North Olmsted Traffic Study

Realignment & Intersection Improvement Alternatives for the Intersection of Lorain Road & Brookpark Road

City of North Olmsted, Ohio

September 2011

Prepared By

NOACA
Planning For Greater Cleveland
noaca.org
The Northeast Ohio Areawide Coordinating Agency (NOACA) is a public organization serving the counties of and municipalities and townships within Cuyahoga, Geauga, Lake, Lorain and Medina (covering an area with 2.1 million people). NOACA is the agency designated or recognized to perform the following functions:

- Serve as the Metropolitan Planning Organization (MPO), with responsibility for comprehensive, cooperative and continuous planning for highways, public transit, and bikeways, as defined in the current transportation law.
- Perform continuous water quality, transportation-related air quality and other environmental planning functions.
- Administer the area clearinghouse function, which includes providing local government with the opportunity to review a wide variety of local or state applications for federal funds.
- Conduct transportation and environmental planning and related demographic, economic and land use research.
- Serve as an information center for transportation and environmental and related planning.
- At NOACA Governing Board direction, provide transportation and environmental planning assistance to the 172 units of local, general purpose government.

The NOACA Governing Board is composed of 38 local public officials. The Board convenes monthly to provide a forum for members to present, discuss and develop solutions to local and areawide issues and make recommendations regarding implementation strategies. As the area clearinghouse for the region, the Board makes comments and recommendations on applications for state and federal grants, with the purpose of enhancing the region’s social, physical, environmental and land use/transportation fabric.

NOACA invites you to take part in its planning process. Feel free to participate, to ask questions and to learn more about areawide planning.

For more information, call:

(216) 241-2414 or log on at: http://www.noaca.org
2011 NOACA BOARD

BOARD OFFICERS

President: Stephen D. Hambley, Medina County Commissioner
First Vice President: Edward O. Fitzgerald, Executive, Cuyahoga County
Second Vice President: Frank G. Jackson, Mayor, City of Cleveland
Secretary: Mary E. Samide, Geauga County Commissioner
Assistant Secretary: Robert C. Downey, City Manager, City of Cleveland Heights
Assistant Secretary: Michael J. Salay, P.E., P.S., Medina County Engineer
Treasurer: Ted Kalo, President, Lorain County Board of Commissioners
Assistant Treasurer: Julius Ciaccia, Jr., Executive Director, Northeast Ohio Regional Sewer District
Assistant Treasurer: Robert E. Auffalushi, Lake County Commissioner
Immediate Past President: James R. Gillis, P.E., P.S., Lake County Engineer

BOARD MEMBERS

CUYAHOGA COUNTY
Robert G. Blonquist, Mayor, City of Olmsted Falls
William R. Cervenik, Mayor, City of Euclid
Joseph M. Cicero, Jr., Mayor, City of Lyndhurst
Dean E. DePiero, Mayor, City of Parma
Robert C. Downey, City Manager, City of Cleveland Heights
Edward O. Fitzgerald, Executive, Cuyahoga County
Charles M. German, Councilman, Cuyahoga County Council
Edward Jure, Director of Regional Collaboration, Cuyahoga County
Earl M. Leiden, Mayor, City of Shaker Heights
Michael S. Pociak, Mayor, Village of Brooklynn Heights
Leonard A. Spredulli, Mayor, Village of Bentleyville
Robert A. Stefaniak, Mayor, City of North Royalton
Michael P. Summers, Mayor, City of Lakewood
Deborah L. Sutliff, Mayor, City of Bay Village
Bonita G. Tsunen, P.E., Public Works Director, Cuyahoga County

CITY OF CLEVELAND
Anthony Brancati, Councilman
Robert N. Brown, Director of Planning
Frank G. Jackson, Mayor
Martin J. Keane, Councilman
Minnie J. Mitchell, Councilwoman
Joniast Wasik, Director of Capital Projects

GEauga COUNTY
Tracy A. Jamison, President, Geauga County Board of Commissioners
Mary E. Samide, Geauga County Commissioner
William S. Young, Geauga County Commissioner

LAKE COUNTY
Robert E. Auffalushi, Lake County Commissioner
James R. Gillis, P.E., P.S., Lake County Engineer
Raymond E. Sines, President, Lake County Board of Commissioners
Daniel P. Troy, Lake County Commissioner
Mark A. Tyler, Mayor, City of Kirtland

Lorain County
Lorain County Commissioner
Lori A. Koleski, Lorain County Commissioner

Anthony M. Krasienko, Mayor, City of Lorain
Dale F. Ruddle, Trustee, Lorain County Township Association

MEDINA COUNTY
Stephen D. Hambley, Medina County Commissioner
James M. Lukas, City Manager/Safety Director, City of Brunswick
Michael J. Salay, P.E., P.S., Medina County Engineer
Kathleen Schenowitz, Trustee, Brunswick Hills Township

NORTHEAST OHIO REGIONAL SEWER DISTRICT (NEORD)
Julius Ciaccia, Jr., Executive Director

