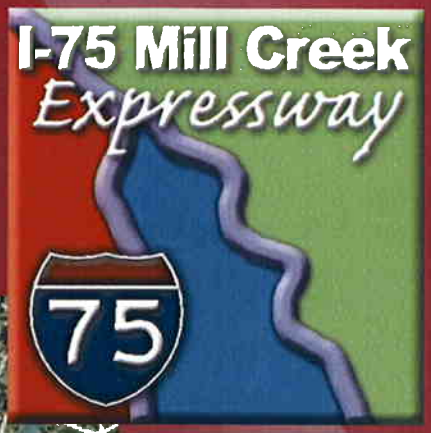
Northside Study
HAM-75-2.30



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May 2008

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Introduction

As part of the I-75 Mill Creek Expressway project (HAM-75-2.30, PID 76257), existing local access ramps forming partial interchanges within the I-74/I-75 system interchange are proposed to be closed and removed. The subject ramps include the Elmore Street exit, Spring Grove Avenue entrance, and Central Parkway I-74 exit and I-75 entrance ramps. The closures are necessary due to several factors among them: physical conflict with new ramp construction, lack of available space to relocate affected service ramps, low traffic utilization and prohibition of partial interchanges. Alternative Interstate access to the surrounding communities will be available at the improved full movement Hopple Street/I-75/I-74 and improved full movement Colerain Avenue/Beekman Street/I-74 interchanges.

Many Northside residents, business owners, and employees at local businesses have communicated concerns over impacts to their community resulting from reduced Interstate access. In response, the City of Cincinnati and the Ohio Department of Transportation commissioned this study to consider the effects of access changes proposed with this project on routes identified as serving redirected traffic and to recommend potential improvements to those routes deemed adversely impacted.

This report documents intersection capacity analyses, travel time assessments, and crash evaluations conducted to forecast future impacts to existing travel routes. For the purpose of providing comparisons of future year 2030 no build versus build conditions, this study defines the Baseline condition as the proposed freeway improvements with all existing subject local access ramps open, and the Build condition as the proposed freeway improvements with the subject local access ramps closed.

Northside Study Area

The area of Cincinnati referred to as Northside was originally settled in the late 1790's but did not develop into a population center until the 1820's with the completion of the Miami-Erie Canal and, later, the CH&D railroad. The town of Cumminsville grew into a bedroom community of Cincinnati which was ultimately annexed by the city of Cincinnati in 1873. By the 1920's, the community had become a busy commercial district of Cincinnati referred to as Knowlton's Corner and contained shops, merchants and manufacturing. The post-World War II industrial boom and completion of the Interstate resulted in fewer people living near to their workplaces causing a decline in housing and lower property values. By the mid-1960's, Northside industry had largely left the area. Beginning in the mid-1980's, population in-fill has occurred attracted to the lower home prices and central location in the Cincinnati Metro area.[1]

The general character of the community today is single and multi-family housing with a central business district along Hamilton Avenue between Spring Grove and Chase Avenues. The 2000 population totaled approximately 9,400 with a primary demographic of Caucasian (58%) and African-American (39%). The community is bounded by I-74 and the Mill Creek to the south, Spring Grove Cemetery east, Mount Airy Forest west and hilly terrain to the north. An asymmetric street grid exists around principal through arterials of Hamilton Avenue (north-south), William P. Dooley Bypass/Spring Grove Avenue (east-west), and Colerain Avenue (north-south). Within the local street network are primary local streets of Blue Rock Street (east-west), Chase Avenue (east-west) and Virginia Avenue (north-south).

As is typical of many older urban neighborhoods, streets are narrow with intersections closely spaced. Parking is generally on-street with sidewalks, and streets are curbed. Numerous small businesses line Hamilton Avenue including restaurants, clothing boutiques and taverns. A large mixed-use redevelopment project is currently planned for the old American Can plant at Hamilton Avenue and Blue Rock Street which will contain multi-unit housing and retail businesses. South of Blue Rock Street to the Mill Creek is a number of light manufacturing and other small industrial uses.

[1] From *The History of Northside Knowlton's Corner and Hamilton Ave.*, www.northside.net

Although not a part of Northside, the area east of I-75 along Central Parkway which includes the Cincinnati State Technical and Community College campus is impacted by the closure of the Central Parkway ramps. The Central Parkway entrance ramp does provide added access to I-75 northbound for Northside.

Study Methodology

This study considers the impact on selected intersections within the study area of future freeway improvements in combination with the closure of subject local access ramps. Intersection locations were selected based on the relative importance of routes and with local agency input. The primary routes through the Northside were established as 1) Virginia Avenue, 2) Colerain Avenue, 3) William P. Dooley Bypass, 4) Spring Grove Avenue and 5) Hamilton Avenue. Focus intersections were then selected to investigate potential impacts and are listed in **Table 1** below.

This study is concerned with three areas of investigation: 1) intersection capacity, 2) travel times, and 3) intersection crash history. Intersection capacity is used to establish the level of service (LOS) for the Baseline and Build conditions. Travel times were obtained in the field for each of the affected routes. The purpose of this evaluation is to provide a relative comparison of trip duration between the Baseline and Build conditions assuming recommended intersection capacity improvements have been made and LOS will not be degraded by redistributed traffic volumes. Intersection crash history is provided to indicate whether a crash problem exists today that could be worsened with increased redistributed traffic and to identify corrective safety measures if necessary. To make this determination, crashes per million vehicles averaged over the last three years were compiled for each focus intersection and compared to the statewide average for similar intersections.

Intersection Capacities

With the proposed ramp closures, Northside motorists will be required to seek out new routes to access I-74/I-75. The redistribution of Interstate-generated trips through the Northside community raised concerns that some local street intersections may operate worse than with the Baseline condition due to changes in travel patterns. As a result, the Ohio Department of Transportation (ODOT) and City of Cincinnati requested that Transystems study and analyze sixteen (16) focus intersections within this area. The focus intersections are listed in Table 1 below, and **Appendix A, Figure 1** provides a study area map showing focus intersection locations.

