Georgia Department of Transportation

NAVIGATOR

Evaluation of the Towing and Recovery Incentive Program (TRIP)

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Date: February 4, 2011
Document No.: NAV01-203
Revision: 1.0

Revision History					
Date	Ver.	By	SCR	Section	Description
1/17/11	0.1	Andy Phlegar, PBS&J		All	First Draft
1/19/11	0.2	Ron Boodhoo, GDOT Hugh Colton, GDOT		All	Review and Comment
1/20/11	0.2	Andy Phlegar, PBS&J		All	Address GDOT Comments
1/21/11	0.2	Karen England, PBSJ		1 - 4	Spelling and Grammar
1/21/11	0.3	Andy Phlegar, PBS&J		All	Update Draft
1/21/11	0.3	Ron Boodhoo, GDOT		All	Review and Comment
1/24/11	0.4	Andy Phlegar, PBS&J		All	Address GDOT Comments Added Section 5.3
1/24/11	0.4	Ron Boodhoo, GDOT		All	Review and Comment
1/25/11	0.5	Andy Phlegar, PBS&J		All	Address GDOT Comments Added Executive Summary
1/25/11	0.5	Karen England, PBS&J		All	Reviewed document
1/25/11	0.6	Andy Phlegar, PBS&J		1.1, 1.2, 5.4	Added sections 1.1, 1.2 and 5.4
1/25/11	0.6	Ron Boodhoo, GDOT		All	Review and Comment
1/26/11	0.7	Andy Phlegar, PBS&J		All	Addressed GDOT Comments
1/26/11	0.7	Ron Boodhoo, GDOT		All	Review and Comment
1/27/11	0.7	Karen England, PBS&J		All	Edits/Comments
1/27/11	0.8	Andy Phlegar, PBS&J		All	Final Edits Submit for Final Draft review.
2/02/11	0.8	Hugh Colton, GDOT Ron Boodhoo, GDOT		All	Review and Comment
2/03/11	0.8	Andy Phlegar, PBS&J		All	Final Draft
2/04/11	0.9	Ron Boodhoo, GDOT		All	Reviewed/Accepted Final Draft
2/04/11	1.0	Ron Boodhoo, GDOT		All	Document published to the server

EXECUTIVE SUMMARY

The Georgia Department of Transportation (GDOT) introduced the Towing and Recovery Incentive Program (TRIP) in early 2008 to provide monetary incentives to qualified towing operators for the quick clearance of large commercial vehicle incidents. This program is a critical component of the metropolitan Atlanta traffic incident management quick clearance program.

A TRIP certified towing operator receives an incentive payment if they arrive at the incident scene and open all lanes to traffic within time frames set by the program. TRIP was activated for 110 incidents during 2008 and 2009. TRIP operators met all program guidelines and received payment for 98 incidents and failed to meet program guidelines and, therefore, received no payment for eight incidents. GDOT determined that TRIP operators were not necessary for four of these incidents and received a token payment for arriving on time.

The total incentive payments paid to towing operators in 2008 and 2009 totaled $284,000. In addition, the administrative costs of the program (including program development, outreach, training, and coordination) from 2007 through 2010 were $551,000. The total cost of TRIP was $835,000.

The goal of the program is the quick clearance of incidents. The study identified 24 incidents from 2007 (pre-TRIP) that would likely have used the program. The clearance times for the 24 pre-trip incidents were compared to the timelines of TRIP incidents. This study determined that TRIP allowed the roadway to be opened to traffic at least 165 minutes (2 hours and 45 minutes) faster than experienced in 2007.

The cost of each incident (in terms of delay, wasted fuel, and excess emissions) was calculated by modeling each incident based on the incident location, typical traffic volumes during the incident, the roadway geometrics at the incident location, and other factors specific to each incident. The average cost of TRIP incidents was determined to be $186,684, a 71 percent decrease from the pre-trip average incident cost of $643,080.

The study evaluated the benefit of TRIP by comparing the cost of each TRIP incident against the cost had the incident taken an additional 60 minutes to clear. This logic assumes that TRIP is only clearing the incident 60 minutes faster, although the research shows an average savings of 165 minutes. This approach, and all others in the study, was designed to underestimate the benefits of the program.

The difference in the cost of the TRIP incident and the same incident with a longer clearance time is the cost savings (the benefit) of having the program in place. The benefit of TRIP (from inception through the end of 2009) was calculated as $9,154,431 of avoided delay, wasted fuel and excess emissions.

With a benefit to cost ratio of 10.96 to 1, TRIP is saving almost eleven dollars for every dollar invested.

Table of Contents

Tables

Figures

1 Background

The Towing Recovery and Incentive Program (TRIP) is a component of the metropolitan Atlanta traffic incident management program. Administered by the Georgia Department of Transportation (GDOT), TRIP is an incentive program that provides monetary bonuses to heavy-duty towing and recovery companies for the quick clearance of incidents involving large commercial vehicles.

Towing and recovery companies that desire to participate in TRIP must complete a stringent application process. Qualified TRIP companies are required to maintain a staff of supervisors and operators who must acquire and maintain national or industry certifications. In addition, each TRIP company must maintain up-to-date equipment and is required to have heavy-duty wreckers and support vehicles with traffic control and fluid spill mitigation equipment.

TRIP incidents involve large vehicles and complicated debris or hazardous material (HAZMAT) spills, which would normally take a significant amount of time to clear from a roadway. TRIP can only be activated by designated personnel, such as a GDOT Highway Emergency Response Operator (HERO) supervisor or a police officer on-scene, based upon specific criteria and procedures.

Once declared a TRIP incident, the designated TRIP company for that area is notified. The TRIP company supervisor must arrive on scene within 30 minutes of notification and all basic equipment must arrive within 45 minutes if called between 5:30 am and 7:00 pm, Monday through Friday; at other times, the equipment is allowed 60 minutes to arrive. The TRIP company remains on scene until they receive an official notice to proceed to clear the incident from the roadway. Upon receiving the notice to proceed, the TRIP company must have the roadway cleared and open to traffic within 90 minutes.

The GDOT HERO unit holds monthly After Incident Reviews (AIR) to discuss and evaluate recent TRIP incidents. During these meetings, the incident timeline is evaluated to determine if the TRIP operator met all time requirements and is eligible for an incentive bonus. TRIP incentive bonus payments are as follows:

- $600 if the TRIP company is called, responds within the specified time, but is not needed.
- $2,500 if the TRIP company is called, responds within the specified time, and has the roadway cleared and opened to traffic within 90 minutes after receiving the notice to proceed.
- An extra $1,000 is paid if additional special equipment was required and provided, and all time requirements were met.

In addition to these bonus incentives, the program provides for liquidated damages to be paid by the TRIP company if the roadway is not cleared and opened to traffic within three hours of the notice to proceed. If the failure to clear the roadway in three hours is determined to be the fault of the TRIP company, they will be fined $600 in liquidated damages and an additional $10 per minute for each minute over three hours that the roadway remains blocked.

The complete TRIP is described in detail in the *Towing & Recovery Incentive Program (TRIP) Research Summary*[1] prepared by Gresham, Smith and Partners, February 26, 2010 and the entire program specifications can be found at http://www.timetaskforce.com/trip.html

1.1 TRIP Coverage

When the program began in 2008 it covered I-285 and all interstates inside I-285, including GA-400, all interchange ramps and the following four "hot spots:"

- I-85 Northside: to Pleasantdale Exit
- I-75 Northside to Windy Hill Exist
- I-20 Westside: to Fulton Industrial Exist
- I-20 Eastside: to Wesley Chapel Exit

The coverage boundaries were expanded in June 2009 and again in April 2010. The current program boundaries are shown in Figure 1.1.

1.2 Purpose

The purpose of this document is to summarize the results of an in depth evaluation of the effectiveness of TRIP and the benefits and costs of the program. The study analyzed 110 incidents in 2008 and 2009 in which TRIP was activated. The study also analyzed 23 incidents that occurred in 2007 (before TRIP was active), that would have been candidates for TRIP activation.

[1] *Towing & Recovery Incentive Program (TRIP) Research Summary, in Support of a TRIP Benefit-Cost Study*. Gresham, Smith and Partners. Final Draft. February 26, 2010.

Figure 1.1: Current TRIP Boundaries

2 PROGRAM COSTS

Since its first use on January 8, 2008, TRIP has been used 110 times (59 times in 2008 and 51 times in 2009). TRIP companies were paid bonuses of $284,000 for their responses to these incidents.

In addition to the bonus payments to the towing companies, GDOT's HERO unit is supported by Delcan for the administration of TRIP, including development of the program, outreach to towing operators, training of operators and emergency response personnel, documentation of individual TRIP incidents, and coordination of After Incident Reviews (AIR). HERO administrative costs were $551,000 from the program's inception in 2007 through the end of 2010.

The total cost of TRIP from inception through the end of 2010 was $835,000, as shown in Table 2.1. This is used as the cost of the program through 2009, even though this includes administrative costs through the end of 2010.

Table 2.1: Cost of the Towing and Recovery Incentive Program

Year	Description	Cost
2007	Program Development and First Year Implementation	$ 256,000
2008	Incentive Payments to TRIP Operators	$ 156,400
2008	Program Maintenance (12 Months) and Program Expansion	$ 125,000
2009	Incentive Payments to TRIP Operators	$ 127,600
2009	Program Maintenance (15 Months) and Program Expansion	$ 170,000

Total Program Cost $ 835,000

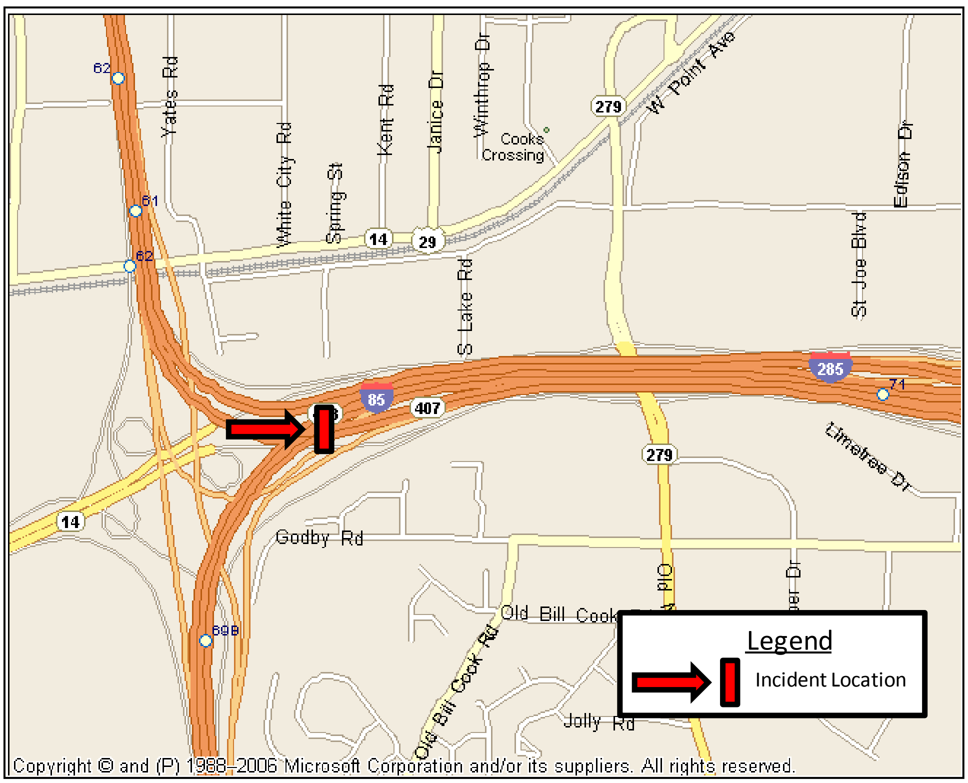
3 Incident Information

This study analyzed the costs of the 110 TRIP incidents that occurred in 2008 and 2009, and 24 incidents that occurred in 2007 that would have been candidates for TRIP activation. The incidents from 2007 (prior to the implementation of TRIP) were selected from a critical review of the NaviGAtor logs that identified these incidents as ones that clearly would have met the criteria for activation of TRIP had it existed at the time of the incident.

As each incident is unique (in terms of spatial, temporal, geographical, lane closure durations, and other factors), the specific details of each incident were collected and used to allow a distinct analysis of each incident and its impact on traffic. The specific details for each incident were collected from various sources as outlined in the sections below.

Throughout the remainder of this document, most figures and tables used to describe the study use the details of the TRIP incident that occurred on September 30, 2009. This incident occurred on Southbound I-285 at the I-285/I-85 interchange southwest of Atlanta. Figure 3.1 shows the location of the incident.

Figure 3.1: Location of September 30, 2009 Incident



The incident occurred on a Wednesday at 1:32 pm; all lanes were re-opened to traffic at 3:06 pm. The incident involved a single tractor trailer that overturned and spilled its load on the roadway. In addition to the spilled load, the tractor's fuel tanks also ruptured and spilled a small amount of fuel on the pavement. Southbound I-285 is a three-lane roadway at this location. The number of lanes blocked to traffic varied during the incident clearance, including two instances when all lanes were blocked.

3.1 Incident Location and Sequence of Events

The location and sequence of events for each incident were collected from the TRIP Incident Logs and the GDOT NaviGAtor logs.

3.1.1 TRIP Incident Logs

The TMC maintains TRIP Incident Logs for each TRIP activation. These logs establish response and clearance times and are used to determine if incentives are paid to the towing company. Figure 3.2 shows a sample incident log .

Figure 3.2: TRIP Incident Log for September 30, 2009 Incident

TOWING RECOVERY INCENTIVE PROGRAM

GDOT Georgia Department of Transportation

Navigator Incident Number	1513651
Time Entered In X-WIN	13:32
Date/TMC Operator	09/30/2009 L MILTON
Time of Call	13:33
Location of TRIP Incident	285EB AT I-85
Name of person who activated TRIP	OFFICER STARK - FULTON COUNTY (404) 612-3001
Name of Towing Company	SOUTHSIDE TOWING
Towing Company Contact Person and Number	BRENDA / 770-964-8220 @ 1340
Time of TRIP Activation	13:33
Time Wrecker Supervisor on Scene	13:56
Time Operator/50 Ton Wrecker on Scene	14:01
Time Operator/30 Ton Wrecker on Scene	14:24
Time Operator and Support Truck on Scene	14:24
Name of Person giving proceed time/ Time.	14:05//HERO SUPV. 514
Name of Person calling in Emergency or Investigation Time (Pause Time)/Time	N/A
Name of Person calling in RE-Start Time/Time	N/A
Name of Person calling for Required Extra Equipment/Time	N/A
Name and time when extra Equipment arrrived on scene	N/A
Name of Person calling in time when extra equipment arrived on scene/Time	N/A
Name of Person who approved extra equipment/Time	N/A
Name of Person calling in 10-72 (Roadway clearance time)	3:06:00 PM / HERO SUPERVISOR 514
Name of Person calling in 10-79 (Incident clearance time)	03:08 AM / BILL (678-873-1273) RHINO SERVICES

TRIP Bringing service to life serco TIME GRTA Delcan H.E.R.O.

3.1.2 NAVIGATOR Logs

The GDOT Transportation Management Center (TMC) manages every incident on the metropolitan Atlanta interstate system. They assign a unique NaviGAtor log number to each incident and the incident data is entered and updated until the incident is cleared. These logs are saved and provide details and time stamps of changes in the numbers of lanes blocked throughout the incident. A portion of the NaviGAtor log for the September 30, 2009 incident is shown in Figure 3.3.

Figure 3.3: NaviGAtor Log for September 30, 2009 Incident

Incident Report :: GDOT-INC-1513651

Sep 30, 2009 13:32:19	**Incident declared by Linarra Milton, GDOT - TMC Operations**
IncidentType	Accident
IncidentLevel	3
ImpactType	Medium
LocationType	Freeway
LocationText	Eastbound I-285 AT I-85
County	Fulton (District-7)
AffectedLane	1 Left Lanes
DetectionType	Call Report
Need Police?	Yes
Need HERO?	Yes
NumberCalls	1
EstimatedEnd	Sep 30 2009 2:32PM
Confirmed?	Yes
ConfirmTime	Sep 30 2009 1:32PM
Confirmed By	Linarra Milton, GDOT - TMC Operations
Alarm Interval	01:15:00
Comment	FULTON KEISHA OVERTURNED TT LOADED WITH VEGETABLES. THEY HAVE A UNIT ON SCENE
Sep 30, 2009 13:33:07	**Incident updated by Linarra Milton, GDOT - TMC Operations**
Comment	OFFICER STARK WITH FULTON COUNTY ADVISED THAT THEY WOULD LIKE TO ACTIVATE TRIP FOR THIS INCIDENT
Sep 30, 2009 13:36:03	**Incident updated by Linarra Milton, GDOT - TMC Operations**
EstimatedEnd	Sep 30 2009 3:32PM
Comment	HERO 514 AND HERO 578 ARE EN ROUTE
Sep 30, 2009 13:37:45	**Incident updated by Linarra Milton, GDOT - TMC Operations**
AffectedLane	2 Right Lanes
Lanes Affected	2
Comment	HAVE VISUAL ON CAM 930. FIRE, EMS AND PD ON SCENE.
Sep 30, 2009 13:39:56	**Incident updated by Mohammed Kalisha, GDOT - TMC Operations**

3.2 Traffic Volume Data

Once the incident location, date, and time were determined from reviewing the TRIP and NaviGAtor logs, the Detector IDs of GDOT traffic detectors in the area of the incident were identified.