GREATER CLEVELAND REGIONAL TRANSIT AUTHORITY (GCRTA)
George M. Dixon, Board President

CLEVELAND-CUYAHOGA COUNTY PORT AUTHORITY: William D. Friedman, President/CEO

OHIO DEPARTMENT OF TRANSPORTATION (ODOT): Myron S. Parkish, Deputy Director, District 12

Ex officio Member: Kurt Pirnie, Chief, Northeast District Office, Ohio Environmental Protection Agency (EPA)

NOACA DIRECTORS

Howard R. Maier, FAICP, Executive Director
Cheryl A. Kunkowski, CPA, Director of Finance & Operations
Planning and Programs Division Directors:
Ronald T. Eckert, P.E., Director of Planning
Jonathan Giblin, Director of Programs
William Davis, Associate Director of Planning
1) Title & Subtitle:
Realignment and Intersection Improvement Alternatives for the Intersection of Lorain Road and Brookpark Road
City of North Olmsted

2) NOACA Report No.:
TR-12-04

3) Author(s)/Contributor(s):
Author: Maher Holozadah, Senior Transportation Engineer
Contributor: Daniel Boyle, Graphics

4) Report Date:
September 2011

5) Performing Organization Name & Address:
Northeast Ohio Areawide Coordinating Agency
1299 Superior Avenue, Cleveland, OH 44114-3204
Phone: (216) 241-2414  FAX: (216) 621-3024
Web site: www.noaca.org

6) Project Task No.
6251-01

7) NOACA Contract/Grant No.
ODOT/FHWA

8) Sponsoring Agency Name & Address:
Ohio Department of Transportation
1980 W. Broad St., Box 899
Columbus, OH 43216-0899

9) Type of Report & Period Covered
Technical Report
July 1, 2010 – June 30, 2011

10) Sponsoring Agency Code

11) Supplementary Notes:
Federal funding for this project was provided by the Federal Highway Administration and administered by the Ohio Department of Transportation.

12) Abstracts:
This technical study report examines a proposed realignment of Brookpark Road with Silverdale Road at Lorain Road in the City of North Olmsted, and various possible lane configuration alternatives for the intersection. The study report provides a portrait of the present alignment, prevailing physical and traffic conditions, and crash history in and near the intersection. The realignment was proposed by the City of North Olmsted, but the various possible lane configuration alternatives were developed and evaluated by NOACA to help North Olmsted select one they may deem best suited to improve the intersection. Any one of these possible alternatives will make the intersection safer and more efficient, facilitate better traffic flow, increase pedestrian safety, and lessen or eliminate potential traffic crashes.

13) Key Words & Document Analysis:
A. Descriptors: N. Olmsted Traffic Study, Intersection Improvement Alternatives, Realignment of Brookpark Road with Silverdale Road at Lorain Road, and Crash History.
B. Identifiers/Open Ended Terms: Lorain Road/Brookpark Road, Level of Service, Possible Lane Configurations, and Safety.

14) Availability Statement:
Posted on the NOACA web site
Available in print at cost of reproduction

15) No. Pages: 33

16) Price:
Cost of Reproduction
North Olmsted Traffic Study

Realignment and Intersection Improvement Alternatives for the Intersection of Lorain Road and Brookpark Road

City of North Olmsted, Ohio

September 2011

Prepared by

NORTHEAST OHIO AREAWIDE COORDINATING AGENCY

Author

Maher Holozadah
Senior Transportation Engineer

The preparation of this publication was financed through grants received from the Federal Highway Administration and the Ohio Department of Transportation and appropriations from the counties of and municipalities within Cuyahoga, Geauga, Lake, Lorain and Medina. The contents do not necessarily reflect official views or policies of the U.S. Department of Transportation or the Ohio Department of Transportation. This report does not constitute a standard or regulation.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Executive Summary</td>
<td>7</td>
</tr>
<tr>
<td>2.0 Intersection Existing Alignment &amp; Lane Configuration (Alternative “No-Build”) and Description of the Problem</td>
<td>11</td>
</tr>
<tr>
<td>3.0 Crash History</td>
<td>13</td>
</tr>
<tr>
<td>• Narrative</td>
<td></td>
</tr>
<tr>
<td>• Crash Charts</td>
<td></td>
</tr>
<tr>
<td>• Collision Diagram</td>
<td></td>
</tr>
<tr>
<td>4.0 Rank per ODOT Highway Safety Program (HSP)</td>
<td>18</td>
</tr>
<tr>
<td>5.0 Base Year 2010 Existing Traffic Volumes, Level-of-Service (LOS) Criteria, and Present Level-of-Service (LOS) for Alternative “No-Build”</td>
<td>19</td>
</tr>
<tr>
<td>• Existing Traffic Volumes</td>
<td></td>
</tr>
<tr>
<td>• Level-of-Service (LOS) Criteria</td>
<td></td>
</tr>
<tr>
<td>• Present Level-of-Service (LOS)</td>
<td></td>
</tr>
<tr>
<td>6.0 Forecast Year 2030 Traffic Volumes and Level-of-Service for Alternative No-Build”</td>
<td>22</td>
</tr>
<tr>
<td>• Forecast Traffic Volumes</td>
<td></td>
</tr>
<tr>
<td>• Forecast Level-of-Service (LOS)</td>
<td></td>
</tr>
<tr>
<td>7.0 Proposed Realignment</td>
<td>22</td>
</tr>
<tr>
<td>8.0 Possible Lane Configuration Alternatives</td>
<td>23</td>
</tr>
<tr>
<td>9.0 Alternative-1 Lane Configuration</td>
<td>23</td>
</tr>
<tr>
<td>• Description</td>
<td></td>
</tr>
<tr>
<td>• Level-of-Service (LOS) For Base Year 2010 and Forecast Year 2030 Traffic Volumes</td>
<td></td>
</tr>
<tr>
<td>10.0 Alternative-2 Lane Configuration</td>
<td>25</td>
</tr>
<tr>
<td>• Description</td>
<td></td>
</tr>
<tr>
<td>• Level of Service (LOS) For Current Year 2010 and Design Year 2030 Traffic Volumes</td>
<td></td>
</tr>
<tr>
<td>11.0 Findings, Conclusions, and Recommendation</td>
<td>27</td>
</tr>
<tr>
<td>12.0 Appendices</td>
<td>29</td>
</tr>
<tr>
<td>• Appendix A: Crash Records Summary Tables ..................................</td>
<td>30</td>
</tr>
<tr>
<td>• Appendix B: Level-of-Service (LOS) Calculations Worksheets (Bound Separately)</td>
<td>33</td>
</tr>
</tbody>
</table>
1.0 Executive Summary

