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**Abbreviated Acoustic Assessment Report**  
**ACME Manufacturing Facility**  
**West Service Road, Anytown, Ontario**

**Prepared for:**

**ACME International Ltd.**  
**100 Headquarters Road,**  
**Metropolis, Ontario**  
**M1A 1A1**

**DRAFT: June 13, 2008**

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## **1 INTRODUCTION & SUMMARY**

Roadrunner Engineering was retained by ACME International, to undertake an environmental Acoustic Assessment of the ACME Manufacturing facility located at 256 West Service Road in Anytown, Ontario. The report is intended to support an application to the Ministry of Environment (MOE) for a Certificate of Approval (Air & Noise) for the facility.

Based on the Ministry of Environment's (MOE) Noise Screening Process for Section 9 Applications, the ACME Manufacturing Facility is required to submit an Acoustic Assessment Report (AAR) to address the noise impact of their facility at representative points of reception. The setback distance between the subject facility and the most impacted residences (about 440 metres to the east), is not sufficient to exempt this facility from submitting an AAR. However, the noise emissions of this facility were found to be insignificant at the nearest points of reception due to:

- i. the modest sound emissions from activities and equipment on site,
- ii. the considerable shielding afforded by intervening commercial/industrial buildings, and
- iii. the high levels of background sound from the intervening Highway 499 expressway.

On this basis, an Abbreviated Acoustic Assessment Report is considered appropriate.

Observations and measurements made by Roadrunner Engineering on-site and at the most impacted points of reception on May 31, 2008, and subsequent analyses indicate that the sound emissions of the facility are well within the sound level limits stipulated in MOE Publication NPC-205. Details are provided in the following sections.

## **2 SITE DESCRIPTION, NOISE SOURCES, & POINTS OF RECEPTION**

Figure 1 shows a scaled zoning map of the surrounding area, with the subject facility marked. The subject site and the lands surrounding it have Industrial and Commercial zoning designations. The most impacted points of reception are one-storey and two-storey single family residences within a residential zone, approximately 440 metres, east of the facility and separated from facility by Highway 499. Representative assessment locations are shown as points "A" and "B" on Figure 1. The intervening industrial/commercial lands on the east side of Highway 499 are massed densely (approximately 90 %) with existing buildings which shield the residences from the facility.

The ACME facility produces anvils, quick-drying cement, catapults, hot-air balloons and related accessories. The facility operates 24 hours per day, five days per week. All work is done indoors. Materials are received and shipped via truck. Sound emissions from shipping and receiving activities are negligible relative to the traffic sound from Highway 499, therefore they not considered further in this study. The significant noise sources at the facility are comprised of process exhausts and general building exhausts on the roof of the facility, as well as a cooling tower and pair of condenser fan units on the roof, and an overhead door in the east wall of the facility, which can be left open during the warmer months. (Noise source duty cycles, and a site plan with marked locations of significant noise sources can be found in the Appendix to the Report.)

### **3 ACOUSTICAL MEASUREMENTS & ANALYSIS**

Visits were made by Roadrunner Engineering to the points of reception during daytime and early morning hours (02:00 to 04:00 am), on May 31, 2008. The site visits were conducted during this time period because the background ambient due to Hwy 499 will be at its lowest level and hence represent the worst case scenario from a noise impact assessment perspective. The facility was operating at what can be considered a typical worst case scenario, from a noise perspective, during this period and was inaudible at the subject points of reception.

To quantify the overall acoustic emissions of the facility, sound levels were measured near each source, and predictive modelling was used to estimate the sound level of the facility at the points of reception. The sound sources were found to be simple in nature, so sound pressure measurements were considered to be sufficient to determine the sound power emission level of each source. The measurements were conducted in full octave bands, during the afternoon of May 31, 2008, using a Spectromatic 6000 sound level meter. Acoustical engineering procedures as per Ministry Publication NPC-103 were followed with respect to measurement positions and avoiding interfering sound from adjacent sources. At the time of the measurements, the weather was suitable for outdoor acoustical measurements (25 degrees Celsius, negligible winds and 62% relative humidity). The traffic sound from Highway 499 was sufficiently loud at the east end of the building roof, that it was necessary to measure sound levels with the condenser fans on and off in order to isolate their sound from the interfering background sound. All instrumentation was within its periodic laboratory calibration period, and correct calibration was verified in the field before and after the measurements using an EZ-Cal model 5150 pistonphone.

