

APPENDIX D
S.R. 0053/NINTH STREET GRADE CROSSING ANALYSIS

This appendix consists of the detailed grade crossing/traffic analysis prepared by Rettew Associates, Inc. for the S.R. 0053/Ninth Street grade crossings located along the Modified Proposed Action's Alternate Route from Philipsburg to Munson. Supporting traffic counts and turning movement counts have been included for documentation purposes.



We answer to you.

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E-mail: rettew@rettew.com • Web site: rettew.com

Engineers
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Landscape
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Environmental
Consultants

November 17, 2009

Kevin Starner, CEP
Skelly and Loy, Inc.
449 Eisenhower Boulevard
Suite 300
Harrisburg, PA 17111-2302

RE: **PA Route 53 and 9th Street Traffic Analysis**
Morris Township, Clearfield County, PA
RETTEW Project No. 04-05830-003

Dear Mr. Starner:

As per your request, we have completed our traffic impact analysis of the PA Route 53 and 9th Street intersection analysis with the addition of the proposed railroad crossings. The purpose of this analysis was to determine the level of service and queue lengths of each intersection approach with the reinstatement of rail service in the vicinity of the subject intersection. Our assumptions were as follows:

- The proposed rail line would cross PA Route 53 approximately 50-feet south of Elk Drive and would cross 9th Street between PA Route 53 and the bridge.
- The time duration that traffic would be stopped for a train traveling through this area was assumed to be approximately 6 minutes.
- The traffic signal would have railroad pre-emption equipment added to it to allow traffic to “clear out” and to be held until the train clears.
- Traffic would be prohibited from entering the section of PA Route 53 between Elk Drive and 9th Street during a railroad pre-emptive event.
- Traffic analyses would be conducted during the highest traffic period of an average weekday along these roadways.

Traffic counts were conducted along PA Route 53 south of 9th Street and along 9th Street west of the bridge to obtain the daily and peak period directional traffic volumes from November 6, 2009 to November 13, 2009. The results of the counts indicated that the average weekday traffic volume along PA Route 53 at Elk Road was approximately 6,300 vehicles per day (vpd) and along 9th Street at PA Route 53 there was approximately 3,850 vpd. The graphs on the following page provide an hourly directional breakdown of the traffic along each roadway for the peak day, Tuesday, November 10, 2009.

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PA Route 53 Daily Traffic Distribution



9th Street Daily Traffic Distribution



In addition to the daily traffic counts, a manual turning movement count was conducted at the intersection of PA Route 53 and 9th Street on Tuesday, November 10, 2009 during the PM peak period of 3:00 to 6:00 PM. The weekday PM peak hour of the entire intersection occurred between 3:15 and 4:15 PM. However, each intersection approach had a different peak. The NB approach of PA Route 53 peaked between 4:30 and 5:30 PM, the SB approach peaked between 3:15 and 4:15 PM, and the WB approach of 9th Street peaked between 5:00 and 6:00 PM.

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Highway capacity analysis uses Level of Service (LOS) to qualitatively relate capacity to operational conditions. LOS ranges from "A" to "F", with "A" being the best operating condition and "F" being the worst. Generally, LOS "C" or better is desirable, but in areas with substantial traffic congestion or flows, LOS "D" is also considered acceptable. The capacity analysis for the subject intersection was conducted in accordance with the methodology presented in the *Highway Capacity Manual 2000* utilizing the SYNCHRO® software, Version 7.

LOS for signalized intersections are measured by average stopped delay per vehicle. The volume to capacity ratio (v/c) relates the peak hour traffic volumes to the theoretical maximum traffic volumes that the intersection can process under ideal conditions. The following table provides a correlation between LOS and average total delay for signalized intersections.

Level of Service	Control or Signal Delay (sec/veh)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0

A capacity analysis was performed at the signalized intersection of PA Route 53 and 9th Street for the existing PM peak period (3:15 – 4:15 PM). The results of that analysis indicated that the overall intersection, and each approach, currently operates at an acceptable level of service. The overall and individual approach levels of service and delays are as follow:

Overall Intersection LOS	A (8.4)
EB Approach LOS	B (16.0)
WB Approach LOS	B (13.2)
NB Approach LOS	A (6.3)
SB Approach LOS	A (6.5)

There is currently no analytical method of modeling an intersection for a pre-emptive or non-reoccurring type of event such as a railroad crossing event, an emergency vehicle pre-emption event, an accident, etc. Therefore, a level of service, or delay determination, for the overall intersection and/or the approaches cannot be calculated.

