



YELLOWSTONE COUNTY BOARD OF PLANNING

CITY OF BILLINGS AND
YELLOWSTONE COUNTY, MONTANA



AGENDA

JUNE 10, 2025 MEETING TIME: 6:00 p.m.
City Council Chambers, 5th Floor
316 N 26th St, Billings MT

NOTICE TO THE PUBLIC

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 Brenda Berns, Planning Clerk at bernsb@billingsmt.gov or call 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. Meeting Minutes of May 28, 2025

Attachments

Minutes of May 28, 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:**

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

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

- a. **Plat Review. Board Discussion. Maplewood County Major Subdivision - Dave Green, Planner II**

Attachments

Proposed Plat

Findings of Fact

Draft SIA

Traffic Study

Variance request from applicant

Attachment A Variance Criteria

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
City Council Chambers, 5th Floor
316 N 26th St, Billings MT



Public Hearing Participation Guidelines

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: 06/10/2025
Title:
Presented by:
Department: Planning & Community Services
Presentation:

Information

RECOMMENDATION

MEETING MINUTES: May 28, 2025

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

ALTERNATIVES

City Council may:

- Approve; or,
- Not Approve

FISCAL EFFECTS

Attachments

Minutes of May 28, 2025



CITY/COUNTY PLANNING BOARD

TUESDAY, May 28, 2025 at 6:00pm

	Position	01/14/2025	01/28/2025	02/11/2025	02/25/2025	03/11/2025	03/26/2025	04/08/2025	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	11/26/2025	12/09/2025	12/23/2025
Jim Ronquillo	Billings Ward I	1	A	1	1	A	1	1	1	A	1														
Roger Gravggaard President	Billings Ward II	1	1	1	1	1	1	1	1	1	1														
Dennie Stephenson	Billings Ward III	1	1	1	1	1	1	1	1	1	1														
John Staley Vice President	Billings Ward IV	V	1	1	1	1	1	1	1	1	1														
David Nordel	Billings Ward V	A	V	V	A	V	A	1	V	1	1														
Troy Boucher	YC District 1	A	A	A	A	A	A	A	A	A	A														
Dennis Cook	YC District 2	A	1	1	1	1	1	1	1	1	1														
Vacant	YC District 3	-	-	-	-	-	-	-	-	-	-														
Vacant	YC District 4	-	-	-	-	-	-	-	-	-	-														
Woody Woods	YC District 5	1	1	1	1	1	1	1	A	1	1														
Alexis Bonogofsky	YC District 6	1	1	V	1	V	1	1	1	A	1														
Morgan Tuss	YC District 7	A	A	A	A	A	A	A	A	A	A														
Vacant	YC Cons. District	-	-	-	-	-	-	-	-	-	-														
Scott Reiter	Ex-Officio SD2	A	A	A	A	A	A	A	A	A	A														

Please note: "A" stands for excused absence, "1" stands for present, "V" stands for Zoom participation, "C" stands for Canceled

Call the Meeting to Order: President Gravgaard called the meeting to order at 6:00 p.m.

Introduction of Planning Board Members and Planning Department Staff

President Gravgaard called for introductions of the members of the Planning Board and staff.

Attending Staff: Wyeth Friday, Planning & Community Services Director; Anna Vickers, Planning Division Manager; Dave Green, Planner; Elyse Monat, Transportation Planner; Brenda Berns, Planning Clerk.

1. Others in Attendance: Craig Dalton, Performance Engineering; Dave Coppock, BPAC; Stephanie Donovan, BPAC

2. Approval of Agenda

Motion

Motion made by Board member Dennie Stephenson, seconded by Board member Nordel to approve the agenda as submitted. Motion passed unanimously.

3. Approval of Minutes: May 13, 2025

Motion

Motion made by Board member Staley, seconded by Board member Nordel to approve the meeting minutes of May 13, 2025. Motion passed unanimously.

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. Disclosure of Outside (Ex-Parte) Communication – There were no outside communications.

6. Disclosure of Conflicts of Interest – There were no conflicts of interests.

7. Old Business

Public Hearing

President Gravgaard opened the public hearing.

a. Public Hearing. Board Recommendation and Motion. Clearwater Estates Subdivision 2nd

The subdivision creates 69 lots and commercial development. The subject property is generally located south of Central Avenue, and west of Twin Pines Townhomes. The property is zoned CMU1 – Corridor Mixed Use 1, N2-Mid-Century Neighborhood Residential, NX1 – Mixed Residential 1, NX2 – Mixed Residential 2.

Dave Green provided an overview of the proposed subdivision. The development includes pedestrian access on the east side and a private park area proposed adjacent to the subject subdivision. The initial Traffic Impact Study (TIS) reviewed multiple intersections, and developer contributions will be required based on traffic impacts identified in the study. The City of Billings Engineering Department noted that while the current TIS may not show the need for a turn lane with this filing, it is anticipated that one will be required in the future. Parkland dedication for the subdivision totals 1.67 acres, with the remaining 1.10 acres of undedicated parkland to be addressed through a cash-in-lieu payment. The City of Billings will provide water service, and sanitary needs will be met through septic systems. A 30-foot-wide easement will be needed to accommodate the necessary infrastructure. Police and fire protection will be provided by the City of Billings.

Staff Recommendation

Staff recommends conditional approval of the proposed subdivision, subject to the 5 conditions of approval as presented in the staff report.

Board Questions

A board member inquired about the commercial portion of the project and whether there was any information available regarding the types of businesses proposed. Staff responded that no specific commercial uses have been confirmed at this time. The board member also expressed concern regarding existing traffic conditions, noting that the area already experiences congestion, in part due to the lack of turn lanes. Staff explained that while turn lanes are not required under the current subdivision filing, they are anticipated to be included in a future phase of the project. The board member indicated that this response did not fully address concerns, citing the limitations of the current roadway and the potential for further impact from future commercial development. Another board member asked for clarification on the proposed use of a private road within the development and questioned the rationale for including a privately maintained roadway.

Applicant's Agent; Craig Dalton, Performance Engineering

Mr. Dalton responded to the questions by explaining that the private road is being proposed to allow for the potential of a gated community and to provide greater flexibility in the development.

The board raised concern about road maintenance and how lot assessments would be handled. In response, Mr. Dalton noted that a Homeowners' Association (HOA) would be required. Since the subdivision will already have an HOA in place for stormwater management, a maintenance agreement for the road would be included in the governing documents. The board expressed concern based on past experience, noting that in other developments, HOA responsibilities and documentation often become unclear or lost over a period of 5 to 10 years. While the proposed approach appears sound, it was emphasized that over time, important elements can be overlooked.

Wyeth Friday commented on the Traffic Impact Study (TIS), noting that City Engineering is evaluating the study based on established requirements and standards. He acknowledged the concerns that have been raised but emphasized the importance of relying on the expertise of professional engineers to guide those evaluations. At this point, he expressed uncertainty about what additional steps could be taken to further address that specific concern. Mr. Friday also mentioned that City Engineering is reviewing both this project and the adjacent development in a coordinated manner. As additional projects are submitted in the area, they may collectively trigger further improvements or requirements based on cumulative impacts.

Board Discussion

A board member inquired whether turn lanes were required by Engineering and, if so, who would be responsible for installation. Staff responded that the developer would be responsible for contributing to the cost and construction of a turn lane, if required. It was clarified that the current filing does not meet the threshold for a turn lane based on projected trip generation; however, such a requirement may be considered with future filings, depending on traffic impact.

Another board member raised concern about the absence of a turn lane in the current proposal and questioned whether the board could evaluate the project's safety with confidence. While acknowledging the financial considerations, the members emphasized the importance of proactive improvements rather than reactive measures following an incident. Staff stated that all applicable requirements are being met under current regulations, and any additional measures would be pursued if warranted.

Several board members expressed concerns about the lack of clarity regarding potential future infrastructure needs and the broader safety implications of the development. One member noted a pattern of unanswered questions, while another acknowledged staff effort but indicated continued uncertainty about the overall process.

A question was raised regarding the possibility of the developer voluntarily constructing a turn lane. Staff reiterated that based on current traffic data, the filing does not require a turn lane. Should future filings indicate the need, appropriate requirements would be applied. The developer referenced the Traffic Impact Study (TIS), stating that the impact on traffic is influenced by overall road usage, not solely by the proposed development. The intended commercial component is expected to remain small in scale with limited traffic impact. Staff advised the board to adhere to established standards and rely on technical analyses such as the TIS. If further clarification is needed, staff recommend direct consultation with the Engineering Division.

Board members restated their concerns related to public safety and referenced previous developments that later necessitated traffic calming measures. They emphasized their role in evaluating both regulatory compliance and the potential safety implications of land use decisions.

Public Hearing

President Gravgaard closed the public hearing.

Motion

Board member Stephenson moved to recommend approval of the Clearwater Estates subdivision, including the findings of fact and conditions of approval. The motion was seconded by Board member Ronquillo to forward the recommendation to City Council for action on June 23, 2025. The motion carried with a vote of 5 in favor and 3 opposed.

Public Hearing

President Gravgaard opened the public hearing.

- b. Public Hearing. Board Recommendation and Motion. 44 West Subdivision.** The subdivision creates 62 lots for residential and commercial development. The subject property is generally located south of Central Avenue, and west of Twin Pines Townhomes. The property is zoned NX2 – Mixed Residential 2 (2 to 8 units) and NX1 – Mixed Residential 1 (1 to 4 units).

Dave Green provided a brief overview of the subdivision. The new street will connect to a section of Bell Avenue; however, a portion of Bell Avenue remains undeveloped and will be addressed by a future developer. Carriage Lane will serve one or two lots, with the dead-end street providing access to two lots before connecting to the main street. The Traffic Impact Study (TIS) for this subdivision is similar to that of the adjacent subdivision. The required parkland dedication for the 44 West subdivision is 0.46 acres. The parks will be privately owned and maintained by a Homeowners' Association (HOA) established by the subdivider. The development features smaller parcel sizes compared to neighboring areas. Utility services will be similar across the development, with stormwater managed through designated collection systems. Carriage Lanes function essentially as alleys, and garbage collection will occur within these alleys. Additionally, a bike trail is proposed within the development, which will be constructed by a private contractor. The City of Billings Engineering Department has stated that if the current TIS does not demonstrate a need for a turn lane with this filing, it is expected that a turn lane will be required in the second filing of the subdivision.

Staff Recommendation

Staff recommends conditional approval of the proposed subdivision, subject to the 4 conditions of approval as presented in the staff report. City council action on June 23, 2025

Board Questions

The board asked if the Traffic Impact Study covers both adjacent subdivisions, which staff confirmed. Questions about a future public road connection were raised, but staff noted it depends on access across developed apartments. A concern was recalled about promised road access blocked by a drainage issue. Staff also noted that the subdivision's parkland borders an undeveloped parcel to the south.

Applicant's Agent; Craig Dalton, Performance Engineering

The applicant's agent addressed the board's concerns by noting that developments to the east plan to cross the drainage area. Proposed pedestrian paths will be constructed with berms to accommodate this. He acknowledged that traffic issues increase as development moves westward and emphasized that road improvements can only be undertaken by the City, as the County has little incentive to invest given the City's impending involvement. He mentioned that property has been purchased for a high school, highlighting the need for better coordination between City and County agencies. Currently, the County and City Traffic Impact Studies (TIS) are not aligned, and it is unreasonable to expect developers to be fully aware of all ongoing and future projects and their cumulative impacts.

Mr. Dalton asked how collaboration between the City and County could be improved to be more proactive. Regarding road widening, he noted that progress is limited due to the patchwork of City and County parcels, making solutions complex and unresolved.

Board Discussion

Board members expressed concern about the lack of collaboration between the City and County, noting that a new commission to separate the two governments is being formed, which they felt is a step backward and will hinder progress. One member remarked that the County's choice not to participate feels like a return to past divisions.

There was appreciation for the discussion and a request for interim transportation plans, particularly regarding traffic on Central Avenue, which had not been addressed in recent briefings. Staff noted previous efforts to study the city and county road systems, acknowledging ongoing challenges with county coordination. They mentioned upcoming updates from the West Neighborhood plan and plans to explore roundabouts as potential solutions.

Finally, the board discussed the possibility of involving developers in future conversations, with staff confirming that real estate professionals would be attending an upcoming meeting.

Public Hearing

President Gravgaard closed the public hearing.

Motion

Motion made by Board member Stephenson moved to recommend approval of the 44 West subdivision including the findings of fact and conditions of approval. The motion was seconded by Board member Ronquillo to forward the recommendation to City Council for action on June 23, 2025. The motion carried with a vote of 7 in favor and 1 opposed.

8. New Business:

- a. Bicycle Pedestrian Advisory Committee (BPAC) Annual Presentation to the Governing Bodies.

Elyse Monat, Transportation Planner, introduced Robby Gress, the new Transportation Planning Intern, to the board.

Ms. Monat then introduced Dave Coppock, the Planning Board appointee, and Stephanie Donovan, one of the City appointees, who were present to deliver the Bicycle and Pedestrian Advisory Committee (BPAC) annual report.

Mr. Coppock provided an overview of the committee's purpose and responsibilities. He explained that BPAC is composed of volunteer members who serve three-year terms. He also noted that there are currently two vacant seats representing the County.

Committee Members:

Chair Dave Coppock (Planning Board)

Vice Chair – Jason Wood (County)

Stephanie Donovan (City)

Kristy Halderman (City)

Anna O'Donnell (City)

Mr. Coppock explained that the committee's primary focus is to ensure that the community's infrastructure supports safe and accessible transportation for pedestrians, bicyclists, and wheelchair users. This mission is carried out by advising City and County staff as well as elected officials, aligning recommendations with community needs, collaborating with decision-makers, and referencing national standards. Key concerns raised by the community include high-speed traffic, unsafe crosswalks, and incomplete bicycle route networks.

Stephanie Donovan presented data related to traffic crashes, highlighting locations where accidents are frequently linked to inadequate signage. A density map covering the period from October 2022 to March 2025 showed the downtown area and Main Street in the Heights as the most impacted by crashes. The West End appeared to have fewer incidents, which may be due to lower pedestrian and bicycle activity in that area. The presentation also included a breakdown of pedestrian crash data, showing higher concentrations in the downtown area and along Grand Avenue. Bicycle-related crashes were also concentrated downtown and on Main Street, with additional scattered incidents throughout Billings. From 2022 to 2025, the severity of crashes was most often categorized as "possible injury." The severity chart was provided by the Montana Department of Transportation (MDT), while earlier maps were sourced from the Police Department.

Ms. Monat added that the committee regularly contacts the Police Department each month to obtain updated crash reports for ongoing monitoring and analysis.

Board Discussion

A board member noted that police may not respond to every incident, suggesting dispatch records might provide more complete information. Another member inquired about data distinguishing adults from children in crash reports. Staff responded that police crash reports lack that level of detail and some information is protected for confidentiality. It was suggested that the time and location of incidents can sometimes indicate whether a child or adult was involved, for example if the incident happens around a school during drop off or pick up hours. BPAC members also observed that many pedestrian-vehicle incidents involve fault on both sides, often due to distractions. For example, right-turning drivers sometimes strike pedestrians in crosswalks.

The board discussed bicycle and pedestrian counts, which are collected across the trail and bikeway system. Trail counters also collect pedestrian data, and locations like Lillis Park have shown high foot traffic. BPAC members emphasized that even well-designed intersections can still see crashes, and they strive to share data with relevant community stakeholders.

Concerns were raised about the lack of bike lanes on State Ave. One of the Planning Board members requested bike lanes there in the future.

The discussion also addressed the West End Neighborhood Plan. There was agreement on the importance of integrating safe routes for children, especially in growing subdivisions.

Staff explained that with the new subdivision regulations, developers can now be required to implement shared use paths identified in the 2017 Bikeways and Trail Master Plan. One of the Planning Board members commented that this seemed like an old document and a staff member stated that the updated 2025 Pedestrian and Bicycle Master Plan was denied. Another staff member noted that a multimodal plan for the West End is currently underway and that the Long-Range Transportation Plan will begin soon.

A staff member also mentioned that the Metropolitan Planning Organization (MPO) hopes to update the Household Travel Survey in the next fiscal year, which is a statistically valid survey looking at where residents travel and what modes they use. A board member asked if qualitative questions were added to this survey, and staff confirmed that surveys and app-based feedback had been used. A Planning Board member suggested that comparing infrastructure with other cities like Missoula could be valuable. BPAC members noted they have conducted informal research but would need more resources to expand on that.

9. Other Business.

Wyeth Friday informed the board that the first meeting of the Interim Planning Commission (IPC) will be held on May 29, 2025. The agenda will be full, including topics such as bylaws, elections, and consultant discussions. He also announced the upcoming Highway 3 Corridor Study open houses: a virtual session on June 4th and an in-person event at the airport on June 5th. Mr. Friday added that there will be a presentation to City Council on June 14th regarding legislative updates and building code changes.

Wyeth shared that a meeting was held recently to gather information about the southside triangle area, with plans to present the findings to City Council in July. Further updates will be provided next week.

Anna Vickers reminded the board that June is the Commuter Challenge month, featuring a kickoff event at Thirsty Street Brewing Company. She encouraged participation, noting there will be prizes and giveaways as part of the campaign.

Anna also reported that progress is being made on the West End Plan. The steering committee is actively working, and public meetings will be scheduled to discuss land use categories. She will continue to keep the board informed.

10. Future Agenda Items

ADJOURNMENT: 7:45PM

Brenda J Berns, Planning Clerk

Planning Board

Date: 06/10/2025
Title: Maplewood Subdivision - Preliminary County Major Plat
Presented by: David Green
Department: Planning & Community Services
Presentation: Yes

Information

RECOMMENDATION

Staff is recommending the Planning Board forward a recommendation to the Board of County Commissioners to conditionally approve the plat of Maplewood Subdivision, adopt the Findings of Fact as presented in the staff report, and approve the variance request.

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

On May 1, 2025, In Sight Engineering, for Regal Land Development, applied for preliminary major plat approval of Maplewood Subdivision. The subdivision will create 78 lots for residential development. The subject property is generally located south of O'Donnell Lane and east of South 72nd Street West. This parcel of land is outside county zoning. The land has been used for farming.

VARIANCES REQUESTED

The applicant has requested a variance from Section 4.6.B.1, of the Yellowstone County Subdivision Regulations, which outlines connection to undeveloped / underdeveloped land surrounding proposed subdivisions. The maximum distance between those connections is 600 feet.

Staff is recommending approval of the variance request.

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.
2. To protect public health and safety and provide maintenance for a shared water system, the applicant shall submit to be recorded with the final plat a maintenance agreement and easement for the shared water system.
3. 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.
4. 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.
5. To protect public health and safety with access to the parkland over an irrigation ditch from The Big Ditch, prior to final plat approval, the applicant will provide two pedestrian accesses over the ditch to the park. Each one will be a minimum of 10 feet wide.
6. 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 lot owners.
7. A Restrictions on Conveyances associated with the phases in the subdivision shall be filed with the final plat. The subdivision improvement agreement (SIA) shall be updated to reflect the date associated with the opening of each phase of the subdivision.
8. To minimize the effects on the natural environment, a copy of the approved weed management plan shall be submitted with the final plat.
9. 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.
10. 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 January 23, 2025
- Preliminary plat application submitted to Planning Division on May 1, 2025
- Departmental Review Meeting May 15, 2025
- Re-submittal of proposed plat May 22, 2025
- Planning Board plat review meeting June 10, 2025
- Planning Board public hearing meeting June 24, 2025
- Preliminary plat to Board of County Commissioners, July 22, 2025
- 60 working-day preliminary plat review period ends July 28, 2025

PLAT INFORMATION

General location: South of O'Donnell Lane and east of South 72nd Street West

Legal Description: SW ¼, SECTION 18, TOWNSHIP 1 SOUTH, RANGE 25 EAST

Owner/Subdivider: Regal Land Development Inc.

