Metropolitan Council

Program Evaluation and Audit

Metro Transit

Diesel Fuel Reconciliation Review

1 August 2011

INTRODUCTION

Background

Metro Transit buses, operating from five garages located throughout the Twin Cities Metropolitan Area, have used an average of almost 7.9 million gallons of diesel fuel per year from 2005 through 2010 at an average annual cost of about $21.3 million dollars. The cost of diesel fuel has varied substantially, ranging from $15.7 million in 2009 to $30.8 million in 2008. Usage has been more stable, ranging from less than 7.2 million gallons in 2010 to almost 8.0 million gallons in 2005 (see Appendices IA and IB for details).

The Heywood, East Metro and Nicollet garages each have the capacity to hold 60,000 gallons of diesel fuel in inventory. The South and Ruter Garages each have a capacity of 45,000 gallons. Diesel fuel is stored in both above ground and underground storage tanks. Above ground storage tanks are located at the East Metro and Ruter garages; underground storage tanks (UST) at the Heywood and Nicollet garages and the South garage employed UST through April 2010 at which time they were replaced with above ground tanks. Metro Transit is currently planning to replace the Heywood and Nicollet UST with above ground tanks during the summer of 2011.

Metro Transit is required by regulation to report excess fuel leakage to the Minnesota Pollution Control Agency (MPCA). Fuel leakage can be easily noticed if it occurs above ground. All piping is above ground and the above ground tanks are equipped with an alarm system in case of spills. That is not the case when diesel fuel leaks from underground storage tanks (UST). For that reason, the MPCA requires daily UST fuel inventory reconciliations and monthly reporting of UST diesel fuel inventory levels.

Buses are refueled nightly. Depending upon the garage, diesel fuel storage tanks are replenished from about once to four times each week in tanker truck quantities of about 7,500 gallons. Due to the high value of diesel fuel inventory, the frequency of its dispersal and replenishment and the negative environmental effects of fuel leakage, reconciling fuel inventory is a necessary control element in safeguarding this Metro Transit asset. An inventory audit of the East Metro garage in April 2009, by Program Evaluation & Audit (Audit) disclosed that diesel fuel varied substantially from the amounts stated in Metro Transit's Txbase inventory system. Based on this, Metro Transit requested that Audit conduct a review of fuel reconciliation processes and procedures.

The current diesel fuel contract was initially valued at $46 million and was executed on June 6, 2007, with a two year term running from July 1, 2007 through June 30, 2009. The contract could also be extended for two one year periods. Amendment 2 to the contract raised the contract ceiling to $71 million. The contract was then extended through June 2010 by mutual agreement of the parties via email communication. On February 24, 2010, Amendment 4 raised the contract ceiling to $100 million and extended it through June 30, 2011.

Assurances

This audit was conducted in accordance with the Institute of Internal Auditors' *International Standards for the Professional Practice of Internal Auditing* and the U. S. Government Accountability Office's *Government Auditing Standards*.

Purpose

This review was conducted to assure that Metro Transit can effectively and efficiently reconcile diesel fuel inventories with the amounts stated in its Txbase inventory system for each of the five bus garages.

Scope

Due to the differences in detecting fuel leakage between above ground and underground storage tanks, each type of storage tank was audited separately. The review was conducted using samples of daily physical inventory recordings at the five garages and comparing that to the data entered into the Txbase inventory system during various periods from December 2008 through December 2010. It also included a review of administration policies, procedures, Work Instructions, actual practices and MPCA requirements.

Methodology

To gain an understanding of Metro Transit fuel reconciling practices and reporting procedures, the following methods of inquiry were used:

- Materials Management and Bus Maintenance personnel were interviewed.
- Inventory disbursements and receipts were sampled and analyzed.
- Monthly MPCA reports were reviewed and data analyzed.
- Metro Transit policies, procedures and work instructions were reviewed.
- MPCA regulations were reviewed.
- Average inventory levels were analyzed.

