Preliminary Report

for

Future Business Park

City of Ramsey

DRAFT

August 19, 2015

Prepared by: Bolton & Menk, Inc.

TABLE OF CONTENTS

INTRODUCTION....1
STUDY CONTENT....1
INITIAL INFORMATION....2
GENERAL DISCUSSION....2
UNDERSTANDING PREVIOUS IMPROVEMENTS....4
ADDITIONAL ANALYSIS....6
COST CONSIDERATIONS....11
COST ALLOCATION ALTERNATIVES....11

APPENDICES

APPENDIX A – FIGURES
APPENDIX B – TRAFFIC STUDY
APPENDIX C – STORM WATER ANALYSIS

INTRODUCTION

The Ramsey City Council and Ramsey Economic Development Authority (EDA) have identified the need to prepare for the development of a new business park within the City. The City is targeting a large area of privately owned green-field space located on the north side of Trunk Highway 10, west of Armstrong Boulevard, for a future Ramsey Business Park. Currently, the City is in the process of rezoning this area to meet future land use goals. Figure 1 in Appendix A depicts the general area of the business park and study area.

The future business park is one component (about 92 acres) of a larger green-field area ready for development (about 350 acres). This larger green-field area includes areas for single-family residential development (about 118 acres), medium-density residential (about 31 acres) and room for a future private school campus (about 90 acres). In addition to green-field development, the City expects a portion of existing adjoining light-industrial space to be redeveloped into a traditional retail/commercial area (about 42 acres). See Figure 2 in Appendix A for future land use goals.

The City's future business park, and larger developable green-field area, will be served by the future Trunk Highway 10/Armstrong Boulevard (CSAH 83) interchange. Construction of this interchange began in the spring of 2015 and is expected for completion in the spring of 2017. The City expects the construction of this major interchange to increase the demand for development of this green-field area; and the future Ramsey Business Park.

The primary roadway system serving this developable area is Bunker Lake Boulevard and Puma Street. These roadways are both Municipal State-Aid (MSA) streets. This analysis includes studying traffic impacts resulting from the future business park (along with other users), examining the feasibility of constructing supporting infrastructure, and developing preliminary design layout plans and specifications.

STUDY CONTENT

The primary purpose of this analysis is to determine minimum required infrastructure needs and costs associated with developing the green-field area. Roadways and intersections included in the study are as follows:

- Bunker Lake Boulevard from Armstrong Boulevard to Puma Street,
- Puma Street from Bunker Lake Boulevard to Alpine Drive,
- The Bunker Lake Boulevard/ Armstrong Boulevard intersection,
- The Bunker Lake Boulevard/ Puma Street intersection,
- The Puma Street/ Alpine Drive intersection, and

- The Armstrong Boulevard/ Alpine Drive intersection.

Figure 3 in Appendix A depicts the roadways and intersections included in this analysis.

Our analysis consists of four separate components that, when tied together, provide an overview of the corridor needs:

- **Traffic Impact Study** – Defines the needs of the roadways and intersections in the study area,
- **Regional Storm Water Analysis** – Defines conceptual storm water ponding needs,
- **Preliminary Design Layout** – Provides a graphical depiction of the roadways and intersections, and
- **Final Report** – Describes required infrastructure improvements, layouts and costs.

INITIAL INFORMATION

Prior to the study, the City of Ramsey provided the following information and guidance for the study area.

- The City is not master-planning this entire developable area. It is unknown where internal driveways, roadways and curb-cuts will be needed. Therefore, the design of Bunker Lake Boulevard and Puma Street should not include any new curb-cut locations.
- Stubbing of sewer and water utilities along Bunker Lake Boulevard and Puma Street should be completed at regular intervals based on future land use needs.
- Cost estimations and design should include: roadway, trails/sidewalks, storm water management, street lighting, trunk water service and trunk sewer service.
- The intersection of Bunker Lake Boulevard and Armstrong Boulevard was constructed in 2011. Verification that this intersection was constructed to accommodate traffic demands must be completed.
- The City has adopted Comprehensive Sanitary Sewer and Water Plans. These plans should be reviewed and consulted as forecasting and design work is completed.
- Regional storm water considerations and solutions should be included in the study.

GENERAL DISCUSSION

While the primary focus of the analysis is related to providing infrastructure to serve development, additional considerations can influence decision-making. The following items were considered throughout the course of the analysis.

Right-of-Way Requirements

While it is anticipated that most of the improvements will be development driven, and Right of Way will be secured through the platting process, understanding and documenting the potential needs will allow the City to plan in advance for acquisitions. The City can then provide that documentation to developers as they begin to consider options within the study area.

Phased Improvements

While there is a general understanding of the improvements required to ultimately serve the area, sequencing of the improvements will allow for planning and fiscal responsibility. Our understanding of the most logical phasing sequence includes:

- **Phase 1** – Complete construction of Bunker Lake Boulevard from Armstrong Boulevard to the westerly school property driveway. Sanitary sewer and water have already been extended to this point.
- **Phase 2** – Construction of Bunker Lake Boulevard from the Phase 1 limits to Puma Street. Construction of Puma Street from Bunker Lake Boulevard to the north. The northerly limits along Puma Street will be the approximate location of a lift station required to serve areas further to the north and west.
- **Phase 3** – Completion of improvements along Puma Street.
- **Future Phases** – We verified the improvements considered can service areas beyond Phase 3. For instance, the gravity sanitary sewer can serve areas west of Puma Street. No further work was completed beyond Phase 3 other these verifications.

Costs for each phase were developed to allow for the City to plan for the sequenced implementation of the improvements. The anticipated phasing is depicted on Figure 4 in Appendix A.

Jurisdictional Authority/Approvals/Permits

As the project moves from the planning stages to design and construction, permits will be required from various agencies. Understanding and planning for requirements associated with obtaining permits and approvals at this time will be critical to the ultimate success of the process. The following agencies will be permitting entities for considered improvements:

- Minnesota Department of Transportation State Aid: Bunker Lake Boulevard and Puma Street are State Aid routes,
- Minnesota Pollution Control Agency: NPDES Storm Water Permit,
- Minnesota Pollution Control Agency: Sanitary Sewer Extension Permit,
- Minnesota Department of Health (MDH): Watermain Extension and Dewatering,

- Anoka County: Work in Right of Way, and
- Lower Rum River Watershed Management Organization: Storm Water.

Recent Improvements

Improvements to the area were completed in 2011. The street and utility improvements completed at that time included:

- Extension of sanitary sewer along the west side of Armstrong Boulevard from just north of Sunwood Drive to Bunker Lake Boulevard,
- Extension of watermain from the east side of Armstrong Boulevard to the west side of Bunker Lake Boulevard,
- Extension of sanitary sewer and watermain in newly platted Bunker Lake Boulevard right-of-way,
- Development of a storm sewer system to service the street and right-of-way requirements,
- Extension of Bunker Lake Boulevard roadway,
- Paving of Puma Street, and
- Extension of a bituminous trail along Puma Street from Bunker Lake Boulevard to Alpine Drive.

All of the improvements completed at that time were consistent with the City's Comprehensive Plans.

UNDERSTANDING PREVIOUS IMPROVEMENTS

Significant consideration and planning was completed prior to completion of the improvements constructed in 2011. Understanding the thoughts behind previous improvements can help avoid omissions when considering future improvements.

Street and Trail Improvements

Bunker Lake Boulevard

The previous improvements provided a two-lane roadway from Armstrong Boulevard to Puma Street. The roadway was designed to allow for future widening and expansion as development and other potential transportation improvements surrounding the area increased traffic on this roadway. It was anticipated that ultimate expansion of Bunker Lake Boulevard to two lanes in each direction with center turn lane would be required for future development along Bunker Lake Boulevard.

The Comprehensive Plan indicates that projected traffic on this roadway could be 11,000 ADT if the street is part of a future Mississippi River crossing. Without being part of a River crossing, the Comprehensive Plan provides 20-year projections of 5,000 ADT.

The roadway was located within the right-of-way to provide future flexibility in roadway expansion with minimal modifications to what will be constructed.

Puma Street

Improvements to Puma Street were evaluated because of the need to extend Bunker Lake Boulevard to Puma Street, a distance of about one-half mile.

Puma Street received only minimal improvements, being widened from 18 feet width to 24 feet and paved with 2 inches of bituminous over 6 inches of aggregate base. More significant upgrades to the roadway were anticipated, but not completed at that time.

The anticipated future requirements included a 32 foot wide street with curb and gutter with full base and pavement improvement.

Bituminous Trails

A 10-foot wide bituminous trail was constructed along the north side of the Bunker Lake Boulevard from Armstrong Boulevard to Puma Street and on the west side of Puma Street from Bunker to Alpine Drive.

Intersections

Bunker Lake Boulevard and Armstrong Boulevard was reconstructed to include turn lanes and signalization.

Sanitary Sewer Improvements

Sanitary sewer was extended north along the west side of Armstrong Boulevard from 146th Avenue/Sunwood Drive NW to Bunker Lake Boulevard. To meet the Comprehensive Sanitary Sewer Plan and serve additional areas beyond the study area, a 21-inch sewer main was constructed. It was intended to extend the 21-inch trunk sewer further to the north to service Fire Station No. 1 and the proposed future location of the water treatment plant.

In accordance with the Comprehensive Plan, an 18-inch sanitary sewer was extended westward along Bunker Lake Boulevard. This line will provide service to the study area, as well as future development that may occur on the south side of Bunker Lake Boulevard, and could be further extended in accordance with the Comprehensive Plan.

Water Distribution and Supply Improvements

Watermain was extended across Armstrong Boulevard from the main on the east side of Armstrong Boulevard. From there, the watermain was further extended westward in Bunker Lake Boulevard.

It was planned to extend this trunk watermain west to Puma Street and north to Alpine Drive via

Puma Street to provide future looping and provide water to un-serviced areas and future developments. Loops within future development would be utilized to promote reliability and functional flexibility as well as promoting fresh water moving throughout the system.

It was previously determined that the elevated storage for the City of Ramsey is adequate to provide fire flow to the study area. The distribution system was also found to be adequate to move the water from the City's three towers to the study area.

Additional Consideration:

The right-of-way of Bunker Lake Boulevard could be utilized for a future route of a 30-inch raw watermain from a future intake on the Mississippi River to the proposed site of the water treatment plant, just south of Fire Station No. 1. Because the exact location of the intake and raw watermain alignment had not yet been determined, no provisions were made during the previous improvements.

Storm Water Management

Drainage for the study area is essentially sheet flow to the center of the site to existing wetlands, and then easterly through the wetlands and through a culvert under Armstrong Boulevard. Runoff continues to flow into the actively developing COR area.

A storm sewer system was installed in Bunker Lake Boulevard to manage the storm water runoff within the right-of-way. We anticipate that this included considerations for the future widening and extension of Bunker Lake Boulevard as well.

Extensive hydraulic modeling was refined and detail added to represent preliminary storm water management conditions for future development scenarios.

ADDITIONAL ANALYSIS

As a portion of this analysis, we completed traffic and storm water studies and reviewed City Comprehensive Plans for sanitary sewer and water main needs for the study area. The traffic study is included as Appendix B and the storm water study is included as Appendix C to this report. The following is a summary of results for the various analyses and reviews.

Traffic Analysis

The traffic analysis was completed to determine required lane geometry for Bunker Lake Boulevard and Puma Street, along with turn lane requirements at four intersections in the study area.

The Future Business Park development is proposed north of Trunk Highway (T.H. 10) and west of Armstrong Boulevard. Armstrong Boulevard is a critical north-south corridor for the City of Ramsey, Anoka County, and the region carrying traffic from T.H. 10 to surrounding areas. The Business Park development includes residential, business park, commercial, and institutional land uses. These land uses result in an increase of 18,500 to 23,300 trips per day into and out of the area at full build.

The traffic increase from both the background growth and the development results in a need for capacity improvements at individual roadways and intersections in the study area. The following concise summary of improvements should be completed based on the mitigation necessary to achieve acceptable operations. For the 2040 Full-Build scenario, operations can be improved, but will still be considered unacceptable at many of the intersections. This is due to the large amount of traffic entering and exiting on Bunker Lake Boulevard and Armstrong Boulevard. Short term improvements are intended to mitigate current safety or operations problems, mid-term improvements are needed to accommodate both development and background traffic growth, and long-term improvements are needed to handle the overall development to year 2040.

Exact timing for improvements will be based upon the actual development timing and background traffic growth. Short Term improvements can be considered as the minimum requirements based on projected traffic growth. Mid Term and Long Term improvements are considerations and may ultimately be required to serve the area.

Short Term Improvements

- Bunker Lake Boulevard (west of Armstrong Boulevard): Expand to a four lane section for development.
    - The eastbound approach should include a 300 foot left turn lane, two through lanes, and one right turn lane.
    - A full median should be provided to the west end of the commercial area.
    - A full access should be at least 845 feet from Armstrong Boulevard and a right in/right out access should be at least 470 feet from Armstrong Boulevard.
- Bunker Lake Boulevard (west of commercial section): Expand to a four lane section for development (two westbound through lanes, one eastbound through lane and one center left turn lane).
    - Right turn lanes (locations and lengths) will be determined based on development type.
    - Outside westbound through lane drops to a right turn lane into the school property.
- Puma Street: Expand to a three lane section for development (two through lanes and one center left turn lane).
    - Right turn lanes (locations and lengths) will be determined based on development type.
- Bunker Lake Boulevard & Puma Street: An all-way stop, two-way stop, or roundabout will operate adequately at this intersection for the 2040 Full-Build conditions. The roundabout option may offer better operations than the other two options at 2040 Full-Build.

Mid-Term Improvements

- Armstrong Boulevard & Alpine Drive: Add northbound and southbound left turn lanes. Modify eastbound and westbound lanes to include a thru/left and a right turn lane.
- Alpine Drive & Puma Street: Add a westbound left turn lane and eastbound right turn lane.
- Armstrong Boulevard & Bunker Lake Boulevard: Re-stripe southbound lanes to include a dual southbound left turn lane. A southbound double left turn lane will help reduce queues entering the COR development. Improvements were done in 2011 to this intersection and a future southbound left turn lane was designed, but not striped.

Long-Term Improvements

- Armstrong Boulevard & Bunker Lake Boulevard: Modify the southerly eastbound through lane to a through-right lane. Another option would be to keep the two through lanes and modify the right turn lane into a free right with an add lane that runs south to T.H. 10.

Alternative Improvements

At several locations along the corridor, opportunities exist for implementation of alternative alignments. These are depicted as options to consider based on development concepts. Alternative concepts are depicted at the intersection of Bunker Lake Boulevard and Puma Street (Figure 10) and the intersection of Puma Street and Alpine Drive (Figure 12). The alternatives are provided for future discussion and will not significantly impact project costs.

Figures 5 through 12 in Appendix A depict future roadway and intersection improvements in the study area.

Sanitary Sewer and Water Main

An 18-inch sanitary sewer main was extended west along Bunker Lake Boulevard as a portion of the 2011 improvements. Based on information contained in the Comprehensive Plan, The 18-inch line will be extended along Bunker Lake Boulevard and north along Puma Street. North of the Puma Street/Bunker Lake Boulevard intersection, grade becomes an issue and a sanitary sewer lift station is required to serve areas further north and west. Phase 3 costs include the lift station, valve vault and forcemain. North of the lift station, the Comprehensive plan indicates a 12-inch gravity main will be adequate to convey sanitary sewer flows from the area. For this analysis, we included an allowance for 8-inch service lines to be extended to properties along the corridor.

A 16-inch water main was extended west along Bunker Lake Boulevard as a portion of the 2011 improvements. The Comprehensive plan indicated that either a 12-inch or a 16-inch water main would be required along Bunker Lake Boulevard and Puma Street, depending on the final selected location of a

future water treatment plant to be constructed in this area. For our analysis, we assumed a 16-inch water main would be constructed, with hydrants and service lines extended to the properties.

Figures 13 through 15 in Appendix A depict sanitary sewer and water main improvements.

Storm Water Management

Storm water management concepts were developed to maintain existing drainage patterns and preserve the conveyance and flood storage capacity of the primary wetland corridor that bisects the area. This will restrict development along the wetland corridor and retain the pre-development flood capacity, thereby maintaining existing flow rates into the COR.

The study area can be segmented into three drainage districts, generally delineated by future land use. Figure 16 in Appendix A displays the drainage area breakdown and a general regional pond layout. The drainage area consists of a multi-use site (Area 1), residential area (Area 2), and commercial and industrial sites (Area 3). The watersheds were modeled under future land use conditions to generally size retention ponds to meet existing flow rates. The ponds were also located with respect to potential storm sewer depths, reductions in wetland impacts, maximization of developable area and potential aesthetic function.

The ponds depicted on Figure 16 in Appendix A depict areas that are best suited for regional rate control basins only. Additional design parameters and regional storm water management planning should be further refined as the areas begin to develop.

Cost estimates were not developed for the regional pond construction or internal site storm sewer conveyance. It is anticipated that costs associated with pond construction will be completed by the developer as a portion of the site grading. Also, it is assumed that internal site drainage will be accommodated by dry swales and ditch systems to reduce storm sewer costs.

Street Lighting

The costs included for street lighting were derived from recent projects within the City of Ramsey and are considered to be reasonable costs associated with providing street and pedestrian lighting along the corridors. Costs include conduit, wiring and the actual light fixtures to be installed. The density of the lighting fixtures is similar to the level provided along the recently constructed Riverdale Drive, east of Armstrong Boulevard. Our understanding is the spacing may be increased (decreasing the number of fixtures) for Phases 2 and 3. This may slightly reduce the costs associated with these phases. The costs provided are considered conservative for that reason and may be reduced depending upon the types of developments proposed.

Trails/Sidewalks

Existing trails were previously constructed along the north side of Bunker Lake Boulevard and the west side of Puma Street. Project costs were prepared which include trails along the south side of Bunker Lake Boulevard and the east side of Puma Street.

Phase Transitions

There is the potential for portions of the roadways to be constructed to wider sections than currently exist. If this occurs, the new roadways will need to taper to meet the existing roadway widths. The tapered sections will then be removed as the next phase of improvements is completed. Costs were included in each phase for these tapering sections.

Right Turn Lane Additions

The roadways depicted in the exhibits depict through lanes and left turn lanes. Right turn lanes will be required at each access off of Bunker Lake Boulevard and Puma Street. Individual access locations were not considered in this study, and so the locations and lengths of right turn lanes were not considered at this time. The actual access locations will be dependent upon the type of land use and internal site characteristics. We included allowances for the right turn lanes in each phase for budgeting purposes.

Landscaping

The base project includes a very utilitarian approach to the area. Bituminous trails and lighting were included, but other features, such as trees, shrubs, decorative features and monuments are not included in the estimated project costs.

Right of Way and Easements

Locations of right of way needs are depicted on the exhibits based on roadway and trail needs. The exact areas will need to be determined during the platting process. We assumed that the rights of way would be dedicated as a portion of the development process and no costs are included in the project costs for acquisitions.

Timing of Improvements

While the improvements discussed and depicted in the exhibits will be required to support the area, timing of the improvements will most likely be dependent upon each proposed development. For instance, the portions of Lot 8 (See Figure 17) that are within Phase 1 could potentially be developed without further public improvements being required immediately. Roadways and intersections are adequate to support development of this parcel and trunk sanitary sewer and trunk water have been extended through this area. In cases such as this, the properties would most likely be assessed at such time as the City determines the public improvements are necessary.

As individual developments are considered, the public infrastructure will need to be reviewed and determinations made as to its adequacy. As upgrades, extensions and improvements are determined to be necessary, funding strategies will need to be developed which may include full of partial assessments to benefitting properties.

COST CONSIDERATIONS

Costs were developed based upon phased implementation. The phasing is as depicted on Figure 4 in Appendix A. All costs presented in the following pages are 2015 costs, with no allowance for inflation.

Improvement Type	Phase 1	Phase 2	Phase 3
Roadway	$ 1,427,000	$ 1,383,000	$ 1,626,000
Trails/Sidewalks	$ 220,000	$ 146,000	$ 175,000
Storm Water Management	$ 0	$ 0	$ 64,000
Street Lighting	$ 143,000	$ 104,000	$ 126,000
Trunk Water	$ 19,000	$ 219,000	$ 247,000
Trunk Sanitary Sewer	$ 11,000	$ 188,000	$ 654,000
Total Costs/Phase	$ 1,820,000	$ 2,040,000	$ 2,892,000

The above costs are considered project costs and include 30% contingencies and project development costs. Project development costs include administrative, engineering, and fiscal related costs.

The roadway costs include allotments for phase transitions associated with tapering pavements sections to match in-place sections where required, and subsequent removals of the transition areas. Right turn lanes are not depicted on the graphics, but will be required. The actual right turn lane locations and lengths will be determined by the entrance locations, land use and associated traffic impacts. Costs are included for right turn lanes in the roadway estimate.

Street lighting costs are based upon recent installations within the City of Ramsey.

For storm water management, costs were included for manholes, catch basins, and pipe within the street sections and included in the roadway costs. No costs for ponding were included for Phases 1, and 2. For Phase 3, ponding costs were included for excavation related activities. We assumed a ponding area would be acquired through the platting process, and ponding within a development site would be expanded to include volume for roadway drainage.

The Phase 2 limits are based upon the area that can be served by a gravity sanitary sewer system. The Phase 3 sanitary sewer costs include a lift station and forcemain.

COST ALLOCATION ALTERNATIVES

The costs, or a portion of the costs, of the improvements are typically allocated back to adjacent properties through the use of assessments, fees and other methods. The costs are typically allocated in a way that is equitable to the properties benefitting from the improvements. Public improvements that will become City owned and maintained are typically constructed through a public process, while secondary improvements are constructed by the property owner. For our analysis, we assumed the following items would be constructed through the public process:

- Roadways, including storm water conveyance systems,
- Trunk Water Facilities,
- Trunk Sanitary Sewer Facilities,
- Trails, and
- Street Lighting.

While the street lights will most likely be installed by a private utility and the trails could potentially be constructed by the property owner, we have included these items as public improvements.

Other improvements were considered secondary and are typically the property owner's responsibility to install:

- Sanitary Sewer Service Extensions,
- Water Service Extensions,
- Natural Gas Lines to Buildings,
- Telephone Service to Buildings,
- Electric Service to Buildings,
- Site Grading,
- Site Landscaping,
- Site Storm Water Conveyance,
- Storm Water Ponding, and
- Easement Dedication.

These types of improvements are typically inspected by the City for conformity with applicable codes and standards, but are constructed by the property owner.

Figure 17 depicts the lots considered for this report and also provides additional information related to each lot. Similar information is presented in the following table:

Identification Number	Zoning Classification	Gross Area (Acres)	Adjusted Frontage (Ft)
Phase 1			
8	E-2 Employment District	23.793	712
9	B-2 Business District	9.628	630
10	COR	7.507	631
Phase 1 Totals		**40.928**	**1,973**
Phase 2			
2	E-2 Employment District	11.021	369
3	E-2 Employment District	9.231	120
7	R-2 High Density Residential	3.000	537
8	E-2 Employment District	21.321	638
Phase 2 Totals		**44.573**	**1,664**

Phase 3			
1	R-2 Medium Density Residential	38.915	1,289
2	E-2 Employment District	28.612	958
4	R-1 MUSA	4.107	419
5	R-1 MUSA	30.508	683
Phase 3 Totals		**102.141**	**3,349**
Not Included in Calculations			
6	Public/Quasi-Public	86.422	3,488
Totals all Phases		**274.064**	**10,474**

The zoning classifications listed in the table above are based on anticipated future zoning for the study area. Gross areas and frontages are based on GIS information and will most likely be refined during subsequent phases of project development.

Several of the parcels were previously assessed for improvements constructed in 2011. The improvements made previously were in direct benefit to parcel 6 to allow for development. Although development did not occur at that time, no further improvements will be required to serve that parcel. Parcel 6 was therefor excluded from calculations that follow. A portion of the improvements will be paid by the City either through utility funds or other means. A list of assumptions is as follows:

- All trunk water and sanitary sewer system costs will be paid for through the City utility funds,
- Assessments will be made to benefitting properties as each phase is constructed,
- Three standard methods of assessments were analyzed including: Frontage, Area, and Per Lot.
- The City's existing assessment policy very closely matches the Frontage method, and
- Gross acreage was used in lieu of net developable acreage in the calculations below.

The table below depicts a distribution based on all costs being assessed to the benefitting properties. We have assumed for this analysis the costs would be assessed to properties benefitting from each phase of construction. For instance, properties directly benefitting from Phase 1 improvements would be assessed for Phase 1 costs at the time of Phase 1 improvements. Some lots benefit from more than one phase of construction and would be assessed as future phases are constructed.

Calculations were based on the areas and front footages (shown on page 12), along with the costs per phase (shown on page 10). Trunk sanitary sewer and trunk watermain were considered City costs and were not included in the calculations. For comparison, a summary of the unit costs used in the calculations is presented below:

Phase	Frontage Method (Cost/FF)	Area Method (Cost/Acre)	Per Lot Method (Cost/Lot)
1	$ 907.25	$ 43,735.34	$ 596,700
2	$ 981.37	$ 36,636.53	$ 408,300
3	$ 594.51	$ 19,492.66	$ 497,800

Based on the above cost distribution, the potential assessments per lot per phase is depicted below:

Identification Number	Frontage Method	Area Method	Per Lot Method
Phase 1			
8	$ 645,900	$ 1,040,600	$ 596,700
9	$ 571,600	$ 421,100	$ 596,700
10	$ 572,500	$ 328,300	$ 596,700
Phase 1 Totals	**$ 1,790,000**	**$ 1,790,000**	**$ 1,790,100**
Phase 2			
2	$ 362,100	$ 403,800	$ 408,300
3	$ 117,800	$ 338,200	$ 408,300
7	$ 527,000	$ 109,900	$ 408,300
8	$ 626,100	$ 781,100	$ 408,300
Phase 2 Totals	**$ 1,633,000**	**$ 1,633,000**	**$ 1,633,200**
Phase 3			
1	$ 766,300	$ 758,500	$ 497,800
2	$ 569,500	$ 557,700	$ 497,800
4	$ 249,100	$ 80,100	$ 497,800
5	$ 406,100	$ 594,700	$ 497,800
Phase 3 Totals	**$ 1,991,000**	**$ 1,991,000**	**$ 1,991,200**
Total all Phases	**$ 5,414,000**	**$ 5,414,000**	**$ 5,414,500**

Previously, improvements were completed in the area and assessed to benefitting properties. At that time, the City assessed 40 percent of the costs and funded the remaining costs. The following table depicts the 40 percent of the costs presented in the table above.

Identification Number	Frontage Method	Area Method	Per Lot Method
Phase 1			
8	$ 258,400	$ 416,200	$ 238,700
9	$ 228,600	$ 168,500	$ 238,700
10	$ 229,000	$ 131,300	$ 238,700
Phase 1 Totals	**$ 716,000**	**$ 716,000**	**$ 716,100**
Phase 2			
2	$ 144,900	$ 161,500	$ 163,300
3	$ 47,100	$ 135,300	$ 163,300
7	$ 210,800	$ 44,000	$ 163,300
8	$ 250,400	$ 312,400	$ 163,300
Phase 2 Totals	**$ 653,200**	**$ 653,200**	**$ 653,200**
Phase 3			
1	$ 306,500	$ 303,400	$ 199,100
2	$ 227,900	$ 223,100	$ 199,100
4	$ 99,600	$ 32,000	$ 199,100
5	$ 162,400	$ 237,900	$ 199,100
Phase 3 Totals	**$ 796,400**	**$ 796,400**	**$ 796,400**
Total all Phases	**$ 2,165,600**	**$ 2,165,600**	**$ 2,165,600**

The information presented in this section of the report is been intended to allow for discussions with property owners and developers to be initiated. Refinement of the amounts presented is anticipated based on those discussions.

APPENDIX A -

FIGURES

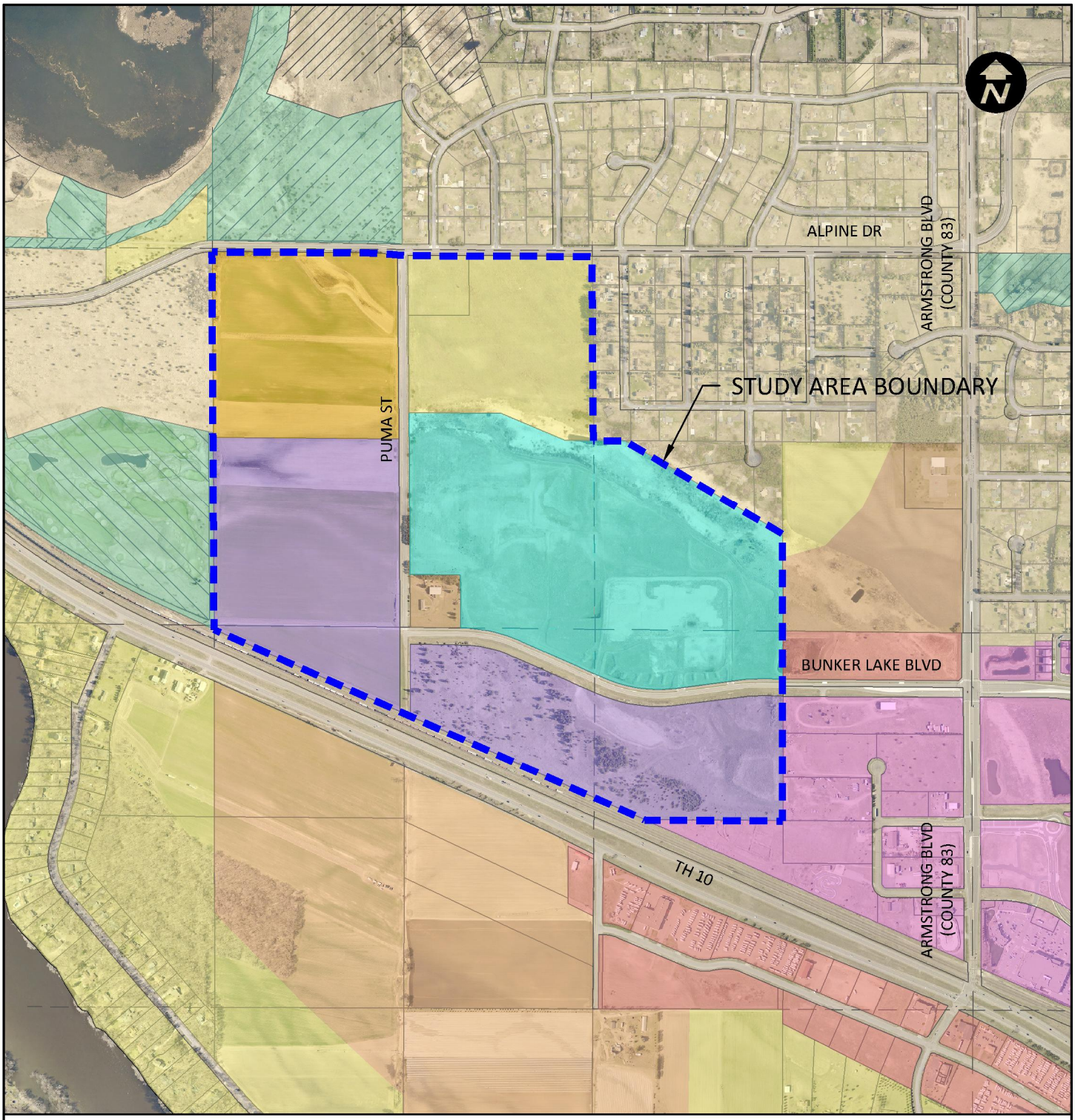
BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 1 - STUDY AREA

July, 2015



LEGEND

- LOW DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- OFFICE PARK
- COMMERCIAL
- MU
- BUSINESS PARK
- PUBLIC
- RURAL DEVELOPING
- RURAL PRESERVE
- PARK

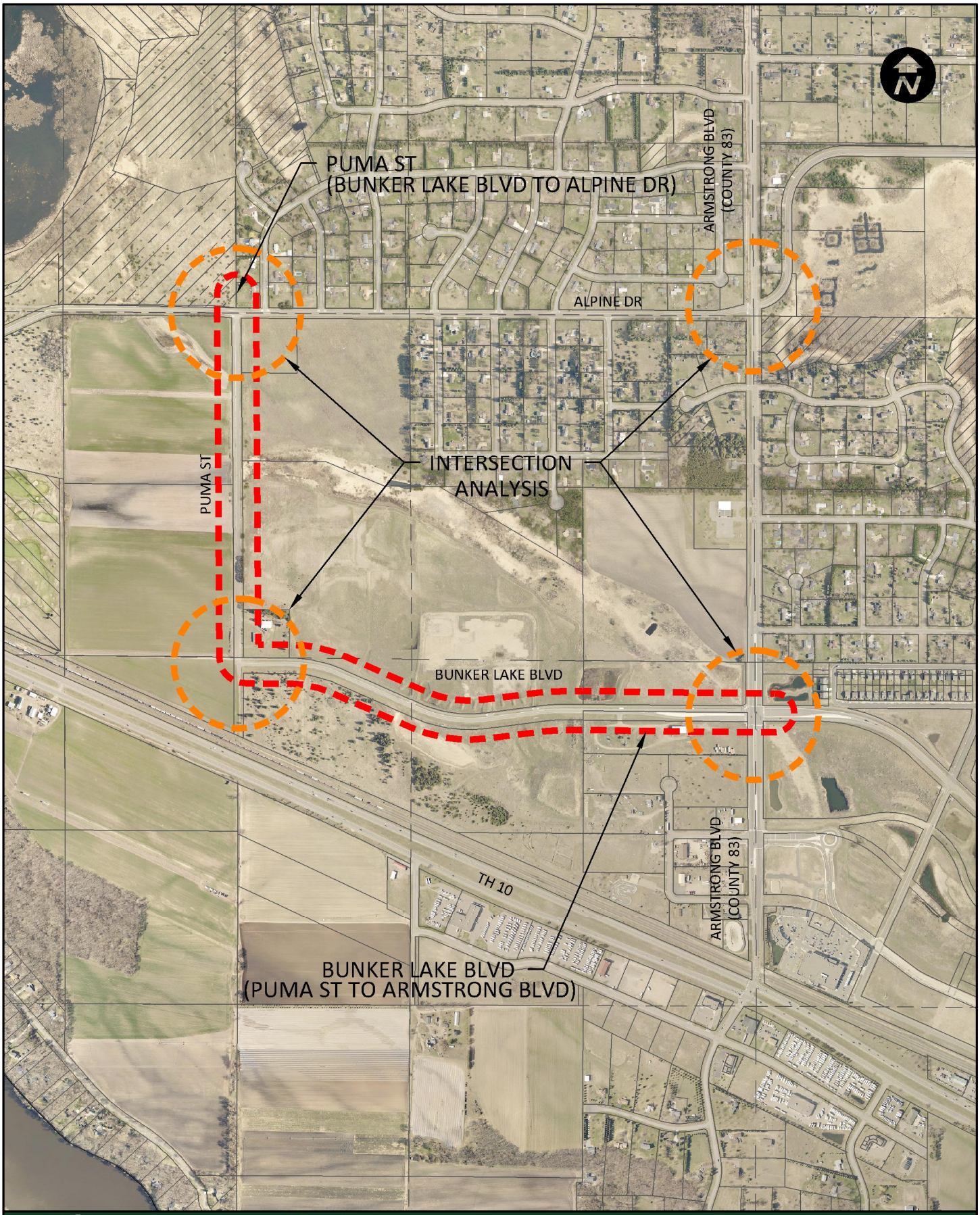
BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 2 - LAND USE

July, 2015



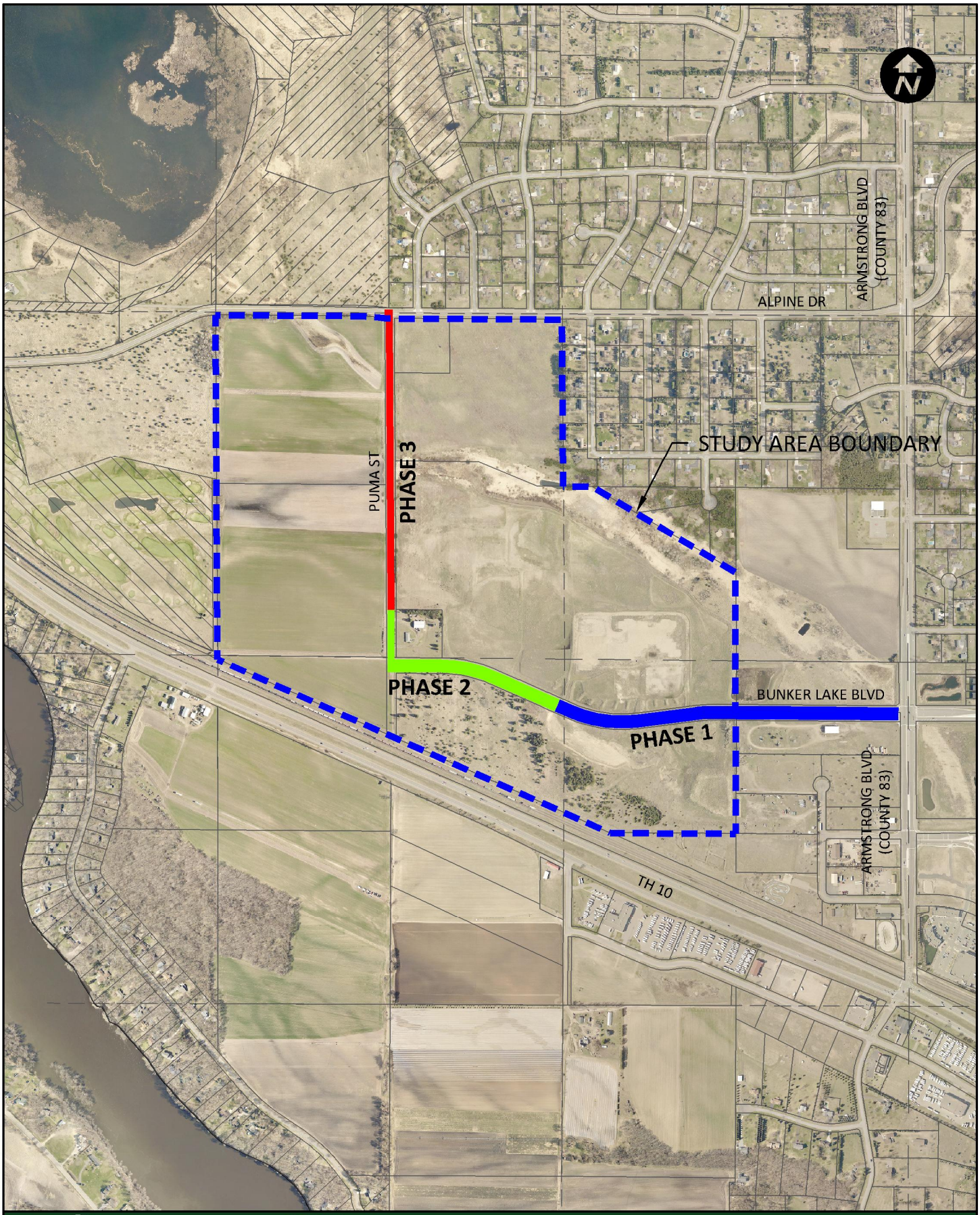
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 3 - INFRASTRUCTURE ANALYSIS

July, 2015



BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 4 - PHASING

July, 2015

ARMSTRONG BLVD
(COUNTY 83)

SEE FIGURE 8

BUNKER LAKE BLVD

ALLOWABLE LOCATION OF
RIGHT-IN/RIGHT-OUT ACCESS

ALLOWABLE LOCATION OF
RIGHT-IN/RIGHT-OUT ACCESS

PHASE 2

PHASE 1

NOTES

RIGHT TURN LANES REQUIRED AT ALL ENTRANCES. LENGTHS AND LOCATIONS DEPENDENT UPON ACCESS LOCATIONS AND LAND USE TYPES.

