INTERNATIONAL ROAD DYNAMICS INC.

LTPP WIM DATA COLLECTION SYSTEMS

INSTALLATION AND CALIBRATION FOR ARIZONA SPS-1 LTPP ID 040100

January 11, 2007

CLIN 2004A TASK ORDER # 9

CONTRACT NO. DTFH61-05-D-00001

U.S. Department of Transportation
Federal Highway Administration

LONG TERM Pavement PERFORMANCE

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1.0 EXECUTIVE SUMMARY

This report details the installation and calibration of the Arizona SPS-1 Weigh-in-Motion (WIM) site located on US93 at mile post 52.5. The WIM site is instrumented with IRD's iSINC (Intelligent Sensor Interface Network Controller) WIM Electronic and the IRD/PAT 1.75 Meter Bending Plate. The north bound driving lane is instrumented for WIM data collection consisting of two inductive loops and two bending plates. The WIM system uses a landline phone for communication and a solar power system to power the equipment. The phone service drop is located 100 ft. north of the WIM cabinet next to the Remote Weather Station.

The WIM equipment installation began on August 7, 2006 and was completed on August 9, 2006. The WIM system was commissioned and calibrated on November 29 and 30 2006 respectively.

The 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

- FHWA – LTPP Contracting Officer's Technical Representative (COTR)
  - Debbie Walker –
  - ph: (202) 493-3068
  - deborah.walker@fhwa.dot.gov

- Arizona DOT
  - Estomih (Tom) Kombe (602) 712-3135

- FHWA Division Office, Division Representative
  - Alan Hansen
  - ph: (602) 379-3645 ext. 108

- LTPP Regional Support Contractor (RCS)
  - Jason Puccinelli
  - ph: (775) 329-4955

- International Road Dynamics, Phase 2 Contractor, Project Manager
  - Bruce Myers -
  - ph: (717) 264-2077
  - bruce.myers@irdinc.com

- Otto Logistics LLC (Calibration Trucks)
  - ph: (480) 641-3500

3.0 SHEET 16 – SITE CALIBRATION SUMMARY

SITE CALIBRATION INFORMATION

1. DATE OF CALIBRATION (MONTH/DAY/YEAR): **November 30, 2006**

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 **21**

TRUCK#	TYPE	SUSPENSION
1	**9**	**1 & 2**
2	**9**	**1 & 2**
3	**X**	**X**
4	**X**	**X**
5	**X**	**X**

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION TYPES:
1 – AIR
2 – LEAF SPRING
3 – OTHER

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   GVW MEAN DIFFERENCE **0.3%** STANDARD DEVIATION **3.7%**
   SINGLE AXLE MEAN DIFFERENCE -**01%** STANDARD DEVIATION **8.4%**
   DOUBLE AXLES MEAN DIFFERENCE **0.3%** STANDARD DEVIATION **6.6%**

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

9. DEFINE THE SPEED RANGES USED (MPH): **40 - 50, 50 - 60, 60 - 70**

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 **%**
    FHWA CLASS 3 **%**
    FHWA CLASS 4&5 **%**
    FHWA CLASS 8 **%**
    FHWA CLASS 9 **%**
    FHWA CLASS 12 **%**
    "UNCLASSIFIED" VEHICLES: **%**

15. PICTURES: _____

16. NOTES:
    _____

PERSON LEADING CALIBRATION EFFORT: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

3.1.1 FINAL SITE CALIBRATION FACTORS ARIZONA SPS-1, US93, MP 52.5

Time of Change : 11-30-2006 12:30pm

Site Parameters

Lane **1**

Upstream Loop
- Loop State **Enabled**
- Module ID **9**
- Channel ID **0**
- Polarity **Active Low**
- Width (cm) **183**

Downstream Loop
- Loop State **Enabled**
- Module ID **9**
- Channel ID **1**
- Polarity **Active Low**
- Width (cm) **183**
- Distance (cm) **800**

Axle Sensors

Axle **1**
- Axle State **Enabled**
- Module ID **5**
- Channel ID **0**
- Polarity Active **High**
- Type **Bending Plate**
- Distance (cm) **270**
- Temp Module UID **1**
- Temp Channel Num **0**

Axle **2**
- Axle State **Enabled**
- Module ID **5**
- Channel ID **1**
- Polarity **Active High**
- Type **Bending Plate**
- Distance (cm) **630**
- Temp Module UID **1**
- Temp Channel Num **0**

Processing
- Axle Sensor Width **50**
- Axle Sep **371**

Calibration

Lane **1**

Axle Sensor **1**
- Threshold **40**
- WIM Calib Factors
  - Speed Bin **1**
  - Max Speed **72 kph (45 mph)**
  - Calibration Factor **2800**
  - Speed Bin **2**
  - Max Speed **80 kph (50 mph)**
  - Calibration Factor **2905**
  - Speed Bin **3**
  - Max Speed **88 kph (55 mph)**
  - Calibration Factor **3015**
  - Speed Bin **4**
  - Max Speed **96 kph (60 mph)**
  - Calibration Factor **3080**
  - Speed Bin **5**
  - Max Speed **105 kph (65 mph)**
  - Calibration Factor **3150**

