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Final Remedial Investigation/Feasibility Study—Environmental Assessment for the Monticello, Utah, Uranium Mill Tailings Site

Volume I
Remedial Investigation

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FOREWORD

The Remedial Investigation/Feasibility Study (RI/FS) has been supplemented to include analyses sufficient to enable the U.S. Department of Energy to assess the impacts of the remedial action alternatives considered in terms of the requirements of the National Environmental Policy Act (NEPA). As such, this RI/FS also serves as an Environmental Assessment (EA) for purposes of NEPA. On the basis of this RI/FS-EA, the Department of Energy would issue a Finding of No Significant Impact (FONSI) for the preferred remedial action alternative identified therein, if appropriate.

EXECUTIVE SUMMARY

The Monticello Millsite is a 78-acre tract located along Montezuma Creek south of the City of Monticello, San Juan County, Utah. The mill was constructed by the Vanadium Corporation of America (VCA) in 1942 with funds from the Defense Plant Corporation. Initially, vanadium was produced, but from 1943 to 1944 a uranium-vanadium sludge was produced by VCA for the Manhattan Engineer District (MED). After milling operations ceased in 1944, VCA leased the mill from 1945 to 1946 to produce the uranium-vanadium sludge for MED. The Atomic Energy Commission (AEC) bought the site in 1948. Uranium milling commenced 15 September 1949 and continued to 1 January 1960, when the mill was permanently closed. Part of the land was transferred to the Bureau of Land Management, but otherwise the site has remained under the control of the AEC and its successor agencies, the U.S. Energy Research and Development Administration and the U.S. Department of Energy.

Approximately 1 million tons of uranium ore were processed at the mill; the resultant tailings are stored in four piles. The total volume of tailings and tailings-contaminated soil is estimated to be 1,570,000 cubic yards. In addition, some properties adjacent to the site (referred to as peripheral properties) are contaminated by residues from ore stockpiles and dispersed tailings. A number of business and residence properties in the City of Monticello are contaminated from the use of radioactive mill tailings as construction and fill material. The tailings piles were stabilized and covered with soil in 1961 to eliminate the possibility of further dispersal or use.

The chemical composition of the tailings is described in terms of the average concentrations of 17 elements. With one exception, these elements are listed as CERCLA hazardous substances at 40 CFR 302.4. The average concentrations of these elements indicate that most are enriched in the tailings and ore relative to typical or "average" sandstones.

Dispersal of ore and tailings during and after milling operations resulted in the contamination of surface soil on the millsite. Vanadium and uranium were the only substances extracted in the milling process; other radioactive and nonradioactive constituents of the ore remained in the tailings and were not separated prior to disposal. Consequently, dispersal of the tailings results in the dispersal of all of these substances. Measurement of a single constituent will adequately portray the areal distribution of the others. Radium-226, a product of the decay of uranium, was selected to portray the distribution of these elements because of the ease of measurement and because a standard for soil has been established at 40 CFR 192.12.

The background concentration of radium-226 in soil in the Monticello area is about 1 picocurie per gram (pCi/g), or about 0.037 disintegrations per second per gram. The regulations at 40 CFR 192 require remediation of open land if the radium-226 concentration in the upper 15 centimeters of soil exceeds 5 pCi/g above background. Thus, the remedial action standard for radium at the millsite is 6 pCi/g. Areas of elevated radium concentration are expected to have elevated concentrations of CERCLA hazardous substances that were enriched in the ore. Areas where radium is at or near background concentration will have correspondingly low concentrations of CERCLA hazardous substances.

Montezuma Creek, an intermittent stream which flows across the site, has cut through Mancos Shale, Dakota Sandstone, and the Burro Canyon Formation, all of Cretaceous age. The mill tailings were deposited on alluvium of Montezuma Creek and on Mancos Shale. The alluvium and Burro Canyon Formation are aquifers. Concentrations of uranium, vanadium, molybdenum, and selenium are elevated in the alluvial aquifer downgradient from the site. The alluvial aquifer is not used for domestic drinking-water supply, but two concerns arise over the observed concentrations of these elements. One is the possibility of this water migrating into the Burro Canyon aquifer, which is used by the City of Monticello for alternate water supply. The Mancos Shale, which locally underlies the alluvium, is impermeable and the Dakota Sandstone underlying the Mancos has been shown by on-site pumping tests to have very low vertical hydraulic conductivity. If there is uniform conductivity throughout the site, the estimated time for water to migrate through 87 feet of Dakota at well 34A on the Vanadium Pile is 745 years. Thus, the potential for contamination of the Burro Canyon aquifer appears to be low. Other concerns arise from the fact that the alluvial aquifer discharges to Montezuma Creek and can therefore affect surface-water quality downstream. Surface water in the creek is used for irrigation.

The drainage area of Montezuma Creek is approximately 26 square miles and is composed of two major sub-basins, North Creek and South Creek. Monticello Reservoir, which was recently constructed along South Creek, has a significant impact on the flood hydrology of Montezuma Creek. It is estimated that the probable maximum flood at the site, which would include a dam failure at Monticello Reservoir, would have a peak discharge of approximately 140,000 cubic feet per second. If left unprotected, the tailings piles would be subject to severe erosion from such a flood event.

Air monitoring for radon emissions and air particulates has been conducted for a number of years at the millsite. Standards listed at 40 CFR 192 for radon emissions on the piles and atmospheric radon concentrations at the edge of piles are exceeded. Radiologic air particulates are below the standards established in DOE Order 5480.1. Nonradiologic air particulate concentrations are consistent with background concentrations.

Natural background radiation is the major contributor to the overall radiation risk at Monticello. However, a smaller, but still significant addition results from the millsite in its present condition.

Several tailings-related elements are found in Montezuma Creek at concentrations that exceed State or Federal regulations. The potential for exposure to these concentrations suggests the need for remedial action to improve water quality. While the surface water should not be (and currently is not) used for drinking water, it appears to be acceptable for use in irrigating alfalfa for cattle.

1.0 INTRODUCTION

1.1 PROGRAM OVERVIEW

The U. S. Department of Energy (DOE), under the authority of the Atomic Energy Act, initiated the Surplus Facilities Management Program (SFMP) in 1978 to assure safe caretaking and decommissioning of government facilities that had been retired from service but which still had radioactive contamination. In 1980, the millsite operated by the Atomic Energy Commission from 1948 to 1960 at Monticello, Utah, was accepted into the SFMP, and the Monticello Remedial Action Project (MRAP) was established to restore the government-owned millsite to safe levels of radioactivity, to dispose of or contain the tailings in an environmentally safe manner, and to perform remedial actions on off-site (vicinity) properties that had been contaminated by radioactive material from the mill operations. In 1983, remedial activities for vicinity properties were separated from MRAP with the establishment of the Monticello Vicinity Properties (MVP) Project. Both MRAP and MVP are currently administered by the Grand Junction Projects Office (GJPO) of the DOE.

From its inception, the SFMP has mandated that decommissioning activities follow the procedural provisions of the National Environmental Policy Act (NEPA). Guidance and requirements for compliance included, but were not limited to, the following:

1. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, issued by the Council on Environmental Quality at 40 CFR 1500 - 1508.

2. Final Guidelines for Compliance with the National Environmental Policy Act, issued by the U. S. Department of Energy at 45 FR 20694 - 20701 on 28 March 1980, and amended at 52 FR 47662 - 47670 on 15 December 1987.

3. The Environmental Compliance Guide, volumes 1 and 2, issued by the U.S. Department of Energy, Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Office of Environmental Compliance and Overview, National Environmental Policy Act Affairs Division, on 21 February 1981.

4. Implementation of the National Environmental Policy Act, U.S. Department of Energy Order 5440.1C, issued 9 April 1985.

In accordance with SFMP policy, MRAP initiated surveillance activities at the millsite in 1980. These activities at first consisted of water quality analysis but were later expanded to include atmospheric radon monitoring and air particulate sampling. Results are described in annual environmental monitoring reports issued at the GJPO (Korte and Thul, 1981, 1982, 1983, 1984; Korte and Wagner, 1985, 1986; Sewell and Spencer, 1987; U.S. Department of Energy, 1988, 1989). These activities continue.

Site characterization activities at the Monticello Millsite commenced in 1981. The resulting *Monticello Remedial Action Project Site Analysis Report* was issued in draft form in 1983 and was finalized in 1984 (Abramiuk and others, issued in draft form in 1983 and was finalized in 1984 (Abramiuk and others, 1984). The Site Analysis Report describes the site's history, geology and hydrology, the extent of surface and subsurface contamination of soil and water, and engineering alternatives for remediation of the site. On the basis of the findings in the draft Site Analysis Report, the GJPO issued an Action Description Memorandum in November 1983 recommending stabilization in place as the preferred remedial action alternative and preparation of an Environmental Assessment. The *Draft Environmental Assessment of Remedial Action at the Monticello Uranium Mill Tailings Site, Monticello, Utah* was completed in July 1985 (Bendix Field Engineering Corporation, 1985); it includes descriptions of remedial action alternatives and supporting information from the Site Analysis Report and on-going studies. While this draft Environmental Assessment was neither published nor used as a NEPA compliance document, it has been used extensively as a source for the present Remedial Investigation.

The Superfund Amendments and Reauthorization Act of 1986 (SARA) placed the SFMP activities at Monticello under the regulatory framework of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and has resulted in a number of new developments. The DOE submitted its Hazard Ranking System Score for the Millsite to the Environmental Protection Agency (EPA) on 31 October 1987. During 1987, existing environmental site characterization and engineering documents were revised into the format of the CERCLA Remedial Investigation/Feasibility Study (RI/FS) and were issued for DOE internal review in January 1988. The DOE, EPA, and the State of Utah entered into a Federal Facility Agreement (FFA) pursuant to CERCLA Section 120 in December 1988. This agreement stipulates the procedural framework for developing and implementing response actions under CERCLA/SARA.

1.2 SITE BACKGROUND INFORMATION

1.2.1 Site Location and Description

The Monticello mill tailings site is a 78-acre tract located in San Juan County, Utah (Figure 1-1). The site lies in Section 36, T. 33 S., R. 23 E., and Section 31, T. 33 S., R. 24 E. (Salt Lake Meridian). It is bordered on the south and southeast by land held by the Bureau of Land Management (BLM). Elsewhere, the site is bordered by the City of Monticello and private property. Land survey (Figure 1-2) indicates encroachments on all boundaries of the site, the largest being on the east and southeast sides. The encroachment onto the property directly east of the millsite has been remedied. The millsite and areas under investigation are shown in relation to the city of Monticello in Figure 1-3.

The Monticello site lies in the valley of Montezuma Creek which has incised a broad erosional surface that slopes eastward from the Abajo Mountains. Elevations of the property range from 6990 feet (ft) at the northwest corner to 6820 ft at the southeast corner. The topography of the millsite and adjacent areas is detailed in Figure 1-4.

A plan of the site is shown in Figure 1-5. The mill area covers approximately 10 acres and the tailings impoundment area covers the remaining 68 acres. During the period of mill operation, the site also included private land to

Figure 1-1. Monticello, Utah, Regional Location Map

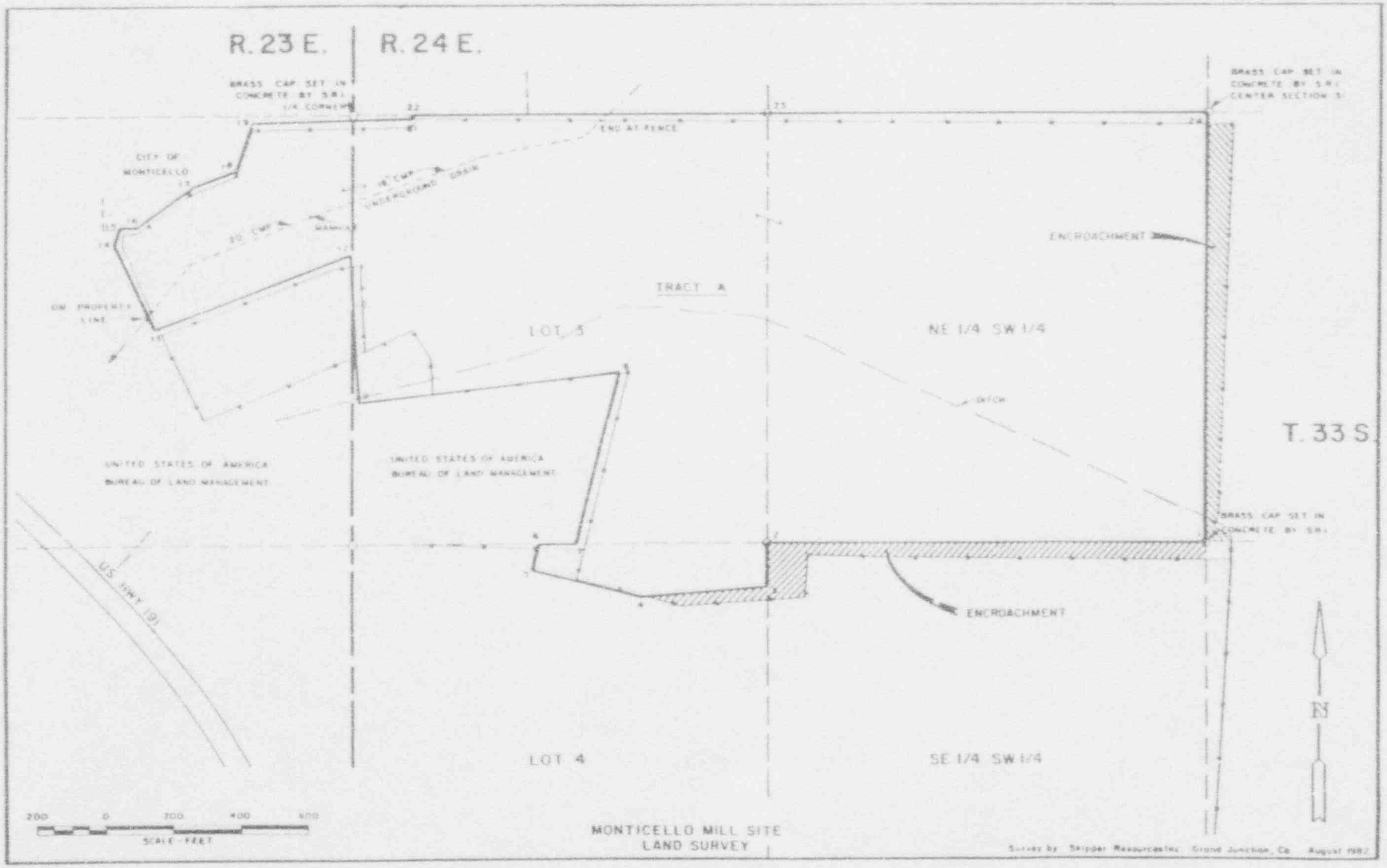


Figure 1-2. Monticello Millsite Land Survey

MRAP - 710002307 - GEOTECHNICAL DATA BASE FOR MONTICELLO MILLSITE CHARACTERIZATION -- R.N. MORRIS; CREATED 09/30/91; LAST UPDATED 11/22/91

