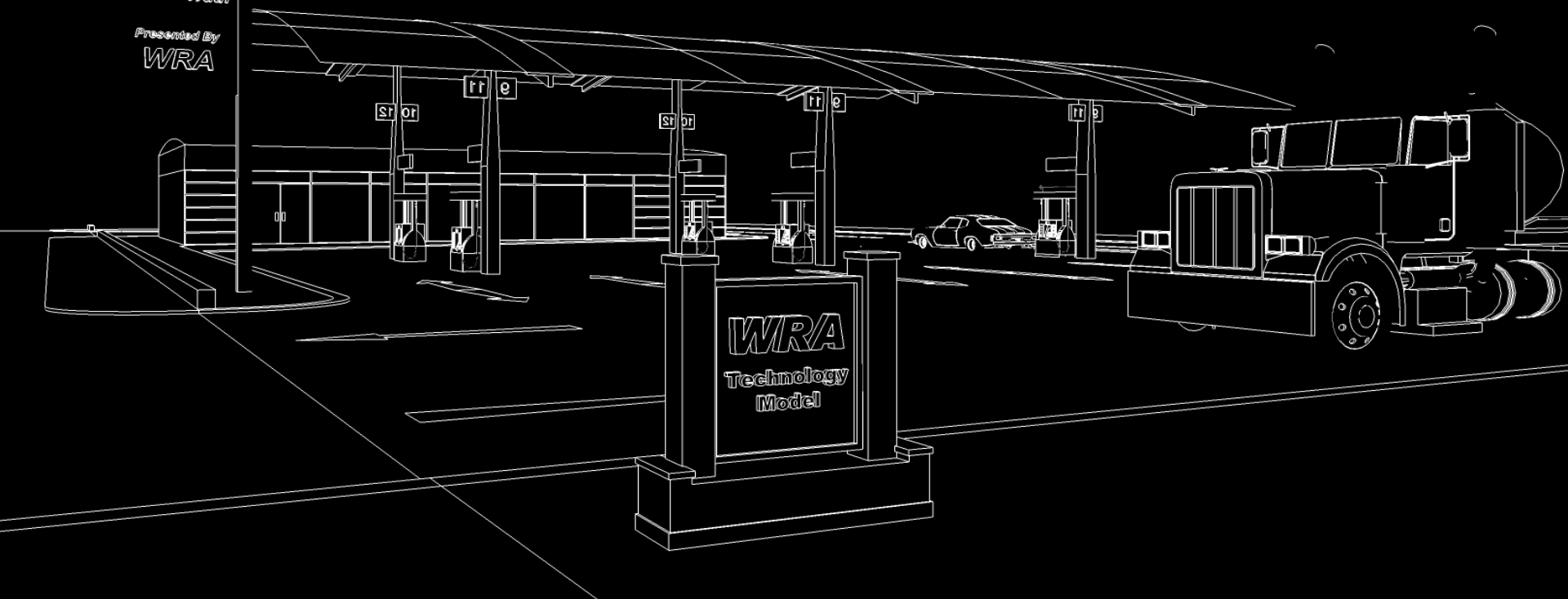


*The  
Cost  
Of  
Accepting  
Error As  
Truth*

*Presented By  
WRA*



Leak Detection Options at High Throughput Sites  
NEIWPCC Webinar  
November 15, 2011

# Why High Throughput?

- ▶ **Evolution of Retail Petroleum Business Models**
- ▶ **Submersible Turbine Pumps**
- ▶ **Tank Manifolding**
- ▶ **Unattended Fueling**
- ▶ **Electronic Payment at the Pump**
- ▶ **24 hour Operations**
- ▶ **(Travel Centers) – Drivers Rest, Parking, and Security**



# Travel Center Characteristics

## Diesel Systems

- ▶ 2-5 UST's Manifolded
- ▶ 40-100 K Tank Capacity
- ▶ 30K-80K Gallons in Daily Sales
  - ▶ 4-10 Deliveries Daily