Axle Sensor **2**
- Threshold **40**
- WIM Calib Factors
  - Speed Bin **1**
  - Max Speed **72 kph (45 mph)**
  - Calibration Factor **2800**
  - Speed Bin **2**
  - Max Speed **80 kph (50 mph)**
  - Calibration Factor **2905**
  - Speed Bin **3**
  - Max Speed **88 kph (55 mph)**
  - Calibration Factor **3015**
  - Speed Bin **4**
  - Max Speed **96 kph (60 mph)**
  - Calibration Factor **3080**
  - Speed Bin **5**
  - Max Speed **105 kph (65 mph)**
  - Calibration Factor **3150**

4.0 WIM SITE INVENTORY

1. ROUTE US93 MILEPOST:52.5 LTPP DIRECTION: **N** S E W

2. SITE DESCRIPTION
   GRADE: 1%
   ☐ Sag vertical
   Nearest SPS section upstream of the site: 040100
   Distance from sensor to nearest upstream SPS Section: 200 ft.

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: 10 ft.

4. PAVEMENT TYPE: 12 inch concrete

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

6. SENSOR SEQUENCE: Loop - Bending Plate - Bending Plate - 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
   Clearance under plates: 2.25 inches
   Clearance/access to flush fines from under system: Unbolt retaining rails and lift bending plate

10. CABINET LOCATION:
    - ☒ Same side of road as LTPP lane
    - ☐ Median
    - ☒ Behind guard rail

    Distance from edge of travel lane to cabinet: 45 ft
    Distance from sensors: 55 ft
    Type: 336
    Access controlled by: ☐ LTPP / ☒ State / ☐ Joint
    Primary contact: Tom Kombe (602) 712-3135
    Alternate contact:

11. POWER:
    Power type: ☐ Overhead / ☐ Underground / ☒ Solar
    Distance from cabinet to drop: 3 ft
    Service provider: 2 X 80 Watt Solar Panels, 2 X 64 Amp Hr. Batteries

12. TELEPHONE:
    Telephone type: ☐ Overhead / ☒ Underground / ☐ Cell
    Distance from cabinet to drop: 100 ft
    Service provider: _____

13. SYSTEM:
    Software: iSINC
    Version: _____
    Connection: ☒ RS232 / ☐ Parallel port / ☐ USB / ☐ Other

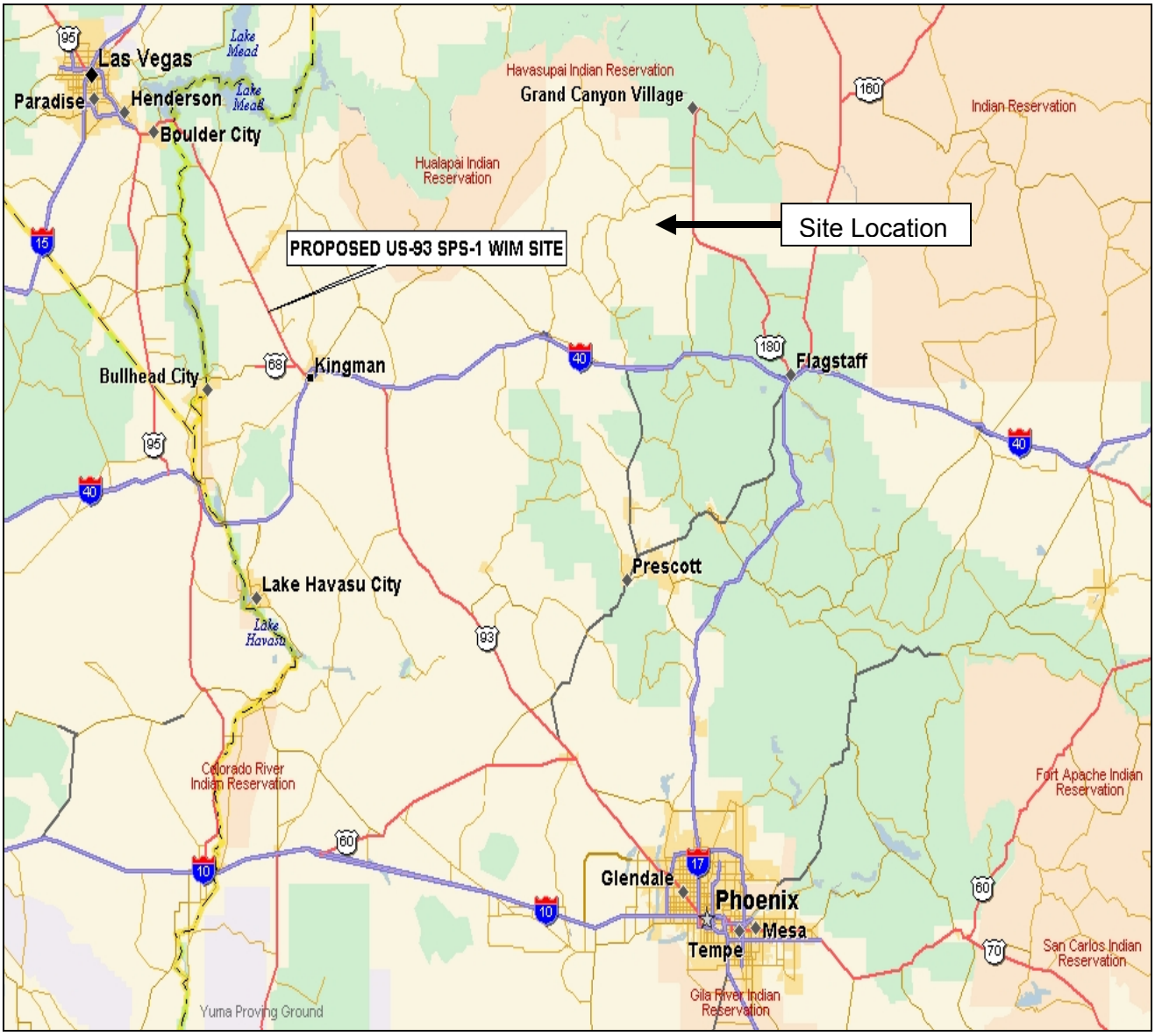
14. TEST TRUCK CYCLE:
    Turnaround time: 12 minutes
    Turnaround distance: 10 miles

