

4.0 MINING IMPACT ANALYSIS

To assess the expected traffic impacts of the proposed project, a traffic operation analysis was completed for three future study years and four analysis scenarios as discussed in Section 2.2. Comparing the results of the various scenarios for each future study year allowed for deficiencies and specific project related impacts to be identified. This section documents the traffic operation analysis results for the following three global conditions:

- Year 2005 Forecast Conditions
- Year 2015 Forecast Conditions
- Year 2025 Forecast Conditions

As presented previously in Section 2.2, each forecast condition compares various development scenarios for each study year as follows:

- No-Build – background growth only (includes No-Build mining company operations);
- No-Build – background growth plus other planned land developments (includes No-Build mining company operations); and
- Build – mining operation plus background growth plus other planned land developments.

The following sections document how the future base roadway and intersection lane geometrics, traffic control and signal operations accommodate the forecast traffic volumes. Identification of deficiencies are listed based on the criteria defined previously in Section 2.7.3. Those intersection movements or intersections identified as being deficient are discussed and considered in the future improvement alternatives or mitigation alternatives evaluation (Section 5.0).

4.1 Future Year Scenarios - Base Lane Geometrics and Traffic Control

4.1.1 Year 2005

The future year scenarios base lane geometrics and traffic control were discussed in Section 2.4.3. Under the Year 2005 scenario, the planned land developments are not expected to be under construction or completed, except for the 25 percent already completed on the Cobblestone Lake development parcel. Therefore, the lane geometrics and traffic control evaluated for the 2005 forecast conditions are the same as the existing conditions. Both the 2005 forecast condition scenarios lane geometrics and traffic control evaluated in the traffic study are illustrated in **Figure 3-1**.

4.1.2 Years 2015 and 2025

The 2015 and 2025 No-Build (background growth only) scenarios assumed that the planned land developments (Brandtjen, Cobblestone, Genstar and Heritage) have not occurred beyond what has already been completed. As such, the 2015 and 2025 No-Build (background growth only) lane geometrics and traffic control evaluated in this traffic study are the same as the existing conditions, as shown previously in **Figure 3-1**.

Under the 2015 and 2025 No-Build (background growth plus other planned land developments) and the Build (mining operation plus background growth plus other planned land developments), the improvement measures required by the planned residential development studies (i.e., Genstar AUAR, Brandtjen EAW and Cobblestone AUAR) were included in the base geometrics as identified in Section 2.4.3. **Figure 4-1** illustrates the base lane geometrics included in the traffic analysis.

4.2 Year 2005 Forecast Conditions Traffic Operation Analysis

The traffic operation analysis for the Year 2005 Forecast Conditions looked at each of the key intersection forecast turning movement volumes, overall intersection LOS, and individual movement LOS for a typical weekday during the forecast AM and PM peak periods. Two scenarios were evaluated; No-Build (background growth only) and the Build (mining operation plus background growth). A scenario including the other planned land developments was not included in the 2005 condition as these developments are not expected to be under construction or completed by Year 2005, except for the 25 percent of the Cobblestone Lake development currently completed.

The proposed mining company phasing, operation and material export quantities under both the No-Build and Build scenarios were presented in Section 2.5. It should be noted that even under the No-Build scenarios, the mining companies continue to generate material export and trucks due to pre-existing mine pits and nearby mining facilities. Section 2.6 details the specific methodology and assumptions used to develop the forecast Year 2005 No-Build and Build traffic volumes evaluated in this traffic study. **Figures 4-2** and **4-3** illustrate the Year 2005 forecast AM and PM peak hour turning movement volumes under the No-Build (background growth only) scenario, respectively. **Figures 4-4** and **4-5** illustrate the Year 2005 forecast AM and PM peak hour turning movement volumes under the Build (mining operation plus background growth) scenario, respectively. In addition, each figure displays the expected site-generated traffic volumes. This site-generated volume does not specifically identify the quantity of other commercial trucks within the background traffic; rather, it only documents the contribution of traffic from the six mining companies. However, the truck percentages used in the operational analysis did include both the mining specific truck volume and the background commercial truck percentages.

In general, left turn movements and minor street stopped control movements will operate at a LOS E or F during peak time periods. Most often, these movements are low volume and the LOS grade would not benefit from most feasible improvement measures. Unless the poor LOS results in an overall degradation to the transportation system, causes impacts to other movements, or would be expected to create unsafe conditions, they are considered to be acceptable.