Engineer and Surveyor: In Site Engineering

Existing Zoning: No zoning

Existing land use: Agricultural

Proposed land use: Residential

Gross and Net area: 128.7 acres / 49.956 acres

Proposed number of lots: 78

Lot size: Max: 61.793 acres
Min: 0.45 acres

Parkland requirements: Parkland dedication required is 3.988 acres. The applicant is proposing to provide 3.193 acres with a cash-in-lieu contribution for the remaining amount.

TRAFFIC IMPACT STUDY OVERVIEW
INTERSECTION COST PARTICIPATION

The net new trips identified in this report are subject to examination under Yellowstone 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 is 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 15 shows the intersection cost participation summary for project trips.

Exhibit 15. Intersection Cost Participation

Intersection	AM	PM	Value in Higher Peak, if 2% or Greater
1. 72nd at King	0.5%	1.3%	-%
2. 72nd at O'Donnell	1.3%	1.6%	-%
2. 72nd at Hesper	1.3%	1.5%	-%
4. 68th at Hesper	1.1%	1.3%	-%
5. 64th at Hesper	0.8%	1.1%	-%
Total Participation %:			0%
x \$500,000			\$0

None of the intersections studied would experience a high enough critical-movement volume increase due to the project to require participation in the cost of future improvements.

CONCLUSIONS AND RECOMMENDATIONS

The Maplewood Estates Subdivision 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. All intersections with two-way stop control were examined with respect to MDT warrants for auxiliary turn lanes, and no turn lanes were found to be warranted with or without this project in the study timeframe. Under the background traffic growth assumptions used here, a southbound left turn lane on 72nd at Hesper Road has been shown to be warranted a few years after this subdivision opens, and is therefore recommended for the County's independent consideration. No intersection cost participation is indicated by the traffic analysis documented in this report.

PARKLAND OVERVIEW:

The parkland requirement for this subdivision is 3.988 Acres. The parkland requirement is met by a dedication of 3.193 acres of public parkland with the remainder to be met by cash-in-lieu of parkland. A Park Maintenance District will be established with the final plat. County Parks have stated they are satisfied with the parkland as proposed and in the location it is shown.

STAKEHOLDERS

The Planning Division has received no public comment as of the writing of this report. Stakeholder input will be received at a public hearing scheduled for this subdivision on June 24, 2025.

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 July 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 are required to:

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

FISCAL EFFECTS

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

SUMMARY

One of the purposes of the County'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 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 minimal impacts from this proposed subdivision.

Attachments

- Proposed Plat
- Findings of Fact
- Draft SIA
- Traffic Study
- Variance request from applicant
- Attachment A Variance Criteria

PRELIMINARY PLAT OF MAPLEWOOD ESTATES - A RESIDENTIAL SUBDIVISION



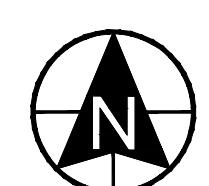
LOCATED IN THE SOUTHWEST $\frac{1}{4}$ OF SECTION 18, T01 S, R25 E, P.M.M.
 PREPARED FOR: REGAL LAND DEVELOPMENT, INC.
 PREPARED BY: IN SITE ENGINEERING
 APRIL 2025

LEGAL DESCRIPTION

LOT 4 SESW FRAC LOT 3 & FRAC NESW, (LESS HWY)
 CONTAINING: 128.700 ACRES



SCALE 1" = 200' (24 x 36)
 SCALE 1" = 400' (11 x 17)

DEVELOPMENT	
Maplewood Estates Residential Subdivision	
DEVELOPER	
REGAL LAND DEVELOPMENT, INC. P.O. BOX 80205 BILLINGS, MT 59108	
	
CIVIL ENGINEER	
IN SITE ENGINEERING, P.C. 4231 CREEKWOOD DR BILLINGS, MT 59108	
	
	
NO.	DATE
1	4/1/2025
2	4/19/2025
3	5/1/2025
4	5/21/2025
5	
6	
7	
DATE	
5/21/2025	
PROJECT	
Maplewood Estates	
DESCRIPTION	
PRELIMINARY PLAT	
SHEET NAME	SHEET NUMBER
Prelim.	1

PRELIMINARY PLAT OF MAPLEWOOD ESTATES - A RESIDENTIAL SUBDIVISION

LOCATED IN SECTION 18, T01 S, R25 E, P.M.M. YELLOWSTONE COUNTY, MONTANA
 PREPARED FOR: REGAL LAND DEVELOPMENT, INC.
 PREPARED BY: IN SITE ENGINEERING
 APRIL 2025

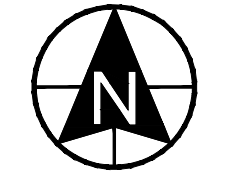
DEVELOPMENT
Maplewood Estates Residential Subdivision

DEVELOPER
REGAL LAND DEVELOPMENT, INC.
 P.O. BOX 80205
 BILLINGS, MT 59108



CIVIL ENGINEER
IN SITE ENGINEERING, P.C.
 4231 CREEKWOOD DR
 BILLINGS, MT 59106

IN SITE ENGINEERING



NO.	DATE	DESCRIPTION
1	4/1/2025	Submit for C&S Rev.
2	4/19/2025	Shared Wells Rev.
3	5/1/2025	Submit Prelim. Plat
4	5/21/2025	Resubmit Prelim. Plat
5		
6		
7		

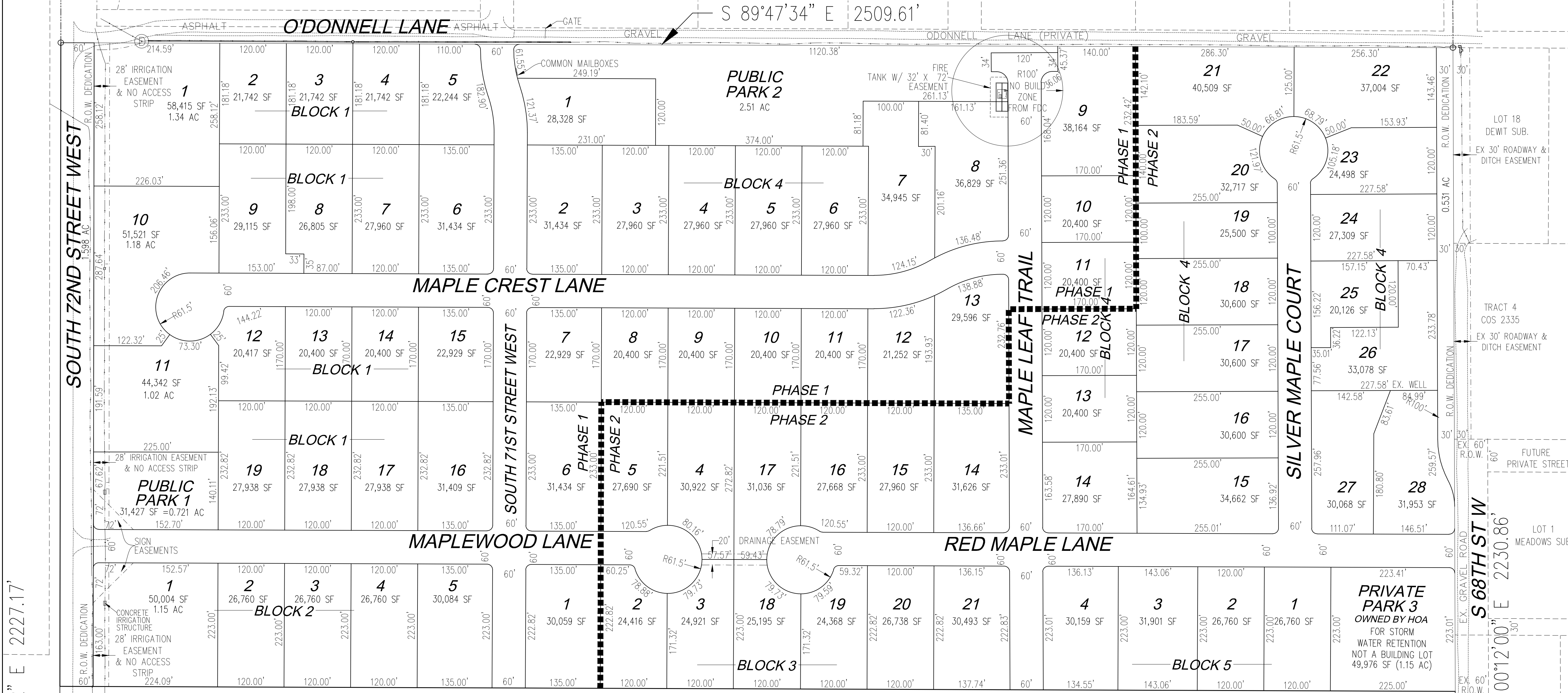
DATE
 5/21/2025

PROJECT
Maplewood Estates

DESCRIPTION
PRELIMINARY PLAT

SHEET NAME
Prelim.

SHEET NUMBER
2



PHASING

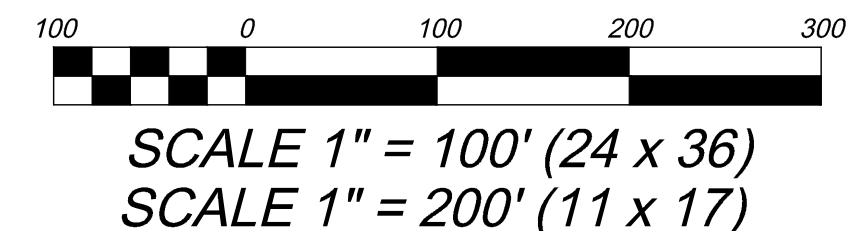
NUMBER OF RESIDENTIAL LOTS IN PHASE 1 = 44 (57%)
 NUMBER OF RESIDENTIAL LOTS IN PHASE 2 = 33 (43%)
 TOTAL NUMBER OF RESIDENTIAL LOTS: 77

TABULATIONS

GROSS AREA:	128.700 AC
TOTAL # OF LOTS:	78
LOT 78 (AGRICULTURAL):	61.793 AC
GROSS RESIDENTIAL AREA:	66.907 AC
R.O.W. DEDICATION FOR EX. ROADS:	2.129 AC
SUBTOTAL (GROSS EXCL. 72ND & 68TH):	64.778 AC
AREA OF INTERNAL ROADS:	9.837 AC
(15% OF GROSS RESIDENTIAL AREA EXCL. 72ND & 68TH)	
LENGTH OF INTERNAL ROADS:	7,142 LF
PRIVATE PARK 3 (STORM DRAIN POND)	1.15 AC
PUBLIC PARKLAND PROVIDED (PARKS 1 & 2)	3.231 AC
NET AREA OF RESIDENTIAL LOTS:	50.56 AC
NUMBER OF RESIDENTIAL LOTS:	77
AVERAGE LOT SIZE:	0.657 AC = 28,619 SF

PARKLAND CALCULATIONS

PARKLAND REQUIREMENT:
 11% OF AREA SUBDIVIDED INTO LOTS LESS THAN 1/2 AC
 (0.11)(7.599 AC) = 0.836 AC
 7.5% OF AREA SUBDIVIDED INTO LOTS BETWEEN 1/2 AND 1 AC
 (0.075)(39.292 AC) = 2.947 AC
 5% OF AREA SUBDIVIDED INTO LOTS BETWEEN 1 AC & 3 AC
 (0.05)(3.672 AC) = 0.184 AC
 TOTAL PARKLAND REQUIRED: 3.967 AC
 PARKLAND PROVIDED (PARKS 1 & 2): 3.231 AC
 CASH-IN-LIEU OF PARKLAND: 0.736 AC



N 00°05'02" E 2227.17'

1067.17'

1070.83'



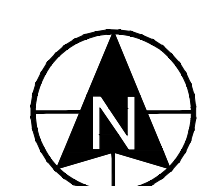
S 89°47'34" E 2515.36'

5
BLOCK 5
 61.793 ACRES

PRELIMINARY PLAT OF MAPLEWOOD ESTATES - A RESIDENTIAL SUBDIVISION

LOCATED IN SECTION 18, T01 S, R25 E, P.M.M. YELLOWSTONE COUNTY, MONTANA
 PREPARED FOR: REGAL LAND DEVELOPMENT, INC.
 PREPARED BY: IN SITE ENGINEERING
 APRIL 2025



DEVELOPMENT	
Maplewood Estates Residential Subdivision	
DEVELOPER	
REGAL LAND DEVELOPMENT, INC. P.O. BOX 80205 BILLINGS, MT 59108	
	
CIVIL ENGINEER	
IN SITE ENGINEERING, P.C. 4231 CREEKWOOD DR BILLINGS, MT 59106	
	
	
NO.	DATE DESCRIPTION
1	4/1/2025 Submit for CAS Rev.
2	4/19/2025 Shared Wells Rev.
3	5/1/2025 Submit Prelim. Plat
4	5/21/2025 Resubmit Prelim. Plat
5	
6	
7	
DATE	
5/21/2025	
PROJECT	
Maplewood Estates	
DESCRIPTION	
PRELIMINARY PLAT	
SHEET NAME	SHEET NUMBER
Prelim.	3

FINDINGS OF FACT

The City-County Planning Division Staff has prepared the Findings of Fact for Maplewood 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 other properties. There will be no effect on the water users downstream 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 shared wells as approved by the Montana Department of Environmental Quality, or its designee. These wells will be owned and maintained by Aquanet. Aquanet will install wells, pumps, and service lines and then bill monthly for water usage. Usually a flat fee plus usage-based rate. They are also the entity that will hold the water right. 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 Aquanet. The applicant shall record a maintenance agreement for the shared wells with the final plat **(Condition #2)**.

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 approved by Montana Department of Environmental Quality, or its designee.

The Subdivision is proposed to be served by individual septic systems on each lot. 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 individual lot owners.

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 the public portion of O’Donnell Lane, South 72nd Street West and South 68th Street West as approved by the Yellowstone County Public Works Department. Roads within the subdivision, will be built to the County standard paved surface road. They built in 60-foot-wide rights of way and be built with a 24-foot paved surface. An RSID will be created to maintain the roads within the subdivision. **(Condition #3)**

A TIS has been submitted for this proposed subdivision. The traffic study showed the impacts would be minimal to the studied intersections and do not meet the threshold for contributions to the County for intersection improvements. In the future should there be more development, then this subdivision can be assessed proportional cost through the Waiver of Right to Protest.

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 Maple Leaf Trail on the edge of the park land, 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 #4)**

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 Elder Grove School District for K through 8. Elder Grove School recently built a new building to accommodate the additional students moving into the area. They have the ability to accommodate more students. West High School will provide school for grades 9 through 12. West High School is currently over capacity.

h. **Parks and recreation** – Parkland dedication required for this subdivision is 3.988 acres. The applicant is proposing to provide 3.193 acres with a cash in lieu contribution for the remaining amount. There is an existing 3.84-acre park in the subdivision to the north of this proposed subdivision. It is off Skycrest Drive approximately ½ road mile away.

The proposed park meets the requirement for street frontage for parkland but, the majority of that frontage has a ditch, The Big Ditch, along the edge of the road, O'Donnell Lane. To improve the access to the park the applicant will provide two pedestrian accesses across The Big Ditch from O'Donnell Lane to the park. The accesses will be a minimum of 10 feet wide (**Condition #5**).

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 #6**).

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

k. **Phasing of Development** - The applicant is proposing to develop this subdivision in phases. Phase 1 and Phase 2. To be recorded with the final plat the applicant shall submit a restriction on conveyances. The subdivision improvement agreement shall be updated to reflect the date associated with the opening of each phase of the subdivision (**Condition #7**).

- Phase 1 consists of Lots 1-19, Block 1; Lots 1-5, Block 2; Lot 1 and Lots 6-13, Block 3; and Lots 1-11, Block 4.
- Phase 2 consists of Lots 2-5 and Lots 14-21, Block 3; Lots 12-28, Block 4; and Lots 1-4, Block 5.
- Public improvements will be constructed by way of a private contract with each phase.

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 is required to get an updated Weed Management Plan. The weed management plan has been completed and a copy will be submitted with final plat (**Condition #8**).

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:

Because this land has been cultivated for farming for so long, there is very little wildlife inhabiting the area with the exception of some rodents and racoons. An occasional deer may wander through the area, but it provides no cover or natural food sources for them. No other wildlife has been observed nesting or frequenting the subdivision site, and this site is not in sage grouse habitat. There are no threatened or endangered species known to inhabit the area.

This site is well-suited for development of a residential neighborhood. The development will be done in a responsible, orderly manner, and in accordance with

Yellowstone County Subdivision Regulations, Administrative Rules of Montana, and DEQ, DNRC, and all other state and local development standards. By so doing, this subdivision will create no significant negative impact to the environment or community but will, instead, be an asset to the area.

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. There is residential development to the north and to the south.

- 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 is future trail shown on South 72nd Street. At a future time when this road is widened the 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 Maplewood Subdivision, approve the variance request and adopt the Findings of Fact as presented in the staff report.

SUBDIVISION IMPROVEMENTS AGREEMENT
Maplewood Estates
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(Yellowstone County)

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	B. Traffic Control Devices	
	C. Access	
	D. Billings Area Bikeway and Trail Master Plan	
	E. Sidewalks	
IV.	Emergency Services	
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VI.	Utilities	
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	C. Power, Telephone, Gas, and Cable Television	
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VIII.	Irrigation	
IX.	Weed Management	
X.	Soils/Geotechnical Study	
XI.	Phasing of Improvements	
XII.	Financial Guarantees	
XIII.	Legal Provisions	

SUBDIVISION IMPROVEMENTS AGREEMENT

Maplewood Estates

This agreement is made and entered into this ____ day of _____, 20__, by and between (*Regal Land Development, Inc.*), whose address for the purpose of this agreement is P.O. Box 80445, Billings, Mt 59108, hereinafter referred to as “Subdivider,” and YELLOWSTONE COUNTY, Montana, hereinafter referred to as “County.”

WITNESSETH:

WHEREAS, the plat of *Maplewood Estates*, 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 *Maplewood Estates*; and

WHEREAS, at a regular meeting conducted on ____ day of _____, 20__, the Yellowstone County Board of County Commissioners conditionally approved a preliminary plat of *Maplewood Estates*; 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 *Maplewood Estates* 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

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

1. A variance from Section 4.6.B.1 is requested to allow 2 accesses to the undeveloped Lot 78 instead of the 3 that would be required. See Variance Request.

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.** 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.** Culverts and associated drainage swales shall not be filled in or altered by the subdivider or subsequent lot owners.
- F.** 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 at no cost to the County and any relocation outside of the public right-of-way shall be subject to securing and recording easements.
- G.** Future maintenance of all public (or common) improvements shall be done through RSID(s) created as part of the SIA for this subdivision.
- H.** Lot 5, Block 5 (61.793 acres) shall have sanitary restrictions that shall be lifted by application to the MDEQ with future development review (subdivision, site plan, or condominium).

- I. Lot owners or their agent will obtain an Access Permit from County Public Works prior to any construction on any lot within the subdivision. The application will include a site plan showing the desired location of the access and show that it meets the requirements outlined by the DEQ storm water requirements for the subdivision. Failure to do so will result in the lot owner or their agent removing what has been installed and locating the access in an approved location at the owner's expense.

III. TRANSPORTATION

The subdivider agrees to guarantee all improvements for a period of one (1) year from the date of final acceptance by Yellowstone County.

A. Streets

- Streets shall be public and have Right-of-way widths of 60 feet.
- Streets shall be paved with 24 feet of asphalt with a 2-foot gravel shoulder along each edge of asphalt
- A Rural Special Improvements District (RSID) for maintenance of the public streets will be established with the Final Plat.

