



INTERNATIONAL ROAD DYNAMICS INC.

## LTPP WIM DATA COLLECTION SYSTEMS

### INSTALLATION AND CALIBRATION FOR NEW MEXICO SPS-5 LTPP ID 350500

May 28, 2008  
CLIN 2004C TASK ORDER # 15



**CONTRACT NO. DTFH61-05-D-00001**



**LONG TERM  
pavement  
PERFORMANCE**

## TABLE OF CONTENTS

<b>1.0 EXECUTIVE SUMMARY</b>	<b>1</b>
<b>2.0 POINT OF CONTACTS</b>	<b>2</b>
<b>3.0 SHEET 16 – SITE CALIBRATION SUMMARY</b>	<b>3</b>
3.1.1 iSINC Site Calibration Factors & Site Parameters as of 05-15-2008	5
<b>4.0 WIM SITE INVENTORY</b>	<b>7</b>
4.1.1 Site Map	9
4.1.2 Pictures, WIM Site	10
4.1.3 Pictures, Installation	13
4.1.4 Site Drawing & Layout	15
4.1.5 WIM Cabinet Concrete Pedestal	17
4.1.6 Electrical Readings	18
<b>5.0 WIM CALIBRATION</b>	<b>19</b>
5.1.1 Test Truck #1 Information	19
5.1.2 Pictures, Test Truck 1	20
5.1.3 Test Truck #2 Information	23
5.1.4 Pictures, Test Truck 2	24
5.1.5 Test Truck #3 Information	27
5.1.6 Pictures, Test Truck 3	28
<b>6.0 TEST TRUCK CALIBRATION RECORDS</b>	<b>31</b>
6.1.1 Validation Runs	31
6.1.2 Test Trucks Error Calculations	32
6.1.3 Overall Performance	33
6.1.4 Weight Graphs	34
6.1.5 Temperature Influence Graphs	35

## 1.0 EXECUTIVE SUMMARY

This report details the installation and calibration of the New Mexico SPS-5 Weigh-in-Motion (WIM) site located on I-10 mile post 50.2. The WIM site is instrumented with IRD's iSINC (Intelligent Sensor Interface Network Controller) WIM Electronics, Kistler Quartz Sensors and inductive loops. The LTPP lane is in the east bound driving lane and is instrumented with two inductive loops and 8 Kistler Quartz sensors.

This Kistler sensor layout used at this site is referred to as a double threshold. There are two sensors arrays which span the entire width of the roadway. Each array weighs each side of the vehicle separately and twice (four measurements per axle).

The WIM system uses a landline modem for remote communication and data downloading. The WIM system power is provided by two 80 watt Solar Panels charging two 12 volt, 90 amp hr. batteries. The WIM Controller cabinet is located on the shoulder approximately 33 ft. south of the north bound shoulder.

The WIM equipment installation began on April 3, 2008 and was completed on April 30, 2008. The site was calibrated on May 15, 2008.

The calibration results demonstrate the WIM system meets the LTPP performance requirements for weight and axle spacing as detailed in the *Data Collection Guide for SPS WIM Sites*.

## 2.0 POINT OF CONTACTS

Debbie Walker (COTR)

FHWA LTPP

ph: 202-493-3068

e: [deborah.walker@fhwa.dot.gov](mailto:deborah.walker@fhwa.dot.gov)

Mark Gardner (RSC)

Fugro

ph: 512-977-1800

Steve Von Stein (Division Representative)

FHWA

ph: (505) 526-2512

Robert Meyers (SHA)

State Highway Agency (New Mexico DOT)

ph: (505) 827-5466

Bruce Myers

International Road Dynamics (Phase 2 Contractor)

ph: 717-264-2077

c: 717-860-1817

e: [bruce.myers@irdinc.com](mailto:bruce.myers@irdinc.com)

### 3.0 SHEET 16 – SITE CALIBRATION SUMMARY

#### SITE CALIBRATION INFORMATION

1. DATE OF CALIBRATION (MONTH/DAY/YEAR): **May 15, 2008**
  
2. TYPE OF EQUIPMENT CALIBRATED:
  - WIM
  - CLASSIFIER
  - BOTH
  
3. REASON FOR CALIBRATION
  - REGULARLY SCHEDULED SITE VISIT
  - RESEARCH
  - EQUIPMENT REPLACEMENT
  - TRAINING
  - DATA TRIGGERED SYSTEM REVISION
  - NEW EQUIPMENT INSTALLATION
  - OTHER (SPECIFY) \_\_\_\_\_
  
4. SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
  - BARE ROUND PIEZO CERAMIC
  - BARE FLAT PIEZO
  - BENDING PLATES
  - CHANNELIZED ROUND PIEZO
  - LOAD CELLS
  - QUARTZ PIEZO
  - CHANNELIZED FLAT PIEZO
  - INDUCTANCE LOOPS
  - CAPACITANCE PADS
  - OTHER (SPECIFY) \_\_\_\_\_
  
5. EQUIPMENT MANUFACTURER: **International Road Dynamics Inc.**

#### WIM SYSTEM CALIBRATION SPECIFICS

6. CALIBRATION TECHNIQUE USED:
  - TRAFFIC STREAM:
    - NUMBER OF TRUCKS \_\_\_\_\_
    - STATIC SCALE
  - TEST TRUCKS:
    - NUMBER OF TEST TRUCKS **2**
    - PASSES PER TRUCK **29**

TRUCK#	TYPE	SUSPENSION	
1	<b><u>9</u></b>	<b><u>1 &amp; 2</u></b>	TYPE PER FHWA 13 BIN SYSTEM SUSPENSION TYPES: 1 – AIR 2 – LEAF SPRING 3 – OTHER
2	<b><u>9</u></b>	<b><u>1 &amp; 2</u></b>	
3	<b><u>X</u></b>	<b><u>X</u></b>	
4	<b><u>X</u></b>	<b><u>X</u></b>	
5	<b><u>X</u></b>	<b><u>X</u></b>	

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)

GVW MEAN DIFFERENCE	<u>-0.9%</u>	STANDARD DEVIATION	<u>2.9%</u>
SINGLE AXLE MEAN DIFFERENCE	<u>-2.3%</u>	STANDARD DEVIATION	<u>2.8%</u>
DOUBLE AXLES MEAN DIFFERENCE	<u>-0.4%</u>	STANDARD DEVIATION	<u>3.7%</u>

8. NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED: 3

9. DEFINE THE SPEED RANGES USED (MPH): 55 - 60, 60 - 65, 65 - 75

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) See following sheets

11. IS AUTO-CALIBRATION USED AT THIS SITE?

IF USED, LIST AND DEFINE AUTO-CALIBRATION VALUE \_\_\_\_\_

CLASSIFIER TEST SPECIFICS

12. METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:

- VIDEO
- MANUAL
- PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT:

- TIME
- NUMBER OF VEHICLES
- NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:

FHWA CLASS 2	<u>100%</u>
FHWA CLASS 3	<u>100%</u>
FHWA CLASS 4&5	<u>100%</u>
FHWA CLASS 8	<u>100%</u>
FHWA CLASS 9	<u>100%</u>
FHWA CLASS 12	<u>%</u>
"UNCLASSIFIED" VEHICLES:	<u>%</u>

15. PICTURES: \_\_\_\_\_

16. NOTES:

\_\_\_\_\_

PERSON LEADING CALIBRATION EFFORT: <u>Bruce Myers</u> CONTACT INFORMATION: <u>717-264-2077</u>
---

**3.1.1 ISINC SITE CALIBRATION FACTORS & SITE PARAMETERS AS OF 05-15-2008**

**Calibration Menu**

Select Lane		1					
Select Axle Sensor		1					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	3760	3691	3549	3694	3623
Select Lane		1					
Select Axle Sensor		2					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	2997	2942	2829	2944	2888
Select Lane		1					
Select Axle Sensor		3					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	3760	3691	3549	3694	3623
Select Lane		1					
Select Axle Sensor		4					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	2997	2942	2829	2944	2888

**Site Parameters Menu**

Lane Name		1
Lane State		ENABLED
Upstream Loop >	Loop State	ENABLED
	Module UID	9
	Channel Num	0
	Polarity Active	LOW
	Width (cm)	200
Downstream Loop >	Loop State	ENABLED
	Module UID	9
	Channel Num	1
	Polarity Active	LOW
	Width (cm)	200
	Distance(cm)	670
Axle Sensors >	Select Axle	1
	Axle State	ENABLED
	Module UID	5
	Channel Num	0
	Polarity Active	HIGH
	Type	KISTLER_DUAL
	Poition	Left
	Distance(cm)	274
	Temp State	ENABLED
	Temp Module UID	5
	Temp Channel Num	0
Axle Sensors >	Select Axle	2
	Axle State	ENABLED
	Module UID	5
	Channel Num	1
	Polarity Active	HIGH
	Type	KISTLER_DUAL
	Poition	Right
	Distance(cm)	274
	Temp State	ENABLED
	Temp Module UID	5
	Temp Channel Num	0
Axle Sensors >	Select Axle	3
	Axle State	ENABLED
	Module UID	5
	Channel Num	2
	Polarity Active	HIGH
	Type	KISTLER_DUAL
	Poition	Left
	Distance(cm)	579
	Temp State	ENABLED
	Temp Module UID	5
	Temp Channel Num	0
Axle Sensors >	Select Axle	4
	Axle State	ENABLED
	Module UID	5
	Channel Num	3
	Polarity Active	HIGH
	Type	KISTLER_DUAL
	Poition	Right
	Distance(cm)	579
	Temp State	ENABLED
	Temp Module UID	5
	Temp Channel Num	0
Processing >	MaxTimeout(ms)	3000
	Dynamic Comp(%)	102
	Sig Wt Diff(%)	40
	Min Axle Wt(kg)	1360
	Veh Rec Mode	Split
	Axl Sep(cm)	307

## 4.0 WIM SITE INVENTORY

1. ROUTE I-10 MILEPOST: 50.2 LTPP DIRECTION: N S E W

2. SITE DESCRIPTION

GRADE: <1%

Sag vertical

Nearest SPS section downstream of the site: 350501

Distance from sensor to nearest downstream SPS Section: 1.1 miles

3. LANE CONFIGURATION

Number of lanes in LTPP direction: 2 lanes

Lane width: 12 ft.

Median painted

Median physical barrier

Median grass

Median none

Shoulder curb and gutter

Shoulder paved AC

Shoulder paved PCC

Shoulder unpaved

Shoulder width: 15 ft.

4. PAVEMENT TYPE: PCC

5. CONDITION: (Surface distresses by type / severity within WIM section)

Good

6. SENSOR SEQUENCE: Loop - Kistler - Kistler - Loop

7. PAVEMENT REPLACEMENT AND/OR GRINDING:

Straightedge check: Performed \_\_\_\_\_ Result:  Pass /  Marginal /  Unsatisfactory

Short wave check: Performed \_\_\_\_\_ Result:  Pass /  Marginal /  Unsatisfactory

Long wave check: Performed \_\_\_\_\_ Result:  Pass /  Marginal /  Unsatisfactory

8. ANY EFFECTS FROM RAMPS OR LANE TRANSITIONS:

Intersection/driveway within 300m upstream, distance: \_\_\_\_\_

Intersection/driveway within 300m downstream, distance: \_\_\_\_\_

LTPP lane used for passing by vehicles traveling in south bound lane

9. DRAINAGE:

Open to ground

Pipe to culvert or ditch

None

French drain

10. CABINET LOCATION:

- Same side of road as LTPP lane  
 Median  
 Behind guard rail  
Distance from edge of travel lane to cabinet: 48 ft  
Distance from sensors: 50 ft  
Type: 336  
Access controlled by:  LTPP /  State /  Joint  
Primary contact: Robert Meyers (505) 827-5466

11. POWER:

- Power type:  Overhead /  Underground /  Solar  
Distance from cabinet to drop: 5 ft  
Service provider: N/A.
- 

12. TELEPHONE:

- Telephone type:  Overhead /  Underground /  Cell  
Distance from cabinet to drop: 100 ft.  
Phone # : (575) 546-9131

13. SYSTEM:

- Software: iSINC  
Version: \_\_\_\_\_  
Connection:  RS232 /  Parallel port /  USB /  Other