Table 1: Intersection Number and Location

• (1) Colerain Avenue & Hoffner Street	• (9) Mitchell Avenue & Kenard Avenue
• (2) Colerain Avenue & Blue Rock Street	• (10) Colerain Avenue & West Fork/Virginia Avenue
• (3) Blue Rock Street & Hamilton Avenue	• (11) Colerain Avenue & Powers Street
• (4) Spring Grove Avenue & Blue Rock Street	• (12) Colerain Avenue & Elmore Street
• (5) Spring Grove Avenue & William P. Dooley Bypass	• (13) Colerain Avenue & William P. Dooley Bypass
• (6) Hamilton Avenue & Chase Avenue	• (14) Ludlow Avenue & Central Parkway
• (7) Virginia Avenue & Chase Avenue	• (15) William P. Dooley Bypass & Elmore Street
• (8) Spring Grove Avenue & Mitchell Avenue	• (16) Hoffner Street & Spring Grove Avenue

The study utilizes design year 2030 volume data at each focus intersection to determine the level of service (LOS) and volume to capacity ratios (v/c) for each intersection traffic movement for the Baseline and Build conditions based on existing site characteristics (intersection geometry, lane widths, etc.).

Level of service (LOS) is a standard measure of effectiveness used to describe operational conditions of a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic

interruptions, and comfort and convenience. Six LOS are defined for intersections using letter designations from A to F with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions.

For intersections, LOS is based solely on control delay per vehicle which includes initial deceleration delay at the beginning of the red interval, queue (backup) move up time during the beginning of the green interval, stopped delay during the red interval, and final acceleration delay to the desired speed at the beginning of the green interval. **Table 2** describes the relationship between average vehicle delay and LOS. From ODOT's *Location and Design Manual, Volume 1* Guide for Selection of Minimum Design Levels of Service (Exhibit 301-1E) figure, the desired LOS for a "new" or "redesigned" road in an urban area is LOS D.

Table 2: Level of Service Delay Ranges for Signalized and Unsignalized Intersections

Level of Service (LOS)	Average Delay Range (sec/veh)	
	Signalized	Unsignalized
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

The volume to capacity ratio (v/c) is a capacity measure of the demand traffic volume to the carrying capacity of the available lanes. A v/c ratio of 1.00 indicates 100% of the available capacity of the roadway is used by the demand traffic, i.e. the roadway is at capacity, and a v/c ratio greater than 1.00 indicates over capacity of the roadway.

When analyzing intersections, both the LOS (qualitative measure) and the v/c (quantitative measure) are considered. Each measure is independent of the other, and as a result, each is considered separately.

As noted above, the study focused on performing capacity analyses at each of the sixteen intersections using design year traffic for the AM and PM design hours under the "Baseline" and "Build" conditions. To determine the design year traffic, manual turning movement counts were taken during the AM and PM peak periods in November 2004 and August 2006 at each intersection listed in Table 1. The overall peak hour for each time period was determined, and the volumes were smoothed between adjacent intersections. The count volumes were then used in conjunction with the Ohio-Kentucky-Indiana (OKI) regional travel demand model to determine the "Baseline" and "Build" condition 2030 design hour volumes, as it has the ability to simulate the future distribution of traffic to all roadways for either condition.

Based on the results of the capacity analyses, intersections were grouped into three categories for the Base and Build conditions. The three categories are: (1) No change or improved LOS; (2) Worse LOS and LOS D or better; and (3) Worse LOS and LOS E or F. Category (1) intersections do not merit correction and no improvements are recommended. Category (2) intersections with v/c ratios equal or greater than 1.00 for any movement and Category (3) intersections are recommended for capacity improvement.

Baseline 2030 Condition

The "Baseline" condition denotes the scenario where the affected existing ramps remain in place in the 2030 design year. This condition assumes improvements to I-74, I-75, and the system interchange. Additionally, existing geometry was assumed at all analyzed intersections. **Table 3** details the LOS and average delays for each of the intersections. Highway Capacity Software (HCS+ v. 5.21), which is based on the 2000 Highway Capacity Manual, was used to complete the capacity analyses. The results show that, for both the AM and PM design hours, fourteen

of the intersections show a LOS D or better. However, the intersection of Mitchell Avenue & Spring Grove Avenue shows LOS F in the PM design hour, and the intersection of Mitchell Avenue& Kenard Avenue shows LOS E in the PM design hour.

Additionally, three other intersections show v/c ratios of greater than 1.0 for at least one movement, meaning that at least one movement exceeds capacity. These intersections are Hamilton Avenue and Chase Avenue in the PM design hour, Colerain Avenue and West Fork Road/Virginia Avenue in the AM design hour, and Hoffner Street and Spring Grove Avenue in the PM design hour. The HCS reports for the "Baseline" condition are found in **Appendix B**.