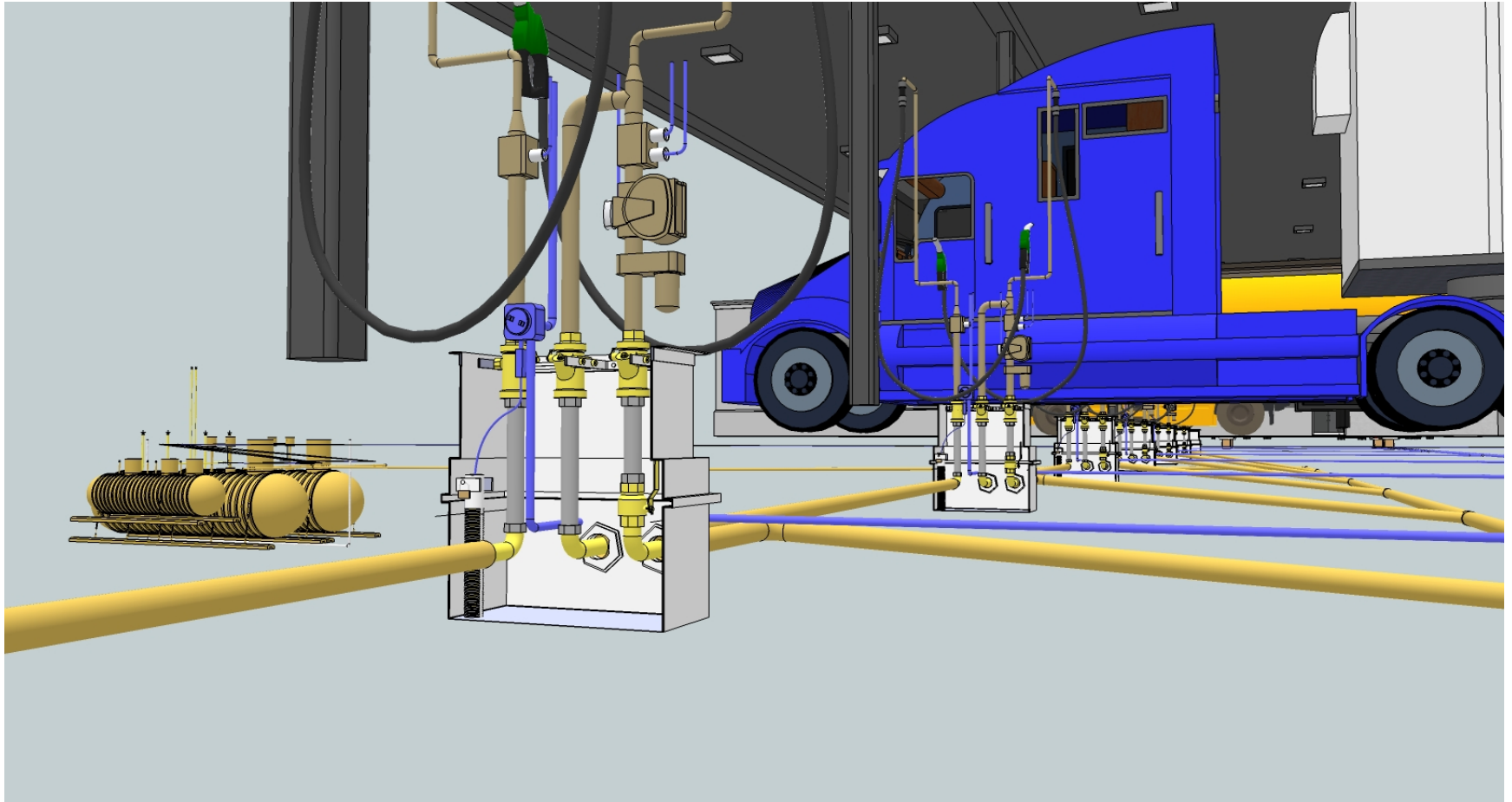
# Travel Center Characteristics

## Gasoline Systems

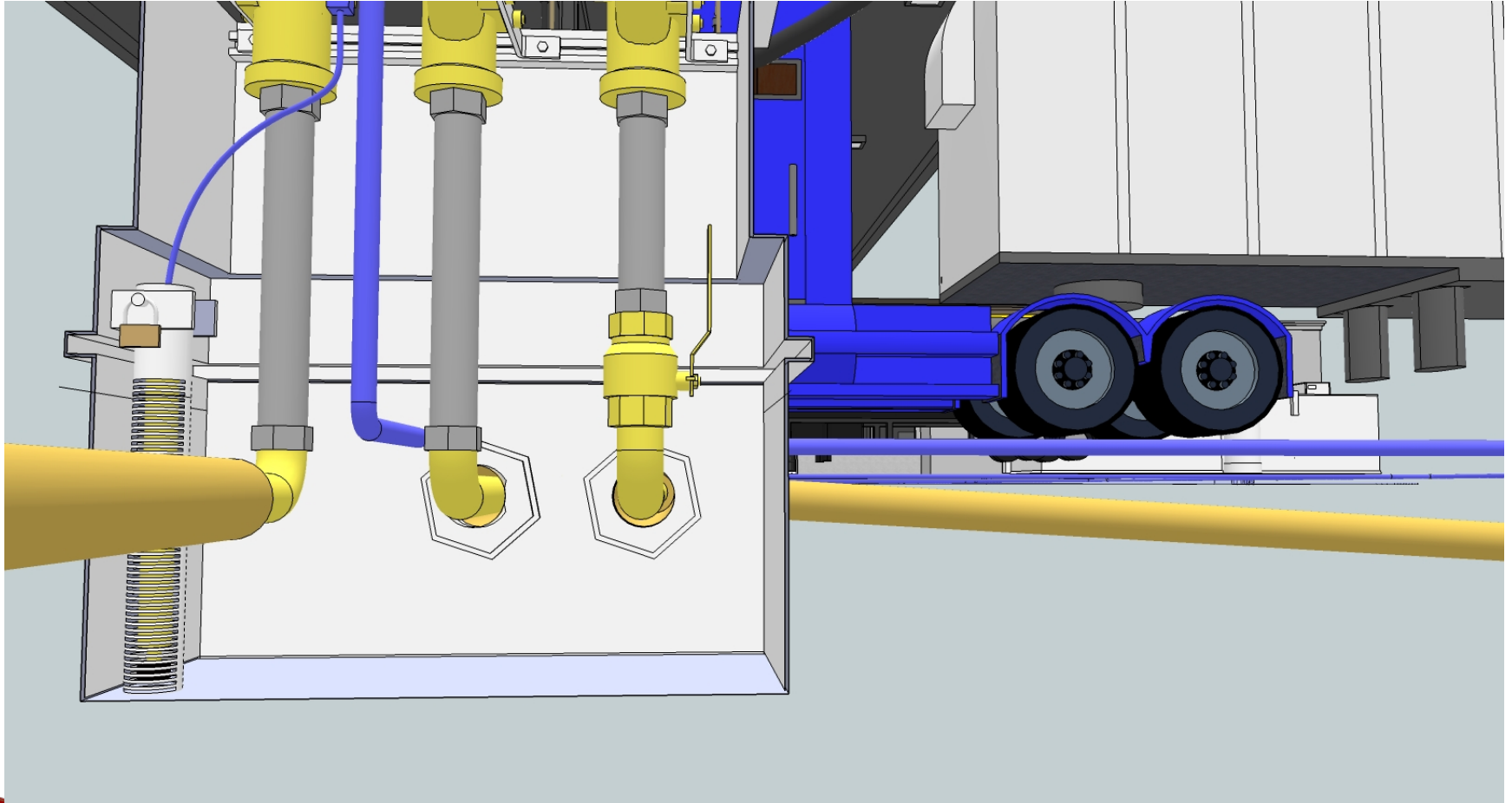
- ▶ **3-5 UST's / Two Tank Manifolds Common**
  - ▶ **Some Compartmented Tanks**
  - ▶ **10K-30K Gallons in Daily Sales**
    - ▶ **12K-20K Tank Sizes**
    - ▶ **2-4 Deliveries Daily**