B. Traffic Control Devices

- Stop signs shall be installed at the 2 places of egress from the subdivision onto South 72nd Street West and onto South 68th Street West.
- Stop signs shall be installed at Maple Crest Lane's approaches to S. 71st Street West.
- A stop sign shall be installed at Maple Crest Lane's approach to Maple Leaf Trail
- Stop signs shall be installed at Maplewood Lane's approaches to S. 71st Street West.
- Stop signs shall be installed at Red Maple Lane's approaches to Maple Leaf Trail
- A Stop sign shall be installed at Silver Maple Court's approach to Red Maple Lane

C. Access

- A minimum of 2 accesses shall be provided for this subdivision.
- One access shall be by way of a connection to South 72nd Street West, a public street.
- One access shall be by way of a connection to South 68th Street West, a public street.

D. Billings Area Bikeway and Trail Master Plan

- The Billings Area Bikeway and Trail Masterplan show no elements within the property being subdivided.
- No improvements are required or proposed at this time.

E. Sidewalks

- Sidewalks are not required since this property is located outside of the Yellowstone County zoning boundaries; however,
- Sidewalks 5' in width shall be installed by homeowners at the time of lot development and shall be maintained by homeowners.
- Sidewalks shall be installed within a 14' wide sidewalk and utility easement along all street frontages, aligned specifically so that the front of the 5-foot wide sidewalk is setback 1 foot behind the front property line/street right-of-way-line.

IV. EMERGENCY SERVICE

- Fire protection facilities shall be provided via a dry hydrant system installed in the first phase of development with a capable 30,000 gallon underground water storage tank. The system shall be capable of providing a minimum of 1,000 gallons per minute at draft.
- The Subdivider shall submit plans and specifications of the dry hydrant system to the Billings Fire Department for review and approval prior to installation of the system. The tank shall be installed within a dry hydrant easement with access from the adjacent public street. The dry hydrant system shall be inspected, acceptance tested, and approved by the Billings Fire Department prior to construction of any buildings in the subdivision. An RSID will be created for maintenance of the dry hydrant with the final plat.
- Internal streets will be paved to county standards and provide emergency access.
- This subdivision is not located within an Urban Wildland Interface Area.

V. STORM DRAINAGE

All drainage improvements shall comply with the provisions of 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.

- Storm water runoff shall be conveyed by roadside drainage swales to a retention pond

VI. UTILITIES

A. Water

In accordance with Section 4.9 Yellowstone County Subdivision Regulations, all proposed water systems must obtain approval by the MDEQ, or its designee.

- Water will be supplied by shared wells, owned and maintained by Aquanet, a public utility company.
- MDEQ approval of the shared wells shall be submitted with the final plat.

B. Septic System

In accordance with Section 4.8 Yellowstone County Subdivision Regulations, all proposed sanitary sewer systems must obtain approval by the MDEQ, or its designee.

- Wastewater will be handled with individual septic systems.
- MDEQ approval letter shall be submitted with the final plat.

C. Power, Telephone, Gas, and Cable Television

- Power, telephone, gas, and cable television utility service will be provided to all lots within an 8' wide utility easement along all street frontages and behind the sidewalks of all internal public roads.

VII. PARKS/OPEN SPACE

- The parkland requirement for this subdivision is 3.967 Acres.
- The parkland requirement is met by a dedication of 3.231 Acres of public parkland with the remainder to be met by cash-in-lieu of parkland.
- A Park Maintenance District will be established with the final plat to maintain the public parkland (Park 1 and Park 2).
- Park 3 shall be owned and maintained by HOA for the purpose of storm water retention. For this reason, Park 3 does not count toward fulfillment of the parkland requirement for this subdivision.

VIII. IRRIGATION

- The Big Ditch Irrigation District provides water to the ditch along the westerly and northerly boundaries of this subdivision. No water rights or ditch shares will be used by this residential development.

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

- No geotechnical study is required.
- Lot owners shall obtain their own geotechnical study for recommendations pertinent to their lot.

XI. PHASING OF IMPROVEMENTS

- Subdivision will be completed in 2 phases.
- Phase 1 consists of Lots 1-19, Block 1; Lots 1-5, Block 2; Lot 1 and Lots 6-13, Block 3; and Lots 1-11, Block 4.
- Phase 2 consists of Lots 2-5 and Lots 14-21, Block 3; Lots 12-28, Block 4; and Lots 1-4, Block 5.
- Public improvements will be constructed by way of a private contract with each phase.

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

Staley Property Residential Subdivision

Traffic Impact Study

Prepared on behalf of:

In Site Engineering P.C.

March 2025



Traffic Impact Study

Prepared for submittal to:



for the project:

Staley Property Residential Subdivision

on behalf of:

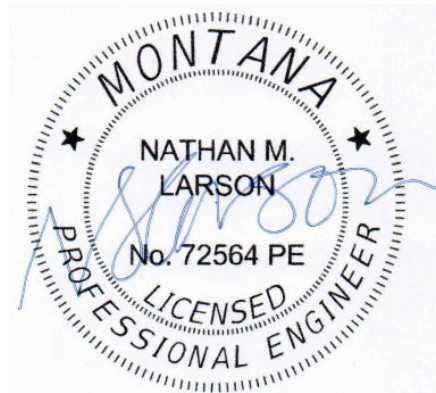
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March 2025

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Cover Photos by 406 Traffic:

Upper right: Intersection signage, 72nd at Hesper
 Bottom: Site as of Winter 2025, panoramic centered on southeast view from 72nd at O'Donnell

1 INTRODUCTION

This report documents the Traffic Impact Study conducted for the Staley Property Residential Subdivision project in unincorporated Yellowstone County, west of Billings. It is situated on multiple existing lots in Section 18, Township 01 S, R25 E. The study documented here was conducted as required by Yellowstone County Subdivision Regulations Section 4.6.C.4.B, in concert with In Site Engineering, P.C.

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 direct coordination with County staff. The five existing study intersections for this project are:

1. S 72nd St W at King Avenue West
2. S 72nd St W at O'Donnell Lane
3. S 72nd St W at Hesper Road
4. S 68th St W at Hesper Road
5. S 64th St W at Hesper Road

The project's proposed new access to S 72nd Street West was also studied with respect to intersection operations after the project is open. The other two proposed access points will be at the existing intersection of S 71st Street West with O'Donnell Lane and a new intersection with 68th Street. These local intersections are not examined separately in this study for two reasons. First, O'Donnell Lane and 68th Street are largely private and unlikely to carry significant non-project through traffic. Second, all traffic from this proposed subdivision is expected to use those intersections (and the project's new primary access south of O'Donnell) to access the arterial network directly. To that end, project-generated traffic was assigned to the existing 72nd at O'Donnell and 68th at Hesper intersections, respectively.

From here forward in this report, study intersections are generally referred to only by their distinguishing street names (e.g., "72nd at Hesper") for the sake of brevity.

1.2 ZONING AND LAND-USE CONTEXT

The project site and all study intersections are outside of the existing city limits and planning jurisdictions of both Laurel and Billings. 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, though the nearby Elder Grove School and Yellowstone Boys and Girls Ranch lie to the southeast and southwest of the project site respectively. These educational facilities are likely to attract some site traffic, but most project trips will come from the greater Billings area to the east, the city of Laurel to the southwest, and Interstate 90 to the east and the south.

1.3 PROJECT DESCRIPTION

The proposed project is a new single-family residential subdivision west of Billings. New local streets, as yet unnamed, will be built completely within the project site, and they will connect to one new site access onto S 72nd Street West, one existing access east of the 72nd at O'Donnell intersection, and one existing access north of the 68th at Hesper intersection. There are no plans to implement any turning restrictions at any of the proposed site access points. No access will be provided to the parts of either O'Donnell or 68th that are private.

A total of 93 lots will be platted. While these lots are expected to be sold and developed in two phases, this study considers only the full buildout of the project. The private park on the eastern part of the site is for Staley subdivision residents and their guests, and will not generate outside traffic at site access points. **Exhibit 2** shows the site plan and proposed access point locations for the proposed subdivision.

Exhibit 1. Overall Site Location and Study Intersections

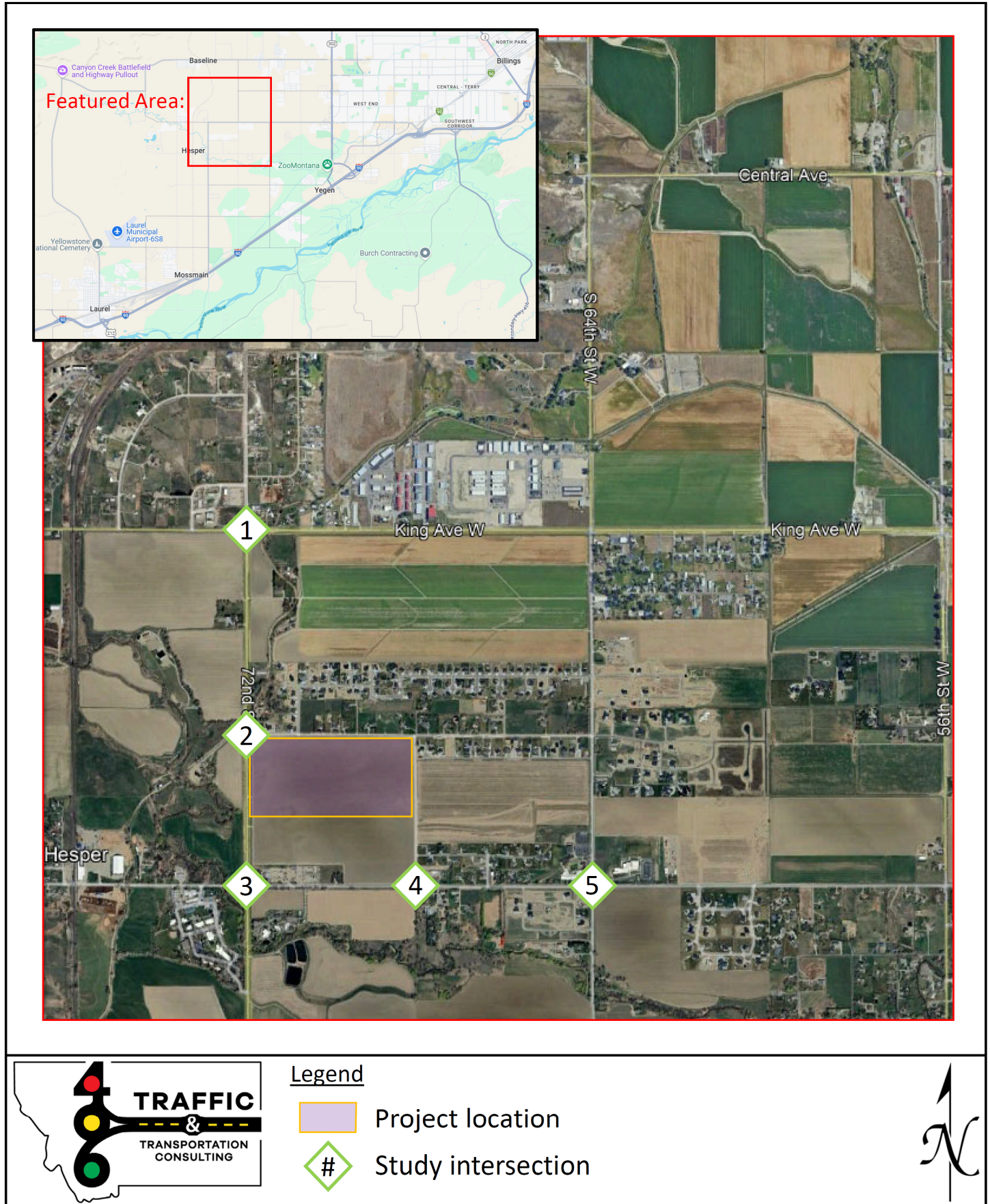
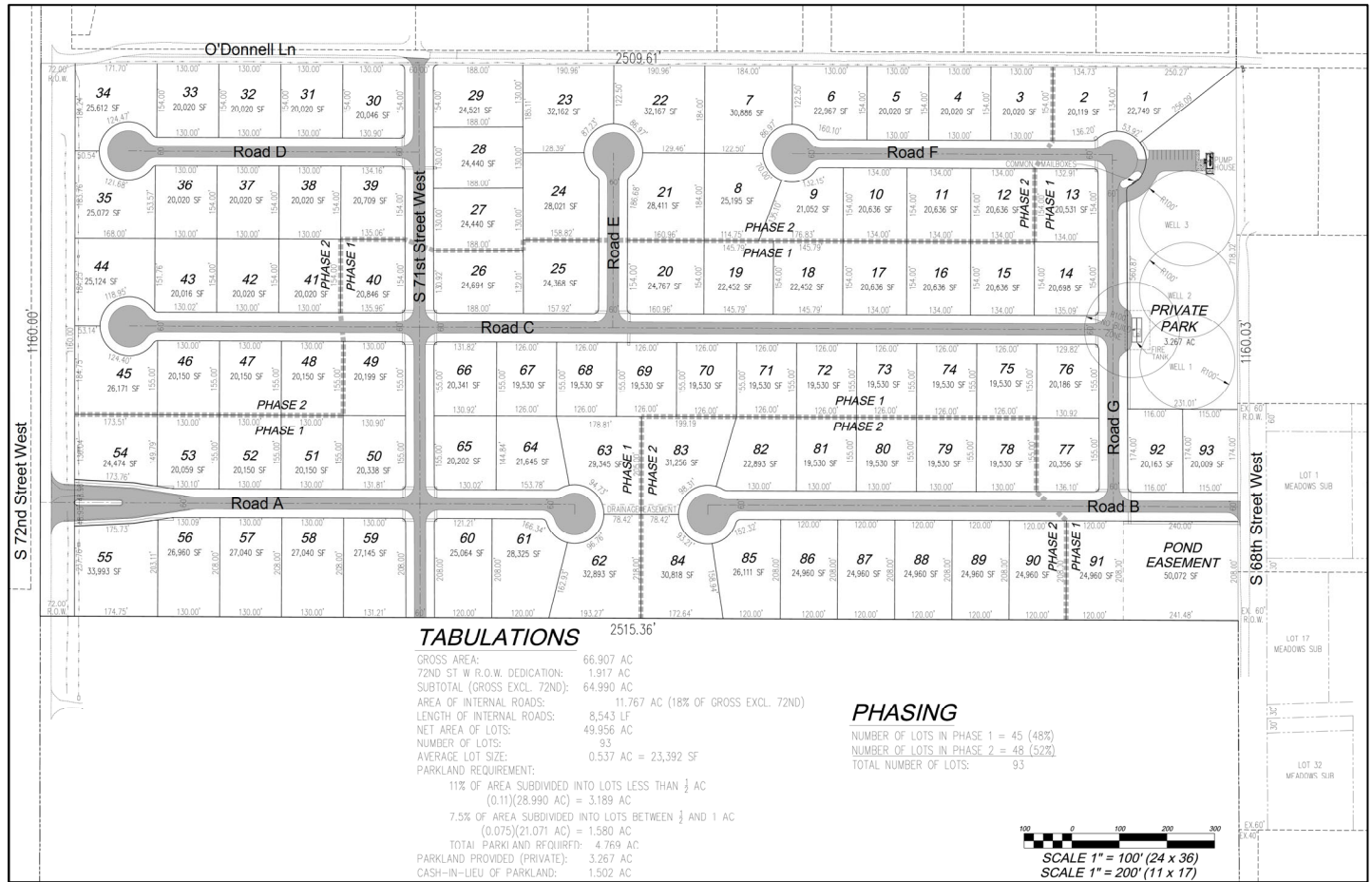


Exhibit 2. Site Plan



Source: In Site Engineering, 2/27/2025

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. Reports for each intersection were 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. Yellowstone County has required a signal warrant analysis for the 64th at Hesper intersection to be included in this study (see Appendix E).

2 EXISTING AND BASE CONDITIONS

2.1 STREETS AND INTERSECTIONS

S 72nd Street West is a rural north-south major collector with one travel lane in each direction. Its speed limit is 55 mph near its intersection with Hesper Road, 45 mph to the north of King Avenue West, and 60 mph elsewhere 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 King Avenue West and to Neibauer Road to the south of the study area. At its southern terminus after crossing over railroad tracks, it turns into Old US 10, which in turn connects to Interstate 90 and Laurel’s Main Street. There is an exclusive right-turn lane at its intersection with King Avenue West, where right-turning vehicles only need to yield to eastbound traffic, unlike left-turning or through moving vehicles which are required to stop. There are no sidewalks or other multimodal facilities on 72nd.

Hesper Road is an east-west local road with one travel lane in each direction. Its default speed limit is 45 mph to the west of 64th and 50 mph to the east of it, but school zones mandate that these speed limits be lower on weekdays. The speed limit is 15 mph from 7:30 a.m. to 5 p.m. on school days near its intersection at 64th because Elder Grove School and Elder Grove Middle School are nearby. Its speed limit is 25 mph to the west of a bridge over Canyon Creek from 8 a.m. to 5 p.m. on school days due to its proximity to the Yellowstone Boys and Girls Ranch, which is at the southwest corner of the intersection with 72nd at Hesper. It connects these education facilities, local farms and residential neighborhoods, and the unincorporated Hesper community to Shiloh Road and Gabel Road in the southwestern Billings area. Short sidewalk segments connect the two schools on either side of 64th, but no other multimodal facilities are located on Hesper in the study area.

S 64th Street West is a rural north-south local road with one travel lane in each direction, though it was analyzed as a collector in this study. Its default speed limit is 50 mph within the study area, but the school zone near Elder Grove School calls for nearby speed limits to be lower. For traffic approaching the school zone from the north and from the south, the speed limit is gradually lowered from 50 mph to 45 mph, then to 35 mph, and finally to 15 mph from 7:30 a.m. to 5 p.m. on school days to the north of Hesper Road. The school zone’s 15 mph signs are equipped with solar-augmented dynamic speed displays. 64th St W connects Elder Grove School and local farms and neighborhoods to east-west routes such as King Avenue West, Grand Avenue at its northern terminus, 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 usually not part of the preferred non-interstate route between Billings and Laurel because of its lower speed limits, particularly in the school zone near Elder Grove School. A pedestrian crosswalk crosses the northern leg of its Hesper intersection, but no other multimodal facilities are located on 64th in the study area.

King Avenue West, in the study area, is an east-west rural major collector with one travel lane in each direction and a speed limit of 60 mph. From 88th St eastward, it collects traffic from north-south routes between Billings and Laurel. It connects small residential neighborhoods, farms, and some industrial developments with the greater Billings area where it becomes one of the city’s busiest commercial corridors before intersecting Interstate 90 and transitioning to Mallowney Lane. There are no sidewalks or other multimodal facilities on King Avenue in the study area.

O’Donnell Lane is an east-west local road with unmarked travel lanes and no posted speed limit. It becomes narrow and unpaved to the east of its intersection with S 71st St W. Presently, it largely serves as an access road linking the Skycrest Estates subdivision and a few other private residences to 72nd. It also intersects 64th to the east of the study area, but this unpaved road segment is for private residents only and is not intended for through traffic. It is gated and signed as such at both 71st and 64th.

