2.0 METHODOLOGY AND ASSUMPTIONS

This section discusses the methodology and assumptions used to evaluate the traffic impacts associated with the proposed project. The general process for evaluating traffic is described in the following sections, including:

- Other planned development parcels within the study area
- Years for analysis and study scenarios
- Time periods studied
- Data collection of existing traffic volumes, roadway characteristics and intersection signal timings
- Proposed project phasing
- Development of the traffic generation forecasts
- Traffic operation analysis procedures

The analysis approach for the Empire Township TIS was to evaluate the existing conditions to develop a base condition for determining the impact of future land use development on the traffic network within the proposed Mining Area. The analysis considered planned development surrounding the Mining Area, as well as predicted number of mining trucks entering the Mining Area traffic network as a result of future mining. This was included to obtain forecast conditions for analysis and comparison. Deficiencies in the network were identified; and effective and feasible measures to improve traffic conditions were evaluated.

2.1 Planned Development Parcels

In addition to the proposed mining project, several future residential developments are planned. Many of these developments have undergone independent environmental review and can be expected to begin construction in the next several years. Four neighboring development parcels were included in the TIS due to their proximity to the proposed project and the expected cumulative traffic impacts that could result. **Figure 2-1** illustrates the four development parcels in relation to the proposed project boundaries.

The four planned development parcels include:

1. Farmington Seed/Genstar Residential Development (Genstar). Genstar is located on the west side of TH 3, south of the proposed Mining Area. This site is 781 acres and proposes 3,896 single and multi-family housing units and 248,000 SF of commercial space.
2. Heritage Residential Development (Heritage). Heritage is located south of the proposed Mining Area, on the east side of TH 3, across from Genstar. This site is 154 acres and proposes 329 single and multi-family housing units and 44,000 SF of commercial space.
3. Brandtjen Farm/Nordic Square Residential Development (Brandtjen). Brandtjen is located west of the Mining Area, bounded by Pilot Knob, 160th Street, Diamond Path and 170th Street. This site encompasses approximately

one square mile and proposes 2,109 single and multi-family housing units and 150,000 SF of commercial space.

4. Cobblestone Lake Residential Development (Cobblestone). Cobblestone is located immediately north of Brandtjen, on the northeast quadrant of the 160th Street/Pilot Knob Road intersection, bounded by Dodd Boulevard, Pilot Knob Road and Diamond Path. This site proposes 3,000 single and multi-family housing units and 300,000 SF of commercial space.

2.2 Study Years and Analysis Scenarios

The 20 key intersections (Table 1-1) were analyzed under four scenarios. The scenarios evaluated were chosen to specifically define or quantify the impact due to the proposed project. In order to make this determination, a comparison between background traffic only, the mining truck contribution and the four planned land developments' traffic contributions needed to be quantified. Therefore, the conditions identifying 'background growth only' do not include the four planned future developments. This allows for a direct comparison of the mining impact versus other development impact. The four scenarios include:

1. *Year 2004 Existing Conditions*

   Scenario 1 included analysis of the Year 2004 existing conditions.

2. *Year 2005 Forecast Conditions*

   Scenario 2 included an analysis of the forecast Year 2005 conditions. Two separate conditions were evaluated:

   - Year 2005 No-Build (background traffic growth only – does not include planned future developments).
   - Year 2005 Build (mining operation plus background traffic growth).

   The existing mining companies are expected to continue producing exports under the No-Build scenario. Later sections will present the assumptions and the expected material quantities for the Year 2005.

3. *Year 2015 Forecast Conditions*

   Scenario 3 included an analysis of the forecast Year 2015 conditions. Three separate conditions were evaluated:

   - Year 2015 No-Build (background traffic growth only – does not include planned future residential developments).
   - Year 2015 No-Build (background traffic growth plus the four planned future residential developments).

- Year 2015 Build (mining operation plus background traffic growth plus the four planned future residential developments).

The existing mining companies are expected to continue producing exports under the two No-Build scenarios. Later sections will present the assumptions and the expected material quantities for the Year 2015.

Again, the planned development parcels included in the analysis are the Genstar, Heritage, Brandtjen and Cobblestone residential developments. Subsequent sections will discuss traffic considerations for these four future developments in greater detail.

4. *Year 2025 Forecast Conditions*

Scenario 4 included an analysis of the forecast Year 2025 conditions. Similar to Scenario 3, Scenario 4 evaluated three separate conditions:

- Year 2025 No-Build (background traffic growth only – does not include planned future residential developments).
- Year 2025 No-Build (background traffic growth plus the four planned future residential developments).
- Year 2025 Build (Mining Operation plus background traffic growth plus the four planned future residential developments).

The mining companies are expected to continue producing exports under the two No-Build scenarios. Later sections will present the assumptions and the expected material quantities for the Year 2025.

2.3 Analysis Time Periods

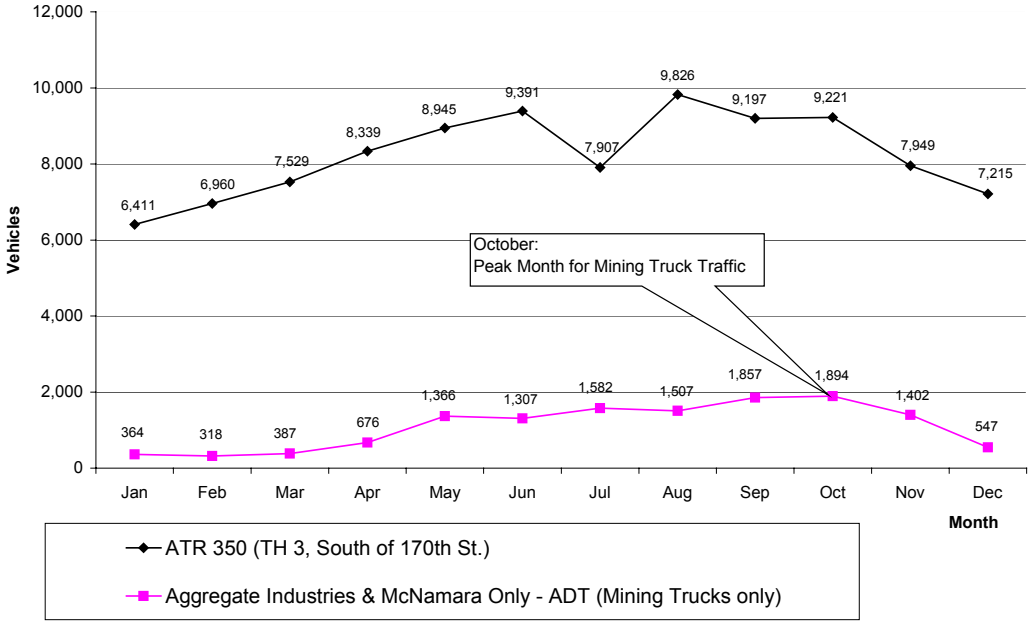
The TIS evaluated the worst-case AM and PM peak hour for each intersection. As can be expected, the peak hour for mining traffic does not necessarily correspond to the peak hour for background traffic. Furthermore, traffic volumes vary for both mining and background vehicles according to time of year, which also do not correspond. This variation was considered to ensure a worst-case and realistic analysis. The following considerations were made:

- Mining company seasonal (monthly) truck volume characteristics
- Roadway background traffic seasonal (monthly) volume characteristics
- Daily, hourly volume trends for background traffic
- Daily, hourly volume trends for mining operation traffic

2.3.1. Seasonal Adjustments

Seasonal data was obtained from both Mn/DOT and the mining operators. Data was acquired from Mn/DOT's Automatic Traffic Recorder (ATR), station 350, to compare the average monthly traffic volumes. Aggregate Industries and McNamara provided raw monthly truck counts for their facilities. **Table 2-1** presents this data and identifies the peak month for the mining operation traffic.

Table 2 - 1. Background Traffic and Mining Truck Traffic Seasonal Trends



Note:
1. Average Monthly-Mining Truck Traffic provided by A.I. and McNamara. A.I. And McNamara are considered indicative of the other mining operations.
   Monthly divided by 22 days to obtain ADT
2. ADT Seasonal Adjustment Factors Determined from:
   Station 350, TH 3, South of 170th St. in Farmington, DAKOTA County, Metro District.
   Minnesota Department of Transportation (Mn/DOT)
   Summary of Continuous Count Station Data (ATRs) for the Year 2000.
   Comparison Report of Average Monthly Volumes

The data represented in **Table 2-1**, obtained from ATR station 350, was only used to develop seasonal factors. The seasonal factors were used to eliminate seasonal volume variations from traffic data collected in different months, resulting in an annual average background traffic volume used in the analyses. **Table 2-2** presents the corresponding seasonal adjustment factors used to in the TIS to develop average annual background traffic volumes.

The monthly traffic volumes obtained from ATR station 350 indicates a dip in traffic levels during the month of July. Typically, traffic volumes during the month of July are similar to June and August. However, this trend was observed during both 1999 and 2000, the only two years where monthly traffic data was available. Although this traffic study used the raw ATR data to develop the monthly seasonal factors shown in **Table 2-2**, an evaluation assessing the sensitivity of the seasonal adjustment factors was completed. The purpose of this

evaluation was to determine whether adjusting the July volume to a more typical level would change the results of the traffic analysis and mitigation measures, presented later in this report. The results of this sensitivity analysis indicated that there would be no change in mitigation measures required as part of the proposed Mining Area. However, the analysis did indicate that a few of the improvement measures (required to accommodate the other planned developments) suggested for the year 2025 scenario may in fact be required under the forecast 2015 scenario.

Table 2 - 2. Background Traffic Seasonal Factors

	Month					
	January	**February**	**March**	**April**	**May**	**June**
Background Roadway Traffic	1.231	1.155	1.048	0.957	0.856	0.836
	Month					
	July	**August**	**September**	**October**	**November**	**December**
Background Roadway Traffic	1.090	0.782	0.859	0.857	1.042	1.150

Source:
Station 350, TH 3, S of CSAH 58 in Farmington, DAKOTA County, Metro District.
Minnesota Department of Transportation (Mn/DOT)
Summary of Continuous Count Station Data (ATRs) for the Year 2001
Comparison Report of Average Monthly Volumes

Table 2-3 presents the seasonal export percentage for the mining companies. The percentage represents how much of the yearly export is completed in the respective month.

