

Level of Service Evaluation & Analysis of Anti-Icing Road Treatments Rural ITS - Big Sky, MT

August 14, 2006

Gregory E. Thompson
2817 South Anthony Lane
Minneapolis, MN 55418
Tel: 612 788-0835



Mobile Platforms

Use as Information Gatherers
&
Data Collectors

Mobile Platforms



Mobile Platforms



Additional Vehicles



Dump
Truck

Waste
Water
Camera
Truck



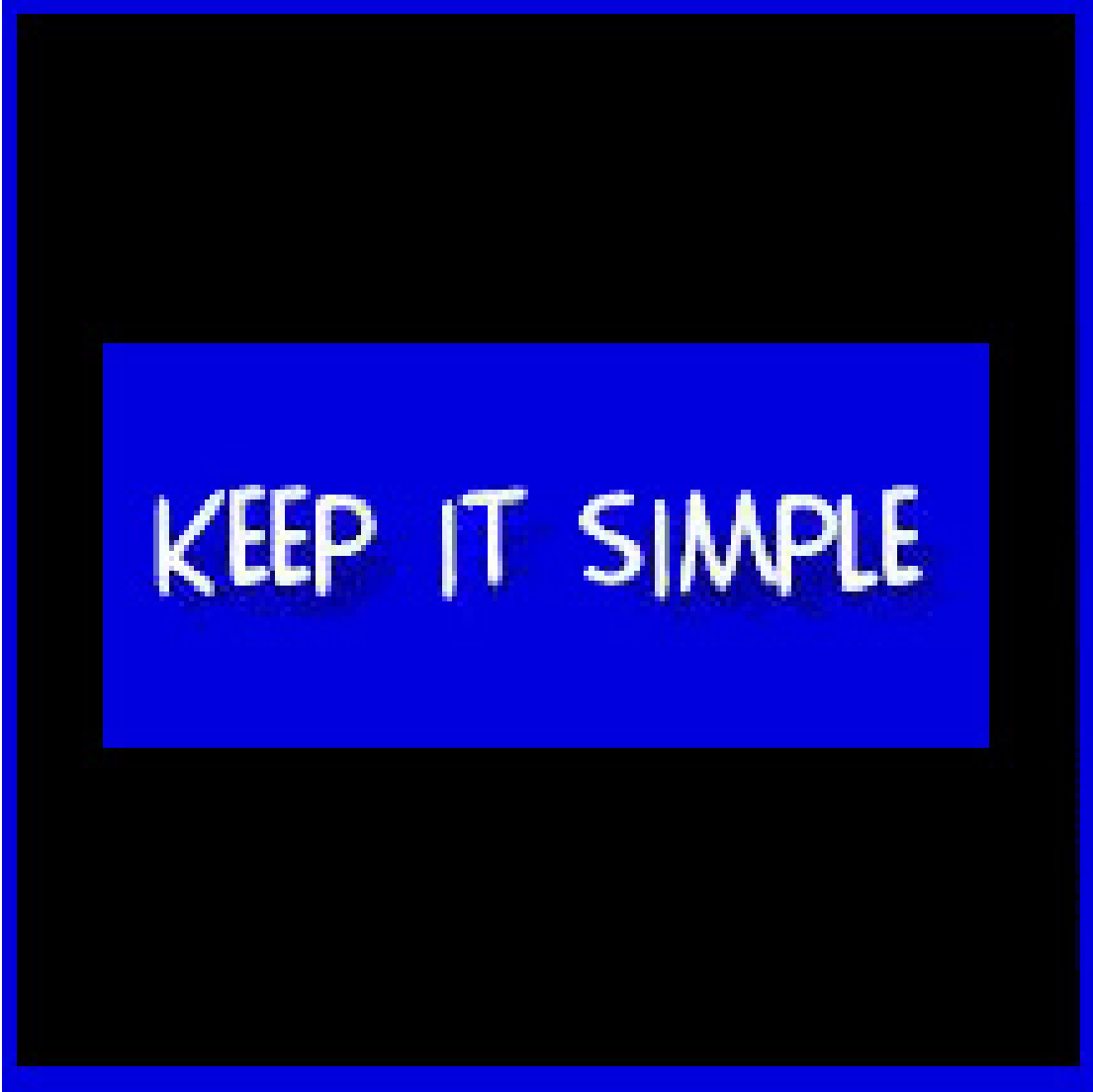
Vacuum
Truck

Supervisor
Truck



Evaluation Truck





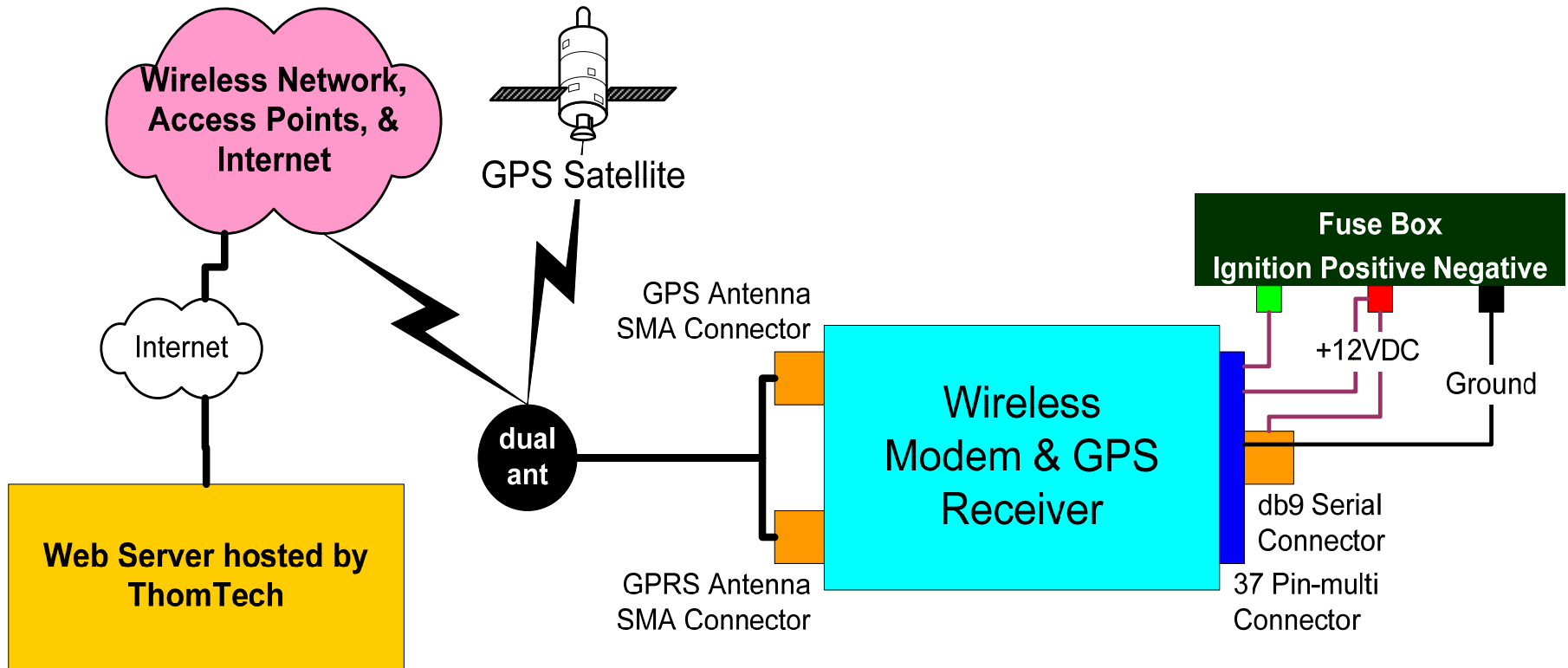
KEEP IT SIMPLE

In-Vehicle Equipment for Collecting Information

Wireless Modem, GPS Receiver, Dual Antenna