14. TEST TRUCK CYCLE:

- Turnaround time: 30 minutes  
Turnaround distance: 30 miles

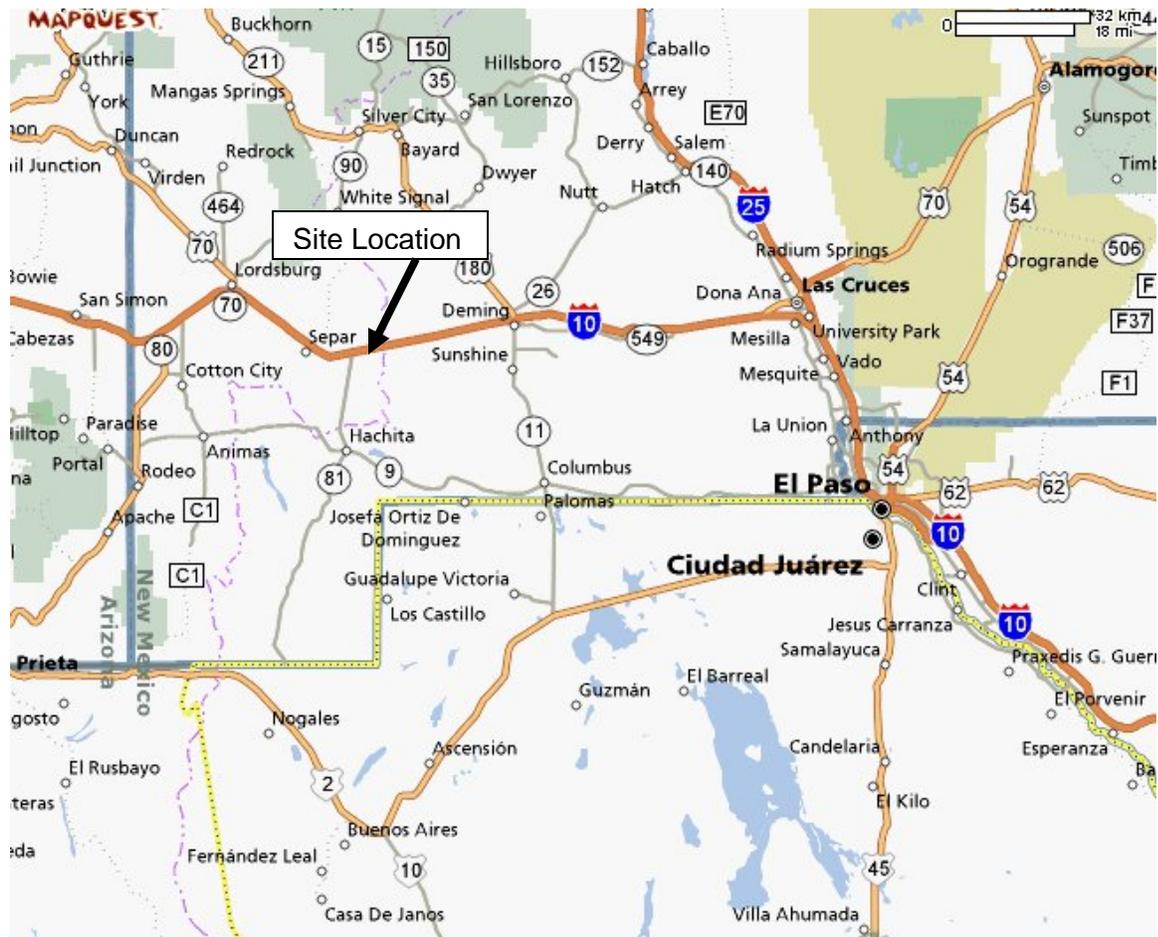
15. PICTURES: See following pages, Site Map, WIM Site, Site layout drawings