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

16. NOTES:
    _____

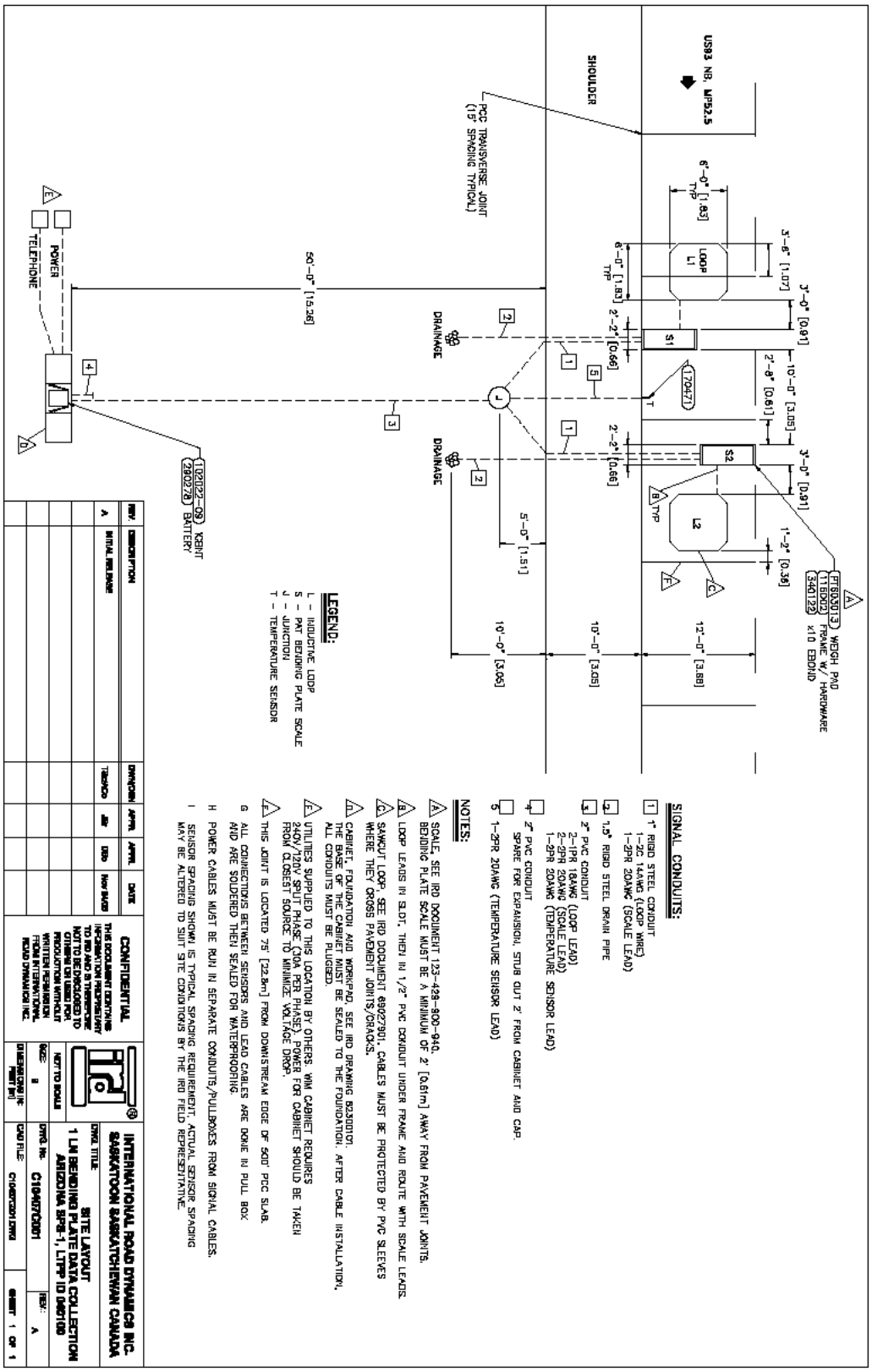
COMPLETED BY: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