The Georgia Institute of Technology maintains an archive of GDOT NaviGAtor detector data used during this project. The Detector IDs and incident dates were forwarded to Dr. A. Guin who queried the database and provided hourly volumes for the detectors and dates identified.

To ensure the availability of detector data, the detector archive to find the date of the incident, the date one week prior to the incident, and equivalent dates (same day of week) from 2007 through 2010. Figure 3.4 shows the combination of requested detectors and dates for the September 30, 2009 incident.

Figure 3.4: NaviGAtor Detector Data Requested for September 30, 2009 Incident

Trip Activation		Date	Detector Station ID 2851103	Detector Station ID 2851101
102	Incident Date	2009-09-30		
	One week Prior	2009-09-23	X	
	Equivalent 2007 Date	2007-10-03		
	Equivalent 2008 Date	2008-10-01		
	Equivalent 2009 date	n/a		
	Equivalent 2010 Date	2010-09-29	X	X

Two detector stations were identified (2851103 and 2851101) and ten date/detector combinations were queried (incident date, one week prior, equivalent 2007 date, equivalent 2008 date, and equivalent 2010 date). Of these ten date sets, the archive only had complete counts for three date/detector combinations (indicated by an "x" in Figure 3.4).

Figure 3.5 shows the hourly traffic volumes recorded by detector 2851103 (just upstream of the September 30, 2009 incident location) one week prior to the incident.

Figure 3.5: NaviGAtor Detector Data for September 30, 2009 Incident

#id	sample_start	volume
2851103	9/23/2009 0:00	867
2851103	9/23/2009 1:00	850
2851103	9/23/2009 2:00	568
2851103	9/23/2009 3:00	602
2851103	9/23/2009 4:00	597
2851103	9/23/2009 5:00	816
2851103	9/23/2009 6:00	1178
2851103	9/23/2009 7:00	1804
2851103	9/23/2009 8:00	1940
2851103	9/23/2009 9:00	1987
2851103	9/23/2009 10:00	1987
2851103	9/23/2009 11:00	2130
2851103	9/23/2009 12:00	2405
2851103	9/23/2009 13:00	2382
2851103	9/23/2009 14:00	2388
2851103	9/23/2009 15:00	2535
2851103	9/23/2009 16:00	2828
2851103	9/23/2009 17:00	3077
2851103	9/23/2009 18:00	2579
2851103	9/23/2009 19:00	2007
2851103	9/23/2009 20:00	1754
2851103	9/23/2009 21:00	1345
2851103	9/23/2009 22:00	1166
2851103	9/23/2009 23:00	952

The GDOT publishes the *Average Annual Daily Traffic (AADT) on the State Traffic and Report Statistics* on their web site (http://www.dot.state.ga.us/statistics/TrafficData/Pages/default.aspx). GDOT updates this web site annually and provides AADT counts collected from permanent and portable traffic collection devices for every segment of Georgia's State Highway System throughout the state. The AADT records were used to verify the NaviGAtor detector counts and to adjust the counts if the hourly count and incident occurred in different years.

3.3 Percentage of Trucks

The percentage of trucks on the interstate was collected from the published reports *Vehicle Classification by Functional Classification and Hour* found on the GDOT Office of Transportation Data (OTD) web site (http://www.dot.state.ga.us/statistics/TrafficData/Pages/atr.aspx). This data was collected for the Urban Principal Arterial – Interstate for 2007, 2008, and 2009 to provide hourly truck percentages for use in determining the delay attributed to trucks. The truck percentages are averages (by hour) for the metropolitan Atlanta Interstates as shown in Table 3.1.

Table 3.1: Percentage of Trucks

	2007	2008	2009
Midnight – 1 am	18.00	14.44	11.43
1 am – 2 am	22.79	18.80	15.06
2 am – 3 am	26.27	21.99	18.21
3 am – 4 am	27.66	23.69	19.75
4 am – 5 am	24.25	23.56	21.09
5 am – 6 am	15.52	14.98	14.58
6 am – 7 am	10.78	9.98	9.59
7 am – 8 am	9.18	8.19	7.48
8 am – 9 am	10.94	9.65	8.12
9 am – 10 am	13.17	12.00	10.20
10 am – 11 am	13.50	12.52	10.78
11 am – Noon	13.10	12.24	10.69
Noon – 1 pm	12.36	11.52	10.09
1 pm – 2 pm	11.84	10.94	9.55
2 pm – 3 pm	11.10	10.18	8.96
3 pm – 4 pm	10.07	9.08	8.14
4 pm – 5 pm	8.98	7.92	7.13
5 pm – 6 pm	8.16	6.95	6.24
6 pm – 7 pm	8.84	7.42	6.48
7 pm – 8 pm	9.83	8.11	7.06
8 pm – 9 pm	10.70	8.72	7.51
9 pm -10 pm	11.21	8.78	7.52
10 pm – 11 pm	12.27	9.52	7.90
11 pm - Midnight	14.34	11.23	9.13

3.3 Geometric Data

The number of lanes at each incident location was determined using data from the NaviGAtor logs and online **Google Maps**. Information on the number and length of lanes upstream of the incident needed to identify the length of the vehicles queues was determined using the **Google Maps** distance measuring tool.

Figure 3.6 shows the available lane geometric information for the September 30, 2009 incident.

Figure 3.6: Lane Geometry for September 30, 2009 Incident

Incident Location	← Direction of travel					
Lanes	3	4	3	4	3	4
Distance (ft)	3540	48460	1780	1090	2350	7110

4 Methodology and Assumptions

The unique data collected for each incident was used to model traffic flow throughout the duration of the incident. The traffic flow analysis for each incident determined the amount of delay caused by the incident and the queue length of vehicles. Based on the results of the analysis, the corresponding cost of each incident was calculated. This section presents the methodology and assumptions used during each of these steps.

4.1 Incident Analysis Methodology

The traffic flow analysis for each incident used a deterministic model of traffic flow based on the **approach volume** and **available capacity** of the roadway during each incident. The deterministic approach assumes no variation in traffic volumes, so a measured traffic volume of 6000 vehicles per hour would indicate the passage of 100 vehicles per minute (6000 vehicles each hour ÷ 60 minutes in each hour) without any variation from minute-to-minute.

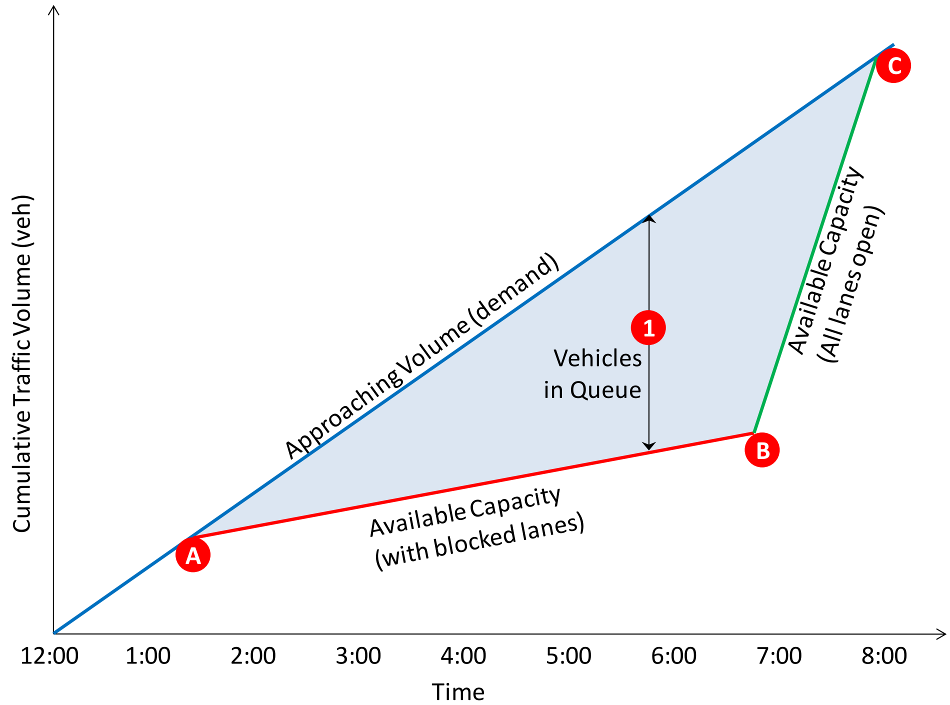
Approach Volume measures how many vehicles want to use the roadway (expressed as vehicles per hour) and is often referred to as demand. In this study, the hourly traffic volumes from the NaviGAtor detectors are used as the indication of the typical demand on the roadway at the time of the incident.

Available Capacity of the roadway indicates the number of vehicles that can pass by a certain point on the roadway. During times when no lanes are blocked, a roadway can carry approximately 2250 passenger vehicles per hour per lane; this is diminished during as incident as varying numbers of lanes are blocked.

A queue of vehicles will form if the approach volume (demand) is greater than the available capacity of the roadway. This queue, or un-served vehicles (the difference between demand and capacity), will continue to increase until a time when the demand decreases below the available capacity. In the case of an incident, the available capacity of the roadway is typically decreased below demand (due to lanes being blocked by an incident) and vehicles queue until the lanes are cleared and full capacity is restored.

Figure 4.1 is a graphical representation (arrival and departure curves) of a simple incident on a roadway. It is simplistic in the assumption that the demand and capacity do not change throughout the day and represents ideal conditions for analysis. As long as there is no blockage and the approach volume is less than the available capacity of the roadway, then no queue will build on the roadway.

Figure 4.1: Simple Incident



Point A represents the beginning of an incident that reduces the available capacity of the roadway to less than the approaching traffic volumes.

Point B represents the time when the incident is cleared and the roadway capacity has been restored. The shaded area represents the queue of vehicles that builds during the time when the approaching traffic is greater than the available capacity.

Point C represents the time when the queue that built up during the blockage has completely dissipated.

Line AC represents the approaching volume.

Line AB represents the available capacity of the roadway during an incident that starts at 1:30 pm and ends at 7:00 pm.

Line BC represents the available capacity of the roadway with the incident cleared and all lanes open to traffic. The slopes of the volume and capacity lines represent the demand and capacity in vehicles per hour.

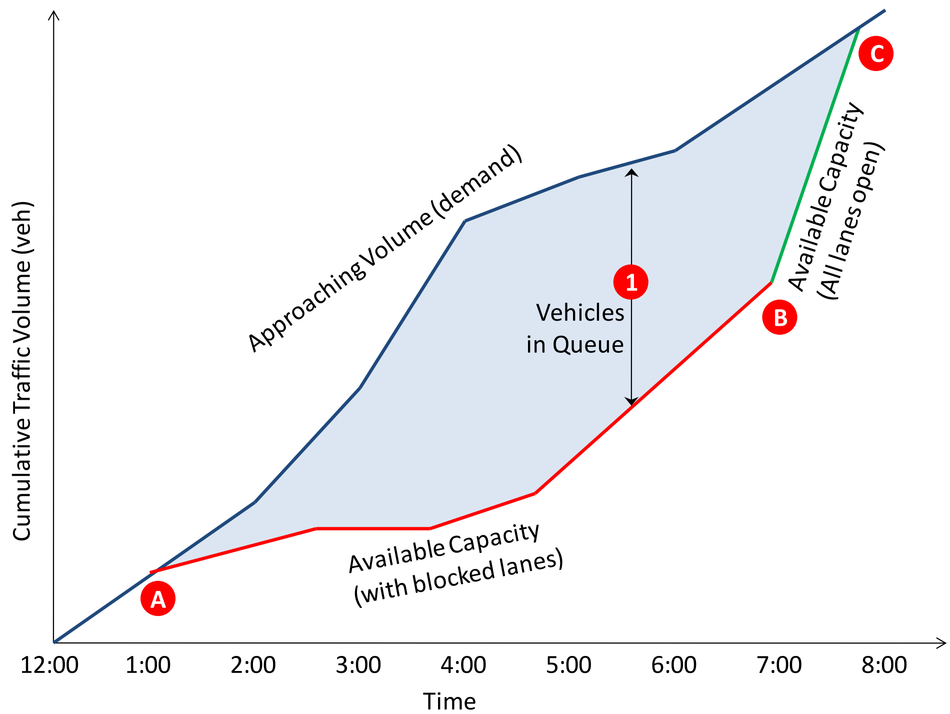
Triangle ABC represents the difference between the number of vehicles approaching the incident and the number of vehicles that can pass the incident. The vehicle hours of delay caused by the incident is found by calculating the area of the shaded triangle.

Line 1 (the vertical distance between the arrival and departure curves) represents the number of vehicles in the queue at any given time. The number of queued vehicles can also be converted to the length of the queue.

For all of the incidents studied, the simplistic model does not apply. Each of the 110 TRIP incidents lasted for more than one hour which required the analysis to address changing approach volumes over time as shown in Figure 4.2. In addition, the number of lanes blocked changed throughout the incident depending upon the actions of the emergency responders and TRIP operator.

Figure 4.2 provides a graphical representation of an incident where the approach volume changes each hour and the available capacity changes several times.

Figure 4.2: Representative Incident



The shaded area still represents the vehicle delay; however, with this more realistic representation of the changing approach volumes and available capacity, the ability to manually calculate the area of the shape becomes increasingly difficult to perform.

This approach to calculating the vehicle hours of delay was coded into a Microsoft® Excel spreadsheet, effectively creating a balance sheet for each minute of the incident. During each minute, a number of vehicles approach the incident (approach volume) and a number of those vehicles can pass the incident (available capacity). If the approach volume is greater than the available capacity, the excess vehicles are added to the queue.

Table 4.1 shows the sequence of lane blockages documented from the NaviGAtor logs for the TRIP incident that occurred on September 30, 2009.

Table 4.1: Lanes Blocked During September 30, 2009 Incident

Time	Description
13:32	1 of 3 lanes blocked.
13:37	2 of 3 lanes blocked
14:07	3 of 3 lanes blocked for wrecker maneuvers
14:24	2 of 3 lanes blocked
14:28	3 of 3 lanes blocked for wrecker maneuvers
14:50	2 of 3 lanes blocked
14:56	1 of 3 lanes blocked
15:06	Lanes clear

Figure 4.3 shows the beginning, middle, and end of the analysis spreadsheet for this incident:

Figure 4.3: Queuing Spreadsheet for September 30, 2009 Incident (Part 1, Vehicles in Queue)

Date-Time	Available Capacity (VPH)	Approaching Traffic (VPH)	% Trucks	Vehicles in Queue (beginning of minute)	Vehicles Added to Queue	Vehicles Exiting Queue	Vehicles in Queue (end of minute)	Cars in Queue	Trucks in Queue
9/30/09 13:32	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:33	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:34	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:35	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:36	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:37	1040	2382	8.8%	0	40	17	22	20	2
9/30/09 13:38	1040	2382	8.8%	22	40	17	45	41	4
9/30/09 13:39	1040	2382	8.8%	45	40	17	67	61	6
9/30/09 13:40	1040	2382	8.8%	67	40	17	89	82	8
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9/30/09 14:05	1043	2388	8.8%	627	40	17	649	592	57
9/30/09 14:06	1043	2388	8.8%	649	40	17	671	612	59
9/30/09 14:07	0	2388	8.8%	671	40	0	711	649	63
9/30/09 14:08	0	2388	8.8%	711	40	0	751	685	66
9/30/09 14:09	0	2388	8.8%	751	40	0	791	721	70
9/30/09 14:10	0	2388	8.8%	791	40	0	831	758	73
9/30/09 14:11	0	2388	8.8%	831	40	0	870	794	77
9/30/09 14:12	0	2388	8.8%	870	40	0	910	830	80
9/30/09 14:13	0	2388	8.8%	910	40	0	950	866	84
9/30/09 14:14	0	2388	8.8%	950	40	0	990	903	87
9/30/09 14:15	0	2388	8.8%	990	40	0	1030	939	91
9/30/09 14:16	0	2388	8.8%	1030	40	0	1069	975	94
.									
.									
9/30/09 15:36	6162	2535	8.8%	545	42	103	484	442	43
9/30/09 15:37	6162	2535	8.8%	484	42	103	424	386	37
9/30/09 15:38	6162	2535	8.8%	424	42	103	363	331	32
9/30/09 15:39	6162	2535	8.8%	363	42	103	303	276	27
9/30/09 15:40	6162	2535	8.8%	303	42	103	242	221	21
9/30/09 15:41	6162	2535	8.8%	242	42	103	182	166	16
9/30/09 15:42	6162	2535	8.8%	182	42	103	121	111	11
9/30/09 15:43	6162	2535	8.8%	121	42	103	61	56	5
9/30/09 15:44	6162	2535	8.8%	61	42	103	1	0	0
9/30/09 15:45	6162	2535	8.8%	1	42	103	0	0	0

Each line of the queuing spreadsheet represents a single minute of the incident and accounts for the vehicle volumes approaching the incident, the available capacity, and the number of vehicles entering, exiting, and remaining in the queue. Each of these values represents a single vehicle without distinguishing between cars and trucks.