In the front parking lot of ACME, immediately east of the building, the facility was barely audible over the traffic sound from the Highway.

In order to quantify the contribution of the facility to the sound levels at the residences, the source sound power levels were used as input to a predictive computer model (CalcRight version 6.2), which takes into account the acoustical effects of distance, ground attenuation, intervening shielding and atmospheric effects. In the analysis, the “predictable worst case hour” of activity included the continuous operation of all of the equipment at the facility. The modelling results are summarized in Table I below. Contours of the predicted sound levels are shown in Figure 1. A summary of calculations is included in the appendix. The modelling results were verified against sound pressure levels measured at the northwest and southwest corners of the plant roof and at the midpoint of the north and south edges of the roof, where the sound of the facility was dominant over the background traffic sound –measured and/or calculated noise levels. The model was found to agree with these spot measurements within 1 dB, confirming the accuracy of the prediction model .

#### **4 SOUND LEVEL CRITERIA, ASSESSMENT & CONCLUSIONS**

The vicinity surrounding the ACME facility is best characterized as a Class 1 (Urban) environment under MOE guidelines, because of the urban hum resulting from vehicular traffic sound. Sound level limits are provided in MOE publication NPC-205, and are site specific, depending upon the characteristic background sound levels at the points of reception. For a facility that can operate during both daytime and nighttime hours, NPC-205 stipulates that the applicable sound level limit is the greater of 45 dBA or the minimum one-hour background sound level due to road traffic (and /or industrial noise sources that are not under investigation by the Ministry or subject municipality) without the contribution of the subject facility

In order to quantify the background sound levels, hourly traffic volumes for Highway 499 were obtained from the Ministry of Transportation, and used as an input to STAMSON version 5.03 – a traffic sound prediction program developed by the MOE. Figure 2, attached, presents a graph of the calculated hourly background traffic sound levels, showing a minimum level of 56 dBA (sample STAMSON output is included in the appendix). Therefore the applicable sound level limit for this facility is 56 dBA, at the residences to the east of the subject facility.

Sound levels were measured at location A between 03:00 and 04:00 am on May 31, 2008, at which time the facility was found to be inaudible and traffic sound was dominant. The measured traffic sound level was 57 dBA, which is considered to be in good agreement with the predicted background sound levels, and confirms that the sound level limit of 56 dBA is conservative. The measurements were conducted using the Spectromatic sound level meter described above, following the methods of MOE procedural guideline NPC-103. The weather was suitable for outdoor acoustical measurements (16 degrees Celsius, negligible wind and 78% relative humidity).

Table I, below, summarize the source sound level measurements, the predicted off-site sound levels of the facility, and the applicable performance limits.

**Table I: Source and Point of Reception Acoustic Assessment Summary Table**

Source Group	L <sub>w</sub> [dBA]	Location A		Location B	
		Dist [m]	L <sub>EQ</sub> [dBA]	Dist [m]	L <sub>EQ</sub> [dBA]
Exhaust Fans (sum of five)	105	514	43	528	38
Open Overhead Door	90	442	30	465	25
Cooling Tower	108	493	46	512	41
Condenser Fans (2 banks of 4 fans)*	96	488	32	499	29
<b>Total Levels</b>	<b>110</b>		<b>48</b>		<b>43</b>
<b>Compliance with MOE Limits</b>					
		Location A		Location B	
Performance Limit		<b>56</b>		<b>56</b>	
Compliant with Limit?		<b>Y</b>		<b>Y</b>	
Verified by Audit Measurement?		<b>Y</b>		<b>Y</b>	

Notes:

L<sub>w</sub> = combined sound power level of source group [dBA re 10<sup>-12</sup> W]

Dist = distance between receiver and centroid of source group

L<sub>EQ</sub> = energy equivalent sound exposure level at point of reception

\* Sound levels of condenser fans include +5 dBA penalty for observed tonal character

\*\* barrier attenuation (shielding) due to the edge of the building is also detailed in assessment and is detailed in the sample calculation.

The sound levels of the facility, determined through measurements and analysis range from 43 dBA to 48 dBA at the nearest points of reception, which is well within the sound level limits of MOE publication NPC-205.

