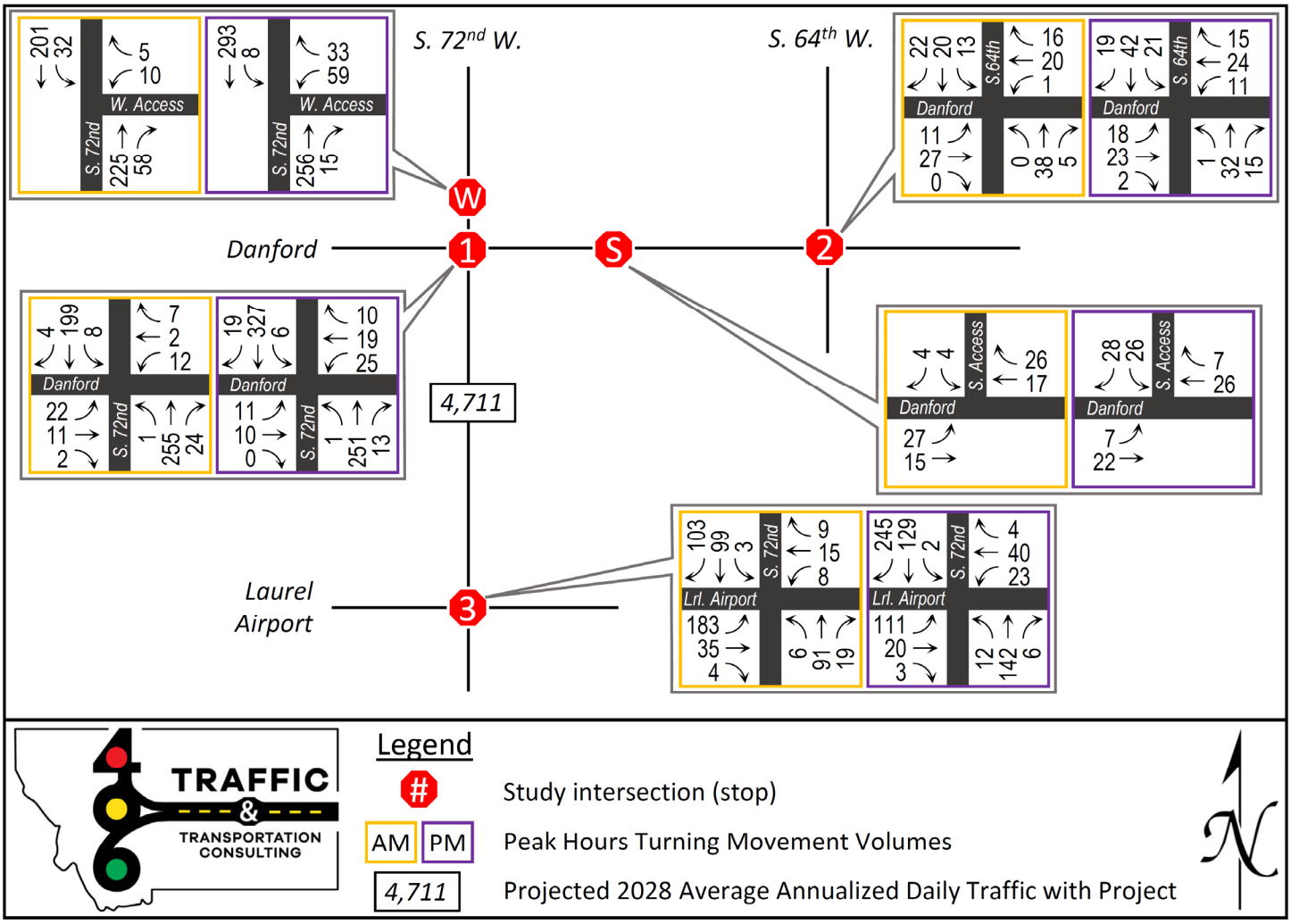


Exhibit 11. 2028 Total Traffic with Project



4 TRAFFIC ANALYSIS RESULTS

4.1 INTERSECTION OPERATIONS

All study intersections operate with two-way stop control (TWSC) in all scenarios. The peak hour intersection Level of Service (LOS) and delay results with and without the project are shown in **Exhibit 12**. Analysis software results are provided in Appendix B.

Exhibit 12. Intersection LOS and Delay Results

	Intersection	LOS (delay, seconds/vehicle) Existing	Future Background	Future With Project	*TWSC Worst Lane Group**
AM Peak	1. 72nd at Danford	B (12.4)	B (12.7)	B (14.2)	Eastbound
	2. 64th at Danford	A (9.9)	A (9.9)	B (10.1)	Eastbound
	3. 72nd at Laurel Airport Road	B (12.4)	B (12.8)	B (14.6)	Eastbound
	4. (A_w) Western Site Access at 72nd	-	-	B (13.1)	Westbound
	5. (A_s) Southern Site Access at Danford	-	-	A (9.2)	Southbound
PM Peak	1. 72nd at Danford	B (13.9)	B (14.4)	C (16.0)	Eastbound
	2. 64th at Danford	B (10.1)	B (10.2)	B (10.7)	Eastbound
	3. 72nd at Laurel Airport Road	B (14.0)	B (14.7)	C (16.7)	Eastbound
	4. (A_w) Western Site Access at 72nd	-	-	B (15.0)	Westbound
	5. (A_s) Southern Site Access at Danford	-	-	A (9.2)	Southbound

* *Worst lane group is the one that determines the intersection LOS at a Two-Way Stop Controlled intersection.*

The results in the table indicate that traffic generated by the project would result in small changes in peak hour delay. Two cases indicate a future LOS that would degrade from B to C under the assumptions used in this study. At the 72nd/Danford intersection, the PM peak hour delay would increase by 1.8 seconds per vehicle for the Eastbound approach, and at the 72nd/Laurel Airport Road intersection, the PM peak hour delay would increase by 2.0 seconds per vehicle, also for the Eastbound approach. The western site access is projected to operate at LOS B, with delay right at the LOS B limit of 15.0 seconds per vehicle, with site traffic in the PM peak hour. With all intersections projected to operate within the peak hour LOS standard documented previously in Section 1.4, no mitigations are necessary to reduce the delay impacts of project-generated traffic.

4.2 AUXILIARY TURN LANES

MDT turn lane analysis was conducted for all turning movements with 40 or more right turning vehicles or 20 or more left turning vehicles on the free-flowing legs of public roads at study intersections and site access points. This analysis was conducted in accordance with the MDT *Traffic Engineering Manual*, Section 28.4.1, using the peak hour total traffic volumes shown previously in Exhibit 10 of this report. For left turn analysis, the MDT chart for a 60 mph design speed was used despite some roadway segments in the study area having current 50 mph posted speed limits because posted speed can vary from design speed. The turning movement conditions that qualified and were subject to this analysis are indicated in **Exhibit 13**, as defined by their peak hour and approach direction.