Table 2 - 3. Mining Company Seasonal Percentages

	Month					
	January	**February**	**March**	**April**	**May**	**June**
Percent of Total Yearly Exports	2.75%	2.41%	2.93%	5.11%	10.35%	9.90%
	Month					
	July	**August**	**September**	**October**	**November**	**December**
Percent of Total Yearly Exports	11.98%	11.41%	14.06%	14.34%	10.62%	4.14%

Source:
A.I. And McNamara mining companies

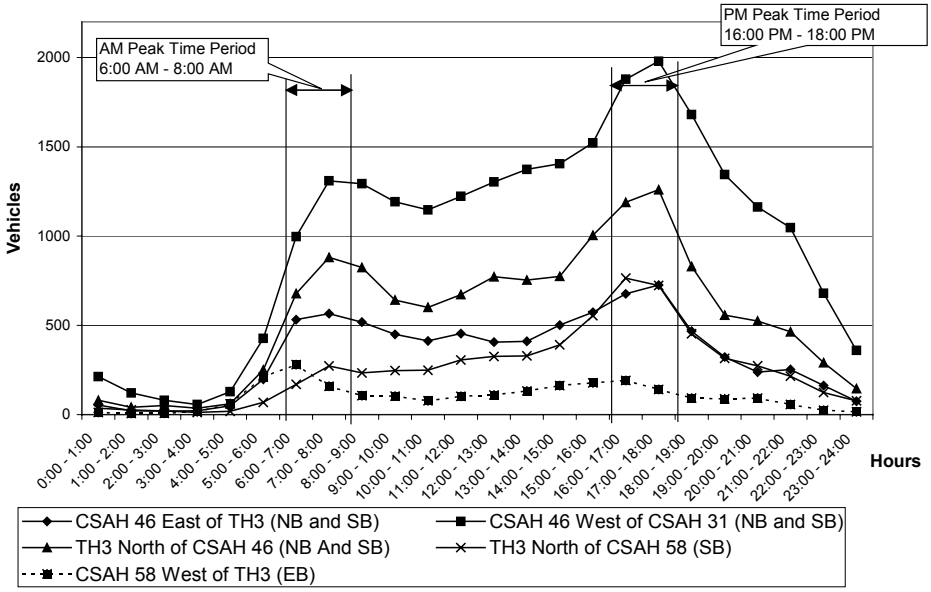
Based on the data obtained and evaluated, October is the peak month for mining traffic. To ensure a worst-case analysis, the traffic analysis used the expected mining company exports for the month of October. Mining exports is the primary variable in quantity of truck traffic as will be discussed in subsequent sections. The background traffic volumes were factored to represent an average daily volume. For example, if a traffic field count was collected in November, the traffic data would be increased by a 1.042 factor.

2.3.2. Peak Hours

The next step in the TIS was to determine the specific time period for analysis. Several 24-hour, hourly traffic counts were collected on roadways surrounding the proposed Mining Area. The hourly trends illustrate the peak hour of traffic; therefore, the critical time period for analysis. It should be noted, these roadways

(i.e. 160th Street, 170th Street and TH 3) include existing mining traffic. The hourly volume trends are illustrated in **Table 2-4**.

Table 2 - 4. Roadway Hourly Volume Trends



Data Source:
URS Corporation: CSAH 46 East of TH3, CSAH 46 West of CSAH 31 and TH3 North of CSAH 46
Dakota County: TH3 North of CSAH 58 and CSAH 58 West of TH3

Based on the evaluation of hourly volumes surrounding the proposed Mining Area, the AM peak period ranged from 6:00 AM to 8:00 AM and the PM peak period ranged between 4:00 PM and 6:00 PM. The TIS evaluated the actual field collected peak hour during the peak period for each individual intersection. **Table 2-5** presents the AM and PM peak hours for each of the key intersections.

Table 2 - 5. Intersection Peak Hour Summary

Intersection	AM Peak Hour	PM Peak Hour
150th Street & TH 3	7:00 AM - 8:00 AM	16:30 PM - 17:30 PM
150th Street & Pilot Knob Road	7:00 AM - 8:00 AM	16:45 PM - 17:45 PM
160th Street & Cedar Avenue	7:00 AM - 8:00 AM	17:00 PM - 18:00 PM
160th Street & Galaxie	7:00 AM - 8:00 AM	16:45 PM - 17:45 PM
160th Street & Foliage	6:30 AM - 7:30 AM	17:00 PM - 18:00 PM
160th Street & Flagstaff	6:30 AM - 7:30 AM	16:45 PM - 17:45 PM
160th Street & Pilot Knob Road	6:45 AM - 7:45 AM	16:45 PM - 17:45 PM
160th Street & Aggregate Industries Mining Access	6:45 AM - 7:45 AM	16:45 PM - 17:45 PM
160th Street & Diamond Path	6:30 AM - 7:30 AM	16:45 PM - 17:45 PM
160th Street & Shannnon Parkway	7:00 AM - 8:00 AM	16:45 PM - 17:45 PM
160th Street & Chippendale	7:00 AM - 8:00 AM	16:30 PM - 17:30 PM
160th Street & TH 3	7:00 AM - 8:00 AM	16:30 PM - 17:30 PM
160th Street & Biscayne	6:45 AM - 7:45 AM	16:45 PM - 17:45 PM
Pilot Knob Road & Dodd Boulevard	7:00 AM - 8:00 AM	16:45 PM - 17:45 PM
Pilot Knob Road & 170th Street	6:45 AM - 7:45 AM	17:00 PM - 18:00 PM
170th Street & Cemstone	6:45 AM - 7:45 AM	16:45 PM - 17:45 PM
TH 3 & 170th Street	7:00 AM - 8:00 AM	16:45 PM - 17:45 PM
170th Street & Biscayne Ave	7:00 AM - 8:00 AM	16:30 PM - 17:30 PM
TH 3 & CSAH 66	7:00 AM - 8:00 AM	16:45 PM - 17:45 PM
TH 3 & Elm Street	7:00 AM - 8:00 AM	16:30 PM - 17:30 PM
TH 3 & 220th Street	6:45 AM - 7:45 AM	16:30 PM - 17:30 PM

Note:
Highlighted intersection indicates an existing mining operation site access point

2.4 Data Collection

In order to evaluate existing conditions and to establish forecast traffic conditions, a wide-scale collection of pertinent data for the study area had to be conducted. Data collection included intersection turning movement counts, Average Daily Traffic (ADT) counts, roadway lane geometrics and signal operation.

2.4.1 Existing Traffic Volumes

To support the analysis, existing traffic volumes were collected and obtained at the key intersections and surrounding roadway segments. The volumes used for the analysis of existing conditions were determined as follows.

Traffic volumes for several intersections were obtained from Mn/DOT and Dakota County. All data obtained from these two agencies were field collected during different months, but are newer than June of 2002. URS Corporation collected the remaining intersections in June, July and August of 2004. The data collected included AM and PM peak period turning movement volumes and several 48-hour roadway segment tube counts along 160th Street, TH 3 and the mining operation access points.

As mentioned in the previous section, consideration to the time of year is necessary to evaluate typical traffic conditions. Depending on the date of the existing traffic count, the previously presented seasonal adjustment factors were applied to develop annual average representative volumes. For example, if a

traffic count was collected in November, the volumes would be multiplied by a 1.042 factor to account for the seasonal volume variation associated with the particular month.

In addition, each intersection turning movement collected prior to Year 2004 was increased according to the forecast background growth rate, to obtain an approximate estimate of current conditions. The background growth will be discussed in a later section.

Raw traffic data was also field collected at the existing mining access points. The turning movements entering and exiting specific mining companies were increased using the monthly export percentages to appropriately account for the peak traffic conditions expected during the month of October. Subsequent sections will discuss in detail the data collected at the mining access points for development of future truck traffic volumes.

The result of applying both the mining and roadway seasonal factors; and considering the background growth rate adjustments for older traffic counts represent worst-case for existing (2004) volumes.

2.4.2 Commercial Truck Traffic

Commercial truck traffic, mining company related or other, can reduce the carrying capacity of roadway segments and intersections. The traffic analysis accounted for the impact to intersection capacity associated with heavy trucks. A vehicle classification count was collected in September 2004 along 170th Street, 160th Street and Pilot Knob Road to determine the approximate peak hour and daily truck percentages. Data obtained from the 2002 Mn/DOT Traffic Flow Maps were used for development of the heavy truck percentage on TH 3.

The truck percentages obtained already account for existing mining traffic within the background volumes (i.e., includes existing mining company generated trucks) and was assumed to be indicative for the segments of roadways collected. The mining access points facilitate primarily heavy trucks, therefore, for these locations additional field collected truck percentages were used for the entering and exiting movements. Refer to Section 2.6.3 for the mining access truck percentage and Chapter 3.0 for documentation of all roadway segment heavy truck percentages.

The future year scenario analyses maintained the existing heavy truck percentage for background traffic; additionally, the percentages were adjusted on all movements where future mining trucks are expected to travel.

2.4.3 Roadway and Intersection Lane Geometrics

Documentation of the existing and future roadway and intersection lane geometrics is a key component in the data collection process for determining traffic operation levels in the study area.

Existing

URS field collected roadway and intersection lane geometrics in May 2004. Section 3.0 describes the intersection lane geometrics used in the traffic analysis for the existing condition.

Future Year Scenarios - (Improvements Required by Planned Residential Development Studies)

Typically, planned, programmed or adopted roadway infrastructure improvements are included in the base analysis (i.e., No-Build condition) of the future year scenarios. Between 160th street and 150th Street, Pilot Knob Road will be widened during the 2005 construction season from a two-lane undivided roadway to a four lane divided roadway. However, the widening does not impact the lane geometrics at the signalized intersections. Under the planned future land development scenarios, the development site access points will be re-configured to appropriate lane geometrics for a residential community and as documented in the Brandtjen EAW and Cobblestone AUAR. The future base lane geometrics and traffic control as identified in the mitigation plans for the Brandtjen and Cobblestone developments are summarized as follows:

1. 160th Street at Aggregate Industries Mining Access (future Cobblestone Lake and Brandtjen Entrance)
   - On the north approach, provide one left turn lane and one shared through/right-turn lane.
   - On the south approach, provide one left turn lane and one shared through/right-turn lane.
   - Install a traffic signal.

2. 160th Street at Diamond Path
   - On the north approach, provide one left turn lane, one through lane and one right turn lane.
   - On the south approach, provide one left turn lane, one through lane and one right turn lane.
   - Extend Diamond Path southward to 170th Street.
   - Install a traffic signal.

3. Pilot Knob Road at Dodd Boulevard

   On the east approach, provide one shared through/left turn lane and one exclusive right turn lane.

The studies listed in Section 1.5 identified roadway needs and appropriate guidelines for maintaining reasonable traffic operations along TH 3 and surrounding roadway network. The Genstar AUAR, Brandtjen EAW and Cobblestone AUAR identified specific roadway improvement measures required to accommodate the individual planned developments. In particular, the TH 3 AMP incorporated recommendations and the forecasted traffic volumes from the Genstar AUAR and the Dakota County Transportation Plan, considered other characteristics, functions and conditions to develop a vision for the TH 3 corridor. The vision provides for guidelines for preserving right-of-way and implementing access and traffic control policies.

Although the TH 3 AMP vision and the Genstar AUAR mitigation plan are not currently programmed, they are considered a requirement to accommodate the Genstar development. Therefore, in order for Genstar to generate the traffic volumes included in its traffic study, implementation of the mitigation plan identified in the Genstar AUAR would be required. As such, the mitigation plan is assumed to be implemented prior to the future analysis scenarios evaluated as part of the proposed mining project and is considered a base condition in 2015 and 2025. Based on the Genstar AUAR mitigation plan and the guidelines set forth in the TH 3 AMP, the following summarizes the key improvements having an influence on the intersections included in the proposed project study area:

- Construct the 195th Street extension.
- Construct the 208th Street extension.
- Provide a four-lane cross-section from north of Elm Street to 160th Street. The four-lane cross-section would begin and end approximately 500 feet north of 160th Street.
- The TH 3 AMP requires exclusive 300-foot northbound/southbound left turn and right turn lanes at all major intersections along TH 3. This includes the intersection of TH 3 at 170th Street.