LEGEND

- TRAVEL LANES
- BITUMINOUS TRAIL
- EXISTING TRAIL
- CONCRETE MEDIAN OR CURB & GUTTER
- ROW ACQUISITION

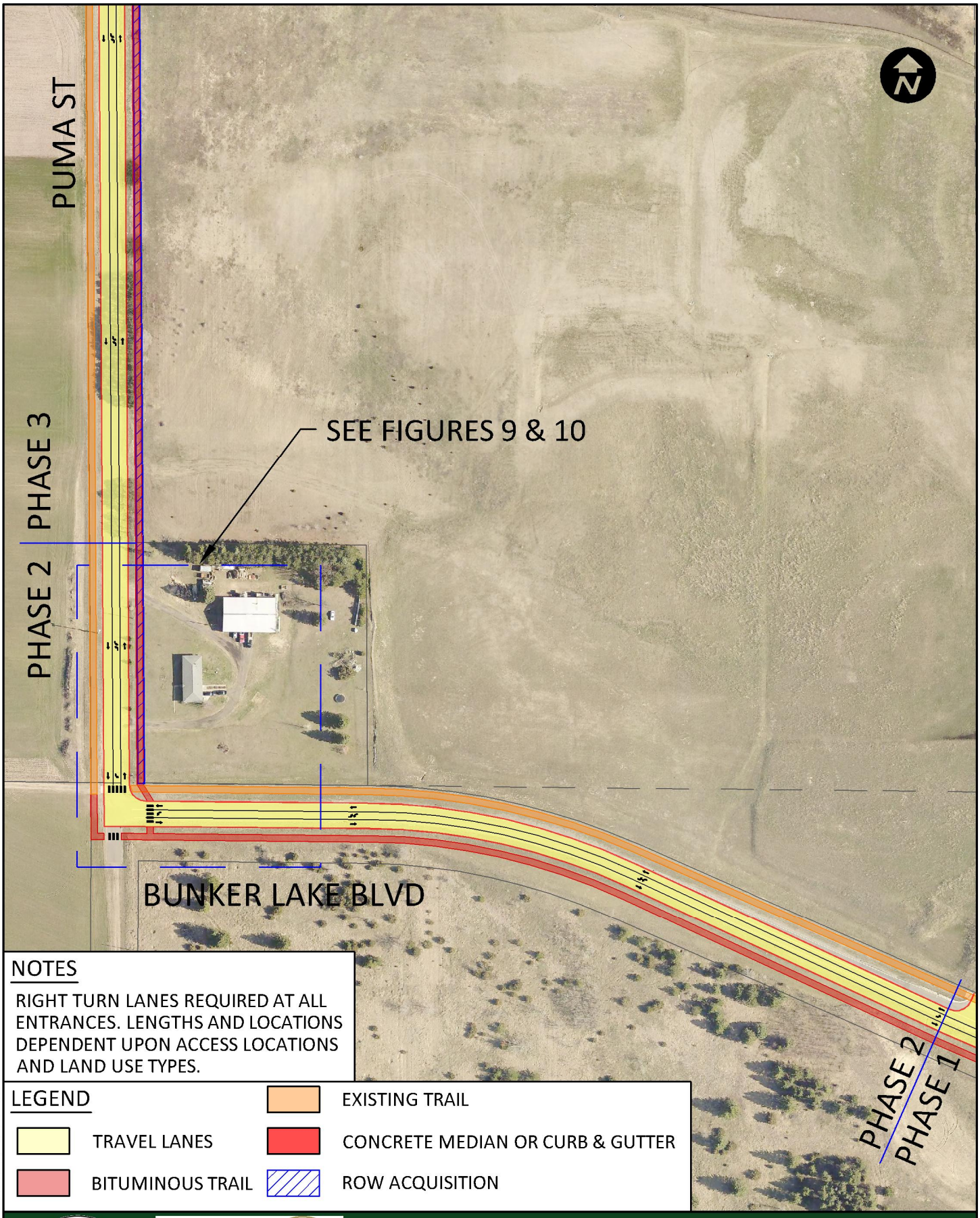
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 5 - GEOMETRICS

July, 2015



NOTES

RIGHT TURN LANES REQUIRED AT ALL ENTRANCES. LENGTHS AND LOCATIONS DEPENDENT UPON ACCESS LOCATIONS AND LAND USE TYPES.

LEGEND

- TRAVEL LANES
- BITUMINOUS TRAIL
- EXISTING TRAIL
- CONCRETE MEDIAN OR CURB & GUTTER
- ROW ACQUISITION

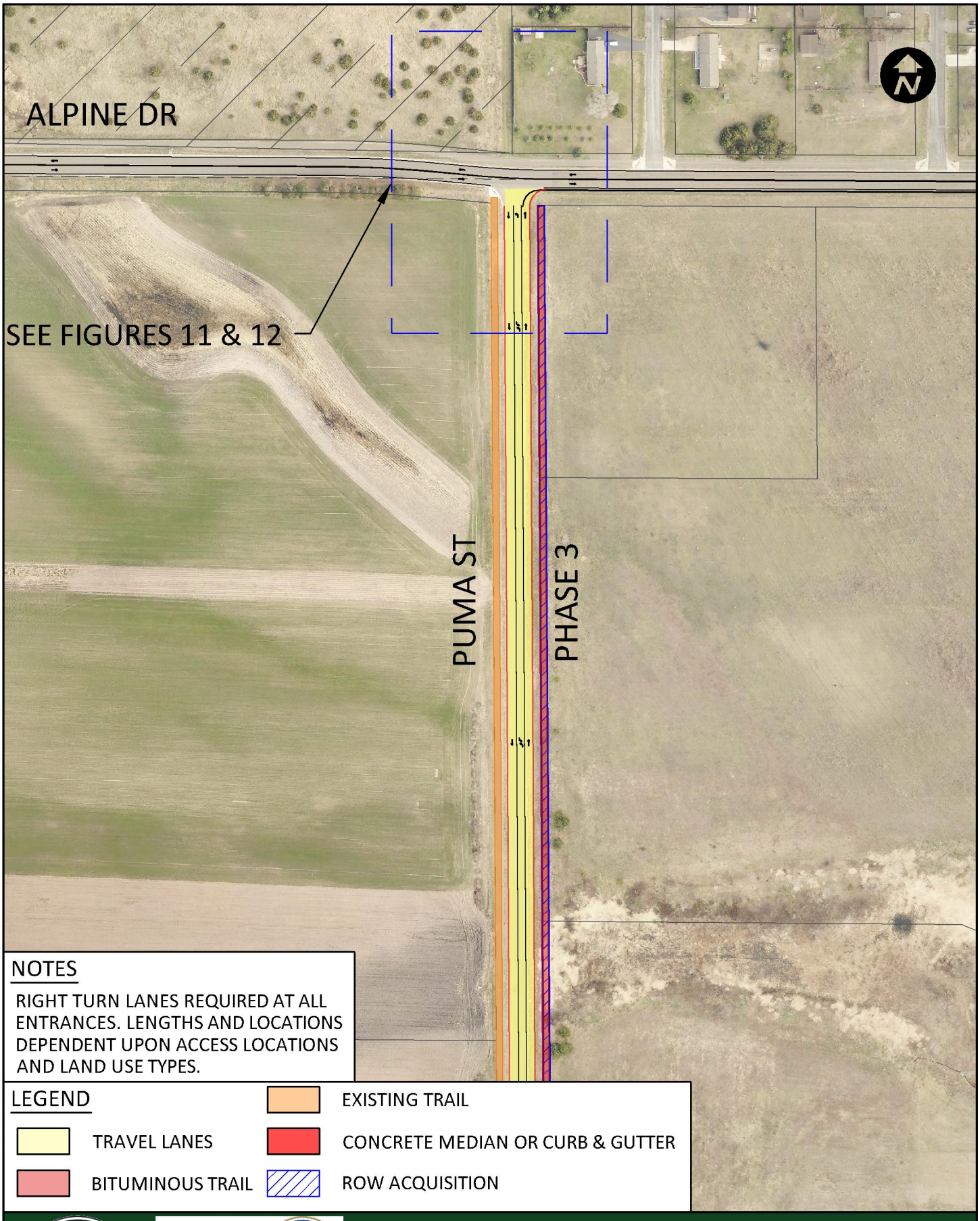
BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 6 - GEOMETRICS

July, 2015



NOTES

RIGHT TURN LANES REQUIRED AT ALL ENTRANCES. LENGTHS AND LOCATIONS DEPENDENT UPON ACCESS LOCATIONS AND LAND USE TYPES.

LEGEND

- TRAVEL LANES
- BITUMINOUS TRAIL
- EXISTING TRAIL
- CONCRETE MEDIAN OR CURB & GUTTER
- ROW ACQUISITION

BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 7 - GEOMETRICS

July, 2015

ARMSTRONG BLVD
(COUNTY 83)

CONVERT TO
DOUBLE LEFT TURN LANE

ALLOWABLE LOCATION OF
RIGHT-IN/RIGHT-OUT ACCESS

BUNKER LAKE BLVD

RESTRIPE AS
SECOND THRU LANE

ALLOWABLE LOCATION OF
RIGHT-IN/RIGHT-OUT ACCESS

LEGEND

- TRAVEL LANES
- BITUMINOUS TRAIL
- EXISTING TRAIL
- CONCRETE MEDIAN OR CURB & GUTTER
- ROW ACQUISITION

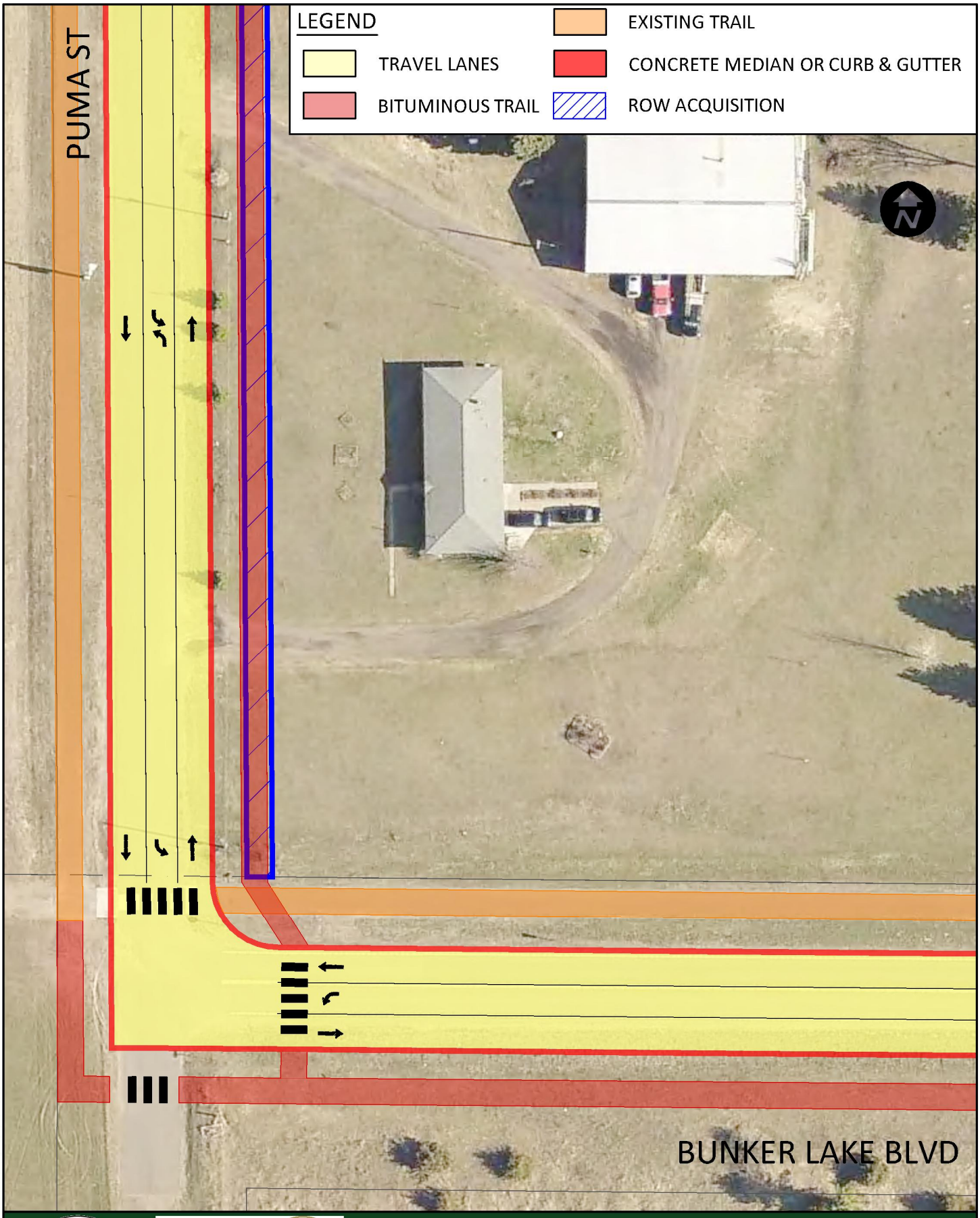
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 8 - BUNKER LAKE BOULEVARD AT ARMSTRONG BOULEVARD

July, 2015



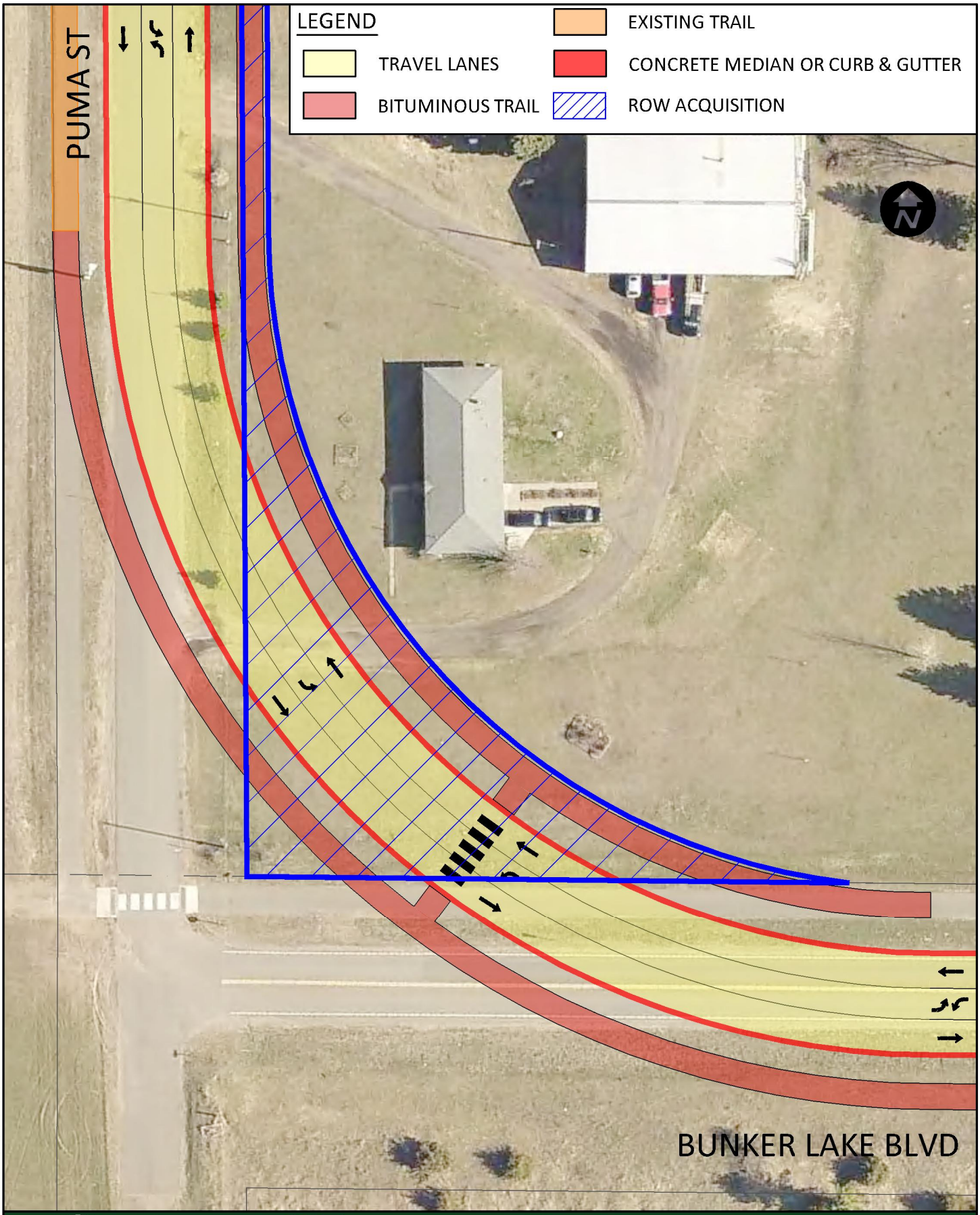
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 9 - BUNKER LAKE BOULEVARD & PUMA STREET

July, 2015



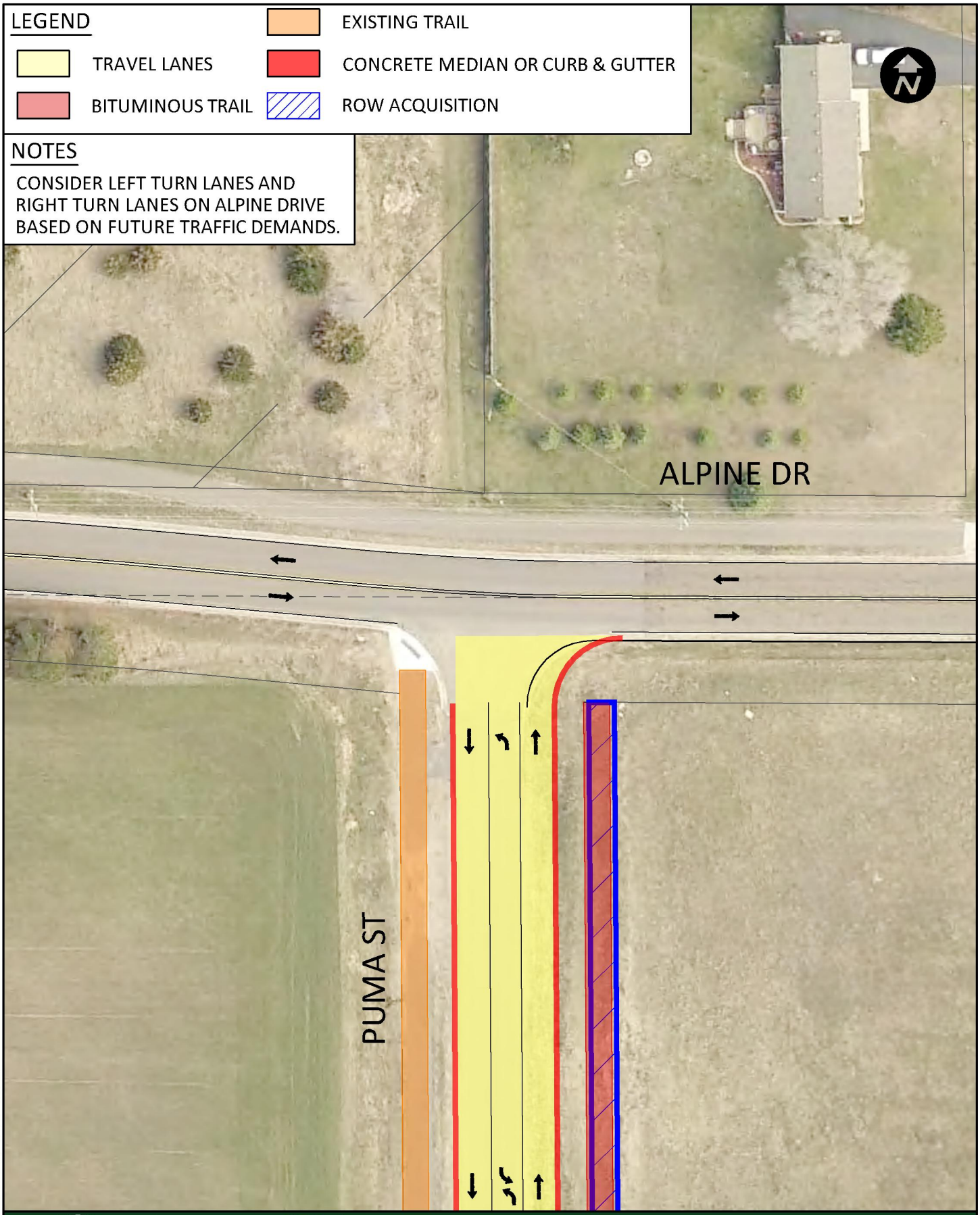
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 10 - BUNKER LAKE BOULEVARD & PUMA STREET
ALTERNATIVE CONCEPT

July, 2015



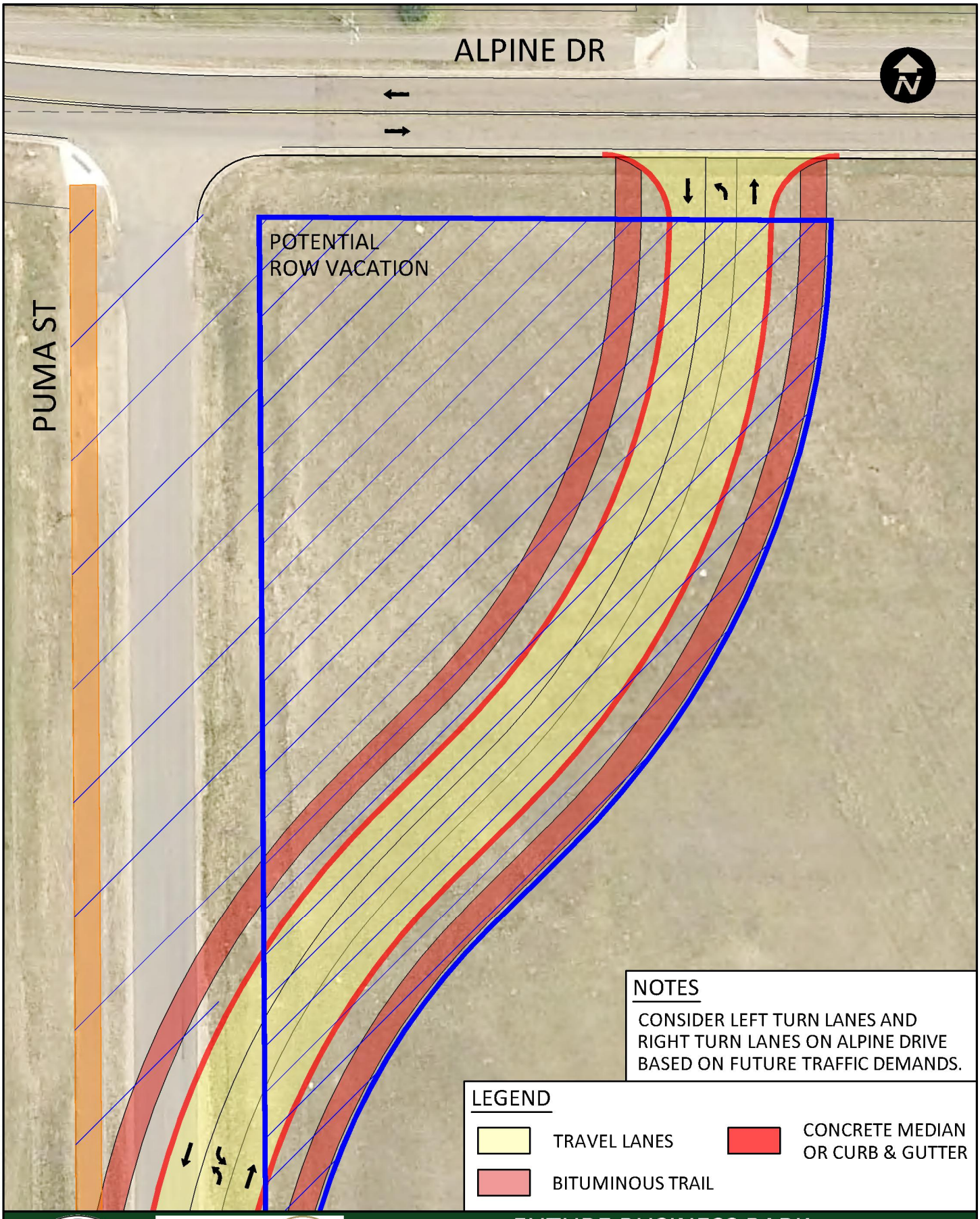
BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 11 - PUMA STREET & ALPINE DRIVE

July, 2015



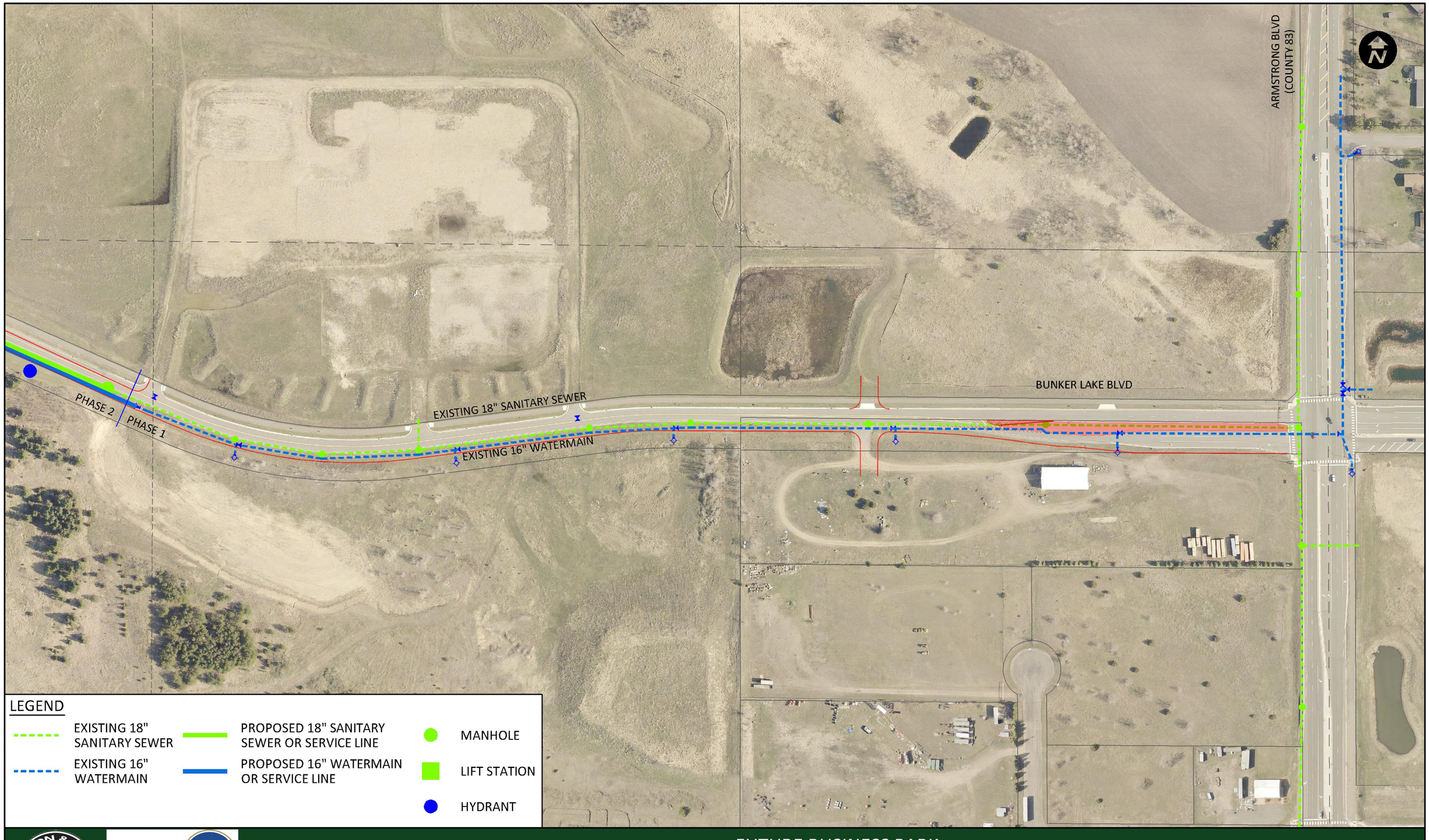
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 12 - PUMA STREET & ALPINE DRIVE
ALTERNATIVE CONCEPT

July, 2015



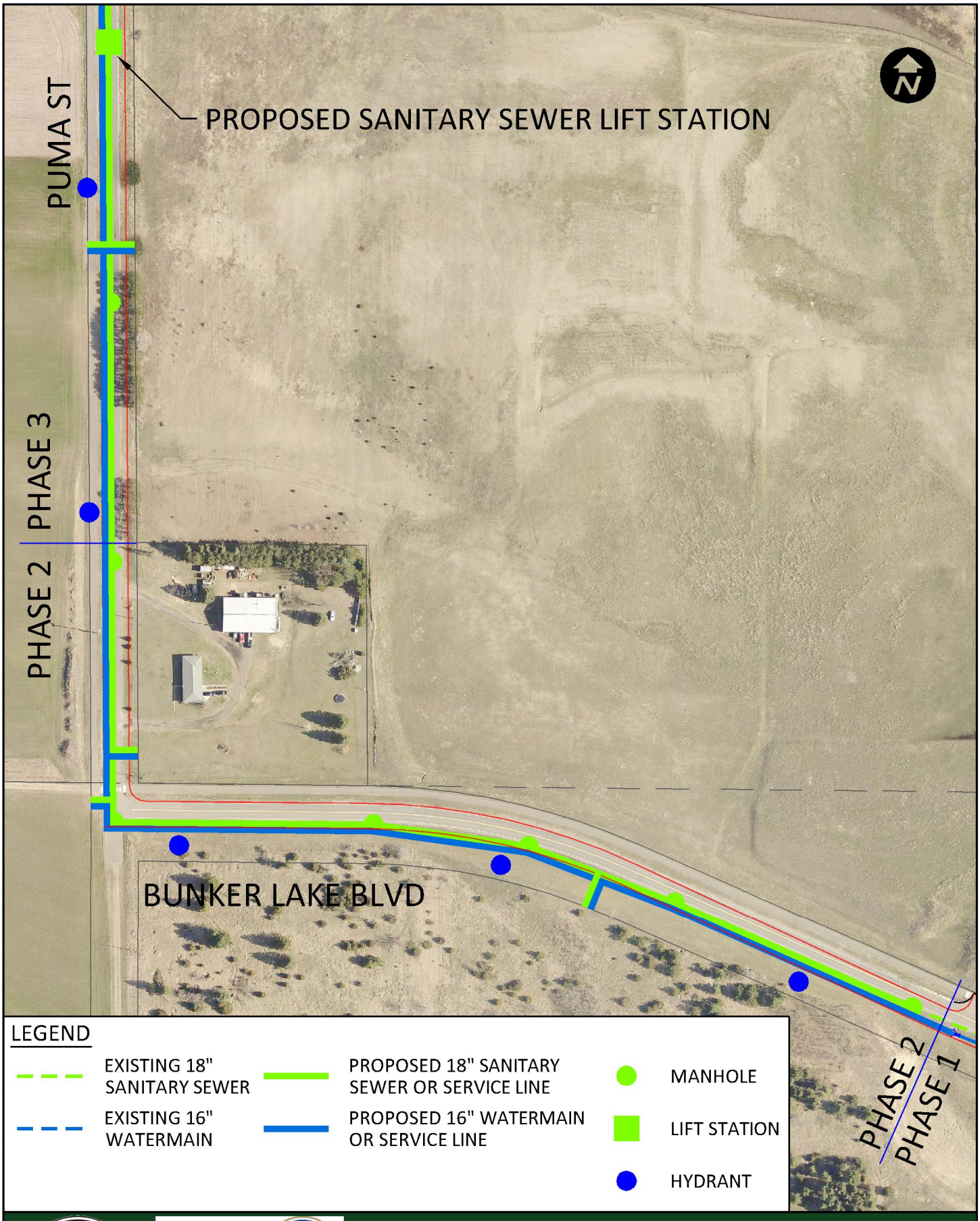
BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 13 - SANITARY SEWER AND WATER