Table 3: 2030 Baseline HCS Results							
Intersection	Time Period	Eastbound LOS (Delay)	Westbound LOS (Delay)	Northbound LOS (Delay)	Southbound LOS (Delay)	Overall LOS (Delay)	Any V/C > 1.0?**
Colerain Avenue & Hoffner Street	AM	B (19.9 sec)	C (20.6 sec)	B (19.5 sec)	C (21.0 sec)	C (20.5 sec)	No
	PM	C (20.1 sec)	B (19.0 sec)	C (20.0 sec)	B (18.6 sec)	B (19.4 sec)	No
Colerain Avenue & Blue Rock Street	AM	N/A	C (22.9 sec)	N/A	A (8.8 sec)	N/A	No
	PM	N/A	B (14.5 sec)	N/A	A (9.5 sec) [L]	N/A	No
Blue Rock Street & Hamilton Avenue	AM	C (22.4 sec)	B (15.8 sec)	B (10.5 sec)	C (22.2 sec)	B (19.6 sec)	No
	PM	C (23.0 sec)	C (34.0 sec)	C (30.5 sec)	A (7.1 sec)	C (25.1 sec)	No
Spring Grove Avenue & Blue Rock Street	AM	N/A	A (7.8 sec) [L]	A (9.6 sec)	N/A	N/A	No
	PM	N/A	A (8.0 sec) [L]	B (11.1 sec)	N/A	N/A	No
Spring Grove Avenue & William Dooley Bypass	AM	B (14.2 sec)	N/A	B (14.5 sec)	B (14.3 sec)	B (14.4 sec)	No
	PM	B (16.1 sec)	N/A	B (15.4 sec)	B (16.6 sec)	B (16.1 sec)	No
Hamilton Avenue & Chase Avenue	AM	B (16.4 sec)	B (16.0 sec)	B (10.5 sec)	B (17.5 sec)	B (15.6 sec)	No
	PM	C (29.1 sec)	C (27.6 sec)	**E (58.5 sec)**	A (4.1 sec)	D (42.9 sec)	Yes (NB=1.09)
Virginia Avenue & Chase Avenue	AM	N/A	B (13.4 sec)	N/A	A (7.9 sec) [L]	N/A	No
	PM	N/A	C (17.1 sec)	N/A	A (8.4 sec) [L]	N/A	No
Mitchell Avenue & Spring Grove Avenue	AM	D (48.9 sec)	D (41.4 sec)	D (47.0 sec)	C (23.2 sec)	D (42.8 sec)	Yes (WB Right=1.06)
	PM	**F (82.2 sec)**	**F (86.9 sec)**	**F (83.0 sec)**	**F (82.7 sec)**	**F (84.2 sec)**	Yes (WB Right=1.41)
Mitchell Avenue & Kenard Avenue	AM	C (30.1 sec)	C (23.4 sec)	C (28.6 sec)	C (28.0 sec)	C (26.4 sec)	No
	PM	**E (74.0 sec)**	**E (65.5 sec)**	**E (77.2 sec)**	**E (66.0 sec)**	**E (70.4 sec)**	Yes (NB Thru=1.09)
Colerain Avenue & West Fork Road/ Virginia Avenue	AM	D (48.3 sec)	D (49.3 sec)	B (14.1 sec)	D (51.5 sec)	D (44.2 sec)	Yes (SB Thru=1.03)
	PM	C (34.2 sec)	C (33.5 sec)	D (36.5 sec)	C (33.8 sec)	D (35.4 sec)	No
Colerain Avenue & Powers Street	AM	B (13.1 sec)	N/A	B (11.6 sec)	B (13.5 sec)	B (12.8 sec)	No
	PM	B (12.9 sec)	N/A	B (12.4 sec)	B (13.0 sec)	B (12.7 sec)	No
Colerain Avenue & Elmore Street	AM	B (13.5 sec)	B (11.6 sec)	N/A	B (13.9 sec)	B (13.2 sec)	No
	PM	B (19.9 sec)	A (9.2 sec)	N/A	B (19.2 sec)	B (13.4 sec)	No
Colerain Avenue & William Dooley Bypass	AM	B (16.9 sec)	N/A	A (9.0 sec)	B (16.7 sec)	B (14.9 sec)	No
	PM	B (13.4 sec)	N/A	B (11.0 sec)	B (13.6 sec)	B (12.1 sec)	No
Ludlow Avenue & Central Parkway	AM	C (21.1 sec)	B (12.5 sec)	C (21.9 sec)	N/A	B (19.4 sec)	No
	PM	B (18.1 sec)	B (16.7 sec)	B (18.5 sec)	N/A	B (17.4 sec)	No
William Dooley Bypass & Elmore Street	AM	N/A	C (22.3 sec)	A (7.5 sec)	C (22.6 sec)	B (15.1 sec)	No
	PM	N/A	C (21.5 sec)	C (21.2 sec)	C (22.6 sec)	C (21.8 sec)	No
Hoffner Street & Spring Grove Avenue	AM	C (29.0 sec)	C (29.8 sec)	A (8.7 sec)	C (30.6 sec)	C (26.1 sec)	No
	PM	D (42.2 sec)	D (40.9 sec)	D (44.6 sec)	B (14.7 sec)	D (37.5 sec)	Yes (NB Thru=1.04)

* [L] = LOS and Delay are for left turn only

**Worst v/c for intersection shown. There may be other v/c ratios greater than 1.0. Please see HCS reports in Appendix A for further details.

Build 2030 Condition

The "Build" condition denotes the scenario where the affected existing ramps in and around the I-74/I-75 systems interchange are closed or relocated on either I-74 or I-75. In this scenario, improvements to I-74, I-75 and the systems interchange were again assumed. Additionally, existing geometry was assumed at all analyzed

intersections except Colerain Avenue and Powers Street and Colerain Avenue and Dooley Bypass. With the removal of the I-74 exit ramp, the Colerain Avenue and Powers Street intersection no longer requires a traffic signal as it becomes a three-leg intersection with Powers Street one way away from Colerain Avenue. Therefore, this intersection was not analyzed. At the intersection of Colerain Avenue and Dooley Bypass, the I-75 southbound entrance ramp is eliminated, changing the geometry of that intersection; the new geometry is reflected in the analyses. **Table 4** details the LOS and average delays for each of the intersections. The results show that, for the 2030 AM and PM design hours, ten of the intersections show LOS D or better. As with the "Baseline" condition, the intersections of Mitchell Avenue and Kenard Avenue and Mitchell Avenue and Spring Grove Avenue show levels of service E or F in one or both of the design hours. Additionally, the intersections of Blue Rock Street and Hamilton Avenue, Hamilton Avenue and Chase Avenue, and Hoffner Street and Spring Grove Avenue all show LOS E in the PM design hour.

No additional intersections show v/c ratios of greater than 1.0 for any movements in either of the design hours. The HCS reports for the "Build" condition are found in Appendix B.