AREA	DATA SOURC	BORING OR TEST PIT NUMBER	SAMPLE NUMBER & TYPE	TOP OF SAMPLE (FEET)	BASE OF SAMPLE (FEET)	SAMPLE MIDPOINT (FEET)	USCS SYMBOL	MATERIAL TYPE	IN-PLACE DRY DENSITY (PCF)	NATURAL MOISTURE CONTENT (PERCENT)	SPECIFIC GRAVITY	FRACTION PASSING #4 SIEVE (PERCENT)	FRACTION PASSING #200 SIEVE (PERCENT)	LIQUID LIMIT	PLASTICITY INDEX	ASTM D 698 MAXIMUM DRY DENSITY (PCF)	ASTM D 698 OPTIMUM MOISTURE CONTENT (PERCENT)	OTHER TESTS
CARBONATE PILE	BENDIX	MRAP-85-01	MKB-652/ST	6.0	8.0	7.00	CL-ML[?]	Tails-slm[?]	89.6	4.6	2.57	100.0	97.0	NP	NP	NA	NA	Consol w/perm, CMR @15 bar
CARBONATE PILE	BENDIX	MRAP-85-02	MKB-661/ST	2.0	4.0	3.00	SM	Tails-snd	107.5	4.0	2.60	100.0	49.0	NP	NP	NA	NA	Consol w/perm, CMR @15 bar
CARBONATE PILE	BENDIX	MRAP-85-02*	MKB-787/BULK	1.0	1.0	1.00	ML	Cover	NA	NA	NA	100.0	66.0	NA	NA	114.7	14.5	
CARBONATE PILE	BENDIX	MRAP-85-02*	MKB-788/BULK	3.0	3.0	3.00	SP	Tails-snd	NA	NA	NA	NA	NA	NA	NA	102.9	13.0	
CARBONATE PILE	BENDIX	MRAP-85-02*	MKB-790/BULK	6.0	6.0	6.00	SC[?]	Tails-slm	NA	NA	2.70	NA	NA	NA	NA	94.6	28.3	
CARBONATE PILE	BENDIX	MRAP-85-03	MKB-749/ST	2.0	4.0	3.00	CL-ML	Tails-slm&snd	92.1	27.4	2.67	100.0	84.0	20.0	4.0	NA	NA	Consol w/perm, CMR @15 bar
CARBONATE PILE	D&M	31SW91-045	1/SS	2.0	4.0	3.00	CL	Tails-slm	NA	35.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	2/SS	4.5	6.0	5.25	SP-SM	Tails-snd	NA	3.3	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	3/SS	6.0	8.0	7.00	SP-SM	Tails-snd	NA	5.4	2.65	100.0	11.4	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	5/SS	10.0	12.0	11.00	SP-SM	Tails-snd	NA	4.5	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	6/SS	13.0	14.0	13.50	SM	Tails-snd	NA	5.5	NA	100.0	16.1	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	7/SS	14.0	16.0	15.00	SM	Tails-snd	NA	14.4	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	8/SS	17.4	18.0	17.70	CL/ML/SM	Tails-snd/slm	NA	27.5	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	9/SS	19.5	20.0	19.75	SM	Tails-snd	NA	3.7	2.65	100.0	15.6	NP	NP	NA	NA	
CARBONATE PILE	D&M	31SW91-045	10/SS	20.2	22.0	21.10	SM	Tails-snd	NA	6.3	NA	100.0	23.8	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	13/SS	26.2	28.2	27.20	SM	Tails-snd	NA	5.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	14/SS	28.3	30.0	29.15	SM	Tails-snd	NA	8.5	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	15/SS	31.2	31.8	31.50	ML/SM	Tails-snd/slm	NA	38.0	NA	NA	NA	NP	NP	NA	NA	
CARBONATE PILE	D&M	31SW91-045	16/SS	32.7	34.0	33.35	CL/ML/SM	Tails-snd/slm	NA	21.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	17/SS	35.0	36.0	35.50	CL/ML/SM	Tails-snd/slm	NA	22.9	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	18/SS	36.0	38.0	37.00	SP-SM	Tails-snd	NA	24.2	2.70	100.0	9.7	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	19/SS	40.0	42.0	41.00	SM	Tails-snd&slm	NA	23.2	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	20/SS	43.0	44.0	43.50	SM	Tails-snd&slm	NA	25.2	NA	100.0	14.9	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	21/SS	44.5	45.8	45.15	CL	Alluvium	NA	28.9	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	22/SS	46.4	47.5	46.95	CL	Alluvium	NA	26.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	23/SS	48.0	50.0	49.00	CL	Alluvium	NA	23.9	NA	NA	NA	33.9	18.3	NA	NA	
CARBONATE PILE	D&M	31SW91-045	24/SS	51.0	52.0	51.50	CL	Alluvium	NA	23.0	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	25/SS	52.0	52.3	52.15	CL	Alluvium	NA	28.0	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-045	26/SS	54.5	56.0	55.25	CL	Alluvium	NA	55.6	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-046	2B/SS	3.0	4.2	3.60	SC/CL	Cover[?]	NA	10.9	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-046	3B/SS	4.2	5.0	4.60	SM	Tails-snd	NA	12.4	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-046	4B/SS	8.0	10.0	9.00	CL	Alluvium	NA	20.1	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-050a	2/SS	3.5	5.5	4.50	SM	Tails-snd[Cover?]	NA	29.7	NA	88.2	12.5	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-050a	3/ST	5.5	7.5	6.50	SM	Tails-snd	88.6	25.4	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-050a	5/SS	10.0	10.5	10.25	SP-SM	Tails-snd	NA	21.3	NA	100.0	7.0	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-051	2/ST	5.5	8.0	6.75	SP-SM	Tails-snd	93.5	7.2	NA	100.0	10.2	NA	NA	NA	NA	Triax-CUPP
CARBONATE PILE	D&M	31SW91-051	4/ST	13.0	15.5	14.25	SM	Tails-snd	82.5	6.8	NA	100.0	21.8	NA	NA	NA	NA	Triax-CUPP, Perm
CARBONATE PILE	D&M	31SW91-051	5/ST	18.0	20.5	19.25	SM	Tails-snd	87.1	7.1	NA	100.0	18.3	NA	NA	NA	NA	Triax-CUPP
CARBONATE PILE	D&M	31SW91-051	8/SS	33.0	35.0	34.00	SM	Tails-snd	NA	11.9	2.78	100.0	14.6	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-051	9/SS	38.0	39.5	38.75	SP	Tails-snd	NA	25.6	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-051	11/SS	43.5	44.4	43.95	CL	Alluvium	NA	25.5	NA	NA	NA	39.1	19.1	NA	NA	
CARBONATE PILE	D&M	31SW91-051	12/SS	48.0	49.3	48.65	CL	Alluvium	NA	24.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	1/SS	4.2	6.0	5.10	SM/CL	Tails-snd/slm	NA	7.7	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	2/SS	9.5	10.2	9.85	CL	Tails-slm	NA	31.1	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	5/SS	15.0	16.0	15.50	SM	Tails-snd	NA	6.2	NA	100.0	14.9	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	6/SS	19.0	20.6	19.80	SM	Tails-snd	NA	8.5	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	8/SS	29.2	31.0	30.10	CL	Alluvium	NA	37.8	2.58	NA	NA	49.0	23.9	NA	NA	
CARBONATE PILE	D&M	31SW91-052	9/SS	34.0	36.0	35.00	CL	Alluvium	NA	9.2	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	10/SS	39.0	41.0	40.00	CL	Alluvium	NA	22.2	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-052	12/SS	49.0	51.0	50.00	CL	Alluvium	NA	26.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-056	1/SS	4.5	5.5	5.00	SM	Tails-snd	NA	12.4	2.69	100.0	35.7	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-056	5/SS	19.0	19.4	19.20	CL	Alluvium	NA	15.5	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-056	6/SS	24.0	26.0	25.00	CL	Alluvium	NA	19.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-056	7/SS	29.0	31.0	30.00	CL	Alluvium	NA	19.4	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	31SW91-056	8/SS	34.5	34.6	34.55	Km	Shale	NA	3.8	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	TP-6	1/ST	3.5	4.0	3.75	SM	Tails-snd	86.1	4.7	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	TP-6	-/BULK	4.5	4.5	4.50	SM	Tails-snd	NA	6.1	NA	NA	NA	NP	NP	101.9	17.2	Consol, Perm
CARBONATE PILE	D&M	TP-6	2/ST	6.0	6.5	6.25	ML	Tails-slm[?]	68.3	20.2	NA	NA	NA	21.5	0.2	NA	NA	
CARBONATE PILE	D&M	TP-6	3/ST	9.0	9.5	9.25	ML	Tails-slm[?]	71.0	35.4	NA	NA	NA	NA	NA	NA	NA	

MRAP - 710002307 - GEOTECHNICAL DATA BASE FOR MONTICELLO MILLSITE CHARACTERIZATION -- R.N. MORRIS, CREATED 09/30/91; LAST UPDATED 11/22/91