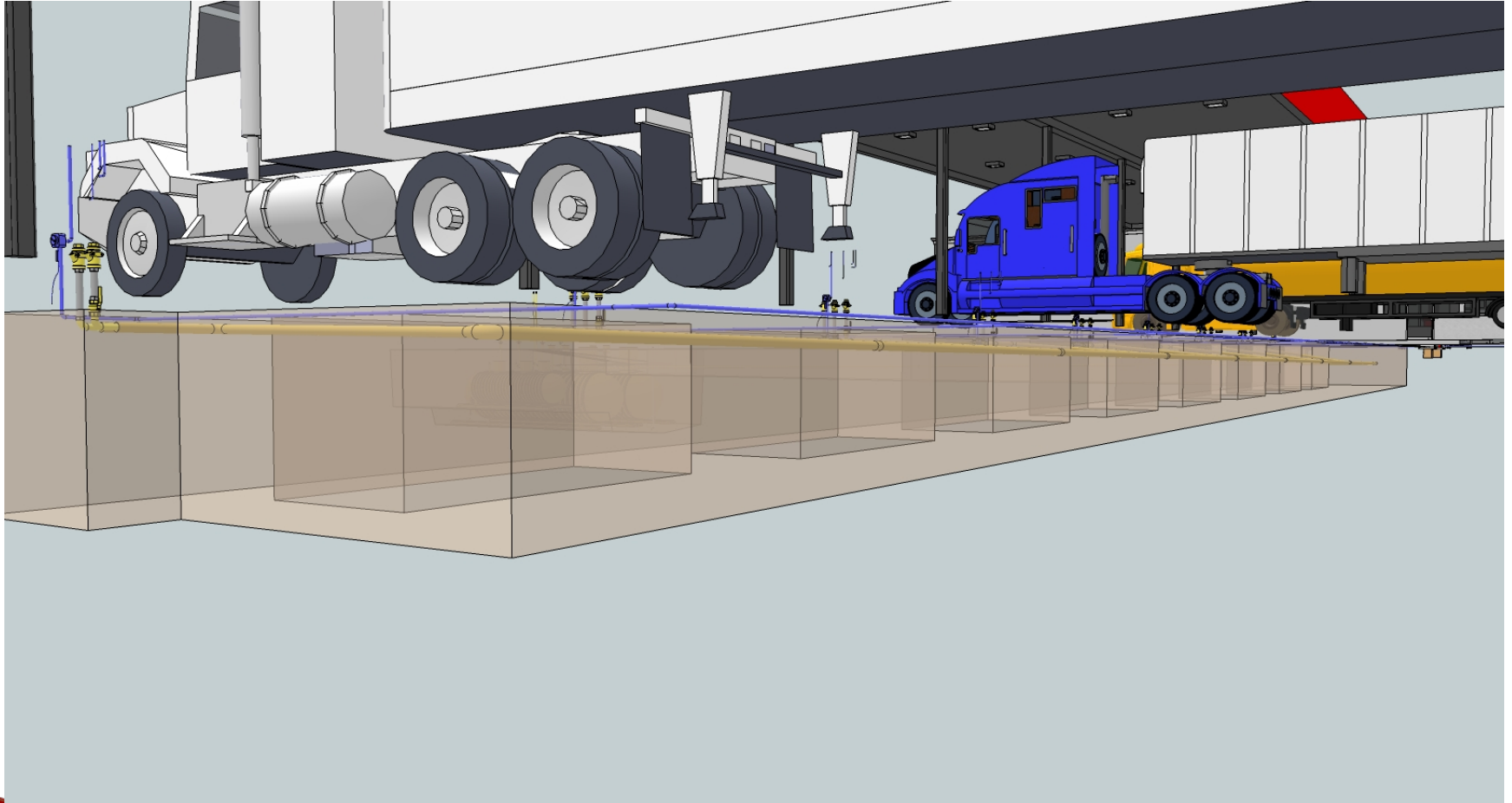
## Sensor Monitoring – Dispenser Containment with Satellite