2.4.4 Railroad Grade Crossing

Currently, Union Pacific Railway (UPR) operates the railroad corridor crossing 170th Street and 160th Street. Unfortunately, UPR is not able to provide detailed schedule information necessary for the TIS. UPR did indicate that trains are not currently scheduled during the AM and PM peak hours; however, from time to time will occur. To support this information, URS observed the railroad grade crossings during field data collection of adjacent intersections. During this time, only two trains (one each day of observation), both occurring during the AM peak hour, were observed. No trains were observed during the PM peak hour. The train crossing lasted approximately 29 seconds on the first day and 60 seconds on the second day. Since the schedule and duration of trains using this railroad track in the future are unknown, the following assumptions were made:

- Although no trains were observed during the PM peak hour, the analysis of the railroad crossing assumed one train event during both the AM and PM peak hours.
- Train crossing assumed to last 60 seconds.
- An additional 35 seconds was added to account for gate down, gate up and warning times.

2.4.5 Signal Timing

Several of the key intersections included in the TIS are currently controlled by a traffic signal system. The operation and timing parameters of a traffic signal system influence the capacity of an intersection. URS personnel field reviewed each signalized intersection to obtain the signal phasing (i.e., type of left turn phases and sequence). Dakota County Traffic Engineering Department and Mn/DOT Office of Traffic Engineering provided existing signal timing parameters for most of the key signalized intersections. Where actual timing parameters were not provided, the signal operation was optimized within the analysis software package.

2.5 Mining Company Material Export and Phasing

The purpose of the TIS is to document the impact of the proposed Mining Consortium plans for the proposed Mining Area and to develop mitigation alternatives for deficiencies incurred from any impacts. In order accomplish this task, detailed information with respect to both existing mining operation characteristics and expected future mining operation characteristics are required.

2.5.1 Existing Mining Company Location and Exports

Several mining operations already exist and are in full operation in or near Empire Township; and therefore, are currently contributing traffic to the roadway system. Two mining companies, Cemstone and Tiller, are currently in operation on properties within the proposed Mining Area. Three other companies, Aggregate Industries, McNamara and Fischer, are in full operation nearby, outside of the proposed Mining Area boundaries. Heikes, which is located east of Biscayne Avenue and south of 170th Street is currently being mined by Aggregate Industries. Aggregate material mined from Heikes is trucked to the Aggregate Industries plant at the 160th Street/Pilot Knob Road intersection for processing and export. Aggregate Industries and McNamara are located on the southeast quadrant of the 160th Street and Pilot Knob Road intersection and northeast quadrant of 160th Street and Pilot Knob Road, respectively. Both Aggregate Industries and McNamara are adjacent to the proposed mining boundaries. Fischer is located on the south side of 150th Street. **Figure 2-2** shows the locations of the existing mining sites and the location of their current entrance/exit access points.

The Mining Consortium provided Year 2003 exported material for each of the current mining operators. The October monthly exports were obtained by

applying the monthly seasonal factors, presented previously in **Table 2-3,** to the 2003 yearly exported quantities. The average daily exports shown in the following tables represent an average weekday during the peak month of October (i.e., assumes 22 days per month). **Table 2-6** summarizes the Year 2003 quantity of aggregate, asphalt, ready mix and concrete block exported for each mining company yearly, during the peak month of October and during a typical weekday. Exported material is the basis for traffic generation of trucks using the roadway network. Traffic Generation is discussed in detail in Section 2.6.

Table 2 - 6. Year 2003 Material Export Quantities

Mining Company	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)
Yearly Exports				
Aggregate Industries	1,881,000	82,700	5,375,829	
Cemstone	286,000	73,214		
Fischer	1,328,000	247,700		
McNamara	112,000			271,526
Tiller	273,000			318,000
Heikes	20,000			
Total	3,880,000	403,614	5,375,829	589,526
Monthly Exports - October				
Aggregate Industries	266,896	9,581	577,409	
Cemstone	40,581	8,482		
Fischer	188,430	28,698		
McNamara	15,892			50,384
Tiller	38,736			59,008
Heikes	2,838			
Total	550,534	46,762	577,409	109,392
Average Daily Exports - Weekday				
Aggregate Industries	12,132	436	26,246	
Cemstone	1,845	386		
Fischer	8,565	1,304		
McNamara	722			2,290
Tiller	1,761			2,682
Heikes	129			
Total	25,024	2,126	26,246	4,972

E.I.E. : Eight Inch Equivalents

Source: Empire Township Mining Consortium, based on year 2003 tax records

2.5.2 Projected Quantity of Material Mined

The traffic analysis of future scenarios, both No-Build and Build is based on the projected quantity of material being mined by each company. Under the No-Build scenarios, total exports are expected to primarily cease by 2023, with the exception of Cemstone. Based on the Scoping EAW, the following summarizes the expected mining activity under each of the 2005, 2015 and 2025 No-Build scenarios:

1. By Year 2005
   - All five mining company exports (aggregate, ready-mix, concrete block and asphalt) are expected to grow by two percent[1] per year (2003 to 2005).
   - Aggregate Industries will be mining aggregate from the Heikes property.
2. By Year 2015
   - Aggregate Industries, McNamara and Fischer are expected to have exhausted all exports from their remote locations outside of the proposed Mining Area.
   - The Heikes property is no longer being mined for material.
   - Tiller and Cemstone exports are expected to grow by two percent per year (2003 to 2015)[1]
3. By Year 2025
   - All mining companies are expected to have exhausted all exports from their remote locations and from their existing parcels within the proposed Mining Area.
   - Only Cemstone is expected to be exporting material. Approximately 300,000 tons[2] of aggregate per year from their railroad off-loading operation will be exported. Assuming a similar ratio of ready-mix to aggregate as existing, Cemstone could be expected to also export 75,000 cubic yards of ready-mix per year.

Under the Build scenarios, the Scoping EAW (page 28) identifies the projected Year 2029 yearly exported mining quantities for the whole proposed Mining Area (includes a sum total of all six mining companies exports) to be as follows:

- 11 million tons of aggregate
- 1 million cubic yards of ready-mixed concrete
- 8 million eight-inch concrete blocks
- 1 million tons of asphalt

Material mined by each mining company was assumed to follow the same characteristics as documented in **Table 2-6**. For example, in 2003, McNamara exported 112,000 tons of aggregate and 271,526 tons of asphalt. This equates to 2.8 percent and 46 percent of the total yearly production of all mining companies for aggregate and asphalt, respectively. Projecting into years 2005, 2015 and

[1] Exhibit 12 of the Sand and Gravel Mining and Accessory Uses Scoping EAW, October 2003.

2025, McNamara is assumed to continue producing 2.8 percent of the aggregate and 46 percent of the asphalt.

To obtain the yearly mining material exports for the analysis period years of 2005, 2015 and 2025, a linear growth rate was computed (comparison between 2003 and 2029). The exception is aggregate, where 6.9 million[2] tons are explicitly projected for 2015, 7.6 million[2] tons for Year 2020 and 11 million[3] tons for year 2029. The following summarizes the product export growth rates used:

- Asphalt - 2.05 percent per year growth from 2003 to 2029
- Concrete Block - 1.54 percent per year growth from 2003 to 2029
- Ready-mix Concrete - 3.55 percent per year growth from 2003 to 2029
- Aggregate - 3.16 percent per year growth from 2020 to 2029

The above growth rates apply to all companies which export these products. The yearly mined material export was converted into monthly exported material by applying the monthly seasonal factors, described in Section 2.3.1. The ADT shown in the following tables represent an average weekday during the peak month of October. The Build and No-Build mined material export projections are shown in **Table 2-7** for the Year 2005, **Table 2-8** for the Year 2015 and **Table 2-9** for the forecast Year 2025.

Table 2 - 7. Projected Year 2005 Build and No-Build Material Export Quantities

[2] Data Provided by Empire Township Mining Consortium using the Scoping EAW.
[3] Target production quantity obtained from the Mining Consortium

Producer	Build Condition				No-build Conditions			
	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)
	Yearly Exports				***Yearly Exports***			
Aggregate Industries	2,114,477	88,678	5,542,756		1,956,992	86,041	5,593,012	
Cemstone	321,499	78,506			297,554	76,172		
Fischer	1,492,836	265,605			1,381,651	257,707		
McNamara	125,902			282,791	116,525			282,496
Tiller	206,372			331,193	284,029			330,847
Dakota County	0							
Heikes	21,995				20,808			
Total	4,283,082	432,789	5,542,756	613,983	4,057,560	419,920	5,593,012	613,343
	Monthly Exports - October				***Monthly Exports - October***			
Aggregate Industries	300,024	10,274	595,338		277,678	9,969	600,736	
Cemstone	45,618	9,096			42,220	8,825		
Fischer	211,819	30,772			196,043	29,857		
McNamara	17,864			52,474	16,534			52,420
Tiller	29,282			61,456	40,301			61,392
Dakota County	0							
Heikes	3,121				2,952			
Total	607,728	50,142	595,338	113,930	575,728	48,651	600,736	113,811
	Average Daily Exports - Weekday				***Average Daily Exports - Weekday***			
Aggregate Industries	13,637	467	27,061		12,622	453	27,306	
Cemstone	2,074	413			1,919	401		
Fischer	9,628	1,399			8,911	1,357		
McNamara	812			2,385	752			2,383
Tiller	1,331			2,793	1,832			2,791
Dakota County	0							
Heikes	142				134			
Total	27,624	2,279	27,061	5,179	26,169	2,211	27,306	5,173

E.I.E. : Eight Inch Equivalents

Source: Empire Township Mining Consortium
Scoping EAW, Exhibit 12 and Exhibit 13

Table 2 - 8. Projected Year 2015 Build and No-Build Material Export Quantities

Producer	Build Condition				No-build Conditions			
	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)
	Yearly Exports				*Yearly Exports*			
Aggregate Industries	3,401,653	125,709	6,458,439					
Cemstone	517,210	111,290			362,717	92,853		
Fischer	2,401,592	376,520						
McNamara	202,544			346,524				
Tiller	332,000			405,834	346,230			403,301
Dakota Co.	45,000							
Heikes	0							
Total	6,900,000	613,519	6,458,439	752,358	708,947	92,853	0	403,301
	Monthly Exports - October				*Monthly Exports - October*			
Aggregate Industries	482,661	14,564	693,690					
Cemstone	73,387	12,894			51,466	10,758		
Fischer	340,763	43,623						
McNamara	28,739			64,301				
Tiller	47,108			75,306	49,127			74,836
Dakota Co.	6,385							
Heikes	0							
Total	979,043	71,081	693,690	139,607	100,593	10,758	0	74,836
	Average Daily Exports - Weekday				*Average Daily Exports - Weekday*			
Aggregate Industries	21,939	662	31,531					
Cemstone	3,336	586			2,339	489		
Fischer	15,489	1,983						
McNamara	1,306			2,923				
Tiller	2,141			3,423	2,233			3,402
Dakota Co.	290							
Heikes	0							
Total	44,502	3,231	31,531	6,346	4,572	489	0	3,402