**Roadrunner Engineering Ltd.**

Prepared by:

Reviewed by:

Joseph Engineer, PEng

Learned Thinkwell, PEng

Figure 1

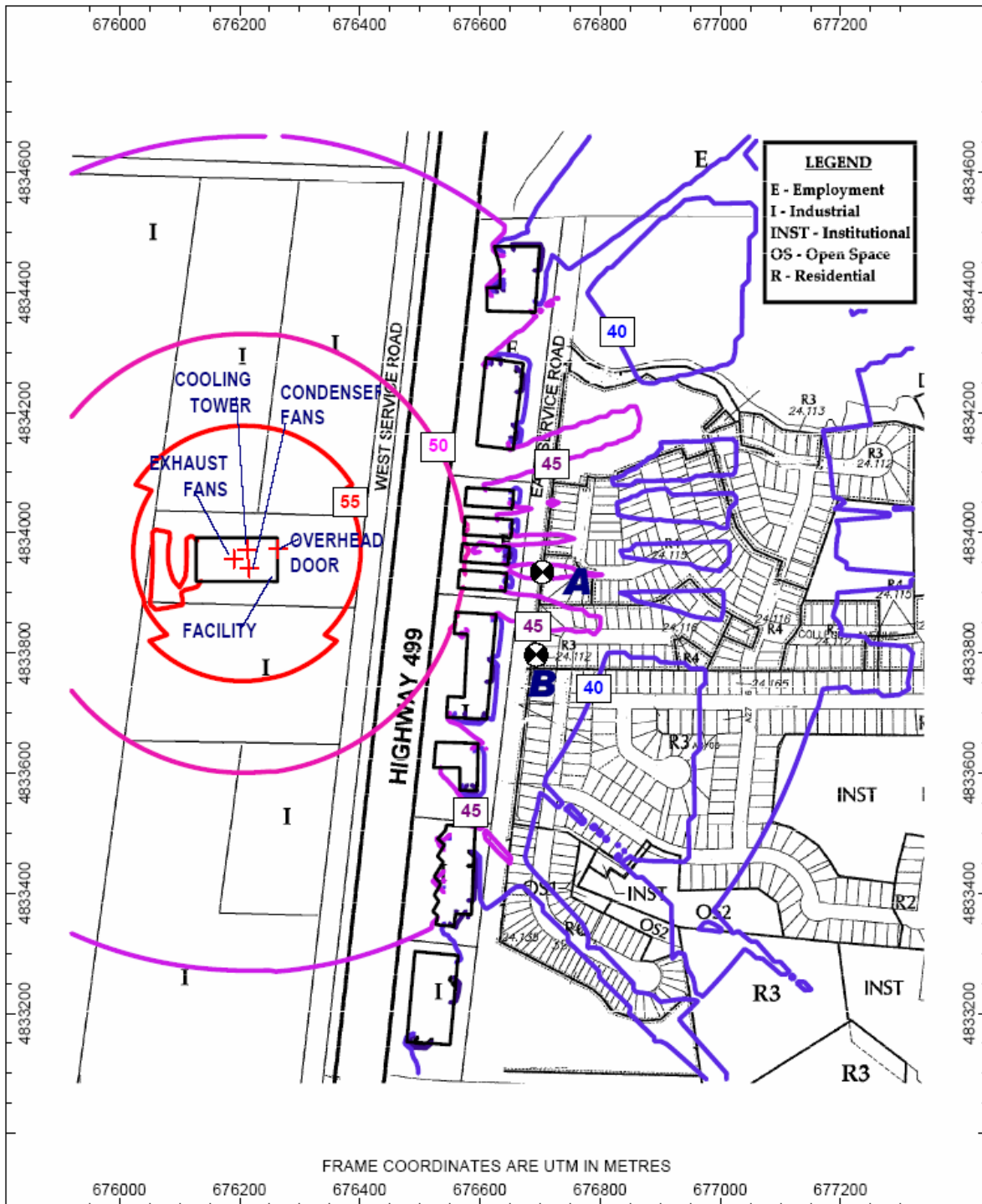
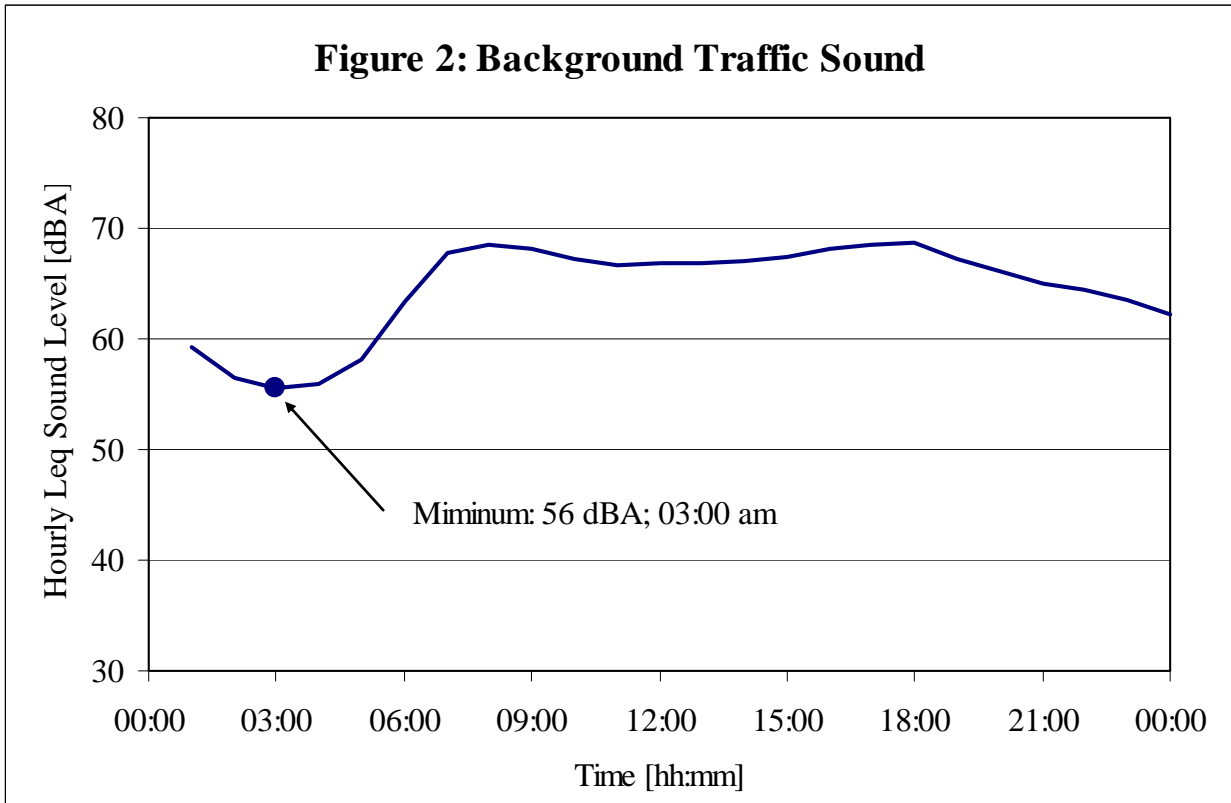