OBSERVATIONS

Underground Storage Tank Reconciliation

Audit reviewed the monthly UST reports submitted to the MPCA for January through December 2010. The chart below indicates those months when specific diesel fuel UST were not in compliance with MPCA variance requirements, followed by an explanation of the variance and subsequent actions taken by Metro Transit to alleviate the problem.

		2010											
Garage	**Tank**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Heywood	1	**X**	**X**		**X**	**X**		**X**	**X**	**X**	**X**	**X**	
Heywood	2	**X**	**X**		**X**	**X**				**X**	**X**	**X**	
Nicollet	All									**X**			
South	1												
South	2				**X**								
South	3												

X = Month when the subject tank was out of MPCA compliance.

Heywood

- Fuel from the two UST flows through individual underground pipes, coming above ground within the garage. At this point, each pipe contains a control valve operated by a hand lever that opens and closes a bypass valve thereby allowing or shutting off flow from an individual UST. These pipes connect to a third one, also controlled with a hand lever that allows the fuel to flow to the six dispensers at which buses are refueled. In January, February, April and May the valves had been opened allowing fuel to mix from the two UST, thereby registering inaccurate readings from which UST the fuel had originated. When this was discovered in February, Facilities Maintenance personnel placed red plastic sleeves on the levers to indicate that they were not to be moved. The problem continued in April and May at which time locks were inserted into the levers. Audit viewed & verified that all three pipes had locked lever valves. Why the levers were initially moved is unknown. The Materials Manager stated that he inquired, but no one accepted responsibility for moving the levers.
- In July, tank 1 was out of compliance and tank 2 was within 9.17% of being non-compliant. Facilities Maintenance personnel hired an independent consultant to calibrate the six fuel dispensers, believing that the dispensers were incorrectly recording the amount of fuel being dispensed. However, the results of that calibration testing disclosed that all dispensers were within acceptable limits of 1/10 of a gallon in a five gallon test. Facility Maintenance personnel believe this is again an issue with an employee tampering with the by-pass valve. However,

the daily variance pattern is not similar to that appearing in those months when the by-pass valve was clearly identified as the problem. No suitable reason could be found for the variance.

- The Materials Manager verified the daily usage and receipt data multiple times, finding no reason for the August tank 1variance.
- In September, the stockkeeper was measuring the depth of each tank with two different measuring sticks and then averaging the results. However, the sticks were not uniform, resulting in inaccurate readings. The stockkeeper has subsequently received additional training on the proper method for measuring diesel fuel inventory. Even when dip readings are taken uniformly, a 1/8 inch miss-read by the stockkeeper could mean the difference between 25 to 28 gallons. A stockkeeper could easily make a 50 gallon error due to dip stick sighting alone.
- In October and November, the vendor's driver split fuel loads, even though, according to MPCA reporting requirements, the tanker load (about 7,500 gallons) should not be split between UST. The vendor is supposed to wait until the storage tank is down to 20,000 gallons (66% full) before a delivery is made. According to the Materials Manager, conflicting statements were obtained from the vendor regarding driver actions. In October, the vendor denied load splitting. In November, the vendor acknowledged that it had occurred.

The delivery truck does not have a flow guage. Therefore, the driver would estimate the amount of fuel that was supplied to each tank. Audit reviewed the daily entries in the monthly reports and verified that the variances occurred the day of or the day after a delivery was made, an indication that load splitting had occurred.

Nicollet: It was thought that a stuck float valve was responsible for the September variances at the Nicollet garage. Facilities Maintenance personnel hired an independent firm to inspect the tanks. No problem was found and the reason for the variance is unknown.

South: The April South garage tank #2 variance was adequately explained due to rearrangement of fuel during the move from UST to above ground tanks.

A review of January through July 2011 UST reports disclosed no reportable variances. Combined with a similar December 2010 report, Metro Transit has gone eight consecutive months with no reportable variances. During 2010, the longest continuous time with no reportable variances was a single month.