E.I.E. : Eight Inch Equivalents

Source: Empire Township Mining Consortium
Scoping EAW, Exhibit 12 and Exhibit 13

Table 2 - 9. Projected Year 2025 Build and No-Build Material Export Quantities

Producer	Build Condition				No-build Conditions			
	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)	Aggregate (Tons)	Ready Mix (Cubic Yards)	Concrete Block (E.I.E.)	Asphalt (Tons)
	Yearly Exports				*Yearly Exports*			
Aggregate Industries	4,642,149	178,205	7,525,395					
Cemstone	705,824	157,764			300,000	75,000		
Fischer	3,277,392	533,752						
McNamara	276,407			424,621				
Tiller	453,072			497,298				
Dakota Co.	61,410							
Heikes	0							
Total	9,416,254	869,720	7,525,395	921,919	300,000	75,000	0	0
	Monthly Exports - October				*Monthly Exports - October*			
Aggregate Industries	658,676	20,646	808,290					
Cemstone	100,150	18,278			42,567	8,689		
Fischer	465,030	61,839						
McNamara	39,219			78,792				
Tiller	64,286			92,278				
Dakota Co.	8,714							
Heikes	0							
Total	1,336,074	100,764	808,290	171,070	42,567	8,689	0	0
	Average Daily Exports - Weekday				*Average Daily Exports - Weekday*			
Aggregate Industries	29,940	938	36,740					
Cemstone	4,552	831			1,935	395		
Fischer	21,138	2,811						
McNamara	1,783			3,581				
Tiller	2,922			4,194				
Dakota Co.	396							
Heikes	0							
Total	60,731	4,580	36,740	7,776	1,935	395	0	0

E.I.E. : Eight Inch Equivalents

Source: Empire Township Mining Consortium
Scoping EAW, Exhibit 12 and Exhibit 13

2.5.3 Mining Company Development Phasing

Over the next 20 years, six different companies will mine a significant portion of the proposed Mining Area. The traffic analysis evaluated three snapshots in time; Year 2005, 2015 and 2025. To efficiently facilitate the mining processes during these time periods, several new plant locations will be located within the Mining Area. Although the mining companies will have pits spanning many acres, the material will be sent via conveyor to the plants for processing. As shown, mining-related traffic volumes are relative to both the plant location and the type and quantity of material mined. **Figure 2-3** and the following text summarize the future mining schedule, phasing and proposed plant access points used as the basis for projecting future traffic conditions evaluated in the TIS:

1. Year 2005
   - All existing mine operators within the Mining Area (Cemstone, Tiller and Heikes) are expected to be mining their currently permitted mines. Dakota County is not expected to be mining any material by 2005.

- Aggregate Industries, McNamara and Fischer are expected to still be mining their existing locations, just outside of the proposed Mining Area boundaries.
- All mining plants are expected to be in their existing locations, excluding Dakota County.
- Production and material exports have grown by the rates documented previously.

2. Year 2015
   - **Aggregate Industries:** A new plant location is expected to be constructed off of 170th Street, east of TH 3. The existing plant site at the 160th Street and Pilot Knob Road intersection will no longer be in operation. Material mined from Aggregate Industries' land will be sent via conveyor to their new plant.
   - **McNamara:** A new plant location is expected to be constructed adjacent to Aggregate Industries, off of 170th Street. Their existing plant site off of 160th Street will no longer be in operation. Material mined from McNamara's land parcels will be sent via conveyor to their new plant.
   - **Tiller:** Tiller will continue to mine their existing land parcels and the Aggregate Industries leased property. They will conveyor mined material to their existing plant location. The existing plant is located south of 160th Street, between CSAH 33 and TH 3.
   - **Cemstone:** Cemstone's primary aggregate and ready-mix operation will continue to use their existing plant facility and land parcels, south of 170th Street. By Year 2015, Cemstone will also be mining the Berg East property. A plant site is located on this parcel for processing the mined aggregate. Cemstone has indicated that all aggregate mined from the Berg property will be trucked exclusively to their plant facility off of 170th Street.
   - **Dakota County:** Dakota County will begin mining their existing land parcels and will conveyor mined material to a plant. The new plant is expected to be located south of 160th Street, between TH 3 and Biscayne Avenue, near their existing maintenance facility.
   - **Fischer:** Fischer is expected to construct a new plant, located south of 170th Street, east of TH 3. Mined material from their land parcels will be sent via conveyor to their new plant. Their existing plant and mining operation, south of 150th Street, will no longer be in operation.

3. Year 2025

- **Aggregate Industries:** Aggregate Industries is expected to be using the 2015 plant, located on 170th Street, east of TH 3. The existing plant site at the 160th Street and Pilot Knob Road intersection will not be in operation. Material mined from Aggregate Industries's land parcels will be sent via conveyor to their new plant.
- **McNamara:** McNamara is expected to continue using their 2015 plant, adjacent to Aggregate Industries, off of 170th Street. Their existing plant site off of 160th Street will not be in operation. Material mined from McNamara's land parcels will be sent via conveyor to their new plant.
- **Tiller:** Tiller will continue to mine their existing land parcels and will conveyor mined material to their existing plant location. The existing plant is located south of 160th Street, between CSAH 33 and TH 3.
- **Cemstone:** Cemstone's primary aggregate and ready-mix operation will continue to use their existing plant facility and land parcels, south off of 170th Street. By Year 2025, Cemstone will also be mining the Berg West property. Cemstone has indicated that most of the aggregate mined from the Berg property will be trucked to their plant facility off of 170th Street.
- **Dakota County:** Dakota County will continue to mine their existing land parcels and will conveyor mined material to a plant. Their plant is expected to be located south of 160th Street, between TH 3 and Biscayne Avenue, near their existing maintenance facility.
- **Fischer:** Fischer is expected to be using their 2015 plant, located south of 170th Street, east of TH 3. Mined material from their land parcels will be sent via conveyor to their plant. Their existing plant and mining operation, south of 150th Street, will not be in operation.

2.5.4 Mining Plant Access Points

Each mining company plant has access to an adjacent roadway to facilitate the trucks exporting the material and their other patrons. The trip generation associated with each mining company is assigned to the access point. If an access point is removed due to the relocation of a plant, the vehicle trips from this location are also removed, and reassigned to the new access point. The proposed access points assumed in the TIS are illustrated in **Figure 2-3**, and are summarized in the following:

1. Year 2005

All mining operation access points are the same as existing. Refer to **Figure 2-2** for existing mining access points.

2. Year 2015 and Year 2025

- **Aggregate Industries and McNamara**: Two driveways with access to 170th Street, between TH 3 and Biscayne Avenue will be provided. Aggregate Industries and McNamara will share the two access points. The existing mining access points off of 160th Street and Pilot Knob Road will no longer be used.
- **Tiller:** Tiller will continue to use its existing driveway with full access at 160th Street, opposite Shannon Parkway. Truck restrictions forcing all vehicles to turn left or right is expected to be enforced.
- **Cemstone:** Cemstone's primary facility west of TH 3 will continue to use the existing access point on 170th Street. The Berg East and Berg West property plant will have a single driveway with access to Biscayne Avenue, south of 170th Street.
- **Dakota County:** Dakota County will continue to use its existing driveway with full access at 160th Street, between TH 3 and Biscayne Avenue.
- **Fischer:** Fischer will have two driveways, opposite the shared McNamara and Aggregate Industries plant access points on 170th Street.

2.6 Traffic Generation

In order to estimate the traffic impacts of the proposed project, it is necessary to estimate the amount of traffic that will be generated. Future traffic volumes include consideration of background traffic growth, the four other future development parcels, the proposed mining operation and the directional orientation of the projected project-generated trips.

2.6.1 Background Traffic Growth

Traffic growth within Empire Township is expected to occur between existing condition and any given future date due to other growth in the surrounding region, particularly because a sizeable portion of Dakota County has yet to develop. This growth is typically termed as background traffic. In other words, background traffic is traffic currently existing on the roadway system and would be there regardless of the mining companies.

The Dakota County Regional Model and the 2025 Dakota County Official Forecast were used to estimate the background growth rate on roadways within the study area. The Regional Model includes Year 2000 socioeconomic data (e.g., population, employment bases, and land uses) and also includes the Metropolitan

Council's Year 2025 socioeconomic projections and Dakota County specific land use changes. The model compared Year 2000 roadway traffic volumes with the Dakota County Regional Model forecasts and the documented Official forecast 2025 volumes. Dakota County indicated that the primary generators contributing to the 2025 Official Forecasts include the four developments of Brandtjen, Cobblestone, Genstar and Heritage. Since the TIS is specifically accounting for four sizeable residential developments in the traffic analysis separately (refer to Section 2.6.2 for traffic generation estimates), the background growth rates were adjusted to prevent double counting of vehicle trips. The modifications removed the estimated dwelling units and ADT generation from the Genstar, Heritage, Brandtjen and Cobblestone Traffic Analysis Zones (TAZs). The result was Year 2025 forecast volumes, without the four planned land uses. A growth in traffic volume was found, which is then assumed to occur linearly over the 25 year study period. **Table 2-10** summarizes the annual growth rates determined for the roadways included in the TIS study area, without the four planned land uses. Again, Brandtjen, Cobblestone, Genstar and Heritage were accounted for in separate traffic generation estimates as discussed in the following section.

Table 2 - 10. Forecast Background Growth Rates

Roadway (East/West)	Growth Rate (percent per year)[1]
150th Street	0.9%
160th Street (west of TH 3)	0.9%
160th Street (east of TH 3)	2.2%
Dodd Boulevard	4.9%
170th Street	3.5%
CSAH 66	2.7%
Elm Street	0.6%
220th Street	2.0%
Roadway (North/South)	**Growth Rate (percent per year)[1]**
Cedar Avenue	2.1%
Galaxie Avenue	2.0%
Foliage Avenue	0.8%
Flagstaff Avenue	1.3%
Pilot Knob Road	1.6%
Diamond Path	8.6%
Shannon Parkway	0.9%
Chippendale Avenue	2.2%
TH3	1.2%
Biscayne Avenue	3.5%

[1] Growth rates based on the 2025 Dakota County Official forecasts and the Dakota County Transportation Model. Adjustments were made for the projects specific treatment of the Brandtjen, Genstar, Heritage and Cobblestone developments.

2.6.2 Planned Future Development Parcels Trip Generation

In addition to background growth rate, four residential development parcels Genstar, Hertiage, Brandtjen and Cobblestone are planned to occur in the locations described in Section 2.1 (see **Figure 2-1)**. To account for future traffic

associated with these developments in the TIS, a trip generation analysis was completed.