Exhibit 13. Locations Qualified for Auxiliary Turn Lane Analysis

Intersection	**Right Turns** (40+ vph) AM Peak	PM Peak	**Left Turns** (20+ vph) AM Peak	PM Peak
1. 72nd at Danford	-	-	-	-
2. 64th at Danford	-	-	-	SB*
3. 72nd at Laurel Airport Road	SB	SB		
4. (A_w) Western Site Access at 72nd	NB	-	SB	-
5. (A_s) Southern Site Access at Danford	-	-	EB	-

* *Movement contains no project trips or opposing trips*

Three of the four AM inbound movements at the site access points qualified for turn lane analysis; only the westbound right at the Southern access did not. None of them met MDT's standard for consideration of new turn lanes. The PM southbound left turn at the 64th at Danford intersection was examined as a qualified location despite having no project trips in either the left turn or its opposing movement, but was not close to meeting MDT's standard. The southbound right turn at the 72nd at Laurel Airport Road intersection has very high volumes in both peak hours. A southbound right turn lane is recommended for further study there even without the project, based on the higher peak hour (PM). Completed charts for these auxiliary right- and left-turn lane analyses are provided in Appendix C.

5 CRASH HISTORY ANALYSIS

Information reported in this crash history analysis includes the total number of reported crashes, injuries, and fatalities, the crash frequencies, crash rates, and severity indices, and the types of collisions at each of the three study intersections. Crash data were acquired from MDT for the 5-year time frame between January 1, 2019 and December 31, 2023, the most recent such period for which crash data were available at the time of this study.

5.1 CRASH FREQUENCY

The following formula was used to calculate crash frequencies for each of the three study intersections, where CF = crash frequency measured in crashes per year:

$$CF = \frac{Total\ Crashes\ within\ time\ period}{Time\ Period}$$

5.2 CRASH RATE

Crash rates, measured in crashes per million entering vehicles, were computed using the following formula, where CF = crash frequency measured in crashes per year, and DEV = daily entering volume:

$$Crash\ Rate = \left(\frac{CF}{365} \div DEV\right) \times 1{,}000{,}000$$

The crash frequency is divided by 365 days per year to approximate the average number of crashes per day.

In order to calculate this rate, the project's field data for peak hour entering volume needed to be converted to a daily average. The average daily entering volumes for the study period were calculated using the following formula, where DEV = daily entering volume, Peak Hour TEV = the total entering volume during the study's current PM peak hour, GrowthFactor = the estimated average annual growth rate assumed for this study based on MDT historical data, and k = a K-Factor from MDT's public-facing traffic count database system for the same location on 72nd where AADT is reported:

$$DEV = \frac{Peak\ Hour\ TEV \times k}{GrowthFactor^3}$$

The Peak Hour TEV is divided by the annual growth rate cubed (to represent three years of growth) and multiplied by a 2021 K-Factor to estimate the average daily entering volumes across the five-year period from which crash data is available. For this calculation, the average DEV is assumed to have occurred in 2021, the middle year of that period.

5.3 CRASH SEVERITY INDEX

The formula below was used to calculate the crash severity index for each of the three study intersections, where K = the number of fatal crashes, ABC = the number of crashes involving an injury of any severity, and PDO = the number of property damage only crashes:

$$Severity\ Index = \frac{(8 \times K) + (3 \times ABC) + (1 \times PDO)}{Total\ Crashes}$$

This formula assigns a weight to each crash severity. For example, an injury crash is considered three times as severe as a PDO crash in this calculation. These weighting coefficients are used by MDT and were provided by a Yellowstone County designee for use in this study.

5.4 CRASH ANALYSIS SUMMARY

Exhibit 14 tabulates the results of the study area crash history analysis.

Exhibit 14. Crash History Analysis Results

Reported Crash Types, Injuries, and Fatalities:			
Study Intersection	72nd at Danford	64th at Danford	72nd at Laurel Airport Road
Right angle	2	2	5
Left turn, opposite direction	0	0	2
Rear end	0	0	1
Total Reported Crashes	2	2	8
Total Number of Fatalities	0	0	1
Total Number of Injuries	7	3	5
Crash Severities, Frequencies, and Rates:			
Study Intersection	72nd at Danford	64th at Danford	72nd at Laurel Airport Road
Property Damage Only Crashes	0	0	3
Possible Injury Crashes	0	0	1
Suspected Minor Injury Crashes	1	1	3
Suspected Serious Injury Crashes	1	1	0
Fatal Crashes	0	0	1
Crash Frequency (crashes/year)	0.4	0.4	1.6
Daily Entering Volume, crash study midpoint year	5,278	1,680	5,860
Crash Rate (crashes per million entering vehicles)	0.21	0.65	0.75
Severity Index	3.0	3.0	2.9

The highest crash frequency and crash rate occurred at the intersection of 72nd at Laurel Airport Road, but this intersection also had the highest daily entering volumes. It saw the highest number of PDO crashes, as well as a slightly lower severity index than the other two. While the number of injuries (7) was highest at the intersection of 72nd at Danford, the vehicles involved in the two crashes had more people in them injured than the vehicles involved in injury crashes at other intersections. Most crashes at the three study intersections were right-angle collisions. This was the only type of collision to occur at either Danford intersection, and is often related to the failure of a side-street driver to properly yield the right of way when facing a stop sign.

The only fatal crash to occur at any of the three study intersections during the study period was a rear-end collision at the intersection of 72nd at Laurel Airport Road. While rear-end collisions are usually not the deadliest collision type, this collision involved a stopped motorcycle with two occupants. The fatal crash happened at night and both drivers involved were considered by MDT to be impaired.

6 INTERSECTION COST PARTICIPATION

The net new trips identified in this report are subject to examination under the County's cost participation program to the extent that they would travel through studied intersections. Cost participation has been estimated for the three public-street intersections in this study under the assumptions that (a) the peak with the highest percentage of trips added to the intersection's critical volume governs contribution and (b) site traffic must result in an increase of 2% in total critical-movement volume, after project trips are considered, to be subject to cost participation. Once it's demonstrated that an intersection is eligible, the applicant pays the entire percentage, not just the marginal part above 2%, unless another arrangement is made with the County. **Exhibit 14** shows the intersection cost participation summary for project trips.

Exhibit 14. Intersection Cost Participation

Intersection	AM	PM	Higher Peak, if 2% or Greater
1. 72nd at Danford	5.0%	6.2%	6.2%
2. 64th at Danford	1.5%	1.3%	-%
3. 72nd at Laurel Airport Road	6.0%	1.5%	6.0%
		Total Participation %:	**12.2%**
		x $500,000	**$61,000**

Two of the three intersections studied would experience a high enough critical-movement volume increase due to the project to require participation in the cost of future improvements. The detailed cost participation calculations for project trips are provided in Appendix D.

7 CONCLUSIONS AND RECOMMENDATIONS

The Platinum Commercial Park project has been studied in accordance with Yellowstone County TIS guidelines and the latest traffic engineering industry standards and references for traffic impact analysis. Because no traffic impacts are indicated with respect to the County's LOS C standard for peak hour intersection operations, no mitigations for traffic operations are recommended as a result of this project. A southbound right turn lane on 72nd at Laurel Airport Road has been shown to be warranted even without this project based on design hour volume per MDT guidelines, and is therefore recommended for the County's independent consideration. The intersection cost participation total for the project is 12.2% of $500,000, or $61,000.

This concludes the Platinum Commercial Park Traffic Impact Study.