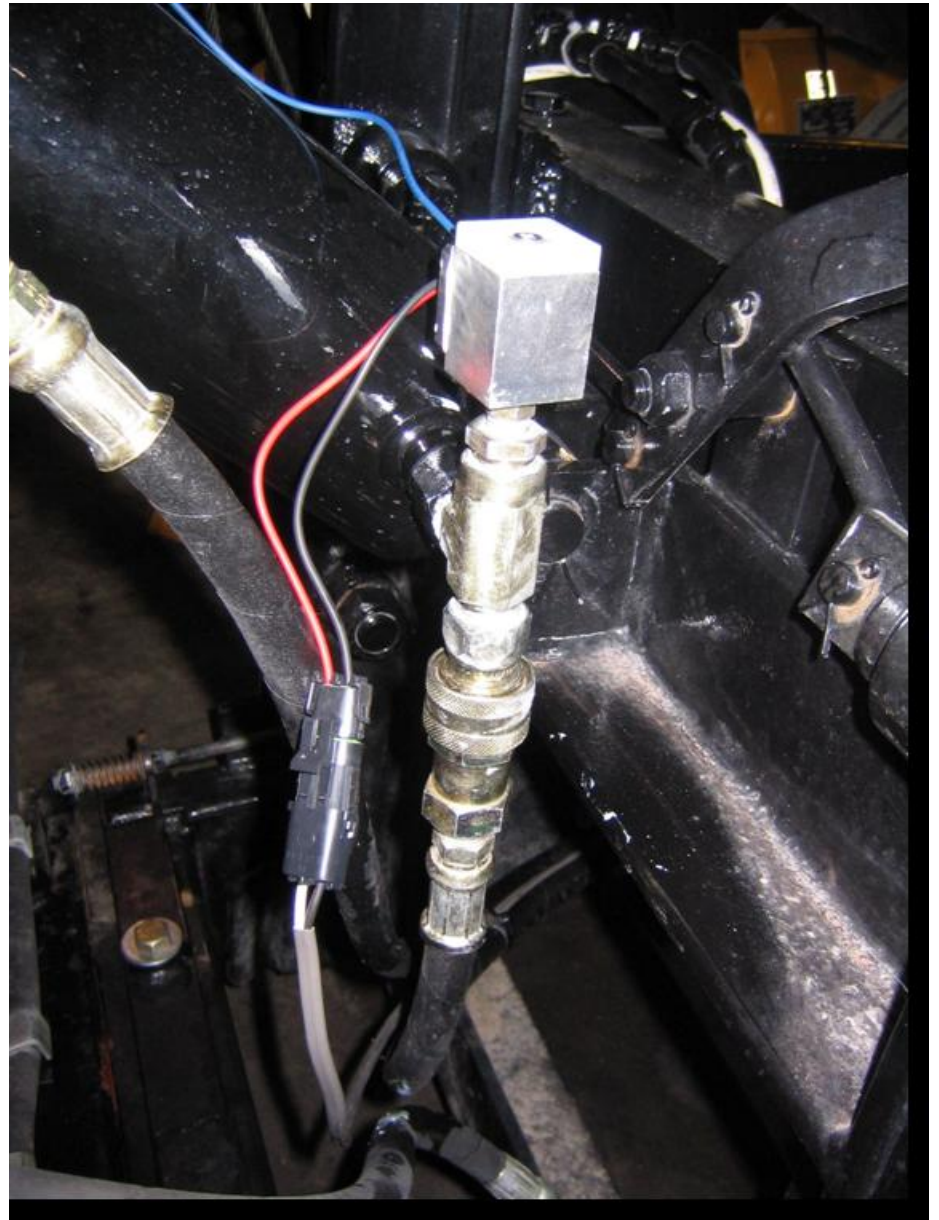
Installation Block Diagram



Tilt Sensor - Inclinator



Installed Hydraulic Pressure Switch

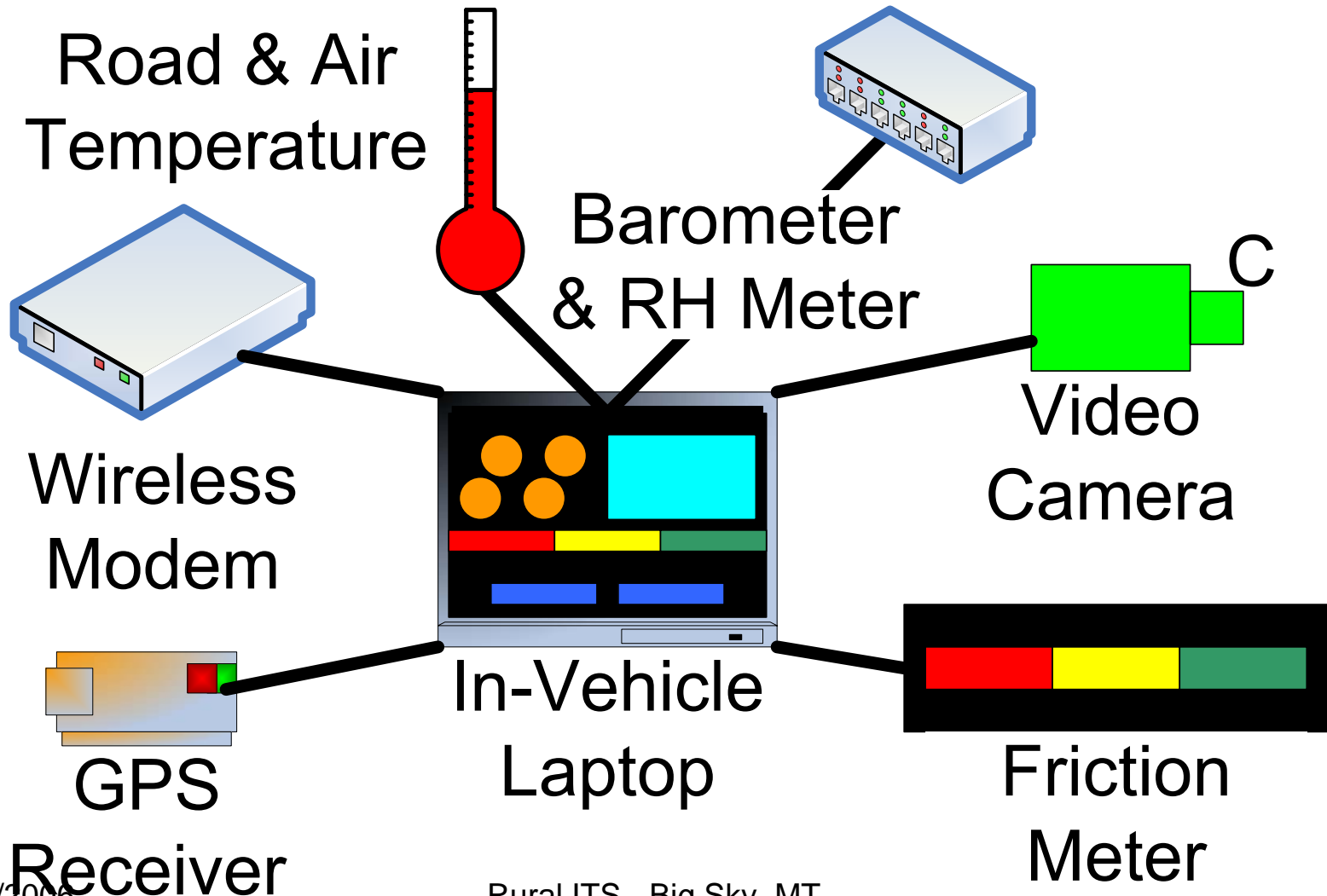


Operator Input Sensors



Roadway Evaluation

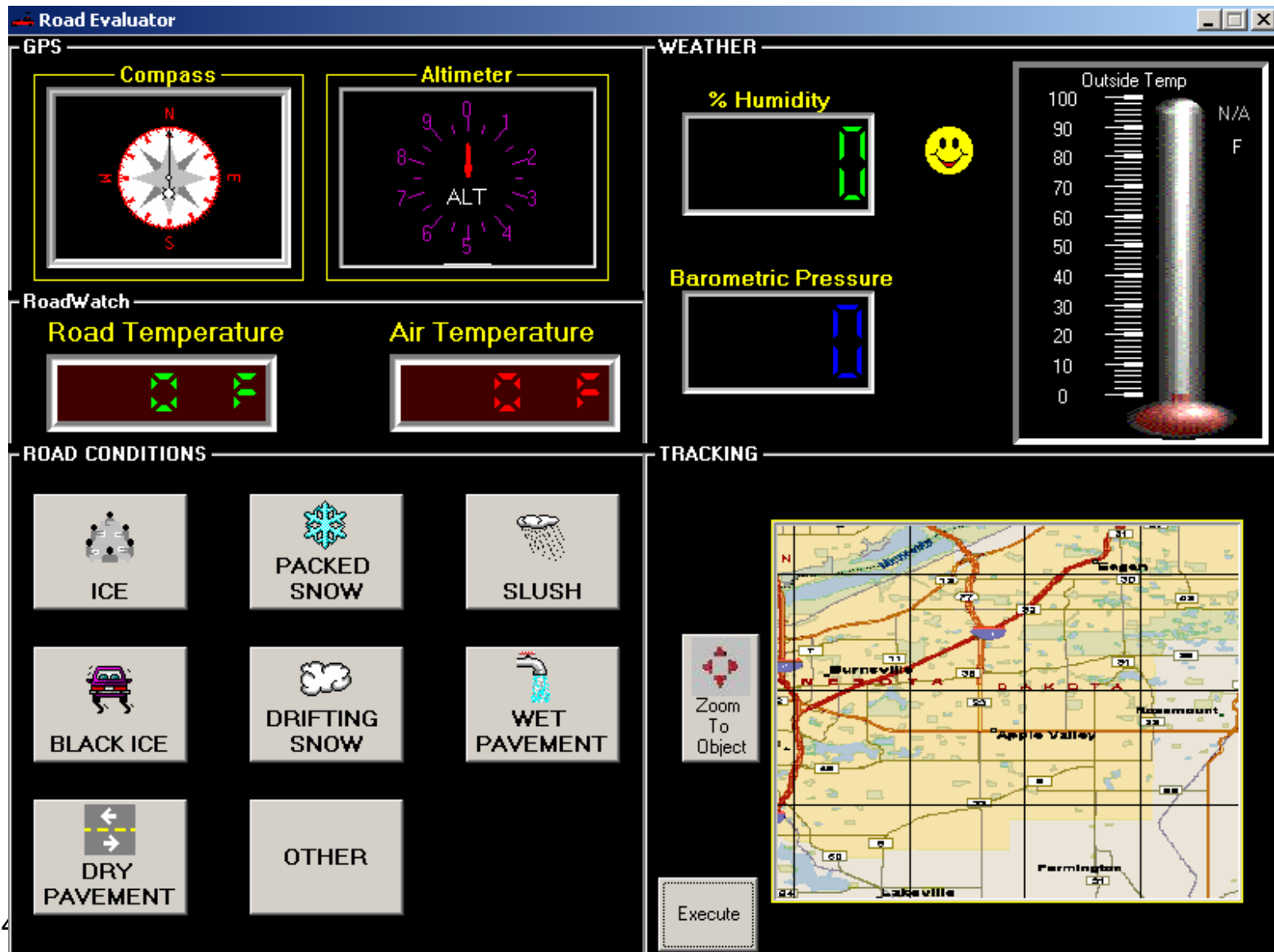
Road Evaluation System