4.2.1 Year 2005 Analysis and Results

2005 No-Build (background growth only) – AM Peak Hour

The 2005 No-Build (background growth only) AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-6**. Generally, unsignalized intersections will display a LOS A, because the higher volume movements are not stopped, so they contribute zero delay to the overall intersection delay calculation. The minor approach, or stopped approach, is the critical movement in consideration. Therefore, at each unsignalized intersection the critical movement vehicle delay (seconds per vehicle) is also shown in **Figure 4-6**.

The traffic operation analysis indicated that all the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better). However, one individual movement at the 150th Street/Pilot Knob Road intersection was identified as a LOS E.

The results of the queuing analysis showed that during the AM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic.

2005 No-Build (background growth only) – PM Peak Hour

The 2005 No-Build (background growth only) PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-7**. Similar to the AM peak hour the stopped approach and critical movement vehicle delay (seconds per vehicle) at each unsignalized intersection is also shown.

The traffic operation analysis indicated that all of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better). Several intersection movements at the 160th Street/Cedar Avenue intersection were reported to operate at a LOS E or F under the 2005 No-Build conditions. These movements do not indicate serious traffic operation deficiencies at this time; however the following summarizes the existing condition traffic operation concerns expected to become problematic in the future condition analyses.

The Cedar Avenue/160th Street intersection operates near capacity. Although an overall intersection LOS D was reported, several movements operate at LOS E or F, including the southbound and eastbound through movement.

The results of the queuing analysis showed that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic. However, the analysis indicated that queue lengths on the north approach to the Cedar Avenue/160th Street intersection extend beyond available storage distances, impacting the upstream intersection from time to time during the peak hour.

2005 Build (mining operation plus background growth only) – AM Peak Hour

The difference between the traffic volumes generated by the mining companies under the No-Build and Build scenarios are expected to be minimal under the 2005 forecast conditions. Existing mining companies already mining within the proposed Mining Area (Tiller and Cemstone) are expected to continue doing so. Of the three mining companies currently operating nearby, only Aggregate Industries is expected to begin exporting material from the proposed Mining Area by 2005.

The 2005 Build (mining operation plus background growth) AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-8**, with critical movement vehicle delay listed at unsignalized intersections.

The traffic operation analysis indicated that all the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better). Similar to the No-Build scenario, one individual movement at the 150th Street/Pilot Knob Road intersection was identified as a LOS E. The results of the queuing analysis showed that during the AM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic.

2005 Build (mining operation plus background growth only) – PM Peak Hour

Similar to the AM peak hour conditions, the difference between the traffic volumes generated by the mining companies under the No-Build and Build scenarios are expected to be minimal under the 2005 forecast conditions. As such, the results of the traffic analysis also reflected very little difference.

The 2005 Build (mining operation plus background growth) PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-9**, with critical movement vehicle delay listed at unsignalized intersections.

The traffic operation analysis indicated that all the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better). Similar to the existing condition PM peak hour and the 2005 No-Build condition, the Cedar Avenue/160th Street intersection is expected to have several movements operating

at a LOS E or F. In addition, the southbound queue lengths are expected to impact the upstream intersection from time to time during the peak hour. The queue length impact between the Build and No-Build conditions is negligible.

All other intersection movement LOS and vehicle queue lengths reported at intersections within the study area are expected to operate at acceptable levels under the 2005 Build (mining company plus background growth) scenario.

4.2.2 Year 2005 Railroad Grade Crossing

A queue length evaluation at the existing railroad grade crossings on 160th Street and 170th Street were evaluated under the forecast Year 2005 No-Build (background growth only) and 2005 Build (mining operation plus background growth) traffic volumes. **Table 4-1** summarizes the results of the queue length analysis.

Table 4 - 1. 2005 Railroad Grade Crossing Queue Lengths

Scenario			160th Street Railroad Crossing	170th Street Railroad Crossing	
Mean Queue Length (ft)	2005 No-Build (Background)	AM	EB	207	178
			WB	152	87
	2005 No-Build (Background)	PM	EB	225	131
			WB	192	182
	2005 Build (Mining + Background)	AM	EB	208	178
			WB	152	87
	2005 Build (Mining + Background)	PM	EB	226	131
			WB	193	182
Storage Space			EB	5250 ⁽¹⁾	8070 ⁽³⁾
			WB	1750 ⁽²⁾	2130 ⁽⁴⁾

Note: (1) - The distance from 160th Street railroad crossing to Diamond Path

(2) - The distance from 160th Street railroad crossing to TH 3

(3) - The distance from 170th Street railroad crossing to Pilot Knob Road

(4) - The distance from 170th Street railroad crossing to TH 3

As indicated in the above table, a train event under the forecast Year 2005 traffic volumes are not expected to generate a queue impact to adjacent intersections during the AM and PM peak time periods.