Figure 1: Scaled Zoning Map Showing Facility Location and Sound Level Contours, Leq [dBA] 4.5 m above Ground

**Figure 2: Background Traffic Sound**



**APPENDIX**  
**Supporting Information**

*{The appendix should include a sample calculation of one the sources, preferable the most dominant source or a source that includes many adjustments}*

## Traffic Sound Calculations

STAMSON 5.0                      SUMMARY REPORT                      Date: 31-05-2008 14:46:56  
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 499\_A.te                      Time Period: 1 hours  
 Description: Minimum hour - traffic sound at A

Road data, segment # 1:

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Car traffic volume : 717 veh/TimePeriod
Medium truck volume : 32 veh/TimePeriod
Heavy truck volume : 48 veh/TimePeriod
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)
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Data for Segment # 1:

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Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 90 %
Surface : 2 (Reflective ground surface)
Receiver source distance : 214.00 m
Receiver height : 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

Result summary

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```

	! source !	Road !	Total !
	! height !	Leq !	Leq !
	! (m) !	! (dBA) !	! (dBA) !
1.	! 1.57 !	! 55.60 !	! 55.60 !
	Total		55.60 dBA

```
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```



## Calculation Summary

Location A		676704	4833934	4.5													
Src ID	Src Name	X	Y	Z	Lx	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	Cmet	Refl	Lr	
NS-1	Exhaust Fans (sum of five)	676190	4833956	8	105	65	0	0	-4	0	1.0	0	0	0	0	43	
NS-2	Open Overhead Door	676263	4833973	2	90	64	0	0	-5	0	0.9	0	0	0	0	30	
NS-3	Cooling Tower	676213	4833972	10	108	65	0	0	-3	0	1.0	0	0	0	0	46	
NS-4	Condenser Fans (2 banks of 4 fans)	676216	4833941	8.5	96	65	0	0	-4	2	0.9	0	0	0	0	32	

Location B		676693	4833796	4.5													
Src ID	Src Name	X	Y	Z	Lx	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	Cmet	Refl	Lr	
NS-1	Exhaust Fans (sum of five)	676190	4833956	8	105	65	0	0	-4	5	1.0	0	0	0	0	38	
NS-2	Open Overhead Door	676263	4833973	2	90	64	0	0	-5	5	0.9	0	0	0	0	25	
NS-3	Cooling Tower	676213	4833972	10	108	65	0	0	-4	5	1.0	0	0	0	0	41	
NS-4	Condenser Fans (2 banks of 4 fans)	676216	4833941	8.5	96	65	0	0	-4	5	1.0	0	0	0	0	29	

Where:  $L_r = L_x - A_{div} + K_0 + D_c - A_{gnd} - A_{bar} - A_{atm} - A_{fol} - A_{hous} + C_{met} + Refl$

X and Y are UTM coordinates in metres, Z is the height above ground, in metres

In the tables above, the column headings for the various sound attenuation mechanisms follow the terminology of ISO Standard 9613-2.  $L_x$  is the A-weighted, one-hour energy-equivalent source sound power level, which includes penalties for distinctive source character, if applicable.  $L_r$  is the A-weighted, one-hour energy-equivalent sound level at the point of reception. The results are presented in terms of overall A-weighted results, at the most impacted off-site point of reception. Full octave band results are available upon request.

FALL

Confidence level = 95%

SB Express		FTMS - COMPASS DATA						
VDS :	Description:							
LHRS :								
Hour Ending	MON	TUE	WED	THU	FRI	*SAT*	*SUN*	
	18-Sep-06	19-Sep-06	20-Sep-06	21-Sep-06	22-Sep-06	23-Sep-06	24-Sep-06	
1:00:00	1088	1055	1207	1235	1309	2177	2835	
2:00:00	550	564	665	687	797	1303	1985	
3:00:00	433	482	549	551	613	946	1151	
4:00:00	470	486	506	618	537	648	763	
5:00:00	853	850	852	897	898	628	584	
6:00:00	2701	2645	2634	2806	2542	1106	775	
