

INTEROFFICE MEMORANDUM
Transportation Division

Clark County, Washington
Department of Public
Works

TO: Michael Mabrey
FROM: Ejaz Khan, P.E.; Traffic Engineer EK
DATE: December 26, 2013
SUBJECT: Livingston Mountain Quarry Overlay District.

I have evaluated the suitability of NE 262nd Avenue roadway corridor for Quarry gravel truck movement, traffic safety and operations. The vicinity map in figure 1 highlights the corridor and intersection evaluated in this study. The trucks from and to the proposed mining area would access via NE 262nd Avenue off NE Bradford Road. NE 262nd Avenue is a two lane paved roadway with lane width ranging between 11 and 12 feet and some gravel shoulder. The dead end road of NE 262nd Avenue was recently overlaid by the County and the pavement appears to be in excellent condition. The corridor is unposted for basic speed and is centerline striped. The corridor is well signed with appropriate traffic control devices and warning signs for safe traffic operations. The corridor has some horizontal and vertical curves and grades up to 16%. Despite the terrain and corridor alignment, none of the horizontal or vertical curves were severe enough to inhibit the safe movement of quarry trucks or create traffic safety and operations issues. NE 262nd Avenue currently carries an ADT of approximately 300 vehicles per day. Crash data for the intersection indicate only one crash over a period of 5 years.

The NE 262nd Avenue intersection with Bradford Road is controlled via a STOP sign. The STOP control for NE 262nd Avenue is visible to the approaching driver, driving a passenger vehicle, from a distance of 800 feet. This would be adequate distance to bring a vehicle to a safe stop. Additionally a "STOP AHEAD" warning sign precedes the STOP control sign. NE 262nd Avenue approaching Bradford Road is on a downhill grade. Steps could be taken to further improve the traffic safety at the intersection. The safety improvements are narrated in the conclusion and recommendation section of this report.

NE Bradford Road is unposted for basic speed. It is centerline and edge line striped and has 11 feet wide travel lanes. Bradford Road approaching NE 262nd Avenue from the west has a reverse curve alignment with an advisory speed of 30 MPH. The intersection sight distance from NE 262nd Avenue, looking east, with drivers' eye 15 feet back of the travelled way, was measured as 700 feet. The sight distance looking west was measured as 330 feet. The horizontal curve alignment of the road and the roadside trees inhibit the line of sight. An advance intersection warning sign at 300 feet ahead of 262nd Avenue is installed on Bradford Road. Bradford Road at NE 262nd Avenue currently carries an ADT of approximately 1,500 vehicles per day.

The NE 262nd Avenue intersection with Bradford Road has a very wide throat with large intersection radius return enabling large vehicles safe and easy ingress and egress from the intersection. The visibility of an eastbound vehicle on Bradford Road waiting to make a left turn on 262nd Avenue was measured as 230 feet. The sight distance for the eastbound approaching vehicle is obstructed due to curved road alignment and trees in the line of sight. An intersection extension line is striped across NE 262nd Avenue connecting the edge of travelled way of Bradford Road. The extension line provides positive guidance to the drivers, across the very wide throat of the intersection and allows drivers to stop closer to the edge of travelled way. This allows for improved sight distance and enhanced traffic operations.

Heading east on Bradford Road/ 53rd Street and south on NE 292nd Avenue/Reilly Road, I observed the pavement to be in good condition. The corridor is unposted for basic speed and is centerline and edge line striped with 11 feet wide travel lane. The corridor is well signed with appropriate traffic control devices and warning signs for safe traffic operations. The corridor has some horizontal and vertical curves and grades up to 13%. Despite the terrain and corridor alignment, none of the horizontal or vertical curves were severe enough to inhibit the safe movement of quarry trucks or create a traffic safety or operational issue. The intersection of NE 39th Street and NE 292nd Avenue is an all-way stop control.