Table 4: 2030 Build HCS Results							
Intersection	Time Period	Eastbound LOS (Delay)	Westbound LOS (Delay)	Northbound LOS (Delay)	Southbound LOS (Delay)	Overall LOS (Delay)	Any V/C >1.0?**
Colerain Avenue & Hoffner Street	AM	B (18.3 sec)	B (18.5 sec)	B (17.8 sec)	B (19.3 sec)	B (18.9 sec)	No
	PM	B (18.9 sec)	B (19.8 sec)	B (19.7 sec)	B (18.7 sec)	B (19.3 sec)	No
Colerain Avenue & Blue Rock Street	AM	N/A	B (13.5 sec)	N/A	A (8.6 sec) [L]	N/A	No
	PM	N/A	C (20.1 sec)	N/A	A (9.8 sec) [L]	N/A	No
Blue Rock Street & Hamilton Avenue	AM	B (18.5 sec)	B (17.2 sec)	B (10.8 sec)	B (19.1 sec)	B (17.1 sec)	No
	PM	**E (60.0 sec)**	**F (90.1 sec)**	**F (86.6 sec)**	B (13.7 sec)	**E (72.0 sec)**	Yes (NB Thru=1.14)
Spring Grove Avenue & Blue Rock Street	AM	N/A	A (7.9 sec) [L]	B (10.1 sec)	N/A	N/A	No
	PM	N/A	A (8.0 sec) [L]	B (13.0 sec)	N/A	N/A	No
Spring Grove Avenue & William Dooley Bypass	AM	B (15.3 sec)	N/A	B (13.8 sec)	B (15.1 sec)	B (14.7 sec)	No
	PM	C (20.4 sec)	N/A	B (16.0 sec)	C (20.2 sec)	B (19.1 sec)	No
Hamilton Avenue & Chase Avenue	AM	B (15.8 sec)	B (15.9 sec)	B (11.3 sec)	B (15.7 sec)	B (14.5 sec)	No
	PM	C (31.0 sec)	C (32.3 sec)	**E (72.9 sec)**	A (3.7 sec)	**E (55.0 sec +)**	Yes (NB Thru=1.12)
Virginia Avenue & Chase Avenue	AM	N/A	C (15.3 sec)	N/A	A (8.2 sec) [L]	N/A	No
	PM	N/A	D (29.3 sec)	N/A	A (8.8 sec) [L]	N/A	No
Mitchell Avenue & Spring Grove Avenue	AM	**E (60.9 sec)**	**E (60.3 sec)**	**E (56.7 sec)**	B (18.2 sec)	D (54.9 sec)	Yes (WB Left=1.06)
	PM	**F (106.9 sec)**	**F (106.1 sec)**	**F (97.5 sec)**	**F (100.7 sec)**	**F (102.4 sec)**	Yes (SB Left=1.50)
Mitchell Avenue & Kenard Avenue	AM	D (36.1 sec)	C (21.6 sec)	C (33.7 sec)	C (29.6 sec)	C (28.2 sec)	No
	PM	**F (98.9 sec)**	**E (59.7 sec)**	**F (95.0 sec)**	**F (83.8 sec)**	**F (80.3 sec)**	Yes (WB Left=1.41)
Colerain Avenue & West Fork Road/ Virginia Avenue	AM	D (40.5 sec)	D (40.7 sec)	B (19.4 sec)	D (40.2 sec)	D (36.8 sec)	No
	PM	D (35.8 sec)	D (35.7 sec)	D (39.2 sec)	C (33.0 sec)	D (37.3 sec)	No
Colerain Avenue & Elmore Street	AM	B (13.0 sec)	B (10.7 sec)	N/A	B (12.9 sec)	B (12.4 sec)	No
	PM	C (27.0 sec)	C (24.8 sec)	N/A	C (28.6 sec)	C (25.7 sec)	No
Colerain Avenue & William Dooley Bypass	AM	B (14.9 sec)	N/A	B (14.5 sec)	B (14.9 sec)	B (14.8 sec)	No
	PM	B (17.9 sec)	N/A	B (18.1 sec)	B (12.1 sec)	B (17.3 sec)	No
Ludlow Avenue & Central Parkway	AM	C (25.6 sec)	A (6.5 sec)	C (24.8 sec)	N/A	C (22.2 sec)	No
	PM	C (24.0 sec)	B (16.0 sec)	C (23.0 sec)	N/A	C (20.1 sec)	No
William Dooley Bypass & Elmore Street	AM	N/A	B (17.3 sec)	B (11.8 sec)	B (17.2 sec)	B (13.7 sec)	No
	PM	N/A	C (25.9 sec)	C (21.7 sec)	C (25.4 sec)	C (22.9 sec)	No
Hoffner Street & Spring Grove Avenue	AM	C (25.4 sec)	C (28.7 sec)	B (11.7 sec)	C (28.2 sec)	C (23.8 sec)	No
	PM	**E (70.2 sec)**	**E (65.8 sec)**	**E (72.3 sec)**	B (14.6 sec)	**E (61.3 sec)**	Yes (NB Thru=1.09)

* [L] = LOS and Delay are for left turn only

**Worst v/c for intersection shown. There may be other v/c ratios greater than 1.0. Please see HCS reports in Appendix B for further details.

Comparison of Alternatives

In order to determine whether improvements are necessary at each intersection, a comparison was made between the "Baseline" and the "Build" conditions. **Table 5** gives a comparison between overall LOS and delay at each intersection and shows locations where the v/c ratio exceeds 1.0 for any movement.

