

# Purpose and Need Report

*for the*

## **Thorn Run Interchange Improvements** Moon Township, Allegheny County, Pennsylvania



*prepared for*

**The Moon Transportation Authority**  
Moon Township, Pennsylvania

*November 2008 ©*

## Introduction

The purpose of the Thorn Run Interchange Improvements Project is to alleviate the significant delay and congestion experienced at the current interchange, as well as the adjacent roadways, and to improve the resulting undesirable safety conditions. The needs for this project have been identified utilizing guidance from the Pennsylvania Department of Transportation Needs Study Handbook, Publication 319 dated September 1996.

## Review of Local/Regional Comprehensive Plans and Other Studies

The following plans/studies were reviewed for consistency and previous recommendations as it relates to this project.

### Moon Township Comprehensive Plan-October 17, 2000

- Serves as policy plan for land use and development.
- The area adjacent to Greater Pittsburgh International Airport should be focused for large development parcels, regional transportation access, and intense infrastructure demands.
- Residents communicated concern with roadway safety, congestion and convenience.
- Township policy recommends a minimum level of service (LOS) D for arterial roadways.
- Business Route 60 improvements will be required as development occurs, requiring regional coordination and cooperation.
- Traffic analysis conducted for plan projected congestion to increase at least three fold.

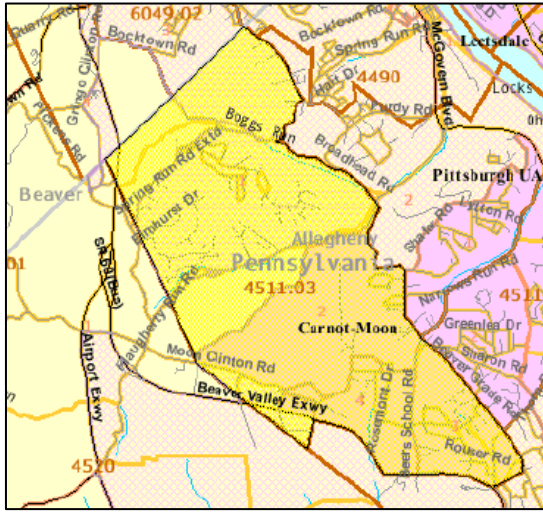
### Thorn Run Interchange Environmental Assessment-August 1989

- Project purpose was to eliminate the at-grade intersection of Thorn Run Road and Business Route 60. The at grade intersection produced several dangerous turning movements including vehicles making u-turns on Business Route 60.
- Four Alternatives were analyzed: a conventional four quadrant interchange, a modified three quadrant diamond interchange, a modified four quadrant diamond interchange with one leg offset to align with relocated Thorn Run Road and a “no-build” alternative.
- The modified three quadrant diamond interchange was selected because it limited stream enclosures/relocations, left two wetlands undisturbed, and produced more desirable traffic conditions.

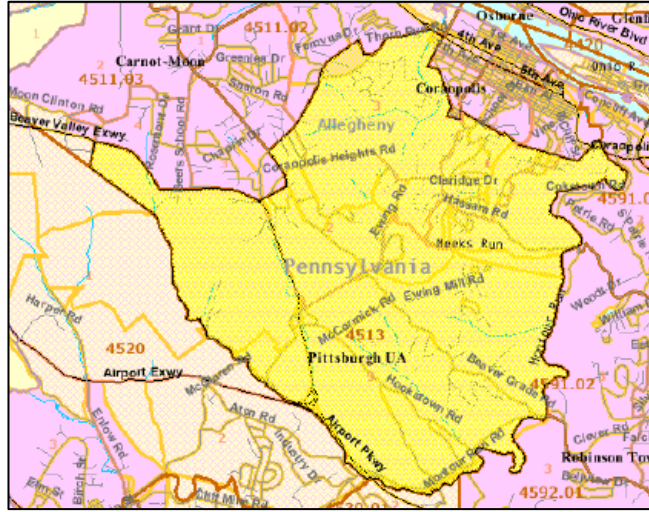
## Existing Socioeconomic Data

To provide background information, U.S. Census, 2000 data was used to evaluate current population, housing, unemployment rate, and income for the proposed project area. The study area is located within two the Census Tracts (4511.03 and 4513) shown below. Data from the State and County was also included for comparison purposes. *Tables 1, 2* and *3* summarize the U.S. Census data.