Reilly Road at Blair Road is a T intersection with a STOP control for Reilly Road. The Blair Road corridor is unposted for basic speed and is centerline and edge line striped. Reilly Road currently carries an ADT of approximately 1,200 vehicles per day. The stop sign on Reilly Road is visible to a southbound sedan vehicle driver, from a distance of from a distance of 490 feet. This is adequate distance to bring a vehicle to a safe stop. Additionally a supplemental "STOP AHEAD" warning sign precedes the STOP control sign. Looking west (right) the intersection sight distance with driver's eye 15 feet back of the travelled way was measured as 1,475 feet. Looking east (left), the intersection sight distance was measured as 320 feet. The vertical curve on Blair Road is responsible for inhibiting the sight distance. It should be noted that the sight distance measured is based on driver's eye height on Blair Road as 3.5 feet. The driver's eye height driving a truck would be approximately eight feet high and that would make a significant difference the available sight distance for a vehicle stopped on Reilly Road. Observation during the field visit indicated that the operational speed for vehicles westbound on Blair Road at Reilly Road is 40 MPH. Blair Road at Reilly Road currently carries an ADT of approximately 3,200 vehicles per day. Crash data for the intersection indicate only one crash over a period of 5 years.

Conclusion and recommendations:

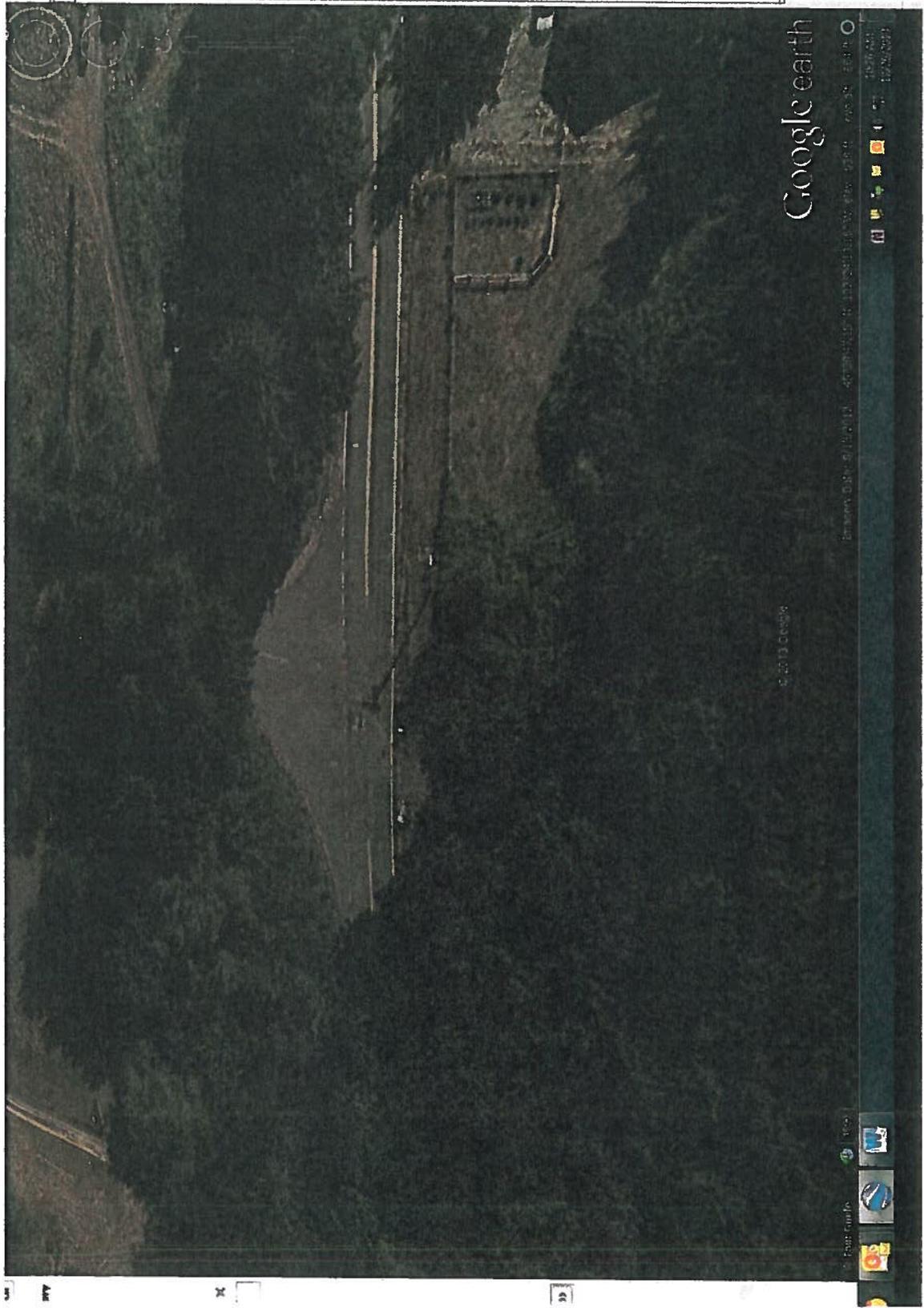
The traffic safety and operations evaluation for the quarry mining operations was limited in scope. The information regarding trips generated by the proposed operation, the hours of operation and the peak hour of operation and the traffic assignment was not available. Elements like queue length and warrants for left turn lane were not evaluated as a part of the evaluation. The following are the