July, 2015



BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 14 - SANITARY SEWER AND WATER

July, 2015

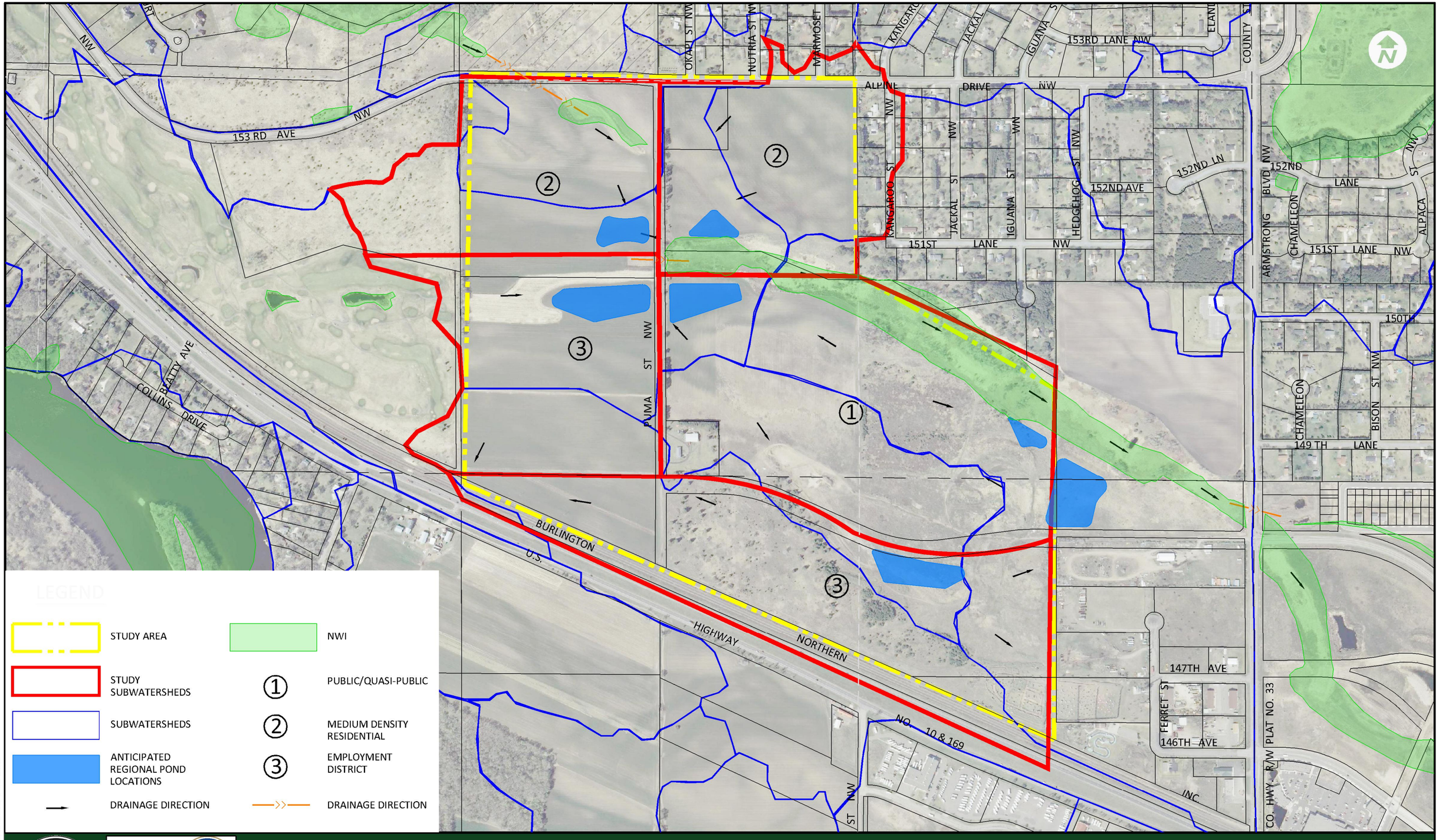
BOLTON & MENK Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 15 - SANITARY SEWER AND WATER

July, 2015



FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 16 - Regional Stormwater Considerations

July, 2015

BOLTON & MENK
Engineers & Surveyors

City of RAMSEY

FUTURE BUSINESS PARK
CITY OF RAMSEY, MINNESOTA

FIGURE 17 - LOTS

July, 2015

APPENDIX B -

TRAFFIC STUDY

Traffic Impact Study for

Future Business Park

City of Ramsey, MN

June 24, 2015

Project Number R16.109828

DRAFT

Submitted by:
Bolton & Menk, Inc.
12224 Nicollet Avenue
Burnsville, MN 55337
P: 952-890-0509
F: 952-890-8065

BOLTON & MENK, INC.
Consulting Engineers & Surveyors

CERTIFICATION

DRAFT

Traffic Impact Study

for

Future Business Park

Ramsey, MN

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By:_____

Bryan T. Nemeth, P.E., PTOE

License No. 43354

Date: 6/25/2015

TABLE OF CONTENTS

Executive Summary **1**

A. Short Term 1

B. Mid-Term 1

C. Long-Term 2

I. Introduction **3**

II. Background **3**

A. Proposed Development 3

III. Measures of Effectiveness **4**

A. Level of Service and Delay 4

IV. Existing Conditions **5**

A. Data Collection 5

B. Operations 8

C. Safety 9

V. No-Build Conditions **11**

A. 2040 No-Build Operations 11

B. No-Build Mitigation 14

VI. Build Conditions **15**

A. Traffic Forecasts 15

B. 2040 Build Operations 22

C. Proposed Mitigation 26

D. Additional Operations Analysis (50% Development Completion) 27

Appendix A- TH 10 & Armstrong Boulevard Overpass Layout **28**

Appendix B- Traffic Volumes **29**

Appendix C- Crash Reports **30**

Appendix D- Trip Generation For Future Business Park Development **31**

Appendix E- Trip Generation For COR Development **32**

Appendix F- Operations Analysis (Available Upon Request) **33**

FIGURES

Figure 1: Proposed Future Business Park Development Location 3
Figure 2.1: Existing Traffic Volumes 6
Figure 2.2: Existing Traffic Volumes (with Overpass) 7
Figure 3: 2040 No-Build Traffic Volumes 13
Figure 4: Trip Generation Zones 16
Figure 5: Trip Distribution Map 17
Figure 6.1: 2040 Build Traffic Volumes (Alternative 1A: High School) 18
Figure 6.2: 2040 Build Traffic Volumes (Alternative 1B: K-12 Schools) 19
Figure 6.3: 2040 Build Traffic Volumes (Alternative 2: Business Park) 20
Figure 6.4: 2040 Build Traffic Volumes (Alternative 3: Low Density Residential) . 21

TABLES

Table 1: Level of Service Criteria 4
Table 2: 2015 Existing Traffic Operations Analysis 8
Table 3: 2015 Existing Traffic Operations Analysis (with Overpass) 8
Table 4: 2040 No-Build Future Traffic Operations Analysis 11
Table 8: 2040 Build Operations Analysis (Alternative 1A: High School) 22
Table 9: 2040 Build Operations Analysis (Alternative 1B: K-12 Schools) 22
Table 10: 2040 Traffic Operations Analysis (Alternative 2: Business Park) 23
Table 11: 2040 Build Operations Analysis (Alternative 3: LD Residential) 23
Table 12: Development Intersection Operations Analysis 24
Table 13: Operations Analysis with River Crossing 25
Table 14: 2030 (50% Development) Operations Analysis 27

APPENDIX

Appendix A- TH 10 & Armstrong Boulevard Overpass Layout 28
Appendix B- Traffic Volumes 29
Appendix C- Crash Reports 30
Appendix D- Trip Generation For Future Business Park Development 31
Appendix E- Trip Generation For COR Development 32
Appendix F- Operations Analysis (Available Upon Request) 33

EXECUTIVE SUMMARY

The Future Business Park development is proposed north of T.H. 10 and west of Armstrong Boulevard. Armstrong Boulevard is a critical north-south corridor for the City of Ramsey, Anoka County, and the region carrying traffic from Trunk Highway (T.H.) 10 to surrounding areas. The Business Park development includes residential, business park, commercial, and institutional land uses. These land uses result in an increase of approximately 18,500 to 23,300 trips per day into and out of the area at full build.

The traffic increase from both the background growth and the development results in a need for capacity improvements at individual intersections in the study area. The following concise summary of improvements should be completed based on the mitigation necessary to achieve acceptable operations. For the 2040 Full-Build scenario, operations can be improved, but are still considered unacceptable at many of the intersections. This is due to the large amount of traffic entering and exiting on Bunker Lake Boulevard and Armstrong Boulevard. Short term improvements are intended to mitigate current safety or operations problems, mid-term improvements are needed to accommodate both development and background traffic growth, and long-term improvements are needed to handle the overall development out to 2040. Exact timing for improvements should be based upon the actual development timing and background traffic growth.

A. Short Term

- Bunker Lake Boulevard (west of Armstrong Blvd): Expand to a four lane section for development.
    - The eastbound approach should include two 300 ft left turn lanes, two through lanes, and one right turn lane.
    - A full median should be provided to the west end of the commercial area.
    - A full access should be at least 845 ft from Armstrong Boulevard and a right in/right out access should be at least 470 ft from Armstrong Boulevard.
- Bunker Lake Boulevard (west of commercial section): Expand to a three lane section for development (two through lanes and one center left turn lane).
    - Right turn lanes (locations and lengths) are to be dictated by development type.
- Puma Street: Expand to a three lane section for development (two through lanes and one center left turn lane).
    - Right turn lanes (locations and lengths) are to be dictated by development type.
- Bunker Lake Boulevard & Puma Street: An all-way stop, two-way stop, or roundabout will operate adequately at this intersection for the 2040 Full-Build conditions. The roundabout option may offer better operations than the other two options at 2040 Full-Build.

B. Mid-Term

- Armstrong Boulevard & Alpine Drive: Add northbound and southbound left turn lanes. Modify eastbound and westbound lanes to include a thru/left and a right turn lane.
- Alpine Drive & Puma Street: Add a westbound left turn lane and eastbound right turn lane.
- Armstrong Boulevard & Bunker Lake Boulevard: Re-stripe southbound lanes to include

a dual southbound left turn lane. A southbound double left turn lane will help reduce queues entering the COR development. Improvements were done in 2011 to this intersection and a future southbound left turn lane was designed, but not striped.

C. Long-Term

- Armstrong Boulevard & Bunker Lake Boulevard: Modify the southerly eastbound through lane to a through-right lane. Another option would be to keep the two through lanes and modify the right turn lane into a free right with an add lane that runs south to T.H. 10.

I. INTRODUCTION

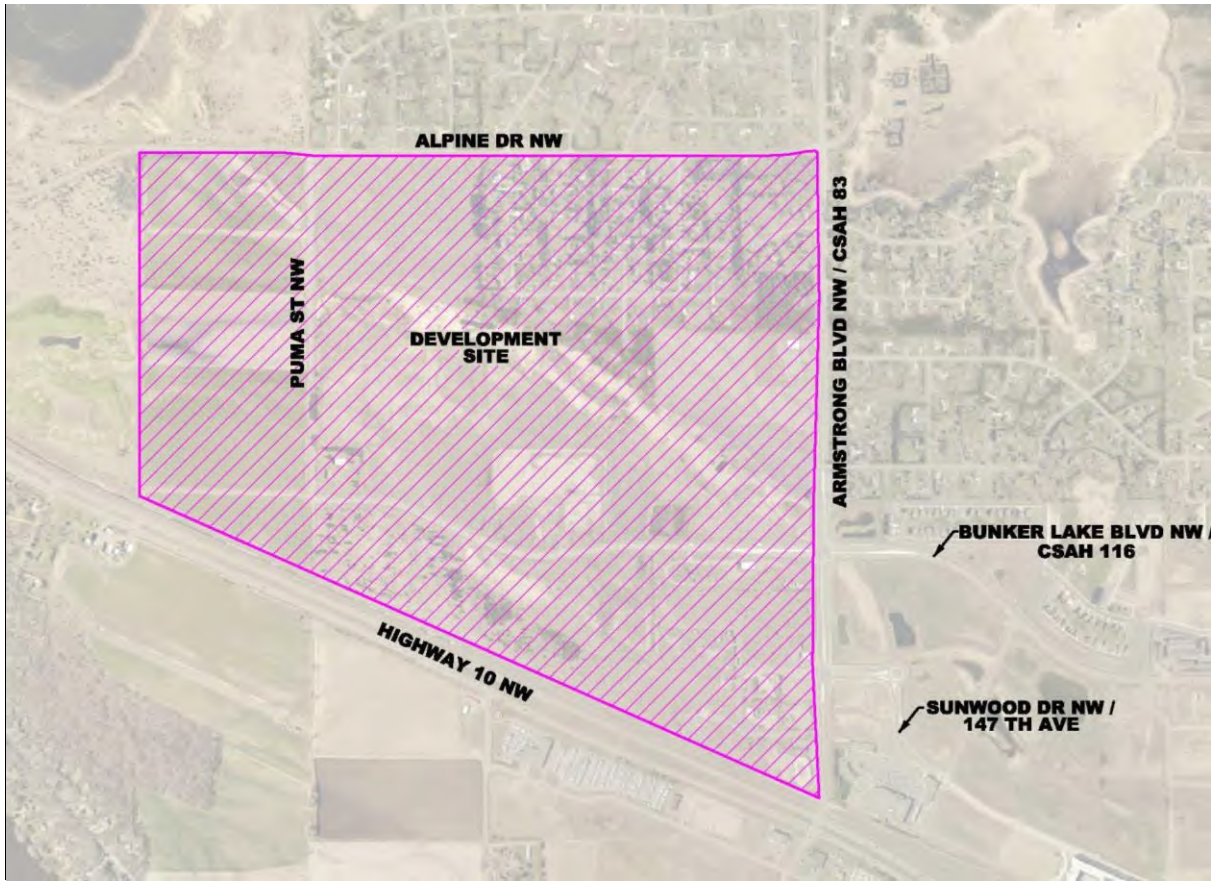
The proposed Future Business Park development is located on the southwest side of the City of Ramsey, north of T.H. 10 and just west of Armstrong Boulevard (CSAH 83). The future development is anticipated to impact the traffic on the public roadway system and surrounding area. Consequently, the traffic control and roadway geometry in the area may need to be modified to accommodate the increased traffic to maintain safety and adequate operations. This study analyzes the anticipated impacts of the Future Business Park development on the surrounding area.

II. BACKGROUND

A. Proposed Development

The proposed Future Business Park development is located just west of Armstrong Boulevard, between T.H. 10 and Alpine Drive. The development will have two main access points: the north entrance at Alpine Drive and Puma Street, and the east entrance at Bunker Lake Boulevard and Armstrong Boulevard. **Figure 1** below outlines the proposed development site. The development is anticipated to include residential, commercial, business park, and institutional land uses.

Figure 1: Proposed Future Business Park Development Location



III. MEASURES OF EFFECTIVENESS

The traffic operations analysis for the intersections consider the following measures to determine the adequacy of the intersection design to meet acceptable operations: intersection delay/Level of Service (LOS) and volume-to-capacity ratios. An explanation of each of these measures is provided below:

A. Level of Service and Delay

The operational analysis results are described as a Level of Service (LOS) ranging from A to F. These letters serve to describe a range of operating conditions for different types of facilities. Levels of Service are calculated based on the 2010 Highway Capacity Manual, which defines the level of service, based on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter into the traffic stream. The average intersection control delay is a volume weighted average of delay experienced by all motorists entering the intersection on all intersection approaches. The control delay is modeled within the analysis software, Trafficware Synchro/SimTraffic. Level of Service D is commonly taken as an acceptable design year LOS. The level of service and its associated intersection delay for a signalized and unsignalized intersection is presented below. The delay threshold for unsignalized intersections is lower for each LOS compared to signalized intersections, which accounts for the fact that people expect a higher level of service when at a stop-controlled intersection.

Table 1: Level of Service Criteria

	Signalized Intersection	**Unsignalized Intersection**
LOS	**Control Delay per Vehicle (sec.)**	**Control Delay per Vehicle (sec.)**
A	≤ 10	≤ 10
B	>10 and ≤ 20	>10 and ≤ 15
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

IV. EXISTING CONDITIONS

There are a total of four signalized intersections and three unsignalized intersections that will be evaluated in this study. The interchange on T.H. 10 & Armstrong Boulevard is currently being built, so the analysis will include a scenario with and without the new overpass. Based on MnDOT's Traffic Data Mapping Application, Armstrong Boulevard carries a range of 4,500 vehicles per day near the north end of the study area and 6,200 vehicles per day near the south end of the study area. Armstrong Boulevard will be a 4 lane divided roadway at the south end of the study area converting to a 2 lane undivided roadway at the north end of the study area. The posted speed limit is 55 mph through the study area along Armstrong Boulevard.

A. Data Collection

1. Traffic Counts

Traffic data was collected in April 2015. This includes 13 hour traffic volumes at the following intersections.

- Armstrong Boulevard & 147th Ave - Signalized
- Armstrong Boulevard & Bunker Lake Boulevard – Signalized
- Armstrong Boulevard & Alpine Drive - Unsignalized
- Alpine Drive & Puma Street – Unsignalized

Traffic data at T.H. 10 & Armstrong Boulevard was pulled from a previous study conducted in 2013.

Figures 2.1 and 2.2 show the existing intersection traffic counts.

Figure 2.1: Existing Traffic Volumes

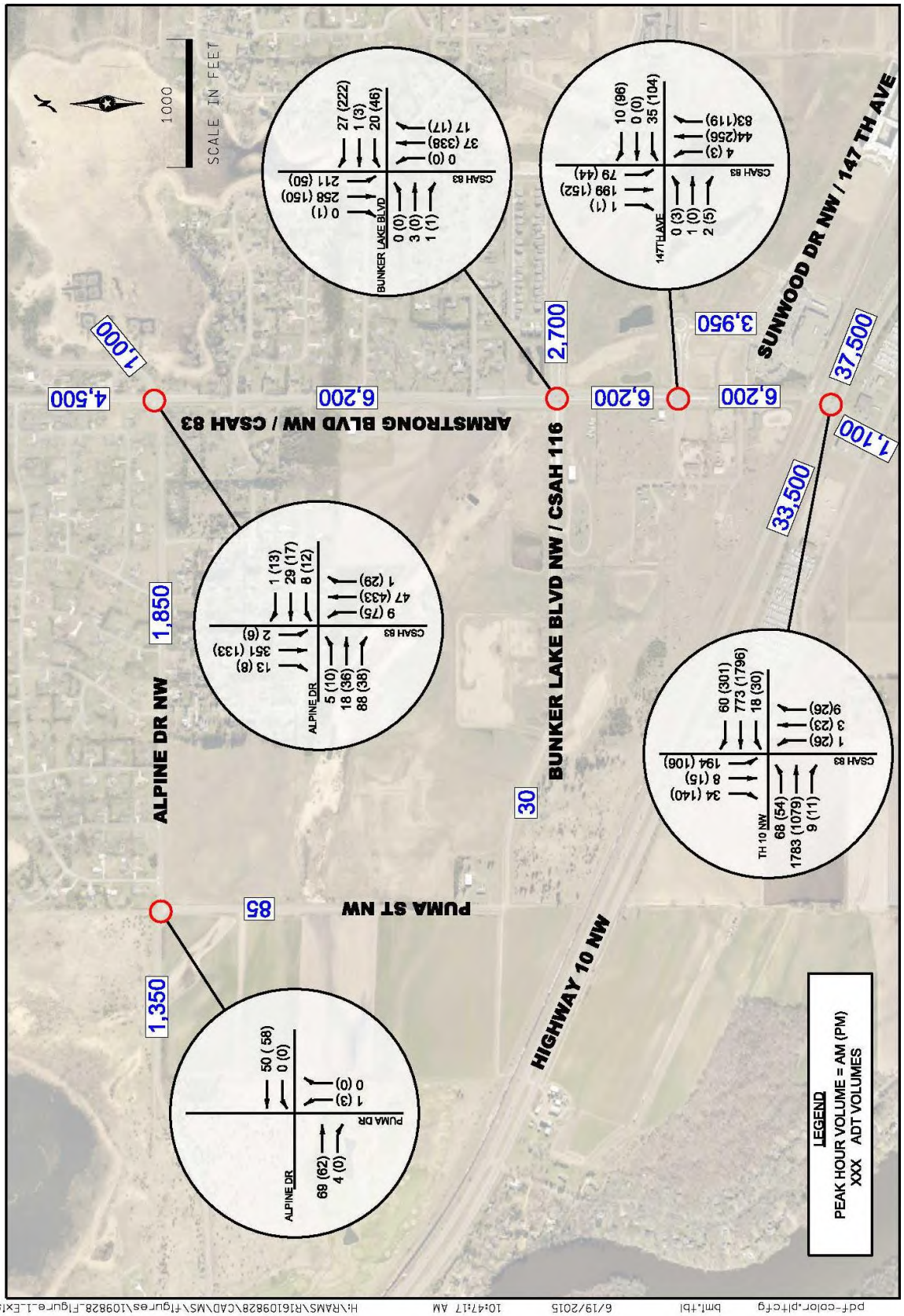
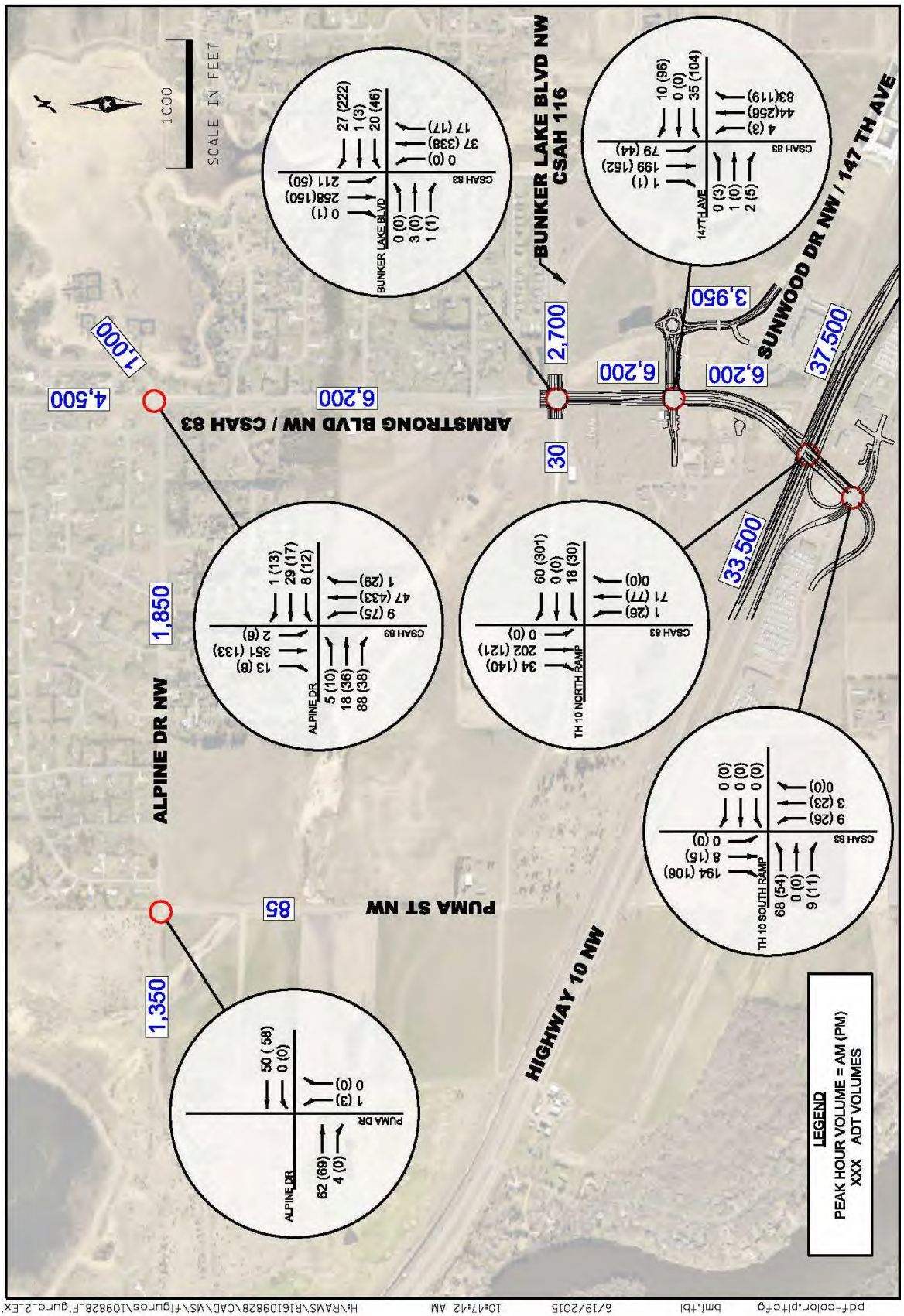


Figure 2.2: Existing Traffic Volumes (with Overpass)



B. Operations

The existing operations analysis was completed for the five intersections within the study area and is shown in **Table 2**. The new interchange between T.H. 10 and Armstrong Boulevard was analyzed at the two exit ramps and is shown in **Table 3**.

Table 2: 2015 Existing Traffic Operations Analysis

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Existing 2015									
TH 10/169 & CSAH 83 (Armstrong Blvd)	AM	46	D	107	F	EBL	EBT	644	1048
Signal	PM	40	D	88	F	WBL	WBT	496	524
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	9	A	35	C	NBL	SBL	53	101
Signal	PM	9	A	33	C	EBL	NBT	39	73
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	10	A	33	C	EBT	SBL	83	143
Signal	PM	9	A	21	C	WBL	NBT	52	87
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	2	A	9	A	EBT	EBR	32	52
TWSC	PM	4	A	13	B	WBL	EBL/T	27	54
Alpine Drive NW & Puma Street NW	AM	1	A	4	A	NBL	NBL/R	2	14
TWSC	PM	1	A	5	A	NBL	NBL/R	3	18

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Table 3: 2015 Existing Traffic Operations Analysis (with Overpass)

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Existing 2015 (With Overpass)									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd)	AM	5	A	14	B	NBL	EBL	33	59
Signal	PM	5	A	12	B	EBL	EBL	23	53
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd)	AM	9	A	20	B	WBL	SBT	50	96
Signal	PM	8	A	20	B	WBL	SBT	41	79
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	7	A	27	C	NBL	SBL	43	90
Signal	PM	9	A	31	C	EBL	SBT	30	65
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	11	B	31	C	WBL	SBL	86	153
Signal	PM	9	A	20	B	SBL	NBT	59	105
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	2	A	9	A	WBL	EBR	34	57
TWSC	PM	4	A	12	B	EBL	EBL/T	30	59
Alpine Drive NW & Puma Street NW	AM	1	A	6	A	NBL	NBL/R	1	8
TWSC	PM	1	A	4	A	NBL	NBL/R	3	17

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Overall, all intersections within the study area operate within acceptable service levels with a LOS of C or better. The T.H 10 & Armstrong Boulevard interchange will alleviate the delays that were caused at the previous signalized intersection. Currently, there is no need for operational mitigation.

C. Safety

1. Safety/Crash Analysis

Beyond the operational analysis, the crash history of the studied intersections was completed using the crash data pulled from Minnesota Crash Mapping Analysis Tool (MnCMAT). The Armstrong Boulevard corridor form 147th Ave to Alpine has had a total of 25 crashes over the 5 year period (2010-2014) with the majority being property damage only crashes. The individual intersection crash reports are shown in **Appendix C**.

Most of the intersections had very few crashes over the last 5 years. The T.H. 10 & Armstrong Boulevard intersection was not analyzed for crashes because it is currently being modified into an interchange. The following is a summary of crashes per intersection:

Armstrong Boulevard at 147th Ave

- 3 crashes (2 rear end, 1 right angle)

Armstrong Boulevard at Bunker Lake Boulevard

- 1 crash (rear end)

Armstrong Boulevard at Alpine Drive

- 14 crashes (8 right angle, 2 rear end, 2 left turn, 1 sideswipe, 1 other)
- The majority of the right angle crashes are caused by westbound vehicles failing to yield to right of way. The existing skew of the east leg may contribute to these right angle crashes by preventing adequate sight distances.
- There has also been an incapacitating injury at this intersection in 2013 (southbound rear end) and a non-incapacitating injury at this intersection in 2014 (northbound left turn into traffic)

Alpine Drive at Puma Street

- 0 crashes

2. Mitigation Recommendations

Mitigation due to safety concerns includes the following:

Bunker Lake Boulevard (west of commercial section)

- Three lane section is recommended (two through lanes & a center two-way-left-turn-lane) once the development is constructed. (short-term)
- Right turn lanes (locations and lengths) are to be dictated by development type. (short-term)

Armstrong Boulevard & Alpine Drive

- Add northbound and southbound left turn lanes. (mid-term)

Alpine Drive & Puma Street

- Add westbound left turn lane. (mid-term)
- Add eastbound right turn lane. (mid-term)

Puma Street

- Three lane section is recommended (two through lanes & a center two-way-left-turn-lane) once the development is constructed. (short-term)
- Right turn lanes (locations and lengths) are to be dictated by development type. (short-term)

V. NO-BUILD CONDITIONS

Historic daily traffic volumes from 2000 to 2013 were used to formulate a 20 year background growth rate of 1.8% for Armstrong Boulevard. Therefore, background traffic was projected to grow by 43% along Armstrong Boulevard. No-Build conditions includes the background growth along with the traffic generated from the COR development. It is assumed that the COR development, east of Armstrong Boulevard, is fully built out for this scenario. The Future Business Park development, the focus of this study, is assumed to generate no traffic for this no-build scenario.

Parts of the COR development have already been built out, so only the portions that haven't been built out were analyzed for potential trips. The total new COR development is projected to generate 37,500 daily trips (6,150 peak hour trips). It was assumed that 1/3 of the traffic generated by the COR development will enter/exit on Bunker Lake Boulevard & Armstrong Boulevard. The COR development trips are included in **Appendix B**.

Assumptions made for all future scenarios include that the signals are uncoordinated, which is what they operate as currently. Signal timings are optimized for each scenario. Left turn movements at signals are all protected except for the westbound left turn at the T.H.10 North Ramp.

A. 2040 No-Build Operations

Future traffic volumes for 2040 were forecasted for the study area without any additional development. Historic growth rates were used to calculate the 20 year growth rate of 1%. This growth rate was applied to Armstrong Boulevard to account for background traffic along the roadway. No-Build 2040 traffic volumes are shown in **Figures 3**.

Table 4: 2040 No-Build Future Traffic Operations Analysis

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Design Year 2040 No-Build									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd)	AM	8	A	19	B	NBL	EBL/T	68	106
Signal	PM	8	A	17	B	NBL	EBL/T	68	107
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd)	AM	10	A	22	C	WBL	WBT	117	198
Signal	PM	12	B	25	C	NBL	SBT	125	217
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	8	A	27	C	NBL	WBT	72	164
Signal	PM	12	B	33	C	NBL	SBT	136	248
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	15	B	36	D	EBT	NBR	92	165
Signal	PM	18	B	31	C	WBL	WBL	178	251
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	4	A	15	B	WBL	EBL/T	30	75
TWSC	PM	7	A	38	E	EBL	NBL/T	56	130
Alpine Drive NW & Puma Street NW	AM	1	A	4	A	NBL	NBL/R	1	10
TWSC	PM	1	A	5	A	NBL	NBL/R	3	17

No Build Scenario assumes the east (COR) development is built out, but the west development has not been built out

*Delay in seconds per vehicle

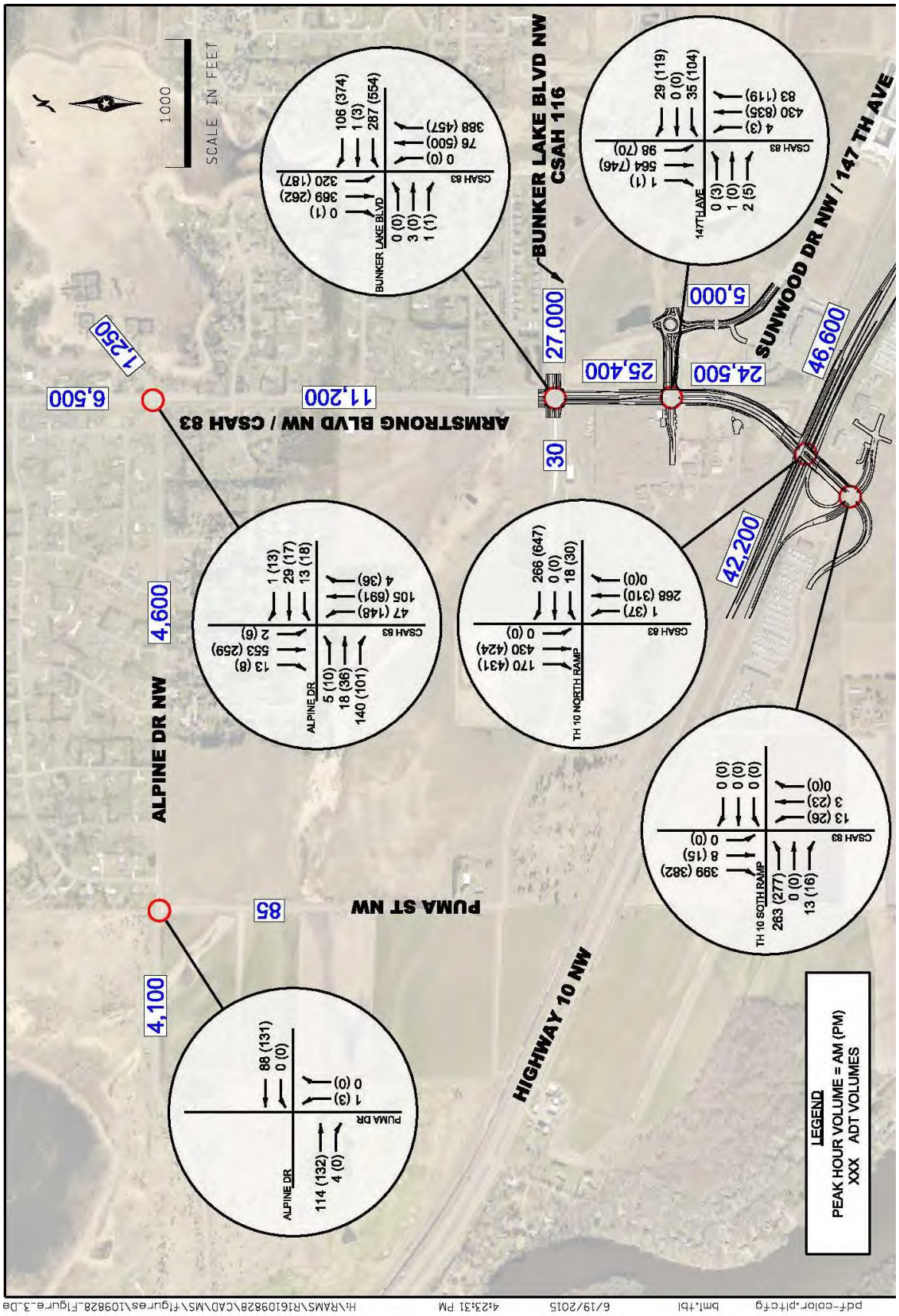
**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Based on the expected growth in the area, the corridor is anticipated to experience acceptable operations at most of the intersections. All intersections operate at an overall level of service of B or higher. Level of Service D is commonly taken as an acceptable design year LOS. The only intersection experiencing significant delay at an individual movement is the eastbound left turn at Armstrong Boulevard & Alpine Drive. This movement experiences 38 seconds of delay (LOS E) during the PM peak hour.