Since a delay calculation cannot be calculated, we evaluated the potential queuing impacts along the subject roadways during the PM peak period with the addition of a 6-minute train crossing event. As previously stated the overall intersection peak hour occurred between 3:15 and 4:15 PM but the individual approaches peaked at different hours. Therefore, we calculated the accumulation of traffic that would occur along each approach for a 6-minute time period based on the current demand of traffic during the highest 15-minute period of the peak hour of each approach. The results of that analysis are summarized in the table below:

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Intersection Queue Summary

Approach	3:15 – 4:15 PM	4:30 – 5:30 PM	5:00 – 6:00 PM
NB PA Route 53	32 veh (800'±)	32 veh (800'±)	32 veh (800'±)
SB PA Route 53	41 veh (1,025'±)	30 veh (750'±)	28 veh (700'±)
WB 9 th Street	26 veh (650'±)	27 veh (675'±)	27 veh (675'±)
EB Troy Hill Road	2 veh (50'±)	2 veh (50'±)	2 veh (50'±)

Reviewing aerial mapping, the closest intersection along PA Route 53 to the north of 9th Street is Dauphin Lane (950') and to the south is US Route 322 (2,825'). Along 9th Street, Mooshannon Street is located approximately 835' from PA Route 53. As you can see traffic, from a 6-minute train event during the highest hour of the day, will not impact any of the adjacent intersections with the exception of Dauphin Lane. As previously indicated, the SB PA Route 53 queue would extend back approximately 1,025' or 41 vehicles. PA Route 53 between 9th Street and Dauphin Lane can accommodate approximately 38 vehicles. Therefore, this intersection *may* be blocked by 3 vehicles for a short amount of time if a train event occurs during the 3:15 – 4:15 PM peak hour.

CONCLUSIONS:

Based on the data collected and our analyses of the existing and proposed traffic operations at the subject intersections, the following conclusions were reached:

- The ADT along PA Route 53 south of 9th Street is approximately 6,300 vpd and along 9th Street east of PA Route 53 is approximately 3,850 vpd.
- The intersection of PA Route 53 and 9th Street currently operates at an acceptable level of service during the peak traffic hour of the day, 3:15 – 4:15 PM.
- There is no analytical method of modeling an intersection for a pre-emptive or non-reoccurring type of event; therefore, a level of service, or intersection delay, cannot be calculated.
- Since a level of service cannot be computed, a queue analysis was completed to determine the extent of traffic backing up from the crossing. All movements, with the exception of the SB PA Route 53 approach, will not impact any adjacent intersections. The SB queue has the potential to extend 3 vehicles beyond the intersection of Dauphin Lane. Since this roadway is a loop road, vehicles could enter/exit this street from its other intersection with PA Route 53 to the north.
- Overall, our analysis of the traffic indicates that with the addition of the proposed railroad crossing in the vicinity of PA Route 53 with 9th Street and Elk Road, there would be minimal impact or delay to the adjacent roadway network. Since our analysis was conducted for the highest traffic hour of the day, any other time during the day when a train event would occur would have even *less* impact to the roadway network.

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November 17, 2009
RETTEW Project No. 04-05830-003

Copies of all analysis worksheets are attached to this letter for your review. If you have any questions regarding the analyses, finding, and/or recommendations or wish to discuss any item(s) contained herein, please do not hesitate to call me at (717) 394-3721.

Sincerely,

A handwritten signature in black ink that reads "John M. Schick". The signature is written in a cursive style with a long, sweeping underline that extends to the left.