This technical study report, requested by the City of North Olmsted, examines the existing conditions at the intersection of Lorain Road and Brookpark Road, referred to as Alternative “No-Build” and two possible lane configuration alternatives, referred to as Alternative 1 Lane-Configuration and Alternative 2 Lane-Configuration, for the realignment of Brookpark Road with Silverdale Road at its intersection with Lorain Road, as proposed by the City of North Olmsted. The purpose of the proposed realignment of a section of Brookpark Road with Silverdale Road is to eliminate one of the two closely spaced traffic signal-controlled intersections with Lorain Road, namely that of Brookpark Road and Lorain Road, that is in proximity to the traffic signal-controlled intersection of Silverdale Road and Lorain Road, and to address present problems related to driveways located at and near the intersection being eliminated. Consolidating the two intersections into one and regulating ingress and egress at those driveways will improve safety and traffic flow.

The study report provides a portrait of the present alignment, prevailing physical and traffic conditions, crash history in and near the intersection, a description of the proposed realignment, and an examination of the two possible improvement alternatives for that realignment. The report also, for the long term, recommends investigating a possible realignment of Brookpark Road with Canterbury Boulevard at its intersection with Lorain Road. This realignment, however, would entail the acquisition of substantial right-of-way.

There were 32 crashes in the three-year period 2007-2009. Nineteen, or about 59%, of the crashes were related to the driveway common to the Speedway gas station and the Boston Market restaurant. The predominant type of crash was rear end collision, followed by angle collision. One crash involved a bicyclist riding on the sidewalk when the rider collided with a vehicle exiting from the driveway of the Speedway gas station. No pedestrian crashes or incidents were reported.

The intersection under Alternative “No-Build” operates reasonably well at Level-of-Service (LOS) “B” based on an effective phase sequence for a best case scenario that allows the right-turn movement from the Lorain Road eastbound approach to move in tandem with the westbound traffic from Brookpark Road. Otherwise, the intersection under the present phase sequence operates at LOS “C”. Although the intersection operates well, it is not without some problems that could not be exposed or identified through the LOS calculations. Only field observations enabled identifying these hidden problems.
In one case, the traffic control signals at this intersection service Brookpark Road and the conjoined driveways of the Boston Market restaurant and the Speedway gas station via two split phases; one split phase for the two conjoined driveways and one split phase for the Brookpark Road eastbound approach. The split phase for the two conjoined driveways presents several traffic movement conflicts as illustrated in the diagram.