**Census Tract 4511.03**



**Census Tract 4513**



**Table 1 - Population**

Area	Total Persons
Pennsylvania	12,281,054
Allegheny County	1,281,666
Census Tract 4511.03	7,178
Census Tract 4513	5,948

Source: US Census, 2000 SF-1 Data Set P3

**Table 2 - Housing Statistics**

Area	Home Occupancy Status	Median Home Value (owner occupied)	Median Rent
Pennsylvania	91.0%	\$97,000	\$531
Allegheny County	92.0%	\$84,200	\$516
Census Tract 4511.03	85.8%	\$126,200	\$654
Census Tract 4513	96.7%	\$130,500	\$721

Source: US Census, 2000 SF1, Data Set QT-H1 and SF 3, Data Set DP-4

**Table 3 - Unemployment and Income Statistics**

Area	Unemployment Rate	Median Family Income	Percent of Families Below Poverty Level
Pennsylvania	3.5%	\$49,184	7.8%
Allegheny County	3.7%	\$49,815	7.9%
Census Tract 4511.03	5.7%	\$67,732	1.0%
Census Tract 4513	0.4%	\$70,972	1.1%

Source: US Census, 2000 SF 3, Data Set DP-3

Each Census Tract is above the state and county for median home value and median rent cost. Census Tract 4511.03 is below the home occupancy status of the state and county, possibly due to the presence of more apartment complexes within the area. Also, the unemployment rate for Census Tract 4511.03 is approximately two percent above the state and county. In contrast, the

median family income for each census tract is well above that of the state and county and the percent of families below poverty level is well below.

**Projected Socioeconomic Data**

Southwestern Pennsylvania Commission (SPC) data was gathered to Year 2035 to provide an overall view of future socioeconomic statistics (projected population, employment, and housing data) for Moon Township, which encompasses the project area. **Table 4** contains the SPC data.

The population of Moon Township was 23,050 in 2005. This number is expected to increase steadily, reaching 33,081 by 2035, an increase of 43.5%. This will increase the population density from 977 persons per square mile to 1,402 persons per square mile. Total employment is also expected to increase steadily from 13,945 in 2005 to 21,415 in 2035, an increase of 53.6%. This will result in an increase of total employment density from 591 persons per square mile to 907 persons per square mile. In direct relation to the increase in population and employment within Moon Township, the number of households (occupied housing units) is expected to increase 69.5% by 2035 from 8,989 households in 2005 to 15,232 households in 2035.

**Table 4 – Forecast of Population, Employment and Housing for Moon Township**

Year	Total Population	Percent Change	Population Density*	Total Employment	Percent Change	Employment Density*	Households	Percent Change
2005	23,050	--	977	13,945	--	591	8,989	--
2010	24,069	4.4%	1,020	15,405	10.5%	653	9,631	7.1%
2020	26,795	16.2%	1,135	17,857	28.1%	757	11,315	25.9%
2025	28,599	24.1%	1,212	19,095	36.9%	809	12,423	38.2%
2030	30,640	32.9%	1,298	20,634	48.0%	874	13,698	52.4%
2035	33,081	43.5%	1,402	21,415	53.6%	907	15,232	69.5%

Source: Southwestern Pennsylvania Commission, January 17, 2008

\*Density is measured per square mile of land

**Existing Development**

The developments located in the vicinity of the Thorn Run are listed in **Table 5**. The areas surrounding the interchange are zoned BP for Business Park District.

**Table 5--Existing Development**

Existing Development - Since Thorn Run Road Interchange Groundbreaking			
Year	Address	Project (2008 Owner)	Lot & Block #
1987	200 Corporate Center Drive	Cherrington Building #200 (HUB Properties Trust)	0595-H-00110-0000-00
1988	1187 Thorn Run Road	One Thorn Run Center (Moon Industrial Dev Auth)	0595-B-00068-0000-00
1988	1170 Thorn Run Road	Days Inn (G.S.P. Motel Assoc.)	0595-B-00112-0000-00
1988	300 Corporate Center Drive	Cherrington Building #300 (HUB Properties Trust)	0595-H-00108-0000-00