16. NOTES:

---

COMPLETED BY: <b>Bruce Myers</b> CONTACT INFORMATION: <b>717-264-2077</b>
--

### 4.1.1 SITE MAP



**I-10 North Bound Mile Post 50.2**

**4.1.2 PICTURES, WIM SITE**





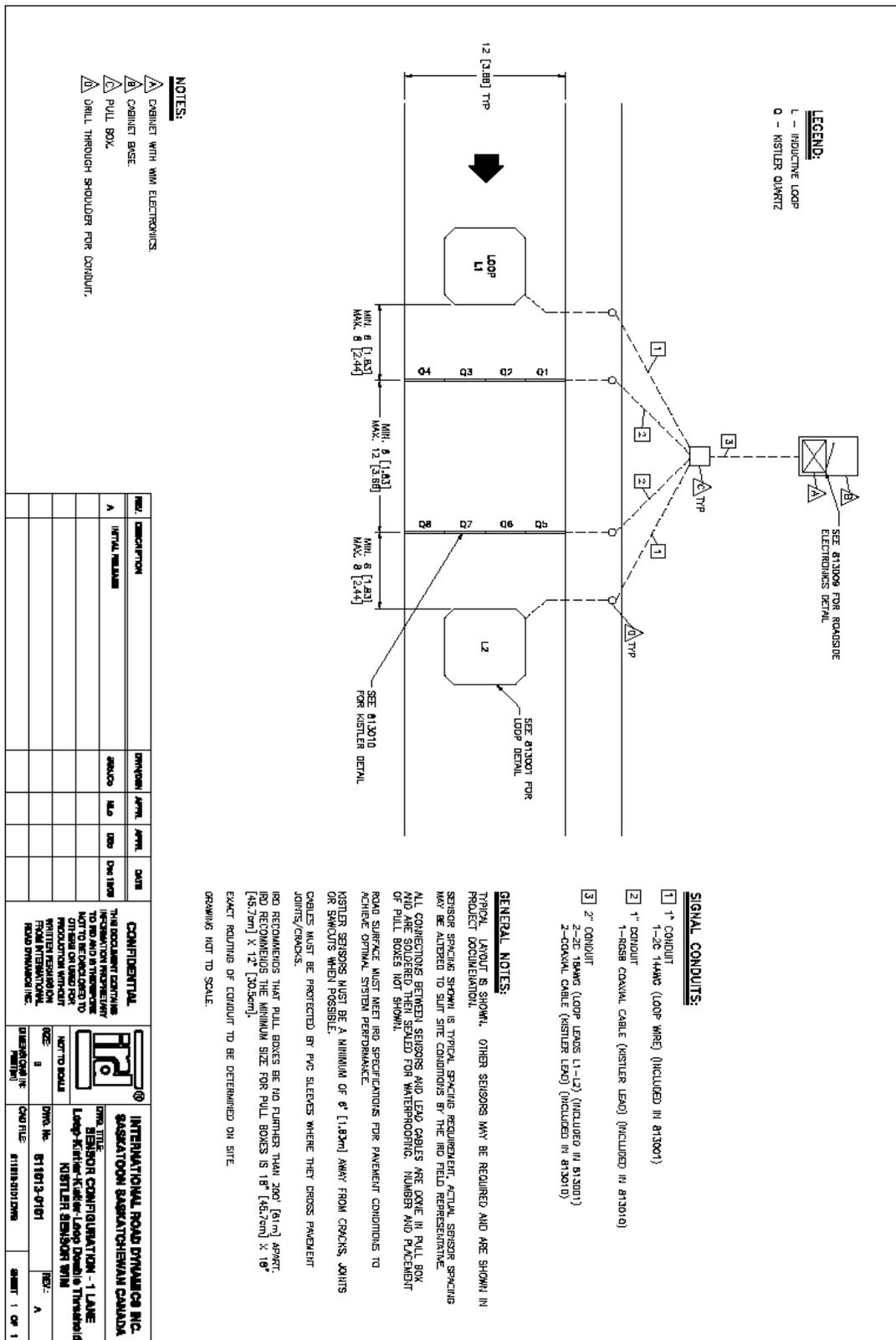


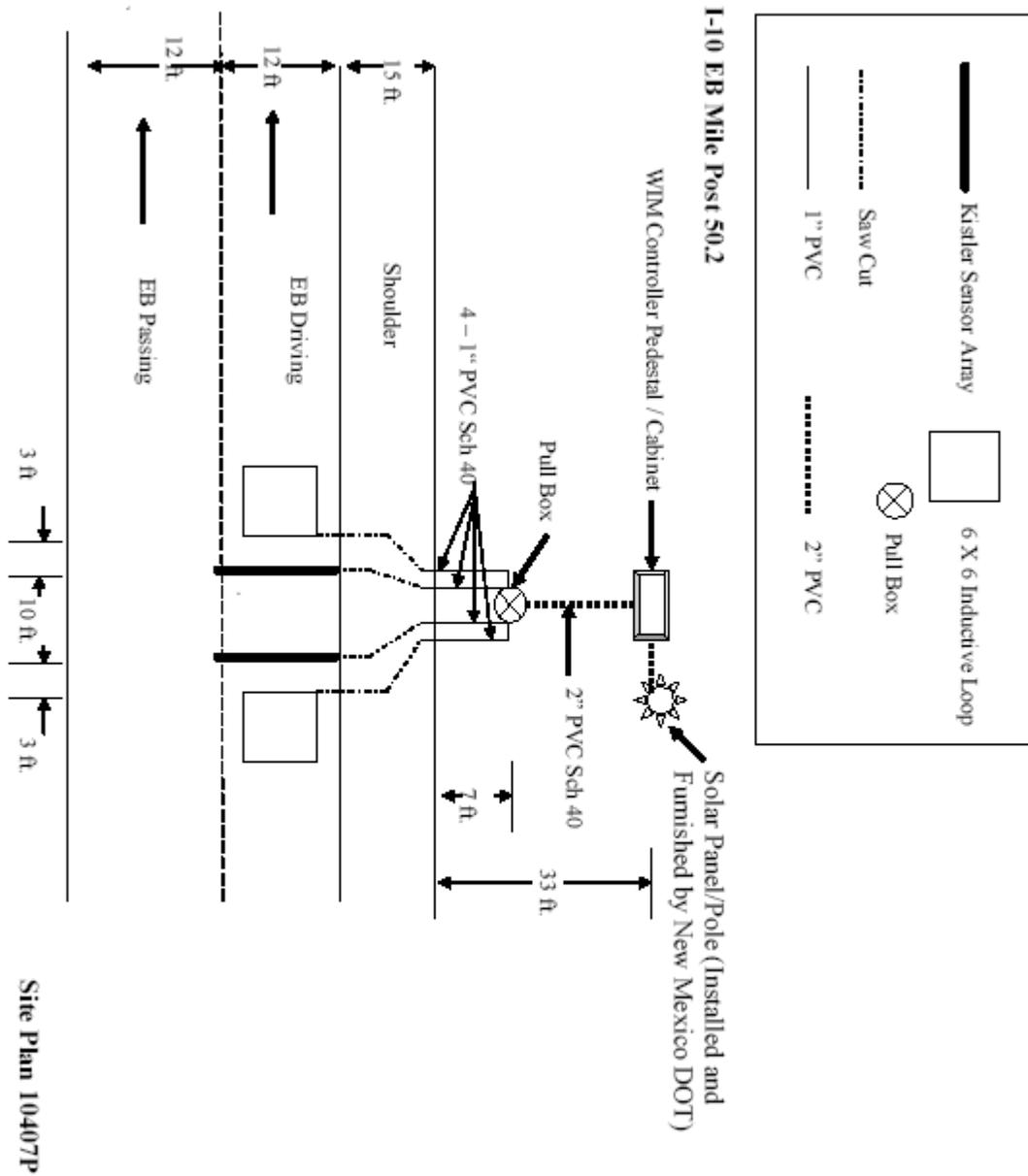
**4.1.3 PICTURES, INSTALLATION**



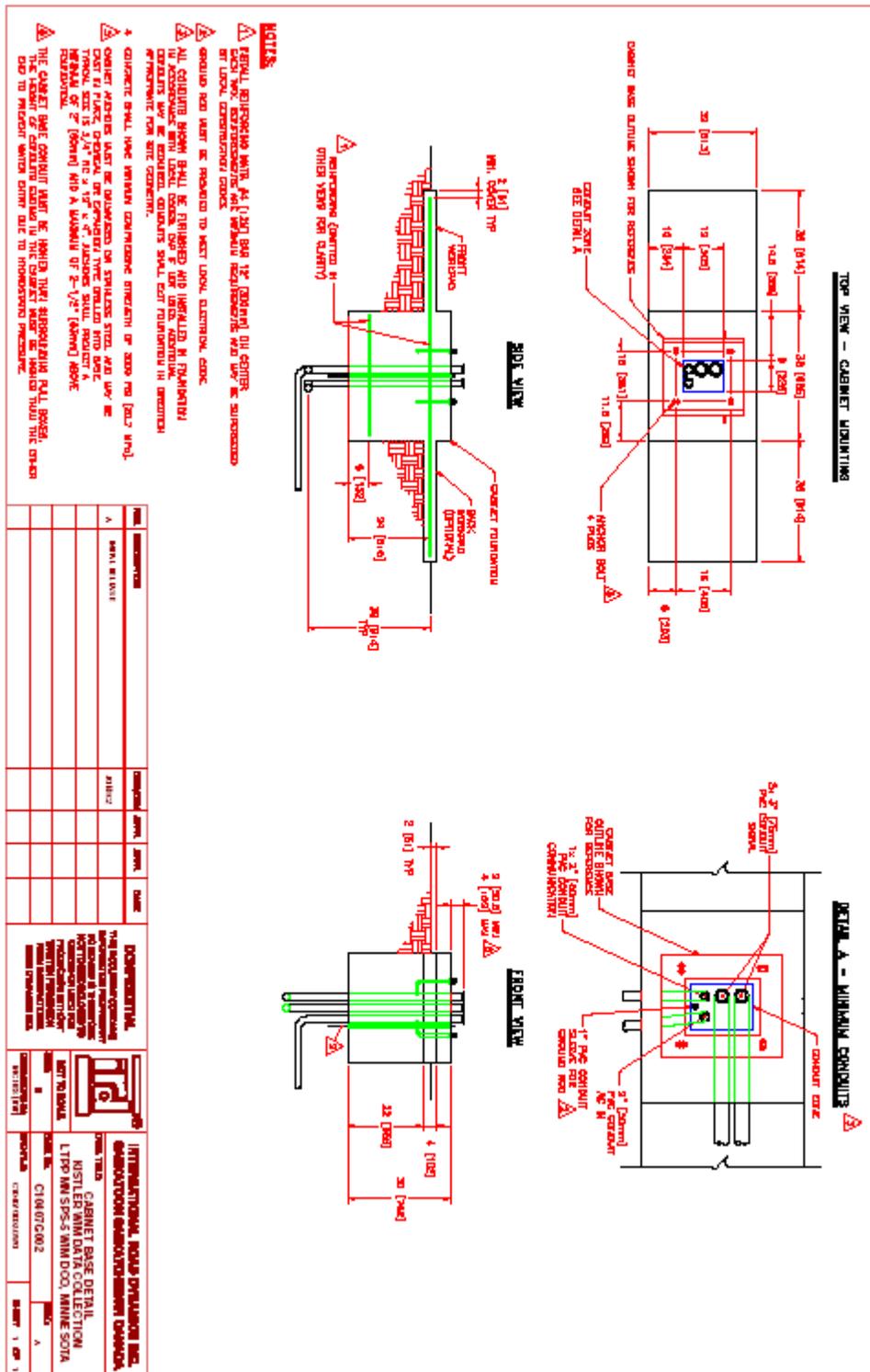


4.1.4 SITE DRAWING & LAYOUT





### 4.1.5 WIM CABINET CONCRETE PEDESTAL



**4.1.6 ELECTRICAL READINGS**



**IRD**  
**Site Service Sheet**

Clear

System Type: iSINC/Kistler Quartz

Date: 5/14/2008 State: NM Location: I-10 Mile Post 50.2  
 Job #: 10407P Site #: \_\_\_\_\_ Directions: Approx. 30 Miles West of Deming, NM

Loops	Lead	Trail					
Lane	1 NB	1 NB					
Resistance	.8 ohm	.8 ohm					
Leakage	inf	inf					
Inductance uH	143 uh	143 uh					
Frequency							

Kistler	Lane - 1	CH 0	CH 1	CH 2	CH 3		
Amplitude		OK	OK	OK	OK		
Capacitance		9.9 nF	9.7 nF	9.8 nF	9.9 nF		
Resistance		inf	inf	inf	inf		

Kistler	Lane - 2						
Amplitude							
Capacitance							
Resistance							
Serial #							

Piezo	Lane - 3						
Amplitude							
Capacitance							
Resistance							
Serial #							

Kistler	Lane - 4						
Amplitude							
Capacitance							
Resistance							
Serial #							

System	
A/C Service	O.K.
Power Supply	13.4 Vdc
DC Supply	13.4 Vdc
Back-Up	13.4 Vdc
System Input	
Modem Power	
Phone off	10 Vdc
Phone on	52 Vdc

**Software**  
 System iSINC

Site Full Operating Capacity Pass

Technician: Bruce Myers Date: 5/14/2008

## 5.0 WIM CALIBRATION

### 5.1.1 TEST TRUCK #1 INFORMATION

DATE OF CALIBRATION: May 15, 2008

1. TEST TRUCK NUMBER: 1      2. FHWA CLASS: 9      3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		9960		D
B		33320		D (B&C combined)
C				
D		27280		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	78000		78000

8. TRACTOR CAB STYLE:  Cab over engine /  Conventional     With sleeper