Table 5: LOS/Delay Comparison

Intersection	AM/ PM	Overall Baseline LOS (Delay)	Overall No Local Access LOS (Delay)	Improved/ Same LOS?	LOS D or Better?	Baseline V/C > 1.0?**	No Local Access V/C > 1.0?**
Colerain Avenue & Hoffner Street	AM	C (20.5 sec)	B (18.9 sec)	Yes	Yes	No	No
	PM	B (19.4 sec)	B (19.3 sec)	Yes	Yes	No	No
Colerain Avenue & Blue Rock Street*	AM	N/A	N/A	N/A	Yes	No	No
	PM	N/A	N/A	N/A	Yes	No	No
Blue Rock Street & Hamilton Avenue	AM	B (19.6 sec)	B (17.1 sec)	Yes	Yes	No	No
	PM	C (25.1 sec)	**E (72.0 sec)**	No	**No**	No	**Yes (NB Thru=1.14)**
Spring Grove Avenue & Blue Rock Street*	AM	N/A	N/A	N/A	Yes	No	No
	PM	N/A	N/A	N/A	Yes	No	No
Spring Grove Avenue & William Dooley Bypass	AM	B (14.4 sec)	B (14.7 sec)	Yes	Yes	No	No
	PM	B (16.1 sec)	B (19.1 sec)	Yes	Yes	No	No
Hamilton Avenue & Chase Avenue	AM	B (15.6 sec)	B (14.5 sec)	Yes	Yes	No	No
	PM	D (42.9 sec)	**E (55.0+ sec)**	No	**No**	**Yes (NB=1.09)**	**Yes (NB=1.12)**
Virginia Avenue & Chase Avenue*	AM	N/A	N/A	N/A	Yes	No	No
	PM	N/A	N/A	N/A	Yes	No	No
Mitchell Avenue & Spring Grove Avenue	AM	D (42.8 sec)	D (54.9 sec)	Yes	Yes	**Yes (WB Right=1.06)**	**Yes (WB Left =1.06)**
	PM	**F (84.2 sec)**	**F (102.4 sec)**	Yes	**No**	**Yes (WB Right=1.41)**	**Yes (SB Left=1.50)**
Mitchell Avenue & Kenard Avenue	AM	C (26.4 sec)	C (28.2 sec)	Yes	Yes	No	No
	PM	**E (70.4 sec)**	**F (80.3 sec)**	No	**No**	**Yes (NB Thru=1.09)**	**Yes (WB Left =1.41)**
Colerain Avenue & West Fork Road/Virginia Avenue	AM	D (44.2 sec)	D (36.8 sec)	Yes	Yes	**Yes (SB Thru=1.03)**	No
	PM	D (35.4 sec)	D (37.3 sec)	Yes	Yes	No	No
Colerain Avenue & Elmore Street	AM	B (13.2 sec)	B (12.4 sec)	Yes	Yes	No	No
	PM	B (13.4 sec)	C (26.8 sec)	No	Yes	No	No
Colerain Avenue & William Dooley Bypass	AM	B (14.9 sec)	B (14.8 sec)	Yes	Yes	No	No
	PM	B (12.1 sec)	B (17.3 sec)	Yes	Yes	No	No
Ludlow Avenue & Central Parkway	AM	B (19.4 sec)	C (22.2 sec)	No	Yes	No	No
	PM	B (17.4 sec)	C (20.1 sec)	No	Yes	No	No
William Dooley Bypass & Elmore Street	AM	B (15.1 sec)	B (13.7 sec)	Yes	Yes	No	No
	PM	C (21.8 sec)	C (22.9 sec)	Yes	Yes	No	No
Hoffner Street & Spring Grove Avenue	AM	C (26.1 sec)	C (23.8 sec)	Yes	Yes	No	No
	PM	D (37.5 sec)	**E (61.3 sec)**	No	**No**	**Yes (NB Thru=1.04)**	**Yes (NB Thru=1.09)**

*two-way stop-controlled intersections which do not show overall LOS; all LOS D or better on all individual approached in both alternatives.

**Worst v/c for intersection shown. There may be other v/c ratios greater than 1.0. Please see HCS reports in Appendices A & B for further details.

Based on the study methodology, the intersections were placed into three groups. The first group includes intersections with no change in LOS or an improved LOS, where the LOS is at least a D. This group includes eight intersections: Colerain Avenue and Hoffner Street; Colerain Avenue and Blue Rock Street; Spring Grove Avenue and Blue Rock Street; Spring Grove Avenue and William Dooley Bypass; Virginia Avenue and Chase Avenue; Colerain Avenue and West Fork Road/Virginia Avenue; Colerain Avenue and William Dooley Bypass; and William Dooley Bypass and Elmore Street. Because the "Build" condition does not degrade the performance of these intersections and the overall LOS remains a D or better, no corrective action is proposed.

The second group includes intersections where LOS degrades from the "Baseline" condition to the "Build" condition, but a LOS D or better is still achieved. Two intersections fall into this category: Colerain Avenue and Elmore Street, and Ludlow Avenue and Central Parkway. The Ludlow Avenue and Central Parkway intersection degrades from a LOS B to a LOS C in the AM design hour, and both intersections degrade from a LOS B to a LOS C during the PM design hour. Because of this degradation in LOS, the v/c ratios were examined to determine if any movements were over capacity in the "Build" condition. At both intersections, no v/c ratios exceed 1.0, so no corrective action is recommended.

The final group includes intersections where LOS either degrades to a LOS E or F or remains at failure. This group includes five intersections: Blue Rock Street and Hamilton Avenue; Hamilton Avenue and Chase Avenue; Mitchell Avenue and Spring Grove Avenue; Mitchell Avenue and Kenard Avenue; and Hoffner Street and Spring Grove Avenue. The Blue Rock Street and Hamilton Avenue, Hamilton Avenue and Chase Avenue, and Hoffner Street and Spring Grove Avenue intersections all degrade to a LOS E during the PM design hour. At Mitchell Avenue and Kenard Avenue, the intersection degrades from a LOS E to a LOS F during the PM design hour. Finally, the intersection of Mitchell Avenue and Spring Grove Avenue remains a LOS F in both design hours for the "Baseline" and "Build" conditions. All five intersections in this group were examined to determine possible corrective actions to improve the LOS to a D or better in both design hours (see *Recommendations* below).

Recommendations

Five intersections were determined to require corrective action in order to operate at an acceptable level of service with acceptable v/c ratios in the "Build" condition. These include Blue Rock Street and Hamilton Avenue, Hamilton Avenue and Chase Avenue, Mitchell Avenue and Spring Grove Avenue, Mitchell Avenue and Kenard Avenue, and Hoffner Street and Spring Grove Avenue. Each intersection is discussed individually below.

Blue Rock Street and Hamilton Avenue

The intersection of Blue Rock Street and Hamilton Avenue is located in a commercial area within the Northside neighborhood. Buildings near this intersection are very close to the roadway, especially on the north and south approaches. Therefore, improvements to this intersection are likely limited to the east and west approaches.

This intersection shows a LOS E during the PM design hour as well as v/c ratios greater than 1.0. Standard lane width is considered 12 feet. If lanes are narrower than this standard width, the capacity can be affected. Lane widths less than the standard 12 feet are one factor hindering the LOS of this intersection. Since no widening is possible on the north and south approaches without affecting adjacent buildings, the substandard left turn lane eastbound was analyzed using a 12 foot width. It was determined that while widening the eastbound left turn lane did decrease overall delay, it did not achieve the required overall LOS D or reduce the v/c ratios below 1.0. However, adding a dedicated westbound right turn lane did achieve an overall LOS D. Due to a vacant lot in the northeast corner of the intersection, it appears that room exists to accommodate this lane without affecting adjacent buildings. The effects of adding the westbound lane on the delay, LOS and v/c ratios are seen in **Table 6** at the end of this section. While the overall LOS D is satisfactory, the northbound v/c ratio is still greater than 1.0. However, without adding more capacity, it is not possible to reduce this v/c ratio to below 1.0. Since adding additional lanes affects adjacent properties, no further improvements are recommended.