S 68th Street West is an unpaved north-south local road with no posted speed limit. It currently serves as an access road for the Lackman subdivision. It intersects Elder Grove Lane and O’Donnell Lane to the north, but

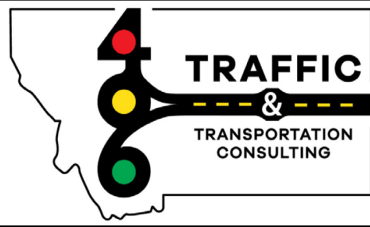
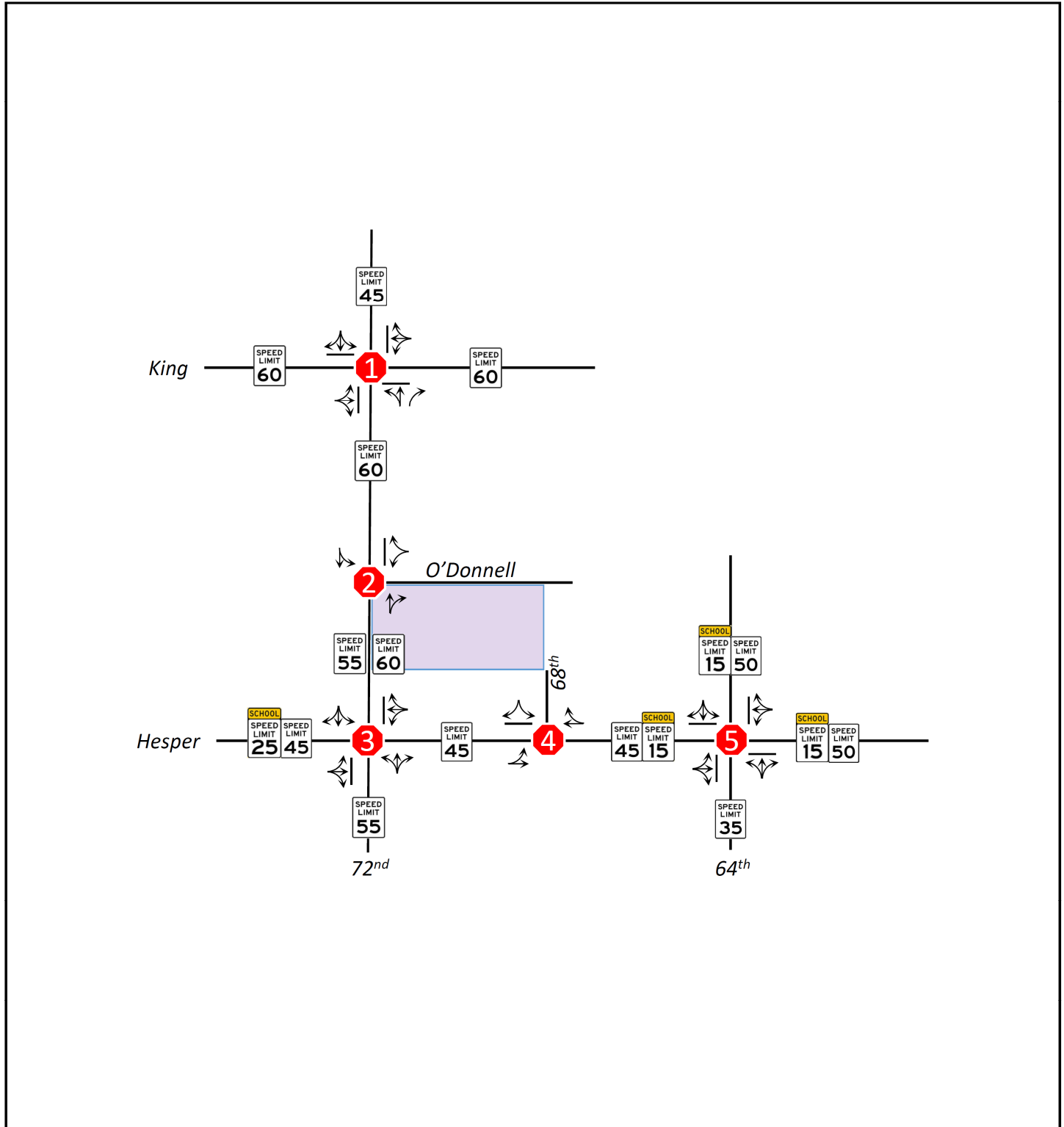
access to the adjacent private properties north of the vicinity of this subdivision's proposed site access was blocked by a farm gate until recently.

No signal-controlled intersections currently exist within the study area; all five study intersections are currently stop-controlled. The intersections of 72nd at King and 64th at Hesper are all-way stop-controlled, while the other three study intersections are two-way stop-controlled. There are suspended flashing signal heads at both all-way stop-controlled intersections, as well as at the intersection of 72nd at Hesper. 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.

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 either collects or estimates traffic counts at multiple locations in the study area from which their annualized average daily traffic (AADT) data was used in this study. Three locations provided meaningful traffic information, but for two of them, MDT has only reported data starting with 2018 counts, and those counts showed some outlying values. For this reason, volumes were examined over the past six years available (2019 through 2024) for a historical perspective. These locations are on 72nd south of King, on King east of 72nd, and on 64th north of Hesper. The historical AADT volumes at these locations are shown in **Exhibit 5**.

Exhibit 4. Road and Intersection Basics



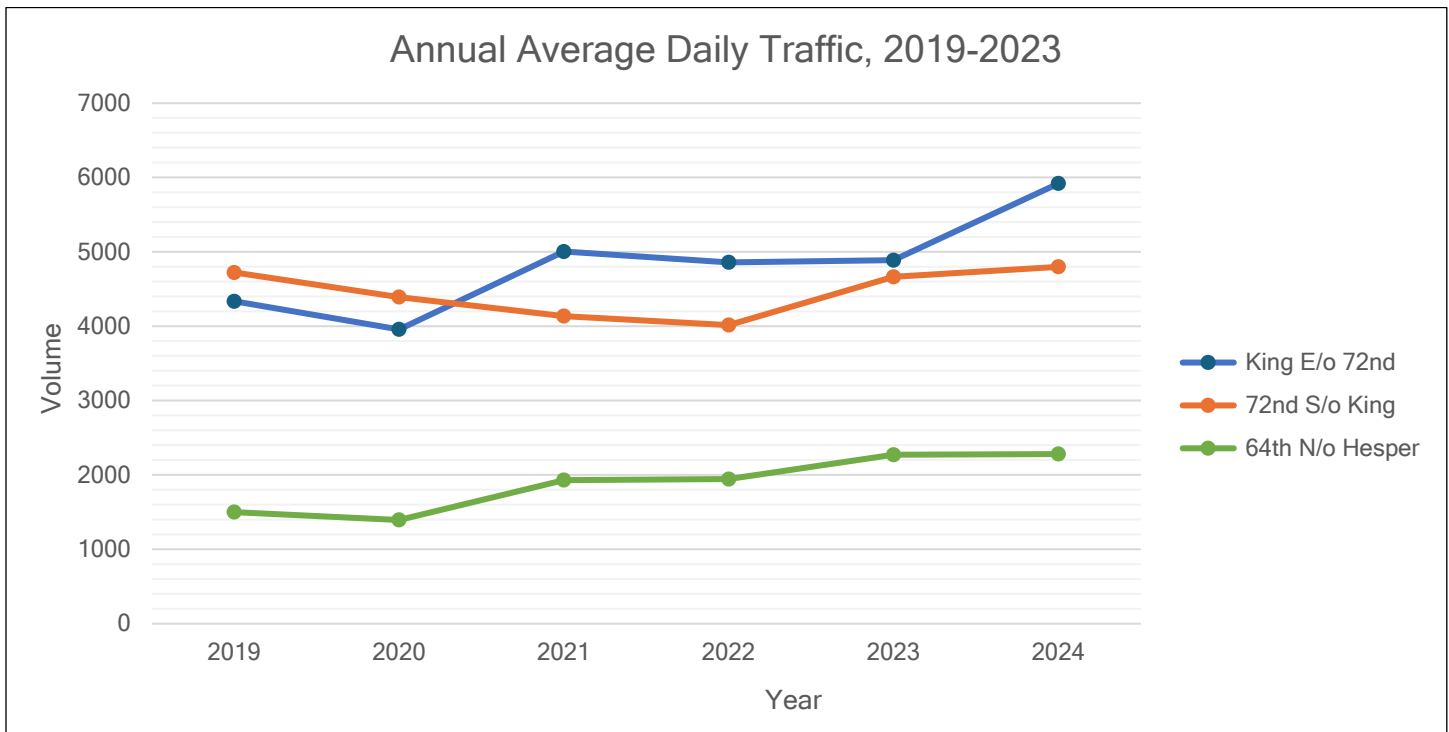
Legend

- # Study intersection (stop)
- Lane group with stop sign
- Lane group without stop sign

- Project Site
- Speed Limit (Selected Locations)



Exhibit 5. Historical AADT



Source: MDT Transportation Data Management System: retrieved 2/25/2025

A few trends can be discerned from these data. The COVID-19 pandemic caused a slight decrease in traffic in 2020, but at two of the three locations traffic levels rebounded in 2021 to exceed pre-pandemic levels. Recovery has taken longer at the 72nd count location. Based on these counts, an annual average traffic growth rate of 4.25% per year was used for this project’s traffic. This growth rate was applied to all existing volumes in order to estimate short-term future traffic and assess potential project impacts to intersection operations.

2.3 RECENT TRAFFIC COUNTS

The study intersections were counted for this project from 7-9 a.m. and from 4-6 p.m. at four of the five study intersections on Wednesday, February 13, 2025 using Miovision cameras. The fifth, 64th at Hesper, was counted from 7 a.m. to 7 p.m. to support the required examination of traffic signal warrants there. 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 a.m. The PM peak hour started at 4 p.m. for most intersections and at 3 p.m. for the 64th at Hesper intersection, where the Elder Grove schools are located. This finding is consistent with the school release time occurring about an hour before the traditional afternoon commute traffic peak. The raw count data for each intersection is provided in **Appendix A**.

Counts at all three study intersections were adjusted for seasonal variation using the MDT’s 2023 seasonal adjustment factors for a February Thursday on (a) urban rural collectors and (b) rural minor arterial/major collectors in MDT financial district 5, which are 1.026 and 1.262, respectively. Existing annualized traffic volumes based on these counts are shown in **Exhibit 6**. (MDT’s 2024 AADT counts are grown by one year to match this study’s existing 2025 traffic counts.)

2.4 PROJECTED TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT

Using the aforementioned 4.25% annual growth rate, existing peak hour traffic was projected four years into the future (2029). This future study year was chosen to reflect the time needed for permitting, site preparation, utility work, lot sales, and the construction and occupancy of the homes themselves, along with an additional year to account for traffic generated by the project to stabilize. **Exhibit 7** shows 2029 Background traffic.

Exhibit 6. Existing Annualized Traffic Volumes

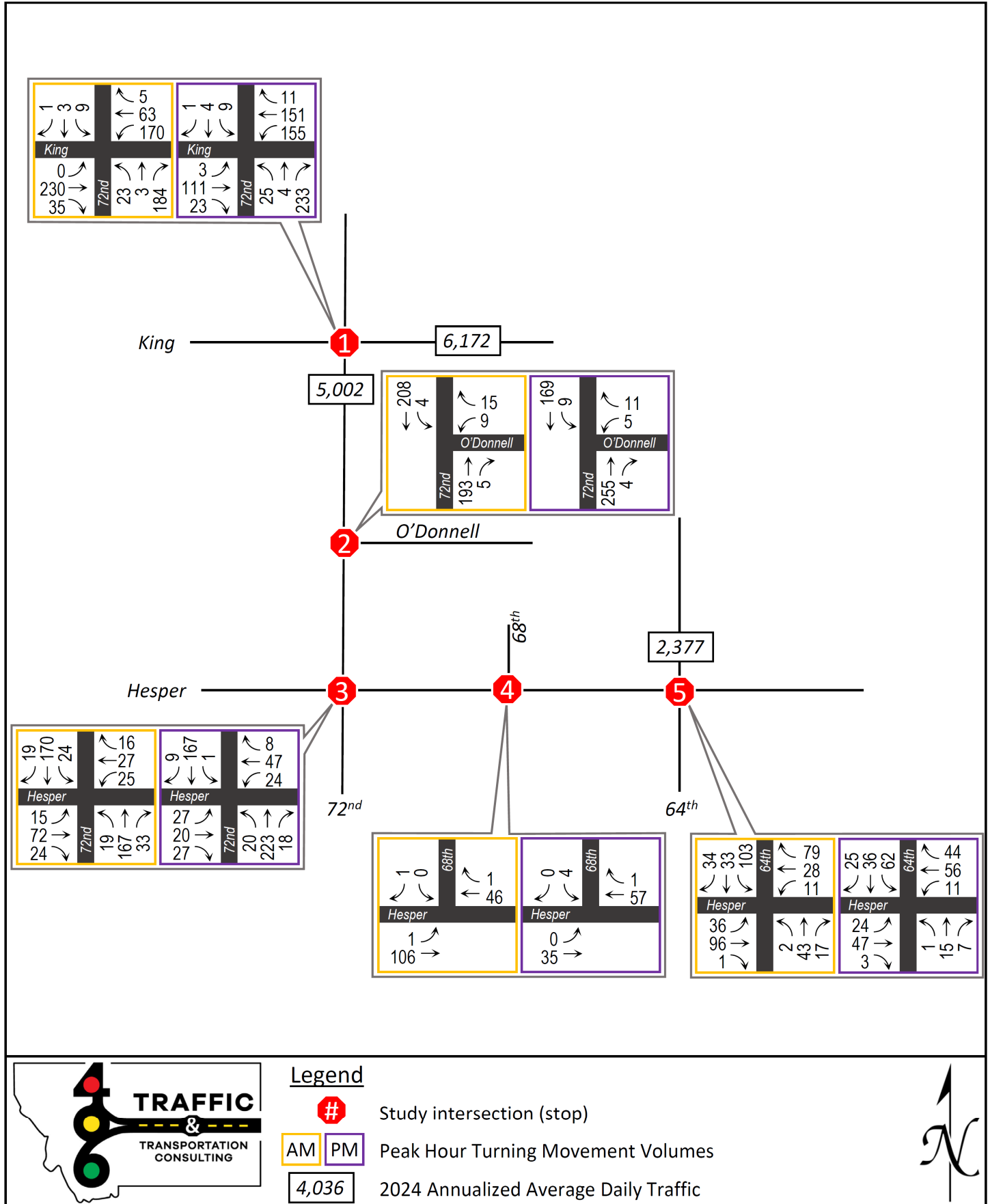
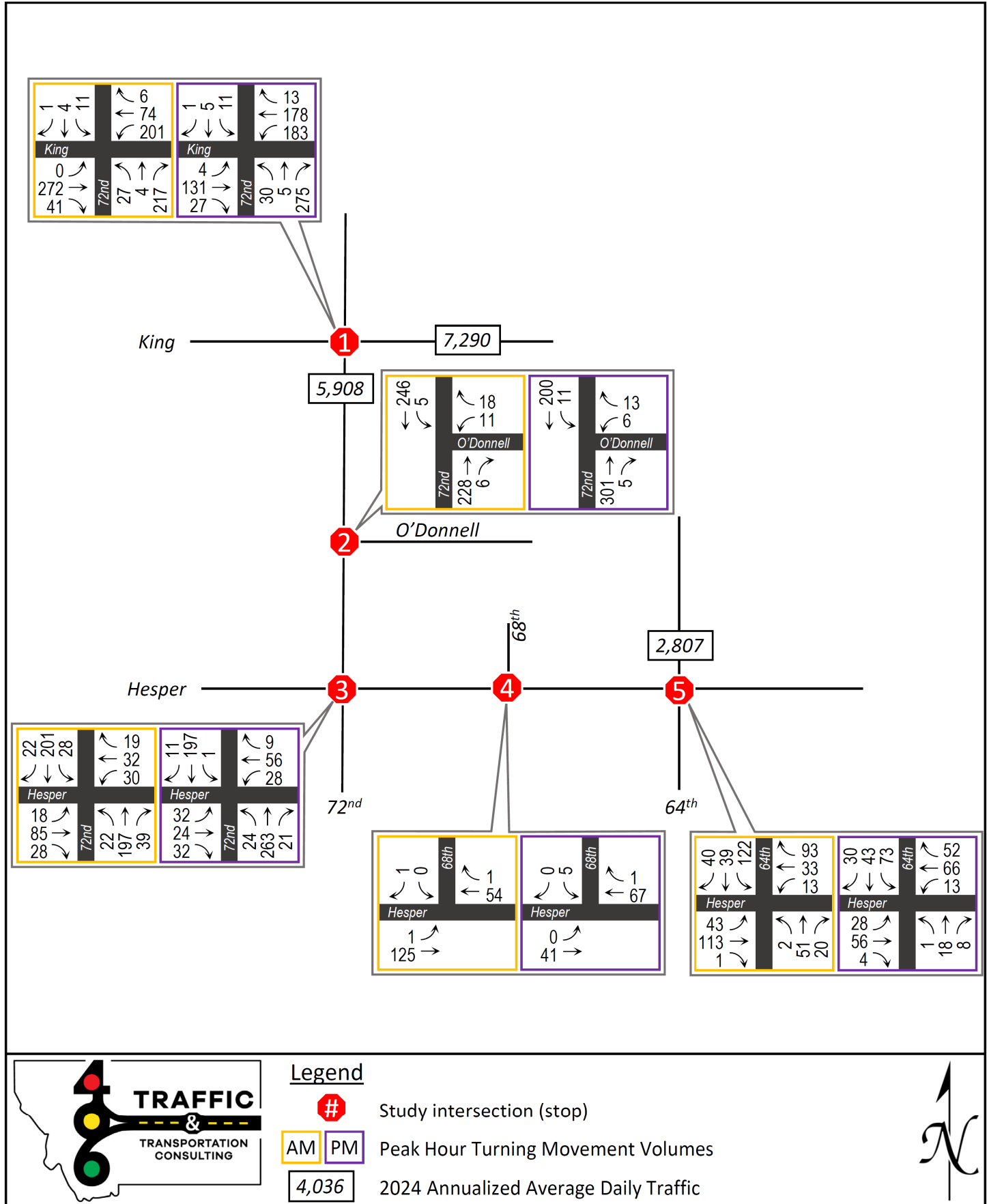


Exhibit 7. Projected 2029 Background Traffic Volumes



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 when both are available, 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 will be for homes, 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 peak-hour travelers do not tend to make discretionary stops at residences like these on their way to somewhere else.

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 210: Single-Family Detached Home	Daily	AM Peak Hour		PM Peak Hour	
	Equation/rate	Equation/rate	In / Out	Equation/rate	In / Out
X = 93 Dwelling Units	$\text{Ln}(T)=0.92\text{Ln}(X)+2.68$	$\text{Ln}(T)=0.91\text{Ln}(X)+0.12$	25%/75%	$\text{Ln}(T)=0.94\text{Ln}(X)+0.27$	63%/37%
Trips (T):	944	70	18 / 52	93	59 / 34

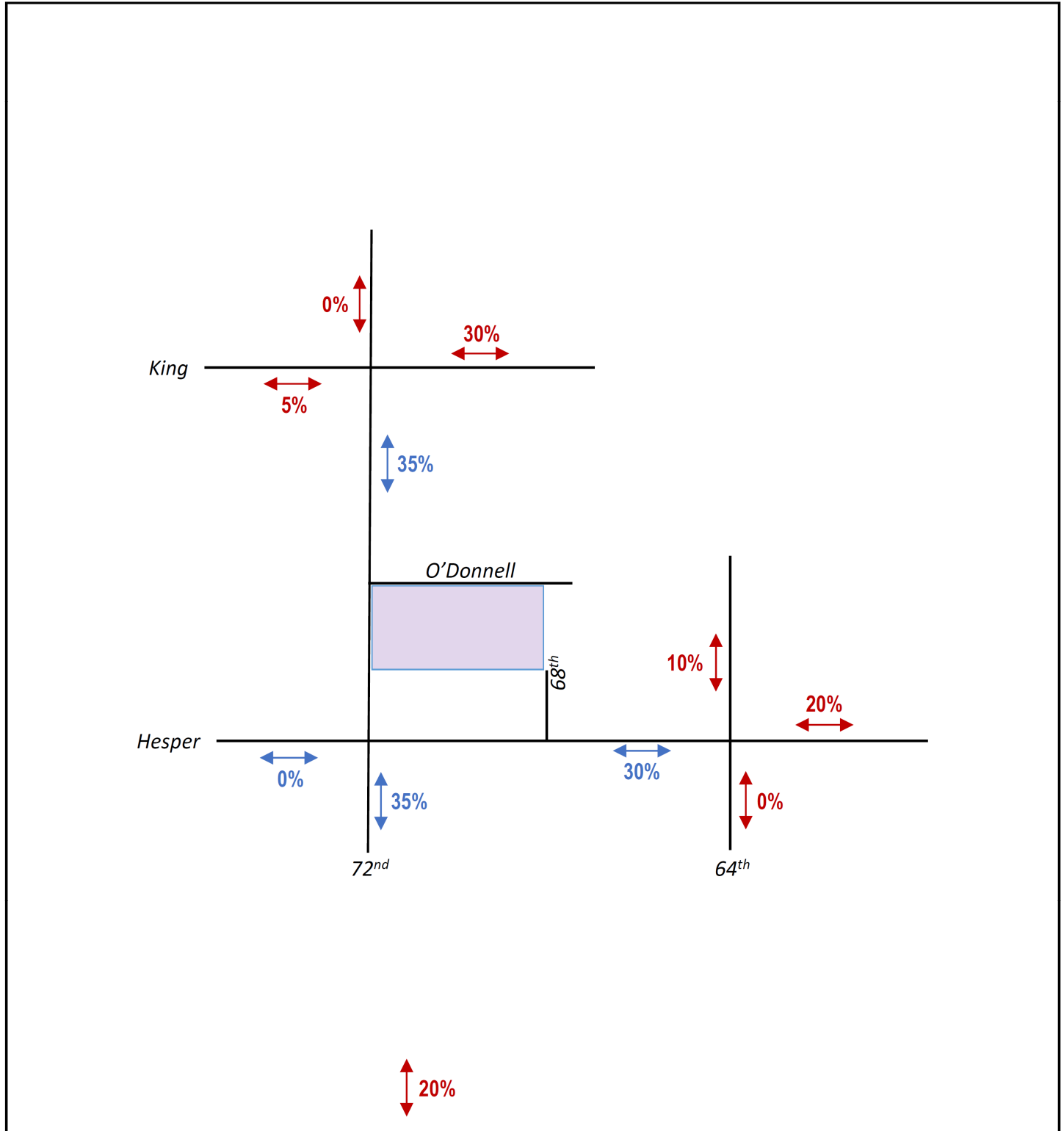
Source: Equations from ITE Trip Generation, 11th Edition.