Boise County, Idaho



User Interface



Another Look

Road Evaluation

Serial Ports Device Serial Port Settings Serial Port Available Camera Saved Settings Data Records

Button Rec Tread Depth 000 Direction ? Timer 300 Seconds Dew Point

Friction Meter: Grip:

Weather Information: GPS Information:

Air Road Speed

%Humidity Barometer Direction

Slush Ice Wet Packed Snow Drifting

Black Ice Clear Wheel Track Dry Juris Other

Pot Hole

Preview

Pause Preview Save

Auto Photo Interval 12

Manual

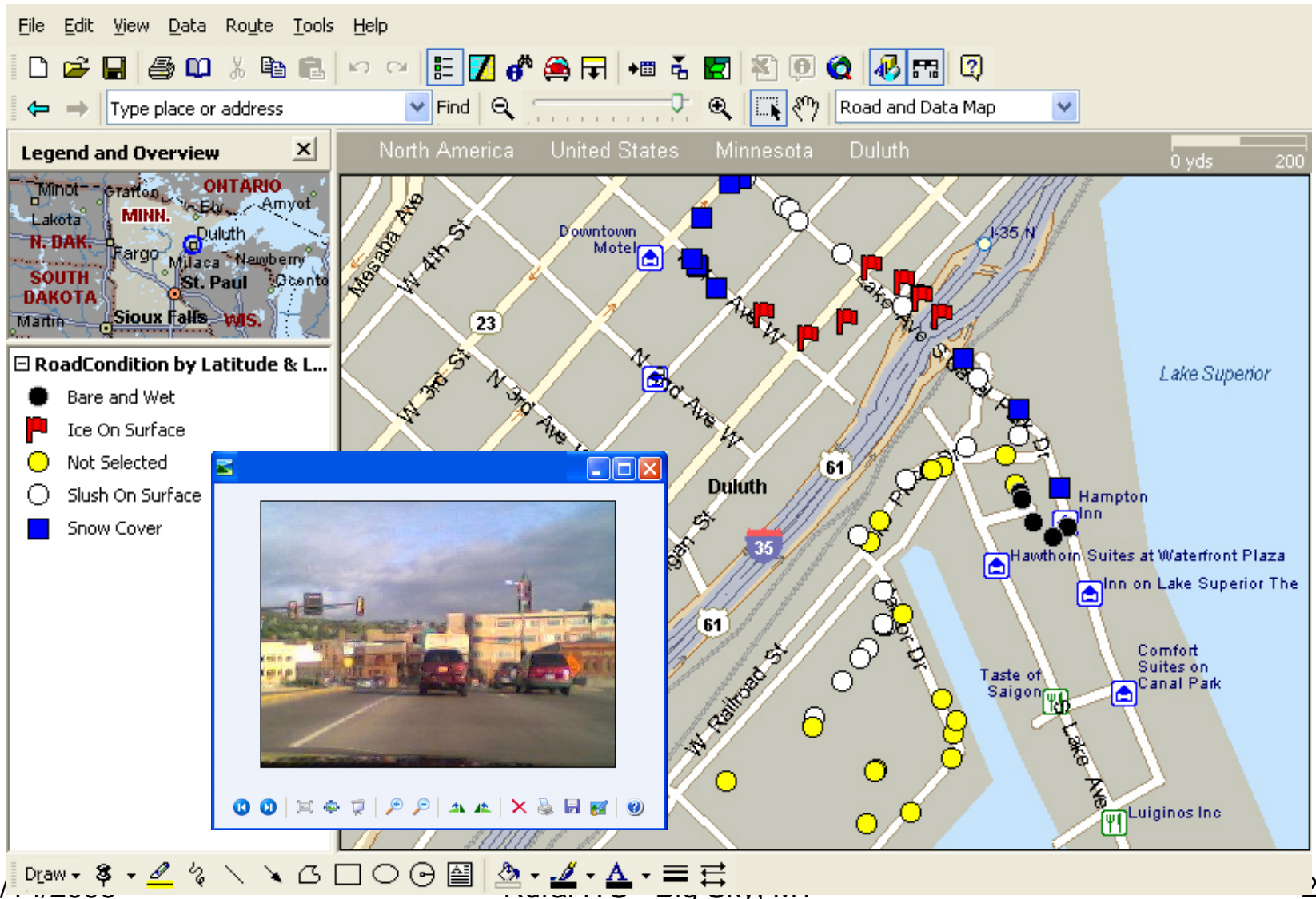
Open Port3-Placer450 LAT: LON: Port 3,Placer450 Setting Saved