4.3 Year 2015 Forecast Conditions Traffic Operation Analysis

The traffic operation analysis for the Year 2015 Forecast Conditions looked at each of the key intersections forecast turning movement volumes, overall intersection LOS, and individual movement LOS for a typical weekday during the forecast AM and PM peak periods. Three scenarios were evaluated; No-Build (background growth only), No-Build (background growth plus planned land developments) and the Build (mining operation plus background growth plus planned land developments).

The proposed mining company phasing, operation and material export quantities expected for the forecast Year 2015 under both the No-Build and Build scenarios were presented in Section 2.5. It should be noted that even under the No-Build

scenarios, the mining companies continue to generate material export and trucks due to pre-existing mine pits and nearby mining facilities. Section 2.6 details the specific methodology and assumptions used to develop the forecast Year 2015 No-Build and Build traffic volumes evaluated in this traffic study. **Figures 4-10 and 4-11** illustrate the Year 2015 forecast AM and PM peak hour turning movement volumes under the No-Build (background growth only) scenario, respectively. **Figures 4-12 and 4-13** illustrate the Year 2015 forecast AM and PM peak hour turning movement volumes under the No-Build (background growth plus planned land developments) scenario, respectively. **Figures 4-14 and 4-15** illustrate the Year 2015 forecast AM and PM peak hour turning movement volumes under the Build (mining operation plus background growth plus planned land developments) scenario, respectively. In addition, each figure displays the expected site-generated traffic volumes. This site-generated volume does not specifically identify the quantity of other commercial trucks within the background traffic; rather, it only documents the contribution of traffic from the six mining companies. However, the truck percentages used in the operational analysis does include both the mining specific truck volume and the background commercial truck percentages.

4.3.1 Year 2015 Analysis and Results

2015 No-Build (background growth only) – AM Peak Hour

Under the 2015 No-Build (background growth only) scenario, only Tiller and Cemstone will be producing exports from the study area. The other developments; Genstar, Brandtjen, Cobblestone and Heritage are assumed to have not occurred. The 2015 No-Build (background growth only) AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-16**, with the critical movement vehicle delay (seconds per vehicle) provided at each unsignalized intersection.

The traffic operation analysis indicated that all the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better). Although a few individual movements at the 150th Street/Pilot Knob Road and 160th Street/TH 3 intersections were reported to operate at a LOS E or F under the 2015 No-Build condition, these movements do not indicate serious traffic operation deficiencies at this time.

The results of the queuing analysis showed that during the AM peak hour, there were no regular issues expected with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic.

2015 No-Build (background growth only) – PM Peak Hour

Similar to the AM peak hour, only Tiller and Cemstone will be producing exports from the study area under the 2015 No-Build (background growth only) scenario. The other developments; Genstar, Brandtjen, Cobblestone and Heritage are assumed to have not occurred. The 2015 No-Build (background growth only) PM

peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-17**. The minor approach, or stopped approach, critical movement vehicle delay (seconds per vehicle) at each unsignalized intersection is also shown.

The traffic operation analysis indicated that all of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with exception to the Cedar Avenue/160th Street intersection. Although a few intersection movements at other intersections within the study area were reported to operate at a LOS E under the 2015 No-Build condition, these movements do not indicate serious traffic operation deficiencies at this time. The following summarizes the 2015 No-Build (background growth only) traffic operation concerns based on the LOS.

The Cedar Avenue/160th Street intersection is expected to operate at a LOS E. Several movements operate at LOS E or F, including the southbound through movement, westbound through, westbound left turn movement, eastbound left turn and the northbound left turn movement.

The results of the queuing analysis show that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the following two locations:

- The southbound queue length to the Cedar Avenue/160th Street intersection is expected to extend beyond available storage distances, impacting the upstream intersection during the peak hour. In addition, the eastbound, westbound and southbound approach left turn movement queue lengths are expected to extend beyond the available storage, with potential to impact through lane traffic.
- The eastbound right turn queue length at the 160th Street/Pilot Knob Road intersection is expected to extend beyond the available storage length, impacting the through lane travel.