9. TRACTOR MANUFACTURER:

Make: Kenworth

Model:

10. TRAILER LOAD DESCRIPTION: Sand

11. TRAILER TARE WEIGHT (lb): \_\_\_\_\_

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	17.1'
B-C	4.3'
C-D	31.8'
D-E	10.1'

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +3 ft

SUSPENSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – three leaves
B	11R24.5	air
C	11R24.5	air
D	11R22.5	air
E	11R22.5	air

**5.1.2 PICTURES, TEST TRUCK 1**







**5.1.3 TEST TRUCK #2 INFORMATION**

DATE OF CALIBRATION: May 15, 2008

1. TEST TRUCK NUMBER: 1      2. FHWA CLASS: 9      3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		11440		D
B		32740		D (B&C combined)
C				
D		33820		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	78000		78000

8. TRACTOR CAB STYLE:  Cab over engine /  Conventional  With sleeper

9. TRACTOR MANUFACTURER:

Make: Kenworth

Model:

10. TRAILER LOAD DESCRIPTION: Sand

11. TRAILER TARE WEIGHT (lb): \_\_\_\_\_

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	19'
B-C	4.3'
C-D	30.3'
D-E	10'

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +2 ft

SUSPENSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – three leaves
B	11R24.5	air
C	11R24.5	air
D	11R22.5	air
E	11R22.5	air

**5.1.4 PICTURES, TEST TRUCK 2**







**5.1.5 TEST TRUCK #3 INFORMATION**

DATE OF CALIBRATION: May 15, 2008

1. TEST TRUCK NUMBER: 2                      2. FHWA CLASS: 9                      3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		112040		D
B		35320		D (B&C combined)
C				
D		14740		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	62100		62100

8. TRACTOR CAB STYLE:  Cab over engine /  Conventional  With sleeper

9. TRACTOR MANUFACTURER:

Make: Peterbuilt

Model:

10. TRAILER LOAD DESCRIPTION: Sand

11. TRAILER TARE WEIGHT (lb): \_\_\_\_\_

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	19.8'
B-C	4.2'
C-D	31.4'
D-E	10'