7:00:00	6496	6745	6744	6804	6471	2078	1060	
8:00:00	7744	8209	7039	7660	7731	2910	1348	
9:00:00	7100	7320	7215	7217	6980	3790	1816	
10:00:00	6104	5916	5746	5943	5570	4441	2906	
11:00:00	4844	5300	5090	5025	5275	4746	4095	
12:00:00	5148	5162	5046	5178	5506	5310	4795	
13:00:00	5220	5248	5264	5220	5524	6147	5667	
14:00:00	5083	5127	5056	5364	5775	5919	6172	
15:00:00	5474	5413	5419	5454	5927	6058	6233	
16:00:00	6050	6177	5927	6256	6656	6342	5816	
17:00:00	6748	6944	6811	6950	7363	6137	5984	
18:00:00	6977	7106	7501	7340	7262	6129	5863	
19:00:00	5431	5759	6072	5891	5826	5795	5612	
20:00:00	4083	4513	4757	5087	4960	4966	4894	
21:00:00	3199	3902	3976	4229	3920	4439	4676	
22:00:00	2920	3451	3578	3849	3511	3888	3782	
23:00:00	2355	2741	2719	3006	3048	3469	2806	
0:00:00	1800	2052	2105	2394	2863	2960	1693	
24 hr Total	98871	103167	102478	105361	106864	92332	83311	
A.M. Total	43531	44734	43293	44321	44229	30083	24113	
P.M. Total	55340	58433	59185	61040	62635	62249	59198	
Noon-Noon		100074	101726	103506	105269	92716	86362	
ADT :	98912			AWC :			103348	

GP2

Traffic Data

**SUMMER**

Confidence level = 95%

NB Express		FTMS - COMPASS DATA						
VDS :	Description							
LHRS :								
Hour Ending	MON	TUE	WED	THU	FRI	*SAT*	*SUN*	
	24-Jul-06	25-Jul-06	26-Jul-06	27-Jul-06	28-Jul-06	29-Jul-06	30-Jul-06	
1:00:00	1326	1534	1601	1342	1648	2134	2627	
2:00:00	726	741	889	795	879	1502	1775	
3:00:00	496	546	628	595	688	1247	1303	
4:00:00	473	517	526	522	610	931	1024	
5:00:00	723	700	698	693	776	814	643	
6:00:00	2695	2646	2618	2648	2500	1277	690	
7:00:00	6590	6768	6594	6214	6050	2914	1139	
8:00:00	6425	6437	6647	6105	6126	4164	1804	
9:00:00	5853	6450	6546	6508	5907	5200	2445	
10:00:00	5723	5950	5732	5864	5700	6550	4148	
11:00:00	5856	5896	5912	5907	6344	6693	5614	
12:00:00	5913	5937	6021	5869	6825	7293	5781	
13:00:00	5685	5774	5952	6069	6840	6891	5752	
14:00:00	6174	5990	5946	6136	7335	6838	5894	
15:00:00	6597	6333	6823	6781	7531	6844	5718	
16:00:00	7117	7303	7348	7357	7146	6491	5591	
17:00:00	7977	8106	8169	7834	7299	6094	4716	
18:00:00	7972	7892	8182	7876	7522	5156	4190	
19:00:00	6617	6885	6786	6673	7038	5895	4535	
20:00:00	4912	5363	5617	6226	6328	4265	4210	
21:00:00	3898	4076	4376	4935	5643	3594	3942	
22:00:00	3706	3894	3863	4268	4856	3510	3720	
23:00:00	2840	3008	3162	3477	4089	3626	3489	
0:00:00	2140	2588	2341	2638	3129	3407	2276	
<hr/>								
24 hr Total	108436	111334	112977	113330	118809	103230	83026	
A.M. Total	42801	44122	44412	43060	44053	40619	28993	
P.M. Total	65635	67212	68565	70270	74756	62611	54033	
Noon-Noon		109757	111624	111625	114323	115375	91604	
<hr/>								
			ADT :	107306		AWD :	112977	

**SUMMER**

Confidence level = 95%

SB Express		FTMS - COMPASS DATA						
VDS :	Description							
LHRS :								
Hour Ending	MON	TUE	WED	THU	FRI	*SAT*	*SUN*	
	14-Aug-06	15-Aug-06	16-Aug-06	17-Aug-06	18-Aug-06	19-Aug-06	20-Aug-06	
1:00:00	1597	1264	1493	1632	1616	2406	2971	
2:00:00	829	708	857	869	904	1534	2110	
3:00:00	538	547	598	634	716	1103	1224	
4:00:00	493	562	587	566	614	886	783	
5:00:00	818	871	878	913	950	709	575	
6:00:00	2555	2540	2552	2509	2387	1114	713	
7:00:00	6301	6332	6438	6334	5913	2202	1045	
8:00:00	7120	6813	7449	7230	6871	2815	1346	
9:00:00	6718	4154	6552	6598	6331	3541	1951	
10:00:00	5510	5757	5530	5634	5403	4142	3152	
11:00:00	5228	5090	5238	5223	5328	4701	4726	
12:00:00	5383	5034	5275	5282	5311	5403	5968	
13:00:00	5166	5004	5098	5335	5488	5855	6694	
14:00:00	5359	4984	5107	5264	5400	5742	5721	
15:00:00	5158	4990	5272	5285	5393	5805	5129	
16:00:00	5891	5990	5843	5299	5959	5789	5312	
17:00:00	6374	6514	6856	5824	6718	5722	5851	
18:00:00	6585	7189	7219	6382	6585	5815	6553	