2015 No-Build (background growth plus planned land developments) – AM Peak Hour

The 2015 No-Build (background growth plus planned land developments) includes the development of the four known land parcels adjacent to the proposed project, in addition to other background growth. Again, only Tiller and Cemstone are expected to be producing exports under this 2015 scenario. As discussed earlier, several roadway and traffic control improvements have been accounted for in the analysis. The 2015 No-Build (background growth plus planned land developments) AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-18**, with the critical movement vehicle delay (seconds per vehicle) shown at each unsignalized intersection.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with two intersections at LOS E or F and movements at two intersections with excessive delays. The following summarizes the traffic operation deficiencies identified in the AM peak hour analysis:

- The 150th Street/Pilot Knob Road intersection is expected to operate at a LOS E. Several movements are expected to operate at a LOS E or LOS F, including left turn movements and the northbound and eastbound through movements.
- The TH 3/170th Street intersection is expected to operate at a LOS F. The eastbound approach (stop controlled) is expected to operate with significant volume and delay, as the primary contributing factor in the intersections poor LOS.
- The Cedar Avenue/160th Street intersection is expected to operate near capacity. Several left turn movements are expected to operate with excessive delay, contributing to the overall degradation of the intersection.
- The eastbound approach to the Pilot Knob Road/Dodd Boulevard is expected to operate at a LOS F, with excessive delays impacting the overall LOS of the intersection.

The results of the queuing analysis show that during the AM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the following three locations:

- The northbound left turn movement at the 160th Street/TH 3 intersection
- The southbound left turn, eastbound left turn and westbound right turn movements at the Cedar Avenue/160th Street intersection.
- The eastbound movements to the TH 3/170th Street intersection.

2015 No-Build (background growth plus planned land developments) – PM Peak Hour

Similar to the AM peak hour, only Tiller and Cemstone will be producing exports from the Mining Area under the 2015 No-Build (background growth plus planned land developments) scenario. The 2015 No-Build (background growth plus planned land developments) PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-19**, with the critical movement vehicle delay (seconds per vehicle) shown at each unsignalized intersection.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with

three intersections at LOS E or F and movements at several intersections with excessive delays. The following summarizes the traffic operation deficiencies identified in the PM peak hour analysis:

- The 150th Street/Pilot Knob Road intersection is expected to operate at a LOS F. Several movements are expected to operate at a LOS E or LOS F, including all left turn movements and the southbound through movement.
- The Cedar Avenue/160th Street intersection is expected to operate at a LOS F. Significant delay on all directions of approach are expected.
- The 160th Street/Pilot Knob Road intersection is expected to operate at a LOS E. The inadequate lane geometrics on the eastbound approach, westbound left turn and southbound through movements are the primary contributors to the poor LOS.
- The eastbound approach to the Pilot Knob Road/Dodd Boulevard is expected to operate at a LOS F, with excessive delays impacting the overall LOS of the intersection.
- The eastbound and southbound approaches to the Pilot Knob Road/170th Street intersection are expected to operate at a LOS F and LOS E, respectively.

The results of the queuing analysis show that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the following four locations:

- At the 150th Street/Pilot Knob Road intersection, excessive vehicle queue lengths are expected on the westbound through, eastbound through, southbound through and northbound left turn approaches.
- At the TH 3/Elm Street intersection, the northbound left turn movement is expected to extend beyond the available storage length.
- The eastbound right turn movement at the 160th Street/Pilot Knob Road intersection.
- The southbound through, eastbound through and westbound left turn movements at the Cedar Avenue/160th Street intersection.

All other intersection movement LOS and vehicle queue lengths reported at intersections within the study area are expected to operate at acceptable levels under the 2015 No-Build (background growth plus planned land developments) scenario.

2015 Build (mining operation plus background growth plus planned land developments) – AM Peak Hour

In addition to the Mining Area site-generated traffic, the 2015 Build (mining operation plus background growth plus planned land developments) includes the the four planned land development parcels adjacent to the Mining Area. The 2015

Build AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-20**, with the critical movement vehicle delay (seconds per vehicle) at each unsignalized intersection also shown.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with four intersections at LOS E or F. In addition to the deficiencies identified in the 2015 No-Build (background growth plus planned land developments) the following deficiencies result as an impact of the proposed Mining Area:

- The TH 3/170th Street intersection westbound approach (stop controlled) is expected to operate at a LOS F. With the increase in traffic on the westbound approach, the eastbound approach (stop controlled) is expected to operate with worse delay than found in 2015 No-Build (background growth plus other planned developments)

The results of the queuing analysis show that during the AM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, with exception to the locations previously identified in the 2015 No-Build (background growth plus planned land developments). It should be noted that the eastbound queue length to the TH 3/170th Street intersection was found to extend beyond the Cemstone access point.