conclusion and recommendation for the 262nd Avenue, Bradford Road, NE 292nd Avenue, Reilly Road corridor.

1. Crash data indicate that the NE 262nd Avenue corridor has been operating within acceptable safety threshold.
2. Crash data indicate that the intersection of NE 262nd Avenue and Bradford road has been operating within acceptable safety threshold.
3. Crash data indicate that the Bradford Road, NE 292nd Avenue, Reilly Road corridor has been operating within acceptable safety threshold.
4. Crash data indicate that the intersection of Reilly Road and Blair Road has been operating within acceptable safety threshold.
5. The geometric layout and the horizontal and vertical alignment of the NE 262nd Avenue corridor will allow safe movement of quarry trucks to and from the mine.
6. The geometric layout NE 262nd Avenue at its intersection with Bradford Road will allow for safe ingress and egress movement for gravel trucks.
7. The Stop sign on NE 262nd Avenue at Bradford Road is visible from sufficient distance to allow a safe stop. However, removal to two trees in the immediate vicinity of the STOP control will further improve the line of sight and consequently enhance traffic safety.
8. Since NE 262nd Avenue approaching Bradford Road is on a relatively long negative downhill grade, it is recommended that "Pavement friction management" be implemented at its approach with Bradford Road to ensure a safe stop by a loaded gravel truck.
9. Since NE 262nd Avenue approaching Bradford Road is on a negative downhill grade, it is recommended that the approach with Bradford Road be white topped (cement concrete pavement surface) to prevent southbound loaded gravel trucks from destroying the pavement.
10. The visibility of vehicle eastbound on Bradford Road waiting to make a left turn was measured as 230 feet. This distance may not be adequate to prevent a rear end crash by a eastbound approaching vehicle. A more detailed study ascertaining left turn queue length, left turn lane warrants, operating speed and traffic volumes at the approach will be necessary to make a more definite assessment.
11. The intersection sight distance from NE 262nd Avenue, looking west (right) along Bradford Road was measured as 330 feet. This sight distance is not adequate for a safe left turn out of NE 262nd Avenue. A loaded gravel truck would require a much higher sight distance than the nominal sight distance of ten times the posted speed. A more detailed study would be necessary to determine the necessary intersection sight distance.

12. The intersection sight distance from NE 262nd Avenue, looking east (left) along Bradford Road was measured as 700 feet. This sight distance meets the minimum requirement for making a right turn out of 362nd Avenue. Note that the 700 feet sight distance was based on driver eye height of 3.5 feet.
13. The geometric layout and the horizontal and vertical alignment of the Bradford Road, 53rd Street, 292nd Avenue and Reilly Road will allow safe movement of gravel trucks.
14. The Stop sign on Reilly Road at Blair Road is visible from a distance of 490 feet to allow a safe stop. A supplemental Stop Ahead sign has also been installed.
15. The intersection sight distance from Reilly Road, looking west (right) along Blair Road was measured as 1,475 feet. This sight distance is adequate for making a safe left turn out of Reilly Road.
16. The intersection sight distance from Reilly Road, looking east (left) along Blair Road was measured as 320 feet. This sight distance is inadequate for making a safe left turn out of Reilly Road. The vertical curve along Blair Road restricts the available sight distance. However, a much better sight distance would be available to the truck driver since the truck driver's eye is situated at a much higher level than a regular (sedan) passenger vehicle. Proper equipment was not available at the time of field visit to determine the intersection sight distance based of truck driver eye height and data could not be recorded.