John M. Schick
Senior Project Manager – Transportation Engineering

Attachments

J:\04\04-05830-003\Trans\PA Route 53 Rail Crossing\PA Route 53 Rail Crossing Analysis.docx

Appendix D: S.R. 0053/Ninth Street Grade Crossing Analysis

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Location: Phillipsburg, Pa
Intersection: Rt 53 / Troy Hill Rd
Date: Tuesday, November 10, 2009
Counter: RZ

File Name : PA Route 53 & 9th Street
Site Code : 00000000
Start Date : 11/10/2009
Page No : 1

Groups Printed- Cars - Heavy Vehicles - RTOR

Start Time	PA Route 53 Southbound					9th Street Westbound					PA Route 53 Northbound					Troy Hill Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:00 PM	21	60	0	0	81	14	1	26	0	41	2	42	2	0	46	1	0	1	0	2	170
03:15 PM	19	60	0	0	79	6	1	47	0	54	1	52	4	0	57	2	0	1	0	3	193
03:30 PM	22	53	1	0	76	18	2	45	0	65	0	61	8	0	69	1	1	1	0	3	213
03:45 PM	20	82	0	0	102	8	3	36	0	47	6	66	8	0	80	1	0	1	0	2	231
Total	82	255	1	0	338	46	7	154	0	207	9	221	22	0	252	5	1	4	0	10	807
04:00 PM	16	70	0	0	86	9	1	43	0	53	1	68	7	0	76	3	1	1	0	5	220
04:15 PM	11	42	1	0	54	4	1	25	0	30	3	40	6	0	49	0	1	1	0	2	135
04:30 PM	13	60	0	0	73	9	2	56	0	67	0	58	11	0	69	0	3	1	0	4	213
04:45 PM	15	43	1	1	60	3	2	41	0	46	2	60	6	0	68	0	1	2	0	3	177
Total	55	215	2	1	273	25	6	165	0	196	6	226	30	0	262	3	6	5	0	14	745
05:00 PM	13	45	0	0	58	9	1	56	0	66	1	70	7	0	78	1	1	1	0	3	205
05:15 PM	19	49	0	0	68	13	3	43	0	59	0	64	6	0	70	1	1	2	0	4	201
05:30 PM	13	44	0	0	57	8	1	56	0	65	1	64	2	0	67	0	1	1	0	2	191
05:45 PM	8	47	0	0	55	3	1	50	0	54	1	43	6	0	50	2	1	1	0	4	163
Total	53	185	0	0	238	33	6	205	0	244	3	241	21	0	265	4	4	5	0	13	760
Grand Total	190	655	3	1	849	104	19	524	0	647	18	688	73	0	779	12	11	14	0	37	2312
Approch %	22.4	77.1	0.4	0.1		16.1	2.9	81	0		2.3	88.3	9.4	0		32.4	29.7	37.8	0		
Total %	8.2	28.3	0.1	0	36.7	4.5	0.8	22.7	0	28	0.8	29.8	3.2	0	33.7	0.5	0.5	0.6	0	1.6	
Cars	187	634	3	1	825	101	19	379	0	499	18	677	61	0	756	12	11	10	0	33	2113
% Cars	98.4	96.8	100	100	97.2	97.1	100	72.3	0	77.1	100	98.4	83.6	0	97	100	100	71.4	0	89.2	91.4
Heavy Vehicles	3	20	0	0	23	3	0	5	0	8	0	11	0	0	11	0	0	0	0	0	42
% Heavy Vehicles	1.6	3.1	0	0	2.7	2.9	0	1	0	1.2	0	1.6	0	0	1.4	0	0	0	0	0	1.8
RTOR	0	1	0	0	1	0	0	140	0	140	0	0	12	0	12	0	0	4	0	4	157
% RTOR	0	0.2	0	0	0.1	0	0	26.7	0	21.6	0	0	16.4	0	1.5	0	0	28.6	0	10.8	6.8