19:00:00	5590	5771	5959	5523	5605	5725	6122	
20:00:00	4477	4803	5034	5107	5476	5028	5070	
21:00:00	3823	4340	4765	4708	4733	4548	5154	
22:00:00	3726	4399	4578	4642	4806	4880	5122	
23:00:00	3058	3719	3930	3700	4266	4963	4775	
0:00:00	2178	2560	2823	2647	3473	3811	3145	
24 hr Total	100573	99935	105929	103140	106246	94220	90212	
A.M. Total	43088	39672	43445	43424	42344	30556	26564	
P.M. Total	57485	60263	62484	59716	63902	63664	63648	
Noon-Noon		97157	103708	105908	102060	94458	90228	
ADT :				100036		AWD :	103165	

**SPRING**

Confidence level = 90%

NB Express		FTMS - COMPASS DATA						
VDS :	Description :							
LHRS								
Hour Ending	MON	TUE	WED	THU	FRI	*SAT*	*SUN*	
	24-Apr-06	25-Apr-06	26-Apr-06	27-Apr-06	28-Apr-06	29-Apr-06	30-Apr-06	
1:00:00	943	1208	1288	1340	1946	2379	2454	
2:00:00	502	710	741	745	863	1486	1738	
3:00:00	416	537	515	540	703	1161	1380	
4:00:00	425	517	494	515	600	1010	1120	
5:00:00	641	753	746	716	819	759	668	
6:00:00	2388	2289	2403	2487	2532	1232	624	
7:00:00	6627	6747	6616	6714	6575	2857	1077	
8:00:00	7125	6256	6972	7192	7043	4071	1828	
9:00:00	6935	6487	6658	6485	6648	4887	2411	
10:00:00	5669	5795	5549	5719	5962	6024	3963	
11:00:00	5002	4705	4785	5236	5469	6743	5361	
12:00:00	5246	5349	5092	5454	6038	6375	5315	
13:00:00	5536	5545	5452	5699	6383	6668	6004	
14:00:00	5854	5918	5845	6044	6660	6474	5922	
15:00:00	6547	6376	6639	6578	6940	6324	5198	
16:00:00	7774	7372	7569	7149	7693	6123	5310	
17:00:00	8935	8470	8348	8134	8042	6157	5026	
18:00:00	8983	8630	8266	8294	7672	6014	5165	
19:00:00	6431	6978	7042	6959	7231	5778	5058	
20:00:00	4671	5165	5655	5838	6416	5265	4583	
21:00:00	3593	4031	4291	4640	4608	3979	4374	
22:00:00	3245	3676	3796	3933	3992	3621	3672	
23:00:00	2700	3566	3250	3334	3677	3378	2973	
0:00:00	1970	2262	2360	2725	3252	2793	2046	
<hr/>								
24 hr Total	108148	109342	110372	112470	117764	101558	83271	
A.M. Total	41909	41353	41859	43143	45198	38984	27940	
P.M. Total	56239	67989	68513	69327	72566	62574	55331	
Noon-Noon		107592	109848	111656	114525	111550	90514	
ADT :				106132	AWD :		111819	

**SPRING**

Confidence level = 90%

LHRS :

SIB Express		FTMS - COMPASS DATA						
VIDS :		Description :						
LHRS :								
Hour Ending	MON	TUE	WED	THU	FRI	*SAT*	*SUN*	
	24-Apr-06	25-Apr-06	26-Apr-06	27-Apr-06	28-Apr-06	29-Apr-06	30-Apr-06	
1:00:00	917	884	1173	1218	1453	2486	2905	
2:00:00	459	772	626	679	823	1554	1946	
3:00:00	381	556	538	556	620	1077	1183	
4:00:00	438	533	491	580	559	750	774	
5:00:00	782	827	801	882	874	704	579	
6:00:00	2374	2428	2431	2437	2458	1121	690	
7:00:00	6545	6660	7000	7004	6568	2444	1046	
8:00:00	8416	8164	8128	8425	8181	3376	1449	
9:00:00	7498	6584	6913	7160	6952	4296	1983	
10:00:00	5905	5481	5859	5879	6043	4946	3130	
11:00:00	5252	5487	5412	5409	5509	5130	4142	
12:00:00	5297	5322	5328	5314	5372	5566	4791	
13:00:00	5176	5280	5286	5288	5553	6305	5308	
14:00:00	5311	5182	5024	5171	5478	5995	5609	
15:00:00	5357	5404	5523	5730	5837	5917	5510	
16:00:00	6283	6247	6303	6274	6526	6162	5455	
17:00:00	6769	6631	6725	6750	6959	6190	5672	
18:00:00	7004	7044	7047	7188	6741	6203	5301	
19:00:00	5332	5558	6030	5724	5671	5976	5300	
20:00:00	4234	4449	4718	4704	5121	4863	5132	
21:00:00	3273	3347	3692	4040	3348	4554	4886	
22:00:00	2955	3254	3612	3656	3636	4003	4084	
23:00:00	2215	2569	2753	2866	3577	3527	3091	
0:00:00	1747	1926	2018	2418	3180	3564	2000	
24 hr Total	99920	100509	103429	105352	107039	96719	81966	
A.M. Total	44264	43698	44700	45543	45412	33460	24618	
P.M. Total	55656	56811	58729	59809	61627	63259	57348	
Noon-Noon		99354	101511	104272	105221	95087	87877	
ADT :				99276	AWD :		103250	