The percentage of trucks during this incident was based upon the time between the start of the incident and total dissipation of the queue (the calculation of the percentage of trucks is discussed in the assumptions section below). Using the percentage of trucks, the number of queued vehicles can be separated into cars and trucks. The length of the queue during each minute is calculated based on the number of cars and trucks in the queue and the length of each vehicle (assumed to be 25 feet for cars and 75 feet for trucks). The calculated queue length assumes that all vehicles are in a single file line. The queue is spread over the available number of lanes to determine the physical length from the point of the incident to the back of the queue.

Figure 4.4 shows the calculations used to convert the number of queued vehicles to the queue length, which is part of the same spreadsheet shown in Figure 4.3.

Figure 4.4: Queue Length Calculations for September 30, 2009 Incident (Part 2, Queue Length)

						Segment 1			Segment 2		
						Number of Lanes		3	Number of Lanes		4
						Length of Segment (ft)		3,540	Length of Segment (ft)		48,460
						Queue Storage Capacity (ft)		10,620	Queue Storage Capacity (ft)		193,840
Date-Time	% Trucks	Cars in Queue	Trucks in Queue	Length of Queue (feet)	Physical length of queue from incident	Capacity Filled (feet)	Physical Length Filled (feet)	Queue Overflow to next segment	Capacity Filled (feet)	Physical Length Filled (feet)	Queue Overflow to next segment
9/30/09 13:32	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:33	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:34	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:35	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:36	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:37	8.8%	20	2	657	219	657	219	-	-	-	-
9/30/09 13:38	8.8%	41	4	1315	438	1,315	438	-	-	-	-
9/30/09 13:39	8.8%	61	6	1972	657	1,972	657	-	-	-	-
9/30/09 13:40	8.8%	82	8	2630	877	2,630	877	-	-	-	-
.											
.											
9/30/09 14:05	8.8%	592	57	19076	5654	10,620	3,540	8,456	8,456	2,114	-
9/30/09 14:06	8.8%	612	59	19735	5819	10,620	3,540	9,115	9,115	2,279	-
9/30/09 14:07	8.8%	649	63	20905	6111	10,620	3,540	10,285	10,285	2,571	-
9/30/09 14:08	8.8%	685	66	22075	6404	10,620	3,540	11,455	11,455	2,864	-
9/30/09 14:09	8.8%	721	70	23245	6696	10,620	3,540	12,625	12,625	3,156	-
9/30/09 14:10	8.8%	758	73	24415	6989	10,620	3,540	13,795	13,795	3,449	-
9/30/09 14:11	8.8%	794	77	25585	7281	10,620	3,540	14,965	14,965	3,741	-
9/30/09 14:12	8.8%	830	80	26755	7574	10,620	3,540	16,135	16,135	4,034	-
9/30/09 14:13	8.8%	866	84	27925	7866	10,620	3,540	17,305	17,305	4,326	-
9/30/09 14:14	8.8%	903	87	29095	8159	10,620	3,540	18,475	18,475	4,619	-
9/30/09 14:15	8.8%	939	91	30265	8451	10,620	3,540	19,645	19,645	4,911	-
9/30/09 14:16	8.8%	975	94	31435	8744	10,620	3,540	20,815	20,815	5,204	-
.											
.											
9/30/09 15:36	8.8%	442	43	14231	4443	10,620	3,540	3,611	3,611	903	-
9/30/09 15:37	8.8%	386	37	12454	3998	10,620	3,540	1,834	1,834	458	-
9/30/09 15:38	8.8%	331	32	10677	3554	10,620	3,540	57	57	14	-
9/30/09 15:39	8.8%	276	27	8900	2967	8,900	2,967	-	-	-	-
9/30/09 15:40	8.8%	221	21	7123	2374	7,123	2,374	-	-	-	-
9/30/09 15:41	8.8%	166	16	5346	1782	5,346	1,782	-	-	-	-
9/30/09 15:42	8.8%	111	11	3569	1190	3,569	1,190	-	-	-	-
9/30/09 15:43	8.8%	56	5	1792	597	1,792	597	-	-	-	-
9/30/09 15:44	8.8%	0	0	15	5	15	5	-	-	-	-
9/30/09 15:45	8.8%	0	0	0	0	-	-	-	-	-	-

This incident started at 13:32 and all lanes were cleared and opened to traffic at 15:06. At 15:45, 39 minutes after all lanes were opened to traffic, no vehicles remained in the queue.

Figure 4.5 shows the summary of the September 30, 2009 TRIP incident.

Figure 4.5: Queuing Results for September 30, 2009 Incident

Results Summary			
	Total	**Cars**	**Trucks**
Total Vehicle Delay (Minutes)	158,337	144,415	13,922
Total Vehicle Delay (Hours)	2639.0	2406.9	232.0
Vehicles Entering Queue	5,443		
Average Delay per Vehicle (Minutes)	29.1		
	Feet	**Vehicles**	
Maximum Queue Length	18,874	2,448	
Average Queue Length	9,456	1,182	
Incident Start	13:32		
Lanes Clear	15:06		
Queue Dissipated	15:45		

Total Vehicle Delay (Minutes) is calculated by summing the values in each of the columns "*Vehicles in Queue (End of Minute)*", "*Cars in Queue*" and "*Trucks in Queue*".

Total Vehicle Delay (Hours) is the vehicle minutes of delay converted to hours.

Vehicles Entering Queue is calculated by summing the values in the column "*Vehicles Added to Queue*" which does not count any vehicles that arrived when no queue existed.

Average Delay per Vehicle (Minutes) is calculated by dividing the total vehicle delay by the number of vehicles that entered the queue during the incident.

Maximum Queue Length is the maximum values from the columns "*Physical length of queue from incident*" and the maximum of the column "*Vehicles in Queue (End of Minute)*".

Average Queue Length is the average values from the columns "*Physical length of queue from incident*" and the maximum of the column "*Vehicles in Queue (End of Minute)*".

Incident Start and **Lanes Clear** times are known values for each incident.

Queue Dissipated is determined by adding rows (time) to the incident analysis spreadsheet until the number of "*Vehicles in Queue (End of Minute)*" is zero.

A separate spreadsheet was developed for each incident studied, which allowed flexibility to create each spreadsheet with the approach volumes, capacity, truck percentages, and changes in each of these factors specific to each incident. The separate modeling of each incident with incident-specific information provided the ability to determine the cost of each incident using a methodical approach instead of attempting to develop an “average cost per incident.”

4.1.1 Incident Analysis Assumptions

The assumptions and approaches described in this section were developed and used consistently during the analysis of each incident.

The project team discussed the major assumptions made during this study; the approaches taken were those that would produce the most conservative calculation of the benefit of the TRIP. The approaches underestimate the number of vehicles delayed during each incident, thereby creating a lower cost of the incident.

4.1.1.1 Approach Volumes

The hourly traffic volumes approaching each incident were determined using actual traffic counts from NaviGAtor. GDOT NaviGAtor detector stations are located approximately every one-third mile along the interstate. Data is collected and archived by the Georgia Institute of Technology (Georgia Tech) for other projects and was made available to this project. This data is not complete as many stations may not have reported for the day in question, or the data was not available for long periods of time.

For each incident, the NaviGAtor detectors directly upstream of the incident were identified and Georgia Tech queried their detector archive to provide hourly volumes from those detectors for:

- The day of the incident,
- One week prior to the incident (same day of week), and
- The equivalent dates in 2007 through 2010. The equivalent date from each year is the same day of week and week of the year. Corrections were made for holiday time frames to address the most similar day.

In most cases, the volumes from the prior week were used as the typical volume on that segment of interstate. If the prior week data was not available, the 2008, 2009, or 2010 NaviGAtor data (whichever was closest to the incident date and available) was used. The measured volumes were adjusted to the year of the incident using the growth/reduction of traffic as measured by the annual average daily traffic (AADT) data available from the GDOT OTD web site.

4.1.1.2 Available Capacity

The capacity of roadway depends upon a number of factors, including the number of available lanes, the number of lanes blocked, and the percentage of trucks in the traffic stream.

Research has shown that the capacity reduction of a lane blockage cannot be calculated as the ratio between the number of lanes blocked versus the number of available lanes. The effect of emergency vehicles, lane clearing activities, and the rubbernecking factor for passing drivers makes the capacity reduction greater than just the percentage of available lanes.

The *2000 Highway Capacity Manual* (*HCM*), provides guidance for a capacity reduction factor for up to three lanes of blockage. The 2006 URS report entitled *Benefit Analysis for the GDOT*

NaviGAtor Program[2] expanded this table by extrapolation to cover up to seven lanes of blockage. The capacity reduction factors used in this research are shown in Table 4.2.

Table 4.2: Capacity Reduction Factors (Percentage of Capacity Remaining)

Number of Lanes	Number of Lanes Blocked						
	1	2	3	4	5	6	7
2	0.35	0					
3	0.49	0.17	0				
4	0.58	0.25	0.13	0			
5	0.65	0.40	0.20	0.1	0		
6	0.71	0.50	0.25	0.17	0.08	0	
7	0.75	0.57	0.36	0.21	0.14	0.07	0
8	0.78	0.63	0.41	0.25	0.19	0.13	0.06

According to the *HCM*, the flow rate corresponding to capacity is 2250 passenger cars per hour per lane (pcphpl). A truck factor based on the hourly percent of trucks and a truck equivalent factor of 1.5 was calculated for each hour (based upon the hourly truck percentages from the GDOT OTD). Hourly truck percentages are obtained from the GDOT Office of Transportation Data. This factor is used to convert the capacity from passenger cars per hour per lane to the number of vehicles based on the percentage of trucks in the traffic stream. The truck factor is calculated as:

$$Truck\ Factor\ = \frac{1}{1 + (Percentage\ of\ Trucks * (1.5 - 1)}$$

Assuming a peak hour factor of 0.95, the available capacity is calculated as:

$$\begin{aligned} &Available\ Capacity \\ &\quad = 2{,}250 * Number\ of\ Lanes * Capacity\ Reduction\ Factor \\ &\quad * Truck\ Factor * Peak\ Hour\ Factor \end{aligned}$$

Figure 4.6 shows the available capacities calculated for the September 30, 2009 incident.

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[2] *Benefits Analysis for the Georgia Department of Transportation NaviGAtor Program*. URS.August 2006. GDOT Document Number NAV01-127 Revision 2.0

Figure 4.6: Available Capacities for September 30, 2009 Incident

Time	# of lanes	# of lanes blocked	Available capacity rate	Peak hour factor	Truck %	Truck factor	Available Capacity
13:32 - 13:37	3	1	0.49	0.95	9.55%	95.44%	2,999
13:37 - 14:00	3	2	0.17	0.95	9.55%	95.44%	1,040
14:00 - 14:07	3	2	0.17	0.95	8.96%	95.71%	1,043
14:07 - 14:24	3	3	0	0.95	8.96%	95.71%	0
14:24 - 14:28	3	2	0.17	0.95	8.96%	95.71%	1,043
14:28 - 14:50	3	3	0	0.95	8.96%	95.71%	0
14:50 - 14:56	3	2	0.17	0.95	8.96%	95.71%	1,043
14:56 - 15:00	3	1	0.49	0.95	8.96%	95.71%	3,007
15:00 - 15:06	3	1	0.49	0.95	8.14%	96.09%	3,019
15:06 - 16:00	3	0	1	0.95	8.14%	96.09%	6,162
16:00 - 17:00	3	0	1	0.95	7.13%	96.56%	6,192
17:00 - 18:00	3	0	1	0.95	6.24%	96.97%	6,218
18:00 - 19:00	3	0	1	0.95	6.48%	96.86%	6,211
19:00 - 20:00	3	0	1	0.95	7.06%	96.59%	6,194
20:00 - 21:00	3	0	1	0.95	7.51%	96.38%	6,180
21:00 - 22:00	3	0	1	0.95	7.52%	96.38%	6,180
22:00 - 23:00	3	0	1	0.95	7.90%	96.20%	6,169

4.1.1.3 Percentage of Trucks

The GDOT OTD web site provided measured hourly truck percentages on the interstate system in metropolitan Atlanta. All of the TRIP incidents lasted more than one hour so the percentage of trucks in the traffic stream changes dynamically over time throughout an incident. The percentage of trucks during a specific incident was determined by taking a weighted average of the truck percentages for the duration of the incident (from the beginning of the incident through the dissipation of the queue). Figure 4.7 shows the truck percentage calculation for the September 30, 2009 incident that started at 13:32 and cleared at 15:45.

Figure 4.7: Calculation of Truck Percentage for September 30, 2009 Incident

Time	Truck % 2009	Incident Duration	Vehicle Volumes	Trucks	
9/23/2009 0:00	11.43		0	0	
9/23/2009 1:00	15.06		0	0	
9/23/2009 2:00	18.21		0	0	
9/23/2009 3:00	19.75		0	0	
9/23/2009 4:00	21.09		0	0	
9/23/2009 5:00	14.58		0	0	
9/23/2009 6:00	9.59		0	0	
9/23/2009 7:00	7.48		0	0	
9/23/2009 8:00	8.12		0	0	
9/23/2009 9:00	10.2		0	0	
9/23/2009 10:00	10.78		0	0	
9/23/2009 11:00	10.69		0	0	
9/23/2009 12:00	10.09		0	0	
9/23/2009 13:00	9.55	47%	1112	106	
9/23/2009 14:00	8.96	100%	2388	214	
9/23/2009 15:00	8.14	75%	1901	155	
9/23/2009 16:00	7.13		0	0	
9/23/2009 17:00	6.24		0	0	
9/23/2009 18:00	6.48		0	0	
9/23/2009 19:00	7.06		0	0	
9/23/2009 20:00	7.51		0	0	
9/23/2009 21:00	7.52		0	0	
9/23/2009 22:00	7.9		0	0	
9/23/2009 23:00	9.13		0	0	
			5401	475	**8.8%**

4.1.1.4 Incidents on Ramps

Incidents that occurred on ramps presented a special set of challenges for calculating the impacts of such incidents. Entrance and exit ramps are not typically instrumented with vehicle detection like the mainline interstates. For the few ramps that are instrumented, the detectors are not easily identifiable for retrieving data from the Georgia Tech data archive. In addition to difficulties in determining traffic volumes, the impacts of ramp incidents on mainline traffic lanes is not typically documented in the NaviGAtor or TRIP logs.

Approaching traffic volumes on the ramps was calculated by determining the hourly traffic volumes on the mainline (from the NaviGAtor detector data) and factoring those hourly volumes by the ration of the ramp AADT and mainline AADT, available from the GDOT OTD web site. This provided an hourly distribution of traffic using the ramp.

Based on the NaviGAtor incident logs, the traffic impacts of ramp incidents depend upon whether the ramp was completely or partially closed during the incident. Of the 56 TRIP incidents that occurred on ramps, 47 were modeled. Thirty-four incidents involved total ramp closures, while 13 ramp incidents were partial closures. To determine the impacts of ramp incidents, the team made the following assumptions.

- **Ramp Completely Closed During Incident** – If the ramp was completely closed during an incident, it was assumed that the emergency responders would block the ramp with vehicles at the exit point from the interstate. At that time, the NaviGAtor changeable message signs would inform motorists that the ramp was closed. Typically, traffic on the mainline would not queue, but would be forced to find a different route to their destination. In reality, during a complete ramp closure, the emergency response vehicles would clear the ramp of vehicles by either letting them pass the incident on a shoulder, or back them down the ramp and re-direct them onto the mainline.