Start Time	PA Route 53 Southbound					9th Street Westbound					PA Route 53 Northbound					Troy Hill Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	03:15 PM					05:00 PM					04:30 PM					04:00 PM					
+0 mins.	19	60	0	0	79	9	1	56	0	66	0	58	11	0	69	3	1	1	0	5	
+15 mins.	22	53	1	0	76	13	3	43	0	59	2	60	6	0	68	0	1	1	0	2	
+30 mins.	20	82	0	0	102	8	1	56	0	65	1	70	7	0	78	0	3	1	0	4	
+45 mins.	16	70	0	0	86	3	1	50	0	54	0	64	6	0	70	0	1	2	0	3	
Total Volume	77	265	1	0	343	33	6	205	0	244	3	252	30	0	285	3	6	5	0	14	
% App. Total	22.4	77.3	0.3	0		13.5	2.5	84	0		1.1	88.4	10.5	0		21.4	42.9	35.7	0		
PHF	.875	.808	.250	.000	.841	.635	.500	.915	.000	.924	.375	.900	.882	.000	.913	.250	.500	.625	.000	.700	
Cars	75	256	1	0	332	33	6	164	0	203	3	249	24	0	276	3	6	3	0	12	
% Cars	97.4	96.6	100	0	96.8	100	100	80	0	83.2	100	98.8	80	0	96.8	100	100	60	0	85.7	
Heavy Vehicles	2	8	0	0	10	0	0	2	0	2	0	3	0	0	3	0	0	0	0	0	
% Heavy Vehicles	2.6	3	0	0	2.9	0	0	1	0	0.8	0	1.2	0	0	1.1	0	0	0	0	0	
RTOR	0	1	0	0	1	0	0	39	0	39	0	0	6	0	6	0	0	2	0	2	
% RTOR	0	0.4	0	0	0.3	0	0	19	0	16	0	0	20	0	2.1	0	0	40	0	14.3	

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Location: Phillipsburg, Pa
Intersection: Rt 53 / Troy Hill Rd
Date: Tuesday, November 10, 2009
Counter: RZ

File Name : PA Route 53 & 9th Street
Site Code : 00000000
Start Date : 11/10/2009
Page No : 2