AREA	DATA SOURC	BORING OR TEST PIT NUMBER	SAMPLE NUMBER & TYPE	TOP OF SAMPLE (FEET)	BASE OF SAMPLE (FEET)	SAMPLE MIDPOINT (FEET)	USCS SYMBOL	MATERIAL TYPE	IN-PLACE DRY DENSITY (PCF)	NATURAL MOISTURE CONTENT (PERCENT)	SPECIFIC GRAVITY	FRACTION PASSING #4 SIEVE (PERCENT)	FRACTION PASSING #200 SIEVE (PERCENT)	LIQUID LIMIT	PLASTICITY INDEX	ASTM D 698 MAXIMUM DRY DENSITY (PCF)	ASTM D 698 OPTIMUM MOISTURE CONTENT (PERCENT)	OTHER TESTS
CARBONATE PILE	D&M	TP-6	4/ST	10.5	11.0	10.75	CL	Tails-slm	70.6	48.3	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	TP-6	6/ST	17.0	17.5	17.25	SM	Tails-snd	73.3	19.6	NA	NA	NA	NA	NA	NA	NA	
CARBONATE PILE	D&M	TP-6	-/BULK	18.0	18.0	18.00	SM	Tails-snd[?]	NA	15.5	NA	100.0	46.4	NA	NA	95.1	18.9	
CARBONATE PILE	D&M	TP-11	-/BULK	6.0	6.0	6.00	SM	Tails-snd[?]	NA	15.7	2.76	100.0	47.6	NA	NA	103.7	16.5	Dir Shear, Perm, Mod Proct
CARBONATE PILE	D&M	TP-11	-/BULK	15.0	15.0	15.00	CL	Tails-slm	NA	53.1	NA	100.0	91.3	NA	NA	96.8	24.0	
VANADIUM PILE	BENDIX	MRAP-85-04	MKB-682/ST	4.0	6.0	5.00	SC	Tails-snd&slm	80.7	39.8	2.62	100.0	44.0	27.0	10.0	NA	NA	Consol w/perm, CMR @15 bar
VANADIUM PILE	BENDIX	MRAP-85-04*	MKB-783/BULK	1.0	1.0	1.00	ML	Cover	NA	NA	NA	NA	71.0	NA	NA	114.3	13.7	
VANADIUM PILE	BENDIX	MRAP-85-04*	MKB-784/BULK	2.0	2.0	2.00	SP	Tails-snd	NA	NA	2.67	NA	NA	NA	NA	107.6	13.2	
VANADIUM PILE	BENDIX	MRAP-85-04*	MKB-786/BULK	7.0	7.0	7.00	ML	Tails-slm	NA	NA	2.60	NA	NA	NA	NA	113.8	15.3	
VANADIUM PILE	BENDIX	MRAP-85-05	MKB-678/ST	8.0	8.0	8.00	CL-ML	Tails-slm	76.1	41.7	2.63	100.0	94.0	21.0	5.0	NA	NA	Consol w/perm, CMR @15 bar
VANADIUM PILE	D&M	31SW91-031	3/ST	5.5	7.5	6.50	SM	Tails-snd	NA	9.4	2.69	100.0	21.4	39.1	17.1	NA	NA	
VANADIUM PILE	D&M	31SW91-032	1/SS	2.0	3.5	2.75	SM/SC	Cover	NA	16.8	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	2/SS	3.5	5.0	4.25	SM/CL	Tails-snd/slm	NA	18.9	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	3/SS	5.0	6.5	5.75	SM	Tails-snd[?]	NA	15.0	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	5/SS	8.5	10.0	9.25	ML	Tails-slm	NA	34.1	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	6/SS	10.0	11.5	10.75	SM	Tails-snd&slm	NA	11.5	2.69	100.0	21.8	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	7/SS	11.5	13.0	12.25	ML	Tails-slm	NA	25.0	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	9/SS	15.0	16.5	15.75	SM/CL	Tails-snd/slm	NA	28.0	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	10/SS	16.5	18.0	17.25	SM/CL	Tails-snd/slm	NA	16.3	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	11/SS	19.0	19.5	19.25	CL	Alluvium	NA	20.9	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	12/SS	19.5	21.5	20.50	CL	Alluvium	NA	18.7	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	13/SS	21.5	23.5	22.50	CL	Alluvium	NA	20.1	NA	NA	NA	44.3	24.0	NA	NA	
VANADIUM PILE	D&M	31SW91-032	14/SS	24.0	25.0	24.50	CL	Alluvium	NA	18.0	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	15/SS	25.5	27.5	26.50	CL	Alluvium	NA	23.9	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	16/SS	27.5	29.5	28.50	CL	Alluvium	NA	17.6	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	17/SS	29.5	31.5	30.50	CL	Alluvium	NA	17.9	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	18/SS	31.5	33.5	32.50	CL	Alluvium	NA	19.5	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	19/SS	33.5	34.8	34.15	CL	Alluvium	NA	17.6	NA	NA	NA	37.9	19.1	NA	NA	
VANADIUM PILE	D&M	31SW91-032	20/SS	35.5	37.5	36.50	CL	Alluvium	NA	23.7	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	21/SS	37.5	39.5	38.50	CL	Alluvium	NA	22.2	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	22/SS	39.5	41.0	40.25	CL	Alluvium	NA	23.1	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	23/SS	41.5	42.8	42.15	SC/CL	Alluvium	NA	23.2	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	24/SS	43.5	44.9	44.20	GC	Alluvium	NA	16.9	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-032	28/SS	48.5	48.9	48.70	Km	Shale	NA	16.6	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-40b	1/ST	6.0	7.5	6.75	CL	Tails-slm	95.1	25.3	NA	NA	NA	45.7	24.9	NA	NA	Perm, CMR
VANADIUM PILE	D&M	31SW91-40b	8/SS	13.5	14.8	14.15	CL	Tails-slm	NA	20.3	2.80	NA	NA	46.7	22.5	NA	NA	
VANADIUM PILE	D&M	31SW91-40b	9/SS	18.5	20.5	19.50	CL	Tails-slm	NA	19.4	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-40b	11/SS	23.5	25.3	24.40	CL	Tails-slm	NA	23.4	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	1/SS	5.0	6.0	5.50	CL	Tails[?]-slm[?]	NA	23.8	NA	NA	NA	31.7	14.0	NA	NA	
VANADIUM PILE	D&M	31SW91-041	2/SS	10.0	11.0	10.50	CL	Alluvium	NA	21.3	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	3/SS	14.0	16.0	15.00	CL	Alluvium	NA	18.8	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	6/SS	24.0	26.0	25.00	CL	Alluvium	NA	14.9	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	7/SS	29.0	31.0	30.00	CL	Alluvium	NA	19.3	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	8/SS	34.5	36.0	35.25	CL	Alluvium	NA	27.7	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	9/SS	39.0	40.0	39.50	SC	Alluvium	NA	13.2	NA	100.0	40.1	NA	NA	NA	NA	
VANADIUM PILE	D&M	31SW91-041	10/SS	44.0	44.5	44.25	Kd	Sandstone	NA	9.3	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	TP-5	1/ST	4.5	5.0	4.75	SM	Tails-snd	90.1	7.4	NA	NA	NA	NP	NP	NA	NA	
VANADIUM PILE	D&M	TP-5	2/ST	5.5	6.0	5.75	CL	Tails-slm	76.7	51.8	NA	NA	NA	NA	NA	NA	NA	Unconf Comp
VANADIUM PILE	D&M	TP-5	4/ST	9.0	9.5	9.25	CL	Tails-slm	71.0	45.7	NA	NA	NA	NA	NA	NA	NA	Unconf Comp
VANADIUM PILE	D&M	TP-5	5/ST	11.0	11.5	11.25	CL	Tails-slm	84.8	16.5	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	TP-5	7/ST	14.0	14.5	14.25	CL	Tails[?]-slm[?]	69.8	51.8	NA	NA	NA	NA	NA	NA	NA	
VANADIUM PILE	D&M	TP-12	-/BULK	6.0	6.0	6.00	CL	Tails-slm	NA	24.3	2.75	NA	NA	29.2	12.3	115.0	14.0	Perm, Mod Proct
VANADIUM PILE	D&M	TP-12	-/BULK	12.0	12.0	12.00	CL	Tails-slm	NA	53.9	2.84	NA	NA	44.7	20.5	100.7	21.2	Triax-CUPP, Perm, Mod Proct, CMR
EAST PILE	BENDIX	MRAP-85-06	MKB-689/ST	2.0	4.0	3.00	SM	Tails-snd	96.4	5.2	2.67	100.0	42.0	NP	NP	NA	NA	Consol w/perm, CMR @15 bar
EAST PILE	BENDIX	MRAP-85-06*	MKB-779/BULK	1.0	1.0	1.00	ML	Cover	NA	NA	NA	100.0	52.0	NA	NA	111.2	14.1	
EAST PILE	BENDIX	MRAP-85-06*	MKB-780/BULK	3.0	3.0	3.00	SM[?]	Tails-snd	NA	NA	NA	NA	NA	NA	NA	107.1	15.3	
EAST PILE	BENDIX	MRAP-85-06*	MKB-782/BULK	15.0	15.0	15.00	SP[?]	Tails-snd[?]	NA	NA	2.70	NA	NA	NA	NA	103.6	15.5	
EAST PILE	BENDIX	MRAP-85-07	MKB-697/ST	2.0	4.0	3.00	SM	Tails-snd	94.0	9.5	2.61	100.0	19.0	NP	NP	NA	NA	Consol w/perm, CMR @15 bar
EAST PILE	BENDIX	MRAP-85-08	MKB-714/ST	12.0	14.0	13.00	CL	Tails-slm	108.6	34.4	2.70	100.0	81.0	41.0	22.0	NA	NA	Consol w/perm, CMR @15 bar
EAST PILE	BENDIX	MRAP-85-09	MKB-70A/ST	4.0	6.0	5.00	ML	Tails-slm	100.7	21.4	2.63	100.0	88.0	42.0	13.0	NA	NA	Consol w/perm, CMR @15 bar
EAST PILE	D&M	31SW91-002	1/SS	3.5	5.5	4.50	SP	Tails-snd	NA	12.8	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-002	2/SS	8.5	10.5	9.50	SM/ML	Tails-snd/slm	NA	15.8	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-002	3/SS	13.5	15.5	14.50	SM/ML	Tails-snd/slm	NA	15.3	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-002	NA	24.0	25.0	24.50	CL	Alluvium	NA	16.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-002	10/SS	28.0	30.0	29.00	CL	Alluvium	NA	16.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	3/SS	7.0	8.3	7.65	ML	MVP spoil	NA	7.2	NA	NA	NA	NA	NA	NA	NA	

MRAP - 710002307 - GEOTECHNICAL DATA BASE FOR MONTICELLO MILLSITE CHARACTERIZATION -- R.N. MORRIS: CREATED 09/30/91; LAST UPDATED 11/22/91

AREA	DATA SOURC	BORING OR TEST PIT NUMBER	SAMPLE NUMBER & TYPE	TOP OF SAMPLE (FEET)	BASE OF SAMPLE (FEET)	SAMPLE MIDPOINT (FEET)	USCS SYMBOL	MATERIAL TYPE	IN-PLACE DRY DENSITY (PCF)	NATURAL MOISTURE CONTENT (PERCENT)	SPECIFIC GRAVITY	FRACTION PASSING #4 SIEVE (PERCENT)	FRACTION PASSING #200 SIEVE (PERCENT)	LIQUID LIMIT	PLASTICITY INDEX	ASTM D 698 MAXIMUM DRY DENSITY (PCF)	ASTM D 698 OPTIMUM MOISTURE CONTENT (PERCENT)	OTHER TESTS
EAST PILE	D&M	31SW91-003	9/SS	20.5	22.0	21.25	CL	Tails-slm	NA	58.2	NA	NA	NA	48.4	22.3	NA	NA	
EAST PILE	D&M	31SW91-003	11/SS	24.5	26.0	25.25	CL/SM	Tails-snd/slm	NA	34.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	12/SS	26.5	28.0	27.25	CL/SM/ML	Tails-snd/slm	NA	50.1	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	13/SS	28.5	30.0	29.25	ML	Tails-snd&slm	NA	28.7	NA	100.0	73.3	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	19/SS	40.0	40.5	40.25	ML	Alluvium	NA	24.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	20/SS	42.0	42.7	42.35	ML	Alluvium	NA	23.6	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	21/SS	46.0	47.5	46.75	ML	Alluvium	NA	25.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-003	22/SS	48.0	49.7	48.85	ML	Alluvium	NA	24.0	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	1/SS	3.5	5.0	4.25	CL	MVP spoil	NA	18.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	2/SS	9.5	10.0	9.75	SM	Tails-snd	NA	26.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	3/U	14.5	15.0	14.75	CL	Tails-slm	82.1	33.1	NA	NA	NA	35.5	12.7	NA	NA	
EAST PILE	D&M	31SW91-004	4/U	19.5	20.0	19.75	CL	Alluvium	95.9	23.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	5/SS	23.5	25.0	24.25	CL	Alluvium	NA	19.6	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	6/SS	27.0	28.4	27.70	CL	Alluvium	NA	19.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	7/SS	28.5	30.0	29.25	CL	Alluvium	NA	18.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	8/SS	33.5	35.0	34.25	CL	Alluvium	NA	22.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-004	9/U	39.5	40.0	39.75	CL	Alluvium	100.2	22.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-008	1/U	4.5	5.0	4.75	SM	Tails-snd	99.2	7.0	NA	100.0	21.0	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-008	4/U	15.0	15.5	15.25	CL	Tails-slm	54.1	82.8	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-008	6/U	19.5	20.0	19.75	ML	Tails-slm	84.3	30.1	NA	NA	NA	23.2	2.8	NA	NA	Triax-CUPP
EAST PILE	D&M	31SW91-008	7/U	23.5	25.0	24.25	CH	Alluvium	67.3	57.4	NA	NA	NA	51.4	23.5	NA	NA	
EAST PILE	D&M	31SW91-008	9/U	28.5	30.0	29.25	CL	Alluvium	81.1	34.2	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-009	4/ST	16.0	17.5	16.75	CL	Tails-snd&slm	95.1	26.0	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-009	7/ST	20.0	22.0	21.00	CL	Tails-slm	60.0	68.3	NA	NA	NA	NA	NA	NA	NA	Unconf Comp, Consol, Perm, CMR
EAST PILE	D&M	31SW91-010a	1/SS	9.0	10.5	9.75	CL	Alluvium	NA	10.8	NA	NA	NA	39.9	18.5	NA	NA	
EAST PILE	D&M	31SW91-010a	3/SS	19.0	20.5	19.75	CL	Alluvium	NA	15.2	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-010a	4/SS	24.0	25.5	24.75	CL	Alluvium	NA	14.6	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-010a	5/SS	29.0	30.5	29.75	CL	Alluvium	NA	15.1	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-010b	3/SS	34.0	35.5	34.75	CL	Alluvium	NA	17.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-010b	4/SS	39.0	40.5	39.75	CL	Alluvium	NA	17.8	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-010b	5/SS	44.0	45.5	44.75	CL/SC	Alluvium	NA	21.1	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-010b	6/SS	49.0	49.5	49.25	SC	Alluvium	NA	12.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-013	3/ST	10.5	12.5	11.50	CL	Tails-slm	59.8	67.2	NA	NA	NA	NA	NA	NA	NA	Unconf Comp
EAST PILE	D&M	31SW91-013	8/ST	25.5	27.5	26.50	CL-ML	Tails-snd/slm	69.7	50.6	NA	NA	NA	NA	NA	NA	NA	Triax-CUPP, Consol
EAST PILE	D&M	31SW91-013	9/SS	28.5	30.5	29.50	CL/SM	Tails-snd/slm	NA	28.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-014	1/U	4.5	5.0	4.75	CL	MVP spoil	108.5	8.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-014	2/U	9.5	10.0	9.75	SM	Tails-snd	96.7	7.8	NA	100.0	22.0	NA	NA	NA	NA	Dir Shear
EAST PILE	D&M	31SW91-014	3/U	14.5	15.0	14.75	CL	Alluvium(?)	90.4	25.1	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-014	7/U	19.5	20.0	19.75	CL	Alluvium(?)	55.0	79.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-014	9/U	24.0	24.5	24.25	CL	Alluvium(?)	62.6	62.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-014	16/SS	48.0	49.3	48.65	Km	Shale	NA	13.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-018b	1/U	2.5	3.8	3.15	SM	Tails-snd	88.3	7.8	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-018b	2/U	7.5	8.8	8.15	SM	Alluvium	85.5	28.4	2.81	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-018b	3/U	12.5	13.7	13.10	CL/SC	Alluvium	NA	18.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	1/SS	5.5	6.5	6.00	ML	Tails-snd&slm(?)	NA	10.3	NA	100.0	55.4	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	3/SS	8.0	9.5	8.75	SM	Tails-snd	NA	12.4	NA	99.2	48.1	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	5/SS	11.0	12.5	11.75	SM	Tails-snd	NA	8.2	NA	99.5	30.8	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	6/SS	12.5	14.0	13.25	SM	Tails-snd	NA	9.0	NA	100.0	33.2	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	7/SS	14.0	15.5	14.75	SM	Tails-snd	NA	17.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	8/SS	15.5	17.0	16.25	SM	Tails-snd	NA	17.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	9/SS	17.0	18.5	17.75	CL	Tails-slm	NA	43.7	NA	NA	NA	35.0	13.9	NA	NA	
EAST PILE	D&M	31SW91-019	10/SS	18.5	20.0	19.25	CL	Tails-slm	NA	34.4	NA	NA	NA	44.7	18.3	NA	NA	
EAST PILE	D&M	31SW91-019	11/SS	20.0	21.5	20.75	CL	Alluvium(?)	NA	25.5	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-019	12/SS	21.5	23.0	22.25	CL	Alluvium(?)	NA	24.7	NA	NA	NA	39.0	19.0	NA	NA	
EAST PILE	D&M	31SW91-019	15/SS	33.0	33.5	33.25	SC	Alluvium	NA	5.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-020	1/SS	4.0	5.5	4.75	CL	Alluvium	NA	10.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-020	2/SS	9.0	10.5	9.75	CL	Alluvium	NA	13.2	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-020	3/SS	14.0	15.5	14.75	CL	Alluvium	NA	16.6	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-020	4/SS	19.0	20.5	19.75	CL	Alluvium	NA	13.8	NA	NA	NA	45.0	23.8	NA	NA	
EAST PILE	D&M	31SW91-020	5/SS	24.0	25.5	24.75	CL	Alluvium	NA	18.0	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-020	6/SS	29.0	30.5	29.75	SC	Alluvium	NA	21.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-020	7/SS	34.0	35.0	34.50	GC	Alluvium	NA	16.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-025	3/U	13.0	13.7	13.35	CL	Alluvium	101.8	22.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-025	4/U	18.0	19.5	18.75	CL	Alluvium	98.5	25.3	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-025	5/SS	23.5	24.8	24.15	SC(?)	Alluvium	97.9	23.2	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	31SW91-025	6/U	29.3	29.8	29.55	Km	Shale	113.4	18.1	NA	NA	NA	NA	NA	NA	NA	