  For this analysis, the number of vehicles that could physically fit on the ramp (from the merge point from the mainline to the point of the incident) was assumed to be delayed on the ramp for the duration of the incident. The delay calculated for this small number of vehicles is a relatively small portion of the delay imposed upon all of the diverted traffic; therefore, the cost of these incidents is undervalued.

- **Ramp Partially Closed During Incident** – If the ramp was partially closed during the incident, it was assumed that traffic would queue on the mainline interstate as they approached the incident. This traffic was allowed to queue in the right-most lanes of the mainline in the same number of lanes as exists on the ramp. This assumption ignored any impacts to mainline through traffic, which lost the use of these lanes during the incident. This approach only calculated the delay on traffic that used the ramp, thereby underestimating the cost of the incident on the system.

4.2 Incident Cost Methodology

The calculations presented above provided delay data that could be used to determine the costs of each incident. The delay imposed upon the system has costs associated with the delay for the motorists involved, the extra emissions introduced into the environment, and the cost of extra fuel wasted.

4.2.1 Incident Cost Assumptions

The study team reviewed three documents to determine appropriate values for each of these factors. The documents reviewed were:

- *TRIP Research Summary* by Gresham, Smith and Partners, February 2010
- *Benefit Analysis for the GDOT NaviGAtor Program* by URS, August 2006
- *Road Ranger Benefit Cost Analysis* (Florida) by Center for Urban Transportation Research, November 2005[3]

The values used in this study are discussed in the following sections.

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[3] Road Ranger Benefit Cost Analysis. Center for Urban Transportation Research. November 2005

4.2.1.1 Cost of Delay

The cost of delay used in each report and the average value for each factor is shown in Table 4.3. The value of truck time varied significantly, so an average value of $69.49 was used for this analysis.

Table 4.3: Cost of Delay

Report	Value of a Person's Time ($/hr)	Vehicle Occupancy	Value of Truck Time ($/hr)
TRIP Research Summary	$ 13.75	1	$ 72.65
Benefit Analysis for the GDOT NaviGAtor Program	$ 17.23	1.16	$ 32.15
Road Ranger Benefit Cost Analysis	$ 13.45	1.5	$ 71.05
2009 Urban Transportation Mobility Report			$ 102.12
Average Value	**$ 14.81**	**1.22**	**$ 69.49**

The Atlanta Regional Commission uses different car occupancy rates for various types of trips. The occupancy rate is 1.08 for home-based work trips, which is the primary type of trip during peak hours. During off-peak hours, the occupancy rates are normally higher due to other types of trips, such as shopping and social, which often involve more than one person in a car. This study included both peak and off-peak travel and does not distinguish between traditional and high-occupancy vehicle (HOV) lanes. As such, an occupancy rate of 1.22 persons per passenger vehicles was determined to be an acceptable, yet conservative, occupancy rate for this study. Using the average cost of vehicle delay ($14.81) and an occupancy rate of 1.22, the cost of delay for passenger vehicles is $14.81 multiplied by 1.22 = $18.07 per vehicle per hour.

Rounding the average costs, the rates for vehicle delay used in this study were:

Passenger vehicles: **$18.07 per hour of delay**

Trucks: **$69.49 per hour of delay**

4.2.1.2 Cost of Emissions

Of the three reports quoted above, only the URS report, entitled *Benefit Analysis for the GDOT NaviGAtor Program,* included air pollution costs. The amount of vehicle emissions and associated costs used in the report are shown in Table 4.4.

Table 4.4: Cost of Emissions

Emission	Emission Rate (Tons per Vehicle Hour of Delay)	Cost per Ton
HC	0.000025676	$6,700
CO	0.00033868	$6,360
NOx	0.000036064	$12,875

These costs were used in this study. The cost for each pollutant type was calculated as:

$$Pollution\ Cost\ =\ Total\ Delay(vehicle\ hours) * \ Emission\ Rate\ * \ Unit\ Cost\ per\ Ton$$

4.2.1.3 Cost of Fuel

The three previously quoted reports used different approaches to determine fuel. Each of these approaches are summarized below:

- ***TRIP Research Summary*** – used an average fuel economy in congested conditions of 18.36 miles per gallon for all vehicles. The fuel consumption was calculated as vehicle miles traveled divided by average fuel economy.

- ***Benefit Analysis for the GDOT NaviGAtor Program*** – used a fuel economy of 21.5 miles per gallon for cars (quoted from a 2006 Environmental Protection Agency report) and 7 miles per gallon for trucks (quoted from a 2002 TRB report). Fuel consumption for cars and trucks was calculated separately using their specific consumption rates.

- ***Road Ranger Benefit Cost Analysis*** – used software called "Freeway Service Patrol Evaluation (FSPE)," developed by the University of California at Berkeley to assess delay and fuel consumption. The report included a brief description of the software, but did not provide detail about how delay and fuel consumption were calculated by the software.

The approach used in this study accounts for the number of trucks impacted by each incident based on the time and duration of the incident; therefore, separate fuel consumption rates can be used. The fuel economy rates used in the *Benefit Analysis for the GDOT NaviGAtor Program* report were employed in this study.

The web site www.GasBuddy.com provides reported costs of both regular and diesel fuel and can be queried by state to provide the lowest, average, and highest prices of fuel. The prices listed on January 17, 2011, are provided in Table 4.5. A gasoline price of $2.84 and a diesel price of $3.01 were used in this study.

Table 4.5: Cost of Fuel (Georgia)

	Regular Unleaded	Diesel
Lowest	$ 2.84 per gallon	$ 3.01 per gallon
Average	$ 3.00 per gallon	Not reported
Highest	$ 3.39 per gallon	$ 3.59 per gallon

The fuel cost calculation is shown below:

$$Fuel\ Cost\ = Miles\ of\ Travel\ *\ Percent\ of\ Trucks\ *\ \frac{Unit\ Diesel\ Price\ per\ gallon}{Truck\ Fuel\ Economy} + Miles\ of\ Travel\ *\ Percent\ of\ Cars * \frac{Unit\ Gas\ Price\ per\ gallon}{Car\ Fuel\ Economy}$$

Where:

Miles of Travel $= Total\ Delay\ (vehicle\ hours) *\ Average\ Speed\ (mph)$

Average Speed $= \frac{Average\ Queue\ Length\ in\ miles}{Average\ Delay\ per\ veh\ in\ hours}$

5 Benefits of TRIP

Cost calculations for delay, emissions, and fuel consumption were performed for each of the incidents modeled and documented in a summary spreadsheet. The spreadsheet results are included in Appendix A.

During the evaluation of incident costs, it became apparent that every incident is unique with its own set of spatial, temporal, and geographic characteristics. These intrinsic differences make it difficult to create direct comparisons between any two individual incidents, as it is difficult to find two incidents with the same amounts of approaching traffic, similar incident clearance timelines, or similar patterns of lane availability.

Table 5.1 shows the number of incidents modeled and their associated costs.

Table 5.1: Incident Costs

Year	TRIP Incidents	Incidents Modeled	Total Cost of Modeled Incidents	Average Cost of Modeled Incident
2007 (Before TRIP)	24	19	$ 12,218,517	$ 643,080
2008	59	46	$ 9,710,454	$ 211,097
2009	51	48	$ 7,854,812	$ 163,641
2008 and 2009 (With TRIP)	110	94	$ 17,565,266	$ 186,864

Using TRIP reduces incident cost an average of 71 percent when compared to the pre-TRIP experience of 2007. This significant decrease in the impacts of these incidents after the implementation of TRIP is attributable to the quick clearance of the roadways. The faster clearance of the roadway creates a measurable reduction in the vehicle hours of delay imposed by an incident with an average savings of $456,216 per incident.

The goal of TRIP, to reduce the clearance time of large incidents, has a direct benefit of reducing the cost of these incidents in terms of lost time, wasted fuel, and excess emissions.

5.1 Comparison of Incident Timelines

Two timestamps were used in this study to determine the clearance time of an incident ─ the incident start time and all lanes clear time. These timestamps are well documented in the TRIP logs and the NaviGAtor logs for the 2007 incidents. They provide documentation for the amount of time each incident blocked the roadway.

During the review of each incident, the following attributes were documented to provide a quick summary for each incident. These attributes are:

- Number of Trucks – The number of large vehicles involved in the incident.
- Number of Cars – The number of passenger vehicles involved in the incident.

- Overturn – The truck overturned during the incident.
- Spilled Load – The truck spilled its load during the incident.
- Spilled Fuel – The truck spilled fuel (from the tractor's fuel tanks) during the incident.
- Fire – A fire was involved that required the fire department to respond.
- HAZMAT – Hazardous materials spilled during the incident requireing HAZMAT response.
- Injury – The number of injuries incurred during the incident.
- Fatality – The number of fatalities incurred during the incident.

Incidents involving a few vehicles with an overturned truck, a spilled load, some spilled fuel, and minor or few injuries are "**typical**" incidents that allow GDOT and the TRIP operators to quickly respond and clear the roadway.

During incidents involving fire, HAZMAT, serious or multiple injuries, or fatalities, the work effort to clear the incident from the roadway increased dramatically. These events required additional resources from other departments and agencies to respond to assist with the incident clean up or investigation. During these incidents, GDOT and the TRIP operator must wait until all other agencies give the go-ahead for cleanup. Each incident involving any of these factors was labeled as "**atypical,**" and was removed from the comparison of TRIP and pre-TRIP incident timelines.

The summary of the incident timelines for all of the incidents is shown in Appendix B. The average duration for each incident was determined by calculating the standard deviation of incident durations and removing outliers that were more than one standard deviation from the mean incident duration. Table 5.2 summarizes the incident durations for each year of the study.

Table 5.2: Duration of Incidents

Year	Average Duration (Excluding Outliers)	
	All Incidents	"Typical" Incidents
2007 (pre-TRIP)	4 hours 43 minutes	4 hours 52 minutes
2008	1 hour 58 minutes (58% improvement from 2007)	1 hour 35 minutes (67% improvement from 2007)
2009	1 hour 37 minutes (66% improvement from 2007)	1 hour 30 minutes (69% improvement from 2007)

TRIP is clearing the roadway in less than half the time it used to take to clear similar incidents. The significant improvement in clearance time is directly responsible for the 71 percent reduction in the average costs of these incidents since the program's inception.

5.2 TRIP Benefits

Comparing the costs of 2007 incidents directly to 2008 and 2009 incidents was determined to be unrealistic due to the unique characteristics of each incident being studied. This study calculated the benefit of TRIP for each incident in 2008 and 2009 by:

1) Determining the cost of the incident using the actual timeline (with TRIP).
2) Creating a hypothetical timeline for the same incident and determining the cost of the incident (without TRIP).
3) Comparing the difference in cost of the incident with and without TRIP to determine the benefits of the program.

The hypothetical clearance timeline was determined by adding one hour of roadway blockage to each 2008 and 2009 incident. This approach allowed the characteristics of each incident to be used to determine the cost of the incident with TRIP (the actual timeline) and without TRIP (the extended timeline). Table 5.1 shows that TRIP saved more than 165 minutes of clearance time, on average, per incident; however, to utilize the most conservative approach. This study only assumed a 60-minute time savings.

Table 5.3 shows the actual and "extended" timeline for the September 30, 2009 incident.

Table 5.3: Lanes Blocked during September 30, 2009 Incident

Time (actual)	Description	Time (Extended)
13:32	1 of 3 lanes blocked.	13:32
13:37	2 of 3 lanes blocked	13:37
14:07	3 of 3 lanes blocked for wrecker maneuvers	14:07
14:24	2 of 3 lanes blocked	14:24
14:28	3 of 3 lanes blocked for wrecker maneuvers	14:28
14:50	2 of 3 lanes blocked	14:50
14:56	1 of 3 lanes blocked	14:56
15:06	Lanes clear	**16:06**

In a further effort to remain conservative, the study evaluated the value of TRIP if a 30-minute savings in clearance time was considered. This assumes a worst case scenario that a TRIP operator will only save 30 minutes of clearance time on each incident. This scenario will provide an extremely low confidence bound for the effectiveness of the program.

This cost of the "extended" timeline was compared to the cost of the actual incident with the difference being the benefit of TRIP for that incident.

$$Benefit\ of\ TRIP = Cost\ of\ Incident\ (extended\ timeline) - Cost\ of\ Incident\ (actual\ timeline)$$

Table 5.4 summarizes the findings for the benefit of the TRIP for the September 30, 2009 incident.

Table 5.4: Benefit of TRIP for September 30, 2009 Incident

Timeline Description	Incident Timeline			Total Delay (Veh Hrs)	Incident Costs				Benefit of TRIP
	Incident Start	All Lanes Clear	Queue Cleared		Delay	Fuel	Emission	Total	
Actual Timeline	13:32	15:06	15:45	2639.0	$59,610.03	$1,486.49	$7,363.92	$68,460.44	Baseline
30 Minute Extension	13:32	15:36	16:11	3613.0	$81,250.21	$2,115.89	$10,081.79	$93,447.89	**$24,987.45**
60 Minute Extension	13:32	16:06	16:39	4527.5	$101,246.36	$2,674.15	$12,633.63	$116,554.15	**$48,093.70**

Each of the 2008 and 2009 incidents were run with an "extended" timelines and the results were documented in a summary spreadsheet. This summary spreadsheet is included in Appendix C. The benefits calculated for several TRIP activations were removed from the final total of benefits as the incidents were ones where the TRIP operator was not used, or in instances where the TRIP operator did not get paid due to not meeting the criteria for quick opening of the roadway. These incidents were not removed from the cost of the program.

The benefits for 72 of the 110 TRIP activations in 2008 and 2009 were used to determine the benefit of TRIP. The average benefit of these 72 incidents was $127,145.

Table 5.5 summarizes the benefits of TRIP.

Table 5.5: Benefit of TRIP

	60 Minute Extensions	30 Minute Extensions
Benefit of TRIP	$9,154,430.63	$4,462,567.05
Cost of TRIP	$835,000	
Benefit-Cost Ratio	**10.96 to 1**	**5.34 to 1**

The benefit-cost ratios calculated for this program are conservative estimates of the value of the program. Some of the reasons that the benefits of TRIP are higher than this study suggests are:

- The cost of the program used in the benefit-cost calculation included the administrative costs for the program through December 2010, but only the benefits for 2008 and 2009 were included.
- TRIP benefits from 72 incidents were included in the benefit-cost calculation. The costs of all 110 incidents were included in the program costs.
- The modeling assumptions used to analyze each incident were developed to underestimate the impact of the incident, thus lowering the calculated benefit of the quick clearance of the incident.

5.3 Non-Monetary Benefits of TRIP

The implementation of TRIP has created an environment where the towing and recovery operator is a valued team member at an incident scene. The towing company employees were historically seen as "by-the-hour" guys that were more interested in logging hours to bill the insurance and freight companies than in actually getting the roadway opened. TRIP encourages these operators to use their expertise to assist the public agencies in getting the roadway opened as quickly as possible.

TRIP is managed by the GDOT HERO unit. As part of this study, the HERO operators were asked for their thoughts of TRIP. Some of their replies are listed here:

> *"The TRIP program stresses the primary goal of opening travel lanes. This becomes well known by all the responders and even if they don't say it they know 'someone is watching' and avoid un-necessary activity and try to reduce closure time."*
>
> *"Obviously they want the bonus. However, because of the AIR they do not want to fail or screw up. There is a sense of competition between the guys and they don't want to be the one called out. They want to be the one praised for a job well done."*
>
> *"Fire Rescue personnel feel secure working with TRIP operators and will frequently utilize them to assist with extrication and even fuel tank securement."*
>
> *"The TRIP program has a way of responders willing to assist each other with tasks that are outside their normal role. There is just more of an atmosphere of cooperation all the way around."*
>
> *"The professional wrecker companies want the standard raised in their profession. They want to be accepted as team member with the emergency responders. TRIP raises the bar. Because of that, they are being accepted as a team member. They are now meeting and training together."*
>
> *"The right, well maintained and well operated equipment shows up on the scene."*
>
> *"As emergency responders (police and fire) became more experienced in working with TRIP companies, they became more receptive to more aggressive clearing techniques. They realized that the TRIP companies knew what they were doing and did it in a safe manner. The responders began to trust the TRIP companies."*

The conclusion derived from these comments is that TRIP provides a sense of purpose for responders. The towing operator is rewarded for assisting the quick clearance of the incident and responding with the right equipment and qualified operators that can open the road as safely and quickly as possible.

TRIP provides a unique incentive to the towing operators and the After Incident Review process allows the public and private agencies to review and refine procedures for future incidents. The results of this process have been a 71 percent reduction in the average incident cost since the implementation of TRIP.