4.1.1 SITE MAP

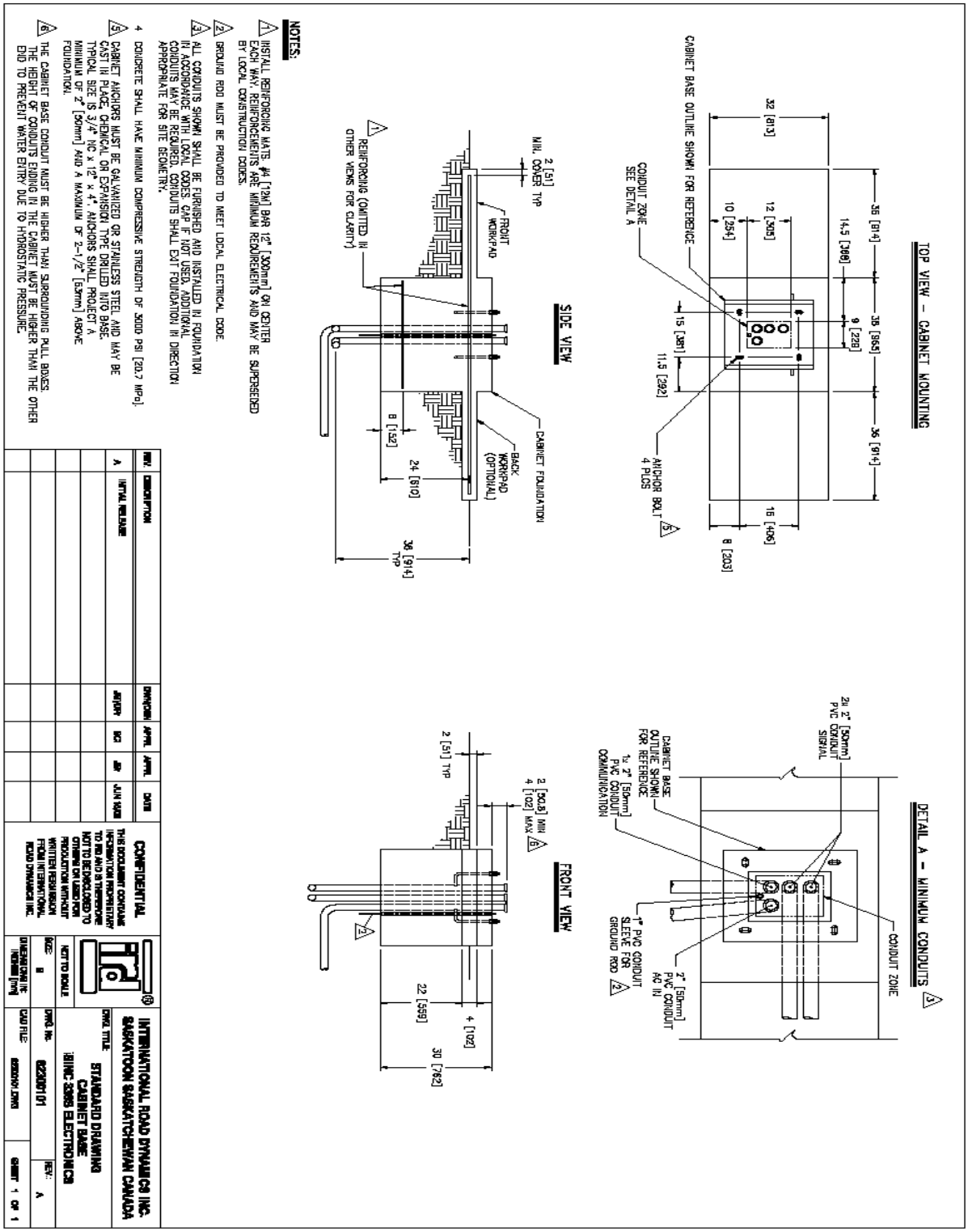

Las Vegas
Paradise
Henderson
Boulder City
Lake Mead
Lake Mead
Havasupai Indian Reservation
Grand Canyon Village
Indian Reservation
Hualapai Indian Reservation
Site Location
PROPOSED US-93 SPS-1 WIM SITE
Bullhead City
Kingman
Flagstaff
Prescott
Lake Havasu City
Lake Havasu
Colorado River Indian Reservation
Fort Apache Indian Reservation
Glendale
Phoenix
Mesa
Tempe
San Carlos Indian Reservation
Gila River Indian Reservation
Yuma Proving Ground