MRAP - 710002307 - GEOTECHNICAL DATA BASE FOR MONTICELLO MILLSITE CHARACTERIZATION -- R.N. MORRIS. CREATED 09/30/91. LAST UPDATED 11/22/91

AREA	DATA SOURC	BORING OR TEST PIT NUMBER	SAMPLE NUMBER & TYPE	TOP OF SAMPLE (FEET)	BASE OF SAMPLE (FEET)	SAMPLE MIDPOINT (FEET)	USCS SYMBOL	MATERIAL TYPE	IN-PLACE DRY DENSITY (PCF)	NATURAL MOISTURE CONTENT (PERCENT)	SPECIFIC GRAVITY	FRACTION PASSING #4 SIEVE (PERCENT)	FRACTION PASSING #200 SIEVE (PERCENT)	LIQUID LIMIT	PLASTICITY INDEX	ASTM D 698 MAXIMUM DRY DENSITY (PCF)	ASTM D 698 OPTIMUM MOISTURE CONTENT (PERCENT)	OTHER TESTS
EAST PILE	D&M	TP-1	1/ST	6.5	7.0	6.75	CL	MVP spoil	103.3	11.1	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-1	-/BULK	7.0	7.0	7.00	CL	MVP spoil	NA	18.2	NA	NA	NA	NA	NA	[illegible]03.1	18.1	Perm, Mod Proct
EAST PILE	D&M	TP-1	2/ST	9.0	9.5	9.25	CL	MVP spoil	86.8	20.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-1	3/ST	14.0	14.5	14.25	SM	Tails-snd	101.9	7.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-1	-/BULK	15.0	15.0	15.00	SM	Tails-snd	NA	10.8	NA	99.0	31.0	NA	NA	109.4	14.3	
EAST PILE	D&M	TP-2	1/ST	9.0	9.5	9.25	SM	Tails-slm	91.6	27.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-2	-/BULK	10.0	10.0	10.00	ML	Tails-slm	NA	33.0	NA	NA	NA	NA	NA	103.0	20.0	Consol, CMR
EAST PILE	D&M	TP-2	2/ST	10.5	11.0	10.75	SM	Tails-snd	87.3	1.7	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-2	3/ST	13.5	14.0	13.75	ML	Tails-snd&slm(?)	65.6	53.6	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-2	-/BULK	14.0	14.0	14.00	ML	Tails-snd&slm(?)	NA	7.8	NA	100.0	54.4	NA	NA	103.5	17.1	CMR
EAST PILE	D&M	TP-2	4/ST	14.5	15.0	14.75	ML	Tails-snd&slm(?)	74.0	25.4	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-4	-/BULK	9.0	9.0	9.00	ML	Tails-snd&slm	NA	32.4	NA	100.0	91.0	NA	NA	98.8	21.5	Dir Shear, Perm, CMR
EAST PILE	D&M	TP-4	3/ST	9.5	10.0	9.75	ML	Tails-snd&slm	89.6	7.9	NA	NA	NA	NA	NA	NA	NA	
EAST PILE	D&M	TP-4	-/BULK	14.0	14.0	14.00	ML	Tails-snd&slm	NA	14.7	2.71	100.0	56.6	NA	NA	101.8	17.3	Perm, CMR
EAST PILE	D&M	TP-4	5/ST	14.5	15.0	14.75	ML	Tails-snd&slm	61.8	57.1	NA	100.0	98.1	NA	NA	NA	NA	
ACID PILE	BENDIX	MRAP-85-10	MKB-723/ST	4.0	6.0	5.00	CL	Tails-slm	66.1	43.5	2.63	100.0	78.0	29.0	11.0	NA	NA	
ACID PILE	BENDIX	MRAP-85-10*	MKB-791/BULK	1.0	1.0	1.00	SM	Cover	NA	NA	NA	100.0	49.0	NA	NA	111.8	16.9	
ACID PILE	BENDIX	MRAP-85-10*	MKB 792/BULK	3.0	3.0	3.00	SP	Tails-snd	NA	NA	NA	NA	NA	NA	NA	110.4	12.4	
ACID PILE	BENDIX	MRAP-85-10*	MKB-793/BULK	8.0	8.0	8.00	CL	Tails-slm	NA	NA	2.76	NA	NA	NA	NA	94.5	26.3	
ACID PILE	BENDIX	MRAP-85-11	MKB-741/ST	4.0	6.0	5.00	CL	Tails-slm	74.8	39.8	2.69	100.0	72.0	44.0	20.0	NA	NA	Cons[illegible] w/perm, CMR @15 bar
ACID PILE	BENDIX	MRAP-85-12	MKB-732/ST	4.0	6.0	5.00	ML	Tails-slm	76.4	40.5	2.68	100.0	87.0	47.0	10.0	NA	NA	Consol w/perm, CMR @15 bar
ACID PILE	D&M	31SW91-026	1/SS	4.5	5.0	4.75	CL	Tails-snd&slm	NA	30.0	NA	NA	NA	33.8	13.1	NA	NA	
ACID PILE	D&M	31SW91-026	2/SS	8.5	9.0	8.75	CL	Alluvium	NA	12.8	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-026	5/SS	13.5	14.5	14.00	CL	Alluvium	NA	17.1	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-027	3/ST	6.0	8.0	7.00	CH	Alluvium	71.5	48.0	NA	NA	NA	58.9	28.7	NA	NA	Triax-CUPP, Unconf Comp, Perm, CMR
ACID PILE	D&M	31SW91-027	4/ST	9.0	11.5	10.25	CH	Alluvium	56.0	75.2	NA	NA	NA	68.5	31.4	NA	NA	Triax-CUPP, Unconf Comp, Consol
ACID PILE	D&M	31SW91-027	6/ST	19.0	20.5	19.75	CL/SC	Alluvium	109.3	18.3	NA	NA	NA	37.4	21.0	NA	NA	Triax-CUPP, Unconf Comp, Perm, CMR
ACID PILE	D&M	31SW91-028	2/SS	4.0	6.0	5.00	SM	Tails-snd(?)	NA	17.2	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	3/SS	6.0	6.9	6.45	SM	Tails-snd	NA	17.2	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	4/SS	9.0	10.0	9.50	CL-ML	Tails-slm	NA	37.6	2.70	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	5/SS	10.5	12.0	11.25	ML	Tails-slm	NA	38.5	NA	NA	NA	34.8	9.6	NA	NA	
ACID PILE	D&M	31SW91-028	6/SS	13.5	15.0	14.25	ML	Tails-snd&slm	NA	27.9	NA	100.0	51.7	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	7/SS	15.0	17.0	16.00	SM	Tails-snd&slm	NA	18.5	NA	100.0	34.7	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	8/SS	18.0	19.0	18.50	ML	Tails-slm	NA	43.3	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	9/SS	19.0	21.0	20.00	ML	Tails-slm	NA	39.0	NA	100.0	65.9	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	10/SS	22.5	23.0	22.75	SM	Tails-snd	NA	60.0	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	11/SS	24.0	25.0	24.50	ML/CL	Tails-snd&slm	NA	53.1	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	12/SS	25.0	27.0	26.00	ML/CL	Tails-snd&slm	NA	56.3	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	13/SS	27.0	29.0	28.00	CL	Tails-snd&slm	NA	56.9	NA	100.0	92.0	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	14/SS	29.0	30.5	29.75	ML/CL	Tails-snd&slm	NA	51.4	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	15/SS	31.0	33.0	32.00	CL	Tails-snd&slm	NA	64.7	NA	NA	NA	46.8	21.2	NA	NA	
ACID PILE	D&M	31SW91-028	16/SS	33.5	34.0	33.75	ML	Tails-snd&slm	NA	41.3	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	17/SS	36.0	37.0	36.50	ML/SC	Alluvium(?)	NA	19.1	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	18/SS	37.5	39.0	38.25	SC/CL	Alluvium	NA	20.9	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-028	19/SS	39.0	41.0	40.00	CL	Alluvium	NA	24.5	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-034	1/SS	5.0	6.0	5.50	ML/CL	Tails-slm	NA	57.3	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-034	3/SS	14.0	16.0	15.00	CL-ML	Tails-slm	NA	87.3	2.86	NA	NA	47.4	17.8	NA	NA	
ACID PILE	D&M	31SW91-034	7/SS	29.0	29.5	29.25	Km	Shale	NA	10.1	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-035	3/SS	5.0	5.5	5.25	SM	Tails-snd	NA	4.6	NA	100.0	20.7	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-035	4/SS	10.0	10.5	10.25	SM	Tails-snd	NA	5.1	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-035	8/SS	15.0	15.5	15.25	SM	Tails-snd	NA	15.3	NA	100.0	28.0	NA	NA	NA	NA	
ACID PILE	D&M	31SW91-035	9/ST	18.0	20.0	19.00	SM	Tails-snd	100.6	13.4	NA	100.0	17.2	NA	NA	NA	NA	Dir Shear, Perm, CMR
ACID PILE	D&M	31SW91-035	12/SS	24.5	25.0	24.75	CL/ML	Tails-slm	NA	59.4	NA	NA	NA	46.0	18.3	NA	NA	
ACID PILE	D&M	TP-7	-/BULK	2.0	2.0	2.00	SM	Tails-snd	NA	9.4	2.71	100.0	42.3	NP	NP	109.0	14.5	Triax-CUPP, Consol, Perm, Mod Proct, CMR
ACID PILE	D&M	TP-7	2/ST	5.0	5.5	5.25	CL	Tails-slm	62.5	62.6	NA	NA	NA	NA	NA	NA	NA	Unconf Shear
ACID PILE	D&M	TP-7	3/ST	6.5	7.0	6.75	CL	Tails-slm	66.1	54.4	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	TP-7	4/ST	9.5	10.0	9.75	CL	Tails-slm	51.3	65.0	NA	NA	NA	NA	NA	NA	NA	Unconf Shear
ACID PILE	D&M	TP-7	5/ST	12.5	13.0	12.75	CL	Tails-slm	53.1	74.1	NA	NA	NA	[illegible]	NA	NA	NA	
ACID PILE	D&M	TP-7	6/ST	16.5	17.0	16.75	CL	Tails-slm	51.4	85.1	NA	NA	NA	NA	NA	NA	NA	Unconf Shear
ACID PILE	D&M	TP-8	1/ST	2.5	3.0	2.75	SM/ML	Tails-snd/slm	76.5	11.8	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	TP-3	2/ST	4.5	5.0	4.75	SM	Tails-snd	90.0	9.5	2.82	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	TP-8	-/BULK	4.5	4.5	4.50	SM	Tails-snd	NA	7.6	NA	100.0	28.9	NA	NA	103.8	15.9	Dir Shear, Perm, Mod Proct, CMR
ACID PILE	D&M	TP-8	3/ST	6.0	6.5	6.25	SM	Tails-snd(?)	82.5	14.3	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	TP-8	4/ST	10.0	10.5	10.25	ML	Tails-slm	63.7	30.8	2.76	100.0	63.5	NA	NA	NA	NA	
ACID PILE	D&M	TP-8	5/ST	12.0	12.5	12.25	CL	Tails-slm	59.2	75.9	NA	NA	NA	NA	NA	NA	NA	Perm
ACID PILE	D&M	TP-8	-/BULK	13.0	13.0	13.00	CL	Tails-slm	NA	NA	NA	NA	NA	NA	NA	NA	NA	

MRAP - 710002307 - GEOTECHNICAL DATA BASE FOR MONTICELLO MILLSITE CHARACTERIZATION -- R.N. MORRIS, CREATED 09/30/91, LAST UPDATED 11/22/91