Above Ground Storage Tank Reconciliation

Since July 2010, the above ground storage tanks at the Ruter, South and East Metro garages have been fitted with a real time fuel inventory management system that tracks capacity, actual inventory and delivery history, among many other information points. The information reported by this system is the same information that is placed into Txbase. This system is also equipped with alarms. In case of a spill, Metro Transit personnel are alerted immediately. In addition, all piping is above ground and small leaks to piping can be readily seen.

The East Metro garage has always employed above ground storage tanks. The Ruter and South garages initially used underground storage tanks, but were retrofitted to above ground tanks in May 2008 and May 2010, respectively. Since the April 2009 inventory review at the East Metro garage in which Audit identified a substantial diesel fuel variance, the following actions have occurred:

- the above ground fuel reconciliation system was implemented at the end of June 2009, in which the actual fuel on hand was used to determine how much fuel was consumed since the last time the meter was read. Previously, the stockkeeper used a conversion chart to determine how many inches of fuel were in each tank based upon the number of gallons read from the tank meter. The gallons seldom matched directly to the inches. Therefore, the stockkeeper rounded the result. The inches were entered into Txbase and then converted back to gallons, resulting in variances due solely to this complicated process.
- Since July 2010, the real time fuel inventory management system has been in place.

Diesel Fuel Dispensing

Diesel fuel dispensers in each garage are controlled by a solenoid operated by the TRAK Fuel Management System (TRAK). TRAK is programmed to energize this solenoid when it recognizes a Metro Transit bus. The system can be over-ridden by manually inputting a valid bus number and current mileage and then swiping an I.D. badge. Each dispenser also has a by-pass lockout that allows unrecorded fuel transactions. The keys to the by-pass lockout are accessed by Facilities personnel and shop Supervisors. The bypass is to be used when a TRAK system failure occurs and buses must be refueled. Communication with Bus Maintenance personnel disclosed that Metro Transit has no written policy or procedure regarding this activity. However, to their knowledge, no one has ever activated the by-pass lockout on any of the fuel dispensers other than to test them.

An updated TRAK system is being tested at the East Metro garage with 30 buses. This radio frequency identification (RFID) upgrade is expected to fix the problem of a very high (about half) failure rate of the plates resulting from the current plate and loop reading system. The new system is also expected to retrieve bus diagnostic data and provide fuelers with bus parking information.

Diesel Fuel Inventory Policy/Procedure

Although Metro Transit has various inventory management policies and procedures, none specifically addresses the amount of diesel fuel to maintain in inventory or how to manage that inventory. Metro Transit has a purchase order with its diesel fuel vendor requiring the vendor to maintain diesel fuel storage tanks on a "keep fill" basis. Every day at 8 a.m., an email is sent from the Txbase inventory system to the vendor and the vendor's agents. The email states the amount of diesel fuel on hand and the capacity of each tank. The vendor uses this report to determine when and how much fuel to deliver to Metro Transit.

Audit randomly sampled seven days between the period November 26, 2010 and December 21, 2010 to determine if a pattern exists for vendor re-supply of diesel fuel. No pattern of resupply could be found. Nicollet with 8.10 days of average diesel fuel usage on hand (days) and Ruter with 7.34 days were consistently maintained with higher inventory levels whereas East Metro (4.96 days), Heywood (5.20 days) and South (5.72 days) were maintained with lower inventory levels. See Exhibit III for additional details.

Audit also compared the daily diesel fuel usage and ending inventory for each of the five garages for November and December 2010. The November to December variances are shown below. In total, December usage increased an average of 1,034 gallons/day; however, inventory increased by 20,301 gallons/day. This is another indication that Metro Transit needs to maintain tighter control over its diesel fuel inventory.

	Average Daily Changes	
Garage	**Usage**	**Inventory**
East Metro	343	7,864
Heywood	154	6,087
Nicollet	(78)	1,753
South	52	4,351
Ruter	564	246
	1,034	**20,301**

Audit also reviewed Metro Transit diesel fuel inventory levels at the five garages from December 2008 to December 2010 and found that they rose constantly from 5.44 days in December 2008 to 7.17 days in December 2010, as shown below. Overall, the Nicollet garage averaged the most inventory for the three years at 7.57 days and East Metro the lowest at 5.22 days.