2015 Build (mining operation plus background growth plus planned land developments) – PM Peak Hour

The 2015 Build PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-21**, with the critical movement vehicle delay (seconds per vehicle) at each unsignalized intersection also shown.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with four intersections at LOS E or F. In addition to the deficiencies identified in the 2015 No-Build (background growth plus planned land developments) PM peak hour scenario, the following deficiencies result as an impact of the proposed Mining Area:

- The northbound left turn movement to the TH 3/160th Street intersection is expected to operate at a LOS F.
- The eastbound and westbound (stop controlled) approaches at the TH 3/170th Street intersection are expected to experience LOS F conditions, with excessive delays expected.
- The southbound left turn movement at the 160th Street/Galaxie Avenue intersection is expected to operate at a LOS F.

The results of the queuing analysis show that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the locations previously identified in the 2015 No-Build (background growth plus planned land developments) scenario. The following identifies additional locations where queue lengths were found to extend beyond the available storage distances:

- At the TH 3/160th Street intersection, the northbound left turn movement is expected to extend beyond the available storage length, having the potential to impact through lane travel.
- Due to decreased capacity along east/west 160th Street, the northbound left turn lane at the 160th Street/Pilot Knob Road intersection extends beyond its available storage lane and impacts northbound through traffic.
- The east and west approach queue lengths at the TH 3/170th Street intersection were found to be excessive.

All other intersection movement LOS and vehicle queue lengths reported at intersections within the study area are expected to operate at acceptable levels under the 2015 Build scenario.

4.3.2 Year 2015 Railroad Grade Crossing

A queue length evaluation at the existing railroad grade crossings on 160th Street and 170th Street were evaluated under the forecast Year 2015 No-Build (background growth only), 2015 No-Build (background growth plus planned land developments) and 2015 Build traffic volumes. **Table 4-2** summarizes the results of the queue length analysis.

Table 4 - 2. 2015 Railroad Grade Crossing Queue Lengths

Scenario				160th Street Railroad Crossing	170th Street Railroad Crossing
Mean Queue Length (ft)	2015 No-Build (Background)	AM	EB	171	241
			WB	124	94
	2015 No-Build (Background)	PM	EB	191	181
			WB	165	202
	2015 No-Build (Background + Planned Developments)	AM	EB	288	289
			WB	212	174
	2015 No-Build (Background + Planned Developments)	PM	EB	327	276
			WB	324	279
	2015 Build (Mining + Background + Planned Developments)	AM	EB	416	444
			WB	328	303
	2015 Build (Mining + Background + Planned Developments)	PM	EB	390	352
			WB	403	376
Storage Space		EB	5250 ⁽¹⁾	8070 ⁽³⁾	
		WB	1750 ⁽²⁾	2130 ⁽⁴⁾	

Note: (1) - The distance from 160th Street railroad crossing to Diamond Path
(2) - The distance from 160th Street railroad crossing to TH 3
(3) - The distance from 170th Street railroad crossing to Pilot Knob Road
(4) - The distance from 170th Street railroad crossing to TH 3

A train event under the forecast Year 2015 traffic volumes are not expected to generate a queue impact to adjacent intersections during the AM and PM peak time periods.

4.4 Year 2025 Forecast Conditions Traffic Operation Analysis

The traffic operation analysis for the Year 2025 Forecast Conditions looked at each of the key intersections forecast turning movement volumes, overall intersection LOS, and individual movement LOS for a typical weekday during the forecast AM and PM peak periods. Three scenarios were evaluated; No-Build (background growth only), No-Build (background growth plus planned land development) and the Build (mining operation plus background growth plus other planned land developments).

The proposed mining company phasing, operation and material export quantities expected for the forecast Year 2025 under both the No-Build and Build scenarios were presented in Section 2.5. It should be noted that even under the No-Build scenarios, the mining companies continue to generate material export and trucks due to pre-existing mine pits and nearby mining facilities. Section 2.6 details the specific methodology and assumptions used to develop the forecast Year 2025 No-Build and Build traffic volumes evaluated in this traffic study. **Figures 4-22 and 4-23** illustrate the Year 2025 forecast AM and PM peak hour turning movement volumes under the No-Build (background growth only) scenario, respectively. **Figures 4-24 and 4-25** illustrate the Year 2025 forecast AM and PM peak hour turning movement volumes under the No-Build (background growth plus planned land developments) scenario, respectively. **Figures 4-26 and 4-27** illustrate the Year 2025 forecast AM and PM peak hour turning movement

volumes under the Build scenario, respectively. In addition, each figure displays the expected site-generated traffic volumes. This site-generated volume does not specifically identify the quantity of other commercial trucks within the background traffic; rather, it only documents the contribution of traffic from the six mining companies. However, the truck percentages used in the operational analysis does include both the mining specific truck volume and the background commercial truck percentages.