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 Hesper Road east of 72nd or to 64th south of Hesper Road because there are no major trip generators in those directions. Trip distribution percentages are shown in **Exhibit 9**.

The project-generated 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 2029 background trips.

Exhibit 9. Distribution of Project Trips



Legend

- 25% Primary Trip Assignment Percentage
- 10% Secondary Trip Assignment Percentage

Project Site



Exhibit 10. Project Trip Assignment

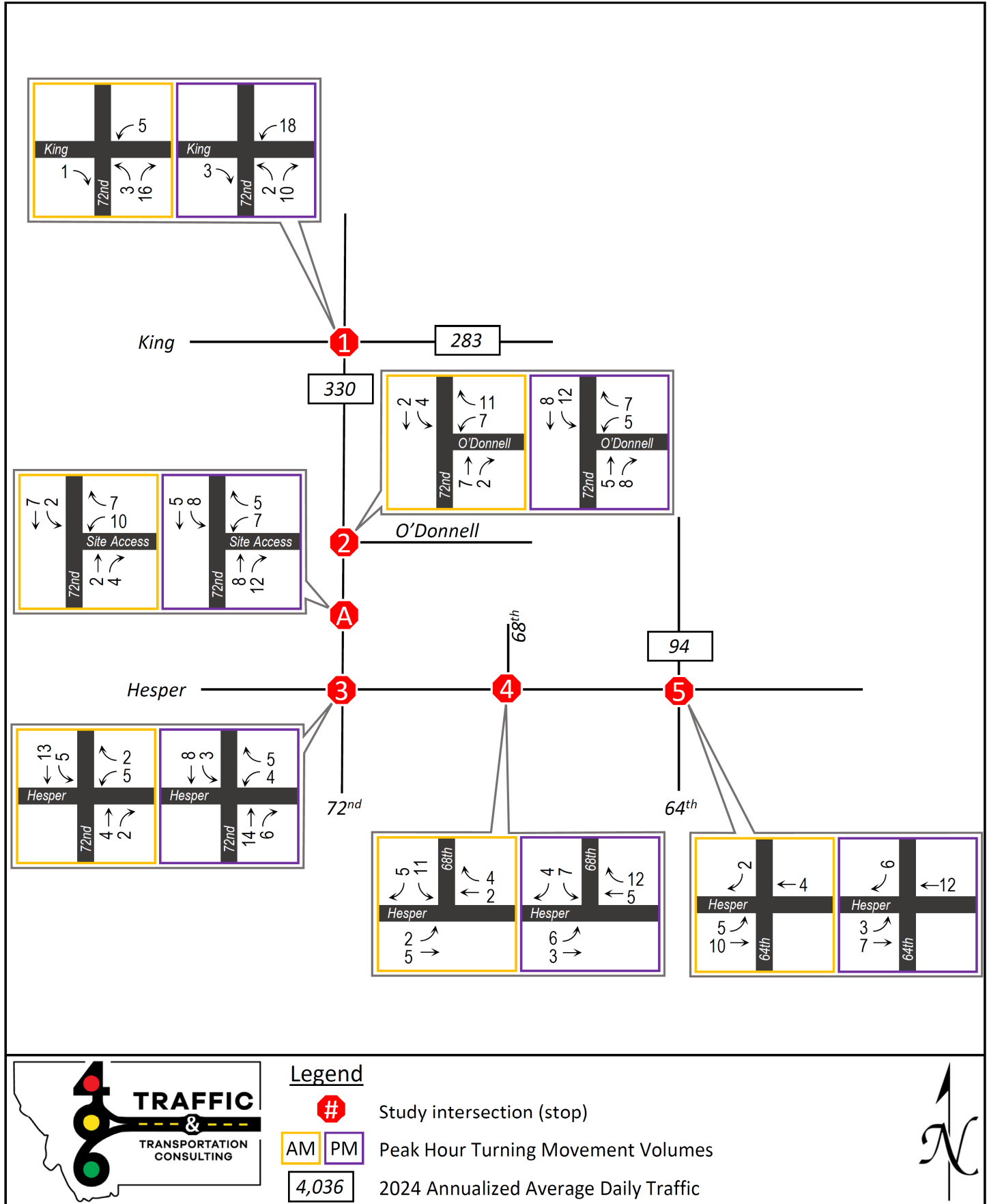
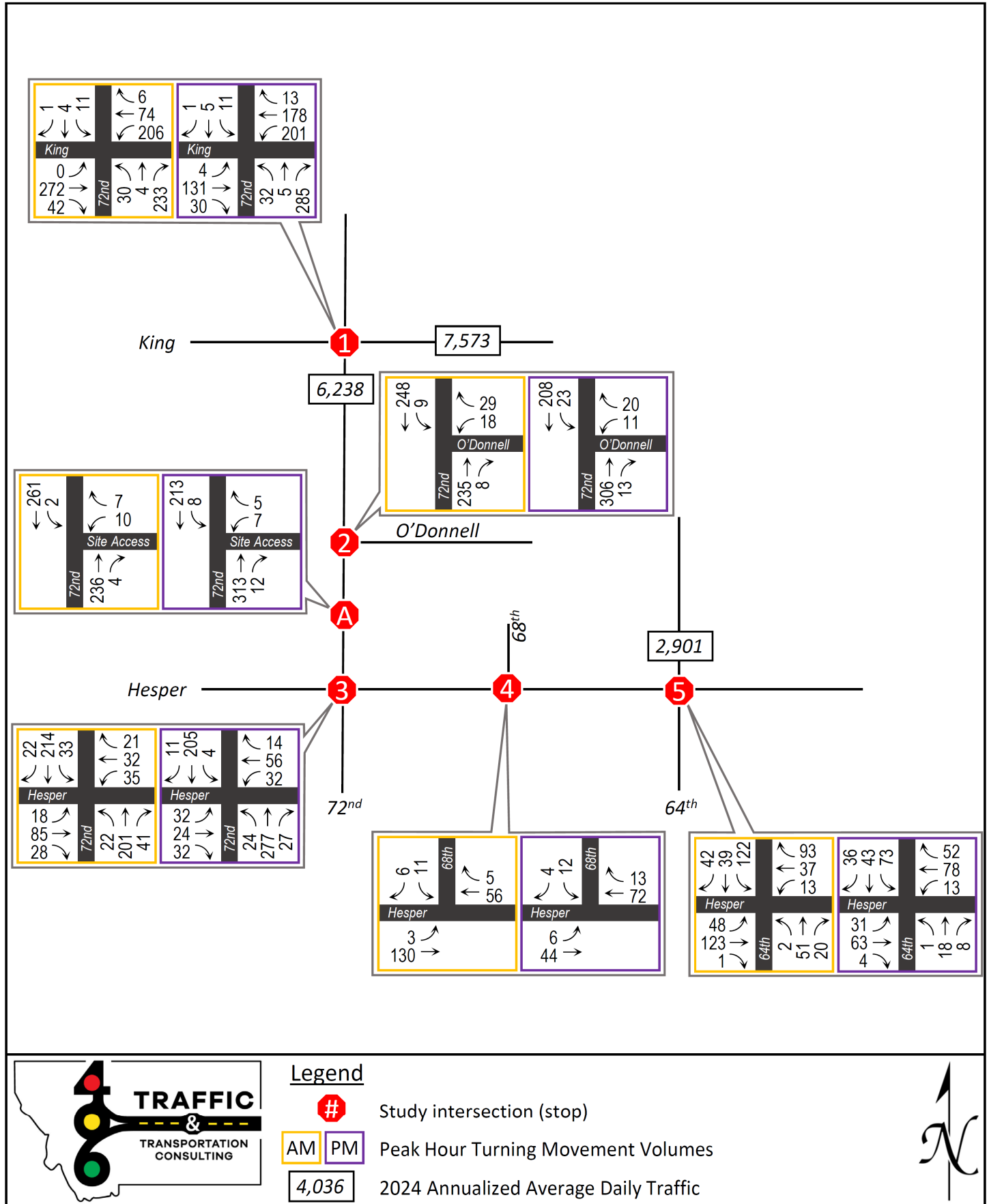


Exhibit 11. 2029 Total Traffic with Project



4 TRAFFIC ANALYSIS RESULTS

4.1 INTERSECTION OPERATIONS

As mentioned earlier, all study intersections operate with stop control 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	Traffic Control	LOS (delay, seconds/vehicle)			TWSC Worst Lane Group*	
		Existing	Future Background	Future With Project		
AM Peak	1. 72 nd at King	AWSC	B (11.8)	B (14.3)	B (14.8)	-
	2. 72 nd at O'Donnell	TWSC	B (10.4)	B (10.9)	B (11.3)	WB
	3. 72 nd at Hesper	TWSC	C (15.5)	C (18.8)	C (20.3)	EB/WB**
	4. 68 th at Hesper	TWSC	A (8.6)	A (8.7)	A (9.7)	SB
	5. 64 th at Hesper	AWSC	B (12.3)	C (16.0)	C (17.2)	-
	6. 72 nd at New Access	TWSC	-	-	B (11.5)	WB
PM Peak	1. 72 nd at King	AWSC	B (11.3)	B (13.8)	B (14.7)	-
	2. 72 nd at O'Donnell	TWSC	B (10.6)	B (11.2)	B (11.7)	WB
	3. 72 nd at Hesper	TWSC	B (14.7)	C (17.0)	C (18.0)	WB
	4. 68 th at Hesper	TWSC	A (9.2)	A (9.3)	A (9.5)	SB
	5. 64 th at Hesper	AWSC	A (9.6)	A (9.9)	B (10.3)	-
	6. 72 nd at New Access	TWSC	-	-	B (12.0)	WB

* Worst lane group is the one that determines the intersection LOS at a Two-Way Stop Controlled intersection.

** In the AM peak for 72nd at Hesper, the EB approach is worst for both conditions without the project, while WB is worst with the project.

The results in the table indicate that traffic generated by the project would result in peak intersection delays of LOS C or better. The highest-delay result found is projected to occur in the AM peak hour for the 72nd at Hesper intersection, where multiple traffic movements would see slightly increased volumes from the project. However, estimated future-year delay is still well within the LOS range. 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)		Left Turns (20+ vph)	
	AM Peak	PM Peak	AM Peak	PM Peak
2. 72 nd at O'Donnell	-	-	-	SB
3. 72 nd at Hesper	NB	-	NB, SB	NB
4. 68 th at Hesper	-	-	-	-
6. (A) New Access to 72 nd	-	-	-	-

None of the six total AM inbound movements at the site access points (considered for this analysis as intersections 2, 4, and 6) qualified for turn lane analysis, and in the PM only one, the SB left at O'Donnell would exhibit a qualifying volume. None of them met MDT's standard for consideration of new turn lanes. The remainder of the qualifying turn lane conditions in the future would occur for the 72nd at Hesper intersection, and none of those would meet the standard for new turn lanes either. However, the AM peak hour SB left turn would be close, and with additional future growth in non-project, would be expected to warrant consideration in 6-7 years. 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 five study intersections. Crash data were acquired from MDT for the 5-year time frame from January 1, 2019 through 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 five study intersections, where CF = crash frequency measured in crashes per year:

$$CF = \frac{\text{Total Crashes within time period}}{\text{Time Period}}$$

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:

$$\text{Crash Rate} = \left(\frac{CF}{365} \div DEV \right) \times 1,000,000$$

The crash frequency is divided by 365 days per year to approximate the average number of crashes per day.

In order to calculate the crash 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 highest peak hour, GrowthFactor = the estimated average annual growth rate assumed for this study based on MDT historical data, and k = an average K-Factor from MDT's public-facing traffic count database system for the same three locations where historic AADT is reported:

$$DEV = \frac{\text{Peak Hour TEV} \times k}{\text{GrowthFactor}^3}$$

Because of the unusually high portion of daily trips taking place during the peak hour at the intersection of 64th at Hesper, and because of the intersection's close proximity to the traffic counting location on 64th, the K-factor used in calculating the daily entering volume at this intersection is derived solely from the traffic counting location on 64th.

The Peak Hour TEV is divided by the annual growth rate cubed (to represent three years of growth) and multiplied by a 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 five 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:

$$\text{Severity Index} = \frac{(8 \times K) + (3 \times ABC) + (1 \times PDO)}{\text{Total Crashes}}$$

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	72 nd at King	72 nd at O'Donnell	72 nd at Hesper	68 th at Hesper	64 th at Hesper
Right angle	2		7		1
Fixed Object	4		1		
Roll Over	1		1		
Wild Animal		1	1		
Rear-End			1		
Left Turn, Opposite Direction			1		
Total Reported Crashes	7	1	12	0	1
Total Number of Fatalities	0	0	0	0	0
Total Number of Injuries	0	0	5	0	0
Crash Severities, Frequencies, and Rates:					
Study Intersection	72 nd at King	72 nd at O'Donnell	72 nd at Hesper	68 th at Hesper	64 th at Hesper
Property Damage Only Crashes	7	1	8		1
Suspected Minor Injury Crashes			3		
Suspected Serious Injury Crashes					
Fatal Crashes					
Unknown			1		
Crash Frequency (crashes/year)	1.4	0.2	2.4	-	0.2
Daily Entering Volume, crash study midpoint year	5744	3565	4808	1228	2320
Crash Rate (crashes per million entering vehicles)	0.67	0.15	1.37	-	0.24
Severity Index	1.0	1.0	1.5	0.0	1.0

The highest crash frequency, crash rate, and severity index occurred at the intersection of 72nd at Hesper. It is the only study intersection where crashes involving injuries occurred, and it is where the most PDO crashes occurred during the 5-year study period. Right-angle crashes were the most frequent type of collision to occur at this intersection. These collisions are often related to the failure of a side-street driver to properly yield the right of way when facing a stop sign. Two of the crashes that involved minor injuries were right-angle collisions, while the other was a left-turn, opposite direction collision. The crash of unknown severity at the intersection of 72nd at Hesper was also a right-angle collision and was treated as a PDO crash because no recorded injuries or fatalities were associated with it. The only crash that occurred at the intersection of 72nd at O'Donnell involved a wild animal, so it was not directly related to an intersection conflict. No crashes were reported at the intersection of 68th at Hesper, and no fatal crashes or serious injuries were reported at any of the five study intersections during the 5-year time period.

6 INTERSECTION COST PARTICIPATION

The net new trips identified in this report are subject to examination under Yellowstone 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 is 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 15** shows the intersection cost participation summary for project trips.

Exhibit 15. Intersection Cost Participation

Intersection	AM	PM	Value in Higher Peak, if 2% or Greater
1. 72 nd at King	0.7%	1.7%	-%
2. 72 nd at O'Donnell	1.6%	1.9%	-%
2. 72 nd at Hesper	1.5%	1.8%	-%
4. 68 th at Hesper	1.4%	1.6%	-%
5. 64 th at Hesper	0.8%	1.3%	-%
Total Participation %:			0%
x \$500,000			\$0

None of the 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 Staley Property Residential Subdivision 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. All intersections with two-way stop control were examined with respect to MDT warrants for auxiliary turn lanes, and no turn lanes were found to be warranted with or without this project in the study timeframe. Under the background traffic growth assumptions used here, a southbound left turn lane on 72nd at Hesper Road has been shown to be warranted a few years after this subdivision opens, and is therefore recommended for the County's independent consideration. No intersection cost participation is indicated by the traffic analysis documented in this report.

This concludes the Staley Residential Traffic Impact Study.

