OMAHA DISTRICT
U.S. ARMY
CORPS OF ENGINEERS

RAMS PROJECT DATA PACKAGE:

MARYSVILLE ROAD/SILVER CREEK

ROAD ALIGNMENT SURVEYING AND ROADBED SAMPLING

LEWIS AND CLARK COUNTY, MONTANA

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LIST OF ABBREVIATIONS AND ACRONYMS

ABA	Acid-Base Accounting
Ag	Silver
As	Arsenic
Ba	Barium
bgs	below ground surface
Cd	Cadmium
Cr	Chromium
Fe	Iron
GPS	Global Positioning System
Hg	Mercury
MDOT	Montana Department of Transportation
Mn	Manganese
NAD	North American Datum
Ni	Nickel
O.D.	Outside Diameter
Pb	Lead
RAMS	Restoration of Abandoned Mine Sites
Sb	Tin
SOPs	Standard Operating Procedures
TCLP	Toxicity Characteristic Leaching Procedure
USACE	U. S. Army - Corps of Engineers
Zn	Zinc

Introduction

As tasked by the Montana Department of Transportation (MDOT), this data package transmits the analytical results of the soil samples collected from twenty-one soil borings drilled along Marysville Road, Marysville, Montana. See Attachment 1 for a map of the soil boring locations. A brief discussion of the drilling and sampling of the roadbed, and survey information for the control points established along Marysville Road are also included. Additional information about field procedures may be obtained by referring to Attachment 2 – Work Plan, Marysville Road/Silver Creek, Road Alignment and the associated RAMS-Standard Operating Procedures (SOPs). More complete information regarding the control point survey will be provided in a separate report from Surveys and Mapping of the Omaha District - U.S. Army Corps of Engineers (USACE).

Background

MDOT requested the USACE install control survey points and sample the roadbed fill in preparation for widening and paving the Marysville Road. Marysville Road is a gravel road, which is narrow, and winding in places, more so in the upper portion near Marysville. The concern with the roadbed fill was that contaminated spoil from mining and milling might have been used to construct the roadbed, requiring removal prior to paving. Of particular concern/interest was the possibility of mercury contamination in the soil. Other possible contaminants include other heavy metals, strongly acidic soil conditions and residual cyanide.

Surveys

Control Surveys

The USACE Omaha District Survey Crew installed control points and surveyed in their locations in accordance with the requested MDOT specifications. Control stations were placed on backslopes so adjacent stations are visible to each other. A typical station consisted of a standard MDOT disk drilled into rock outcropping. Horizontal coordinates were determined by postprocessing Global Positioning System (GPS) data collected by four Trimble receivers. Vertical control was established by differential levels using a Wild Diglev. Control standards were to meet requirements of the National Map Accuracy Standards. Control point survey data is included as Attachment 3.

Soil Boring Surveying

The USACE Omaha District Survey Crew staked and surveyed the boring locations just off the "north" edge of the road. The actual boring locations were drilled in the middle

of the "north" traffic lane of the road by the USACE drill crew, and were therefore offset from the surveyed locations. Survey data for the staked locations on the "north" edge of the road (MR0201 through MR0220) and offset distances to the actual boring locations in the "north" traffic lane of the road are shown in Table 1, below. Survey data are in the Montana State Plane Coordinate System North American Datum (NAD) 83 datum. One location, MR0221, was staked but not surveyed. The location of MR0221 is estimated relative to the adjacent Drumlummon Mill foundation. Boring locations were staked using a 2X2 wood stake, marked with the boring number. A lath, painted orange/red fluorescent on top or tied with similar colored flagging, was installed adjacent to the survey stake to facilitate locating the survey stake. Final boring locations were not surveyed and no elevations were determined for the soil boring locations.

TABLE 1: SOIL BORING SURVEY DATA

Soil Boring Point ID	Survey Stake Northing-Feet (1)	Survey Stake Easting-Feet (1)	Soil Boring Offset-Feet
MR0201	923723.796	1296576.645	27.3
MR0202	922799.059	1294296.977	25.0
MR0203	922263.263	1292922.356	23.0
MR0204	922021.233	1291384.569	21.5
MR0205	922485.222	1289505.603	22.0
MR0206	923404.104	1287336.495	10.0
MR0207	923990.355	1284504.880	21.0
MR0208	924315.302	1282852.267	11.0
MR0209	923952.575	1279192.353	11.0
MR0210	923478.004	1277222.477	9.5
MR0211	922985.318	1276399.020	10.5
MR0212	923140.843	1275348.778	10.5
MR0213	923382.487	1274888.148	11.0
MR0214	923754.823	1273986.486	9.5, 7.0 "west"
MR0215	924714.032	1272694.521	10.0
MR0216	924825.135	1270868.629	12.0
MR0217	924485.041	1269261.306	6.0, 13.0 "west"
MR0218	924356.064	1268703.723	8.0
MR0219	923726.782	1268122.003	10.0
MR0220	923527.183	1267994.452	12.0
MR0221	N.A.	N.A.	(2)

(1) Projection type: Plane NAD 83; Distance Units: US Survey Feet;
Description: Wood lathe and Hub at north edge of road for points 01-20.
(2) MR0221: Approx. 30-feet North of mill foundation, 1-foot East of road centerline.