4.1.2 PICTURES, WIM SITE

4.1.3 SITE LAYOUT



4.1.4 WIM CABINET CONCRETE PEDESTAL



4.1.5 ELECTRICAL READINGS

International Road Dynamics Inc.

Site Service Sheet

Clear

Bending Plate **System Type:** iSINC

Date: 11/29/2006 **State:** AZ **Location:** US93 Mile Post 52.5
Job #: 10407C **Site #:** **Directions:** ~Approx. 20 miles N of Kingman

Loops	Lane - 1		Lane -		Lane -		Lane -	
	Lead	Trail	Lead	Trail	Lead	Trail	Lead	Trail
Resistance	1.0	1.0						
Leakage	inf.	inf.						
Inductance								
Frequency	N/A	N/A						

Weighpads	Lane - 1		Lane -		Lane -		Lane -	
	Lead	Trail	Lead	Trail	Lead	Trail	Lead	Trail
Supply	979Ω	979Ω						
Signal	846Ω	846Ω						
Shield	inf.	inf.						
Zero Pt	0.2 mV	0.1 mV						
Serial #								

Piezos	Lane -		Lane -		Lane -		Lane -	
Amplitude								
Capacitance								
Resistance								

System

A/C Service	
Power Supply	13.2
Solar Panel	N/A
Back-Up	13.5 VDC
System Input	N/A
Modem Power	13.2 VDC
Phone off hook	10 VDC
Phone on hook	50 VDC

Temp Sensor

Red to Blk	8 MΩ
Red to Wht	6.07MΩ
Wht to Blk	40KΩ

Technician: Bruce Myers **Date:** 11/29/2006

5.0 WIM CALIBRATION

5.1.1 TEST TRUCK #1 INFORMATION

DATE OF CALIBRATION: **November 30, 2006**

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		9440		D
B		25760		D (B&C combined)
C				
D		25900		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)
	61100		61100

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

9. TRACTOR MANUFACTURER:
   Make: Peterbilt
   Model:

10. TRAILER LOAD DESCRIPTION: Trash

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	14.5'
B-C	4.3'
C-D	33.5’
D-E	4.1’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.5 ft

SUSPENSSION:

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

5.1.2 PICTURES, TEST TRUCK 1

5.1.3 TEST TRUCK #2 INFORMATION

DATE OF CALIBRATION: **November 30,, 2006**

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		9640		D
B		34860		D (B&C combined)
C				
D		33580		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)
	78080		

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

9. TRACTOR MANUFACTURER:
   Make: Peterbilt
   Model:

10. TRAILER LOAD DESCRIPTION: Trash

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	14.5’
B-C	4.3’
C-D	34.2’
D-E	4’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.5 ft

SUSPENSSION:

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

5.1.4 PICTURES, TEST TRUCK 2

6.0 TEST TRUCK CALIBRATION RECORDS - DECEMBER 20, 2006

6.1.1 VALIDATION RUNS

International Road Dynamics Inc.

FHWA VERIFICATION

Static Test Vehicle Measurements

ID				GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1				61.3	9.6	25.8	25.9	14.5	4.3	33.5	4.1
2				78.3	9.8	34.9	33.6	14.5	4.3	34.2	4.0