Appendix A: Raw Traffic Count Data

Study Name 72nd Street & King Avenue
Start Date 2/13/2025
Start Time 7:00 AM
Site Code
Project 406 Yellowstone County Counts

Type Classification	Road				Totals											
	72nd St W Southbound				King Avenue W Westbound				72nd St W Northbound				King Avenue W Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	0	0	2	0	0	5	20	0	30	0	4	0	5	48	0	0
7:15 AM	0	1	2	0	1	5	31	0	33	0	3	0	11	46	0	0
7:30 AM	0	0	3	0	0	11	41	0	47	1	1	0	8	64	0	0
7:45 AM	0	0	0	0	0	13	34	0	38	1	8	0	5	46	0	0
8:00 AM	1	1	2	0	3	21	29	0	28	0	6	0	4	26	0	0
8:15 AM	0	2	2	0	1	15	21	0	26	0	1	0	4	27	0	0
8:30 AM	0	0	2	0	0	25	25	0	27	0	1	0	4	28	0	0
8:45 AM	0	0	0	0	0	13	15	0	23	0	3	0	3	24	0	0
4:00 PM	1	0	3	0	2	27	25	0	54	0	5	0	6	28	0	0
4:15 PM	0	2	1	0	3	31	31	0	49	0	7	0	6	28	2	0
4:30 PM	0	1	1	0	2	24	29	0	39	2	4	0	4	18	0	0
4:45 PM	0	0	2	0	2	38	38	0	43	1	4	0	2	14	0	0
5:00 PM	0	0	1	0	1	27	45	0	26	1	3	0	6	22	0	0
5:15 PM	0	0	4	0	2	38	38	0	34	0	6	0	1	20	0	0
5:30 PM	0	0	1	0	3	31	27	0	41	0	3	0	7	12	0	0
5:45 PM	1	1	0	0	1	28	36	0	35	0	5	0	3	15	0	0

Study Name 72nd St & O'Donnell Lane

Start Date 2/13/2025

Start Time 7:00 AM

Site Code

Project 406 Yellowstone County Counts

**Type Road
Classification Totals**

Start Time	72nd St W Southbound				O'Donnell Lane Westbound				72nd St W Northbound				O'Donnell Lane Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM		25	1	0	0		4	0	0	37		0				
7:15 AM		41	2	0	5		2	0	1	37		0				
7:30 AM		52	0	0	3		1	0	1	39		0				
7:45 AM		37	0	0	3		2	0	2	45		0				
8:00 AM		35	1	0	1		2	0	0	32		0				
8:15 AM		25	2	0	0		1	0	1	23		0				
8:30 AM		28	2	0	0		0	0	1	34		0				
8:45 AM		18	0	0	2		0	0	1	20		0				
4:00 PM		29	0	0	3		2	0	2	66		0				
4:15 PM		37	2	0	3		0	0	0	47		0				
4:30 PM		35	1	0	1		1	0	1	41		0				
4:45 PM		33	4	0	2		1	0	0	48		0				
5:00 PM		52	0	0	0		3	0	2	29		0				
5:15 PM		35	0	0	1		2	0	2	39		0				
5:30 PM		33	0	0	0		1	0	1	46		0				
5:45 PM		36	4	0	0		3	0	2	33		0				

Study Name Hesper Road & 72nd Street
Start Date 2/13/2025
Start Time 7:00 AM
Site Code
Project 406 Yellowstone County Counts

Type Road
Classification Totals

Start Time	S 72nd St W Southbound				Hesper Road Westbound				S 72nd St W Northbound				Hesper Road Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	1	27	1	0	2	5	4	0	5	27	0	0	3	17	8	0
7:15 AM	1	34	4	0	2	2	4	0	5	28	1	0	5	11	6	0
7:30 AM	7	39	7	0	1	2	2	0	10	36	3	0	4	20	3	0
7:45 AM	4	33	6	0	5	9	8	0	8	37	4	0	5	20	2	0
8:00 AM	3	29	2	0	5	8	6	0	3	31	7	0	5	6	1	0
8:15 AM	4	26	0	0	0	6	1	0	0	21	10	0	4	4	4	0
8:30 AM	5	19	1	0	0	2	1	0	7	28	3	0	5	5	5	0
8:45 AM	4	14	1	0	0	1	2	0	1	17	5	0	2	8	2	0
4:00 PM	2	22	0	0	2	10	7	0	4	58	2	0	8	10	7	0
4:15 PM	1	41	0	0	0	9	3	0	5	42	2	0	8	0	6	0
4:30 PM	1	33	1	0	4	10	5	0	1	35	6	0	2	4	3	0
4:45 PM	3	36	0	0	0	8	4	0	4	42	6	0	3	2	5	0
5:00 PM	6	46	0	0	0	7	7	0	4	29	6	0	2	7	3	0
5:15 PM	1	35	1	0	3	11	3	0	1	38	3	0	3	2	2	0
5:30 PM	1	30	3	0	1	5	7	0	6	35	5	0	2	3	4	0
5:45 PM	6	29	1	0	1	7	2	0	5	36	4	0	5	0	2	0

Study Name Hesper Road & 68th Street
Start Date 2/13/2025
Start Time 7:00 AM
Site Code
Project 406 Yellowstone County Counts

Type Road
Classification Totals

Start Time	S 68th St W Southbound				Hesper Road Westbound				S 68th St W Northbound				Hesper Road Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	1		0	0	0	10		0						22	0	0
7:15 AM	0		0	0	0	6		0						20	0	0
7:30 AM	0		0	0	0	5		1						31	1	0
7:45 AM	0		0	0	1	24		0						30	0	0
8:00 AM	1		0	0	0	15		0						9	0	0
8:15 AM	0		0	0	0	8		0						5	0	0
8:30 AM	0		0	0	0	2		0						7	1	0
8:45 AM	0		0	0	0	3		0						7	1	0
4:00 PM	0		1	0	0	20		0						13	0	0
4:15 PM	0		3	0	0	9		0						8	0	0
4:30 PM	0		0	0	1	13		0						7	0	0
4:45 PM	0		0	0	0	14		0						6	0	0
5:00 PM	0		0	0	0	10		0						9	0	0
5:15 PM	0		0	0	0	18		0						6	0	0
5:30 PM	1		0	0	0	11		0						11	0	0
5:45 PM	0		0	0	0	10		0						7	0	0

Study Name Hesper Road & 64th Street
Start Date 2/13/2025
Start Time 7:00 AM
Site Code
Project 406 Yellowstone County Counts

Type Road
Classification Totals

Start Time	64th St W Southbound				Hesper Road Westbound				64th St W Northbound				Hesper Road Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	0	3	11	0	3	11	1	0	1	4	0	0	0	21	1	0
7:15 AM	2	2	12	0	6	4	4	0	4	3	0	0	0	21	3	0
7:30 AM	3	4	14	0	12	3	2	0	6	11	1	0	1	26	9	0
7:45 AM	14	13	50	0	54	14	3	0	5	19	0	0	0	34	21	0
8:00 AM	14	13	24	0	5	6	2	0	2	9	1	0	0	13	2	0
8:15 AM	1	5	4	0	3	8	2	0	0	6	0	0	0	5	1	0
8:30 AM	1	4	3	0	2	1	1	0	3	4	0	0	1	4	2	0
8:45 AM	2	6	4	0	1	2	0	0	2	5	0	0	0	6	3	0
3:00 PM	5	6	10	0	13	10	2	0	2	7	0	0	1	14	13	0
3:15 PM	15	19	42	0	18	24	6	0	2	2	0	0	2	5	4	0
3:30 PM	2	5	5	0	7	11	2	0	3	3	0	0	0	11	3	0
3:45 PM	2	5	3	0	5	10	1	0	0	3	1	0	0	16	3	0
4:00 PM	4	7	6	0	6	20	1	0	2	9	1	0	1	16	1	0
4:15 PM	3	5	3	0	5	9	6	0	2	1	0	0	1	7	1	0
4:30 PM	2	11	4	0	7	12	0	0	2	5	1	0	0	4	3	0
4:45 PM	1	7	3	0	9	14	2	0	2	4	1	0	0	7	3	0
5:00 PM	4	6	2	0	7	12	4	0	0	8	2	0	1	9	1	0
5:15 PM	3	4	5	0	13	19	3	0	4	4	1	0	2	3	4	0
5:30 PM	4	6	2	0	5	8	1	0	2	11	0	0	0	9	3	0
5:45 PM	2	5	5	0	3	16	2	0	2	3	0	0	1	8	2	0

Appendix B: Analysis Software Output

Scenario Order:

Existing AM

Existing PM

Future Background AM

Future Background PM

Future With Project AM

Future With Project PM

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	0	230	35	170	63	5	23	3	184	9	3	1
Future Vol, veh/h	0	230	35	170	63	5	23	3	184	9	3	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	3	3	3	4	4	4	0	0	0
Mvmt Flow	0	280	43	207	77	6	28	4	224	11	4	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	12.2	12.2	10.9	9.4
HCM LOS	B	B	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	88%	0%	0%	71%	69%
Vol Thru, %	12%	0%	87%	26%	23%
Vol Right, %	0%	100%	13%	2%	8%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	26	184	265	238	13
LT Vol	23	0	0	170	9
Through Vol	3	0	230	63	3
RT Vol	0	184	35	5	1
Lane Flow Rate	32	224	323	290	16
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.058	0.34	0.455	0.427	0.027
Departure Headway (Hd)	6.621	5.461	5.071	5.3	6.184
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	542	660	714	679	578
Service Time	4.354	3.194	3.071	3.329	4.232
HCM Lane V/C Ratio	0.059	0.339	0.452	0.427	0.028
HCM Control Delay, s/veh	9.8	11	12.2	12.2	9.4
HCM Lane LOS	A	B	B	B	A
HCM 95th-tile Q	0.2	1.5	2.4	2.1	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	9	15	193	5	4	208
Future Vol, veh/h	9	15	193	5	4	208
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, %	5	5	3	3	3	3
Mvmt Flow	10	17	214	6	4	231

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	457	217	0	0	220
Stage 1	217	-	-	-	-
Stage 2	240	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.13
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.227
Pot Cap-1 Maneuver	556	815	-	-	1343
Stage 1	812	-	-	-	-
Stage 2	793	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	554	815	-	-	1343
Mov Cap-2 Maneuver	554	-	-	-	-
Stage 1	812	-	-	-	-
Stage 2	790	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.41	0	0.15
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	693	34
HCM Lane V/C Ratio	-	-	0.039	0.003
HCM Ctrl Dly (s/v)	-	-	10.4	7.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection												
Int Delay, s/veh	5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	72	24	25	27	16	19	167	33	24	170	19
Future Vol, veh/h	15	72	24	25	27	16	19	167	33	24	170	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	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	5	5	5	2	2	2	4	4	4	2	2	2
Mvmt Flow	17	84	28	29	31	19	22	194	38	28	198	22

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	519	541	209	553	533	213	220	0	0	233	0	0
Stage 1	265	265	-	258	258	-	-	-	-	-	-	-
Stage 2	254	277	-	295	276	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	463	444	824	444	453	827	1338	-	-	1335	-	-
Stage 1	734	684	-	747	695	-	-	-	-	-	-	-
Stage 2	744	676	-	713	682	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	403	425	824	332	433	827	1338	-	-	1335	-	-
Mov Cap-2 Maneuver	403	425	-	332	433	-	-	-	-	-	-	-
Stage 1	717	668	-	733	681	-	-	-	-	-	-	-
Stage 2	680	663	-	588	666	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	15.51		15.15		0.67		0.87	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	151	-	-	471	434	199	-	-
HCM Lane V/C Ratio	0.017	-	-	0.274	0.182	0.021	-	-
HCM Ctrl Dly (s/v)	7.7	0	-	15.5	15.1	7.8	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0.7	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	1	106	46	1	0	1
Future Vol, veh/h	1	106	46	1	0	1
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	69	69	69	69	69	69
Heavy Vehicles, %	1	1	4	4	0	0
Mvmt Flow	1	154	67	1	0	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	68	0	-	0	224 67
Stage 1	-	-	-	-	67 -
Stage 2	-	-	-	-	157 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1539	-	-	-	769 1002
Stage 1	-	-	-	-	960 -
Stage 2	-	-	-	-	877 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1539	-	-	-	768 1002
Mov Cap-2 Maneuver	-	-	-	-	768 -
Stage 1	-	-	-	-	959 -
Stage 2	-	-	-	-	877 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.07	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	17	-	-	-	1002
HCM Lane V/C Ratio	0.001	-	-	-	0.001
HCM Ctrl Dly (s/v)	7.3	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	36	96	1	11	28	79	2	43	17	103	33	34
Future Vol, veh/h	36	96	1	11	28	79	2	43	17	103	33	34
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Heavy Vehicles, %	8	8	8	3	3	3	3	3	3	1	1	1
Mvmt Flow	69	185	2	21	54	152	4	83	33	198	63	65
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	12.7	11	10.1	13.8
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	27%	9%	61%
Vol Thru, %	69%	72%	24%	19%
Vol Right, %	27%	1%	67%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	62	133	118	170
LT Vol	2	36	11	103
Through Vol	43	96	28	33
RT Vol	17	1	79	34
Lane Flow Rate	119	256	227	327
Geometry Grp	1	1	1	1
Degree of Util (X)	0.189	0.406	0.333	0.497
Departure Headway (Hd)	5.719	5.72	5.282	5.468
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	624	627	678	657
Service Time	3.785	3.775	3.338	3.516
HCM Lane V/C Ratio	0.191	0.408	0.335	0.498
HCM Control Delay, s/veh	10.1	12.7	11	13.8
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	0.7	2	1.5	2.8

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	3	111	23	155	151	11	25	4	233	9	4	1
Future Vol, veh/h	3	111	23	155	151	11	25	4	233	9	4	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	5	5	5	1	1	1	2	2	2	9	9	9
Mvmt Flow	3	123	26	172	168	12	28	4	259	10	4	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	9.6	12.7	10.6	9.2
HCM LOS	A	B	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	86%	0%	2%	49%	64%
Vol Thru, %	14%	0%	81%	48%	29%
Vol Right, %	0%	100%	17%	3%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	29	233	137	317	14
LT Vol	25	0	3	155	9
Through Vol	4	0	111	151	4
RT Vol	0	233	23	11	1
Lane Flow Rate	32	259	152	352	16
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.056	0.365	0.216	0.485	0.026
Departure Headway (Hd)	6.218	5.074	5.112	4.958	6.05
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	571	702	693	719	595
Service Time	4.007	2.862	3.211	3.038	4.05
HCM Lane V/C Ratio	0.056	0.369	0.219	0.49	0.027
HCM Control Delay, s/veh	9.4	10.8	9.6	12.7	9.2
HCM Lane LOS	A	B	A	B	A
HCM 95th-tile Q	0.2	1.7	0.8	2.7	0.1

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	5	11	255	4	9	169
Future Vol, veh/h	5	11	255	4	9	169
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	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	6	13	290	5	10	192

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	505	292	0	0	294
Stage 1	292	-	-	-	-
Stage 2	213	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	531	752	-	-	1273
Stage 1	762	-	-	-	-
Stage 2	828	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	526	752	-	-	1273
Mov Cap-2 Maneuver	526	-	-	-	-
Stage 1	762	-	-	-	-
Stage 2	820	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.58	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	663	91
HCM Lane V/C Ratio	-	-	0.027	0.008
HCM Ctrl Dly (s/v)	-	-	10.6	7.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection												
Int Delay, s/veh	3.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	27	20	27	24	47	8	20	233	18	1	167	9
Future Vol, veh/h	27	20	27	24	47	8	20	233	18	1	167	9
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	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	0	0	0	2	2	2	1	1	1
Mvmt Flow	31	23	31	27	53	9	23	265	20	1	190	10

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	534	528	195	524	523	275	200	0	0	285	0	0
Stage 1	197	197	-	320	320	-	-	-	-	-	-	-
Stage 2	337	331	-	203	202	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.1	6.5	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.5	4	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	455	454	844	467	462	769	1372	-	-	1283	-	-
Stage 1	802	736	-	696	656	-	-	-	-	-	-	-
Stage 2	675	644	-	803	738	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	389	445	844	419	452	769	1372	-	-	1283	-	-
Mov Cap-2 Maneuver	389	445	-	419	452	-	-	-	-	-	-	-
Stage 1	802	735	-	682	643	-	-	-	-	-	-	-
Stage 2	600	631	-	749	737	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	13.53		14.71		0.57		0.04	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	131	-	-	506	460	10	-	-
HCM Lane V/C Ratio	0.017	-	-	0.166	0.195	0.001	-	-
HCM Ctrl Dly (s/v)	7.7	0	-	13.5	14.7	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.7	0	-	-

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	35	57	1	4	0
Future Vol, veh/h	0	35	57	1	4	0
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	70	70	70	70	70	70
Heavy Vehicles, %	3	3	0	0	0	0
Mvmt Flow	0	50	81	1	6	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	83	0	-	0	132 82
Stage 1	-	-	-	-	82 -
Stage 2	-	-	-	-	50 -
Critical Hdwy	4.13	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.227	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1508	-	-	-	867 983
Stage 1	-	-	-	-	946 -
Stage 2	-	-	-	-	978 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1508	-	-	-	867 983
Mov Cap-2 Maneuver	-	-	-	-	867 -
Stage 1	-	-	-	-	946 -
Stage 2	-	-	-	-	978 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0	0	9.18
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1508	-	-	-	867
HCM Lane V/C Ratio	-	-	-	-	0.007
HCM Ctrl Dly (s/v)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	47	3	11	56	44	1	15	7	62	36	25
Future Vol, veh/h	24	47	3	11	56	44	1	15	7	62	36	25
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Heavy Vehicles, %	6	6	6	3	3	3	13	13	13	3	3	3
Mvmt Flow	41	81	5	19	97	76	2	26	12	107	62	43
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	9	9	8.3	9.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	32%	10%	50%
Vol Thru, %	65%	64%	50%	29%
Vol Right, %	30%	4%	40%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	74	111	123
LT Vol	1	24	11	62
Through Vol	15	47	56	36
RT Vol	7	3	44	25
Lane Flow Rate	40	128	191	212
Geometry Grp	1	1	1	1
Degree of Util (X)	0.055	0.173	0.239	0.278
Departure Headway (Hd)	4.964	4.877	4.503	4.724
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	718	734	794	759
Service Time	3.019	2.923	2.546	2.767
HCM Lane V/C Ratio	0.056	0.174	0.241	0.279
HCM Control Delay, s/veh	8.3	9	9	9.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.6	0.9	1.1

Intersection	
Intersection Delay, s/veh	14.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	0	272	41	201	74	6	27	4	217	11	4	1
Future Vol, veh/h	0	272	41	201	74	6	27	4	217	11	4	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	3	3	3	4	4	4	0	0	0
Mvmt Flow	0	332	50	245	90	7	33	5	265	13	5	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	15.3	15	12.6	10.1
HCM LOS	C	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	87%	0%	0%	72%	69%
Vol Thru, %	13%	0%	87%	26%	25%
Vol Right, %	0%	100%	13%	2%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	31	217	313	281	16
LT Vol	27	0	0	201	11
Through Vol	4	0	272	74	4
RT Vol	0	217	41	6	1
Lane Flow Rate	38	265	382	343	20
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.073	0.427	0.568	0.535	0.037
Departure Headway (Hd)	6.971	5.815	5.353	5.616	6.737
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	513	617	672	641	528
Service Time	4.728	3.571	3.401	3.665	4.824
HCM Lane V/C Ratio	0.074	0.429	0.568	0.535	0.038
HCM Control Delay, s/veh	10.3	12.9	15.3	15	10.1
HCM Lane LOS	B	B	C	B	B
HCM 95th-tile Q	0.2	2.1	3.6	3.2	0.1

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	11	18	228	6	5	246
Future Vol, veh/h	11	18	228	6	5	246
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, %	5	5	3	3	3	3
Mvmt Flow	12	20	253	7	6	273

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	541	257	0	0	260	0
Stage 1	257	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.13	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.227	-
Pot Cap-1 Maneuver	497	775	-	-	1299	-
Stage 1	779	-	-	-	-	-
Stage 2	757	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	494	775	-	-	1299	-
Mov Cap-2 Maneuver	494	-	-	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	753	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.95	0	0.16
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	638	36
HCM Lane V/C Ratio	-	-	0.051	0.004
HCM Ctrl Dly (s/v)	-	-	10.9	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	85	28	30	32	19	22	197	39	28	201	22
Future Vol, veh/h	18	85	28	30	32	19	22	197	39	28	201	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	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	5	5	5	2	2	2	4	4	4	2	2	2
Mvmt Flow	21	99	33	35	37	22	26	229	45	33	234	26

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	610	637	247	651	627	252	259	0	0	274	0	0
Stage 1	312	312	-	303	303	-	-	-	-	-	-	-
Stage 2	299	326	-	348	324	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	402	391	785	382	400	787	1294	-	-	1289	-	-
Stage 1	692	652	-	706	664	-	-	-	-	-	-	-
Stage 2	704	643	-	668	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	336	370	785	258	379	787	1294	-	-	1289	-	-
Mov Cap-2 Maneuver	336	370	-	258	379	-	-	-	-	-	-	-
Stage 1	672	633	-	690	648	-	-	-	-	-	-	-
Stage 2	629	628	-	524	630	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	18.83		18.5		0.67		0.88	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	149	-	-	411	360	197	-	-
HCM Lane V/C Ratio	0.02	-	-	0.371	0.262	0.025	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	18.8	18.5	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	1	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Traffic Vol, veh/h	1	125	54	1	0	1
Future Vol, veh/h	1	125	54	1	0	1
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	69	69	69	69	69	69
Heavy Vehicles, %	1	1	4	4	0	0
Mvmt Flow	1	181	78	1	0	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	80	0	-	0	263 79
Stage 1	-	-	-	-	79 -
Stage 2	-	-	-	-	184 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1525	-	-	-	730 987
Stage 1	-	-	-	-	949 -
Stage 2	-	-	-	-	852 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1525	-	-	-	730 987
Mov Cap-2 Maneuver	-	-	-	-	730 -
Stage 1	-	-	-	-	948 -
Stage 2	-	-	-	-	852 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.06	0	8.65
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	14	-	-	-	987
HCM Lane V/C Ratio	0.001	-	-	-	0.001
HCM Ctrl Dly (s/v)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	16
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	43	113	1	13	33	93	2	51	20	122	39	40
Future Vol, veh/h	43	113	1	13	33	93	2	51	20	122	39	40
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Heavy Vehicles, %	8	8	8	3	3	3	3	3	3	1	1	1
Mvmt Flow	83	217	2	25	63	179	4	98	38	235	75	77
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	16.2	13.4	11.6	19.2
HCM LOS	C	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	27%	9%	61%
Vol Thru, %	70%	72%	24%	19%
Vol Right, %	27%	1%	67%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	73	157	139	201
LT Vol	2	43	13	122
Through Vol	51	113	33	39
RT Vol	20	1	93	40
Lane Flow Rate	140	302	267	387
Geometry Grp	1	1	1	1
Degree of Util (X)	0.25	0.527	0.436	0.642
Departure Headway (Hd)	6.411	6.285	5.877	5.978
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	559	574	612	603
Service Time	4.464	4.328	3.924	4.017
HCM Lane V/C Ratio	0.25	0.526	0.436	0.642
HCM Control Delay, s/veh	11.6	16.2	13.4	19.2
HCM Lane LOS	B	C	B	C
HCM 95th-tile Q	1	3.1	2.2	4.6