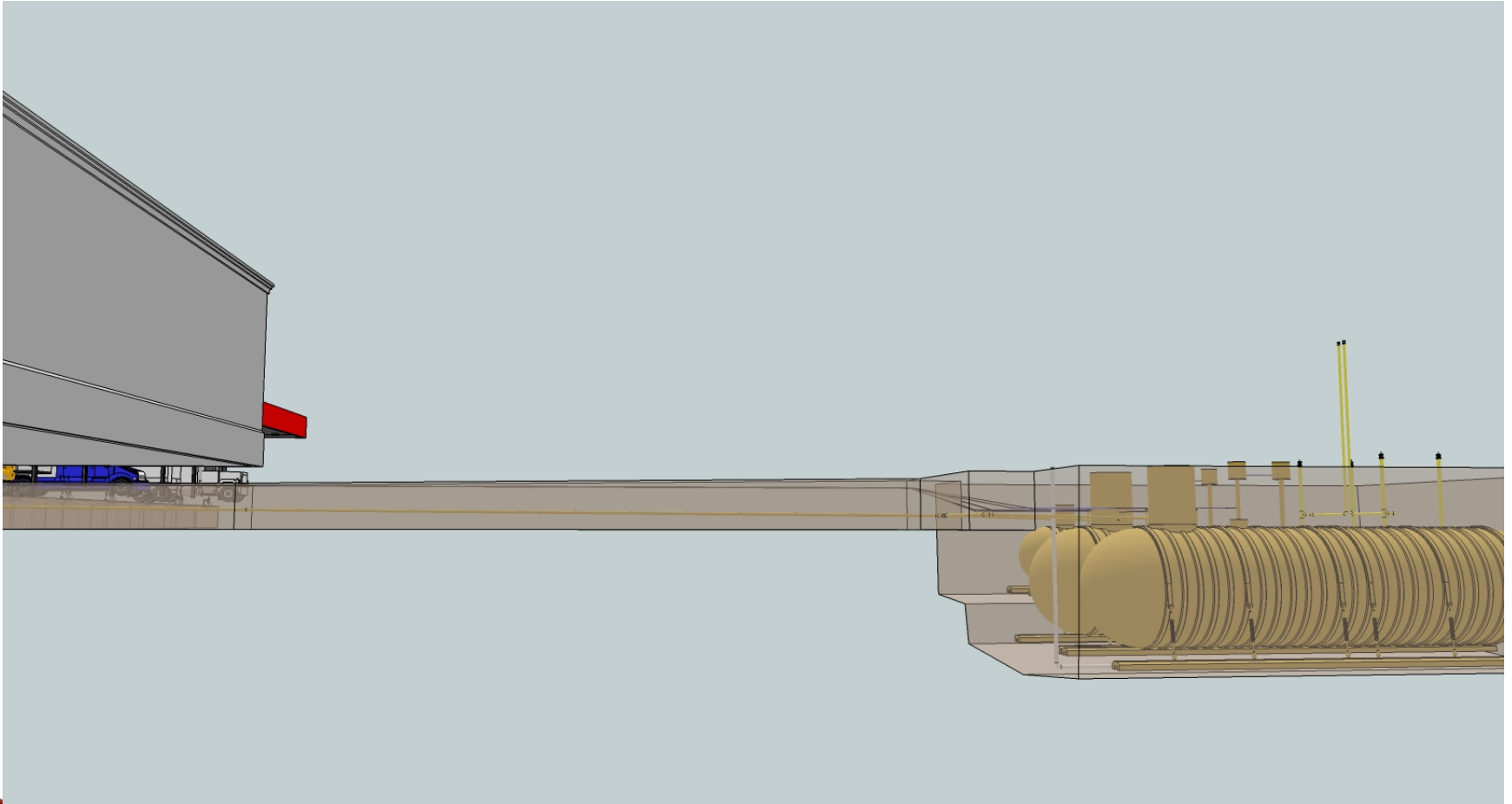
## Sensor Monitoring- Dispenser Containment