Start Time	PA Route 53 Southbound					9th Street Westbound					PA Route 53 Northbound					Troy Hill Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:15 PM to 04:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	19	60	0	0	79	6	1	47	0	54	1	52	4	0	57	2	0	1	0	3	193
03:30 PM	22	53	1	0	76	18	2	45	0	65	0	61	8	0	69	1	1	1	0	3	213
03:45 PM	20	82	0	0	102	8	3	36	0	47	6	66	8	0	80	1	0	1	0	2	231
04:00 PM	16	70	0	0	86	9	1	43	0	53	1	68	7	0	76	3	1	1	0	5	220
Total Volume	77	265	1	0	343	41	7	171	0	219	8	247	27	0	282	7	2	4	0	13	857
% App. Total	22.4	77.3	0.3	0		18.7	3.2	78.1	0		2.8	87.6	9.6	0		53.8	15.4	30.8	0		
PHF	.875	.808	.250	.000	.841	.569	.583	.910	.000	.842	.333	.908	.844	.000	.881	.583	.500	1.000	.000	.650	.927
Cars	75	256	1	0	332	39	7	113	0	159	8	241	21	0	270	7	2	3	0	12	773
% Cars	97.4	96.6	100	0	96.8	95.1	100	66.1	0	72.6	100	97.6	77.8	0	95.7	100	100	75.0	0	92.3	90.2
Heavy Vehicles	2	8	0	0	10	2	0	1	0	3	0	6	0	0	6	0	0	0	0	0	19
% Heavy Vehicles	2.6	3.0	0	0	2.9	4.9	0	0.6	0	1.4	0	2.4	0	0	2.1	0	0	0	0	0	2.2
RTOR	0	1	0	0	1	0	0	57	0	57	0	0	6	0	6	0	0	1	0	1	65
% RTOR	0	0.4	0	0	0.3	0	0	33.3	0	26.0	0	0	22.2	0	2.1	0	0	25.0	0	7.7	7.6
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	13	60	0	0	73	9	2	56	0	67	0	58	11	0	69	0	3	1	0	4	213
04:45 PM	15	43	1	1	60	3	2	41	0	46	2	60	6	0	68	0	1	2	0	3	177
05:00 PM	13	45	0	0	58	9	1	56	0	66	1	70	7	0	78	1	1	1	0	3	205
05:15 PM	19	49	0	0	68	13	3	43	0	59	0	64	6	0	70	1	1	2	0	4	201
Total Volume	60	197	1	1	259	34	8	196	0	238	3	252	30	0	285	2	6	6	0	14	796
% App. Total	23.2	76.1	0.4	0.4		14.3	3.4	82.4	0		1.1	88.4	10.5	0		14.3	42.9	42.9	0		
PHF	.789	.821	.250	.250	.887	.654	.667	.875	.000	.888	.375	.900	.682	.000	.913	.500	.500	.750	.000	.875	.934
Cars	60	191	1	1	253	34	8	160	0	202	3	249	24	0	276	2	6	3	0	11	742
% Cars	100	97.0	100	100	97.7	100	100	81.6	0	84.9	100	98.8	80.0	0	96.8	100	100	50.0	0	78.6	93.2
Heavy Vehicles	0	6	0	0	6	0	0	4	0	4	0	3	0	0	3	0	0	0	0	0	13
% Heavy Vehicles	0	3.0	0	0	2.3	0	0	2.0	0	1.7	0	1.2	0	0	1.1	0	0	0	0	0	1.6
RTOR	0	0	0	0	0	0	0	32	0	32	0	0	6	0	6	0	0	3	0	3	41
% RTOR	0	0	0	0	0	0	0	16.3	0	13.4	0	0	20.0	0	2.1	0	0	50.0	0	21.4	5.2
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	13	45	0	0	58	9	1	56	0	66	1	70	7	0	78	1	1	1	0	3	205
05:15 PM	19	49	0	0	68	13	3	43	0	59	0	64	6	0	70	1	1	2	0	4	201
05:30 PM	13	44	0	0	57	8	1	56	0	65	1	64	2	0	67	0	1	1	0	2	191
05:45 PM	8	47	0	0	55	3	1	50	0	54	1	43	6	0	50	2	1	1	0	4	163
Total Volume	53	185	0	0	238	33	6	205	0	244	3	241	21	0	265	4	4	5	0	13	760
% App. Total	22.3	77.7	0	0		13.5	2.5	84	0		1.1	90.9	7.9	0		30.8	30.8	38.5	0		
PHF	.697	.944	.000	.000	.875	.635	.500	.915	.000	.924	.750	.861	.750	.000	.849	.500	1.000	.625	.000	.813	.927
Cars	53	183	0	0	236	33	6	164	0	203	3	239	19	0	261	4	4	4	0	12	712
% Cars	100	98.9	0	0	99.2	100	100	80.0	0	83.2	100	99.2	90.5	0	98.5	100	100	80.0	0	92.3	93.7
Heavy Vehicles	0	2	0	0	2	0	0	2	0	2	0	2	0	0	2	0	0	0	0	0	6
% Heavy Vehicles	0	1.1	0	0	0.8	0	0	1.0	0	0.8	0	0.8	0	0	0.8	0	0	0	0	0	0.8
RTOR	0	0	0	0	0	0	0	39	0	39	0	0	2	0	2	0	0	1	0	1	42
% RTOR	0	0	0	0	0	0	0	19.0	0	16.0	0	0	9.5	0	0.8	0	0	20.0	0	7.7	5.5
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	19	60	0	0	79	6	1	47	0	54	1	52	4	0	57	2	0	1	0	3	193
03:30 PM	22	53	1	0	76	18	2	45	0	65	0	61	8	0	69	1	1	1	0	3	213
03:45 PM	20	82	0	0	102	8	3	36	0	47	6	66	8	0	80	1	0	1	0	2	231
04:00 PM	16	70	0	0	86	9	1	43	0	53	1	68	7	0	76	3	1	1	0	5	220
Total Volume	77	265	1	0	343	41	7	171	0	219	8	247	27	0	282	7	2	4	0	13	857
% App. Total	22.4	77.3	0.3	0		18.7	3.2	78.1	0		2.8	87.6	9.6	0		53.8	15.4	30.8	0		
PHF	.875	.808	.250	.000	.841	.569	.583	.910	.000	.842	.333	.908	.844	.000	.881	.583	.500	1.000	.000	.650	.927
Cars	75	256	1	0	332	39	7	113	0	159	8	241	21	0	270	7	2	3	0	12	773
% Cars	97.4	96.6	100	0	96.8	95.1	100	66.1	0	72.6	100	97.6	77.8	0	95.7	100	100	75.0	0	92.3	90.2
Heavy Vehicles	2	8	0	0	10	2	0	1	0	3	0	6	0	0	6	0	0	0	0	0	19
% Heavy Vehicles	2.6	3.0	0	0	2.9	4.9	0	0.6	0	1.4	0	2.4	0	0	2.1	0	0	0	0	0	2.2
RTOR	0	1	0	0	1	0	0	57	0	57	0	0	6	0	6	0	0	1	0	1	65
% RTOR	0	0.4	0	0	0.3	0	0	33.3	0	26.0	0	0	22.2	0	2.1	0	0	25.0	0	7.7	7.6