Dynamic Test Vehicle Measurements

ID	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	778	64	45	57.0	9.8	22.2	25.1	14.7	4.5	33.5	4.1
2	779	64	45	74.5	9.4	31.5	33.6	14.6	4.3	34.3	4.0
1	821	55	45	61.6	10.2	25.9	25.5	14.6	4.4	33.8	4.1
2	822	54	45	81.2	11.0	33.6	36.5	14.6	4.4	34.3	4.1
1	859	46	46	63.9	10.9	26.4	26.6	14.5	4.4	33.5	4.0
2	860	45	46	77.9	10.6	34.3	32.9	14.4	4.3	34.3	4.0
1	923	54	46	64.4	10.5	27.6	26.3	14.6	4.4	33.6	4.1
2	924	55	46	79.4	10.2	32.8	36.3	14.7	4.4	34.4	4.0
1	978	63	46	61.8	9.3	24.6	27.9	14.6	4.4	33.7	4.0
2	979	65	46	79.1	8.8	36.1	34.1	14.6	4.3	34.4	4.0
1	1024	46	44	64.5	9.7	28.1	26.7	14.6	4.4	33.6	4.0
2	1025	45	44	78.9	10.5	34.1	34.3	14.6	4.2	34.3	4.0
1	1080	55	42	65.0	10.1	26.6	27.3	14.7	4.4	33.4	4.1
2	1081	55	42	80.9	10.8	34.2	35.8	14.6	4.3	34.3	4.1
1	1122	64	43	59.4	9.5	22.4	27.5	14.7	4.4	33.8	4.1
2	1123	65	43	73.0	10.6	31.2	31.3	14.6	4.3	34.2	4.0
1	1175	46	42	61.6	9.4	26.8	25.4	14.7	4.4	33.7	4.1
2	1176	46	42	78.5	10.2	33.5	33.8	14.6	4.3	34.3	4.1
1	1228	55	43	59.9	9.4	24.2	26.3	14.6	4.4	33.7	4.2
2	1231	55	43	78.5	10.2	33.4	34.8	14.6	4.4	34.4	4.1
2	1277	65	44	80.4	9.4	36.9	34.0	14.5	4.3	34.5	4.0
1	1318	45	42	61.4	9.8	24.9	26.8	14.6	4.2	33.7	4.0
2	1319	45	42	72.7	8.8	30.3	33.5	14.5	4.3	34.0	4.1
1	1373	64	36	63.3	*6.9*	27.3	29.2	14.6	4.3	33.6	4.0
2	1374	65	36	77.5	8.8	36.0	32.7	14.5	4.3	34.4	4.0
1	1411	64	35	65.2	9.1	27.3	28.9	14.6	4.4	33.9	4.0
2	1412	65	35	82.1	9.8	37.3	35.1	14.6	4.3	34.4	3.9
1	1456	64	34	64.9	8.0	27.1	*29.9*	14.6	4.3	33.6	4.0
2	1457	65	34	74.7	10.2	*28.3*	36.1	14.7	4.2	34.5	4.0
1	1494	55	33	60.1	9.8	24.5	25.8	14.6	4.4	33.7	4.1
2	1495	56	33	77.2	9.7	33.8	33.7	14.6	4.4	34.2	4.1
1	1540	63	32	60.3	9.1	22.6	28.5	14.7	4.4	33.9	4.0
2	1541	65	32	76.9	10.4	33.8	32.7	14.6	4.3	34.5	4.1
1	1583	56	31	62.5	8.8	27.1	26.5	14.6	4.4	33.6	4.1
2	1584	55	31	79.5	10.0	34.2	35.2	14.6	4.4	34.4	4.1
1	1624	55	30	59.2	8.9	25.1	25.0	14.7	4.4	33.4	4.2
2	1625	54	30	77.0	10.0	32.0	35.1	14.6	4.4	34.3	4.1