AREA	DATA SOURC	BORING OR TEST PIT NUMBER	SAMPLE NUMBER & TYPE	TOP OF SAMPLE (FEET)	BASE OF SAMPLE (FEET)	SAMPLE MIDPOINT (FEET)	USCS SYMBOL	MATERIAL TYPE	IN-PLACE DRY DENSITY (PCF)	NATURAL MOISTURE CONTENT (PERCENT)	SPECIFIC GRAVITY	FRACTION PASSING #4 SIEVE (PERCENT)	FRACTION PASSING #200 SIEVE (PERCENT)	LIQUID LIMIT	PLASTICITY INDEX	ASTM D 698 MAXIMUM DRY DENSITY (PCF)	ASTM D 698 OPTIMUM MOISTURE CONTENT (PERCENT)	OTHER TESTS
ACID PILE	D&M	TP-9	1/ST	1.5	2.0	1.75	SM	Tails-snd	89.6	4.5	NA	NA	NA	NA	NA	NA	NA	
ACID PILE	D&M	TP-9	2/ST	3.0	3.5	3.25	SM	Tails-snd	86.0	6.6	NA	100.0	16.8	NA	NA	NA	NA	
ACID PILE	D&M	TP-9	-/BULK	10.0	10.0	10.00	ML	Alluvium	NA	23.4	NA	93.8	69.0	34.2	18.1	114.0	14.9	Perm, Mod Proct, CMR
SOMERVILLE TRACT	BENDIX	MRAP-85-17	MKB-766/SS	0.0	2.0	1.00	SC	Alluvium	NA	48.2	2.83	100.0	31.0	33.0	10.0	NA	NA	Perm, CMR @15 bar
SOMERVILLE TRACT	BENDIX	MRAP-85-17	MKB-830/BULK	0.0	5.0	2.50	ML	Alluvium(Shale?)	NA	NA	NA	87.0	81.0	NA	NA	108.3	17.0	
SOMERVILLE TRACT	BENDIX	MRAP-85-18	MKB-768/SS	0.0	2.0	1.00	CL	Alluvium	NA	14.3	2.55	100.0	65.0	32.0	14.0	NA	NA	Perm, Consol w/perm, CMR @15 bar
SOMERVILLE TRACT	BENDIX	MRAP-85-18	MKB-833/BULK	0.0	5.0	2.50	ML	Alluvium	NA	NA	NA	100.0	80.0	NA	NA	103.3	19.0	
BLM COMPOUND	BENDIX	MRAP-85-20	MKB-753/SS	0.0	2.0	1.00	OL	Alluvium	NA	10.8	2.62	100.0	80.0	41.0	7.0	NA	NA	Perm, CMR @15 bar
BLM COMPOUND	BENDIX	MRAP-85-20	MKB-836/BULK	0.0	3.0	1.50	OL	Alluvium	NA	NA	NA	100.0	71.0	NA	NA	101.9	18.9	
BLM COMPOUND	D&M	36SE91-058	2/SS	3.5	4.5	4.00	CL	Alluvium	NA	25.4	NA	NA	NA	40.7	20.0	NA	NA	
BLM COMPOUND	D&M	36SE91-058	3B/SS	4.5	5.5	5.00	CL	Alluvium	NA	31.6	NA	NA	NA	36.0	16.6	NA	NA	
BLM COMPOUND	D&M	36SE91-058	4B/SS	9.0	10.5	9.75	ML	Alluvium	NA	27.1	NA	100.0	79.2	NA	NA	NA	NA	
VALLEY BOTTOM	BENDIX	MRAP-85-21	MKB-756/SS	0.0	2.0	1.00	OL	Alluvium	NA	7.5	2.60	NA	NA	30.0	10.0	NA	NA	Perm, CMR @15 bar
VALLEY BOTTOM	BENDIX	MRAP-85-21	MKB-826/BULK	0.0	3.0	1.50	SM	Tails-snd	NA	NA	NA	100.0	43.0	NA	NA	115.2	13.6	
VALLEY BOTTOM	D&M	31SW91-001	3/SS	3.5	4.8	4.15	CL	Alluvium	NA	12.8	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-001	7/SS	8.5	10.0	9.25	CL	Alluvium	NA	15.8	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-001	8/SS	13.5	14.3	13.90	CL	Alluvium	NA	15.3	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-001	11/BULK	24.0	25.0	24.50	GC	Alluvium	NA	16.5	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-023	2/SS	8.6	8.9	8.75	SC	Alluvium	NA	9.9	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-023	3/SS	13.5	13.8	13.65	SW	Alluvium	NA	6.4	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-030	1/SS	4.0	6.0	5.00	CL	Alluvium	NA	10.9	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-030	2/SS	9.5	11.0	10.25	SC	Alluvium	NA	12.5	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	31SW91-030	3/SS	14.3	14.7	14.50	Km	Shale	NA	12.3	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-071	1/SS	3.5	4.0	3.75	SM	Alluvium	NA	10.2	NA	83.1	46.7	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-071	4/SS	9.5	10.0	9.75	SP	Alluvium	NA	8.1	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-071	6/SS	14.0	14.5	14.25	SM	Alluvium	NA	13.8	NA	60.4	18.5	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-072	1/SS	4.5	5.0	4.75	ML	Alluvium	NA	10.7	NA	97.3	71.3	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-084a	3/SS	5.0	5.5	5.25	ML	Alluvium[?]	NA	9.5	NA	100.0	51.4	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-084a	4/SS	10.0	10.5	10.25	ML	Alluvium[?]	NA	9.9	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	36SE91-084a	5/SS	13.5	14.5	14.00	CL	Alluvium[?]	NA	13.2	NA	NA	NA	NA	NA	NA	NA	
VALLEY BOTTOM	D&M	TP-13	-/BULK	5.0	5.0	5.00	GC	Alluvium	NA	20.2	NA	65.1	41.9	38.4	17.6	116.1	13.2	
MAIN MILLSITE	D&M	31SW91-055b	8/SS	6.0	6.5	6.25	CL	Alluvium	NA	27.7	NA	NA	NA	NA	NA	NA	NA	
MAIN MILLSITE	D&M	31SW91-055b	9A/SS	9.3	9.8	9.55	CL	Alluvium	NA	26.8	NA	NA	NA	NA	NA	NA	NA	
MAIN MILLSITE	D&M	31SW91-055b	10/SS	13.5	15.0	14.25	CL	Alluvium	NA	31.6	NA	NA	NA	NA	NA	NA	NA	
MAIN MILLSITE	D&M	36SE91-061	2/SS	3.8	4.5	4.15	CL	Alluvium(Shale?)	NA	23.9	NA	NA	NA	NA	NA	NA	NA	
MAIN MILLSITE	D&M	36SE91-067a	1B/SS	0.5	2.0	1.25	CL	Fill	NA	11.8	NA	NA	NA	46.3	23.9	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-011	3/SS	10.0	10.5	10.25	CL	Alluvium(Shale?)	NA	23.6	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-021	4/SS	8.5	9.0	8.75	CL	Alluvium	NA	7.3	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-022	4/SS	10.0	10.5	10.25	CL	Alluvium	NA	10.8	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-036	1/SS	2.0	2.5	2.25	CL	Alluvium	NA	8.6	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-038	3/SS	9.0	10.3	9.65	CL	Alluvium	NA	14.2	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-038	4/SS	10.3	11.0	10.65	SC	Alluvium	NA	14.6	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-038	5/SS	14.0	14.2	14.10	CL	Alluvium	NA	12.2	NA	NA	NA	NA	NA	NA	NA	
SOUTH VALLEY WALL	D&M	31SW91-054	4/SS	4.5	5.0	4.75	CL	Alluvium	NA	11.4	NA	100.0	80.4	43.3	23.4	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-016	1B/SS	3.5	5.5	4.50	CL	Alluvium[?]	NA	12.9	NA	NA	NA	36.3	17.1	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-016	2B/SS	8.5	10.5	9.50	CL	Alluvium[?]	NA	20.1	NA	100.0	97.8	NA	NA	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-033	1/SS	2.0	4.0	3.00	CL	Alluvium	NA	14.2	NA	NA	NA	NA	NA	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-033	3/SS	9.0	11.0	10.00	CL	Alluvium	NA	10.9	NA	NA	NA	33.6	13.8	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-053	3B/SS	8.5	9.0	8.75	CL	Alluvium[?]	NA	21.2	NA	NA	NA	NA	NA	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-053	6B/SS	14.5	15.0	14.75	CL	Alluvium[?]	NA	23.8	2.70	NA	NA	48.3	25.0	NA	NA	
NORTH VALLEY WALL	D&M	31SW91-053	7B/SS	18.5	19.0	18.75	CL	Alluvium[?]	NA	23.8	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-073	[illegible]	3.5	3.8	3.65	CL	Alluvium	NA	11.0	NA	NA	NA	36.9	15.9	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-073	[illegible]	13.5	14.3	13.90	CL	Alluvium	NA	15.0	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-073	4/SS	20.0	20.5	20.25	CL	Alluvium	NA	30.1	NA	NA	NA	44.9	22.8	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-076	3/SS	5.0	5.5	5.25	CL	Alluvium	NA	23.0	NA	NA	NA	41.3	20.7	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-076	4/SS	9.5	10.0	9.75	CL	Alluvium	NA	17.5	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-076	6/SS	15.0	15.5	15.25	CL	Alluvium	NA	16.6	NA	NA	NA	27.0	9.4	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-076	7/SS	20.0	20.5	20.25	CL	Alluvium	NA	19.1	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-077	2/SS	3.5	4.3	3.90	CL	Alluvium(Loess?)	NA	17.4	NA	NA	NA	49.9	23.7	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-077	3/SS	8.5	9.5	9.00	CL	Alluvium(Loess?)	NA	15.8	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-078	2/SS	8.5	9.5	9.00	CL	Alluvium	NA	18.0	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-078	3/SS	13.5	14.3	13.90	CL	Alluvium	NA	16.8	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-080	2/SS	5.0	6.0	5.50	CL	Alluvium	NA	15.9	NA	NA	NA	44.7	23.4	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-080	3/SS	10.0	10.8	10.40	SW	Alluvium	NA	6.9	NA	NA	NA	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-082	2/SS	3.5	4.0	3.75	SM	Alluvium	NA	6.9	NA	66.0	38.4	NA	NA	NA	NA	
BLM PROPERTY-NORT	D&M	36SE91-082	3/SS	8.5	10.5	9.50	CL	Alluvium[?]	NA	23.5	NA	NA	NA	NA	NA	NA	NA	

MRAP - 710002307 - GEOTECHNICAL DATA BASE FOR MONTICELLO MILLSITE CHARACTERIZATION -- R.N. MORRIS. CREATED 09/30/91. LAST UPDATED 11/22/91

AREA	DATA SOURC	BORING OR TEST PIT NUMBER	SAMPLE NUMBER & TYPE	TOP OF SAMPLE (FEET)	BASE OF SAMPLE (FEET)	SAMPLE MIDPOINT (FEET)	USCS SYMBOL	MATERIAL TYPE	IN-PLACE DRY DENSITY (PCF)	NATURAL MOISTURE CONTENT (PERCENT)	SPECIFIC GRAVITY	FRACTION PASSING #4 SIEVE (PERCENT)	FRACTION PASSING #200 SIEVE (PERCENT)	LIQUID LIMIT	PLASTICITY INDEX	ASTM D 698 MAXIMUM DRY DENSITY (PCF)	ASTM D 698 OPTIMUM MOISTURE CONTENT (PERCENT)	OTHER TESTS
BLM PROPERTY-NORT	D&M	TP-10	-/BULK	5.0	5.0	5.00	CL	Loess[?]	NA	10.9	NA	100.0	86.6	29.5	11.1	107.7	14.2	Mod Proct
BLM PROPERTY-NORT	D&M	TP-10	2/ST	6.0	6.5	6.25	CL	Loess[?]	91.7	8.2	NA	NA	NA	27.9	9.6	NA	NA	Unconf Comp
BLM PROPERTY-NORT	D&M	TP-10	4/ST	11.0	11.5	11.25	CL	Loess[?]	109.3	10.7	NA	NA	NA	43.8	21.6	NA	NA	Perm

KEY:

- USCS: Unified Soil Classification System group symbol, ASTM D 2487 or D2488 (For rocks, symbol indicates geologic unit)
- ASTM: Test designation of the American Society for Testing and Materials
- BENDIX: "Data Collection for Engineering for the Uranium Mill Tailings Site and Adjacent Peripheral Properties, Monticello, Utah." Bendix Field Engineering Corporation, September 1986
- D&M: "Final Report, Monticello Remedial Action Project, 1991 Millsite Characterization Study." Dames & Moore, September 17, 1991
- *: Sample taken from a test pit excavated next to the designated borehole
- [?]: Questionable value or identification

MATERIAL TYPE:

Tails-snd	Tailings sands
Tails-slm	Tailings slimes
Tails-snd/slm	Tailings sands and slimes, interbedded
Tails-snd&slm	Tailings sands and slimes, mixed
Cover	Cover material in place on tailings piles
MVP spoils	Material removed from Monticello Vicinity Properties
Alluvium	Miscellaneous surficial deposits, mostly stream-laid
Loess	Windblown fine-grained deposits
Shale	Mancos Shale, usually weathered
Sandstone	Dakota Sandstone
Fill	Miscellaneous man-made fill

OTHER TESTS:

Mod Proct	Modified Proctor compaction
Unconf Comp	Unconfined compressive strength
Dir Shear	Direct shear, consolidated-drained
Triax-CUPP	Triaxial shear, consolidated-undrained with pore pressure measurements
Consol	One-dimensional consolidation
Perm	Permeability, falling-head or flexible-membrane
CMR	Capillary moisture rise

SAMPLE TYPES:

BULK	Disturbed bag sample of loose cuttings or material from test pit
SS	Disturbed sample from 3.0" O.D. standard split-spoon drive sampler
ST	Relatively undisturbed sample from 3.0" O.D. thin-walled (Shelby) tube sampler
U	Relatively undisturbed sample from Dames & Moore Type "U" ring-lined drive sampler

All data in this table compiled or interpreted from consultant's reports by R.N. Morris, Chem-Nuclear Geotech, Inc., October 1991. Checked by L.H. Golden & corrected by R.N. Morris, November 1991.