In another case, the existing phase sequence is restrictive. During the split phase for the Brookpark Road westbound approach, the right turn movement from the Lorain Road eastbound approach to Brookpark Road eastbound is unnecessarily prohibited from moving simultaneously with the westbound traffic movement from Brookpark Road. Furthermore, right-turns on red from the Lorain Road eastbound approach onto Brookpark Road eastbound are also unnecessarily prohibited. Only the east-west traffic movements on Lorain Road move simultaneously on the same phase. A more effective phase sequence, shown above, upon which the calculation of the Level-of-Service was based, should be the one in operation.
Alternative 1 Lane-Configuration, shown below, delivers Level-of-Service (LOS) “B” in the am peak period and LOS “C” in the pm peak period. It does not provide for through traffic movement from Silverdale Road to Brookpark Road eastbound. Alternative 2 Lane-Configuration, on the other hand, shown below, also delivers LOS “B” in the am peak period and LOS “C” in the pm peak period, but provides for through traffic movement from Silverdale Road to Brookpark Road eastbound. Either alternative would satisfy the objectives for which the realignment of Brookpark Road with Silverdale Road is intended. It appears that neither Alternative 1 nor Alternative 2 would require the acquisition of public right of way. They also could utilize much of the existing infrastructure.
If, at the design stage, it is determined that the prevailing physical conditions may constrain the production of an alignment at significantly less oblique angles, it is recommended to investigate a realignment alternative, perhaps for the long term, of Brookpark Road with Canterbury Road at its intersection with Lorain Road that might have better attributes. It may provide for better access, cater more to the demands of the present patterns of traffic movements, and align the approaches at much less oblique angles to enable the provision of left-turn bays at all four approaches. Such realignment, however, appears to require the acquisition of substantial public right-of-way, as illustrated in the diagrams, which show different lane configuration options for the northbound approach of Brookpark Road.
2.0 Intersection Existing Alignment and Lane Configuration (Alternative “No-Build”) and Description of the Problem

Lorain Road is State Route 10 (SR10). Its functional classification is major arterial. Brookpark Road is State Route 17 (SR17). It is classified as a minor arterial. Both roadways are on NOACA’s congestion management system roadway network. They intersect at a location in proximity to the intersection of Silverdale Road with Lorain Road. The two signalized intersections are very closely spaced with a distance of about 210 feet. The following diagram depicts the existing geometry and alignment of the two intersections:

The intersection of Lorain Road and Brookpark Road is primarily a three-approach intersection with excessively skewed approaches that present adverse conditions for effective and safe traffic movement. Making safe and timely stops, or clearing the intersection when making left turns into or from adjacent driveways is not always risk-free. The intersection is also in close proximity to the intersection of Silverdale and Lorain Road. The existing alignment and traffic control of the intersection poses the following adverse or undesirable conditions:
1. A large surface area inherent in the expanse of the intersection;
2. Formation of two closely spaced traffic signal-controlled intersections, namely Lorain Road with Brookpark Road and Lorain Road with Silverdale Road, with a distance between them of about 210 feet;
3. Skewed intersection approaches (Oblique angles);
4. The presence of conjoined approaches of two private driveways (the approaches of the Boston Market and Speedway gas station driveways) and share a common curb cut located near and made a part of the intersection. The conjoined driveway approaches are controlled by a single split phase in a single traffic control signal, which creates traffic movement conflicts as shown in the diagram below;
5. Two split phases (one for the Brookpark Road westbound approach and one for the conjoined approaches of the two driveways) entail a longer cycle length;
6. A split phase for the intersection of Silverdale with Lorain Road; and
7. The present phase sequence for Lorain Road and Brookpark Road is unnecessarily restrictive compared with a more effective phase sequence (see diagram).
3.0 Crash History

Narrative: Crash records for the most recent three-year crash history for the intersection of Lorain Road/Brookpark Road were obtained from the City of North Olmsted. The three-year period includes years 2007, 2008, and 2009.

The crash records were examined to identify the types of crashes and to extract from the records narratives crash data for tabulation and further analysis. Crash record numbers, crash types, dates of crashes, times, contributing factors, and other relevant data were tabulated by year and shown in tables 1, 2, and 3 presented in Appendix A.

There were 9, 14, and 10 crashes in years 2007, 2008, and 2009, respectively, for a total of 33 crashes in the three-year period. One crash was discounted for not being associated with the intersection. One crash involved a bicyclist riding on the sidewalk when the rider collided with a vehicle exiting from the driveway of the Speedway gas station. The other crash occurred on the one-lane, right-turn exit loop (slip ramp) when the driver attempted to overtake a vehicle proceeding ahead of him. Hence 31 of the 33 vehicular crashes occurred within the intersection and its three approaches. Nineteen or about 61% of the crashes were related to the driveway common to the Speedway gas station and the Boston Market restaurant. The predominant type of crash was rear end collision, followed by angle collision. No pedestrian crashes or incidents were reported.

Crash statistics reveal that most crashes occur between the hours of about 12:00 p.m. and 3:00 p.m. Although there was only one crash that resulted in a minor injury, all other crashes were property damage only (PDO) crashes. The primary contributing factors appear to be driver inattention and failure to control or failure to yield. The heavy traffic movements, present lane configuration, alignment of the intersection, and the driveways controlled by a split phase by the same traffic control signal of the intersection are elements in drivers’ actions that cause driver inattention and failure to control or to yield. Rear end collisions, for example, usually occur due to sudden stops or slowdowns attributable to interference from adjacent driveways or due to sudden stops at the traffic control signals. Left-turn collisions, attributable to failure to yield, often occur due to the presence of points of conflict.
**Crash Charts:** Various charts were developed to present crash statistical data such as crashes by day of week, time of day, crash severity, and contributing factors.