Appendix A: Raw Traffic Count Data

Study Name **S 72nd St W & Danford Rd**
Start Date **10/30/2024**
Start Time **7:00 AM**
Project **406 West Billings (Laurel)**
Type **Road**
Classification **Totals**

	S 72nd St W Southbound				Danford Road Westbound				S 72nd St W Northbound				Danford Road Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	0	37	4	0	0	1	0	0	0	47	0	0	0	0	1	0
7:15 AM	1	36	1	0	1	0	1	0	1	38	0	0	1	0	2	0
7:30 AM	0	47	2	0	3	0	0	0	0	63	0	0	0	4	6	0
7:45 AM	1	46	0	0	0	1	3	0	0	59	1	0	1	3	5	0
8:00 AM	2	50	1	0	0	0	1	1	1	36	0	0	1	0	1	0
8:15 AM	0	38	1	0	0	1	3	0	1	36	0	0	0	1	4	0
8:30 AM	0	41	1	0	0	1	0	0	1	44	1	0	1	0	1	0
8:45 AM	2	31	0	0	0	0	2	0	2	39	0	0	0	2	7	0
4:00 PM	1	65	1	0	1	0	0	1	4	63	2	0	0	1	4	0
4:15 PM	3	64	0	0	1	0	2	0	1	59	1	0	2	1	4	0
4:30 PM	3	65	0	0	1	0	2	0	0	61	0	0	0	1	4	0
4:45 PM	1	61	0	0	1	3	3	0	1	34	0	0	0	0	7	0
5:00 PM	2	67	0	0	1	8	1	0	1	52	0	0	0	2	0	0
5:15 PM	3	66	0	0	3	2	0	0	3	63	0	0	0	3	0	0
5:30 PM	5	76	0	0	0	5	1	0	2	58	0	0	0	4	5	0
5:45 PM	3	53	2	0	1	1	1	0	1	53	1	0	0	0	4	0

Study Name **S 64th St W & Danford Rd**
Start Date **10/30/2024**
Start Time **7:00 AM**
Project **406 West Billings (Laurel)**
Type **Road**
Classification **Totals**

	S 64th St W Southbound				Danford Road Westbound				S 64th St W Northbound				Danford Road Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	0	0	3	0	0	2	0	0	0	3	0	0	0	4	1	0
7:15 AM	2	4	3	0	1	0	0	0	1	10	0	0	0	4	1	0
7:30 AM	1	4	7	0	2	2	1	0	1	8	0	0	0	10	2	0
7:45 AM	3	6	2	0	8	2	0	0	2	9	0	0	0	5	5	0
8:00 AM	1	5	0	0	4	1	0	0	1	9	0	0	0	4	0	0
8:15 AM	0	1	2	0	2	2	0	0	0	4	0	0	1	4	1	0
8:30 AM	0	3	7	0	1	1	0	0	1	3	0	0	0	2	1	0
8:45 AM	2	4	2	1	0	1	1	0	2	7	0	0	0	4	0	0
4:00 PM	1	7	1	0	1	2	4	0	2	8	0	0	1	2	2	0
4:15 PM	3	7	2	0	2	4	0	0	1	9	0	0	0	3	3	0
4:30 PM	4	15	10	0	4	4	2	0	6	12	0	0	1	1	0	0
4:45 PM	3	8	4	0	1	5	2	0	3	5	1	0	1	2	0	0
5:00 PM	6	9	1	0	7	6	3	0	3	8	0	0	0	2	0	0
5:15 PM	2	8	5	0	2	4	3	0	2	5	0	0	0	3	3	0
5:30 PM	3	10	1	0	1	4	3	0	1	4	0	0	1	3	1	0
5:45 PM	0	6	2	0	2	3	0	0	1	7	1	0	0	2	0	0

Study Name **S 72nd St W & Laurel Airport Rd**
Start Date **10/30/2024**
Start Time **7:00 AM**
Project **406 West Billings (Laurel)**
Type **Road**
Classification **Totals**

	S 72nd St W Southbound				Laurel Airport Road Westbound				S 72nd St W Northbound				Laurel Airport Road Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	9	25	1	0	1	0	3	0	4	16	0	0	0	4	25	0
7:15 AM	17	21	1	0	1	4	2	0	8	12	0	0	1	11	30	0
7:30 AM	23	20	0	0	6	1	3	0	3	19	0	0	0	7	40	0
7:45 AM	30	22	1	0	2	3	1	0	6	21	1	0	2	6	35	0
8:00 AM	21	27	1	0	0	6	2	0	1	7	5	0	1	9	28	0
8:15 AM	18	20	7	0	4	1	4	0	6	12	5	0	0	5	20	0
8:30 AM	15	23	2	0	6	1	5	0	1	9	5	0	1	5	33	0
8:45 AM	17	16	2	0	1	2	3	0	3	12	6	0	3	10	26	0
4:00 PM	39	25	4	0	7	5	8	0	1	39	1	0	0	3	25	0
4:15 PM	24	34	4	0	2	4	6	0	4	33	1	0	1	9	32	0
4:30 PM	41	22	3	0	4	8	1	0	1	29	1	0	0	10	21	0
4:45 PM	44	23	1	0	1	10	7	0	2	21	6	0	0	5	20	0
5:00 PM	54	27	0	0	0	10	5	0	2	31	1	0	1	9	25	0
5:15 PM	46	18	0	0	0	7	3	0	1	43	1	0	0	5	26	0
5:30 PM	47	27	1	0	3	11	7	0	1	33	3	0	2	0	24	0
5:45 PM	28	28	0	0	0	2	5	0	0	24	1	0	1	7	26	0

Appendix B: Analysis Software Output

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	16	8	2	8	2	3	1	193	2	4	180	3
Future Vol, veh/h	16	8	2	8	2	3	1	193	2	4	180	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	15	15	15	11	11	11	11	11	11
Mvmt Flow	19	9	2	9	2	4	1	227	2	5	212	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	454	455	214	456	455	228	215	0	0	229	0	0
Stage 1	223	223	-	231	231	-	-	-	-	-	-	-
Stage 2	231	232	-	226	225	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.25	6.65	6.35	4.21	-	-	4.21	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.25	5.65	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.25	5.65	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.635	4.135	3.435	2.299	-	-	2.299	-	-
Pot Cap-1 Maneuver	513	498	821	493	482	780	1303	-	-	1287	-	-
Stage 1	775	715	-	744	690	-	-	-	-	-	-	-
Stage 2	768	709	-	748	694	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	506	496	821	480	480	780	1303	-	-	1287	-	-
Mov Cap-2 Maneuver	506	496	-	480	480	-	-	-	-	-	-	-
Stage 1	772	712	-	743	689	-	-	-	-	-	-	-
Stage 2	761	708	-	733	691	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	12.39	12.04	0.04	0.17
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	9	-	-	518	526	38	-	-
HCM Lane V/C Ratio	0.001	-	-	0.059	0.029	0.004	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	12.4	12	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	23	0	1	5	15	0	36	5	12	19	7
Future Vol, veh/h	8	23	0	1	5	15	0	36	5	12	19	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	6	6	6	5	5	5	2	2	2	11	11	11
Mvmt Flow	10	29	0	1	6	19	0	46	6	15	24	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	109	112	29	119	113	49	33	0	0	53	0	0
Stage 1	60	60	-	49	49	-	-	-	-	-	-	-
Stage 2	49	53	-	70	64	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.56	6.26	7.15	6.55	6.25	4.12	-	-	4.21	-	-
Critical Hdwy Stg 1	6.16	5.56	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.56	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.054	3.354	3.545	4.045	3.345	2.218	-	-	2.299	-	-
Pot Cap-1 Maneuver	860	771	1035	849	771	1011	1578	-	-	1497	-	-
Stage 1	942	837	-	956	848	-	-	-	-	-	-	-
Stage 2	954	843	-	933	836	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	828	762	1035	808	763	1011	1578	-	-	1497	-	-
Mov Cap-2 Maneuver	828	762	-	808	763	-	-	-	-	-	-	-
Stage 1	932	829	-	956	848	-	-	-	-	-	-	-
Stage 2	929	843	-	890	827	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	9.87	9	0	2.35
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1578	-	-	778	928	539	-	-
HCM Lane V/C Ratio	-	-	-	0.051	0.029	0.01	-	-
HCM Ctrl Dly (s/v)	0	-	-	9.9	9	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	132	33	4	8	14	9	6	59	18	3	90	91
Future Vol, veh/h	132	33	4	8	14	9	6	59	18	3	90	91
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	48	48	48	20	20	20	8	8	8
Mvmt Flow	147	37	4	9	16	10	7	66	20	3	100	101