Port: 1. 2. 3. 4. 5. 6. 7. 8.

Road Surface Picture



Click for Photo



Reporting & Analysis

Raw Data

"MDC_ID","GPS_STATUS","DATE&TIME","LATITUDE","LONGITUDE","SPEED","DIRECTION","HIGHWAY","ACTIVITY","INCIDENT","INPUT1","INPUT2","INPUT3","INPUT4","INPUT5","INPUT6","ROAD_TEMPERATURE","AIR_TEMPERATURE","MSG_ID","MATERIAL","UNITS","SPINNER","AUGER","RATE","LIQUID","TEMP","COMPENSATION","SKIP_SANDING"

1234,08/Y/N/-/,01/17/01 13:15:11,44.7895,-
93.2669,000,000,000,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:15:21,44.7894,-
93.2670,000,204,000,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:15:26,44.7895,-
93.2670,000,354,001,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:15:31,44.7897,-
93.2670,000,004,001,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:15:41,44.7897,-
93.2670,000,000,001,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:15:51,44.7899,-
93.2662,000,074,001,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:16:01,44.7902,-
93.2642,000,084,001,000,000,001,000,001,001,001,001,62,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:16:11,44.7902,-
93.2618,000,090,001,000,000,001,000,001,001,001,001,61,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:16:21,44.7902,-
93.2593,000,090,001,000,000,001,000,001,001,001,001,61,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

1234,08/Y/N/-/,01/17/01 13:16:29,44.7902,-
93.2576,000,090,001,003,000,001,000,001,001,001,001,61,70,%ST,GRANC,E,SP14 ,F,500,P000,RTXX,TT,SKF:C

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help Adobe PDF Type a question for help

Arial 8 B

A3 Vehicle

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Vehicle	Date	Time	Address	Speed	Course	Messages	Inputs	GTB	GAR	RT	AT	Latitude	Longitude
4		May. 19, 2006	7:50:36 AM	US Hwy 53				F_flow Not Plowing, Wing Not Plowing						
5	1002			Virginia, MN, 55792	9 mph	SW					38	48	47.52335	-92.561783
6				US Hwy 169				F_flow Not Plowing, Wing Not Plowing						
7	1003	Jul. 10, 2006	10:56:36 AM	Mountain Iron, MN, 55768	60 mph	W					71	68	47.498451	-92.679352
8		Jun. 30, 2006	4:35:36 PM	US Hwy 53				F_flow Not Plowing, Wing Not Plowing						
9	1004			Virginia, MN, 55792	0 mph	NW					29	42	47.523266	-92.561783
10				US Hwy 53				F_flow Not Plowing, Wing Not Plowing						
11	1004	Jun. 30, 2006	4:35:36 PM	Virginia, MN, 55792	0 mph	NW					16	17	47.523266	-92.561783
12		Jun. 01, 2006	12:20:00 PM	US Hwy 169				F_flow Not Plowing, Wing Not Plowing						
13	1005			Hibbing, MN, 55746	0 mph	SW					66	69	47.445816	-92.887337
14		Apr. 14, 2006	4:30:00 PM	Comstock Lake Road 7508-7465				F_flow Not Plowing, Wing Not Plowing						
15	1006			Cotton, MN, 55724	0 mph	W					36	34	47.169716	-92.475731
16		Jun. 01, 2006	2:20:24 PM	*US Hwy 53 (507 ft away)				F_flow Not Plowing, Wing Not Plowing						
17	1007			Mountain Iron, MN, 55768	0 mph	NW					69	60	47.524117	-92.561798
18				US Hwy 53 2856-2701				F_flow Not Plowing, Wing Not Plowing						

Sheet1 / Sheet2 / Sheet3 /

Ready NUM

start Microsoft Powe... URS_dist2 SAIL-II Web Se... http://156.98.4... Microsoft Excel ... 10:27 AM

Sample
Data in
MS Excel

Reporting - 1

Stop Report

selected parameters:

' Truck#244333'
10/26/2005 00:00:00 AM – 10/26/2005 11:59:59 PM

staff	vehicle	group	address	stop	restart	duration
Garder#244	26025	Grader	604 NW 91 ST ST	10/25 01:56:43 PM	10/25 01:58:45 PM	0 hr 2 min
Garder#244	26025	Grader	GRATIGNY PKWY	10/26 09:02:20 AM	10/26 09:32:11 AM	0 hr 29.9 min
Garder#244	26025	Grader	743 NW 81 ST ST	10/26 10:11:41 AM	10/26 10:22:52 AM	0 hr 11.2 min
Garder#244	26025	Grader	245 RAVENNA AVE	10/26 10:36:15 AM	10/26 10:40:12 AM	0 hr 4 min
Garder#244	26025	Grader	245 RAVENNA AVE	10/26 10:40:18 AM	10/26 10:45:02 AM	0 hr 4.7 min
Garder#244	26025	Grader	10469 NW 31 ST AVE	10/26 11:50:50 AM	10/26 11:54:19 AM	0 hr 3.5 min
Garder#244	26025	Grader	10469 NW 31 ST AVE	10/26 11:54:38 AM	10/26 11:56:21 AM	0 hr 1.7 min
Garder#244	26025	Grader	10450 NW 36 TH PL	10/26 02:03:28 PM	10/26 02:05:08 PM	0 hr 1.7 min

Reporting - 2

Maintenance Report

selected

parameters:

Maintenance Group

vehicle	driver	group	current miles	next service miles	vehicle comments
22399	SIVULA	Maintenance	8571	10565	New Unit
22507	BLACKLEDGE	Maintenance	0	0	Maintenance
22515	LARSON	Maintenance	1200	1800	New Unit
22809	TAYLOR	Maintenance	6914	9877	New Unit
23148	DISANTO	Maintenance	1551	5000	Homeland
24229	LAUER	Maintenance	0	0	Accident
24370	SCHROEDER	Maintenance	12532	11200	Exempt
26015	CORR	Maintenance	2086	5000	
26019	MONTGOMERY	Maintenance	49696	53666	
26108	HOPKINS	Maintenance	2252	5000	
26124	BRUINS	Maintenance	45807	46042	New Unit
27315	ANDERSON	Maintenance	7628	11255	New Unit
27328	BRODERSON	Maintenance	10787	13811	New Unit
28312	VASKO	Maintenance	5891	5900	Maintenance

Stop Report

Stop Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Reload Home Search Favorites RSS Print Mail News Groups Feeds

Address http://70.58.239.33/mwwireless/reporting/rptStop.php?filterSQL=staffID%20IN%20('14')%20AND%20datetime%20BETWEEN%20'07/12/2006%2000:00:00%' Go Links

Stop Report

selected parameters: ', Bob'
07/12/2006 00:00:00 AM - 07/12/2006 11:59:59 PM

staff	vehicle	group	address	stop	restart	duration	comment
, Bob	693	Hermel	Sturgis St	07/11 09:50:08 PM	07/12 08:15:42 AM	10 hr 25.6 min	
, Bob	693	Hermel	22	07/12 08:16:03 AM	07/12 08:16:45 AM	0 hr 0.7 min	
, Bob	693	Hermel	22	07/12 08:18:37 AM	07/12 08:54:06 AM	0 hr 35.5 min	
, Bob	693	Hermel	2082 Lookout Dr	07/12 08:54:29 AM	07/12 09:01:29 AM	0 hr 7 min	
, Bob	693	Hermel	2078 Howard Dr W	07/12 09:03:16 AM	07/12 09:20:22 AM	0 hr 17.1 min	
, Bob	693	Hermel	1883 Commerce Dr	07/12 09:25:57 AM	07/12 09:32:00 AM	0 hr 6.1 min	
, Bob	693	Hermel	1250 Court St	07/12 10:03:50 AM	07/12 10:20:44 AM	0 hr 16.9 min	
, Bob	693	Hermel	Merger St	07/12 10:54:30 AM	07/12 11:13:45 AM	0 hr 19.3 min	
, Bob	693	Hermel	Industrial Blvd	07/12 11:26:26 AM	07/12 11:27:28 AM	0 hr 1 min	
, Bob	693	Hermel	Industrial Blvd	07/12 11:27:33 AM	07/12 01:04:17 PM	1 hr 36.7 min	
, Bob	693	Hermel	22	07/12 02:16:22 PM	07/12 02:37:26 PM	0 hr 21.1 min	
, Bob	693	Hermel	1836 Madison Ave	07/12 02:49:00 PM	07/12 03:01:19 PM	0 hr 12.3 min	
, Bob	693	Hermel	311 Briargate Rd	07/12 03:09:33 PM	07/12 03:17:26 PM	0 hr 7.9 min	
, Bob	693	Hermel	790 Main St	07/12 03:49:55 PM	07/12 03:56:43 PM	0 hr 6.8 min	
, Bob	693	Hermel	22	07/12 04:27:18 PM	07/12 04:52:14 PM	0 hr 24.9 min	
, Bob	693	Hermel	Sturgis St	07/12 05:09:27 PM	07/12 05:34:55 PM	0 hr 25.5 min	
, Bob	693	Hermel	Sturgis St	07/12 05:59:57 PM	07/12 07:43:58 PM	1 hr 44 min	
, Bob	693	Hermel	305 Briargate Rd	07/12 07:52:33 PM	07/12 11:31:34 PM	3 hr 39 min	
, Bob	693	Hermel	0 Mccauley St	07/12 11:42:38 PM	07/13 05:41:34 AM	5 hr 58.9 min	