4.4.1 Year 2025 Analysis and Results

2025 No-Build (background growth only) – AM Peak Hour

Under the 2025 No-Build (background growth only) scenario, only Cemstone will be producing exports from the Mining Area. For the purpose of this scenario, the other developments; Genstar, Brandtjen, Cobblestone and Heritage are assumed to have not occurred. The 2025 No-Build (background growth only) AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-28**.

The traffic operation analysis indicated most all the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with one intersection at LOS E. By 2025, the following roadway deficiencies are expected:

- At the Pilot Knob Road/Dodd Boulevard intersection, the eastbound left turn movement is expected to operate at a LOS F, with excessive delay. The delay results in degrading the overall intersection LOS to an E.
- Several critical movements at the Cedar Avenue/160th Street intersection are expected to operate at a LOS E.

Although a few intersection movements at other intersections within the study area were reported to operate at a LOS E under the 2025 No-Build condition, these movements do not indicate serious traffic operation deficiencies at this time.

The results of the queuing analysis show that during the AM peak hour, there are no regular issues expected with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic.

2025 No-Build (background growth only) – PM Peak Hour

Similar to the AM peak hour, only Cemstone will be producing exports from the Mining Area under the 2025 No-Build (background growth only) scenario. Again, the other developments; Genstar, Brandtjen, Cobblestone and Heritage are assumed to have not occurred. The 2025 No-Build (background growth only) PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-29**.

The traffic operation analysis indicated that all of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with two intersections at LOS E or F. The following summarizes operational deficiencies expected under the 2025 No-Build (background growth only) scenario:

- The Cedar Avenue/160th Street intersection is expected to operate at a LOS F by Year 2025. The critical movements operate at LOS E or F, including the southbound through movement, westbound through, westbound left turn movement, eastbound left turn and the northbound left turn movement.
- The eastbound approach to the Pilot Knob Road/170th Street intersection is expected to operate at a LOS F with excessive vehicle delay. The excessive east approach delay degrades the overall intersection operation to a LOS E.
- The southbound left turn movement at the 160th Street/Galaxie Avenue intersection is expected to operate at LOS E.
- Although the 160th Street/Pilot Knob Road intersection is expected to operate at a LOS D, several high volume critical individual movements are expected to operate at a LOS E.
- At the Pilot Knob Road/Dodd Boulevard intersection, the eastbound left turn movement is expected to operate at a LOS F, with excessive delay.

Although a few individual movements at other intersections within the study area were reported to operate at a LOS E under the 2025 No-Build condition, these movements do not indicate serious traffic operation deficiencies.

The results of the queuing analysis show that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the following three locations:

- The southbound queue length to the Cedar Avenue/160th Street intersection is expected to extend beyond available storage distances, impacting the upstream intersection during the peak hour. In addition, the eastbound through, westbound through and southbound through approach movement queue lengths are expected to extend beyond the available storage, impacting operations at upstream locations.
- The eastbound right turn queue length at the 160th Street/Pilot Knob Road intersection is expected to extend beyond the available storage length, impacting the through lane travel.
- Excessive queue lengths are expected for the eastbound left turn lane at the Pilot Knob Road/Dodd Boulevard intersection.

2025 No-Build (background growth plus planned land developments) – AM Peak Hour

The 2025 No-Build (background growth plus planned land developments) includes the four planned land development parcels adjacent to the Mining Area, in addition to other background growth. Again, only Cemstone is expected to be producing exports within the Mining Area under this 2025 scenario. As discussed earlier, several roadway and traffic control improvements have been accounted for in the analysis. The 2025 No-Build (background growth plus planned land developments) AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-30**.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with four intersections at LOS E or F. The following summarizes the traffic operation deficiencies identified in the AM peak hour analysis:

- The 150th Street/Pilot Knob Road intersection is expected to operate at a LOS E. Several movements are expected to operate at a LOS E or LOS F, including left turn movements and the northbound and eastbound through movements.
- The Cedar Avenue/160th Street intersection is expected to operate at a LOS E. All left turn movements and the eastbound through movement are expected to operate at a LOS F with excessive delay.
- The TH 3/170th Street intersection is expected to operate at a LOS F. The eastbound approach (stop controlled) is expected to operate with significant volume and delay, as the primary contributing factor in the intersections poor LOS.
- The eastbound approach to the Pilot Knob Road/Dodd Boulevard is expected to operate at a LOS F, with excessive delays to vehicle traffic.
- The eastbound and westbound approaches to the Pilot Knob Road/170th Street intersection are expected to operate at a LOS E.