Figure 3: 2040 No-Build Traffic Volumes



B. No-Build Mitigation

There are few mitigation recommendations due to the adequate level of service at most intersections. The following suggestions are anticipated to provide adequate service for the 2040 No-Build conditions.

1. Geometric Improvements

It is recommended that the following changes be made with regard to the intersection geometry in the study area to provide acceptable operations in 2040:

Armstrong Boulevard & Alpine Drive

- Add eastbound and westbound thru/left and right turn lanes (mid-term)

Armstrong Boulevard & Bunker Lake Boulevard

- Re-stripe southbound lanes to include a dual southbound left turn lane. A southbound double left turn lane will help reduce queues entering the COR development. Improvements were done in 2011 to this intersection and a future southbound left turn lane was designed, but not striped. (mid-term)

The proposed 2040 no-build mitigation should provide a LOS of D or better for all intersection movements. A more thorough investigation should be conducted for a possible re-alignment of the east leg of Armstrong Boulevard & Alpine Drive.

VI. BUILD CONDITIONS

A. Traffic Forecasts

The full build traffic forecast was calculated by combining the anticipated growth (2040 No-build volumes) with the expected amount of trips the proposed development will generate. Trip forecasts were generated using the information within the Institute of Transportation Engineers (ITE) Trip Generation Manual. ITE provides codes that correlate a land use with the anticipated traffic based on previous studies.

Figure 4 shows different trip generation zones within the development along with the land use in each zone. These zones are based on where traffic will enter/exit the development. Zone 1 will be evaluated with four alternatives in the north quadrant; a high school, K-12 schools, Business Park, and low density residential. The business park option is expected to generate the most traffic in Zone 1 (2,000 peak hour trips, 7,050 daily trips), while the low density residential option is expected generate the least amount of traffic in Zone 1 (1,150 peak hour trips, 4,900 daily trips). The total development (Zones 1-5) is projected to generate anywhere from 18,500 to 23,300 new daily trips. More detailed information regarding trip generations for each scenario is included in **Appendix B**.

The following access assumptions were made for each zone:

Access off of Bunker Lake Boulevard:

- Zone 1 & 3

Access off of Armstrong Boulevard:

- Zone 2

Access off of Puma Street

- Zone 4

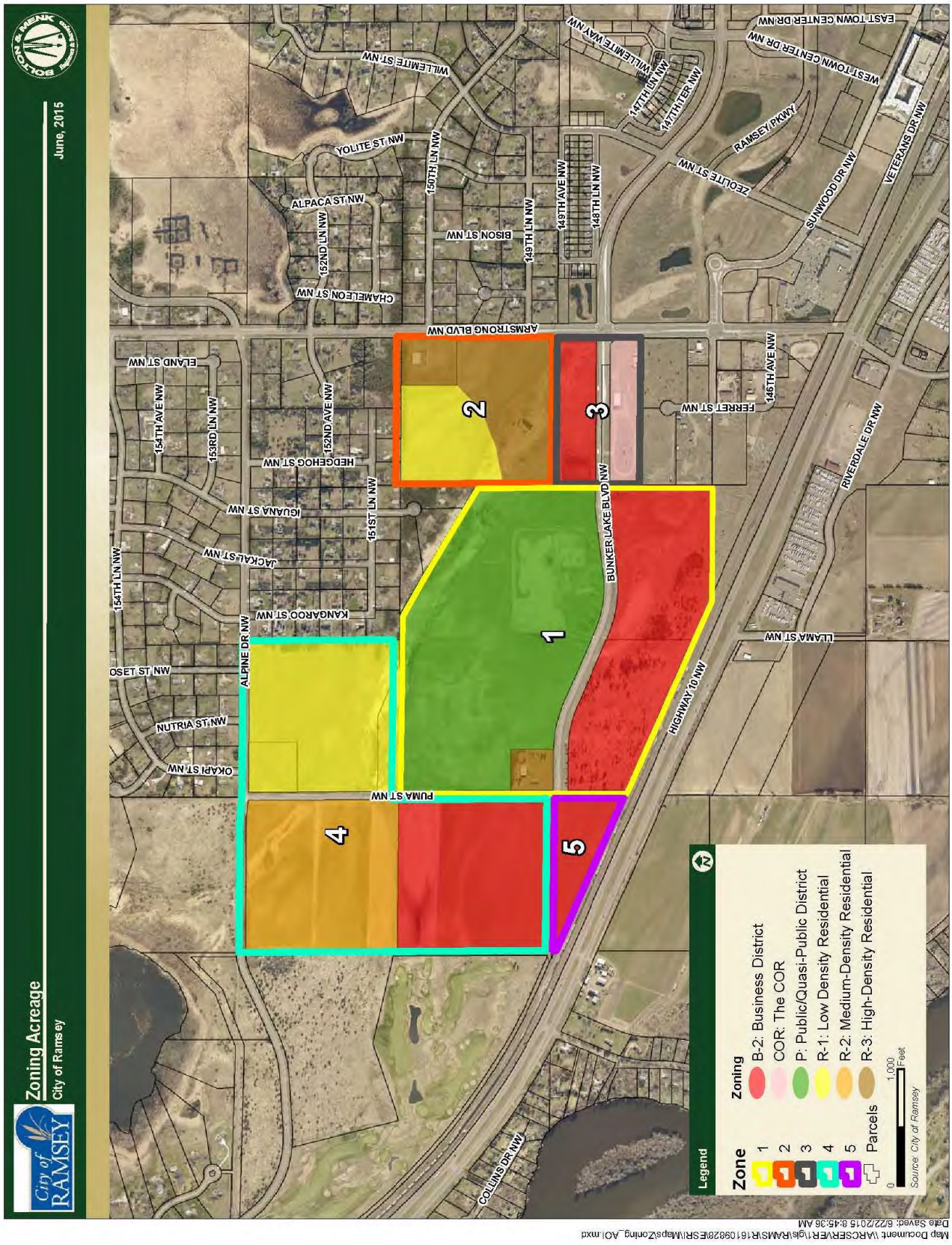
Accesses off of Bunker Lake Boulevard and Puma Street

- Zone 5

Trips to and from the development area are generally directed to the south to T.H. 10. The trips were distributed to the roadway using existing trip distribution as a basis. The generated trips from the proposed development were added to the 2040 No-Build forecasted volumes to develop the 2040 Build conditions. The trip distribution to and from the development is shown in **Figure 5**. The 2040 Build traffic volumes can be seen in **Figure 6.1** thorough **6.4**.

The different alternatives correspond to the land use on the north side of Zone 1. Alternative 1A assumes a high school is built, Alternative 1B assumes K-12 schools are built, Alternative 2 assumes a business park is built, and Alternative 3 assumes low density residential homes are built.

Figure 4: Trip Generation Zones



Map Document: \\ARCSERVER1\gis\RAMS\R16109828ESR\Maps\Zoning_AOI.mxd
Date Saved: 6/22/2015 8:45:36 AM

Figure 5: Trip Distribution Map

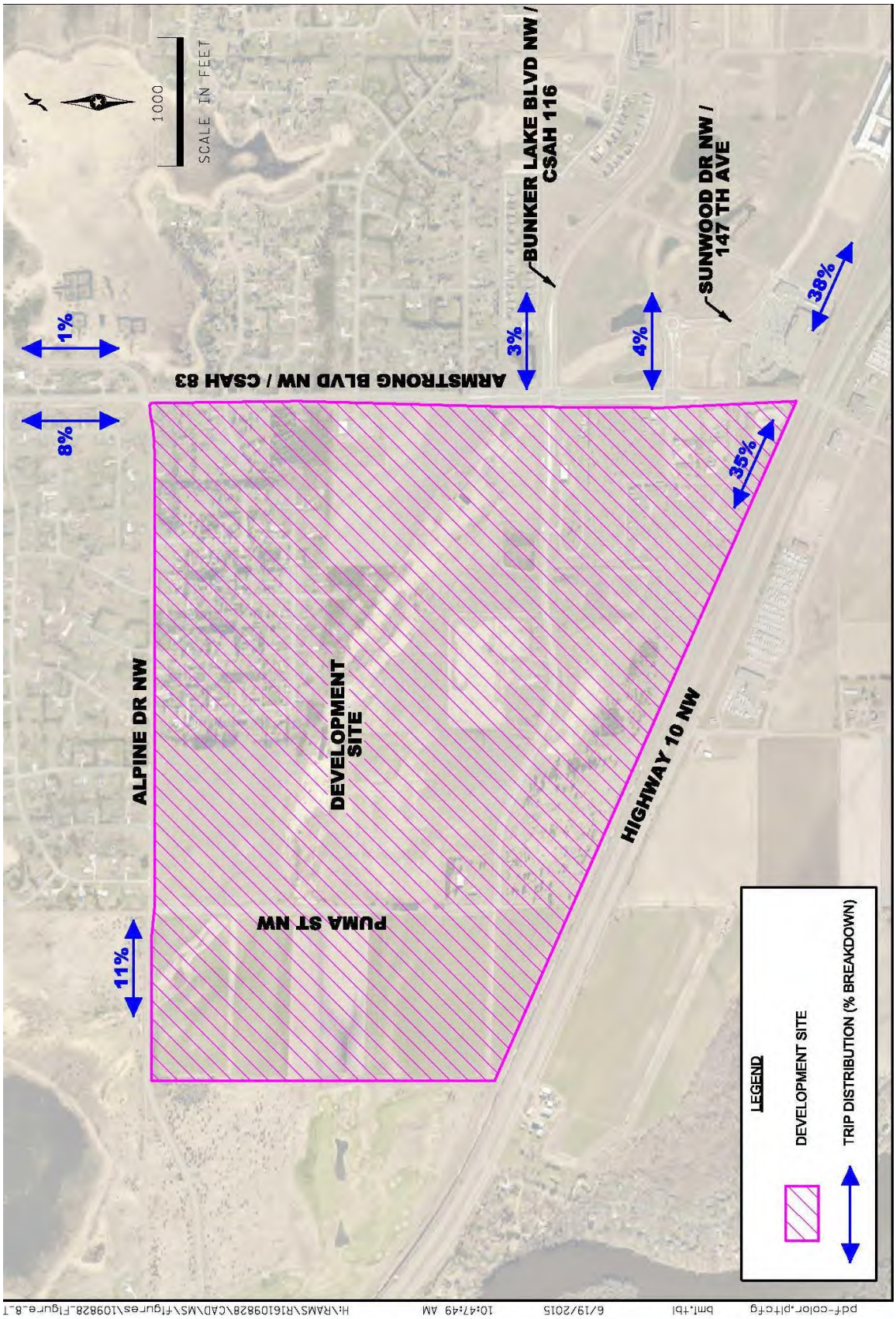


Figure 6.1: 2040 Build Traffic Volumes (Alternative 1A: High School)

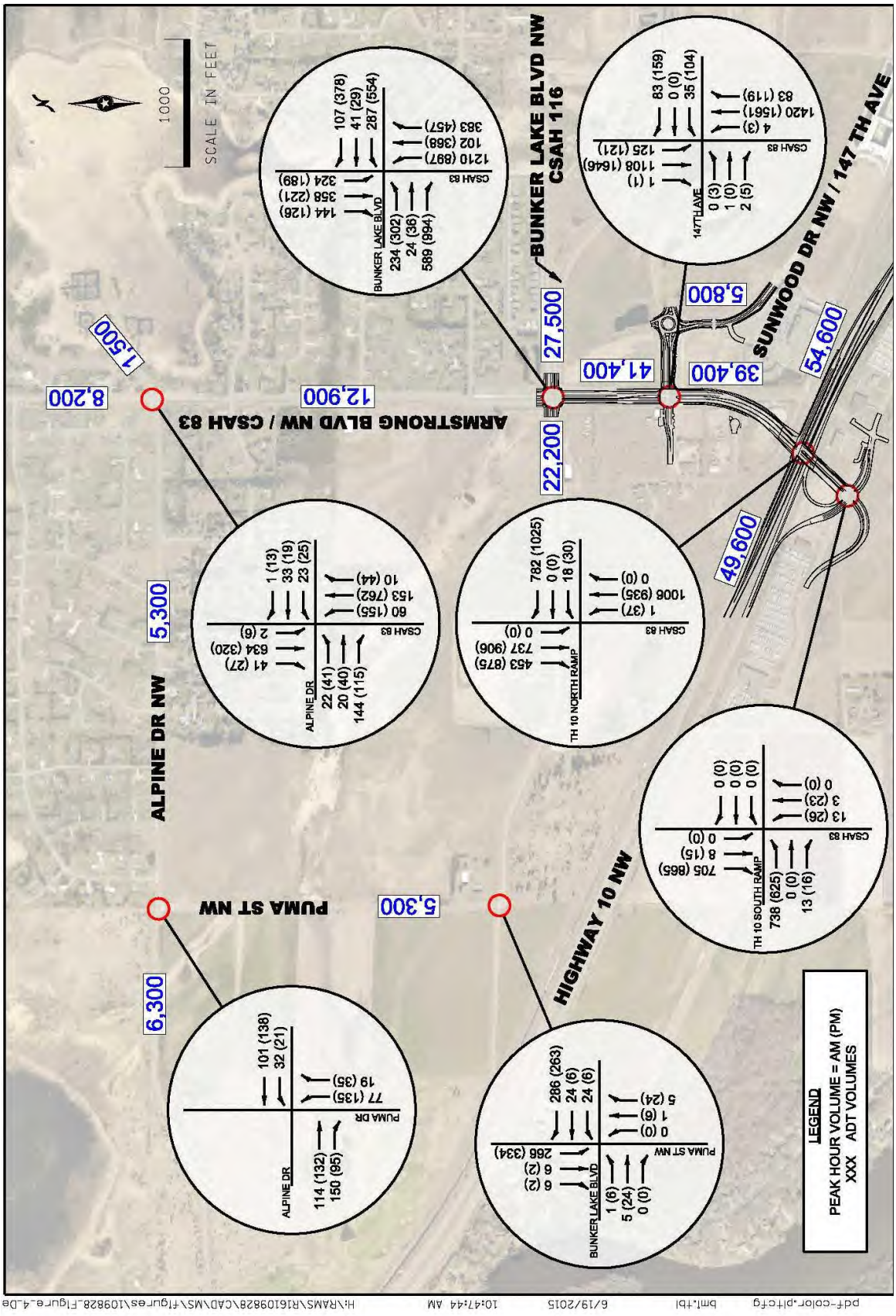


Figure 6.2: 2040 Build Traffic Volumes (Alternative 1B: K-12 Schools)

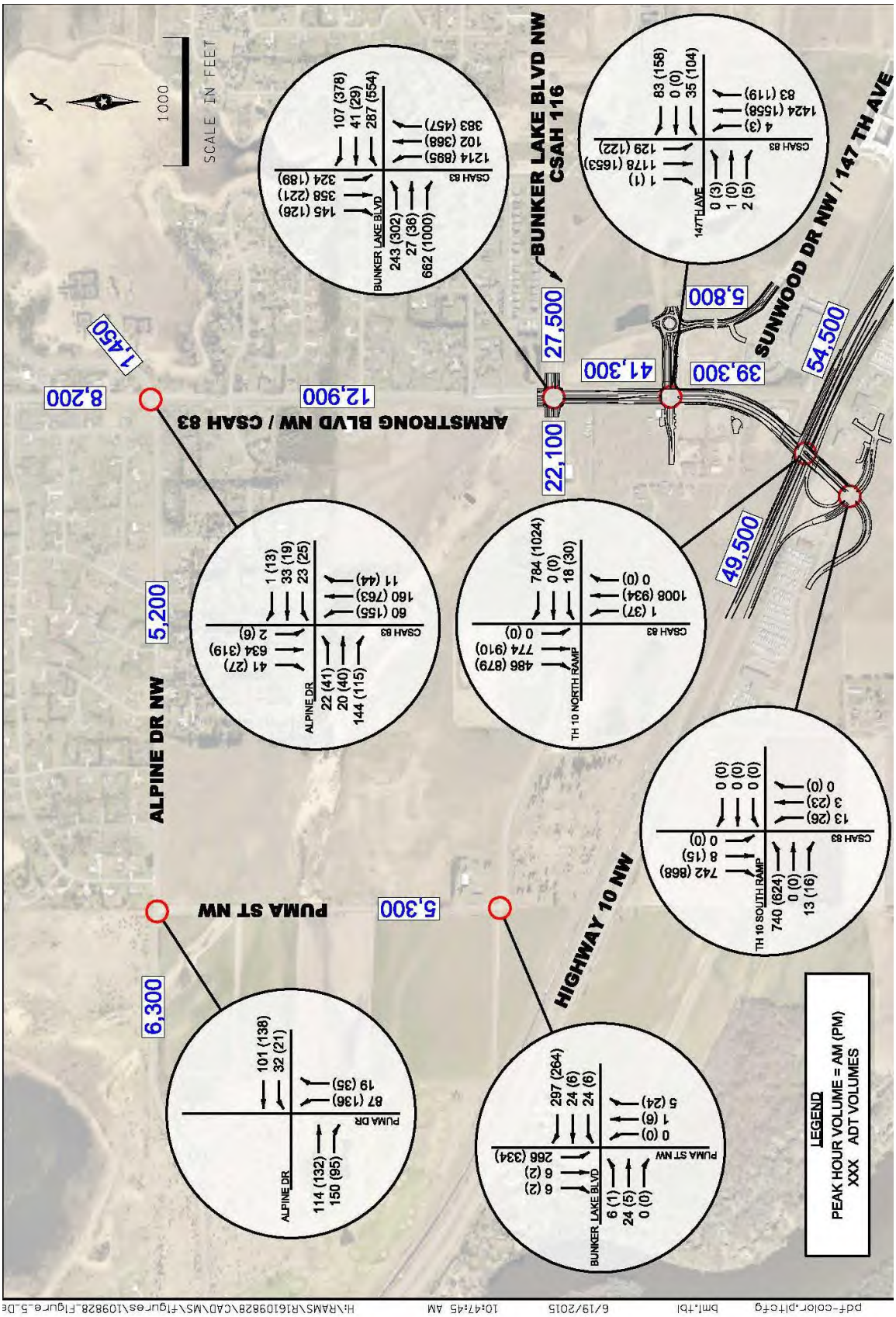


Figure 6.3: 2040 Build Traffic Volumes (Alternative 2: Business Park)

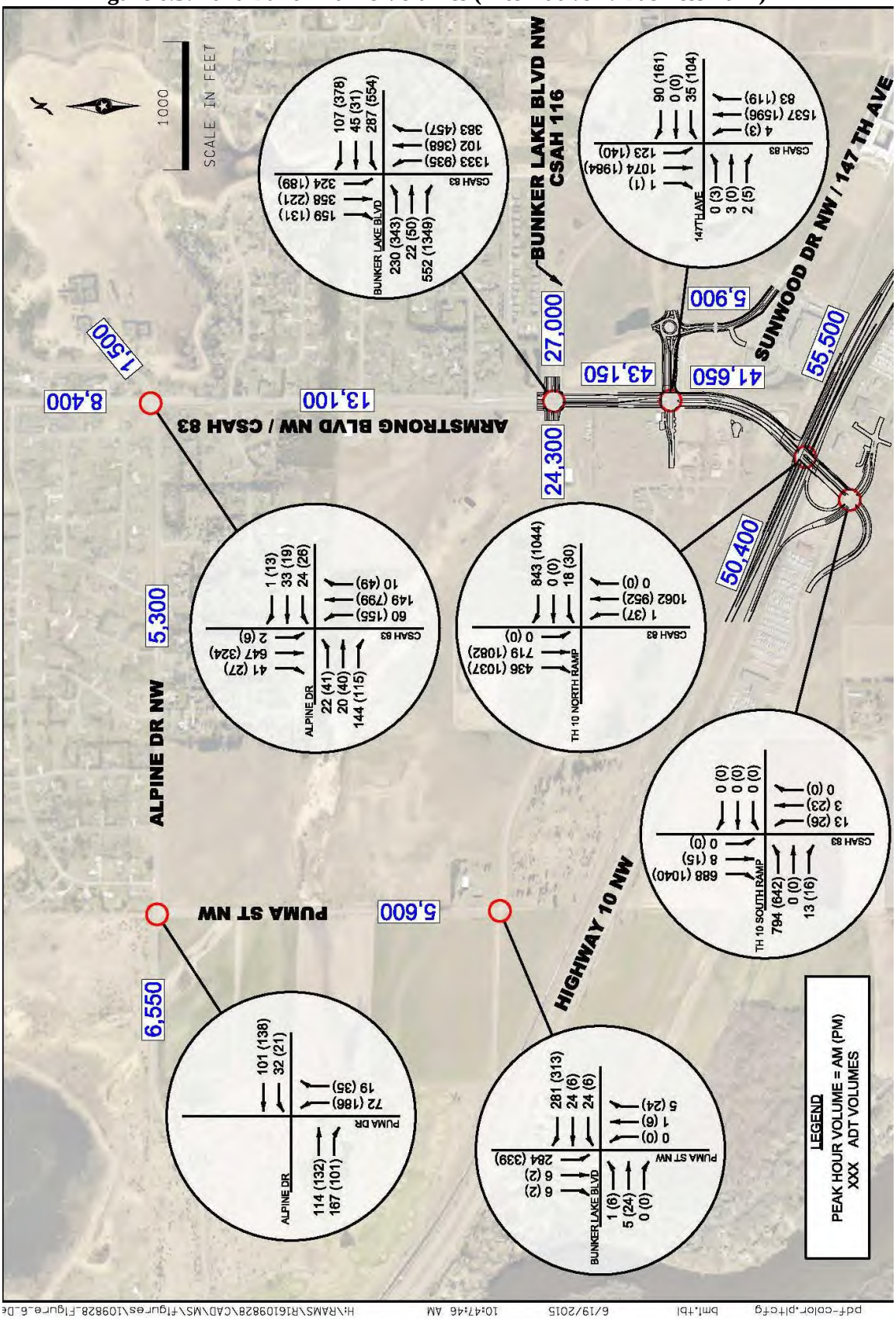
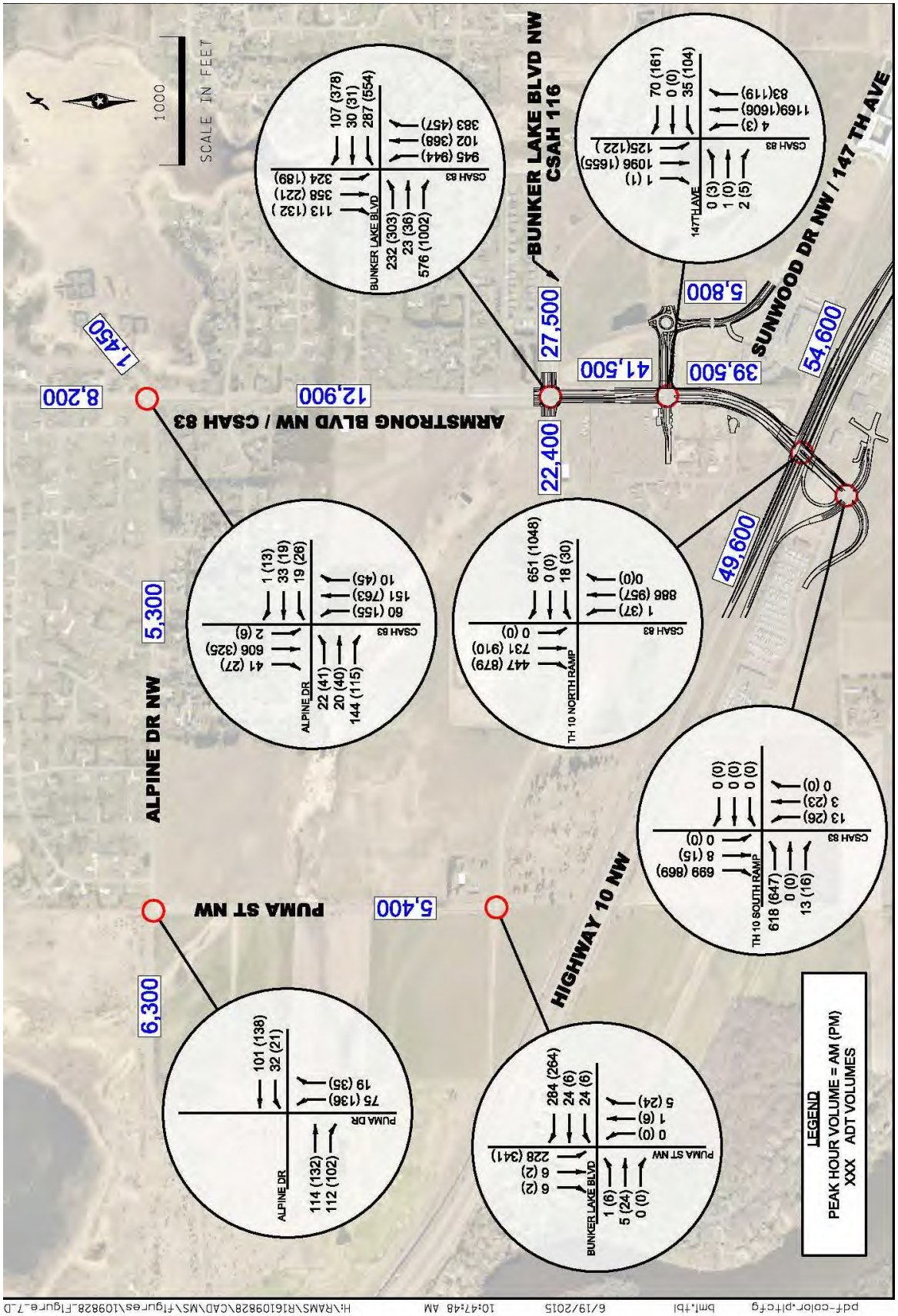


Figure 6.4: 2040 Build Traffic Volumes (Alternative 3: Low Density Residential)



B. 2040 Build Operations

1. Operations Analysis

The traffic operations results for the 2040 Build is included in Tables 8-11.

Table 8: 2040 Build Operations Analysis (Alternative 1A: High School)

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Design Year 2040 Alternative 1A									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd)	AM	47	D	86	F	EBL	EBT	149	734
Signal	PM	18	B	29	C	NBL	EBL	130	241
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd)	AM	131	F	326	F	WBR	WBT/R	1106	2034
Signal	PM	112	F	280	F	WBR	WBT/R	1104	2061
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	67	E	175	F	NBL	NBT	894	1276
Signal	PM	60	E	114	F	NBT	NBT	873	1262
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	66	E	162	F	WBL	NBT	793	990
Signal (Added EB through-right, left, and SB left turn lanes)	PM	74	E	182	F	NBL	NBT	821	1014
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	4	A	25	C	WBR	EBL/T	36	88
TWSC	PM	9	A	54	F	EBL	EBL/T	76	171
Alpine Drive NW & Puma Street NW	AM	2	A	7	A	NBL	NBL/T	36	58
TWSC	PM	3	A	8	A	NBL	NBL/R	47	74
Puma Street NW & Bunker Lake Blvd	AM	4	A	9	A	SBT	SBL/T/R	56	84
Option 1: AWSC	PM	4	A	9	A	WBL	SBLR/E	59	86
Puma Street NW & Bunker Lake Blvd	AM	1	A	11	B	EBL	NBT/L	14	49
Option 2: 3 Legged intersection (with curve)	PM	1	A	8	A	EBL	EBL/T	23	43
Puma Street NW & Bunker Lake Blvd	AM	3	A	4	A	SBT	SBL/T/R	18	57
Option 3: Roundabout	PM	3	A	4	A	SBT	WBL/T/R	25	64

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Table 9: 2040 Build Operations Analysis (Alternative 1B: K-12 Schools)

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Design Year 2040 Alternative 1B									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd)	AM	32	C	56	E	EBL	EBL	225	446
Signal	PM	20	B	34	C	EBL	EBL	140	277
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd)	AM	137	F	322	F	WBR	WBT/R	1064	1975
Signal	PM	104	F	243	F	WBR	WBT/R	1037	2033
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	90	F	166	F	NBL	NBT	920	1217
Signal	PM	86	F	237	F	NBL	NBT	822	1330
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	85	F	322	F	WBL	NBT	802	994
Signal (Added EB through-right, left, and SB left turn lanes)	PM	100	F	296	F	WBL	NBT	797	1074
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	4	A	19	C	EBT	EBL/T	36	80
TWSC	PM	7	A	29	D	WBL	EBL/T	52	106
Alpine Drive NW & Puma Street NW	AM	2	A	8	A	NBL	NBL/T	38	60
TWSC	PM	3	A	9	A	NBL	NBL/T	49	79
Puma Street NW & Bunker Lake Blvd	AM	4	A	9	A	SBT	SBL/T/R	54	77
Option 1: AWSC	PM	4	A	10	A	SBT	SBL/T/R	59	87
Puma Street NW & Bunker Lake Blvd	AM	1	A	8	A	EBL	NBL/R	13	43
Option 2: 3 Legged intersection (with curve)	PM	1	A	8	A	EBL	EBL/R	24	46
Puma Street NW & Bunker Lake Blvd	AM	3	A	3	A	SBL	SBL/T/R	18	53
Option 3: Roundabout	PM	3	A	5	A	NBT	SBL/T/R	19	58

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Table 10: 2040 Traffic Operations Analysis (Alternative 2: Business Park)

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Design Year 2040 Alternative 2									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd)	AM	81	F	147	F	EBL	EBT	434	1574
Signal	PM	48	D	95	F	EBL	EBT	174	815
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd)	AM	118	F	312	F	WBR	WBT/R	1134	2008
Signal	PM	115	F	347	F	WBR	WBT/R	1212	2070
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	62	E	189	F	NBL	NBT	948	1183
Signal	PM	86	F	140	F	EBL	NBT	893	1263
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	73	E	228	F	WBL	NBT	798	996
Signal (Added EB through-right, left, and SB left turn lanes)	PM	100	F	293	F	WBL	NBT	841	959
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	4	A	19	C	WBL	EBL/T	35	82
TWSC	PM	6	A	27	D	EBT	NBL/T	47	123
Alpine Drive NW & Puma Street NW	AM	2	A	7	A	NBL	NBL/R	33	52
TWSC	PM	3	A	9	A	NBL	NBL/T	51	79
Puma Street NW & Bunker Lake Blvd	AM	4	A	10	A	SBT	SBL/T/R	60	91
Option 1: AWSC	PM	5	A	10	A	WBL	SBL/T/R	59	90
Puma Street NW & Bunker Lake Blvd	AM	1	A	11	B	EBL	NBL/T	14	45
Option 2: 3 Legged intersection (with curve)	PM	1	A	8	A	EBL	EBL/R	23	47
Puma Street NW & Bunker Lake Blvd	AM	3	A	4	A	SBT	SBL/T/R	20	57
Option 3: Roundabout	PM	3	A	4	A	EBT	SBL/T/R	20	64

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Table 11: 2040 Build Operations Analysis (Alternative 3: LD Residential)

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Design Year 2040 Alternative 3									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd)	AM	13	B	24	C	NBL	EBL/R	101	176
Signal	PM	28	C	52	D	EBL	EBL/R	190	417
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd)	AM	85	F	225	F	WBR	WBT/R	694	1628
Signal	PM	109	F	285	F	WBR	WBT/R	1143	2056
CSAH 83 (Armstrong Blvd & 147th Avenue	AM	62	E	272	F	NBL	NBT	824	1289
Signal	PM	87	F	163	F	NBL	NBT	887	1282
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd)	AM	72	E	189	F	NBL	NBT	812	1025
Signal (Added EB through-right, left, and SB left turn lanes)	PM	98	F	307	F	WBL	NBT	817	1026
CSAH 83 (Armstrong Blvd) & Alpine Drive NW	AM	4	A	18	C	EBL	NBL/T	32	86
TWSC	PM	7	A	33	D	EBL	EBL/T	59	131
Alpine Drive NW & Puma Street NW	AM	2	A	7	A	NBL	NBL/R	32	55
TWSC	PM	3	A	8	A	NBL	NBL/T	45	72
Puma Street NW & Bunker Lake Blvd	AM	4	A	7	A	WBL	SBL/T/R	52	80
Option 1: AWSC	PM	4	A	9	A	SBT	SBL/T/R	62	95
Puma Street NW & Bunker Lake Blvd	AM	1	A	8	A	EBL	NBL/T	12	45
Option 2: 3 Legged intersection (with curve)	PM	1	A	8	A	EBL	EBL/R	23	41
Puma Street NW & Bunker Lake Blvd	AM	3	A	4	A	EBT	SBL/T/R	16	51
Option 3: Roundabout	PM	3	A	4	A	NBT	SBL/T/R	26	71

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Based on the expected growth in the area, and the generated trips from the proposed development, the study area is anticipated to have unacceptable operations at multiple intersections. Three of the signalized intersections have an overall LOS of E or worse in all of the alternative scenarios. The other signalized intersection, T.H. 10 South Ramp, is projected to have an acceptable overall LOS in Alternative 1A, 1B, and 3. The alternative 2 scenario shows the T.H. 10 South Ramp intersection having a LOS F during the AM peak hour. All signalized intersections have at least one movement with a LOS of D or worse in all of the scenarios. The unsignalized intersections are projected to operate adequately with the exception of Armstrong Boulevard & Alpine Drive. The eastbound and westbound approaches are experiencing excessive delays at this intersection for all alternatives. Alternative 2 will be used to determine what mitigation is necessary in the study area because it generated the most traffic out of the four alternatives. Overall, the operations can be improved, but are still considered unacceptable at many of the intersections. This is due to the large amount of traffic entering and exiting on Bunker Lake Boulevard and Armstrong Boulevard.