Date:	2006/11/30
Technician:	Bruce Myers
Location:	Arizona SPS-1, US93

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	778	64	45	-7.0%	2.1%	14.0%	-3.1%	0.2	0.2	0.0	0.0
2	779	64	45	-4.9%	-4.1%	-9.7%	0.0%	0.1	0.0	0.1	0.0
1	821	55	45	0.5%	6.3%	0.4%	-1.5%	0.1	0.1	0.3	0.0
2	822	54	45	3.7%	12.2%	-3.7%	8.6%	0.1	0.1	0.1	0.1
1	859	46	46	4.2%	13.5%	2.3%	2.7%	0.0	0.1	0.0	-0.1
2	860	45	46	-0.5%	8.2%	-1.7%	-2.1%	-0.1	0.0	0.1	0.0
1	923	54	46	5.1%	9.4%	7.0%	1.5%	0.1	0.1	0.1	0.0
2	924	55	46	1.4%	4.1%	-6.0%	8.0%	0.2	0.1	0.2	0.0
1	978	63	46	0.8%	-3.1%	-4.7%	7.7%	0.1	0.1	0.2	-0.1
2	979	65	46	1.0%	10.2%	3.4%	1.5%	0.1	0.0	0.2	0.0
1	1024	46	44	5.2%	1.0%	8.9%	3.1%	0.1	0.1	0.1	-0.1
2	1025	45	44	0.8%	7.1%	-2.3%	2.1%	0.1	-0.1	0.1	0.0
1	1080	55	42	6.0%	5.2%	3.1%	5.4%	0.2	0.1	-0.1	0.0
2	1081	55	42	3.3%	10.2%	-2.0%	6.5%	0.1	0.0	0.1	0.1
1	1122	64	43	-3.1%	-1.0%	13.2%	6.2%	0.2	0.1	0.3	0.0
2	1123	65	43	-6.8%	8.2%	10.6%	-6.8%	0.1	0.0	0.0	0.0
1	1175	46	42	0.5%	-2.1%	3.9%	-1.9%	0.2	0.1	0.2	0.0
2	1176	46	42	0.3%	4.1%	-4.0%	0.6%	0.1	0.0	0.1	0.1
1	1228	55	43	-2.3%	-2.1%	-6.2%	1.5%	0.1	0.1	0.2	0.1
2	1231	55	43	0.3%	4.1%	-4.3%	3.6%	0.1	0.1	0.2	0.1
2	1277	65	44	2.7%	-4.1%	5.7%	1.2%	0.0	0.0	0.3	0.0
1	1318	45	42	0.2%	2.1%	-3.5%	3.5%	0.1	-0.1	0.2	-0.1
2	1319	45	42	-7.2%	10.2%	13.2%	-0.3%	0.0	0.0	-0.2	0.1
1	1373	64	36	3.3%	28.1%	5.8%	12.7%	0.1	0.0	0.1	-0.1
2	1374	65	36	-1.0%	10.2%	3.2%	-2.7%	0.0	0.0	0.2	0.0
1	1411	64	35	6.4%	-5.2%	5.8%	11.6%	0.1	0.1	0.4	-0.1
2	1412	65	35	4.9%	0.0%	6.9%	4.5%	0.1	0.0	0.2	-0.1
1	1456	64	34	5.9%	16.7%	5.0%	15.4%	0.1	0.0	0.1	-0.1
2	1457	65	34	-4.6%	4.1%	18.9%	7.4%	0.2	-0.1	0.3	0.0
1	1494	55	33	-2.0%	2.1%	-5.0%	-0.4%	0.1	0.1	0.2	0.0
2	1495	56	33	-1.4%	-1.0%	-3.2%	0.3%	0.1	0.1	0.0	0.1
1	1540	63	32	-1.6%	-5.2%	12.4%	10.0%	0.2	0.1	0.4	-0.1
2	1541	65	32	-1.8%	6.1%	-3.2%	-2.7%	0.1	0.0	0.3	0.1
1	1583	56	31	2.0%	-8.3%	5.0%	2.3%	0.1	0.1	0.1	0.0
2	1584	55	31	1.5%	2.0%	-2.0%	4.8%	0.1	0.1	0.2	0.1
1	1624	55	30	-3.4%	-7.3%	-2.7%	-3.5%	0.2	0.1	-0.1	0.1
2	1625	54	30	-1.7%	2.0%	-8.3%	4.5%	0.1	0.1	0.1	0.1

6.1.3 OVERALL PERFORMANCE

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Specifications					
Confidence	95%	Speed range low	40	to	50
	(1.96)	Speed range medium	50	to	60
Gross vehicle weight	10%	Speed range high	60	to	70
Tandem group weight	15%	Temperature range low	20	to	30
Single axle weight	20%	Temperature range medium	30	to	40
Axle spacings	0.5	Temperature range high	40	to	50

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Overall					
Characteristic	Error	StdDev	Specification	Calculated	Pass/Fail
Gross vehicle weight	0.3%	3.7%	10%	7.5%	pass
Tandem group weight	0.3%	6.6%	15%	13.2%	pass
Single axle weight	-0.1%	8.4%	20%	16.5%	pass
Axle spacings	0.1	0.1	0.5	0.3	pass

Speed range 40 to 50 (8 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.4%	3.7%	10%	7.9%
Tandem group weight	-0.1%	4.8%	15%	9.8%
Single axle weight	3.0%	7.2%	20%	9.9%
Axle spacings	0.0	0.1	0.5	0.2

Speed range 50 to 60 (14 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.9%	2.9%	10%	6.8%
Tandem group weight	0.5%	4.7%	15%	9.8%
Single axle weight	2.8%	6.0%	20%	15.0%
Axle spacings	0.1	0.1	0.5	0.2

Speed range 60 to 70 (15 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-0.4%	4.4%	10%	9.3%
Tandem group weight	0.4%	8.7%	15%	17.7%
Single axle weight	-4.5%	9.2%	20%	23.2%
Axle spacings	0.1	0.1	0.5	0.3

Temperature range 20 to 30 (2 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-2.5%	1.2%	10%	5.1%
Tandem group weight	-2.5%	5.3%	15%	13.0%
Single axle weight	-2.6%	6.6%	20%	16.0%

Temperature range 30 to 40 (12 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.0%	3.5%	10%	8.1%
Tandem group weight	2.1%	7.8%	15%	17.6%
Single axle weight	-5.0%	9.8%	20%	24.9%

Temperature range 40 to 50 (23 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.2%	3.9%	10%	8.0%
Tandem group weight	-0.4%	5.9%	15%	12.2%
Single axle weight	2.6%	6.5%	20%	15.9%