	Days Inventory			
Garage	**Dec '08**	**Dec '09**	**Dec '10**	**Average**
East Metro	4.11	5.55	5.99	5.22
Heywood	6.13	6.10	6.63	6.29
Nicollet	5.78	7.86	9.06	7.57
South	5.27	8.69	7.35	7.11
Ruter	5.90	6.65	6.84	6.46
	27.20	**34.85**	**35.87**	**32.64**
Average	**5.44**	**6.97**	**7.17**	**6.53**

CONCLUSIONS

1. *Metro Transit has been affected by a weakness in the internal controls over personnel access, use and reporting of changes in positioning of the diesel fuel by-pass valve regulating flow of fuel from individual underground storage tanks at the Heywood garage. However, it appears that those controls have been strengthened and are currently adequate to prevent unauthorized access.*

Turning the by-pass valve affects the tank from which diesel fuel is dispensed. As a result, the monthly reports that Metro Transit submits to the MPCA show variances that could indicate leakage from underground storage tanks. Material Management and Facilities and Engineering personnel must then take time from other tasks to determine the reason for the variance. This occurred in four of the 12 months for which reports were submitted in 2010. Locks were placed on the by-pass valves in May and there have not been any reportable variances due to unauthorized adjustment of the by-pass valve for 14 successive months (June 2010 through July 2011).

2. *Metro Transit has adequate internal controls in place to assure accurate reporting of diesel fuel inventory at those garages fitted with above ground storage tanks (South, Ruter and East Metro).*

All above ground storage tanks have been fitted with a real time, alarm equipped, fuel inventory management system that records actual inventory and alerts Metro Transit personnel in case of a spill. In addition, piping is above ground, allowing personnel to notice and respond to small leaks.

3. *Metro Transit has an internal control system for safeguarding the dispensing of diesel fuel; however, it contains some weaknesses that can be strengthened.*

The TRAK Fuel Management System can be manually over-ridden and diesel fuel dispensers are fitted with by-pass lockouts allowing unrecorded fuel transactions. The keys to the by-pass lockout are accessed by Facilities personnel and shop Supervisors. The bypass is to be used when a TRAK system failure occurs and buses must be refueled. Communication with Bus Maintenance personnel disclosed that Metro Transit has no written policy or procedure regarding this activity.

4. *Metro Transit does not have a policy for the amount of diesel fuel to maintain in inventory, leaving the decision to the discretion of the diesel fuel vendor.*

Metro Transit has a purchase order with its vendor requiring that it maintain diesel fuel storage tanks on a “keep fill” basis. No pattern of resupply could be found, with inventory levels ranging from 8.10 days average usage at the Nicollet garage to 4.96 days at the East Metro garage.

There was no correlation between need and supply from one garage to another and also from one year to another. Although December 2010 usage increased an average of 1,034 gallons/day between November and December for the five garages, inventory increased by 20,301 gallons/day. In addition. diesel fuel inventory increased significantly from 5.44 days average usage in December 2008 to 7.1.7 days average usage in December 2010.

RECOMMENDATIONS

Program Evaluation and Audit recommendations are categorized according to the level of risk of the finding (conditions) they are designed to resolve. The categories are:

- **Essential** – Steps must be taken to avoid the emergence of critical risks to the Council or to add great value to the Council and its programs. Essential recommendations are tracked through the Audit Database and status is reported twice annually to the Council's Audit Committee.
- **Significant** – Adds value to programs or initiatives of the Council, but is not necessary to avoid major control risks or other critical risk exposures. Significant recommendations are also tracked with status reports to the Council's Audit Committee.
- **Considerations** – Recommendation would be beneficial, but may be subject to being set aside in favor of higher priority activities for the Council, or may require collaboration with another program area or division. Considerations are not tracked or reported. Their implementation is solely at the hands of management.
- **Verbal Recommendation** – An issue was found that bears mentioning, but is not sufficient to constitute a control risk or other repercussions to warrant inclusion in the written report. Verbal recommendations are documented in the file, but are not tracked or reported regularly.