![Accidents by Time of Day](chart1)

![Accidents by Day of Week](chart2)

![Severity Distribution by Year](chart3)
The charts below show that 97% of the crashes were property damage only (PDO) crashes. The majority of them occurred on dry pavement during daylight and clear weather conditions. Environmental factors, therefore, do not play a significant role in contributing to the occurrence of these crashes.
**Collision Diagram:** A collision diagram, shown below, was constructed to depict the types of crashes and to show their approximate relative locations. The collision diagram shows that most of the collisions occurred within and near the conjoined Boston Market restaurant/Speedway gas station driveways that share the traffic signal-controlled intersection. There were 19 out of 31 crashes at and near the driveway, representing about 61% of the crashes.
4.0 Rank per ODOT Highway Safety Program (HSP)

A segment of Lorain Road (SR10) between Butternut Ridge Road and Ranchview Avenue ranks 99th in the State in ODOT’s Highway Safety Program listing of roadway segments with the most crashes based on crash data for 2007-2009. The table below shows the ranking among several other roadway segments in the ODOT District 12 region, which includes North Olmsted, and the map shows the extent of the segment, which also encompasses the intersection of Brookpark Road and Lorain Road.
5.0 Base Year 2010 Existing Traffic Volumes, Level-of-Service Criteria, and Present Level-Of-Service (LOS) for Alternative “No-Build”

Existing Traffic Volumes:
Traffic volumes at this intersection for base year 2010 were counted in mid 2010, while schools were still in session, by a consultant hired by the City of North Olmsted. The intersection services about 27,565 vehicles per day. The following diagrams show the average daily traffic (ADT) and the am and pm peak-hour traffic volumes.
**Level-of-Service (LOS) Criteria:**

The Level-of-Service (LOS) is a measure of how well an intersection operates under certain conditions such as traffic volumes, number of lanes and lane assignment, signal timing and phasing sequence, and lane widths among other things. Intersection LOS represents the vehicular delays when drivers stop at the intersection (stopped delay) to await a phase that gives them permission for the right of way, and then the time taken to prepare and begin to drive through it (start up lost time/delay). Intersection capacity analyses are used to calculate these delays using procedures outlined in the 2000 and 2010 Highway Capacity Manual published by the Transportation Research Board.

The capacity analyses procedures provide calculated average vehicle delay in seconds per vehicle. This is based on traffic volumes, number of lanes, traffic control type, grade, channelization, and percent of heavy vehicles at each intersection. A range of average vehicle delay at the intersection is assigned a letter grade designation for Level-of-Service (LOS) ranging from “A” for best LOS to “F” for worst LOS. Intersection Level-of-Service designations and ranges of delay for signalized intersections, as defined by the Transportation Research Board, are shown in the Table below.

<table>
<thead>
<tr>
<th>LEVEL-OF-SERVICE DESIGNATION (For Signalized Intersections)</th>
<th>AVERAGE DELAY (In Seconds/Vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&lt;= 10.0</td>
</tr>
<tr>
<td>B</td>
<td>10.1 - 20.0</td>
</tr>
<tr>
<td>C</td>
<td>20.1 - 35.0</td>
</tr>
<tr>
<td>D</td>
<td>35.1 - 55.0</td>
</tr>
<tr>
<td>E</td>
<td>55.1 - 80.0</td>
</tr>
<tr>
<td>F</td>
<td>&gt; 80.0</td>
</tr>
</tbody>
</table>
Present Level-of-Service (LOS):
Level-of-Service (LOS) analyses for existing conditions were conducted to estimate the quality of operation of the intersection and to describe its ability to deliver service. The overall level of operation of the intersection of Lorain Road and Brookpark Road in the a.m. and p.m. peak periods under existing traffic, geometric, signal timing, and signal phasing conditions is estimated to be LOS “C” based on the present restrictive phasing sequence. The LOS based on a best case scenario with the least restrictive or most effective phase sequence would be “B”. Level-of-Service “D” is considered borderline satisfactory for intersections in urbanized areas, but LOS “E” and below are considered unsatisfactory or failure condition. The following diagram and LOS table show the results of the LOS analyses.

Level-of-Service, Lorain Road / Brookpark Road (Base Year 2010 Existing Conditions)

<table>
<thead>
<tr>
<th>Approach</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay</td>
<td>Level-of-Service</td>
</tr>
<tr>
<td>Lorain Road Northeast Bound</td>
<td>11.1</td>
<td>A</td>
</tr>
<tr>
<td>Lorain Road Southwest Bound</td>
<td>17.6</td>
<td>B</td>
</tr>
<tr>
<td>Brookpark Road Westbound</td>
<td>19.9</td>
<td>B</td>
</tr>
<tr>
<td>Speedway/Boston Market Driveways</td>
<td>25.8</td>
<td>C</td>
</tr>
<tr>
<td>Intersection</td>
<td>14.4</td>
<td>B</td>
</tr>
</tbody>
</table>
6.0 Forecast Year 2030 Traffic Volumes and Level-of-Service (LOS) for Alternative “No-Build”

Level-of-Service (LOS) with the existing geometry in forecast year 2030 will be the same as the LOS for base year 2010 existing conditions because the traffic volumes and directional movements are expected to remain about the same. NOACA’s Regional Transportation Model was used to determine whether there will be any future change in the traffic volumes. No growth is forecast for the area for the near or long term. Current population, land use, socioeconomic conditions, and automobile ownership are expected to remain relatively constant. The traffic patterns and travel demands in year 2030 are expected to mimic current conditions.