Hamilton Avenue and Chase Avenue

The intersection of Hamilton Avenue and Chase Avenue is also located in the commercial area of the Northside neighborhood; however, unlike the intersection of Hamilton Avenue and Blue Rock Street, buildings are very close to the roadway on all four approaches. Therefore, no widening is possible without affecting the adjacent properties. While the intersection does degrade in LOS from a D to an E, its overall average delay is only 55.0 seconds in the PM peak. This is very close to a LOS D. Because of this, along with the negative impact of widening on the adjacent properties, no capacity improvements are recommended.

Mitchell Avenue and Spring Grove Avenue

The intersection of Mitchell Avenue and Spring Grove Avenue is located in an area slightly removed from most of the other intersections analyzed in this study. The east leg of this intersection is restricted by an adjacent railroad bridge. However, there is some room for lane widening and additions on all legs.

Several improvements in combination are necessary to improve LOS to a D or better. First, the only lane that is 12 feet wide or greater is the eastbound left turn lane. By increasing all other lanes to this standard width delay and v/c ratios decrease. Lane additions are also necessary. A northbound right turn lane on Spring Grove Avenue is recommended, with the current shared through/right lane remaining shared. This requires the channelized right turn lane that currently exists to be removed, making the right turn no longer a free movement (there is no exclusive right turn lane currently, this free movement actually operates as a signalized movement). Next, one of the southbound through lanes needs restriped and marked as a shared through/left lane, and the northbound and southbound movements should be split. This change means that the signal operates in split phasing for all movements. These corrective actions result in a LOS D in the AM and PM design hours, and no v/c ratios greater than 1.0, as shown in Table 6 below.

Mitchell Avenue and Kenard Avenue

The Mitchell Avenue and Kenard Avenue intersection lies between the Mitchell Avenue and Spring Grove Avenue intersection and the I-75 interchange with Mitchell Avenue. The north leg of this intersection is an access drive to the businesses located between Spring Grove Avenue and Mill Creek. Due to its configuration, more than one exit lane on this leg is not feasible. Additionally, increasing lane widths to the standard 12 feet on the westbound leg might affect the access road to these businesses that runs adjacent to Mitchell Avenue east of the intersection. However, increasing the lane widths on the northbound and eastbound legs to 12 feet helps decrease average delay and reduces v/c ratios.

The northbound and southbound legs currently operate under split phasing. Changing these movements to permitted phasing, along with changing the northbound leg configuration on Kenard to include a designated right turn lane and a shared left/through lane, helps increase the LOS to a B in the AM design hour and a C in the PM design hour and decreases all the v/c ratios to less than 1.0. Adding a northbound right turn overlap phase during the westbound protected left turn movement also helps reduce the delay. Results are shown in Table 6 below.

Hoffner Street and Spring Grove Avenue

The intersection of Hoffner Street, Spring Grove Avenue, Hamilton Avenue and Ludlow Avenue is a six-leg intersection; two of the legs are one-way streets heading away from the intersection. Currently, the eastbound and westbound legs (Hoffner Street and Spring Grove Avenue) operate as split phases due to dual westbound left turn lanes. However, only one westbound left turn lane is necessary for operations, and removing the split phasing decreases average delay and v/c ratios. Additionally, adding an eastbound protected left turn phase during the AM peak period and a westbound protected left turn phase during the PM peak period leads to a LOS C for both design hours, as shown in Table 6.

Table 6: Capacity Analysis Results for Improved Intersections								
Intersection	Time Period	Eastbound LOS (Delay)	Westbound LOS (Delay)	Northbound LOS (Delay)	Southbound LOS (Delay)	Overall LOS (Delay)	Any V/C > 1.0?	Max V/C
Blue Rock Street & Hamilton Avenue	AM	C (20.4 sec)	B (16.9 sec)	B (10.9 sec)	C (21.2 sec)	B (18.5 sec)	No	SB=0.84
	PM	D (51.4 sec)	C (33.0 sec)	D (55.0- sec)	B (12.9 sec)	D (42.6 sec)	Yes	NB Thru=1.06
Hamilton Avenue & Chase Avenue	AM	B (15.8 sec)	B (15.9 sec)	B (11.3 sec)	B (15.7 sec)	B (14.5 sec)	No	SB=0.75
	PM	C (31.0 sec)	C (32.3 sec)	E (72.9 sec)	A (3.7 sec)	E (55.0+ sec)	Yes	NB=1.12
Mitchell Avenue & Spring Grove Avenue	AM	D (35.6 sec)	D (36.6 sec)	D (35.1 sec)	C (29.9 sec)	D (35.3 sec)	No	NB Thru=0.95
	PM	D (51.7 sec)	D (44.4 sec)	D (54.7 sec)	D (49.9 sec)	D (49.8 sec)	No	NB Thru=1.00
Mitchell Avenue & Kenard Avenue	AM	C (20.5 sec)	B (13.7 sec)	B (14.8 sec)	C (20.2 sec)	B (16.4 sec)	No	WB Left=0.87
	PM	D (41.5 sec)	B (18.7 sec)	B (19.0 sec)	D (44.0 sec)	C (28.6 sec)	No	EB Thru=0.99
Hoffner Street & Spring Grove Avenue	AM	C (26.3 sec)	B (18.6 sec)	B (11.6 sec)	C (24.7 sec)	C (21.3 sec)	No	SB=0.91
	PM	C (26.7 sec)	D (40.8 sec)	D (37.5 sec)	B (11.9 sec)	C (31.3 sec)	No	NB Thru=0.98

Travel Time Assessments

A majority of comments received from a public meeting held on September 28, 2006, focused on the perceived increase in travel time resulting from the proposed ramp closures in the "Build" condition. To determine whether these concerns were warranted, a travel time study was undertaken.

Travel time studies were conducted in the fall of 2006 for the Northside area. The studies were conducted during morning (7:00 AM through 9:00 AM) and evening (3:00 PM through 6:00 PM) peak periods. Routes to specific destinations within each area were made for "to" and "from" loop routes based on current likely paths and potential future paths for the "Build" condition. Figures of these routes are found in **Appendix C**. The times were recorded by stopwatch from the start point to end point of each route. These times and comparisons are shown in **Table 7**.