5.4 Accident Experience

One of the goals of quick clearance initiatives such as TRIP is to minimize the exposure to secondary incidents by limiting the amount of time that vehicles are standing still (queued) on the interstate. The queuing models developed for each incident provide an estimate of the queue length and duration of the queue for each incident. The following data points were used to query the NaviGAtor incident logs to determine how many possible secondary incidents may have occurred during each of the TRIP (and pre-TRIP) incidents studied.

- Incident Start Time
- Queue Clear Time
- Maximum Queue Length (ft)

These parameters allowed GDOT TMC staff to query the NaviGAtor database and attempt to identify incidents that occurred within the traffic queue of each incident. The NaviGAtor database allows the incident logs to be sorted by Interstate, County, Date, and Time. From this initial sorting of incidents, the NaviGAtor incident log for each possible secondary incident had to be read individually to determine if the incident:

1) was within the physical boundaries of the queue;
2) occurred between the incident start and queue clear times; and
3) was an accident or a stall.

Table 5.6 presents the summary of secondary incidents that were found during this study.

Table 5.6: Secondary Incidents

Year	Total NaviGAtor Incident Logs	TRIP Incidents	Accidents in Incident Queue	Stalls in Incident Queue
2007	32,610	24	0	9
2008	51,684	59	5	18
2009	55,503	51	5	19

The secondary accidents found during this study do not prove, nor disprove the generally accepted theory that queues of stopped vehicles create a hazard that will result in secondary incidents. The data indicates an extreme difference in the number of incidents recorded within NaviGAtor between 2007 and 2008. The data presented above indicates that additional work to define and interpret the data to find secondary incidents may be needed. Non-linear statistical models need to be developed in future studies to better explain the spatial and temporal characteristics of secondary incidents before concrete recommendations can be made.

Several factors make the secondary incident data subject to further questioning, such as:

- During 2007, the TMC staff was transitioning from a mix of GDOT and private employees to completely private. After this transition, aggressive training, process management, and quality assurance practices have been put in place within the TMC. This may have an impact on the numbers of incidents reported, and how they are described in the NaviGAtor log.

- The NaviGAtor software does not allow for an incident to be easily characterized as secondary to another incident. In some cases the TMC operator will add a comment in the log that the incident is related to a separate NaviGAtor incident, but this practice appeared to be inconsistent in the early logs. The NaviGAtor software is currently being replaced and the new software provides a specific "check-box" that allows an operator to document an incident as a secondary.

The secondary incident information found in this study can be useful in future studies, but the information on the reduction in secondary accidents attributed to TRIP is inconclusive, as the pattern shown is inconsistent with typical expectations. This could be due to the dynamic nature of secondary incidents and could be remedied in the future by developing a statistical model that accounts for the temporal and spatial characteristics of secondary incidents. Furthermore, there are some existing data quality issues that could inhibit identification of secondary incidents.

6 CONCLUSIONS

TRIP has cost $835,000 from its inception through the end of 2010. This includes $284,000 in monetary incentives paid to TRIP operators and $551,000 in management and administrative costs from inception through November 2010. During 2008 and 2009, TRIP was activated for 110 incidents.

Prior to TRIP it required an average of 283 minutes from the beginning of an incident to open the roadway. During the first year of TRIP (2008), the average clearance time dropped 58 percent to 118 minutes. In 2009, the roadway was opened in 97 minutes, a 66 percent improvement.

This study calculated the value of TRIP by calculating the actual cost of each TRIP incident in 2008 and 2009. These actual costs were compared with the first alternative, which assumes it would have taken 60 minutes longer to open the lane. The addition of 60 minutes to the actual incident timelines is a conservative approach to calculating the cost of the incident as the data shows that, on average, TRIP saved more than 165 minutes. Assuming a 60-minute savings, the value of TRIP is $9,154,431, giving a benefit-to-cost ratio of 10.98 to 1. Using a more conservative scenario, the second alternative assumes that TRIP provided only 30 minutes of savings in clearing the lanes. Even with this extremely conservative approach, the value of TRIP is $4,462,567 with a benefit-to-cost ratio of 5.35 to 1.

In addition to the monetary benefits of the program, TRIP ensures that qualified operators respond to the incident scene with trained staff, the appropriate equipment, and a desire to do the job right and open the road quickly. The value of these other benefits should not be overlooked when reviewing the benefits of the program

TRIP provides a direct method to minimize the number of hours of delay imposed upon the public due to large incidents. The costs of the program are extremely small when compared to the value of time, wasted fuel, and excess emissions that it helps to avoid.

APPENDIX A

Cost of Incidents

2007 Cost of Incidents

Trip Activation	Incident Date	Vehicle Hours of Delay			Delay	Average Queue		Incident Timeline				Fuel Consumed (gal)		Emissions (Tons)			Delay Costs			
		All	Cars	Trucks	Minutes per vehicle	Feet	Vehicles	T3: Incident Start (time)	T5: All Lanes Clear (time)	Queue Cleared (time)	Percent of Trucks	Cars	Trucks	HC	CO	NOx	Delay	Fuel	Emissions	Total
2007-01	Friday, January 05, 2007	992.1	847.5	144.6	503.5	3,012	93	19:59	6:33	6:36	14.6%	2.7	1.4	0.025	0.336	0.036	$ 25,361.05	$ 11.84	$ 2,768.38	**$ 28,141.27**
2007-02	Tuesday, February 13, 2007	238.0	197.2	40.8	12.1	159	24	22:59	4:15	4:15	17.1%	1.4	0.9	0.006	0.081	0.009	$ 6,398.24	$ 6.50	$ 664.12	**$ 7,068.87**
2007-03	Friday, March 02, 2007	3,490.0	3,101.1	388.9	33.0	4,523	748	5:49	10:17	10:17	11.1%	224.8	86.2	0.090	1.182	0.126	$ 83,055.96	$ 897.76	$ 9,738.57	**$ 93,692.29**
2007-04	Monday, March 12, 2007	555.0	488.5	66.5	27.3	2,389	154	6:32	12:03	12:03	12.0%	22.6	9.5	0.014	0.188	0.020	$ 13,447.40	$ 92.63	$ 1,548.68	**$ 15,088.72**
2007-05	Monday, March 12, 2007	3,997.1	3,543.7	453.4	29.2	7,005	1,370	13:38	16:15	16:31	11.3%	449.5	175.9	0.103	1.354	0.144	$ 95,535.05	$ 1,806.17	$ 11,153.59	**$ 108,494.81**
2007-06	Friday, March 30, 2007	982.7	864.6	118.2	13.7	1,517	211	12:10	15:26	15:27	11.2%	51.1	19.8	0.025	0.333	0.035	$ 23,835.48	$ 204.59	$ 2,742.15	**$ 26,782.22**
2007-07	Monday, April 09, 2007							11:26	14:40								$ -	$ -	$ -	**$ -**
2007-08	Tuesday, April 10, 2007																			
2007-09	Tuesday, April 10, 2007	445.4	386.5	58.9	6.5	1,729	151	9:13	12:05	12:09	13.2%	54.4	25.4	0.011	0.151	0.016	$ 11,076.32	$ 230.78	$ 1,242.85	**$ 12,549.96**
2007-10	Monday, April 16, 2007																			
2007-11	Friday, April 27, 2007	1,582.4	1,405.0	177.4	67.7	4,895	318	11:19	16:08	16:16	11.2%	53.7	20.8	0.041	0.536	0.057	$ 37,713.35	$ 215.12	$ 4,415.56	**$ 42,344.03**
2007-12	Monday, June 04, 2007	379.5	346.9	32.6	88.1	2,254	154	16:13	23:21	23:21	8.6%	4.7	1.4	0.010	0.129	0.014	$ 8,533.23	$ 17.40	$ 1,058.96	**$ 9,609.60**
2007-13	Tuesday, June 05, 2007	164,996.1	147,288.7	17,707.4	177.5	28,337	10,321	7:12	16:27	23:10	10.7%	12432.5	4575.4	4.236	55.883	5.950	$ 3,891,728.92	$ 49,080.44	$ 460,408.68	**$ 4,401,218.04**
2007-14	Friday, June 08, 2007	91,800.3	81,741.5	10,058.9	118.7	16,627	5,053	3:02	16:09	21:11	11.0%	6048.9	2296.3	2.357	31.092	3.311	$ 2,175,914.73	$ 24,090.58	$ 256,161.54	**$ 2,456,166.85**
2007-15	Tuesday, June 19, 2007	8,815.7	8,007.8	807.8	46.8	14,185	2,011	14:37	18:37	18:59	9.2%	1282.3	399.1	0.226	2.986	0.318	$ 200,820.55	$ 4,843.06	$ 24,599.52	**$ 230,263.13**
2007-16	Monday, July 16, 2007	1,182.4	1,031.4	151.0	17.5	2,001	191	19:50	1:35	1:35	12.8%	62.3	28.1	0.030	0.400	0.043	$ 29,128.53	$ 261.53	$ 3,299.39	**$ 32,689.45**
2007-17	Wednesday, July 18, 2007																			
2007-18	Tuesday, July 24, 2007	120,486.0	106,951.6	13,534.5	289.7	40,451	11,832	18:50	0:40	4:59	11.2%	7896.0	3058.8	3.094	40.807	4.345	$ 2,872,935.30	$ 31,631.81	$ 336,206.74	**$ 3,240,773.85**
2007-19	Thursday, July 26, 2007	17,519.5	15,623.5	1,896.0	29.4	19,903	2,485	10:40	15:49	17:42	10.8%	5591.6	2079.4	0.450	5.934	0.632	$ 414,041.56	$ 22,139.13	$ 48,886.79	**$ 485,067.48**
2007-20	Saturday, July 28, 2007	93.6	81.3	12.3	3.8	101	19	21:43	2:04	2:04	13.1%	1.1	0.5	0.002	0.032	0.003	$ 2,323.67	$ 4.84	$ 261.18	**$ 2,589.69**
2007-21	Monday, July 30, 2007																			
2007-22	Friday, August 03, 2007	7,403.6	6,592.4	811.2	38.1	8,483	1,670	11:57	16:09	16:22	11.0%	775.4	294.4	0.190	2.508	0.267	$ 175,483.09	$ 3,088.21	$ 20,659.17	**$ 199,230.47**
2007-23	Wednesday, August 22, 2007	8,515.0	6,932.3	1,582.7	94.1	14,949	1,744	22:05	4:34	4:34	18.6%	582.0	408.5	0.219	2.884	0.307	$ 235,236.01	$ 2,882.27	$ 23,760.44	**$ 261,878.71**
2007-24	Friday, August 31, 2007	7.0	6.1	0.9	0.6	25	2	4:17	7:11	7:12	12.9%	0.1	0.1	0.000	0.002	0.000	$ 172.76	$ 0.57	$ 19.53	**$ 192.86**
2007-25	Tuesday, September 04, 2007	2,496.9	2,216.4	280.5	6.7	2,919	485	4:27	7:40	9:35	11.2%	510.6	197.8	0.064	0.846	0.090	$ 59,538.30	$ 2,045.35	$ 6,967.40	**$ 68,551.05**
2007-26	Friday, September 07, 2007	12,887.4	11,369.4	1,518.0	31.2	14,249	2,569	5:55	9:15	10:54	11.8%	2743.7	1127.4	0.331	4.365	0.465	$ 310,910.41	$ 11,185.83	$ 35,961.28	**$ 358,057.52**
2007-27	Wednesday, September 12, 2007	5,081.0	4,546.3	535.0	26.2	12,686	1,773	5:26	13:18	13:18	10.5%	1163.8	419.4	0.130	1.721	0.183	$ 119,320.61	$ 4,567.42	$ 14,178.13	**$ 138,066.16**