## Sensor Monitoring – Pipe Slope Toward UST's

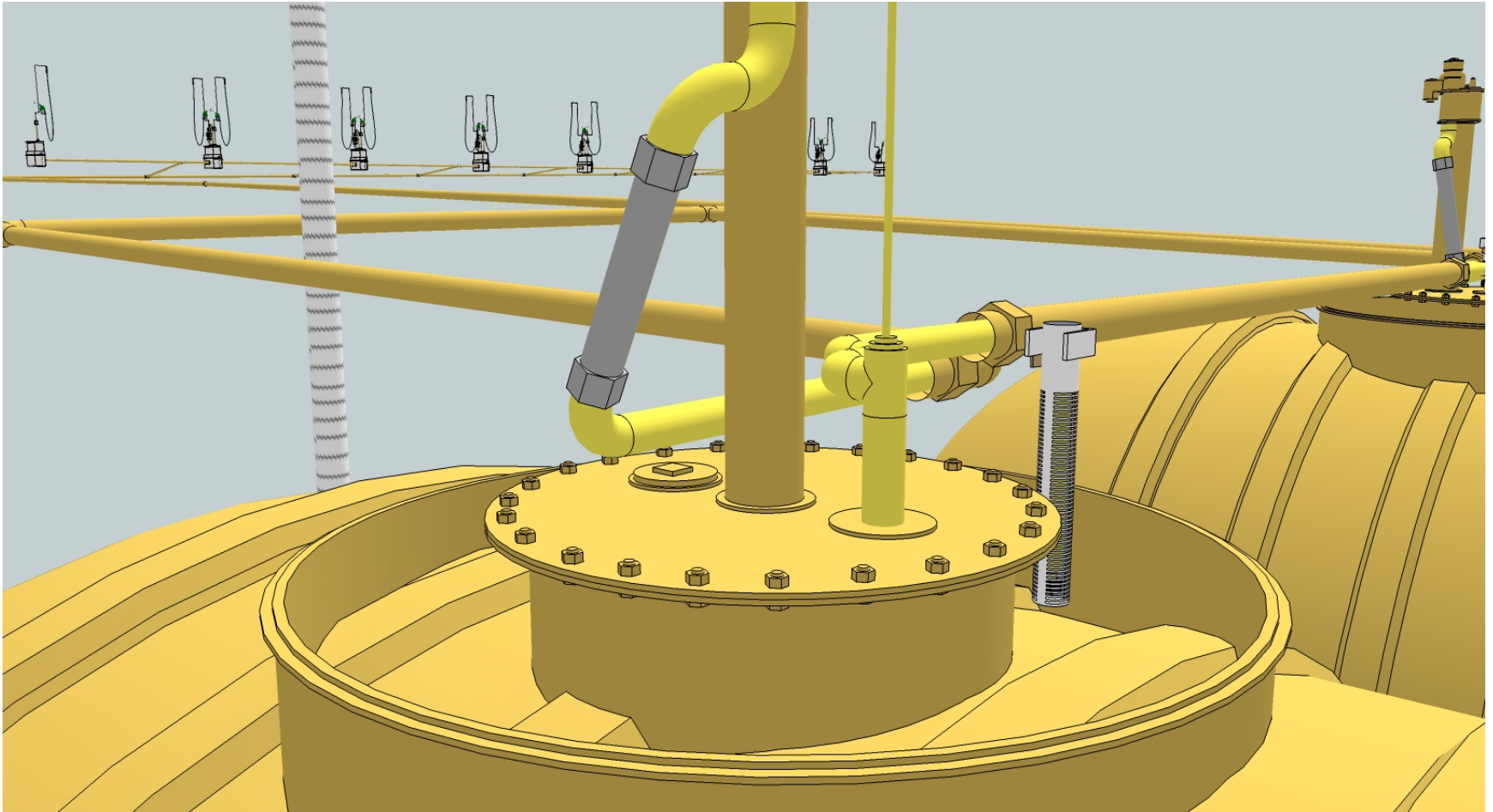


## Sensor Monitoring-Piping Slope Toward UST's





## Sensor Monitoring – Tank Sump



## PetroNetwork Continual Reconciliation

- ▶ **CITLDS Method Certified for Tank Systems up to 100,000 gallons and up to 5 Tanks in a Manifold**
- ▶ **Monitors Tanks and Associated Lines**
- ▶ **Handles Monthly Throughputs up to 2,718,000 Gallons**
- ▶ **Used with Magnetostrictive ATGS Systems**
- ▶ **Adjusts for Temperature Effects**
- ▶ **Calculates Delivery Amounts**
- ▶ **6- 15 Days of Data**



# On Site Processor Installation



# CITLDS Performance Summary

System	Maximum Monthly Throughput
PetroNetwork	2,718,013 Gallons
Veeder Root / Gilbarco	221,980 Gallons
OPW / Dresser Wayne Europe	130,000 Gallons
Franklin Incon EBW	257,818 Gallons
Omntech	154,195 Gallons
Hectronic	126,923 Gallons
Caldwell	147,136 Gallons



# Point Of View Comparison

## Layers Of Uncertainty

Loss Investigation Based on Month's Data

Delivery Dispatch

Fuel Accounting – Daily Stock Control

30 LD



**Inventory and SIR Practice**

## Layers Of Audit

Delivery Audits

Meter Drift Analysis

Theft Identification

Dispenser Flow Rates (Max Flow – As Used)