1. (Essential) Metro Transit should implement a formal written diesel fuel inventory policy and revise its current procedures allowing the fuel supplier to determine inventory levels.

The current system of "keep fill" diesel fuel inventory management provides Metro Transit's diesel fuel supplier an incentive to maximize deliveries and determine the level of inventory maintained at each of Metro Transit's five garages. Metro Transit cannot maintain effective control over its diesel fuel inventories unless it assumes responsibility for determining when deliveries are to be made.

Management Response: *Metro Transit concurs that the amount stocked should be determined by Metro Transit. As such, Metro Transit Material Management reviewed and updated its "Active Inventory Management" procedure. Material Management also communicated those changes and new requirements to the vendor.*

Staff Responsible: *Manager, Material Management*

Timetable: *Review of Policy - Completed*
Procedural Changes – Completed

2. (Significant) Metro Transit should prepare and implement a formal written policy regarding the TRAK Fuel Management System for dispensing diesel fuel.

The TRAK Fuel Management System can be manually over-ridden, allowing unrecorded fuel transactions. In addition, keys to fuel dispenser by-pass lockout valves can be accessed by both Facilities personnel and shop Supervisors. Although valid operational reasons exist for these conditions, Metro Transit has no formal written policy or procedure regarding this activity. A formal policy covering access to the TRAK system, access to keys to by-pass valves and discipline for breaking policy is one way of tightening controls over unauthorized access to the Metro Transit fuel dispensing system.

Management Response: *A Standard Operating Procedure (SOP) was jointly developed by Bus Maintenance and Facilities & Engineering to communicate the process for using the over-ride mechanism.*

Staff responsible: *Bus Maintenance and Engineering & Facilities*

Timetable: *Completed*

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Exhibit IA: Diesel Fuel Usage & Cost
2005 – 2010

	Usage							#	Tank	Total
Garage	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**	**Tanks**	**Capacity**	**Capacity**
East Metro	1,833,990	1,872,540	1,964,119	1,987,825	1,870,439	1,806,719	11,011,935	3	20,000	60,000
Heywood	2,072,449	1,999,588	2,050,815	2,154,501	1,816,660	1,821,213	11,588,326	2	30,000	60,000
Nicollet	1,508,436	1,488,855	1,520,523	1,389,012	1,321,770	1,295,206	8,291,548	3	20,000	60,000
Ruter	1,244,878	991,528	1,045,603	1,117,623	1,080,524	1,082,796	6,355,541	3	15,000	45,000
South	1,294,528	1,194,715	1,192,137	1,244,644	1,145,031	1,152,086	7,007,766	3	15,000	45,000
Total	**7,954,281**	**7,547,226**	**7,773,197**	**7,893,605**	**7,234,424**	**7,158,020**	**44,255,116**			**270,000**
Average 2005-2010							**7,375,853**			
Supplier				**Cost**						
Western		8,863,810	22,514,776	30,768,663	15,706,598	19,169,619	92,683,400			
BP	11,808,129	9,900,016					21,708,145			
Mansfield	4,328,423						4,328,423			
Total	**16,136,552**	**18,763,826**	**22,514,776**	**30,768,663**	**15,706,598**	**19,169,619**	**118,719,968**			
Average 2005-2010							**19,786,661**			
Av. Cost/Gallon	**$2.03**	**$2.49**	**$2.90**	**$3.90**	**$2.17**	**$2.68**	**$2.68**			

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Exhibit IB: Diesel Fuel Usage & Cost