7.0 Proposed Realignment

The City of North Olmsted would like to realign a section of the divided four-lane Brookpark Road with Silverdale Road at its intersection with Lorain Road. This proposed realignment, shown in the schematic diagram below, takes advantage of the existing available right-of-way, and the potential low cost, short term implementation attributes of this possible solution. Two possible lane configuration alternatives were developed to cater to this proposed realignment.

Schematic Diagram of Proposed Realignment Presented By the City of North Olmsted
8.0 Possible Lane Configuration Alternatives

In consultation and discussion with the City of North Olmsted, two possible lane configuration alternatives were chosen for consideration from among several preliminary ones previously explored, besides Alternative “No-Build” described earlier. Alternative 1 lane configuration consists of a two-lane, one-way Brookpark Road westbound approach that terminates at the Silverdale Road intersection with Lorain Road. It (Alternative 1) maintains the Brookpark two through-lanes at their original intersection with Lorain Road for the right-turn traffic movement from Lorain Road to Brookpark Road eastbound. Alternative 2 lane configuration, on the other hand, provides for one Brookpark through-lane eastbound at the intersection with Silverdale Road and Lorain Road. It (Alternative 2) maintains one Brookpark through-lane at its original intersection with Lorain Road for the right-turn traffic movement from Lorain Road to Brookpark Road eastbound. Alternatives 1 and 2, and the Level-of-Service associated with them are described in more detail in the following sections.

9.0 Alternative-1 Lane Configuration

Alternative 1 lane configuration, shown in the diagram below, consists of a two-lane, one-way approach from Brookpark Road at Silverdale Lorain Roads. One of the lanes will be designated as exclusive left-turn bay, and the other will be assigned for left and through traffic movements. Silverdale Road will be modified from its present one lane approach shared by the left and right turn movements to a two-lane approach with two exclusive turn bays for each turn movement separately.

Alternative 1 Schematic Diagram: Lorain Road / Brookpark Road / Silverdale
Level-of-Service for Alternative 1 Lane-Configuration for Base Year 2010 and Forecast Year 2030 Traffic Volumes and Traffic Control Signal Timing and Phasing Conditions

The overall Level-of-Service (LOS) for the intersection for Alternative 1 Lane-Configuration under both base year 2010 and forecast year 2030 traffic and signal timing and phasing conditions will be “B” in the am peak period and “C” in the pm peak period. Forecast year 2030 LOS will be similar to existing Base year 2010 LOS, as there will be no change in the traffic volumes and traffic movement patterns.

The following LOS diagram and table show the LOS for all group movements, approaches, and overall intersection operation.
10.0 Alternative-2 Lane Configuration

Alternative 2 lane configuration, shown in the diagram below, provides for a two-way traffic movement at Brookpark Road at its intersection with Silverdale and Lorain Roads. It consists of a two-lane approach from Brookpark Road westbound at Lorain Road, and one receiving lane eastbound. The westbound Brookpark Road approach will have one lane assigned exclusively for left-turn traffic movement and one lane assigned for shared left and through traffic movements. Brookpark Road will also maintain one through lane at its original intersection with Lorain Road for right-turn traffic from Lorain Road to Brookpark Road eastbound. Silverdale Road, however, will be modified from its present one lane shared right, through, and left-turn approach to a two-lane approach with one lane for an exclusive left-turn bay and one shared lane for right- and through-traffic movements.

A left-turn movement from Lorain Road westbound to Lorain Road eastbound was precluded at this juncture at the behest of the City of North Olmsted pending examination at the design stage by the City to determine whether it would be geometrically feasible to provide for it. If providing for left-turn is found to be feasible, a left-turn movement may be allowed to take advantage of space available for an exclusive left-turn bay.
The Level-of-Service (LOS) for Alternative 2 lane configuration is “B” in the am peak period and “C” in the pm peak period. The LOS for Base Year 2010 and Forecast Year 2030 will be the same because the traffic volumes are expected to remain about the same.

### Level-of-Service for Alternative 2 Lane Configuration

<table>
<thead>
<tr>
<th>Lorain Rd/Brookpark Rd Approach</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorain Rd SW, Northeast Bound</td>
<td>18.6</td>
<td>19.2</td>
</tr>
<tr>
<td>Lorain Rd NE, Southwest Bound</td>
<td>19.4</td>
<td>22.0</td>
</tr>
<tr>
<td>Brookpark Road, West Bound</td>
<td>17.7</td>
<td>25.8</td>
</tr>
<tr>
<td>Silverdale Road, South Bound</td>
<td>15.7</td>
<td>21.3</td>
</tr>
<tr>
<td>Intersection</td>
<td>18.5</td>
<td>22.1</td>
</tr>
</tbody>
</table>