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	244	256	151	214	297	76	201	0	0	86	0	0
Stage 1	157	157	-	89	89	-	-	-	-	-	-	-
Stage 2	87	99	-	125	208	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.58	6.98	6.68	4.3	-	-	4.18	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.58	5.98	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.58	5.98	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.932	4.432	3.732	2.38	-	-	2.272	-	-
Pot Cap-1 Maneuver	710	648	896	654	545	872	1270	-	-	1474	-	-
Stage 1	845	768	-	817	740	-	-	-	-	-	-	-
Stage 2	921	813	-	779	652	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	676	643	896	609	541	872	1270	-	-	1474	-	-
Mov Cap-2 Maneuver	676	643	-	609	541	-	-	-	-	-	-	-
Stage 1	843	766	-	812	736	-	-	-	-	-	-	-
Stage 2	886	809	-	737	650	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	12.4	11.06	0.57	0.12
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	124	-	-	673	628	27	-	-
HCM Lane V/C Ratio	0.005	-	-	0.279	0.055	0.002	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	12.4	11.1	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.1	0.2	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	9	0	3	16	5	1	225	7	2	261	13
Future Vol, veh/h	9	9	0	3	16	5	1	225	7	2	261	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	4	4	4	2	2	2
Mvmt Flow	10	10	0	3	18	6	1	253	8	2	293	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	569	568	301	562	571	257	308	0	0	261	0	0
Stage 1	305	305	-	259	259	-	-	-	-	-	-	-
Stage 2	264	263	-	303	312	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	436	435	744	435	428	777	1241	-	-	1304	-	-
Stage 1	709	666	-	741	690	-	-	-	-	-	-	-
Stage 2	746	695	-	702	654	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	413	434	744	423	426	777	1241	-	-	1304	-	-
Mov Cap-2 Maneuver	413	434	-	423	426	-	-	-	-	-	-	-
Stage 1	707	664	-	741	689	-	-	-	-	-	-	-
Stage 2	720	694	-	690	652	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	13.93	13.12	0.03	0.06
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	8	-	-	423	470	13	-	-
HCM Lane V/C Ratio	0.001	-	-	0.048	0.057	0.002	-	-
HCM Ctrl Dly (s/v)	7.9	0	-	13.9	13.1	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	8	2	10	19	14	1	30	14	20	40	15
Future Vol, veh/h	3	8	2	10	19	14	1	30	14	20	40	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	15	15	15	9	9	9	4	4	4	5	5	5
Mvmt Flow	4	11	3	13	25	19	1	40	19	27	53	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	172	178	63	164	179	49	73	0	0	59	0	0
Stage 1	117	117	-	52	52	-	-	-	-	-	-	-
Stage 2	55	61	-	112	127	-	-	-	-	-	-	-
Critical Hdwy	7.25	6.65	6.35	7.19	6.59	6.29	4.14	-	-	4.15	-	-
Critical Hdwy Stg 1	6.25	5.65	-	6.19	5.59	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.25	5.65	-	6.19	5.59	-	-	-	-	-	-	-
Follow-up Hdwy	3.635	4.135	3.435	3.581	4.081	3.381	2.236	-	-	2.245	-	-
Pot Cap-1 Maneuver	763	693	966	785	703	1000	1514	-	-	1526	-	-
Stage 1	857	775	-	943	838	-	-	-	-	-	-	-
Stage 2	925	819	-	876	778	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	708	680	966	756	689	1000	1514	-	-	1526	-	-
Mov Cap-2 Maneuver	708	680	-	756	689	-	-	-	-	-	-	-
Stage 1	842	760	-	942	837	-	-	-	-	-	-	-
Stage 2	879	818	-	846	764	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	10.13	9.95	0.16	1.97
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	38	-	-	719	785	455	-	-
HCM Lane V/C Ratio	0.001	-	-	0.024	0.073	0.017	-	-
HCM Ctrl Dly (s/v)	7.4	0	-	10.1	9.9	7.4	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	95	19	3	22	38	4	11	127	6	2	95	190
Future Vol, veh/h	95	19	3	22	38	4	11	127	6	2	95	190
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	5	5	5	10	10	10	3	3	3
Mvmt Flow	102	20	3	24	41	4	12	137	6	2	102	204

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	389	375	204	280	474	140	306	0	0	143	0	0
Stage 1	209	209	-	163	163	-	-	-	-	-	-	-
Stage 2	181	167	-	117	311	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.55	6.25	4.2	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.045	3.345	2.29	-	-	2.227	-	-
Pot Cap-1 Maneuver	570	556	836	666	484	900	1210	-	-	1434	-	-
Stage 1	793	729	-	832	757	-	-	-	-	-	-	-
Stage 2	821	760	-	881	653	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	513	549	836	631	478	900	1210	-	-	1434	-	-
Mov Cap-2 Maneuver	513	549	-	631	478	-	-	-	-	-	-	-
Stage 1	792	728	-	823	749	-	-	-	-	-	-	-
Stage 2	764	752	-	851	652	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	14.04	12.65	0.61	0.05
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	136	-	-	523	539	11	-	-
HCM Lane V/C Ratio	0.01	-	-	0.24	0.128	0.002	-	-
HCM Ctrl Dly (s/v)	8	0	-	14	12.7	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.4	0	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	8	2	8	2	3	1	204	2	4	190	3
Future Vol, veh/h	17	8	2	8	2	3	1	204	2	4	190	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	15	15	15	11	11	11	11	11	11
Mvmt Flow	20	9	2	9	2	4	1	240	2	5	224	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	478	479	225	481	480	241	227	0	0	242	0	0
Stage 1	235	235	-	244	244	-	-	-	-	-	-	-
Stage 2	244	245	-	238	236	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.25	6.65	6.35	4.21	-	-	4.21	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.25	5.65	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.25	5.65	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.635	4.135	3.435	2.299	-	-	2.299	-	-
Pot Cap-1 Maneuver	494	483	809	474	467	767	1290	-	-	1273	-	-
Stage 1	764	707	-	732	681	-	-	-	-	-	-	-
Stage 2	756	700	-	737	686	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	487	480	809	461	464	767	1290	-	-	1273	-	-
Mov Cap-2 Maneuver	487	480	-	461	464	-	-	-	-	-	-	-
Stage 1	761	704	-	731	680	-	-	-	-	-	-	-
Stage 2	749	699	-	722	683	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	12.7	12.3	0.04	0.16
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	9	-	-	499	509	36	-	-
HCM Lane V/C Ratio	0.001	-	-	0.064	0.03	0.004	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	12.7	12.3	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	24	0	1	5	16	0	38	5	13	20	7
Future Vol, veh/h	8	24	0	1	5	16	0	38	5	13	20	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	6	6	6	5	5	5	2	2	2	11	11	11
Mvmt Flow	10	31	0	1	6	21	0	49	6	17	26	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	115	119	30	126	120	52	35	0	0	55	0	0
Stage 1	63	63	-	52	52	-	-	-	-	-	-	-
Stage 2	52	55	-	74	68	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.56	6.26	7.15	6.55	6.25	4.12	-	-	4.21	-	-
Critical Hdwy Stg 1	6.16	5.56	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.56	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.054	3.354	3.545	4.045	3.345	2.218	-	-	2.299	-	-
Pot Cap-1 Maneuver	852	764	1033	840	765	1007	1577	-	-	1494	-	-
Stage 1	937	834	-	953	846	-	-	-	-	-	-	-
Stage 2	951	841	-	928	832	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	818	756	1033	797	756	1007	1577	-	-	1494	-	-
Mov Cap-2 Maneuver	818	756	-	797	756	-	-	-	-	-	-	-
Stage 1	927	825	-	953	846	-	-	-	-	-	-	-
Stage 2	924	841	-	883	823	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	9.94	9.01	0	2.42
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1577	-	-	770	926	556	-	-
HCM Lane V/C Ratio	-	-	-	0.053	0.03	0.011	-	-
HCM Ctrl Dly (s/v)	0	-	-	9.9	9	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	140	35	4	8	15	9	6	62	19	3	95	96
Future Vol, veh/h	140	35	4	8	15	9	6	62	19	3	95	96
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	48	48	48	20	20	20	8	8	8
Mvmt Flow	156	39	4	9	17	10	7	69	21	3	106	107