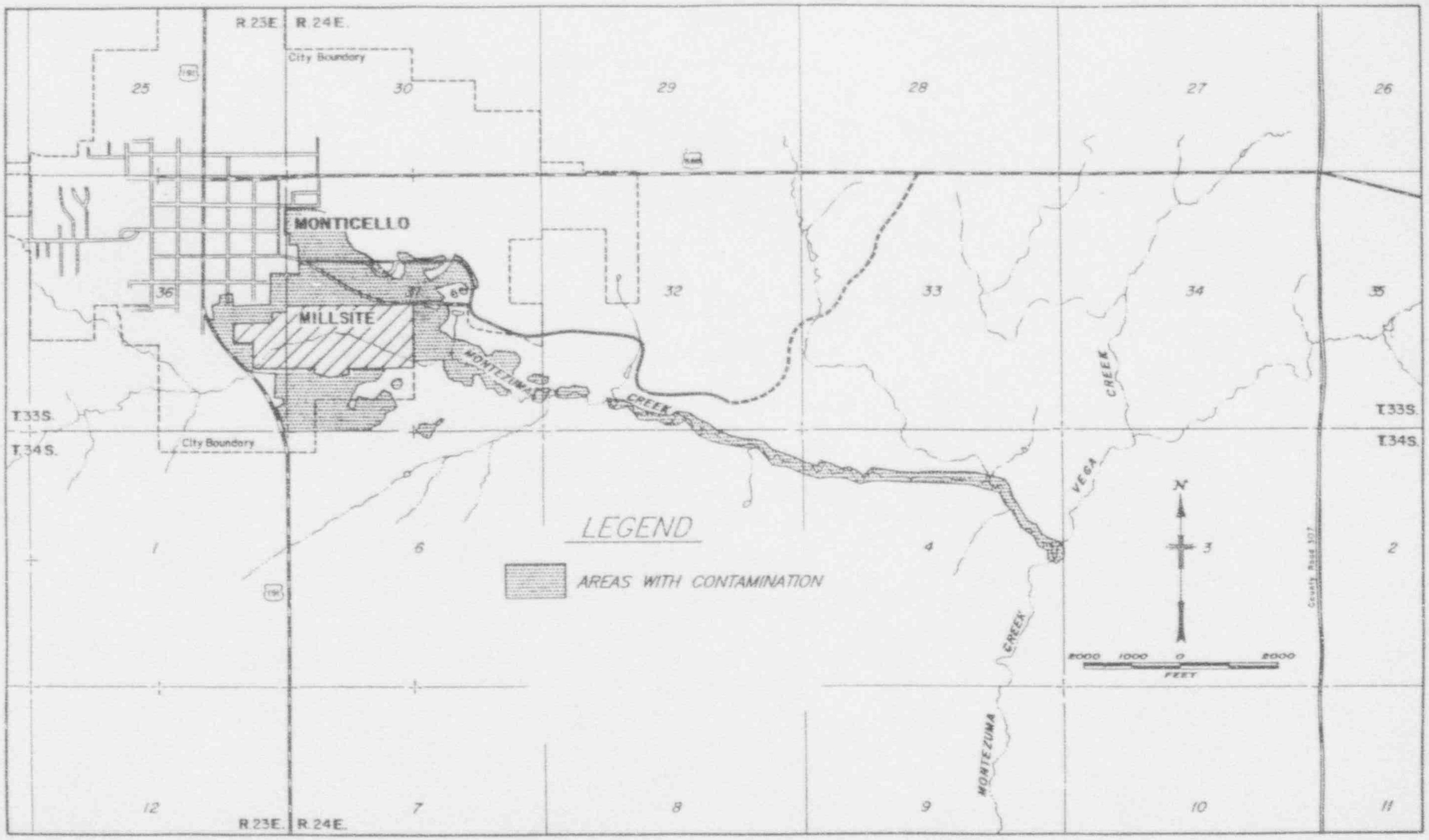
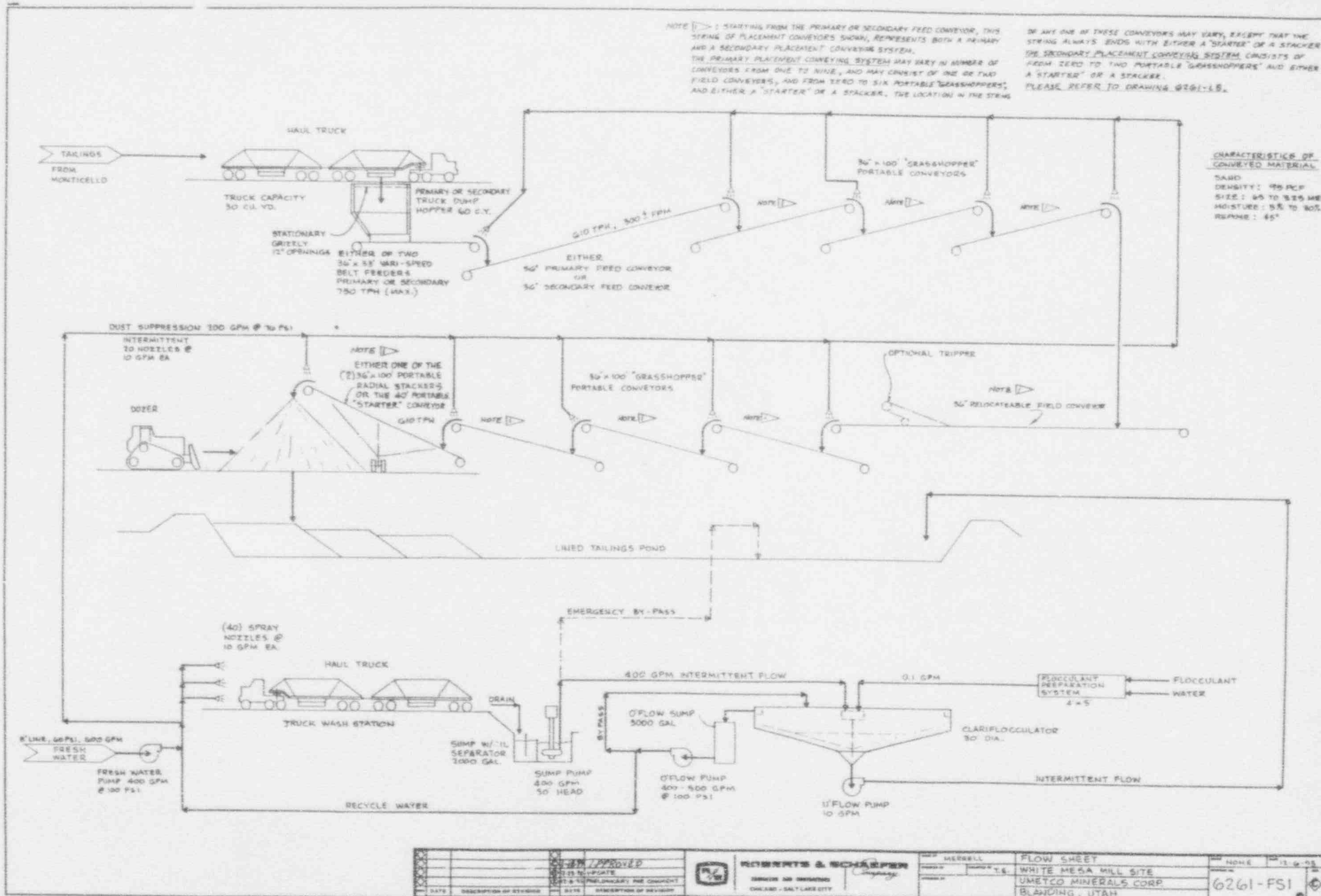
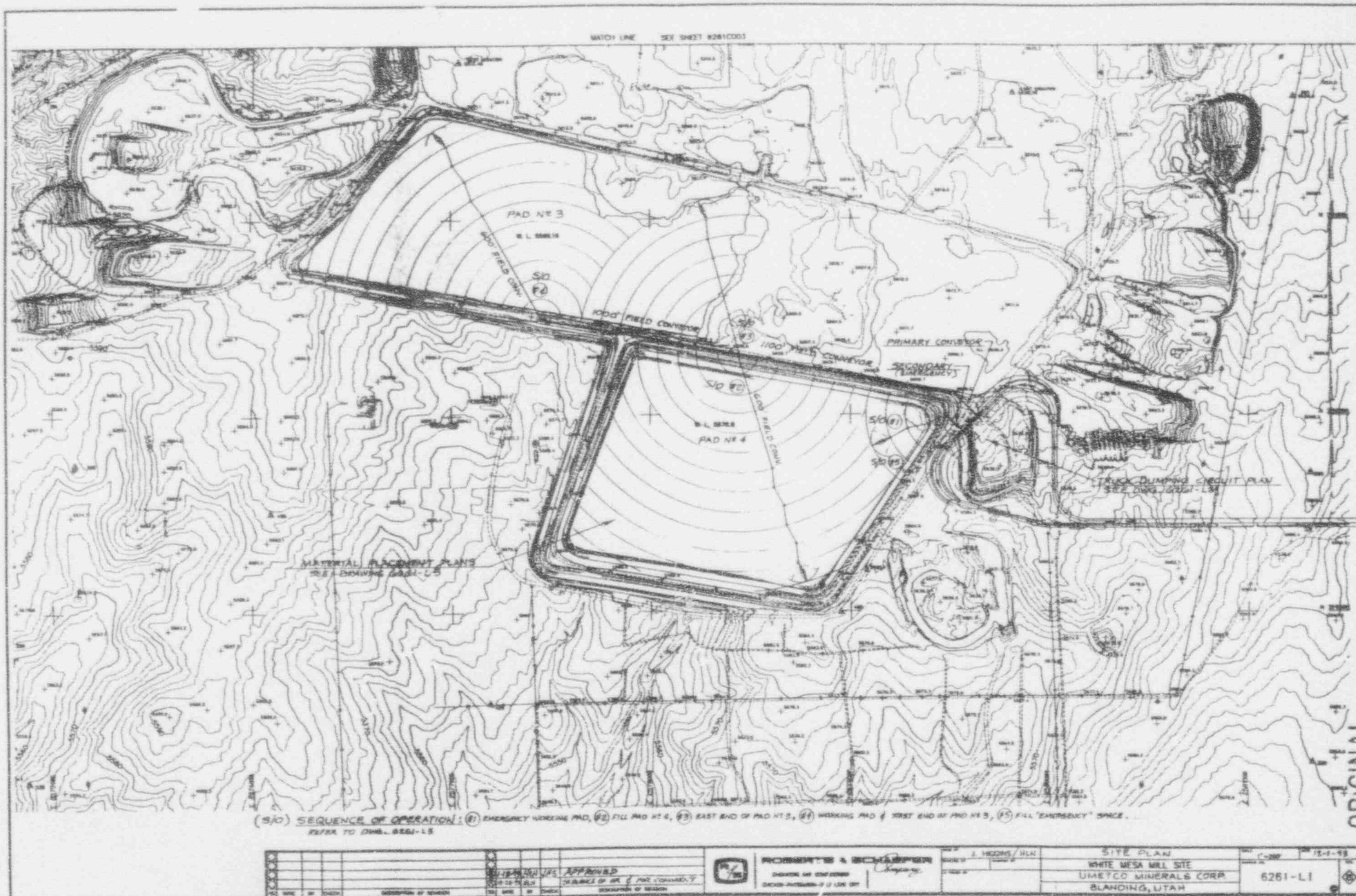
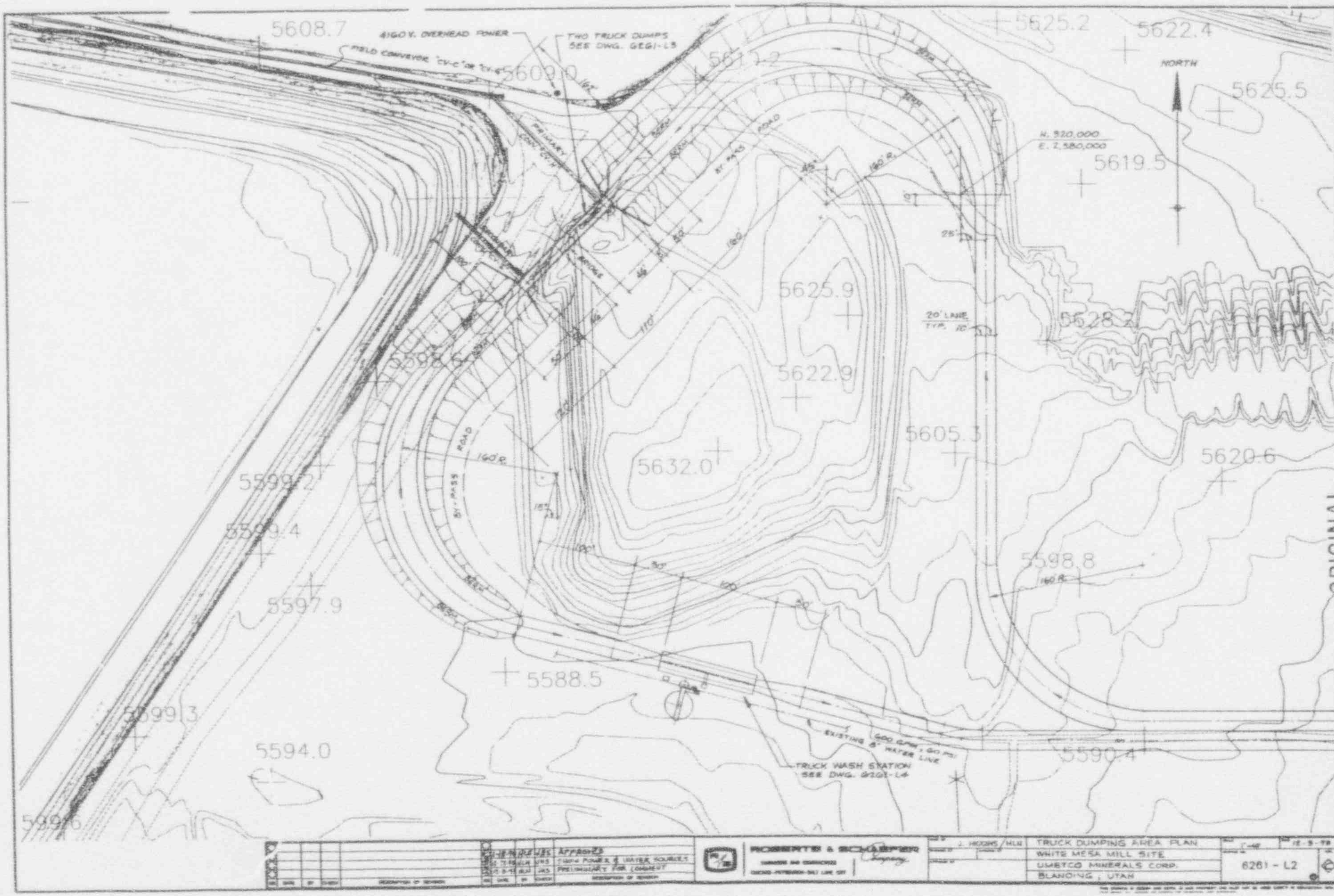