Table 7: Travel Time Study Locations									
		Existing			Future			Difference	
Location	Routes	Distance	AM Peak	PM Peak	Distance	AM Peak	PM Peak	AM Peak	PM Peak
Hamilton Avenue & Blue Rock Street	I-75 NB to Hamilton & Blue Rock	2.7 Miles	5:01	5:27	3.5 Miles	6:48	8:30	1:47	3:03
	I-75 SB to Hamilton & Blue Rock A	4.2 Miles	5:21	6:08	3.1 Miles	6:21	11:20	1:00	5:12
	I-75 SB to Hamilton & Blue Rock B	4.2 Miles	5:21	6:08	5.0 Miles	6:38	7:48	1:18	1:40
	I-75 NB from Hamilton & Blue Rock	4.0 Miles	5:21	6:08	3.2 Miles	8:13	7:30	2:52	1:22
	I-75 SB from Hamilton & Blue Rock	2.7 Miles	4:46	4:36	3.6 Miles	7:07	7:11	2:21	2:35
College Drive & Central Parkway/ Ludlow Avenue & Central Parkway	College to Ludlow	0.3 Mile	0:53	0:53	0.6 Mile	1:46	1:46	0:53	0:53
	I-74 EB to College & Ludlow A	1.9 Miles	3:51	2:16	4.8 Miles	6:11	12:59	2:02	10:43
	I-74 EB to College & Ludlow B	1.9 Miles	3:51	2:16	3.7 Miles	9:27	11:32	5:18	9:16
	I-74 NB from College & Ludlow A	3.4 Miles	3:26	10:31	4.8 Miles	6:11	12:59	2:45	2:28
	I-75 NB from College & Ludlow B	3.4 Miles	3:26	10:31	3.7 Miles	9:27	11:32	6:01	0:51
Dreman Avenue & Dirr Street	I-74 WB to Dreman & Dirr	0.8 Mile	3:47	4:24	2.0 Miles	3:39	4:19	(-) 0:08	(-) 0:05
	Dreman & Dirr to I-74 EB	0.5 Mile	0:55	1:09	1.4 Miles	2:58	2:34	2:03	1:25

To properly evaluate the perceived increase in travel times, four intersections in the Northside area were chosen that represented the locations of community services and other important points of significance to the community. Those four locations are as follows:

1 Intersection of Hamilton Avenue and Blue Rock Street – represents the center of the business district within Northside and the Fire Department is two blocks west along Blue Rock Street

2 Intersection of Ludlow Avenue and Central Parkway – the police department is just northwest of this intersection along Ludlow Avenue and entrances to Cincinnati State Technical College are just south and southeast

3 Intersection of College Drive and Central Parkway – the southern gateway to Cincinnati State Technical College and representative of business and community facilities south on Central Parkway

4 Intersection of Dreman Avenue and Dirr Street – just east of this point is the Spring Grove Avenue entrance ramp. This location is the closest to the ramp and therefore would have the longest route under the "Build" condition.

The purpose of the travel time study was to determine the current routes (and times) to and from these points to each of the major freeways. "Build" condition routes for getting drivers to and from these points were then determined. In each instance, locations were determined along the freeways where timing either began or ended depending on the direction of travel (to or from the four points). For instance, on I-75, the railroad bridge that travels over the mainline just south of the SR 562 exit/entrance ramps provided the northern terminus of the study, the Western Hills Viaduct ramps provided the southern terminus of the study, and the Montana Avenue ramps provided the western terminus along I-74. In addition, a midpoint along some routes was calculated where the railroad tracks cross over and under I-74 just west of mainline I-75.

Peak period travel times were collected on October 18th, 25th, 26th, 30th, 31st, and November 1st & 2nd, 2006. A follow-up day was also needed on November 21st. Each route (described as follows) was driven for the AM peak period (7:00 to 9:00) and the PM peak period (3:00 to 6:00).

Results

The travel time results for each route to and from the specified points are detailed below. It should be noted that in some instances the existing route either to or from (or both) one of the points will not change in the "Build" condition. In those instances a description of the single route is all that is included. Maps of the routes used for this study are found in Appendix C.

Hamilton Avenue and Blue Rock Street

Travel times to and from the Hamilton Avenue and Blue Rock Street intersection were measured to and from I-75 to the north and to and from I-75 to the south. The current route to and from I-74 will not change in the "Build" condition.

I-75 Northbound to Hamilton Avenue and Blue Rock Street

This route was calculated from the Western Hills Viaduct ramp to I-74 exiting at Elmore Street. The route continues east on Powers Street, left on Spring Grove Avenue, left on Hamilton Avenue and continues to the Blue Rock Street intersection. The total length of this route is 2.7 miles and it took on average, 5 minutes 1 second (AM Peak) and 5 minutes 27 seconds (PM Peak).

The "Build" condition route follows I-75 from the Western Hills Viaduct ramp to I-74 and exits at the Colerain Avenue/Beekman Street interchange. The route continues east on Colerain Avenue and bears to the left at Blue Rock Street, continuing to the Hamilton Avenue intersection. This route is 3.5 miles in length and it took on average, 6 minutes 48 seconds (AM Peak) and 8 minutes 30 seconds (PM Peak).

I-75 Southbound to Hamilton Avenue and Blue Rock Street

The existing condition route for southbound I-75 uses the same exit ramp (Elmore Street) as the northbound route. The route follows I-75 northbound from the Western Hills Viaduct ramp to the Hamilton Avenue/Blue Rock Street intersection. The total length of this route is 4.2 miles and it took an average of 5 minutes 21 second (AM Peak) and 6 minutes 8 seconds (PM Peak).

In the "Build" condition, two possible routes were measured for comparison to reach the Hamilton Avenue and Blue Rock Street intersection. One route follows I-75 south to the Mitchell Avenue Interchange and then utilizes Spring Grove Avenue to the destination point. This route is 3.1 miles in length and on average, took 6 minutes 21 seconds (AM Peak) and 11 minutes 20 seconds (PM Peak). The other route follows I-75 southbound to I-74 westbound, the Colerain Avenue/Beekman Street interchange and then continues east to Blue Rock Street. This route is 5 miles in length and has average travel times of 6 minutes 38 seconds (AM Peak) and 7 minutes 48 seconds (PM Peak).