Cost of Incidents: 2007 **$ 12,218,517.04**

2008 Cost of Incidents

Trip Activation	Incident Date	Vehicle Hours of Delay			Delay	Average Queue		Incident Timeline			Percent of Trucks	Fuel Consumed (gal)		Emissions (Tons)			Delay Costs			
		All	Cars	Trucks	Minutes per vehicle	Feet	Vehicles	T3: Incident Start (time)	T5: All Lanes Clear (time)	Queue Cleared (time)		Cars	Trucks	HC	CO	NOx	Delay	Fuel	Emissions	Total
1	Sunday, January 13, 2008	54.6	47.8	6.7	41.7	614	39	10:35	11:55	11:57	12.3%	0.4	0.2	0.001	0.018	0.002	$ 1,331.41	$ 1.54	$ 152.24	**$ 1,485.19**
2	Wednesday, January 16, 2008	915.0	832.4	82.6	5.9	4,559	549	7:22	7:39	9:01	9.0%	340.1	103.3	0.023	0.310	0.033	$ 20,779.84	$ 1,276.71	$ 2,553.24	**$ 24,609.79**
3	Tuesday, January 22, 2008																			
4	Sunday, February 24, 2008	184,536.2	166,835.1	17,701.2	229.9	32,891	10,802	6:23	19:45	23:27	9.6%	12614.4	4114.4	4.738	62.501	6.655	$ 4,244,466.34	$ 48,209.38	$ 514,933.80	**$ 4,807,609.52**
5	Tuesday, March 04, 2008	118.4	104.6	13.8	3.1	1,129	70	11:32	13:10	13:11	11.6%	20.1	8.1	0.003	0.040	0.004	$ 2,847.64	$ 81.67	$ 330.36	**$ 3,259.67**
6	Wednesday, March 05, 2008	110.1	98.6	11.5	1.2	489	83	5:15	6:15	6:19	10.4%	21.2	7.6	0.003	0.037	0.004	$ 2,580.66	$ 83.14	$ 307.23	**$ 2,971.03**
7	Wednesday, March 05, 2008	2,310.6	2,143.5	167.1	26.5	12,367	1,540	16:34	17:37	18:03	7.2%	528.9	126.0	0.059	0.783	0.083	$ 50,340.97	$ 1,881.43	$ 6,447.55	**$ 58,669.95**
8	Thursday, April 10, 2008	18,982.7	17,480.3	1,502.4	50.9	33,255	4,706	17:37	19:17	21:38	7.9%	6037.2	1590.5	0.487	6.429	0.685	$ 420,239.33	$ 21,933.17	$ 52,969.74	**$ 495,142.23**
9	Wednesday, April 23, 2008	94.8	87.0	7.8	52.5	760	52	18:52	20:39	20:40	8.2%	0.7	0.2	0.002	0.032	0.003	$ 2,113.96	$ 2.44	$ 264.53	**$ 2,380.93**
10	Thursday, May 01, 2008	177.4	159.3	18.1	51.5	2,189	152	13:54	15:02	15:03	10.0%	3.6	1.2	0.005	0.060	0.006	$ 4,136.03	$ 13.87	$ 495.02	**$ 4,644.93**
11	Wednesday, May 14, 2008							18:49	19:46											
12	Friday, May 16, 2008	116.7	106.5	10.2	28.5	2,057	140	7:27	8:13	8:16	8.7%	4.1	1.2	0.003	0.040	0.004	$ 2,633.06	$ 15.12	$ 325.64	**$ 2,973.83**
13	Friday, June 06, 2008	154.6	137.4	17.2	26.3	1,751	115	12:31	13:50	13:51	11.1%	4.8	1.9	0.004	0.052	0.006	$ 3,677.80	$ 19.32	$ 431.40	**$ 4,128.52**
14	Thursday, June 12, 2008							2:42	3:51											
15	Thursday, June 12, 2008							5:39	6:46											
16	Monday, June 16, 2008	154.6	136.4	18.2	7.8	560	41	4:41	7:55	7:55	11.8%	5.2	2.1	0.004	0.052	0.006	$ 3,729.22	$ 21.09	$ 431.40	**$ 4,181.71**
17	Saturday, June 21, 2008	176.2	157.9	18.2	113.2	1,204	40	5:27	9:49	9:51	10.4%	0.9	0.3	0.005	0.060	0.006	$ 4,121.29	$ 3.47	$ 491.63	**$ 4,616.39**
18	Sunday, June 22, 2008	24,700.1	22,771.1	1,929.1	75.7	26,285	5,058	15:37	18:31	20:29	7.8%	4179.5	1086.0	0.634	8.366	0.891	$ 545,485.95	$ 15,138.50	$ 68,923.69	**$ 629,548.14**
19	Monday, June 23, 2008	35,681.1	32,853.4	2,827.7	100.6	24,120	5,947	15:16	17:51	21:15	7.9%	4164.4	1097.1	0.916	12.085	1.287	$ 790,098.67	$ 15,129.40	$ 99,565.31	**$ 904,793.39**
20	Tuesday, July 01, 2008	2,864.4	2,627.7	236.7	18.3	6,524	859	18:29	21:43	21:48	8.3%	494.9	137.6	0.074	0.970	0.103	$ 63,926.09	$ 1,819.76	$ 7,992.88	**$ 73,738.73**
21	Wednesday, July 09, 2008							14:46	16:34											
22	Thursday, July 10, 2008	6,017.7	5,498.6	519.1	27.9	14,942	2,028	14:24	16:15	17:21	8.6%	1556.9	449.9	0.155	2.038	0.217	$ 135,422.06	$ 5,775.90	$ 16,791.92	**$ 157,989.89**
23	Saturday, July 12, 2008							8:04	10:19											
24	Wednesday, July 30, 2008	7,231.4	6,599.7	631.7	33.0	9,166	2,028	19:40	21:51	22:35	8.8%	968.2	286.9	0.186	2.449	0.261	$ 163,141.53	$ 3,613.36	$ 20,178.65	**$ 186,933.54**
25	Thursday, July 31, 2008	4,163.1	3,757.2	405.9	17.9	10,030	1,343	13:14	15:03	16:19	9.7%	1113.3	367.3	0.107	1.410	0.150	$ 96,091.83	$ 4,267.57	$ 11,616.80	**$ 111,976.21**
26	Thursday, July 31, 2008	5,660.6	5,179.1	481.6	45.8	19,104	2,633	19:23	20:38	21:31	8.5%	1141.9	325.8	0.145	1.917	0.204	$ 127,043.40	$ 4,223.62	$ 15,795.46	**$ 147,062.48**
27	Saturday, August 02, 2008							9:45	11:21											
28	Saturday, August 09, 2008	4,127.7	3,634.0	493.6	23.7	4,834	935	9:00	13:06	13:24	12.0%	391.6	164.0	0.106	1.398	0.149	$ 99,960.10	$ 1,605.77	$ 11,518.02	**$ 113,083.90**
29	Wednesday, August 20, 2008							4:51	8:02											
30	Wednesday, August 20, 2008							7:16	9:06											
31	Wednesday, August 20, 2008	1,587.7	1,404.7	183.0	21.8	7,476	972	8:37	10:13	10:14	11.5%	254.7	101.6	0.041	0.538	0.057	$ 38,097.07	$ 1,029.27	$ 4,430.35	**$ 43,556.69**
32	Wednesday, August 20, 2008	183.0	165.6	17.3	63.1	1,877	126	14:24	15:48	15:50	9.5%	2.6	0.8	0.005	0.062	0.007	$ 4,194.27	$ 9.92	$ 510.65	**$ 4,714.84**
33	Tuesday, August 26, 2008	755.2	652.3	102.8	45.3	2,469	213	3:22	6:26	6:40	13.6%	18.8	9.1	0.019	0.256	0.027	$ 18,929.46	$ 80.74	$ 2,107.33	**$ 21,117.52**
34	Tuesday, August 26, 2008	612.8	1,412.9	199.9	14.9	8,144	1,052	10:09	11:07	11:40	12.4%	155.1	67.4	0.016	0.208	0.022	$ 39,419.61	$ 643.37	$ 1,709.97	**$ 41,772.95**
35	Tuesday, August 26, 2008							11:23	12:14											
36	Tuesday, August 26, 2008	12,787.6	11,721.5	1,066.1	59.8	14,650	2,051	18:38	21:24	22:03	8.3%	1518.4	422.1	0.328	4.331	0.461	$ 285,869.70	$ 5,582.67	$ 35,682.80	**$ 327,135.17**
37	Tuesday, September 02, 2008	49.4	43.2	6.2	43.7	1,031	33	4:57	6:25	6:26	12.6%	0.5	0.2	0.001	0.017	0.002	$ 1,211.38	$ 2.25	$ 137.85	**$ 1,351.48**
38	Wednesday, September 03, 2008	10,757.2	9,832.8	924.4	49.6	15,949	2,144	13:27	15:20	18:26	8.6%	1671.0	482.9	0.276	3.643	0.388	$ 241,896.61	$ 6,199.39	$ 30,017.12	**$ 278,113.12**
39	Friday, September 05, 2008	54.3	48.5	5.8	104.0	727	24	12:32	14:47	14:47	10.7%	0.2	0.1	0.001	0.018	0.002	$ 1,279.35	$ 0.71	$ 151.52	**$ 1,431.58**
40	Saturday, September 06, 2008							11:46	13:13											
41	Monday, September 08, 2008	2,787.5	2,577.1	210.4	28.5	13,583	1,002	15:56	18:00	18:42	7.5%	649.5	161.8	0.072	0.944	0.101	$ 61,184.25	$ 2,331.48	$ 7,778.30	**$ 71,294.03**
42	Monday, September 15, 2008	659.0	489.9	69.1	15.5	945	94	22:16	5:14	5:17	10.5%	19.0	6.8	0.017	0.223	0.024	$ 13,653.37	$ 74.59	$ 1,838.89	**$ 15,566.85**
43	Tuesday, September 23, 2008	983.5	883.6	99.8	108.5	3,170	228	6:06	10:21	10:24	10.2%	13.6	4.8	0.025	0.333	0.035	$ 22,900.16	$ 53.05	$ 2,744.38	**$ 25,697.60**
44	Saturday, September 27, 2008	16,726.0	14,841.8	1,884.3	41.4	13,430	3,014	9:55	11:55	15:27	11.3%	2543.7	995.3	0.429	5.665	0.603	$ 399,104.62	$ 10,220.11	$ 46,672.59	**$ 455,997.32**
45	Wednesday, October 01, 2008	14,968.4	13,544.3	1,424.1	34.4	19,912	2,673	11:55	15:45	17:29	9.5%	4144.4	1336.2	0.384	5.070	0.540	$ 343,681.83	$ 15,792.02	$ 41,768.15	**$ 401,242.00**
46	Tuesday, October 21, 2008	128.1	112.2	15.9	63.8	1,289	83	10:07	11:38	11:39	12.4%	1.2	0.5	0.003	0.043	0.005	$ 3,132.14	$ 4.97	$ 357.45	**$ 3,494.57**
47	Thursday, October 23, 2008	1,716.6	1,536.8	179.9	7.4	3,929	858	5:21	6:44	7:20	10.5%	431.1	155.4	0.044	0.581	0.062	$ 40,268.46	$ 1,692.07	$ 4,790.04	**$ 46,750.57**
48	Friday, October 24, 2008	3,879.7	3,501.7	378.0	28.5	6,791	916	5:15	7:01	7:59	9.6%	441.7	144.1	0.100	1.314	0.140	$ 89,536.64	$ 1,688.10	$ 10,826.00	**$ 102,050.74**
49	Saturday, October 25, 2008	179.9	160.0	19.9	123.4	1,282	42	11:02	15:16	15:18	11.1%	0.9	0.3	0.005	0.061	0.006	$ 4,273.76	$ 3.51	$ 502.00	**$ 4,779.27**
50	Monday, October 27, 2008	2,394.9	2,184.9	209.9	21.8	9,755	887	14:28	16:09	17:09	8.8%	516.6	153.1	0.061	0.811	0.086	$ 54,063.16	$ 1,927.88	$ 6,682.78	**$ 62,673.82**
51	Saturday, November 15, 2008							4:30	7:50											
52	Tuesday, November 18, 2008							17:38	0:56											
53	Saturday, November 29, 2008	224.6	182.4	42.2	18.8	916	110	0:42	2:43	2:43	18.8%	4.7	3.3	0.006	0.076	0.008	$ 6,228.12	$ 23.39	$ 626.73	**$ 6,878.24**
54	Wednesday, December 03, 2008	39.9	36.0	3.9	42.5	554	19	13:52	15:59	16:00	9.7%	0.2	0.1	0.001	0.014	0.001	$ 921.47	$ 0.95	$ 111.34	**$ 1,033.76**
55	Friday, December 05, 2008	107.8	94.5	13.4	56.2	748	72	9:43	11:11	11:12	12.4%	0.7	0.3	0.003	0.037	0.004	$ 2,638.61	$ 2.76	$ 300.81	**$ 2,942.17**
56	Wednesday, December 10, 2008	1,093.2	977.5	115.7	14.6	6,133	810	13:27	14:32	14:47	10.6%	217.0	79.0	0.028	0.370	0.039	$ 25,701.66	$ 854.10	$ 3,050.49	**$ 29,606.25**
57	Friday, December 12, 2008	63.1	57.3	5.9	39.6	1,182	40	14:43	16:15	16:17	9.3%	0.9	0.3	0.002	0.021	0.002	$ 1,445.30	$ 3.42	$ 176.08	**$ 1,624.79**
58	Thursday, December 18, 2008	155.7	127.2	28.5	7.5	625	77	3:47	5:47	5:47	18.3%	5.6	3.9	0.004	0.053	0.006	$ 4,278.74	$ 27.51	$ 434.47	**$ 4,740.72**
59	Sunday, December 28, 2008	482.3	425.9	56.4	6.9	966	125	7:45	9:51	9:55	11.7%	31.5	12.8	0.012	0.163	0.017	$ 11,614.48	$ 128.10	$ 1,345.82	**$ 13,088.40**

Cost of Incidents: 2008 **$ 9,710,454.40**

2009 Cost of Incidents

Trip Activation	Incident Date	Vehicle Hours of Delay			Delay	Average Queue		Incident Timeline			Percent of Trucks	Fuel Consumed (gal)		Emissions (Tons)			Delay Costs			
		All	Cars	Trucks	Minutes per vehicle	Feet	Vehicles	T3: Incident Start (time)	T5: All Lanes Clear (time)	Queue Cleared (time)		Cars	Trucks	HC	CO	NOx	Delay	Fuel	Emissions	Total
60	Friday, January 02, 2009	66.0	58.9	7.1	3.3	248	25	10:39	11:54	12:00	10.7%	2.3	0.9	0.002	0.022	0.002	$ 1,557.60	$ 9.24	$ 184.17	**$ 1,751.01**
61	Tuesday, January 06, 2009	481.6	430.3	51.4	96.4	2,555	206	9:49	12:03	12:07	10.7%	6.0	2.2	0.012	0.163	0.017	$ 11,346.53	$ 23.78	$ 1,343.87	**$ 12,714.18**
62	Wednesday, January 07, 2009	3,503.8	3,414.5	362.2	14.7	9,383	1,374	10:48	12:39	13:20	10.3%	1060.3	374.0	0.090	1.187	0.126	$ 86,863.15	$ 4,136.90	$ 9,777.08	**$ 100,777.13**
63	Thursday, January 08, 2009	61,915.0	56,974.4	4,940.6	113.8	18,193	9,776	13:31	19:12	19:49	8.0%	4813.1	1285.5	1.590	20.970	2.233	$ 1,372,747.15	$ 17,538.51	$ 172,768.95	**$ 1,563,054.61**
64	Tuesday, January 13, 2009	33.6	31.2	2.3	17.9	279	20	15:49	17:30	17:30	7.0%	0.3	0.1	0.001	0.011	0.001	$ 723.55	$ 0.91	$ 93.76	**$ 818.22**
65	Saturday, January 24, 2009	582.1	527.0	55.1	19.6	1,091	147	6:20	10:15	10:16	9.5%	15.5	5.0	0.015	0.197	0.021	$ 13,350.84	$ 59.06	$ 1,624.30	**$ 15,034.20**
66	Sunday, January 25, 2009	82.0	74.4	7.6	78.9	1,457	49	13:11	14:49	14:50	9.2%	0.7	0.2	0.002	0.028	0.003	$ 1,872.40	$ 2.74	$ 228.81	**$ 2,103.96**
67	Thursday, January 29, 2009	8,316.8	7,526.6	790.2	17.1	7,270	1,338	4:46	6:46	9:13	9.3%	1695.0	533.8	0.214	2.817	0.300	$ 190,903.11	$ 6,420.73	$ 23,207.38	**$ 220,531.22**
68	Friday, February 13, 2009																			
69	Wednesday, February 25, 2009	30.2	27.9	2.4	2.3	427	44	21:58	22:37	22:38	7.9%	2.7	0.7	0.001	0.010	0.001	$ 670.88	$ 9.92	$ 84.27	**$ 765.06**
70	Thursday, February 26, 2009	91.0	82.2	8.8	98.1	651	44	12:11	14:14	14:14	9.7%	0.3	0.1	0.002	0.031	0.003	$ 2,096.72	$ 1.10	$ 253.93	**$ 2,351.75**
71	Friday, February 27, 2009	1,884.9	1,743.2	141.7	22.1	9,716	1,257	20:24	21:24	21:53	7.5%	405.1	100.9	0.048	0.638	0.068	$ 41,343.22	$ 1,454.29	$ 5,259.67	**$ 48,057.17**
72	Monday, March 02, 2009	23,308.3	21,453.4	1,854.8	39.6	23,570	3,122	11:45	13:39	19:11	8.0%	6745.9	1801.7	0.598	7.894	0.841	$ 516,514.37	$ 24,581.57	$ 65,039.98	**$ 606,135.93**
73	Thursday, March 05, 2009	26,971.5	25,069.3	1,902.2	60.3	25,049	3,443	14:58	16:53	20:50	7.0%	5507.3	1273.2	0.693	9.135	0.973	$ 585,141.00	$ 19,473.10	$ 75,261.86	**$ 679,875.96**
74	Friday, March 06, 2009	2,406.2	2,179.6	226.6	47.5	6,556	969	8:13	10:03	10:40	9.4%	159.0	50.7	0.062	0.815	0.087	$ 55,127.88	$ 604.19	$ 6,714.31	**$ 62,446.39**
75	Tuesday, March 10, 2009	2,117.4	1,981.1	136.2	20.9	9,434	1,337	17:36	18:44	19:10	6.4%	472.8	99.3	0.054	0.717	0.076	$ 45,259.45	$ 1,641.74	$ 5,908.44	**$ 52,809.63**
76	Sunday, March 15, 2009	414.6	379.1	35.5	48.8	3,642	249	7:37	9:09	9:16	8.6%	14.9	4.3	0.011	0.140	0.015	$ 9,316.55	$ 55.45	$ 1,156.91	**$ 10,528.91**
77	Monday, March 16, 2009	1,499.0	1,391.4	107.6	13.2	8,458	1,183	19:10	19:45	20:25	7.2%	471.1	112.3	0.038	0.508	0.054	$ 32,617.22	$ 1,675.87	$ 4,182.84	**$ 38,475.93**
78	Monday, March 16, 2009	212.7	196.7	16.0	5.6	1,638	228	20:38	21:30	21:33	7.5%	30.4	7.6	0.005	0.072	0.008	$ 4,665.85	$ 109.18	$ 593.52	**$ 5,368.56**
79	Friday, March 27, 2009	11,769.9	10,520.2	1,249.7	36.8	17,206	2,271	9:58	11:38	12:41	10.6%	2600.3	947.0	0.302	3.986	0.424	$ 276,922.73	$ 10,235.15	$ 32,842.98	**$ 320,000.87**
80	Saturday, March 28, 2009	8,959.2	8,119.0	840.2	34.6	7,348	990	11:27	12:55	14:30	9.4%	911.1	290.3	0.230	3.034	0.323	$ 205,081.21	$ 3,461.47	$ 24,999.95	**$ 233,542.63**
81	Sunday, March 29, 2009	5.6	5.1	0.4	4.6	39	3	6:45	8:48	8:48	7.9%	0.0	0.0	0.000	0.002	0.000	$ 119.94	$ 0.08	$ 15.63	**$ 135.65**
82	Wednesday, April 01, 2009	7,968.7	7,148.6	820.1	35.3	19,118	2,598	10:31	12:11	13:33	10.3%	2046.1	721.6	0.205	2.699	0.287	$ 186,151.08	$ 7,983.01	$ 22,236.03	**$ 216,370.13**
83	Friday, April 03, 2009	11,596.4	10,571.5	1,024.9	30.8	21,353	3,802	7:13	8:42	10:15	8.8%	3875.3	1148.5	0.298	3.928	0.418	$ 262,228.28	$ 14,462.85	$ 32,358.85	**$ 309,049.97**
84	Wednesday, April 08, 2009	76.0	64.5	11.5	44.9	546	34	0:44	2:58	2:59	15.2%	0.4	0.2	0.002	0.026	0.003	$ 1,964.53	$ 1.86	$ 212.07	**$ 2,178.47**
85	Thursday, May 07, 2009	401.7	369.0	32.7	17.9	5,005	344	7:54	8:50	9:03	8.1%	54.6	14.8	0.010	0.136	0.014	$ 8,939.49	$ 199.40	$ 1,120.91	**$ 10,259.80**
86	Tuesday, May 12, 2009	69,805.5	64,903.3	4,902.3	125.1	27,206	11,199	17:15	21:25	23:28	7.0%	7462.1	1725.1	1.792	23.642	2.517	$ 1,513,346.63	$ 26,384.81	$ 194,786.77	**$ 1,734,518.21**
87	Wednesday, May 13, 2009	161.2	149.3	12.0	105.0	2,240	78	19:44	21:44	21:46	7.4%	1.7	0.4	0.004	0.055	0.006	$ 3,531.46	$ 6.02	$ 449.82	**$ 3,987.30**
88	Friday, May 15, 2009	3,620.8	331.2	289.6	19.4	13,246	1,597	7:00	8:17	9:15	8.0%	1202.1	321.1	0.093	1.226	0.131	$ 26,108.49	$ 4,380.49	$ 10,103.56	**$ 40,592.54**
89	Tuesday, June 16, 2009	521.9	471.8	50.1	82.4	2,879	125	12:30	14:40	14:44	9.6%	8.7	2.8	0.013	0.177	0.019	$ 12,006.03	$ 33.30	$ 1,456.32	**$ 13,495.64**
90	Thursday, June 18, 2009	70,978.2	64,300.8	6,677.4	110.1	42,755	8,638	6:04	10:10	14:15	9.4%	13198.7	4206.0	1.822	24.040	2.560	$ 1,625,812.24	$ 50,144.48	$ 198,059.10	**$ 1,874,015.82**
91	Monday, June 22, 2009	11,123.4	10,258.1	865.3	76.5	16,955	2,889	19:51	2:14	2:14	7.8%	1201.4	312.2	0.286	3.767	0.401	$ 245,475.10	$ 4,351.57	$ 31,038.98	**$ 280,865.64**
92	Tuesday, July 07, 2009							12:30	13:27											
93	Monday, July 27, 2009	15,305.1	13,206.1	2,099.0	179.0	22,926	2,791	23:03	3:51	4:30	13.7%	894.1	436.0	0.393	5.184	0.552	$ 384,469.97	$ 3,851.59	$ 42,707.68	**$ 431,029.23**
94	Thursday, July 30, 2009	5,370.8	4,959.0	411.8	21.3	13,198	1,831	14:24	15:52	17:19	7.7%	1623.5	416.0	0.138	1.819	0.194	$ 118,216.19	$ 5,862.81	$ 14,986.80	**$ 139,065.79**
95	Wednesday, August 05, 2009	90.6	76.5	14.1	41.9	707	43	4:02	6:05	6:07	15.5%	0.7	0.4	0.002	0.031	0.003	$ 2,362.03	$ 3.10	$ 252.81	**$ 2,617.94**
96	Monday, August 10, 2009	1,707.8	1,551.3	156.5	21.0	8,268	1,281	13:32	14:35	14:51	9.2%	322.7	100.4	0.044	0.578	0.062	$ 38,904.38	$ 1,218.70	$ 4,765.48	**$ 44,888.57**
97	Sunday, August 23, 2009	1,933.5	1,791.3	142.2	97.6	5,676	707	19:12	21:43	21:54	7.4%	55.0	13.5	0.050	0.655	0.070	$ 42,247.04	$ 196.95	$ 5,395.28	**$ 47,839.28**
98	Monday, August 31, 2009	53.2	48.6	4.6	36.7	1,185	40	14:11	15:27	15:29	8.7%	0.8	0.2	0.001	0.018	0.002	$ 1,197.77	$ 3.08	$ 148.45	**$ 1,349.30**
99	Monday, September 14, 2009	393.3	360.4	32.9	233.7	2,374	93	20:33	0:46	0:47	8.4%	1.9	0.5	0.010	0.133	0.014	$ 8,798.00	$ 7.13	$ 1,097.47	**$ 9,902.61**
100	Sunday, September 20, 2009	882.9	813.9	69.1	16.9	8,067	631	15:03	16:07	16:26	7.8%	205.4	53.4	0.023	0.299	0.032	$ 19,507.47	$ 743.89	$ 2,463.66	**$ 22,715.02**
101	Monday, September 21, 2009	1,017.5	932.4	85.1	29.6	5,347	269	13:11	15:58	16:57	8.4%	89.0	25.1	0.026	0.345	0.037	$ 22,760.39	$ 328.17	$ 2,839.25	**$ 25,927.81**
102	Wednesday, September 30, 2009	2,639.0	2,406.9	232.0	30.2	9,456	1,182	13:32	15:06	15:45	8.8%	398.3	118.0	0.068	0.894	0.095	$ 59,610.03	$ 1,486.49	$ 7,363.92	**$ 68,460.44**
103	Wednesday, October 07, 2009	10,662.7	9,927.6	735.1	25.8	19,432	2,734	15:19	16:21	19:12	6.9%	3951.8	899.6	0.274	3.611	0.385	$ 230,455.96	$ 13,930.77	$ 29,753.43	**$ 274,140.16**
104	Sunday, October 18, 2009	211.7	193.1	18.6	87.8	2,894	98	13:36	15:42	15:44	8.8%	3.4	1.0	0.005	0.072	0.008	$ 4,781.48	$ 12.55	$ 590.73	**$ 5,384.77**
105	Wednesday, November 04, 2009	684.5	624.1	60.4	64.9	5,149	403	8:01	9:33	9:42	8.8%	26.2	7.8	0.018	0.232	0.025	$ 15,473.56	$ 97.70	$ 1,910.04	**$ 17,481.30**
106	Thursday, November 05, 2009	7,244.9	6,640.6	604.3	41.9	24,430	2,300	6:36	8:26	9:43	8.3%	2047.3	569.2	0.186	2.454	0.261	$ 161,976.50	$ 7,527.64	$ 20,216.33	**$ 189,720.46**
107	Tuesday, November 10, 2009	269.4	241.6	27.8	26.6	2,539	137	11:08	12:48	13:05	10.3%	12.2	4.3	0.007	0.091	0.010	$ 6,297.10	$ 47.57	$ 751.74	**$ 7,096.40**
108	Wednesday, November 25, 2009							18:48	19:52											
109	Wednesday, December 02, 2009	223.3	202.8	20.5	28.4	1,914	144	13:21	14:47	14:53	9.2%	7.2	2.2	0.006	0.076	0.008	$ 5,088.78	$ 27.28	$ 623.10	**$ 5,739.15**
110	Wednesday, December 30, 2009	595.3	539.2	56.2	15.3	4,472	340	12:47	14:22	14:31	9.4%	83.3	26.6	0.015	0.202	0.021	$ 13,647.71	$ 316.55	$ 1,661.14	**$ 15,625.40**