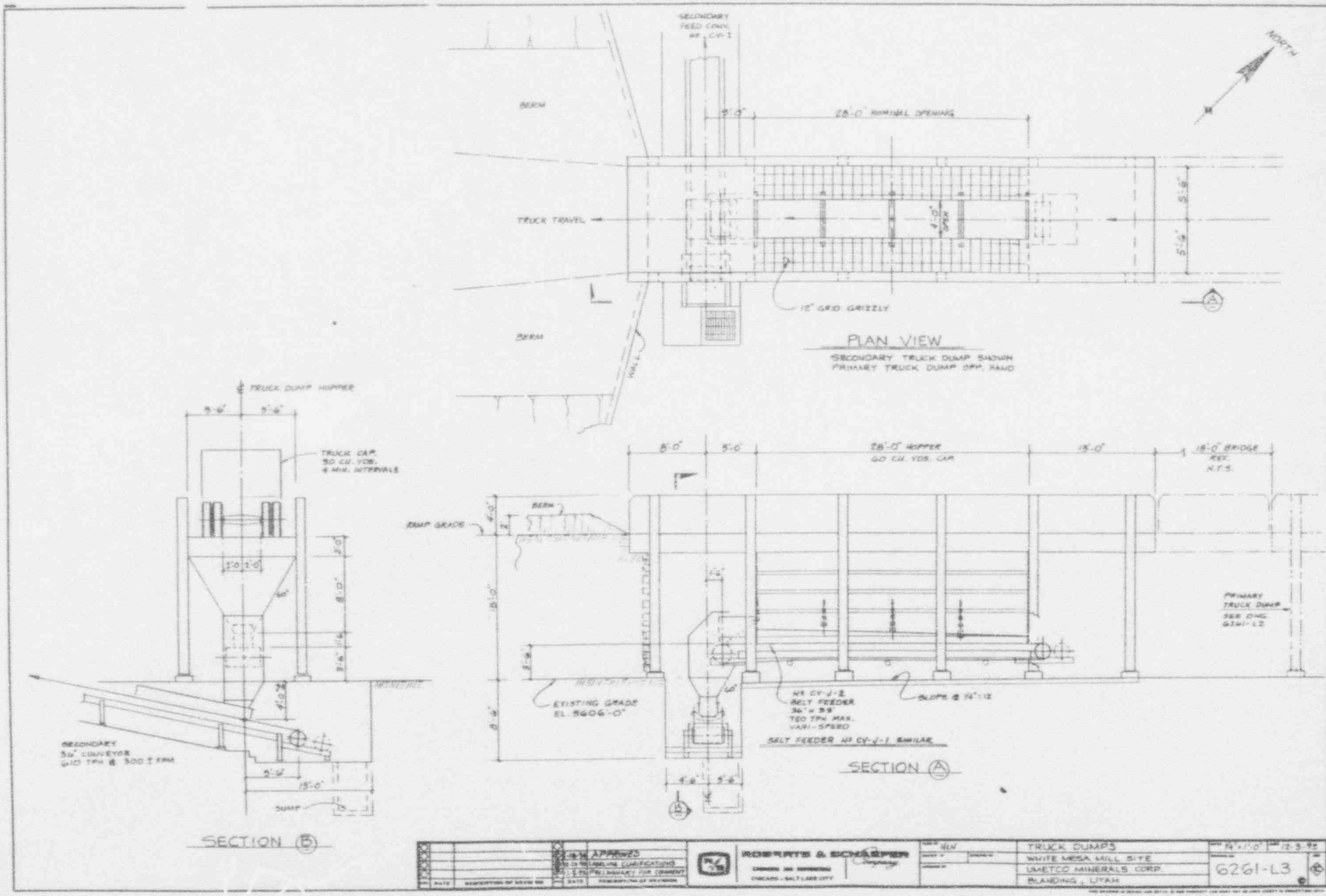
Figure 1-3. Contaminated Areas Under Investigation


NOTE 1: STARTING FROM THE PRIMARY OR SECONDARY FEED CONVEYOR, THIS STRING OF PLACEMENT CONVEYORS SHOWN, REPRESENTS BOTH A PRIMARY AND A SECONDARY PLACEMENT CONVEYING SYSTEM.
THE PRIMARY PLACEMENT CONVEYING SYSTEM MAY VARY IN NUMBER OF CONVEYORS FROM ONE TO NINE, AND MAY CONSIST OF ONE OR TWO FIELD CONVEYORS, AND FROM ZERO TO SIX PORTABLE "GRASSHOPPERS", AND EITHER A "STARTER" OR A STACKER. THE LOCATION IN THE STRING OF ANY ONE OF THESE CONVEYORS MAY VARY, EXCEPT THAT THE STRING ALWAYS ENDS WITH EITHER A "STARTER" OR A STACKER.
THE SECONDARY PLACEMENT CONVEYING SYSTEM CONSISTS OF FROM ZERO TO TWO PORTABLE "GRASSHOPPERS" AND EITHER A "STARTER" OR A STACKER.
PLEASE REFER TO DRAWING 6261-L8.
CHARACTERISTICS OF CONVEYED MATERIAL
SAND
DENSITY: 95 PCF
SIZE: 65 TO 325 MESH
MOISTURE: 5% TO 30%
REPOSE: 45°
TAILINGS FROM MONTICELLO
HAUL TRUCK
TRUCK CAPACITY 30 CU. YD.
PRIMARY OR SECONDARY TRUCK DUMP HOPPER 60 C.Y.
STATIONARY GRIZZLY 12" OPENINGS
EITHER OF TWO 36" x 38' VARI-SPEED BELT FEEDERS PRIMARY OR SECONDARY 750 TPH (MAX.)
610 TPH, 300 ± FPM
EITHER
36" PRIMARY FEED CONVEYOR
OR
36" SECONDARY FEED CONVEYOR
36" x 100' "GRASSHOPPER" PORTABLE CONVEYORS
NOTE
DUST SUPPRESSION 200 GPM @ 70 PSI
INTERMITTENT 20 NOZZLES @ 10 GPM EA.
DOZER
EITHER ONE OF THE (2) 36" x 100' PORTABLE RADIAL STACKERS OR THE 40' PORTABLE "STARTER" CONVEYOR
610 TPH
36" x 100' "GRASSHOPPER" PORTABLE CONVEYORS
OPTIONAL TRIPPER
36" RELOCATEABLE FIELD CONVEYOR
LINED TAILINGS POND
EMERGENCY BY-PASS
(40) SPRAY NOZZLES @ 10 GPM EA.
HAUL TRUCK
TRUCK WASH STATION
DRAIN
8" LINE, 60 PSI, 600 GPM
FRESH WATER
FRESH WATER PUMP 400 GPM @ 100 PSI
SUMP W/OIL SEPARATOR 2000 GAL.
SUMP PUMP 400 GPM 50 HEAD
BY-PASS
400 GPM INTERMITTENT FLOW
O'FLOW SUMP 5000 GAL.
O'FLOW PUMP 400 - 500 GPM @ 100 PSI
0.1 GPM
FLOCCULANT PREPARATION SYSTEM 4 x 5
FLOCCULANT
WATER
CLARIFLOCCULATOR 30' DIA.
U'FLOW PUMP 10 GPM
INTERMITTENT FLOW
RECYCLE WATER
APPROVED
UPDATE
PRELIMINARY FOR COMMENT
DATE
DESCRIPTION OF REVISION
ROBERTS & SCHAEFER Company
CHICAGO - SALT LAKE CITY
MERRELL
T.S.
FLOW SHEET
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
NONE
12-6-93
6261-FS1

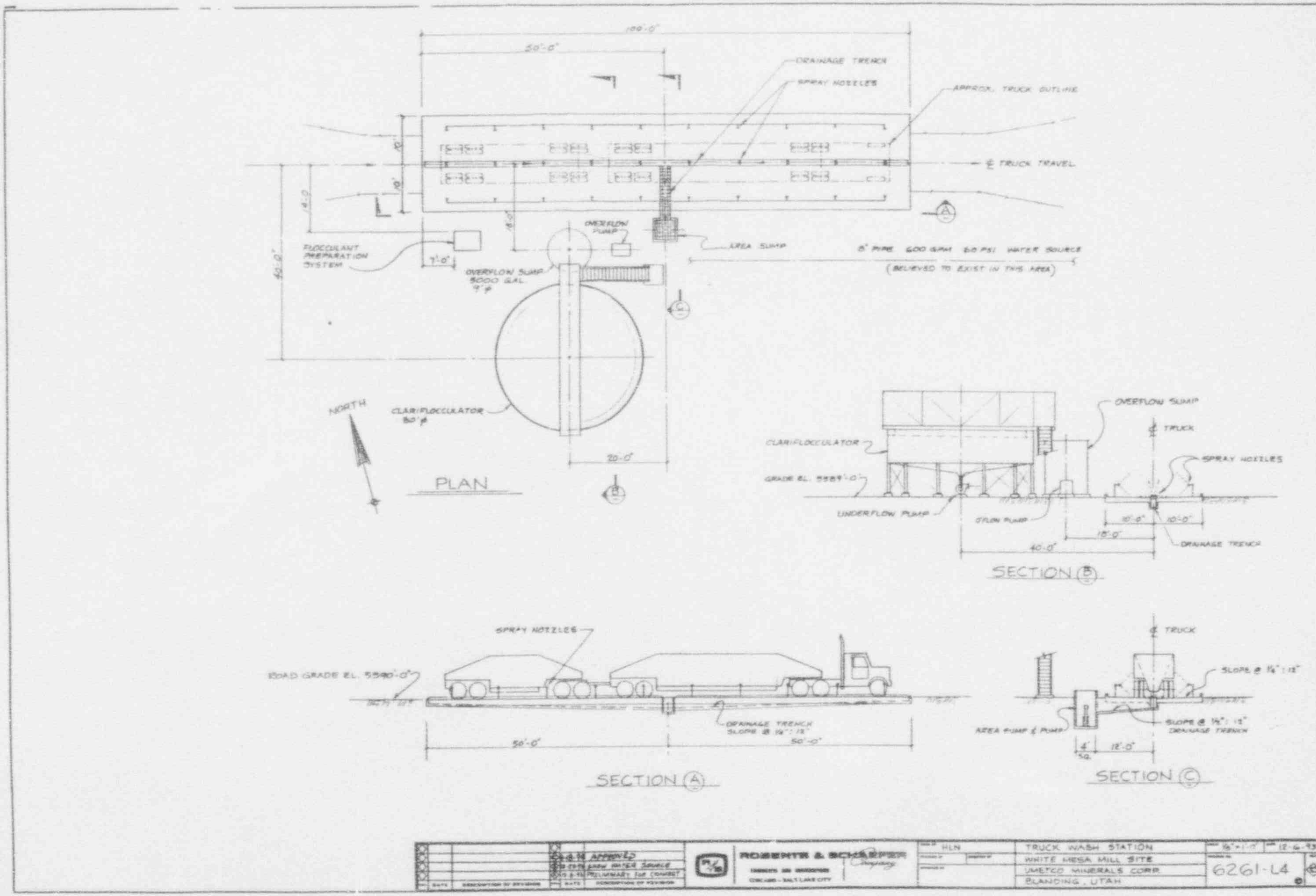
ORIGINAL


MATCH LINE SEE SHEET 6261C003
PAD Nº 3
PAD Nº 4
600' FIELD CONV.
1000' FIELD CONVEYOR
1100' FIELD CONVEYOR
PRIMARY CONVEYOR
SECONDARY
TRUCK DUMPING CIRCUIT PLAN
MATERIAL PLACEMENT PLANS
(S/O) SEQUENCE OF OPERATION: (#1) EMERGENCY WORKING PAD, (#2) FILL PAD Nº 4, (#3) EAST END OF PAD Nº 3, (#4) WORKING PAD & WEST END OF PAD Nº 3, (#5) FILL "EMERGENCY" SPACE.
REFER TO DWG. 6261-L5
APPROVED
ROBERTS & SCHAEFER Company
J. HIGGINS/HLN
SITE PLAN
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
6261-L1
ORIGINAL


ORIGINAL
NORTH
4160 V. OVERHEAD POWER
FIELD CONVEYOR "CV-C" OR "CV-6"
TWO TRUCK DUMPS
SEE DWG. G6G1-L3
PRIMARY
BY-PASS ROAD
160' R.
N. 320,000
E. 2,580,000
20' LANE
TYP. 10'
TRUCK WASH STATION
SEE DWG. G2G1-L4
EXISTING 8" WATER LINE
600 GPM, 60 PSI
5608.7
5609.0
5625.2
5622.4
5625.5
5619.5
5625.9
5628.2
5622.9
5605.3
5632.0
5620.6
5598.8
5598.6
5599.2
5599.4
5597.9
5588.5
5599.3
5594.0
5590.4
ROBERTS & SCHAEFER Company
APPROVED
TRUCK DUMPING AREA PLAN
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
6261 - L2


NORTH
SECONDARY FEED CONV. Nº CV-1
BERM
TRUCK TRAVEL
5'-0"
28'-0" NOMINAL OPENING
5'-6"
4'-0" OPEN
12" GRID GRIZZLY
WALL
PLAN VIEW
SECONDARY TRUCK DUMP SHOWN
PRIMARY TRUCK DUMP OPP. HAND
℄ TRUCK DUMP HOPPER
TRUCK CAP. 30 CU. YDS. 4 MIN. INTERVALS
SECONDARY 36" CONVEYOR 610 TPH @ 300 FPM
SUMP
SECTION B
8'-0"
28'-0" HOPPER
60 CU. YDS. CAP.
13'-0"
18'-0" BRIDGE REF. N.T.S.
RAMP GRADE
BERM
PRIMARY TRUCK DUMP SEE DWG. 6261-L2
EXISTING GRADE EL. 5606'-0"
Nº CV-J-2 BELT FEEDER 36" x 35' 750 TPH MAX. VARI-SPEED
SLOPE @ 1/4":12
BELT FEEDER Nº CV-J-1 SIMILAR
SECTION A
APPROVED
ROBERTS & SCHAEFER Company
CHICAGO - SALT LAKE CITY
TRUCK DUMPS
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
1/4"=1'-0"
12-3-92
6261-L3