The Level-of-Service (LOS) for Alternative 2 lane configuration is “B” in the am peak period and “C” in the pm peak period. The LOS for Base Year 2010 and Forecast Year 2030 will be the same because the traffic volumes are expected to remain about the same.
11.0 **Findings, Conclusions, and Recommendations**

**Findings and Conclusions:**

The results of the study support the idea of realigning a section of Brookpark Road with Silverdale to eliminate its intersection with Lorain Road at the conjoined driveways on the northern side of Lorain Road of the Speedway gas station and Boston Market restaurant. The signalized intersection to be eliminated is too closely spaced to the intersection of Silverdale at Lorain Road, and is controlled by a phasing sequence that contains two split phases. The T-Intersection of Silverdale Road with Lorain Road, by virtue of its proximity to the existing signalized intersection to be eliminated, is also controlled by split phases. The proposed realignment provides for eliminating all split phasing and enables the free flow of right-turning traffic from the Lorain Road eastbound approach to eastbound Brookpark Road. Such modification will improve the operation of the intersection and increase its overall Level-of-Service.

The present alignment of Lorain Road and the characteristics of the landscape within which the proposed realignment of Brookpark Road with Silverdale Road might be implemented may continue to present physical constraints that may prevent the production of an alignment free from sharp oblique angles between Lorain Road and Brookpark Road. Such oblique angles, depending on how acutely, may not provide the needed curvature or turning radius to allow for a left turn movement from the Lorain Road westbound approach onto Brookpark Road eastbound to take advantage of the existing left turn bay on the Lorain Road westbound approach. The feasibility of securing the needed turning radius or curvature should be investigated for Alternative 2 at the design stage.

**Recommendations:**

Based on the aforementioned findings and conclusions, and by further examination of the general landscape of the area in the vicinity of the intersection of Lorain Road with Brookpark Road and Silverdale Road, it is recommended to consider and examine realigning Brookpark Road with Canterbury at its intersection with Lorain Road, either as a substitute to the realignment proposed earlier and described in this study report or in lieu of it at some point in time in the long term. The following lane-configuration options are presented for consideration and further analyses:
Option 1

Figure R1: Schematic Diagram of the Realignment of Brookpark Road with Canterbury at Lorain Road, Option 1 Lane Configuration

Option 2

Figure R2: Schematic Diagram of the Realignment of Brookpark Road with Canterbury at Lorain Road, Option 2 Lane Configuration
APPENDICES

1. APPENDIX A: Crash Records Summary Tables (Attached with report)

2. APPENDIX B: Level-of-Service (LOS) Calculations Worksheets (Bound Separately)
### APPENDIX A

Crash Records Summary Tables

<table>
<thead>
<tr>
<th>Order #</th>
<th>Crash Record</th>
<th>Date of Crash</th>
<th>Day of week</th>
<th>Time of Crash</th>
<th>Type of Crash</th>
<th>Severity of Crash</th>
<th>Contributing Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T61400</td>
<td>01/15/07</td>
<td>Monday</td>
<td>12:23</td>
<td>Rear End</td>
<td>PDO</td>
<td>Wet Pavement</td>
</tr>
<tr>
<td>2</td>
<td>T61437</td>
<td>01/26/07</td>
<td>Friday</td>
<td>21:56</td>
<td>Angle</td>
<td>Injury</td>
<td>Interference from Driveway</td>
</tr>
<tr>
<td>3</td>
<td>T61628</td>
<td>03/19/07</td>
<td>Monday</td>
<td>13:10</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Maintain Assured Clear Distance</td>
</tr>
<tr>
<td>4</td>
<td>T61641</td>
<td>03/23/07</td>
<td>Friday</td>
<td>12:17</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Stop</td>
</tr>
<tr>
<td>5</td>
<td>T61889</td>
<td>06/08/07</td>
<td>Friday</td>
<td>12:13</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Control Due to Slippery Surface</td>
</tr>
<tr>
<td>6</td>
<td>T61977</td>
<td>07/08/07</td>
<td>Sunday</td>
<td>13:04</td>
<td>Angle</td>
<td>PDO</td>
<td>Inattention: Coming out of Private Driveway to Main Rd</td>
</tr>
<tr>
<td>7</td>
<td>T62052</td>
<td>07/31/07</td>
<td>Tuesday</td>
<td>13:40</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Control</td>
</tr>
<tr>
<td>8</td>
<td>T62221</td>
<td>09/20/07</td>
<td>Thursday</td>
<td>12:07</td>
<td>Bicyclist</td>
<td>Not Reported</td>
<td>Failure to Yield: Vehicle - Bicycle Collision on Sidewalk</td>
</tr>
<tr>
<td>9</td>
<td>T62407</td>
<td>11/23/07</td>
<td>Friday</td>
<td>15:54</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to Obey Traffic Control Signal</td>
</tr>
</tbody>
</table>

PDO: Property Damage Only
### Table 2: Crashes in Year 2008 at the Intersection of Lorain Rd/Brookpark Rd