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Road: Rt. 53
 Location: 300 ft S of Troy Hill Rd
 Counter: 21457
 Weather: Clear

RETTEW Associates, Inc.
 3020 Columbia Avenue
 Lancaster, PA 17603

Site Code: 1106092
 Station ID: 1106092
 A to B NB

Latitude: 40° 9'0866.000 North

Start Time	09-Nov-09		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
	NB	SB	NB	SB												
12:00 AM	13	13	12	15	15	11	13	17	21	21	21	21	21	21	21	15
01:00	12	15	15	7	6	6	6	9	9	10	9	9	9	9	9	10
02:00	13	18	10	5	12	4	11	4	10	15	15	15	15	15	11	9
03:00	18	11	8	6	8	10	11	7	11	13	9	9	9	9	11	9
04:00	29	38	25	35	27	36	21	41	26	32	26	26	26	26	26	36
05:00	74	101	57	82	50	95	59	93	56	85	85	85	85	85	59	91
06:00	125	154	101	136	105	135	122	156	116	147	147	147	147	147	121	151
07:00	136	230	154	248	115	236	134	242	119	197	197	197	197	197	132	231
08:00	138	228	119	224	135	217	134	204	111	201	201	201	201	201	127	215
09:00	147	176	149	193	145	187	156	208	155	245	245	245	245	245	150	202
10:00	164	207	159	274	149	175	150	210	171	231	231	231	231	231	159	219
11:00	201	199	181	268	180	197	190	229	206	244	244	244	244	244	192	227
12:00 PM	212	196	214	247	204	232	206	189	271	216	216	216	216	216	221	216
01:00	191	209	198	204	195	201	184	214	224	241	241	241	241	241	198	214
02:00	195	239	231	232	230	229	216	253	222	249	249	249	249	249	219	240
03:00	259	240	230	292	223	234	231	299	286	260	260	260	260	260	219	240
04:00	305	251	278	239	245	245	304	247	247	247	247	247	247	247	246	246
05:00	261	228	257	208	258	203	283	223	206	245	245	245	245	245	265	216
06:00	219	158	187	159	199	176	249	177	176	177	177	177	177	177	214	168
07:00	146	110	143	95	156	126	137	106	106	106	106	106	106	106	146	109
08:00	106	70	96	82	118	78	94	110	78	82	82	82	82	82	104	85
09:00	69	45	81	57	65	49	83	82	45	47	47	47	47	47	74	58
10:00	52	33	50	25	45	44	79	59	45	44	44	44	44	44	56	40
11:00	23	21	25	22	31	21	31	28	28	28	28	28	28	28	40	22
Lane	3108	3187	3015	3381	2916	3147	3104	3365	2014	2407	2407	2407	2407	2407	3067	3285
Day	6295	6295	6396	6396	6063	6063	6469	6469	4421	4421	4421	4421	4421	4421	6352	6352
AM Peak	11:00	07:00	11:00	10:00	11:00	07:00	11:00	07:00	11:00	09:00	09:00	09:00	09:00	09:00	11:00	07:00
Vol.	201	230	181	274	180	236	190	242	206	245	245	245	245	245	192	231
PM Peak	16:00	16:00	16:00	15:00	17:00	16:00	16:00	15:00	15:00	15:00	15:00	15:00	15:00	15:00	16:00	15:00
Vol.	305	251	278	292	258	245	304	259	286	260	260	260	260	260	283	257
Comb. Total	6295	6295	6396	6396	6063	6063	6469	6469	9402	9402	9402	9402	9402	9402	5468	12403
ADT	ADT 6,144		ADT 6,144													