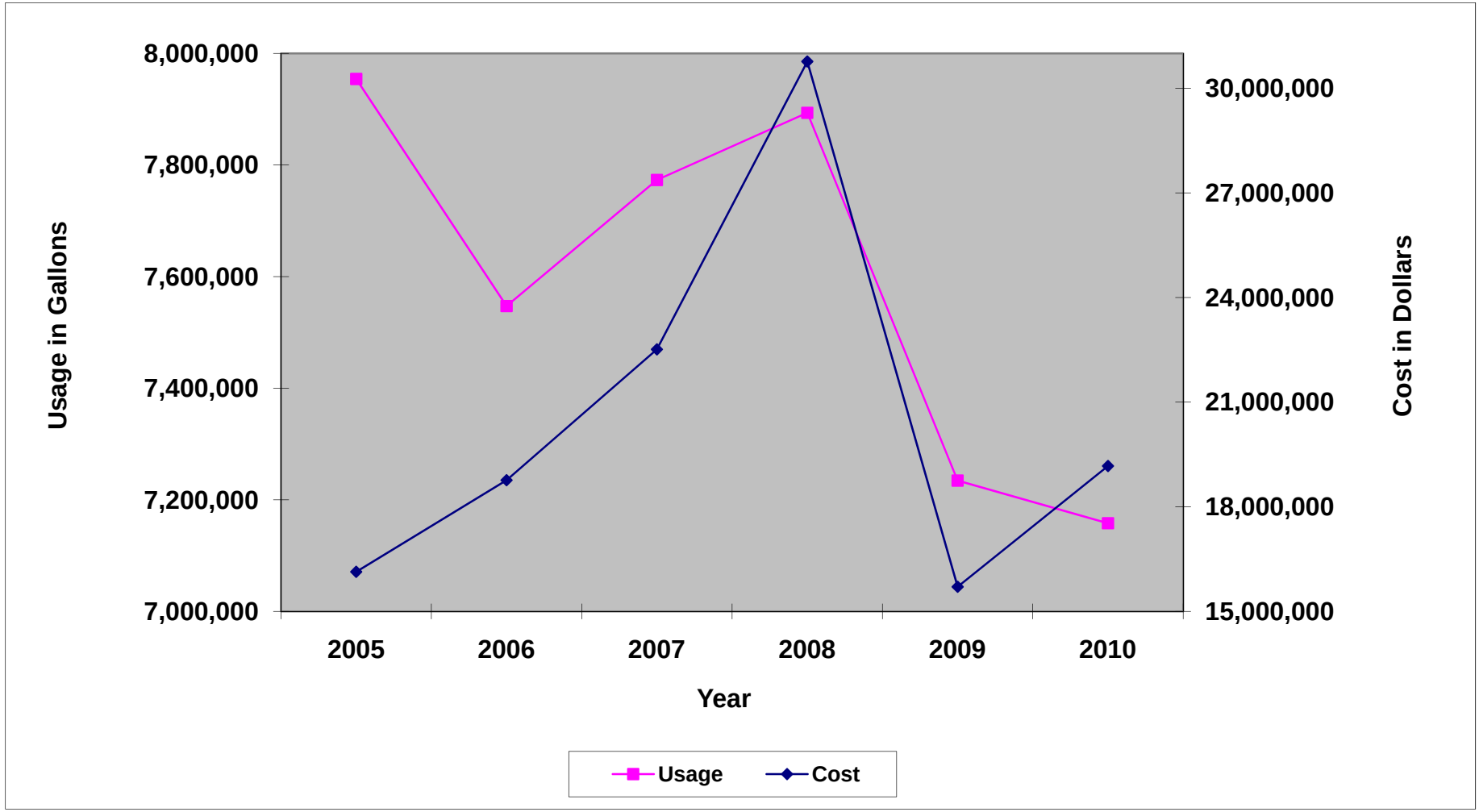

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Exhibit II: Estimated Average Diesel Fuel Inventory

	Average Inventory - 2010 thru October			
Garage	**High**	**Low**	**Average**	**Daily Use**
Heywood	56,388	31,309	43,670	7,261
Ruter	36,281	20,313	27,705	4,070
East Metro	51,042	26,549	39,460	7,658
South	32,128	12,523	24,869	4,896
Nicollet	47,310	20,886	35,631	5,094
	223,149	**111,580**	**171,336**	**28,978**