Based on the Genstar AUAR, the following land use characteristics and assumptions were used for the future Genstar site:

- 781-acre parcel of land, including 2,230 single-family and 1,666 multi-family townhome dwelling units. 248,000 SF of commercial space is expected
- Zero[4] percent complete by Year 2005
- Approximately 78 percent (i.e., 1,728 single-family dwelling units, 1,291 multi-family townhome dwelling units and 192,200 SF of commercial space) complete by Year 2015
- 100 percent complete by Year 2025
- Commercial space trip generation included a 50 percent reduction for pass-by and internal captured trips
- Trip generation rates (i.e., vehicles per dwelling unit) as documented in the Genstar AUAR. The Genstar AUAR used the Institute of Transportation Engineers (ITE) Trip Generation Manual, 6th Edition. These values are consistent with standard traffic engineering practice; therefore, are carried through into this TIS

Based on the July 27, 2004 Development Plat, the Heritage development included the following land use characteristics and assumptions:

- A 154 acre parcel of land including 169 single-family, and 160 multi-family townhome dwelling units, approximately 44,100 SF of commercial retail and 4 softball fields is anticipated
- Zero percent complete by Year 2005
- 100 percent complete by Year 2015
- ITE Trip Generation Manual 7th Edition used for development of vehicle trip rates

Based on the Brandtjen EAW, the Brandtjen development (including Nordic Square) included the following land use characteristics and assumptions:

- A large parcel of land including 453 single-family, and 1,272 multi-family townhome dwelling units, 384 senior housing units and approximately 150,000 SF of commercial retail is anticipated

[4] The Genstar AUAR assumed 25 percent would be completed by year 2005. However, based on the current status of the development, Genstar is not expected to have completed any of its development by 2005.

- Zero percent complete by Year 2005
- 100 percent complete by Year 2015
- Trip generation rates (i.e., vehicles per dwelling unit) as documented in the Brandtjen EAW. The Brandtjen EAW used the trip rates documented in the ITE Trip Generation Manual, 7th Edition. These values are consistent with standard traffic engineering practice; therefore, are carried through into this TIS

Based on the Cobblestone AUAR, the Cobblestone development included the following land use characteristics and assumptions:

- A parcel of land including 600 single-family, and 2,400 multi-family townhome dwelling units and approximately 300,000 SF of commercial retail are expected.
- 25 percent complete by Year 2005 (the development adjacent to Diamond Path has already been completed).
- 100 percent complete by Year 2015
- Trip generation rates (i.e., vehicles per dwelling unit) as documented in the Cobblestone AUAR. The Cobblestone AUAR used the trip rates documented in the ITE Trip Generation Manual, 6th Edition. These values are consistent with standard traffic engineering practice; therefore, are carried through into this TIS.

Table 2-11 and **Table 2-12** present the Year 2015 and Year 2025 trip generation estimates, respectively, for the future planned residential developments, as documented in the Genstar AUAR, Brandtjen EAW, Cobblestone AUAR and Heritage Site Plan.

Table 2 - 11. Year 2015 Planned Future Development Trip Generation

AM Peak Hour

Land Use	Units/Size	Size/Number	Directional Distribution Entering	Directional Distribution Exiting	Peak Hour Trips Entering	Peak Hour Trips Exiting	Peak Hour Trips Total Trips
Genstar Residential Development							
1. Residential Single-Family	Dwelling Unit	1,728	25%	75%	**302**	**915**	**1,217**
2. Residential Multi-Family-Townhome	Dwelling Unit	1,291	17%	83%	**62**	**302**	**364**
3. Commercial - Retail	SFGLA	192,200	62%	38%	**62**	**39**	**101**
Total Trips					**426**	**1,256**	**1,682**
Heritage Residential Development							
1. Residential Single-Family	Dwelling Unit	169	25%	75%	**32**	**96**	**128**
2. Residential Multi-Family-Townhome	Dwelling Unit	160	17%	83%	**13**	**62**	**75**
3. Comercial - Retail	SFGLA	44100	62%	38%	**14**	**9**	**23**
4. Softball Fields	Fields	4	50%	50%	**3**	**3**	**6**
Total Trips					**62**	**170**	**232**
Brandtjen/Nordic Square Residential Development							
1. Residential Single-Family	Dwelling Unit	453	25%	75%	**85**	**255**	**340**
2. Residential Multi-Family-Townhome	Dwelling Unit	1272	17%	83%	**95**	**465**	**560**
3. Commercial - Retail	SFGLA	150000	45%	55%	**59**	**72**	**131**
4. Senior Housing - Attached	Dwelling Unit	384	61%	39%	**19**	**12**	**31**
Total Trips					**258**	**804**	**1,061**
Cobblestone Residential Development							
1. Residential Single-Family	Dwelling Unit	600	25%	75%	**110**	**340**	**450**
2. Residential Multi-Family-Townhome	Dwelling Unit	2400	17%	83%	**180**	**880**	**1060**
3. Comercial-Retail	SFGLA	300000	45%	55%	**240**	**240**	**480**
Total Trips					**530**	**1,460**	**1,990**
Total Estimated Trips (Genstar, Heritage, Brandtjen/Nordic Square and Cobblestone Lake Developments)					**1,276**	**3,689**	**4,965**

PM Peak Hour

Land Use	Units/Size	Size/Number	Directional Distribution Entering	Directional Distribution Exiting	Peak Hour Trips Entering	Peak Hour Trips Exiting	Peak Hour Trips Total Trips
Genstar Residential Development							
1. Residential Single-Family	Dwelling Unit	1,728	64%	36%	**872**	**492**	**1,364**
2. Residential Multi-Family-Townhome	Dwelling Unit	1,291	67%	33%	**329**	**159**	**488**
3. Commercial - Retail	SF GFLA	192,200	44%	56%	**109**	**140**	**248**
Total Trips					**1,310**	**791**	**2,100**
Heritage Residential Development							
1. Residential Single-Family	Dwelling Unit	169	63%	37%	**108**	**64**	**172**
2. Residential Multi-Family-Townhome	Dwelling Unit	160	67%	33%	**59**	**29**	**88**
3. Commercial - Retail	SFGLA	44,100	44%	56%	**25**	**32**	**57**
4. Softball Fields	Fields	4	69%	31%	**57**	**26**	**83**
Total Trips					**249**	**150**	**400**
Brandtjen/Nordic Square Residential Development							
1. Residential Single-Family	Dwelling Unit	453	63%	37%	**288**	**169**	**458**
2. Residential Multi-Family-Townhome	Dwelling Unit	1272	67%	33%	**443**	**218**	**661**
3. Commercial - Retail	SFGLA	150000	61%	39%	**292**	**186**	**478**
4. Senior Housing - Attached	Dwelling Unit	384	48%	52%	**20**	**22**	**42**
Total Trips					**1,043**	**596**	**1,639**
Cobblestone Residential Development							
1. Residential Single-Family	Dwelling Unit	600	63%	37%	**390**	**220**	**610**
2. Residential Multi-Family-Townhome	Dwelling Unit	2400	67%	33%	**870**	**430**	**1300**
3. Commercial - Retail	SFGLA	300000	61%	39%	**490**	**440**	**880**
Total Trips					**1,750**	**1,090**	**2,790**
Total Estimated Trips (Genstar, Heritage, Brandtjen/Nordic Square and Cobblestone Lake Developments)					**4,353**	**2,627**	**6,929**

Source:

1. Trip generation estimates are based directly from the Genstar AUAR Report, Brandtjen/Nordic Square EAW and Cobblestone Lake AUAR.
2. Trip generation of Heritage residential development is estimated using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Edition.
3. Heritage development land use based on Proposed Development Plat provided by Empire Township on July 27, 2004.
4. Softball fields trip genertion based on ITE land use code 488 (soccer complex). Trip generation rates are not published for a softball complex. However, a softball complex would be expected to generate trips similar to a soccer complex.
5. The commercial retail uses were reduced by 15% to account for captured trips (I.e., linked internal trips between residential homes and the retail uses).

Table 2 - 12. Year 2025 Planned Future Development Trip Generation

AM Peak Hour

Land Use	Units/Size	Size/Number	Directional Distribution Entering	Directional Distribution Exiting	Peak Hour Trips Entering	Peak Hour Trips Exiting	Peak Hour Trips Total Trips
Genstar Residential Development							
1. Residential Single-Family	Dwelling Unit	2,230	25%	75%	**390**	**1,180**	**1,570**
2. Residential Multi-Family-Townhome	Dwelling Unit	1,666	17%	83%	**80**	**390**	**470**
3. Commercial - Retail	SFGLA	248,000	62%	38%	**80**	**50**	**130**
Total Trips					**550**	**1,620**	**2,170**
Heritage Residential Development							
1. Residential Single-Family	Dwelling Unit	169	25%	75%	**32**	**96**	**128**
2. Residential Multi-Family-Townhome	Dwelling Unit	160	17%	83%	**13**	**62**	**75**
3. Commercial - Retail	SFGLA	44,100	62%	38%	**14**	**9**	**23**
4. Softball Fields	Fields	4	50%	50%	**3**	**3**	**6**
Total Trips					**62**	**170**	**232**
Brandtjen/Nordic Square Residential Development							
1. Residential Single-Family	Dwelling Unit	453	25%	75%	**85**	**255**	**340**
2. Residential Multi-Family-Townhome	Dwelling Unit	1272	17%	83%	**95**	**465**	**560**
3. Commercial - Retail	SFGLA	150,000	45%	55%	**59**	**72**	**131**
4. Senior Housing - Attached	Dwelling Unit	384	61%	39%	**19**	**12**	**31**
Total Trips					**258**	**804**	**1,061**
Cobblestone Residential Development							
1. Residential Single-Family	Dwelling Unit	600	25%	75%	**110**	**340**	**450**
2. Residential Multi-Family-Townhome	Dwelling Unit	2400	17%	83%	**180**	**880**	**1060**
3. Comercial-Retail	SFGLA	300000	45%	55%	**240**	**240**	**480**
Total Trips					**530**	**1,460**	**1,990**
Total Estimated Trips (Genstar and Heritage Developments)					**1,400**	**4,053**	**5,453**

PM Peak Hour

Land Use	Units/Size	Size/Number	Directional Distribution Entering	Directional Distribution Exiting	Peak Hour Trips Entering	Peak Hour Trips Exiting	Peak Hour Trips Total Trips
Genstar Residential Development							
1. Residential Single-Family	Dwelling Unit	2,230	64%	36%	**1,125**	**635**	**1,760**
2. Residential Multi-Family-Townhome	Dwelling Unit	1,666	67%	33%	**425**	**205**	**630**
3. Commercial - Retail	SF GFLA	248,000	44%	56%	**140**	**180**	**320**
Total Trips					**1,690**	**1,020**	**2,710**
Heritage Residential Development							
1. Residential Single-Family	Dwelling Unit	169	63%	37%	**108**	**64**	**172**
2. Residential Multi-Family-Townhome	Dwelling Unit	160	67%	33%	**59**	**29**	**88**
3. Commercial - Retail	SFGLA	44,100	62%	38%	**14**	**9**	**23**
4. Softball Fields	Fields	4	69%	31%	**57**	**26**	**83**
Total Trips					**239**	**127**	**366**
Brandtjen/Nordic Square Residential Development							
1. Residential Single-Family	Dwelling Unit	453	63%	37%	**288**	**169**	**458**
2. Residential Multi-Family-Townhome	Dwelling Unit	1272	67%	33%	**443**	**218**	**661**
3. Commercial - Retail	SFGLA	150,000	61%	39%	**292**	**186**	**478**
4. Senior Housing - Attached	Dwelling Unit	384	48%	52%	**20**	**22**	**42**
Total Trips					**1,043**	**596**	**1,639**
Cobblestone Residential Development							
1. Residential Single-Family	Dwelling Unit	600	63%	37%	**390**	**220**	**610**
2. Residential Multi-Family-Townhome	Dwelling Unit	2400	67%	33%	**870**	**430**	**1300**
3. Comercial-Retail	SFGLA	300000	61%	39%	**490**	**440**	**880**
Total Trips					**1,750**	**1,090**	**2,790**
Total Estimated Trips (Genstar and Heritage Developments)					**4,722**	**2,833**	**7,505**

Note:

1. Trip generation estimates are based directly from the Genstar AUAR Report, Brandtjen/Nordic Square EAW and Cobblestone Lake AUAR.
2. Trip generation of Heritage residential development is estimated using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Edition.
3. Heritage development land use based on Proposed Development Plat provided by Empire Township on July 27, 2004.
4. Softball fields trip genertion based on ITE land use code 488 (soccer complex). Trip generation rates are not published for a softball complex. However, a softball complex would be expected to generate trips similar to a soccer complex.
5. The commercial retail uses were reduced by 15% to account for captured trips (I.e., linked internal trips between residential homes and the retail uses).