Soil Borings and Sampling

Twenty-one soil borings numbered MR02-01 through MR02-21 were drilled and sampled from August 21st through the 23rd, 2002, by the USACE Omaha District, Core Drill Unit. Borings were drilled in the center of the "north" lane of the Marysville Road, Route L2590, from the intersection with Highway 279 (MR0201) west to the Drumlummon Mine and Mill site (MR0220) on the east side of Marysville, Montana. One additional boring (MR0221) was drilled on a side road to the Drumlummon Mine and Mill site. See Attachment 1 for a map of the drilling locations, Attachment 4 for the drilling logs of the twenty-one soil borings, and Attachment 5 for the Daily Quality Control Reports and field notes.

The borings were sampled continuously from the road surface to a maximum depth of ten feet below ground surface (bgs) or refusal for soil logging, geotechnical bag sampling, splitspoon blow counts and composite analytical sampling. Most borings refused above 10 feet bgs and sample recovery was often less than half the sampled interval, due to the rocky soil. Three boring locations, MR0202, MR0216 and MR0217 (in areas assumed to be uncontaminated) were sampled at 0 to 1.5, 1.5 to 3.0 and 3.0 to 4.5 feet bgs with a 2-inch O.D. splitspoon, with blow counts recorded for each 6-inchs of drive. The remainder of those borings and the full depth of all other borings were sampled using a (carbon steel) 5-foot continuous soil core sampler. One composite sample for chemical analysis was created from each boring by taking equal sub-samples from the surface and at each foot of depth, and homogenized. After sampling, borings were backfilled with tamped drill cuttings to about three feet below the surface and the remainder of the hole was backfilled with a cement grout cap.

Twenty–one (21) composite analytical samples (one composite sample from each boring) were collected for analysis of Metals (Ag, As, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, & Zn), pH (soil), Total Cyanide, and Acid-Base Accounting (ABA). Two (2) composite samples (MR0218 and MR0221) were also collected and sent for analysis of Toxicity Characteristic Leaching Procedure (TCPL) Metals. Three (3) 16-ounce geotechnical bag samples (two from boring MR0202 and one from MR0214) were collected and sent to the USACE Geotechnical Engineer for visual inspection only. ABA samples were sent to Energy Laboratory, Billings, Montana for analysis. ABA samples were shipped in one-pint zip lock plastic bags, in coolers without ice, per previous instructions from Energy Laboratory. Samples for all other analysis were sent to the USACE Environmental Chemistry Branch Laboratory, Omaha, Nebraska. Samples sent to the USACE Laboratory were shipped in 4-ounce and 8-ounce glass jars, in iced coolers. The TCLP samples were selected by the field geologist from those samples thought to be most contaminated, based on appearance in the field. The geotechnical bag samples were representative samples of significant soil types encountered during drilling. No field duplicate samples were taken. Table 2, below, gives the general roadbed sampling data.

TABLE 2: ROADBED SAMPLING INTERVALS AND ANALYSIS

Soil Boring Number	Sampled Interval (Ft. bgs)	Feet Recovered	Analysis
MR0201	0-10.0	5.0	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0202	0-10.0*	4.2	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0203	0-8.5	4.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0204	0-8.5	5.0	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0205	0-6.0	5.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0206	0-10.0	7.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0207	0-7.0	5.0	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0208	0-10.0	6.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0209	0-8.0	5.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0210	0-6.0	3.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0211	0-7.0	4.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0212	0-5.0	3.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0213	0-1.5	1.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0214	0-1.5	1.0	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0215	0-6.0	1.5	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0216	0-6.0*	3.4	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0217	0-4.5*	1.7	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0218	0-9.0	4.0	Metals, pH, Total Cyanide, Acid-Base Accounting, TCLP Metals
MR0219	0-4.5	0.3	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0220	0-4.5	1.0	Metals, pH, Total Cyanide, Acid-Base Accounting
MR0221	0-5.0	3.5	Metals, pH, Total Cyanide, Acid-Base Accounting, TCLP Metals

* Splitspoon samples 0-1.5, 1.5-3.0, & 3.0-4.5; remainder by continuous soil core.

Sampling Results

The qualified sample results for the twenty-one composite soil samples analyzed for Metals (Ag, As, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, & Zn), pH (soil), Total Cyanide, and Acid-Base Accounting, and two samples for TCLP Metals are shown on the tables in Appendix A of the Chemical Data Quality Assessment Report (CDQAR), Attachment 6. The work plan was executed with no deviations and all samples were collected and analyzed. Sample recoveries were sometimes less than desirable, but adequate for all analysis desired. Some data was qualified, though all is usable.