2. Additional Analysis

Additional operations analysis was completed to determine what intersection control would be adequate for the first development entrance west of Armstrong Boulevard on Bunker Lake Boulevard. Because of the heavy traffic along Bunker Lake Boulevard, it was assumed that stop control would not be suitable for this intersection. A roundabout and signal were modeled for the 2040 PM Build Alternative 2 scenario and the results are shown below.

Table 12: Development Intersection Operations Analysis

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
First Development Entrance on Bunker Lake Road (West of Armstrong Boulevard)									
Signal *Lanes: (EB/WB: L, T, T, R. NB/SB: L/T,R)*	PM	30	C	58	E	WBL	SBT	152	310
Roundabout *Lanes: (EB/WB: L/T, T/R. NB/SB: L/T/R)*	PM	27	D	46	E	EB	EBT/R	150	300

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

The signal or roundabout options both operate with an adequate overall level of service if the lanes shown are constructed. There will be at least one movement that has a LOS E or worse in both of the options.

Analysis was also completed to model the intersections if a river crossing was constructed along Armstrong Boulevard. It was assumed that the largest change in traffic due to the addition of the river crossing would be on T.H. 10. Therefore, the T.H. 10 ramp intersections were evaluated for operations. Intersections north of T.H. 10 were assumed to operate similarly to the scenarios without the river crossing.

Table 13: Operations Analysis with River Crossing

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
2040 Build Alt 2 (With River Crossing)									
T.H. 10 South Ramp *Signal*	PM	151	F	475	F	EBL	EBT	1621	2762
T.H. 10 North Ramp *Signal*	PM	98	F	205	F	SBT	WBT/R	667	1550

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

The delays at these intersections get worse with the river crossing because additional vehicles are using these ramps to access the river crossing from T.H. 10. A more thorough investigation should be conducted in the future to determine countermeasures if a river crossing is to be constructed.

C. Proposed Mitigation

1. Mitigation

The proposed No-Build mitigations identified under the No-Build Conditions should be considered as well as the following to improve operations for the 2040 Build condition. Although these changes will improve operations, many of the intersections will still be considered unacceptable. This is due to the large amount of traffic entering and exiting on Bunker Lake Boulevard and Armstrong Boulevard.

a) Traffic Control

It is recommended that the following changes be made with regard to the traffic control in the study area:

Bunker Lake Boulevard & Puma Street

- All-way stop control, a 3 legged intersection with two-way stop control, and a roundabout were evaluated at this intersection. Each option operated with adequate levels of service. (short-term)

b) Geometric Improvements

It is recommended that the following changes be made with regard to the intersection geometry of the study area:

Armstrong Boulevard & Bunker Lake Boulevard

- Add a second eastbound left turn lane (short-term)
- Convert the southerly eastbound through lane into a through-right lane (long-term)
- Another option would be an eastbound free-right with an add lane that can be extended to the T.H. 10 North Ramp (long-term)

It is recommended that free-rights only be constructed when actually needed due the impact they have on pedestrian movements. Another option may be to signalize the right turn movement and provide an overlap phase to provide more green time to the right turn.

D. Additional Operations Analysis (50% Development Completion)

A 2030 analysis was also completed to determine when the study area would start experiencing significant delays. This analysis assumes 50% of the Future Business Park development is complete and 50% of the COR development is complete.

Table 14: 2030 (50% Development) Operations Analysis

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
Design Year 2030 Build Alternative Alternative 2 (50% Development)									
TH 10/169 South Ramp & CSAH 83 (Armstrong Blvd) *Signal*	PM	9	A	17	B	NBL	EBL	64	100
TH 10/169 North Ramp & CSAH 83 (Armstrong Blvd) *Signal*	PM	12	B	22	C	NBL	SBT	178	330
CSAH 83 (Armstrong Blvd & 147th Avenue *Signal((Added EB through, right, left, and SB left turn lanes)*	PM	11	B	37	D	EBL	NBT	130	203
CSAH 83 (Armstrong Blvd & CSAH 116 (Bunker Lake Blvd) *Signal*	PM	37	D	72	E	WBL	EBT	146	561
CSAH 83 (Armstrong Blvd) & Alpine Drive NW *TWSC*	PM	5	A	22	C	EBL	NBL/T	40	126
Alpine Drive NW & Puma Street NW *TWSC*	PM	3	A	6	A	NBR	NBL/T	41	66

Assumes the east (COR) development and west development are 50% built out

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

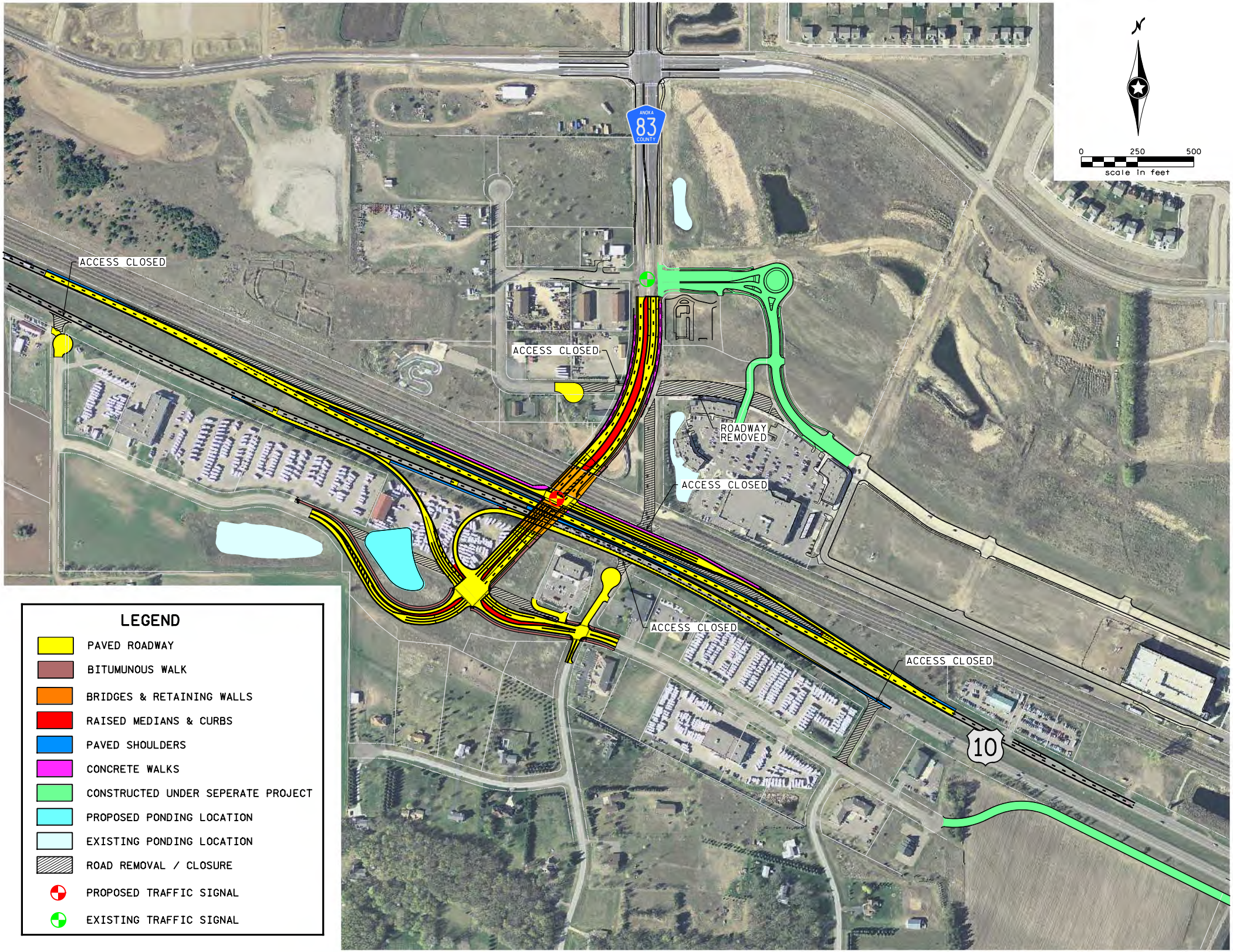
****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

At 50% development, the intersections are anticipated to operate with adequate delays. Therefore, it is projected that the intersections will start to experience excessive delays anywhere from 50% to 100% completion of the development.

APPENDIX A-

TH 10 & ARMSTRONG BOULEVARD

OVERPASS LAYOUT


ACCESS CLOSED
ACCESS CLOSED
ROADWAY REMOVED
ACCESS CLOSED
ACCESS CLOSED
ACCESS CLOSED
ANOKA 83 COUNTY
10
N
0 250 500
scale in feet
LEGEND
PAVED ROADWAY
BITUMUNOUS WALK
BRIDGES & RETAINING WALLS
RAISED MEDIANS & CURBS
PAVED SHOULDERS
CONCRETE WALKS
CONSTRUCTED UNDER SEPERATE PROJECT
PROPOSED PONDING LOCATION
EXISTING PONDING LOCATION
ROAD REMOVAL / CLOSURE
PROPOSED TRAFFIC SIGNAL
EXISTING TRAFFIC SIGNAL

APPENDIX B-

TRAFFIC VOLUMES

Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 1 - Alpine Dr & Puma St NW, 4-8-15, 6am-7pm
Site Code : 1
Start Date : 4/8/2015

Alpine Dr and Puma St NW
Ramsey, MN

Groups Printed- Cars + - Trucks

	Southbound						Alpine Dr Westbound						Puma St NW Northbound						Alpine Dr Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	0	0	0	3	0	0	3	10
06:15 AM	0	0	0	0	0	0	0	0	12	0	0	12	0	0	0	0	0	0	0	0	6	0	0	6	18
06:30 AM	0	0	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	0	0	0	13	1	0	14	21
06:45 AM	0	0	0	0	0	0	0	0	12	0	0	12	0	0	0	0	0	0	0	0	9	0	0	9	21
Total	0	0	0	0	0	0	0	0	38	0	0	38	0	0	0	0	0	0	0	0	31	1	0	32	70
07:00 AM	0	0	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	0	0	0	12	0	0	12	19
07:15 AM	0	0	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	0	0	0	14	1	0	15	30
07:30 AM	0	0	0	0	0	0	0	0	19	0	0	19	0	1	0	0	0	1	0	0	19	2	0	21	41
07:45 AM	0	0	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	0	0	17	1	0	18	27
Total	0	0	0	0	0	0	0	0	50	0	0	50	0	1	0	0	0	1	0	0	62	4	0	66	117
08:00 AM	0	0	0	0	0	0	0	0	14	0	0	14	0	1	0	0	0	1	0	0	11	2	0	13	28
08:15 AM	0	0	0	0	0	0	0	0	11	0	0	11	0	1	0	0	0	1	0	0	15	0	0	15	27
08:30 AM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	0	0	0	7	1	0	8	19
08:45 AM	0	0	0	0	0	0	0	1	8	0	0	9	0	0	0	0	0	0	0	0	11	0	0	11	20
Total	0	0	0	0	0	0	0	1	44	0	0	45	0	2	0	0	0	2	0	0	44	3	0	47	94
09:00 AM	0	0	0	0	0	0	0	1	10	0	0	11	0	0	0	0	0	0	0	0	5	0	0	5	16
09:15 AM	0	0	0	0	0	0	0	0	8	0	0	8	0	0	0	0	0	0	0	0	8	0	0	8	16
09:30 AM	0	0	0	0	0	0	0	0	7	0	0	7	0	1	0	0	0	1	0	0	5	0	0	5	13
09:45 AM	0	0	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	0	0	4	0	0	4	10
Total	0	0	0	0	0	0	0	1	31	0	0	32	0	1	0	0	0	1	0	0	22	0	0	22	55
10:00 AM	0	0	0	0	0	0	0	0	8	0	0	8	0	1	0	0	0	1	0	0	7	0	0	7	16
10:15 AM	0	0	0	0	0	0	0	0	4	0	0	4	0	1	0	0	0	1	0	0	0	0	0	0	5
10:30 AM	0	0	0	0	0	0	0	0	6	0	0	6	0	1	0	3	0	4	0	0	5	1	0	6	16
10:45 AM	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	14	0	0	14	17
Total	0	0	0	0	0	0	0	0	21	0	0	21	0	3	0	3	0	6	0	0	26	1	0	27	54
11:00 AM	0	0	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	0	0	5	0	0	5	11
11:15 AM	0	0	0	0	0	0	0	0	10	0	0	10	0	1	0	0	0	1	0	0	7	1	0	8	19
11:30 AM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	0	0	0	6	0	0	6	17
11:45 AM	0	0	0	0	0	0	0	0	8	0	0	8	0	1	0	0	0	1	0	0	6	0	0	6	15
Total	0	0	0	0	0	0	0	0	35	0	0	35	0	2	0	0	0	2	0	0	24	1	0	25	62
12:00 PM	0	0	0	0	0	0	0	0	8	0	0	8	0	1	0	0	0	1	0	0	21	1	0	22	31
12:15 PM	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	7	0	0	7	11
12:30 PM	0	0	0	0	0	0	0	0	6	0	0	6	0	2	0	0	0	2	0	0	8	0	1	9	17
12:45 PM	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	12	0	0	12	15
Total	0	0	0	0	0	0	0	0	21	0	0	21	0	3	0	0	0	3	0	0	48	1	1	50	74
01:00 PM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	0	0	0	11	0	0	11	22
01:15 PM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	0	0	0	7	1	0	8	19
01:30 PM	0	0	0	0	0	0	0	1	9	0	0	10	0	0	0	1	0	1	0	0	4	1	0	5	16
01:45 PM	0	0	0	0	0	0	0	0	11	0	0	11	0	2	0	0	0	2	0	0	7	0	0	7	20
Total	0	0	0	0	0	0	0	1	42	0	0	43	0	2	0	1	0	3	0	0	29	2	0	31	77

Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 1 - Alpine Dr & Puma St NW, 4-8-15, 6am-7pm
Site Code : 1
Start Date : 4/8/2015
Page No : 2

Alpine Dr and Puma St NW
Ramsey, MN

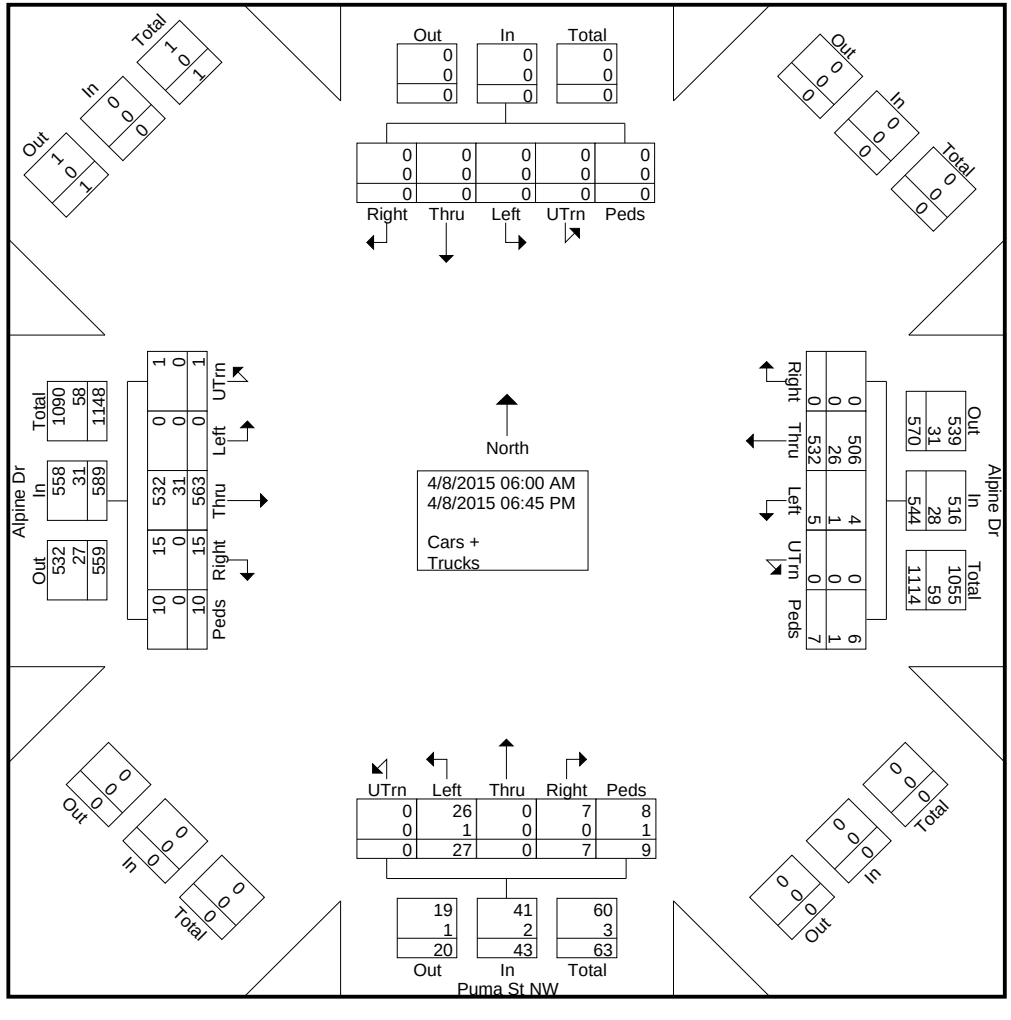
Groups Printed- Cars + - Trucks

	Southbound						Alpine Dr Westbound						Puma St NW Northbound						Alpine Dr Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
02:00 PM	0	0	0	0	0	0	0	0	14	0	1	15	0	0	0	0	0	0	0	0	7	0	0	7	22
02:15 PM	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	0	0	11	0	0	11	16
02:30 PM	0	0	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	0	0	10	0	1	11	20
02:45 PM	0	0	0	0	0	0	0	0	16	0	0	16	0	3	0	0	0	3	0	0	7	0	0	7	26
Total	0	0	0	0	0	0	0	0	44	0	1	45	0	3	0	0	0	3	0	0	35	0	1	36	84
03:00 PM	0	0	0	0	0	0	0	1	12	0	0	13	0	0	0	0	0	0	0	0	13	0	0	13	26
03:15 PM	0	0	0	0	0	0	0	1	16	0	0	17	0	2	0	1	0	3	0	0	9	0	0	9	29
03:30 PM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	0	0	0	12	0	0	12	23
03:45 PM	0	0	0	0	0	0	0	0	8	0	0	8	0	0	0	1	0	1	0	0	21	0	2	23	32
Total	0	0	0	0	0	0	0	2	47	0	0	49	0	2	0	2	0	4	0	0	55	0	2	57	110
04:00 PM	0	0	0	0	0	0	0	0	16	0	2	18	0	0	0	0	0	0	0	0	18	1	0	19	37
04:15 PM	0	0	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	0	1	0	17	0	0	18	32
04:30 PM	0	0	0	0	0	0	0	0	22	0	0	22	0	0	0	0	0	0	0	0	19	0	0	19	41
04:45 PM	0	0	0	0	0	0	0	0	8	0	0	8	0	2	0	0	0	2	0	0	20	0	1	21	31
Total	0	0	0	0	0	0	0	0	60	0	2	62	0	2	0	0	0	2	1	0	74	1	1	77	141
05:00 PM	0	0	0	0	0	0	0	0	14	0	1	15	0	1	0	0	0	1	0	0	13	0	0	13	29
05:15 PM	0	0	0	0	0	0	0	0	14	0	1	15	0	2	0	0	0	2	0	0	28	0	0	28	45
05:30 PM	0	0	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	0	0	0	24	0	0	24	38
05:45 PM	0	0	0	0	0	0	0	0	15	0	0	15	0	1	0	0	0	1	0	0	13	0	0	13	29
Total	0	0	0	0	0	0	0	0	57	0	2	59	0	4	0	0	0	4	0	0	78	0	0	78	141
06:00 PM	0	0	0	0	0	0	0	0	10	0	0	10	0	2	0	0	0	2	0	0	10	0	0	10	22
06:15 PM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	1	4	5	0	0	12	0	2	14	30
06:30 PM	0	0	0	0	0	0	0	0	11	0	1	12	0	0	0	0	1	1	0	0	7	1	0	8	21
06:45 PM	0	0	0	0	0	0	0	0	10	0	1	11	0	0	0	0	4	4	0	0	6	0	3	9	24
Total	0	0	0	0	0	0	0	0	42	0	2	44	0	2	0	1	9	12	0	0	35	1	5	41	97
Grand Total	0	0	0	0	0	0	0	5	532	0	7	544	0	27	0	7	9	43	1	0	563	15	10	589	1176
Apprch %	0	0	0	0	0		0	0.9	97.8	0	1.3		0	62.8	0	16.3	20.9		0.2	0	95.6	2.5	1.7		
Total %	0	0	0	0	0	0	0	0.4	45.2	0	0.6	46.3	0	2.3	0	0.6	0.8	3.7	0.1	0	47.9	1.3	0.9	50.1	
Cars +	0	0	0	0	0	0	0	4	506	0	6	516	0	26	0	7	8	41	1	0	532	15	10	558	1115
% Cars +	0	0	0	0	0	0	0	80	95.1	0	85.7	94.9	0	96.3	0	100	88.9	95.3	100	0	94.5	100	100	94.7	94.8
Trucks	0	0	0	0	0	0	0	1	26	0	1	28	0	1	0	0	1	2	0	0	31	0	0	31	61
% Trucks	0	0	0	0	0	0	0	20	4.9	0	14.3	5.1	0	3.7	0	0	11.1	4.7	0	0	5.5	0	0	5.3	5.2

Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 1 - Alpine Dr & Puma St NW, 4-8-15, 6am-7pm
Site Code : 1
Start Date : 4/8/2015
Page No : 3

Alpine Dr and Puma St NW
Ramsey, MN



Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 1 - Alpine Dr & Puma St NW, 4-8-15, 6am-7pm
Site Code : 1
Start Date : 4/8/2015
Page No : 4

Alpine Dr and Puma St NW
Ramsey, MN

	Southbound						Alpine Dr Westbound						Puma St NW Northbound						Alpine Dr Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 07:15 AM																									
07:15 AM	0	0	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	0	0	0	14	1	0	15	30
07:30 AM	0	0	0	0	0	0	0	0	19	0	0	19	0	1	0	0	0	1	0	0	19	2	0	21	41
07:45 AM	0	0	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	0	0	17	1	0	18	27
08:00 AM	0	0	0	0	0	0	0	0	14	0	0	14	0	1	0	0	0	1	0	0	11	2	0	13	28
Total Volume	0	0	0	0	0	0	0	0	57	0	0	57	0	2	0	0	0	2	0	0	61	6	0	67	126
% App. Total	0	0	0	0	0		0	0	100	0	0		0	100	0	0	0		0	0	91	9	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.750	.000	.000	.750	.000	.500	.000	.000	.000	.500	.000	.000	.803	.750	.000	.798	.768
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 11:15 AM																									
11:15 AM	0	0	0	0	0	0	0	0	10	0	0	10	0	1	0	0	0	1	0	0	7	1	0	8	19
11:30 AM	0	0	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	0	0	0	6	0	0	6	17
11:45 AM	0	0	0	0	0	0	0	0	8	0	0	8	0	1	0	0	0	1	0	0	6	0	0	6	15
12:00 PM	0	0	0	0	0	0	0	0	8	0	0	8	0	1	0	0	0	1	0	0	21	1	0	22	31
Total Volume	0	0	0	0	0	0	0	0	37	0	0	37	0	3	0	0	0	3	0	0	40	2	0	42	82
% App. Total	0	0	0	0	0		0	0	100	0	0		0	100	0	0	0		0	0	95.2	4.8	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.841	.000	.000	.841	.000	.750	.000	.000	.000	.750	.000	.000	.476	.500	.000	.477	.661
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 04:30 PM																									
04:30 PM	0	0	0	0	0	0	0	0	22	0	0	22	0	0	0	0	0	0	0	0	19	0	0	19	41
04:45 PM	0	0	0	0	0	0	0	0	8	0	0	8	0	2	0	0	0	2	0	0	20	0	1	21	31
05:00 PM	0	0	0	0	0	0	0	0	14	0	1	15	0	1	0	0	0	1	0	0	13	0	0	13	29
05:15 PM	0	0	0	0	0	0	0	0	14	0	1	15	0	2	0	0	0	2	0	0	28	0	0	28	45
Total Volume	0	0	0	0	0	0	0	0	58	0	2	60	0	5	0	0	0	5	0	0	80	0	1	81	146
% App. Total	0	0	0	0	0		0	0	96.7	0	3.3		0	100	0	0	0		0	0	98.8	0	1.2		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.659	.000	.500	.682	.000	.625	.000	.000	.000	.625	.000	.000	.714	.000	.250	.723	.811

Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 2 - Armstrong Blvd NW & Alpine Dr, 4-8-15, 6am-7pm
Site Code : 2
Start Date : 4/8/2015
Page No : 1

Armstrong Blvd NW and Alpine Dr
Ramsey, MN

Groups Printed- Cars + - Trucks

	Armstrong Blvd NW Southbound						Alpine Dr Westbound						Armstrong Blvd NW Northbound						Alpine Dr Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	58	0	0	58	0	2	3	0	0	5	0	0	6	0	0	6	0	0	1	10	0	11	80
06:15 AM	0	3	73	2	0	78	0	3	4	0	0	7	0	4	12	0	0	16	0	0	1	7	0	8	109
06:30 AM	0	2	82	0	0	84	0	1	4	0	0	5	0	1	8	0	0	9	0	4	2	15	0	21	119
06:45 AM	0	3	87	0	0	90	0	0	8	0	0	8	0	1	6	0	0	7	0	1	3	21	0	25	130
Total	0	8	300	2	0	310	0	6	19	0	0	25	0	6	32	0	0	38	0	5	7	53	0	65	438
07:00 AM	0	2	89	3	0	94	0	0	4	0	0	4	0	4	9	0	0	13	0	1	4	21	0	26	137
07:15 AM	0	0	90	2	0	92	0	2	9	0	0	11	0	1	10	0	0	11	0	0	4	23	0	27	141
07:30 AM	0	0	107	6	0	113	0	1	13	1	0	15	0	2	11	1	0	14	0	3	4	27	0	34	176
07:45 AM	0	0	65	2	0	67	0	5	3	0	0	8	0	2	17	0	0	19	0	1	6	17	0	24	118
Total	0	2	351	13	0	366	0	8	29	1	0	38	0	9	47	1	0	57	0	5	18	88	0	111	572
08:00 AM	0	0	63	1	0	64	0	7	8	1	0	16	0	9	14	0	0	23	0	4	1	12	0	17	120
08:15 AM	0	1	43	1	0	45	0	2	5	0	0	7	0	6	9	2	0	17	0	2	5	19	0	26	95
08:30 AM	0	1	56	2	0	59	0	4	5	2	1	12	0	3	15	1	0	19	0	1	2	11	0	14	104
08:45 AM	0	1	36	4	0	41	0	0	2	0	0	2	0	6	14	1	0	21	0	2	4	9	0	15	79
Total	0	3	198	8	0	209	0	13	20	3	1	37	0	24	52	4	0	80	0	9	12	51	0	72	398
09:00 AM	0	2	53	2	0	57	0	0	3	1	0	4	0	5	12	3	0	20	0	0	2	7	0	9	90
09:15 AM	0	0	43	1	0	44	0	1	4	1	0	6	0	5	24	1	0	30	0	0	3	7	0	10	90
09:30 AM	0	1	28	0	0	29	0	0	3	1	0	4	0	4	17	0	0	21	0	0	3	11	0	14	68
09:45 AM	0	0	23	0	0	23	0	1	3	1	0	5	0	7	25	2	0	34	0	0	0	7	0	7	69
Total	0	3	147	3	0	153	0	2	13	4	0	19	0	21	78	6	0	105	0	0	8	32	0	40	317
10:00 AM	0	1	28	1	0	30	0	1	3	0	0	4	0	3	26	4	0	33	0	1	1	7	0	9	76
10:15 AM	0	0	25	1	0	26	0	1	1	2	0	4	0	6	19	3	0	28	0	0	2	3	1	6	64
10:30 AM	0	3	25	1	0	29	0	3	2	1	0	6	0	3	25	1	0	29	0	0	2	3	0	5	69
10:45 AM	0	2	25	1	0	28	0	4	1	2	0	7	0	2	23	0	0	25	0	2	5	9	0	16	76
Total	0	6	103	4	0	113	0	9	7	5	0	21	0	14	93	8	0	115	0	3	10	22	1	36	285
11:00 AM	0	0	33	1	0	34	0	2	3	0	0	5	0	7	26	1	0	34	0	1	0	7	0	8	81
11:15 AM	0	0	33	1	0	34	0	0	3	2	0	5	0	13	55	3	0	71	0	1	2	5	0	8	118
11:30 AM	0	2	28	0	0	30	0	2	1	0	0	3	0	9	29	1	1	40	0	0	4	7	1	12	85
11:45 AM	0	2	26	0	0	28	0	2	1	0	0	3	0	10	28	2	0	40	0	2	1	6	0	9	80
Total	0	4	120	2	0	126	0	6	8	2	0	16	0	39	138	7	1	185	0	4	7	25	1	37	364
12:00 PM	0	2	33	0	0	35	0	3	6	2	0	11	0	2	25	2	0	29	0	2	3	13	0	18	93
12:15 PM	0	1	20	0	0	21	1	0	5	0	0	6	0	4	29	1	0	34	0	1	2	9	0	12	73
12:30 PM	0	1	27	0	0	28	0	1	1	1	0	3	0	3	21	4	0	28	0	1	3	7	0	11	70
12:45 PM	0	1	30	0	0	31	0	1	2	2	1	6	0	12	33	0	1	46	0	2	4	10	0	16	99
Total	0	5	110	0	0	115	1	5	14	5	1	26	0	21	108	7	1	137	0	6	12	39	0	57	335
01:00 PM	0	0	30	2	0	32	0	1	4	0	0	5	0	8	26	2	0	36	0	0	2	10	0	12	85
01:15 PM	0	0	21	0	0	21	0	2	5	0	0	7	0	10	25	3	0	38	0	1	0	9	1	11	77
01:30 PM	0	1	31	0	0	32	0	3	1	0	0	4	0	8	31	1	0	40	0	0	0	5	0	5	81
01:45 PM	0	0	26	3	0	29	0	1	1	2	0	4	0	8	35	1	0	44	0	1	5	7	0	13	90
Total	0	1	108	5	0	114	0	7	11	2	0	20	0	34	117	7	0	158	0	2	7	31	1	41	333

Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 2 - Armstrong Blvd NW & Alpine Dr, 4-8-15, 6am-7pm
Site Code : 2
Start Date : 4/8/2015
Page No : 2

Armstrong Blvd NW and Alpine Dr
Ramsey, MN

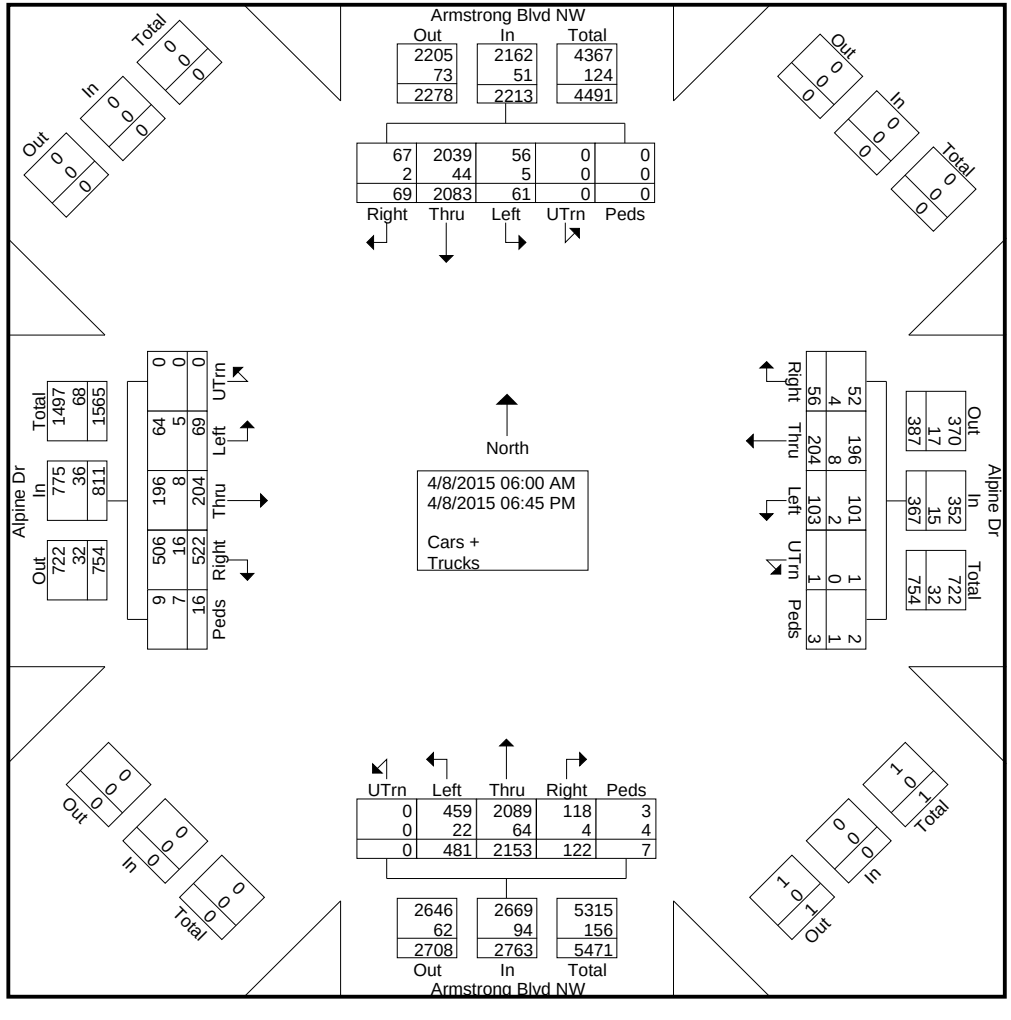
Groups Printed- Cars + - Trucks

	Armstrong Blvd NW Southbound						Alpine Dr Westbound						Armstrong Blvd NW Northbound						Alpine Dr Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
02:00 PM	0	0	28	0	0	28	0	4	5	1	0	10	0	8	41	5	1	55	0	1	0	12	1	14	107
02:15 PM	0	1	31	1	0	33	0	2	3	1	0	6	0	8	52	2	0	62	0	0	2	11	0	13	114
02:30 PM	0	3	31	0	0	34	0	1	0	1	0	2	0	16	52	1	0	69	0	0	4	8	0	12	117
02:45 PM	0	2	25	2	0	29	0	1	4	3	0	8	0	14	68	1	0	83	0	2	3	7	0	12	132
Total	0	6	115	3	0	124	0	8	12	6	0	26	0	46	213	9	1	269	0	3	9	38	1	51	470
03:00 PM	0	3	23	1	0	27	0	1	4	2	0	7	0	20	71	2	0	93	0	0	6	8	0	14	141
03:15 PM	0	2	29	2	0	33	0	1	3	0	0	4	0	12	66	4	0	82	0	5	2	8	3	18	137
03:30 PM	0	3	34	2	0	39	0	1	6	3	0	10	0	13	79	2	0	94	0	1	6	8	0	15	158
03:45 PM	0	0	37	0	0	37	0	3	2	1	0	6	0	9	78	7	1	95	0	3	11	8	1	23	161
Total	0	8	123	5	0	136	0	6	15	6	0	27	0	54	294	15	1	364	0	9	25	32	4	70	597
04:00 PM	0	0	37	2	0	39	0	1	6	1	0	8	0	22	85	2	0	109	0	1	8	13	2	24	180
04:15 PM	0	1	35	0	0	36	0	2	5	6	0	13	0	16	96	11	1	124	0	3	10	6	1	20	193
04:30 PM	0	2	37	2	0	41	0	3	5	4	0	12	0	28	126	11	0	165	0	1	7	15	1	24	242
04:45 PM	0	3	32	6	0	41	0	3	3	3	0	9	0	9	102	4	0	115	0	4	11	12	1	28	193
Total	0	6	141	10	0	157	0	9	19	14	0	42	0	75	409	28	1	513	0	9	36	46	5	96	808
05:00 PM	0	0	29	0	0	29	0	4	4	0	1	9	0	22	109	3	1	135	0	2	8	5	0	15	188
05:15 PM	0	0	27	2	0	29	0	1	7	1	0	9	0	19	81	5	0	105	0	4	12	11	0	27	170
05:30 PM	0	1	38	4	0	43	0	2	5	1	0	8	0	24	84	2	1	111	0	3	10	15	1	29	191
05:45 PM	0	0	39	0	0	39	0	0	1	2	0	3	0	17	76	6	0	99	0	1	7	4	0	12	153
Total	0	1	133	6	0	140	0	7	17	4	1	29	0	82	350	16	2	450	0	10	37	35	1	83	702
06:00 PM	0	2	23	1	0	26	0	1	2	1	0	4	0	19	76	3	0	98	0	2	5	7	1	15	143
06:15 PM	0	1	35	2	0	38	0	1	5	2	0	8	0	16	54	6	0	76	0	1	5	8	1	15	137
06:30 PM	0	3	37	3	0	43	0	9	5	1	0	15	0	10	36	4	0	50	0	1	2	9	0	12	120
06:45 PM	0	2	39	2	0	43	0	6	8	0	0	14	0	11	56	1	0	68	0	0	4	6	0	10	135
Total	0	8	134	8	0	150	0	17	20	4	0	41	0	56	222	14	0	292	0	4	16	30	2	52	535
Grand Total	0	61	2083	69	0	2213	1	103	204	56	3	367	0	481	2153	122	7	2763	0	69	204	522	16	811	6154
Apprch %	0	2.8	94.1	3.1	0		0.3	28.1	55.6	15.3	0.8		0	17.4	77.9	4.4	0.3		0	8.5	25.2	64.4	2		
Total %	0	1	33.8	1.1	0	36	0	1.7	3.3	0.9	0	6	0	7.8	35	2	0.1	44.9	0	1.1	3.3	8.5	0.3	13.2	
Cars +	0	56	2039	67	0	2162	1	101	196	52	2	352	0	459	2089	118	3	2669	0	64	196	506	9	775	5958
% Cars +	0	91.8	97.9	97.1	0	97.7	100	98.1	96.1	92.9	66.7	95.9	0	95.4	97	96.7	42.9	96.6	0	92.8	96.1	96.9	56.2	95.6	96.8
Trucks	0	5	44	2	0	51	0	2	8	4	1	15	0	22	64	4	4	94	0	5	8	16	7	36	196
% Trucks	0	8.2	2.1	2.9	0	2.3	0	1.9	3.9	7.1	33.3	4.1	0	4.6	3	3.3	57.1	3.4	0	7.2	3.9	3.1	43.8	4.4	3.2

Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 2 - Armstrong Blvd NW & Alpine Dr, 4-8-15, 6am-7pm
Site Code : 2
Start Date : 4/8/2015
Page No : 3

Armstrong Blvd NW and Alpine Dr
Ramsey, MN



Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 2 - Armstrong Blvd NW & Alpine Dr, 4-8-15, 6am-7pm
Site Code : 2
Start Date : 4/8/2015
Page No : 4

Armstrong Blvd NW and Alpine Dr
Ramsey, MN

	Armstrong Blvd NW Southbound						Alpine Dr Westbound						Armstrong Blvd NW Northbound						Alpine Dr Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 06:45 AM																									
06:45 AM	0	3	87	0	0	90	0	0	8	0	0	8	0	1	6	0	0	7	0	1	3	21	0	25	130
07:00 AM	0	2	89	3	0	94	0	0	4	0	0	4	0	4	9	0	0	13	0	1	4	21	0	26	137
07:15 AM	0	0	90	2	0	92	0	2	9	0	0	11	0	1	10	0	0	11	0	0	4	23	0	27	141
07:30 AM	0	0	107	6	0	113	0	1	13	1	0	15	0	2	11	1	0	14	0	3	4	27	0	34	176
Total Volume	0	5	373	11	0	389	0	3	34	1	0	38	0	8	36	1	0	45	0	5	15	92	0	112	584
% App. Total	0	1.3	95.9	2.8	0		0	7.9	89.5	2.6	0		0	17.8	80	2.2	0		0	4.5	13.4	82.1	0		
PHF	.000	.417	.871	.458	.000	.861	.000	.375	.654	.250	.000	.633	.000	.500	.818	.250	.000	.804	.000	.417	.938	.852	.000	.824	.830
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 11:15 AM																									
11:15 AM	0	0	33	1	0	34	0	0	3	2	0	5	0	13	55	3	0	71	0	1	2	5	0	8	118
11:30 AM	0	2	28	0	0	30	0	2	1	0	0	3	0	9	29	1	1	40	0	0	4	7	1	12	85
11:45 AM	0	2	26	0	0	28	0	2	1	0	0	3	0	10	28	2	0	40	0	2	1	6	0	9	80
12:00 PM	0	2	33	0	0	35	0	3	6	2	0	11	0	2	25	2	0	29	0	2	3	13	0	18	93
Total Volume	0	6	120	1	0	127	0	7	11	4	0	22	0	34	137	8	1	180	0	5	10	31	1	47	376
% App. Total	0	4.7	94.5	0.8	0		0	31.8	50	18.2	0		0	18.9	76.1	4.4	0.6		0	10.6	21.3	66	2.1		
PHF	.000	.750	.909	.250	.000	.907	.000	.583	.458	.500	.000	.500	.000	.654	.623	.667	.250	.634	.000	.625	.625	.596	.250	.653	.797
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 04:15 PM																									
04:15 PM	0	1	35	0	0	36	0	2	5	6	0	13	0	16	96	11	1	124	0	3	10	6	1	20	193
04:30 PM	0	2	37	2	0	41	0	3	5	4	0	12	0	28	126	11	0	165	0	1	7	15	1	24	242
04:45 PM	0	3	32	6	0	41	0	3	3	3	0	9	0	9	102	4	0	115	0	4	11	12	1	28	193
05:00 PM	0	0	29	0	0	29	0	4	4	0	1	9	0	22	109	3	1	135	0	2	8	5	0	15	188
Total Volume	0	6	133	8	0	147	0	12	17	13	1	43	0	75	433	29	2	539	0	10	36	38	3	87	816
% App. Total	0	4.1	90.5	5.4	0		0	27.9	39.5	30.2	2.3		0	13.9	80.3	5.4	0.4		0	11.5	41.4	43.7	3.4		
PHF	.000	.500	.899	.333	.000	.896	.000	.750	.850	.542	.250	.827	.000	.670	.859	.659	.500	.817	.000	.625	.818	.633	.750	.777	.843

Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 3 - Armstrong Blvd NW & Bunker Lake Blvd, 4-8-15, 6am-7pm
Site Code : 3
Start Date : 4/8/2015
Page No : 1

Armstrong Blvd NW and Bunker Lake Blvd
Ramsey, MN

Groups Printed- Cars + - Trucks

	Armstrong Blvd NW Southbound						Bunker Lake Blvd Westbound						Armstrong Blvd NW Northbound						Bunker Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	12	59	0	0	71	0	1	0	5	0	6	0	0	4	2	0	6	0	0	0	0	0	0	83
06:15 AM	0	24	61	0	0	85	0	0	0	3	0	3	0	0	12	1	0	13	0	0	0	0	0	0	101
06:30 AM	0	37	66	0	2	105	0	3	0	5	2	10	0	0	4	4	0	8	0	0	0	1	0	1	124
06:45 AM	0	50	63	0	0	113	0	1	0	4	0	5	0	0	4	4	0	8	0	0	0	0	0	0	126
Total	0	123	249	0	2	374	0	5	0	17	2	24	0	0	24	11	0	35	0	0	0	1	0	1	434
07:00 AM	0	42	66	0	0	108	0	3	0	7	0	10	0	0	7	1	0	8	0	0	0	0	0	0	126
07:15 AM	0	50	66	0	0	116	0	4	0	7	0	11	0	0	5	2	0	7	0	0	1	0	0	1	135
07:30 AM	0	71	74	0	0	145	0	7	1	6	0	14	0	0	10	7	0	17	0	0	1	1	0	2	178
07:45 AM	0	48	52	0	0	100	0	6	0	7	0	13	0	0	15	7	0	22	0	0	1	0	0	1	136
Total	0	211	258	0	0	469	0	20	1	27	0	48	0	0	37	17	0	54	0	0	3	1	0	4	575
08:00 AM	0	22	60	0	0	82	0	1	1	13	0	15	0	0	10	3	0	13	0	0	1	0	0	1	111
08:15 AM	0	21	49	0	0	70	0	3	1	11	0	15	0	0	16	6	0	22	0	0	1	0	0	1	108
08:30 AM	0	32	55	0	0	87	0	1	0	5	0	6	0	0	16	0	0	16	0	0	0	1	0	1	110
08:45 AM	0	7	44	0	0	51	0	6	0	14	0	20	1	0	11	1	0	13	0	0	1	0	0	1	85
Total	0	82	208	0	0	290	0	11	2	43	0	56	1	0	53	10	0	64	0	0	3	1	0	4	414
09:00 AM	0	17	44	0	0	61	0	4	0	5	0	9	0	0	17	1	0	18	0	0	1	0	0	1	89
09:15 AM	0	5	43	0	0	48	0	2	0	15	0	17	0	0	18	1	0	19	0	0	0	0	0	0	84
09:30 AM	0	11	38	0	0	49	0	5	1	7	0	13	0	0	19	2	0	21	0	0	0	0	0	0	83
09:45 AM	0	10	31	0	0	41	0	3	0	8	0	11	0	0	26	1	0	27	0	0	0	0	0	0	79
Total	0	43	156	0	0	199	0	14	1	35	0	50	0	0	80	5	0	85	0	0	1	0	0	1	335
10:00 AM	0	7	36	0	0	43	0	2	1	12	0	15	0	0	19	1	0	20	0	0	0	0	0	0	78
10:15 AM	0	8	24	0	0	32	1	3	1	5	1	11	0	0	23	2	0	25	0	0	0	0	0	0	68
10:30 AM	0	5	32	2	0	39	0	4	0	11	0	15	0	2	17	3	0	22	0	0	0	1	0	1	77
10:45 AM	0	10	30	0	0	40	0	6	0	11	0	17	0	0	14	0	0	14	0	0	0	0	0	0	71
Total	0	30	122	2	0	154	1	15	2	39	1	58	0	2	73	6	0	81	0	0	0	1	0	1	294
11:00 AM	0	11	38	0	1	50	1	4	0	11	1	17	0	0	27	2	1	30	0	0	0	0	1	1	98
11:15 AM	0	13	29	0	0	42	0	5	1	12	1	19	0	0	28	2	0	30	0	0	0	1	0	1	92
11:30 AM	0	6	34	0	0	40	0	7	0	15	0	22	0	1	32	2	0	35	0	0	0	0	0	0	97
11:45 AM	0	3	37	0	0	40	0	3	0	11	1	15	0	0	36	3	0	39	0	0	0	0	0	0	94
Total	0	33	138	0	1	172	1	19	1	49	3	73	0	1	123	9	1	134	0	0	0	1	1	2	381
12:00 PM	1	10	30	0	0	41	0	1	0	6	0	7	0	1	25	6	0	32	0	0	0	2	0	2	82
12:15 PM	0	8	28	0	0	36	0	4	0	16	0	20	1	0	22	2	0	25	0	0	0	0	0	0	81
12:30 PM	0	9	33	0	0	42	0	4	0	9	0	13	0	1	23	2	0	26	0	0	0	0	0	0	81
12:45 PM	0	12	29	0	1	42	0	5	0	18	1	24	0	0	30	7	1	38	0	0	0	0	0	0	104
Total	1	39	120	0	1	161	0	14	0	49	1	64	1	2	100	17	1	121	0	0	0	2	0	2	348
01:00 PM	0	10	27	0	0	37	0	4	0	11	0	15	0	0	27	5	0	32	0	0	0	0	0	0	84
01:15 PM	0	11	28	0	1	40	0	4	0	12	2	18	0	3	30	1	1	35	0	0	0	2	1	3	96
01:30 PM	0	10	26	0	0	36	0	3	1	9	0	13	0	0	31	2	0	33	0	0	2	0	0	2	84
01:45 PM	0	4	31	0	0	35	0	2	1	14	1	18	1	0	32	2	1	36	0	0	0	0	0	0	89
Total	0	35	112	0	1	148	0	13	2	46	3	64	1	3	120	10	2	136	0	0	2	2	1	5	353

Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 3 - Armstrong Blvd NW & Bunker Lake Blvd, 4-8-15, 6am-7pm
Site Code : 3
Start Date : 4/8/2015
Page No : 2

Armstrong Blvd NW and Bunker Lake Blvd
Ramsey, MN

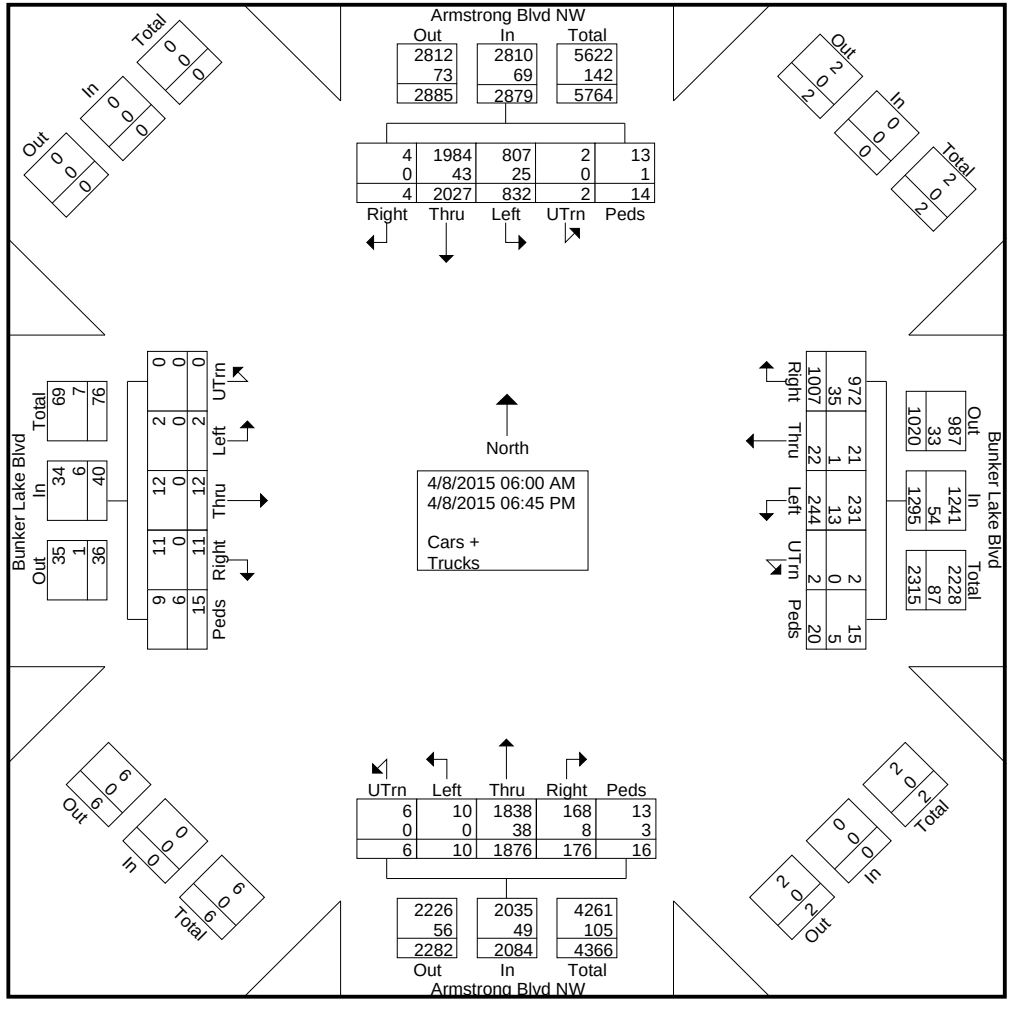
Groups Printed- Cars + - Trucks

	Armstrong Blvd NW Southbound						Bunker Lake Blvd Westbound						Armstrong Blvd NW Northbound						Bunker Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
02:00 PM	0	10	30	0	0	40	0	5	0	18	0	23	0	0	40	3	0	43	0	0	0	0	0	0	106
02:15 PM	0	11	31	0	0	42	0	6	0	13	0	19	0	0	45	10	0	55	0	0	0	1	0	1	117
02:30 PM	0	8	39	0	0	47	0	4	0	28	0	32	0	1	41	5	0	47	0	1	0	0	0	1	127
02:45 PM	0	13	19	0	0	32	0	4	3	26	0	33	0	0	58	5	0	63	0	0	0	0	0	0	128
Total	0	42	119	0	0	161	0	19	3	85	0	107	0	1	184	23	0	208	0	1	0	1	0	2	478
03:00 PM	0	13	23	0	0	36	0	7	0	49	0	56	0	0	50	7	0	57	0	0	0	0	0	0	149
03:15 PM	0	9	33	0	0	42	0	5	1	38	0	44	0	0	49	3	0	52	0	0	0	0	0	0	138
03:30 PM	0	13	34	0	3	50	0	16	1	46	0	63	0	0	53	5	0	58	0	0	0	0	2	2	173
03:45 PM	0	15	36	0	0	51	0	6	0	37	0	43	2	0	63	5	0	70	0	0	0	0	0	0	164
Total	0	50	126	0	3	179	0	34	2	170	0	206	2	0	215	20	0	237	0	0	0	0	2	2	624
04:00 PM	0	17	27	0	0	44	0	5	0	45	1	51	0	0	65	4	0	69	0	0	1	0	0	1	165
04:15 PM	0	12	37	0	0	49	0	14	0	50	0	64	0	0	80	2	1	83	0	0	0	0	1	1	197
04:30 PM	0	15	43	0	1	59	0	17	0	77	2	96	1	0	90	6	0	97	0	0	0	1	1	2	254
04:45 PM	0	14	38	0	1	53	0	8	2	39	1	50	0	0	82	5	2	89	0	0	0	0	2	2	194
Total	0	58	145	0	2	205	0	44	2	211	4	261	1	0	317	17	3	338	0	0	1	1	4	6	810
05:00 PM	0	9	31	1	0	41	0	7	1	56	0	64	0	0	86	4	0	90	0	0	0	0	0	0	195
05:15 PM	0	8	32	0	0	40	0	9	2	27	2	40	0	0	87	7	0	94	0	0	0	0	0	0	174
05:30 PM	0	14	43	0	1	58	0	4	0	42	0	46	0	0	81	3	1	85	0	0	0	0	1	1	190
05:45 PM	1	14	33	0	0	48	0	1	2	20	0	23	0	1	77	5	1	84	0	1	0	0	0	1	156
Total	1	45	139	1	1	187	0	21	5	145	2	173	0	1	331	19	2	353	0	1	0	0	1	2	715
06:00 PM	0	10	28	0	2	40	0	5	1	33	2	41	0	0	68	3	1	72	0	0	1	0	1	2	155
06:15 PM	0	13	33	1	1	48	0	5	0	24	2	31	0	0	56	3	6	65	0	0	0	0	5	5	149
06:30 PM	0	9	36	0	0	45	0	4	0	17	0	21	0	0	37	4	0	41	0	0	0	0	0	0	107
06:45 PM	0	9	38	0	0	47	0	1	0	17	0	18	0	0	58	2	0	60	0	0	1	0	0	1	126
Total	0	41	135	1	3	180	0	15	1	91	4	111	0	0	219	12	7	238	0	0	2	0	6	8	537
Grand Total	2	832	2027	4	14	2879	2	244	22	1007	20	1295	6	10	1876	176	16	2084	0	2	12	11	15	40	6298
Apprch %	0.1	28.9	70.4	0.1	0.5		0.2	18.8	1.7	77.8	1.5		0.3	0.5	90	8.4	0.8		0	5	30	27.5	37.5		
Total %	0	13.2	32.2	0.1	0.2	45.7	0	3.9	0.3	16	0.3	20.6	0.1	0.2	29.8	2.8	0.3	33.1	0	0	0.2	0.2	0.2	0.6	
Cars +	2	807	1984	4	13	2810	2	231	21	972	15	1241	6	10	1838	168	13	2035	0	2	12	11	9	34	6120
% Cars +	100	97	97.9	100	92.9	97.6	100	94.7	95.5	96.5	75	95.8	100	100	98	95.5	81.2	97.6	0	100	100	100	60	85	97.2
Trucks	0	25	43	0	1	69	0	13	1	35	5	54	0	0	38	8	3	49	0	0	0	0	6	6	178
% Trucks	0	3	2.1	0	7.1	2.4	0	5.3	4.5	3.5	25	4.2	0	0	2	4.5	18.8	2.4	0	0	0	0	40	15	2.8

Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 3 - Armstrong Blvd NW & Bunker Lake Blvd, 4-8-15, 6am-7pm
Site Code : 3
Start Date : 4/8/2015
Page No : 3

Armstrong Blvd NW and Bunker Lake Blvd
Ramsey, MN



Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 3 - Armstrong Blvd NW & Bunker Lake Blvd, 4-8-15, 6am-7pm
Site Code : 3
Start Date : 4/8/2015

Armstrong Blvd NW and Bunker Lake Blvd
Ramsey, MN

	Armstrong Blvd NW Southbound						Bunker Lake Blvd Westbound						Armstrong Blvd NW Northbound						Bunker Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 07:00 AM																									
07:00 AM	0	42	66	0	0	108	0	3	0	7	0	10	0	0	7	1	0	8	0	0	0	0	0	0	126
07:15 AM	0	50	66	0	0	116	0	4	0	7	0	11	0	0	5	2	0	7	0	0	1	0	0	1	135
07:30 AM	0	71	74	0	0	145	0	7	1	6	0	14	0	0	10	7	0	17	0	0	1	1	0	2	178
07:45 AM	0	48	52	0	0	100	0	6	0	7	0	13	0	0	15	7	0	22	0	0	1	0	0	1	136
Total Volume	0	211	258	0	0	469	0	20	1	27	0	48	0	0	37	17	0	54	0	0	3	1	0	4	575
% App. Total	0	45	55	0	0		0	41.7	2.1	56.2	0		0	0	68.5	31.5	0		0	0	75	25	0		
PHF	.000	.743	.872	.000	.000	.809	.000	.714	.250	.964	.000	.857	.000	.000	.617	.607	.000	.614	.000	.000	.750	.250	.000	.500	.808
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 11:00 AM																									
11:00 AM	0	11	38	0	1	50	1	4	0	11	1	17	0	0	27	2	1	30	0	0	0	0	1	1	98
11:15 AM	0	13	29	0	0	42	0	5	1	12	1	19	0	0	28	2	0	30	0	0	0	1	0	1	92
11:30 AM	0	6	34	0	0	40	0	7	0	15	0	22	0	1	32	2	0	35	0	0	0	0	0	0	97
11:45 AM	0	3	37	0	0	40	0	3	0	11	1	15	0	0	36	3	0	39	0	0	0	0	0	0	94
Total Volume	0	33	138	0	1	172	1	19	1	49	3	73	0	1	123	9	1	134	0	0	0	1	1	2	381
% App. Total	0	19.2	80.2	0	0.6		1.4	26	1.4	67.1	4.1		0	0.7	91.8	6.7	0.7		0	0	0	50	50		
PHF	.000	.635	.908	.000	.250	.860	.250	.679	.250	.817	.750	.830	.000	.250	.854	.750	.250	.859	.000	.000	.000	.250	.250	.500	.972
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 04:15 PM																									
04:15 PM	0	12	37	0	0	49	0	14	0	50	0	64	0	0	80	2	1	83	0	0	0	0	1	1	197
04:30 PM	0	15	43	0	1	59	0	17	0	77	2	96	1	0	90	6	0	97	0	0	0	1	1	2	254
04:45 PM	0	14	38	0	1	53	0	8	2	39	1	50	0	0	82	5	2	89	0	0	0	0	2	2	194
05:00 PM	0	9	31	1	0	41	0	7	1	56	0	64	0	0	86	4	0	90	0	0	0	0	0	0	195
Total Volume	0	50	149	1	2	202	0	46	3	222	3	274	1	0	338	17	3	359	0	0	0	1	4	5	840
% App. Total	0	24.8	73.8	0.5	1		0	16.8	1.1	81	1.1		0.3	0	94.2	4.7	0.8		0	0	0	20	80		
PHF	.000	.833	.866	.250	.500	.856	.000	.676	.375	.721	.375	.714	.250	.000	.939	.708	.375	.925	.000	.000	.000	.250	.500	.625	.827

Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 4 - Armstrong Blvd NW & 147th Ave NW, 4-8-15, 6am-7pm
Site Code : 4
Start Date : 4/8/2015
Page No : 1

Armstrong Blvd NW and 147th Ave NW
Ramsey, MN

Groups Printed- Cars + - Trucks

	Armstrong Blvd NW Southbound						147th Ave NW Westbound						Armstrong Blvd NW Northbound						147th Ave NW Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	10	53	0	0	63	0	3	0	1	0	4	0	0	7	7	0	14	0	0	0	0	0	0	81
06:15 AM	0	10	51	0	0	61	0	6	0	1	1	8	0	0	12	9	0	21	0	0	0	0	0	0	90
06:30 AM	0	8	61	1	0	70	0	8	1	0	0	9	0	1	9	13	0	23	0	0	1	0	0	1	103
06:45 AM	0	13	50	0	0	63	0	8	1	1	0	10	0	3	7	14	0	24	0	0	0	0	0	0	97
Total	0	41	215	1	0	257	0	25	2	3	1	31	0	4	35	43	0	82	0	0	1	0	0	1	371
07:00 AM	0	13	57	0	0	70	0	4	0	2	0	6	0	2	6	8	0	16	0	0	0	0	0	0	92
07:15 AM	0	29	43	0	0	72	0	6	0	1	0	7	0	0	6	26	0	32	0	0	0	0	0	0	111
07:30 AM	0	20	60	0	0	80	0	18	0	4	0	22	0	1	12	27	0	40	0	0	1	2	0	3	145
07:45 AM	1	17	39	1	0	58	0	7	0	3	0	10	0	1	18	22	0	41	0	0	0	0	0	0	109
Total	1	79	199	1	0	280	0	35	0	10	0	45	0	4	42	83	0	129	0	0	1	2	0	3	457
08:00 AM	0	13	45	4	0	62	0	7	1	4	0	12	0	0	9	17	0	26	0	0	1	0	0	1	101
08:15 AM	0	9	37	1	0	47	0	7	1	5	0	13	0	1	20	16	0	37	0	0	0	2	0	2	99
08:30 AM	0	14	42	0	0	56	0	8	0	5	0	13	0	0	8	12	0	20	0	1	0	1	0	2	91
08:45 AM	0	13	38	0	0	51	0	7	1	6	0	14	0	2	8	20	0	30	0	0	1	0	0	1	96
Total	0	49	162	5	0	216	0	29	3	20	0	52	0	3	45	65	0	113	0	1	2	3	0	6	387
09:00 AM	0	14	34	1	0	49	0	5	0	4	0	9	0	2	12	6	0	20	0	1	0	2	0	3	81
09:15 AM	0	10	36	0	0	46	0	4	0	7	0	11	0	0	13	17	0	30	0	0	0	1	0	1	88
09:30 AM	0	6	35	1	0	42	0	15	0	9	0	24	0	0	11	19	0	30	0	0	0	4	0	4	100
09:45 AM	0	7	26	0	0	33	0	10	0	7	0	17	0	1	22	12	0	35	0	0	0	0	0	0	85
Total	0	37	131	2	0	170	0	34	0	27	0	61	0	3	58	54	0	115	0	1	0	7	0	8	354
10:00 AM	0	13	25	1	0	39	0	6	0	5	0	11	0	0	14	19	0	33	0	0	0	0	0	0	83
10:15 AM	0	3	24	0	0	27	0	12	2	7	0	21	0	0	19	17	0	36	0	0	2	1	0	3	87
10:30 AM	0	12	24	0	0	36	0	13	1	6	0	20	0	0	17	12	0	29	0	0	0	0	0	0	85
10:45 AM	0	9	26	0	0	35	0	15	1	0	0	16	0	0	14	17	0	31	0	0	0	1	0	1	83
Total	0	37	99	1	0	137	0	46	4	18	0	68	0	0	64	65	0	129	0	0	2	2	0	4	338
11:00 AM	0	16	27	0	0	43	0	10	2	9	1	22	0	0	20	22	0	42	0	0	0	0	0	0	107
11:15 AM	0	10	26	0	0	36	0	10	1	10	1	22	0	2	21	22	0	45	0	0	3	0	0	3	106
11:30 AM	1	14	24	1	0	40	0	10	1	12	0	23	0	2	19	20	0	41	0	0	1	2	0	3	107
11:45 AM	0	14	21	1	0	36	0	17	0	9	0	26	0	1	29	27	0	57	0	1	0	1	0	2	121
Total	1	54	98	2	0	155	0	47	4	40	2	93	0	5	89	91	0	185	0	1	4	3	0	8	441
12:00 PM	0	12	23	1	0	36	0	15	0	8	0	23	0	1	22	27	0	50	0	1	0	2	0	3	112
12:15 PM	0	6	26	0	0	32	0	16	0	8	0	24	0	1	20	24	0	45	0	0	1	1	0	2	103
12:30 PM	0	14	24	0	0	38	0	17	1	8	0	26	0	0	16	21	0	37	0	0	0	0	0	0	101
12:45 PM	0	10	23	0	0	33	0	14	1	10	0	25	0	0	28	23	0	51	0	0	0	2	0	2	111
Total	0	42	96	1	0	139	0	62	2	34	0	98	0	2	86	95	0	183	0	1	1	5	0	7	427
01:00 PM	0	7	24	1	0	32	1	12	0	7	0	20	0	0	25	16	0	41	0	0	0	0	0	0	93
01:15 PM	0	14	18	1	0	33	0	8	0	9	0	17	0	2	23	21	0	46	0	1	0	1	0	2	98
01:30 PM	0	7	23	0	0	30	0	14	0	12	0	26	0	0	21	25	0	46	0	0	0	1	0	1	103
01:45 PM	0	12	22	0	0	34	0	22	0	16	1	39	0	0	18	35	0	53	0	0	2	1	0	3	129
Total	0	40	87	2	0	129	1	56	0	44	1	102	0	2	87	97	0	186	0	1	2	3	0	6	423

Traffic Data Inc
PO Box 16296
St. Louis Park, MN 55416

File Name : 4 - Armstrong Blvd NW & 147th Ave NW, 4-8-15, 6am-7pm
Site Code : 4
Start Date : 4/8/2015
Page No : 2