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Exhibit III: Fuel Availability & Supplier Deliveries

Location	Date	On Hand	Capacity	Available Storage	Average Daily Usage	Days Available	Same Day Delivery
Nicollet	12/21/10	41,452	60,912	19,460	5,094	8.14	8,114
Nicollet	12/20/10	42,824	60,912	18,088	5,094	8.41	8,114
Nicollet	12/17/10	43,109	60,912	17,803	5,094	8.46	0
Nicollet	12/14/10	39,937	60,912	20,975	5,094	7.84	8,108
Nicollet	11/30/10	35,530	60,912	25,382	5,094	6.97	7,538
Nicollet	11/29/10	39,511	60,912	21,401	5,094	7.76	0
Nicollet	11/26/10	46,490	60,912	14,422	5,094	9.13	0
		288,853	**426,384**	**137,531**	**35,658**	**8.10**	**31,874**
Ruter	12/21/10	28,334	43,842	15,508	4,070	6.96	8,110
Ruter	12/20/10	24,625	43,842	19,217	4,070	6.05	8,123
Ruter	12/17/10	30,857	43,842	12,985	4,070	7.58	0
Ruter	12/14/10	28,816	43,842	15,026	4,070	7.08	7,598
Ruter	11/30/10	28,249	43,842	15,593	4,070	6.94	7,568
Ruter	11/29/10	32,322	43,842	11,520	4,070	7.94	0
Ruter	11/26/10	35,921	43,842	7,921	4,070	8.83	0
		209,124	**306,894**	**97,770**	**28,490**	**7.34**	**31,399**
Heywood	12/21/10	40,032	60,912	20,880	7,261	5.56	8,113
Heywood	12/20/10	38,408	60,912	22,504	7,261	5.29	8,115
Heywood	12/17/10	40,911	60,912	20,001	7,261	5.63	8,115
Heywood	12/14/10	36,156	60,912	24,756	7,261	4.98	7,605
Heywood	11/30/10	29,712	60,912	31,200	7,261	4.09	15,173
Heywood	11/29/10	35,952	60,912	24,960	7,261	4.95	0
Heywood	11/26/10	43,093	60,912	17,819	7,261	5.93	0
		264,264	**426,384**	**162,120**	**50,827**	**5.20**	**47,121**

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Exhibit III: Fuel Availability & Supplier Deliveries (continued)

Location	Date	On Hand	Capacity	Available Storage	Average Daily Usage	Days Available	Same Day Delivery
South	12/21/10	30,932	45,084	14,152	4,896	6.32	7,604
South	12/20/10	27,248	45,084	17,836	4,896	5.57	7,607
South	12/17/10	34,638	45,084	10,446	4,896	7.07	0
South	12/14/10	23,107	45,084	21,977	4,896	4.72	8,104
South	11/30/10	22,281	45,084	22,803	4,896	4.55	8,104
South	11/29/10	26,154	45,084	18,930	4,896	5.34	0
South	11/26/10	31,816	45,084	13,268	4,896	6.50	0
		196,176	**315,588**	**119,412**	**34,272**	**5.72**	**31,419**
East Metro	12/21/10	42,679	59,715	17,036	7,658	5.57	7,605
East Metro	12/20/10	43,962	59,715	15,753	7,658	5.74	15,717
East Metro	12/17/10	43,962	59,715	15,753	7,658	5.74	0
East Metro	12/14/10	38,718	59,715	20,997	7,658	5.06	15,184
East Metro	11/30/10	25,827	59,715	33,888	7,658	3.37	7,581
East Metro	11/29/10	31,993	59,715	27,722	7,658	4.18	0
East Metro	11/26/10	38,697	59,715	21,018	7,658	5.05	7,568
		265,838	418,005	152,167	53,606	4.96	53,655
	Total	**1,224,255**	**1,893,255**	**669,000**	**202,853**	**6.04**	**195,468**
							0.96