1988	100 Corporate Center Drive	Cherrington Building #100 (Italimpianti of America Inc)	0595-H-00113-0000-00
1988	1700 Beaver Grade Road	Cherrington Golf Club / Moon Township Library (Moon Twp)	0595-M-00070-0000-00
1988	995 Beaver Grade Road	Thorn / Beaver Place (Fedorchak Rodney N & Josephine)	0596-L-00381-0000-00
1988	190 Hyeholde Drive	Hyeholde Caberet (McKenna Quentin C & Barbara K S)	0596-S-00283-0000-00
1989	500 Corporate Center Drive	Cherrington Building #500 (HUB Properties Trust)	0595-L-00125-0000-00
1989	900 Commerce Drive	A.P.O.C. Building 900 (Minnock Construction Co )	0596-K-00009-0000-00
1990	400 Corporate Center Drive	Cherrington Building #400 (HUB Properties Trust)	0595-M-00095-0000-00
1990	1134 Thorn Run Road	Thorn Run Crossings / Mellon Bank (Thorn Run Development Co)	0596-K-00036-0000-00
1990	200 Russell Road	Roy Johns Headquarters (Johns Roy F Jr)	0596-N-00183-0000-00
1991	450 Cherrington Parkway	Marriott Courtyard (HPTCY Co)	0595-G-00150-0000-00
1991	550 Cherrington Parkway	Embassy Suites (DHG Pittsburgh LLC)	0595-L-00110-0001-00
1991	600 Corporate Center Drive	Cherrington Building #600 (HUB Properties Trust)	0595-M-00060-0000-00
1991	345 Rouser Road	Airport Office Park Building 5 (Johns Roy F & Earle W Kazis)	0596-P-00215-0000-00
1991	1011 Beaver Grade Road	Hoss's Restaurant (Hoss's Restaurant Operations Inc)	0596-R-00055-0000-00
1992	650 Cherrington Parkway	State Farm Insurance (Weinstein Gary J)	0595-R-00075-0000-00
1992	Cherrington Parkway	Liberty Mutual (HUB Properties Trust)	0595-R-00077-0000-00
1993	1300 Commerce Drive	Shields & Callahan (Shields & Callahan Realty Co)	0596-P-00141-0000-00
1994	1605 Corporate Center Drive	Westpointe Building #3 (Westpointe Corporate Center Two LP)	0595-G-00014-0000-00
1994	700 Cherrington Parkway	Lenders Services (HUB Properties Trust)	0595-S-00025-0000-00
1994	Edgetowne Drive	Howard Hanna Office (Howard Hanna Real Estate Services)	0596-L-00070-0000-00
1996	725 Cherrington Parkway	Cherrington Medical Office (CM&S Association)	0595-S-00325-0000-00
1997	1134 Thorn Run Road	Thorn Run Crossings / Brueggers (Thorn Run Development Co)	0596-K-00036-0000-00
1998	1009 Beaver Grade Road	DiCicco Office Building (DiCicco Samuel E)	0596-L-00123-0000-00
1999	1600 Coraopolis Road	UPMC (University of Pgh Medical Center System)	0595-C-00397-0000-00
1999	1000 Cherrington Parkway	Cutler Hammer Headquarters (Cutler Hammer Inc)	0595-M-00050-0000-00
1999	500 Commerce Drive	Airport Commerce Drive Assoc. (Airport Commerce Drive Assoc.)	0596-P-00139-0000-00
2000	1550 Coraopolis Heights Road	Westpointe Building #1 (Westpointe Corporate Center One LP)	0596-R-00199-0000-00
2002	1555 Coraopolis Heights Road	Westpointe Building #2 (Westpointe Corporate Center Two LP)	0595-C-00112-0000-00

2002	2222 Ewing Road	First Health (First Health Group Corp)	0501-N-00244-0000-00
2004	1522 Coraopolis Heights Road	Huntsman Funeral Home (Huntsman James R & Susan G)	0596-R-00019-0000-00
2009	1000 Cherrington Parkway	Cutler Hammer Expansion (Cutler Hammer Inc)	0595-M-00050-0000-00
2009	989 Beaver Grade Road	West Aircomm Federal Credit Union	0596-K-00121-0000-00

### **Future Development**

*Table 6*, below, lists the future developments planned in the vicinity of the Thorn Run interchange.

***Table 6--Future Development***

<b>Future Development - Estimate</b>			
<b>Year</b>	<b>Address</b>	<b>Project</b>	<b>Lot &amp; Block #</b>
2010	Ewing Road	Office Building #1	0696-D-00396-0000-00
2010	Cherrington Parkway	Flex-Space Office Building #1	0696-D-00396-0000-00
2013	Ewing Road	Office Building #1 Expansion	0696-D-00396-0000-00
2014	Cherrington Parkway	Flex-Space Office Building #2	0696-D-00396-0000-00
Future	Cherrington Parkway	Flex-Space Office Building #3	0696-D-00396-0000-00
Future	Cherrington Parkway	Flex-Space Officer Building #4	0696-D-00396-0000-00

### **Level of Service**

A level of service (LOS) analysis was conducted to calculate the delay experienced by an average motorist. There are six levels of service that are defined for signalized and unsignalized intersections. These include letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst.