2.6.3 Proposed Project (Mining Facility) Trip Generation

By Year 2015 all six mining operators will be located within the boundaries of the proposed Empire Township Mining Area. As mentioned earlier, the quantity of material exported is the primary variable contributing to the generation of traffic from the mine. As presented earlier, the critical time periods for analysis are the AM and PM peak hours of traffic. Therefore, the goal of the trip generation analysis was to convert the projected yearly export of material for each mining company into an AM and PM peak hour volume of traffic (truck and other vehicle), which can then be evaluated for traffic operation issues. Both the No-Build and Build scenarios utilized the same methodologies for forecasting future mining-related traffic.

Section 2.5.2 presented the yearly projected quantity of material exports (aggregate, ready-mix, concrete block and asphalt) as provided by the Mining Consortium and identified in the Scoping EAW. Also, Section 2.5.2 discussed the conversion of yearly exports to a typical weekday during the peak month of October. The next step was to determine how many trucks each type of material export equates to. Consistent with the average truckloads provided by the Mining Consortium and as reported in the Scoping EAW, the following conversion factors were used:

- Aggregate: 20 tons per truck
- Ready Mix: 7 cubic yards per truck
- Concrete Block: 540 eight-inch blocks per truck
- Asphalt: 13 tons per truck

Based on the above conversion factors, the daily volume of trucks were obtained from the daily quantity of exports (**Tables 2-6** through **2-9**). It should be noted that the daily quantity of exports represents an exiting volume of traffic. To obtain the daily truck traffic, the calculated volume was doubled. **Table 2-13** presents the expected number of daily trucks (entering and exiting) on a weekday during the peak month of October in Year 2004.

Table 2 - 13. Mining Company Forecast Daily Truck Volume

Producer	Existing (2004)	2005	2015	2025
Aggregate Industries	1,500	1,597	2,500	3,398
Cemstone	308	325	501	693
Fischer	1,284	1,362	2,115	2,917
McNamara	435	448	580	729
Tiller	548	563	741	938
Dakota Co.	0	0	29	40
Total	**4,075**	**4,296**	**6,466**	**8,714**

Note:
Daily truck volume is a total of both entering and exiting

Both intersection turning movement and hourly traffic volume counts were collected at the access points to several of the existing mining companies. The counts collected all traffic entering and exiting the facility by hour and by movement (left-turn, right-turn, through) during a weekday, and a weekday AM and PM peak hour, respectively.

The traffic count identified a number of non-truck vehicle types entering and exiting the mining companies. These vehicles would be associated with employees, customers, maintenance vehicles or some other business-related form. Based on this observation, it was necessary that the trip generation analysis account for these "other vehicles."

A manual vehicle classification count was conducted in July 2004 to obtain the actual truck percentages during the AM and PM peak hours for the mining access points. The daily 'other vehicles' were estimated based on comparing the calculated existing daily truck volumes (from average daily quantity of material export) to the field collected total daily traffic volume at each of the mining company access points. **Table 2-14** presents the truck percentage for each mining company (e.g., comparing the computed daily truck volume to the total daily volume field collected at the Cemstone access point resulted in approximately 77 percent of the daily traffic being trucks, the remaining 33 percent are 'other vehicles').

Table 2 - 14. AM and PM Peak Hour and Daily Mining Company Truck Percentage

Producer	AM Peak Hour	PM Peak Hour	Estimated Daily
Aggregate Industries[1]	81%	30%	88%
Cemstone[1]	68%	43%	77%
Fischer[2]	81%	30%	88%
McNamara[1]	53%	70%	23%
Tiller[3]	70%	54%	64%
Dakota Co.[2]	70%	54%	64%

[1] Based on URS Corporation field collected vehicle classification volumes in July 2004

[2] Fischer assumed to be same as Aggregate Industries and Dakota County assumed to be same as Tiller

[3] Based on URS Corporation field collected volumrd June 2004

Applying the hourly distribution obtained from the field counts and data provided by the mining companies to the daily truck volumes computed in previous **Table 2-13** resulted in hourly truck volumes for each mining company. To obtain the 'other vehicles' a comparison between the peak hour truck volumes and turning movement field counts was made. Based on this comparison the AM and PM peak hour percent of daily mining traffic (both truck and 'other vehicle') was

obtained. **Table 2-15** presents the AM and PM peak hour percentages of total daily mining-related traffic.

Table 2 - 15. AM and PM peak Hour Percentages of Total Daily Mining-Related Traffic

Producer	AM Peak Hour	PM Peak Hour
Aggregate Industries[1]	9.16%	4.10%
Cemstone[1]	9.78%	5.98%
Fischer[2]	9.16%	4.10%
McNamara[1]	6.51%	6.07%
Tiller[3]	5.65%	3.35%
Dakota Co.[2]	5.65%	3.35%

[1] Based on hourly entrance/exit distribution field collected by URS Corporation in July 2004

[2] Fischer distribution assumed to be the same as Aggregate Industries and Dakota Co. distribution assumed to be the same as Tiller

[3] Based on hourly entrance/exit distribution field collected by URS Corporation in June 2004

Projecting into Year 2005, 2015 and 2025 assumed the percentage relationship between trucks and 'other vehicles' and the percentage relationship between AM/PM peak hours and daily remained constant. **Table 2-16** presents the Year 2005 AM and PM peak hour trip generation estimate for the No-Build scenarios, based on the exported quantity of material for both the No-Build and Build scenarios, the calculated number of expected trucks, and existing mining traffic characteristics and relationships shown.

Table 2 - 16. Year 2005 No-Build Mining Company Trip Generation

AM Peak Hour

Producer	Daily Traffic			AM Peak (Percent of Daily)	Directional Distribution[1]		AM Peak Hour Entering Traffic			AM Peak Hour Exiting Traffic			Total AM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	1,493	241	1,734	9.16%	49%	51%	64	15	78	66	15	81	129	30	159
Cemstone	307	102	408	9.78%	53%	47%	14	7	21	13	6	19	27	13	40
Fischer	1,279	206	1,485	9.16%	49%	51%	55	13	67	56	13	69	111	25	136
McNamara	442	1,528	1,969	6.51%	43%	57%	29	26	55	39	35	73	68	60	128
Tiller	612	266	879	5.65%	53%	47%	20	6	26	18	6	23	38	12	50
Dakota Co.	0	0	0	5.65%	53%	47%	0	0	0	0	0	0	0	0	0
Total	**4,132**	**2,343**	**6,475**				**182**	**66**	**247**	**191**	**74**	**265**	**373**	**140**	**513**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

PM Peak Hour

Producer	Daily Traffic			PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic			PM Peak Hour Exiting Traffic			Total PM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	1,493	241	1,734	4.10%	32%	68%	7	16	23	15	34	49	21	50	71
Cemstone	307	102	408	5.98%	36%	64%	4	5	9	7	9	16	11	14	24
Fischer	1,279	206	1,485	4.10%	32%	68%	6	14	19	12	29	42	18	43	61
McNamara	442	1,528	1,969	6.07%	46%	54%	38	16	55	45	19	65	84	36	120
Tiller	612	266	879	3.35%	26%	74%	5	3	8	13	9	22	17	12	29
Dakota Co.	0	0	0	3.35%	26%	74%	0	0	0	0	0	0	0	0	0
Total	**4,132**	**2,343**	**6,475**				**59**	**54**	**113**	**92**	**100**	**192**	**151**	**154**	**306**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

Table 2-17 presents the Year 2005 AM and PM peak hour trip generation estimate for the proposed Build mining operations.

Table 2 - 17. Year 2005 Proposed Build Mining Company Trip Generation

AM Peak Hour

Producer	Daily Traffic			AM Peak (Percent of Daily)	Directional Distribution[1]		AM Peak Hour Entering Traffic			AM Peak Hour Exiting Traffic			Total AM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	1,597	214	1,812	9.16%	49%	51%	67	15	82	69	16	84	135	31	166
Cemstone	325	98	424	9.78%	53%	47%	15	7	22	13	6	20	28	13	41
Fischer	1,362	183	1,545	9.16%	49%	51%	57	13	70	58	13	72	115	26	142
McNamara	448	1,538	1,986	6.51%	43%	57%	29	26	55	39	35	74	68	61	129
Tiller	563	319	882	5.65%	53%	47%	18	8	26	16	7	23	35	15	50
Dakota Co.	0	0	0	5.65%	53%	47%	0	0	0	0	0	0	0	0	0
Total	**4,296**	**2,353**	**6,649**				**186**	**69**	**255**	**196**	**77**	**273**	**382**	**147**	**528**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

PM Peak Hour

Producer	Daily Traffic			PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic			PM Peak Hour Exiting Traffic			Total PM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	1,597	214	1,812	4.10%	32%	68%	7	16	24	15	36	51	22	52	74
Cemstone	325	98	424	5.98%	36%	64%	4	5	9	7	9	16	11	14	25
Fischer	1,362	183	1,545	4.10%	32%	68%	6	14	20	13	30	43	19	44	63
McNamara	448	1,538	1,986	6.07%	46%	54%	39	17	55	46	20	65	84	36	121
Tiller	563	319	882	3.35%	26%	74%	4	4	8	12	10	22	16	14	30
Dakota Co.	0	0	0	3.35%	26%	74%	0	0	0	0	0	0	0	0	0
Total	**4,296**	**2,353**	**6,649**				**60**	**56**	**116**	**93**	**105**	**197**	**153**	**161**	**313**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

Table 2-18 presents the Year 2015 AM and PM peak hour trip generation estimate for the No-Build scenarios.