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	256	269	159	224	312	79	212	0	0	90	0	0
Stage 1	166	166	-	93	93	-	-	-	-	-	-	-
Stage 2	91	103	-	132	219	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.58	6.98	6.68	4.3	-	-	4.18	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.58	5.98	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.58	5.98	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.932	4.432	3.732	2.38	-	-	2.272	-	-
Pot Cap-1 Maneuver	697	637	886	644	534	867	1258	-	-	1468	-	-
Stage 1	836	761	-	813	737	-	-	-	-	-	-	-
Stage 2	917	810	-	773	644	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	662	632	886	596	530	867	1258	-	-	1468	-	-
Mov Cap-2 Maneuver	662	632	-	596	530	-	-	-	-	-	-	-
Stage 1	834	759	-	808	733	-	-	-	-	-	-	-
Stage 2	881	805	-	728	642	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	12.8	11.22	0.54	0.12
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	119	-	-	660	614	25	-	-
HCM Lane V/C Ratio	0.005	-	-	0.302	0.058	0.002	-	-
HCM Ctrl Dly (s/v)	7.9	0	-	12.8	11.2	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.3	0.2	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	9	0	3	17	5	1	238	7	2	276	14
Future Vol, veh/h	9	9	0	3	17	5	1	238	7	2	276	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	4	4	4	2	2	2
Mvmt Flow	10	10	0	3	19	6	1	267	8	2	310	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	602	600	318	593	604	271	326	0	0	275	0	0
Stage 1	322	322	-	274	274	-	-	-	-	-	-	-
Stage 2	279	278	-	320	330	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	415	417	727	414	410	763	1223	-	-	1288	-	-
Stage 1	694	654	-	728	680	-	-	-	-	-	-	-
Stage 2	732	684	-	688	642	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	391	416	727	403	409	763	1223	-	-	1288	-	-
Mov Cap-2 Maneuver	391	416	-	403	409	-	-	-	-	-	-	-
Stage 1	692	653	-	727	679	-	-	-	-	-	-	-
Stage 2	705	684	-	676	641	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	14.4	13.54	0.03	0.05
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	7	-	-	403	450	12	-	-
HCM Lane V/C Ratio	0.001	-	-	0.05	0.062	0.002	-	-
HCM Ctrl Dly (s/v)	7.9	0	-	14.4	13.5	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	8	2	11	20	15	1	32	15	21	42	16
Future Vol, veh/h	3	8	2	11	20	15	1	32	15	21	42	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	15	15	15	9	9	9	4	4	4	5	5	5
Mvmt Flow	4	11	3	15	27	20	1	43	20	28	56	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	181	188	67	173	189	53	77	0	0	63	0	0
Stage 1	123	123	-	55	55	-	-	-	-	-	-	-
Stage 2	59	65	-	117	133	-	-	-	-	-	-	-
Critical Hdwy	7.25	6.65	6.35	7.19	6.59	6.29	4.14	-	-	4.15	-	-
Critical Hdwy Stg 1	6.25	5.65	-	6.19	5.59	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.25	5.65	-	6.19	5.59	-	-	-	-	-	-	-
Follow-up Hdwy	3.635	4.135	3.435	3.581	4.081	3.381	2.236	-	-	2.245	-	-
Pot Cap-1 Maneuver	752	684	962	775	694	995	1509	-	-	1521	-	-
Stage 1	851	770	-	939	835	-	-	-	-	-	-	-
Stage 2	921	816	-	871	773	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	694	670	962	745	680	995	1509	-	-	1521	-	-
Mov Cap-2 Maneuver	694	670	-	745	680	-	-	-	-	-	-	-
Stage 1	835	755	-	939	834	-	-	-	-	-	-	-
Stage 2	873	815	-	839	758	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	10.21	10.03	0.15	1.97
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	35	-	-	709	776	453	-	-
HCM Lane V/C Ratio	0.001	-	-	0.024	0.079	0.018	-	-
HCM Ctrl Dly (s/v)	7.4	0	-	10.2	10	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	100	20	3	23	40	4	12	135	6	2	100	201
Future Vol, veh/h	100	20	3	23	40	4	12	135	6	2	100	201
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	5	5	5	10	10	10	3	3	3
Mvmt Flow	108	22	3	25	43	4	13	145	6	2	108	216

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	412	397	216	297	502	148	324	0	0	152	0	0
Stage 1	220	220	-	174	174	-	-	-	-	-	-	-
Stage 2	192	177	-	123	328	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.55	6.25	4.2	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.045	3.345	2.29	-	-	2.227	-	-
Pot Cap-1 Maneuver	550	540	824	650	467	890	1192	-	-	1423	-	-
Stage 1	783	721	-	821	749	-	-	-	-	-	-	-
Stage 2	809	752	-	874	642	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	490	533	824	613	461	890	1192	-	-	1423	-	-
Mov Cap-2 Maneuver	490	533	-	613	461	-	-	-	-	-	-	-
Stage 1	781	720	-	811	740	-	-	-	-	-	-	-
Stage 2	750	743	-	843	641	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	14.73	13.03	0.63	0.05
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	140	-	-	502	520	10	-	-
HCM Lane V/C Ratio	0.011	-	-	0.264	0.139	0.002	-	-
HCM Ctrl Dly (s/v)	8.1	0	-	14.7	13	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.1	0.5	0	-	-