Done Internet

start | midwest_wi_13jun20... | Data_Collection | Midwest Wireless Aut... | Stop Report - Microso... | 7:11 AM

Alert Reporting

**selected
parameters:**

'Perez, Andres'
05/11/2006 00:00:00 AM - 05/11/2006 11:59:59 PM

sent	to	subject	vehicle	staff	group	alert text
05/11 06:56:40 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 06:56:40 AM 9473 SW 32ND ST Vehicle Number: 27301 Speed: 50
05/11 06:59:39 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 06:59:39 AM 10789 SW 32ND ST Vehicle Number: 27301 Speed: 50
05/11 07:00:01 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 07:00:01 AM 10974 SW 32ND ST Vehicle Number: 27301 Speed: 50
05/11 07:00:01 AM	mvp@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 07:00:01 AM 10974 SW 32ND ST Vehicle Number: 27301 Speed: 50
05/11 07:02:39 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 07:02:39 AM 11717 SW 24TH ST Vehicle Number: 27301 Speed: 50
05/11 09:10:33 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 09:10:33 AM 4302 SW 137TH AVE Vehicle Number: 27301 Speed: 50
05/11 09:24:47 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 09:24:47 AM 16591 SW 88TH ST Vehicle Number: 27301 Speed: 50
05/11 09:28:14 AM	javi@miamidade.gov	Speed Alert	27301	Perez, Andres	Building	Driver: Andres Perez 05/11/2006 09:28:14 AM 9308 SW 177TH AVE Vehicle Number: 27301 Speed: 50

Count Tips Report

Example Count Containers Report

selected parameters: Group 4
05/11/2006 00:00:00 AM - 05/11/2006 11:59:59 PM

vehicle	driver	group	tips	recycling	hazardous waste
22403	Chitolie, Bernard	4	82	14	3
23144	Perry, Donald	4	114	45	19
24353	Council, Joseph	4	56	76	15
26016	Roy, Lucien	4	23	0	10
26025	Barrington, Leo	4	96	62	43
26026	Straniero, Johnny	4	145	83	36
26125	Hampton, Roland	4	51	3	17
26126	Urquiaga, Willy	4	45	52	30

Material Usage Report

Truck: 68 Date: 1/22/05		Amount	Units
Total Granular Used	12,455	Pounds	
Total Pre-Wet Used	165.3	Gallons	
Total Direct Liquid Used	245.7	Gallons	
Total Other Used	0	Other	

Example Cost Report

Month	Sand	Chips	CG-90	CaCl	MgCl
Units	loads	Loads	tons	#80lb bag	gallons
Oct-01	\$0.00	\$74.00	\$4,838.74	\$0.00	\$0.00
Nov-01	\$101.12	\$0.00	\$1,893.42	\$3,446.10	\$7,473.82
Dec-01	\$2,742.88	\$453.25	\$9,887.86	\$4,479.93	\$36,992.81
Jan-02	\$1,422.00	\$610.50	\$3,786.84	\$0.00	\$15,631.29
Feb-02	\$3,425.44	\$795.50	\$10,308.62	\$4,135.32	\$17,014.41
Mar-02	\$448.72	\$249.75	\$1,262.28	\$6,547.59	\$11,460.46
	\$8,140.16	\$2,183.00	\$31,977.76	\$18,608.94	\$88,572.79

Cost of Materials Used for 2001-2002 Season by Month

Total Material Cost for 2001-2002 Season	\$149,482
--	-----------

Summary

- Efficiency
- Safety
- Litigation
- Training
- Reporting
- Evaluating

We Don't Need to Remove Snow & Ice



8/14/2006

Rural ITS - Big Sky, MT

32

Summary & Questions

Gregory Thompson
ThomTech Design, Inc.
2817 South Anthony Lane #107
Minneapolis, MN 55418
Tel: 612 788-0835
Email: greg@thomtechdesign.com
Web: www.thomtechdesign.com