<table>
<thead>
<tr>
<th>Order #</th>
<th>Crash Record</th>
<th>Date of Crash</th>
<th>Day of week</th>
<th>Time of Crash</th>
<th>Type of Crash</th>
<th>Severity of Crash</th>
<th>Contributing Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T62601</td>
<td>01/04/08</td>
<td>Friday</td>
<td>15:12</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>2</td>
<td>T62628</td>
<td>01/13/08</td>
<td>Sunday</td>
<td>14:38</td>
<td>Angle</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>3</td>
<td>T62629</td>
<td>01/13/08</td>
<td>Sunday</td>
<td>16:14</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>4</td>
<td>T62716</td>
<td>02/01/08</td>
<td>Friday</td>
<td>14:11</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to Yield</td>
</tr>
<tr>
<td>5</td>
<td>T62750</td>
<td>02/10/08</td>
<td>Sunday</td>
<td>12:20</td>
<td>Angle</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>6</td>
<td>T62769</td>
<td>02/15/08</td>
<td>Friday</td>
<td>13:55</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Control / Reckless Driving</td>
</tr>
<tr>
<td>7</td>
<td>T62956</td>
<td>04/11/08</td>
<td>Friday</td>
<td>14:22</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Control / Following Too Closely</td>
</tr>
<tr>
<td>8</td>
<td>T63011</td>
<td>04/26/08</td>
<td>Saturday</td>
<td>19:17</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>9</td>
<td>T63028</td>
<td>05/04/08</td>
<td>Sunday</td>
<td>14:28</td>
<td>Passing Sideswipe</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>10</td>
<td>T63166</td>
<td>06/13/08</td>
<td>Friday</td>
<td>14:27</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to Yield / Interference from Private Driveway</td>
</tr>
<tr>
<td>11</td>
<td>T63291</td>
<td>07/26/08</td>
<td>Saturday</td>
<td>11:51</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to Yield / Interference from Private Driveway</td>
</tr>
<tr>
<td>12</td>
<td>T63578</td>
<td>10/31/08</td>
<td>Friday</td>
<td>14:44</td>
<td>Passing Sideswipe</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>13</td>
<td>T63594</td>
<td>11/05/08</td>
<td>Wednesday</td>
<td>10:32</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to Yield</td>
</tr>
<tr>
<td>14</td>
<td>T63749</td>
<td>12/09/08</td>
<td>Tuesday</td>
<td>17:45</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention / Reckless Driving</td>
</tr>
</tbody>
</table>

PDO: Property Damage Only
<table>
<thead>
<tr>
<th>Order #</th>
<th>Crash Record</th>
<th>Date of Crash</th>
<th>Day of week</th>
<th>Time of Crash</th>
<th>Type of Crash</th>
<th>Severity of Crash</th>
<th>Contributing Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T63906</td>
<td>01/10/09</td>
<td>Saturday</td>
<td>11:40</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention / Following too closely</td>
</tr>
<tr>
<td>2</td>
<td>T63980</td>
<td>01/27/09</td>
<td>Tuesday</td>
<td>19:11</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention / Following too closely</td>
</tr>
<tr>
<td>3</td>
<td>T64023</td>
<td>02/04/09</td>
<td>Wednesday</td>
<td>14:29</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to yield</td>
</tr>
<tr>
<td>4</td>
<td>T64102</td>
<td>2/26/09</td>
<td>Thursday</td>
<td>19:46</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention / Following too closely</td>
</tr>
<tr>
<td>5</td>
<td>T64267</td>
<td>04/18/09</td>
<td>Saturday</td>
<td>16:20</td>
<td>Rear End</td>
<td>PDO</td>
<td>Inattention</td>
</tr>
<tr>
<td>6</td>
<td>T64338</td>
<td>05/09/09</td>
<td>Saturday</td>
<td>10:17</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to yield</td>
</tr>
<tr>
<td>7</td>
<td>T64634</td>
<td>08/21/09</td>
<td>Friday</td>
<td>11:52</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Control / Mechanical Failure</td>
</tr>
<tr>
<td>8</td>
<td>T64685</td>
<td>09/12/09</td>
<td>Saturday</td>
<td>17:00</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to yield</td>
</tr>
<tr>
<td>9</td>
<td>T65023</td>
<td>12/26/09</td>
<td>Saturday</td>
<td>16:15</td>
<td>Rear End</td>
<td>PDO</td>
<td>Failure to Control / Following too Closely</td>
</tr>
<tr>
<td>10</td>
<td>T65043</td>
<td>12/29/09</td>
<td>Tuesday</td>
<td>12:09</td>
<td>Angle</td>
<td>PDO</td>
<td>Failure to yield</td>
</tr>
</tbody>
</table>
APPENDIX B

Level-of-Service (LOS) Calculations Worksheets

Lorain Road/Brookpark Road

For

Alternative “No-Build” (Existing Conditions)
AM & PM Peak Periods

Alternative 1 Lane-Configuration (Build Conditions)
AM & PM Peak Periods

&

Alternative 2 Lane-Configuration (Build Conditions)
AM & PM Peak Periods

BOUND SEPARATELY
Available Upon Request