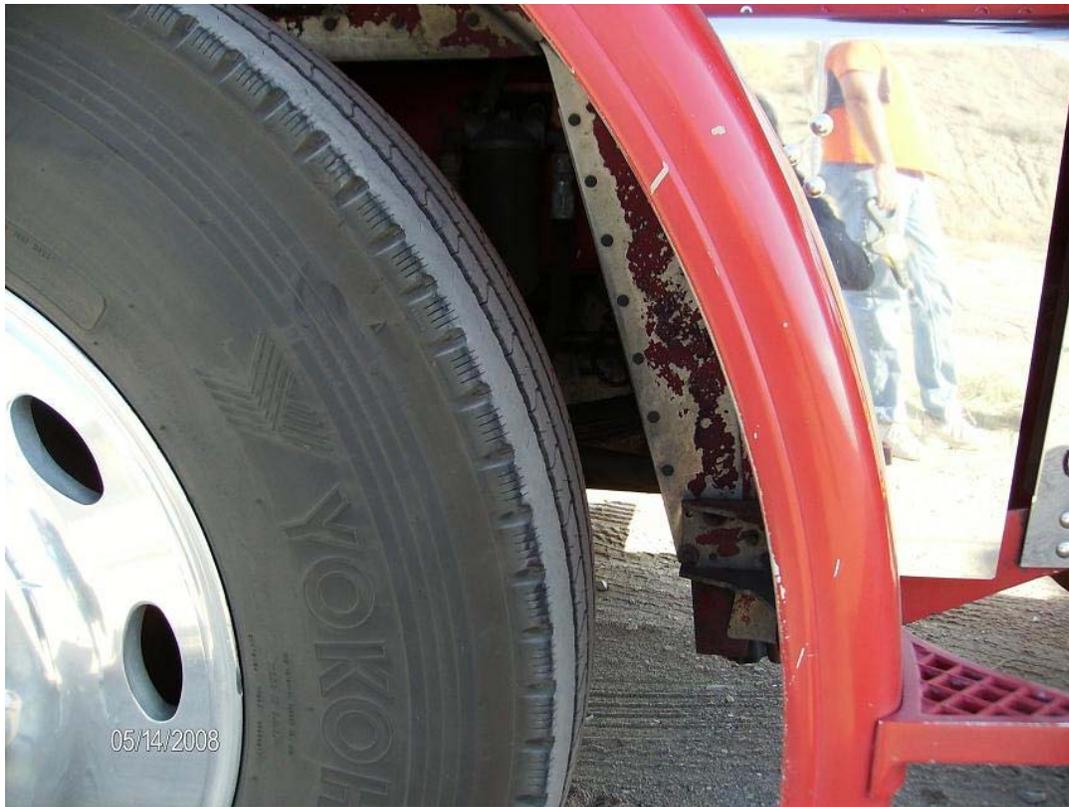
KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +2 ft

SUSPENSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – two leaves
B	11R24.5	air
C	11R24.5	air
D	11R22.5	air
E	11R22.5	air

**5.1.6 PICTURES, TEST TRUCK 3**







## 6.0 TEST TRUCK CALIBRATION RECORDS

### 6.1.1 VALIDATION RUNS



International Road Dynamics Inc.  
 FHWA VERIFICATION 2008a

#### Static Test Vehicle Measurements

ID	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	70.6	10.0	33.3	27.3	17.1	4.3	31.8	10.1
2	78.0	11.4	32.7	33.8	19.0	4.3	30.3	10.0
3	62.1	12.0	35.3	14.7	19.9	4.4	29.6	10.2

#### Dynamic Test Vehicle Measurements

ID	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	3788	69	88	68.8	9.5	33.0	26.3	17.1	4.3	31.5	9.9
2	3789	70	88	75.2	11.3	31.0	32.9	18.8	4.3	30.2	10.0
3	3782	74	88	61.8	11.7	35.2	14.9	19.9	4.3	29.7	10.0
1	3978	60	93	69.8	9.5	33.4	26.8	17.1	4.3	31.6	10.0
2	3980	59	93	77.3	11.6	31.9	33.8	18.8	4.3	30.0	9.9
3	3981	60	93	61.2	12.0	34.5	14.7	20.0	4.4	29.7	10.0
1	4138	65	99	72.8	10.1	34.7	28.1	17.2	4.3	31.5	10.0
2	4143	64	99	80.4	11.4	33.8	35.2	18.9	4.3	30.3	10.0
3	4144	64	99	61.7	11.9	34.8	15.0	20.0	4.3	29.7	10.1
1	4301	66	97	71.7	9.7	34.7	27.4	17.1	4.3	31.6	10.0
3	4307	58	97	62.7	11.9	37.4	15.4	19.9	4.3	29.7	10.0
1	4561	69	93	72.1	10.0	34.8	27.3	17.2	4.3	31.5	10.0
2	4562	67	93	76.1	11.2	31.0	33.9	18.8	4.3	30.2	10.0
3	4550	73	93	61.1	11.6	34.3	15.2	19.9	4.3	29.6	10.0
1	4667	60	89	75.1	10.0	36.2	28.9	17.1	4.3	31.5	9.9
2	4668	59	89	76.4	10.9	32.3	33.2	18.8	4.3	30.2	9.9
3	4670	59	89	64.2	12.2	36.4	15.7	20.0	4.3	29.7	10.0
1	4822	65	84	69.0	9.5	33.4	26.0	17.2	4.3	31.7	10.0
2	4824	64	84	79.5	11.0	33.5	35.0	18.9	4.3	30.3	10.1
3	4826	64	84	59.5	11.3	33.9	14.3	20.0	4.3	29.6	10.0
1	4966	68	80	72.0	9.7	34.8	27.5	17.2	4.3	31.6	10.0
2	4968	67	80	74.3	10.8	30.8	32.8	18.8	4.3	30.2	10.0
3	4972	69	80	61.9	11.7	35.2	15.0	20.0	4.3	29.6	10.0
1	5220	69	82	69.1	9.6	32.9	26.5	17.1	4.3	31.4	9.9
2	5221	67	82	74.9	10.5	31.0	33.5	18.8	4.3	30.1	10.0
3	5217	70	82	59.7	12.0	33.2	14.5	19.9	4.3	29.6	10.0
1	5474	60	84	72.9	10.1	35.2	27.6	17.1	4.3	31.6	10.0
2	5475	59	84	76.5	11.8	32.1	32.6	18.7	4.3	30.1	10.0
3	5476	59	84	61.0	11.6	34.7	14.8	19.9	4.3	29.7	10.0
1	5612	65	80	73.1	9.9	34.8	28.4	17.1	4.3	31.7	10.1
2	5613	64	80	74.0	10.6	31.0	32.4	18.8	4.3	30.2	10.0
3	5615	62	80	59.5	11.5	31.4	14.6	20.0	4.4	29.8	10.1
1	5830	69	84	70.7	9.4	34.3	26.8	17.1	4.3	31.5	10.0
2	5831	67	84	76.5	10.9	31.6	33.9	18.8	4.3	30.3	10.0
3	5833	65	84	59.2	11.6	33.4	14.2	20.1	4.3	29.7	10.0
1	5950	69	83	68.5	9.7	32.6	26.1	17.2	4.3	31.5	10.0
2	5955	68	82	78.3	11.8	32.0	34.5	18.8	4.3	30.2	10.0
3	5940	73	82	59.1	11.8	33.0	14.2	20.2	4.4	29.8	10.1