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	22	11	2	12	2	7	1	255	24	8	199	4
Future Vol, veh/h	22	11	2	12	2	7	1	255	24	8	199	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	15	15	15	11	11	11	11	11	11
Mvmt Flow	26	13	2	14	2	8	1	300	28	9	234	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	559	586	236	576	574	314	239	0	0	328	0	0
Stage 1	255	255	-	316	316	-	-	-	-	-	-	-
Stage 2	304	331	-	259	258	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.25	6.65	6.35	4.21	-	-	4.21	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.25	5.65	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.25	5.65	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.635	4.135	3.435	2.299	-	-	2.299	-	-
Pot Cap-1 Maneuver	437	420	798	410	412	697	1277	-	-	1182	-	-
Stage 1	745	692	-	668	632	-	-	-	-	-	-	-
Stage 2	702	642	-	718	671	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	425	415	798	392	407	697	1277	-	-	1182	-	-
Mov Cap-2 Maneuver	425	415	-	392	407	-	-	-	-	-	-	-
Stage 1	738	686	-	667	631	-	-	-	-	-	-	-
Stage 2	690	641	-	695	665	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	14.18	13.26	0.03	0.31
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	6	-	-	433	461	68	-	-
HCM Lane V/C Ratio	0.001	-	-	0.095	0.054	0.008	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	14.2	13.3	8.1	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.2	0	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	27	0	1	20	16	0	38	5	13	20	22
Future Vol, veh/h	11	27	0	1	20	16	0	38	5	13	20	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	6	6	6	5	5	5	2	2	2	11	11	11
Mvmt Flow	14	35	0	1	26	21	0	49	6	17	26	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	135	128	40	128	139	52	54	0	0	55	0	0
Stage 1	73	73	-	52	52	-	-	-	-	-	-	-
Stage 2	62	55	-	76	87	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.56	6.26	7.15	6.55	6.25	4.12	-	-	4.21	-	-
Critical Hdwy Stg 1	6.16	5.56	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.56	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.054	3.354	3.545	4.045	3.345	2.218	-	-	2.299	-	-
Pot Cap-1 Maneuver	828	755	1020	838	746	1007	1552	-	-	1494	-	-
Stage 1	927	826	-	953	846	-	-	-	-	-	-	-
Stage 2	940	841	-	925	817	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	774	746	1020	790	738	1007	1552	-	-	1494	-	-
Mov Cap-2 Maneuver	774	746	-	790	738	-	-	-	-	-	-	-
Stage 1	916	817	-	953	846	-	-	-	-	-	-	-
Stage 2	893	841	-	876	807	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	10.1	9.56	0	1.76
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1552	-	-	754	836	385	-	-
HCM Lane V/C Ratio	-	-	-	0.065	0.057	0.011	-	-
HCM Ctrl Dly (s/v)	0	-	-	10.1	9.6	7.4	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	183	35	4	8	15	9	6	91	19	3	99	103
Future Vol, veh/h	183	35	4	8	15	9	6	91	19	3	99	103
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	48	48	48	20	20	20	8	8	8
Mvmt Flow	203	39	4	9	17	10	7	101	21	3	110	114

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	297	309	167	261	356	112	224	0	0	122	0	0
Stage 1	174	174	-	125	125	-	-	-	-	-	-	-
Stage 2	123	136	-	136	231	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.58	6.98	6.68	4.3	-	-	4.18	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.58	5.98	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.58	5.98	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.932	4.432	3.732	2.38	-	-	2.272	-	-
Pot Cap-1 Maneuver	656	605	877	607	503	830	1245	-	-	1429	-	-
Stage 1	828	755	-	779	712	-	-	-	-	-	-	-
Stage 2	881	784	-	768	636	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	621	600	877	561	499	830	1245	-	-	1429	-	-
Mov Cap-2 Maneuver	621	600	-	561	499	-	-	-	-	-	-	-
Stage 1	826	753	-	775	708	-	-	-	-	-	-	-
Stage 2	845	780	-	723	634	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	14.57	11.61	0.41	0.11
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	90	-	-	621	580	24	-	-
HCM Lane V/C Ratio	0.005	-	-	0.397	0.061	0.002	-	-
HCM Ctrl Dly (s/v)	7.9	0	-	14.6	11.6	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.9	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	5	225	58	32	201
Future Vol, veh/h	10	5	225	58	32	201
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	30	30	11	11	11	11
Mvmt Flow	12	6	265	68	38	236

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	611	299	0	0	333	0
Stage 1	299	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Critical Hdwy	6.7	6.5	-	-	4.21	-
Critical Hdwy Stg 1	5.7	-	-	-	-	-
Critical Hdwy Stg 2	5.7	-	-	-	-	-
Follow-up Hdwy	3.77	3.57	-	-	2.299	-
Pot Cap-1 Maneuver	415	679	-	-	1178	-
Stage 1	693	-	-	-	-	-
Stage 2	683	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	400	679	-	-	1178	-
Mov Cap-2 Maneuver	400	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	658	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	13.08	0	1.12
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	463	247	-
HCM Lane V/C Ratio	-	-	0.038	0.032	-
HCM Ctrl Dly (s/v)	-	-	13.1	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	15	17	26	4	4
Future Vol, veh/h	27	15	17	26	4	4
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	85	85	85	85	85	85
Heavy Vehicles, %	4	4	15	15	30	30
Mvmt Flow	32	18	20	31	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	51	0	-	0	116	35
Stage 1	-	-	-	-	35	-
Stage 2	-	-	-	-	81	-
Critical Hdwy	4.14	-	-	-	6.7	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	5.7	-
Follow-up Hdwy	2.236	-	-	-	3.77	3.57
Pot Cap-1 Maneuver	1543	-	-	-	817	963
Stage 1	-	-	-	-	920	-
Stage 2	-	-	-	-	876	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1543	-	-	-	800	963
Mov Cap-2 Maneuver	-	-	-	-	800	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	876	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	4.75	0	9.17
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1157	-	-	-	874
HCM Lane V/C Ratio	0.021	-	-	-	0.011
HCM Ctrl Dly (s/v)	7.4	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	10	0	25	19	10	1	251	13	6	327	19
Future Vol, veh/h	11	10	0	25	19	10	1	251	13	6	327	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	4	4	4	2	2	2
Mvmt Flow	12	11	0	28	21	11	1	282	15	7	367	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	687	690	378	678	694	289	389	0	0	297	0	0
Stage 1	392	392	-	292	292	-	-	-	-	-	-	-
Stage 2	295	299	-	387	402	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	364	371	673	363	364	745	1159	-	-	1265	-	-
Stage 1	637	610	-	712	668	-	-	-	-	-	-	-
Stage 2	718	670	-	633	597	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	335	368	673	350	361	745	1159	-	-	1265	-	-
Mov Cap-2 Maneuver	335	368	-	350	361	-	-	-	-	-	-	-
Stage 1	633	606	-	711	667	-	-	-	-	-	-	-
Stage 2	683	669	-	617	593	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	16.04	15.84	0.03	0.13
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	7	-	-	350	393	30	-	-
HCM Lane V/C Ratio	0.001	-	-	0.067	0.155	0.005	-	-
HCM Ctrl Dly (s/v)	8.1	0	-	16	15.8	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.5	0	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	23	2	11	24	15	1	32	15	21	42	19
Future Vol, veh/h	18	23	2	11	24	15	1	32	15	21	42	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	15	15	15	9	9	9	4	4	4	5	5	5
Mvmt Flow	24	31	3	15	32	20	1	43	20	28	56	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	186	190	69	183	193	53	81	0	0	63	0	0
Stage 1	125	125	-	55	55	-	-	-	-	-	-	-
Stage 2	61	65	-	127	137	-	-	-	-	-	-	-
Critical Hdwy	7.25	6.65	6.35	7.19	6.59	6.29	4.14	-	-	4.15	-	-
Critical Hdwy Stg 1	6.25	5.65	-	6.19	5.59	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.25	5.65	-	6.19	5.59	-	-	-	-	-	-	-
Follow-up Hdwy	3.635	4.135	3.435	3.581	4.081	3.381	2.236	-	-	2.245	-	-
Pot Cap-1 Maneuver	747	682	959	763	690	995	1504	-	-	1521	-	-
Stage 1	849	768	-	939	835	-	-	-	-	-	-	-
Stage 2	918	816	-	860	770	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	684	668	959	712	676	995	1504	-	-	1521	-	-
Mov Cap-2 Maneuver	684	668	-	712	676	-	-	-	-	-	-	-
Stage 1	832	754	-	939	834	-	-	-	-	-	-	-
Stage 2	864	815	-	807	755	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	10.74	10.21	0.15	1.9
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	35	-	-	685	757	434	-	-
HCM Lane V/C Ratio	0.001	-	-	0.084	0.088	0.018	-	-
HCM Ctrl Dly (s/v)	7.4	0	-	10.7	10.2	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	111	20	3	23	40	4	12	142	6	2	129	245
Future Vol, veh/h	111	20	3	23	40	4	12	142	6	2	129	245
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	5	5	5	10	10	10	3	3	3
Mvmt Flow	119	22	3	25	43	4	13	153	6	2	139	263