The results of the queuing analysis show that during the AM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except at the following five locations:

- The northbound left turn movement at the 160th Street/TH 3 intersection
- The southbound left turn, eastbound through and left turn and westbound right turn movements at the Cedar Avenue/160th Street intersection.
- The eastbound movements to the TH 3/170th Street intersection.

- The eastbound left turn movement at the Pilot Knob Road/Dodd Boulevard intersection.
- The westbound approach to the Pilot Knob Road/150th Street intersection.

2025 No-Build (background growth plus planned land developments) – PM Peak Hour

Similar to the PM peak hour, only Cemstone will be producing exports from the study area under the 2025 No-Build (background growth plus planned land developments) scenario. The 2025 No-Build (background growth plus planned land developments) PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-31**.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (LOS D or better), with five intersections at LOS E or F. The following summarizes the traffic operation deficiencies identified in the PM peak hour analysis:

- The 150th Street/Pilot Knob Road intersection is expected to operate at a LOS F. Several movements are expected to operate at a LOS E or LOS F, including all left turn movements, the eastbound and the southbound through movements.
- The Cedar Avenue/160th Street intersection is expected to operate at a LOS F. Significant delay on all directions of approach are expected.
- The 160th Street/Pilot Knob Road intersection is expected to operate at a LOS E. Several high volume critical through and left turn movements are expected to operate at a LOS F. The inadequate lane geometrics on the eastbound approach, westbound left turn and southbound through movements are the primary contributors to the poor LOS.
- The eastbound, westbound and southbound approaches to the Pilot Knob Road/170th Street intersection are expected to operate at a LOS F. An overall intersection LOS F is expected.
- The southbound left turn movement at the 160th Street/Galaxie Avenue intersection is expected to operate at LOS E.
- The eastbound approach to the Pilot Knob Road/Dodd Boulevard is expected to operate at a LOS F, with excessive delays to vehicle traffic. An overall intersection LOS E is expected.
- The eastbound and westbound approaches (stop controlled) at the TH 3/170th Street intersection are expected to operate at a LOS F with significant delay.
- The TH 3/150th Street intersection is expected to operate near capacity. Several movements including the southbound through, northbound left turn, eastbound approach and westbound left turn are expected to operate at a LOS E.

The results of the queuing analysis show that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the following seven locations:

- At the 150th Street/Pilot Knob Road intersection, excessive vehicle queue lengths are expected on the westbound through, eastbound through, southbound through and northbound left turn approaches.
- At the TH 3/Elm Street intersection, the northbound left turn movement is expected to extend beyond the available storage length.
- The eastbound right turn movement at the 160th Street/Pilot Knob Road intersection. Other movements at this intersection are expected to have excessive queue lengths.
- At the 160th Street/Galaxie Avenue intersection, the north approach is expected to have excessive vehicle queues.
- All approaches and movements to the Cedar Avenue/160th Street intersection are expected to be excessive with significant impacts to upstream intersections.
- The eastbound left turn movement at the Pilot Knob Road/Dodd Boulevard intersection.
- Excessive vehicle queues are expected on the southbound, and westbound approaches to the Pilot Knob Road/170th Street intersection.

All other intersection movement LOS and vehicle queue lengths reported at intersections within the study area, not listed above, are expected to operate at acceptable levels under the 2025 No-Build (background growth plus planned land developments) scenario.

2025 Build (mining operation plus background growth plus planned land developments) – AM Peak Hour

In addition to the proposed Mining Area site-generated mining traffic, the 2025 Build includes the development of the four known land parcels adjacent to the proposed project. The 2025 Build AM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-32**.

The traffic operation analysis indicated that most of the key intersections in the study area are expected to operate at acceptable levels (i.e., LOS D or better), with seven intersections at LOS E or F. In addition to the deficiencies identified in the 2025 No-Build (background growth plus planned land developments) AM peak hour analysis, the following deficiencies result as an impact of the proposed Mining Area:

- The TH 3/170th Street intersection westbound approach (stop controlled) is expected to operate at a LOS F. With the increase in traffic on the westbound approach, the eastbound approach (stop controlled) is expected to operate with significant worse delay than previously reported. The increased eastbound approach delay is expected to adversely impact the Cemstone access point.
- The northbound approach to the 160th Street/Flagstaff Avenue intersection is expected to operate at a LOS E. The additional through traffic along 160th Street causes the increased delay on the minor street approach at Flagstaff Avenue.
- The northbound left turn movement at the TH 3/160th Street intersection is expected to operate at a LOS F, with potential impacts to through lane traffic safety and delay.