*Table 7* depicts the level of service criteria for signalized and unsignalized intersections. As per PennDOT guidelines, a LOS “D” is the threshold for an acceptable level of service in urban conditions.

***Table 7--Level of Service Criteria***

<b>Level of Service</b>	<b>Description of Expected Traffic Delay</b>	<b>Unsignalized Average Total Delay (sec/veh)</b>	<b>Signalized Stop Delay (sec/veh)</b>
A	Little or None	≤ 10	≤ 10
B	Short	>10 and ≤ 15	>10 and ≤ 20
C	Average	>15 and ≤ 25	>20 and ≤ 35
D	Long	>25 and < 35	>35 and < 55
E	Very Long	>35 and ≤ 50	>55 and ≤ 80
F	Excessive	>50	>80

Source: Highway Capacity Manual (HCM), (2000 Edition).

Levels of service for existing (Year 2008), Year 2011 no-build, and Year 2031 no-build, were calculated for the AM and PM peak hours on a typical weekday, incorporating existing peak hour factors, roadway grades, lane widths and heavy vehicle percentages into the calculations. Highway Capacity Software (HCS) from McTrans was utilized to provide levels of service at the conventional study intersections. At the intersections with non-traditional stop control, Kimball utilized Trafficware's SimTraffic simulation summary to obtain levels of service. Year 2031 represents 20 years past the date of anticipated construction. This year is analyzed to ensure improvements are designed to meet future conditions, thus reducing the need for additional improvements in a short amount of time after construction. The overall intersection levels of service were determined to be:

**Table 8--Intersection Levels of Service**

Intersection/Approach	Level of Service		
	2008 Existing	2011 No Build	2031 No Build
<b>Thorn Run Road Ext. and Rouser Road</b>			
Eastbound (Rouser Rd)			
-Left	C	C	D
-Through-Right	A	A	D
Westbound (Drive)			
-Left-Through-Right	B	B	B
Southbound (Thorn Run Road)			
-Left-Through-Right	F	F	F
<b>Thorn Run Road Ext. and Business Route 60 NB Ramps</b>			
Eastbound (SR 0060 NB Ramps)			
-Left	F	F	F
-Right	F	F	F
Northbound (Thorn Run Rd)			
-Left	B	B	E
<b>Thorn Run Road Ext. and Coraopolis Heights Road/Cherrington Pkwy.</b>			
Eastbound (Coraopolis Heights Rd)			
-Left	A	C	C
-Through-Right	A	B	B
Westbound (Coraopolis Heights Rd)			
-Left	A	A	C
-Through	B	C	F
-Right	A	A	C
Northbound (Thorn Run Rd Ext)			
-Left	B	C	F
-Through	C	D	F
-Right	B	C	F
Southbound (Thorn Run Rd Ext)			
-Left	B	C	D
-Through	B	B	C
-Right	A	A	A
<b>Coraopolis Heights Road and Business Route 60 SB Ramps</b>			
Westbound (Coraopolis Heights Road)			
-Left	B	E	F
Southbound (SR Business 60 Ramps)			
-Left	F	F	F
-Through-Right	A	B	C

<b>UPMC Driveway and Coraopolis Heights Road</b>			
Eastbound (Coraopolis Heights Rd)			
-Left	A	A	A
Westbound (Coraopolis Heights Rd)			
-Left	A	A	B
Northbound (UPMC Dwy)			
-Left-Through-Right	C	C	D
Southbound (UPMC Dwy)			
-Left-Through-Right	C	C	F
<b>Thorn Run Road Ext. and Commerce Drive</b>			
Eastbound (Commerce Dr)			
-Left-Right	D	D	F
Northbound (Thorn Run Rd)			
-Left-Through	A	A	B

As indicated above, four movements have a LOS F in 2008. By 2031 the number of movements with a LOS F increases to eleven. Twenty movements within the project area had LOS degradation. Please see the attached Level of Service map for the locations of the above intersections. The year in which each intersection degrades to an unacceptable level, LOS E or worse, is detailed in **Table 9**.