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	4	131	27	183	178	13	30	5	275	11	5	1
Future Vol, veh/h	4	131	27	183	178	13	30	5	275	11	5	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	5	5	5	1	1	1	2	2	2	9	9	9
Mvmt Flow	4	146	30	203	198	14	33	6	306	12	6	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	10.7	16.3	12.5	9.8
HCM LOS	B	C	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	86%	0%	2%	49%	65%
Vol Thru, %	14%	0%	81%	48%	29%
Vol Right, %	0%	100%	17%	3%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	35	275	162	374	17
LT Vol	30	0	4	183	11
Through Vol	5	0	131	178	5
RT Vol	0	275	27	13	1
Lane Flow Rate	39	306	180	416	19
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.071	0.463	0.277	0.611	0.034
Departure Headway (Hd)	6.606	5.46	5.542	5.291	6.523
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	543	660	648	682	547
Service Time	4.344	3.197	3.583	3.323	4.582
HCM Lane V/C Ratio	0.072	0.464	0.278	0.61	0.035
HCM Control Delay, s/veh	9.9	12.8	10.7	16.3	9.8
HCM Lane LOS	A	B	B	C	A
HCM 95th-tile Q	0.2	2.5	1.1	4.2	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	13	301	5	11	200
Future Vol, veh/h	6	13	301	5	11	200
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	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	7	15	342	6	13	227

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	597	345	0	0	348
Stage 1	345	-	-	-	-
Stage 2	252	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	469	703	-	-	1217
Stage 1	722	-	-	-	-
Stage 2	794	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	463	703	-	-	1217
Mov Cap-2 Maneuver	463	-	-	-	-
Stage 1	722	-	-	-	-
Stage 2	785	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.18	0	0.42
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	604	94
HCM Lane V/C Ratio	-	-	0.036	0.01
HCM Ctrl Dly (s/v)	-	-	11.2	8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	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	32	24	32	28	56	9	24	263	21	1	197	11
Future Vol, veh/h	32	24	32	28	56	9	24	263	21	1	197	11
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	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	0	0	0	2	2	2	1	1	1
Mvmt Flow	36	27	36	32	64	10	27	299	24	1	224	13

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	618	610	230	605	604	311	236	0	0	323	0	0
Stage 1	232	232	-	365	365	-	-	-	-	-	-	-
Stage 2	385	377	-	240	239	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.1	6.5	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.5	4	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	400	408	807	413	415	734	1331	-	-	1243	-	-
Stage 1	768	710	-	658	627	-	-	-	-	-	-	-
Stage 2	636	614	-	768	712	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	325	397	807	358	404	734	1331	-	-	1243	-	-
Mov Cap-2 Maneuver	325	397	-	358	404	-	-	-	-	-	-	-
Stage 1	768	710	-	642	611	-	-	-	-	-	-	-
Stage 2	548	598	-	705	711	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	15.46		16.95		0.6		0.04	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	138	-	-	443	406	9	-	-
HCM Lane V/C Ratio	0.02	-	-	0.225	0.26	0.001	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	15.5	17	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	1	0	-	-

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	41	67	1	5	0
Future Vol, veh/h	0	41	67	1	5	0
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	70	70	70	70	70	70
Heavy Vehicles, %	3	3	0	0	0	0
Mvmt Flow	0	59	96	1	7	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	97	0	-	0	155 96
Stage 1	-	-	-	-	96 -
Stage 2	-	-	-	-	59 -
Critical Hdwy	4.13	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.227	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1490	-	-	-	841 965
Stage 1	-	-	-	-	932 -
Stage 2	-	-	-	-	969 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1490	-	-	-	841 965
Mov Cap-2 Maneuver	-	-	-	-	841 -
Stage 1	-	-	-	-	932 -
Stage 2	-	-	-	-	969 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0	0	9.32
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1490	-	-	-	841
HCM Lane V/C Ratio	-	-	-	-	0.008
HCM Ctrl Dly (s/v)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	9.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	28	56	4	13	66	52	1	18	8	73	43	30
Future Vol, veh/h	28	56	4	13	66	52	1	18	8	73	43	30
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Heavy Vehicles, %	6	6	6	3	3	3	13	13	13	3	3	3
Mvmt Flow	48	97	7	22	114	90	2	31	14	126	74	52
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	9.5	9.7	8.7	10.5
HCM LOS	A	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	32%	10%	50%
Vol Thru, %	67%	64%	50%	29%
Vol Right, %	30%	5%	40%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	88	131	146
LT Vol	1	28	13	73
Through Vol	18	56	66	43
RT Vol	8	4	52	30
Lane Flow Rate	47	152	226	252
Geometry Grp	1	1	1	1
Degree of Util (X)	0.067	0.213	0.293	0.342
Departure Headway (Hd)	5.194	5.058	4.674	4.887
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	682	704	763	730
Service Time	3.281	3.128	2.737	2.951
HCM Lane V/C Ratio	0.069	0.216	0.296	0.345
HCM Control Delay, s/veh	8.7	9.5	9.7	10.5
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.2	0.8	1.2	1.5

Intersection	
Intersection Delay, s/veh	14.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	0	272	42	206	74	6	30	4	233	11	4	1
Future Vol, veh/h	0	272	42	206	74	6	30	4	233	11	4	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	3	3	3	4	4	4	0	0	0
Mvmt Flow	0	332	51	251	90	7	37	5	284	13	5	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	15.8	15.6	13.2	10.2
HCM LOS	C	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	88%	0%	0%	72%	69%
Vol Thru, %	12%	0%	87%	26%	25%
Vol Right, %	0%	100%	13%	2%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	34	233	314	286	16
LT Vol	30	0	0	206	11
Through Vol	4	0	272	74	4
RT Vol	0	233	42	6	1
Lane Flow Rate	41	284	383	349	20
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.081	0.462	0.579	0.553	0.037
Departure Headway (Hd)	7.021	5.858	5.445	5.705	6.848
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	509	614	659	631	519
Service Time	4.781	3.617	3.499	3.759	4.944
HCM Lane V/C Ratio	0.081	0.463	0.581	0.553	0.039
HCM Control Delay, s/veh	10.4	13.6	15.8	15.6	10.2
HCM Lane LOS	B	B	C	C	B
HCM 95th-tile Q	0.3	2.4	3.7	3.4	0.1

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	18	29	235	8	9	248
Future Vol, veh/h	18	29	235	8	9	248
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, %	5	5	3	3	3	3
Mvmt Flow	20	32	261	9	10	276

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	561	266	0	0	270
Stage 1	266	-	-	-	-
Stage 2	296	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.13
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.227
Pot Cap-1 Maneuver	484	766	-	-	1288
Stage 1	772	-	-	-	-
Stage 2	748	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	479	766	-	-	1288
Mov Cap-2 Maneuver	479	-	-	-	-
Stage 1	772	-	-	-	-
Stage 2	741	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.3	0	0.27
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	623	63
HCM Lane V/C Ratio	-	-	0.084	0.008
HCM Ctrl Dly (s/v)	-	-	11.3	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	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	18	85	28	35	32	21	22	201	41	33	214	22
Future Vol, veh/h	18	85	28	35	32	21	22	201	41	33	214	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	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	5	5	5	2	2	2	4	4	4	2	2	2
Mvmt Flow	21	99	33	41	37	24	26	234	48	38	249	26

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	642	671	262	684	660	258	274	0	0	281	0	0
Stage 1	338	338	-	309	309	-	-	-	-	-	-	-
Stage 2	303	333	-	375	351	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	383	374	770	363	383	781	1277	-	-	1281	-	-
Stage 1	670	635	-	701	660	-	-	-	-	-	-	-
Stage 2	700	639	-	646	632	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	315	352	770	239	361	781	1277	-	-	1281	-	-
Mov Cap-2 Maneuver	315	352	-	239	361	-	-	-	-	-	-	-
Stage 1	646	612	-	685	644	-	-	-	-	-	-	-
Stage 2	623	624	-	501	610	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	19.96		20.33		0.66		0.97	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	145	-	-	391	336	217	-	-
HCM Lane V/C Ratio	0.02	-	-	0.39	0.305	0.03	-	-
HCM Ctrl Dly (s/v)	7.9	0	-	20	20.3	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.8	1.3	0.1	-	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	3	130	56	5	11	6
Future Vol, veh/h	3	130	56	5	11	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	1	1	4	4	0	0
Mvmt Flow	4	188	81	7	16	9

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	88	0	-	0	282 85
Stage 1	-	-	-	-	85 -
Stage 2	-	-	-	-	197 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1514	-	-	-	712 980
Stage 1	-	-	-	-	944 -
Stage 2	-	-	-	-	841 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1514	-	-	-	710 980
Mov Cap-2 Maneuver	-	-	-	-	710 -
Stage 1	-	-	-	-	941 -
Stage 2	-	-	-	-	841 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.17	0	9.72
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	41	-	-	-	787
HCM Lane V/C Ratio	0.003	-	-	-	0.031
HCM Ctrl Dly (s/v)	7.4	0	-	-	9.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	17.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	48	123	1	13	37	93	2	51	20	122	39	42
Future Vol, veh/h	48	123	1	13	37	93	2	51	20	122	39	42
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Heavy Vehicles, %	8	8	8	3	3	3	3	3	3	1	1	1
Mvmt Flow	92	237	2	25	71	179	4	98	38	235	75	81
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	18.1	14.2	12	20.5
HCM LOS	C	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	28%	9%	60%
Vol Thru, %	70%	72%	26%	19%
Vol Right, %	27%	1%	65%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	73	172	143	203
LT Vol	2	48	13	122
Through Vol	51	123	37	39
RT Vol	20	1	93	42
Lane Flow Rate	140	331	275	390
Geometry Grp	1	1	1	1
Degree of Util (X)	0.258	0.586	0.46	0.664
Departure Headway (Hd)	6.614	6.374	6.025	6.127
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	540	566	597	589
Service Time	4.681	4.425	4.08	4.177
HCM Lane V/C Ratio	0.259	0.585	0.461	0.662
HCM Control Delay, s/veh	12	18.1	14.2	20.5
HCM Lane LOS	B	C	B	C
HCM 95th-tile Q	1	3.8	2.4	4.9

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	10	7	236	4	2	261
Future Vol, veh/h	10	7	236	4	2	261
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	88	88	88	88	88	88
Heavy Vehicles, %	0	0	4	4	3	3
Mvmt Flow	11	8	268	5	2	297

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	572	270	0	0	273
Stage 1	270	-	-	-	-
Stage 2	301	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.13
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.227
Pot Cap-1 Maneuver	485	773	-	-	1285
Stage 1	780	-	-	-	-
Stage 2	755	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	484	773	-	-	1285
Mov Cap-2 Maneuver	484	-	-	-	-
Stage 1	780	-	-	-	-
Stage 2	754	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.51	0	0.06
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	572	14
HCM Lane V/C Ratio	-	-	0.034	0.002
HCM Ctrl Dly (s/v)	-	-	11.5	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	4	131	30	201	178	13	32	5	285	11	5	1
Future Vol, veh/h	4	131	30	201	178	13	32	5	285	11	5	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	5	5	5	1	1	1	2	2	2	9	9	9
Mvmt Flow	4	146	33	223	198	14	36	6	317	12	6	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	10.9	17.8	13.1	10
HCM LOS	B	C	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	86%	0%	2%	51%	65%
Vol Thru, %	14%	0%	79%	45%	29%
Vol Right, %	0%	100%	18%	3%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	37	285	165	392	17
LT Vol	32	0	4	201	11
Through Vol	5	0	131	178	5
RT Vol	0	285	30	13	1
Lane Flow Rate	41	317	183	436	19
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.076	0.487	0.286	0.648	0.035
Departure Headway (Hd)	6.687	5.537	5.624	5.355	6.647
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	536	649	638	675	536
Service Time	4.43	3.279	3.672	3.391	4.716
HCM Lane V/C Ratio	0.076	0.488	0.287	0.646	0.035
HCM Control Delay, s/veh	10	13.5	10.9	17.8	10
HCM Lane LOS	A	B	B	C	A
HCM 95th-tile Q	0.2	2.7	1.2	4.8	0.1

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	11	20	306	13	23	208
Future Vol, veh/h	11	20	306	13	23	208
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	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	13	23	348	15	26	236

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	644	355	0	0	363	0
Stage 1	355	-	-	-	-	-
Stage 2	289	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	441	693	-	-	1202	-
Stage 1	714	-	-	-	-	-
Stage 2	765	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	430	693	-	-	1202	-
Mov Cap-2 Maneuver	430	-	-	-	-	-
Stage 1	714	-	-	-	-	-
Stage 2	746	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.74	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	569	179
HCM Lane V/C Ratio	-	-	0.062	0.022
HCM Ctrl Dly (s/v)	-	-	11.7	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	32	24	32	32	56	14	24	277	27	4	205	11
Future Vol, veh/h	32	24	32	32	56	14	24	277	27	4	205	11
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	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	0	0	0	2	2	2	1	1	1
Mvmt Flow	36	27	36	36	64	16	27	315	31	5	233	13

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	649	648	239	640	639	330	245	0	0	345	0	0
Stage 1	248	248	-	385	385	-	-	-	-	-	-	-
Stage 2	401	400	-	256	255	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.1	6.5	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.5	4	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	381	388	797	391	396	716	1321	-	-	1219	-	-
Stage 1	753	699	-	642	615	-	-	-	-	-	-	-
Stage 2	623	600	-	753	700	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	303	376	797	336	385	716	1321	-	-	1219	-	-
Mov Cap-2 Maneuver	303	376	-	336	385	-	-	-	-	-	-	-
Stage 1	750	696	-	626	599	-	-	-	-	-	-	-
Stage 2	531	584	-	688	697	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	16.22		18		0.57		0.14	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	129	-	-	420	392	32	-	-
HCM Lane V/C Ratio	0.021	-	-	0.238	0.296	0.004	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	16.2	18	8	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	1.2	0	-	-

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	6	44	72	13	12	4
Future Vol, veh/h	6	44	72	13	12	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	70	70	70	70	70	70
Heavy Vehicles, %	3	3	0	0	0	0
Mvmt Flow	9	63	103	19	17	6

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	121	0	-	0	192 112
Stage 1	-	-	-	-	112 -
Stage 2	-	-	-	-	80 -
Critical Hdwy	4.13	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.227	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1460	-	-	-	801 946
Stage 1	-	-	-	-	918 -
Stage 2	-	-	-	-	948 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1460	-	-	-	796 946
Mov Cap-2 Maneuver	-	-	-	-	796 -
Stage 1	-	-	-	-	912 -
Stage 2	-	-	-	-	948 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.9	0	9.46
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	216	-	-	-	829
HCM Lane V/C Ratio	0.006	-	-	-	0.028
HCM Ctrl Dly (s/v)	7.5	0	-	-	9.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	10.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	31	63	4	13	78	52	1	18	8	73	43	36
Future Vol, veh/h	31	63	4	13	78	52	1	18	8	73	43	36
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Heavy Vehicles, %	6	6	6	3	3	3	13	13	13	3	3	3
Mvmt Flow	53	109	7	22	134	90	2	31	14	126	74	62
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	9.9	10.1	8.8	10.9
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	32%	9%	48%
Vol Thru, %	67%	64%	55%	28%
Vol Right, %	30%	4%	36%	24%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	98	143	152
LT Vol	1	31	13	73
Through Vol	18	63	78	43
RT Vol	8	4	52	36
Lane Flow Rate	47	169	247	262
Geometry Grp	1	1	1	1
Degree of Util (X)	0.07	0.241	0.325	0.361
Departure Headway (Hd)	5.423	5.125	4.751	4.962
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	665	694	750	718
Service Time	3.423	3.209	2.829	3.041
HCM Lane V/C Ratio	0.071	0.244	0.329	0.365
HCM Control Delay, s/veh	8.8	9.9	10.1	10.9
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	0.2	0.9	1.4	1.6

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	7	5	313	12	8	213
Future Vol, veh/h	7	5	313	12	8	213
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	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	8	6	356	14	9	242

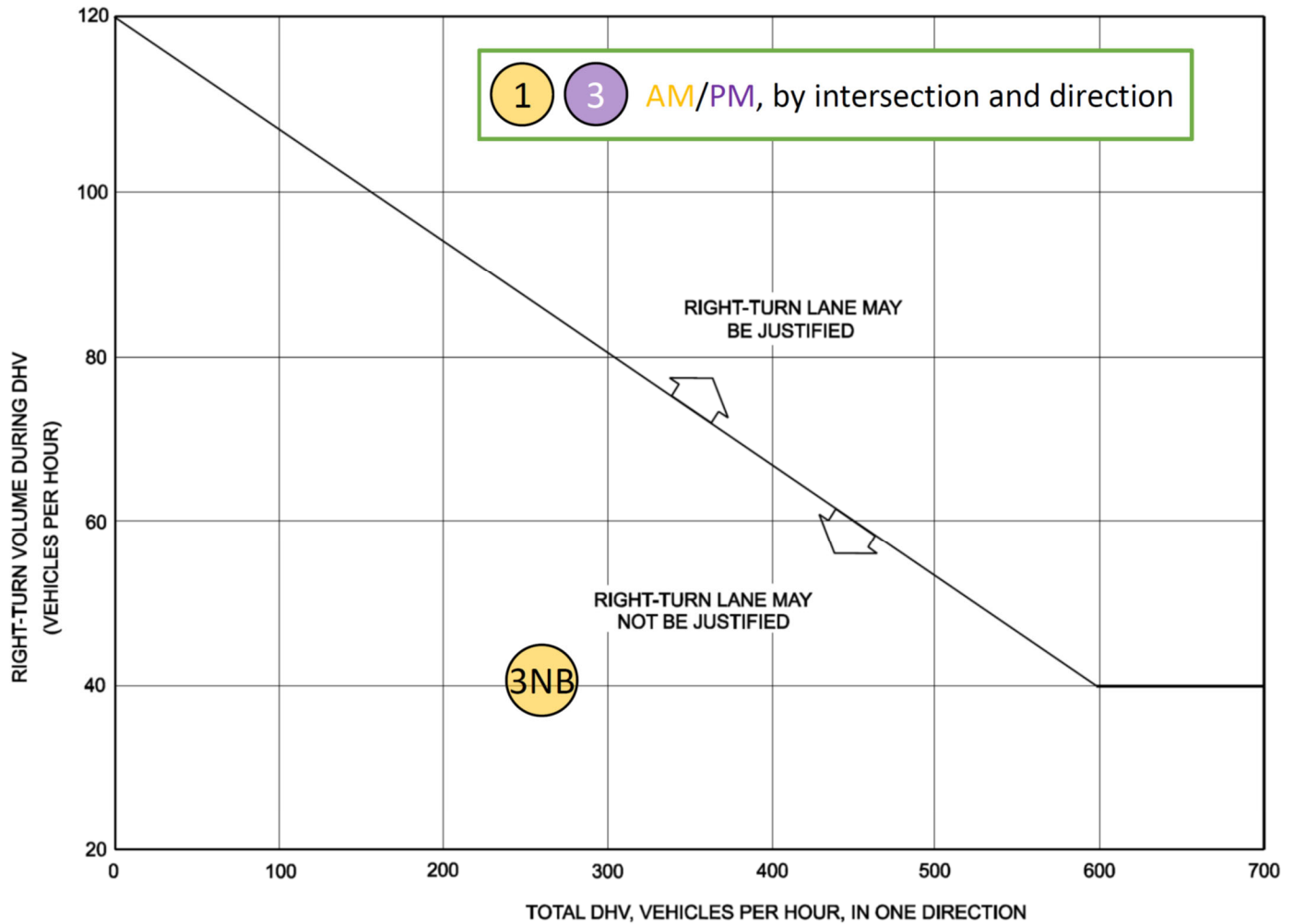
Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	623	363	0	0	369
Stage 1	363	-	-	-	-
Stage 2	260	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	453	687	-	-	1195
Stage 1	709	-	-	-	-
Stage 2	788	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	449	687	-	-	1195
Mov Cap-2 Maneuver	449	-	-	-	-
Stage 1	709	-	-	-	-
Stage 2	781	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	12.04	0	0.29
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	525	65
HCM Lane V/C Ratio	-	-	0.026	0.008
HCM Ctrl Dly (s/v)	-	-	12	8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