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	475	460	270	335	588	156	402	0	0	159	0	0
Stage 1	275	275	-	182	182	-	-	-	-	-	-	-
Stage 2	200	185	-	154	406	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.15	6.55	6.25	4.2	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.545	4.045	3.345	2.29	-	-	2.227	-	-
Pot Cap-1 Maneuver	500	498	768	612	417	882	1114	-	-	1414	-	-
Stage 1	731	683	-	813	744	-	-	-	-	-	-	-
Stage 2	802	747	-	842	592	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	440	491	768	575	411	882	1114	-	-	1414	-	-
Mov Cap-2 Maneuver	440	491	-	575	411	-	-	-	-	-	-	-
Stage 1	730	681	-	803	734	-	-	-	-	-	-	-
Stage 2	742	737	-	810	591	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	16.68	13.99	0.62	0.04
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	134	-	-	451	472	8	-	-
HCM Lane V/C Ratio	0.012	-	-	0.319	0.153	0.002	-	-
HCM Ctrl Dly (s/v)	8.3	0	-	16.7	14	7.5	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.4	0.5	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	59	33	256	15	8	292
Future Vol, veh/h	59	33	256	15	8	292
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	30	30	4	4	2	2
Mvmt Flow	66	37	288	17	9	328

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	642	296	0	0	304	0
Stage 1	296	-	-	-	-	-
Stage 2	346	-	-	-	-	-
Critical Hdwy	6.7	6.5	-	-	4.12	-
Critical Hdwy Stg 1	5.7	-	-	-	-	-
Critical Hdwy Stg 2	5.7	-	-	-	-	-
Follow-up Hdwy	3.77	3.57	-	-	2.218	-
Pot Cap-1 Maneuver	397	682	-	-	1256	-
Stage 1	695	-	-	-	-	-
Stage 2	658	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	394	682	-	-	1256	-
Mov Cap-2 Maneuver	394	-	-	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	652	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	14.97	0	0.21
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	464	48	-
HCM Lane V/C Ratio	-	-	0.223	0.007	-
HCM Ctrl Dly (s/v)	-	-	15	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	22	26	7	26	28
Future Vol, veh/h	7	22	26	7	26	28
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	89	89	89	89	89	89
Heavy Vehicles, %	0	0	4	4	30	30
Mvmt Flow	8	25	29	8	29	31

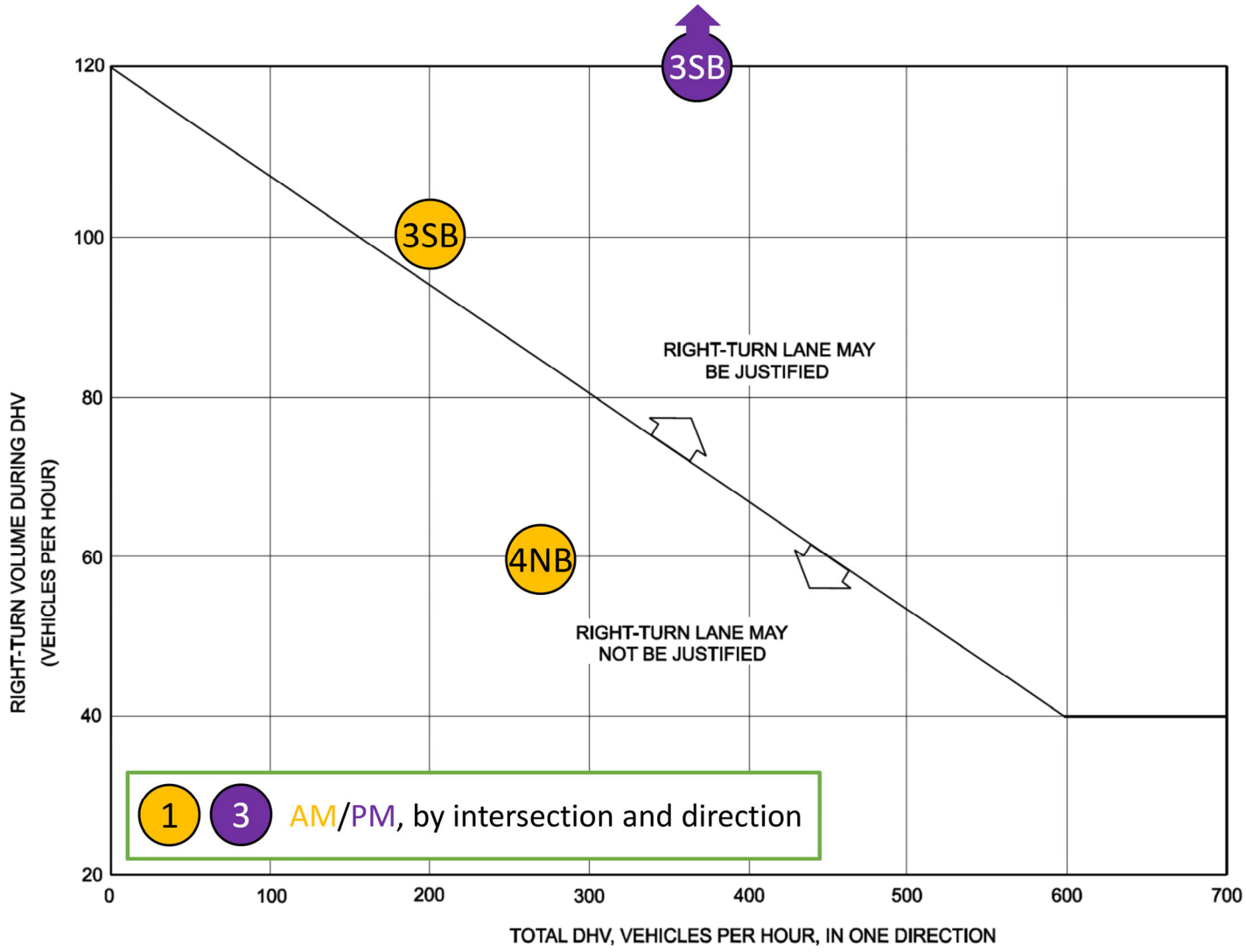
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	37	0	-	0	74	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	40	-
Critical Hdwy	4.1	-	-	-	6.7	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	5.7	-
Follow-up Hdwy	2.2	-	-	-	3.77	3.57
Pot Cap-1 Maneuver	1587	-	-	-	865	966
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1587	-	-	-	861	966
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	917	-
Stage 2	-	-	-	-	915	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.76	0	9.23
HCM LOS			A