Armstrong Blvd NW and 147th Ave NW
Ramsey, MN

Groups Printed- Cars + - Trucks

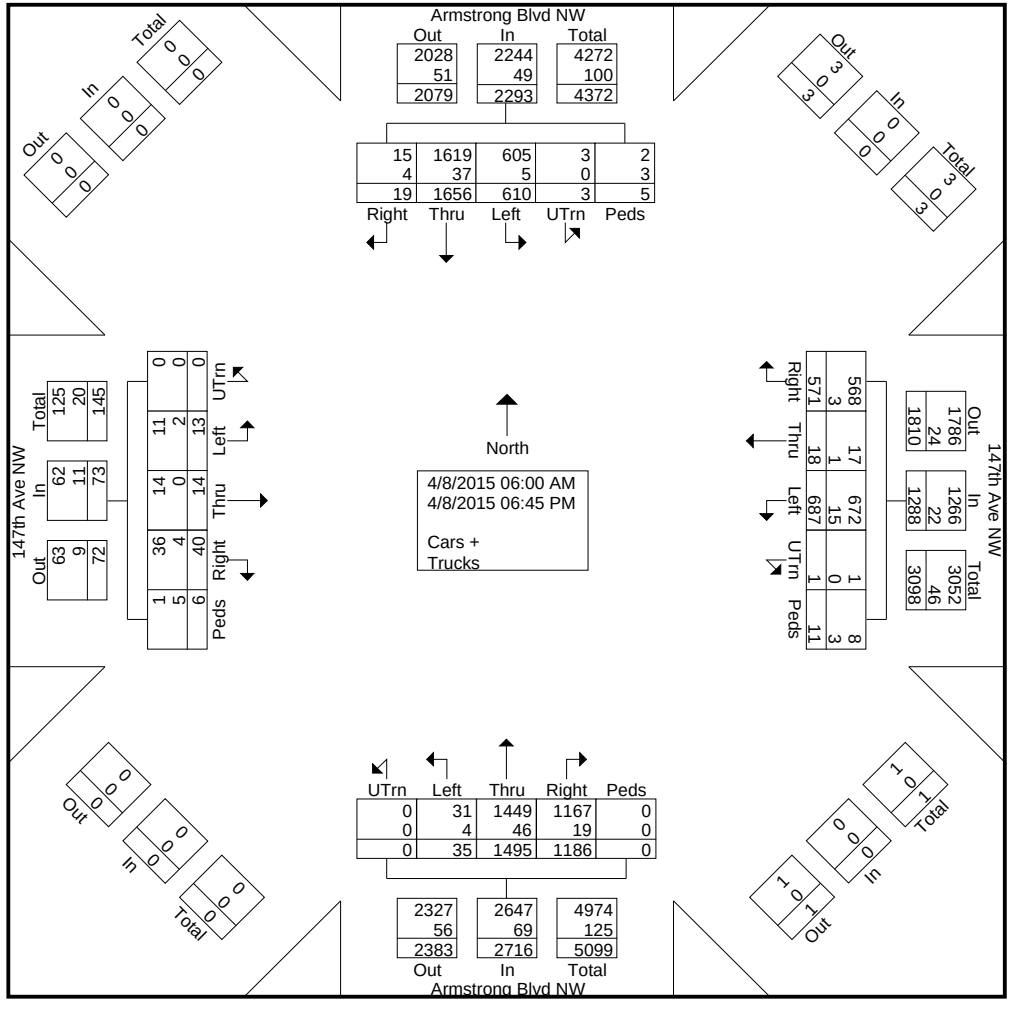
	Armstrong Blvd NW Southbound						147th Ave NW Westbound						Armstrong Blvd NW Northbound						147th Ave NW Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
02:00 PM	0	8	26	0	0	34	0	17	1	13	0	31	0	2	29	26	0	57	0	0	0	2	0	2	124
02:15 PM	0	13	25	1	0	39	0	9	1	15	0	25	0	0	44	26	0	70	0	0	0	0	0	0	134
02:30 PM	0	12	31	0	0	43	0	13	0	7	0	20	0	1	37	28	0	66	0	0	0	0	0	0	129
02:45 PM	0	8	13	1	0	22	0	10	0	18	0	28	0	0	45	27	0	72	0	1	0	0	0	1	123
Total	0	41	95	2	0	138	0	49	2	53	0	104	0	3	155	107	0	265	0	1	0	2	0	3	510
03:00 PM	0	4	26	0	0	30	0	20	0	16	0	36	0	0	42	37	0	79	0	1	0	0	0	1	146
03:15 PM	0	12	25	0	0	37	0	19	0	12	0	31	0	1	37	28	0	66	0	1	0	1	0	2	136
03:30 PM	0	20	31	1	2	54	0	13	1	12	0	26	0	1	50	29	0	80	0	0	1	0	0	1	161
03:45 PM	0	15	27	0	0	42	0	20	0	20	0	40	0	0	50	34	0	84	0	0	0	1	0	1	167
Total	0	51	109	1	2	163	0	72	1	60	0	133	0	2	179	128	0	309	0	2	1	2	0	5	610
04:00 PM	0	11	24	0	0	35	0	12	0	22	0	34	0	2	49	28	0	79	0	0	0	1	0	1	149
04:15 PM	0	13	36	0	0	49	0	29	0	28	0	57	0	0	55	31	0	86	0	0	0	1	1	2	194
04:30 PM	0	11	49	1	1	62	0	26	0	30	1	57	0	1	70	25	0	96	0	3	0	0	0	3	218
04:45 PM	0	9	40	0	0	49	0	24	0	19	2	45	0	0	61	36	0	97	0	0	0	0	0	0	191
Total	0	44	149	1	1	195	0	91	0	99	3	193	0	3	235	120	0	358	0	3	0	2	1	6	752
05:00 PM	0	11	27	0	0	38	0	25	0	19	0	44	0	2	68	27	0	97	0	0	0	4	0	4	183
05:15 PM	0	11	31	0	2	44	0	15	0	28	0	43	0	2	71	41	0	114	0	1	0	2	0	3	204
05:30 PM	1	17	27	0	0	45	0	21	0	22	0	43	0	0	59	28	0	87	0	0	0	0	0	0	175
05:45 PM	0	10	26	0	0	36	0	16	0	26	1	43	0	0	51	38	0	89	0	1	0	3	0	4	172
Total	1	49	111	0	2	163	0	77	0	95	1	173	0	4	249	134	0	387	0	2	0	9	0	11	734
06:00 PM	0	9	22	0	0	31	0	20	0	18	1	39	0	0	59	35	0	94	0	0	0	0	0	0	164
06:15 PM	0	14	27	0	0	41	0	20	0	21	1	42	0	0	38	27	0	65	0	0	0	0	5	5	153
06:30 PM	0	10	30	0	0	40	0	14	0	10	1	25	0	0	28	23	0	51	0	0	0	0	0	0	116
06:45 PM	0	13	26	0	0	39	0	10	0	19	0	29	0	0	46	19	0	65	0	0	0	0	0	0	133
Total	0	46	105	0	0	151	0	64	0	68	3	135	0	0	171	104	0	275	0	0	0	0	5	5	566
Grand Total	3	610	1656	19	5	2293	1	687	18	571	11	1288	0	35	1495	1186	0	2716	0	13	14	40	6	73	6370
Apprch %	0.1	26.6	72.2	0.8	0.2		0.1	53.3	1.4	44.3	0.9		0	1.3	55	43.7	0		0	17.8	19.2	54.8	8.2		
Total %	0	9.6	26	0.3	0.1	36	0	10.8	0.3	9	0.2	20.2	0	0.5	23.5	18.6	0	42.6	0	0.2	0.2	0.6	0.1	1.1	
Cars +	3	605	1619	15	2	2244	1	672	17	568	8	1266	0	31	1449	1167	0	2647	0	11	14	36	1	62	6219
% Cars +	100	99.2	97.8	78.9	40	97.9	100	97.8	94.4	99.5	72.7	98.3	0	88.6	96.9	98.4	0	97.5	0	84.6	100	90	16.7	84.9	97.6
Trucks	0	5	37	4	3	49	0	15	1	3	3	22	0	4	46	19	0	69	0	2	0	4	5	11	151
% Trucks	0	0.8	2.2	21.1	60	2.1	0	2.2	5.6	0.5	27.3	1.7	0	11.4	3.1	1.6	0	2.5	0	15.4	0	10	83.3	15.1	2.4

Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 4 - Armstrong Blvd NW & 147th Ave NW, 4-8-15, 6am-7pm
Site Code : 4
Start Date : 4/8/2015
Page No : 3

Armstrong Blvd NW and 147th Ave NW
Ramsey, MN



Traffic Data Inc

PO Box 16296
St. Louis Park, MN 55416

File Name : 4 - Armstrong Blvd NW & 147th Ave NW, 4-8-15, 6am-7pm
Site Code : 4
Start Date : 4/8/2015
Page No : 4

Armstrong Blvd NW and 147th Ave NW
Ramsey, MN

	Armstrong Blvd NW Southbound						147th Ave NW Westbound						Armstrong Blvd NW Northbound						147th Ave NW Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 07:15 AM																									
07:15 AM	0	29	43	0	0	72	0	6	0	1	0	7	0	0	6	26	0	32	0	0	0	0	0	0	111
07:30 AM	0	20	60	0	0	80	0	18	0	4	0	22	0	1	12	27	0	40	0	0	1	2	0	3	145
07:45 AM	1	17	39	1	0	58	0	7	0	3	0	10	0	1	18	22	0	41	0	0	0	0	0	0	109
08:00 AM	0	13	45	4	0	62	0	7	1	4	0	12	0	0	9	17	0	26	0	0	1	0	0	1	101
Total Volume	1	79	187	5	0	272	0	38	1	12	0	51	0	2	45	92	0	139	0	0	2	2	0	4	466
% App. Total	0.4	29	68.8	1.8	0		0	74.5	2	23.5	0		0	1.4	32.4	66.2	0		0	0	50	50	0		
PHF	.250	.681	.779	.313	.000	.850	.000	.528	.250	.750	.000	.580	.000	.500	.625	.852	.000	.848	.000	.000	.500	.250	.000	.333	.803
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 11:15 AM																									
11:15 AM	0	10	26	0	0	36	0	10	1	10	1	22	0	2	21	22	0	45	0	0	3	0	0	3	106
11:30 AM	1	14	24	1	0	40	0	10	1	12	0	23	0	2	19	20	0	41	0	0	1	2	0	3	107
11:45 AM	0	14	21	1	0	36	0	17	0	9	0	26	0	1	29	27	0	57	0	1	0	1	0	2	121
12:00 PM	0	12	23	1	0	36	0	15	0	8	0	23	0	1	22	27	0	50	0	1	0	2	0	3	112
Total Volume	1	50	94	3	0	148	0	52	2	39	1	94	0	6	91	96	0	193	0	2	4	5	0	11	446
% App. Total	0.7	33.8	63.5	2	0		0	55.3	2.1	41.5	1.1		0	3.1	47.2	49.7	0		0	18.2	36.4	45.5	0		
PHF	.250	.893	.904	.750	.000	.925	.000	.765	.500	.813	.250	.904	.000	.750	.784	.889	.000	.846	.000	.500	.333	.625	.000	.917	.921
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 04:30 PM																									
04:30 PM	0	11	49	1	1	62	0	26	0	30	1	57	0	1	70	25	0	96	0	3	0	0	0	3	218
04:45 PM	0	9	40	0	0	49	0	24	0	19	2	45	0	0	61	36	0	97	0	0	0	0	0	0	191
05:00 PM	0	11	27	0	0	38	0	25	0	19	0	44	0	2	68	27	0	97	0	0	0	4	0	4	183
05:15 PM	0	11	31	0	2	44	0	15	0	28	0	43	0	2	71	41	0	114	0	1	0	2	0	3	204
Total Volume	0	42	147	1	3	193	0	90	0	96	3	189	0	5	270	129	0	404	0	4	0	6	0	10	796
% App. Total	0	21.8	76.2	0.5	1.6		0	47.6	0	50.8	1.6		0	1.2	66.8	31.9	0		0	40	0	60	0		
PHF	.000	.955	.750	.250	.375	.778	.000	.865	.000	.800	.375	.829	.000	.625	.951	.787	.000	.886	.000	.333	.000	.375	.000	.625	.913

APPENDIX C-

CRASH REPORTS

Crash Detail Report

Alpine St & Armstrong (2010-2015)

Report Version 1.0 March 2010

Crash ID: 102370213 **Date:** 08/25/2010 **Time:** 1806
County: ANOKA **City:** RAMSEY
Sys: 04-CSAH
Route: 02000083 001+00.001

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: DRY
Light Cond: DAYLIGHT
Weather 1: CLEAR
Weather 2: CLEAR

First Event: ON ROADWAY
To Junction: INTERSECTION-RELATED
Traffic Device: STOP SIGN OTHER
Speed Limit: 55
Diagram: OTHER
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	W	N	
Veh Act:	STRAIGHT AHEAD	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	VAN OR MINIVAN	
Age:	44	27	
Gender:	M	M	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	DISREGARD TRAFFIC DEVICE	UNKNOWN	

Crash ID: 102370225 **Date:** 08/25/2010 **Time:** 1942
County: ANOKA **City:** RAMSEY
Sys: 04-CSAH
Route: 02000083 001+00.001

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: DRY
Light Cond: DAYLIGHT
Weather 1: CLEAR
Weather 2: NOT SPECIFIED

First Event: ON ROADWAY
To Junction: 4-LEGGED INTERSECTION
Traffic Device: STOP SIGN OTHER
Speed Limit: 55
Diagram: REAR END
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	N	N	
Veh Act:	STRAIGHT AHEAD	LEFT TURN	
Veh Type:	PASSENGER CAR	PASSENGER CAR	
Age:	17	22	
Gender:	F	M	
Cond:	NORMAL	NORMAL	
Cont Fact	IMPROPER PASSING	OTHER	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 102800070	**Date:** 10/01/2010	**Time:** 1402	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	PROPERTY DAMAGE	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	STOP SIGN OTHER
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	RIGHT ANGLE
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	W	S	
Veh Act:	START TRAFFIC	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	PASSENGER CAR	
Age:	50	37	
Gender:	M	F	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 102940180	**Date:** 10/21/2010	**Time:** 1624	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	POSSIBLE INJURY	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	NOT APPLICABLE
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	RIGHT ANGLE
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	W	S	
Veh Act:	STRAIGHT AHEAD	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	PASSENGER CAR	
Age:	27	23	
Gender:	M	F	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 110860009 **Date:** 03/26/2011 **Time:** 2233 **Sys:** 05-MSAS
County: ANOKA **City:** RAMSEY **Route:** 31480112 002+00.177

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL UNDERRIDE SIDE
Surf Cond: ICE/PACKED SNOW
Light Cond: DARK - UNKNOWN LIGHTING
Weather 1: CLEAR
Weather 2: NOT SPECIFIED

First Event: ON ROADWAY
To Junction: NON-JUNCTION
Traffic Device: NOT APPLICABLE
Speed Limit: 45
Diagram: UNKNOWN
Officer:
Reliability: LESS CONFIDENT
# of Vehicles: 1.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	EAST		
Veh Act:	STRAIGHT AHEAD		
Veh Type:	PICKUP TRUCK		
Age:	20		
Gender:	M		
Cond:	NORMAL		
Cont Fact	WEATHER		
Cont Fact	NOT SPECIFIED		

Crash ID: 123020017 **Date:** 10/27/2012 **Time:** 2256 **Sys:** 04-CSAH
County: ANOKA **City:** RAMSEY **Route:** 02000083 001+00.001

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: DRY
Light Cond: DARK - STREET LIGHTS ON
Weather 1: CLEAR
Weather 2: NOT SPECIFIED

First Event: ON ROADWAY
To Junction: 4-LEGGED INTERSECTION
Traffic Device: STOP SIGN OTHER
Speed Limit: 55
Diagram: RIGHT ANGLE
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	S	W	
Veh Act:	STRAIGHT AHEAD	PED. FAIL TO YIELD R/W TO T	
Veh Type:	SPORT UNTILITY VEHICLE	PASSENGER CAR	
Age:	54	17	
Gender:	F	M	
Cond:	NORMAL	NORMAL	
Cont Fact	NO IMPROPER DRIVING	DISTRACTION	
Cont Fact	NOT SPECIFIED	FAIL TO YIELD ROW	

Crash ID: 130860106	**Date:** 03/27/2013	**Time:** 1404	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	INCAPACITATING INJURY	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	NOT APPLICABLE
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	REAR END
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	S	S	
Veh Act:	LEFT TURN	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	PASSENGER CAR	
Age:	20	21	
Gender:	M	M	
Cond:	UNKNOWN	NORMAL	
Cont Fact	NO IMPROPER DRIVING	FAIL TO YIELD ROW	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 131930115	**Date:** 07/12/2013	**Time:** 0906	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	POSSIBLE INJURY	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	INTERSECTION-RELATED
Road Char:	STRAIGHT AND GRADE	**Traffic Device:**	STOP SIGN OTHER
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	RIGHT ANGLE
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	W	S	
Veh Act:	STRAIGHT AHEAD	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	SPORT UNTILITY VEHICLE	
Age:	16	39	
Gender:	F	F	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 132210084 **Date:** 08/09/2013 **Time:** 1316 **Sys:** 04-CSAH
County: ANOKA **City:** RAMSEY **Route:** 02000083 001+00.001

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: DRY
Light Cond: DAYLIGHT
Weather 1: CLEAR
Weather 2: NOT SPECIFIED

First Event: ON ROADWAY
To Junction: 4-LEGGED INTERSECTION
Traffic Device: STOP SIGN OTHER
Speed Limit: 55
Diagram: RIGHT ANGLE
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	N	W	
Veh Act:	00	PED. FAIL TO YIELD R/W TO T	
Veh Type:	VAN OR MINIVAN	SPORT UNTILITY VEHICLE	
Age:	47	70	
Gender:	F	M	
Cond:	NORMAL	NORMAL	
Cont Fact	NO IMPROPER DRIVING	FAIL TO YIELD ROW	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 140370338 **Date:** 02/05/2014 **Time:** 1818 **Sys:** 04-CSAH
County: ANOKA **City:** RAMSEY **Route:** 02000083 001+00.001

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: ICE/PACKED SNOW
Light Cond: DARK - NO STREET LIGHTS
Weather 1: CLEAR
Weather 2: NOT SPECIFIED

First Event: ON ROADWAY
To Junction: 4-LEGGED INTERSECTION
Traffic Device: STOP SIGN OTHER
Speed Limit: 55
Diagram: RIGHT ANGLE
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	EAST	N	
Veh Act:	PED. FAIL TO YIELD R/W TO	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	VAN OR MINIVAN	
Age:	49	50	
Gender:	F	F	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 141050144	**Date:** 04/15/2014	**Time:** 1639	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	PROPERTY DAMAGE	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	STOP SIGN OTHER
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	RIGHT ANGLE
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	N	W	
Veh Act:	STRAIGHT AHEAD	STRAIGHT AHEAD	
Veh Type:	SPORT UNTILITY VEHICLE	PASSENGER CAR	
Age:	32	32	
Gender:	F	F	
Cond:	NORMAL	NORMAL	
Cont Fact	NO IMPROPER DRIVING	FAIL TO YIELD ROW	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 141440014	**Date:** 05/22/2014	**Time:** 1806	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	NON-INCAPACITATING INJURY	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND GRADE	**Traffic Device:**	NOT APPLICABLE
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	LEFT TURN INTO TRAFFIC
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	N	S	
Veh Act:	LEFT TURN	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	PASSENGER CAR	
Age:	40	33	
Gender:	F	M	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	VISION OBSCURED - SUN OR H	NOT SPECIFIED	

Crash ID: 141980169	**Date:** 07/17/2014	**Time:** 1709	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	POSSIBLE INJURY	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	INTERSECTION-RELATED
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	STOP SIGN OTHER
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	SIDESWIPE OPPOSING
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	W	N	
Veh Act:	PED. FAIL TO YIELD R/W TO	STRAIGHT AHEAD	
Veh Type:	SPORT UNTILITY VEHICLE	TRUCK W/ SEMI TRAILER	
Age:	37	60	
Gender:	F	M	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 143000098	**Date:** 10/27/2014	**Time:** 1150	**Sys:** 04-CSAH		
County: ANOKA	**City:** RAMSEY		**Route:** 02000083	001+00.001	

Severity:	PROPERTY DAMAGE	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND GRADE	**Traffic Device:**	STOP SIGN OTHER
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	RIGHT ANGLE
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLOUDY	**Reliability:**	CONFIDENT
Weather 2:	CLOUDY	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	S	N	
Veh Act:	STRAIGHT AHEAD	LEFT TURN	
Veh Type:	PASSENGER CAR	TRUCK WITH 1 TRAILER	
Age:	25	30	
Gender:	F	M	
Cond:	NORMAL	NORMAL	
Cont Fact	NO IMPROPER DRIVING	FAIL TO YIELD ROW	
Cont Fact	NO IMPROPER DRIVING	DISTRACTION	

Selection Filter:

WORK AREA: COUNTY_CODE('02') - FILTER: CRASH_YEAR('2010','2011','2012','2013','2014','2015') - SPATIAL FILTER APPLIED

Analyst:

Jeremy Melquist

Notes:

Crash Detail Report

Armstrong Blvd & 147th Ave (2010-2015)

Report Version 1.0 March 2010

Crash ID: 101570144 **Date:** 06/06/2010 **Time:** 1439
County: ANOKA **City:** RAMSEY
Sys: 04-CSAH
Route: 02000083 000+00.137

Severity: PROPERTY DAMAGE
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: WET
Light Cond: DAYLIGHT
Weather 1: RAIN
Weather 2: CLOUDY

First Event: ON ROADWAY
To Junction: NON-JUNCTION
Traffic Device: NOT APPLICABLE
Speed Limit: 55
Diagram: REAR END
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	S	S	
Veh Act:	STRAIGHT AHEAD	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	PASSENGER CAR	
Age:	24	53	
Gender:	F	M	
Cond:	NORMAL	UNDER THE INFLUENCE	
Cont Fact	NO IMPROPER DRIVING	CHEMICAL IMPAIRMENT	
Cont Fact	NOT SPECIFIED	NOT SPECIFIED	

Crash ID: 102180091 **Date:** 08/06/2010 **Time:** 0904
County: ANOKA **City:** RAMSEY
Sys: 04-CSAH
Route: 02000083 000+00.147

Severity: POSSIBLE INJURY
Road Type: 2 LANES UNDIV 2_WAY
Road Char: STRAIGHT AND LEVEL
Crash Type: COLL W/MV IN TRANSPORT
Surf Cond: DRY
Light Cond: DAYLIGHT
Weather 1: CLEAR
Weather 2: NOT SPECIFIED

First Event: ON ROADWAY
To Junction: 4-LEGGED INTERSECTION
Traffic Device: NOT APPLICABLE
Speed Limit: 55
Diagram: REAR END
Officer:
Reliability: CONFIDENT
# of Vehicles: 2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	S	S	
Veh Act:	STOPPED TRAFFIC	STRAIGHT AHEAD	
Veh Type:	MOTORCYCLE	PASSENGER CAR	
Age:	30	22	
Gender:	F	F	
Cond:	NORMAL	NORMAL	
Cont Fact	NO IMPROPER DRIVING	DISTRACTION	
Cont Fact	NOT SPECIFIED	FOLLOWING TOO CLOSELY	

Crash ID:	102250199	**Date:**	08/13/2010	**Time:**	1827
County:	ANOKA	**City:**	RAMSEY		

Sys: 04-CSAH
Route: 02000083 000+00.147

Severity:	PROPERTY DAMAGE	**First Event:**	ON ROADWAY
Road Type:	4_6 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	STOP SIGN OTHER
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	DRY	**Diagram:**	RIGHT ANGLE
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLOUDY	**Reliability:**	CONFIDENT
Weather 2:	CLOUDY	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	S	W	
Veh Act:	OVERTAKING/PASSING	STRAIGHT AHEAD	
Veh Type:	PASSENGER CAR	SPORT UNTILITY VEHICLE	
Age:	16	21	
Gender:	F	F	
Cond:	NORMAL	NORMAL	
Cont Fact	IMPROPER LANE	NO IMPROPER DRIVING	
Cont Fact	INEXPERIENCE	NO IMPROPER DRIVING	

Crash ID:	150060294	**Date:**	01/06/2015	**Time:**	1120
County:	ANOKA	**City:**	RAMSEY		

Sys: 05-MSAS
Route: 31480104 000+00.900

Severity:	PROPERTY DAMAGE	**First Event:**	OTHER
Road Type:	OTHER	**To Junction:**	TRF CIRCLE OR ROUNDABOUT
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	NOT APPLICABLE
Crash Type:	COLL W/LIGHT POLE	**Speed Limit:**	30
Surf Cond:	ICE/PACKED SNOW	**Diagram:**	HEAD ON
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	CLEAR	**Reliability:**	CONFIDENT
Weather 2:	CLEAR	**# of Vehicles:**	1.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	EAST		
Veh Act:	RIGHT TURN		
Veh Type:	PASSENGER CAR		
Age:	45		
Gender:	F		
Cond:	NORMAL		
Cont Fact	WEATHER		
Cont Fact	UNKNOWN		

Selection Filter:

WORK AREA: COUNTY_CODE('02') - FILTER: CRASH_YEAR('2010','2011','2012','2013','2014','2015') - SPATIAL FILTER APPLIED

Analyst:

Jeremy Melquist

Notes:

Crash Detail Report

Armstrong Blvd & Bunker Lake Blvd (2010-2015)

Report Version 1.0 March 2010

Crash ID:	140950029	**Date:**	04/04/2014	**Time:**	0832
County:	ANOKA	**City:**	RAMSEY		

Sys:	04-CSAH		
Route:	02000116	000+00.017	

Severity:	PROPERTY DAMAGE	**First Event:**	ON ROADWAY
Road Type:	2 LANES UNDIV 2_WAY	**To Junction:**	4-LEGGED INTERSECTION
Road Char:	STRAIGHT AND LEVEL	**Traffic Device:**	TRAFFIC SIGNALS
Crash Type:	COLL W/MV IN TRANSPORT	**Speed Limit:**	55
Surf Cond:	ICE/PACKED SNOW	**Diagram:**	REAR END
Light Cond:	DAYLIGHT	**Officer:**	
Weather 1:	SNOW	**Reliability:**	CONFIDENT
Weather 2:	NOT SPECIFIED	**# of Vehicles:**	2.00

	Unit 1	Unit 2	Unit 3
Trav Dir:	W	W	
Veh Act:	RIGHT TURN	RIGHT TURN	
Veh Type:	PASSENGER CAR	BUS (16+ SEATS)	
Age:	20	58	
Gender:	M	F	
Cond:	NORMAL	NORMAL	
Cont Fact	FAIL TO YIELD ROW	NO IMPROPER DRIVING	
Cont Fact	ILLEGAL SPEED	NOT SPECIFIED	

Selection Filter:

WORK AREA: COUNTY_CODE('02') - FILTER: CRASH_YEAR('2010','2011','2012','2013','2014','2015') - SPATIAL FILTER APPLIED

Analyst:

Jeremy Melquist

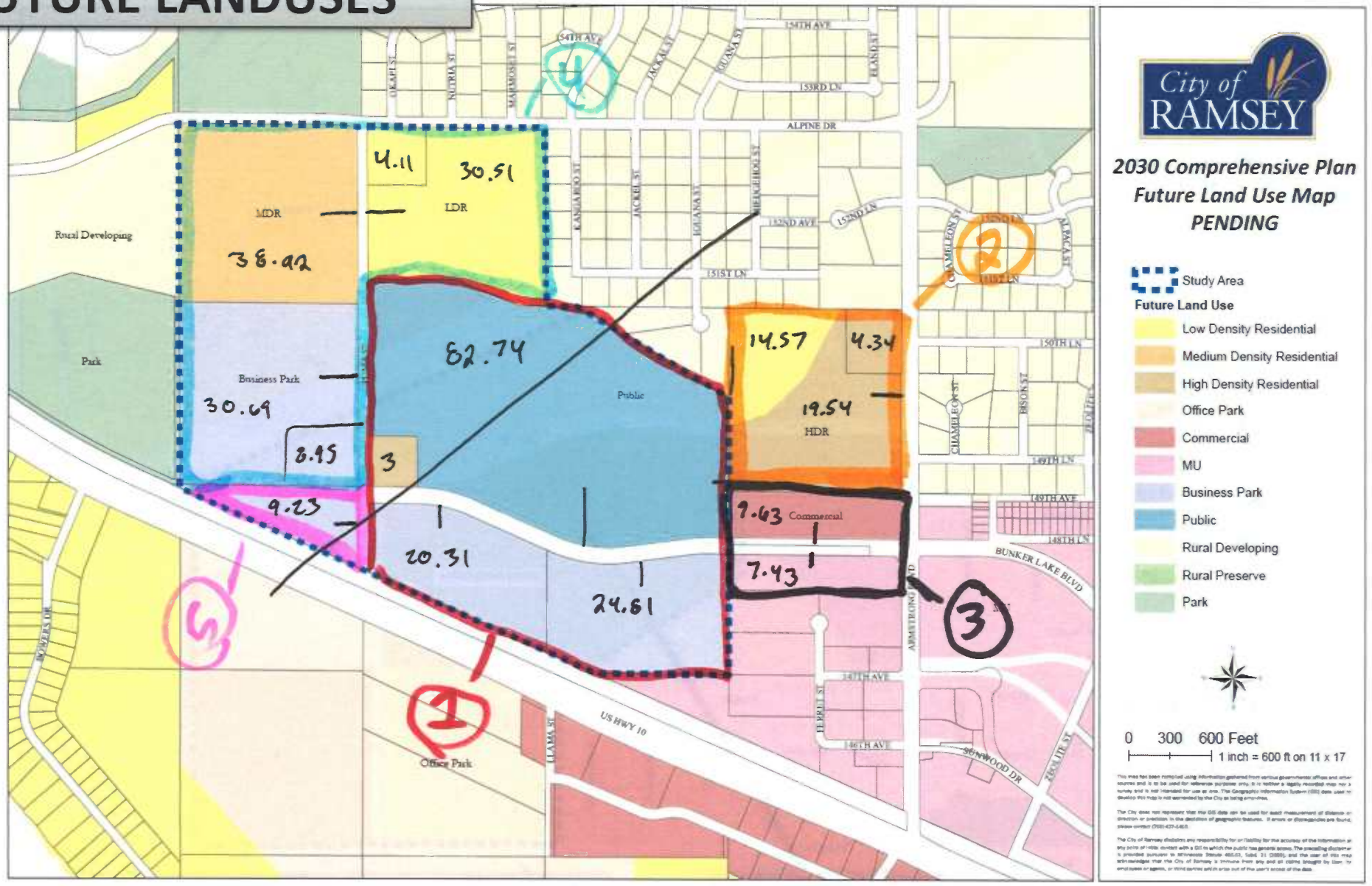
Notes:

APPENDIX D-

TRIP GENERATION FOR FUTURE BUSINESS PARK DEVELOPMENT

Appendix C PENDING

FUTURE LANDUSES



Ramsey EDA Traffic Assumptions
Zone 1 Alternative A: High School

High School		180 K ft²		ITE Code	530	Internal-to-Internal Reduction				Pass-by		New Trips	
	Based on Square Feet	86.42 Acres											
	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		entering	exiting	entering	exiting
AM	3.06	551	71	29	391	160	0%	392	160	0%	0	0	392	160
Afternoon	2.12	382	31	69	118	264	0%	119	264	0%	0	0	119	264
PM	0.97	175	54	46	95	81	0%	95	81	0%	0	0	95	81
Weekday	12.89	2321	50	50	1161	1161	0%	1161	1161	0%	0	0	1161	1161

Business Park		45.12 Acres		ITE Code	130	Internal-to-Internal Reduction				Pass-by		New Trips	
	Based on Acres												
	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		entering	exiting	entering	exiting
AM	8.55	386	83	17	320	66	10%	289	60	0%	0	0	289	60
Afternoon	4.42	200	50	50	100	100	10%	90	90	0%	0	0	90	90
PM	8.84	399	21	79	84	315	10%	76	284	0%	0	0	76	284
Weekday	63.11	2848	50	50	1424	1424	15%	1211	1211	0%	0	0	1211	1211

Ramsey EDA Traffic Assumptions
Zone 1 Alternative 1A: High School

					Pass-by		New Trips	
					entering	exiting	entering	exiting
AM	937	712	225	AM	0	0	681	220
Afternoon	582	218	364	Afternoon	0	0	209	354
PM	574	178	396	PM	0	0	171	365
Weekday	5169	2585	2585	Weekday	0	0	2372	2372

Ramsey EDA Traffic Assumptions

Zone 1 Alternative 1B: K-12 School

86.42 Acres

Elementary School — 50 K ft² — ITE Code 520 — Internal-to-Internal Reduction

Based on Square Feet

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	5.2	260	56	44	146	114	10%	132	103	0%	0	0	132	103
Afternoon	3.11	156	44	56	69	87	10%	62	79	0%	0	0	62	79
PM	1.21	61	45	55	27	34	10%	25	31	0%	0	0	25	31
Weekday	15.43	772	50	50	386	386	10%	348	348	0%	0	0	348	348

Middle School — 50 K ft² — ITE Code 522 — Internal-to-Internal Reduction

Based on Square Feet

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	4.35	218	55	45	120	98	10%	108	89	0%	0	0	108	89
Afternoon	2.52	126	45	55	57	69	10%	52	63	0%	0	0	52	63
PM	1.19	60	52	48	31	29	10%	29	26	0%	0	0	29	26
Weekday	13.78	689	50	50	345	345	10%	311	311	0%	0	0	311	311

High School — 80 K ft² — ITE Code 530 — Internal-to-Internal Reduction

Based on Square Feet

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	3.06	245	71	29	174	71	10%	157	64	0%	0	0	157	64
Afternoon	2.12	170	31	69	53	117	10%	48	106	0%	0	0	48	106
PM	0.97	78	54	46	42	36	10%	38	33	0%	0	0	38	33
Weekday	12.89	1032	50	50	516	516	10%	465	465	0%	0	0	465	465

Business Park — 45.12 Acres — ITE Code 130 — Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	386	83	17	320	66	10%	289	60	0%	0	0	289	60
Afternoon	4.42	200	50	50	100	100	10%	90	90	0%	0	0	90	90
PM	8.84	399	21	79	84	315	10%	76	284	0%	0	0	76	284
Weekday	63.11	2848	50	50	1424	1424	15%	1211	1211	0%	0	0	1211	1211

					Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	1109	760	349	AM	0	0	686	316
Afternoon	652	278	374	Afternoon	0	0	252	338
PM	598	185	413	PM	0	0	168	374
Weekday	5341	2671	2671	Weekday	0	0	2335	2335

Ramsey EDA Traffic Assumptions

Zone 1 Alternative 2: Business Park

Business Park		131.54 Acres			ITE Code	130	Internal-to-Internal Reduction				Pass-by		New Trips	
	Based on Acres													
	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		entering	exiting	entering	exiting
AM	8.55	1125	83	17	934	191	10%	841	173	0%	0	0	841	173
Afternoon	4.42	582	50	50	291	291	10%	262	262	0%	0	0	262	262
PM	8.84	1163	21	79	244	919	10%	220	827	0%	0	0	220	827
Weekday	63.11	8302	50	50	4151	4151	15%	3529	3529	0%	0	0	3529	3529

					Pass-by		New Trips	
					entering	exiting	entering	exiting
AM	1125		934	191	AM	0	0	841	173
Afternoon	582		291	291	Afternoon	0	0	262	262
PM	1163		244	919	PM	0	0	220	827
Weekday	8302		4151	4151	Weekday	0	0	3529	3529

Ramsey EDA Traffic Assumptions

Zone 1 Alternative 3: Low Density Residential

Single Family Detached Housing 260 units ITE Code 210 86.42 Acres

Based on Dwelling Units 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	192	25	75	48	144	48	144
Afternoon	0.51	0	31	69	0	0	0	0
PM	1.01	249	63	37	157	92	157	92
Weekday	9.57	2505	50	50	1253	1253	1253	1253

Business Park 45.12 Acres ITE Code 130 Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	386	83	17	320	66	10%	289	60	0%	0	0	289	60
Afternoon	4.42	200	50	50	100	100	10%	90	90	0%	0	0	90	90
PM	8.84	399	21	79	84	315	10%	76	284	0%	0	0	76	284
Weekday	63.11	2848	50	50	1424	1424	15%	1211	1211	0%	0	0	1211	1211

AM	578	368	210	
Afternoon	200	100	100	
PM	648	241	407	
Weekday	5353	2677	2677	

	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	0	0	337	204
Afternoon	0	0	90	90
PM	0	0	233	376
Weekday	0	0	2464	2464

Ramsey EDA Traffic Assumptions

Zone 2 off of Armstrong

Single Family Detached Housing 44 units ITE Code 210 14.57 Acres

Based on Dwelling Units 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting
AM	0.75	41	25	75	10	31
Afternoon	0.51	23	31	69	7	16
PM	1.01	51	63	37	32	19
Weekday	9.57	489	50	50	245	245

New Trips

entering	exiting
10	31
7	16
32	19
245	245

Low Rise Apartment 235 units ITE Code 221 19.54 Acres

Based on Dwelling Units 7 to 15 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting
AM	0.46	111	21	79	23	88
Afternoon	0.29	69	31	69	21	48
PM	0.58	144	65	35	94	50
Weekday	6.59	1591	50	50	796	796

Assume 12 Units per Acre

New Trips

entering	exiting
23	88
21	48
94	50
796	796

			Pass-by	
			entering	exiting
AM	152	34	118	AM
Afternoon	92	29	63	Afternoon
PM	195	126	69	PM
Weekday	2080	1040	1040	Weekday

New Trips	
entering	exiting
34	118
29	63
126	69
1040	1040

Ramsey EDA Traffic Assumptions

Zone 3: Off of Bunker Lake Blvd

Retail/Commercial		170.9 K ft^2			ITE Code	X	Internal-to-Internal Reduction				Pass-by		New Trips	
	Based on Square Feet		17.06 Acres											
	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		entering	exiting	entering	exiting
AM	7.41	1267	53	47	672	595	20%	538	477	46%	248	220	290	257
Afternoon	5.46	934	50	50	467	467	20%	374	374	40%	150	150	224	224
PM	10.91	1865	51	49	951	914	20%	761	732	39%	297	286	464	446
Weekday	124.59	21296	50	50	10648	10648	30%	7454	7454	39%	2908	2908	4546	4546

					Pass-by		New Trips	
					entering	exiting	entering	exiting
AM	1267	672	595	AM	248	220	290	257
Afternoon	934	467	467	Afternoon	150	150	224	224
PM	1865	951	914	PM	297	286	464	446
Weekday	21296	10648	10648	Weekday	2908	2908	4546	4546