**Table 9—Unacceptable Level of Service Summary**

INTERSECTION	YEAR INTERSECTION DEGRADES TO UNACCEPTABLE LOS*
(1) Thorn Run Road/Rouser Road	2008
(2) Thorn Run Road/Bus. SR 0060 NB Ramps	2008
(3) Thorn Run Rd/Cherrington Pkwy/Coraopolis Heights Rd	2012
(4) Bus. SR 0060 SB Ramps/Coraopolis Heights Road	2008
(5) UPMC Driveway/Coraopolis Heights Road	2021
(6) Thorn Run Road/Commerce Drive	2012

\*-Unacceptable LOS is a Level of Service E or worse.

## **Queuing**

A queuing analysis was performed to determine if queues in auxiliary turn lanes or between intersections extend beyond the available storage length. The projected storage lane lengths for the left and right turn lanes at each of the study intersections were calculated based on the methodologies detailed in *AASHTO A Policy on Geometric Design of Highways and Streets*. See **Table 10** for queue lengths within the project area.

**Table 10—Vehicle Queue Comparison**

Intersection/Approach	Existing Storage Capacity (feet)	Required Queue Length (feet)			
		No Build 2011		No Build 2031	
		AM	PM	AM	PM
<b>Thorn Run Road Ext. and Rouser Road</b>		<b>UNSIGNALIZED</b>		<b>UNSIGNALIZED</b>	
Eastbound (Rouser Rd)					
-Left	85	20	80	20	110
-Through-Right	>1000	95	385	130	540
Westbound (Drive)					

-Left-Through-Right	320	20	70	20	95
Northbound (Thorn Run Road Ext)					
-Left	160	230	85	320	120
Southbound (Thorn Run Road Ext)					
-Left-Through-Right	>2000	1060	790	1485	1095
<b>Thorn Run Road Ext. and Business Route 60 NB Ramps</b>					
Eastbound (SR 0060 NB Ramps)					
-Left	300	555	395	770	550
-Right	900	715	380	1020	540
Northbound (Thorn Run Road Ext)					
-Left	330	150	520	220	700
Southbound (Thorn Run Road Ext)					
-Right	210	215	285	305	400
<b>Thorn Run Road Ext. and Coraopolis Heights Road/Cherrington Pkwy.</b>					
Eastbound (Coraopolis Heights Rd)					
-Left	510	155	295	205	360
-Through-Right	510	400	220	590	320
Westbound (Coraopolis Heights Rd)					
-Left	150	85	20	140	25
-Through	>1500	185	310	245	420
-Right	150	175	195	250	275
Northbound (Cherrington Pkwy)					
-Left	90	60	265	85	390
-Through	>2500	40	380	75	555
-Right	90	20	120	20	180
Southbound (Thorn Run Rd Ext)					
-Left	350	235	340	325	475
-Through	350	440	105	660	155
-Right	280	905	840	1230	1160
<b>Coraopolis Heights Road and Business Route 60 SB Ramps</b>					
Eastbound (Coraopolis Heights Road)					
-Right	110	20	95	20	110
Westbound (Coraopolis Heights Road)					
-Left	470	885	1295	1240	1835
Southbound (SR Business 60 Ramps)					
-Left	330	505	295	740	445
-Through-Right	>1500	195	45	220	50
<b>UPMC Driveway and Coraopolis Heights Road</b>					
Eastbound (Coraopolis Heights Rd)					
-Left	65	65	25	90	30
Westbound (Coraopolis Heights Rd)					
-Left	45	20	20	20	20
Northbound (UPMC Dwy)					
-Left-Through-Right	175	20	20	20	20
Southbound (UPMC Dwy)					
-Left-Through-Right	150	25	85	35	120
<b>Thorn Run Road Ext. and Commerce Drive</b>					
Eastbound (Commerce Dr)					
-Left-Right	60	35	105	45	145

It is projected in 2011 that fifteen queues will exceed the available storage. That number increases to twenty one by 2031 (no-build conditions). The worst case being at the Coraopolis Heights Road and Business Route 60 Southbound Ramps intersection, the queue length is exceeded by 1,365 feet in 2031, well beyond the Coraopolis Heights Road and Thorn Run Road Extension intersection.

**Accident Analysis**

An accident analysis was conducted to assess the overall safety within the project limits of the Thorn Run Interchange. Accident data was compiled via accident reports from the Moon Township Police Department. The accident data was provided for the following intersections: Thorn Run Road Extension (Ext.) and Business Route 60 Northbound Ramps, Thorn Run Road Ext. and Rouser Road/Thorn Run Center Drive, Thorn Run Road Ext. and Coraopolis Heights Road, and Coraopolis Heights Road and Business Route 60 Southbound Ramps. The accident data provides a five (5)-year chronology of crash incidents.