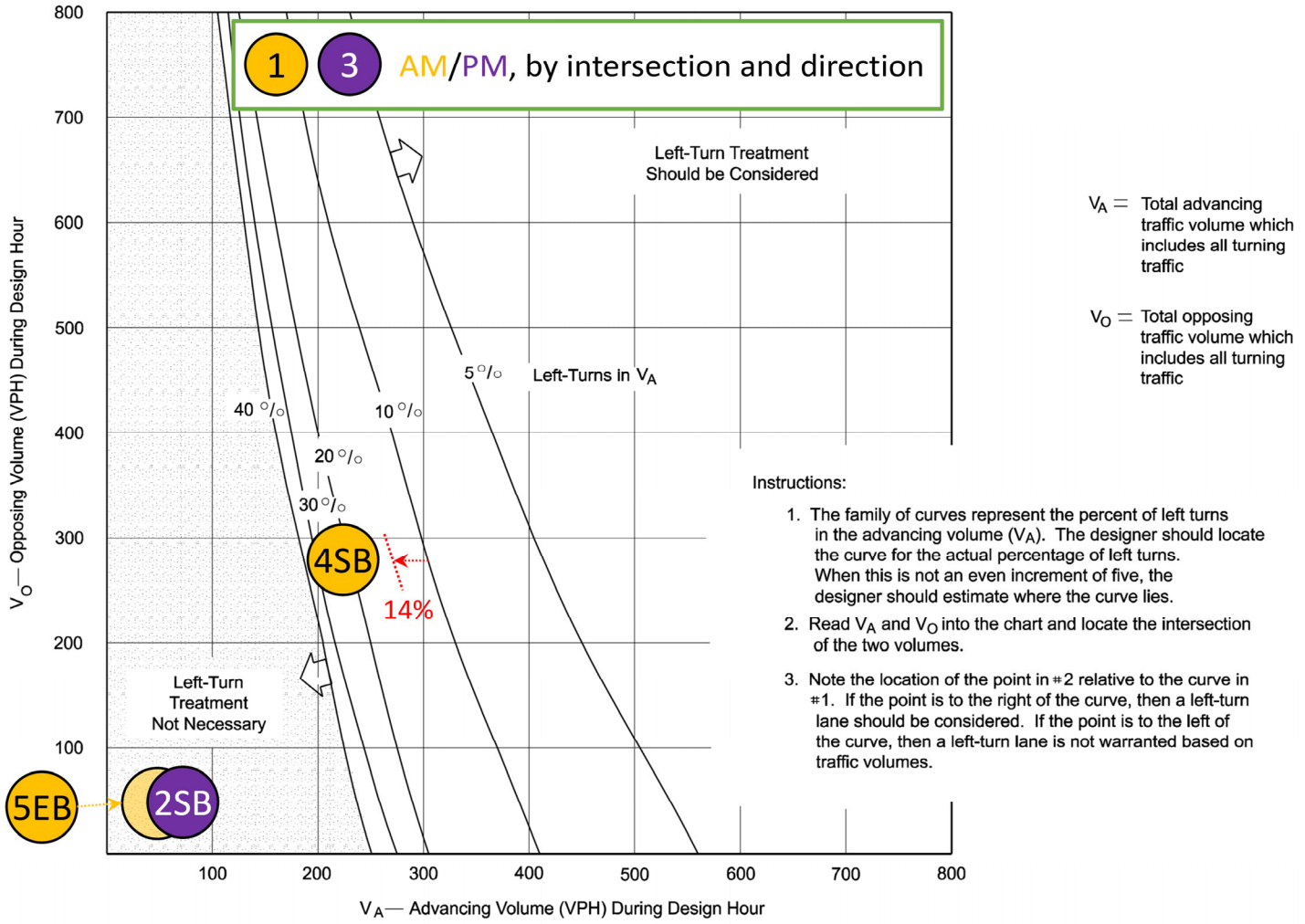
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	434	-	-	-	912
HCM Lane V/C Ratio	0.005	-	-	-	0.067
HCM Ctrl Dly (s/v)	7.3	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Appendix C: Auxiliary Turn Lane Analysis Charts

Right Turn Lane Analysis Chart (from MDT Design Manual, Figure 28.4A)



Left Turn Lane Analysis Chart (from MDT Design Manual, Figure 28.4C)



Appendix D: Intersection Cost Participation Calculations

Yellowstone County Cost Participation Worksheet: Platinum Commercial Park TIS

Whether a movement pair is critical is based on Total traffic (Background + Project)

1: 72nd at Danford

Lane Group		AM Peak Hour		PM Peak Hour	
(**critical**)	Lanes	Vproject	Per Lane	Vproject	Per Lane
EB T	1	2	2	1	**1**
WB L	1	4	4	22	**22**
WB T	1	0	**0**	2	2
EB L	1	5	**5**	1	1
NB T	1	51	**51**	13	13
SB L	1	4	**4**	4	4
SB T	1	8	8	51	**51**
NB L	1	0	0	0	**0**
Project **Critical** Lane Volume			60		74
Critical Lane Capacity			1200		1200
% Increase			5.0%		6.2%
Max % Increase			6.2%		

2: 64th at Danford

Lane Group		AM Peak Hour		PM Peak Hour	
(**critical**)	Lanes	Vproject	Per Lane	Vproject	Per Lane
EB T	1	2	2	15	15
WB L	1	0	0	0	0
WB T	1	14	**14**	4	**4**
EB L	1	2	**2**	15	**15**
NB T	1	No project traffic in these movements			
SB L	1				
SB T	1				
NB L	1				
Project **Critical** Lane Volume			16		19
Critical Lane Capacity			1200		1200
% Increase			1.3%		1.6%
Max % Increase			1.6%		

3: 72nd at Laurel Airport

Lane Group		AM Peak Hour		PM Peak Hour	
(**critical**)	Lanes	Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in these movements			
WB L	1				
WB T	1				
EB L	1	43	**43**	11	**11**
NB T	1	29	**29**	7	**7**
SB L	1	0	0	0	0
SB T	1	5	5	29	29
NB L	1	0	0	0	0
Project **Critical** Lane Volume			72		18
Critical Lane Capacity			1200		1200
% Increase			6.0%		1.5%
Max % Increase			6.0%		