Maintenance Verification

Site Characterization – Tank Geometry Model

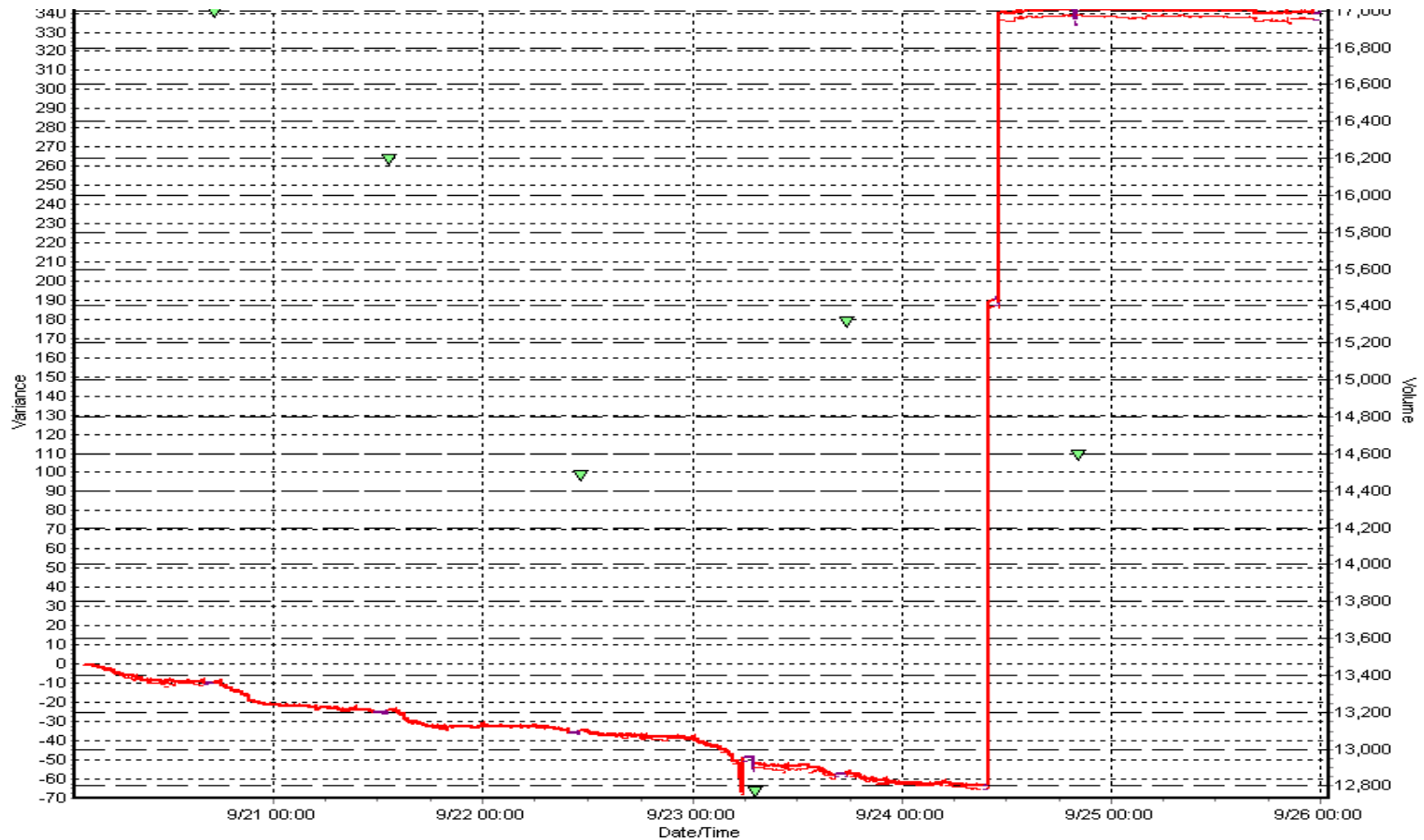
Over 500,000 Lines Of Data



**Continual  
Reconciliation Method**

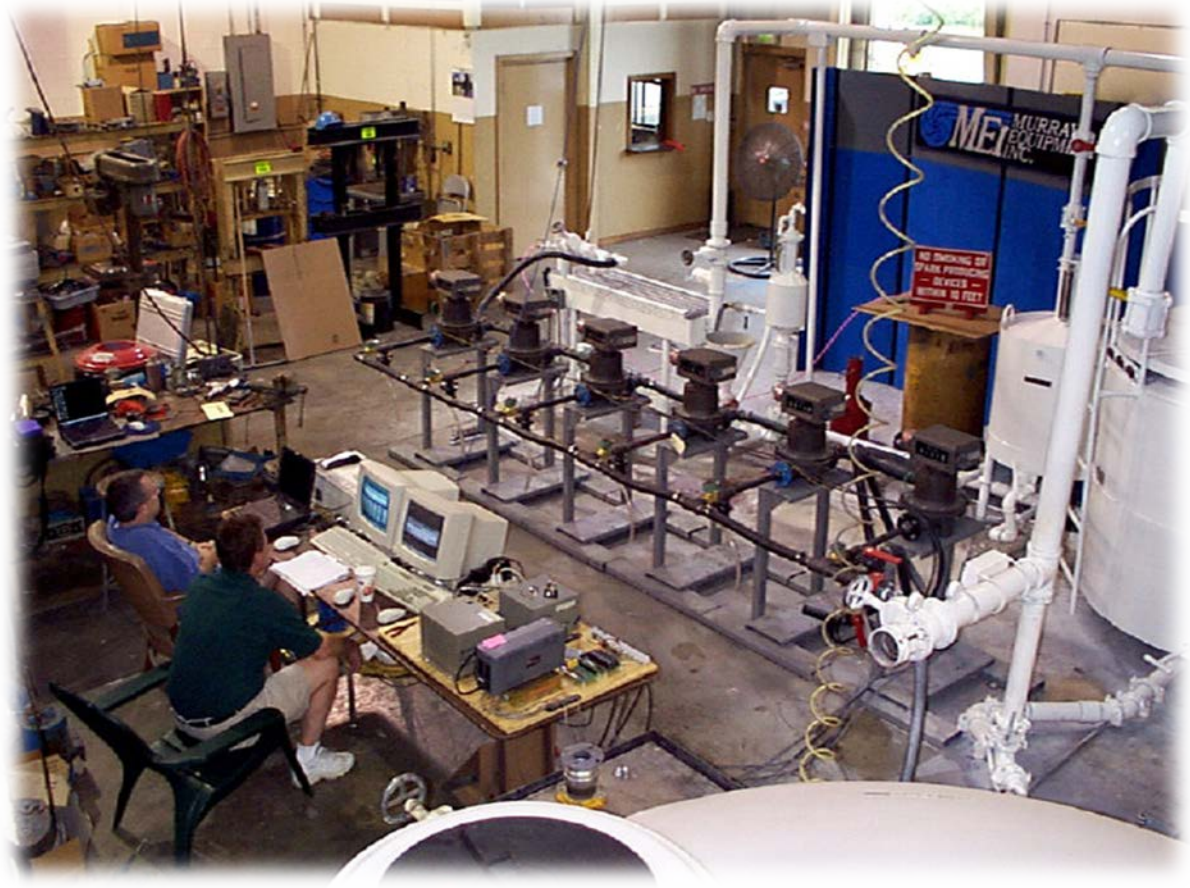


# Meter Drift Effects





# Controlled Performance Evaluation



# Calibration Effects

*On 100,000 throughput. . .*

*0 ci = 0 gal  
+1ci = 87 gal loss  
+2ci = 174 gal loss  
+3ci = 260 gal loss  
+4ci = 397 gal loss  
+5ci = 433 gal loss*





# Meter Drift Effects

Dispenser	Calibration	Gallons Sold	Factor	Amt Held Back (+) or Given Away (-)
1	-35	130000	0.9975	328.28
2	15	155000	1.0011	-167.75
3	-65	135000	0.9953	633.12
4	490	120000	1.0354	-4242.42
5	5	96000	1.0004	-34.63
6	-50	70000	0.9964	252.53
7	5	50000	1.0004	-18.04
8	-45	25000	0.9968	81.17
				-3167.75
			\$3.0990	(\$9,816.85)