**6.1.2 TEST TRUCKS ERROR CALCULATIONS**

Truck	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	3788	69	88	-2.5%	-5.0%	-0.9%	-3.7%	0.0	0.0	-0.3	-0.2
2	3789	70	88	-3.6%	-0.9%	-5.2%	-2.7%	-0.2	0.0	-0.1	0.0
3	3782	74	88	-0.5%	-2.5%	-0.3%	1.4%	0.0	-0.1	0.1	-0.2
1	3978	60	93	-1.1%	-5.0%	0.3%	-1.8%	0.0	0.0	-0.2	-0.1
2	3980	59	93	-0.9%	1.8%	-2.4%	0.0%	-0.2	0.0	-0.3	-0.1
3	3981	60	93	-1.4%	0.0%	-2.3%	0.0%	0.1	0.0	0.1	-0.2
1	4138	65	99	3.1%	1.0%	4.2%	2.9%	0.1	0.0	-0.3	-0.1
2	4143	64	99	3.1%	0.0%	3.4%	4.1%	-0.1	0.0	0.0	0.0
3	4144	64	99	-0.6%	-0.8%	-1.4%	2.0%	0.1	-0.1	0.1	-0.1
1	4301	66	97	1.6%	-3.0%	4.2%	0.4%	0.0	0.0	-0.2	-0.1
3	4307	58	97	1.0%	-0.8%	5.9%	4.8%	0.0	-0.1	0.1	-0.2
1	4561	69	93	2.1%	0.0%	4.5%	0.0%	0.1	0.0	-0.3	-0.1
2	4562	67	93	-2.4%	-1.8%	-5.2%	0.3%	-0.2	0.0	-0.1	0.0
3	4550	73	93	-1.6%	-3.3%	-2.8%	3.4%	0.0	-0.1	0.0	-0.2
1	4667	60	89	6.4%	0.0%	8.7%	5.9%	0.0	0.0	-0.3	-0.2
2	4668	59	89	-2.1%	-4.4%	-1.2%	-1.8%	-0.2	0.0	-0.1	-0.1
3	4670	59	89	3.4%	1.7%	3.1%	6.8%	0.1	-0.1	0.1	-0.2
1	4822	65	84	-2.3%	-5.0%	0.3%	-4.8%	0.1	0.0	-0.1	-0.1
2	4824	64	84	1.9%	-3.5%	2.4%	3.6%	-0.1	0.0	0.0	0.1
3	4826	64	84	-4.2%	-5.8%	-4.0%	-2.7%	0.1	-0.1	0.0	-0.2
1	4966	68	80	2.0%	-3.0%	4.5%	0.7%	0.1	0.0	-0.2	-0.1
2	4968	67	80	-4.7%	-5.3%	-5.8%	-3.0%	-0.2	0.0	-0.1	0.0
3	4972	69	80	-0.3%	-2.5%	-0.3%	2.0%	0.1	-0.1	0.0	-0.2
1	5220	69	82	-2.1%	-4.0%	-1.2%	-2.9%	0.0	0.0	-0.4	-0.2
2	5221	67	82	-4.0%	-7.9%	-5.2%	-0.9%	-0.2	0.0	-0.2	0.0
3	5217	70	82	-3.9%	0.0%	-5.9%	-1.4%	0.0	-0.1	0.0	-0.2
1	5474	60	84	3.3%	1.0%	5.7%	1.1%	0.0	0.0	-0.2	-0.1
2	5475	59	84	-1.9%	3.5%	-1.8%	-3.6%	-0.3	0.0	-0.2	0.0
3	5476	59	84	-1.8%	-3.3%	-1.7%	0.7%	0.0	-0.1	0.1	-0.2
1	5612	65	80	3.5%	-1.0%	4.5%	4.0%	0.0	0.0	-0.1	0.0
2	5613	64	80	-5.1%	-7.0%	-5.2%	-4.1%	-0.2	0.0	-0.1	0.0
3	5615	62	80	-4.2%	-4.2%	11.0%	-0.7%	0.1	0.0	0.2	-0.1
1	5830	69	84	0.1%	-6.0%	3.0%	-1.8%	0.0	0.0	-0.3	-0.1
2	5831	67	84	-1.9%	-4.4%	-3.4%	0.3%	-0.2	0.0	0.0	0.0
3	5833	65	84	-4.7%	-3.3%	-5.4%	-3.4%	0.2	-0.1	0.1	-0.2
1	5950	69	83	-3.0%	-3.0%	-2.1%	-4.4%	0.1	0.0	-0.3	-0.1
2	5955	68	82	0.4%	3.5%	-2.1%	2.1%	-0.2	0.0	-0.1	0.0
3	5940	73	82	-4.8%	-1.7%	-6.5%	-3.4%	0.3	0.0	0.2	-0.1

**6.1.3 OVERALL PERFORMANCE**



**International Road Dynamics Inc.**  
 FHWA VERIFICATION 2008a

Specifications					
Confidence	95%		Speed range low	52	to 62
	(1.96)		Speed range medium	62	to 68
Gross vehicle weight	10%		Speed range high	68	to 76
Tandem group weight	15%		Temperature range low	80	to 90
Single axle weight	20%		Temperature range medium	90	to 100
Axle spacings	0.5		Temperature range high	100	to 120

Overall					
Characteristic	Error	StdDev	Specification	Calculated	Pass/Fail
Gross vehicle weight	-0.9%	2.9%	10%	6.5%	pass
Tandem group weight	-0.4%	3.7%	15%	7.7%	pass
Single axle weight	-2.3%	2.8%	20%	7.7%	pass
Axle spacings	-0.1	0.1	0.5	0.3	pass

Speed range 52 to 62 (11 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.1%	3.1%	10%	6.3%
Tandem group weight	0.7%	4.4%	15%	9.5%
Single axle weight	-0.9%	2.9%	20%	9.6%
Axle spacings	-0.1	0.1	0.5	0.3