Table 2 - 18. Year 2015 No-Build Mining Company Trip Generation

AM Peak Hour

Producer	Daily Traffic			AM Peak (Percent of Daily)	Directional Distribution[1]		AM Peak Hour Entering Traffic			AM Peak Hour Exiting Traffic			Total AM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	0	0	0	9.16%	49%	51%	0	0	0	0	0	0	0	0	0
Cemstone	374	124	497	9.78%	53%	47%	17	8	26	16	7	23	33	16	49
Fischer	0	0	0	9.16%	49%	51%	0	0	0	0	0	0	0	0	0
McNamara	0	0	0	6.51%	43%	57%	0	0	0	0	0	0	0	0	0
Tiller	747	324	1,071	5.65%	53%	47%	24	8	32	22	7	28	46	15	61
Dakota Co.	0	0	0	5.65%	53%	47%	0	0	0	0	0	0	0	0	0
Total	**1,120**	**448**	**1,568**				**42**	**16**	**58**	**37**	**14**	**51**	**79**	**30**	**109**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

PM Peak Hour

Producer	Daily Traffic			PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic			PM Peak Hour Exiting Traffic			Total PM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	0	0	0	4.10%	32%	68%	0	0	0	0	0	0	0	0	0
Cemstone	374	124	497	5.98%	36%	64%	5	6	11	8	11	19	13	17	30
Fischer	0	0	0	4.10%	32%	68%	0	0	0	0	0	0	0	0	0
McNamara	0	0	0	6.07%	46%	54%	0	0	0	0	0	0	0	0	0
Tiller	747	324	1,071	3.35%	26%	74%	6	4	9	16	11	26	21	15	36
Dakota Co.	0	0	0	3.35%	26%	74%	0	0	0	0	0	0	0	0	0
Total	**1,120**	**448**	**1,568**				**10**	**10**	**20**	**24**	**22**	**45**	**34**	**32**	**66**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

Table 2-19 presents the Year 2015 AM and PM peak hour trip generation estimate for the proposed build mining operations.

Table 2 - 19. Year 2015 Proposed Build Mining Company Trip Generation

AM Peak Hour

Producer	Daily Traffic			AM Peak (Percent of Daily)	Directional Distribution[1]		AM Peak Hour Entering Traffic			AM Peak Hour Exiting Traffic			Total AM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	2,500	335	2,835	9.16%	49%	51%	104	24	128	107	25	132	211	48	260
Cemstone	501	151	652	9.78%	53%	47%	23	11	34	21	10	30	43	20	64
Fischer	2,115	284	2,399	9.16%	49%	51%	88	20	108	91	21	112	179	41	220
McNamara	580	1,992	2,572	6.51%	43%	57%	38	34	71	51	45	96	89	79	167
Tiller	741	420	1,161	5.65%	53%	47%	24	11	35	21	9	31	46	20	66
Dakota Co.	29	16	45	5.65%	53%	47%	1	0	1	1	0	1	2	1	3
Total	**6,466**	**3,198**	**9,665**				**278**	**100**	**378**	**292**	**110**	**401**	**570**	**209**	**779**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

PM Peak Hour

Producer	Daily Traffic			PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic			PM Peak Hour Exiting Traffic			Total PM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	2,500	335	2,835	4.10%	32%	68%	11	26	37	24	56	79	35	81	116
Cemstone	501	151	652	5.98%	36%	64%	6	8	14	11	14	25	17	22	39
Fischer	2,115	284	2,399	4.10%	32%	68%	9	22	31	20	47	67	30	69	98
McNamara	580	1,992	2,572	6.07%	46%	54%	50	21	71	59	25	85	109	47	156
Tiller	741	420	1,161	3.35%	26%	74%	6	5	10	16	13	29	21	18	39
Dakota Co.	29	16	45	3.35%	26%	74%	0	0	0	1	1	1	1	1	2
Total	**6,466**	**3,198**	**9,665**				**82**	**82**	**164**	**130**	**156**	**286**	**212**	**238**	**450**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

Table 2-20 presents the Year 2025 AM and PM peak hour trip generation estimate for the No-Build scenarios.

Table 2 - 20. Year 2025 No-Build Mining Company Trip Generation

AM Peak Hour

Producer	Daily Traffic			AM Peak (Percent of Daily)	Directional Distribution[1]		AM Peak Hour Entering Traffic			AM Peak Hour Exiting Traffic			Total AM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	0	0	0	9.16%	49%	51%	0	0	0	0	0	0	0	0	0
Cemstone	306	102	408	9.78%	53%	47%	14	7	21	13	6	19	27	13	40
Fischer	0	0	0	9.16%	49%	51%	0	0	0	0	0	0	0	0	0
McNamara	0	0	0	6.51%	43%	57%	0	0	0	0	0	0	0	0	0
Tiller	0	0	0	5.65%	53%	47%	0	0	0	0	0	0	0	0	0
Dakota Co.	0	0	0	5.65%	53%	47%	0	0	0	0	0	0	0	0	0
Total	**306**	**102**	**408**				**14**	**7**	**21**	**13**	**6**	**19**	**27**	**13**	**40**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

PM Peak Hour

Producer	Daily Traffic			PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic			PM Peak Hour Exiting Traffic			Total PM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	0	0	0	4.10%	32%	68%	0	0	0	0	0	0	0	0	0
Cemstone	306	102	408	5.98%	36%	64%	4	5	9	7	9	16	11	14	24
Fischer	0	0	0	4.10%	32%	68%	0	0	0	0	0	0	0	0	0
McNamara	0	0	0	6.07%	46%	54%	0	0	0	0	0	0	0	0	0
Tiller	0	0	0	3.35%	26%	74%	0	0	0	0	0	0	0	0	0
Dakota Co.	0	0	0	3.35%	26%	74%	0	0	0	0	0	0	0	0	0
Total	**306**	**102**	**408**				**4**	**5**	**9**	**7**	**9**	**16**	**11**	**14**	**24**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

Table 2-21 presents the Year 2025 AM and PM peak hour trip generation estimate for the proposed Build mining operations.

Table 2 - 21. Year 2025 Proposed Build Mining Company Trip Generation

AM Peak Hour

Producer	Daily Traffic			AM Peak (Percent of Daily)	Directional Distribution[1]		AM Peak Hour Entering Traffic			AM Peak Hour Exiting Traffic			Total AM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	3,398	456	3,854	9.16%	49%	51%	141	32	174	146	33	179	287	66	353
Cemstone	693	209	902	9.78%	53%	47%	32	15	47	28	13	42	60	28	88
Fischer	2,917	391	3,308	9.16%	49%	51%	121	28	149	125	29	154	247	57	303
McNamara	729	2,503	3,232	6.51%	43%	57%	48	42	90	64	57	121	111	99	210
Tiller	938	532	1,469	5.65%	53%	47%	31	13	44	27	12	39	58	25	83
Dakota Co.	40	22	62	5.65%	53%	47%	1	1	2	1	1	2	2	1	4
Total	**8,714**	**4,113**	**12,827**				**374**	**131**	**506**	**391**	**145**	**536**	**765**	**276**	**1041**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

PM Peak Hour

Producer	Daily Traffic			PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic			PM Peak Hour Exiting Traffic			Total PM Peak Hour Traffic		
	Truck	Other Vehicle	Total		Entering	Exiting	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total	Truck	Other Vehicle	Total
Aggregate Industries	3,398	456	3,854	4.10%	32%	68%	15	35	50	32	76	108	47	111	158
Cemstone	693	209	902	5.98%	36%	64%	8	11	20	15	19	34	23	31	54
Fischer	2,917	391	3,308	4.10%	32%	68%	13	30	43	28	65	93	41	95	136
McNamara	729	2,503	3,232	6.07%	46%	54%	63	27	90	74	32	106	137	59	196
Tiller	938	532	1,469	3.35%	26%	74%	7	6	13	20	17	36	27	23	49
Dakota Co.	40	22	62	3.35%	26%	74%	0	0	1	1	1	2	1	1	2
Total	**8,714**	**4,113**	**12,827**				**107**	**109**	**216**	**170**	**209**	**379**	**277**	**319**	**595**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation

The total trip generation volumes for each mining operator, as shown in the prior tables, are associated with the location of their respective plants. At the plant site, the raw material is prepared for shipment or used to make other products (asphalt, ready mix or concrete blocks). Trucks and 'other vehicles' enter the mining facility via a driveway to the plant location for pick-up.

Material Transport (Mine Pit to Plant)

In addition to the trip generation associated with the exporting of material from the main mining plant locations, consideration was given to the transport of material from the mining pits to the plants.

Currently, material mined from the Heikes property is being trucked to Aggregate Industries's plant in Lakeville. Aggregate Industries indicated approximately 30,000 tons per year are exported to their existing plant facility. The existing condition traffic volumes reflect this truck volume in the analysis. The 30,000 tons per year equals approximately 10 trucks per day and is expected to cease prior to 2015. This truck volume was assumed to be negligible.

In the future, Cemstone will be mining the Berg East and Berg West properties for aggregate. The aggregate mined from this site will be trucked to locations in Burnsville and other retail locations. Data provided by Cemstone indicated 6,000 truck trips per year from Year 2006 to 2030 are expected. **Table 2-22** summarizes the daily, AM peak hour and PM peak hour internal trip generation expected as a

result of the trucking from the Berg property. This truck volume was assumed to be negligible and was not further considered in the TIS.

Table 2 - 22. Cemstone - Berg Property Truck Trip Generation

AM Peak Hour

Producer	Daily Traffic	AM Peak (Percent of Daily)	Directional Distribution[1]		Trips		
			Enter	Exit	Enter	Exit	Total
Cemstone	78	9.78%	53%	47%	4	4	8
Total	**78**				**4**	**4**	**8**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation in June 2004.

PM Peak Hour

Producer	Daily Traffic	PM Peak (Percent of Daily)	Directional Distribution[1]		PM Peak Hour Entering Traffic		
			Entering	Exiting	Truck	Truck	Total
Cemstone	78	5.98%	36%	64%	2	3	5
Total	**78**				**2**	**3**	**5**

[1] Directional distribution refers to the split of entering/exiting traffic and is based on turning movement counts collected by URS Corporation in July 2004.

All other mined parcels will conveyor material from the mine pits to the respective mining operator plant site. Therefore, no additional truck traffic generation is expected as a result of transporting material from the mining pits to plant sites.

2.6.4 Distribution of Planned Future Land Use and Mining Facility Trip Generation

The regional distribution refers to the geographic orientation of vehicles approaching or departing the study area. Generally, the regional distribution was in a percentage form and was applied to the total trip generation volumes determined in the previous section to assign travel paths and forecast volumes.

Traffic generation from the study area consists of two different types: residential housing from the planned future developments, and mining company-related as part of the proposed project. Both developments have very different traffic characteristics; therefore, the regional distribution percentages were considered separately.

Regional Distribution of Planned Future Development Parcels

Both the Genstar and Heritage residential developments will be located along TH 3, south of the proposed Mining Area. As part of the Genstar AUAR, the 195th Street and 208th Street extensions were considered implemented. Since the developments are very similar in nature, with destinations being similar, the travel

characteristics and route choice would also be consistent. The Genstar AUAR documents the regional percentages as follows:

- To the north: 45 percent
- To the south: 25 percent
- Using 195th Street and 208th Street Extension: 30 percent

The Genstar AUAR also documented the roadway route choice (traffic assignment to each intersection movement). This TIS assumed the Genstar AUAR percentages in the development of forecast traffic volumes generated by the Genstar and Heritage planned future developments. The TIS also considered the 195th Street and 208th Street extensions as part of the regional distribution. The regional distribution and intersection trip assignment percentages were used directly from the Genstar AUAR[5].

Both the Brandtjen and Cobblestone residential developments are located along 160th Street and Pilot Knob Road, west of the proposed Mining Area. Since the developments are very similar in nature, with destinations being similar, the travel characteristics and route choice (trip assignment to each intersection) would also be consistent. The Brandtjen EAW documents the regional percentages[6] as follows:

- To the west/northwest: 51 percent
- To the north/northeast: 18 percent
- To the east: 23 percent
- To the south: 4 percent
- To southeast: 4 percent

The Brandtjen EAW documented both the directional distribution and intersection traffic assignment for the Brandtjen development. The TIS assumed the Brandtjen EAW regional percentages and intersection trip assignment in the development of forecast traffic volumes generated by Brandtjen[6] and Cobblestone[7] future developments.