Cost of Incidents: 2009 **$ 7,854,811.62**

APPENDIX B

Incident Timelines

2007 Incident Timelines (Typical Incidents)

Trip Activation	Incident Date	Tractor Trailers	Cars	Overturn	Spilled Load	Spilled Fuel	Fire	HAZMAT	Injury	Fatality	Typical/ Atypical	Reason	Incident Timeline		
													T3: Incident Start (time)	T5: All Lanes Clear (time)	Typical Incidents Only Roadway Clearance (HH:MM)
2007-01	Friday, January 05, 2007	2					X				Atypical	Fire	19:59	6:33	
2007-02	Tuesday, February 13, 2007	1	5		X	X			1		typical		22:59	4:15	5:16
2007-03	Friday, March 02, 2007		Bus	X					X	6	Atypical	Fatality	5:49	10:17	
2007-04	Monday, March 12, 2007	1		X	X						typical		6:32	12:03	5:31
2007-05	Monday, March 12, 2007	2		X	X	X					typical		13:38	16:15	2:37
2007-06	Friday, March 30, 2007	Light truck		X	X				1	1	Atypical	Fatality	12:10	15:26	
2007-07	Monday, April 09, 2007	1		X	X	X			1		typical		11:26	14:40	3:14
2007-08	Tuesday, April 10, 2007	?	?	?	?										
2007-09	Tuesday, April 10, 2007	Cement Truck		X	X	X					typical		9:13	12:05	2:52
2007-10	Monday, April 16, 2007														
2007-11	Friday, April 27, 2007	1	1	X	X				2		typical		11:19	16:08	4:49
2007-12	Monday, June 04, 2007	1		X	X				1		typical		16:13	23:21	7:08
2007-13	Tuesday, June 05, 2007	1		X	X						typical		7:12	16:27	9:15
2007-14	Friday, June 08, 2007	2			X				1		typical		3:02	16:09	13:07
2007-15	Tuesday, June 19, 2007	2				X					typical		14:37	18:37	4:00
2007-16	Monday, July 16, 2007	1	1	X	X	X		X	1		Atypical	HAZMAT	19:50	1:35	
2007-17	Wednesday, July 18, 2007														
2007-18	Tuesday, July 24, 2007	1		X							typical		18:50	0:40	5:50
2007-19	Thursday, July 26, 2007	2									typical		10:40	15:49	5:09
2007-20	Saturday, July 28, 2007	1		X	X	X			3		typical		21:43	2:04	4:21
2007-21	Monday, July 30, 2007														
2007-22	Friday, August 03, 2007	1		X	X				1		typical		11:57	16:09	4:12
2007-23	Wednesday, August 22, 2007	1		X	X					1	Atypical	Fatality	22:05	4:34	
2007-24	Friday, August 31, 2007	1					X				Atypical	Fire	4:17	7:11	
2007-25	Tuesday, September 04, 2007	1									typical		4:27	7:40	3:13
2007-26	Friday, September 07, 2007	1	1	X	X				3	2	Atypical	Fatality	5:55	9:15	
2007-27	Wednesday, September 12, 2007	1		X					1		typical		5:26	13:18	7:52

Average	5:31
Std. Deviation	2:43
Avg. + 1 Std Dev	8:15
Avg - 1 Std Dev	2:47
Average (without Outliers)	4:52

2008 Incident Timelines (Typical Incidents)

Trip Activation	Incident Date	Tractor Trailers	Cars	Overturn	Spilled Load	Spilled Fuel	Fire	HAZMAT	Injury	Fatality	Typical/ Atypical	Reason	Incident Timeline		
													T3: Incident Start (time)	T5: All Lanes Clear (time)	Typical Incidents Only Roadway Clearance (HH:MM)
1	Sunday, January 13, 2008	1		X							Typical		10:35	11:55	1:20
2	Wednesday, January 16, 2008	1	1								Typical		7:22	7:39	0:17
3	Tuesday, January 22, 2008	1		X	X						Typical				0:00
4	Sunday, February 24, 2008	1		X				X	X		Atypical	HAZMAT	6:23	19:45	
5	Tuesday, March 04, 2008	1				X					typical		11:32	13:10	1:38
6	Wednesday, March 05, 2008	1		X							typical		5:15	6:15	1:00
7	Wednesday, March 05, 2008	1									typical		16:34	17:37	1:03
8	Thursday, April 10, 2008	2			X						typical		17:37	19:17	1:40
9	Wednesday, April 23, 2008	1		X							typical		18:52	20:39	1:47
10	Thursday, May 01, 2008	1		X							typical		13:54	15:02	1:08
11	Wednesday, May 14, 2008	1									typical		18:49	19:46	0:57
12	Friday, May 16, 2008	1	2	X							typical		7:27	8:13	0:46
13	Friday, June 06, 2008	1							1		typical		12:31	13:50	1:19
14	Thursday, June 12, 2008	1							1		typical		2:42	3:51	1:09
15	Thursday, June 12, 2008	1	3						1		typical		5:39	6:46	1:07
16	Monday, June 16, 2008	2		X							typical		4:41	7:55	3:14
17	Saturday, June 21, 2008	1		X				X			Atypical	HAZMAT	5:27	9:49	
18	Sunday, June 22, 2008	1	10			X			10		Atypical	Multiple injuries	15:37	18:31	
19	Monday, June 23, 2008	1	2							1	Atypical	Fatality	15:16	17:51	
20	Tuesday, July 01, 2008	1		X							typical		18:29	21:43	3:14
21	Wednesday, July 09, 2008	1		X		X			1		typical		14:46	16:34	1:48
22	Thursday, July 10, 2008	1									typical		14:24	16:15	1:51
23	Saturday, July 12, 2008	1		X							typical		8:04	10:19	2:15
24	Wednesday, July 30, 2008	1					X				Atypical	Fire	19:40	21:51	
25	Thursday, July 31, 2008	1				X			1		typical		13:14	15:03	1:49
26	Thursday, July 31, 2008	Box truck	3		X				1		Atypical	Life Flight/Serious Injury	19:23	20:38	
27	Saturday, August 02, 2008	1		X	X						typical		9:45	11:21	1:36
28	Saturday, August 09, 2008	1		X	X						typical		9:00	13:06	4:06
29	Wednesday, August 20, 2008	1				X	X		1		Atypical	Fire	4:51	8:02	
30	Wednesday, August 20, 2008	1		X	X	X					typical		7:16	9:06	1:50
31	Wednesday, August 20, 2008		3						3		typical		8:37	10:13	1:36
32	Wednesday, August 20, 2008	1		X							typical		14:24	15:48	1:24
33	Tuesday, August 26, 2008	1	1				X			2	Atypical	Fatality	3:22	6:26	
34	Tuesday, August 26, 2008	2	2								typical		10:09	11:07	0:58
35	Tuesday, August 26, 2008	2									typical		11:23	12:14	0:51
36	Tuesday, August 26, 2008	1					X				Atypical	Fire	18:38	21:24	
37	Tuesday, September 02, 2008	2		X					1		typical		4:57	6:25	1:28
38	Wednesday, September 03, 2008	1		X							typical		13:27	15:20	1:53
39	Friday, September 05, 2008	1		X					1		typical		12:32	14:47	2:15
40	Saturday, September 06, 2008	1		X							typical		11:46	13:13	1:27
41	Monday, September 08, 2008	1			X						typical		15:56	18:00	2:04
42	Monday, September 15, 2008	1		X	X	X					typical		22:16	5:14	6:58
43	Tuesday, September 23, 2008	1		X	X	X	X				Atypical	Fire	6:06	10:21	
44	Saturday, September 27, 2008	Light Truck		X	X				2		typical		9:55	11:55	2:00
45	Wednesday, October 01, 2008	1	2	X	X				1		Atypical	Life Flight/long delay	11:55	15:45	
46	Tuesday, October 21, 2008	1									typical		10:07	11:38	1:31
47	Thursday, October 23, 2008	1				X					typical		5:21	6:44	1:23
48	Friday, October 24, 2008	Dump Truck	1		X						typical		5:15	7:01	1:46
49	Saturday, October 25, 2008	1		X		X					typical		11:02	15:16	4:14
50	Monday, October 27, 2008	Dump Truck		X	X						typical		14:28	16:09	1:41
51	Saturday, November 15, 2008	3		X	X				1		typical		4:30	7:50	3:20
52	Tuesday, November 18, 2008	1				X		X			Atypical	HAZMAT	17:38	0:56	
53	Saturday, November 29, 2008		Bus						1		typical		0:42	2:43	2:01
54	Wednesday, December 03, 2008	1		X	X						typical		13:52	15:59	2:07
55	Friday, December 05, 2008	1		X		X					typical		9:43	11:11	1:28
56	Wednesday, December 10, 2008	1	1								typical		13:27	14:32	1:05
57	Friday, December 12, 2008	1		X					1		typical		14:43	16:15	1:32
58	Thursday, December 18, 2008	1	1	X				X	1		Atypical	HAZMAT	3:47	5:47	
59	Sunday, December 28, 2008	1				X					typical		7:45	9:51	2:06

Average	1:49
Std. Deviation	1:08
Avg. + 1 Std Dev	2:58
Avg - 1 Std Dev	0:41
Average (without Outliers)	1:32