The results of the queuing analysis show that during the AM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the locations previously identified in the 2025 No-Build (background growth plus planned land developments), including:

- The northbound left turn movement at the 160th Street/TH 3 intersection is further exacerbated.
- The eastbound queue length to the TH 3/170th Street intersection was found to extend beyond the Cemstone access point. As a result of this queue length, the Cemstone access could be negatively impacted.
- The northbound approach at the Cedar Avenue/160th Street intersection, in addition to the other approaches previously listed. The additional westbound and southbound left turn movement volumes push the already capacity constrained intersection into further degradation.
- The westbound approach to the Pilot Knob Road/150th Street intersection.

2025 Build (mining operation plus background growth plus planned land developments) – PM Peak Hour

The 2025 Build PM peak hour turning movement LOS and overall intersection LOS for each of the key intersections are shown in **Figure 4-33**.

As identified under the No-Build scenario, the traffic operation analysis indicated that nine key intersections in the study area are expected to operate at unacceptable levels (i.e., LOS D or worse). In addition to the deficiencies identified in the 2015 No-Build (background growth plus planned land developments) PM peak hour scenario the following deficiencies result as an impact of the proposed Mining Area:

- The TH 3/160th Street intersection is expected to degrade to a LOS E. The northbound left turn movement, westbound left turn and eastbound right turn movements to the TH 3/160th Street intersection is expected to operate at a LOS F – the primary contributing movements to the expected intersection degradation.
- The 160th Street/Galaxie Avenue intersection is expected to degrade to a LOS E. The additional through traffic along 160th Street greatly impacts the southbound movements.
- The eastbound and westbound (stop controlled) approaches at the TH 3/170th Street intersection are expected to experience LOS F conditions.
- The northbound approach to the 160th Street/Flagstaff Avenue intersection is expected to operate at a LOS F. The additional through traffic along 160th Street causes the increased delay on the minor street approach at Flagstaff Avenue.

The results of the queuing analysis show that during the PM peak hour, there are no regular issues with vehicles spilling through adjacent intersections or queues extending out of turn bays and blocking through traffic, except for the locations previously identified in the 2025 No-Build (background growth plus planned land developments) scenario. The following identifies additional locations where queue lengths were found to create a deficiency:

- The eastbound right turn movement at the 160th Street/Pilot Knob Road intersection. Other movements at this intersection are expected to have excessive queue lengths. The westbound queue length is expected to adversely impact the operation at the 160th Street/Cobblestone-Brandtjen intersection and the 160th Street/Diamond Path intersections.

4.4.2 Year 2025 Railroad Grade Crossing

A queue length evaluation at the existing railroad grade crossings on 160th Street and 170th Street were evaluated under the forecast Year 2025 No-Build (background growth only), 2025 No-Build (background growth plus planned land developments) and 2025 Build traffic volumes. **Table 4-3** summarizes the results of the queue length analysis.

Table 4 - 3. 2025 Railroad Grade Crossing Queue Lengths

Scenario			160th Street Railroad Crossing	170th Street Railroad Crossing
Mean Queue Length (ft)	2025 No-Build (Background)	AM	EB	325
			WB	100
	2025 No-Build (Background)	PM	EB	247
			WB	223
	2025 No-Build (Background + Planned Developments)	AM	EB	378
			WB	197
	2025 No-Build (Background + Planned Developments)	PM	EB	358
			WB	311
	2025 Build (Mining + Background + Planned Developments)	AM	EB	600
			WB	370
	2025 Build (Mining + Background + Planned Developments)	PM	EB	468
			WB	437
Storage Space			EB	5250 ⁽¹⁾
			WB	1750 ⁽²⁾

Note: (1) - The distance from 160th Street railroad crossing to Diamond Path

(2) - The distance from 160th Street railroad crossing to TH 3

(3) - The distance from 170th Street railroad crossing to Pilot Knob Road

(4) - The distance from 170th Street railroad crossing to TH 3

A train event under the forecast Year 2025 traffic volumes are not expected to generate a queue impact to adjacent intersections during the AM and PM peak time periods.