CHAPTER 4 – DATA ACQUISITION

The fieldwork for Phase III was performed from January 17th through January 20th, 2004.

The GPS control point used for this survey was FHWA point PT3500 located west of SR537 near MP 49. The coordinates for this FHWA control point, established by field personnel during the Phase I survey, which is based on the WGS84 spheroid (no geoid model), are listed in table 1.

Table 1. Base Station Coordinates.

WGS84 Coordinates	**Latitude**	**Longitude**	**Elevation**
	36° 42' 50.22013" N	107° 00' 32.01764" W	2235.99 m
FHWA PT3500*	**Northing**	**Easting**	**Elevation**
	69956.42 m	37260.19 m	2236.00 m
* - FHWA coordinates are measured in meters and based on a local grid system.			

A GPS repeater station was also used. The repeater was located at the top of the road cut west of SR537 approximately halfway between MP 53 and MP 54. The repeater provided greatly improved GPS radio link coverage without changing control points.

4.1 DATA ACQUISITION METHODS

To facilitate a direct comparison of the Phase III data with the Phase I and Phase II data, the same basic data acquisition parameters, instrument calibration location, and initial data reduction procedures were used for the Phase III investigation.

To rapidly acquire data along profile lines, in one lane of SR537 at a time, the EM31-3 was mounted on a trailer constructed primarily from non-conductive materials (see figure 5). Due to the configuration change between the EM31-3 and the standard EM31, it was necessary to make some modifications to the original trailer used in the Phase I and Phase II surveys. The EM31-3 was securely mounted to the trailer and a GPS receiver was positioned directly above the center point between the Tx coil and the 1 m (3.28 ft) Rx coil. As previously described, different dipole orientations and instrument heights impact the effective depth of investigation, thus a variety of dipole orientations and instrument heights were used for each pass in each lane. Table 2 identifies the field setup for each pass made during Phase III data acquisition.

The instrument manufacturer recommended that the minimum distance between the All Terrain Vehicle (ATV) and the nearest coil should be greater than 2.3 m (7.6 ft) in order to minimize any potential interference from the ATV. A Trimble 5700 GPS rover system was mounted on the ATV with only the GPS receiver antenna, attached by the antenna cable, mounted on the instrument trailer.

Table 2. EM31-3 Instrument Height and Orientation

Instrument	Coil Separation	Coil Height*	Dipole Orientation
EM31-3	1m	49 cm	Vertical
	2m	47 cm	Vertical
	4m	47 cm	Vertical
EM31-3	1m	67 cm	Horizontal
	2m	67 cm	Horizontal
	4m	65 cm	Horizontal

* Nominal coil height above existing road surface.

The GPS data were both logged in RTK on the Trimble Survey Controller (TSC1) data logger and with post-processing data logging enabled on each GPS receiver. RTK data were collected continuously at 1 Hz (1 per second) on the TSC1 data logger mounted on the ATV. Data for post-processing were collected at 2 Hz in order to acquire a full day's data on the Trimble 4700 receivers without downloading data during the day. The post-processed data would only be used to improve GPS positioning during periods of low GPS satellite coverage or poor radio link with the GPS base station.

EM31-3 data were logged in automatic (time) mode at a sample rate of 5 Hz. Nominal data acquisition speed using the ATV was about 16 km/h (10 mph), yielding a data station interval of about 1 m (3.28 ft) along the EMI lines, and a GPS survey data station interval of about 4.5 m (14.8 ft) along the profile lines. Data were collected along two profile lines, one profile along the center of each lane.

Daily field instrument calibration checks were performed for the EM31-3 instrument. Instrument calibration was performed following the manufacturer's specifications. The calibration site is located at a pull-off along the west side of SR537 across the road from MP 49. In addition to instrument calibration checks, the quadrature and in-phase components were recorded at this location at the start and end of data collection for each instrument orientation to check and compensate for daily instrument drift, if any. The in-phase component is primarily a "metal detection component" for the EM31-3 instrument. The in-phase data were recorded along the roadway for this investigation, but were only used to assist in identifying metallic structures (e.g., metal culverts) beneath the roadway. Quadrature component data recorded near metallic features can be biased by the influence of the metal on the bulk conductivity readings.

4.2 SITE SPECIFIC CONSIDERATIONS AND LIMITATIONS

During the Phase I survey in September, 2001 several significant limitations were prevalent at the site. These included vehicular traffic concerns, surveying control and coordinate issues, and GPS coverage limitations. The main concern at the site during Phase I surveying was safety issues arising from heavy haul truck traffic, nearly continuous Monday through Friday and from dawn to dusk. During the Phase II and Phase III geophysical surveys, the gravel haul trucks

were not operating and only limited heavy truck traffic was present during the survey, which did not significantly affect the safety of the crew or the data quality.

Since field personnel established GPS surveying control during the Phase I survey, no further GPS survey control points were needed for the Phase II or Phase III surveys. DGPS post-processing was not used for Phase II or Phase III.