CC: Matt Griswold, P.E.; -Traffic Engineering Manager



NE 262nd Avenue at Bradford Road- Aerial View



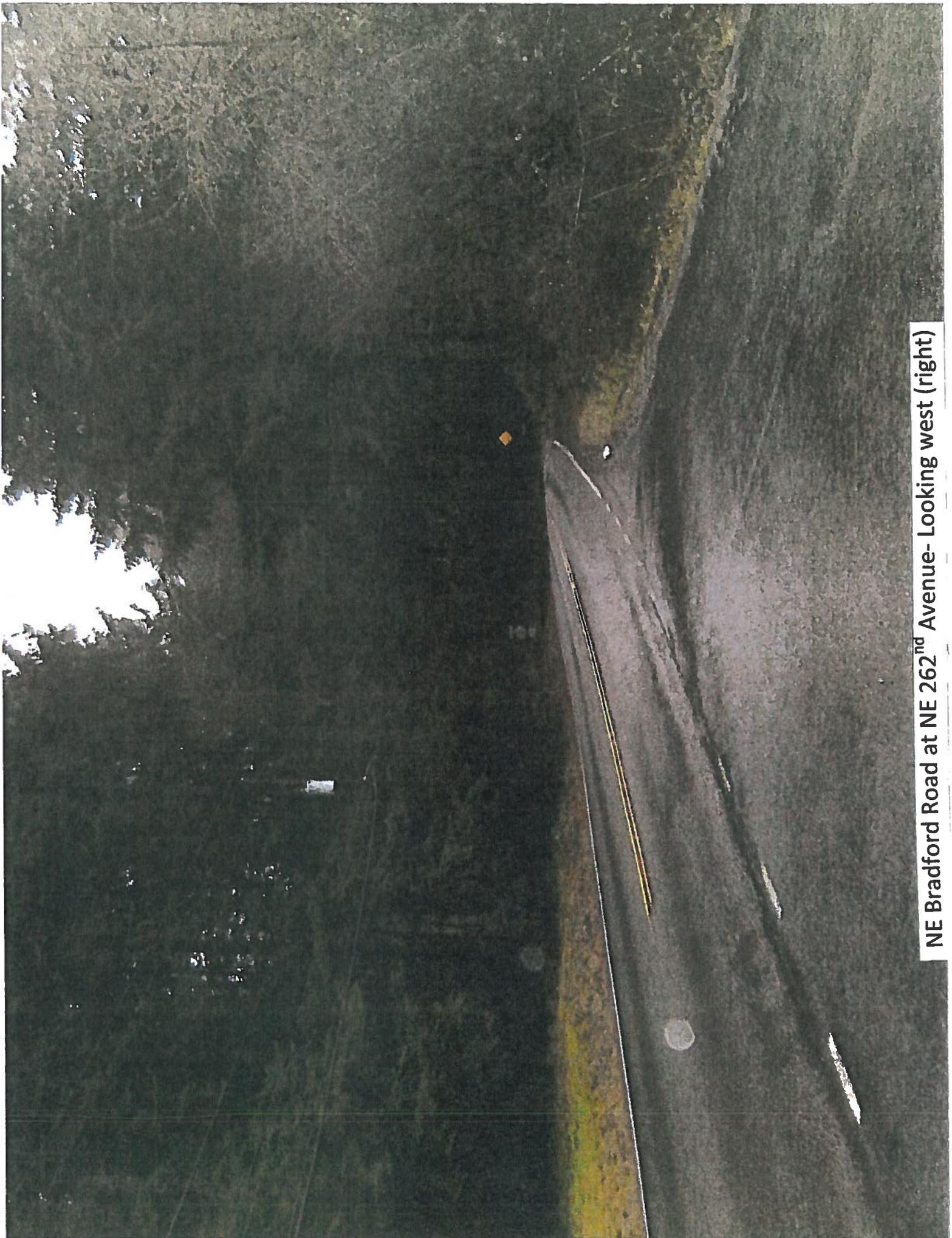
NE 262nd Avenue at Bradford Road looking South



NE 262nd Avenue at Bradford Road- Looking north



NE Bradford Road at NE 262nd Avenue- Looking east (left)



NE Bradford Road at NE 262nd Avenue- Looking west (right)



NE Reilly Road at Blair Road- Looking north



NE Blair Road at Reilly Road- looking south



NE Blair Road at Reilly Road- Looking east (left)