I-75 Northbound from Hamilton Avenue and Blue Rock Street

Currently, the existing condition route follows Hamilton Avenue south (which becomes Ludlow Avenue) to Central Parkway and then enters I-75 northbound. The total length of this route is 4.0 miles and it took on average 5 minutes 21 seconds (AM Peak) and 6 minutes 8 seconds (PM Peak).

The "Build" condition route utilizes Blue Rock Street east to Spring Grove Avenue north to the Mitchell Avenue interchange, where it connects to I-75 northbound. This route is 3.2 miles in length and on average took 8 minutes 13 seconds (AM Peak) and 7 minutes 30 seconds (PM Peak).

I-75 Southbound from Hamilton Avenue and Blue Rock Street

The existing condition route for I-75 southbound uses the Spring Grove Avenue entrance ramp to I-75 southbound. The route continues to the Western Hills viaduct exit ramp. The total length of this route is approximately 2.7 miles and on average, the route took 4 minutes 46 seconds (AM Peak) and 4 minutes 36 seconds (PM Peak).

The "Build" condition route follows Blue Rock Street west to Colerain Avenue to the Colerain Avenue/Beekman Street interchange. The route continues on I-74 eastbound to I-75 southbound where it ends at the Western Hills Viaduct ramp. Currently the westbound Colerain to I-74 movement is not allowed; however, it is proposed to include this movement in the "Build" condition. Therefore, time was stopped and started at the proposed "Build" locations for this movement. This route is 3.6 miles in length and has average travel times of 7 minutes 7 seconds (AM Peak) and 7 minutes 11 seconds (PM Peak).

College Drive and Central Parkway/Ludlow Avenue and Central Parkway

Travel times to and from College Drive and Ludlow Avenue were measured to northbound I-75 and from eastbound I-74. In most cases the routes described below only include average times to or from College Drive or Ludlow Avenue only. Because these two points are so close to each other, it was measured repeatedly. At a distance of 0.3 miles apart, it took 53 seconds on average to drive between both points. Moreover, the entrance ramp to I-75 northbound from Central Parkway is 0.15 miles away from each point. Therefore, if the starting or ending point is not Ludlow Avenue or it is not College Drive, adding an additional 53 seconds to the average time will generate the approximate time to the other point.

Access to I-74 westbound and I-75 southbound in the existing and "Build" conditions would utilize the Hopple Street Interchange. In addition, access from I-75 southbound and I-75 northbound would most likely make use of Hopple Street as well.

I-74 Eastbound to College Drive and Ludlow Avenue

Traveling to College Drive from the Montana Avenue Interchange, the Central Parkway exit ramp is considered the existing primary route. This route is 1.9 miles in length and the average travel times are 3 minutes 51 seconds (AM Peak) and 2 minutes 16 seconds (PM Peak).

The "Build" condition route is from Montana Avenue on I-74 to southbound I-75, exiting at the Hopple Street Interchange. The route continues north on Central Parkway to College Street. This route's length is 3.8 miles and the average travel times are 7 minutes 1 second (AM Peak) and 6 minutes 18 seconds (PM Peak).

I-75 Northbound from College Drive and Ludlow Avenue

The existing route from College Drive to the SR 562 exit/entrance ramps utilizes the Central Parkway entrance ramp to I-75 northbound. This route is 3.4 miles in length and on average took 3 minutes 26 seconds (AM Peak) and 10 minutes 31 seconds (PM Peak).

In the "Build" condition, two possible routes were measured for comparison to travel from the College Drive point. One route follows Central Parkway south to the Bates Avenue entrance ramp (Note that in the "Build" condition this ramp will be directly accessed off of Hopple Street). The route continues to I-75 northbound to the SR 562 interchange. This route is 4.8 miles in length and on average is 6 minutes 11 seconds (AM Peak) and 12 minutes 59 seconds (PM Peak). The other route follows Ludlow Avenue north to Spring Grove Avenue. It then continues north to the Mitchell Avenue Interchange and onto I-75 northbound. This route is 3.7 miles in length with average travel times of 9 minutes 27 seconds (AM Peak) and 11 minutes 32 seconds (PM Peak).

Dreman Avenue and Dirr Street

Note that travel times for the Dreman Avenue and Dirr Street intersection were measured to and from the I-74/I-75 Railroad Bridge. Since the "trips" overlap either northbound or southbound along I-75, this point was established to lessen redundancy. Therefore, the only routes used for comparison were I-74 westbound to the intersection and from the intersection to eastbound I-74.

In both the current and "Build" conditions, access to westbound I-74 and from eastbound I-74 are provided at the Colerain Avenue/Beekman Street interchange.

I-74 Westbound to Dreman Avenue and Dirr Street

This route was calculated from the I-74/I-75 split, exiting at the Elmore Street exit ramp. The route then continues right onto Colerain Avenue, right onto Elmore Street and South on Dirr Street. This route is 0.8 miles in length and has travel time averages of 3 minutes 47 seconds (AM Peak) and 4 minutes 24 seconds (PM Peak).

The "Build" condition route follows I-74 west, exiting at the Colerain Avenue interchange. It then proceeds east and south on Colerain Avenue, right onto Elmore Street, and left onto Dirr Street. The length of this route is 2.0 miles and average travel times of 3 minutes 39 seconds (AM Peak) and 4 minutes 19 seconds (PM Peak).

Dreman Avenue and Dirr Street to I-74 Eastbound

The existing route from the Dreman Avenue/Dirr Street intersection follows the Spring Grove Avenue entrance ramp to the I-74/I-75 interchange. This route is 0.5 miles in length and averages 55 seconds (AM Peak) and 1 minute 9 seconds (PM Peak).

The Colerain Avenue/Beekman Street interchange currently does not accommodate making right turns from northbound Beekman Avenue onto I-74 which clearly affects its value as an alternate route. The "Build" condition of this route assumes the proposed changes to the Colerain Avenue/Beekman Street interchange are made and northbound turns onto I-74 are permitted.

To replicate the "Build" condition interchange, the time was paused when the vehicle reached the existing I-74 interchange (traveling northbound on Beekman Street under mainline I-74) and was restarted when the vehicle crossed under the interstate (traveling southbound on Beekman Street) to turn onto the I-74 entrance ramp.

The measured route follows Dirr Street north to Elmore Street to Beekman Avenue north. The length of this route is 1.4 miles and the average time is 2 minutes 58 seconds (AM Peak) and 2 minutes 34 seconds (PM Peak).