Ramsey EDA Traffic Assumptions

Zone 4: Off of Puma St

Business Park — 39.64 Acres — ITE Code 130 — Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	339	83	17	281	58	10%	254	52	0%	0	0	254	52
Afternoon	4.42	176	50	50	88	88	10%	80	80	0%	0	0	80	80
PM	8.84	351	21	79	74	277	10%	67	250	0%	0	0	67	250
Weekday	63.11	2502	50	50	1251	1251	15%	1064	1064	0%	0	0	1064	1064

Single Family Detached Housing — 104 units — ITE Code 210 — 34.62 Acres — 3 Units per Acre

Based on Dwelling Units

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	83	25	75	21	62	21	62
Afternoon	0.51	53	31	69	16	37	16	37
PM	1.01	109	63	37	69	40	69	40
Weekday	9.57	1078	50	50	539	539	539	539

Residential Townhouse — 234 units — ITE Code 230 — 38.92 Acres — 3 to 7 Units per Acre — Assume 6 Units per Acre

Based on Dwelling Units

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.44	102	17	83	17	85	17	85
Afternoon	0.26	61	31	69	19	42	19	42
PM	0.52	121	67	33	81	40	81	40
Weekday	5.81	1348	50	50	674	674	674	674

				Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	524			319	205	AM	0	0	292	199
Afternoon	290			123	167	Afternoon	0	0	115	159
PM	581			223	358	PM	0	0	217	330
Weekday	4928			2464	2464	Weekday	0	0	2277	2277

Ramsey EDA Traffic Assumptions

Zone 5: Off of Ruma EB & NB (Split 50/50)

Business Park		9.23 Acres			ITE Code	130	Internal-to-Internal Reduction				Pass-by		New Trips	
	Based on Acres													
	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		entering	exiting	entering	exiting
AM	8.55	79	83	17	66	13	10%	60	13	0%	0	0	60	13
Afternoon	4.42	41	50	50	21	21	10%	19	19	0%	0	0	19	19
PM	8.84	82	21	79	17	65	10%	16	59	0%	0	0	16	59
Weekday	63.11	583	50	50	292	292	15%	248	248	0%	0	0	248	248

					Pass-by		New Trips	
					entering	exiting	entering	exiting
AM	79	66	13	AM	0	0	60	13
Afternoon	41	21	21	Afternoon	0	0	19	19
PM	82	17	65	PM	0	0	16	59
Weekday	583	292	292	Weekday	0	0	248	248

Ramsey EDA Traffic Assumptions

Alternative 1: High School

High School — 180 K ft² — ITE Code 530 — Internal-to-Internal Reduction

Based on Square Feet — 86.42 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	3.06	551	71	29	391	160	0%	392	160	0%	0	0	392	160
Afternoon	2.12	382	31	69	118	264	0%	119	264	0%	0	0	119	264
PM	0.97	175	54	46	95	81	0%	95	81	0%	0	0	95	81
Weekday	12.89	2321	50	50	1161	1161	0%	1161	1161	0%	0	0	1161	1161

Business Park — 93.99 Acres — ITE Code 130 — Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	804	83	17	667	137	10%	601	124	0%	0	0	601	124
Afternoon	4.42	416	50	50	208	208	10%	188	188	0%	0	0	188	188
PM	8.84	831	21	79	175	656	10%	158	591	0%	0	0	158	591
Weekday	63.11	5932	50	50	2966	2966	15%	2522	2522	0%	0	0	2522	2522

Retail/Commercial — 170.9 K ft² — ITE Code X — Internal-to-Internal Reduction

Based on Square Feet — 17.06 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	7.41	1267	53	47	672	595	20%	538	477	46%	248	220	290	257
Afternoon	5.46	934	50	50	467	467	20%	374	374	40%	150	150	224	224
PM	10.91	1865	51	49	951	914	20%	761	732	39%	297	286	464	446
Weekday	124.59	21296	50	50	10648	10648	30%	7454	7454	39%	2908	2908	4546	4546

Single Family Detached Housing — 104 units — ITE Code 210 — 34.62 Acres

Based on Dwelling Units — 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	83	25	75	21	62	21	62
Afternoon	0.51	53	31	69	16	37	16	37
PM	1.01	109	63	37	69	40	69	40
Weekday	9.57	1078	50	50	539	539	539	539

Single Family Detached Housing — 44 units — ITE Code 210 — 14.57 Acres

Based on Dwelling Units — 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	41	25	75	10	31	10	31
Afternoon	0.51	53	31	69	16	37	16	37
PM	1.01	51	63	37	32	19	32	19
Weekday	9.57	489	50	50	245	245	245	245

Residential Townhouse — 234 units — ITE Code 230 — 38.92 Acres

Based on Dwelling Units — 3 to 7 Units per Acre — Assume 6 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.44	102	17	83	17	85	17	85
Afternoon	0.26	61	31	69	19	42	19	42
PM	0.52	121	67	33	81	40	81	40
Weekday	5.81	1348	50	50	674	674	674	674

Low Rise Apartment — 235 units — ITE Code 221 — 19.54 Acres

Based on Dwelling Units — 7 to 15 Units per Acre — Assume 12 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.46	111	21	79	23	88	23	88
Afternoon	0.29	69	31	69	21	48	21	48
PM	0.58	144	65	35	94	50	94	50
Weekday	6.59	1591	50	50	796	796	796	796

	#	entering	exiting	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	2918	1791	1127	248	220	1355	806
Afternoon	1915	850	1065	150	150	604	839
PM	3245	1464	1782	297	286	992	1268
Weekday	33566	16783	16783	2908	2908	10482	10482

West of Commercial Area

	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	0	0	1031	431
Afternoon	0	0	342	531
PM	0	0	403	752
Weekday	0	0	4896	4896

Ramsey EDA Traffic Assumptions

Alternative 1B: K-12 School

86.42 Acres

Elementary School — 50 K ft² — ITE Code 520 — Internal-to-Internal Reduction

Based on Square Feet

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	5.2	260	56	44	146	114	10%	132	103	0%	0	0	132	103
Afternoon	3.11	156	44	56	69	87	10%	62	79	0%	0	0	62	79
PM	1.21	61	45	55	27	34	10%	25	31	0%	0	0	25	31
Weekday	15.43	772	50	50	386	386	10%	348	348	0%	0	0	348	348

Middle School — 50 K ft² — ITE Code 522 — Internal-to-Internal Reduction

Based on Square Feet

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	4.35	218	55	45	120	98	10%	108	89	0%	0	0	108	89
Afternoon	2.52	126	45	55	57	69	10%	52	63	0%	0	0	52	63
PM	1.19	60	52	48	31	29	10%	29	26	0%	0	0	29	26
Weekday	13.78	689	50	50	345	345	10%	311	311	0%	0	0	311	311

High School — 80 K ft² — ITE Code 530 — Internal-to-Internal Reduction

Based on Square Feet

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	3.06	245	71	29	174	71	10%	157	64	0%	0	0	157	64
Afternoon	2.12	170	31	69	53	117	10%	48	106	0%	0	0	48	106
PM	0.97	78	54	46	42	36	10%	38	33	0%	0	0	38	33
Weekday	12.89	1032	50	50	516	516	10%	465	465	0%	0	0	465	465

Business Park — 93.99 Acres — ITE Code 130 — Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	428	83	17	355	73	10%	320	66	0%	0	0	320	66
Afternoon	4.42	221	50	50	111	111	10%	100	100	0%	0	0	100	100
PM	8.84	442	21	79	93	349	10%	84	315	0%	0	0	84	315
Weekday	63.11	3156	50	50	1578	1578	15%	1342	1342	0%	0	0	1342	1342

Retail/Commercial — 170.9 K ft² — ITE Code X — Internal-to-Internal Reduction

Based on Square Feet — 17.06 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	7.41	1267	53	47	672	595	20%	538	477	46%	248	220	290	257
Afternoon	5.46	934	50	50	467	467	20%	374	374	40%	150	150	224	224
PM	10.91	1865	51	49	951	914	20%	761	732	39%	297	286	464	446
Weekday	124.59	21296	50	50	10648	10648	30%	7454	7454	39%	2908	2908	4546	4546

Single Family Detached Housing — 104 units — ITE Code 210 — 34.62 Acres

Based on Dwelling Units — 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	83	25	75	21	62	21	62
Afternoon	0.51	48	31	69	15	33	15	33
PM	1.01	109	63	37	69	40	69	40
Weekday	9.57	1078	50	50	539	539	539	539

Single Family Detached Housing — 44 units — ITE Code 210 — 14.57 Acres

Based on Dwelling Units — 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	41	25	75	10	31	10	31
Afternoon	0.51	48	31	69	15	33	15	33
PM	1.01	51	63	37	32	19	32	19
Weekday	9.57	489	50	50	245	245	245	245

Residential Townhouse — 234 units — ITE Code 230 — 38.92 Acres

Based on Dwelling Units — 3 to 7 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	Assume 6 Units per Acre	New Trips entering	New Trips exiting
AM	0.44	102	17	83	17	85		17	85
Afternoon	0.26	61	31	69	19	42		19	42
PM	0.52	121	67	33	81	40		81	40
Weekday	5.81	1348	50	50	674	674		674	674

Low Rise Apartment — 235 units — ITE Code 221 — 19.54 Acres

Based on Dwelling Units — 7 to 15 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	Assume 12 Units per Acre	New Trips entering	New Trips exiting
AM	0.46	111	21	79	23	88		23	88
Afternoon	0.29	69	31	69	21	48		21	48
PM	0.58	144	65	35	94	50		94	50
Weekday	6.59	1591	50	50	796	796		796	796

					Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	2714	1528	1186	AM	248	220	1079	844
Afternoon	1785	811	974	Afternoon	150	150	556	728
PM	2880	1388	1492	PM	297	286	915	1001
Weekday	30962	15481	15481	Weekday	2908	2908	9265	9265

West of Commercial Area

	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	0	0	755	469
Afternoon	0	0	296	423
PM	0	0	326	485
Weekday	0	0	3679	3679

Ramsey EDA Traffic Assumptions

Alternative 2: Business Park

High School 0 K ft² ITE Code 530 Internal-to-Internal Reduction

Based on Square Feet 0 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	3.06	0	71	29	0	0	0%	0	0	0%	0	0	0	0
Afternoon	2.12	0	31	69	0	0	0%	0	0	0%	0	0	0	0
PM	0.97	0	54	46	0	0	0%	0	0	0%	0	0	0	0
Weekday	12.89	0	50	50	0	0	0%	0	0	0%	0	0	0	0

Business Park 180.41 Acres ITE Code 130 Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	1543	83	17	1281	262	10%	1153	237	0%	0	0	1153	237
Afternoon	4.42	798	50	50	399	399	10%	360	360	0%	0	0	360	360
PM	8.84	1595	21	79	335	1260	10%	302	1135	0%	0	0	302	1135
Weekday	63.11	11386	50	50	5693	5693	15%	4840	4840	0%	0	0	4840	4840

Retail/Commercial 170.9 K ft² ITE Code X Internal-to-Internal Reduction

Based on Square Feet 17.06 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	7.41	1267	53	47	672	595	20%	538	477	46%	248	220	290	257
Afternoon	5.46	934	50	50	467	467	20%	374	374	40%	150	150	224	224
PM	10.91	1865	51	49	951	914	20%	761	732	39%	297	286	464	446
Weekday	124.59	21296	50	50	10648	10648	30%	7454	7454	39%	2908	2908	4546	4546

Single Family Detached Housing 104 units ITE Code 210 34.62 Acres

Based on Dwelling Units 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	83	25	75	21	62	21	62
Afternoon	0.51	53	31	69	16	37	16	37
PM	1.01	109	63	37	69	40	69	40
Weekday	9.57	1078	50	50	539	539	539	539

Single Family Detached Housing 44 units ITE Code 210 14.57 Acres

Based on Dwelling Units 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	41	25	75	10	31	10	31
Afternoon	0.51	53	31	69	16	37	16	37
PM	1.01	51	63	37	32	19	32	19
Weekday	9.57	489	50	50	245	245	245	245

Residential Townhouse 234 units ITE Code 230 38.92 Acres

Based on Dwelling Units 3 to 7 Units per Acre

Assume 6 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.44	102	17	83	17	85	17	85
Afternoon	0.26	61	31	69	19	42	19	42
PM	0.52	121	67	33	81	40	81	40
Weekday	5.81	1348	50	50	674	674	674	674

Low Rise Apartment 235 units ITE Code 221 19.54 Acres

Based on Dwelling Units 7 to 15 Units per Acre

Assume 12 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.46	111	21	79	23	88	23	88
Afternoon	0.29	69	31	69	21	48	21	48
PM	0.58	144	65	35	94	50	94	50
Weekday	6.59	1591	50	50	796	796	796	796

	#	entering	exiting	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	3106	2014	1092	248	220	1515	759
Afternoon	1915	923	992	150	150	657	747
PM	3834	1529	2305	297	286	1041	1731
Weekday	36699	18350	18350	2908	2908	11639	11639

West of Commercial Area

	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	0	0	1191	384
Afternoon	0	0	395	439
PM	0	0	452	1215
Weekday	0	0	6053	6053

Ramsey EDA Traffic Assumptions

Alternative 3: Low Density Residential

High School 0 K ft² ITE Code 530 Internal-to-Internal Reduction

Based on Square Feet 0 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	3.06	0	71	29	0	0	0%	0	0	0%	0	0	0	0
Afternoon	2.12	0	31	69	0	0	0%	0	0	0%	0	0	0	0
PM	0.97	0	54	46	0	0	0%	0	0	0%	0	0	0	0
Weekday	12.89	0	50	50	0	0	0%	0	0	0%	0	0	0	0

Business Park 93.99 Acres ITE Code 130 Internal-to-Internal Reduction

Based on Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	8.55	804	83	17	667	137	10%	601	124	0%	0	0	601	124
Afternoon	4.42	416	50	50	208	208	10%	188	188	0%	0	0	188	188
PM	8.84	831	21	79	175	656	10%	158	591	0%	0	0	158	591
Weekday	63.11	5932	50	50	2966	2966	15%	2522	2522	0%	0	0	2522	2522

Retail/Commercial 170.9 K ft² ITE Code X Internal-to-Internal Reduction

Based on Square Feet 17.06 Acres

	Average Rate	#	% enter	% exit	entering	exiting		entering	exiting		Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	7.41	1267	53	47	672	595	20%	538	477	46%	248	220	290	257
Afternoon	5.46	934	50	50	467	467	20%	374	374	40%	150	150	224	224
PM	10.91	1865	51	49	951	914	20%	761	732	39%	297	286	464	446
Weekday	124.59	21296	50	50	10648	10648	30%	7454	7454	39%	2908	2908	4546	4546

Single Family Detached Housing 364 units ITE Code 210 121.04 Acres

Based on Dwelling Units 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	265	25	75	66	199	66	199
Afternoon	0.51	184	31	69	57	127	57	127
PM	1.01	337	63	37	212	125	212	125
Weekday	9.57	3414	50	50	1707	1707	1707	1707

Single Family Detached Housing 44 units ITE Code 210 14.57 Acres

Based on Dwelling Units 3 Units per Acre

	rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.75	41	25	75	10	31	10	31
Afternoon	0.51	184	31	69	57	127	57	127
PM	1.01	51	63	37	32	19	32	19
Weekday	9.57	489	50	50	245	245	245	245

Residential Townhouse 234 units ITE Code 230 38.92 Acres

Based on Dwelling Units 3 to 7 Units per Acre

Assume 6 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.44	102	17	83	17	85	17	85
Afternoon	0.26	61	31	69	19	42	19	42
PM	0.52	121	67	33	81	40	81	40
Weekday	5.81	1348	50	50	674	674	674	674

Low Rise Apartment 235 units ITE Code 221 19.54 Acres

Based on Dwelling Units 7 to 15 Units per Acre

Assume 12 Units per Acre

	Average Rate	#	% enter	% exit	entering	exiting	New Trips entering	New Trips exiting
AM	0.46	111	21	79	23	88	23	88
Afternoon	0.29	69	31	69	21	48	21	48
PM	0.58	144	65	35	94	50	94	50
Weekday	6.59	1591	50	50	796	796	796	796

	#	entering	exiting	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	2549	1446	1103	248	220	1008	783
Afternoon	1664	772	892	150	150	566	756
PM	3298	1513	1785	297	286	1041	1271
Weekday	33581	16791	16791	2908	2908	10489	10489

West of Commercial Area

	Pass-by entering	Pass-by exiting	New Trips entering	New Trips exiting
AM	0	0	685	407
Afternoon	0	0	264	357
PM	0	0	451	756
Weekday	0	0	4903	4903

APPENDIX E-

TRIP GENERATION FOR COR DEVELOPMENT

City of RAMSEY

NORTH

0 125 250

LANDFORM

From Site to Finish

EXHIBIT 5
TAZ MAP

05.21.2012

Table 1 - Land Uses and Traffic Generation

							AM Peak			PM Peak			Daily
Zone/Block	Code	Land Use	Dwelling Units	Sq. ft.	Park Area[1] (sq. ft.)	ITE Code[2]	Total	In	Out	Total	In	Out	Total
1a	3	Retail		11,882		820	10	6	4	35	17	18	408
1b	3	Retail		9,022		820	7	4	3	27	13	14	310
1c	3	Supermarket		62,396		850	179	109	70	524	267	257	5103
1d	3	Retail		13,283		820	11	6	4	40	19	20	456
1e	3	Retail		7,300		820	6	4	2	22	11	11	251
2a	3	Retail		5,248		820	4	3	2	16	8	8	180
2b	3	Retail		39,000		820	31	19	12	116	57	59	1340
2c	2	Daycare Center		10,320		565	101	54	48	103	48	55	654
2d	1	Senior Housing - Assisted Living	84			254	9	6	3	15	7	8	179
3a	1	Luxury Apartments / Townhomes	230			220	94	19	75	114	74	40	1224
3a	3	Retail		67,085		820	54	33	21	200	98	102	2305
3b	2	Government Office Building		49,107		730	231	194	37	48	15	33	2708
3c	0	Park & Ride (Northstar)[3]											
4a	2	Clinic		50,092		720	92	73	19	139	37	101	1448
4b	3	Sit Down Restaurant		9,037		931	6	3	3	54	36	18	650
4c	3	Hotel[4]		24,900		310	14	9	6	15	8	7	209
4d	2	Office Park		110,000		770	136	120	16	131	22	109	969
5a	2	Mortuary[5]		17,598		710	3	2	1	17	6	11	139
5b	2	Business Park		93,871		770	107	90	17	97	22	75	958
6a	2	Office Park		44,827		770	56	49	7	53	9	44	395
6b	3	Retail		13,070		820	10	6	4	39	19	20	449
6c	2	General Office		17,987		710	22	20	3	21	4	18	158
6d	2	General Office		17,987		710	22	20	3	21	4	18	158
7a	2	Charter School[6]		50,511		534	468	258	211	264	129	135	1405
7b	2	Medical Office		33,374		720	61	49	13	92	25	67	965
7c	3	Retail		24,780		820	20	12	8	74	36	38	851
8a	0	City Park w/ Lake			430,000								
8b	2	General Office		43,584		710	54	48	6	52	9	43	384
8c	2	General Office		43,584		710	54	48	6	52	9	43	384
9a	0	City Park w/ Lake			171,445								
9b	1	Apartments	95			220	39	8	31	47	31	16	505
9c	1	Apartments	200			220	82	16	65	99	64	35	1064
9d	2	General Office		59,696		710	74	65	9	71	12	59	526
9e	2	General Office		42,765		710	53	47	6	51	9	42	377
9f	2	General Office		59,208		710	73	65	9	71	12	59	522
10a	2	General Office		8,400		710	10	9	1	10	2	8	74
10a	1	Apartments	20			220	8	2	7	10	6	3	106
10b	2	General Office		8,400		710	10	9	1	10	2	8	74
10b	3	Specialty Retail		4,200		820	3	2	1	13	6	6	144
10b	1	Apartments	30			220	12	2	10	15	10	5	160
10c	1	Apartments - Senior	90			220	9	3	6	12	7	5	251
10c	1	Apartments	90			220	37	7	29	45	29	16	479
10d	2	General Office		11,500		710	14	13	2	14	2	11	101
10d	3	Specialty Retail		11,500		820	9	6	4	34	17	18	395
10e	2	General Office		8,500		710	11	9	1	10	2	8	75
10e	3	Specialty Retail		4,250		820	3	2	1	13	6	6	146
10f	2	General Office		11,900		710	15	13	2	14	2	12	105
10f	3	Specialty Retail		8,500		820	7	4	3	25	12	13	292
10f	1	Apartments	14			220	6	1	5	7	5	2	74
10g	3	Specialty Retail		7,600		820	6	4	2	23	11	12	261
10g	2	General Office		7,600		710	9	8	1	9	2	8	67
10g	1	Apartments	36			220	15	3	12	18	12	6	192
10h	3	Specialty Retail		6,300		820	5	3	2	19	9	10	216
10i	3	Specialty Retail		6,100		820	5	3	2	18	9	9	210
10i	2	General Office		6,100		710	8	7	1	7	1	6	54
10i	1	Apartments	26			220	11	2	8	13	8	5	138
11a	3	Specialty Retail		17,000		820	14	8	5	51	25	26	584
11a	1	Apartments	118			220	48	10	39	59	38	20	628
11b	2	General Office		11,000		710	14	12	2	13	2	11	97
11b	1	Apartments	26			220	11	2	8	13	8	5	138
11c	2	General Office		20,700		710	26	23	3	25	4	20	182
11c	1	Apartments	50			220	20	4	16	25	16	9	266
11d	2	General Office		10,700		710	13	12	2	13	2	11	94
11d	3	Specialty Retail		10,700		820	9	5	3	32	16	16	368
11d	1	Apartments	26			220	11	2	8	13	8	5	138
11e	2	General Office		5,900		710	7	6	1	7	1	6	52
11e	3	Specialty Retail		11,800		820	9	6	4	35	17	18	405
11e	1	Apartments	44			220	18	4	14	22	14	8	234
11f	3	Specialty Retail		11,800		820	9	6	4	35	17	18	405
11f	2	General Office		5,900		710	7	6	1	7	1	6	52
11f	1	Apartments	44			220	18	4	14	22	14	8	234
11g	0	City Park			82,804								
12a	3	Sit Down Restaurant		12,000		931	8	4	4	72	48	24	864
12b	3	Community Center		160,000		310	207	126	81	186	69	117	2929
13a	3	Retail		19,200		820	15	9	6	57	28	29	660
13b	3	Retail		16,664		820	13	8	5	50	24	25	572
14a	3	Gas Station w/Convenience Store[7]		5,000		945	317	162	155	388	194	194	1563
14b	3	Retail		10,628		820	9	5	3	32	16	16	365

Table 1 - Land Uses and Traffic Generation

							AM Peak			PM Peak			Daily
Zone/Block	Code	Land Use	Dwelling Units	Sq. ft.	Park Area[1] (sq. ft.)	ITE Code[2]	Total	In	Out	Total	In	Out	Total
14c	3	Fast Food Restaurant w/Drive-Through		4,800		**934**	**190**	**97**	**93**	**129**	**67**	**62**	**1905**
15	3	Shopping Center		135,986		**820**	**109**	**66**	**42**	**406**	**199**	**207**	**4671**
16	3	Retail		94,960		**820**	**76**	**46**	**30**	**283**	**139**	**145**	**3262**
17a	3	Sit Down Restaurant		6,000		**931**	**4**	**2**	**2**	**36**	**24**	**12**	**432**
17b	3	Sit Down Restaurant		5,470		**931**	**4**	**2**	**2**	**33**	**22**	**11**	**394**
17c	3	Sit Down Restaurant		5,470		**931**	**4**	**2**	**2**	**33**	**22**	**11**	**394**
17d	0	City Park w/ Lake			480,000								
18a	1	Condos	80			**230**	**28**	**5**	**23**	**33**	**22**	**11**	**372**
18b	1	Condos	69			**230**	**24**	**4**	**20**	**29**	**19**	**9**	**321**
18c	1	Condos	48			**230**	**17**	**3**	**14**	**20**	**13**	**7**	**223**
18d	1	Townhomes	32			**230**	**11**	**2**	**9**	**13**	**9**	**4**	**149**
19a	1	Townhomes	52			**230**	**18**	**3**	**15**	**22**	**14**	**7**	**242**
19b	1	Single Family - Detached	14			**210**	**8**	**2**	**6**	**11**	**7**	**4**	**107**
19c	1	Townhomes	31			**230**	**11**	**2**	**9**	**13**	**9**	**4**	**144**
20a	1	Townhomes	42			**230**	**15**	**3**	**12**	**17**	**12**	**6**	**195**
20b	1	Single Family - Detached	14			**210**	**8**	**2**	**6**	**11**	**7**	**4**	**107**
20c	1	Townhomes	28			**230**	**10**	**2**	**8**	**12**	**8**	**4**	**130**
21a	1	Townhomes	77			**230**	**27**	**5**	**22**	**32**	**21**	**11**	**358**
21b	1	Townhomes	90			**230**	**32**	**5**	**26**	**37**	**25**	**12**	**418**
22a	1	Single Family - Detached	23			**210**	**14**	**3**	**10**	**19**	**12**	**7**	**176**
22b	1	Townhomes	72			**230**	**25**	**4**	**21**	**30**	**20**	**10**	**335**
23a	1	Single Family - Detached	44			**210**	**26**	**7**	**20**	**36**	**22**	**13**	**337**
23b	1	Single Family - Detached	19			**210**	**11**	**3**	**9**	**15**	**10**	**6**	**145**
24a	1	Single Family - Detached	7			**210**	**4**	**1**	**3**	**6**	**4**	**2**	**54**
24b	0	City Park w/ Lake & Amphitheater			320,000								
24c	1	Single Family - Detached	17			**210**	**10**	**3**	**8**	**14**	**9**	**5**	**130**
Total			1,982	1,724,042	1,484,249		3,889	2,272	1,618	5,502	2,578	2,924	57,079

Residential Total (Code 1)	1,982	0			748	153	595	916	595	322	9,953
Office Total (Code 2)	0	861,111			1,755	1,326	429	1,422	395	1,027	13,177
Retail Total (Code 3)	0	862,931			1,386	792	594	3,164	1,588	1,576	33,949
	1,982	1,724,042			3,889	2,272	1,618	5,502	2,578	2,924	57,079

Notes:

[1] Due to the minimal amount of traffic generated by parks, they were not considered traffic generators in the original study. Likewise, parks are not considered traffic generators in this forecast.

[2] The trip generation was based on the methods and average rates published in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition*.

[3] The traffic generated by the park and ride was included in the analysis of the original study, however the unspecified volumes were added directly to the intersection traffic assignment instead of being listed with the other trip generation numbers. Accordingly, the traffic volumes generated by the park and ride facitiliy are not considered with the rest of the generated traffic in this forecast.

[4] The number of dwelling units (DU) for the hotel was obtained by proportioning the proposed hotel to the hotel in the original study via the their respective footprints. The hotel was modeled as having 32 rooms.

[5] Mortuary is assumed to operate similarly to a cemetary with 3 employees (ITE Land Use Code 566).

[6] Currently, there is no data for daily traffic volumes generated by 534 - Private School (K-8). For public elementary, junior high, and high schools, the ratio of the total daily traffic to the A.M. peak hour traffic is approximately 3.0. The total daily traffic generated by the charter school was calculated by multiplying the A.M. peak hour traffic by a factor of 3.0.

[7] Due to the lack of data for total weekday trips generated by 945 - Gas Station w/Convenience Store using square footage, the total weekday trips were calculated using the number of fueling positions. Based on the typical size of gas stations currently being constructed, it was assumed that new gas station will have 12 fueling positions.

The forecasts reflect a 20% internal capture rate consistent with the original AUAR's traffic impact study.

APPENDIX F-

OPERATIONS ANALYSIS (AVAILABLE UPON REQUEST)

- Civil & Municipal Engineering
- Water & Wastewater Treatment
- Transportation Planning & Engineering Services
- Aviation Services
- Water Resources Engineering
- Landscape Architecture
- Environmental Review Services
- Cultural Resource Management
- Land Surveying
- Geographic Information System Services
- Project Funding & Financing

www.bolton-menk.com

APPENDIX C-

STORM WATER ANALYSIS

BOLTON & MENK, INC.
Consulting Engineers & Surveyors
2035 County Road D East • Suite B • Maplewood, MN 55109-5314
Phone (651) 704-9970 • Fax (651) 704-9971
www.bolton-menk.com

June 25, 2015

Patrick Brama
Economic Development Manager
City of Ramsey
7550 Sunwood Drive NW
Ramsey, Minnesota 550303

RE: Future Business Park
City of Ramsey
Project No.: R16.109828

Dear Mr. Brama,

Project Background

The city of Ramsey is considering the area west of Armstrong Boulevard, East of Plum Street, north of T.H. 10 and south of Alpine Drive, for future development. Storm water retention ponds will ultimately be required to control the runoff from the study area into the COR in accordance with the City's Surface Water Management Plan requirements. The following report summarizes the existing conditions and proposed pond layout options.

The site is situated in the Lower Rum River WMO (LRRWMO). Therefore, hydraulics, water quality, rate control, and volume reduction will be considered based on WMO and City requires. For the purposes of this study, preliminary regional stormwater management facilities were design based on assumed land uses and specific design requirements defined by LRRWMO.

Hydrologic and Hydraulic Modeling

For this study, Bolton & Menk analyzed the existing and proposed conditions using Storm and Sanitary Analysis (SSA) developed by Autodesk, Inc. which utilizes NRCS TR-20 hydrology methodologies to hydrodynamically route stormwater through the drainage system. For this study, the 2-year, 10-year, and 100-year rainfall return intervals were analyzed using Atlas 14 rainfall depths and the US Soils Conservation Services (SCS) Type II 24-hour standard rainfall distribution. The corresponding rainfall depths are 2.86", 4.26", and 7.11", respectively. Modeling for future development was tied into existing regional modeling provided by the city.

Existing Conditions

Drainage from the Lake Itasca outfall is directed toward the study area upstream of Alpine Dr. Overland flow passes through a series of culverts under Alpine Dr., Puma St. NW, and Armstrong Blvd. Flow at the Armstrong crossing is particularly critical as discharge enters the COR area. New development and stormwater management has been designed and constructed around the total contributing flow rate from

the areas upstream of Armstrong Blvd.

It is our understanding that a storm sewer system installed in Bunker Lake Boulevard to manage the stormwater runoff within the right of way.

The City's regional hydrology and hydraulics model for the WMISS watershed was utilized to develop the existing peak flow rates into the COR area. Table 1 summarizes the peak inflow for a variety of rainfall return intervals.

Table 1: Summary of Peak Flow Under Armstrong Blvd.

Rainfall Event	Rainfall Depth (in)	Peak Flow Through Armstrong Blvd. (crfs)
2-Year	2.86	10.1
10-Year	4.26	19.1
100-Year	7.1	22.1

Proposed Conditions

The study area can was delineated three main areas based on land use as defined in Figure 1. These areas are further described below.

Potential regional pond locations were identified (Figure 1). Initially, ponds are assumed to be wet basins with dead storage sized equal to the runoff volume from a 2.5" rainfall event per LRRWMO. Therefore, volume reduction and water quality would be accommodated on site by the developer. These parameters may be changed as final land uses are established and as stormwater management goals are confirmed. For example:

- The basins could be converted to dry ponds and accommodate volume control.
- Ground water elevations should be confirmed to ensure that 3' separation from the water table can be achieved.
- The basins may be used as regional rate control, water quality, and volume reduction thereby eliminating the need for additional stormwater management on site.

Area 1: Public/Quasi-Public Area

This area is defined as Public/Quasi-Public. Currently, the site has been proposed to house the Legacy Christian Academy campus. However, development may change. Therefore we have determined the total inflow and approximate sizing requirements per Lower Rum River WMO (LRRWMO) for each assumed rate of impervious area construction including the school site, single family residential, and employment district. Table 2 summarizes required dead storage and volume reduction for each land use option based on LRRWMO requirements.

Suggested areas for ponding include the northwest corner of the site, and the existing pond on the

southeast portion of the site. If development plans change, these ponds can easily be relocated. Also, sizing requirements may change if the area becomes multi-use.

Table 2: Summary of Pond Volume Requirements for Multiple Uses in the Public/Quasi-Public Area.

Future Land Use	Assumed Impervious Area (ac)	Dead Storage (ft^3)	1" Volume (ft^3)
School	40.5	500339	146979
Residential	34.2	434558	124110
Employment District	76.5	632759	277586

Area 2: Residential Area

North of the 150th Ln NW and on both east and west sides of Puma Street, the land use is proposed as single family residential. East of Puma, the proposed site is approximately 49 acres of which about 38% will be impervious. Pond volume requirements for dead storage and volume reduction are, 88,200 cubic feet and 67,590 cubic feet respectively. Proposed ponding for this site is in the south west corner of the proposed development.

West of Puma, the proposed site is approximately 47 acres of which about 38% will be impervious. Pond volume requirements for dead and live storage are, 84,600 cubic feet and 64,832 cubic feet respectively.

The proposed area for ponding is in the southeast corner of the site. The proposed ponds would overflow into the existing wetland, maintaining the existing flow paths through the downstream corridor.

Employment District Area (Area 3)

South of 150th Ln NW and west of Puma Street, the city is proposing to use this land for future industrial/commercial development. This area totals 51 acres, of which 85% will be new impervious, resulting in pond volumes of 91,800 cubic feet for dead storage and 157,361 cubic feet for volume reduction.

South of Bunker Lake Boulevard, the city plans to use the 79 acres for further commercial/industrial development, 85% of which will be new impervious area. This will require 142,400 cubic feet and 243,210 cubic feet of dead storage and volume reduction, respectively. Drainage from this area will ultimately connect into the storm sewer system along Bunker Lake and discharge into the pond in the southeast corner of the school property.

Recommendations

The ponds as laid out in this report indicate areas that are best suited for regional rate control basins only. It is recommended that additional design parameters and regional stormwater management planning be further refined as the areas begin to develop. These may include the following.

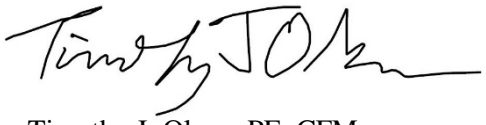
- Create regional facilities that accommodate rate control, water quality, and volume reduction and assess property owners to alleviate the City's upfront investment.
- Develop drainage and utility easements for the required pond foot print for ultimate build-out and require the developer to increase the size of the basin based on a percentage of developed area and/or impervious surface.
- Establish maximum rates of impervious surface construction per land use. Anything above those rates would have to accommodate rate control, water quality, and volume reduction on site.
- Trunk storm sewer lines should also be preliminarily sized to serve future development, routed to regional pond locations, and dedicated to drainage and utility easement.

Cost estimates have not been developed for the regional pond construction or internal site storm sewer conveyance. It is anticipated that costs associated with pond construction will be determined by the developer as site grading. Also, it is assumed that internal drainage will be accommodated by dry swales and ditch systems to reduce storm sewer costs.

We appreciate the opportunity to present this preliminary report of findings. If you have any questions, please contact me at 651-704-9970 or timol@bolton-menk.com at your convenience.

Sincerely,

BOLTON & MENK, INC.



Timothy J. Olson, PE, CFM
Water Resources Project Manager