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6.1.4 WEIGHT GRAPHS

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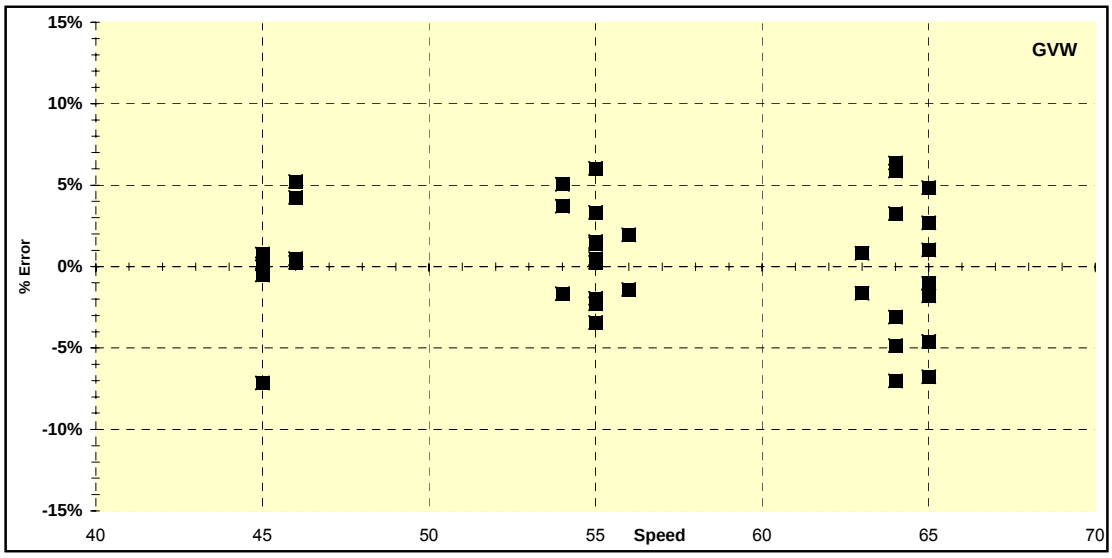

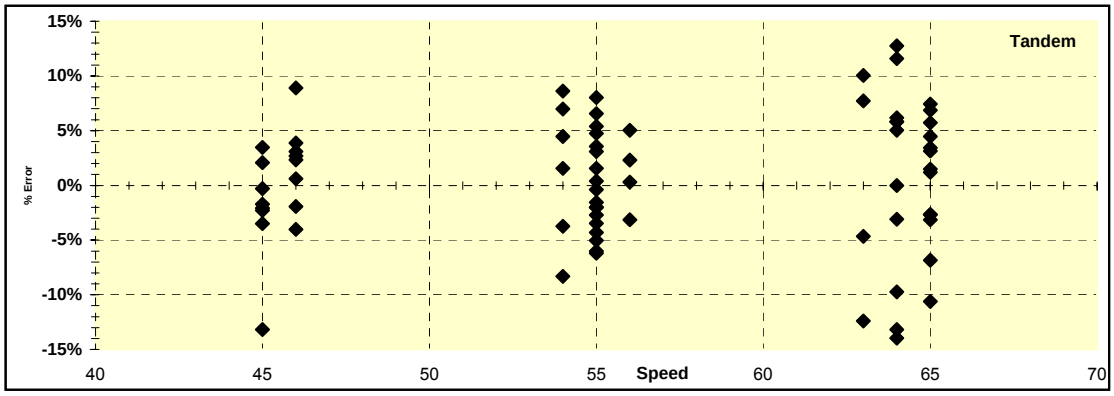

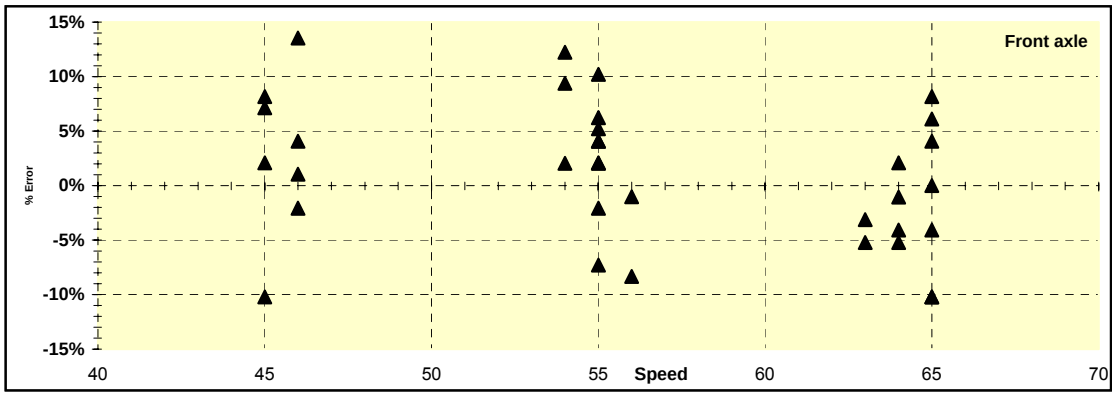

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6.1.5 TEMPERATURE INFLUENCE GRAPHS

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