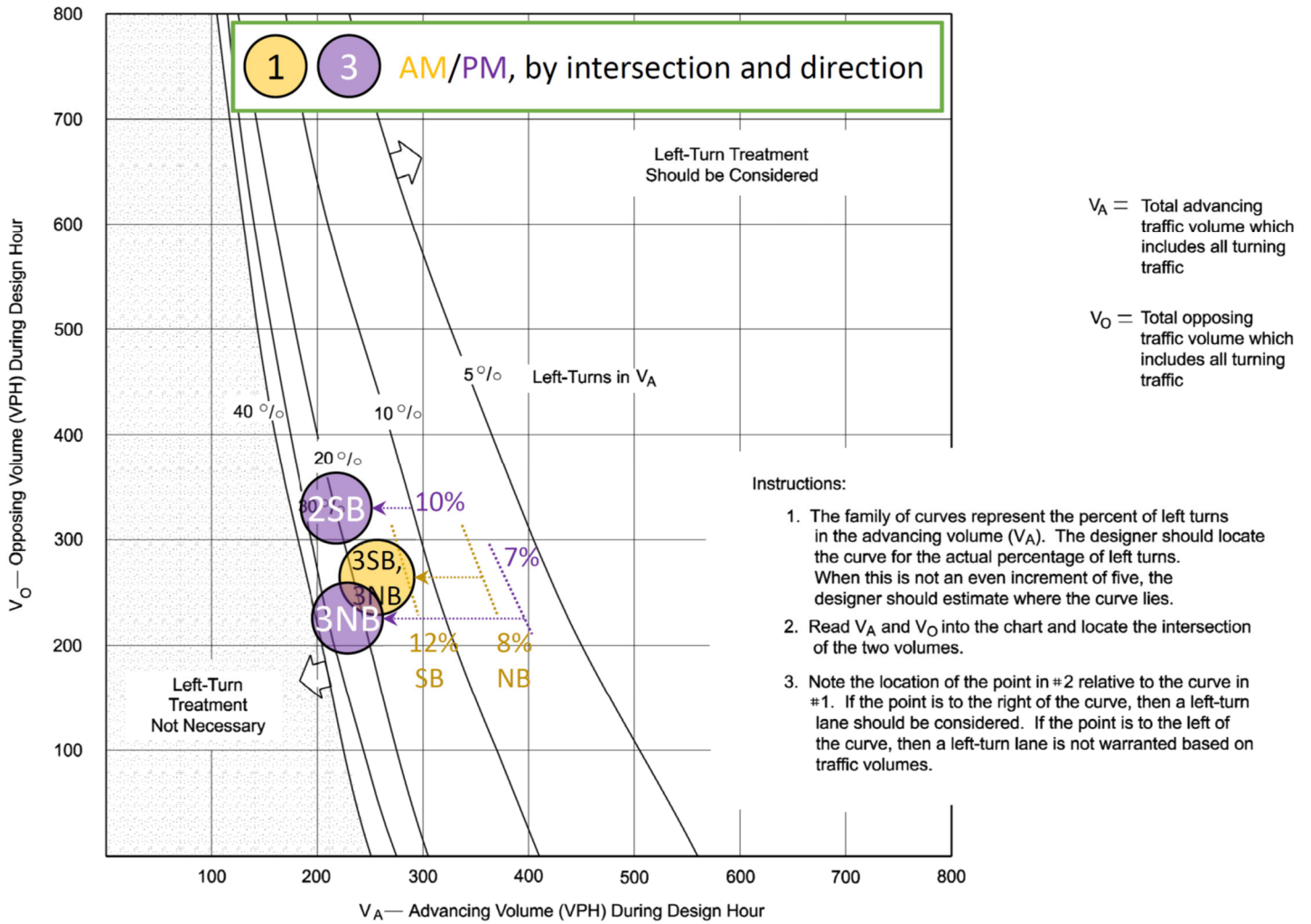
Appendix C: Auxiliary Turn Lane Analysis Charts

Right Turn Lane Analysis Chart (using MDT Design Manual, Figure 28.4A)



Note: For highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.

Left Turn Lane Analysis Chart (using MDT Design Manual, Figure 28.4C)



Appendix D: Intersection Cost Participation Calculations

Yellowstone County Cost Participation Worksheet: Staley Residential

Whether a movement pair is **critical** is based on Project traffic

1: 72nd at King

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in this movement			
WB L	1	5	5	18	18
WB T	1	No project traffic in these movements			
EB L	1	No project traffic in these movements			
NB T	1	No project traffic in these movements			
SB L	1	No project traffic in these movements			
SB T	1	No project traffic in these movements			
NB L	1	3	3	2	2
Project Critical Lane Volume		8		20	
Critical Lane Capacity		1200		1200	
% Increase		0.7%		1.7%	
Max % Increase		1.7%			

2: 72nd at O'Donnell

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in this movement			
WB L	1	7	7	5	5
WB T	1	No project traffic in these movements			
EB L	1	No project traffic in these movements			
NB T	1	7	7	5	5
SB L	1	4	4	12	12
SB T	1	2	2	8	8
NB L	1	No project traffic in this movement			
Project Critical Lane Volume		18		22	
Critical Lane Capacity		1140		1140	
% Increase		1.6%		1.9%	
Max % Increase		1.9%			

(does not meet the 2% threshold)

3: 72nd at Hesper

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in this movement			
WB L	1	5	5	4	4
WB T	1	No project traffic in these movements			
EB L	1	No project traffic in these movements			
NB T	1	4	4	14	14
SB L	1	5	5	3	3
SB T	1	13	13	8	8
NB L	1	No project traffic in this movement			
Project Critical Lane Volume		18		21	
Critical Lane Capacity		1200		1200	
% Increase		1.5%		1.8%	
Max % Increase		1.8%			

4: 68th at Hesper

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	5	5	3	3
WB L	1	No project traffic in this movement			
WB T	1	2	2	5	5
EB L	1	2	2	6	6
NB T	1	No project traffic in this movement			
SB L	1	11	11	7	7
SB T	1	No project traffic in these movements			
NB L	1	No project traffic in these movements			
Project Critical Lane Volume		16		18	
Critical Lane Capacity		1140		1140	
% Increase		1.4%		1.6%	
Max % Increase		1.6%			

5: 64th at Hesper

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	10	10	7	7
WB L	1	No project traffic in this movement			
WB T	1	4	4	12	12
EB L	1	5	5	3	3
NB T	1	No project traffic in these movements			
SB L	1	No project traffic in these movements			
SB T	1	No project traffic in these movements			
NB L	1	No project traffic in these movements			
Project Critical Lane Volume		10		15	
Critical Lane Capacity		1200		1200	
% Increase		0.8%		1.3%	
Max % Increase		1.3%			

Appendix E: Traffic Signal Warrant Analysis for 64th at Hesper

Traffic signal warrant analysis of the 2029 “With Project” condition was conducted using the procedures documented in the 11th edition of the Manual on Uniform Traffic Control Devices, the most recent available at the time of this study. Traffic data informing this analysis was collected at the same time as counts for the rest of this study, and covered 12 consecutive hours (7 a.m. through 7 p.m.) on a Thursday when both schools at the intersection were fully open and no road use restrictions, such as those due to construction or maintenance, were observed on the approaching or surrounding roadways. Of the nine warrants available, none were met. A summary of the data, thresholds, and determinations is provided on the following page. Additional details and highlights include:

- MUTCD warrant analysis relies heavily on the concept of “major” and “minor” streets, and is generally (though not explicitly) geared toward examining whether two-way stop controlled (TWSC) intersections might be operating under conditions where a traffic signal should be considered. This intersection has already met warrants for all-way stop control (AWSC) and has been controlled that way for some time. To that end, both vehicles and pedestrians seeking to cross the “major” street at this intersection do not experience the delays and potential dangers that would be present at a TWSC intersection.
- For Warrant 2, Four-Hour Volume, the major street (Hesper) volume is too low to graph the relationship between it and the minor volume. If the graph were to be extended to capture lower volumes, the estimated minor street volume is far below the approximate minor-street minimum to meet the warrant.
- Warrant 3, Peak Hour, is specifically indicated in the MUTCD as being applicable “only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or [HOV] facilities that attract or discharge large numbers of vehicles over a short time.” While the definition of “large” in the context of such uses could render it debatable here due to the rural, low-volume nature of the study area, we believe that the location of the Elder Grove schools on the northwest and northeast corners of this intersection justifies the inclusion of this warrant in the analysis. Both vehicular and pedestrian activity at the intersection are very clearly and heavily dependent on school hours.
- Warrant 4, Pedestrian Volume, “is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street,” per the MUTCD. AWSC removes this delay by requiring all vehicles to stop at the intersection and yield to pedestrians crossing. In addition, 95% of pedestrian activity observed in the 12-hour count period is in the north crosswalk, crossing 64th, which is the minor street.
- Warrant 5, School Crossing, “is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal,” per the MUTCD. As with Warrant 4, most if not all schoolchildren here are already using a crossing that is governed by the existing intersection traffic control, and that crossing is, by the definition of the MUTCD, a crossing of the minor street rather than the major one. The MUTCD also indicates that “[b]efore a decision is made to install a traffic control signal, consideration should be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.” Warning signs, overhead flashing beacons, crossing guards during school start/end periods, and school speed zones are already in use at the intersection.
- Warrant 7, Crash Experience, was examined in detail using the five-year crash history data received for this TIS from MDT. Only one crash was reported at this intersection during those five years. It was a right-angle collision, which qualifies it in part for consideration under this warrant, but it occurred during construction when a ‘flagger, law enforcement, crossing guard, etc.’ was present, and the crash did not include either injuries or pedestrians. We believe that the scarcity of crashes indicates the effectiveness of the traffic control and supplemental warning device regime in place at the intersection now.

While no signal warrants are projected to be met using the information in this TIS, further engineering study of this intersection could be warranted if changes occur in the assumptions employed.

Traffic Signal Needs Analysis Summary: S 68th Street West at Hesper Road

Scenario: Future (2029) with Staley Residential Subdivision	
Analysis Date: 3/21/2025	Conducted by: 406 Traffic & Transportation Consulting
Major Street: Hesper Road (E/W), has 1 lane	Minor Street 1: S. 64th Street West (N/S), has 1 lane
Speed Limit: 45 mph	Number of Approaches: 4

Traffic Volumes

Hour:	1	2	3	4	5	6	7	8	9	10	11	12
Start Time:	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Hesper EB:	164	44	43	30	32	34	43	52	86	53	52	35
Hesper WB:	140	40	25	37	55	70	64	101	131	109	111	68
64th NB:	65	38	26	22	35	31	23	30	28	36	44	19
64th SB:	153	97	30	38	47	55	34	32	143	67	58	22
Total Entering Volume:	522	219	124	127	169	190	164	215	388	265	265	144
TEV Rank:	1	5	12	11	8	7	9	6	2	3	3	10
Use for:	Warrant 3			Warrant 1			Warrant 2					
Major, Both Directions:	304	84	68	67	87	104	107	153	217	162	163	103
Minor, Higher Direction:	153	97	30	38	47	55	34	32	143	67	58	22

Warrants

											Met?
1 Eight-Hour Vehicular Volume (either condition)	Condition A: Large Volume of Intersecting Traffic					or Condition B: Interruption of Continuous Traffic					No
	Major (Both Dir.)		Minor (Higher Dir.)		Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	87	350 ^c	47	105 ^c	No	87	525 ^c	47	53 ^c	No	
2 Four-Hour Vehicular Volume	MUTCD Figure 4C-2 for speed over 40 mph					Major Street volume too low to appear on Figure 4C-2					No
	Major (Both Dir.)		Minor (Higher Dir.)		Met?						
	Value	Minimum	Value	Minimum	Met?						
	162	N/A	67	N/A	No						
3 Peak Hour* (either condition)	Condition A (must meet all three subconditions)					or Condition B (MUTCD Figure 4C-4)					No
			Value	Minimum	Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
			Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	1. Veh-Hrs of Delay		1.2	4	No	304	N/A	153	~310	No	
2. Minor Volume		153	75	Yes							
3. Total Ent. Volume		522	800	No							
4 Pedestrian Volume (either criterion)	Criterion A: Four-hour (MUTCD Figure 4C-7)					or Criterion B: One Hour (MUTCD Figure 4C-8)					No
	Major (Both Dir.)		Pedestrians		Met?	Major (Both Dir.)		Pedestrians		Met?	
	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	162	N/A	0 Peds	N/A	No	304	N/A	7 Peds	N/A	No	
5 School Crossing	Very few (if any) students cross the major street. The minor street crossing used is already stop-controlled. All intersection approaches are already well-signed with school zone speed restrictions.										No
6 Coordinated Signal System	No signals in the roadway network nearby.										No
7 Crash Experience ** Condition A not evaluated (all conditions)	Condition B, 1-year Period (Table 4C-4)					and Condition C, 80% of Warrant 1 [Condition A]					No
	Angle+Ped Crashes		or Fatal+Injury A+P		Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	1	4	1	3	No	87	400	47	120	No	
	or Condition B, 3-year Period (Table 4C-5)					or Condition C, 80% of Warrant 1 [Condition B]					
	Angle+Ped Crashes		or Fatal+Injury A+P		Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?		
1	6	1	4	No	87	600	47	60	No		
					or Condition C, 80% of Warrant 4						
		Four Hour Ped		One Hour Ped							
		Value	Minimum	Value	Minimum	Met?					
		0 Peds	N/A	7 Peds	N/A	No					
8 Roadway Network	No second major route present and no need indicated to concentrate traffic at this location.										No
9 Intersection Near Grade Xing	No railroad grade crossing nearby.										No

Warrants Met: **0**
Recommendation: No Signal

Notes:

- c: Warrant 1 minimum values used for "70%" to account to reflect major-street speed over 40 mph
- * Warrant 3, Peak Hour, is indicated by the MUTCD as follows: "This signal warrant should be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time."
- ** No trial of alternatives with observance and enforcement has been attempted at this location.



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Application for Variance from the Yellowstone County Subdivision Regulations' Requirement to Provide an Additional Stub Street to the Adjacent Undeveloped Land South of the Residential Area at Maplewood Estates (Section 4.6.B.1)

A. A variance is requested to allow two stub street accesses to the undeveloped Lot 5, Block 5 (61.793 acres) on the Preliminary Plat of Maplewood Estates instead of the three that would be required by the Yellowstone County Subdivision Regulations. The section of the regulations from which a variance is requested is 4.6.B.1, which reads: "The maximum distance between connections to undeveloped lands shall not exceed 600 feet." The length of the northern boundary of the undeveloped parcel, Lot 5, Block 5, that is adjacent to the residential lot area within Maplewood Estates is 2443 feet. If 3 stub streets were provided to Lot 5, Block 5, each being 60 feet in right-of-way width, 4 blocks would be created with an average of 565.75 feet between connections. This variance is to request that two stub streets be allowed instead of three, which creates the following distances between connections to Lot 5, Block 5: 707 feet between 72nd Street West and 71st Street West, 874 feet from 71st Street West to Maple Leaf Trail, and 743 feet from Maple Leaf Trail to S. 68th Street West. Providing two accesses as proposed accomplishes the intended purpose of the cited section of the Subdivision Regulations, which is to encourage grid connectivity, and the resultant block lengths are not unreasonably long. Because Lot 5, Block 5 is within and a part of Maplewood Estates, and because it will be able to access South 72nd Street West along its entire frontage, and because it will also be able to access South 68th Street West along its entire frontage, another stub street is not deemed necessary besides the two proposed on the preliminary plat (S. 71st Street West & Maple Leaf Trail).

1. The granting of this variance will not be detrimental to public health, safety, or general welfare or injurious to other adjoining properties. The undeveloped parcel has more than adequate access and grid connectivity as described above and will provide adequate traffic circulation in the future.
2. A unique condition to this specific site that presents an undue hardship to the owner if the strict interpretation of the cited section of the Subdivision Regulations were followed to the letter is the topography of the site. The land slopes downward to the southeast. Since storm runoff is not allowed to be stored within the public road right-of-way, a retention pond is needed in the southeast corner of the proposed residential area. This retention pond takes 225 feet of the frontage adjacent to the undeveloped land on Lot 5, Block 5, which otherwise could be developed into 2 buildable lots. At the same time, the retention pond provides open space connectivity, which is a mitigating factor in that it reduces the effective block length between Maple Leaf Trail and S. 68th Street West to 517.6 feet. Another hardship is having a principal arterial street, South

72nd Street West, running along the entire west boundary of the subdivision. This requires greater right-of-way dedication than a local street would require while at the same time restricting access to all lots along the west boundary of the subdivision. This results in a much greater cost, due to both the additional land given up for the dedication itself and the cost of constructing an additional parallel internal road necessitated by the access restriction. If another stub street were required to the south above the 2 proposed, it would either cause the loss of a buildable lot or a narrowing of the lots along the south boundary to accommodate the additional stub. For these reasons, along with those stated in the first paragraph above, another stub street to the south is not warranted. The two proposed stub street accesses provide adequate grid connectivity to the adjacent undeveloped land in this case.

3. This variance will not result in any increase in taxpayer burden.
4. This variance will not place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy. This subdivision is outside the MPO zoning area.
5. Because the objective of neighborhood connectivity is still satisfied by the two proposed stub street accesses provided to the undeveloped adjacent land (Lot 5, Block 5), and because the resulting three block lengths are not unreasonably long, the design of the preliminary plat as shown is equally effective.

Thank you for your consideration of this variance.



Scott Worthington
In Site Engineering

Attachment A

Maplewood Subdivision is a proposed major subdivision in Yellowstone County. The applicant is requesting a variance from Section 4.6.B.1 which requires a connection to undeveloped land from this subdivision every 600 feet.

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 applicant is proposing to provide two (2) future connections to the vacant land to the south. The Yellowstone County Subdivision Regulations requires one (1) connection every 600 feet maximum. With this requirement the applicant would be required to have three (3) connections but none of them would be 600 feet apart. As outlined in the variance request the proposed two connections are 707 feet from 72nd Street to 71st Street. From 68th Street to Maple Leaf Trail is 743 feet. With 874 feet between Maple Leaf Trail and 71st Street. With one less connection than what is required will not have a strong negative impact of future movements between this subdivision and development to the south.

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 topographical conditions that would impact the ability to make connections to the south. The land has been used as a farm field and this development only uses half of the land for the project.

3. The variance will not result in an increase in taxpayer burden.

The variance will not result in an increase in taxpayer burden. There will be one less section of road to maintain.

4. The variance will not in any manner place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy.

The proposed development is outside of the Yellowstone County zoning jurisdiction and so will not create any non-conformance with zoning.

5. The subdivider must prove that the alternative design is equally effective, and the objectives of the improvements are satisfied.

The proposed connections to the south will meet the intent of the regulations, to have connections for future development and not create subdivision islands.