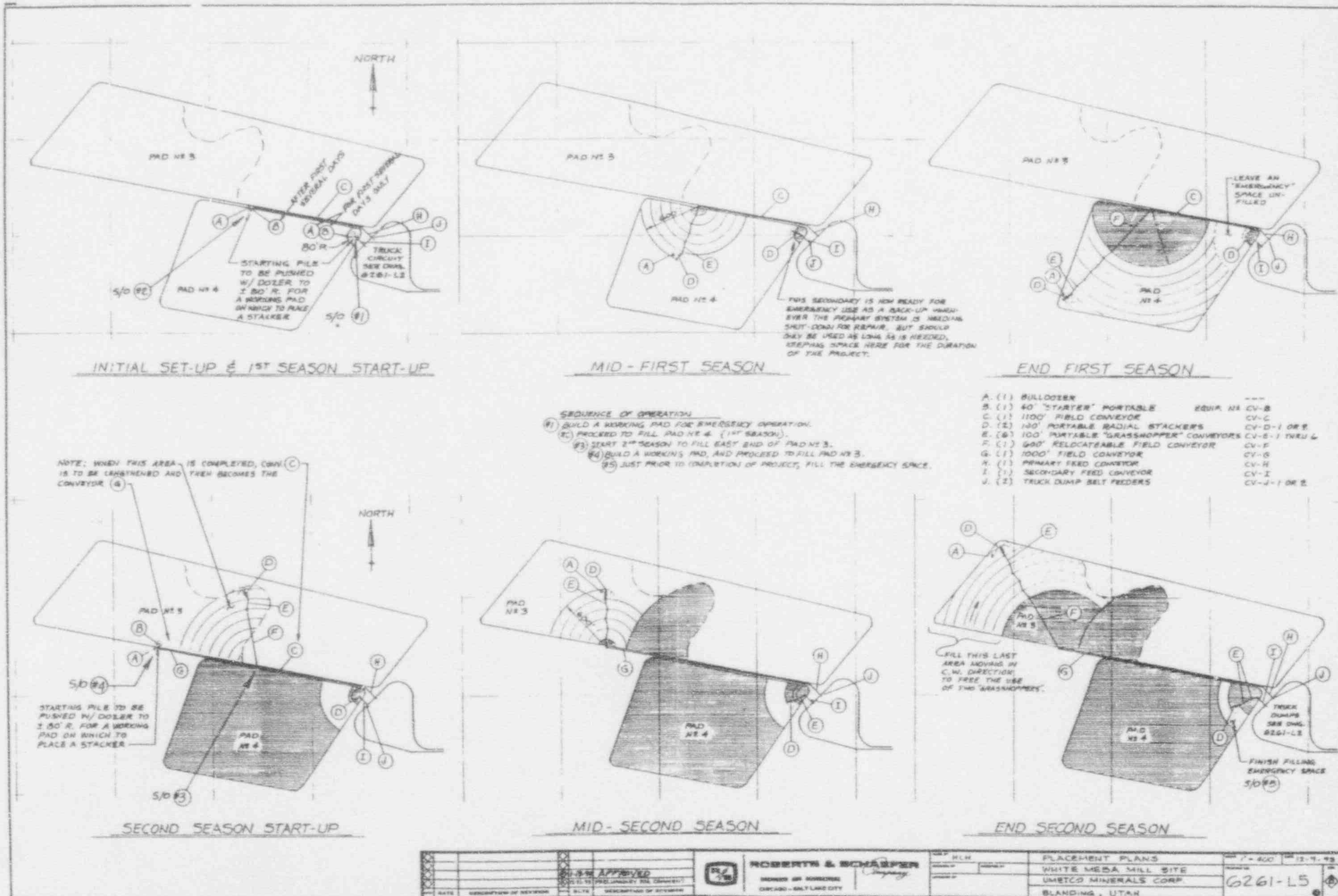
ORIGINAL



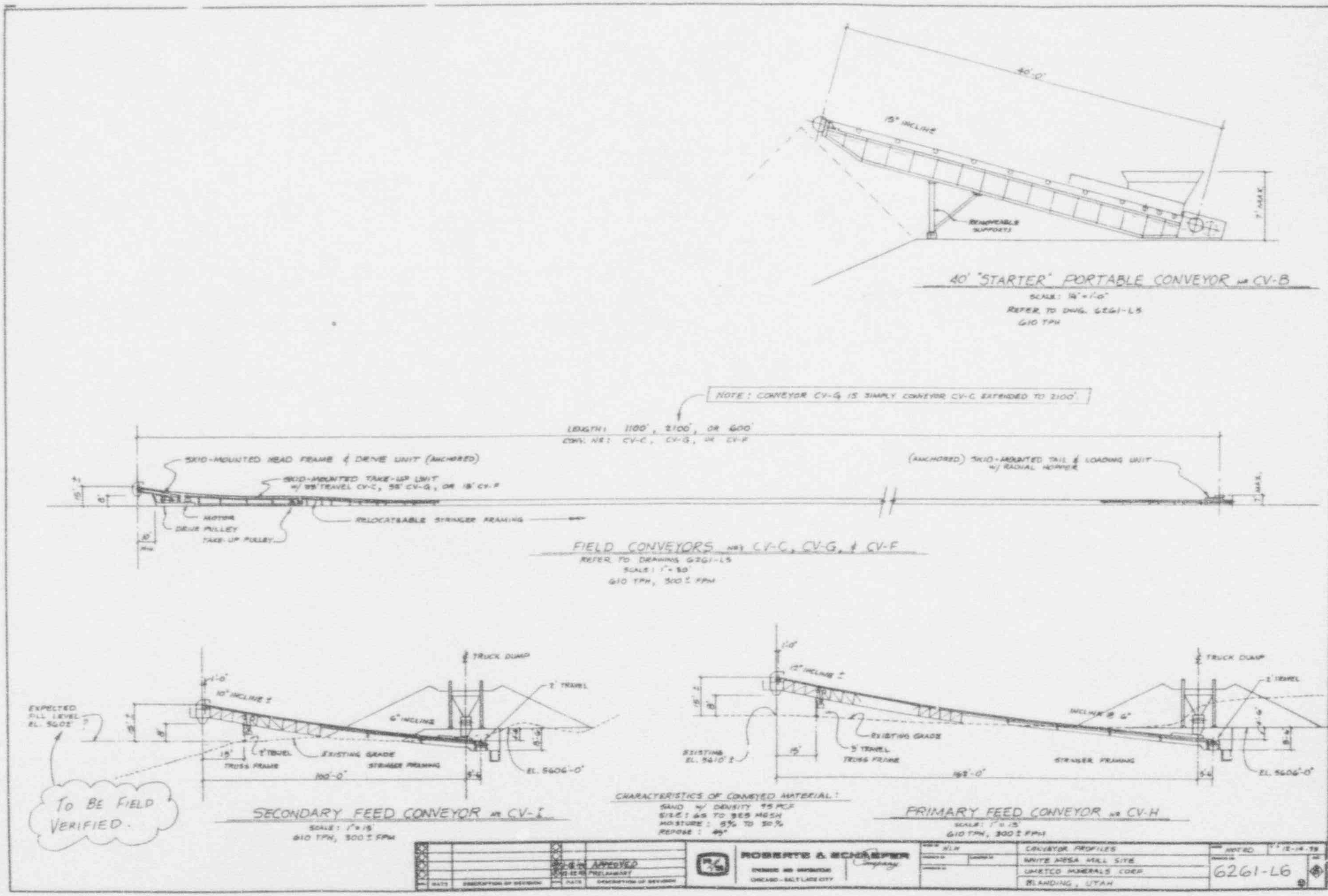
100'-0"
50'-0"
DRAINAGE TRENCH
SPRAY NOZZLES
APPROX. TRUCK OUTLINE
℄ TRUCK TRAVEL
FLOCCULANT PREPARATION SYSTEM
7'-0"
OVERFLOW PUMP
AREA SUMP
8" PIPE 600 GPM 60 PSI WATER SOURCE
(BELIEVED TO EXIST IN THIS AREA)
OVERFLOW SUMP 5000 GAL.
CLARIFLOCCULATOR 30' ⌀
NORTH
20'-0"
40'-0"
PLAN
OVERFLOW SUMP
℄ TRUCK
CLARIFLOCCULATOR
SPRAY NOZZLES
GRADE EL. 5589'-0"
UNDERFLOW PUMP
O'FLOW PUMP
10'-0"
15'-0"
DRAINAGE TRENCH
SECTION B
SPRAY NOZZLES
ROAD GRADE EL. 5590'-0"
DRAINAGE TRENCH SLOPE @ 1/4":12"
50'-0"
SECTION A
SLOPE @ 1/4":12"
AREA PUMP & PUMP
SLOPE @ 1/4":12" DRAINAGE TRENCH
4' SQ.
12'-0"
SECTION C
ROBERTS & SCHAEFER Company
CHICAGO - SALT LAKE CITY
HLN
TRUCK WASH STATION
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
12-6-93
6261-L4
B

ORIGINAL

ORIGINAL



NORTH
PAD NO 3
PAD NO 4
STARTING PILE TO BE PUSHED W/ DOZER TO ± 80' R. FOR A WORKING PAD ON WHICH TO PLACE A STACKER
TRUCK CIRCUIT SEE DWG. 6261-L2
INITIAL SET-UP & 1ST SEASON START-UP
THIS SECONDARY IS NOW READY FOR EMERGENCY USE AS A BACK-UP WHENEVER THE PRIMARY SYSTEM IS NEEDING SHUT-DOWN FOR REPAIR, BUT SHOULD ONLY BE USED AS LONG AS IS NEEDED, KEEPING SPACE HERE FOR THE DURATION OF THE PROJECT.
MID - FIRST SEASON
LEAVE AN "EMERGENCY" SPACE UN-FILLED
END FIRST SEASON
SEQUENCE OF OPERATION
#1 BUILD A WORKING PAD FOR EMERGENCY OPERATION.
#2 PROCEED TO FILL PAD NO 4 (1ST SEASON).
#3 START 2ND SEASON TO FILL EAST END OF PAD NO 3.
#4 BUILD A WORKING PAD, AND PROCEED TO FILL PAD NO 3.
#5 JUST PRIOR TO COMPLETION OF PROJECT, FILL THE EMERGENCY SPACE.
A. (1) BULLDOZER ---
B. (1) 40' "STARTER" PORTABLE EQUIP. NO CV-B
C. (1) 1100' FIELD CONVEYOR CV-C
D. (2) 140' PORTABLE RADIAL STACKERS CV-D-1 OR 2
E. (6) 100' PORTABLE "GRASSHOPPER" CONVEYORS CV-E-1 THRU 6
F. (1) 600' RELOCATEABLE FIELD CONVEYOR CV-F
G. (1) 1000' FIELD CONVEYOR CV-G
H. (1) PRIMARY FEED CONVEYOR CV-H
I. (1) SECONDARY FEED CONVEYOR CV-I
J. (2) TRUCK DUMP BELT FEEDERS CV-J-1 OR 2
NOTE: WHEN THIS AREA IS COMPLETED, CONV. C IS TO BE LENGTHENED AND THEN BECOMES THE CONVEYOR G
STARTING PILE TO BE PUSHED W/ DOZER TO ± 80' R. FOR A WORKING PAD ON WHICH TO PLACE A STACKER
SECOND SEASON START-UP
MID - SECOND SEASON
FILL THIS LAST AREA MOVING IN C.W. DIRECTION TO FREE THE USE OF TWO "GRASSHOPPERS"
FINISH FILLING EMERGENCY SPACE
END SECOND SEASON
ROBERTS & SCHAEFER Company
CHICAGO - SALT LAKE CITY
PLACEMENT PLANS
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
6261-L5



40'-0"
15° INCLINE
REMOVABLE SUPPORTS
7' MAX.
40' "STARTER" PORTABLE CONVEYOR No CV-B
SCALE: 1/4"=1'-0"
REFER TO DWG. 6261-L5
610 TPH
NOTE: CONVEYOR CV-G IS SIMPLY CONVEYOR CV-C EXTENDED TO 2100'.
LENGTH: 1100', 2100', OR 600'
CONV. NO: CV-C, CV-G, OR CV-F
SKID-MOUNTED HEAD FRAME & DRIVE UNIT (ANCHORED)
SKID-MOUNTED TAKE-UP UNIT W/ 35' TRAVEL CV-C, 55' CV-G, OR 18' CV-F
MOTOR
DRIVE PULLEY
TAKE-UP PULLEY
RELOCATABLE STRINGER FRAMING
(ANCHORED) SKID-MOUNTED TAIL & LOADING UNIT W/ RADIAL HOPPER
FIELD CONVEYORS NOS CV-C, CV-G, & CV-F
REFER TO DRAWING 6261-L5
SCALE: 1"=30'
610 TPH, 300± FPM
EXPECTED FILL LEVEL EL. 5602 ?
TO BE FIELD VERIFIED.
10° INCLINE ±
6° INCLINE
TRUCK DUMP
2' TRAVEL
3' TRAVEL
TRUSS FRAME
EXISTING GRADE
STRINGER FRAMING
100'-0"
EL. 5606'-0"
SECONDARY FEED CONVEYOR No CV-I
SCALE: 1"=15'
610 TPH, 300± FPM
CHARACTERISTICS OF CONVEYED MATERIAL:
SAND W/ DENSITY 95 PCF
SIZE: 65 TO 325 MESH
MOISTURE: 5% TO 30%
REPOSE: 45°
12° INCLINE ±
INCLINE 6°
EXISTING GRADE
EXISTING EL. 5610' ±
3' TRAVEL
TRUSS FRAME
STRINGER FRAMING
193'-0"
EL. 5606'-0"
PRIMARY FEED CONVEYOR No CV-H
SCALE: 1"=15'
610 TPH, 300± FPM
APPROVED
PRELIMINARY
DATE
DESCRIPTION OF REVISION
ROBERTS & SCHAEFER Company
ENGINEERS AND CONTRACTORS
CHICAGO - SALT LAKE CITY
CONVEYOR PROFILES
WHITE MESA MILL SITE
UMETCO MINERALS CORP.
BLANDING, UTAH
12-14-78
6261-L6

ORIGINAL