RETTEW Associates, Inc.
 3020 Columbia Avenue
 Lancaster, PA 17603

Road: Troy Hill Rd/ Ninth St
 Location: 400 ft S of Rt. 53
 Counter: 21486
 Weather: Clear

Site Code: 1106091
 Station ID: 1106091
 A to B WB

Latitude: 40° 9'08.34" 000 North

Start Time	02-Nov-09		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	20	20
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	17	13
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	11	9
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	4	6
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	2	4
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	9	30
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	15	36
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22	15
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	25	32
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	39	50
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	48	82
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	62	51
12:00 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	82	81
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	95	102
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	143	114
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	125	131
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	119	111
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	119	118
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	123	127
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	124	136
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	119	113
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	174	130
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	167	120
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	116	121
Lane	0	0	0	0	0	0	0	0	0	2017	1415	1762	1690	1621	1879	1698
Day	0	0	0	0	0	0	0	0	0	3432	3452	3220	3577			
AM Peak Vol.										10:00	10:00	10:00	11:00	10:00	11:00	10:00
PM Peak Vol.										12:00	12:00	12:00	13:00	12:00	13:00	12:00
										125	115	121	173	132	118	131
										17:00	16:00	15:00	12:00	13:00	15:00	12:00
										277	151	167	134	153	190	136

Lanes, Volumes, Timings

1: Ninth Street & Pa Route 53

11/11/2009

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	2	4	41	7	171	8	247	27	77	265	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	12	12	11	12	11	11	12	11	11	12
Grade (%)		-12%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	275		0	280		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Satd. Flow (prot)	0	1756	0	0	1600	0	1745	1762	0	1694	1783	0
Flt Permitted		0.659			0.929		0.569			0.571		
Satd. Flow (perm)	0	1189	0	0	1500	0	1045	1762	0	1018	1783	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			204			13				
Link Speed (mph)		30			30			45			45	
Link Distance (ft)		747			80			515			433	
Travel Time (s)		17.0			1.8			7.8			6.6	
Peak Hour Factor	0.65	0.65	0.65	0.84	0.84	0.84	0.88	0.88	0.88	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	0%	5%	0%	1%	0%	3%	0%	3%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	20	0	0	261	0	9	312	0	92	316	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		31.0	31.0		31.0	31.0	
Minimum Split (s)	22.5	22.5		22.3	22.3		36.8	36.8		36.8	36.8	
Total Split (s)	25.3	25.3	0.0	25.3	25.3	0.0	39.8	39.8	0.0	39.8	39.8	0.0
Total Split (%)	38.9%	38.9%	0.0%	38.9%	38.9%	0.0%	61.1%	61.1%	0.0%	61.1%	61.1%	0.0%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.3	1.3		1.3	1.3	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	4.0	6.3	6.3	4.0	5.8	5.8	4.0	5.8	5.8	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		8.4			8.4		31.1	31.1		31.1	31.1	
Actuated g/C Ratio		0.16			0.16		0.60	0.60		0.60	0.60	
v/c Ratio		0.10			0.63		0.01	0.29		0.15	0.29	
Control Delay		16.0			13.2		5.5	6.3		6.2	6.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		16.0			13.2		5.5	6.3		6.2	6.6	
LOS		B			B		A	A		A	A	
Approach Delay		16.0			13.2			6.3			6.5	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		4			15		1	34		10	36	
Queue Length 95th (ft)		12			57		6	89		31	87	
Internal Link Dist (ft)		667			1			435			353	
Turn Bay Length (ft)							275			280		

2009 Existing Conditions
PM Peak

PA Route 53 Crossings Analysis
Page 1

Lanes, Volumes, Timings

1: Ninth Street & Pa Route 53

11/11/2009

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)		443			683		691	1169		673	1178	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.05			0.38		0.01	0.27		0.14	0.27	

Intersection Summary

Area Type:	Other
Cycle Length:	65.1
Actuated Cycle Length:	51.6
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.63
Intersection Signal Delay:	8.4
Intersection LOS:	A
Intersection Capacity Utilization	80.0%
ICU Level of Service	D
Analysis Period (min)	15

Splits and Phases: 1: Ninth Street & Pa Route 53

ø2	ø4
39.8 s	25.3 s
ø6	ø8
39.8 s	25.3 s