Mining Company Regional Distribution

The proposed mining operations within Empire Township are expected to generate a significant portion of the metro area gravel, asphalt and concrete products. As such, mining company vehicle travel routes would generally be along major east/west and north/south roadways. In addition, the geographic orientation or the location in the metro area the vehicles are destined to is relative to the construction activities. Aggregate Industries, McNamara and Tiller

[5] Farmington Seed/Genstar AUAR, September 2003, Figure 21-6.
[6] Brandtjen Farm Development EAW, August 13, 2004, Figures D-5, Figure D-12, Figure D-13 and Figure D-16.
[7] Cobblestone Lake Development AUAR, February 9, 2001, Exhibit 16 and also based on Brandtjen Farm Development EAW, August 13, 2004, Figures D-5, Figure D-12, Figure D-13 and Figure D-16.

provided their estimated existing regional orientation based on truck and construction activities during the last year. **Table 2-23** summarizes the regional distribution provided by the Mining Consortium. The average percentages identified were applied to all mining companies.

Table 2 - 23. Mining Company Existing Regional Distribution

Directional Orientation	A.I.	McNamara	Tiller	Average
North	15%	15%	5%	12%
Northeast	15%	5%	5%	8%
Northwest	10%	15%	35%	20%
East	5%	5%	5%	5%
Southeast	5%	5%	5%	5%
South	10%	15%	5%	10%
Southwest	15%	20%	5%	13%
West	25%	20%	35%	27%
				100%

Source: Aggregate Industries, McNamara, and Tiller Mine Operators, based on truck tickets

Based on logical route choice, mining vehicles are expected to use east/west and north/south collector roadways to get to and from their destinations. Based on this assumption and the data provided by the mining companies, **Figure 2-4** illustrates the approximate existing regional distribution and roadway assignment for the major roadways surrounding the proposed Mining Area.

Year 2005

No major changes in the metro area construction activities or mining company market areas are expected by Year 2005 that would result in a much different travel pattern for Empire Township mining-related vehicles. The mining vehicles are expected to continue heading to and from mostly the north, northwest and westerly directions. The TIS assumes the same regional distribution and roadway assignment as documented in **Figure 2-4**.

Year 2015 and Year 2025

Directional orientation of mining truck traffic is dependent upon construction activities and their anticipated delivery zones. As such, the forecast years 2015 and 2025 are expected to be slightly different than Year 2005, since construction hot spots will likely change over time. The forecast regional distribution was developed based upon two primary sources; the first source being the Metropolitan (Met) Council Regional Travel Demand Model (Year 2030 socioeconomic data) and the second being the Empire Township Mining Consortium projected market areas.

Based on the Met Council population, employment and land use growth projections, a relative percentage estimate could be made for growth hot spot locations within the seven county area. Growth in population, employment and

residential is expected to spur commercial and retail type developments. Furthermore, the growth of these land use types also spurs infrastructure improvements, which necessitates the need for material mined by the Mining Consortium. The Mining Consortium provided anticipated market areas for each mining company. Evaluating the mining market area and comparing it with locations of the projected regional growth areas (from 2030 Met Council projections) resulted in a forecast directional orientation for mining trucks. **Figure 2-5** illustrates the forecast Year 2015 and 2025 regional distribution for the proposed Mining Area.

The Met Council Regional Travel Demand Model (TDM) was used to direct vehicle trips to the surrounding and adjacent roadways. The TDM is comprised of Traffic Analysis Zone's (TAZ) coded with socioeconomic data, land use and the roadway network. Based on the regional distribution percentages determined for 2015 and 2025, the TDM was used to identify the travel shed (logical roadway choices) for each direction. Using the TDM, vehicle trip percentages were assigned to each roadway between the TAZs within each travel shed. The TDM considers logical route choice, travel time of each route choice, driver behavior with respect to congestion, roadway capacity thresholds and many other factors, which may contribute to the roadway or route a driver may chose to use. The mining truck trip assignment was used to develop future traffic volumes for each scenario analyzed. Forecast traffic volumes are presented in Section 4.0.

2.7 Traffic Operation Analysis Procedure

In order to determine the impacts of proposed developments on the surrounding roadway system, a traffic operation analysis is conducted. A traffic operations analysis is a process that estimates the quality of traffic flow along segments of roadway and through intersections. The ability of an intersection to process the existing or future approach traffic is affected by the magnitudes of these volumes, their movement desires, the geometric design of the intersection, and the traffic control. The analysis process included determining level of service for each of the key intersections for the existing conditions and future year conditions.

2.7.1 Analysis Tool

The approach to the traffic operations analysis is derived from the established methodologies documented in the Highway Capacity Manual (HCM)[8]. The HCM contains a series of analysis techniques that are used to evaluate the operation of transportation facilities under specified conditions. "Synchro5" is a Highway Capacity Manual implementing operation analysis software package that was used to evaluate the roadway network and as an input database for all the lane geometrics, turn movement volumes, traffic control and signal timing characteristics. Synchro5 reports several measures of effectiveness (MOE) useful in evaluating the capacity of a system and for comparing alternative conditions for assessing impacts. This information was then transferred to SimTraffic 5, the

[8] Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., 2000

traffic simulation model, to produce the analysis results for all the unsignalized intersections.

SimTraffic is a microscopic computer model that simulates each individual vehicle's characteristics and behavior in response to traffic volumes, signal operations, turning movements, pedestrians, and intersection configuration. The model can simulate driver behavior and response to surrounding traffic flow as well as different vehicle types and speed. It can reasonably estimate vehicle delay and queue lengths at intersections and can create visual animations of the traffic operations.

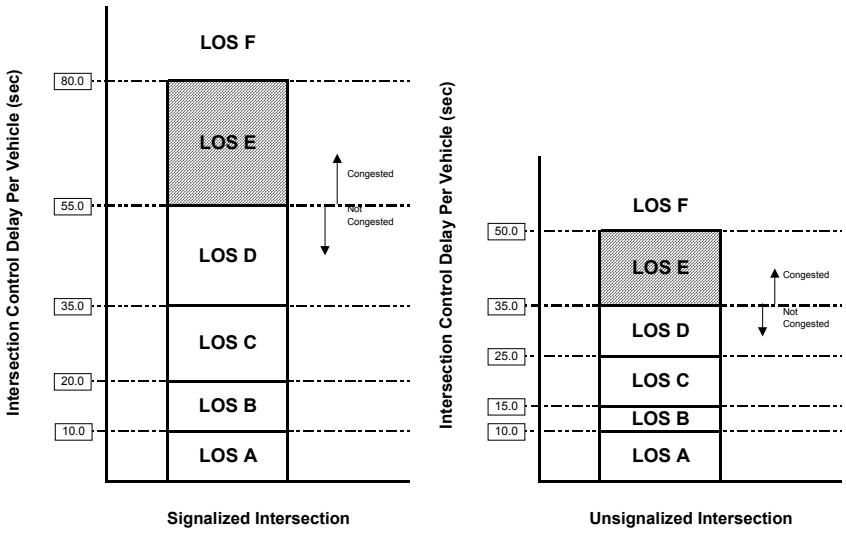
In this study, Synchro was used to report the signalized intersections and SimTraffic results were reported for the unsignalized intersections. Due to the number of approach lanes and crossing lanes at the unsignalized intersections, the HCM methodologies cannot appropriately estimate the expected vehicle delay. By simulating the individual vehicles, SimTraffic was able to analyze the operations of individual movements and the overall intersection, and most closely approximated the impact of queuing at adjacent intersections. In addition, where through lane queues block turn lanes or upstream intersections, SimTraffic was needed to analyze these interactions.

2.7.2 Level of Service Summary

The results of the analysis are typically presented in the form of a letter grade (A-F) that provides a qualitative indication of the operational efficiency or effectiveness. The letter grade assigned to traffic operations analysis results is referred to as Level of Service (LOS)[9]. By definition, LOS A conditions represent high-quality operations (i.e., motorists experience very little delay or interference) and LOS F conditions represent very poor operations (i.e., extreme delay or severe congestion). **Table 2-24** shows a graphical interpretation of Level of Service.

Table 2 - 24. Level of Service Criteria[10]

[9] *Highway Capacity Manual, 2000*.
[10] *Highway Capacity Manual, 2000* – Table 9-1 for signalized intersections.



In accordance with the Mn/DOT and Dakota County guidelines, this traffic analysis used the LOS D/E boundary as the indicator of acceptable traffic operations and congestion. LOS D is generally considered an acceptable operating condition during AM and PM peak hours.

2.7.3 Defining Impacts

As previously discussed, traffic impacts can be defined in a number of ways including:

- LOS of the entire intersection
- LOS of individual movements within an intersection
- The relationship between the queue length and the storage length of an intersection movement

The following standards were used as the first step to define possible deficiencies:

- If at an intersection, the overall level of service of the intersection is expected to be at a LOS E or F, there could be a potential deficiency
- If one or more individual movements at an intersection, the level of service is expected to be at a LOS E or F, which results in a significant decrease in the overall operational efficiency at the intersection, there might be a potential deficiency
- If one or more queue lengths at an intersection exceeds the storage length, which results in significant upstream traffic impacts, there might be a potential deficiency

The next step was to determine if the deficiency warrants a roadway improvement (due to expected background traffic or other planned land developments) or a mitigation measure (due to expected mining operation traffic) or). The following

guidelines are applied when conducting a traffic study and identifying deficiencies that would or would not be considered warranted:

- All intersections operating at a LOS E or F as a result of background traffic or mining-generated traffic would be considered for roadway improvements or mitigation measures where appropriate
- Not all intersection movements expected to be at a LOS E or F require roadway improvements or mitigation measures. For example, if an individual movement operates at a LOS E or F but has a low volume, the movement would not be expected to significantly decrease the overall operation at the intersection.
- If a queue length at a particular intersection exceeds the storage length causing through traffic to spill back through the next upstream intersection, then the intersection would be considered for roadway improvements or mitigation measures
- If a queue length at a particular intersection exceeds the storage length and does not clear out throughout the peak hour, with the result that traffic volumes for the entire system begin to decrease, then roadway improvements or mitigation measures would be considered
- Not all queue lengths that exceed storage lengths necessitate roadway improvements or mitigation measures. For example, if a queue length exceeds the storage length by only a short distance, the queue would not be expected to have a significant upstream impact. Or if the queue diminishes (clears out) regularly throughout the peak hour, the movement would not be expected to significantly disrupt upstream traffic

Once a specific deficiency was identified that necessitates consideration for a roadway improvement or mitigation measure, the following solutions were evaluated to reduce or eliminate the deficiency:

- Adjusting the intersection phasing, and/or reassigning the lane geometry
- Implementing geometric improvements, including adding through lanes, adding turn lanes or lengthening turn lanes
- Suggesting ways to reduce the number of vehicles that use that intersection or individual intersection movement, such as directing vehicles to alternate routes, infrastructure improvements or recommending alternate modes of transportation.