2009 Incident Timelines (Typical Incidents)

Trip Activation	Incident Date	Tractor Trailers	Cars	Overturn	Spilled Load	Spilled Fuel	Fire	HAZMAT	Injury	Fatality	Typical/ Atypical	Reason	Incident Timeline		
													T3: Incident Start (time)	T5: All Lanes Clear (time)	Typical Incidents Only Roadway Clearance (HH:MM)
60	Friday, January 02, 2009	1		X							Typical		10:39	11:54	1:15
61	Tuesday, January 06, 2009	1				X					Typical		9:49	12:03	2:14
62	Wednesday, January 07, 2009	1									Typical		10:48	12:39	1:51
63	Thursday, January 08, 2009	1					X				Typical		13:31	19:12	5:41
64	Tuesday, January 13, 2009	1		X	X				1		Typical		15:49	17:30	1:41
65	Saturday, January 24, 2009	Box Truck	1				X		3		Atypical	Fire	6:20	10:15	
66	Sunday, January 25, 2009	1	1		X						Typical		13:11	14:49	1:38
67	Thursday, January 29, 2009	1		X	X	X					Typical		4:46	6:46	2:00
68	Friday, February 13, 2009	1									Typical				
69	Wednesday, February 25, 2009	1									Typical		21:58	22:37	0:39
70	Thursday, February 26, 2009	Bucket		X					1		Typical		12:11	14:14	2:03
71	Friday, February 27, 2009	Box Truck		X							Typical		20:24	21:24	1:00
72	Monday, March 02, 2009	2							1		Typical		11:45	13:39	1:54
73	Thursday, March 05, 2009	1		X	X						Typical		14:58	16:53	1:55
74	Friday, March 06, 2009	1	2						3		Typical		8:13	10:03	1:50
75	Tuesday, March 10, 2009	2							1		Typical		17:36	18:44	1:08
76	Sunday, March 15, 2009	1									Typical		7:37	9:09	1:32
77	Monday, March 16, 2009	1									Typical		19:10	19:45	0:35
78	Monday, March 16, 2009	1				X		X			Atypical	HAZMAT	20:38	21:30	
79	Friday, March 27, 2009	1	3		X	X			2		Typical		9:58	11:38	1:40
80	Saturday, March 28, 2009	1		X	X				1		Typical		11:27	12:55	1:28
81	Sunday, March 29, 2009	1		X							Typical		6:45	8:48	2:03
82	Wednesday, April 01, 2009	1	1			X					Typical		10:31	12:11	1:40
83	Friday, April 03, 2009	RV		X		X		X	1		Atypical	HAZMAT	7:13	8:42	
84	Wednesday, April 08, 2009	1		X							Typical		0:44	2:58	2:14
85	Thursday, May 07, 2009	1				X					Typical		7:54	8:50	0:56
86	Tuesday, May 12, 2009	Dump Truck			X						Typical		17:15	21:25	4:10
87	Wednesday, May 13, 2009	1		X							Typical		19:44	21:44	2:00
88	Friday, May 15, 2009	1			X						Typical		7:00	8:17	1:17
89	Tuesday, June 16, 2009	1			X						Typical		12:30	14:40	2:10
90	Thursday, June 18, 2009	1			X		X				Atypical	Fire	6:04	10:10	
91	Monday, June 22, 2009	1			X		X				Atypical	Fire	19:51	2:14	
92	Tuesday, July 07, 2009	1									Typical		12:30	13:27	0:57
93	Monday, July 27, 2009	2	2	X	X	X		X	2		Atypical	HAZMAT	23:03	3:51	
94	Thursday, July 30, 2009	1				X					Typical		14:24	15:52	1:28
95	Wednesday, August 05, 2009	1	3	X		X					Typical		4:02	6:05	2:03
96	Monday, August 10, 2009	and Dump Tr	4						8		Typical		13:32	14:35	1:03
97	Sunday, August 23, 2009	1	2						1	1	Atypical	Fatality	19:12	21:43	
98	Monday, August 31, 2009	1		X	X						Typical		14:11	15:27	1:16
99	Monday, September 14, 2009	1		X	X	X	X	X	1		Atypical	HAZMAT	20:33	0:46	
100	Sunday, September 20, 2009	1		X							Typical		15:03	16:07	1:04
101	Monday, September 21, 2009	1	larta Bus						1		Typical		13:11	15:58	2:47
102	Wednesday, September 30, 2009	1		X	X	X			1		Typical		13:32	15:06	1:34
103	Wednesday, October 07, 2009	2							1		Typical		15:19	16:21	1:02
104	Sunday, October 18, 2009	1									Typical		13:36	15:42	2:06
105	Wednesday, November 04, 2009	1		X							Typical		8:01	9:33	1:32
106	Thursday, November 05, 2009	1		X	X						Typical		6:36	8:26	1:50
107	Tuesday, November 10, 2009	1		X		X					Typical		11:08	12:48	1:40
108	Wednesday, November 25, 2009	1	2						1		Typical		18:48	19:52	1:04
109	Wednesday, December 02, 2009	1				X					Typical		13:21	14:47	1:26
110	Wednesday, December 30, 2009	1		X							Typical		12:47	14:22	1:35

Average	1:44
Std. Deviation	0:52
Avg. + 1 Std Dev	2:36
Avg - 1 Std Dev	0:51
Average (without Outliers)	1:35

APPENDIX C

Incident Timelines

Trip Activation	Incident Date	Delay Costs Actual Timeline	Delay Costs Extended Timeline	Value of Avoided Delay (Benefit of TRIP)	Use Benefit Value?	Value of TRIP Benefit
1	Sunday, January 13, 2008	$ 1,485.19	$ 2,630.66	$ 1,145.47		$ 1,145.47
2	Wednesday, January 16, 2008	$ 24,609.79	$ 157,899.44	$ 133,289.65		$ 133,289.65
3	Tuesday, January 22, 2008				No	$ -
4	Sunday, February 24, 2008	$ 4,807,609.52	$ 5,399,585.18	$ 591,975.66		$ 591,975.66
5	Tuesday, March 04, 2008	$ 3,259.67	$ 3,945.76	$ 686.09		$ 686.09
6	Wednesday, March 05, 2008	$ 2,971.03	$ 60,839.94	$ 57,868.92		$ 57,868.92
7	Wednesday, March 05, 2008	$ 58,669.95	$ 188,106.12	$ 129,436.17		$ 129,436.17
8	Thursday, April 10, 2008	$ 495,142.23	$ 877,956.64	$ 382,814.40		$ 382,814.40
9	Wednesday, April 23, 2008	$ 2,380.93	$ 4,716.90	$ 2,335.97		$ 2,335.97
10	Thursday, May 01, 2008	$ 4,644.93	$ 8,816.56	$ 4,171.63		$ 4,171.63
11	Wednesday, May 14, 2008					$ -
12	Friday, May 16, 2008	$ 2,973.83	$ 8,447.64	$ 5,473.81		$ 5,473.81
13	Friday, June 06, 2008	$ 4,128.52	$ 7,286.70	$ 3,158.19		$ 3,158.19
14	Thursday, June 12, 2008					$ -
15	Thursday, June 12, 2008					$ -
16	Monday, June 16, 2008	$ 4,181.71	$ 4,179.73	$ (1.98)		$ (1.98)
17	Saturday, June 21, 2008	$ 4,616.39	$ 5,750.85	$ 1,134.46	No	$ -
18	Sunday, June 22, 2008	$ 629,548.14	$ 792,229.19	$ 162,681.05		$ 162,681.05
19	Monday, June 23, 2008	$ 904,793.39	$ 1,360,054.11	$ 455,260.73		$ 455,260.73
20	Tuesday, July 01, 2008	$ 73,738.73	$ 90,676.12	$ 16,937.39	No	$ -
21	Wednesday, July 09, 2008					$ -
22	Thursday, July 10, 2008	$ 157,989.89	$ 377,489.28	$ 219,499.39		$ 219,499.39
23	Saturday, July 12, 2008					$ -
24	Wednesday, July 30, 2008	$ 186,933.54	$ 309,584.79	$ 122,651.25		$ 122,651.25
25	Thursday, July 31, 2008	$ 111,976.21	$ 439,786.79	$ 327,810.58		$ 327,810.58
26	Thursday, July 31, 2008	$ 147,062.48	$ 359,702.46	$ 212,639.98		$ 212,639.98
27	Saturday, August 02, 2008					$ -
28	Saturday, August 09, 2008	$ 113,083.90	$ 172,987.70	$ 59,903.80	No	$ -
29	Wednesday, August 20, 2008					$ -
30	Wednesday, August 20, 2008					$ -
31	Wednesday, August 20, 2008	$ 43,556.69	$ 223,146.18	$ 179,589.49		$ 179,589.49
32	Wednesday, August 20, 2008	$ 4,714.84	$ 8,325.79	$ 3,610.95		$ 3,610.95
33	Tuesday, August 26, 2008	$ 21,117.52	$ 32,968.91	$ 11,851.39		$ 11,851.39
34	Tuesday, August 26, 2008	$ 41,772.95	$ 192,627.75	$ 150,854.80	No	$ -
35	Tuesday, August 26, 2008					$ -
36	Tuesday, August 26, 2008	$ 327,135.17	$ 494,104.34	$ 166,969.18		$ 166,969.18
37	Tuesday, September 02, 2008	$ 1,351.48	$ 2,241.02	$ 889.55		$ 889.55
38	Wednesday, September 03, 2008	$ 278,113.12	$ 506,083.38	$ 227,970.26		$ 227,970.26
39	Friday, September 05, 2008	$ 1,431.58	$ 2,062.02	$ 630.44		$ 630.44
40	Saturday, September 06, 2008					$ -
41	Monday, September 08, 2008	$ 71,294.03	$ 122,220.31	$ 50,926.28		$ 50,926.28
42	Monday, September 15, 2008	$ 15,566.85	$ 39,452.94	$ 23,886.09		$ 23,886.09
43	Tuesday, September 23, 2008	$ 25,697.60	$ 32,151.45	$ 6,453.85		$ 6,453.85
44	Saturday, September 27, 2008	$ 455,997.32	$ 778,110.11	$ 322,112.79		$ 322,112.79
45	Wednesday, October 01, 2008	$ 401,242.00	$ 561,259.27	$ 160,017.27	No	$ -
46	Tuesday, October 21, 2008	$ 3,494.57	$ 5,807.84	$ 2,313.27		$ 2,313.27
47	Thursday, October 23, 2008	$ 46,750.57	$ 106,132.79	$ 59,382.22		$ 59,382.22
48	Friday, October 24, 2008	$ 102,050.74	$ 477,298.76	$ 375,248.03	No	$ -
49	Saturday, October 25, 2008	$ 4,779.27	$ 5,857.62	$ 1,078.36		$ 1,078.36
50	Monday, October 27, 2008	$ 62,673.82	$ 138,390.88	$ 75,717.05		$ 75,717.05
51	Saturday, November 15, 2008					$ -
52	Tuesday, November 18, 2008					$ -
53	Saturday, November 29, 2008	$ 6,878.24	$ 6,994.47	$ 116.23		$ 116.23
54	Wednesday, December 03, 2008	$ 1,033.76	$ 1,622.33	$ 588.57		$ 588.57
55	Friday, December 05, 2008	$ 2,942.17	$ 5,415.11	$ 2,472.94		$ 2,472.94
56	Wednesday, December 10, 2008	$ 29,606.25	$ 78,207.05	$ 48,600.81		$ 48,600.81
57	Friday, December 12, 2008	$ 1,624.79	$ 2,634.22	$ 1,009.43		$ 1,009.43
58	Thursday, December 18, 2008	$ 4,740.72	$ 73,775.20	$ 69,034.48		$ 69,034.48
59	Sunday, December 28, 2008	$ 13,088.40	$ 70,802.98	$ 57,714.58		$ 57,714.58
60	Friday, January 02, 2009	$ 1,751.01	$ 2,443.87	$ 692.86		$ 692.86
61	Tuesday, January 06, 2009	$ 12,714.18	$ 19,801.13	$ 7,086.95		$ 7,086.95
62	Wednesday, January 07, 2009	$ 100,777.13	$ 268,015.51	$ 167,238.38		$ 167,238.38
63	Thursday, January 08, 2009	$ 1,563,054.61	$ 1,622,476.53	$ 59,421.93	No	$ -
64	Tuesday, January 13, 2009	$ 818.22	$ 2,050.82	$ 1,232.60		$ 1,232.60
65	Saturday, January 24, 2009	$ 15,034.20	$ 27,489.12	$ 12,454.92		$ 12,454.92
66	Sunday, January 25, 2009	$ 2,103.96	$ 3,422.57	$ 1,318.61		$ 1,318.61
67	Thursday, January 29, 2009	$ 220,531.22	$ 1,051,770.68	$ 831,239.46		$ 831,239.46
68	Friday, February 13, 2009					$ -
69	Wednesday, February 25, 2009	$ 765.06	$ 2,630.02	$ 1,864.96		$ 1,864.96
70	Thursday, February 26, 2009	$ 2,351.75	$ 3,486.80	$ 1,135.05		$ 1,135.05
71	Friday, February 27, 2009	$ 48,057.17	$ 173,249.38	$ 125,192.21		$ 125,192.21
72	Monday, March 02, 2009	$ 606,135.93	$ 1,368,976.71	$ 762,840.78	No	$ -
73	Thursday, March 05, 2009	$ 679,875.96	$ 987,348.52	$ 307,472.56		$ 307,472.56
74	Friday, March 06, 2009	$ 62,446.39	$ 145,865.60	$ 83,419.22		$ 83,419.22
75	Tuesday, March 10, 2009	$ 52,809.63	$ 124,643.26	$ 71,833.63		$ 71,833.63
76	Sunday, March 15, 2009	$ 10,528.91	$ 19,146.13	$ 8,617.21		$ 8,617.21
77	Monday, March 16, 2009	$ 38,475.93	$ 181,496.78	$ 143,020.85		$ 143,020.85
78	Monday, March 16, 2009	$ 5,368.56	$ 14,890.41	$ 9,521.85		$ 9,521.85
79	Friday, March 27, 2009	$ 320,000.87	$ 477,005.36	$ 157,004.49		$ 157,004.49
80	Saturday, March 28, 2009	$ 233,542.63	$ 704,222.11	$ 470,679.48		$ 470,679.48
81	Sunday, March 29, 2009	$ 135.65	$ 172.78	$ 37.13		$ 37.13
82	Wednesday, April 01, 2009	$ 216,370.13	$ 499,627.77	$ 283,257.64		$ 283,257.64
83	Friday, April 03, 2009	$ 309,049.97	$ 834,816.47	$ 525,766.50		$ 525,766.50
84	Wednesday, April 08, 2009	$ 2,178.47	$ 5,244.20	$ 3,065.73		$ 3,065.73
85	Thursday, May 07, 2009	$ 10,259.80	$ 46,531.45	$ 36,271.66		$ 36,271.66
86	Tuesday, May 12, 2009	$ 1,734,518.21	$ 1,734,518.21	$ -		$ -
87	Wednesday, May 13, 2009	$ 3,987.30	$ 6,064.61	$ 2,077.31		$ 2,077.31
88	Friday, May 15, 2009	$ 40,592.54	$ 329,515.93	$ 288,923.39		$ 288,923.39
89	Tuesday, June 16, 2009	$ 13,495.64	$ 20,366.20	$ 6,870.55	No	$ -
90	Thursday, June 18, 2009	$ 1,874,015.82	$ 2,535,010.00	$ 660,994.17	No	$ -
91	Monday, June 22, 2009	$ 280,865.64	$ 522,999.69	$ 242,134.05		$ 242,134.05
92	Tuesday, July 07, 2009					$ -
93	Monday, July 27, 2009	$ 431,029.23	$ 595,924.78	$ 164,895.55		$ 164,895.55
94	Thursday, July 30, 2009	$ 139,065.79	$ 458,434.38	$ 319,368.59	No	$ -
95	Wednesday, August 05, 2009	$ 2,617.94	$ 4,733.45	$ 2,115.51		$ 2,115.51
96	Monday, August 10, 2009	$ 44,888.57	$ 150,660.20	$ 105,771.63		$ 105,771.63
97	Sunday, August 23, 2009	$ 47,839.28	$ 66,798.60	$ 18,959.32		$ 18,959.32
98	Monday, August 31, 2009	$ 1,349.30	$ 2,391.95	$ 1,042.65		$ 1,042.65
99	Monday, September 14, 2009	$ 9,902.61	$ 12,485.34	$ 2,582.74		$ 2,582.74
100	Sunday, September 20, 2009	$ 22,715.02	$ 83,722.44	$ 61,007.42		$ 61,007.42
101	Monday, September 21, 2009	$ 25,927.81	$ 33,606.29	$ 7,678.48		$ 7,678.48
102	Wednesday, September 30, 2009	$ 68,460.44	$ 116,554.15	$ 48,093.70		$ 48,093.70
103	Wednesday, October 07, 2009	$ 274,140.16	$ 886,249.43	$ 612,109.27		$ 612,109.27
104	Sunday, October 18, 2009	$ 5,384.77	$ 8,822.24	$ 3,437.48		$ 3,437.48
105	Wednesday, November 04, 2009	$ 17,481.30	$ 30,101.60	$ 12,620.31		$ 12,620.31
106	Thursday, November 05, 2009	$ 189,720.46	$ 373,908.97	$ 184,188.52		$ 184,188.52
107	Tuesday, November 10, 2009	$ 7,096.40	$ 11,604.09	$ 4,507.69		$ 4,507.69
108	Wednesday, November 25, 2009					$ -
109	Wednesday, December 02, 2009	$ 5,739.15	$ 12,737.82	$ 6,998.67		$ 6,998.67
110	Wednesday, December 30, 2009	$ 15,625.40	$ 25,671.27	$ 10,045.87		$ 10,045.87
					Value of TRIP	**$ 9,154,430.63**