Speed range 62 to 68 (16 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-0.9%	3.1%	10%	7.3%
Tandem group weight	-0.4%	3.6%	15%	7.5%
Single axle weight	-3.0%	3.0%	20%	9.1%
Axle spacings	0.0	0.1	0.5	0.3

Speed range 68 to 76 (11 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-1.8%	2.0%	10%	6.0%
Tandem group weight	-1.4%	3.0%	15%	7.4%
Single axle weight	-2.6%	1.9%	20%	6.5%
Axle spacings	-0.1	0.1	0.5	0.3

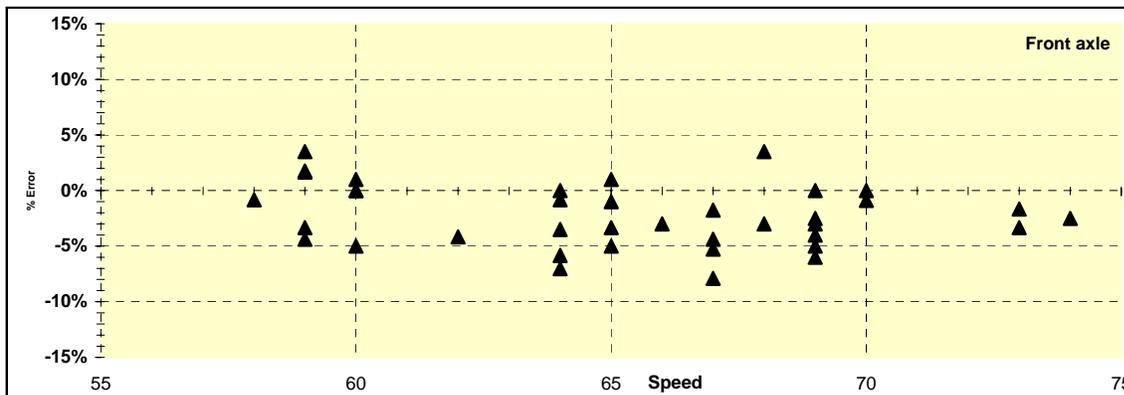
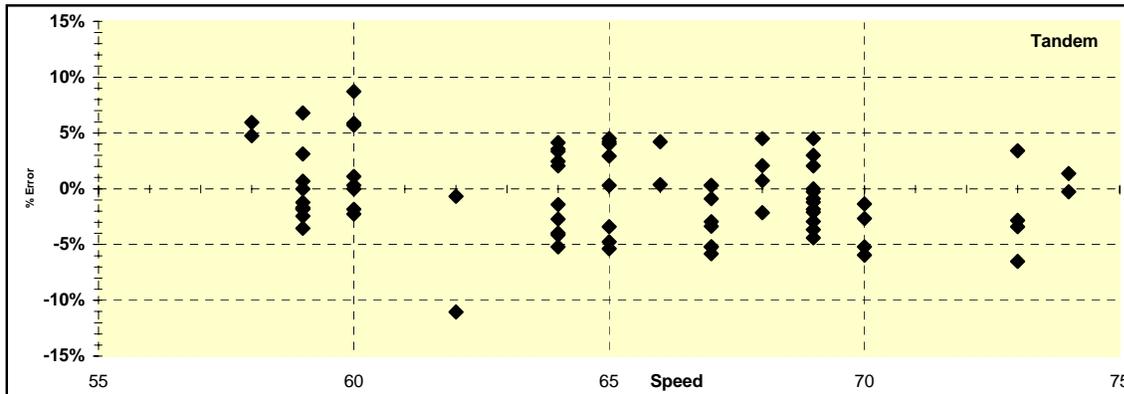
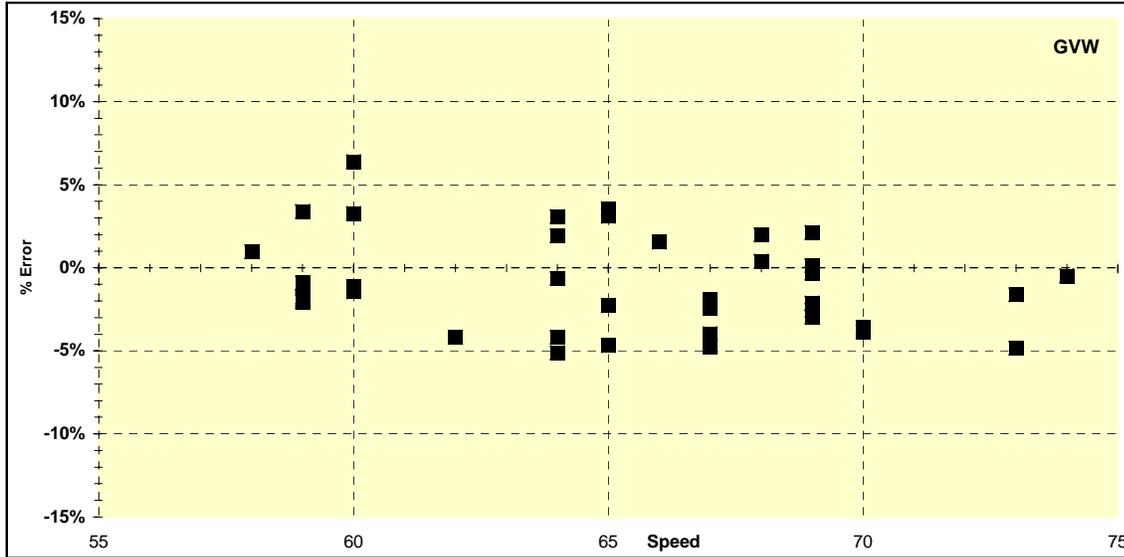
Temperature range 80 to 90 (27 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-1.4%	3.1%	10%	7.6%
Tandem group weight	-1.0%	3.8%	15%	8.6%
Single axle weight	-2.7%	3.0%	20%	8.7%

Temperature range 90 to 100 (11 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.2%	2.0%	10%	4.3%
Tandem group weight	1.1%	3.0%	15%	7.1%
Single axle weight	-1.1%	2.0%	20%	5.2%

### 6.1.4 WEIGHT GRAPHS



International Road Dynamics Inc.  
FHWA VERIFICATION 2008a



### 6.1.5 TEMPERATURE INFLUENCE GRAPHS



International Road Dynamics Inc.  
FHWA VERIFICATION 2008a