# Delivery Audit

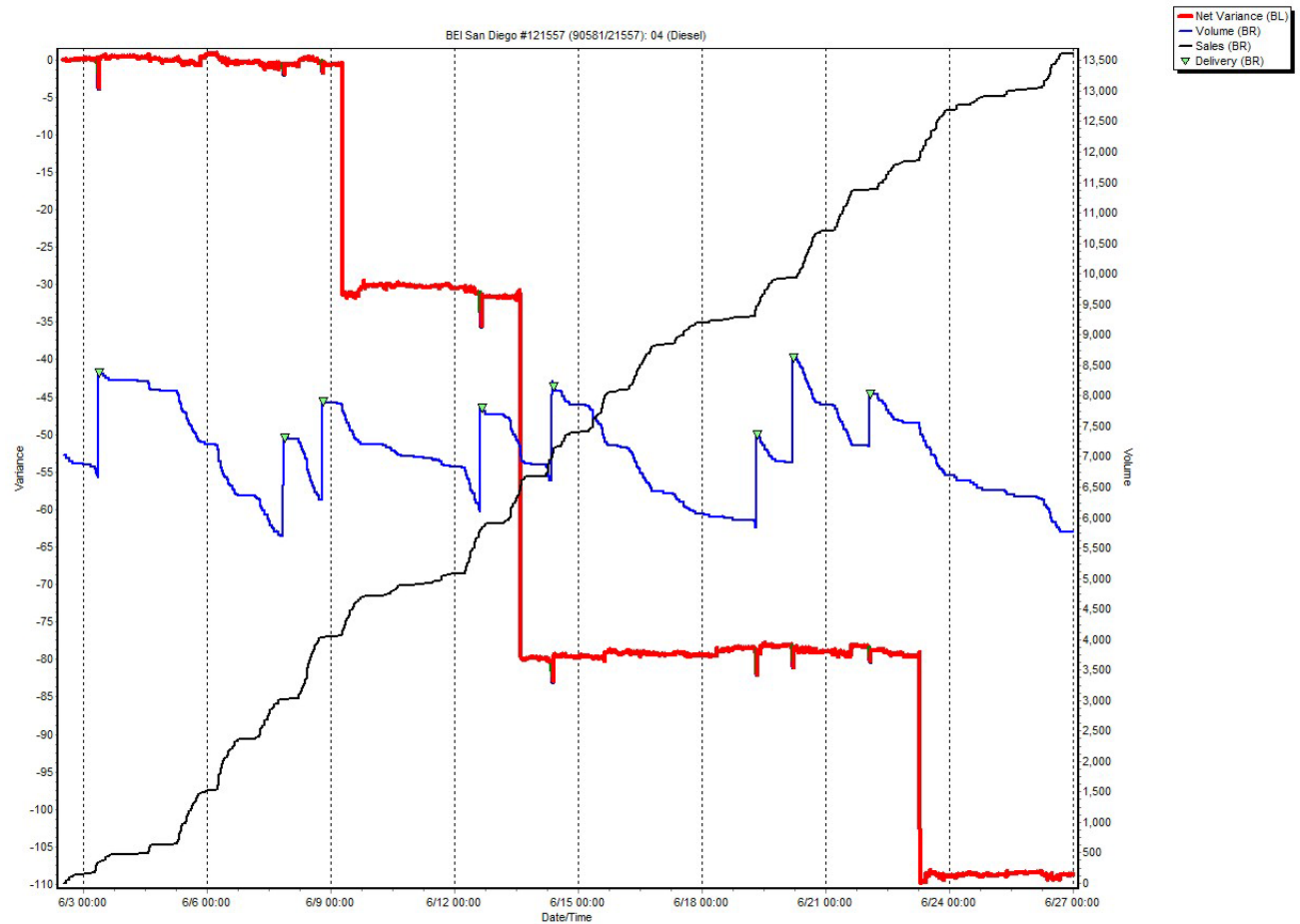
Store	Product	WRA Gross Settled Delivery	WRA Net Settled Delivery	WRA Gross Quick Delivery	WRA Net Quick Delivery	Date	BL#	Driver	Time Finished Loading	Time Delivered on Ticket	Company Gross	Company Net	Gross Diff	Net Diff
Rt 195	Diesel	0	0	7791	7786	4/24/2010 1:24	30962	A	23:35	0:25	7801	7800	-8	-13
Rt 195	Diesel	7793	7787	0	0	4/24/2010 1:39								
Rt 195	Diesel	0	0	7179	7133	4/24/2010 5:12	<b>18255</b>	<b>B</b>	<b>3:09</b>	<b>4:43</b>	<b>7797</b>	<b>7747</b>	<b>-618</b>	<b>-613</b>
Rt 195	Diesel	7179	7134	0	0	4/24/2010 5:30								
Rt 195	Diesel	0	0	23921	23780	4/24/2010 14:17	18256	A	6:38	8:30	4801	4764	-35	-1
							18257	A	7:21	9:00	3800	3773		
							18260	A	10:01	11:40	7754	7699		
							18261	A	10:53	12:35	7601	7545		
Rt 195	Diesel	0	0	15357	15255	4/24/2010 17:07	18263	A	13:12	15:00	7769	7718	-13	-8
Rt 195	Diesel	39279	39025	0	0	4/24/2010 18:11	18264	A	14:18	15:55	7601	7545		
Rt 195	Diesel	0	0	7780	7749	4/24/2010 20:13	18266	A	18:26	20:00	7799	7763	-21	-14
Rt 195	Diesel	7778	7749	0	0	4/24/2010 21:09								
Rt 195	Diesel	0	0	7789	7754	4/24/2010 23:35	182672	A	21:39	23:09	7801	7765	-14	-12
Rt 195	Diesel	7787	7753	0	0	4/24/2010 23:40								
Total		69816	69448	69817	69457									
		70524	70119											
Diff		-708	-671											



# Dispenser Theft



# Theft Signature In Log File



# Dispenser Flow Rates Truck Diesel

07:30 Friday, May 28, 2010 1

### *Diesel Dispensers May 20 to May 26 2010*

[illegible]

*A=Auto Diesel B=Does Not Exist G=Gasoline K=Kerosene N=Not Enough Data*



# Issues Related to 3 GPH Leak Detection

- ▶ **Requires Off-On Cycle for Test**
- ▶ **Testing Once Hourly to Standard**
- ▶ **High Throughput Facilities and Number of Off-On Cycles**



# Issues Related to 3 GPH Leak Detection 832 K Monthly Throughput

```
W 1: MASTER PUMP 3  
  
3.0 GAL/HR RESULTS:  
  
LAST TEST:  
SEP 15, 2011 10:10 AM PASS  
  
NUMBER OF TESTS PASSED  
PREV 24 HOURS :    69  
SINCE MIDNIGHT :    39  
  
0.20 GAL/HR RESULTS:  
  
NO 0.20 DATA AVAILABLE  
0.10 GAL/HR RESULTS:  
  
NO 0.10 DATA AVAILABLE  
  
NO-VENT TEST ABORTS:  
0 OUT OF 0 TEST
```

## Issues Related to 3 GPH Leak Detection

- ▶ **High Throughput Operators Have Worked to Address the Issue**
- ▶ **Real-Time Alerting**
- ▶ **Continuous Transfer of Information to a Headquarters Facility and Help Desk Notification**
- ▶ **Incorporates Flow and Non-Flow States**





# Leak Detection During Flow Beta Testing



# High Throughput Leak Detection

## Questions and Answers