Vehicle accidents or crashes happen for a multitude of reasons. These may include prevailing environmental conditions (rain, snow/ice, fog, darkness, or construction activity), physical roadway deficiencies such as inadequate sight distances, poor geometrics, traffic controls, or most importantly driver behavior such as running the red light, not paying sufficient attention to the road and other drivers, falling asleep on the wheel, being distracted by activities inside or outside the vehicle, alcohol, etc. A total of 88 accidents were recorded for the Thorn Run Interchange during the five-year period (2003-2007).

The crash rates for each intersection were calculated and then compared using the Homogenous Report for State Road Crashes in Years 2003 to 2007. According to the crash rate table obtained from PennDOT, the statewide average crash rate for an unsignalized intersection similar to those in the project area is 0.53 crashes/million vehicle miles (MVM). It was determined that the crash rate for the Thorn Run Road Extension and Business Route 60 Northbound Ramps intersection is 1.65 crashes/ MVM. For the Thorn Run Road Ext. and Rouser Road/Thorn Run Center Drive intersection, it was determined that the crash rate is 0.33 crashes/MVM. The Thorn Run Road Ext. and Coraopolis Heights Road intersection had a crash rate of 1.02 crashes/MVM. While the Coraopolis Heights Road and Business Route 60 Southbound Ramps intersection had a crash rate of 0.16 crashes/MVM. Refer to **Table 11** for complete accident statistics.

**Table 11—Calculated Crash Rates**

<b>Intersection</b>	<b>AM/PM</b>	<b>Average Crash Rate* (crashes/MVM)</b>	<b>Calculated Crash Rate (crashes/MVM)</b>
Thorn Run Road Ext. and Business 60 NB Ramps	AM	0.53	1.60
Thorn Run Road Ext. and Business 60 NB Ramps	PM	0.53	1.65
Thorn Run Road Ext. and Rouser Road	AM	0.53	0.33
Thorn Run Road Ext. and Rouser Road	PM	0.53	0.30
Thorn Run Road Ext. and Coraopolis Heights Rd	AM	0.53	1.02
Thorn Run Road Ext. and Coraopolis Heights Rd	PM	0.53	0.93
Coraopolis Heights Road and Business 60 SB Ramps	AM	0.53	0.16

Coraopolis Heights Road and Business 60 SB Ramps	PM	0.53	0.15
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\* From PennDOT Homogeneous Report for State Road Crashes, Unsignalized Intersection

### **Summary of Project Needs**

The following is a summary of project needs:

- Total population, employment, and households in Moon Township are expected to increase 32.9%, 48.0% and 52.4% respectively by the year 2030.
- A large amount of development in the area of the Thorn Run Interchange has taken place or is proposed to take place in the next ten years.
- Current conditions result in four LOS F turning movements within the project limits.
- 2031 No Build conditions will result in LOS F for eleven turning movements within the project limits.
- Twenty turning movements have LOS degradation from 2008 to 2031.
- In 2011 fifteen queues exceed available storage; by 2031 twenty-one vehicle queues will exceed the available storage. The worst case being at the Coraopolis Heights Road and Business Route 60 Southbound Ramps intersection, the queue length is exceeded by 1,365 feet in 2031.
- The crash rate determined for intersections of Thorn Run Road Extension and the Business Route 60 NB Ramps and Coraopolis Heights Road were significantly higher than the statewide average rate.

### **Needs Statement**

The Thorn Run Interchange and adjacent roadways experience, and will continue to experience, delay, congestion and related safety issues without proposed roadway improvements. As documented in the above summary of needs, this area has been subject to a large amount of development; has four turning movements resulting in LOS F; and has crash rates exceeding the statewide average at the Thorn Run Road Extension and Business Route 60 northbound ramp intersection and the Thorn Run Road Extension and Coraopolis Heights Road intersection. Future roadway conditions for this area are also expected to degrade as a result of increased population and employment; additional development; LOS degradation of twenty turning movements (eleven resulting in LOS F); and exceeding available queue storage for fifteen queues in 2011 and twenty-one queues in 2031. The Thorn Run Interchange Improvements Project will investigate alternatives to alleviate the present and anticipated future conditions/problems associated with this interchange.

INTERSECTION LEVEL OF SERVICE MAP  
THORN RUN INTERCHANGE, MOON TWP. PA

LEGEND

